

FIXED FLEXIBILITY

*Adaptive Reuse: Odda Smelting Works -
The Shell Roof*

03. DIGITAL POSTERS

DIPLOMA PROJECT
MASTER OF ARCHITECTURE
STUDENT: **VIOLA STARR**

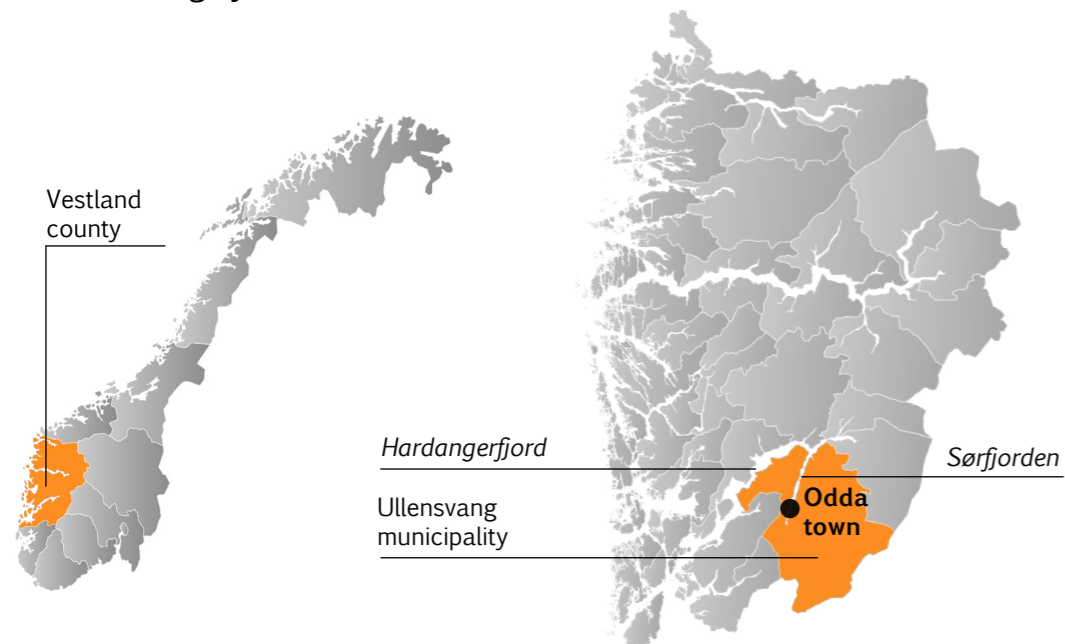
THE LOCATION: Odda

G E O G R A P H Y

Odda is a **former industrial town** located in the Western part of Norway, in Vestlandet county, more specifically- Ullensvang municipality. Odda can be found in the southern part of the Sørffjorden, on the eastern side of the famous Hardangerfjord, a place with **multiple tourist destinations** and national landmarks such as the famous rock formation Trolltunga and the Folgefonna glacier national park. Overall, the region is known for its' incredible Scandinavian nature views, but is also home to multiple industrial heritage pearls, Odda Smelting Works being one of them.

Odda as a place in its entirety is a prime manifestation of the industrial growth of the early 20th century in Norway. Since the early 1900's, Odda Smelting Works has been a **cornerstone company** and fueled the development of the adjacent surroundings, attracting industry workers to form and develop the industrial town of Odda as one of the largest settlements in the region.

With the shutdown of the factory in 2003, the post-industrial town has had periods with decreasing population. This has been happening since the start of 1970's and into the first decade of the 21st century, meaning 40 years with degrowth. This due to changing demographics, where younger generations seek to move away to places with larger growth and opportunities. This has been brought to attention and the recent development plans seek to create a more **urban environment** in order to provide new opportunities for Odda with its' roughly 7000 inhabitants.



