

FIXED FLEXIBILITY

Adaptive Reuse: Odda Smelting Works - The Shell Roof

02. P R O G R A M

DIPLOMA PROJECT
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FIXED FLEXIBILITY

Adaptive Reuse: Odda Smelting Works - The Shell Roof

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00. BRIEF

Adaptive reuse- the process of repairing and restoring existing buildings for new or continued use- is becoming an essential part of architectural practice. As mounting demographic, economic and ecological challenges limit opportunities for new construction, architects increasingly focus on transforming and adapting existing buildings.¹ [...] They are valued for their essential history, their intrinsic sense of collective memory, and the physical contribution that they make to the built environment. But what is to be done with the huge stock of redundant structures?² In my diploma project I aim to answer this question by focusing on transformation of a part of a former Norwegian Industrial Site, located in the town of Odda.

The site of **Odda Smelting Works** (OSW) is an important industrial and cultural heritage pearl located in the Western part of Norway, near famous tourist destinations such as Trolltunga and Hardangerfjorden. The municipality of Odda is home to roughly 7000 inhabitants (SSB, 2019), the majority of whom assign OSW a prominent local significance.

Here, the main challenges are of contradicting nature. Majority of the large, 160 000 square meter site, is obsolete and requires spatial reuse and urban transformation in order to revitalize the former industrial town and bring it to life through new development.

At the same time, we are dealing with an important industrial heritage site, where most of the building mass is listed as a part of **UNESCO Industrial World Heritage** and is to be preserved.

This leads us to the question of transformation strategy and approach, trying to balance the notions of **authenticity, integrity** and **identity** with the need for **future-oriented reuse** and rebranding of the area.

In my project, I am focusing on one particular structure at the Smelting Works and exploring the feasibility of a bottom-up **adaptive reuse** approach. The site in question is a former raw material storage area known as **The Shell Roof** or "**Skalltaket**".

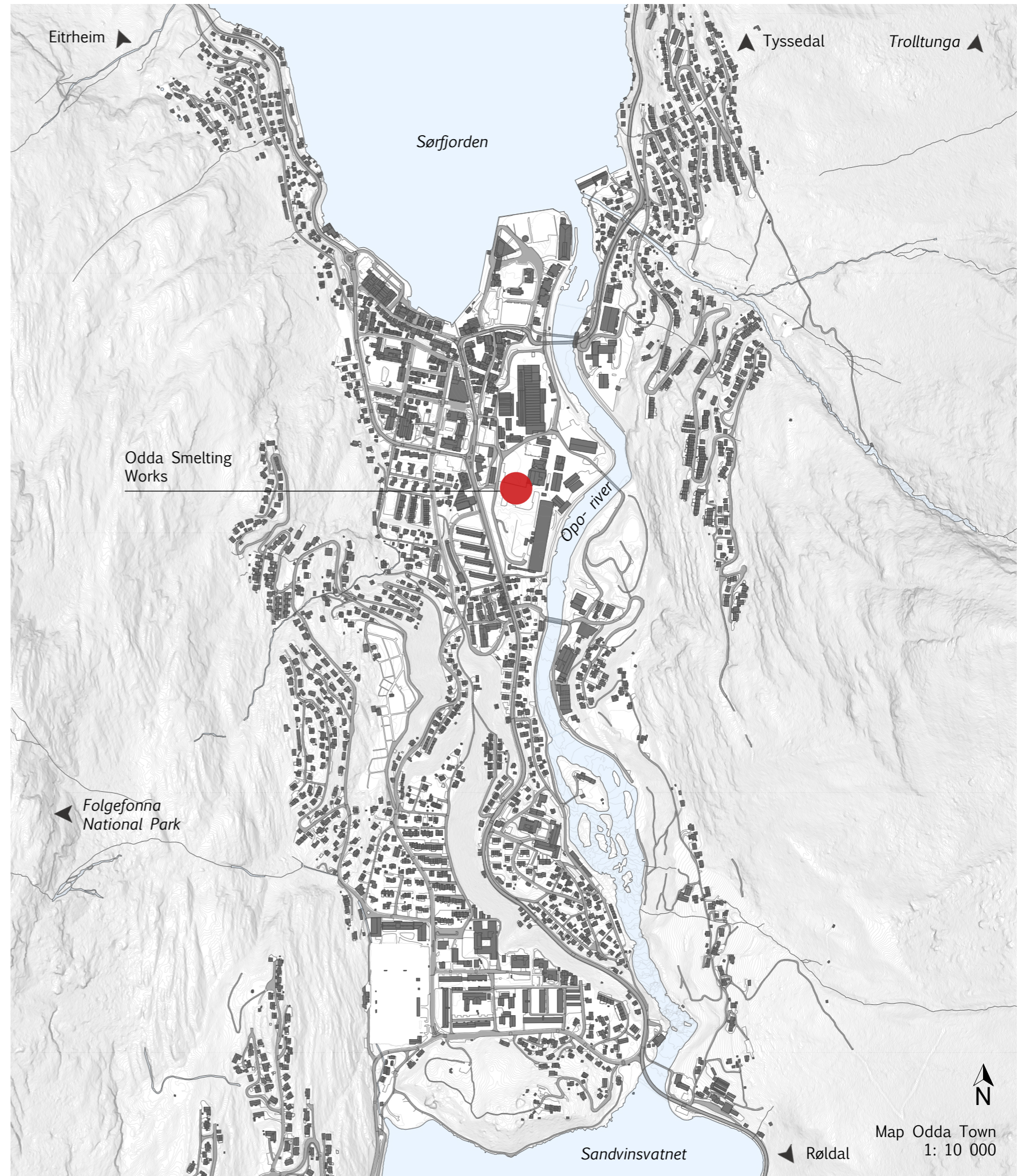
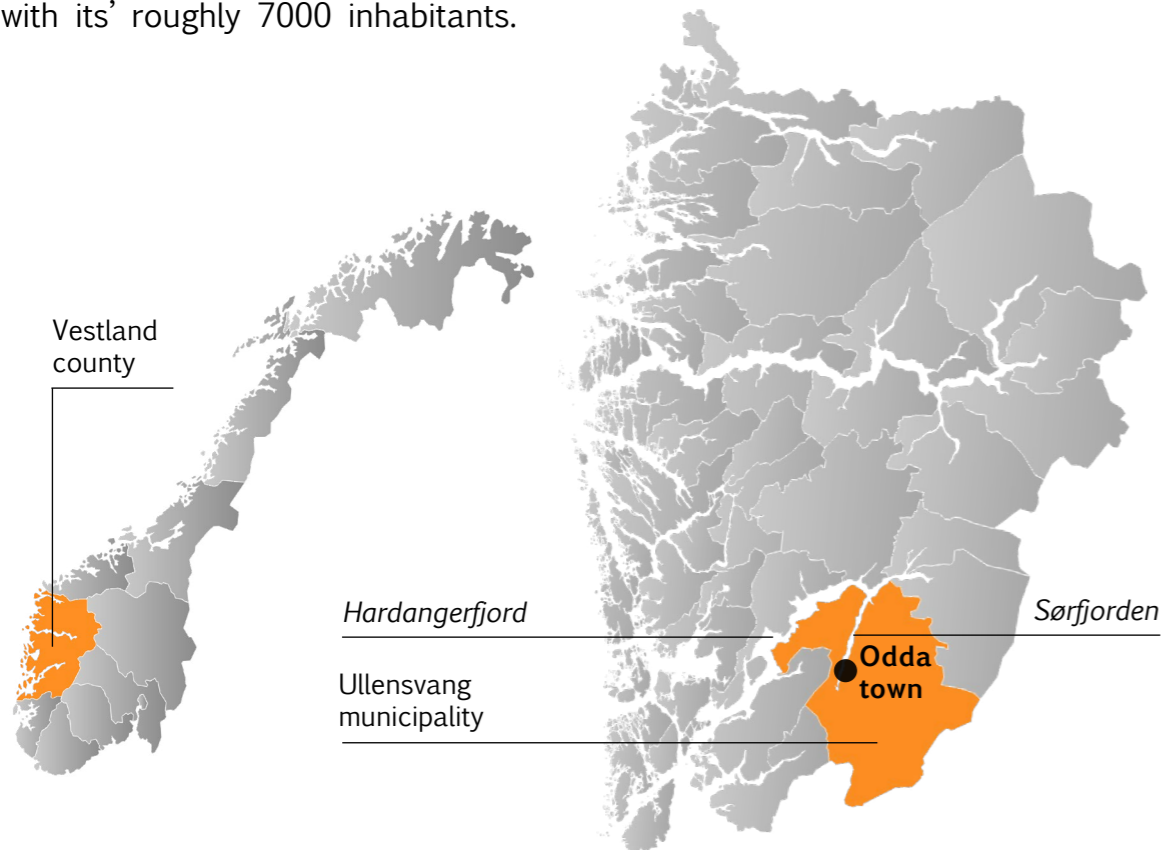


01.THE LOCATION: Odda *GEOGRAPHY*

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 Sør fjorden, 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, 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.



02.THE PLACE: Odda Smelting Works

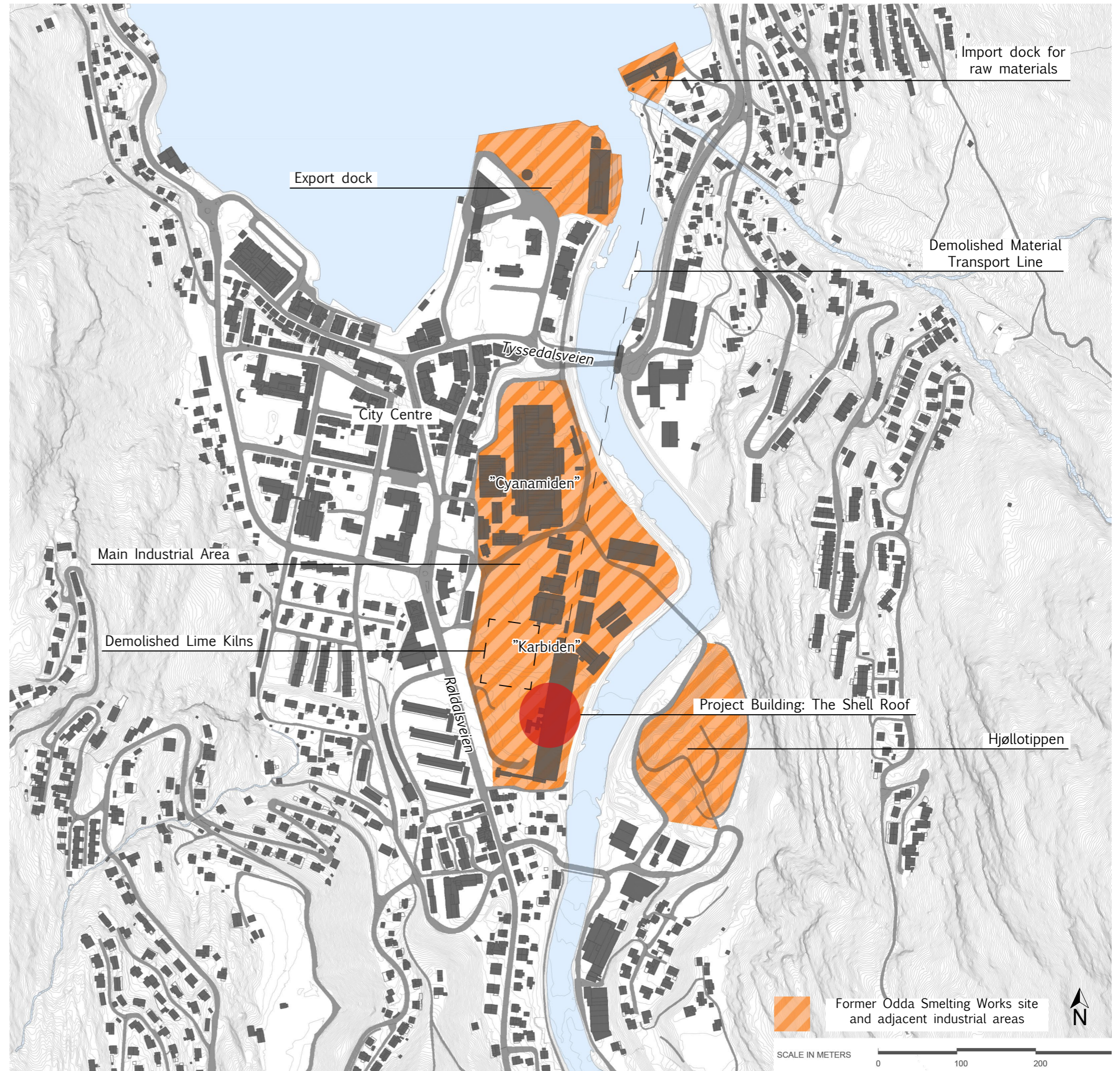
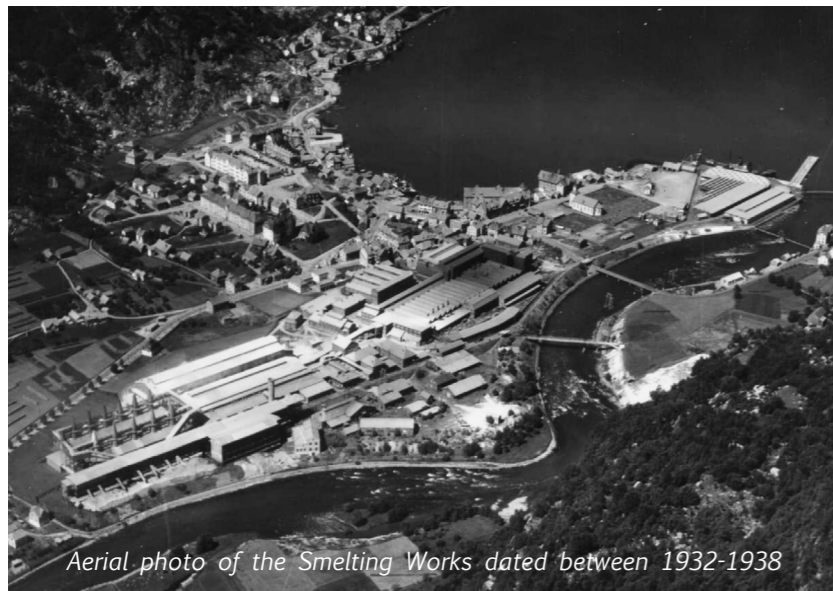
HISTORICAL CONTEXT

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.



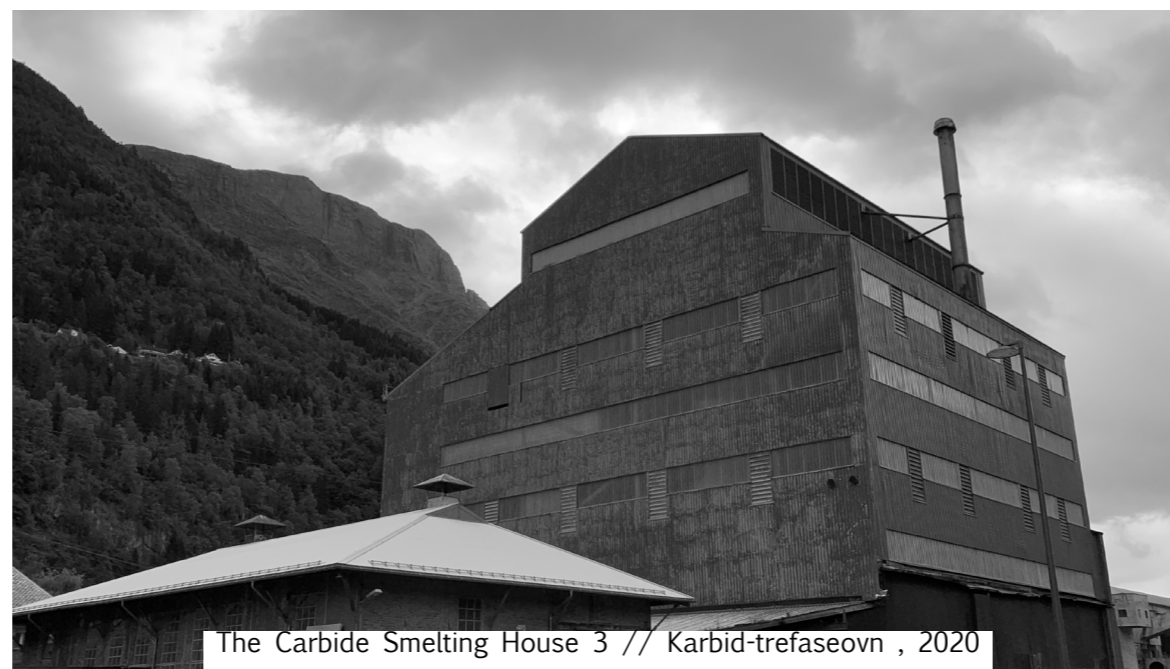
02.THE PLACE: Odda Smelting Works

FACILITIES AND FUNCTIONS - A VISUAL REPRESENTATION

Before proposing alterations to any part of the site, it is important to understand the **dynamic industrial chain processes** that have been taking place in the factory. The electrochemical processes involved in production have required the Tyssedal Powerplant to be built in order to sustain the demand for power. At a point, the factory has been largest in terms of both scale and production.

