THE PRACTICE OF GROUNDING

MEDIATING BETWEEN UNSTABLE SOIL AND A RELOCATING CITY

by Louis Distler; Anneke Sandow I Master Thesis 2026

Chalmers School of Architecture + Department of Architecture + Civil Engineering

Examiner: Naima Callenberg I Supervisor: Daniel Norell

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Architectural Experimentation

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Abstract

This thesis investigates the symbolic and material act of grounding in architecture, rethinking how buildings meet the earth beyond the standardised logic of concrete foundations. It considers the foundation as both an ecological and expressive element, shifting attention from what rises above the ground to the conditions beneath it. Central to this inquiry is the distinction between ‘grounding’ – the symbolic relationship between building and earth - and 'founding' – its technical and constructive realisation.

Rather than providing neutral and passive support, the ground is a living, active and often unstable element that challenges the concepts of grounding and founding. Climatic, geological, and anthropogenic transformations increasingly render the soil dynamic and unpredictable, demanding a careful negotiation between instability of the ground and adaptability of foundations.

The project is located in Kiruna, Sweden, where decades of iron ore mining have caused physical and territorial instability, including a substantial “deformation zone” where the ground is sinking, resulting in a gradual relocation of the city. The “relocation” process in fact consists in buildings in the zone being demolished and new buildings being erected east of the zone. The thesis addresses this condition through the design of a building that accompanies the process by gathering, sorting, and disseminating elements and materials from demolished buildings in the deformation zone of Old Kiruna. Embracing this “movement” as an architectural premise, the mobile and adaptable design shifts with the changing urban landscape, constantly renegotiating its relationship with the ground. Thus, grounding is presented as a recurring, temporary act rather than a permanent one.

Developed through a research-by-design approach combining theoretical inquiry, precedent analysis, and material exploration, the design proposal translates the instability of the site into an architectural system capable of movement and adaptation.

Keywords: foundation, Kiruna, movement, adaptation, recycling rentre

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Reading Instructions

The booklet begins with an introduction outlining our motivation and the topic's relevance within contemporary architectural discourse, followed by a theoretical background that establishes the basis for discussion. The knowledge gathered in this section leads into our manifesto, [working title], which serves as the conceptual guide for the presented design proposal.

Throughout the work, a colour-coding system is used to distinguish between the two primary actors — ground and building — as well as between background and design:

- Blue: Ground, Background
- Brown: Building, Design

C=83 M=59 Y=25 K=5

C=39 M=73 Y=68 K=19

Glossary

The research process revealed the challenge of identifying precise terminology for the architectural elements and symbolic dimensions under discussion. Given that the field is characterised by concepts that are open to subjective interpretation and frequently carry multiple meanings, some definitions are required. While these definitions are not universally valid, they are intended to provide clarity for this thesis.

datum

A visual or spatial element that organises and unifies a composition by acting as a reference point to which other elements relate (Ching, 2014).

foundation

The term 'foundation' is employed to denote the physical base of a structure that connects it to the ground. In this thesis, it focuses specifically on the engineering aspects of founding a building.

found/ founding

– “to bring something into existence” ("founded," n.d.). In this thesis it refers to bringing the building into existence, as it couldn’t stand without being founded.

ground

The ground is “the thing you walk on” (Kipnis, 2014, 11:55 min.). So, the solid surface of the earth. The term is frequently characterised in conjunction with the term 'earth'.

grounding

‘Grounding' is a design principle that refers to the relationship between a building and the land it occupies. It is about the symbolic and architectural connection with the site.

land

In contrast to ground, land is defined as the “policies of social, political and legal life” (Kipnis, 2014, 12:01 min.) associated with the ground. Thus, the concept of land concerns a geographical area where the interaction between political and social structures and the physical environment is particularly significant.

program

Architects describe through a program the intended function of an architectural building structure. It is a detailed breakdown of the spaces within the project.

vernacular

In architecture, 'vernacular' is a word that describes a building method that uses materials found in the local area. “[...] They often seem to virtually grow out of their environment, and in this way directly impact the face of their surroundings and landscapes” (Vernacular architecture : atlas for living throughout the world, 2019, p. 7). Furthermore, given that vernacular architecture is informed by local conditions and subject to change, the description of a particular building offers only a snapshot of an ongoing process.

Introduction

This project is motivated by a personal fascination with materials research and a growing frustration with the highly restricted and standardised nature of contemporary construction practices. When designing building foundations, architects often almost automatically specify a concrete strip foundation and/or a foundation slab (Fig. 01). These solutions have become so embedded in construction culture that they are rarely critically reconsidered.

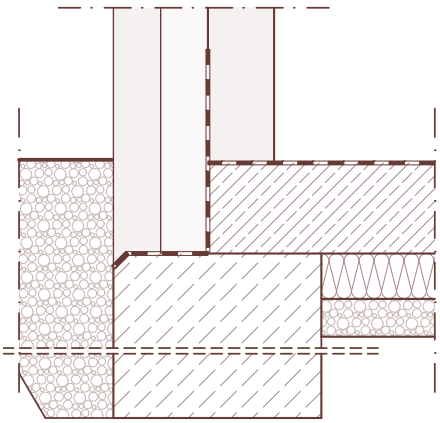
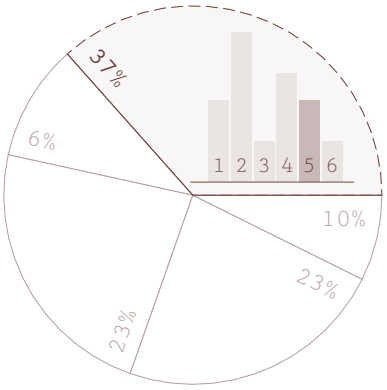


Fig. 01 Standardised Detail

Current architectural discourse on material innovation tends to focus primarily on what happens above the ground. Yet what lies beneath remains largely overlooked. As a result, foundations are often treated as purely technical elements rather than as meaningful components of architectural design.

Furthermore, it seems that we have lost the ability to make architectural statements through the design of a building's foundation - the very act of grounding itself. This is particularly significant because foundations represent the moment where architecture first engages with the ground. It establishes the physical and conceptual relationship between building and site, mediating between human intention and natural conditions. Despite its significance, the architectural, symbolic or ecological potential inherent in foundations is rarely explored in today's practice.

This thesis therefore seeks to re-examine the foundation not merely as a structural necessity, but as a critical site of architectural investigation. This reconsideration becomes particularly urgent in the context of the Anthropocene, where the environmental impact of the construction industry has reached unprecedented scales.



37% Buildings & Construction

1 Residential Direct	6%
2 Residential Indirect	11%
3 Non-Residential Direct	3%
4 Non-Residential Indirect	8%
5 Concrete, Aluminium, Steel	6%
6 Brick, Glass	3%

10 % Other Construction
23 % Transport
23 % Other Industry
6 % Other

Fig. 02 Energy Related Carbon Emission

Positioning in the Anthropocene

The building industry is responsible for the production of 37% of energy-related carbon emissions (United Nations Environment Programme Yale Center for Ecosystems + Architecture, 2023), making it a key player in the climate debate and highlighting the urgent need for action. However, it has received only a small portion of climate-related development aid funds, and while only the operational phase of a building has seen a reduction in carbon emissions, it appears that the reduction of embodied carbon emissions is struggling to keep up with the decarbonisation goals (United Nations Environment Programme Yale Center for Ecosystems + Architecture, 2023).

Fig. 03 Standard Concrete Construction

A significant contribution to a building's carbon footprint is often made by building foundations, primarily due to the use of energy-intensive materials such as concrete and steel. A study was carried out by the

Deutsche Gesellschaft für Nachhaltiges Bauen (German Sustainable Building Council), in which 50 sustainably certified buildings were analysed. It was found that approximately 19% of emissions from component production can be attributed to foundations, highlighting their significance as a key driver of environmental impact in construction (Braune et al., 2021).

Despite their considerable environmental impact, the dominance of these materials is not inevitable, but rather the result of their favourable performance characteristics, economic incentives (Constructing architecture materials, processes, structures : a handbook, 2022), and long-standing industry practices. Their effectiveness in meeting high standards for moisture resistance and load-bearing capacity has led to their widespread adoption. At the same time, industrialisation and economic incentives have focused research and innovation on these materials, further entrenching their use. With global population and prosperity continuing to rise, construction activity is expanding to support increasing demands for comfort and well-being, thereby intensifying the pressure to develop more sustainable foundation materials and methods.

This challenge calls for a broader reconsideration of how foundations are conceptualised in architecture. In this context, architects should reconsider the point of contact as a sensitive threshold between human intention and natural processes, rather than a fixed technical solution. It is in the act of founding that architecture first negotiates gravity, stability and meaning. Re-engaging with this act offers the potential to reconsider not only how, but also why, we build in a certain way.

Underground Climate Change

In addition to the visible environmental impacts of construction, recent research has begun to reveal another, largely overlooked phenomenon: the gradual warming of the urban subsurface. This process, often referred to as underground climate change, describes the long-term increase in ground temperatures beneath cities caused by buildings, infrastructure, and underground transport systems.

Recent research has highlighted the gradual warming of the urban subsurface, a phenomenon known as underground climate change. A study by Alessandro Rotta Loria (2023), which quantifies the impacts of subsurface heat islands on civil infrastructure, shows that this process can significantly affect the built environment by altering soil properties and, consequently, influencing the durability, aesthetics, and operational performance of building structures.

Despite its potential consequences for both urban infrastructure and ecological systems, the architectural implications of underground climate change remain largely unexplored. If the ground beneath our buildings is not a static and neutral support but an active and changing environment, then the design of foundations must be reconsidered not only as a structural necessity but also as a site of environmental interaction.

Building on Uncertain Ground

Kiruna, a town in northern Sweden that was built around an iron ore mine, is currently being moved to a new location. This is a consequence of the underground sublevel caving method that has been employed in the operation of the mine. The geology of the old town's ground is characterised by unstable and unpredictable ground, which is subject to continuous deformation as the mining operations proceed. In contrast to the earlier buildings constructed using vernacular methods, the current development of the new city centre appears to disregard both this instability and the prospect of further future relocations. Many new structures are founded on concrete at minimum, if not built entirely from it – raising the question of whether a city 'on the move', built on ever-shifting ground, should not be designed in the same spirit: capable of moving again.

Fig. 04 The Relocation of Hjalmar Lundbohmsgården, 2017

Grounding a ‘Walking’ Building

Capable of moving again' – to embrace this ethos through design means more than developing an adaptable structural system. It requires an ongoing re-negotiation between the building and the ground: one that acknowledges the instability beneath as a condition to work with rather than overcome. In doing so, the design proposal does not merely respond to a technical reality but takes on a symbolic dimension – expressing a willingness to remain in dialogue with an uncertain and shifting ground, much like the city of Kiruna itself.

Thesis Structure

The booklet is ordered by the way the argument is built, not by the sequence in which the work unfolded. It begins with a conceptual and theoretical groundwork. From there it turns to Kiruna, chosen as a site whose ground is in motion. Few places make the relationship between building and ground as pressing, which is what makes it a productive testing ground for the thesis. A series of explorations then tests the ideas and sharpens them into working tools. These strands converge in a single design proposal. A concluding discussion reflects on the proposal and its wider implications.

Background

This thesis examines the structural element of the foundation – the transition from structure to ground – within the context of a dynamic and evolving environment. As this transition operates on both a technical and a symbolic level, a clear distinction in terminology is necessary. For this purpose, the terms 'founding' and 'grounding' are introduced and used throughout this thesis.

While ‘founding’ refers to the structural and technical aspects of a foundation and is derived from the literal definition of the term, ‘grounding’ describes the symbolic relationship between a building and the ground. It thus focuses on how a building meets, connects to, and is perceived in relation to the ground.

Founding

The structural purpose of a foundation is to transfer all loads from the structure to the ground, while limiting the resulting deformation to within an acceptable range (Allen & Iano, 2014). To achieve this, foundations need to withstand dead loads, live loads, rain and snow loads, wind loads, seismic activity loads, and loads caused by soil and hydrostatic pressure (Allen & Iano, 2014). The ability of the ground to resist these loads without sinking, sliding or tipping over depends on its properties, making a thorough soil investigation by an expert an essential first step in foundation design.

Soil is the loose surface material formed through the weathering of solid rock, consisting of particles whose void spaces are filled with water, air, or both (Knappett et al., 2012). A fundamental distinction is made between organic and inorganic soils: while organic soils contain a significant proportion of decomposed plant material and are generally considered unsuitable for construction due to their propensity to settle (Hestermann & Rongen, 2015; Knappett et al., 2012), inorganic soils such as sand, gravel or rock are mineral in origin and are frequently regarded as suitable building materials.

Understanding these soil types requires looking at how they are arranged within the ground. Soils are typically structured in horizontal layers called soil horizons, stacked vertically from the surface down to bedrock. Six main horizons are distinguished: O – Organic, A – Topsoil, E – Eluviation, B – Subsoil, C – Parent material and R – Bedrock (Rohland, 2023). The presence and thickness of each horizon differ depending on location, climate and geology, meaning not every soil profile contains all six layers, as also illustrated in the schematic overview (Fig. 05).

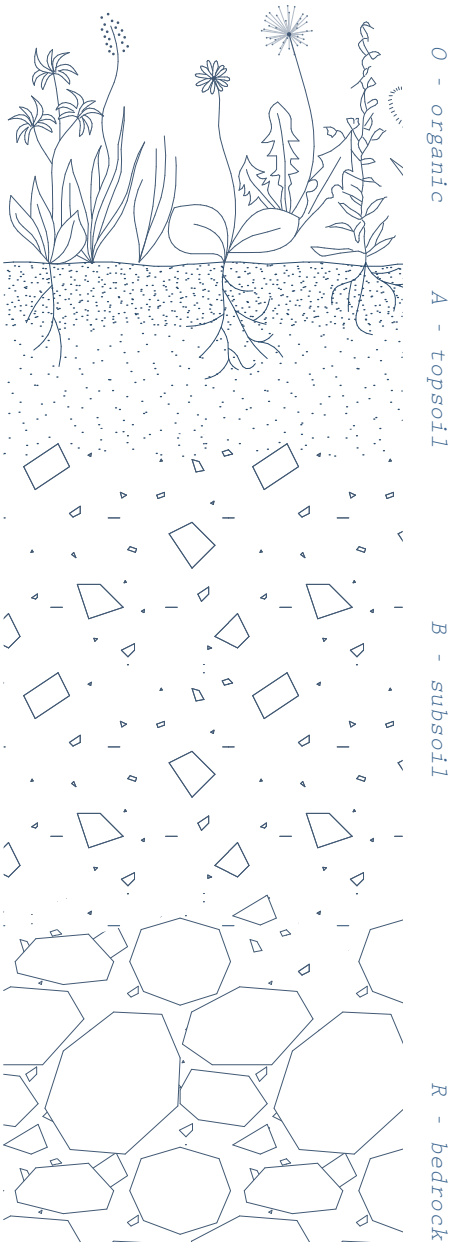


Fig. 05 Schematic Soil Section

With this understanding of how soils are structured, it becomes possible to classify them according to their properties and suitability for construction. A distinction is commonly made between six soil types: rock, non-cohesive soil, cohesive soil, organic soil, natural soil and filled soil (SS-EN ISO 14688-1:2018). The hatches used to represent these soil types (Fig. 06 – Fig. 11) are not universally standardized and serve solely to distinguish between soil types within this thesis.

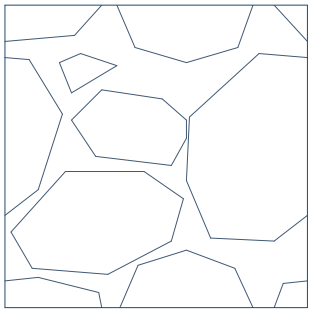


Fig. 06 Rock

Rock

Rock can be generally described as a good building material due to its lateral beating capacity (Allen & Iano, 2014). It includes impermeable, hard rock types such as granite, gabbro, porphyry, basalt, gneiss, as well as permeable, porous rock types such as tuff, travertine, marble and sandstone (Hestermann & Rongen, 2015).

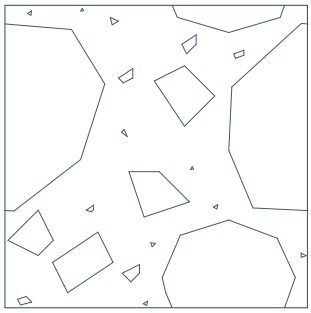


Fig. 07 Non-cohesive Soil

Non-cohesive Soil

Non-cohesive soils include sand, gravel, cobbles and mixtures thereof. The individual grains are not bonded together, meaning these soils have no cohesion and are water permeable. Their load-bearing capacity is primarily determined by the degree of friction between the constituent particles (Allen & Iano, 2014) and increases with grain size and density (Hestermann & Rongen, 2015).

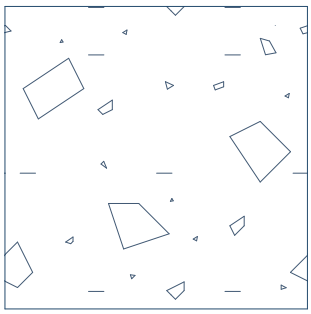


Fig. 08 Cohesive Soil

Cohesive Soil

Clay, Loam and Silt are cohesive soil materials. The grains are bound together by cohesion, which increases with higher clay content (Hestermann & Rongen, 2015). Their load-bearing capacity is considered low (Allen & Iano, 2014) and decreases as humidity rises (Hestermann & Rongen, 2015). Due to their narrow pores, cohesive soils offer considerable resistance to the movement of water. Pore water can only escape slowly, which reduces compressibility and means that settlement can still occur even after some time. Additionally, cohesive soils are particularly susceptible to frost, as water trapped within the pores freezes and expands, causing uplift of the structure (Hestermann & Rongen, 2015).

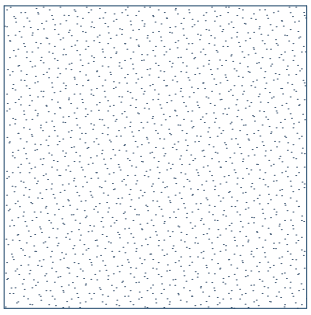


Fig. 09 Organic Soil

Organic Soil

Organic soil (peat, mud, humus) consists of the remains of plant matter that have decomposed to varying degrees. Depending on this degree of decomposition, a distinction is made between undecomposed (fibrous), moderately decomposed (pseudo-fibrous) or heavily decomposed (amorphous) peat (Knappett et al., 2012). With organic soil, significant settlement is to be expected (Hestermann & Rongen, 2015) and is therefore generally considered unsuitable as a foundation material (Allen & Iano, 2014).

Natural Soil

Formed through long-term geological processes, natural soil is located beneath the topsoil and the parent material. It encompasses soils with varying grain sizes and load-bearing capacities (Allen & Iano, 2014; Hestermann & Rongen, 2015).

Filled Soil

Filled soil (compacted or uncompacted) refers to artificially deposited material created by dumping or filling (Hestermann & Rongen, 2015; SS-EN ISO 14688-1:2018). While it is generally considered unsuitable as a foundation material due to its variable composition and potentially insufficient compaction, it may be used as such provided that its load-bearing capacity can be verified (SS-EN 1997-1:2005).

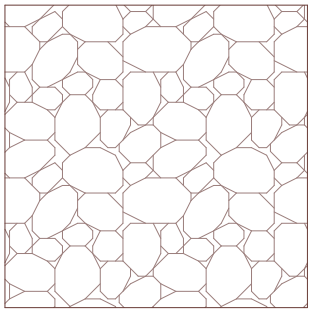


Fig. 10 Filled Soil

Soil Types	Soil Materials	Load Bearing Capacity
Rock	Granite, basalt, limestone, sandstone, tuff, pumice	Generally Suitable
Non-cohesive soil	Cobbles, gravel, sand, gravelly sand, mixtures thereof	Generally Suitable
Cohesive soil	Clay, silt, loam, marl	Conditionally Suitable
Organic soil	Peat (fibrous, pseudo-fibrous, amorphous), mud, humus	Generally Unsuitable
Natural soil	All naturally occurring soils below topsoil	Conditionally Suitable
Filled soil	Excavation spoil, construction debris, variable fill material (compacted/ uncompacted)	Generally Unsuitable/ with Verification

Fig. 11 Summary Soil Types and their Load Bearing Capacity

Due to their different load-bearing capacities, the condition of the soil determines the type of foundation a building requires. Foundations are generally classified as either shallow or deep (Constructing Architecture, 2022).

Shallow foundations are chosen when there is consistent load-bearing soil beneath the structure. As they are placed close to the surface the base of the foundation must be located at a frost-free depth between 0.8 to 1.5 metres below ground level depending on local meteorological conditions (Hestermann & Rongen, 2015). There are three main types of shallow foundation: raft, strip footing and individual foundations (Constructing Architecture, 2022).

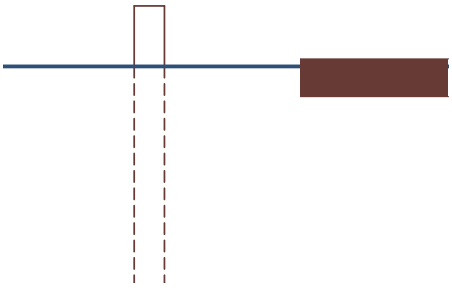


Fig. 12 Shallow and deep foundation

Raft

Raft foundations distribute loads evenly across the entire foundation area and are constructed on a sub-base layer of at least 5 cm to prevent dirt from accumulating on the underside of the raft (Hestermann & Rongen, 2015). They are particularly suitable when individual or strip foundations would be placed too closely together, at different heights, or where poor soil conditions and significant load variations make a continuous slab the more economic and technical solution (Hestermann & Rongen, 2015).

Fig. 13 Raft foundation

Strip footing

This type of foundation is strip-shaped and transfers loads from load-bearing walls into the ground, typically wider than the wall above to distribute the load over a larger area (BauNetz Wissen, n.d.). Today's strip or wall footings can be either reinforced or unreinforced concrete depending on the prevailing ground conditions. In older buildings, masonry foundations can still be found (Hestermann & Rongen, 2015).

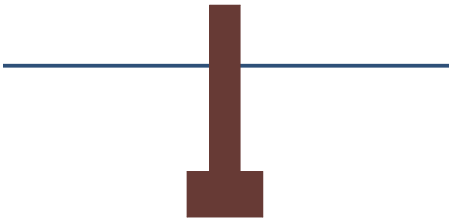


Fig. 14 Strip footing

Individual foundations

Individual Foundations are used to transfer loads from isolated structural elements such as columns, piers or pilotis into the ground (Constructing Architecture, 2022). Due to the higher load requirements, individual foundations are predominantly constructed from reinforced concrete (Hestermann & Rongen, 2015).

Deep foundations are used when stable building ground is only available at greater depths and soil improvements are not possible (Hestermann & Rongen, 2015). By extending to greater depth, they bypass weak soil layers and transfer loads to more competent ground below (Allen & Iano, 2014). They are most commonly realised as pile foundations, although further specialised foundation types exist beyond the scope of this thesis.

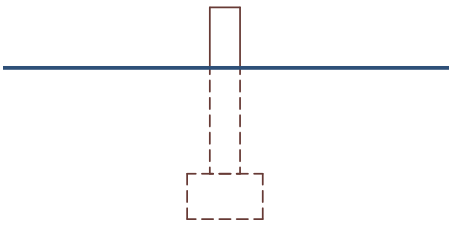


Fig. 15 Individual foundation

Pile foundation

There are two main types of pile foundation: fixed (end-bearing) and floating. Fixed piles can be further distinguished into first and second order. A first-order pile foundation is embedded in a load-bearing soil layer, beneath which there are no further unstable layers. It is generally considered to be the most reliable of all pile foundations. If soft layers exist beneath a hard formation at a greater depth, it is referred to as a second-order pile foundation. Unlike first-order foundations, significant settlement can still occur due to the compression of the deeper soft layers below the hard stratum. The pile penetrates the upper soft layer, eliminating settlement within it, while settlement caused by the compression of the deeper layers is accepted. As with first-order piles, loads are transferred through a combination of end-bearing and skin friction. In the absence of load-bearing soil layers, a floating foundation is used. Consequently, the piles are situated exclusively within a non-load-bearing soil layer. These piles bear the load solely through skin friction and are therefore driven as deep as possible into the soft soil (Schmitt, 1962).

It should be noted that pile foundations are further differentiated by their installation method, such as driven or bored piles.

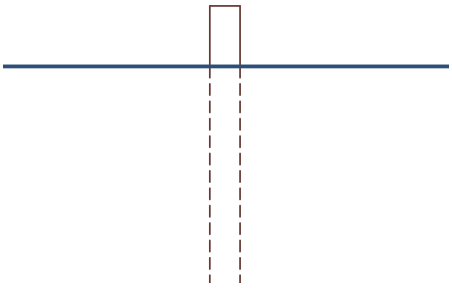


Fig. 16 Pile foundation

Fig. 17 Re-use Foundation

Fig. 18 Limecrete Floor Slab

Sustainable Foundation Approaches

Sustainable alternatives to conventional concrete foundations are an active area of research and professional practice, with institutions such as RISE demonstrating that CLT-based foundation systems can replace traditional concrete slabs without compromising structural performance – several of which have already been implemented in real building projects (RISE, n.d.). Beyond material substitution, a broader range of low-carbon alternatives exists for cases where new foundations are unavoidable. Engineers such as Beth Williams of Build Collective advocate for solutions ranging from limecrete slabs and soil nail plates for shallow foundations to steel screw piles – often fabricated from recycled oil and gas industry pipes – for deeper applications (Williams, 2024). While all of these alternatives offer meaningful reductions in embodied carbon, the reuse of existing foundations remains the most resource-efficient approach. It can lean to significant savings in materials and embodied carbon, provided the load profile of the new structure is comparable to that of the original building (Tayler, 2020).

Grounding

Although the foundation does the hard structural work, it disappears once a building is finished. What remains visible is how the building meets the earth – the grounding defined in this thesis as the symbolic and phenomenological relationship between a building and the ground it occupies.

A building can appear to grow out of the ground, to float above it, to contrast with it, or to mediate between earth and structure. What carries this stance is the element visibly in contact with the ground, often a plinth or a platform: the same element shifts meaning by how it is set, a platform levelling and separating, a plinth isolating.

Grounding is therefore distinct from founding. Founding brings the building into existence structurally; grounding stages its relationship to the site. A range of reference projects employing diverse founding methods were collected, analysed and categorised to establish a catalogue. Each project's grounding strategy is drawn as an abstracted elevation registering its perceived relationship to context, set beside a technical section recording the actual method of founding.

