

The Mongstad Experience
Facilitating a transition in time, function and space

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Project Report

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Delta Interventions 2017/2018
North Sea: Landscapes of Coexistence

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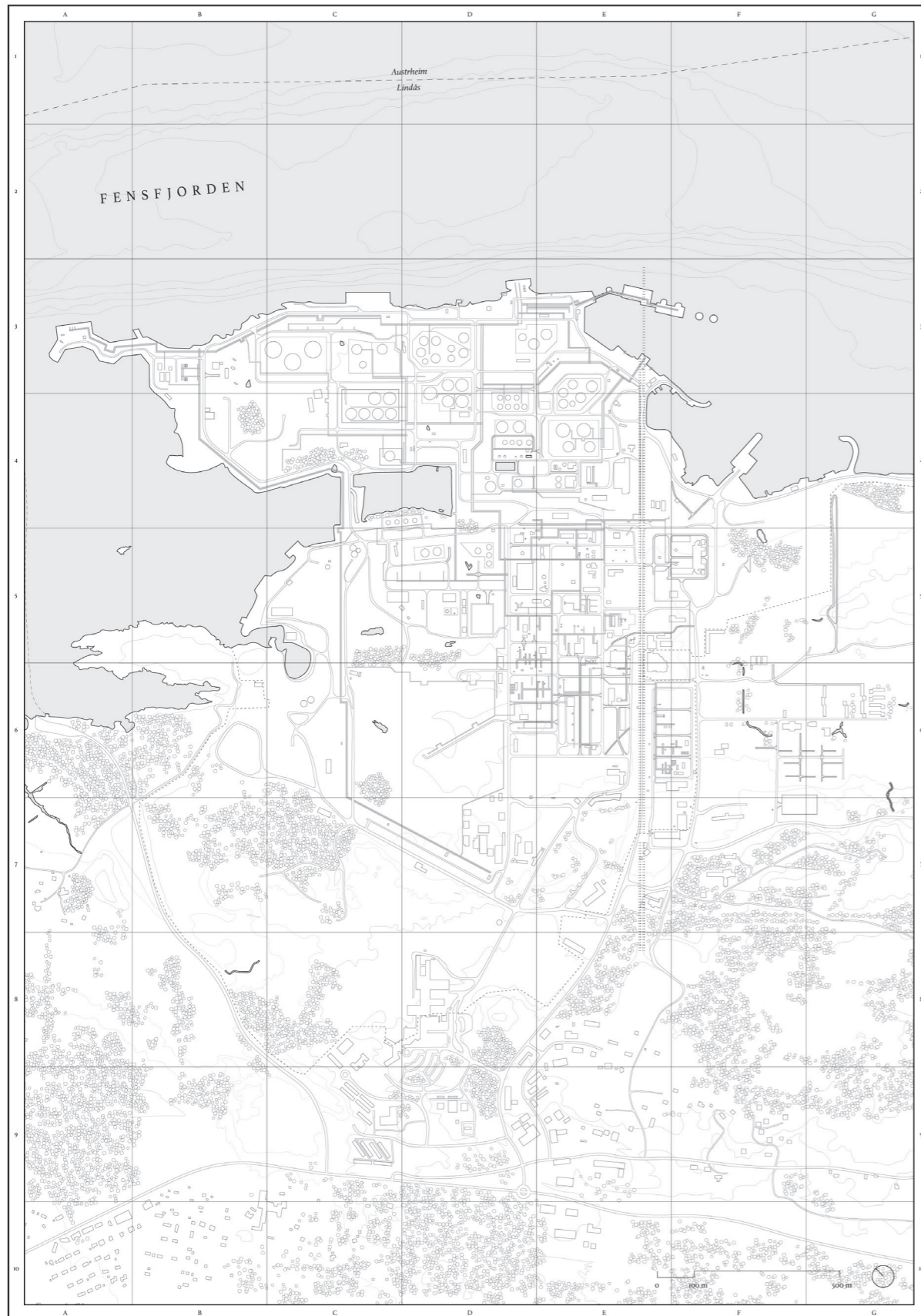
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PROJECT I



LINE + PROGRAM

The masterplan of this project is linear. The line crosses through all of the refinery. By creating this 'line' the refinery is separated into two parts, being the western and eastern part.

While the left side all revolves around productivity and intensive physical work, the right side is about innovation and research. The western part, where refining in the traditional way will take place until it will lose its function, and the eastern part, where the site will develop towards a 'green' future to remain competitive.

At the same time, this line crosses through the various existing geographical conditions: from a rocky hill, meandering through the productive heart of the refinery until it ends up in the fjord. Except for being merely an indicator of the local conditions, the 'line' optimises productivity on site.

Determined by the characteristics of the site, the program of the line is divided into three categories, that are all equally important:

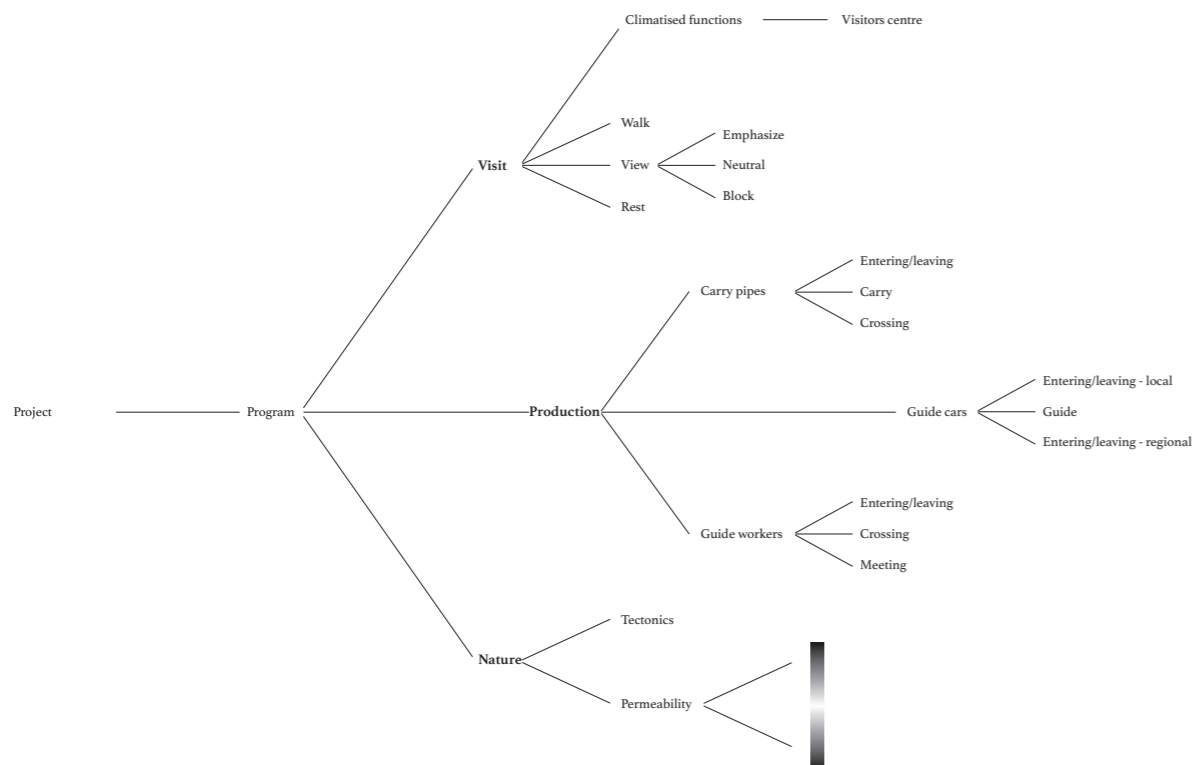
1. Production;
2. Visit
3. Nature

The productivity of the site is the pivot of the project; the only thing that gives this refinery the right to exist. Productivity can be subdivided into traffic, pipelines and employees. All three of these programmatic layers have events that decide on what happens to the project at a certain point.

Nature is an important actor in the project as well. Subdivided into nature's tectonics, which decides how the relation to the topography is being experienced throughout the project, and permeability: the openness of the project towards the natural surroundings.

A new function is added in the form of a site visit. The main purpose of this function is to expose unknowing visitors and experts in the field to the site specific events, thus raising awareness of the situation as it is. Along the visit, which spans the total 2 km of the project, multiple nodes offer rest or contemplation to the visitor.

Depending on which future Mongstad will face, it will carry new pipelines needed for the transport of CO₂ caught off from the refinery towards the CCS. When Mongstad is being transformed, the project can be utilized for different industrial purposes, or reused elsewhere.