These energy-intensive processes are the logical backbone for the factory's **morphology** and have therefore dictated the programmatic and structural layout of the industrial facilities. Every area and every building had their assigned function as a part of a bigger "ecosystem". The **programmatic and material diversity** has been great, ranging from docks, cable- and railways to workshops, limestone kilns, smelting ovens, warehouses and dwellings.

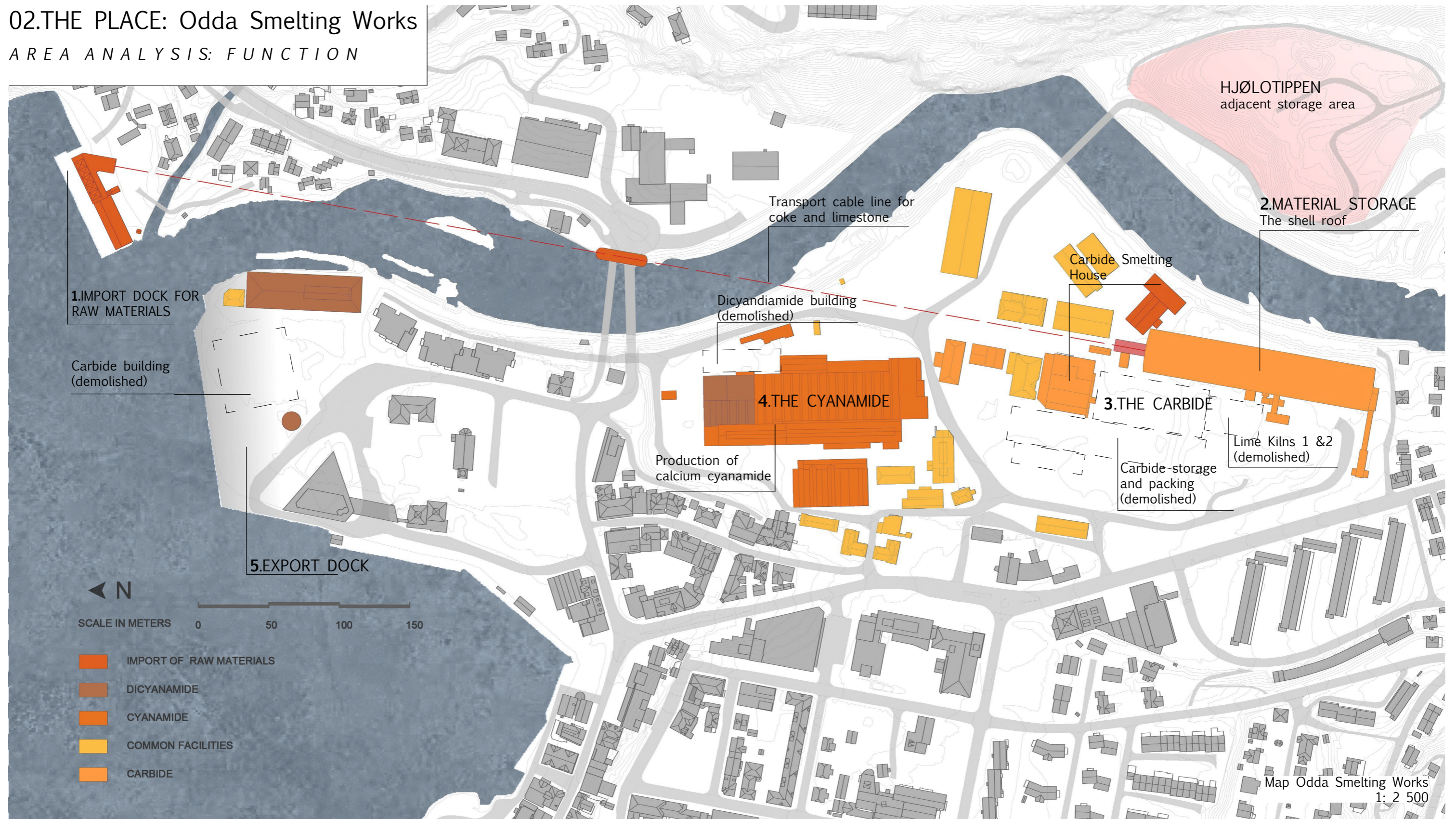
Here, we see some of the key facilities, mainly captured during their heyday. These photos are picked out to give a brief overview over a significantly large area and thus, provide some historic context and paint a picture of factory's morphological diversity and its' beauty.



Photographs retrieved from digitalmuseum.no and nvim.no

02.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.

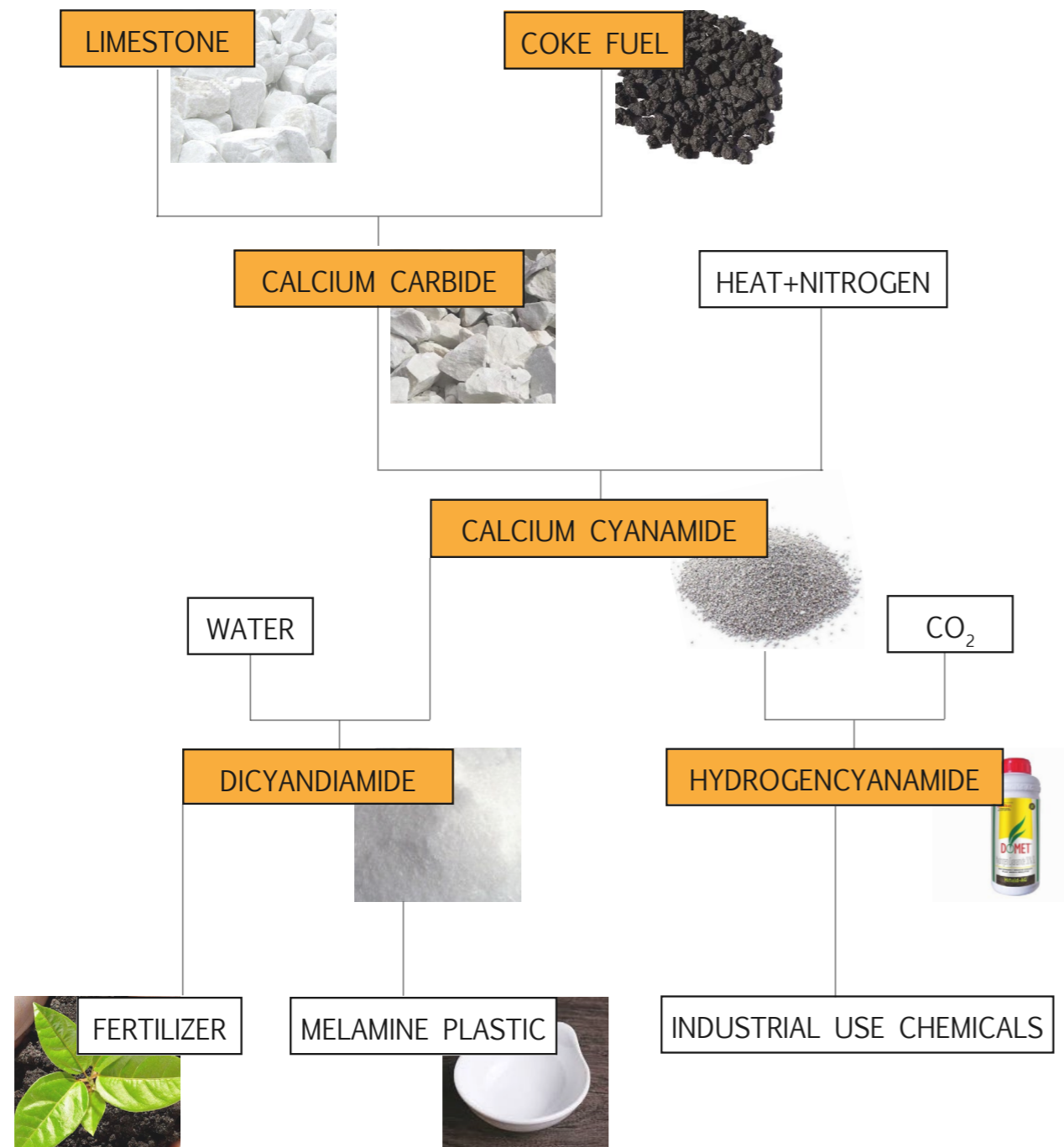
02.THE PLACE: Odda Smelting Works

INDUSTRIAL PRODUCTS AND MATERIALS

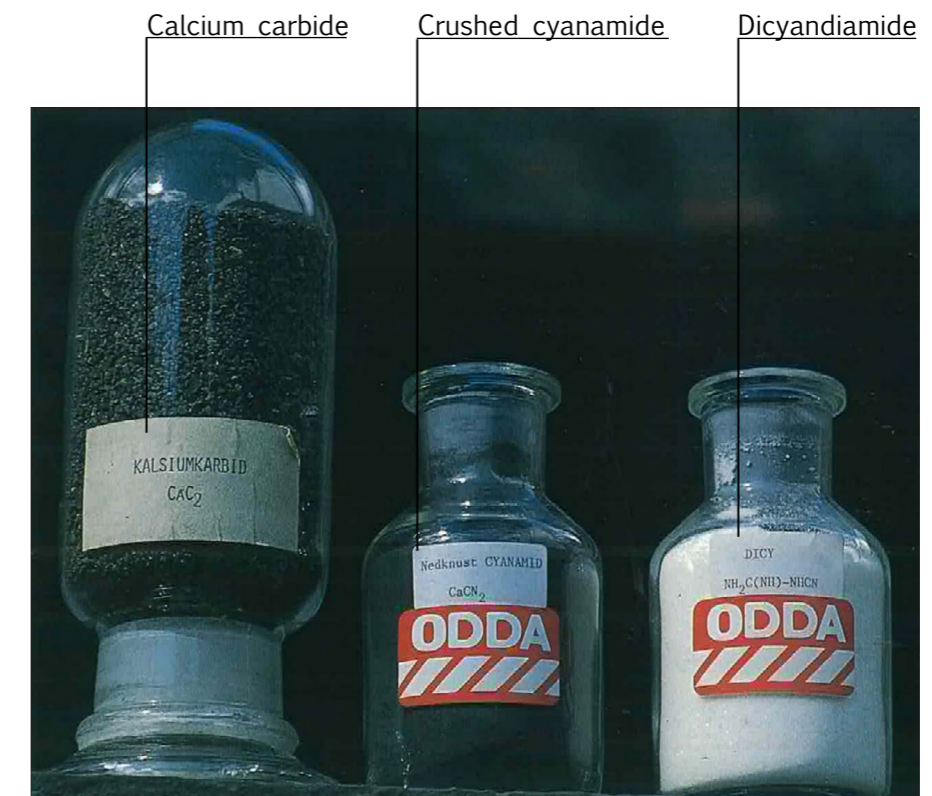
One can abstract the large-scale production at OSW as a chain of industrial processes happening in stages.

The four main materials at the factory were, calcium carbide, calcium cyanamide, dicyandiamide and hydrogencyanamide.

The structure and layout of the factory are therefore adapted to accommodate to those specific products. The **integrity** of the Odda Smelting Works can only be sustained through maintenance and preservation of all the different parts of the production line.



Odda Smelting Works industrial process chain diagram (simplified)



Material Sample Photographs

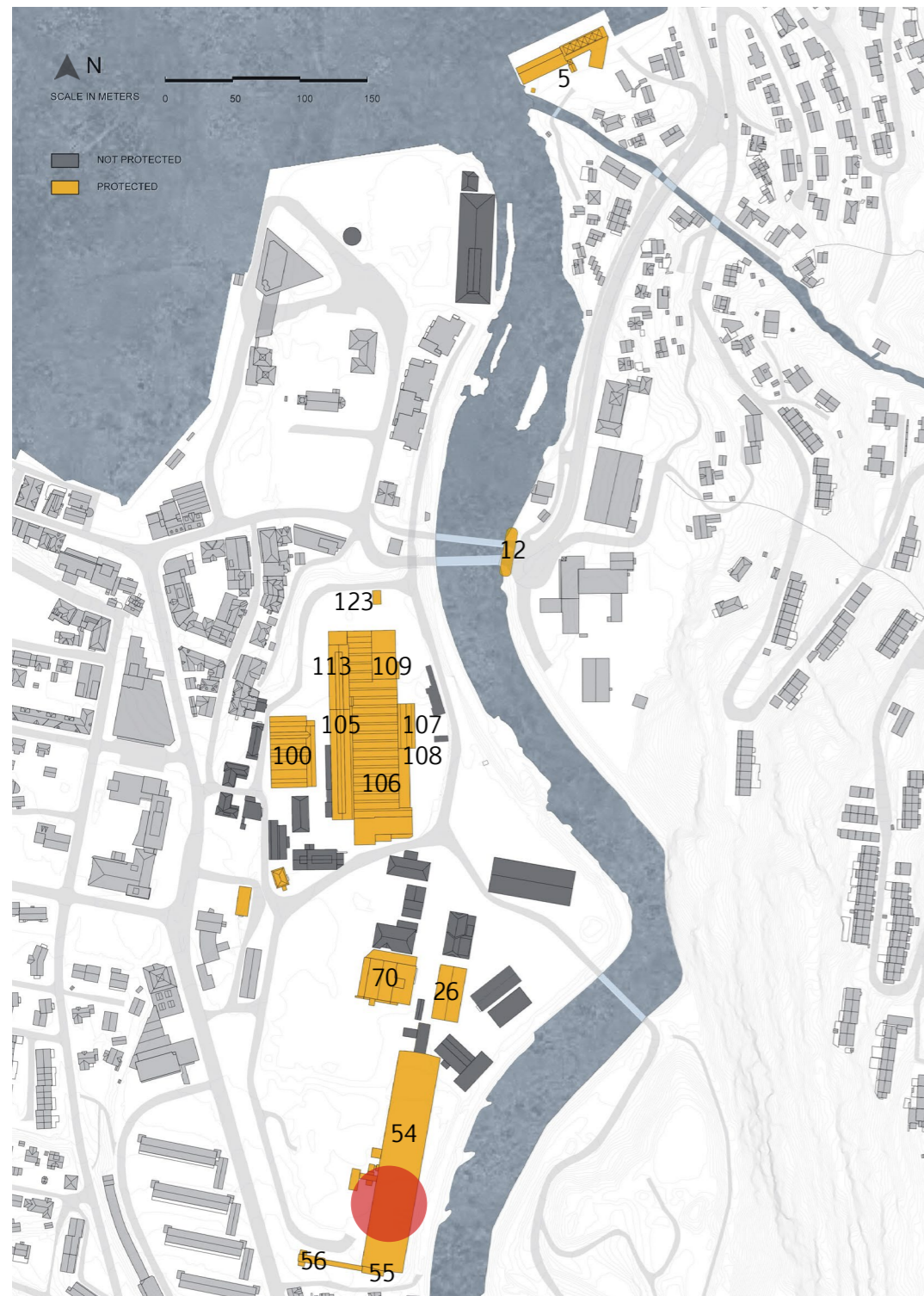
Retrieved from p. 5-6, report *ODDA SMELTEVERK vurdering av verneverdier* by Helge Schjelderup sivilarkitekter MNAL AS

02.THE PLACE: Odda Smelting Works

PROTECTED BUILDINGS

The list of buildings deemed important to protect and preserve includes 16 buildings on site. The structure of interest, **the Shell Roof** is one of them (nr. 54).

The conservation decision (Fredningsvedtaket) states that: “Protection includes main elements such as floor plans, materiality, surface treatment, permanent fixtures, permanent production equipment, as well as some temporary fixtures.”