THE PLACE: Odda Smelting Works

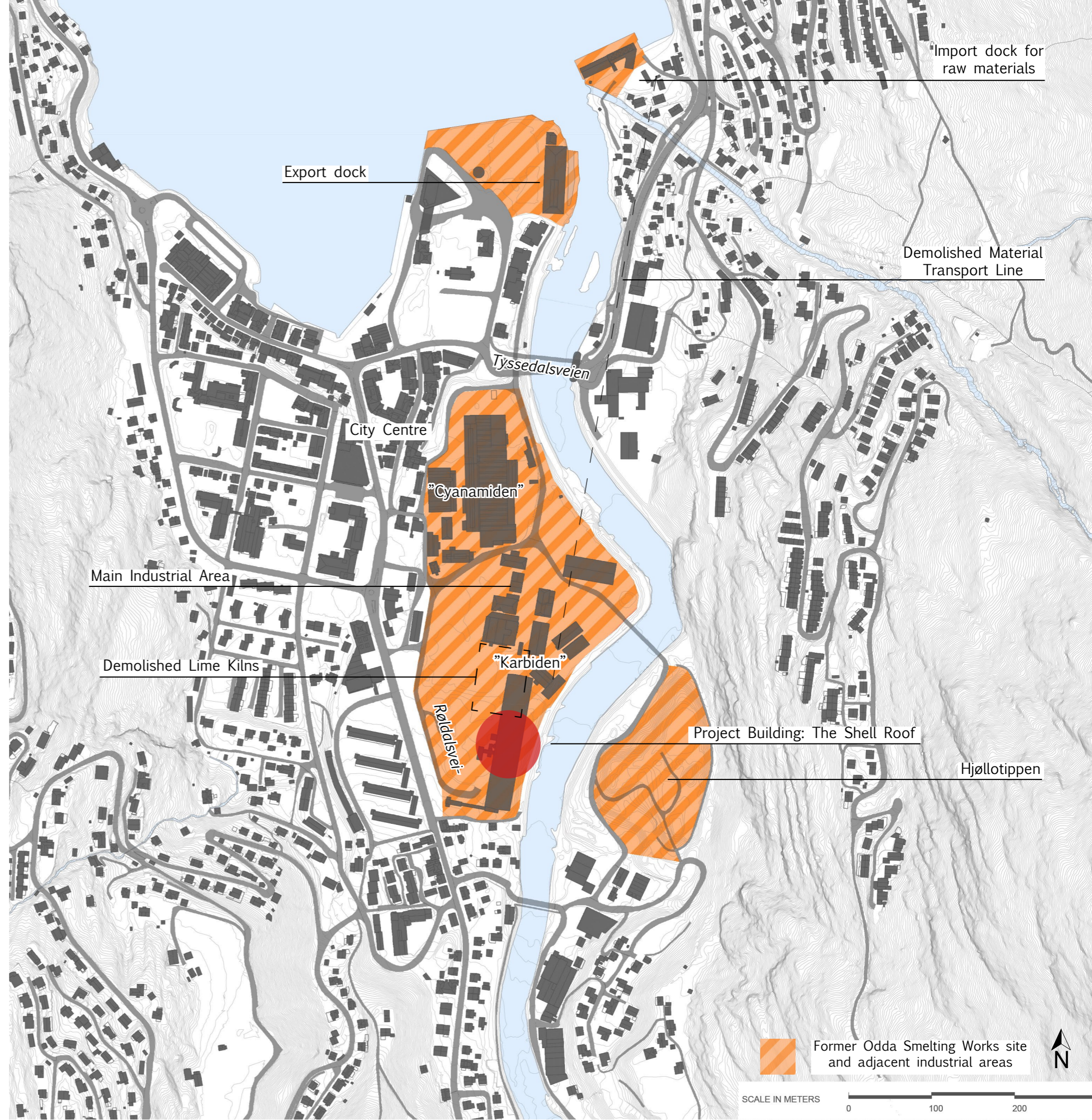
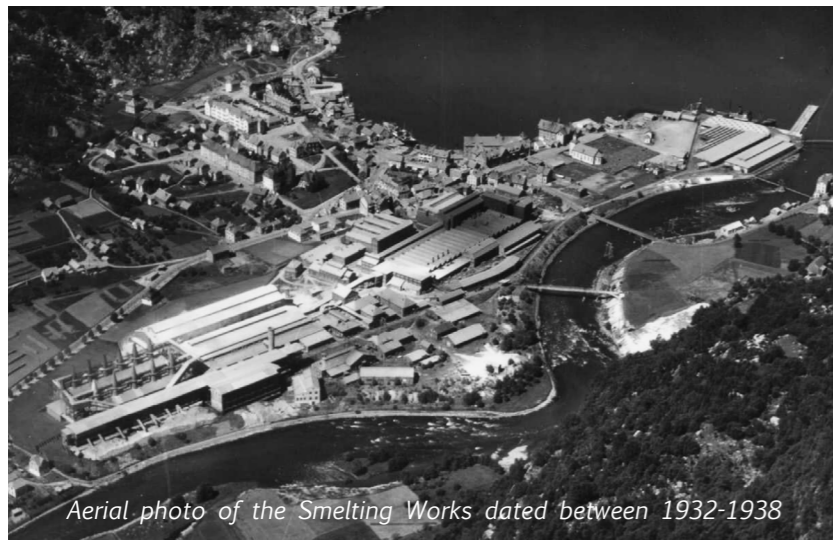
HISTORICAL CONTEXT

The site is located closely to the town centre and is neighbouring with the most central pedestrian streets. Therefore, it holds a **great urban transformation potential**. It covers roughly half the total town area and consists of several facilities, as seen here. A few parts of the former OSW have sadly been demolished in the period leading up to UNESCO-listing as a Industrial World Heritage Site.

OSW has been active in the period from 1924 until 2003, when the company **went bankrupt** and production of cyanamide and carbide was laid off. Since then, large parts of the plant have been standing **unutilized** and **neglected**.

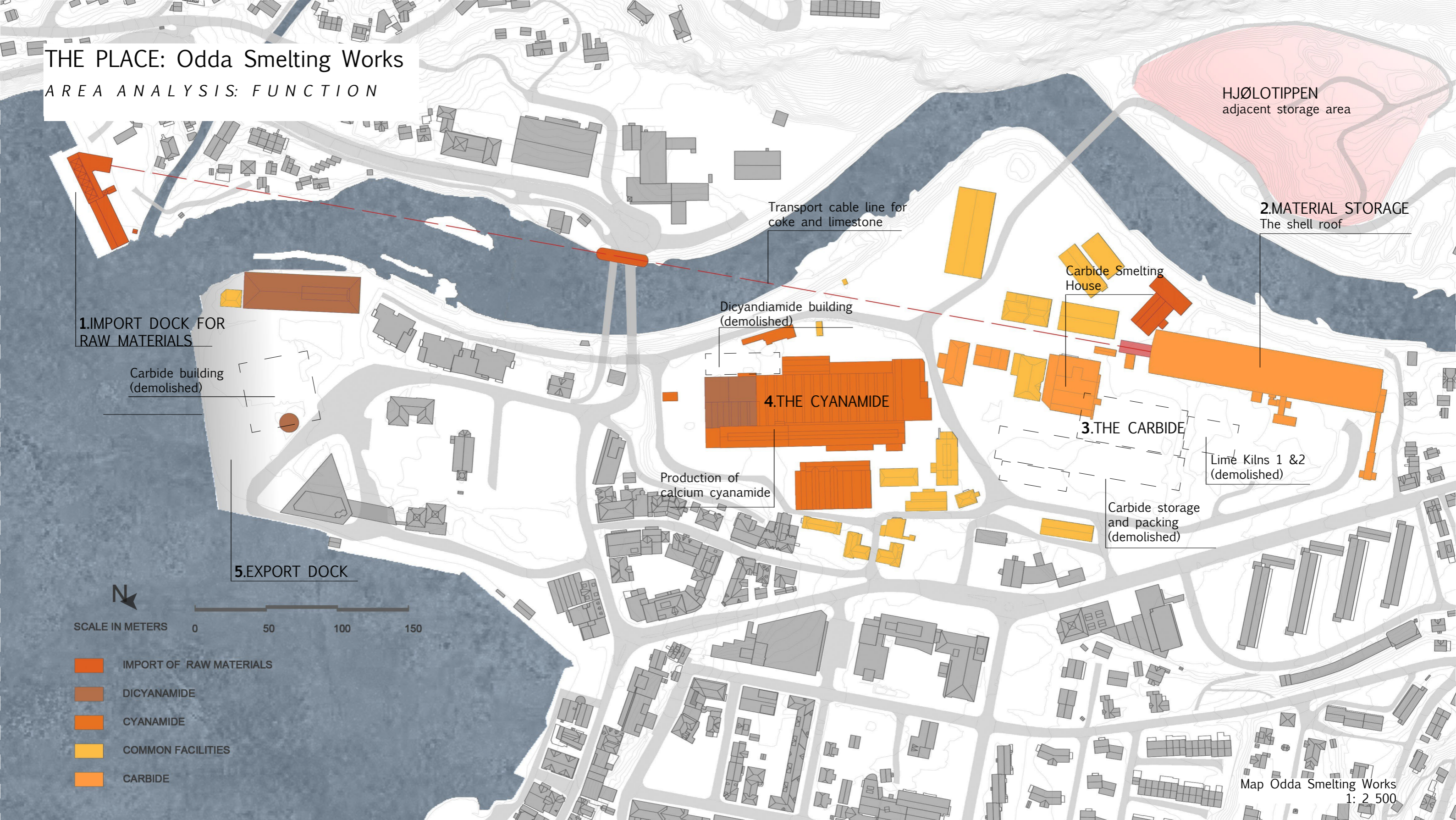
Some industrial equipment has been sold or removed from the site, and the lime kilns in the “Carbide”-area, together with the material transportation line from the import dock leading to the Shell Roof, have been torn down. This happened in the period of inactivity after 2003 leading up to the preservation decision in March 2011, and what is left serves as the current building mass layout.