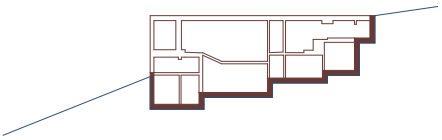


Fig. 19 Therme Vals Founding

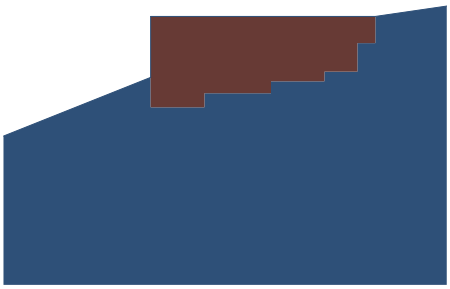


Fig. 20 Therme Vals Grounding

Cut into an Alpine slope, the baths are founded as a massive concrete structure embedded in the mountainside. Layered Valser quartzite reads as solid stone, grounding the building integratively as though excavated from the earth rather than placed upon it.

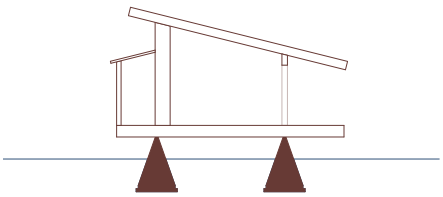


Fig. 21 Akeno Raised Floor Founding

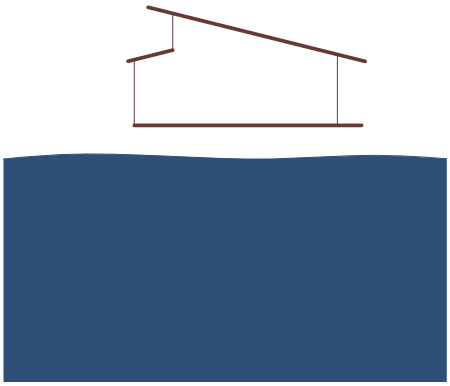


Fig. 22 Akeno Raised Floor Grounding

The house rests on a few pyramidal steel supports that barely disturb the soil, leaving the ground beneath permeable. Lifted clear, its strong horizontals make the wooden structure appear to float, touching the earth lightly rather than resting on it.

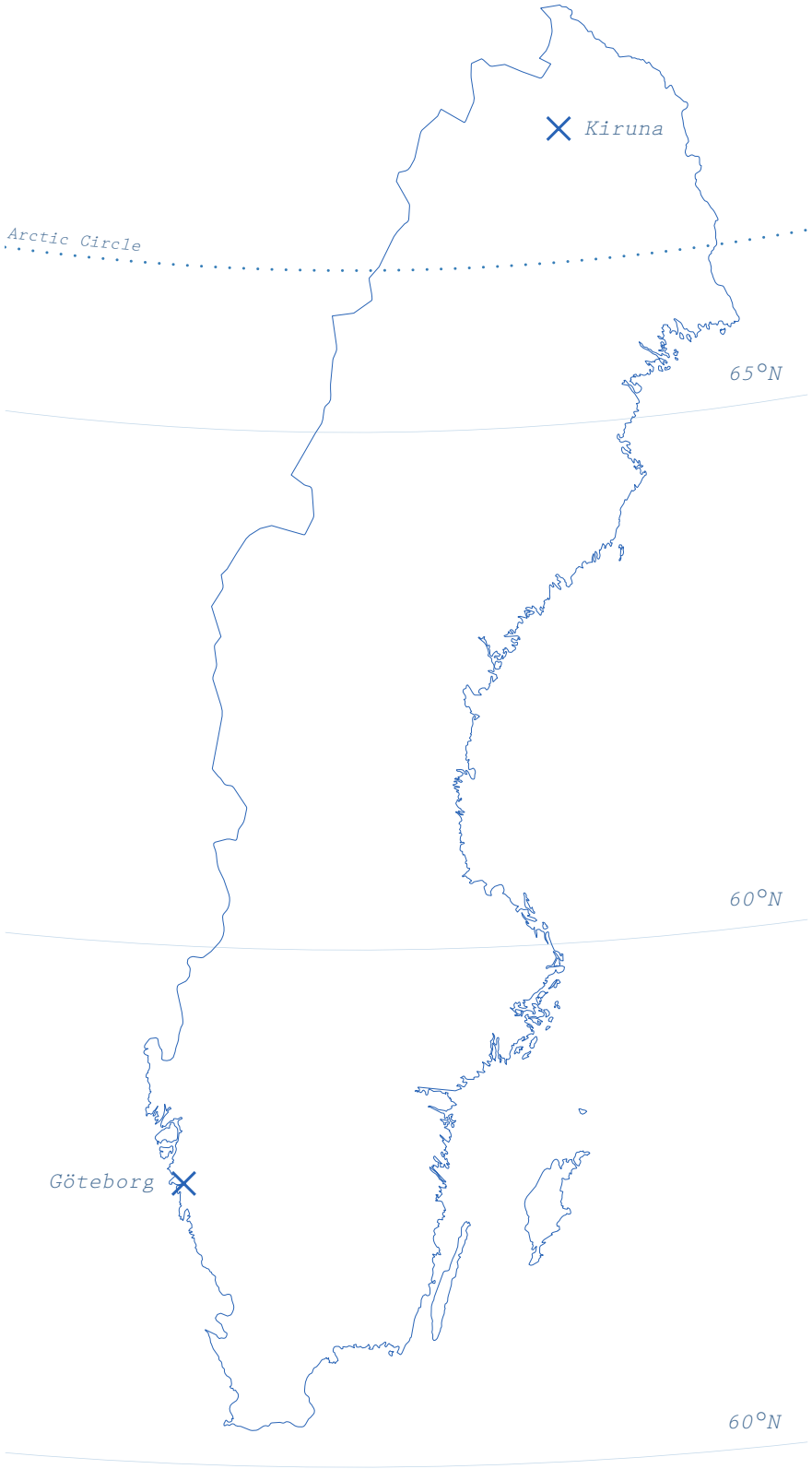


Fig. 23 Location of Kiruna in Sweden, 1 : 7 500 000

The interplay of founding and grounding is examined in the following through Kiruna, a site whose ground is not static but set in motion by the mine beneath it – an instability that makes the relation between building and earth especially revealing.

Context

Located about 145 kilometres north of the Arctic Circle, Kiruna has an inland subarctic climate of long, severe winters, with temperatures that can fall below −30 °C (Ebrahimabadi, 2015). The persistent cold and the underlying permafrost shape the soil conditions and limit vegetation growth (Sjöholm, 2025). I In late December the sun does not rise for several weeks – the polar night – while the short summer brings the midnight sun; snow cover can last up to eight months, and the surrounding landscape is dominated by taiga and extensive reindeer grazing areas (see Fig. 25) (Sjöholm, 2025). Set between the mountains of Luossavaara and Kiirunavaara, west of Lake Luossajärvi, the city sits within a topography that strongly influences its local microclimate, affecting wind patterns and temperature (Brunnström, 1980). Beneath those same mountains lie the iron ore deposits that define its existence; the history of Kiruna is therefore inseparable from the history of its mines.

City's Historic Development

The origins of ore extraction in Sweden go back to the 17th century (Carrasco, 2020), with the first industrial expeditions and colonial-minded settlements emerging in sites such as Svappavaara, Kiirunavaara and Luossavaara. It was, however, only in the 19th century that more consistent and systematic efforts were made to study and control the land. The drawing of mine claim maps defined the commercially exploitable areas and instigated scientific research into the geological quality of the land. The land itself, originally inhabited by the Indigenous Sámi people, had been gradually claimed by the Swedish state over the preceding centuries (Laestadius, 2020).

The Sámi are an Indigenous people of northern Europe, living across Sápmi, a region that spans parts of Norway, Sweden, Finland, and Russia. Estimated at over 100,000, they are one people bound by shared cultural and linguistic ties while encompassing distinct regional communities and several Sámi languages. Reindeer herding holds particular cultural significance and, alongside fishing and hunting, remains part of Sámi life today (Amnesty International, 2025).

City foundation

The longstanding Sámi presence did not slow the colonisation and industrial development of the region, which accelerated rapidly at the turn of the 20th century (Sjöholm, 2025). In 1900, two iron ore mines opened – one on each mountain – and the town was founded to accommodate the workers employed in the mining (Carrasco, 2020). The town's planning was guided by Hjalmar Lundbohm, the first managing director of LKAB – Luossavaara-Kiirunavaara Aktiebolag, established 1890 (LKAB, n.d.-a). Lundbohm explicitly rejected the shanty-town conditions common to mining settlements at the time and envisioned Kiruna as a 'model town' with high-quality housing and civic infrastructure (Brummer, 1993). Planned as a company town – "a settlement completely owned, built and operated by an individual or corporate entrepreneur" (Porteous, 1970, p. 127) – for the mining company LKAB the city was organised in three separate areas: the company town, an adjacent service and supply town, and an area built for the railway (Brunnström, 1980).

Following this tripartite division, LKAB commissioned Gustaf Wickman to design the company area and Per Olof Hallman to plan the service and supply town. The railway area, by contrast, was designed by Folke Zettervall, chief architect at the Royal Railway Board (Sjöholm, 2025).

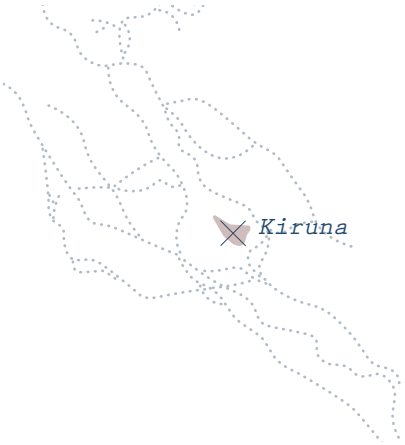


Fig. 24 Reindeer Grazing Lands & Paths

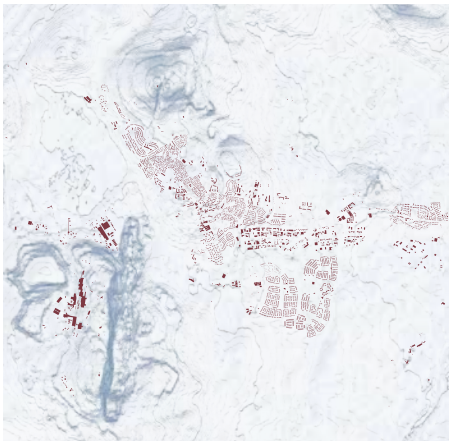


Fig. 25 Kiruna's Topograpy

Fig. 26 One of the First Dwellings in 1900

Fig. 27 Town Plan of Kiruna, 1900

The town plan by Per Olof Hallman represented a pioneering development in Swedish urban planning: the first adapted to the terrain through organic lines rather than a rigid grid. The street layout was designed with two principal objectives in mind: to break up wind exposure and to maximise solar access. These features made Kiruna an early example of climate-responsive urban planning in Sweden (Bedoire, 2020; Sjöholm, 2025).

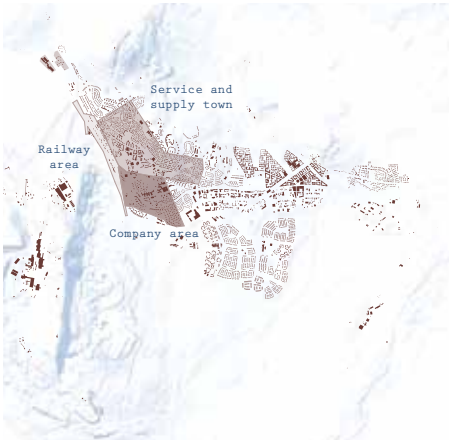


Fig. 28 Tripartite division of Kiruna

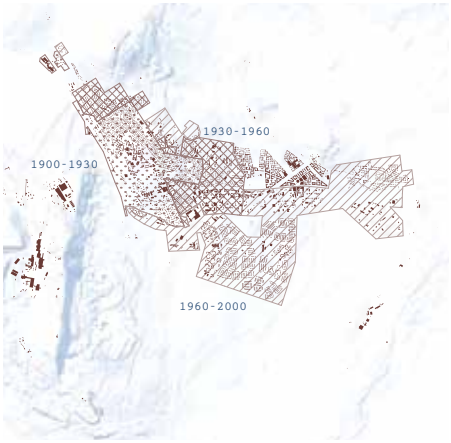


Fig. 29 Kiruna's Historic Development

Consolidation and Identity

While Hallman's town plan provided the framework for early urban development, the years that followed saw Kiruna evolve from a company-driven mining settlement into an established Swedish town. In 1907, the Swedish state became a part-owner of LKAB, marking the beginning of a gradual transition from private to public control over the mining operations (Carrasco, 2020). Population growth was rapid: by 1910, around 7,500 people (Kiruna kommun, n.d.-a) lived in Kiruna, attracted by employment in the expanding mines. During this period, the town's most iconic landmark was constructed – the Kiruna Church, designed by Gustaf Wickman and opened in 1912. Built entirely of wood and inspired by the form of a traditional Sámi kåta, the church became a symbol of Kiruna's distinctive architectural identity (Bedoire, 2020) – even as the people whose dwelling gave it that form remained outside the model town it came to symbolise. In 1948, Kiruna was granted full town rights – a formal recognition that consolidated the three originally separate areas into one integrated municipality and paved the way for further expansion through new residential neighbourhoods (Brunnström, 1993).


Fig. 30 Iron Ore Mine Kiirunavaara, 1912

Modernism and the Arctic City

The post-war decades brought a second major phase of urban development. Master plans prepared by Eglers Stadsplanebyrå in 1956 and revised in 1968 guided the modernisation of Kiruna in line with broader Swedish urban renewal trends. As LKAB expanded and the town faced a severe housing shortage in the post-war boom, many of Kiruna's older wooden buildings were demolished and replaced by larger concrete developments (Brunnström, 1993; Sjöholm, 2020).

At the same time, a fundamental technological shift was underway in the mines themselves: in the early 1960s, LKAB began transitioning from open-pit to underground mining at Kiirunavaara, a decision that would eventually transform the Kiirunavaaragruvan into one of the largest underground iron ore mines in the world (Brunnström, 1993; LKAB, n.d.-c).


Fig. 31 Iron Ore Mine Kiirunavaara, 1970

Architecturally, this era is most closely associated with the work of the British-Swedish architect Ralph Erskine, who developed a vision for an

“ideal Arctic city” tailored to the climatic conditions and needs of its inhabitants (Maudsley, 2020). One of the few projects from this vision actually realised in Kiruna was the Ortdrivaren block (1959–1962), a residential complex shaped and oriented to minimise wind exposure and shadowing (Luciani & Poma, 2023; Maudsley, 2020).

Heritage and the Mönsterstad Legacy

By the 1980s, the extensive demolitions of the post-war decades had triggered a new awareness of Kiruna's historical built environment. In 1984, the local council adopted a conservation plan that, for the first time, formally designated Kiruna as a heritage site and recognised the cultural and historical significance of the buildings designed by Wickman, Hallman, and Zettervall, alongside modernist developments such as Erskine's Ortdrivaren block (Sjöholm, 2016). During this period, the concept of Kiruna as a Mönsterstad, or "model town", gained significant traction in both academic and popular discourse. Originally, the term had referred specifically to the company area with its superior housing and civic amenities; over time, however, its meaning expanded to encompass the entire town as a coherent architectural and social achievement (Sjöholm, 2025). This self-understanding as a model town would later be put to the test by the announcement of the town's relocation.

Kiruna Must Move: Early Planning for Relocation

Although it had already become clear in the 20th century, with the beginning of underground mining, that the town would eventually need to be relocated, this issue was long underestimated (Abrahams, 2009; Sotoca, 2020). In 2004, following decades of underground mining at Kiirunavaara, the Kiruna municipal council announced that significant parts of the town would have to be relocated (Sjöholm, 2025). LKAB has stated that the iron ore deposit extends beneath the built environment and that, as a result, ground deformations are expected to occur as mining operations continue (Abrahams, 2009; Sjöholm, 2025).

The planning process assessed six potential relocation areas, narrowing to two: an extension either north-east or north-west (Sjöholm, 2025). Among the proposals was an early, highly futuristic vision by architect Anders Wilhelmson with LKAB, oriented north-west (Abrahams, 2009; Wilhelmson Arkitekter, n.d.). The council ultimately selected the north-eastern site (Sjöholm, 2025).

In 2012, an international urban design competition was launched under the explicit ambition of creating "the model city of the future, 2.0" – a formulation that consciously echoed Lundbohm's


Fig. 32 Ortdrivaren Kvarteret


Fig. 33 Old Kiruna Town Hall, c. 1963


Fig. 34 Old Hospital


Fig. 35 Proposal by Wilhelmson

original Mönsterstad vision from 1900 (Kiruna Council, 2012). The winning entry, Kiruna 4-ever by White Architects in collaboration with Ghilardi + Hellsten Arkitekter, Spacescape, and Vectura Consulting, formed the basis for the new development plan adopted in 2014 (Kiruna Council, 2013; Sjöholm, 2025). Implementation began in earnest in the following years.

New Kiruna Takes Shape

The first completed structure on the new site was the town hall by Henning Larsen Architects, inaugurated in 2018 (Henning Larsen, 2018). In August 2025, Wickman's iconic wooden church was carefully transported three kilometres east to its new location (LKAB, 2025), joining a small number of heritage buildings preserved through relocation; the majority of the original built environment, however, has been or will be demolished. The relocation process is expected to continue in phases until 2035 (Hardy, 2019). Yet despite its ambition, the new Kiruna has also drawn critical attention: the relocated centre is situated in a colder, less sheltered area than the original site, with reduced solar access and stronger wind exposure, as Jennie Sjöholm has highlighted in her publication “Kiruna: The Arctic town that forgot about winter” (2025).

Furthermore, the perspectives of the Indigenous Sámi population, whose traditional grazing lands continue to be affected by mining operations, remain underrepresented in the new urban environment (Amnesty International, 2025; Hardy, 2019). The relocation thus reshapes not only the physical city but also tests the very identity of Kiruna as a model town.

Fig. 36 Proposal by White Arkitekter

Fig. 37 New Kiruna Town Hall

Fig. 38 Move of the Kiruna Church

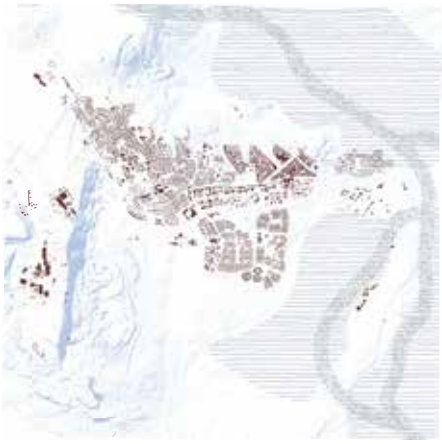


Fig. 39 Reindeer Herding around Kiruna

Fig. 40 Kiirunaavara 1902

Long before the mine, the Sámi inhabited this land, their reindeer routes crossing the terrain on which Kiruna would later stand – including Luossajärvi, the lake next to Kiruna. As extraction has expanded, these routes have been progressively severed, and the eastward relocation now threatens to sever them again.

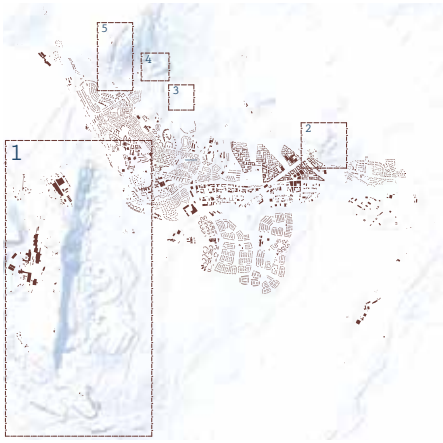


Fig. 41 Kiruna's Mine Location

Fig. 42 Iron Ore Field, 1903

Ore extraction once spread across several sites around Kiruna. Today only Kiirunavaara remains in operation; the rest have closed. What began as a dispersed mining landscape has contracted to the single underground mine whose advance now governs the city's future.

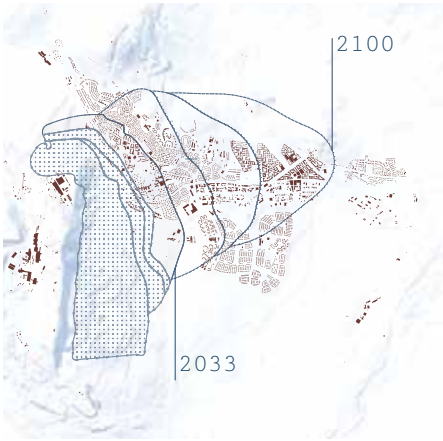


Fig. 43 Possible New Deformation Lines

Fig. 44 Crack in Plinth (Old Kiruna), 2026

Underground mining at Kiirunavaara deforms the ground above, advancing toward the old town and opening cracks in buildings and earth alike. A fence marks the edge of the deformation zone and is moved outward once a year – the slow, visible measure of a ground that no longer holds still.

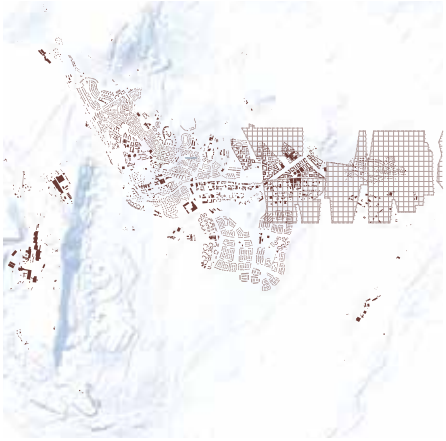
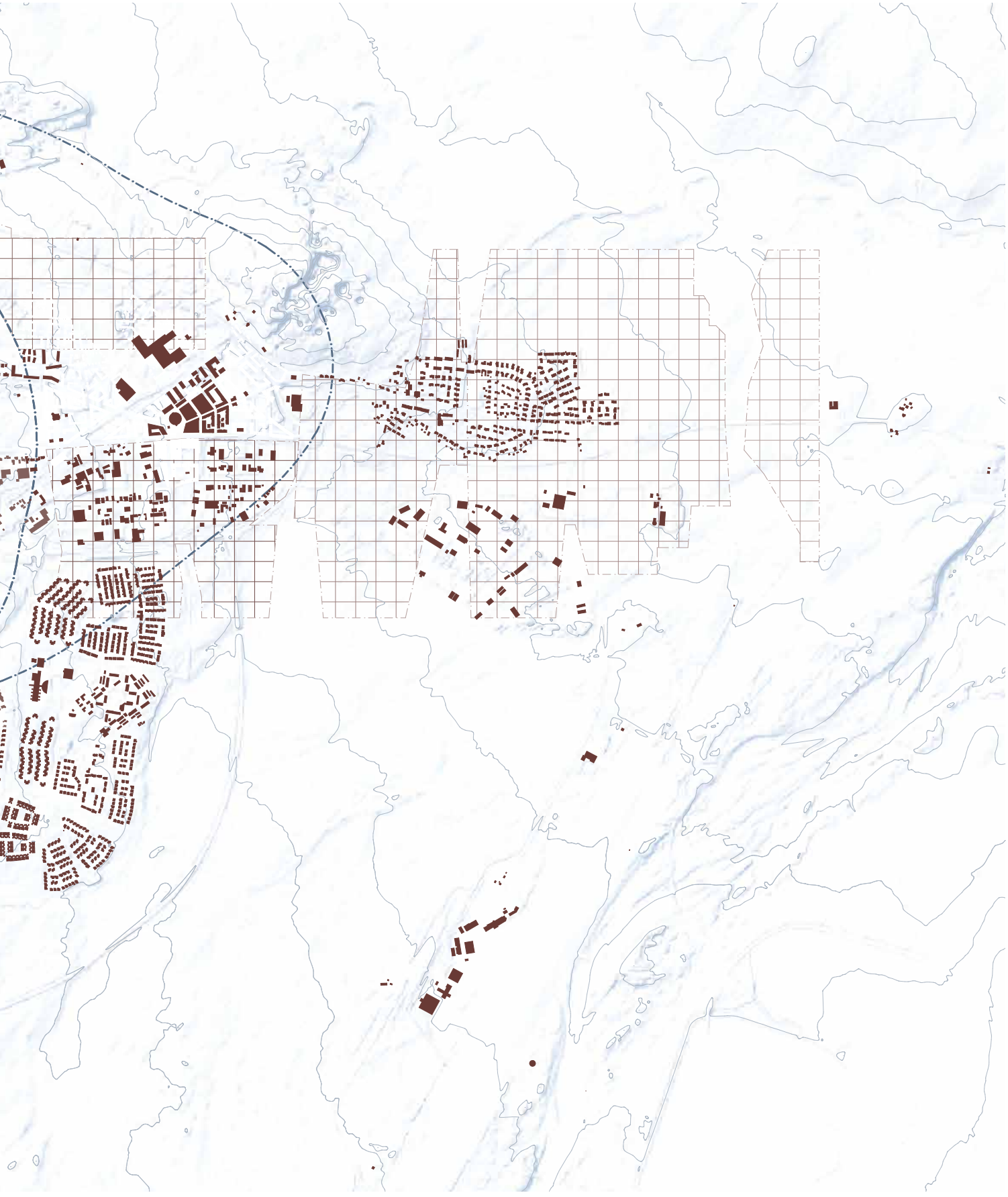


Fig. 45 The City's 'Movement'

Fig. 46 Hjalmar Lundbohmsgården, 2019

White Arkitekter's winning proposal shifts Kiruna north-east, ahead of the advancing deformation: forty-two buildings are relocated, the rest of the old centre demolished. The phased plan anticipates further expansion as the deformation zone grows.