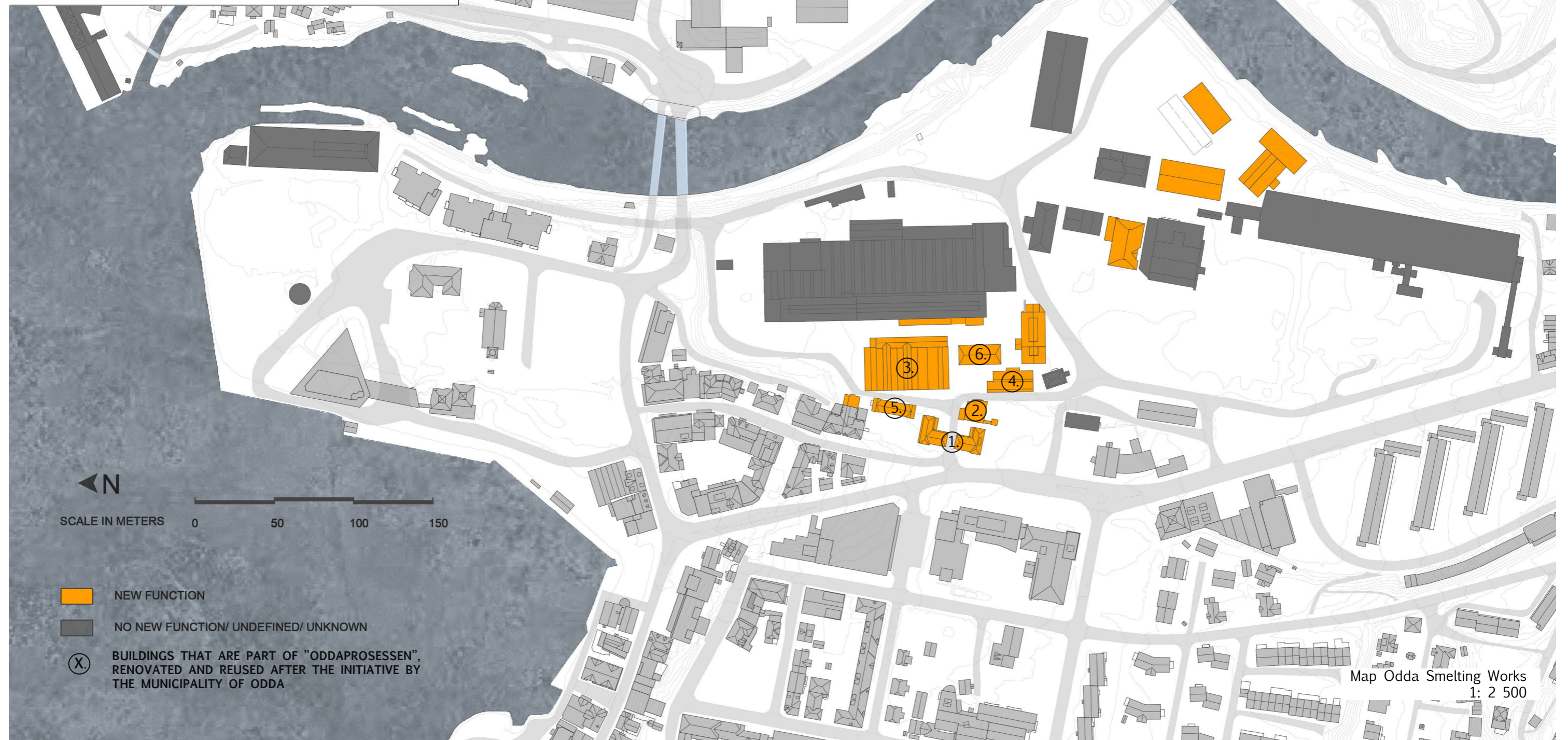


Bygn.nr.	Bygningsnavn	Bygn.nr.	Bygningsnavn	Bygn.nr.	Bygningsnavn
	FELLESBYGG / ANLEGG		IMPORT		CYANAMIDE / KARBONAT
1	Hovedkontor	4	Fordelingsstasjon karbid	100	Lindehus
2	Portvakt og bedriftslegekontor	4A	Fordelingsstasjon karbid "ny"	100A	Luftinntak Bokko
3	Fagforening og hovedverneombud	5	Importkai, kalksteinssilo	101	Fordelingstasjon Cyan, dicy
7	Velferdsbygg for pensjonister	6	Hengebro over elva Opo	102	Rørbro fra kjølehus til møllehus
10	Bro over elva Opo	8	Bro over elva ved importkaien	103	Karbidmøllehus cyan
11	Bro over gangvei	9	Importkai	104	Karbidsilohus cyan
15	Brovekt med hus	12	Beskyttelsesbro over Riksvei 500	105	Lagerhus cyan (ovnshus I)
25	Hovedlager og instrumentverksted	13	Taubane	106	Ovnshus II og III cyan
25B	Oljelager	14	Beskyttelsesnett under taubane	107	Kjølehus cyan
26	Smie, rør- og motorverksted		KALK- OG KARBIDFABRIKK	108	Papirlager cyan
27	Jernlager	16	Trefaseovnshus I	109	Cyanamidknuser
28	Plateverksted	18	Kjølehus	110	Oddakalkfabrikk
30	Lager	19	Lager for dunk til karbidpakkeriet	111	Lager Oddakalk / PCC testfabrikk
32	Industrivernkontorer	21	Dunkefabrikk	113	Råcyanamidsilo
33	Rubhall-A, lager ildfast	22	Lager for dunk til karbidpakkeriet	114	Råcyanamidsilo (ikke i bruk)
34	Reservevedelslager	23	Karbidpakkeri	115	Lager div.
35	Rubhall-B, ildfast / mek. lager	24	Containerpakkeri	123	Spiserom cyan
36	Kontor og velferdsrom på eksportkaien	29	Kompresorstasjon CO- gass	125	Silo for filterkake
37	Dicylager på eksportkaien	40	Analysesstasjon	127	Silo og transportanlegg filterkake
37A	Områdeverksted eksportkai	45	Velferdsbygg "kubb"		DICY OG CY- 50 FABRIKK
38	Nye karbidlager eksportkai	46	Priestovn maskinhus	200	Dicyfabrikk
39	Eksportkai	47	Kontrollrom kalkovner	201	Kjelehus
41	Sentraltoalett	48	Oljetanker øst for råstofflageret	204	CO2 gasskompresshus
43	Lager laboratorium	49	Kokstørkeanlegg	205	Tungoljetanker
85	Lager for spesialavfall	50	Blanderom for råmaterialer	207	Områdeverksted dicy
100B	Motorlager	51	Kalkovn II, kybel med tavlerom	208	Pumpestasjon dicy
119	Sentralbadet med garderobe	52	Kalkovn I	210	Kontrollrom dicy
120	Maskin- og elektrikerverksted	53	Trefaseovnshus II	211	CTP- gassrensanlegg
121	Mantel- og containerverksted	54	Råstofflager kalk/koks	212	Dicipakkeri
122	Laboratorium	55	Knusestasjon	213	CY-50 fabrikk
124	Tekniske kontorer	56	Omlastingstasjon	214	Pallelager dicipakkeri
126	Oljetank, eksportkai	57	Døgnsilo kalkovn	215	Oljeanlegg dicy
128	Trafokiosk filterkakeanlegg	57A	Døgnsilo priestovn		
140	Driftskontor og møterom	58	Velferdsbygg kalk/karbid		
203	Hoveddriftskontor og garderobe	59	Hus for kjølebelte og siloer		
	Hjølloppen	60	Hus for skrapjernpresse		
	Hjøllobrakkene	70	Trefaseovnshus III		
	Vanninntak Vasstun	71	Fortykkeranlegg		
		72	Venturislamanlegg v/ kalkovn		
		79	Kontrollrom karbidpakkeri		
		80	Karbidsilobygg		
		81	Dunkepakkeri og silobygg		
		82	Filtrering		
		83	Pallelager karbid		
		84A	Velferdsbrakke, karbidpakkeri		
		84B	Verkstedbrakke, karbidpakkeri		

Visual representation of the 16 protected buildings as of 2011 done by the Norwegian Directorate of Cultural Heritage (Riksantikvaren)

02.THE PLACE: Odda Smelting Works

BUILDINGS WITH AND
WITHOUT NEW FUNCTIONS



Some of the buildings at OSW have already found new use. Odda Municipality has bought and revitalized seven buildings (Smelt1) on the site as a part of the value creation initiative called “Oddaprosessen”, led by Riksantikvaren (The Norwegian Directorate of Cultural Heritage). The seven buildings are the following:

1-2. Administrasjonsbygg Sør og Nord (two buildings)
5. Containerverkstedet

3. Portvaktbygget (Smelt Café)
6. KraftLaben (Vitensenteret- Educational Centre)

4. Lindehuset
7. Sentralbadet (Literature Centre)

This selection of buildings has the least industrial-specific character, which allows for easier adaptation to house new functions. Industry-specific buildings often undergo alterations to meet new requirements dictated by new program, meaning that the preservation-values such as authenticity and integrity are at risk. This might explain why larger industrial facilities on site are **still unutilized**, mainly because they are protected by Riksantikvaren and are deemed valuable by UNESCO. Any alteration, therefore, calls for preliminary analysis and value-assessment.

03.INDUSTRIAL HERITAGE SITES: Common Issues and Possibilities

BACKGROUND

The **balancing act** between preservation and transformation of the built heritage opens up for a plethora of interdisciplinary questions and challenges. These topics have become increasingly more relevant as the obsolete building stock in Europe has grown the past few decades. Industrial sites have started to become redundant when the original function of the buildings has disappeared with shifts in technology, society and economy, and the question of what to do with them has become of urgency.

In the book *Industrial Heritage Sites in Transformation: Clash of Discourses*, published by Routledge in 2015, the editors Heike Oevermann and Harald A. Mieg discuss **main lines of conflict** that emerge when dealing with industrial heritage.

Those are mainly conflicts of interests between municipal administration, stakeholders and cultural heritage protectors. Three main perspectives in discourses are defined and mentioned by researcher Oevermann and professor Mieg in the book, and usually relate to one of the following fields:

- Heritage Conservation
- Urban Development
- Architectural Production

Each one of these three understandings have different discourses attached to them and professionals from respective fields are usually involved. To reach a clear strategy might be difficult, as each of the fields targets different values.

Heritage Conservation: Values authenticity and integrity; concerned with preservation

Urban Development: Values vision, development, economic value and environmental value, and aims for a prosperous and livable city

Architectural Production: concerned with aesthetics and design and strives to bring forth contemporary architecture

When different perspectives and interests clash, there is a possible solution of *bridging values*; finding common points of interest and common values, like accessibility, character or reuse.



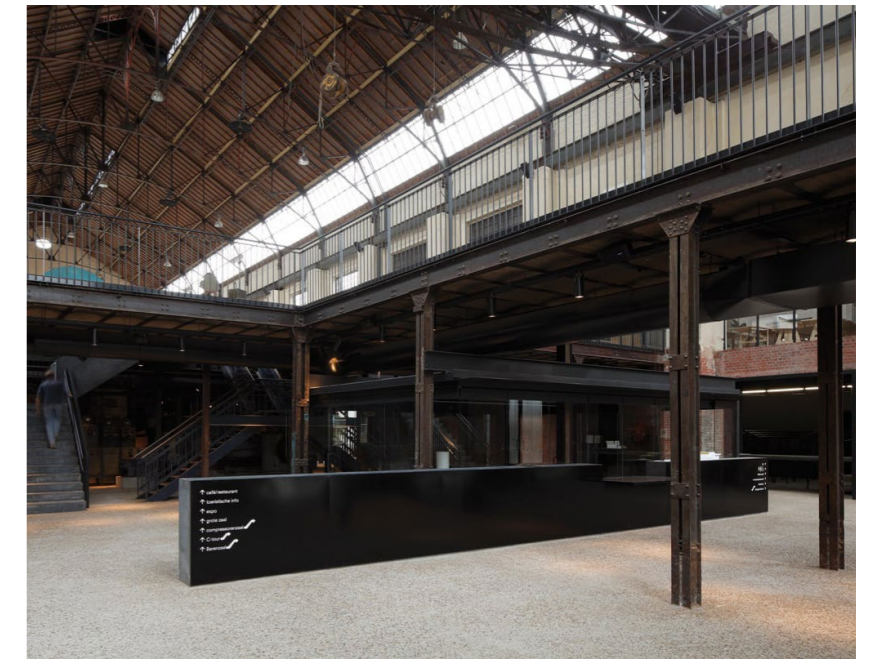
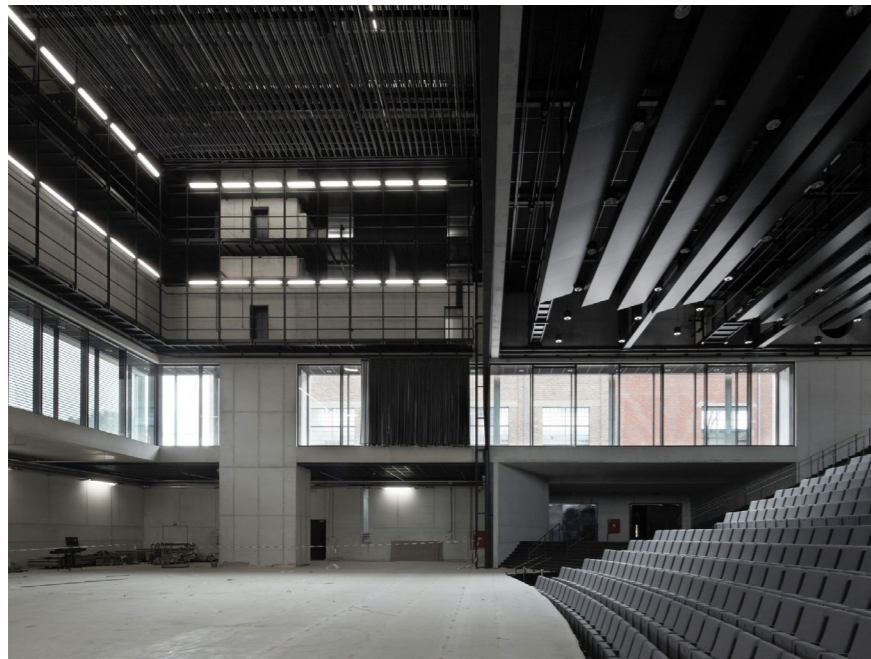
Odda Smelting Works Physical Landscape Model
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03.INDUSTRIAL HERITAGE SITES: Common Issues and Possibilities

REFERENCE: C-MINE

Located in Genk, Belgium, the coal mine was operational between 1917 and 1980's, when the facility went bankrupt. Similarly to Odda, widespread unemployment followed and the area lost a significant part of its' identity. New industries were attracted in an attempt to transform the area. Revitalization happened in 2004-2010, during which the most significant buildings were preserved, which are the shaft towers, the administrative building, the energy building and some stables and sheds.¹

The site itself is transformed into a creative hub organized around four key aspects- education, creative economy, recreation, and artistic creation. It houses various functions such as school of art and design, a cinema, art gallery+museum, a cultural centre and a hub for young entrepreneurs. The project also houses a music room, restaurant, event hall, exhibitions spaces and tourist facilities. This gives C-mine a renewed identity and creates a point of attraction in Genk, while preserving the most prominent industrial landmarks.



¹ Plevvoets B, Cleempoel K. (2019), p. 169

03.INDUSTRIAL HERITAGE SITES: Common Issues and Possibilities

REFERENCE: ZECH E ZOLLVEREIN

Zeche Zollverein is a large former coal refinery in the city of Essen, Germany. The architects Fritz Schupp and Martin Kemmer developed Zollverein following the graphic language of the Bauhaus – combining form and function. It has also like Odda Smelting Works, been inscribed into the UNESCO list of World Heritage Sites, only 10 before Odda, in 2001. It has been fully shut down in 1988 and revitalized in 2001-2010 by OMA and is now one of the anchor points of the European Industrial Heritage.

Back in it's hayday, Zeche Zollverein was the largest coal mine in the world, with the largest coking plant in Europe. Today the historical site includes the pits, coking plants, railway lines, pit heaps, miner's housing and consumer and welfare facilities. It also houses The Red Dot Design Museum in Essen, as well as various other museums, dance grounds, music theatre and restaurants.



04.INTERVENTION STRATEGY: Adaptive Reuse

THEORETICAL BACKGROUND

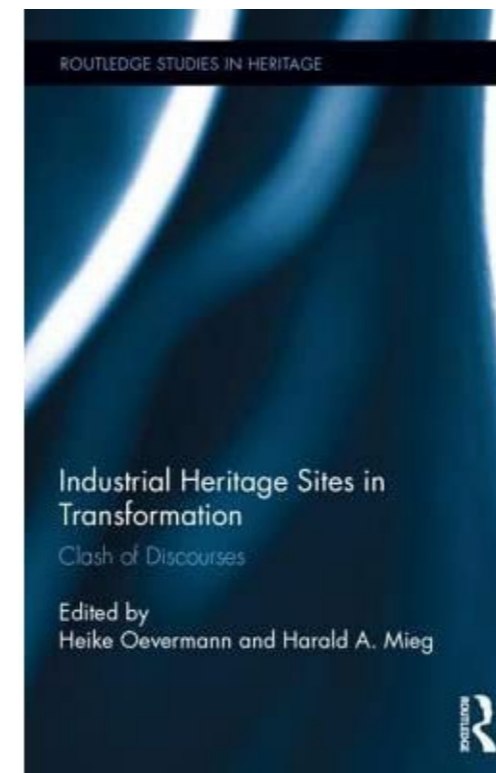
In search for the right intervention-approach, it has been helpful to look at how other industrial heritage sites like Zeche Zollverein and C-Mine have been dealt with. The relevant book by Bie Plevoets and Koenraad van Cleempoel titled *Adaptive Reuse of the Built Heritage* presents a rough specter of alterations that a historic building or site can be subjected to, namely, renovation, **adaptation**, alteration, and remodeling. Renovation is one of the gentlest of approaches, while remodeling is the most drastic one.

Programmatic adaptation can feasibly be applied in case with the shell roof, as the structure is protected against most physical intervention, but its' form is relatively open and doesn't require extensive alteration or remodeling in order to introduce new function. By being assigned new function, the building is thus **preserved through active use**.

Having said that, important factors, such as identity, context and architectural form, as well as geographic location and societal/economic demands, all play a significant role in the decision-making process. Those notions should be considered beforehand, but they fall under different value-categories.