SPATIALISE

In order to be able to translate the program into a three dimensional entity, the three categories of the program have been considered more thoroughly. Since the project should at all times support and optimise productivity the required dimensions are taken as parameters to start the design from.

Production

a) Cars drive by over the chosen axis already. In order to make the site more productive, these cars may drive here still; this street may become a new backbone serving the area. The area that should be free for cars to drive through is the width of a usual street: around 6500 mm. the height is determined by the height of trucks too, and should be a minimal of 5000 mm.

b) I studied elevated and lower level pipelines crossing the area nowadays. From these studies I took

- i. The minimal dimensions needed to carry them;
- ii. The finding that these are vulnerable structures that have to be protected by the structure supporting them;
- iii. The way in which on-site employees can access them: via flat, steep stairs.

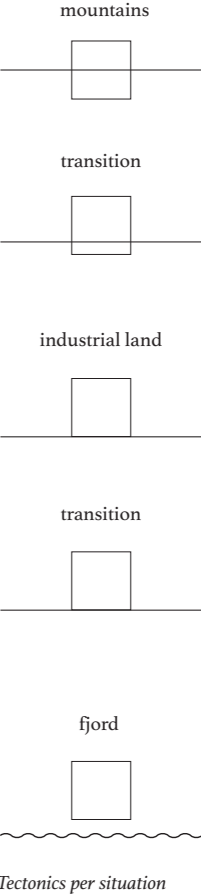
c) Besides maintaining the pipelines it should also be safe for workers to cross the new spine of the project. This should not decrease productivity, so shouldn't affect the car traffic. This is why this will happen on an elevated level.

Nature

The nature is, as opposed to productivity, a parameter that determines what happens to the project in terms of openness, and how it touches the ground. In response to its surroundings the tectonics of the module are determined.

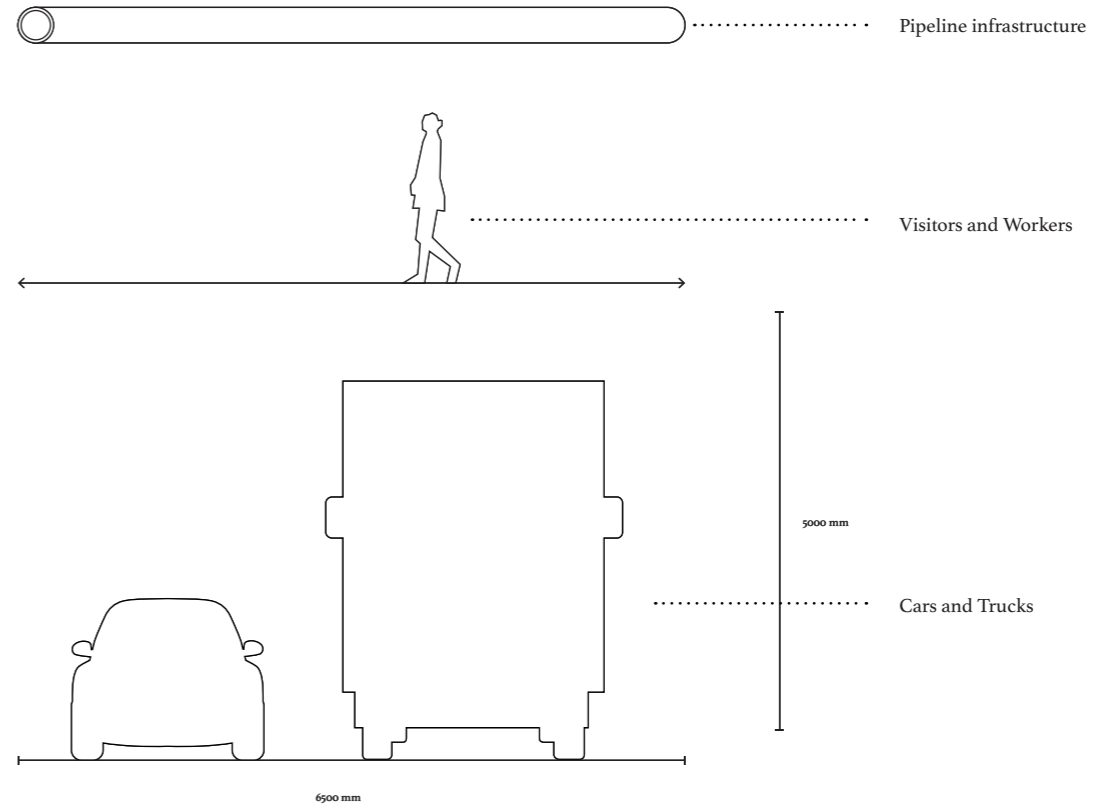
a) The southern end of the project is situated in the mountains, while the northern end of the project is situated at the fjord. this should be experienceable at these ends, in the way of placing the module in, on or above the land.

b) The project should be more or less permeable regarding the position on the line; in this way not only making nature experienceable but also allowing for flora and fauna to develop uninterruptedly.





Pipelines as found on site



Program in 2D

Visit

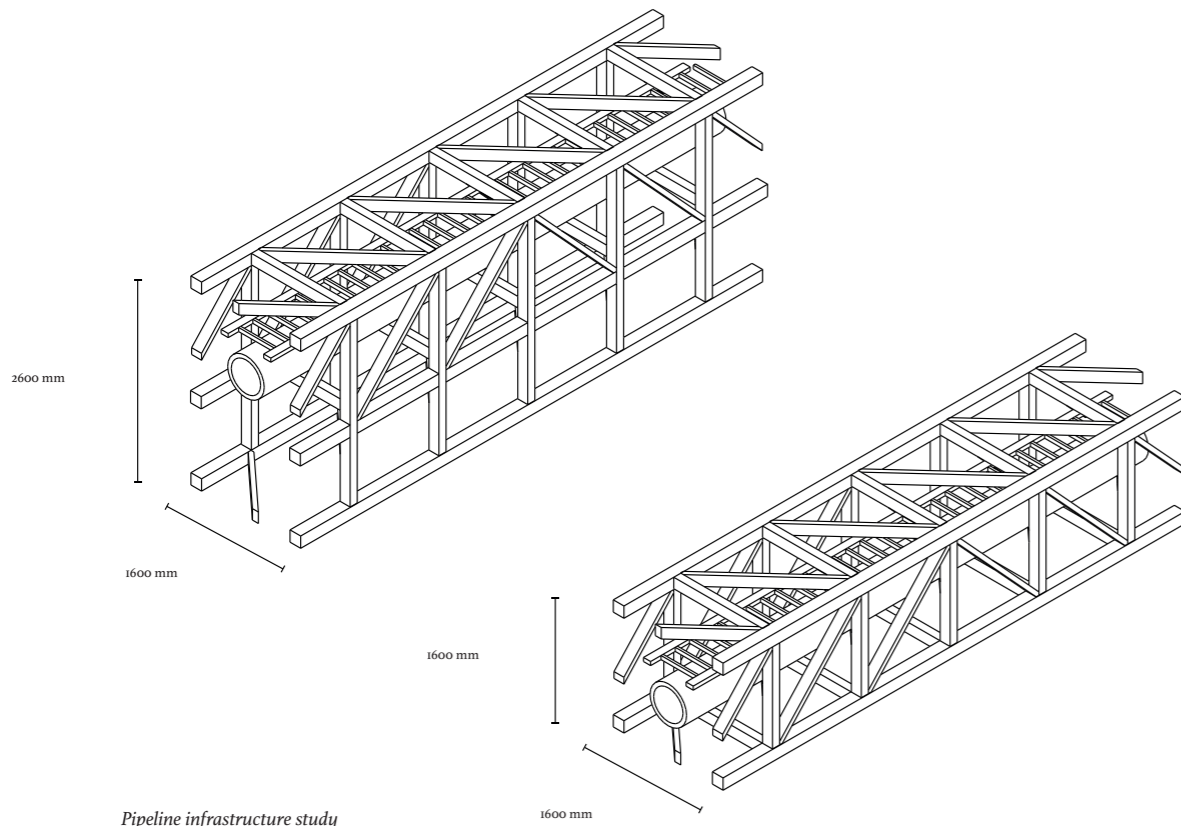
A guided visit to the site is divided into the actual walk, and points of interest where one can rest or is exposed to or guarded off from certain views.

a) By allowing visitors on the site I aim at opening the territory up to the rest of the world, however, as long as this site is being used for refining purposes it's of course not safe to let people walk here freely. Therefore the walk should be enclosed.


b) Even though it's enclosed it should be curated what visitors see. The main aim is to show what actually happens on site, that causes these people to live in such welfare, but also to protect them against harmful emissions.

c) This can be done by literally framing views, and with permeability of material that encloses the route. Rules have are set for what to emphasize on, but also, what to block from ones view.