Fig. 47 Layered Analysis Map of Kiruna


Beeing demolished
Going to be demolished
Secure until 2100
Mine buildings

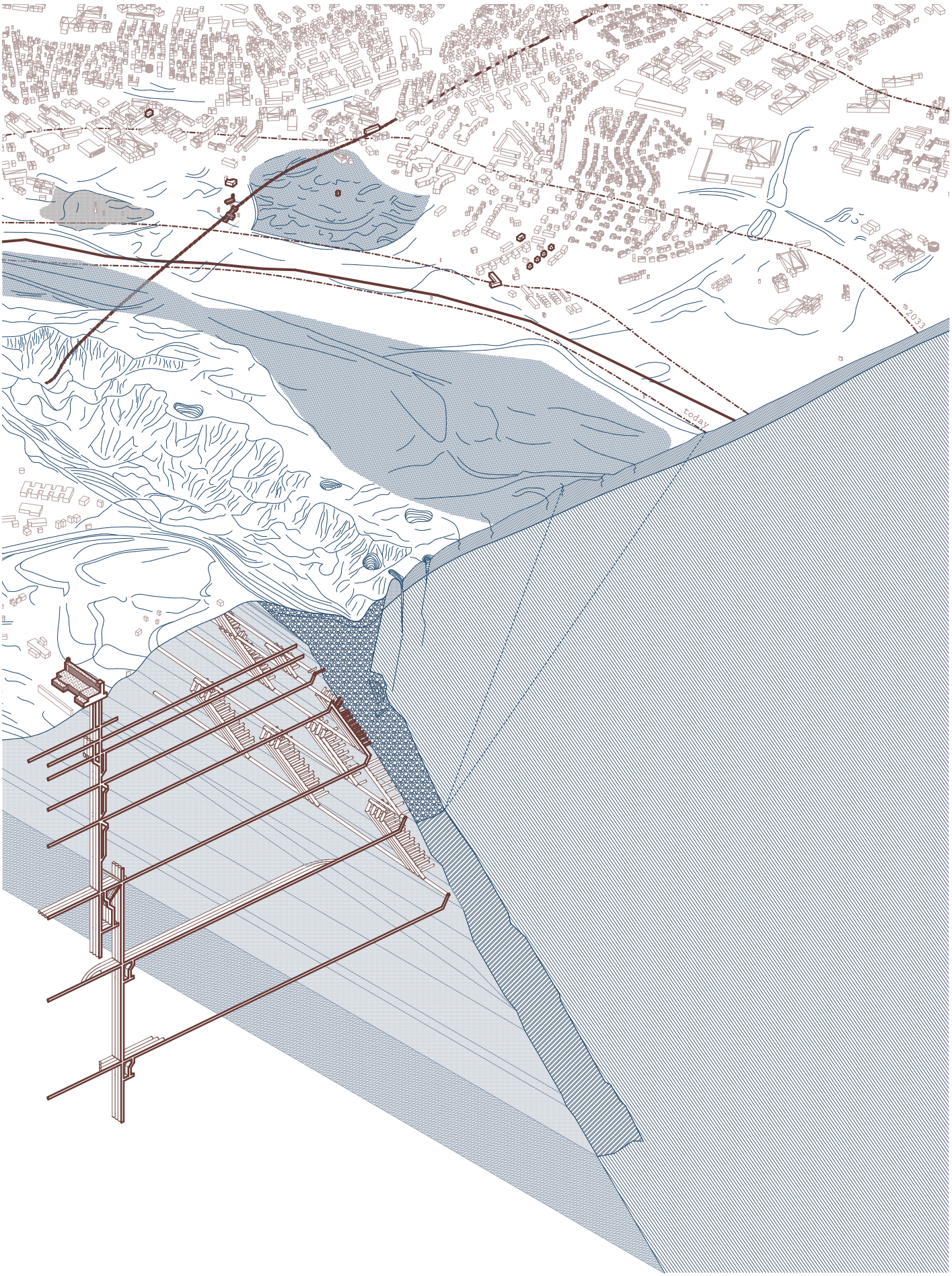


Fig. 48 Axonometric of the ‘Underground City’ (the Mine) and the Sinkholes in Relation to the Old Town of Kiruna

Relevance

“Kiruna’s time is up. So one man must relocate it.”

(The City They Had to Move, 2009).

The land on which Kiruna stands is Sámi land. Within the Sámi relation to territory, a successful presence is one that sustains existing continuity and leaves no permanent mark, a dwelling that can be withdrawn when the season turns (Jääskeläinen, 2020). Against this measure, the present condition is an inversion: the mining industry that brought the town into being is now consuming the ground beneath it, and the deformation it produces is legible everywhere, in fenced demolition zones, monitored cracks, and a town centre that has had to move to survive. What the Sámi tradition treats as a transgression – the irreversible marking of land – has become the governing logic of the place.

Today the mine produces around 90% of Europe's iron ore (Nobile, 2023) and roughly two-thirds of Kiruna's population are economically dependent on its operation (Diş & Karimnia, 2021; Page, 2024). According to the municipality's head of planning, Nina Eliasson, most of the 6,000 residents required to move are satisfied with the relocation process (Page, 2024). Set beside that dependence, the figure is difficult to read as straightforward consent: it remains unclear whether support for the move reflects genuine endorsement or the limited room for dissent available to a population whose livelihoods depend on the very cause of the relocation. The question of how much say the inhabitants of Kiruna actually hold over the fate of their town runs beneath everything that follows.

The relocation of the town centre, driven by ground deformation from the mining below, has been a pressing concern for the municipality for over two decades. It has produced repeated disagreement between Kiruna Kommun and LKAB over compensation, land ownership, and new infrastructure (Meredith, 2025). Under Swedish minerals law, LKAB, as the party causing the damage, is obliged to compensate for it, and has committed to relocating a number of culturally significant structures and documenting the area before demolition (LKAB, n.d.-b). In practice, the limits of that obligation have themselves been contested, with disputes over how much new construction and how many further relocations the company is required to fund.

Following negotiations between LKAB, Kiruna Kommun, and the County Administrative Board, the Municipal Executive Board decided on 20 May 2019 that forty-two buildings would be relocated (LKAB, n.d.-b). Among them are Gustaf Wickman's wooden church, some

Bläckhornen houses, and the clock tower of the old town hall by Artur von Schmalensee, together with the building's door handles designed by Esaias Poggats (Carrasco, 2020). The transport of Kiruna at the end of August 2025 became the most internationally visible moment of the arrangement (LKAB, 2025; Meredith, 2025).

What this relocation makes visible is a distinction the thesis takes as its starting point. When a building is moved in Kiruna it is severed from its foundation (Fig. 50) and only the wooden part above is moved to the new town. Relocation is therefore possible only for structures that can tolerate being lifted: the timber houses, whose joints absorb the deformations of the move, are the ones that travel. Concrete and brick structures, mostly built since the 1960s, cannot be moved whole and are demolished. The selection of what survives is thus not primarily a cultural judgement but a structural one, decided at the point where building meets ground.

The recycling centre, the Kiruna Portal, which the winning White Arkitekter proposal had envisaged as the means of returning building components from the old town to the new, was never realised (Kiruna Council, 2013; Lindstedt, 2026). Its absence is the immediate occasion for this thesis. Without it, most of the old town's-built fabric is not reused but demolished (Lindstedt, 2026). As the relocation proceeds, the town's material history, collective memory, and the attachments embedded in its everyday fabric are being lost rather than preserved – a loss against which forty-two relocated buildings register less as a relocated city than as the rescue of a few selected fragments.

The condition is unlikely to settle. LKAB extracts the ore by sub-level caving, blasting at 1,365 metres depth and allowing the rock above to collapse and propagating deformation toward the old centre. The mapping of White Arkitekter for their competition proposal from 2014 suggested a local deformation rate of 40 metres per year. Newer mappings conducted by the authors of this thesis suggest they are closer to 50 metres. The eventual extent cannot be reliably predicted, as mining at this depth has no precedent against which to model the ground's behaviour (Sjöberg et al., 2017). As extraction continues downward from its current depth of 1,365 metres up to 2,000 metres, the affected zone will expand further (LKAB, 2026). White Arkitekter anticipated that the new centre might itself be reached by deformations around 2100 (Arkitekter, 2016); accounting for more recent measurements, the thesis's projection brings that horizon forward to roughly 2085 as seen in Figure 44. The point is not the precise date but its implication: the new Kiruna is being built on ground that is itself provisional. With much of the new centre

Fig. 49 Preparation for Movement of Arbetarbostaden B, 2017

constructed in concrete – and, by Vestling's account, only a single building designed so that it could be moved again – the structures now rising would, in turn, have to be demolished and new buildings would need to be built again (Appendix A – Interview with Kiruna Municipality).

Fig. 50 Demolition of old Kiruna, while iron ore mining continues in the background

Research Question

How do founding (the technical act of laying a foundation) and grounding (the symbolic relation between building and earth), together with context, inform the design of a built structure and its ground?

What does it entail to build on the mining-induced unstable ground of Kiruna, and how can this condition become a generative force in architectural design?

If the city of Kiruna is itself in motion, what does it mean for a building to participate in that process rather than resist it – and what architectural, material, and temporal consequences follow?

As the investigation and exploration phase progressed, it became evident that each sub-phase of the thesis would raise questions that might not be answered but still need to be addressed.

Some of these have been collected and are presented on the right.

Fig. 51 Mine Kiirunavaara and the City, 2017

What are the main tasks of a foundation? How does a foundation work? How have architectural foundations evolved in their material, spatial, and symbolic dimensions? How can insights from history, symbolism, and material experimentation lead to new, context-sensitive foundation strategies? Is it possible to build a fully sustainable foundation? Can architecture in damaged or uncertain ground conditions re-establish a meaningful relationship with its site? If so, how? How can ground conditions be made visible in an architectural project? Can a foundation dictate architectural design? What vernacular and region-specific grounding methods do exist? What can be learned from them?

What is the output of this course for you? What is something you gain? What do you do with all the information? How affects the founding method the wall/ transition space of the building? How does ground affect the entrance?

What does massive mean? Is a concrete foundation massive, just because of the material's density? What can be considered as light touch? Can a building have a light touch, even if its entire floor area touches the ground? Are point foundations always light touch? How is the biodiversity influenced underneath elevated buildings? What does integrative mean? How is this implemented architecturally? When does something become reversible?

What is the role of façade design? Does it influence the overall architectural appearance of a foundation? What is above and underneath the ground? Is reversal possible?

How is the floor attached to the primary structure? How is the truss attached to the granite foundation? Do the granite blocks sink? Is there something else underneath the granite? Does the house shrink due to the compression of the rammed earth walls? Why is the slab structure in the basement different? Why is the foundation with small concrete piles better than just a basic foundation plate?

How would this building look like with another foundation system? What qualities are gained and lost as a result? What happens below the ground?

What happens with the deformation zone in the future? Why are the buildings in the deformation zone demolished? Due to instability? Are the foundations staying or could they be moved? Why are not just the foundations left? Which buildings are demolished next? Does the deformation zone serve as a memorial to the man-made plundering of natural resources? Is such a memorial necessary? Can this compensate for the damage, or is it an attempt to divert attention? Are the other Bläckhornen houses moved? What happens to the old fire station? Is the cave mining or the open pit mining more profitable and why did LKAB switch?

Why does the ground sink? How does deformation work? Are there holes in the ground that are collapsing due to the vibration from the mine? What effects does it have? What is the timeframe for deformations?

How deep do piles need to be to withstand the deformation caused by the mine?

Method and Tools

The project has been developed through two parallel processes – a theoretical investigation of grounding and founding, and a context-specific investigation of Kiruna. Their symbiosis took shape in the development of the concept and design proposal.

Theoretical Research

The theoretical investigation is based on a literature review of architectural theory, symbolism and building practice with particular focus on foundations and the relationship between building and ground. The review was later expanded into a historical overview of architects' positions on the ground, providing a basis for understanding how the conceptual relationship has evolved over time.

In parallel, the Grounding and Founding Catalogue was developed, a collection of reference projects analysed through both their symbolic and technical relationship with the ground. The projects were redrawn in a unified graphical language with particular emphasis on the visual representation of their grounding and founding. The catalogue served two purposes: it informed the development of the graphical language itself, which was subsequently carried through into the design drawings, and it built up an iconographic vocabulary of how buildings meet the ground.

Some reference projects were further explored through two additional methods. First, axonometric sections were drawn to combine the ground condition with the founding of the building. Second, to investigate the symbolic dimension of a building's relationship with the ground, a transformative model exploration of Mies van der Rohe's Farnsworth House was conducted: by altering the building's founding method while keeping the rest constant, the exercise made visible how this change affects the building's grounding as a whole.

From the historical overview, recurring grounding elements were extracted and organised into a matrix that served as a bridge between research and design, distilling the theoretical material into a set of grounding strategies for the proposal.

Context Research

The theoretical investigation, together with the broader background of the thesis, led to the choice of a site characterised by a non-static ground: Kiruna exemplifies this in two ways: the land itself is unstable, deformed by the iron ore extraction beneath the city; and the act of founding has become temporal, as the ongoing requires buildings to be re-established at each new ground.

Site-specific research about the city's context combined literature review of books and newspaper articles with archival studies at Lantmäteriet and Digitalt Museum. A central strand of this research was the engagement with Kiruna's successive urban planning proposals, from the city's founding to the present-day relocation. Each was examined for the conclusions it drew from its specific context. To gain a direct sense of the place, a site visit to Kiruna was also conducted, including a guided tour of the LKAB mine. During the visit, the design's site and its surroundings were documented photographically on both film and digital. Together, the literature, archival material, urban plans, and first-hand impressions from the visit informed the mapping of Kiruna's history and development.

Inspired by the graphical representation of the ground by Design Earth (El Hadi Jazairy + Rania Ghosn et al., 2016), the geographical relationship between the mine and the city was investigated through an axonometric drawing. It depicts the mine as a city beneath the ground, the LKAB excavation activity, and the resulting fate of the buildings – distinguishing those marked for demolition from those to be physically relocated. The drawing makes visible the causal chain that links the mining activity below ground to the sinkholes that emerge above it, and ultimately to the city's ongoing relocation.

Three interviews informed the work from different perspectives. The urban development strategist of Kiruna municipality, responsible for coordinating the relocation, provided insight into the official planning logic and decision-making behind the move. Mats Spett, retired head of the city archive and a long-standing chronicler of Kiruna's history, offered an in-depth understanding of the city's historical and built fabric. Gregor Kallina, a Viennese photographer who has been documenting the transformation of Kiruna over several years, contributed the critical view of an outside observer engaged with the process over time.

Design Methods

The matrix of grounding strategies was tested against the ground conditions encountered along the design's site. A long section through the site was developed both to understand the existing conditions and to explore how different strategies from the matrix could respond to them. In parallel, prototyping models and 3D-modelling allowed the strategies to be examined three-dimensionally and at different scales.

Theoretical Foundation

Throughout history, architects, theorists and societies have articulated the relationship between buildings and the ground on which they stand in different ways. The following text gives a selected overview of chosen architects' own writings, as well as the work of critics and historians who have studied them. Beginning with the Greek temple in antiquity, it then focuses on the twentieth and twenty-first centuries, when the question of grounding became increasingly contested – first by avant-garde movements aiming to transcend the ground, and then by modernist critics who sought to recover it.

Greek

The Greek temple is set on a crepidoma, a stepped platform which replaces the uneven ground beneath. The upper portion, known as the stylobate, ensures the structure above is perfectly horizontal and establishes a datum for the temple's geometric discipline (Unwin, 1997).

It is more than just a plinth. Its complex stepped structure serves a specific purpose: to overcome the uneven terrain of the Greek landscape and elevate the temple to a level of monumentality that could challenge those of Egyptian temples built on flat plains. The platform is a response to topography rather than an attempt to deny it. It is the device by which that relationship is staged: it separates the unordered life and nature around it from the geometric order above, while simultaneously anchoring the temple to the specific place (Aureli & Tattara, 2021).

However, the temple does not relate to the surrounding buildings; it stands alone. It follows its own ideal system of proportions, which are detached from those of the surrounding world (Unwin, 1997).

Gottfried Semper

In Die Vier Elemente der Baukunst, Gottfried Semper proposed that the first human dwelling consists of four elements: the hearth, the earthwork, the framework or roof, and the enclosing membrane. The hearth was the moral and social centre of the settlement, but since the ground was prone to flooding, dampness and irregularity, the fire was raised up. The hearth on its mound becomes the prototype of the raised floor: a means of separating human life from the chaotic wild, and of protecting it (Semper, 1863).

The piled-up mass of stone required to form the mound is known as stereotomy. This earthwork belongs to the ground; its load-bearing masonry works through pressure and counter-pressure along the vertical axis, anchoring itself to the earth through its own weight. Its relationship with the earth becomes apparent through stratification:

Fig. 52 The Temple of Apollo at Corinth by Spintharus of Corinth

Fig. 53 Jarnac House by Ledoux

the horizontal layering of stone and the visible vertical gaps. The earthwork anchors the building in the ground, both visually and physically.

Rising above it is a tectonic structure of a completely different order. It is a lightweight frame assembled from linear components. The two operate in combination, but they are not the same thing. The distinction between the tectonic and the stereotomic would prove to be a decisive factor in later architectural theory.

Claude-Nicolas Ledoux

While Semper viewed earthworks as a way for buildings to connect with their surroundings, Ledoux employed plinths to create a sense of isolation. He rejected the Baroque tendency to merge the environment with the building. Instead, he articulated buildings against their surroundings, using the plinth as the principal device to do so (Kaminer, 2019).

In his late 18th-century design for Jarnac House, the one-storey plinth serves as more than just a base. It creates a complex, multi-layered appearance of walls and fortifications, further emphasised by the recessed main volume. The result is a building that appears to be lifted out of the world in which it stands, giving it an autonomous appearance.

Ledoux thus marks a turning point. While the plinth had previously signified elevation towards the sacred and separation from

profane life, it now becomes a symbol of architectural independence, asserting itself against society (Kaminer, 2019). He begins to shape the modern conception of the plinth as an isolating device, a notion that will be adopted, modified and ultimately challenged throughout the twentieth century.

El Lissitzky

"One of our utopian ideas is the desire to overcome the limitations of the substructure, the earthbound" (Lissitzky, 1970, p. 64). For El Lissitzky, the question was not how to ground the building but how to escape the ground altogether. By challenging gravity, the architecture should serve the advancement of humanity to a higher level of culture, and that the next stage of life should encompass all aspects of existence (Lissitzky, 1970).

Lissitzky's Wolkenbügel was one of the projects in which this attitude found form. Conceived as a horizontal city above the streets of Moscow, the Wolkenbügel lifted programme and circulation into the air, supported by minimal vertical cores. The ground was reduced to the points where these cores touched it; everything that mattered happened above. The earth was not engaged or articulated but bypassed (Lissitzky, 1970).

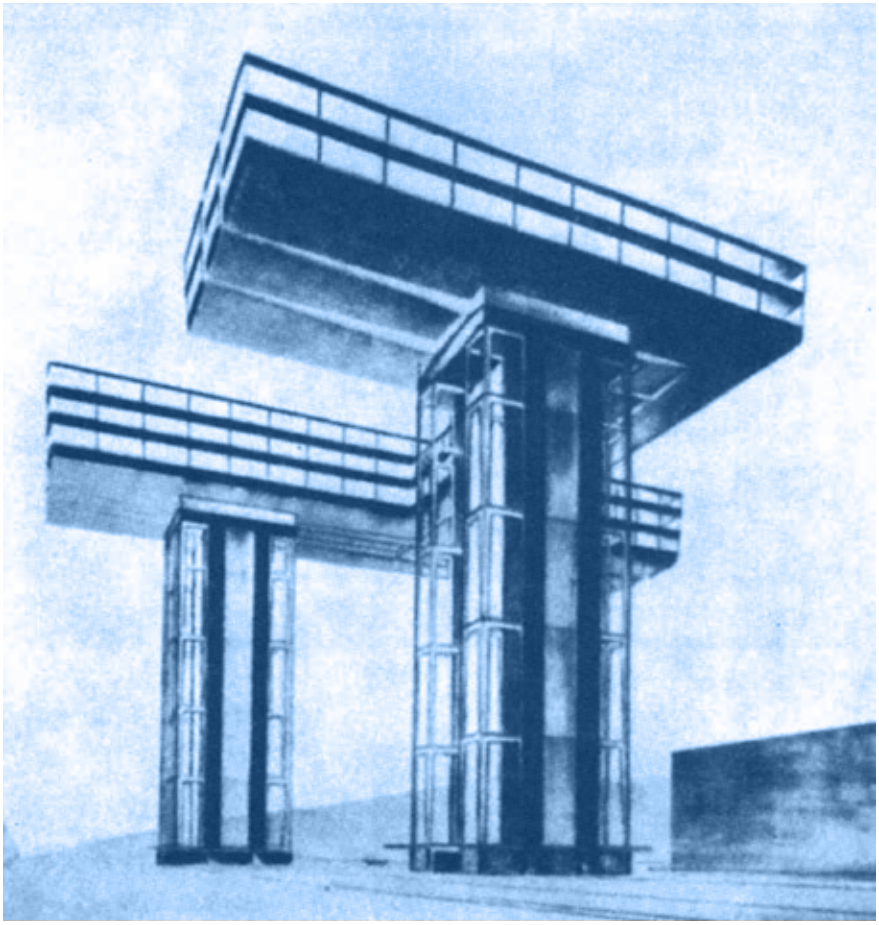


Fig. 54 Der Wolkenbügel by El Lissitzky

Where Ledoux had used the plinth to remove the building from its surroundings, Lissitzky proposed to remove it from the ground itself. The two gestures are related – both are operations of withdrawal – but Lissitzky's is more radical: it does not separate the building from its context by elevation; it tries to abolish the relationship altogether.

Le Corbusier

In Five Points Towards a New Architecture, Le Corbusier proposed that the supports – the pilotis – should elevate the ground floor several metres above the earth. The argument was at once practical and ideological: lifting the building would allow rooms above to receive light and air, while leaving the ground beneath free for the garden to pass through unobstructed. The same area gained beneath the building would be returned, on top, as a roof garden. The ground floor was to be democratised, not only for inhabitants but for non-inhabitants, animals, and ecosystems alike (Corbusier & Jeanneret, 1970).

An example of this is the Unité d'habitation (1952), which, once built, stood alone and detached from its surrounding urban environment. The block's emphatic verticality reflects Le Corbusier's enduring fascination with the polarities of the vertical and the horizontal, and of building against nature (Benton, 2013). Its roof was designed to resemble an artificial landscape – a sculpted plateau of concrete volumes that creates the paradox of ground suspended above the city (Aureli & Tattara, 2021). This brings to mind El Lissitzky and can be traced back to Le Corbusier's avant-garde belief in cultivating the new man, a belief he shared with the Russian Constructivist movement (Frampton, 2001).

Mies van der Rohe

The plinth is a recurring element in Mies's work throughout his career, which has led to him using it for different purposes, which again has led to different interpretations by architectural theorists and historians.

Fritz Neumeyer reads the plinth as a device for holding contraries together: freedom and order, the building and the landscape it sits in. Rather than synthesising these pairs, the plinth maintains them as a balanced opposition. In Mies's early houses, this takes a particular form. The Riehl House (1907) already hints at this separation, using an extended retaining wall to divide the building from the surrounding landscape (Neumeyer, 1989). In the Urbig House (1915–17), he then replaces the rigid base with a stepped sequence of platforms, through which the building mediates with the surrounding rather than separating from it (Kaminer, 2019).

Fig. 55 Unité d'habitâtion by Le Corbusier

Fig. 56 Riehl House by Mies v. d. Rohe

Fig. 57 Urbig House by Mies v.d. Rohe

Fig. 58 Seagram Building by Mies v.d. Rohe

Fig. 59 Neue Nationalgallerie by Mies v.d. Rohe

Fig. 60 Solar Pavillion by Alison and Peter Smithson

K. Michael Hays extends this logic to the Seagram Plaza (1958), where the same operation plays out on the urban scale. The plaza's claim to being a plinth is modest – only three steps separate it from the sidewalk at the entrance – but the modesty is precisely the point. Through this slight elevation, the building is set apart from the street while the public lobby still links to the city. The result is a "simultaneous production of difference from and integration with the social city" – a distance held just close enough to maintain the connection (Hays, 1997, p. 283).

Pier Vittorio Aureli rephrases the question. Rather than acting as a mediator, the plinth establishes a boundary that separates the Seagram Building from its surrounding, mass-produced urban environment. This argument highlights a contradiction in Mies's own practice, given that his architecture openly embraces industrial materials and reproducible elements (Aureli, 2011). This is particularly evident in the Neue Nationalgalerie (1965), which is isolated from the context of Berlin, relating to it only through set views from above (Kaminer, 2019).

Throughout Mies's career a trajectory emerges: early house plinths mediate between building and landscape, Seagram's modest plaza offers limited separation while admitting the public, and the Neue Nationalgalerie's plinth fully isolates the building.

Alison and Peter Smithson

Where Mies refined the plinth as an instrument of isolation, in the same time period Alison and Peter Smithson turned in the opposite direction. Working in the austerity of post-war Britain and shaped by the photography of Nigel Henderson – which documented the profane, spontaneous textures of everyday life – they sought to rethink architecture from the ground up (Smithson & Smithson, 1990).

Their concept of the as found challenged modernist doctrine by attending to what was already there. As they wrote, as found meant "not only adjacent buildings but all those marks that constitute remembrancers of a place" (Smithson & Smithson, 1990, p. 201) – the trees, the surface of the existing ground, the residues of prior occupation. A new building was treated as an incomer (Smithson & Smithson, 1990). The as found approach demanded a fresh perspective on the mundane, rejecting artificiality in favour of raw material honesty: "the woodness of the wood; the sandiness of sand" (Smithson & Smithson, 1990, p. 201).

For grounding, this position has clear consequences. The ground is not a datum to be levelled, nor a landscape to be replaced by a roof garden. It is a condition with its own marks, traces and life, into which the building inserts itself with care. The Upper Lawn Pavilion in Wiltshire exemplifies this attitude: a small structure that respects the existing wall, the existing trees, the existing topography. The Smithsons offer a counter-current to both Ledoux's plinth and Le Corbusier's pilotis – a way of meeting the ground that neither isolates nor abstracts but receives and integrates.

Marcel Breuer

When Breuer was commissioned to design the Whitney Museum on Madison Avenue in 1963, the question he asked himself was urban rather than sculptural. He wondered how to build a museum for modern art amidst Manhattan's skyscrapers (Bergdoll & Beyer, 2016).

The answer was a careful negotiation, most clearly seen in the sunken sculpture court at the front of the site, which separates the museum from the pavement by a constructed gap. Access is granted via a bridge spanning the trench, sheltered beneath a projecting canopy. Visitors do not enter the museum from the street; they transition out of the street and over a bridge into a different domain (Bergdoll & Beyer, 2016).

Breuer's approach is therefore distinct from the plinth and the piloti. While Mies's plinth produces isolation through elevation, Breuer's trench produces separation through careful transition. While Le

Fig. 61 Whitney Museum by Marcel Breuer

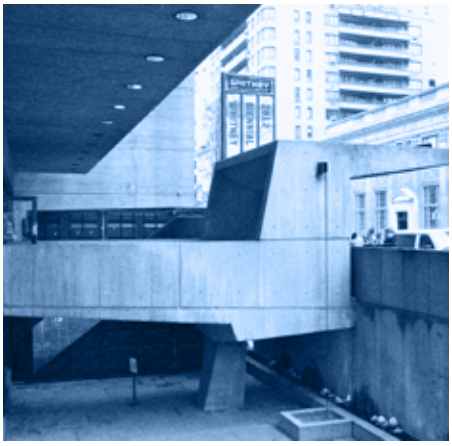


Fig. 62 Whitney Museum, Bridge Trench

Corbusier's pilotis lift the building free of the ground, Breuer cuts the ground away to reveal the building's relationship with it. The Whitney does not reject the city but engages with it by positioning itself deliberately and visibly just outside of it.

Rem Koolhas

Bigness diagnoses that contemporary buildings are shaped less by architectural intention and more by a series of technological inventions. For example, the elevator replaced the architectural logic of vertical movement with a mechanical one. The increasing distance between the structural core and the outer skin has made the façade meaningless. Buildings are too large, too deep, and too autonomous in their internal organisation to be part of any urban fabric. They refuse any obligation to their surroundings, adopting an attitude of 'fuck context' (Koolhaas, 1995, p. 502).