To make sure key values of *heritage preservation* are preserved, the following documents prominent within European conservation perspective are being utilized as guidelines to define basic principles:

- The Charter of Venice (ICOMOS, 1964)
- The World Heritage Convention (UNESCO 1972)
- Norway: *Kulturminneloven* serves as a national guideline



05.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*², where old equipment has been removed, to make space for new, often incrementally.

The carbide kilns that we see casings of (left), 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.

² Machado R. (1976): *Architecture as Palimpsest*.



05.THE SITE: The Shell Roof

ORIGINAL SPATIAL UTILIZATION



Redistribution Station

Crushing Station

Carbide Kilns (Demolished)

Limestone Mounds

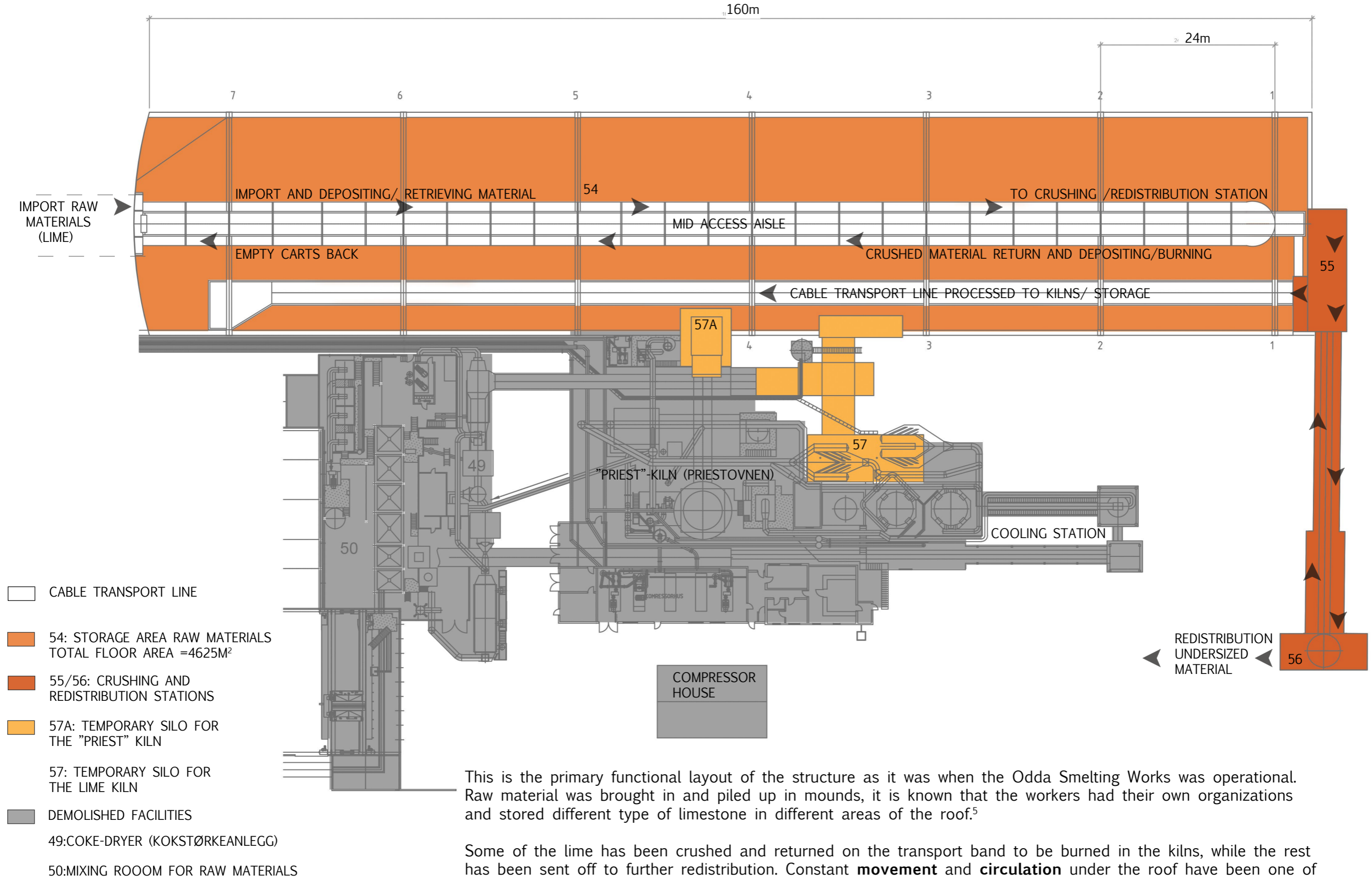
Coke (fuel) Mounds

Tightening Tower for the Cable Transport Line

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

05.THE SITE: The Shell Roof

ORIGINAL STRUCTURE AND FUNCTION DIAGRAM



This is the primary functional layout of the structure as it was when the Odde 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.⁵

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.

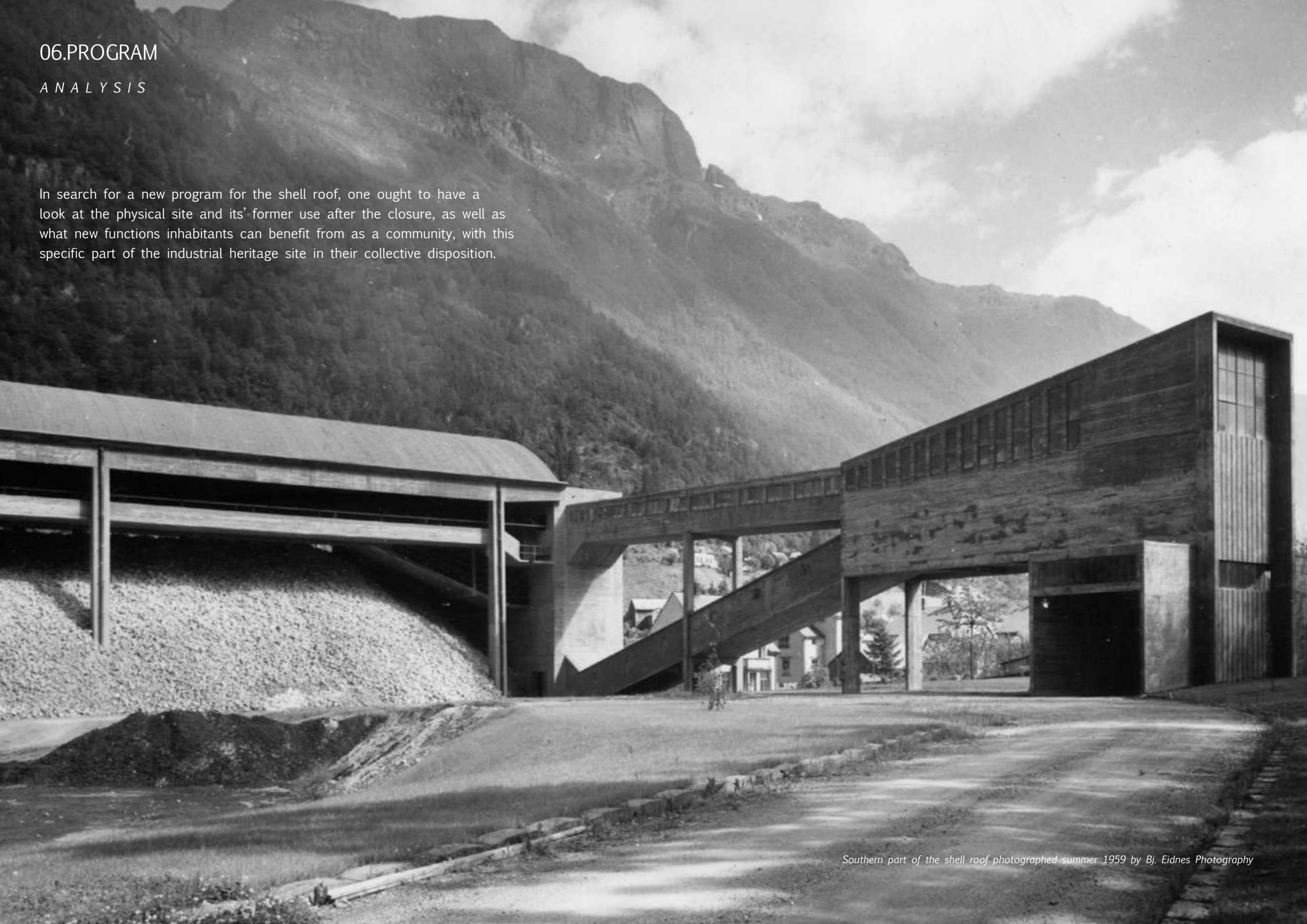
Plan
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N

⁵ Arkipartner AS for Riksantikvaren (2012): Documentation project "Kalkovnene ved smelteverket"

06.PROGRAM

ANALYSIS

In search for a new program for the shell roof, one ought to have a look at the physical site and its' former use after the closure, as well as what new functions inhabitants can benefit from as a community, with this specific part of the industrial heritage site in their collective disposition.



Southern part of the shell roof photographed summer 1959 by Bj. Eidnes Photography

06.PROGRAM

EXISTING REUSE SUGGESTIONS

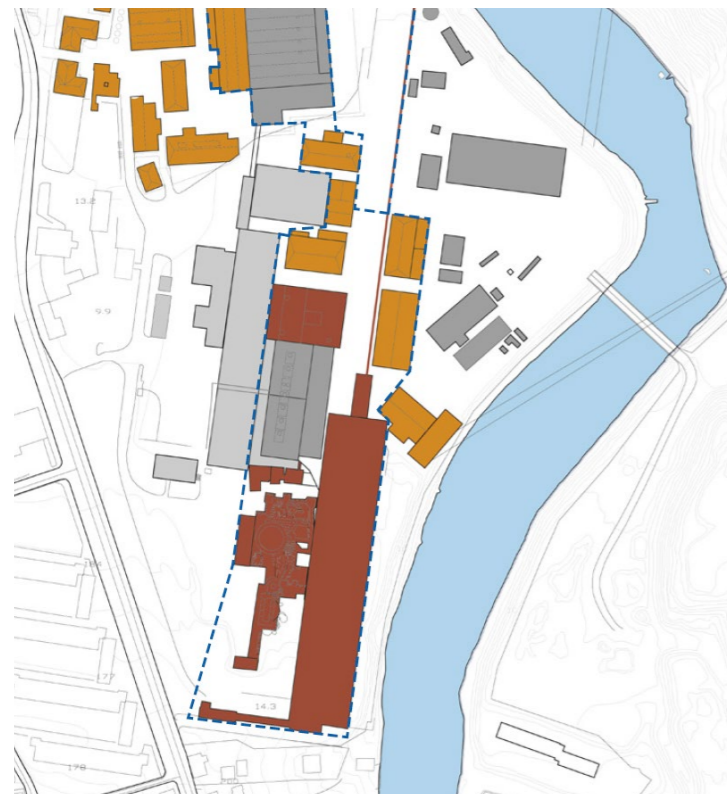
Since the Smelting Work site closure in 2003, a variety of **feasibility studies** and reports have been conducted in order to give an idea of how the smelting works site can be reused and urbanized and made inviting and accessible.

Here we have a couple of general suggestions by some of the actors of the architectural- and planning field on how to tackle the Shell Roof.

There seems to be a consensus, that there is a need for a **flexible program** that involves both a recreational area and a gathering space for the various inhabitant groups of Odda.

Either way, regardless of further intervention, the notion of flexibility and reversibility is to be closely considered.

2008: STEDSANALYSE OSW BY ASPLAN VIAK

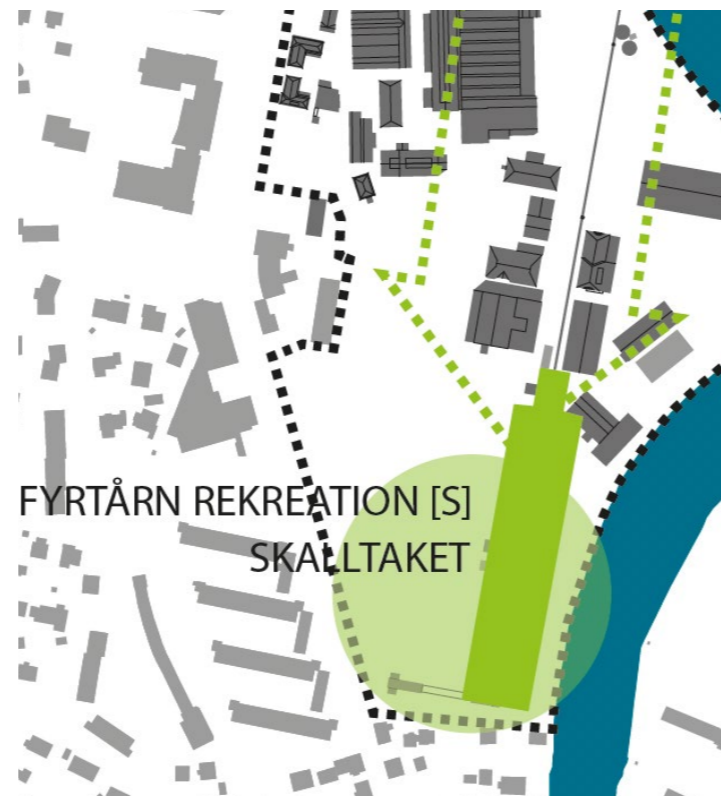


Oppsummering forslag vern:

- foreslås vernet etter kulturminneloven (suggested protected)
- foreslås regulert til spesialområde bevaring §25.6 i plan- og bygningsloven
- foreslås ikke vernet
- revet pr. april 2008
- tidligere interesseområde fredning

Retrieved from *Stedsanalyse Odda Smelteverk 2008* by Asplan Viak, p.48

2014: ODDA SMELTEVERK MULIGHETSSTUDIE BY GOTTLIEB PALUDAN ARCHITECTS W/ DANSK BYGNINGARV AND NORCONSULT

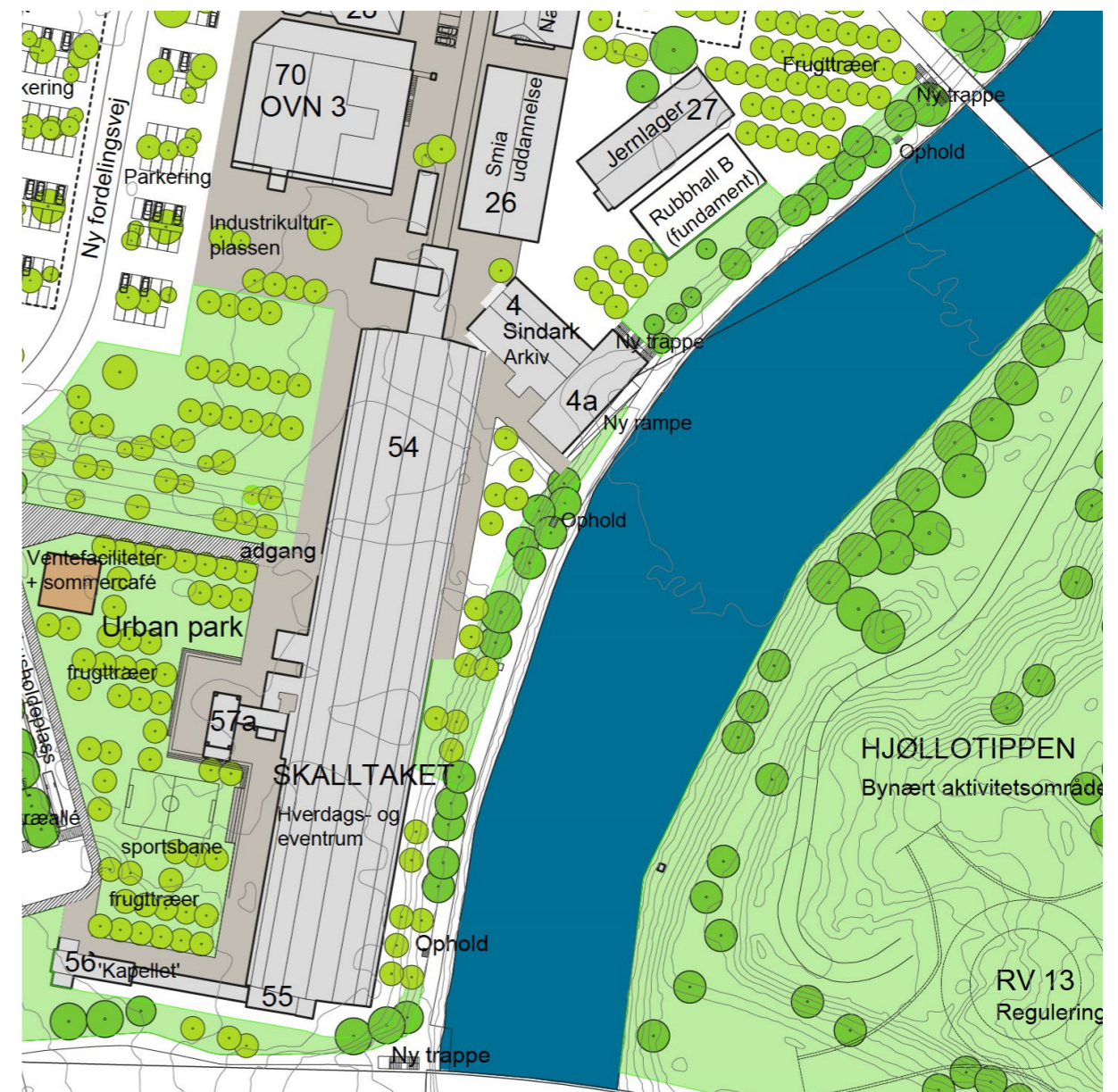


Odda Smelteverk, fyrtårnet i den rekreative funksjonsklyngen knyttes til Importkaia og Skalltaket (suggested for recreational use)

Skalltaket - Oddas utendørs forsamlingshus

- Aktivitetsplass (rekreasjon, fritid, fysisk aktivitet – et særlig fokus på unge)
- Kunstskøytebane i vinterhalvåret
- Konsertplass (lokal & regional)
- Etablere fasiliteter som toaletter, vann, teltvegger (evt. mobile)
- Gjøre hele Skalltaket tilgjengelig (rydde opp, etablere belegging etc.)
- Utvikle eventrekke / -kalender (Utvikle og skru opp for antallet av aktiviteter)
- Formidle og selge utleierammer

Retrieved from *Odda Smelteverk Mulighetsstudie Juni 2014* by Gottlieb Paludan Architects, Dansk Bygningsarv and Norconsult, p.35, 37, 63, 126-127



06.PROGRAM

CURRENT USE

A GATHERING SPACE FOR DIFFERENT GROUPS AND PURPOSES



From various sources, both local media and reports, it is known that the shell roof is an informal gathering space for different arrangements. Both animal exhibition fairs, various concerts and "hang out"-grounds for Odda's youth are some of the activities that have been known to take place under the roof since 2003.