This visit will be included in the governmental tourism strategy in Norway.

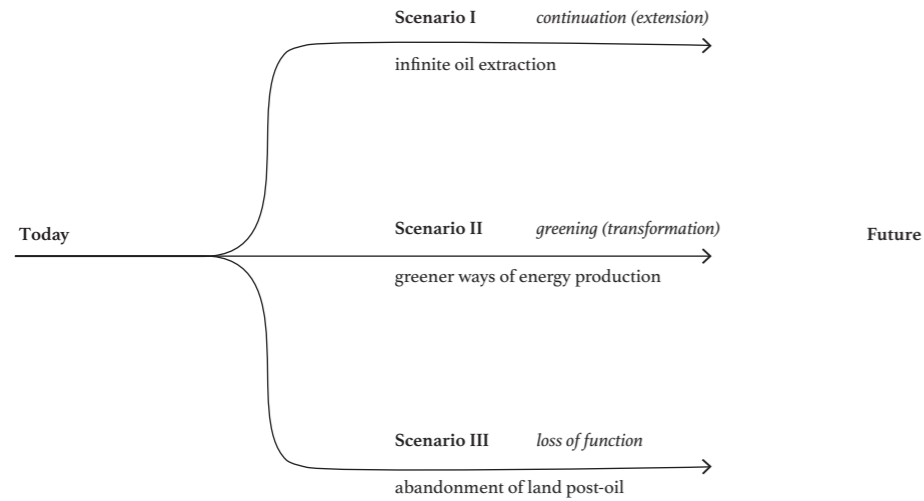


Pipeline infrastructure study



II INFRA STRUCTURE

SCENARIO'S



At all times, it should be kept in mind that the future of the oil industry is extremely uncertain. All changes in laws or legislations made, will directly affect industry dependent sites such as the Mongstad refinery.

To cope with such uncertainty, an architectural project should be highly adaptive. What to adapt to depends on the range in scenario's for the future. Based on the current status quo, trends in the country and trends worldwide, I set out three extreme scenario's for Mongstads future.

1. Continuation of business as usual - infinite oil extraction.

The refinery's processes will still take place, but as already planned, CO2 from the complete refinery will be caught off to be processed elsewhere on the site.

2. Greening or transformation - greener ways of energy production.

The transformation of the refinery: just as in the case of Porto Marghera in Venice will ensure the site's productive purpose, but in a 'greener' way. The current structures will be used for different purposes, and extended where necessary.

3. Loss of function - abandonment of land post oil.

The third scenario that can take place is that of the complete loss of function of the site. Though, considering its potential in geographical and infrastructural sense, the site is likely to be slowly taken into use for different purposes such as a settlement or other types of industrial activities. In this case, only traces of what once was there should be visible on the place where the project has been.

INFRASTRUCTURE/MODULARITY

The uncertainty of the oil industry makes the refinery a challenging case. On top of this it has been decided that the intervention done spans a two kilometer long line. This line is not only a symbolic division, but also a potential new spine of the site that should be optimally used.

To cope with the complexity of this assignment, an adaptable project has to evolve. From this point of view, the main condition for the project is derived: that of being infrastructural. The project will be modular, so be able to grow and shrink over time.

Dealing with the scenario's should happen by setting down traces of an architectural infrastructure that allows for flexible development to take place; a directed field within which the future life of the site can unfold.

Architectural infrastructure is a way of coming up with concrete proposals and realistic strategies of implementation. Because the project shouldn't do more or less than serving its purpose as written down in 'program', and allow for different future scenario's, only minimal, yet precise limits for future construction and utilisation have to be designed.

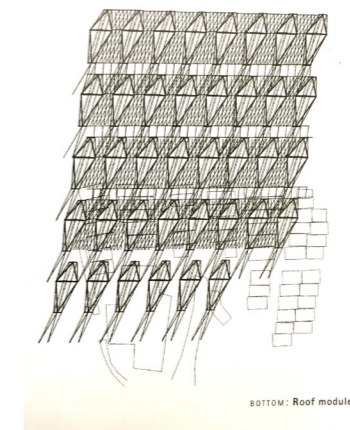
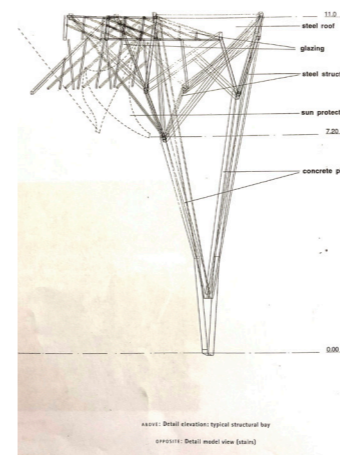
References

Since designing an architectural infrastructure was something relatively new to me, I've studied reference projects to come up with a way of dealing with this specific type of architecture. Among these were Stan Allen's proposals for the reconstruction of the Souks in Beirut and the logistical activities zone in Barcelona. By designing a smaller piece into detail, a larger area can be dealt with, of course dependent of the nature of the problem that is being encountered. These projects helped me with defining an approach towards a project of this scale.

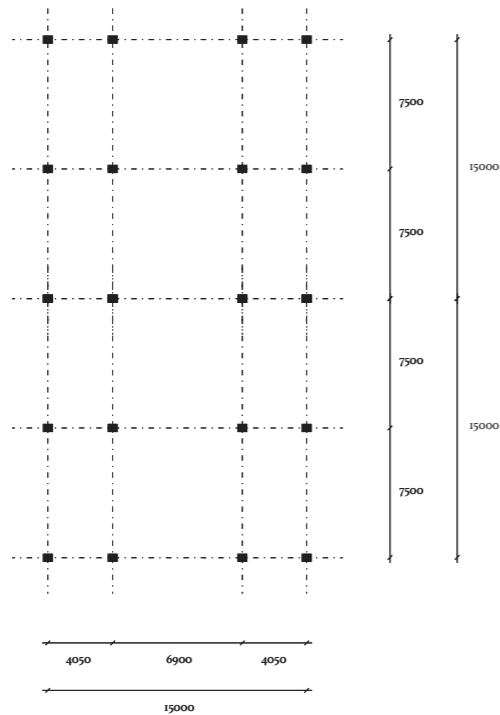
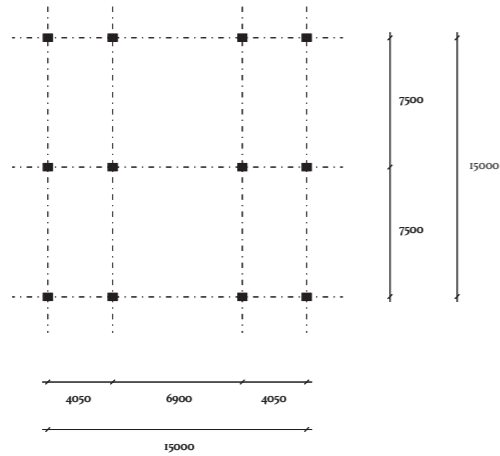
"setting down traces of an architectural infrastructure that allows for flexible development to take place (...); a directed field within which the future life of the site can unfold" - Stan Allen



II - Infrastructure



BOTTOM: Roof modules



THE MODULE

When considering all these preconditions as a puzzle, the module that the project consists of is the conclusion of it all. What I propose is to place a steel structure, that will be distributed along the 2 kilometers span of the project. The module can host all of the program at the same time.

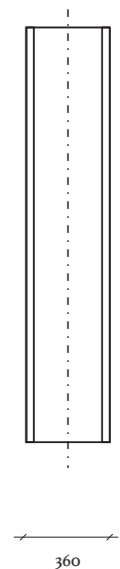
Depending on the size of the cars, I decided on a grid. This grid, in plan, consists of three bays of consecutively 4050 mm, 6900 mm and again 4050 mm: the middle bay wide enough for two car lanes, the side bays wide enough for pipelines and workers walking next to it, or walking people and vertical access next to each other. The total width is 15 meters in both directions: the available space on the productive part of the project on site.