In the 1993 competition for two libraries in Paris, OMA tried to overcome this condition not by returning to the traditional ground but by reinventing it. The surface was treated as a fabric, warped and folded for density. The result was meant to be a vertical, intensified landscape – one that denied the concept of the ground as a flat datum. A continuous ramp ran from the street to the roof that connected everything. In OMA's own terms, the path and public realm took on the permanence of the city itself, while the programmatic content remained as impermanent as the city's other contents (Koolhaas, 1995).

Koolhaas's position is therefore double-edged. He diagnoses the detachment of the contemporary building from the ground as a structural condition – irreversible, produced by technology and scale – and then proposes, through the folded ground, a strategy that internalises the built ground inside the building. It is no longer outside; it has been pulled up into the building's section as a continuous, manipulated surface.

Kenneth Frampton

Drawing on Semper's Der Stil, Kenneth Frampton distinguishes the tectonic from the stereotomic – a symbolism modern architecture has lost. As glass skyscrapers look increasingly alike, architecture risks becoming a generic, floating commodity. This stems from a profit-driven logic that conceives buildings as voids to be filled efficiently, indifferent to topography, history, and the soul of a specific place (Frampton, 1995).

But the problem of rootlessness is older than modernity. Drawing on Heidegger, Frampton traces back to the translation of Greek

thought into Latin, in which the Greek attention to the spirit of things gave way to a Roman concern with power, administration, and law. To recover what was lost, architecture must return to the thing itself – and phenomenology, the study of how things are experienced, becomes the discipline through which this return is possible. Drawing on Gregotti, the remedy is not to imitate the environment but to absorb the complexity of the site and its inherent logic, identifying what Frampton, after Norberg-Schulz, calls the genius loci of a place (Frampton, 1995).

In practice this means an architecture that pays attention to its own parts: how it is assembled, how it meets the earth, how it rises from the ground, how its joints become the locus of meaning, and how the facade expresses the structure beneath it. Frampton elaborates this as building the site, a phrase he borrows from Mario Botta – terracing into a hillside, stepping down a slope, working with irregular topography so that the building embodies the prehistory, geology, and unique character of the ground it stands on (Frampton, 1995).

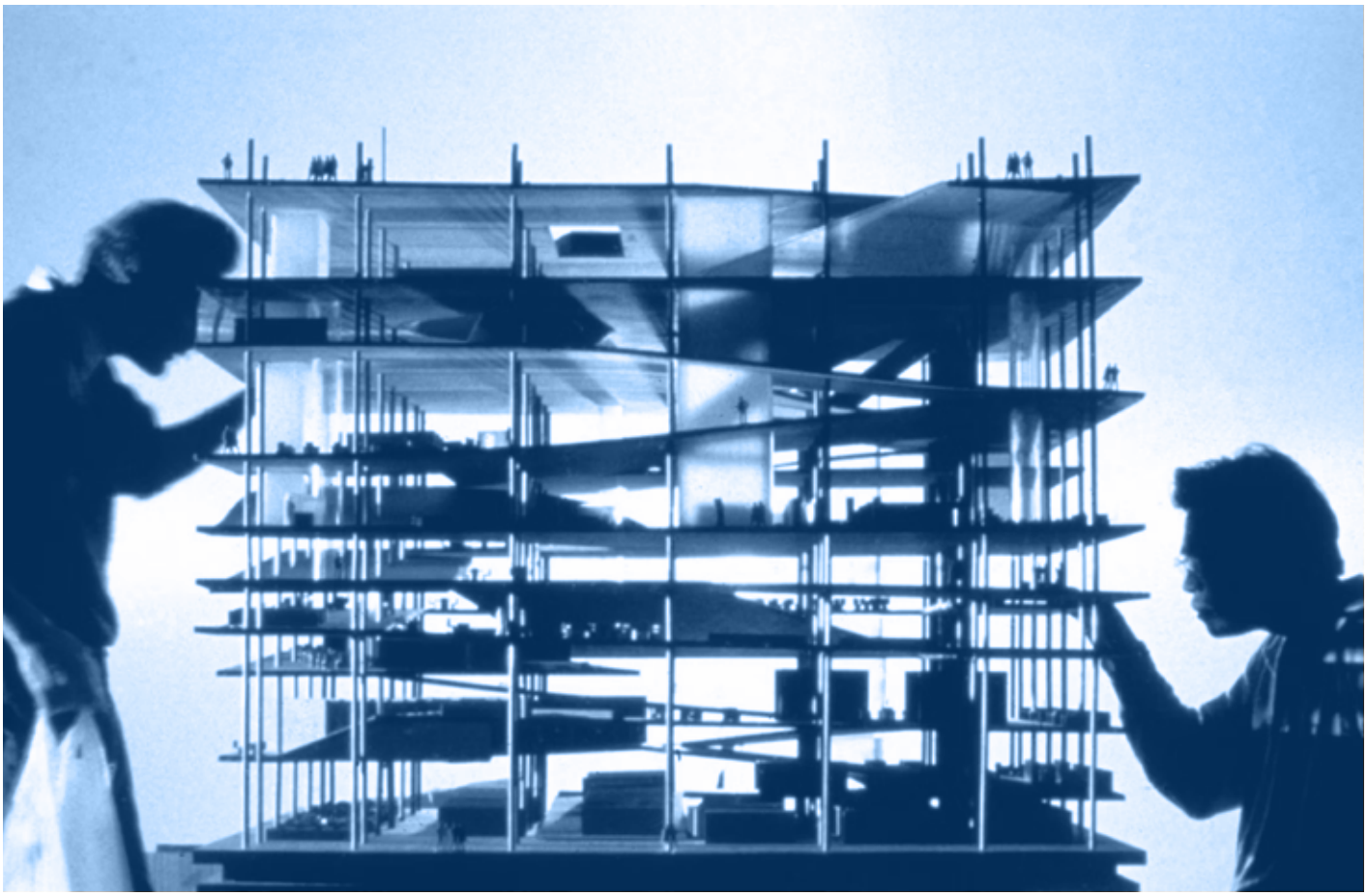


Fig. 63 Jussieu - Two Libraries by OMA

Mio Tsuyenama and Fuminori Nousaku

The Japanese architects Mio Tsuneyama and Fuminori Nousaku begin from the conviction that contemporary architecture must be less invasive to the ecosystems it occupies. Their proposal is to make only subtle contact with the ground and to use only what is locally available, thereby creating ecosystems specific to each condition and situation. A revival of traditional or vernacular wisdom, they argue, makes less invasive ecologies possible – and offers a way out of the framework of post-modern architecture toward what they describe as a city built with fungus, an area where humans and multiple species can coexist. (Nousaku & Tsuneyama, 2024)

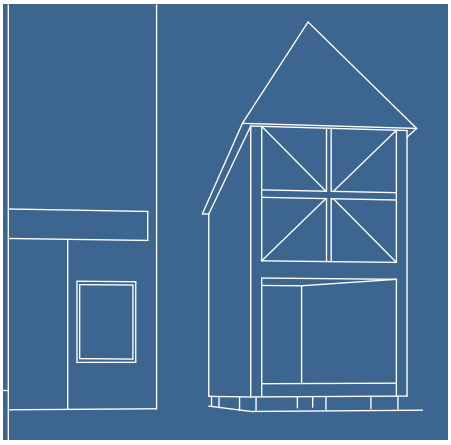


Fig. 64 Piles and Pointed Roof by Fuminori Nousaku.

Their project, 'Piles and Pointed Roof', exemplifies this philosophy. Built in response to the extensive grey infrastructure constructed by the City of Tokyo to counteract potential flooding, the project challenges the sealing of the ground and disruption to its hydrological cycles. Rather than sealing the ground, the project is positioned on the outskirts of Tokyo City to allow the ground to breathe, as traditional Japanese houses, or minka, did. The building stands on reversible steel screw piles, each fourteen metres long, which can be removed without causing permanent damage to the ground. A trench surrounds the plot and is pierced by bamboo pipes. It is filled with coal and small stones to allow rainwater to run off and be absorbed by the earth and mycelium beneath (Joanelly, 2023).

Unlike El Lissitzky and Le Corbusier, Tsuneyama and Nousaku use visual separation from the ground to heal it – to return what sealing has taken away: air, water, life and mycelium. Here, the separation from the ground is not an act of neglect, but a gesture of care that draws on vernacular building traditions and is therefore integrative.

Sámi

The Sámi position cannot be located on the same axis as the European architectural theorists discussed above. The European tradition asks how a building should meet the ground; the Sámi tradition begins from a different premise – that land is not a surface to be met by structures but a continuity of relationships sustained across generations, seasons, and species.

Two concepts articulate this difference. Birgejupmi refers to a community's ability to sustain itself within a given territory without depleting its resources, while árbediehtu denotes the generational transfer of traditional knowledge required to enact that sustainability. Both presuppose an inseparable connection between land and people; as Rauna Kuokkanen argues, "the health of the people cannot be separated from the health of the land" (Jääskeläinen, 2020, p. 49).

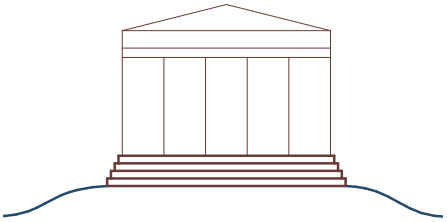
From this premise, the Sámi derive specific land-use strategies, such as rotating grazing areas, applying deep ecological observation, and treating the landscape as a generational inheritance rather than a commodified resource (Jääskeläinen, 2020).

There are two implications that matter for an architectural reading. Firstly, the unit of grounding is not the building itself. Rather, it is the seasonal cycle of herding and the network of relationships between herders, reindeer, water and forest. Secondly, a successful intervention is defined as one that sustains or strengthens existing continuity. A building that does not unnecessarily damage the land, leaves no permanent mark and can be removed when the season changes, approaches the Sámi conception more closely than any European position.

Summary

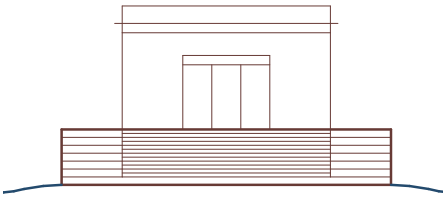
Across these positions, the question of how a building meets the earth has been answered along a spectrum. At one end stand the gestures of withdrawal – Ledoux's plinth, Lissitzky's Wolkenbügel, the floating tectonic frame Frampton diagnosed in modernism – which lift the building free of its surroundings and assert a separate order. At the other end stand the gestures of reception – the Smithsons' as found, Tsuneyama and Nousaku's reversible piles, the Sámi understanding of land as inheritance – which try to disturb the ground as little as possible and to read what is already there.

Between these poles lie more complex strategies: the Greek crepidoma, which mediates between landscape and order; Semper's earthwork, which anchors the tectonic frame to the ground while remaining categorically distinct from it; Mies's plinth, read variously as isolating, mediating, or separating; Le Corbusier's pilotis, which lift the building while claiming to preserve the ground; Breuer's bridge across a constructed gap; Koolhaas's folded ground, which internalises landscape inside the building's section.



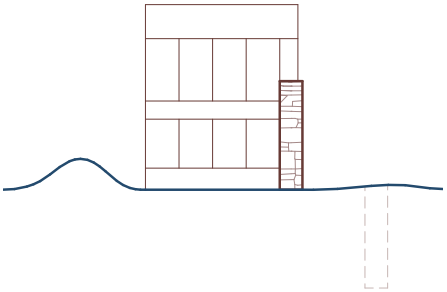
Greek (Early third quarter of the 6th century BCE)

The crepidoma separates geometric order from unordered nature, anchoring the temple to its place yet detaching it through its own ideal proportions.



Claude-Nicolas Ledoux (late 18th century)

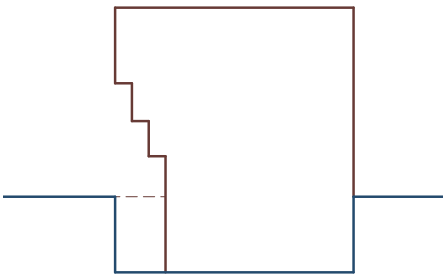
Against the Baroque merging of building and environment, Ledoux's plinth isolates the building – no longer a sign of the sacred but of architectural independence.



Alison and Peter Smithson (1962)

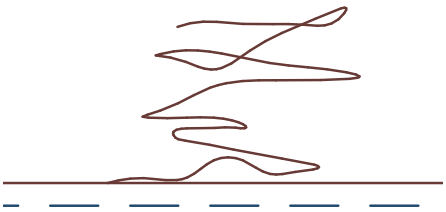
Neue Nationalgalerie.

The as found attends to existing marks, traces, and material honesty, treating the building as an incomer. The ground is a condition into which the building integrates itself with care.



Marcel Breuer (1966)

At the Whitney, a sunken court separates the museum from the pavement by a constructed gap, crossed by a bridge. Breuer separates through transition rather than elevation, cutting the ground away to reveal the building.



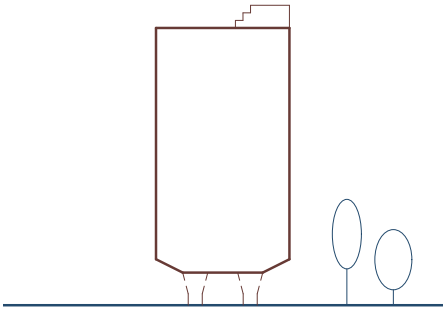
Rem Koolhaas (1992)

Bigness diagnoses the building's detachment from the ground as irreversible. In the Paris libraries OMA reinvents the ground as a folded landscape, mediating between urban fabric and the inside of the building.

Fig. 65 Visual Summary of the Theoretical Foundation

El Lissitzky (1929)

The question was not how to ground but how to escape the ground. The Wolkenbügel lifted programme above Moscow on minimal cores, seeking to isolate from context.

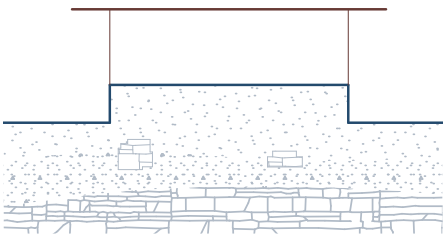


Le Corbusier (1952)

The pilotis lift the ground floor to admit light and air while letting garden pass beneath. Yet the Unité stood separated, its sculpted roof a ground suspended above the city.

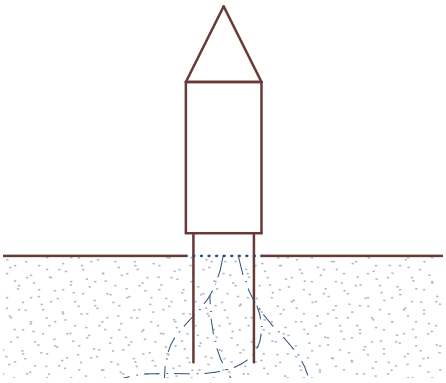
Ludwig Mies van der Rohe (1968)

The plinth recurs across Mies's career and is read variously: mediating between building and landscape in the early houses, offering limited separation at Seagram, fully isolating at the



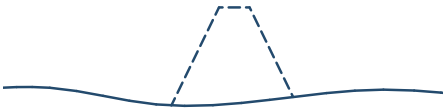
Kennethh Frampton (1995)

Frampton diagnoses a modern loss of the tectonic and stereotomic, tracing rootlessness to antiquity. The remedy is to recover a site's genius loci and build the site, embodying its geology and character.



Fuminori Nousaku (2022)

Architecture must touch the ground only lightly, using local materials. Piles and Pointed Roof answers Tokyo's flood infrastructure with reversible screw piles that let the ground breathe – raising the house to heal it.



Sámi

Land is not a surface met by structures but a continuity of relationships across generations and species. A successful intervention leaves no permanent mark and can be removed when the season changes.

Explorations

The main drivers for the explorations were finding a way to test ways of illustrating grounding and founding together with ground conditions, as well as translating the theoretical framework into a driving force for the design.

Exploration 01 – Founding in Detail

'Haus Rauch', by Roger Boltshauser and Martin Rauch, and 'Naturum Store Mosse', by White Arkitekter, are depicted in axonometric detail at the point where the buildings meet the soil. Combining an axonometric view with section cuts uncovers the technical aspects of founding in relation to grounding, as well as the soil conditions. This reveals how 'Haus Rauch' appears to be integrated into the landscape, incorporating excavated clay from the site; however, its foundation still consists of standardised concrete strips. In contrast, Naturum blends into forest landscapes on unstable marshland using four granite point foundations to support its upper wooden structure.

The result is a graphic convention for the design: the continuation of color-coding blue for the ground and brown for the built in more detailed drawings and shared hatching to express material origin.

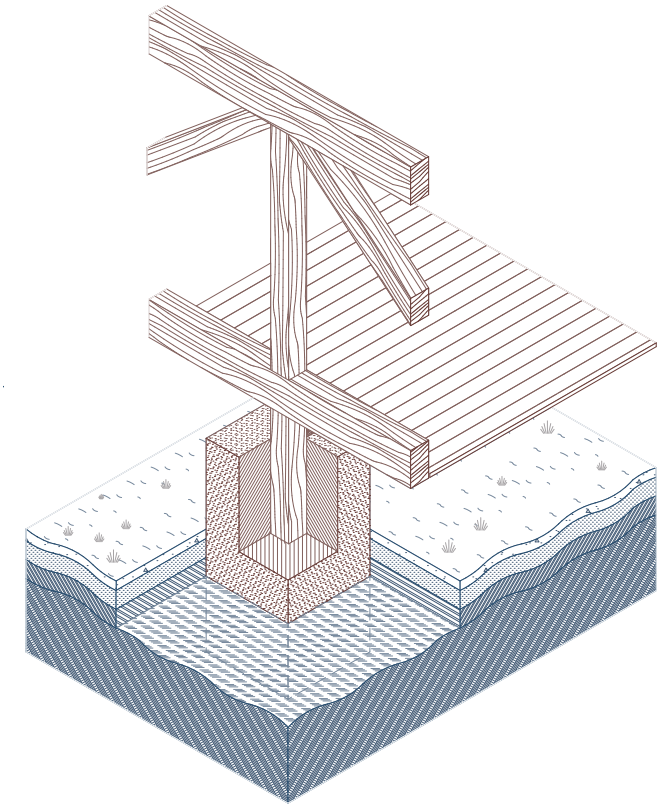


Fig. 66 Axonometry Naturum Store Mosse

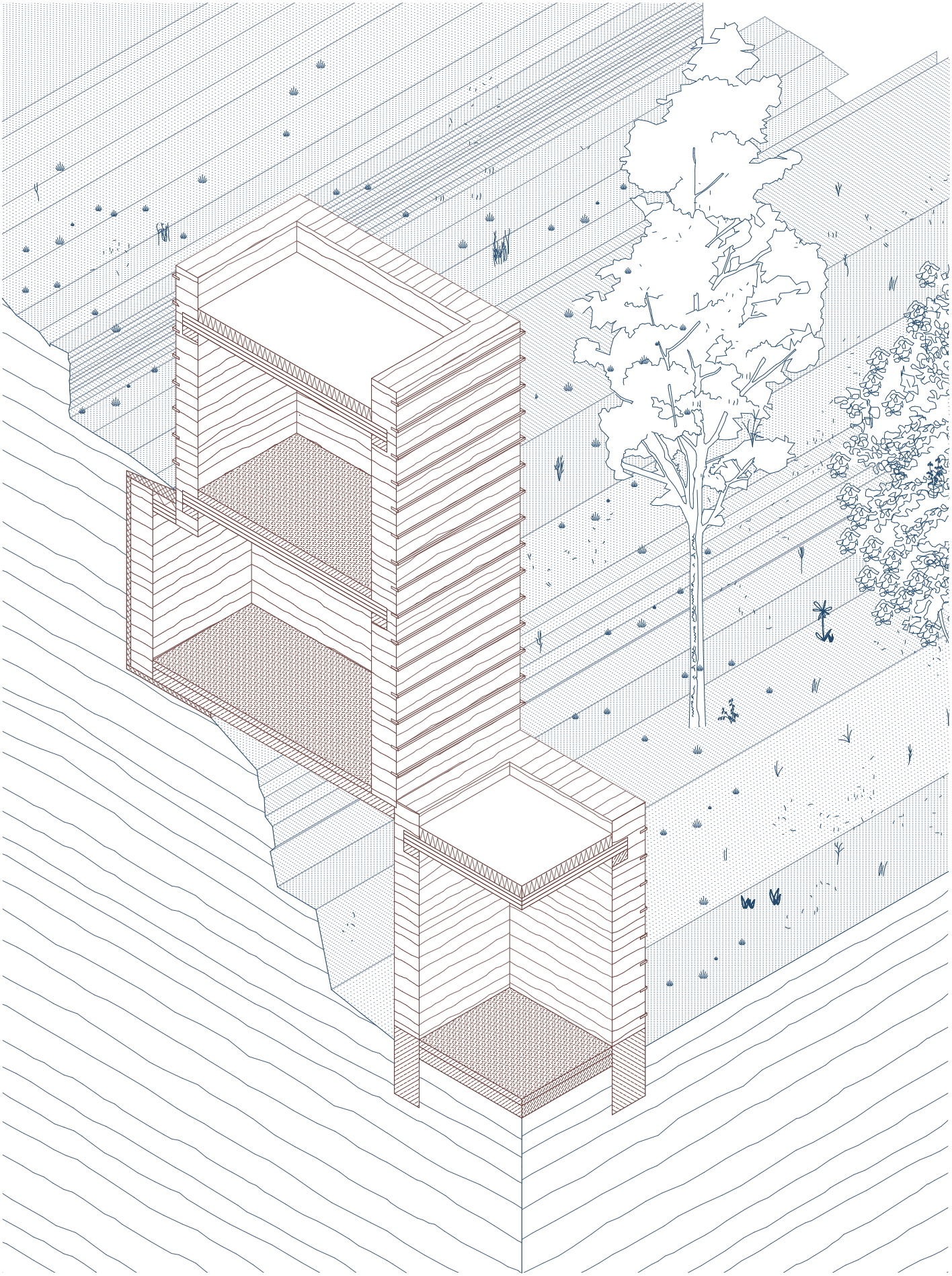


Fig. 67 Axonometry Haus Rauch

Exploration 02 – Transformative Grounding

An abstracted 1:100 model of the Farnsworth House is rebuilt four times. The upper volume is held fixed; only the element towards the ground is changed. The interventions are driven by the urge of understanding grounding as an architectural asset.

Each variation focuses on the architectural consequence of grounding. The stepped down original blends with the site and stages a mediating threshold through stairs and veranda. The extended core isolates the building from nature, acting as a plinth it turns the upper volume into a watchtower. Sitting directly on the ground the house becomes part of it and loses its proportions with its elevation. The massive platform replaces mediating with stereotomy – the building separates from the chaos of nature, appearing as a datum for the building on top.

The exploration shows that the expressive power of grounding and how specific elements can have different effects for a buildings relationship to the ground.

Fig. 68 Farnsworth House, Original

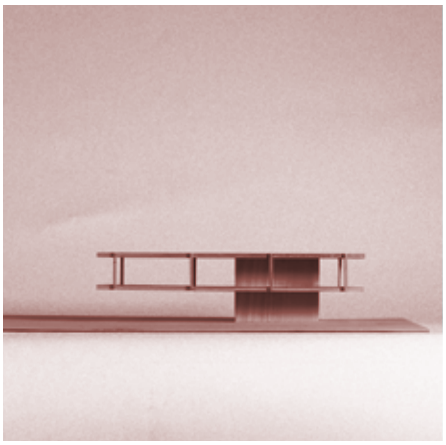


Fig. 69 Farnsworth House, Extended Core

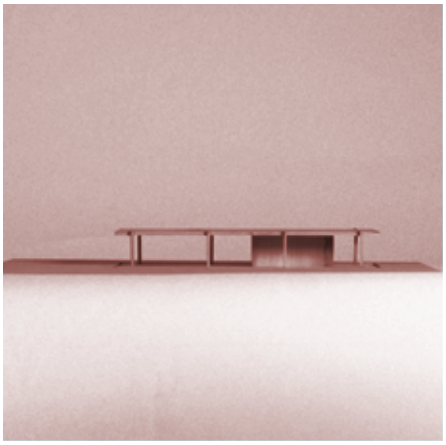


Fig. 70 Farnsworth House, on Ground

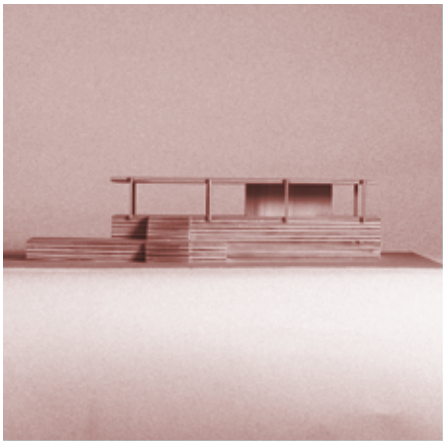


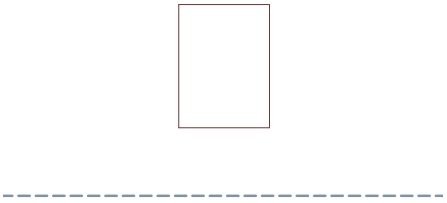
Fig. 71 Farnsworth House, Platfrom

Exploration 03 - Grounding Matrix

The matrix transforms the theoretical material from argument into inventory. The grounding elements identified in theory – pilotis, the ‘As found’, folded ground, bridge & trench and plinth – and partly tested in the explorations are ordered along the relational categories: integrative, mediating, separating, isolating.

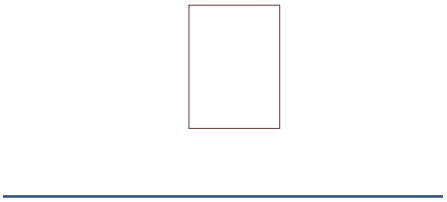
An element is not fixed to one category. The matrix shows where each tends, and where the same element shifts register depending on how it is used. The Pilotis as used by Le Corbusier separate while in the hands of Fuminori Nousaku they integrate. What was theory becomes a working set of tools, and the immediate point of departure for the design.