In my proposal I want to balance and combine the flexibility that the shell roof yields with a more defined programmatic and structural organization, thus also providing sheltered spaces for various uses and activities.

06.PROGRAM: Building vs. Structure

DEFINITIONS

As previously mentioned, the municipality of Odda has already adapted a few of the buildings for reuse. As formerly mentioned, the so called Odda Process (“Oddaprosessen”) was an incentive between several actors to restore and reuse seven smaller buildings in the entrance area of the Smelting Works.⁶ Thus, functions like a literature house, a youth science centre, a café and a few other service providers and retailers have moved in.

Those are specific programs and require for a defined function within a fixed building. Most buildings and structures on the site of Smelting Works had a highly specialized function, as it tends to be on an industrial site. Yet, the buildings reused in *Oddaprosessen* are still of a more tangible size. The shell roof, however, is different in character. It can be seen as a large space under a structure that isn't a *building*, in a traditional sense.⁷ The structure has a roof but lacks the walls. This structure doesn't impose the same constraints as a building does and provides an inherent flexibility from the ground floor all the way up to the roof, but is also harder to define.

The architectural expression can be deemed to be utilitarian and values practicality over aesthetics. The form manifests itself in a simple, yet bold, brutalist style. Those qualities are unique and should be preserved and accented in order to keep the *identity* of the structure.

BUILDINGS (RENOVATED+REUSED UNDER ODDAPROSESSEN)



VS

FLEXIBLE STRUCTURE



⁶ Rikasantikvaren (2011): *Rapport Oddaprosessen- Verdiskapningsprogrammet på kulturminneområdet*

⁷ The definition of a building by the Cambridge Dictionary: “building (noun)- a structure with walls and a roof, such as a house or factory”

07.ARCHITECTURAL CONCEPT: Values

My aim in this project has been to bridge different values through the reuse proposal. Responding to three different fields and their demands, uniting them under one roof.

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.

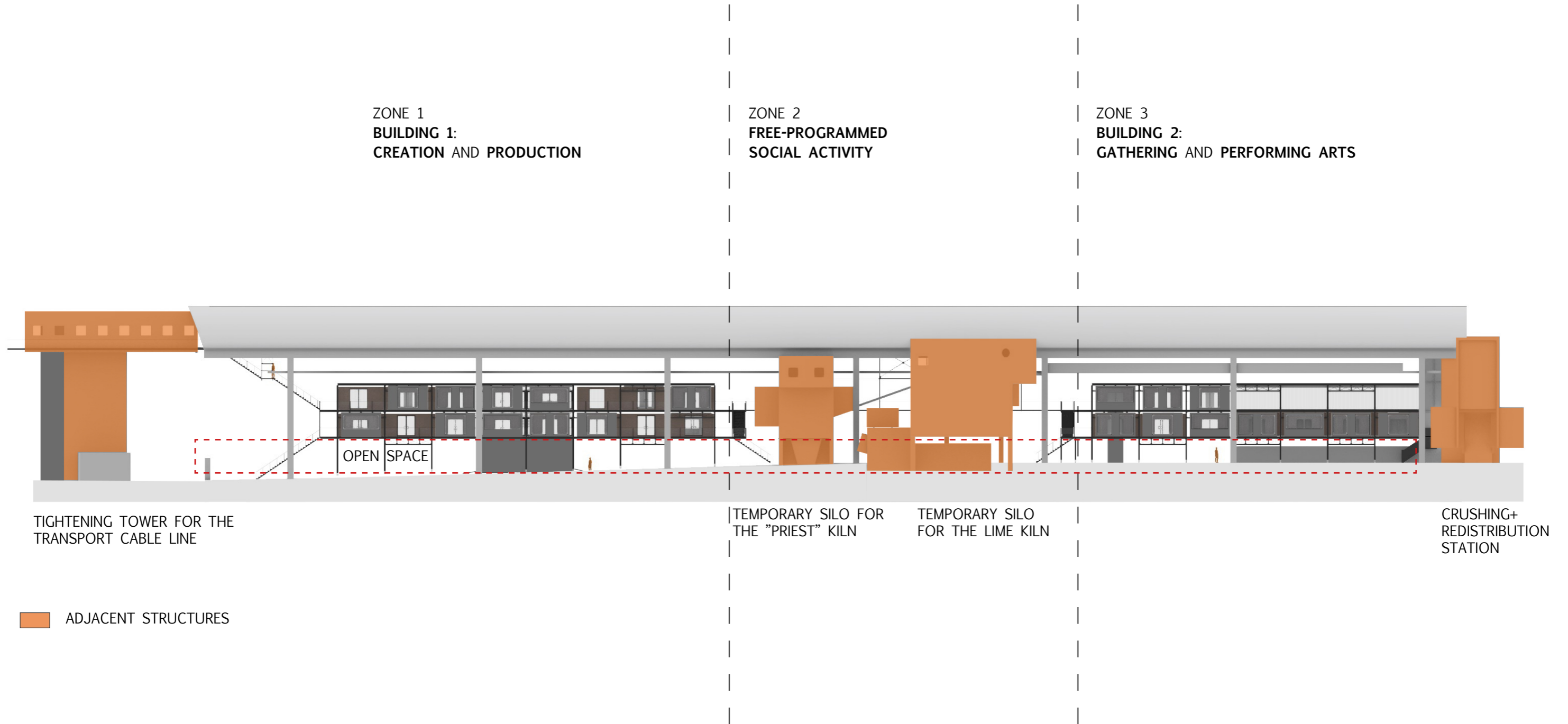
Economic viability: flexible construction, can be removed or added after demand, rentable spaces generate income for the owner (Smelteverk Nærings Utvikling). Transforming parts of the roof into a potential tourist landmark (The Tightening Tower).

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.



07.ARCHITECTURAL CONCEPT: Fixed Flexibility

ZONE DIAGRAM



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.

07.ARCHITECTURAL CONCEPT: Fixed Flexibility

PROGRAM DIAGRAM

PROGRAM:
-DIFFERENT SIZE MODULES FOR RENT

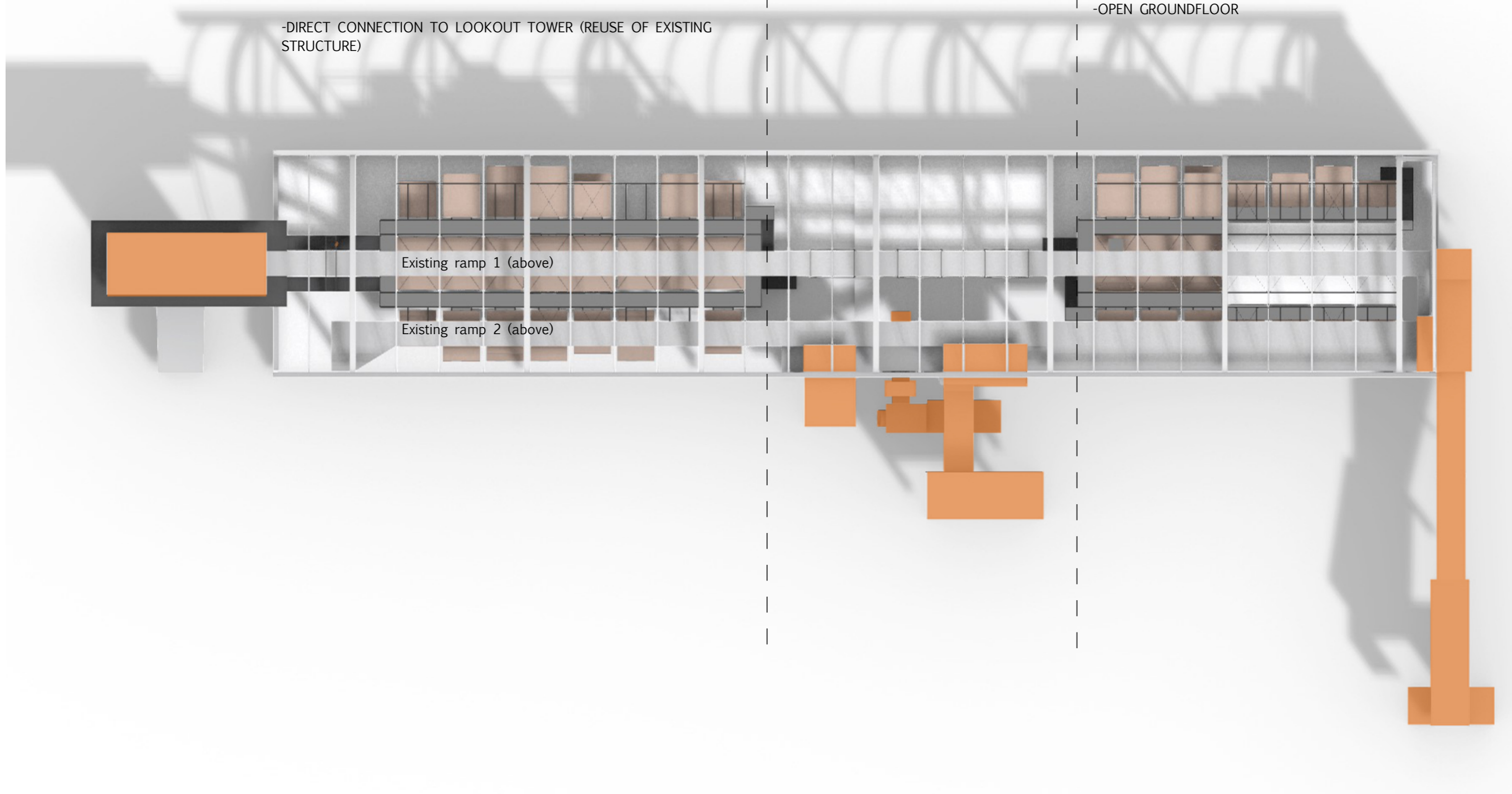
-OPEN GROUND FLOOR, TEMPORARY WORKSHOP PATCHES FOR RENT

-DIRECT CONNECTION TO LOOKOUT TOWER (REUSE OF EXISTING STRUCTURE)

PROGRAM:
-AN OPEN PATCH, A RECREATION ZONE BY THE OLD SILO-STRUCTURES

PROGRAM:
-CONCERT VENUE AND RENTABLE HEREARSAL ROOMS

-OPEN GROUND FLOOR



Existing ramp 1 (above)

Existing ramp 2 (above)

07.ARCHITECTURAL CONCEPT: Fixed Flexibility

LEVELS OF PERMANENCE DIAGRAM

TEMPORARY

CLADDED
CLT-MODULES IN
3 DIFFERENT SIZES

SEMI-PERMANENT

EXPANDABLE BOLTED
STEEL FRAMEWORK
ALLOWING FOR
MODULE ADDITION
AND INSERTED
MIDSECTION MODULES

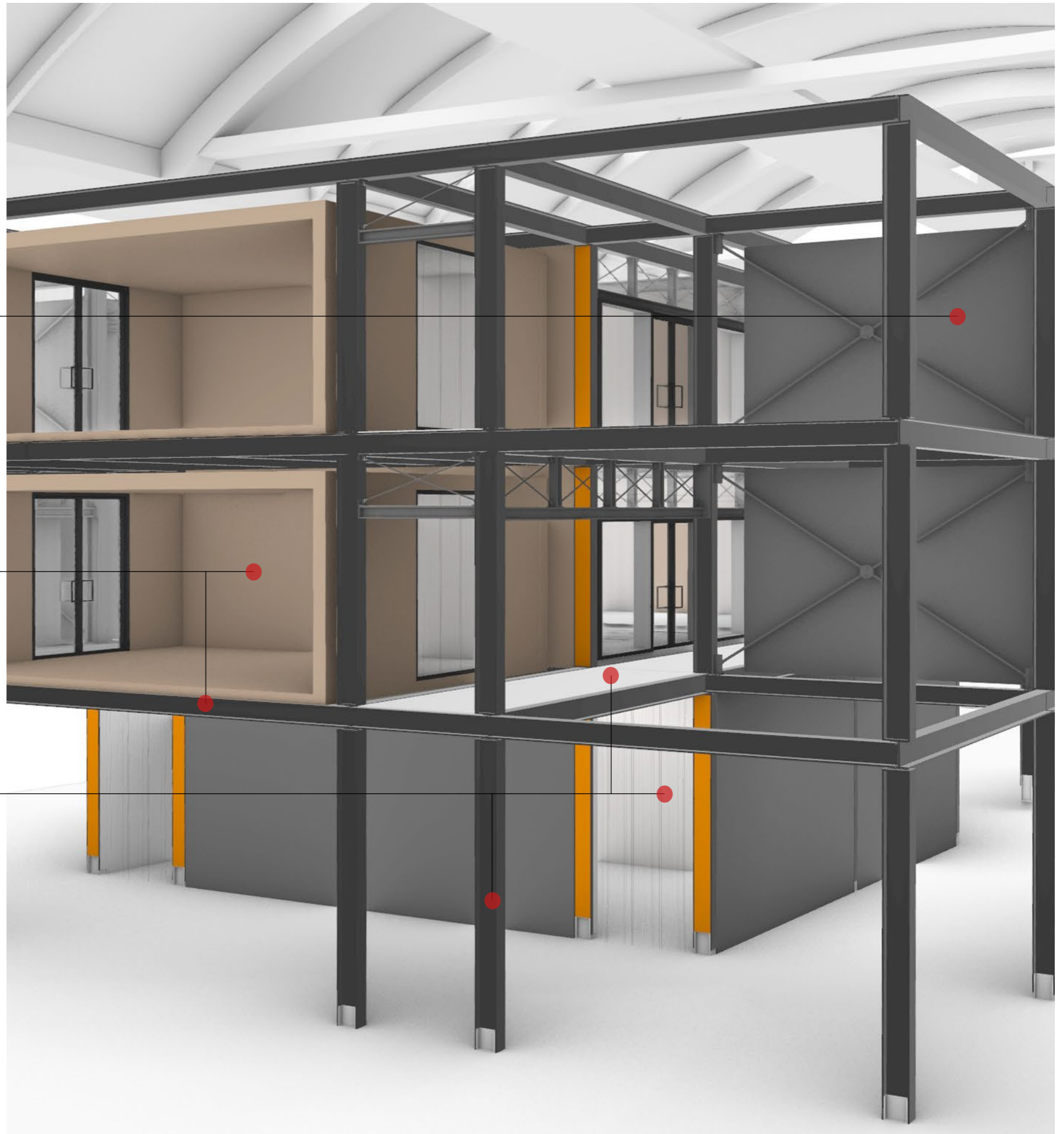
PERMANENT

-FOUNDATION
CIRCULATION AILES
+STRUCTURAL CORE

3 LEVELS OF PERMANENCE

THE PREMISE FOR PROJECTS' FLEXIBILITY LIES IN THE CONSTRUCTION.
THERE ARE THREE LEVELS OF PERMANENCE IN THE STRUCTURE:
PERMANENT, SEMI-PERMANENT AND TEMPORARY