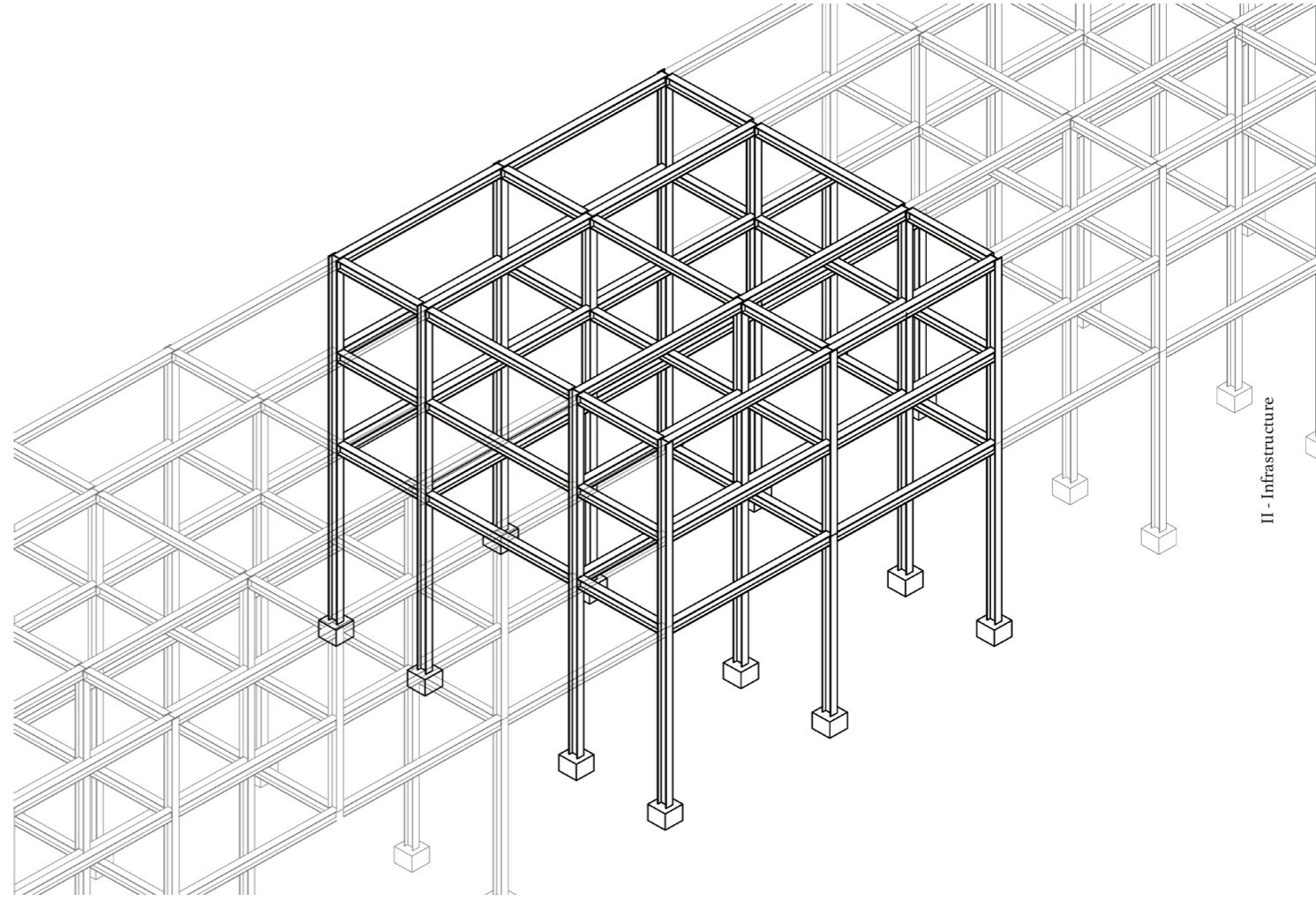
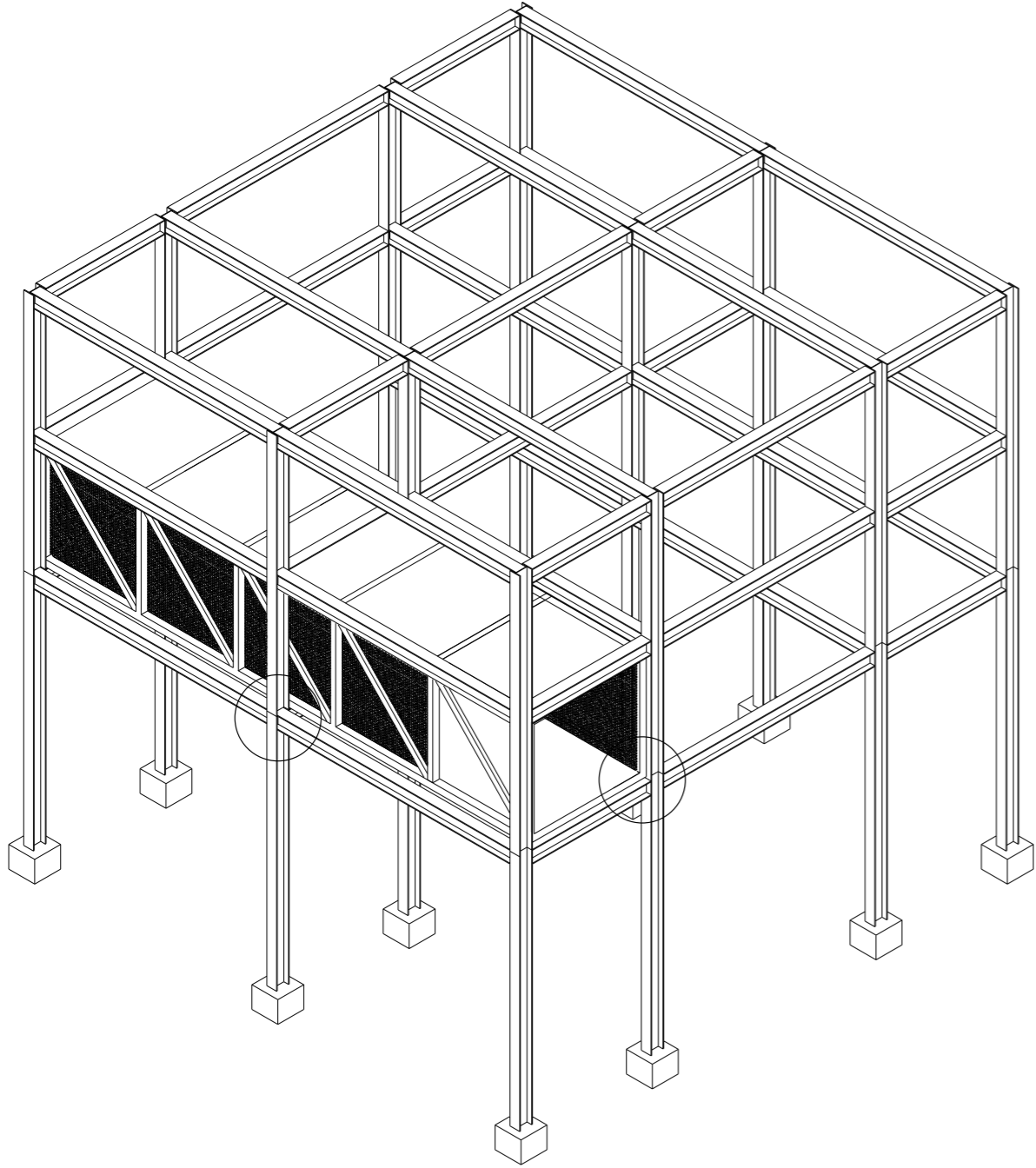
In the other direction the width of the module's bays is 7500 mm: half of 15000, which makes it easy to repeat the module in this direction. It's also still a reasonable length to be spanned by steel beams.

As mentioned before I'll have to use steel as the constructional material. Because the location is known for rough weather conditions, such as salty winds throughout the year, and precipitation in the form of rain and snow, it has to be made of corten steel. The material builds itself a protective layer through corrosion, and can in this way survive. In comparison to regular steel the material is relatively expensive. However, normal steel should have a protective coating which has to be renewed every 2-3 years. Corten pays back for itself in 5 to 7 years time. Because of the corrosion layer, the outer layers of the steel plates will be weak. Because of this the columns can't be welded together. Which is fine, since the structure should be demountable. Nuts and bolts should do the trick.

HE 360 profiles will be placed on the intersections of the grid, to support the different levels the module could have. The choice for a HE360 profile came was calculated in accordance to the maximum span of 7500 mm that the beams should be able to make, while bearing an uncertain load.