ISOLATING



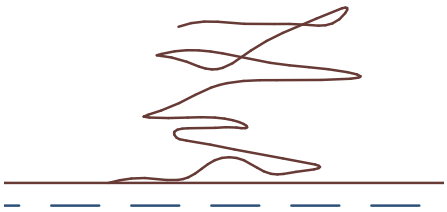
abolishing the
ground relation

SEPARATING



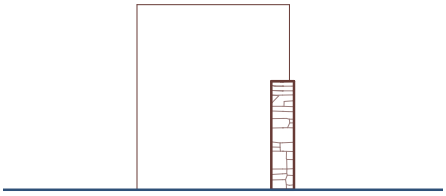
democratising
the space
underneath

MEDIATING



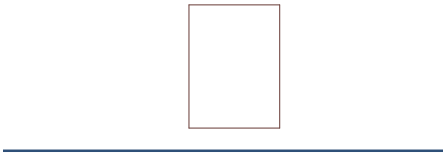
man-made ground
warped to pull
it inside

INTEGRATING



receiving the
existing

AS FOUND



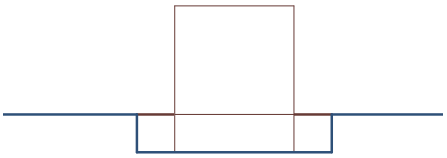
light touch as
act of care

PILOTIS

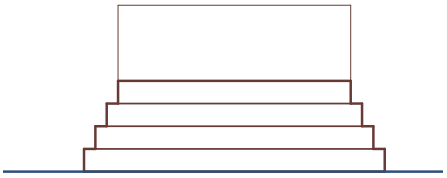
FOLDED GROUND

autonomy against
the surroundings

raised datum



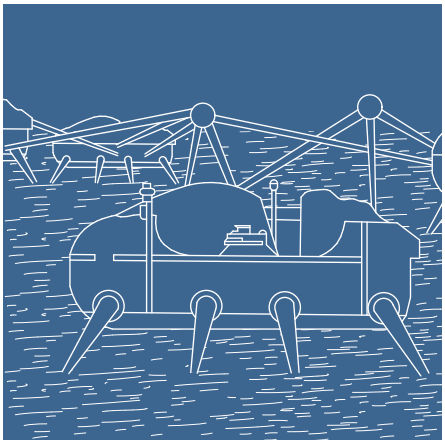
transition
across a gap



threshold to
surrounding
context

References

Platforms, Design Earth are used as visual and theoretical references; their arguments and drawings shape how the ground is read. Zumthor's Mine Zinc Museum, the Sovringsverk and Archigram serve as architectural and conceptual references, while Dombauhütte, Återbruket and Temporary Tecture inform the building's concept and program.



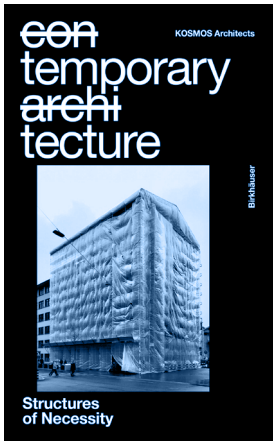


Fig. 72 Visual Summary of the Used References

Platforms

Pier Vittorio Aureli and Martino Tattara's book is referenced for its arguments and illustrations. Their historical breakdown of platforms informs the thesis, and the design directly echoes their illustrations focusing on the grounding as well as the founding.

After Oil

Design Earth speculates on the Gulf's geography in the decades after oil. Its axonometric drawings unveil the strata beneath the ground and place them in relation to the former oilrig above, staging the long-term consequences of the current fossil fuel regime.

Mine Zinc Museum

Peter Zumthor's design at Allmannajuvet marks a once-active Norwegian zinc mine. Museum and café stand over the precipitous landscape on a grid of timber supports. The buildings combine sleek and industrial aesthetics to reference the history underground.

High-Tech Architecture

The architectural style was a neo-futurist, pro-consumerist techno-utopia drawing on technology to imagine a new reality. Against modernist rigidity, it proposed flexible, ready-made structures and an obsession with movement, indeterminacy and consumer culture.

Sovringsverk

Designed by Håkon Ahlberg and built in 1958 after the switch to sub-level caving, LKAB's Sovringsverk sits atop the Kiruna mine's elevator shafts. Its industrial aesthetic is characterised by a corrugated metal sheet façade and small, functionally positioned windows.

Walking City

Ron Herron's concept, produced as part of Archigram, imagines giant mechanical pods roaming a post-apocalyptic landscape – a nomadic, interchangeable city that walks and adapts to endless change. The pods contain urban and residential areas and form an itinerant metropolis.

Dombauhütte

The stonemasons' lodges were workshops involved in the construction of Gothic cathedrals across Europe and are now responsible for their continuous restoration. They operate as permanent on-site assemblies, making architecture a process rather than an object.

Återbruket/Bauteilbörse

Återbruket in Sweden and Bauteilbörse in German-speaking Europe are organisations dedicated to the cataloguing, repair and redistribution of salvaged building components. They operate as small-scale infrastructures for material reuse.

Temporary Tecture

The book discusses elements like scaffolding, fake facades and event infrastructure as a serious field of architectural inspiration. It argues that lightweight, reusable structures responding to current needs can achieve a more vital form of architecture than permanent buildings.

The foundation is architecture's first decision. It connects a building to the ground - the made to the given.

Yet in current practice, the foundation has become invisible in two senses. It is buried in the earth and forgotten in the design. Standardised details have replaced the question of this place: its geology and its history. The ground beneath every project is reduced to an abstract, levelled surface - as if it were the same ground everywhere.

What is hidden is rarely designed. But this concealment is deceptive: the foundation determines how a building stands, how it transfers loads, how it relates to its place - and how long it remains. It rests on ground shaped over millennia, and it often outlasts the building itself. The foundation is the slowest part of architecture.

A building that does not negotiate with its specific ground does not truly stand on it. It is merely placed there - interchangeable, indifferent, untethered.

Precisely because standardised construction offers a frictionless way of meeting the ground, we must resist this default. A foundation should be a negotiation with the ground on which it is built - a response to the site itself: its history, culture, topography and geography.

If architecture claims to be site-specific, it must begin where it touches the ground. The foundation must no longer remain a hidden standard detail. It is the first architectural act of a building - and often one of the last fragments to survive.

Design

The preceding chapters established the conceptual apparatus, the situated condition, and the vocabulary the design now tests. What follows is a speculation: a projective proposal that asks how one might build within Kiruna's deformation zone rather than retreat from it.

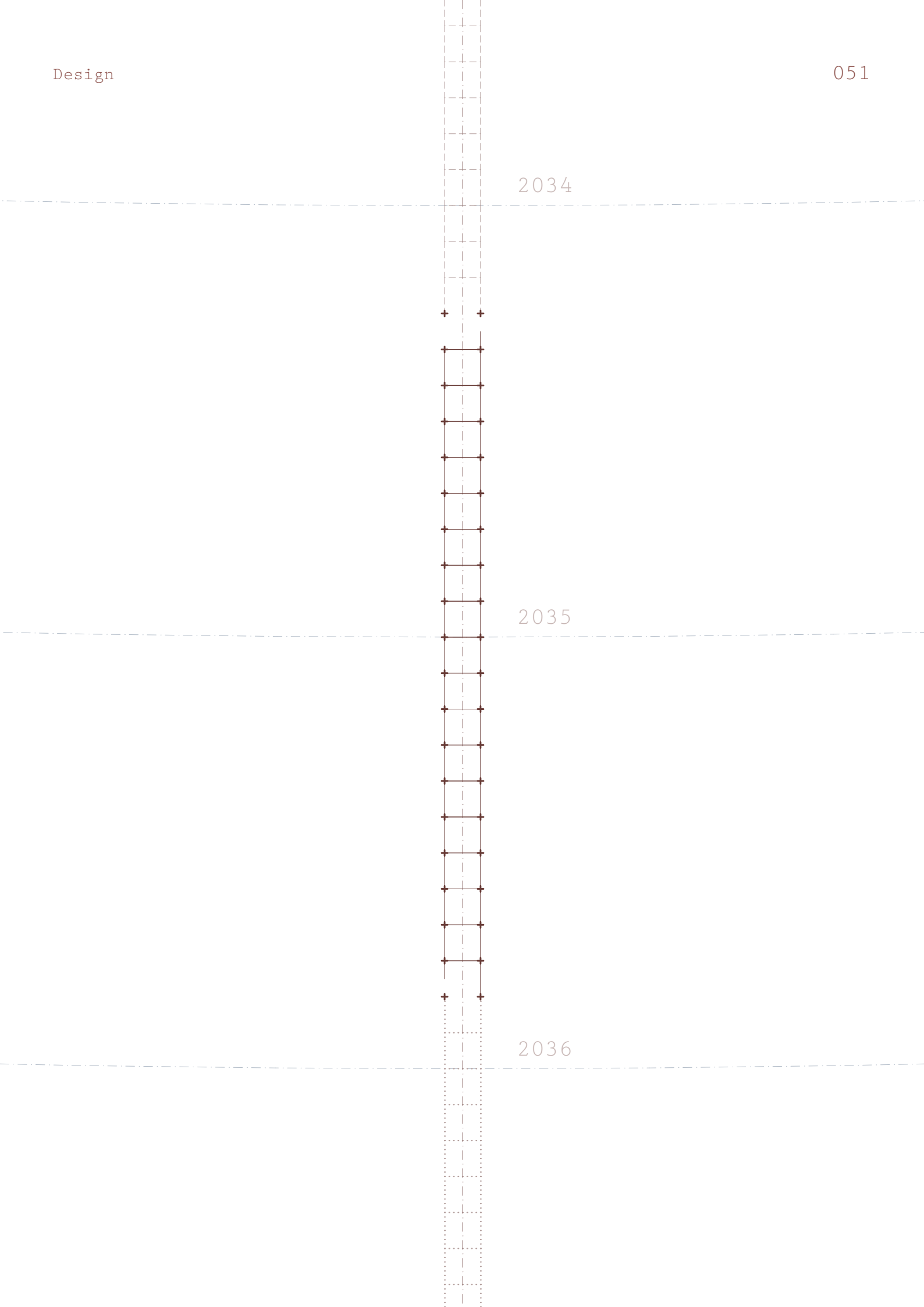
When a building in Kiruna is moved, it is severed from its foundation; when it is demolished, the foundation is the last part to be taken away. The foundation outlives the building it carried. But what if it were allowed to stay – and what if a structure could work with the moving ground instead of being removed by it?

The relocation offers no such structure. Of the old town, only forty-two buildings are relocated; the rest are demolished, their traces cleared, with little material reused, while the deformation zone continues to expand. The new town, meanwhile, is built in concrete: fixed, unmovable, and – should the ground ever demand it again – destined for the same demolition it was meant to escape.

To build within the deformation zone is therefore to accept a single premise: the ground will not hold still. The proposal internalises this condition from the ground up. It is a mobile reuse centre that advances with the demolitions, rescuing what would otherwise be lost – a sorting facility for urban mining, inspired by LKAB's Sovringsverk, that collects, cleans, catalogues, repairs and stores salvaged elements before redistributing them to the new city. Material enters at the rear, where the old city is dismantled, and leaves at the front, where the new one is built.

A permanent foundation has no logic here. The building carries only a temporary one, reset each month as it advances along the deformation line, renegotiating its relationship to the ground with every move. It is, in this sense, a paradoxical structure: a building without a permanent foundation.

Each resettlement begins with reading the ground. The history, location, culture, genius loci and former program of each site are analysed and translated, through the Grounding Matrix, into a grounding method that expresses the building's relationship to that specific place. As the actual geotechnical conditions could not be surveyed on site, these groundings remain projective – gestures tested in drawing rather than soil.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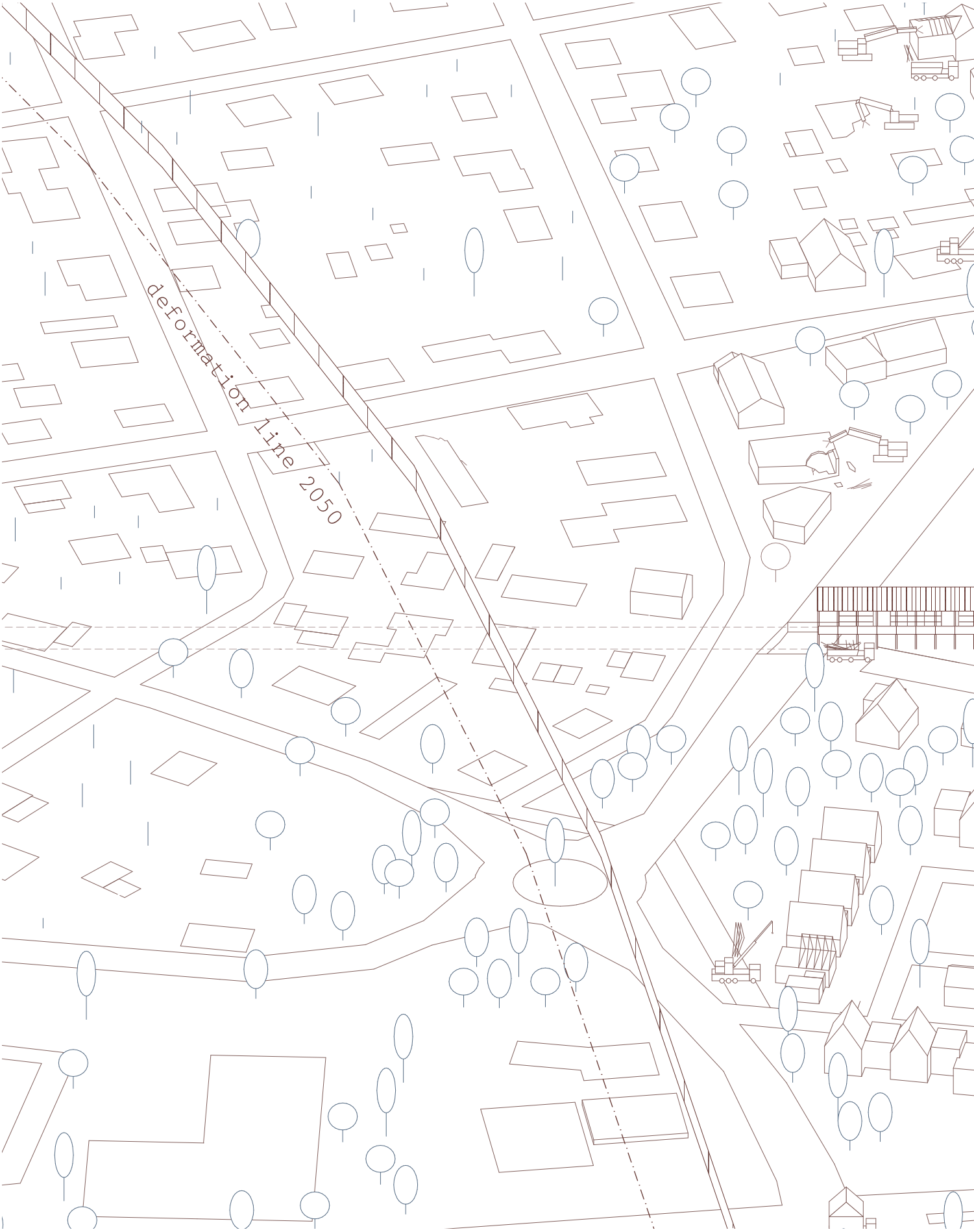
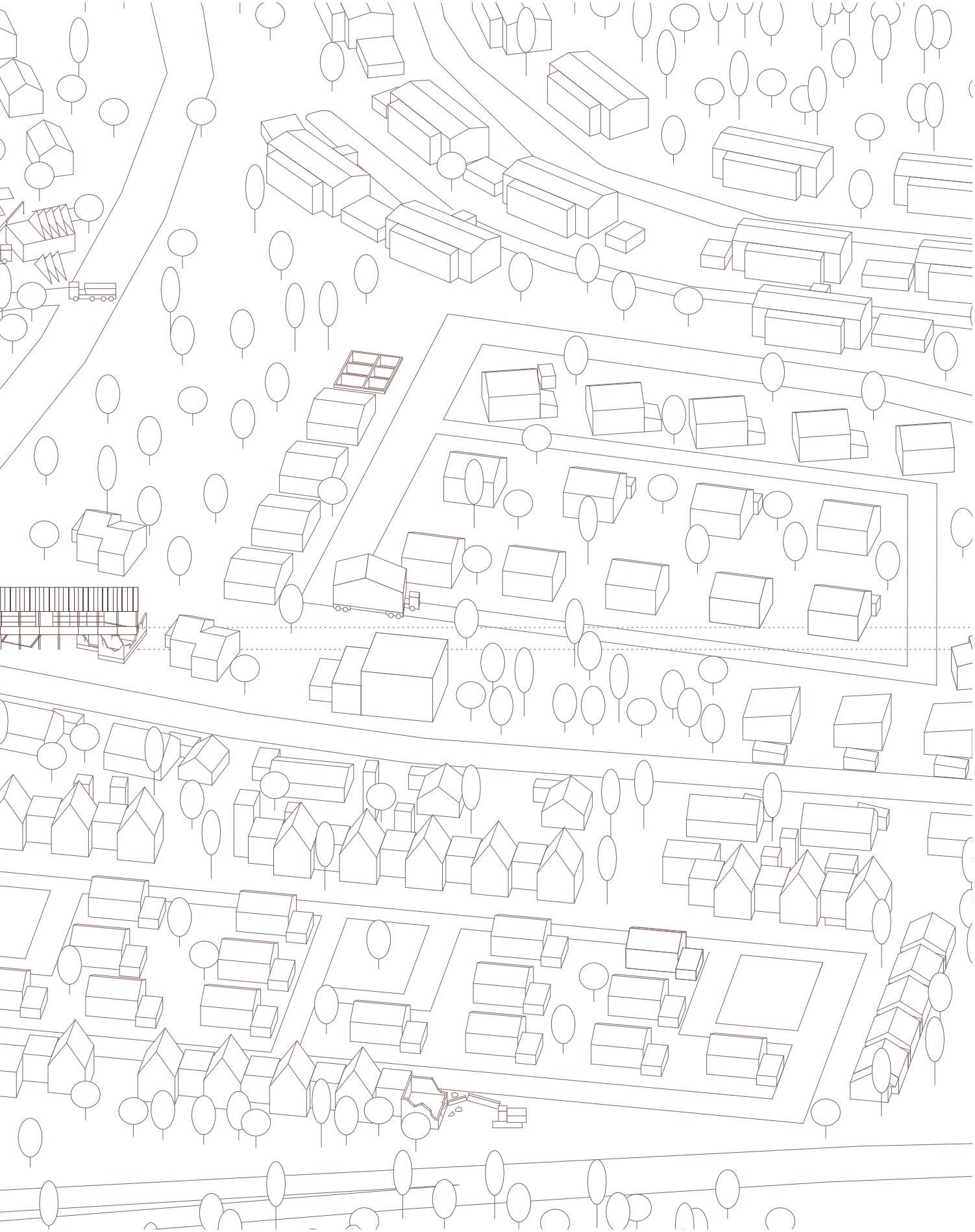


Fig. 73 Design Proposal Situated in the Urban Context



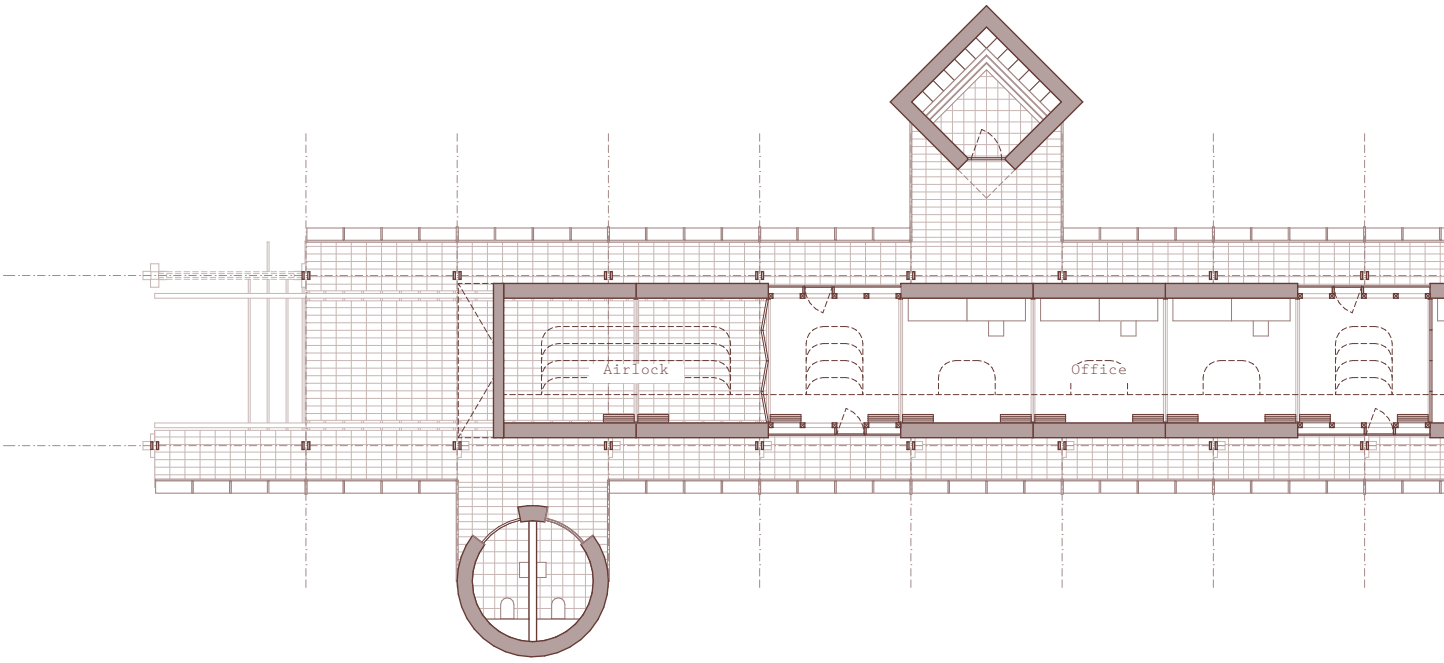
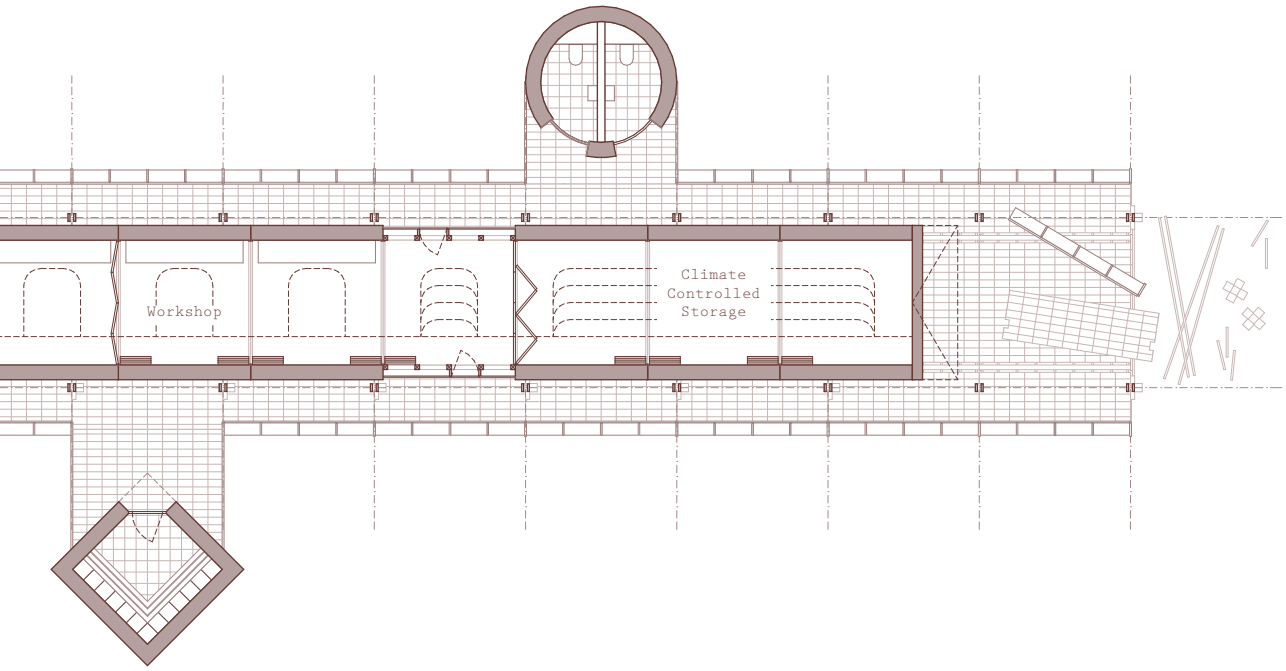


Fig. 74 Schematic Floor Plan of the Design Proposal

The building consists of fourteen pods grouped into four work zones: airlock, office, workshop, and climate-controlled storage. Buffer pods between the zones provide staging space between work steps.

Components enter through a folding gate at the rear, handed from the exoskeleton's crane to a hanging rail that runs along the ceiling of each pod, allowing workers to move heavy elements by hand. All workstations are grouped along the north side, leaving the south as a continuous path for material flow. In the airlock, components are cleaned and assessed; in the office, they are scanned and their repairs planned; in the workshop, modifications are carried out. Temperature-sensitive materials are held in the climate-controlled pods, while finished components leave through the front gate and are exhibited on hanging rails beneath the structure.

The diagram opposite shows the range of building components the centre processes, ordered by size and weight. Components longer than 3.5 metres and heavier than 500 kg are excluded from the workstations inside the facility but are still catalogued by the building component hunters working from the centre.