DESPITE THE VARIOUS GRADES OF PERMANENCE, THE STRUCTURE IS
COMPLETELY DISMANTABLE, MAKING THE PROJECT **REVERSIBLE**



08.PROJECT: Fixed Flexibility

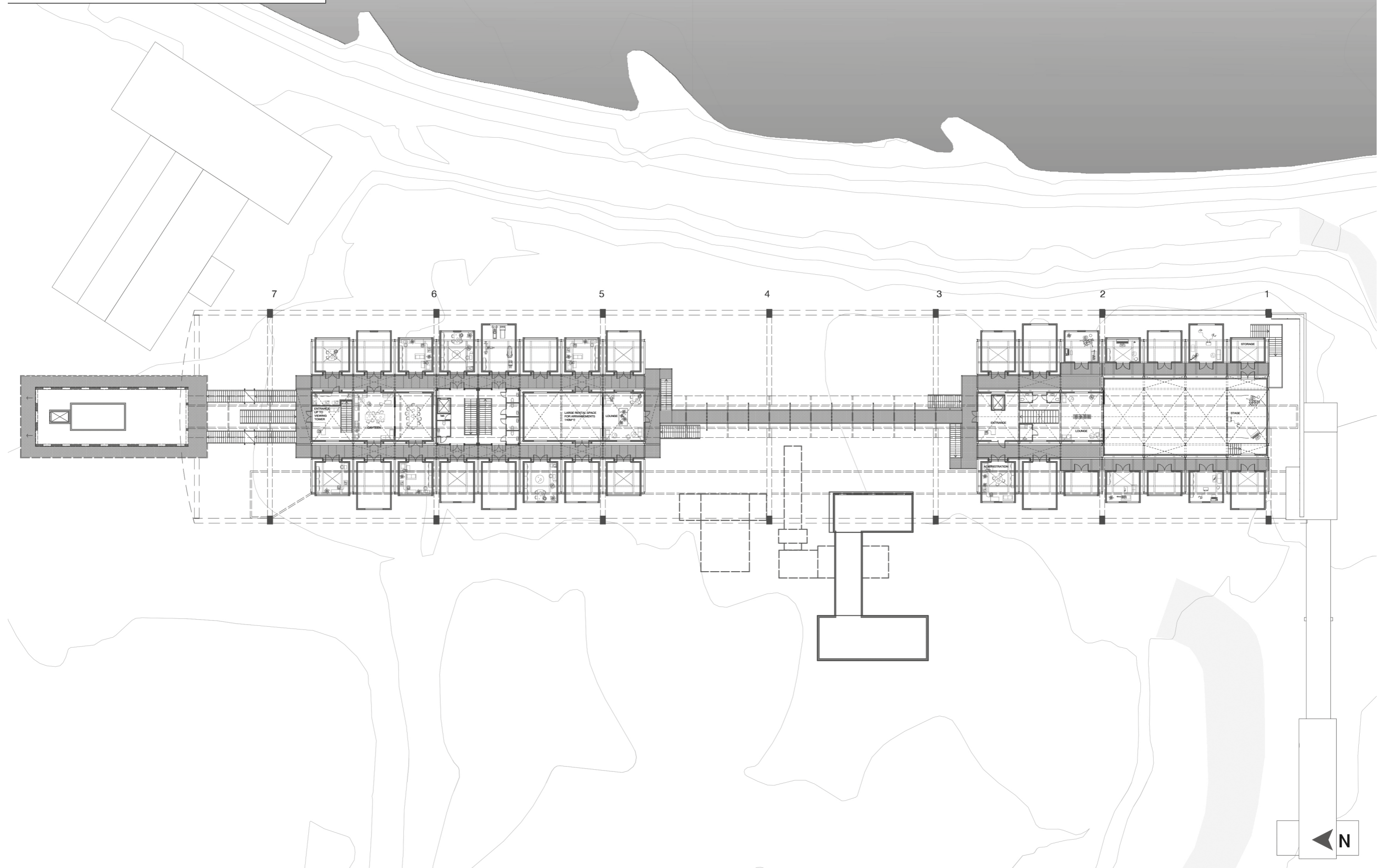


ADDRESSED VALUES

1. HERITAGE CONSERVATION
2. ARCHITECTURAL PRODUCTION
3. URBAN DEVELOPMENT

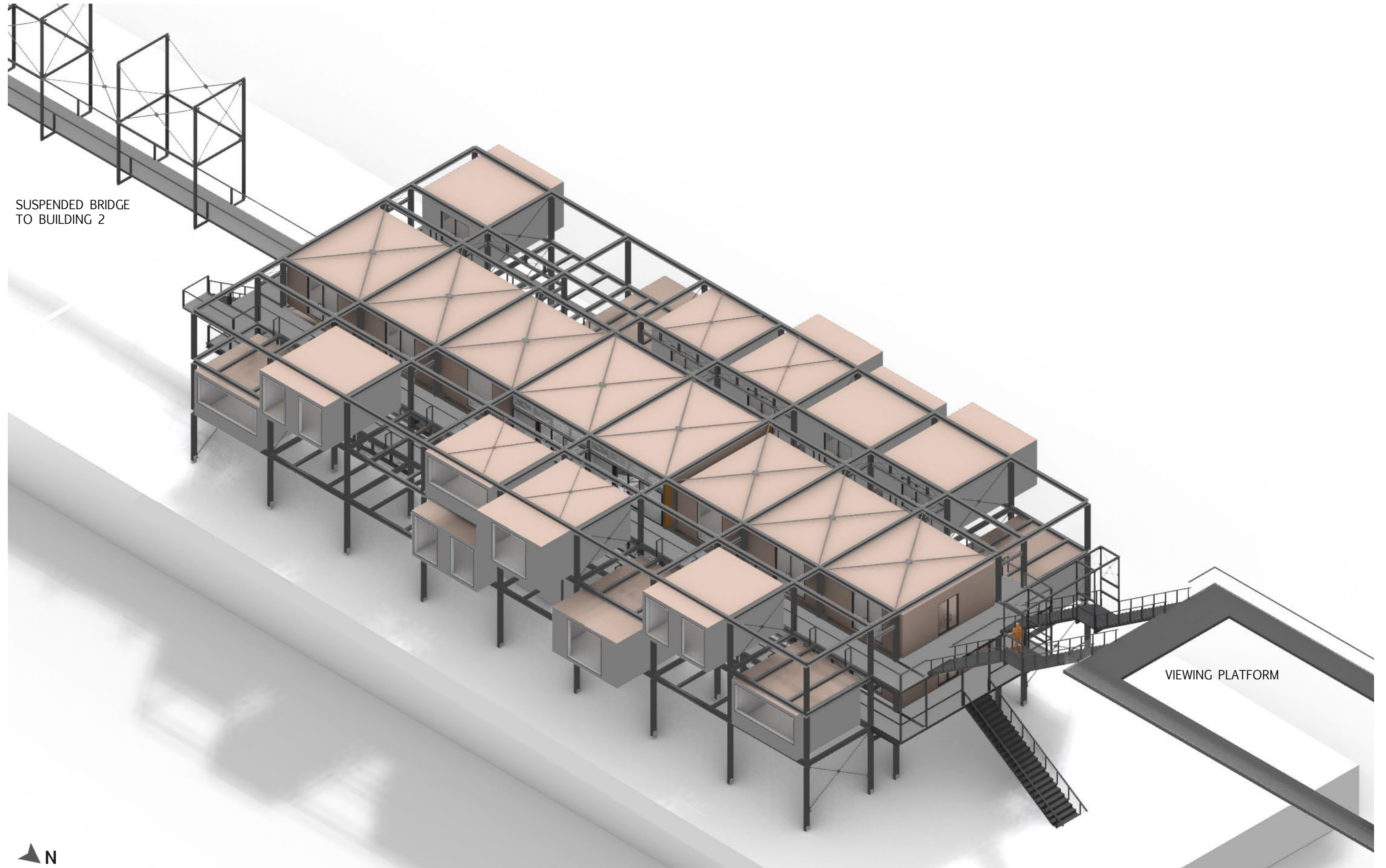
08.PROJECT: Fixed Flexibility

SITUATION PLAN 1: 500



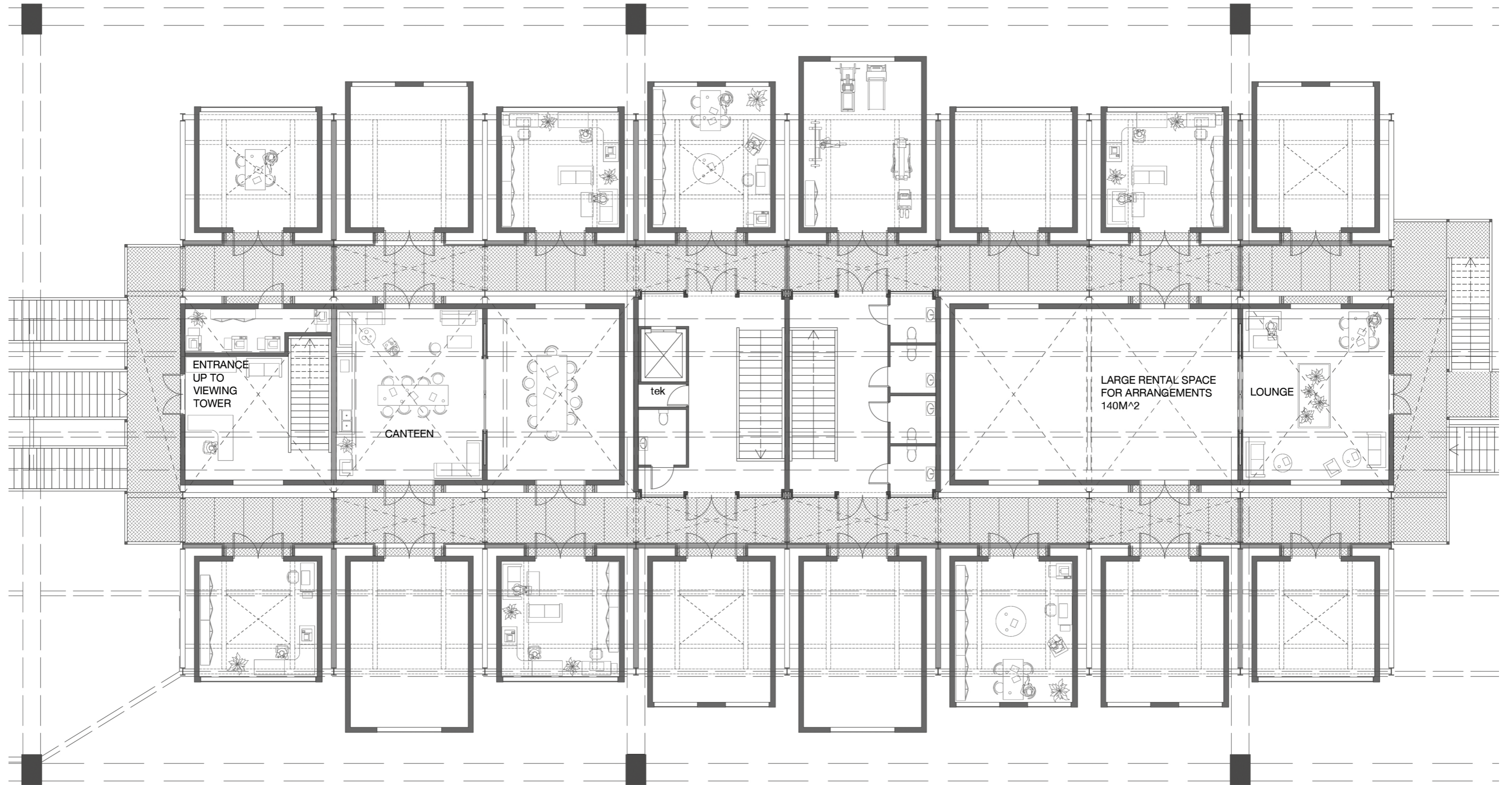
08.PROJECT: Fixed Flexibility

BUILDING 1 FUNCTION ISOMETRY



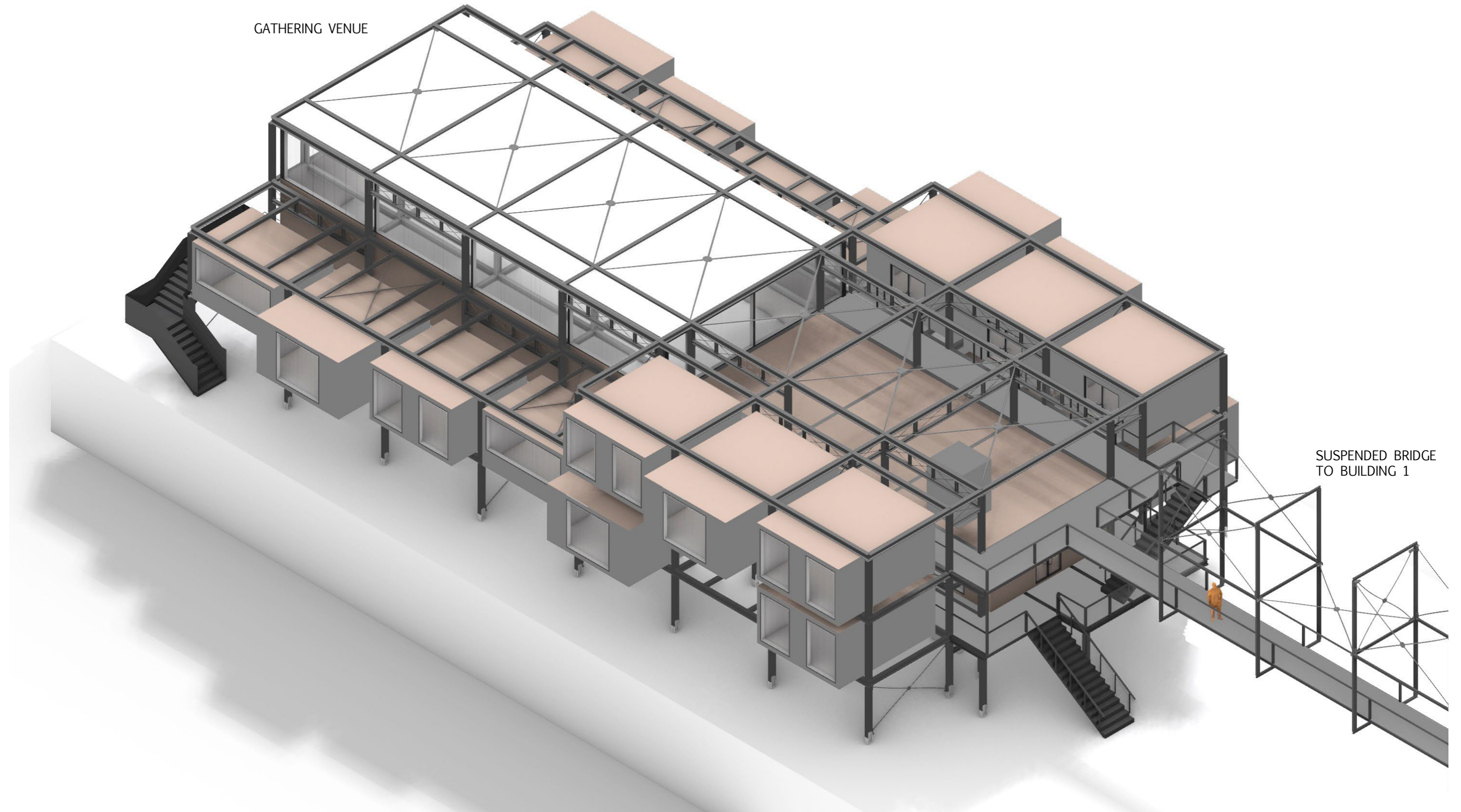
08.PROJECT: Fixed Flexibility

BUILDING 1 PLAN 1:150



08.PROJECT: Fixed Flexibility

BUILDING 2 FUNCTION BRIEF



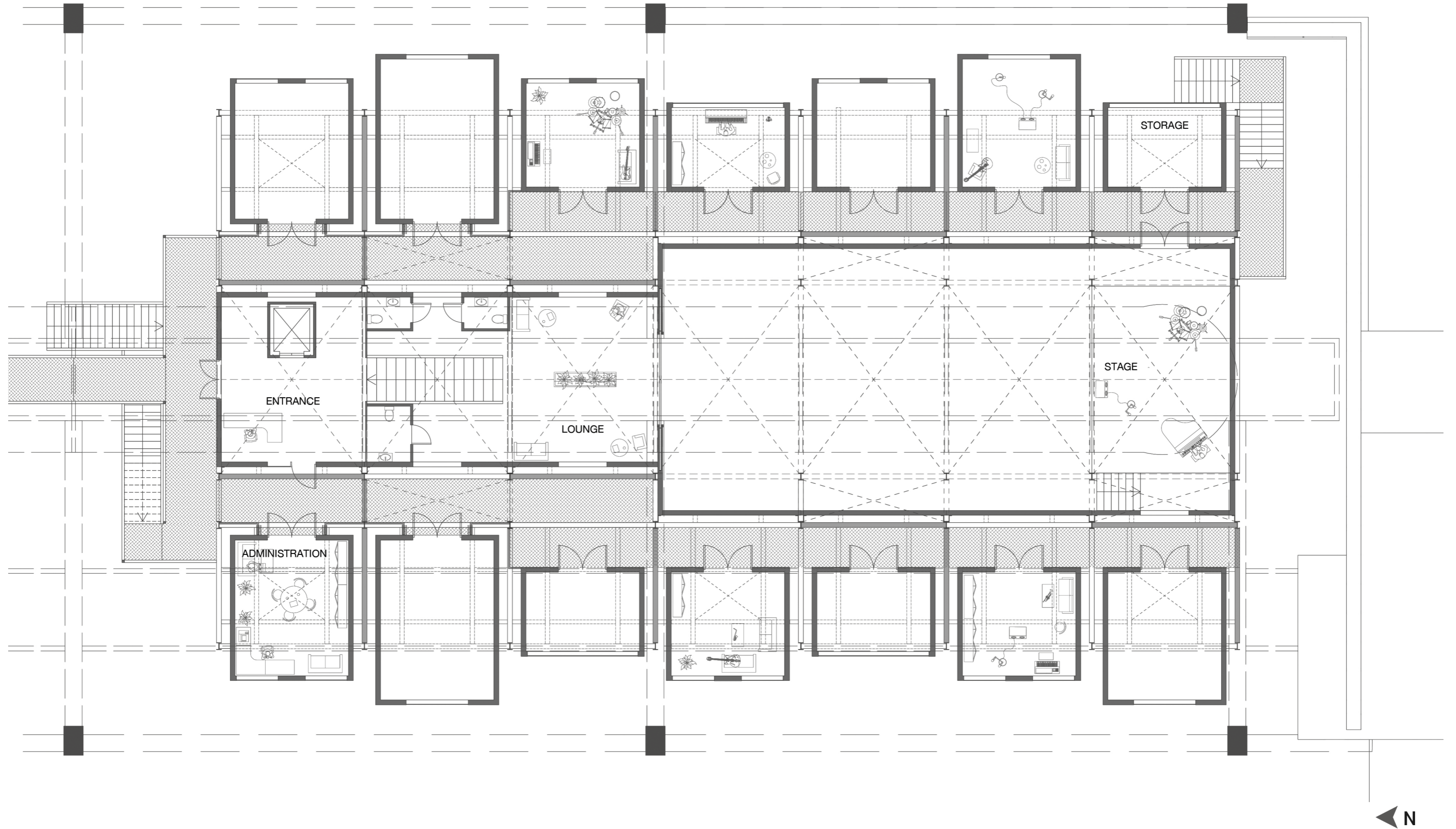
GATHERING VENUE

SUSPENDED BRIDGE
TO BUILDING 1



08. PROJECT: Fixed Flexibility

BUILDING 2 PLAN 1:150