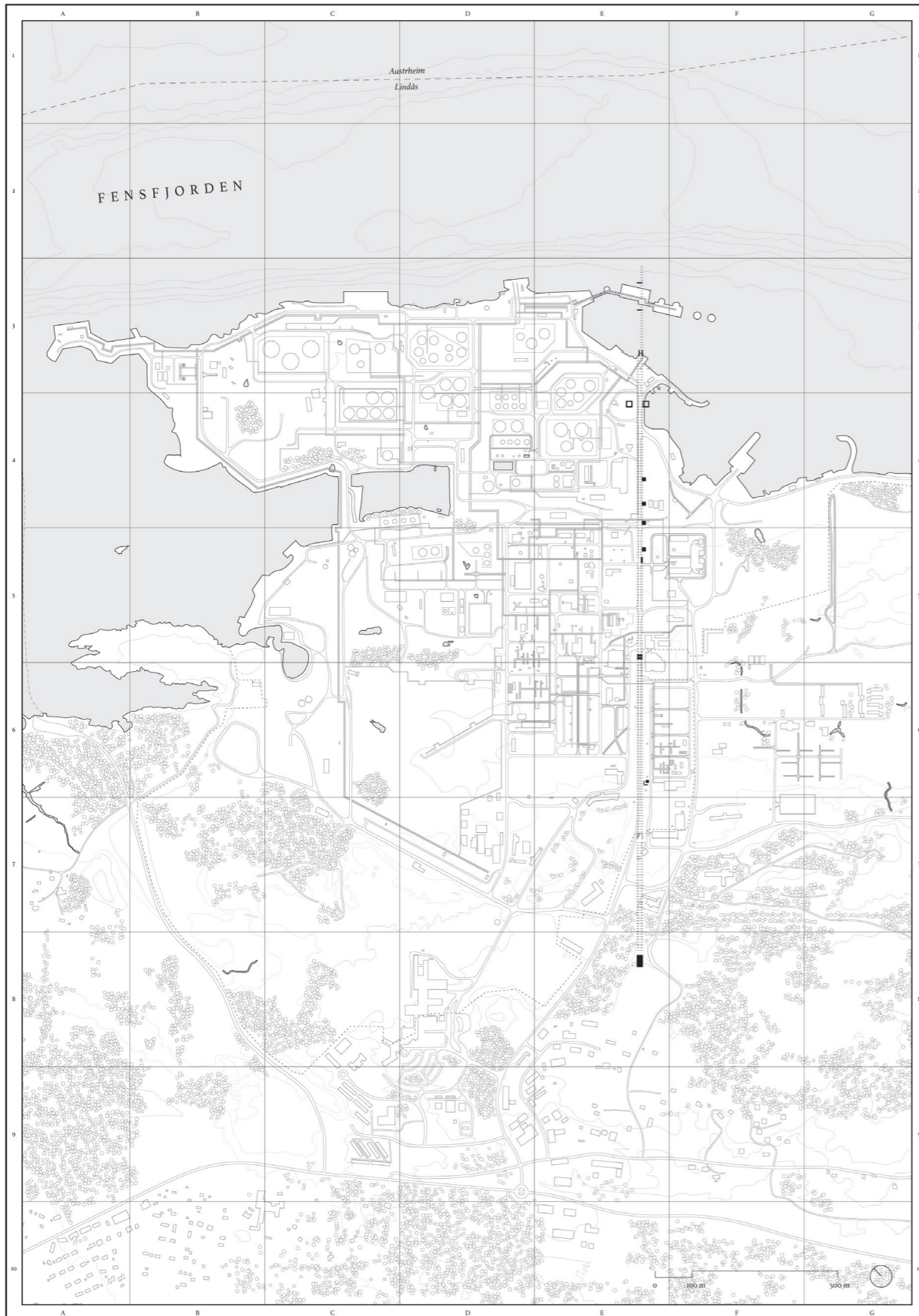
Since the preconditions as derived from the program require for the project to have a specific height, the complete module is built up from 4 layers of each 3750 mm. so this is what the section of a complete module will look like: rooted on concrete foundation sticking out of the earth.







III MASTER PLAN



CONCRETE INTERVENTIONS



Whereas this steel module ensures a flexible, recyclable, yet constructive basis for the project, exceptions and services will be facilitated by concrete interventions. The structure I've created services the refinery whenever needed, but the impact of the activities happening on site on a national, but even global level are big enough to be able to commemorate whenever the site loses its function. That's why Visiting the site will be combined with elements that give the current state of the refinery more permanence.

I chose to use concrete as a material to design monolithic pieces from, that now all service a guided visit of the refinery, and in accordance by the way this industrial function erupted here: as a very brutal, irreversible act.

To ensure the nodes' fitting into the project, and to make sure these merely serve their specific purpose, a set of rules is created. These rules make sure the dimensions of the nodes don't exceed the dimension of a single module, and will also make them easy to connect to the steel project.

Primary design rules

1. Only 90° or 45° angles
2. As minimal as possible
3. Grid: 3000 x 3000 x 3000 mm
4. Max dim 15000 x 15000 x 15000 mm
5. Symbolic element: concrete. Human element: steel
6. Visitor in enclosed space at all times

Secondary design rules

- A. Loadbearing slabs 500 mm
- B. Secondary slabs 250 mm
- C. Window/ door openings 1 grid / 0,5 grid
- D. Narrow openings 300 mm * ..

Connection Infrastructure + Nodes

- A. Width steel path: 1500 mm ctc
- B. Height steel path: 3000 mm
- C. Distance to concrete: 0,5*3000*..