There is approximately 40 000 m² worth of building mass on site with a lot of **potential for transformation and reuse** of appropriate parts for future development and growth of Odda town.



THE PLACE: Odda Smelting Works

AREA ANALYSIS: FUNCTION



By roughly understanding **the industrial process chains**, one can reference some of the **symbolic and functional values** in new architectural additions which may be beneficial for indirect preservation of the history and identity of this place. Here is a schematic breakdown of the factory before its' shutdown:

1. Import dock with adjacent cable line is used for importing raw materials.
2. Raw materials are brought in, stored and processed under the shell roof-structure, on the southern end of the site.
3. The carbide-area is used in production of calcium carbide from raw materials like different limestone grains and coke fuel through a chain of sorting and smelting processes.
4. The produced calcium carbide is then being utilized in the making of calcium cyanamide, a fraction of which is then used in production of dicyanamide and hydrogen cyanamide.
5. The products are then lastly exported from the export dock.

THE SITE: The Shell Roof

THE STRUCTURE

In my transformation project, the premise-defining piece of architecture is the 160-meter-long roof-structure of reinforced concrete in the former carbide storage-area of the Smelting Works.

This roof, known as “The Shell Roof” or *Skalltaket* in Norwegian, has primarily served as a **storage area for raw materials**.

It was built in 1955-56 and is a prime example of Norwegian industrial architecture that utilizes raw untreated concrete and falls under the architectural style known as **brutalism**.

Historically, this structure has had more functions than just pure material storage. It has been a **combined unit** for both transport, storage and processing of lime and coke. In addition, the adjacent substructures on the west side have been housing lime kilns for carbide-production.

It has to be noted, that during the nearly 100-year life span of the Odda factory, multiple technological alterations have been made due to modernization of the industrial process, and the technological equipment surrounding the site (such as lime kilns) has once been modernized and replaced many times. These alterations and additions to the technology can indirectly be viewed as an industrial *Palimpsest*, where old equipment has been removed, to make space for new, often incrementally.

The caribe kilns (marked grey on the structure diagram) were deemed unimportant by the Norwegian Cultural heritage authority and demolished in 2011. However, the shell roof still stands as a symbol of the activity that has been taken place on the site.



The Shell Roof as seen from Hjølotippen, 1959. Retrieved from Norsk Digitalmuseum

Current state of the structure, facing north. August 2020.