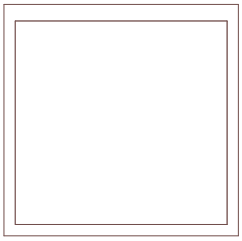


Fig. 75 Processable: Window

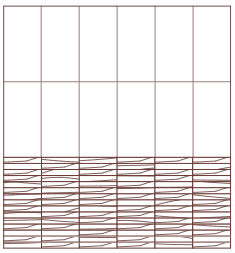


Fig. 76 Processable: Parquet

> 3.5 m or 500 kg

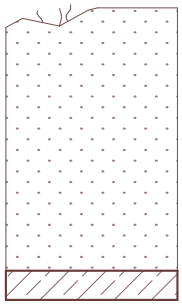


Fig. 77 Catalogued Only: Concrete Slab

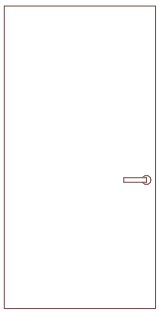


Fig. 78 Processable: Door

Fig. 79 Processable: Toilet

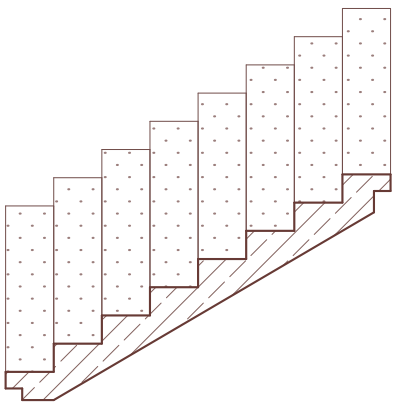


Fig. 80 Catalogued Only: Concrete Stairs

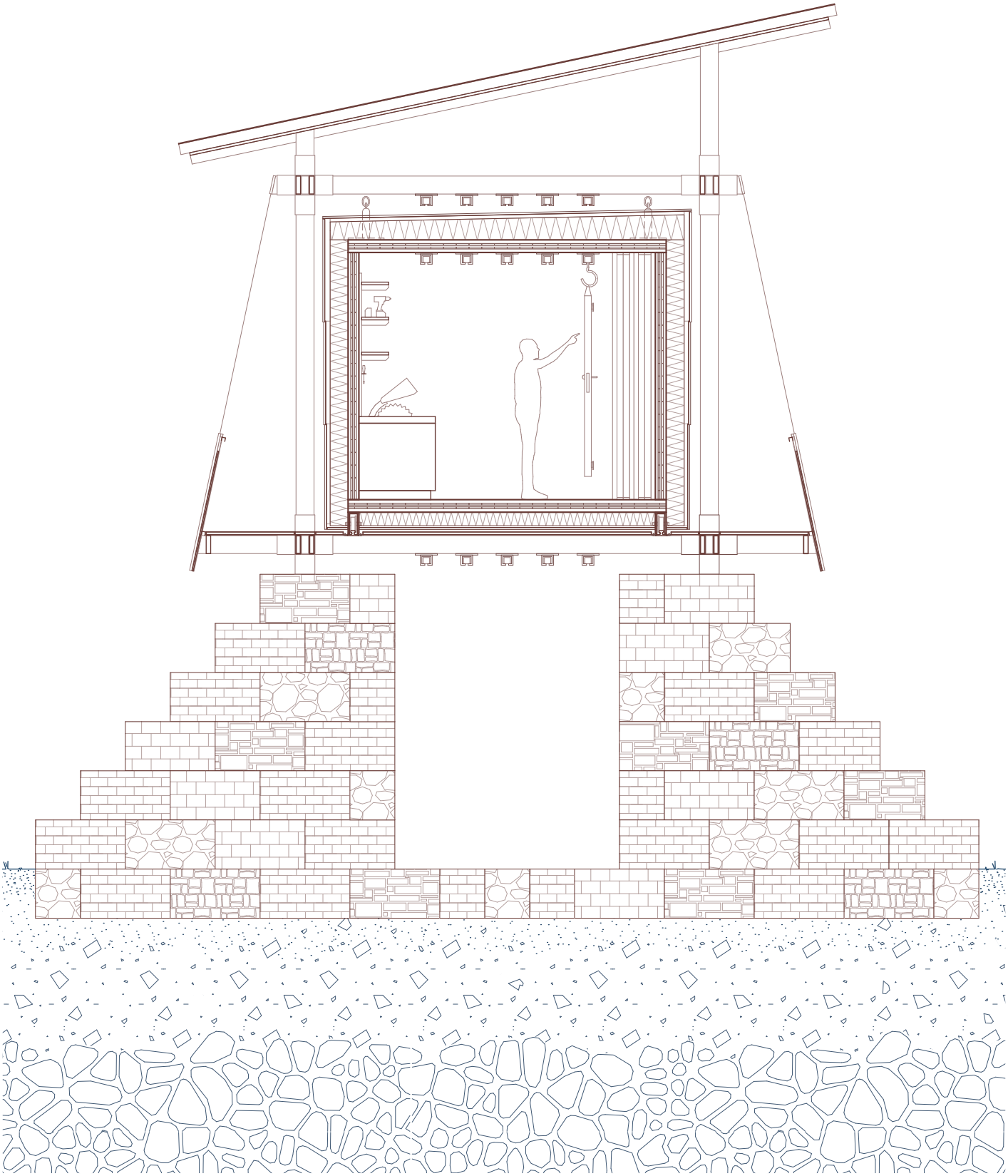


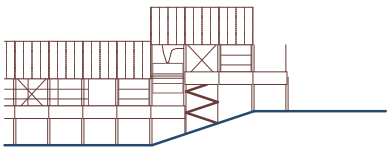
Fig. 81 Detailed Section, Level of Detail 1:20 (scaled)

The exoskeleton is built of doubled hollow steel profiles joined by plus-shaped nodes that express the additive logic of the structure. Doubling the profiles keeps each member light enough to be carried by one or two people, which is what makes the monthly resettlement possible at all. Balconies with integrated solar panels are suspended from the upper nodes, giving maintenance access and partial energy self-sufficiency; they too follow the additive logic, assembled from modular steel components so that whole balcony units can be relocated without dismantling them piece by piece.

The pods run on flange wheels along rails mounted to the transversal beams. Their load-bearing structure is Dowel Laminated Timber, left exposed inside to create a workshop atmosphere; externally they are insulated with wood fibre and clad in trapezoidal metal sheet – a reference both to the Sovringsverk and to the wooden façades of traditional Swedish building. Buffer pods are clad in polycarbonate, marking their distinct function and admitting daylight into the otherwise enclosed structure. Folding polycarbonate doors at both ends of each pod let workers separate spaces as needed: during individual moves, for noise protection, or to shield the interior when the front gate is open.

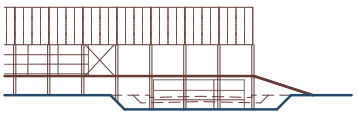
Four further pods stand alongside the main line – two round, two diamond-shaped – holding the workers' changing facilities, toilets and kitchen. Unlike the working pods, these are reset only twice a year, lifted by the mobile cranes already operating in the demolition zone rather than moved by hand.

Each month the building advances by one module. At the rear, the exoskeleton is dismantled member by member; because the doubled profiles are light, each can be lifted by hand, hung on the same rail system that carries the components, and pushed forward through the pods – cleaned and patched where necessary along the way – before being reassembled at the front. The pods move whole: each is decoupled from its rails and pushed forward by one or two workers walking the grating between modules, doors closed to limit heat loss and separate the working pods from those in transit. Keeping every part light enough to move by hand is a deliberate response to the climate – assembly must remain possible at −20°C, without heavy lifting equipment.



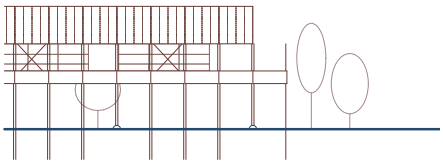
Uneven Ground
topography

Mediate
with
Folded Ground



Sealed Ground
streets

Separate
with
Trench & bridge

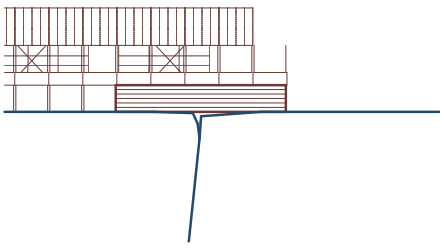


Natural Ground
forest, meadows, etc.

Integrate
with
Pilotis

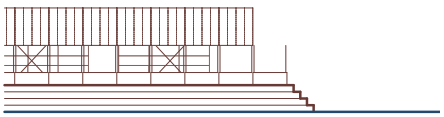
The exoskeleton remains constant; only its grounding changes. On its monthly path through the demolition zone the building meets eight distinct ground conditions, and with each it must renegotiate its relationship to the earth. This is not merely technical. Each condition carries symbolic weight – the formerly sacred ground of Kiruna Church, the damaged terrain scarred by mining, the sealed asphalt of the roads that carry the demolition itself – and none can be answered with a single foundation type.

The diagram classifies these conditions and assigns each a grounding attitude drawn from the Grounding Matrix. The following pages examine every situation in turn, showing both the symbolic gesture and its technical resolution.



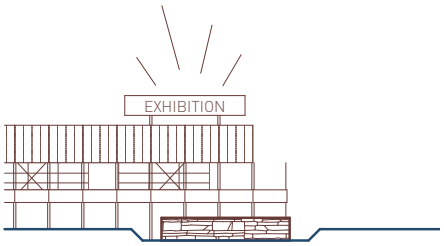
Damaged Ground
sinkholes, intoxicated land, etc

Isolate
with
Plinth



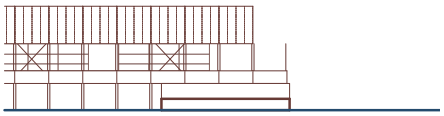
Holy Ground
church, ground, cemetery

Separate
with
Platform



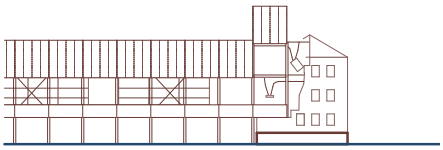
Built Ground
cultural valuable foundation

Integrate
with
As Found



Built Ground
brick / concrete foundation

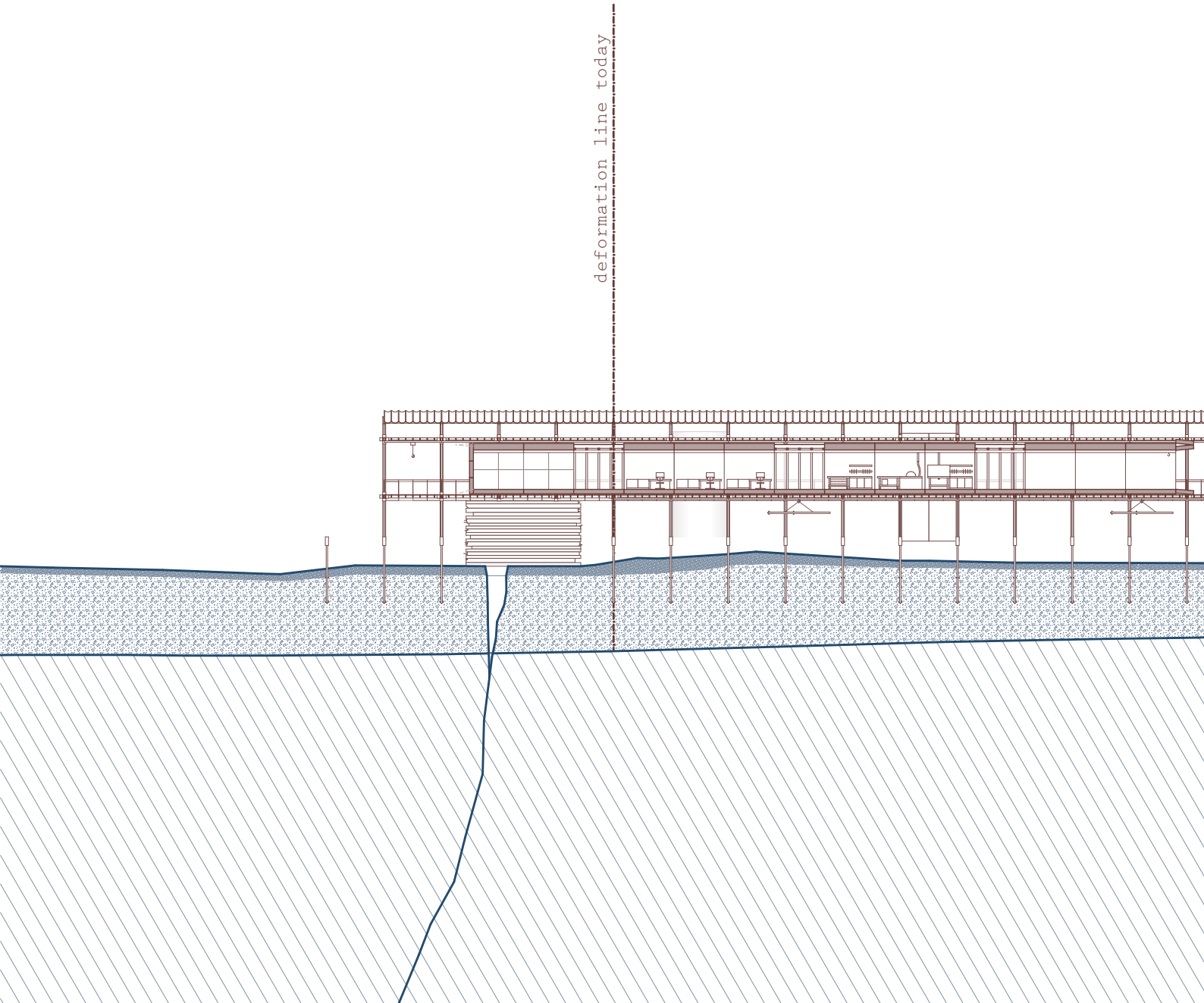
Integrate
with
As Found



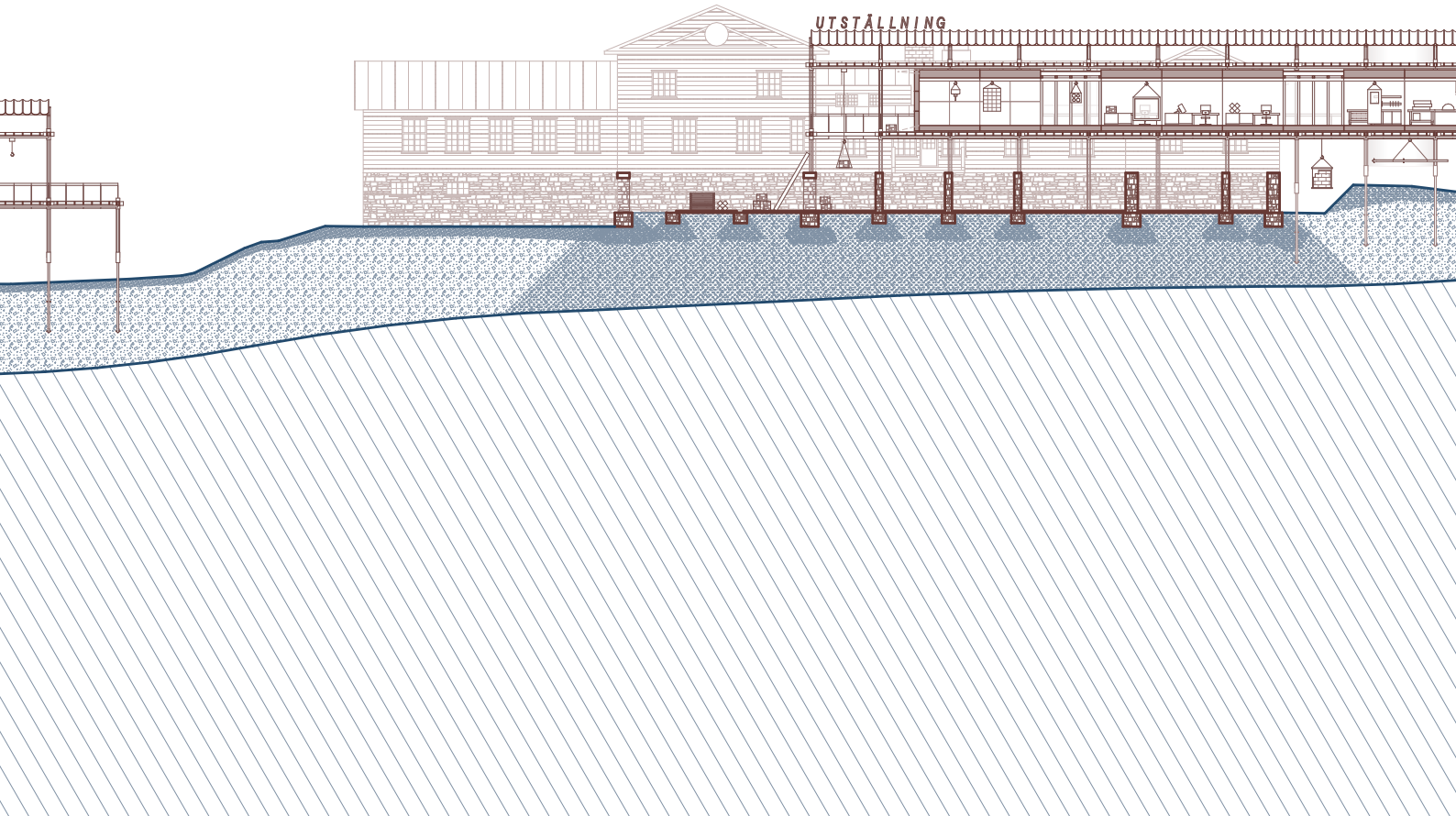
Built Ground
brick / concrete building

Integrate
with
As Found

WHAT CANNOT BE HEALED MUST BE SHOWN.



WHAT WAS BURIED IS NOW DISPLAYED.



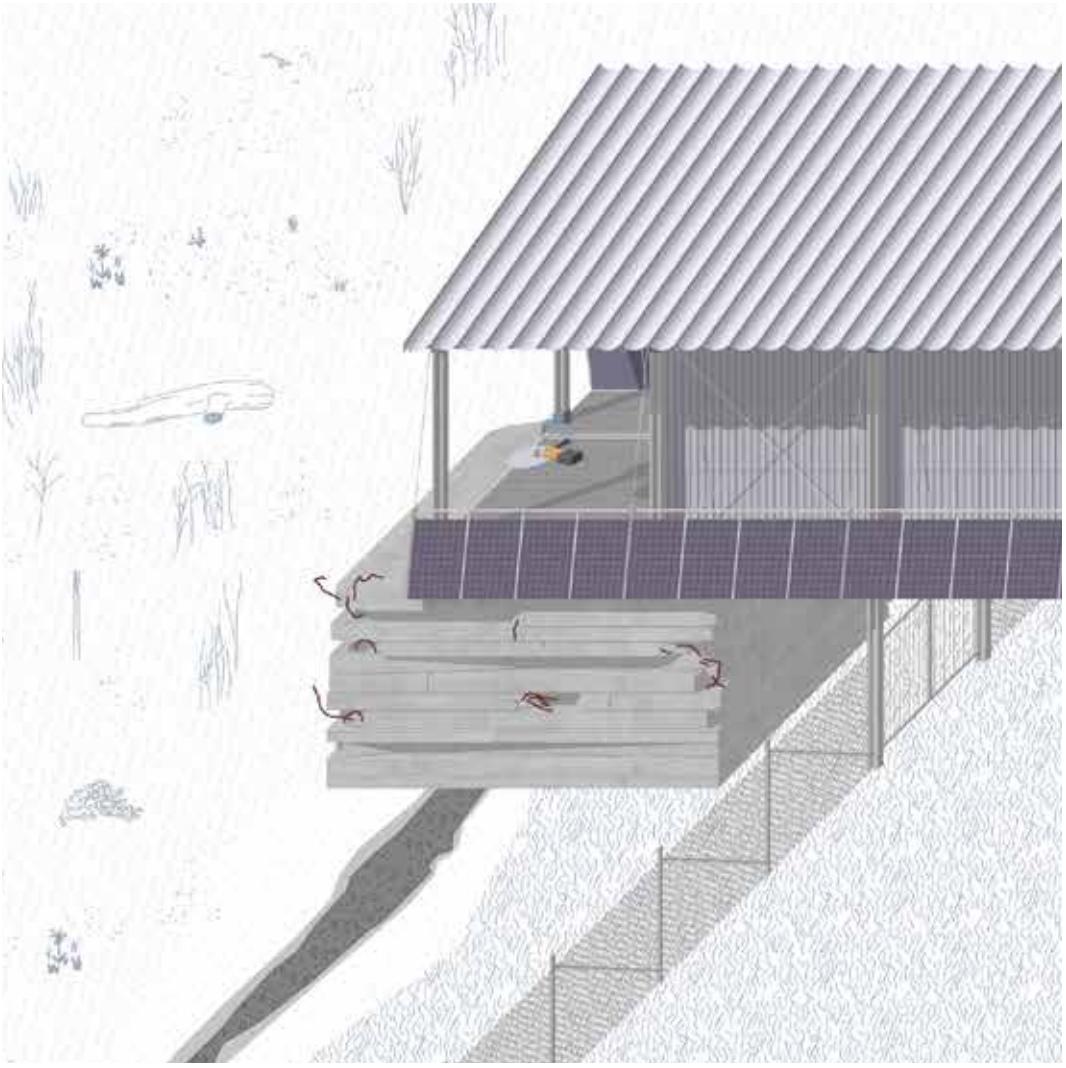


Fig. 82 Design Proposal Reacts to Damaged Ground

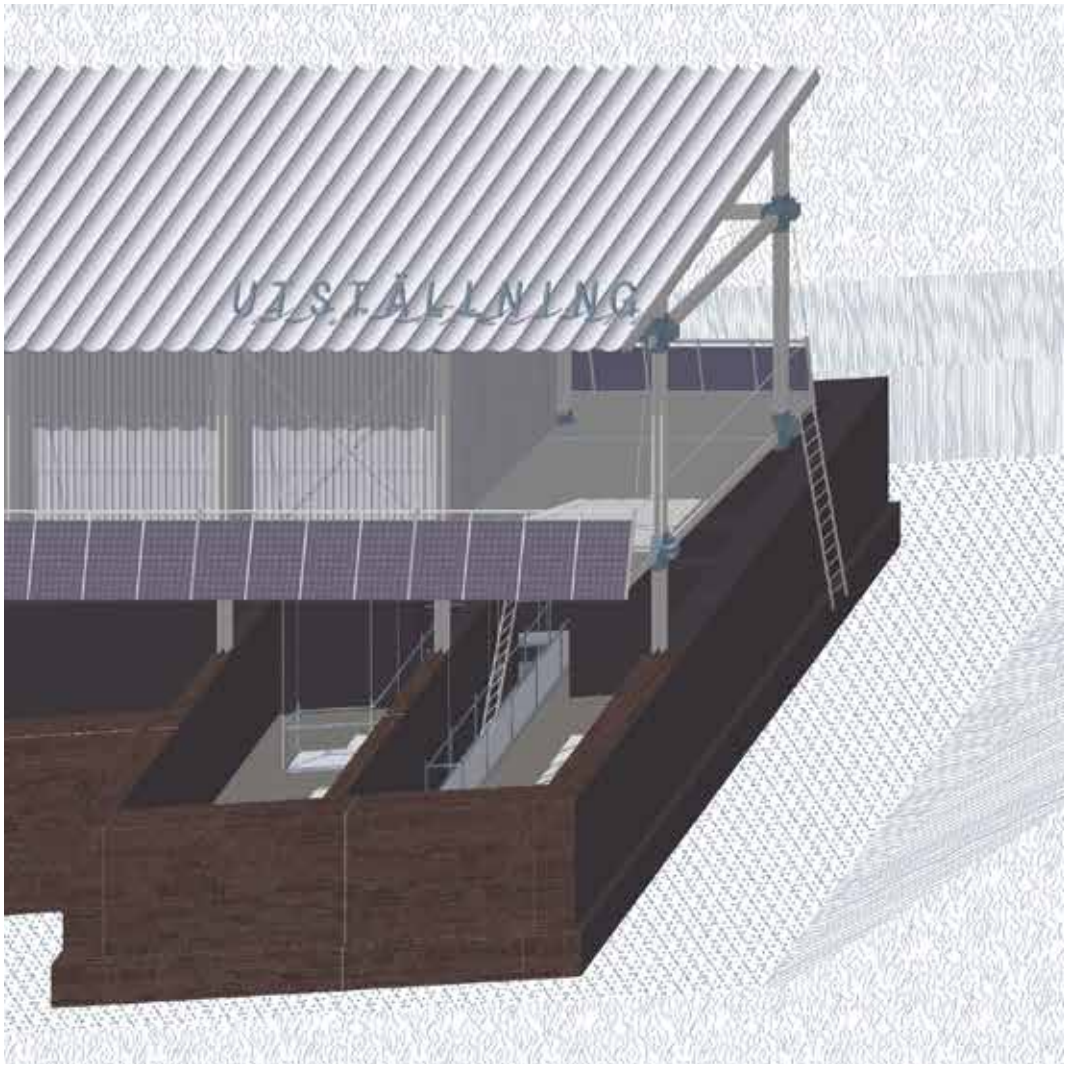
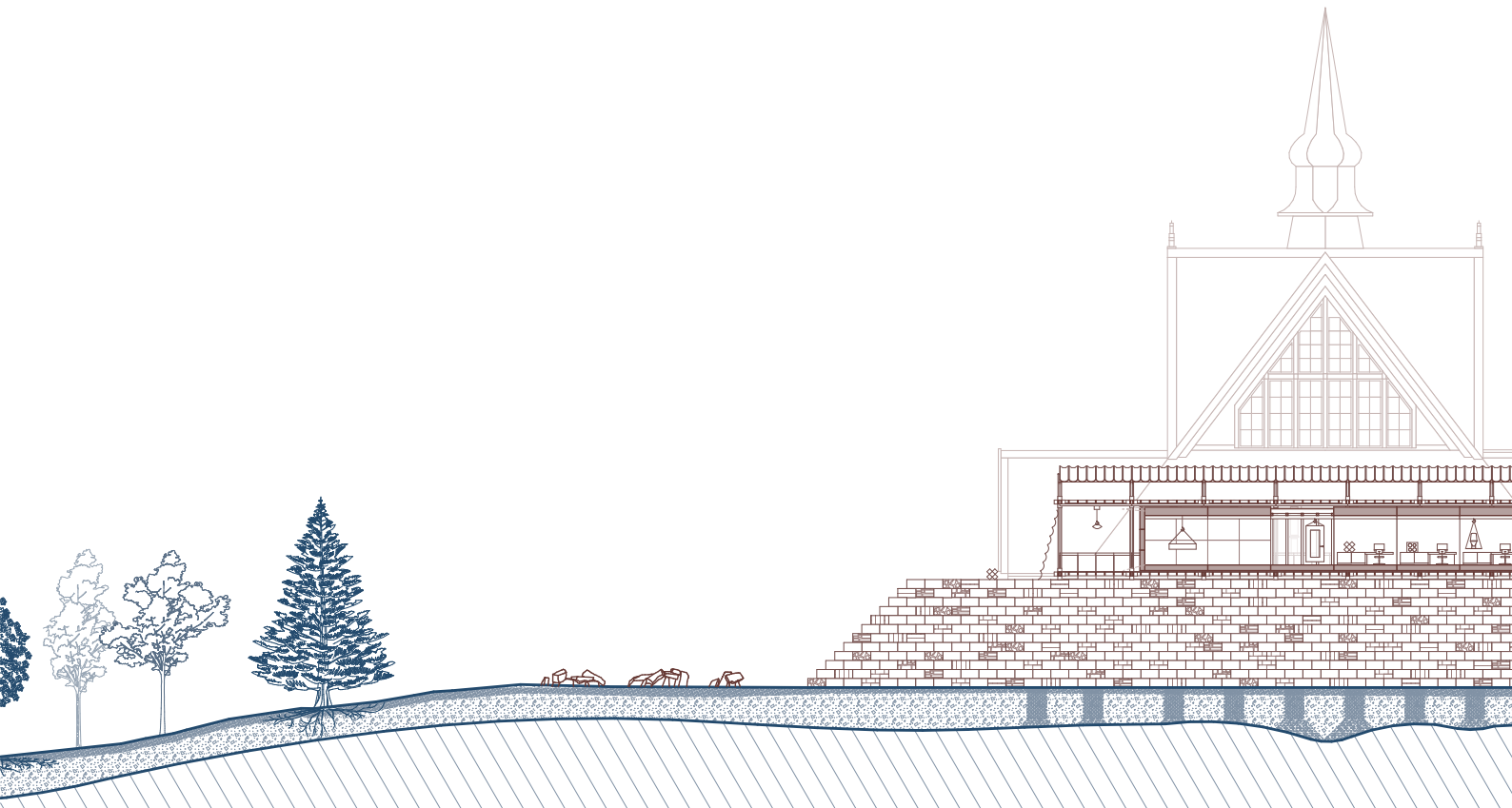


Fig. 83 Design Proposal Reacts to Built Ground: Cultural Valuable Foundation

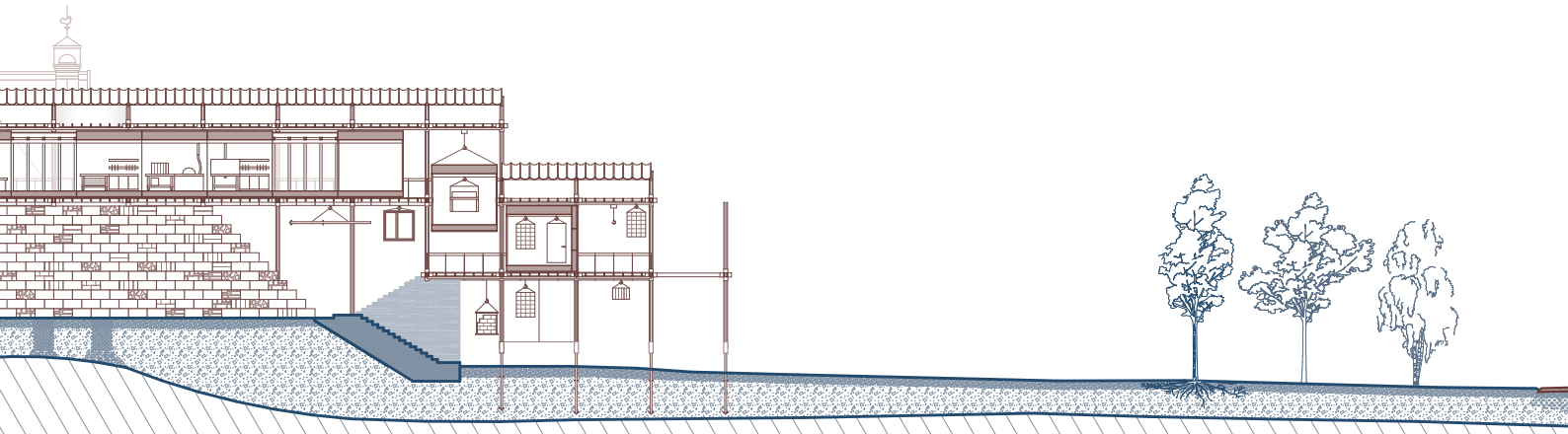
WHAT WOULD BE RUBBLE BECOMES A POD

THE TOPOGRAPHY IS



IUM.