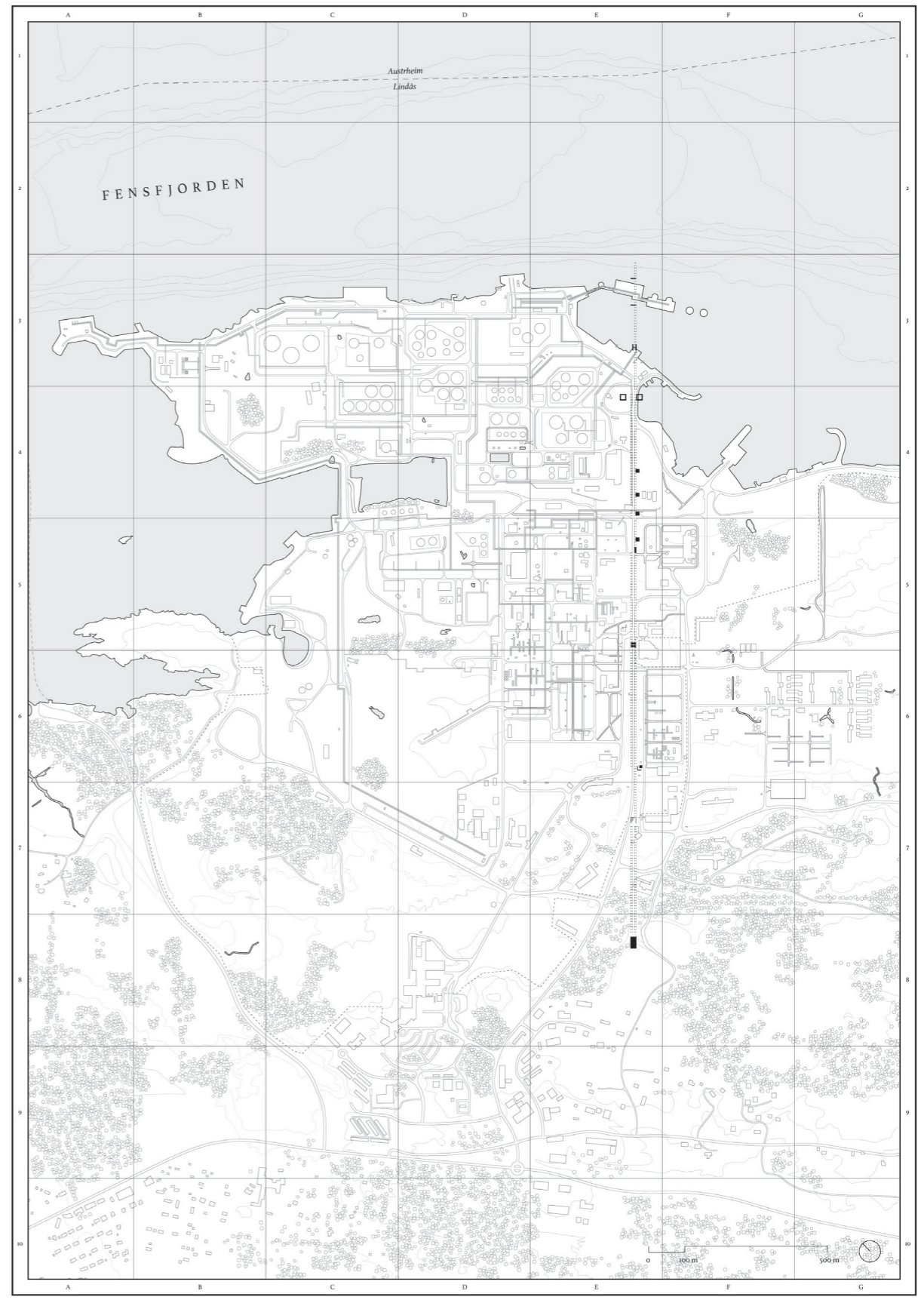
Google Earth
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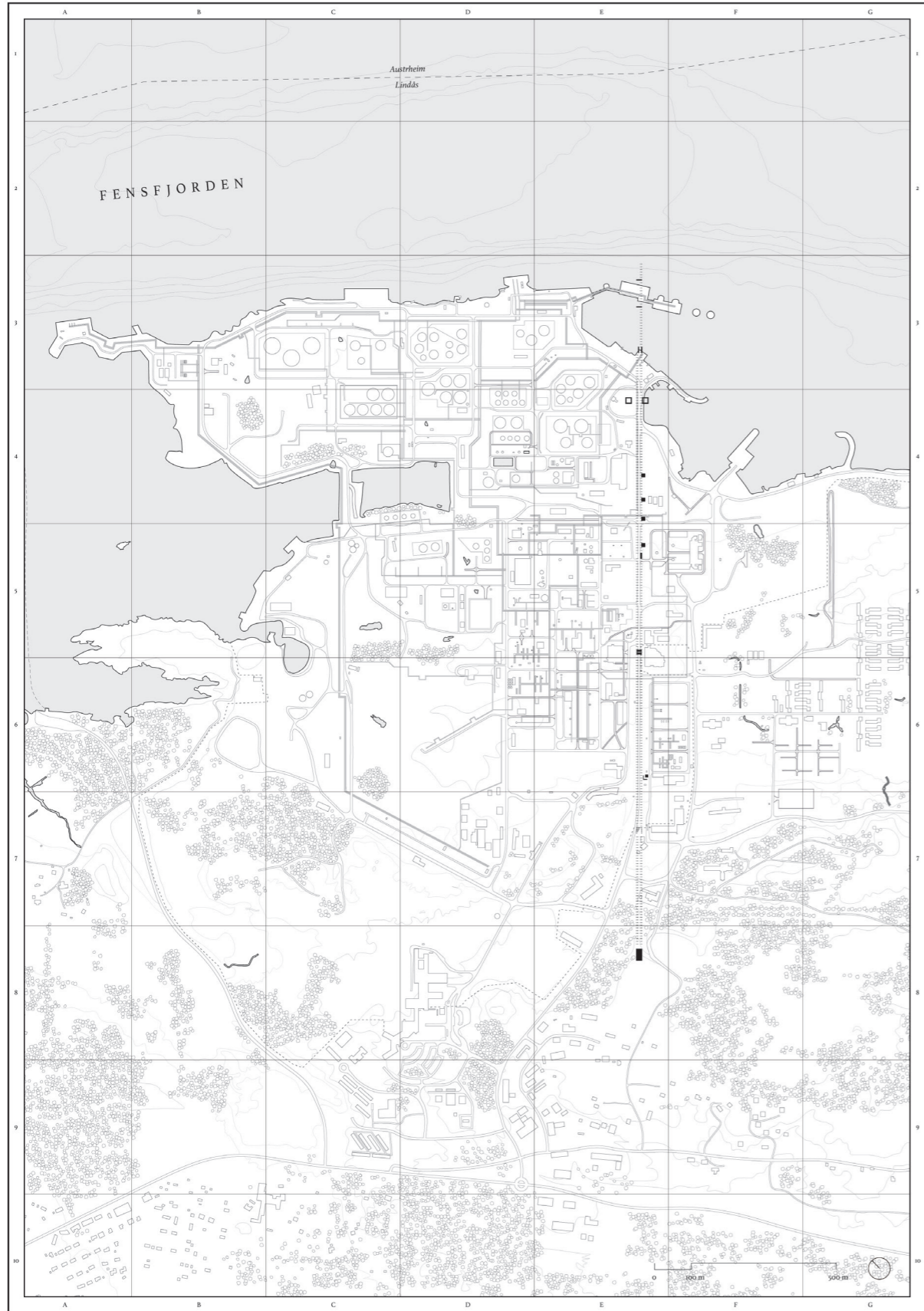
| | Tectonics | Relation to line | Focus on view | Stay / Continue | Service? | Experiential tools | Level of comfort | Comforting tools |
|---|-----------|------------------|---------------|-----------------|----------|--------------------|------------------|------------------|
| 1 | | | +++ | S/C | | | +++ | |
| 2 | | | + | C | X | | + | |
| 3 | | | +++ | S | | | ++ | |
| 4 | | | ++ | S/C | X | | + | |
| 5 | | | +++ | S | | | + | |
| 6 | | | ++ | C | X | | + | |
| 7 | | | + | S | | | ++ | |
| 8 | | | ++ | S/C | X | | + | |
| 9 | | | +++ | S | X | | ++ | |

- Directing view
- Framing view
- Directing visitor
- Roof/shelter
- Heated bench

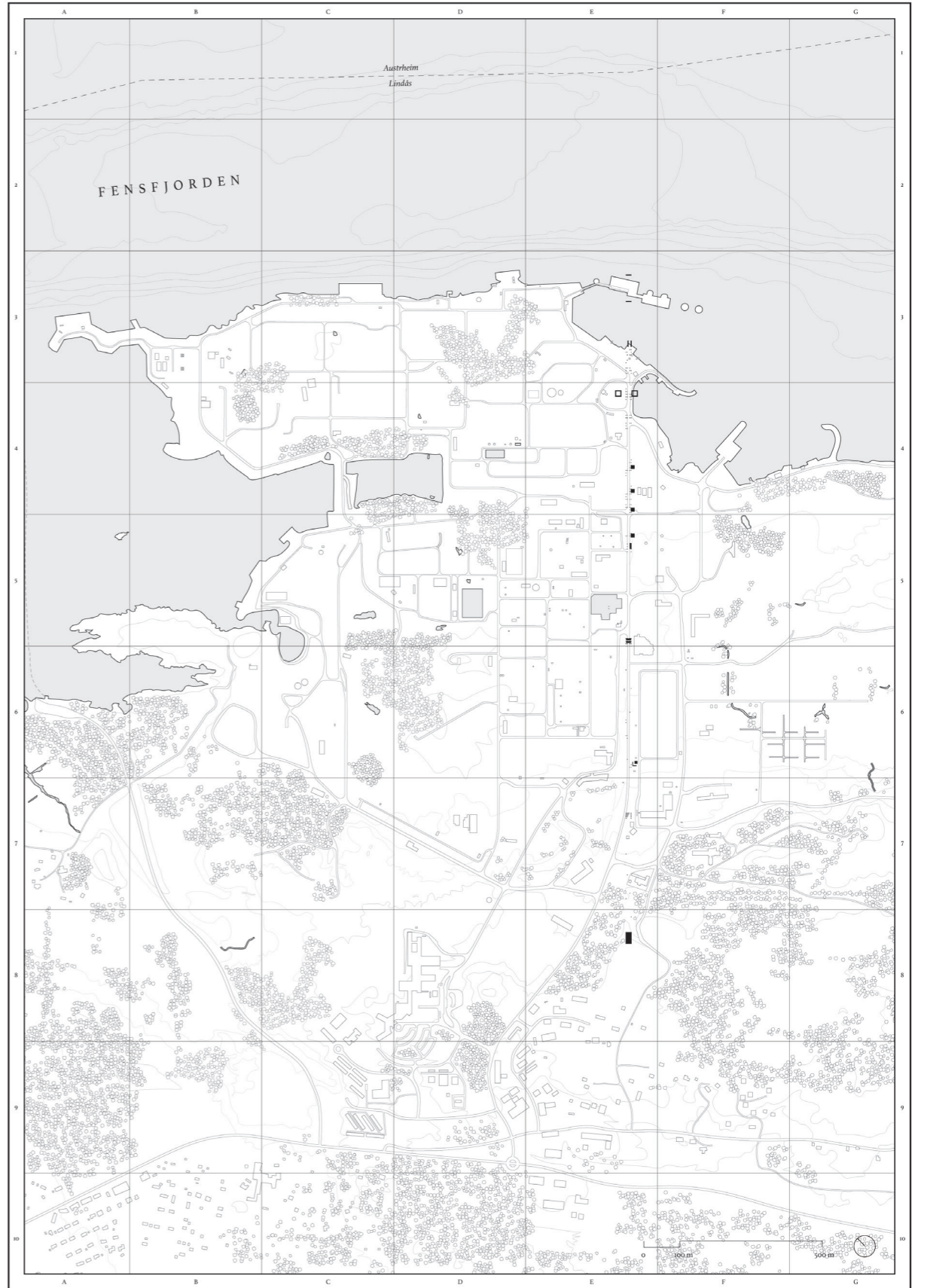
Parameters to determine the architecture of each node