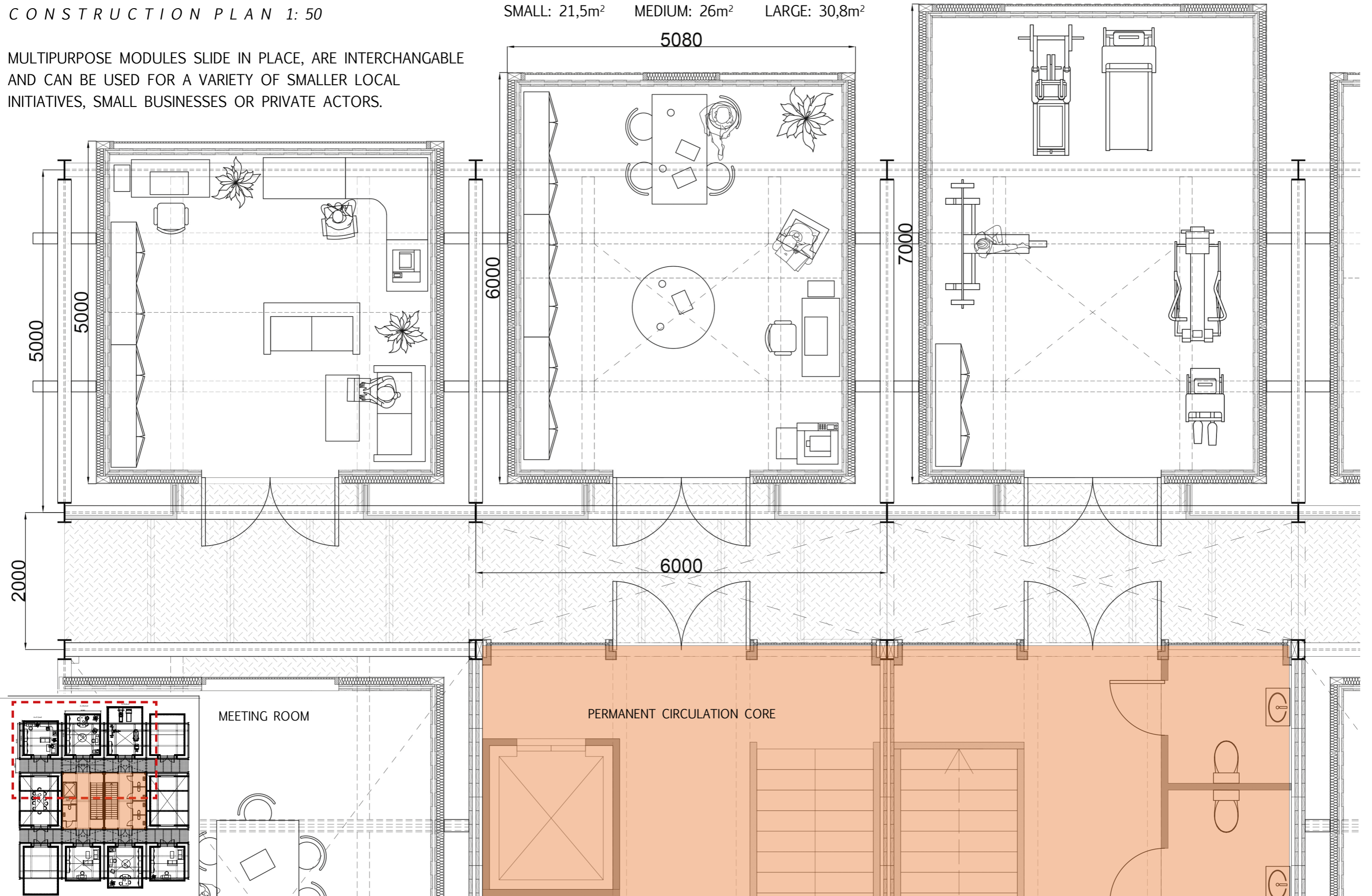


08.PROJECT: Fixed Flexibility

CONSTRUCTION PLAN 1: 50

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



08.PROJECT: Fixed Flexibility

STEEL MODULE SYSTEM CONSTRUCTION

CONSTRUCTION DESCRIPTION

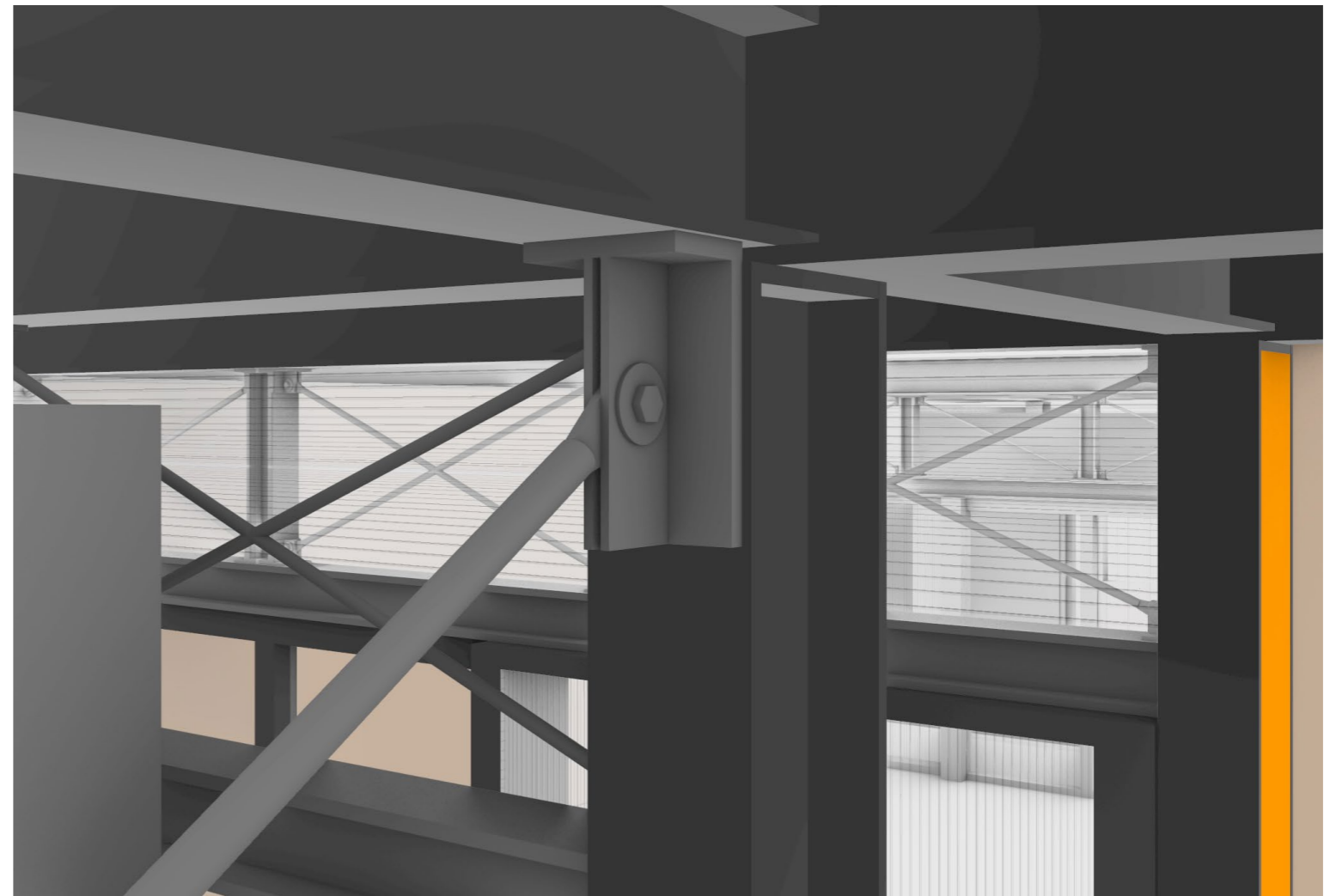
STEEL BEAMS AND COLUMNS 200X300MM SERVE AS THE FRAMEWORK FOR THE INSERTIBLE CLT-MODULES CLAD WITH STEEL.

THE BEAMS ARE BOLTED TOGETHER AND CAN EASILY BE DISASSEMBLED. THE BEAMS CREATE MODULAR UNITS THAT ATTACH TO MAIN CIRCULATION RAMP.

THE CONSTRUCTION IS BRACED BY CROSSBRACING SYSTEM IN THREE DIRECTIONS.

THE FLOORING IN THE CORE PREDOMINANTLY CONSISTS OF SUSPENDED WOOD PLANKS, XPS-INSULATION AND PLYWOOD. THE MODULES ARE INSULATED, THE CORRIDORS ARE NOT INSULATED.

THE OUTER WALLS CONSIST OF POLYCARBONATE AND INSULATED CLT.