S MIRRORED BY FOLDING THE LANDSCAPE.



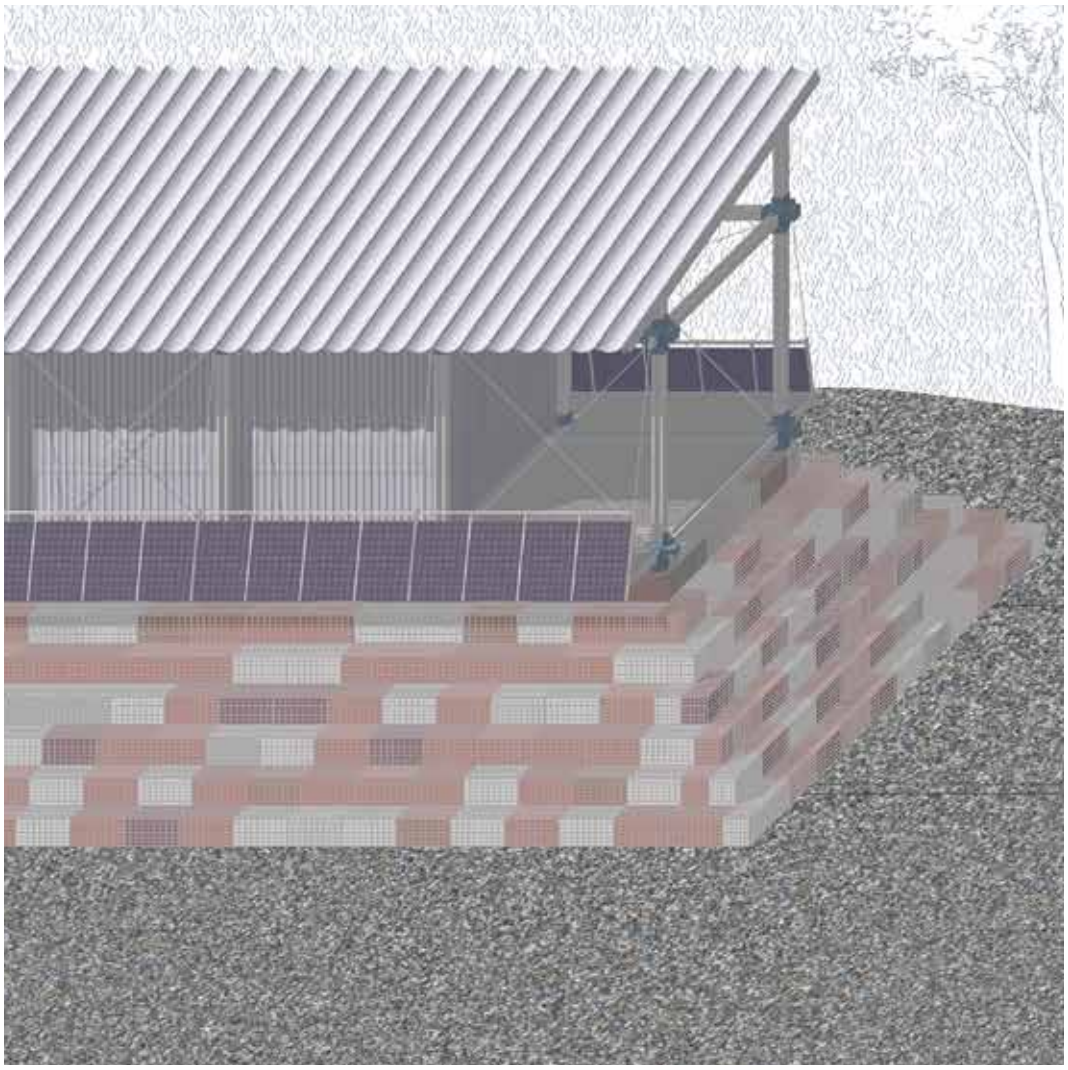


Fig. 84 Design Proposal Reacts to Holy Ground

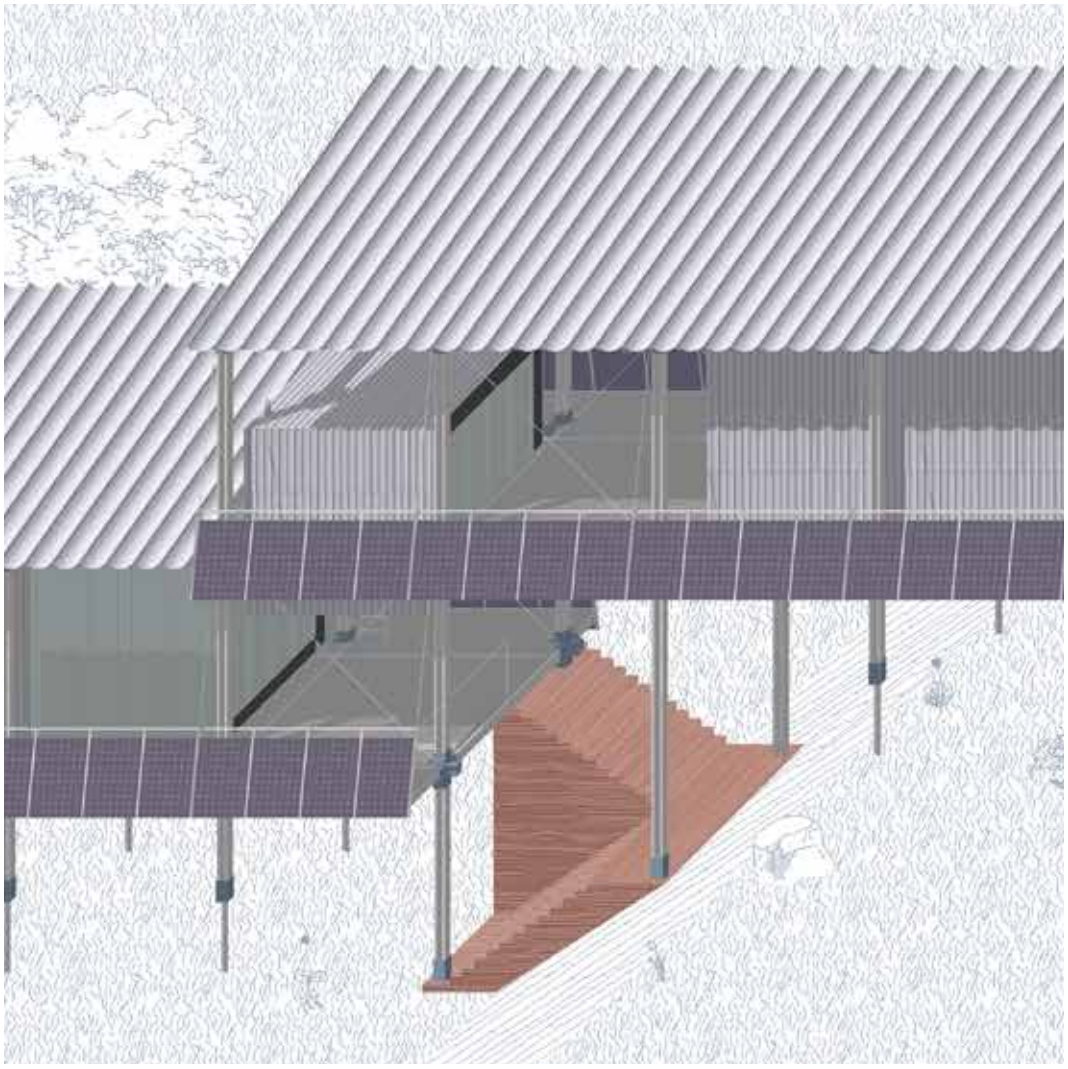
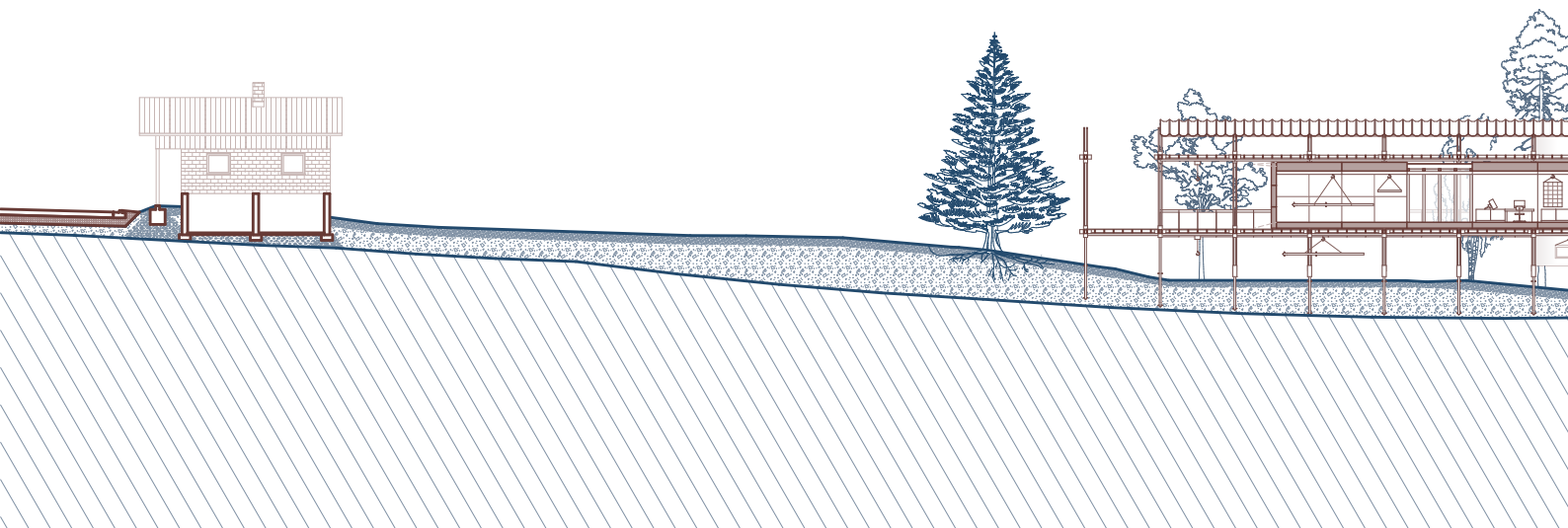


Fig. 85 Design Proposal Reacts to Uneven Ground

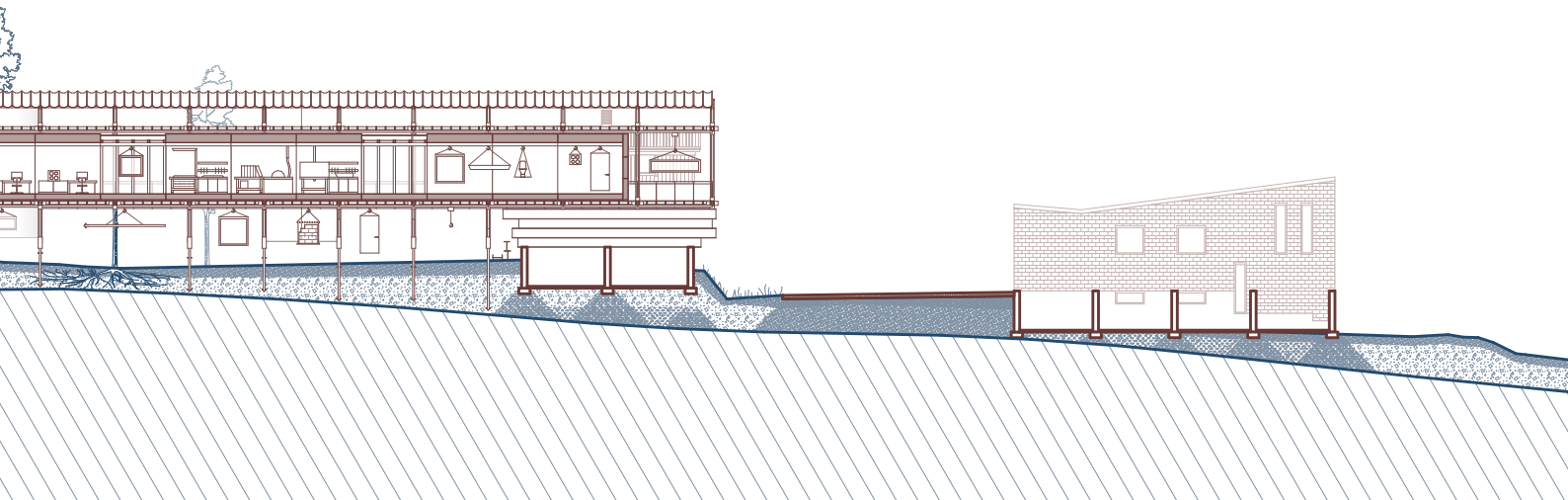
THE SAMI LEFT NO TRACE. SO SHOULD WE

FOUNDATIONS OUTLI



(AS WELL).

IVE THEIR BUILDINGS. USE THEM TWICE.



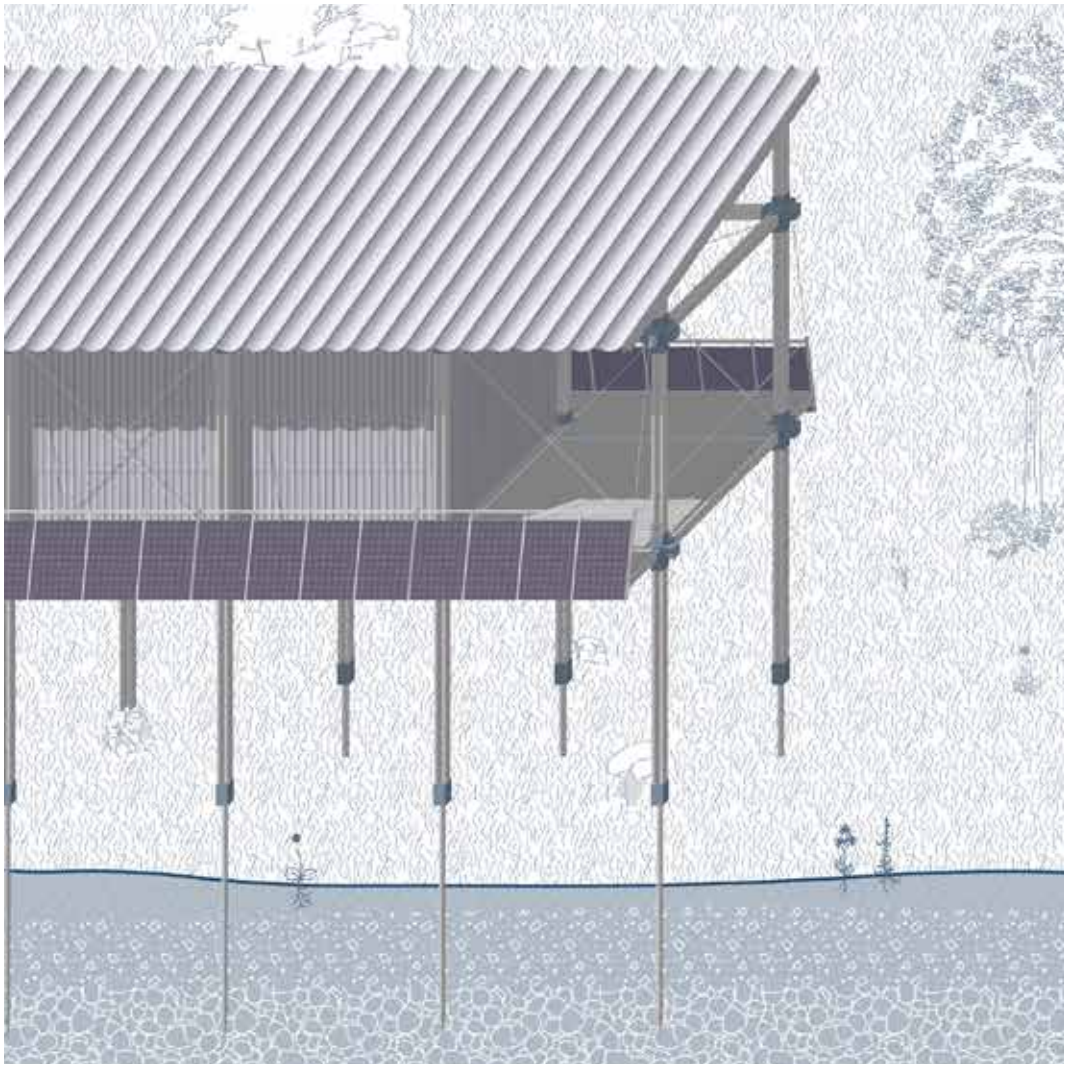


Fig. 86 Design Proposal Reacts to Natural Ground

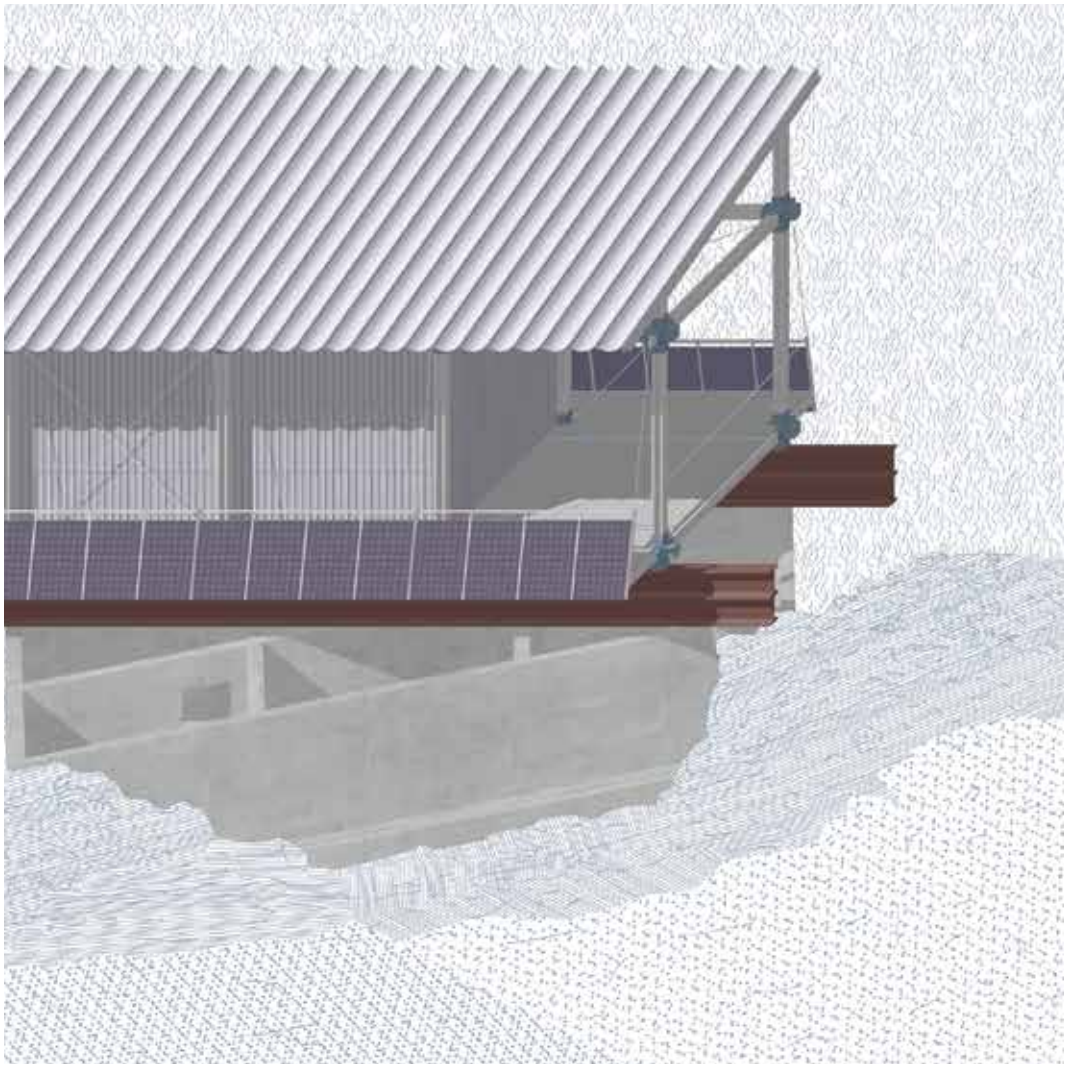


Fig. 87 Design Proposal Reacts to Built Ground: Concrete Foundation

TO BUILD PERMANENT IN A MOVI

TO CROSS THE STREET, REMOVE IT.

ING CITY IS TO BUILD FOR DEMOLITION.

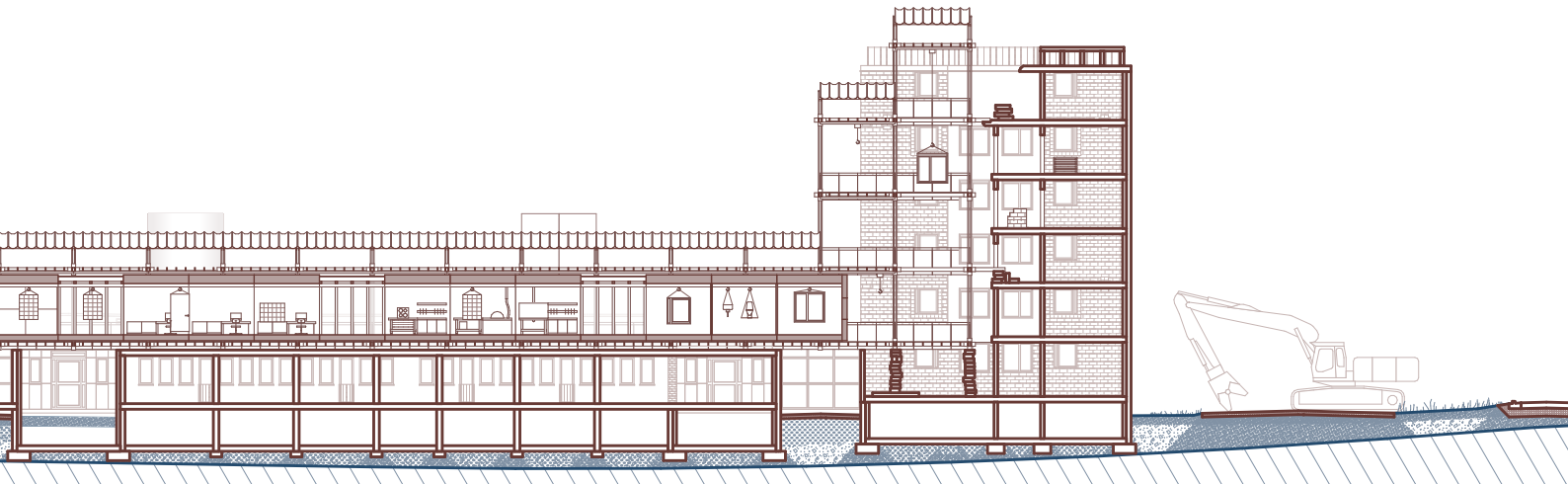


Fig. 88 Design Proposal Reacts to Sealed Ground

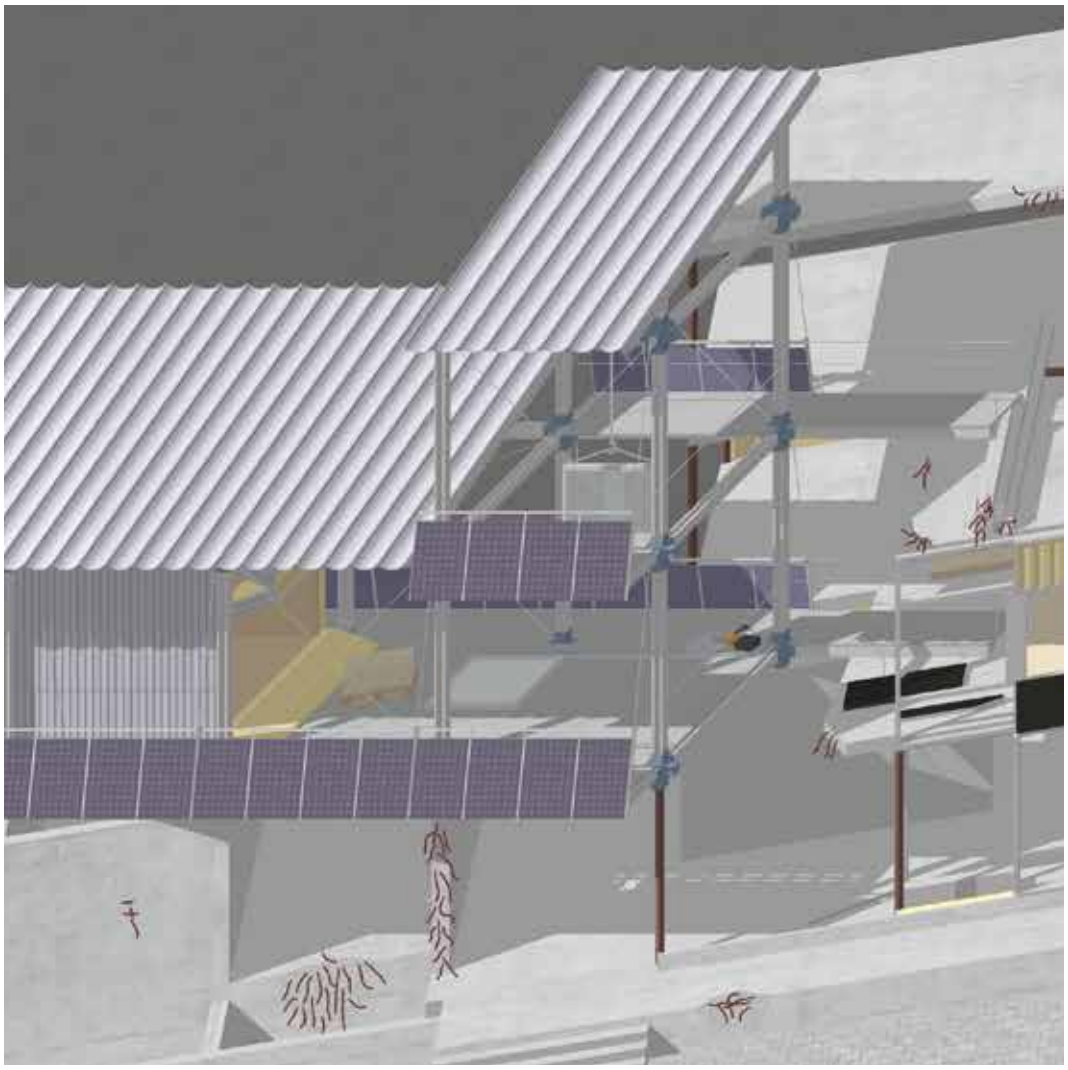


Fig. 89 Design Proposal Reacts to Built Ground: Concrete/Brick Building

Discussion

This thesis began from the observation that the foundation – the architectural element through which a building first meets the ground – has been reduced in contemporary practice to a standardised technical fitting. To re-open the foundation as a site of architectural thought, three research questions were posed: a conceptual one, asking how founding and grounding together with context inform the design of a built structure and its ground; a situated one, asking what it entails to build on the mining-induced unstable ground of Kiruna and how this condition might become a generative force; and a third, also situated, asking what it means for a building to participate in a city's own movement rather than resist it, and what architectural, material, and temporal consequences follow.