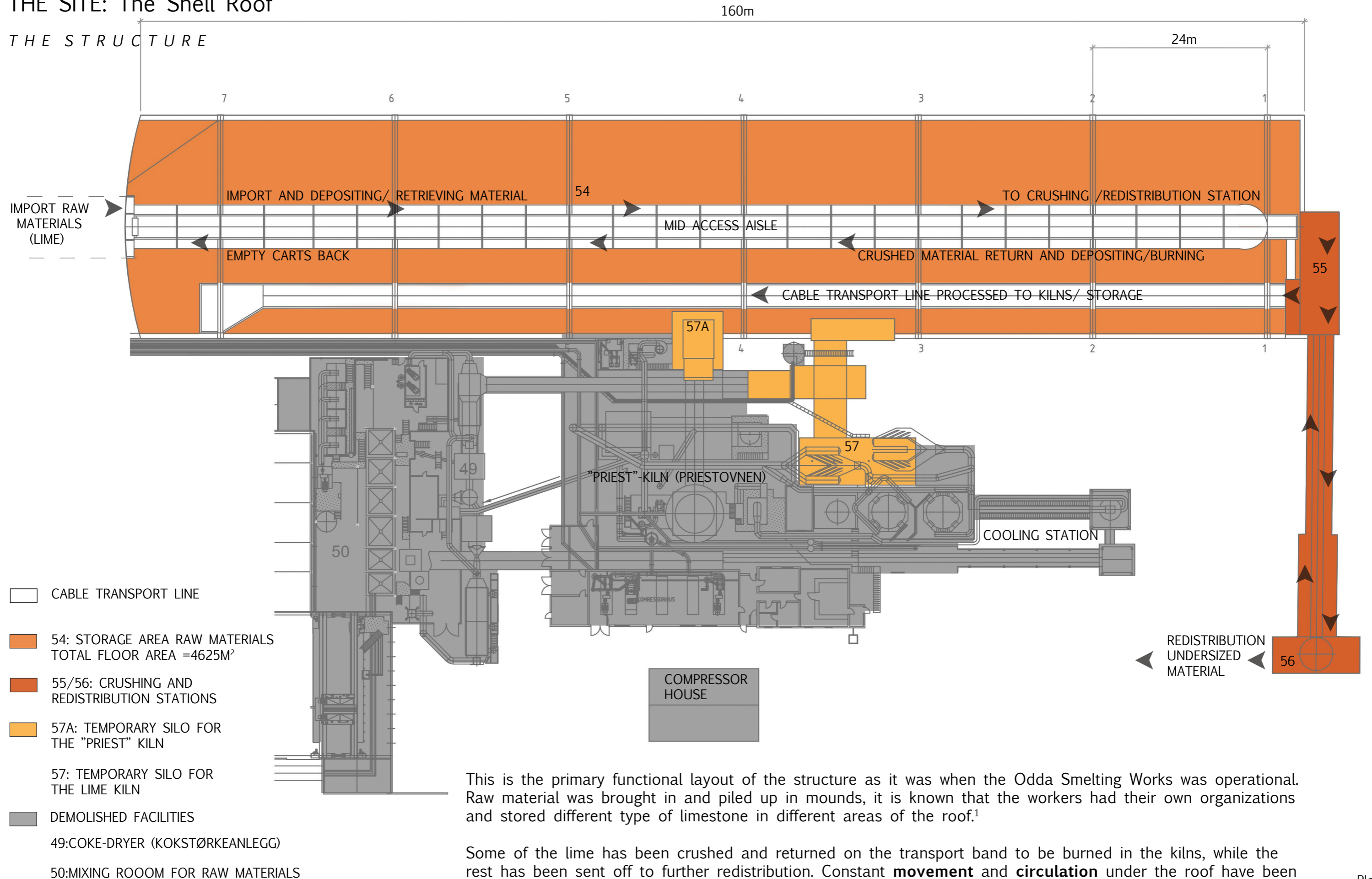


Current state of the structure, facing south. August 2020.



THE SITE: The Shell Roof

THE STRUCTURE



This is the primary functional layout of the structure as it was when the Odda Smelting Works was operational. Raw material was brought in and piled up in mounds, it is known that the workers had their own organizations and stored different type of limestone in different areas of the roof.¹

Some of the lime has been crushed and returned on the transport band to be burned in the kilns, while the rest has been sent off to further redistribution. Constant **movement** and **circulation** under the roof have been one of the most important qualities.

¹ Arkipartner AS for Riksantikvaren (2012): Documentation project "Kalkovnene ved smelteverket"

ARCHITECTURAL CONCEPT: Values

My aim in this project has been to bridge different values within the heritage site- discussion.

1. Heritage conservation

Authenticity: referencing former function, no surface treatment or unnecessary restoration of the Shell Roof or the adjacent elements.

Integrity: minimal demolition of existing elements, trying to create a sense of coherency throughout the project with the added intervention. Helps protect shell roofs' identity by referencing its former dynamic use, the new program is related to the original function.

Reversibility: due to projects' construction principle, the added alterations are fully reversible and can be removed without damaging or harming the existing structure.

2. Architectural production

Aesthetics: Introducing new structure with material and formal ambition to supplement the surroundings, communicating within the same industrial language.