Masterplan in case of scenario 1





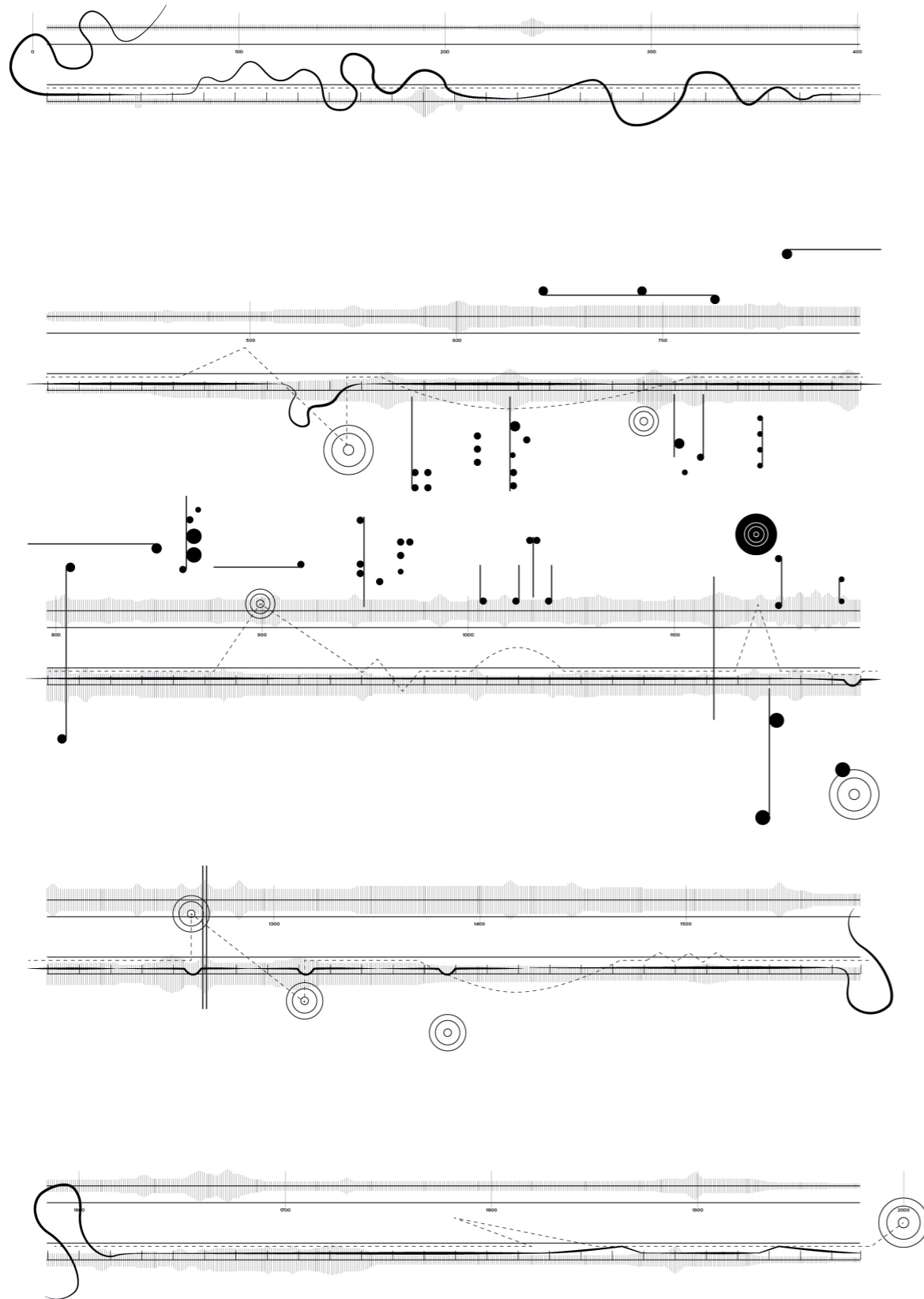
Masterplan in case of scenario 2



Masterplan in case of scenario 3



IV EXPERIENCE










EXPERIENCE

An important part of the project is a visit through the refinery that is offered. This visit, starting from the mountains and ending up above the Fensfjorden, can be experienced by anyone.

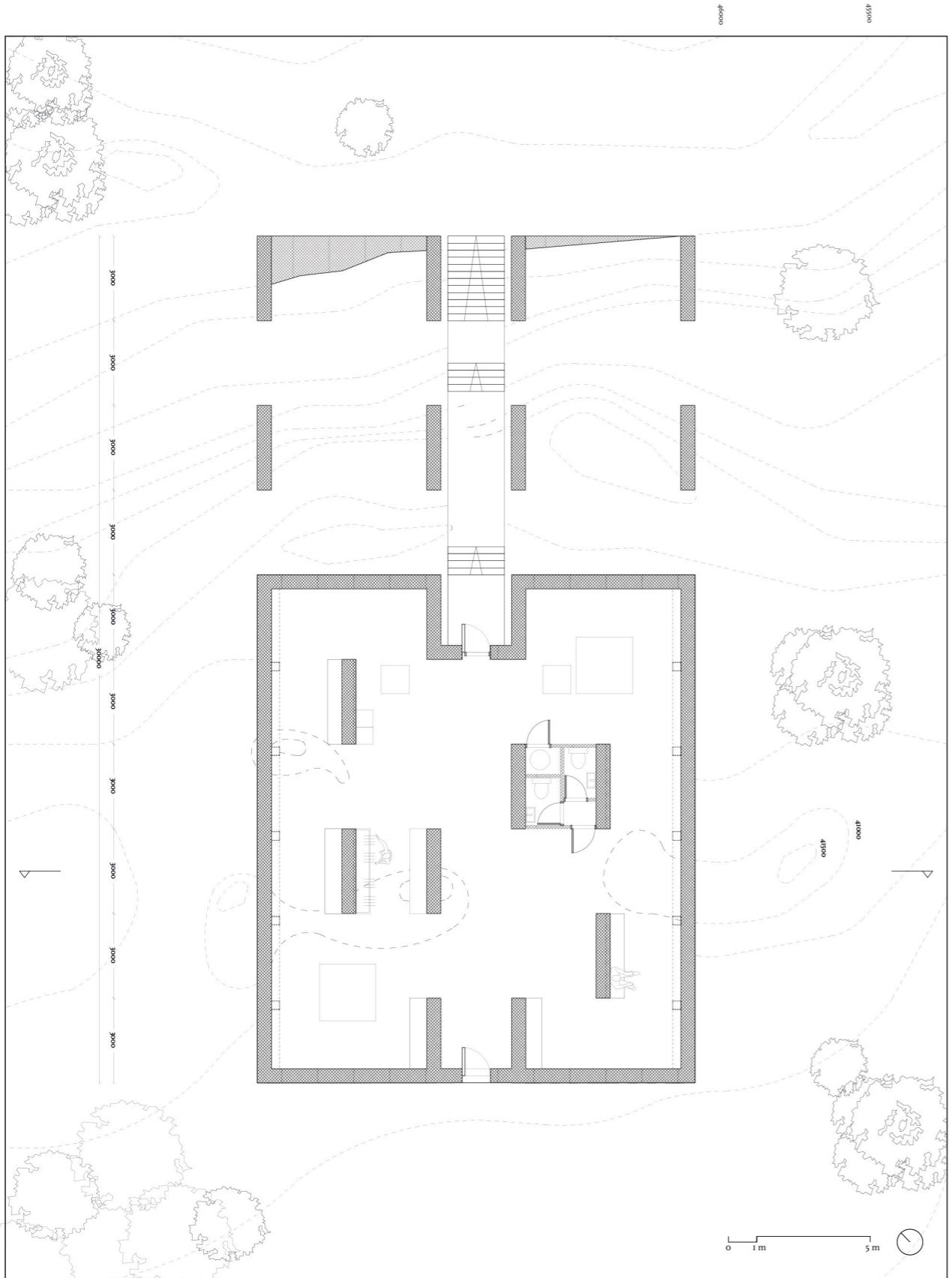
The visit takes place over the full two kilometers that the project stretches. On the way the visitor will be confronted with different industrial situations and geographic conditions. As an example, on the following pages a visit to the site is done on an average day in the near future.