The design proposal – a mobile reuse centre advancing monthly along Kiruna's deformation line, sorting and redistributing salvaged material from the demolished old city to the new – has served as the testing ground for all three.

On the conceptual question

The thesis approached the conceptual question by separating two dimensions that practice has tended to collapse: founding as the technical transfer of loads, and grounding as the symbolic and phenomenological relation between building and earth. The historical survey identified a set of recurring architectural elements – pilotis, platform, plinth, folded ground, bridge & trench, and the as found – through which architects have expressed intent at the point where building meets ground. Four grounding attitudes were identified across these positions: integrative, mediating, separating and isolating.

The matrix developed from this research is the thesis's own contribution. Rather than cataloguing the historical positions, it organises them into a working vocabulary in which each element shifts register depending on how it is used – pilotis can separate or integrate, a plinth can isolate or separate. The matrix translates historical argument into design decisions and yields, in the Kiruna context, eight distinct grounding types.

What this demonstrates is that founding and grounding are inseparable in practice. The same physical element carries technical and symbolic meaning simultaneously; a designer cannot determine one without determining the other. The manifesto re-emphasises this in normative terms, and the design proposal demonstrates it directly: each of the eight ground encounters along the deformation line is resolved as both a structural and a representational decision.

On the situated question

Treating Kiruna's instability as a design condition rather than an obstacle produced a building of a different kind – one whose entire concept is organised around the four-metre monthly advance of the deformation line toward the city centre. The monthly ground subsidence dictates the structural grid and the additive logic of the modular exoskeleton, and it is the reason the building does not merely stand on the ground but periodically renegotiates its relationship to it.

The design contrasts sharply with the generic concrete buildings of new Kiruna, whose foundations are technically capable but conceptually unprepared for further relocation. By contrast, the proposal practises what might be called repetitive founding: the same building lands on the ground in eight different ways. This takes the city's situation to its logical conclusion. If Kiruna is a city that has had to move once and may have to move again, then permanence becomes a design choice rather than an unexamined default – and the design reverses the default, treating provisionally as the condition and permanence as the exception.

A further consequence is that the foundation shifts from singular to plural. A conventional building has one foundation; here there are eight types, each responding to a different ground condition along its path. This makes a second contribution visible: the ground deformations, which currently are only perceptible to citizens once a year, when the fence enclosing the "death zone" is reset, are made continuously visible through the building's monthly movement in the form of disassembly and assembly. The building thus operates as an instrument of perception in addition to a built structure – registering the mining's effect on the surface at a rhythm closer to the rhythm at which it is actually occurring.

On the question of participation in process

The third question asked what it means for a building to participate in Kiruna's ongoing transformation rather than resist it. The current relocation treats demolition as waste removal: a sequence of buildings to be cleared so that the ground may be released to the mine. Approaching the same process as a circular movement of material – what the thesis has called urban mining – reframes the existing city as a resource the relocation has so far been failing to use.

The Sovringsverk analogy, drawn from LKAB's own ore-sorting plant, is therefore not merely poetic. It proposes a structural parallel between two extraction logics operating in the same territory: one that draws material out of the bedrock and one that draws material out of the buildings standing above it. Asking whether this second logic can be

supported by infrastructure in the way the first one is led directly to the architectural proposition the design tests. The building functions as the facility through which the transfer between old and new city becomes possible – collecting, sorting, repairing, and redistributing material as it advances along the same line as the demolition itself.

What the design begins to answer is therefore a more general question: what kind of architecture can mediate between a city being unmade and a city being made? The proposal does not resolve this question fully, but it demonstrates that mediation is itself an architectural program, with its own spatial, structural, and symbolic requirements.

Underlying all three answers is a context that must be named directly: Kiruna stands on Sámi land, and the mine that necessitates the relocation operates under state-backed extraction. The thesis has tried to acknowledge this and the Sámi understanding of land as relational continuity has informed the design's commitment to leaving no permanent trace. But the design remains a European architectural proposal, and this should be stated rather than concealed.

Positioning to the references

The understanding of grounding developed here is most directly indebted to Frampton's tectonic, which gave the thesis its language for treating the point of contact with the ground as architecturally meaningful rather than merely structural. The reference to Archigram's Walking City is acknowledged but also held at a distance: where Archigram placed its walking pods in a post-apocalyptic landscape as a speculative gesture, this thesis places one in the deformation zone of an existing city, where the conditions Archigram imagined are present without the speculative framing. The aesthetic and structural register of the design draws from Kiruna's own industrial heritage, particularly the corrugated metal cladding and logic of the Sovringsverk.

Limitations

The structural and geotechnical claims in this thesis sit at the level of design proposal. Verification with site-specific soil data and structural calculation would require collaboration with engineering disciplines, and outreach during the thesis did not yield this access. The supply-chain and regulatory feasibility of the urban-mining proposal has been addressed through analogy and architectural reasoning rather than economic or legal study. And the engagement with Sámi land relations is drawn from secondary sources rather than direct consultation.

How the work can continue

The study of grounding strategies developed in the matrix is not exhaustive. Further research could expand it by studying additional architects, theorists, and building cultures – particularly those outside the European tradition that has dominated the survey here.

The issue of dealing with unstable ground is likely to become more prevalent – and not least at Kiruna's own outskirts. The Per Geijer deposit will extend sub-level caving mining into the wider Sápmi region, producing a new deformation zone. Current planning addresses this by keeping settlements off the future deformation zone, but the question of how a moving ground affects what already crosses it – reindeer paths, seasonal routes, the relational continuity discussed earlier – remains open. Beyond Kiruna, the question extends to other geographies where the ground itself is becoming unstable: coastal cities anticipating sea-level rise, regions affected by permafrost loss, areas of subsidence. What does grounding, in the sense developed here, look like in those contexts? And what does the manifesto's principle of grounding look like applied to a dense urban site rather than a peripheral one? A re-engagement with vernacular grounding methods as shown by Fuminori Nousaku and Mio Tsuneyama, conducted in this comparative spirit, could open new ideas.

For Kiruna specifically, this work could contribute to a renewed dialogue. As more buildings fall within the deformation zone in the coming decades, the absence of a legal or economic framework for circular relocation will become harder to defend. A continuation of this research could advocate for municipal planning policies that treat relocation as a process of redistribution rather than removal.

What the thesis ultimately proposes is that the foundation is not a fixed technical solution but requires a careful negotiation between building, ground, and time. This negotiation belongs to the architectural concept itself; it cannot be appended to a design once the building above has been decided. In Kiruna, the mine has forced the question into the open, and the answer this thesis arrived at is a building that does not ground itself permanently – that practises grounding as a recurring act rather than a singular one, dictating the design throughout. What this demonstrates is that taking grounding seriously is not a restriction but an opening. Engaging the specific ground is what allows a building to belong to its place rather than merely occupy it.

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010 Fig. 18 Limecrete Floor Slab

Limecrete. (n.d.). A Freshly Laid Limecrete Floor. https://limecrete.co.uk. Used with permission.

011 Fig. 19 Therme Vals Founding

011 Fig. 21 Akeno Raised Floor Founding

011 Fig. 20 Therme Vals Grounding

011 Fig. 22 Akeno Raised Floor Grounding

012 Fig. 23 Location of Kiruna in Sweden, 1 : 7 500 000

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013 Fig. 24 Reindeer Grazing Lands & Paths

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013 Fig. 25 Kiruna's Topograpy

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013 Fig. 26 One of the First Dwellings in 1900

Mesch, B. (1903). Dwelling house from 1900 in Kiruna. The "Kåkbrillaskåken", mainly built of smashed pork boxes [Photograph]. Tekniska museet, Stockholm, Sweden. https://digitaltmuseum.org/021016316854/boningshud-fran-1900-i-kiruna-kakbrillaskaken-huvudsakligen-byggd-av-sonderslagna. Public domain (CC Public Domain Mark).

013 Fig. 27 Town Plan of Kiruna, 1900

F. G. Landströms bokhandel. (1915). Map over Kiruna town plan [Map]. F. G. Landströms bokhandel, Kiruna, Sweden. https://libris.kb.se/x84b91lkv5t552kk. Public domain (CC Public Domain Mark).

014 Fig. 28 Tripartite division of Kiruna

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014 Fig. 29 Kiruna's Historic Development

Own illustration based on:

Sjöholm, J. (2016). Heritagisation, re-heritagisation and de-heritagisation of built environments: The urban transformation of Kiruna, Sweden [Doctoral thesis, Luleå University of Technology, Department of Civil, Environmental and Natural Resources Engineering, Architecture and Water]. https://urn.kb.se/resolve?urn=urn:nbn:se:ltu:diva-26065 , p. 37

Data sources as in Figure 29.

014 Fig. 30 Iron Ore Mine Kiirunavaara, 1912

Mesch, B. (1912). Iron ore field, iron ore mine, Kiruna [Photograph]. Tekniska museet. https://digitaltmuseum.org/021016316620/jarnmalmsfalt-jarnmalmsgruva-kiruna. Public domain (CC Public Domain Mark).

014 Fig. 31 Iron Ore Mine Kiirunavaara, 1970

SVT Bild. (c. 1970). A view of Kiruna in the 1970s. Drilling is now taking place a kilometre down in the mine. [Photograph]. Sveriges Television (SVT). https://www.sverigesradio.se/artikel/3868091.

015 Fig. 32 Ortdrivaren Kvarteret

Rönnberg, B. (c. 1958–1961). The Ortdrivaren block. Exterior of apartment buildings. [Photograph]. ArkDes. https://digitaltmuseum.org/011015013692/kvarteret-ortdrivaren-exterior-av-flerfamiljshus. Public domain (CC Public Domain Mark).

015 Fig. 33 Old Kiruna Town Hall, c. 1963

Lindgren, D. (2008). Kiruna stadshus [Photograph]. Wikimedia Commons. https://sv.wikipedia.org/wiki/Fil:Kiruna_stadshus_1.JPG. Licensed under CC BY-SA 3.0.

015 Fig. 34 Old Hospital

Almquist & Cöster AB. (n.d.). Kiruna. Utsikt med Sjukhuset och Kirunavaara [Postcard]. AB Almquist & Cöster, Hälsingborg. https://www.facebook.com/tusentoner/posts/817974823690067/. © AB Almquist & Cöster ("Ensamrätt").

015 Fig. 35 Proposal by Wilhelmson

Own illustration based on:

Wilhelmson Arkitekter. (n.d.). New Kiruna. Retrieved 01.03.2026 from https://www.wilhelmson.se/press.htm#ki

Data sources as in Figure 29.

016 Fig. 36 Proposal by White Arkitekter

Own illustration based on:

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Data sources as in Figure 29.

016 Fig. 37 New Kiruna Town Hall

Hufton+Crow. (2018). Kiruna City Hall, designed by Henning Larsen. [Photograph by Hufton+Crow]. Henning Larsen. https://henninglarsen.com/projects/kiruna-city-hall. © Hufton+Crow. Used with permission.

016 Fig. 38 Move of the Kiruna Church

Kallina, G. (2025). 25-08-19_Kiruna_120_2400px.jpg [Photograph]. Gregor Kallina / Anzenberger. https://www.gregorkallina.com/iron-heart. © Gregor Kallina. Used with permission.

017 Fig. 39 Reindeer Herding around Kiruna

Own illustration.

Data sources as in Figure 25 and 29.

017 Fig. 41 Kiruna's Mine Location

Own illustration.

Data sources as in Figure 29.

017 Fig. 43 Possible New Deformation Lines

Own illustration based on own calculations using data from:

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Data sources as in Figure 29.

017 Fig. 45 The City's 'Movement'

Own illustration.

Data sources as in Figure 29 and 37.

017 Fig. 40 Kiirunaavara 1902

Mesch, B. (1902). A scene from Kirunavaara. In the foreground, a group of travellers with reindeer. [Photograph]. Tekniska museet, Stockholm, Sweden. https://digitaltmuseum.org/021016339196/motiv-fran-kirunavaara-i-forgrunden-ett-resesallskap. Sourced via DigitaltMuseum. Inventory number: TEKA0072417. Public Domain Mark (CC PDM).

017 Fig. 42 Iron Ore Field, 1903

Mesch, B. (1903). Iron ore field. H.M. Oscar II's monogram [Photograph]. Tekniska museet, Stockholm, Sweden. https://digitaltmuseum.org/021016316631/jarnmalmsfalt-h-m-oscar-ii-s-monogram-70-42-mtr-vid-kirunavaara-gjort-av. Public domain (CC Public Domain Mark).

017 Fig. 44 Crack in Plinth (Old Kiruna), 2026

017 Fig. 46 Hjalmar Lundbohmsgården, 2019

Kallina, G. (2019). Kiruna cityscape undergoing relocation, featured in WIRED [Photograph]. WIRED. https://www.wired.com/gallery/swedish-mining-town-sinking/. © Gregor Kallina. Used with permission.

018 Fig. 47 Layered Analysis Map of Kiruna

Own illustration.

Data sources as in Figure 40, 42, 44 and 46.

020 Fig. 48 Axonometric of the 'Underground City' (the Mine) and the Sinkholes in Relation to the Old Town of Kiruna

023 Fig. 49 Preparation for Movement of Arbetarbostaden B, 2017

Kallina, G. (2017). Kiruna_20170313_190_8Bit_2400px [Photograph]. Gregor Kallina / Anzenberger. https://www.gregorkallina.com/iron-heart. © Gregor Kallina. Used with permission.

023 Fig. 50 Demolition of old Kiruna, while iron ore mining continues in the background

024 Fig. 51 Mine Kiirunavaara and the City, 2017

Vågen, A. (2017). Kiirunavaara and the city centre of the mining town of Kiruna [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Kiirunavaara_September_2017_10.jpg. Licensed under CC BY-SA 4.0.

029 Fig. 52 The Temple of Apollo at Corinth by Spintharus of Corinth

Werner, B. (2017). The Temple of Apollo at Corinth. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Korinth_BW_2017-10-10_10-55-28.jpg. Licensed under CC BY-SA 3.0.

029 Fig. 53 Jarnac House by Ledoux

Ledoux, C. N. (1804). The house isolated by the plinth, Ledoux's Jarnac House [Engraving]. Princeton Architectural Press, New York. Public domain (CC Public Domain Mark).

030 Fig. 54 Der Wolkenbügel by El Lissitzky

Cox, P. (1924). Lissitzky's design for 'The Wolkenbügel'. View towards Strastnoj Boulevard. [Photograph]. Collection van Abbemuseum, the Netherlands, Vienna. Used with permission.

031 Fig. 55 Unité d'habitâtion by Le Corbusier

U.S. Agency for International Development. (1952). Unité d'habitation, Marseille [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Corbusier_Building_-DPLA-_86ab5ae3f3cdec9ba5aecd7b59afa956.jpg. Public domain (CC Public Domain Mark).

031 Fig. 56 Riehl House by Mies v. d. Rohe

Riehl House, Potsdam-Neubabelsberg, view from lower garden (Mies van der Rohe, 1906–07). (1907). [Photograph]. Museum of Modern Art (MoMA), New York, USA. https://search.scalarchives.com/?16141816133845785070

031 Fig. 57 Urbig House by Mies v.d. Rohe

031 Fig. 58 Seagram Building by Mies v.d. Rohe

Ohyama, K. (2017). Seagram Building, New York (Mies van der Rohe, 1958) [Photographed by Ken Ohyama from FUNABASHI]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Seagram_Building_(35098307116).jpg. Licensed under CC BY-SA 2.0.

032 Fig. 59 Neue Nationalgallerie by Mies v.d. Rohe

Gravier, A. (1968). Neue Nationalgalerie, Berlin (Mies van der Rohe, 1968) [Photograph]. Unsplash. https://unsplash.com/de/fotos/ein-grosses-gebaude-mit-vielen-fenstern-MLcWxYVO2fA. Unsplash Licence.

032 Fig. 60 Solar Pavillion by Alison and Peter Smithson

seier+seier. (2010). Upper Lawn Pavilion (Solar Pavilion), Tisbury (Alison and Peter Smithson, 1962) [Photograph by seier+seier]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Tisbury,_Font_Hill_Estate,Upper_Lawn_Pavilion(Solar_Pavilion),_2010.jpg. Licensed under CC BY 2.0.

033 Fig. 61 Whitney Museum by Marcel Breuer

Suresh, A. (2019). The Met Breuer (formerly Whitney Museum of American Art), New York (Marcel Breuer, 1966) [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:MET_Breuer_(48377070386).jpg. Licensed under CC BY 2.0.

033 Fig. 62 Whitney Museum, Bridge Trench

Paris, J. (2011). Entrance bridge, Whitney Museum of American

Art, New York (Marcel Breuer, 1966) [Photograph]. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Whitney_Museum_bridge.jpg. Licensed under CC BY 2.0.

035 Fig. 63 Jussieu - Two Libraries by OMA

Werlemann, H. (1992). Jussieu – Two Libraries [Photograph]. OMA (Office for Metropolitan Architecture). https://www.oma.com/projects/jussieu-two-libraries. © Hans Werlemann. Used with permission.

036 Fig. 64 Piles and Pointed Roof by Fuminori Nousaku.

038 Fig. 65 Visual Summary of the Theoretical Foundation

040 Fig. 66 Axonometry Naturum Store Mosse

041 Fig. 67 Axonometry Haus Rauch

042 Fig. 68 Farnsworth House, Original

042 Fig. 70 Farnsworth House, on Ground

042 Fig. 69 Farnsworth House, Extended Core

042 Fig. 71 Farnsworth House, Platfrom

046 Fig. 72 Visual Summary of the Used References

Rage, K. (2017). Zinkgruvemuseet, Allmannajuvet. Arkitektur av Peter Zumthor. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Zinkminenmuseum_Sauda_–_Allmannajuvet.jpg. Licensed under CC BY-SA 3.0.

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book/9783035628685. © KOSMOS Architects.

052 Fig. 73 Design Proposal Situated in the Urban Context

054 Fig. 74 Schematic Floor Plan of the Design Proposal

055 Fig. 75 Processable: Window

055 Fig. 78 Processable: Door

055 Fig. 76 Processable: Parquet

055 Fig. 79 Processable: Toilet

055 Fig. 77 Catalogued Only: Concrete Slab

055 Fig. 80 Catalogued Only: Concrete Stairs

056 Fig. 81 Detailed Section, Level of Detail 1:20 (scaled)

062 Fig. 82 Design Proposal Reacts to Damaged Ground

063 Fig. 83 Design Proposal Reacts to Built Ground: Cultural Valuable Foundation

066 Fig. 84 Design Proposal Reacts to Holy Ground

067 Fig. 85 Design Proposal Reacts to Uneven Ground

070 Fig. 86 Design Proposal Reacts to Natural Ground

071 Fig. 87 Design Proposal Reacts to Built Ground: Concrete Foundation

074 Fig. 88 Design Proposal Reacts to Sealed Ground

075 Fig. 89 Design Proposal Reacts to Built Ground: Concrete/ Brick Building

Appendix

Appendix A - Interview with Kiruna Municipality

Sigrid Vestling is an urban strategist at Kiruna Municipality. She has been involved in the city's relocation project since her master's thesis and served as the main contact person for the municipal perspective on Kiruna's relocation.

The following section presents a condensed summary of an interview conducted on 11 February 2026 via Microsoft Teams. A copy of the summary has been shared with the municipality via email.

How are foundations handled when houses are relocated or demolished, and are materials reused? Are there goals for recycling, reusing? (Specific Rates)

The mining company is carrying out the work. It has laid new foundations on the new site. The ground in the new town is softer. The old town was built on a hill. The ground in the new town contains more groundwater and therefore has different properties and requirements. Some of the old foundations were incorporated into the landscape design. For example, the design of parks was used to showcase the remains of old buildings. (1st part of Gruvstadsparken)

Is the Gruvstadsparken well perceived by the residents? Do people come to look at their houses?

There is a little bit of both. The development of the city is an emotional topic. While the first part of Gruvstadsparken was well designed and suited to the residents, the new park in the old city centre has been more and more avoided. People say its harsh.

Is it possible to access the zone which is behind the fence?

The zone is completely closed for the public. People from LKAB may come in. It's probably mainly for measuring the deformations. It is a risk zone.

Do you know about the different foundation methods in New Kiruna?

No information on Kiruna Kommun's site. The Kiruna Bostäder (KBAB, municipal building company) may have information about that.

Are there worries that Kiruna might be affected in the future again?

The city did not have a choice about where to build, since the Kiruna Municipality does not own much land. They bought the land from the Swedish government. If the city must move again, the question arises: "How can a city be built that understands the qualities and heritage connected to the old city, without copying it?" Furthermore, there are a lot of political factors in the future that need to be considered. The government is interested in the minerals. What should be done

with the people? Where should they go? Will the people of Kiruna stay? Or will they just take the money and move south? Right now the Kiruna Municipality has a lot of job opportunities. That might be a factor why people choose to stay. It's a very big experiment what is done in Kiruna. It is about architecture, urban planning, sociology and economy – it's mixed, it's everything in one. The place is a very strategic place for Europe.

In the event that Kiruna must move again, has the possibility been considered of building the new buildings in a way that would make it easier for them to be relocated?

Yes, there is an example of an elderly home from 2014/2015. The building structure is modular, so it's easier to move again. (Movägen, Älderboende)

Are there specific needs for spaces asked for by the residents during the move?

There are two things. Firstly, the municipality of Kiruna and LKAB did not undertake any strategic planning for the new areas. People moved into the completed buildings, but the surrounding area was not yet finished. Secondly, the materials and colours of the new city centre are uniform, and the city is generally perceived as grey. As the construction phase of New Kiruna had to progress very quickly, greening was left until last. The lesson learned from this first phase is that greening needs to happen earlier and colours need to be added. We need to determine which colours could be beneficial for the city and how we define diversity.

Were Ralph Erskine's colour concepts considered, particularly those used in his designs for Arctic City and the Ortdrivaren building?

The first urban plan for Kiruna was very well adapted to the northern climate. While 19th-century planners built with nature, Erskine tried to understand it and build against it. New Kiruna has a different climate and geographical conditions. The city sits lower down and is exposed to strong winds. As construction in the south of New Kiruna is still ongoing, the wind from the south cannot yet be blocked. Due to the limited amount of land available, the city had to be built in a fairly dense manner. This has resulted in issues regarding sunlight. Furthermore, the aim was to create a city centre. The decision was made to build it in the style of a large Swedish city. It is possible that the earlier planners' ideas were lost while the new city was built so quickly. Lastly, the technical aspects of constructing an entirely new city take centre stage, so that people's feelings about a space may tend to be overlooked.

Can you think of any ways in which people could be taken into account more? Are there specific spaces to be given for this?

There are many plans for the new city parks, especially about greening. In addition, work has begun on activities that will be offered throughout the year. These activities are intended to make the city more vibrant. One example of a smaller intervention from last year is the flower pot initiative. The flower pots, which were originally planned to be black, were ultimately painted in colours inspired by Old Kiruna. This shows that even a small intervention can have a big impact.

Do you know what happened to the building material of Ortdrivaren after it has been torn down? Has it been stored somewhere?

[don't know] It could be that the building material contains asbestos. [forwarded to Clara Nyström]

Are there plans of the old fire station and the old hospital of old Kiruna? Could we get access to them?

[forwarded to Bygglovskontoret]

How is the city hall grounded in terms of what foundation has been used?

[don't know]

AI Appendix

AI tools (Claude, Anthropic) were used primarily to translate source material from Swedish into English. They were further used to support language refinement and proofreading of the authors' own text. No conceptual, analytical, or design content was generated by AI; all output was reviewed and verified by the authors, who assume full responsibility for the content of the thesis.

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