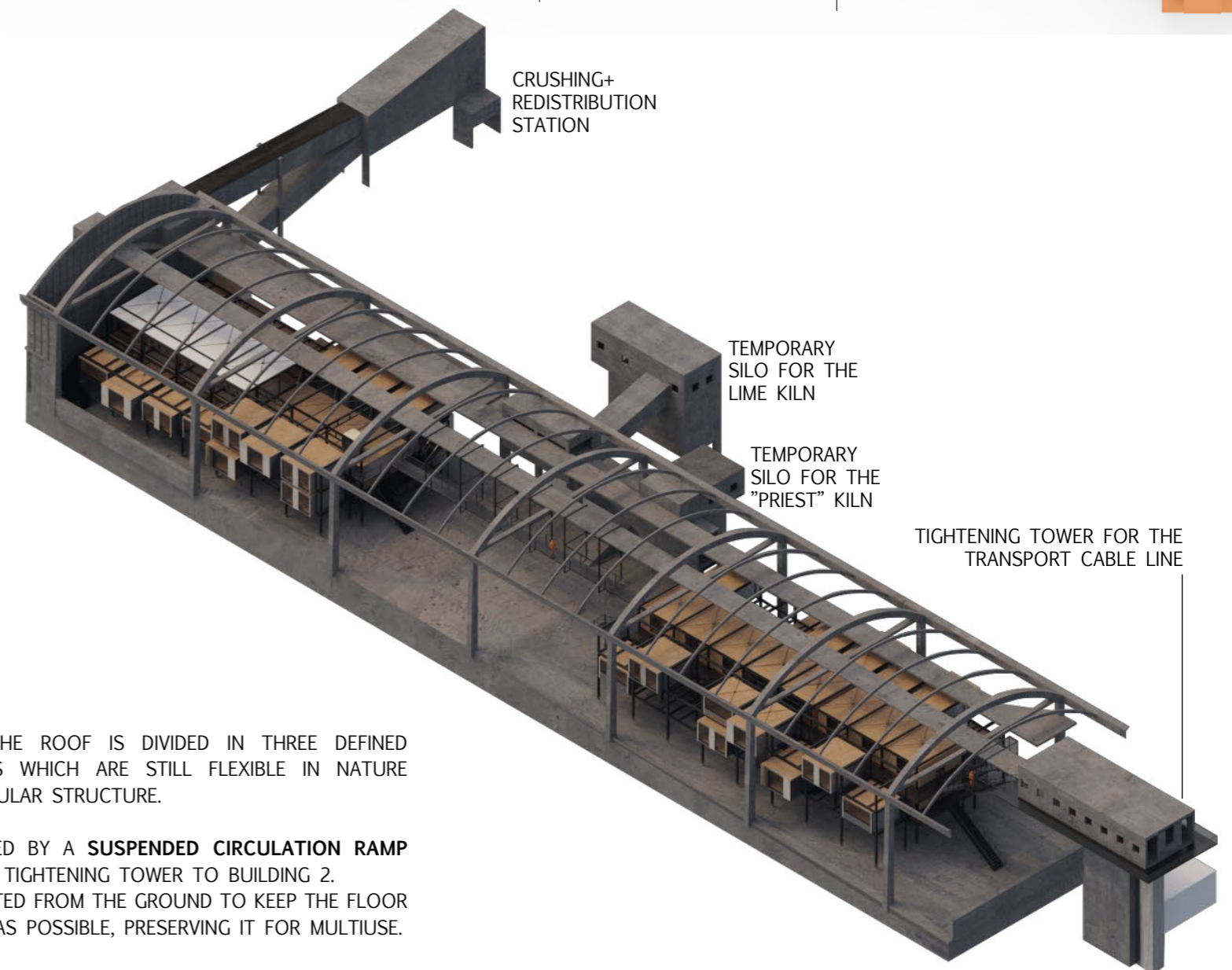
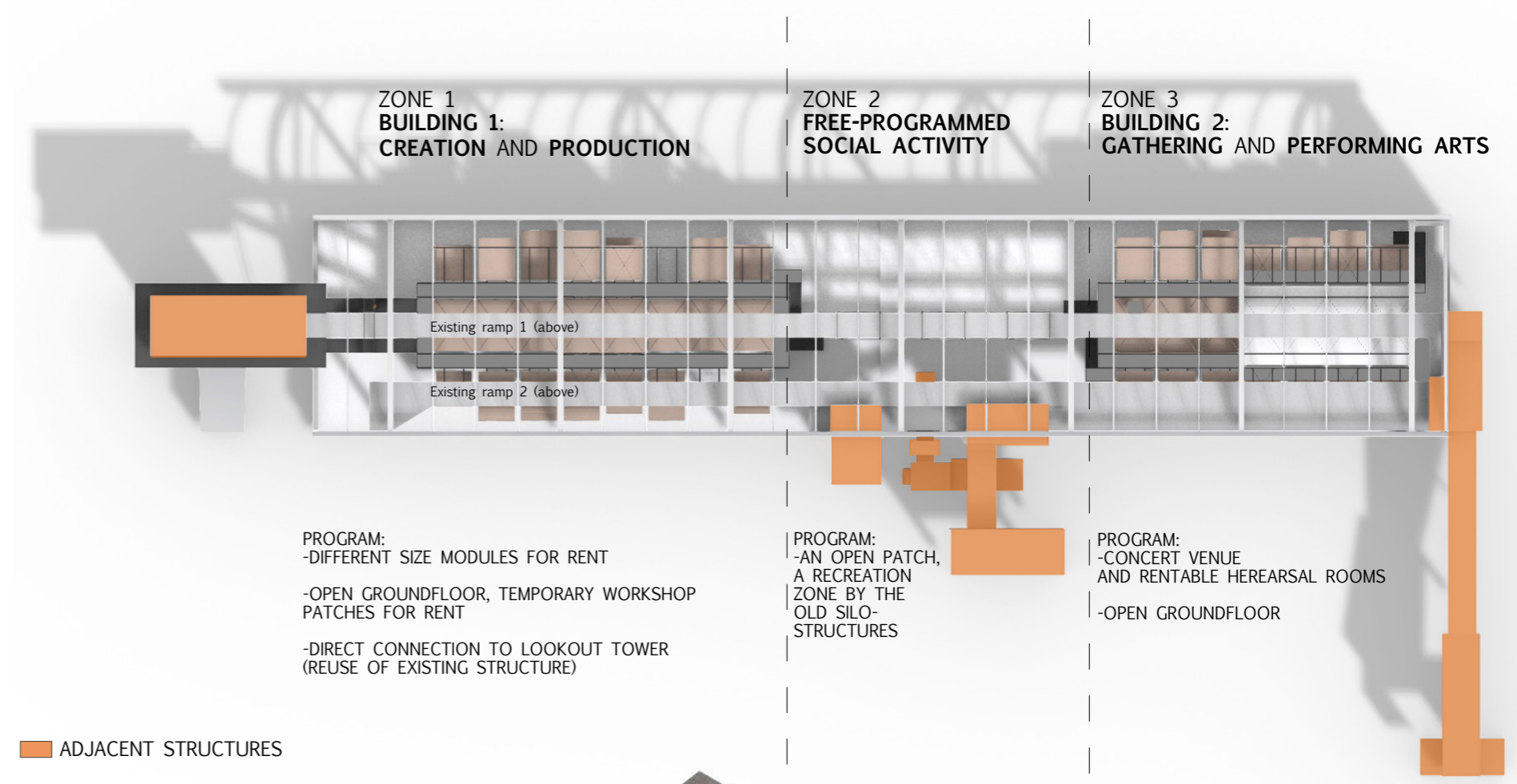
Image: Enhancing/ taking into consideration the existing structural logic and patterns of the shell roof, respecting its' given possibilities and limitations, creating a new symbiosis.

3. Urban development

Development: introducing modular base structure with three levels of permanence, allowing people to decide the contents within a set framework.

Economic viability: flexible construction, can be removed or added after demand, rentable spaces generate income for the owner (Smelteverk Nærings Utvikling). Transforming parts of the roof into a potential tourist landmark (The Tightening Tower).