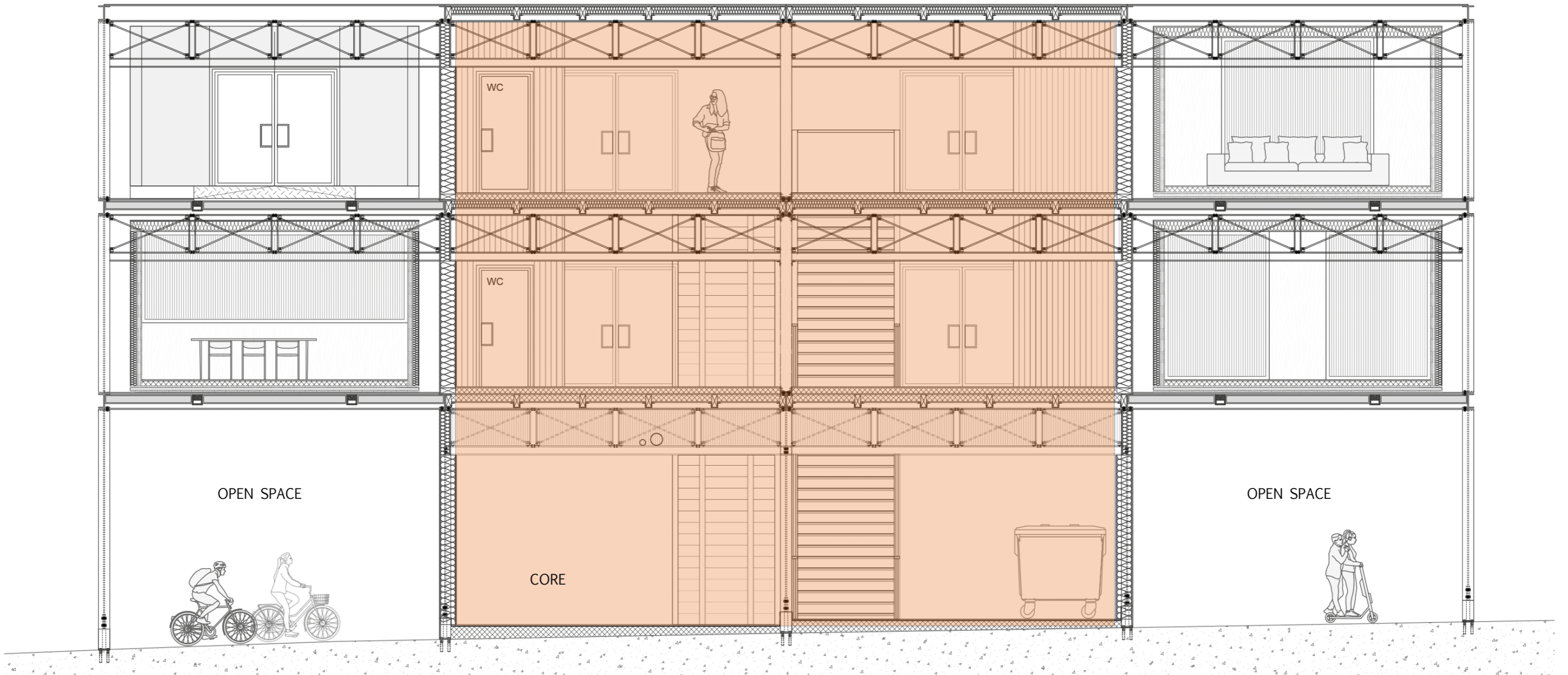
08.PROJECT: Fixed Flexibility

CONSTRUCTION PRINCIPLE - LONG SECTION

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

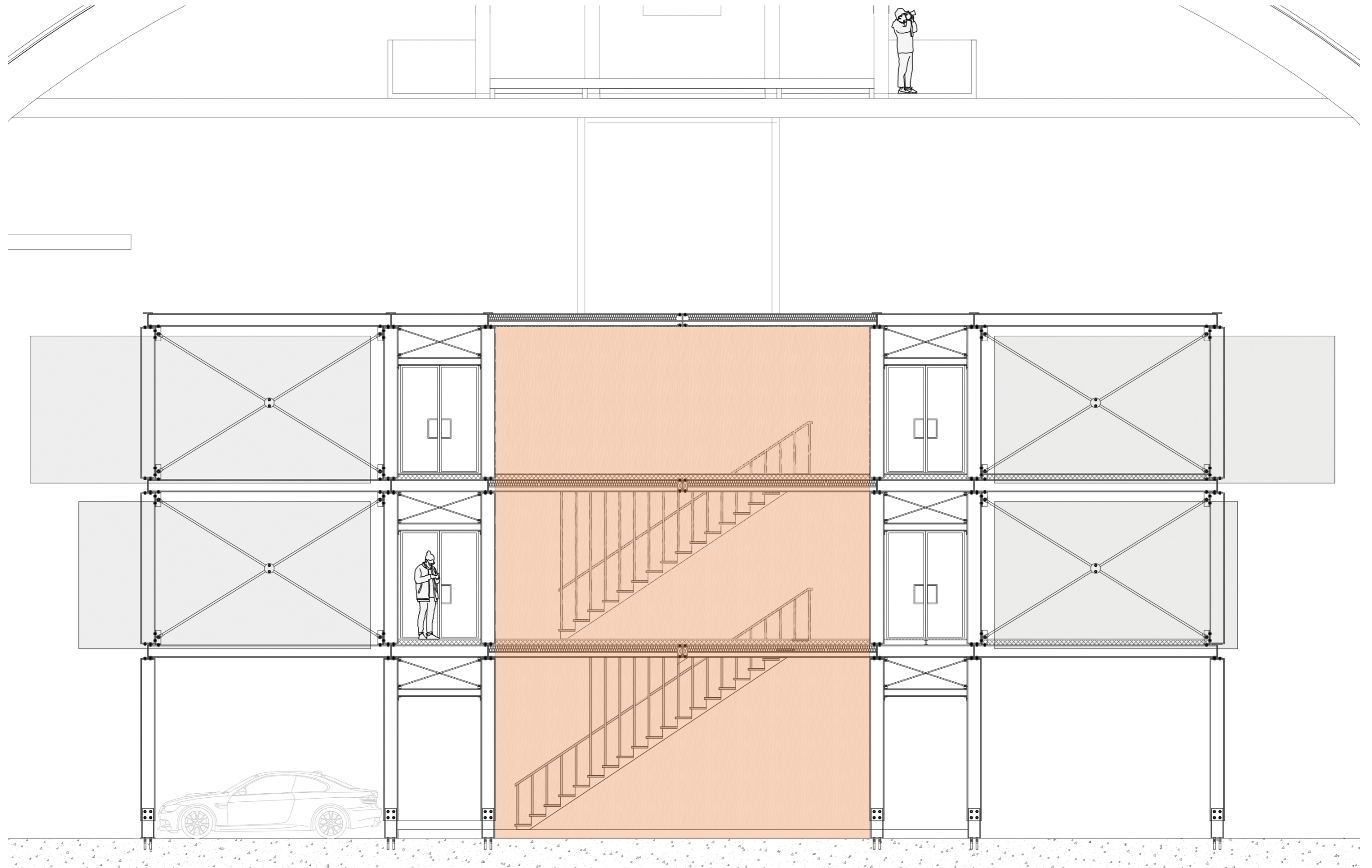
← MORE MODULES

MORE MODULES →



08.PROJECT: Fixed Flexibility

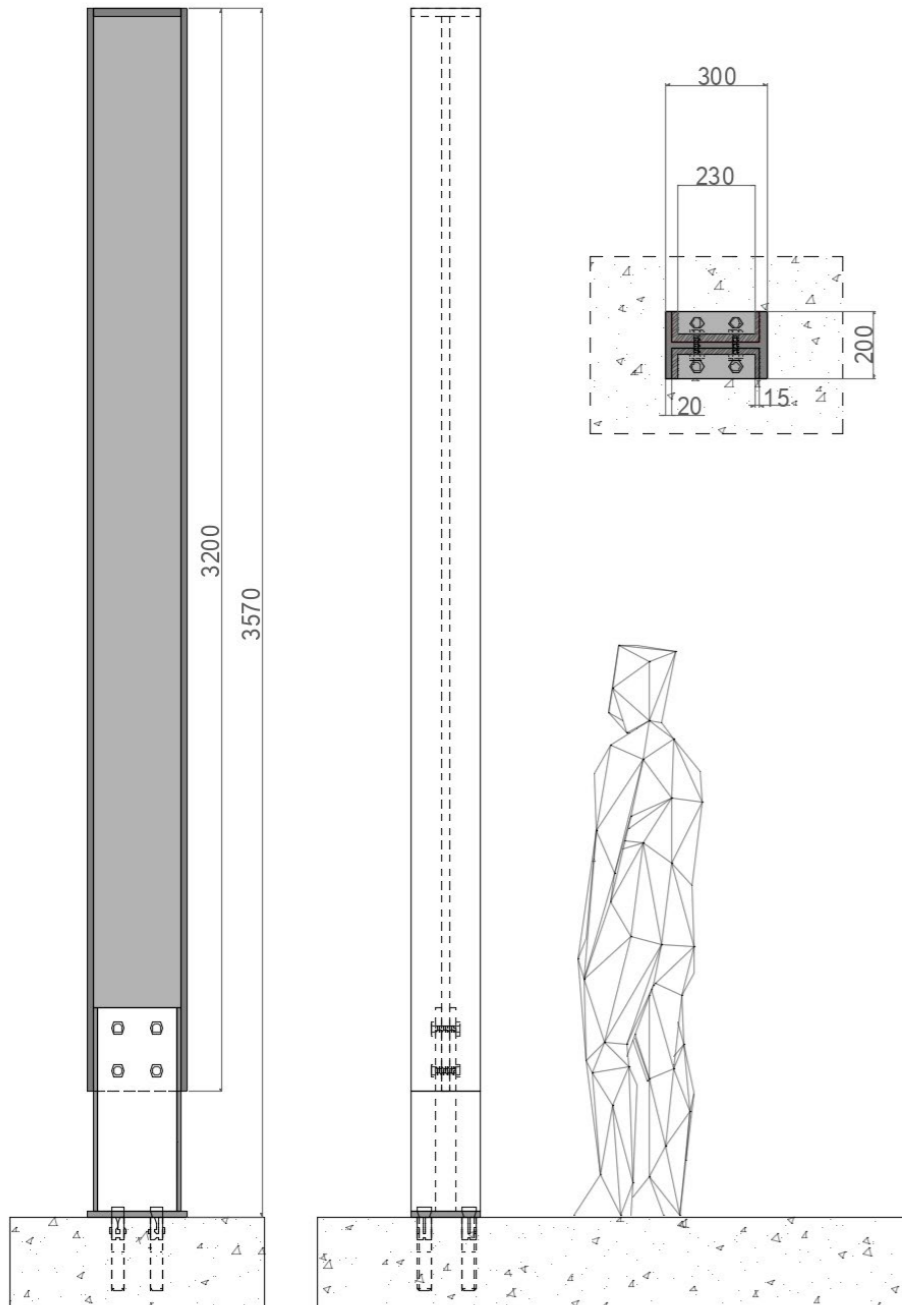
CONSTRUCTION PRINCIPLE - SHORTSECTION



08.PROJECT: Fixed Flexibility

CONSTRUCTION DETAILS

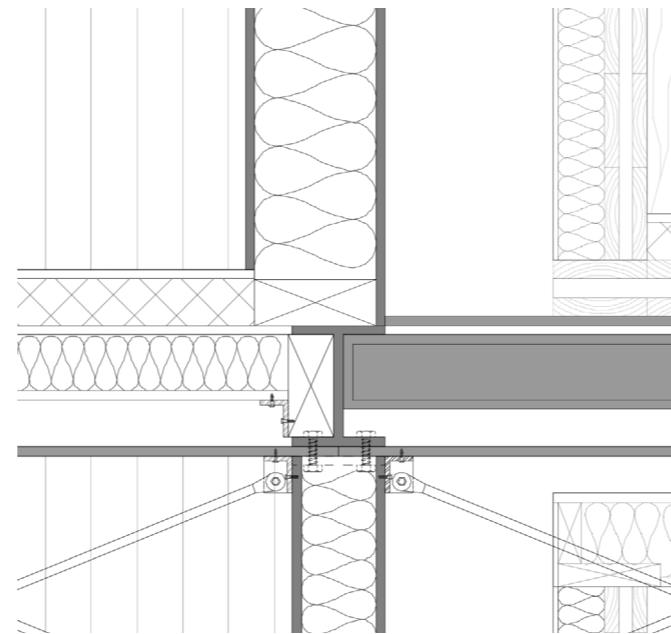
FOUNDATION 1:10



CONSTRUCTION DESCRIPTION

FOUNDATION COLUMNS ARE BOLTED IN THE CONCRETE FLOORING OF THE SHELL ROOF

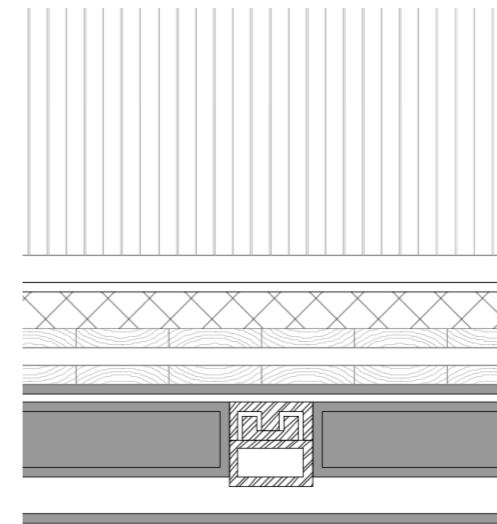
BOLTED BEAM INTERSECTIONS 1:10



CONSTRUCTION DESCRIPTION

THE SECTION ILLUSTRATES BOLTED INTERSECTION BETWEEN COLUMN AND BEAMS

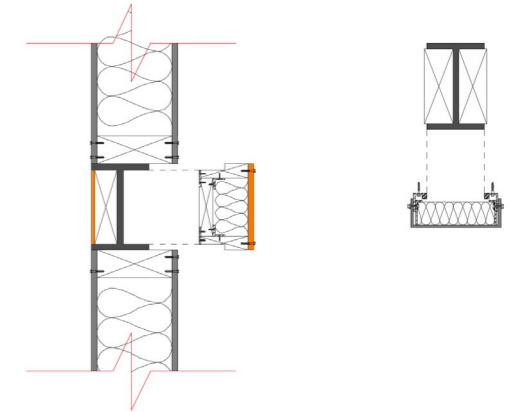
MODULE RAILS 1:10



CONSTRUCTION DESCRIPTION

THE STEEL RAIL MAKES IT POSSIBLE TO EASILY SLIDE THE MODULE IN AND OUT OF THE FRAME STRUCTURE

COLUMN INSULATION VENEERS 1:10



CONSTRUCTION DESCRIPTION

THE VENEER MASKS AND INSULATES THE STEEL COLUMN IN PLACES WHERE IT'S EXPOSED INTO THE BUILDING ENVELOPE

08.PROJECT: Fixed Flexibility

ILLUSTRATIONS



Open Recreation Zone September at 3PM

08.PROJECT: Fixed Flexibility

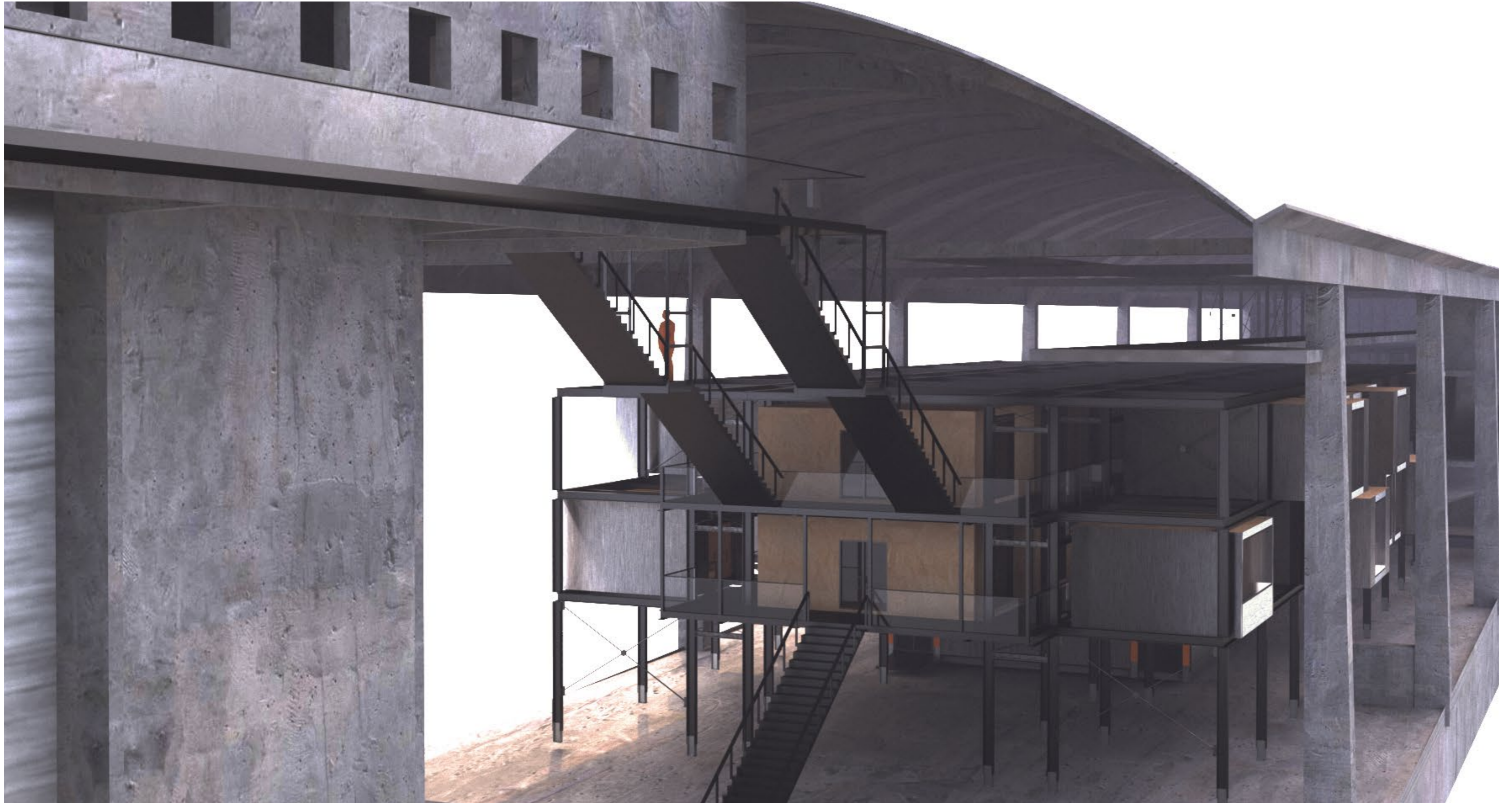
ILLUSTRATIONS



Building 1 Isle

08.PROJECT: Fixed Flexibility

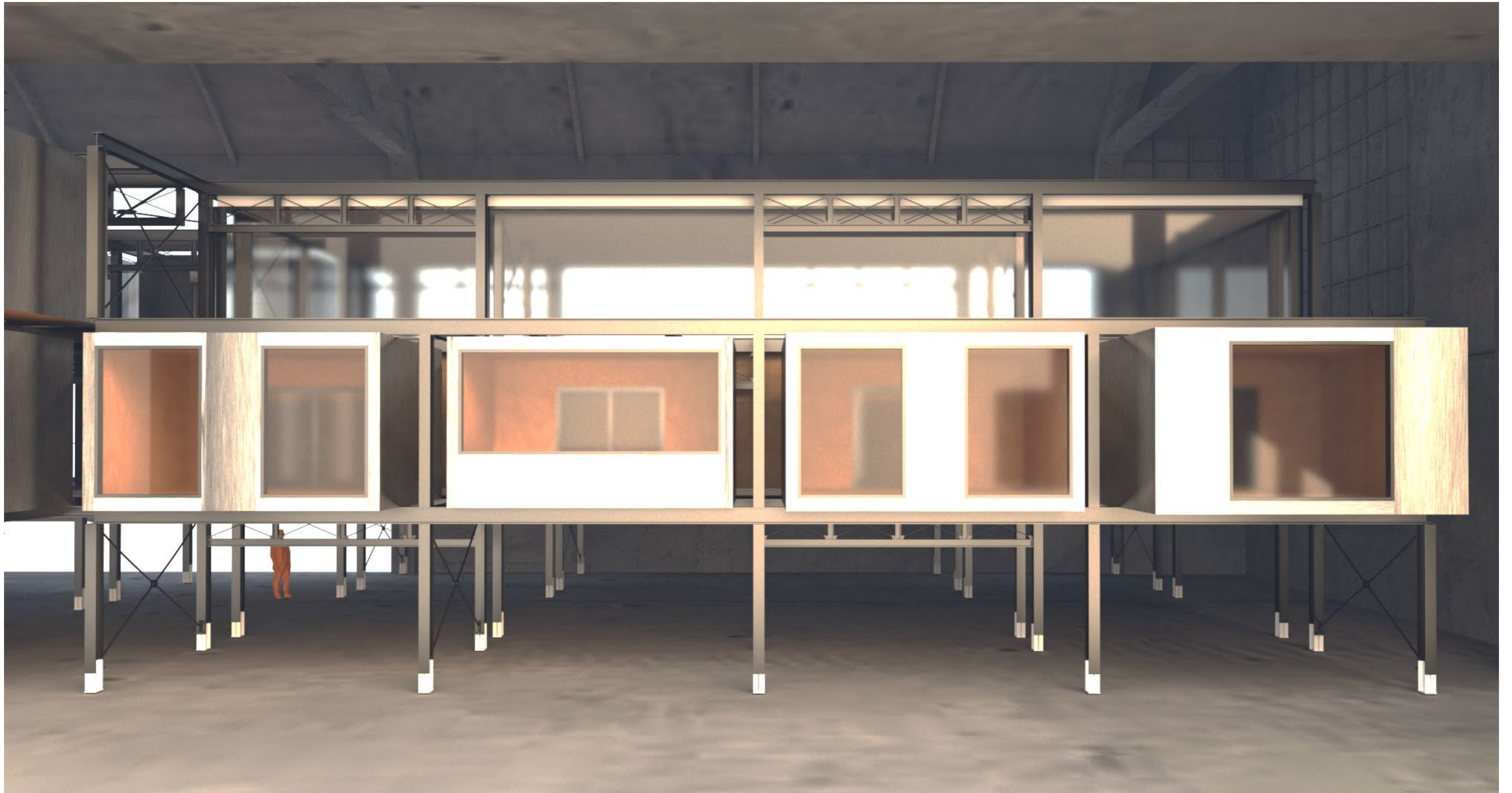
ILLUSTRATIONS



Building 1 and The Viewing Tower

08.PROJECT: Fixed Flexibility

ILLUSTRATIONS



Building 2, September at 3PM

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