Bottom-up approach: allowing Odda to take ownership of the place module by module, inviting inhabitants to incrementally occupy its' multiple functions that are provided by structural flexibility, thus making parts of the structure more accessible.

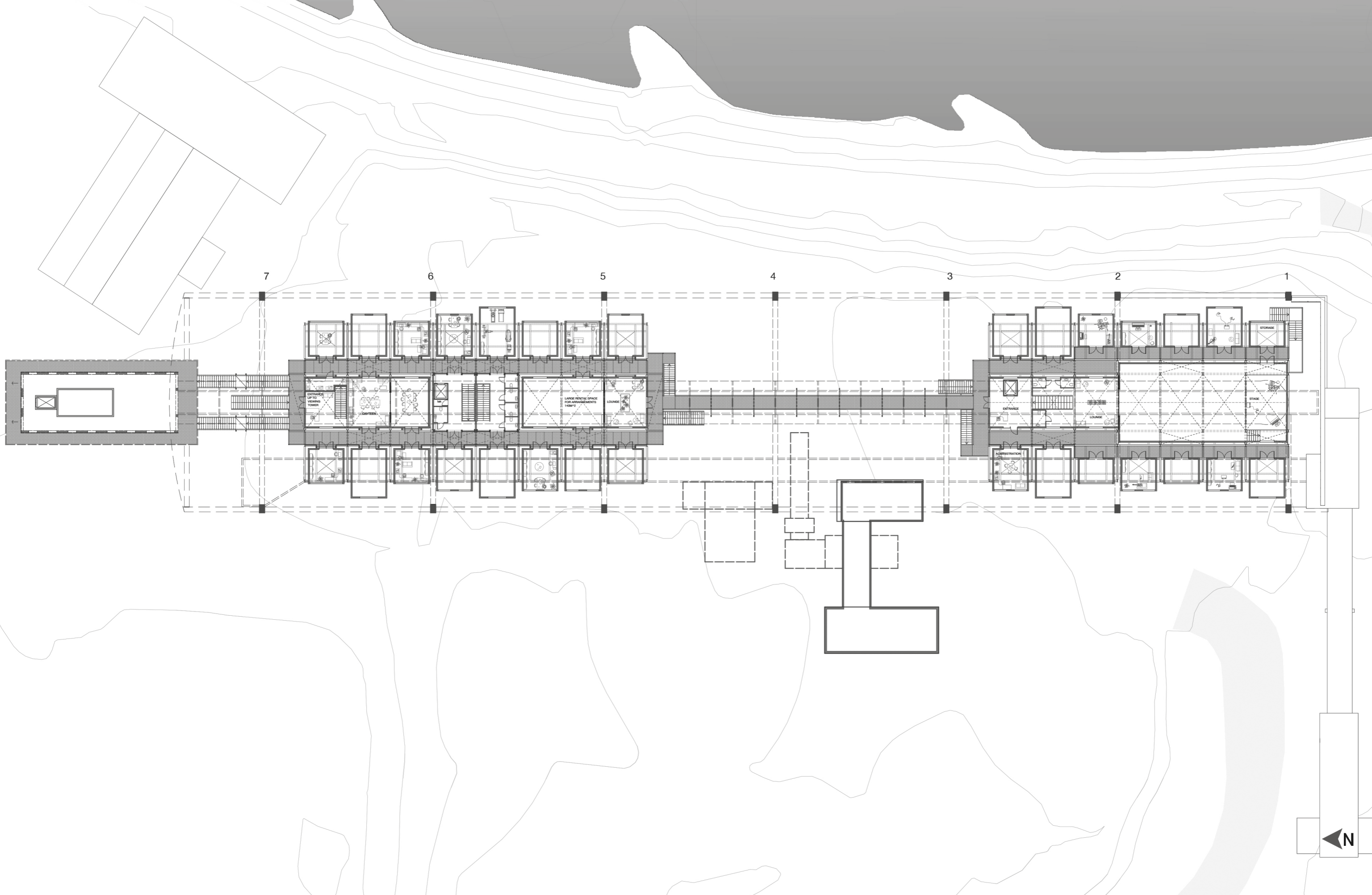


THE SPACE UNDER THE ROOF IS DIVIDED IN THREE DEFINED PROGRAMMATIC ZONES WHICH ARE STILL FLEXIBLE IN NATURE BECAUSE OF THE MODULAR STRUCTURE.

THE ZONES ARE UNITED BY A **SUSPENDED CIRCULATION RAMP** THAT RUNS FROM THE TIGHTENING TOWER TO BUILDING 2. THE PROJECT IS ELEVATED FROM THE GROUND TO KEEP THE FLOOR AREA OPEN AS MUCH AS POSSIBLE, PRESERVING IT FOR MULTIUSE.

PROJECT: Fixed Flexibility

SITUATION PLAN 1: 500

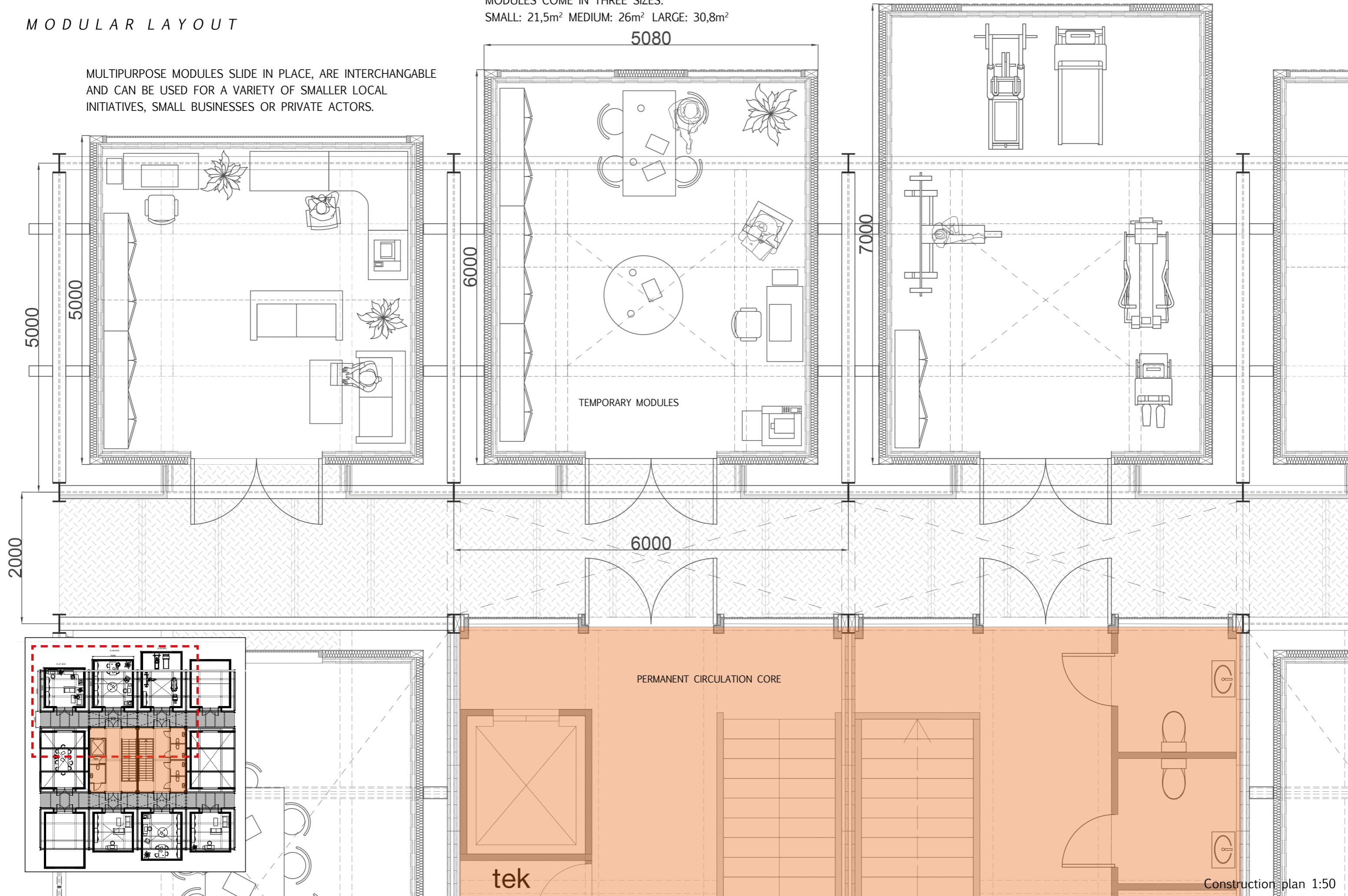


PROJECT: Fixed Flexibility

MODULAR LAYOUT

MULTIPURPOSE MODULES SLIDE IN PLACE, ARE INTERCHANGABLE AND CAN BE USED FOR A VARIETY OF SMALLER LOCAL INITIATIVES, SMALL BUSINESSES OR PRIVATE ACTORS.

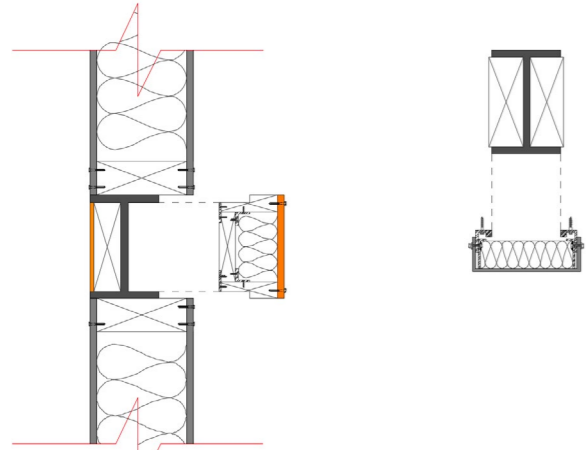
MODULES COME IN THREE SIZES:
SMALL: 21,5m² MEDIUM: 26m² LARGE: 30,8m²



PROJECT: Fixed Flexibility

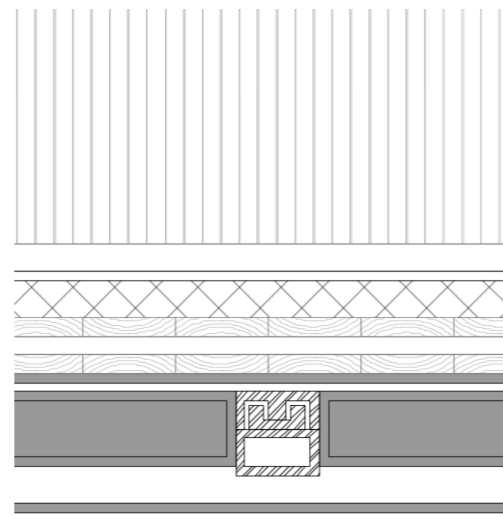
CONSTRUCTION DETAILS

COLUMN INSULATION VENEERS 1:10



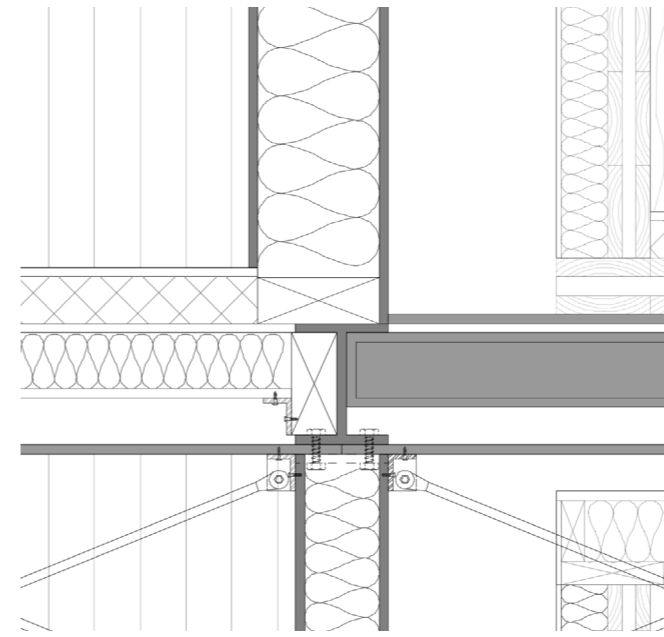
The veneer masks and insulates the steel column in places where it's exposed into the building envelope

MODULE RAILS 1:10



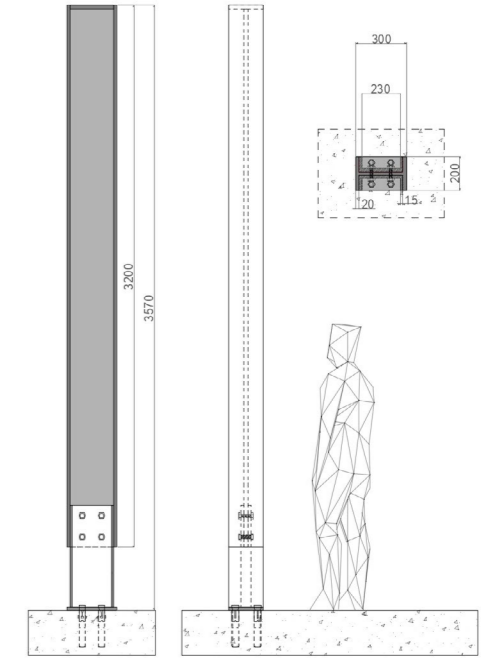
The steel rail makes it possible to easily slide the module in and out of the frame structure

BOLTED BEAM INTERSECTIONS 1:10



The section illustrates bolted intersection between steel column and beams

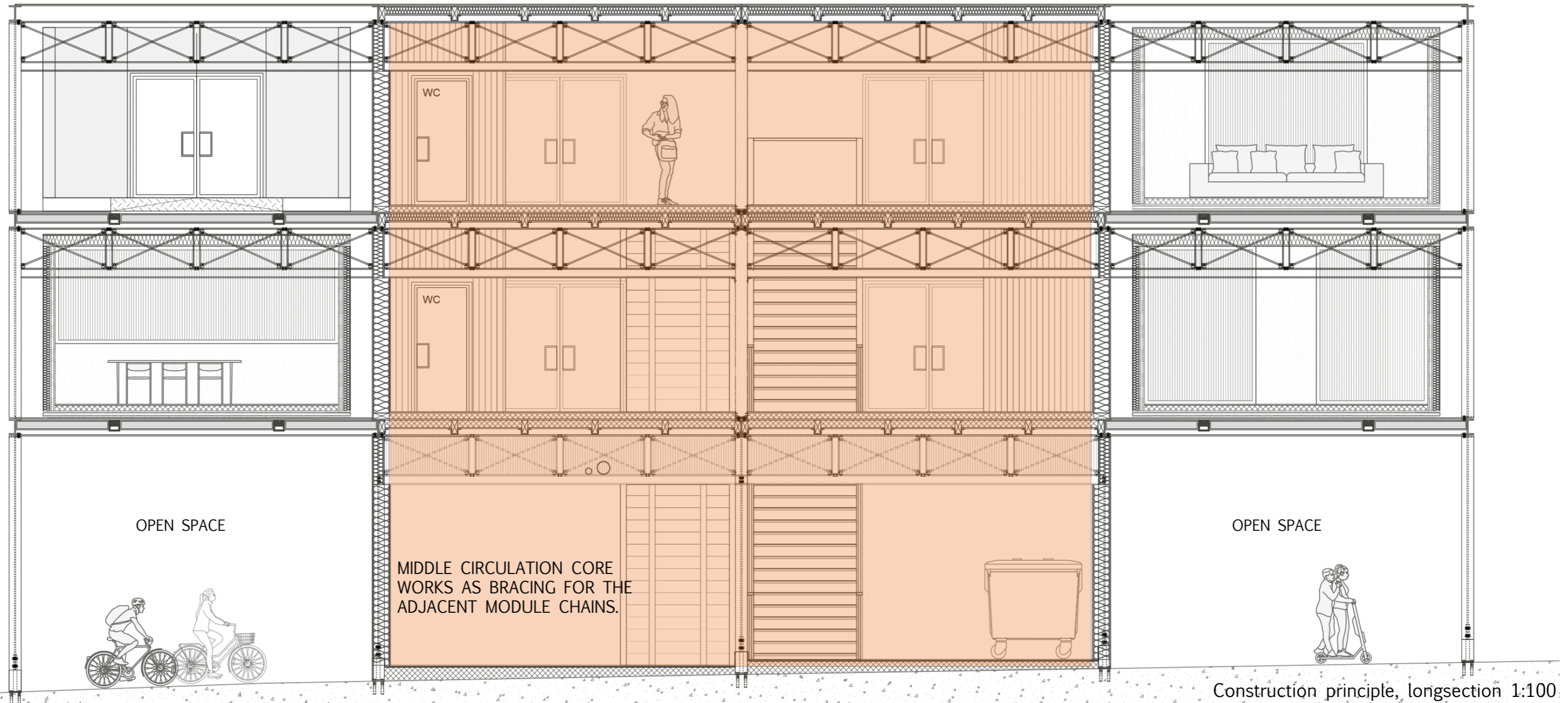
FOUNDATION 1:20



Foundation columns are bolted in the concrete flooring of the shell roof

← MORE MODULES

MORE MODULES →



OPEN SPACE

MIDDLE CIRCULATION CORE WORKS AS BRACING FOR THE ADJACENT MODULE CHAINS.

OPEN SPACE

Construction principle, longsection 1:100

PROJECT: Fixed Flexibility

RENDERS