At this point in time, the TCM is in full effect, and the weather is grey and dreary as always. The nodes are being discovered, and it will be clear how these work. The ongoing path can be experienced as well, while suffering from different weather conditions.

-  Point of interest
-  Noise
-  Distance (m)
-  Viewlines
-  Walking path
-  15 m grid
-  Linear grid

9
8
7
6
5
4
3
2
1

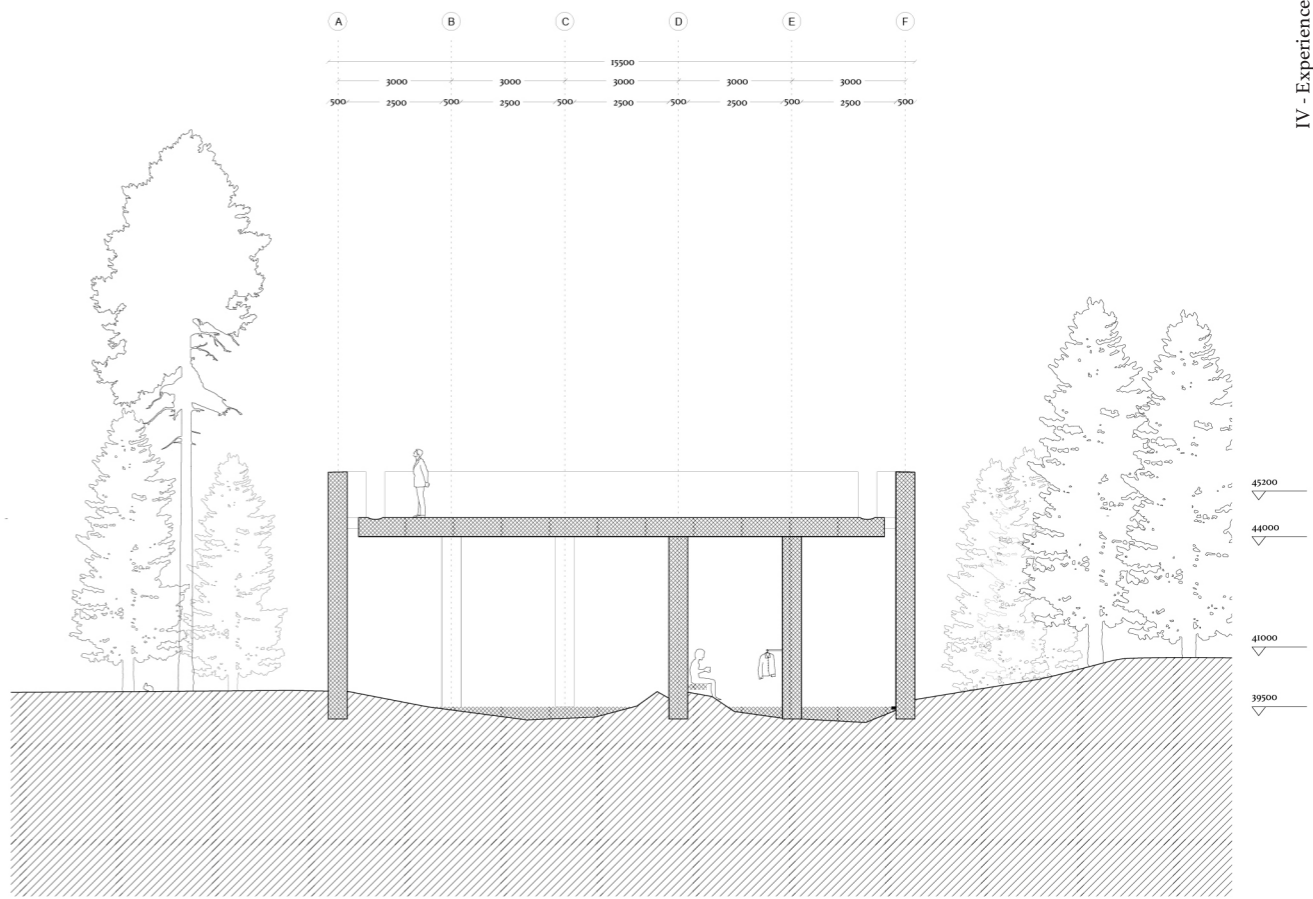




1 VISITOR CENTRE

The visitor arrives on a horizontal concrete platform. A remarkable monotonous steel structure forms a long line which reaches onto the water.

Inside this robust pavilion the visitor is educated about the position of Mongstad as oil refinery within a bigger system.





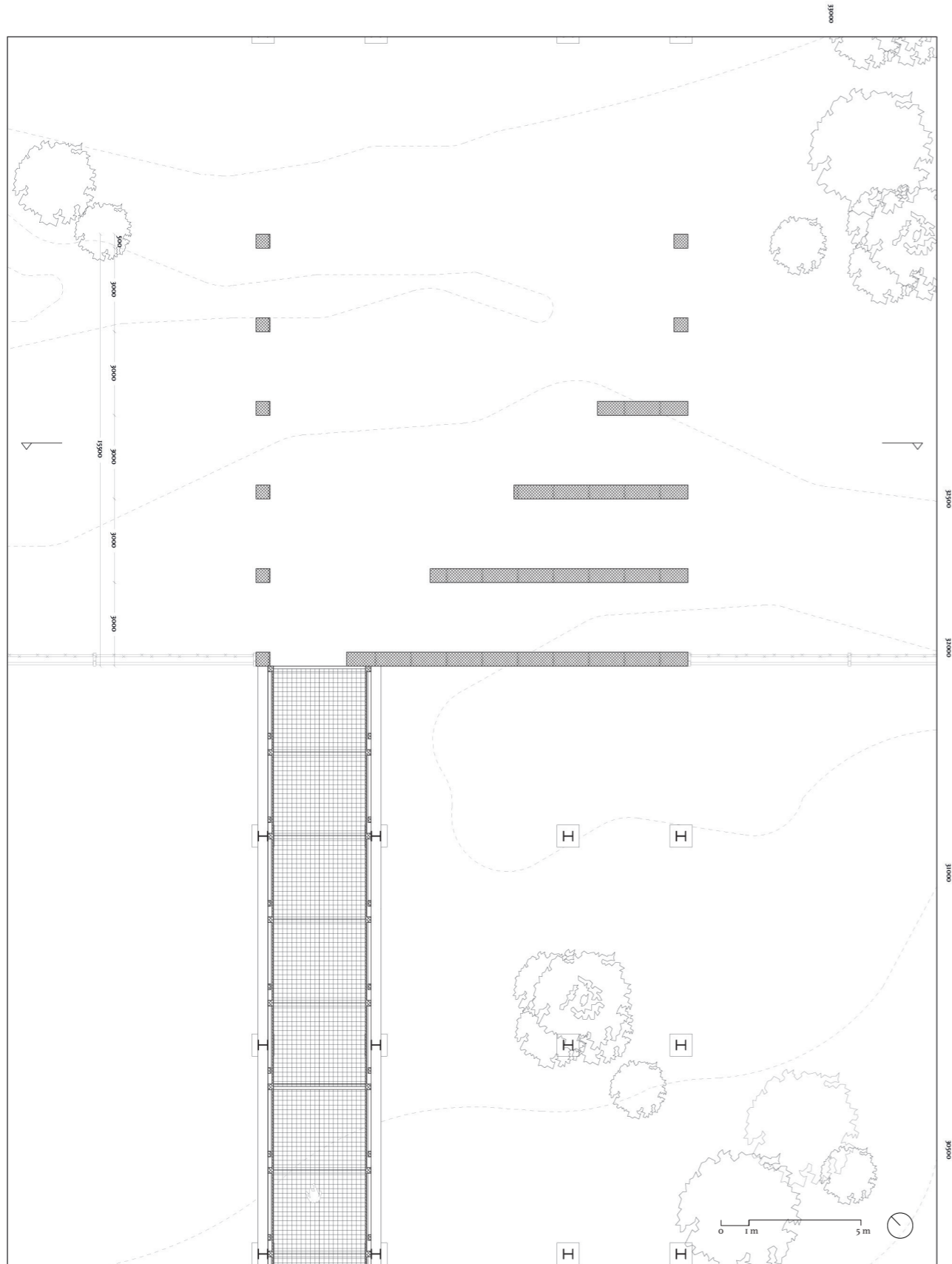
Interior

The visitor enters a dark, humid space. The visitor centre is an enclosed shell, in which the importance of the project is illustrated and exhibited.

The place can be experienced as shelter. If needed, warmth and comfort can be found while leaning against a wall or sitting on a concrete bench. However, the main purpose is to make a visitor concentrate on what the project is about.

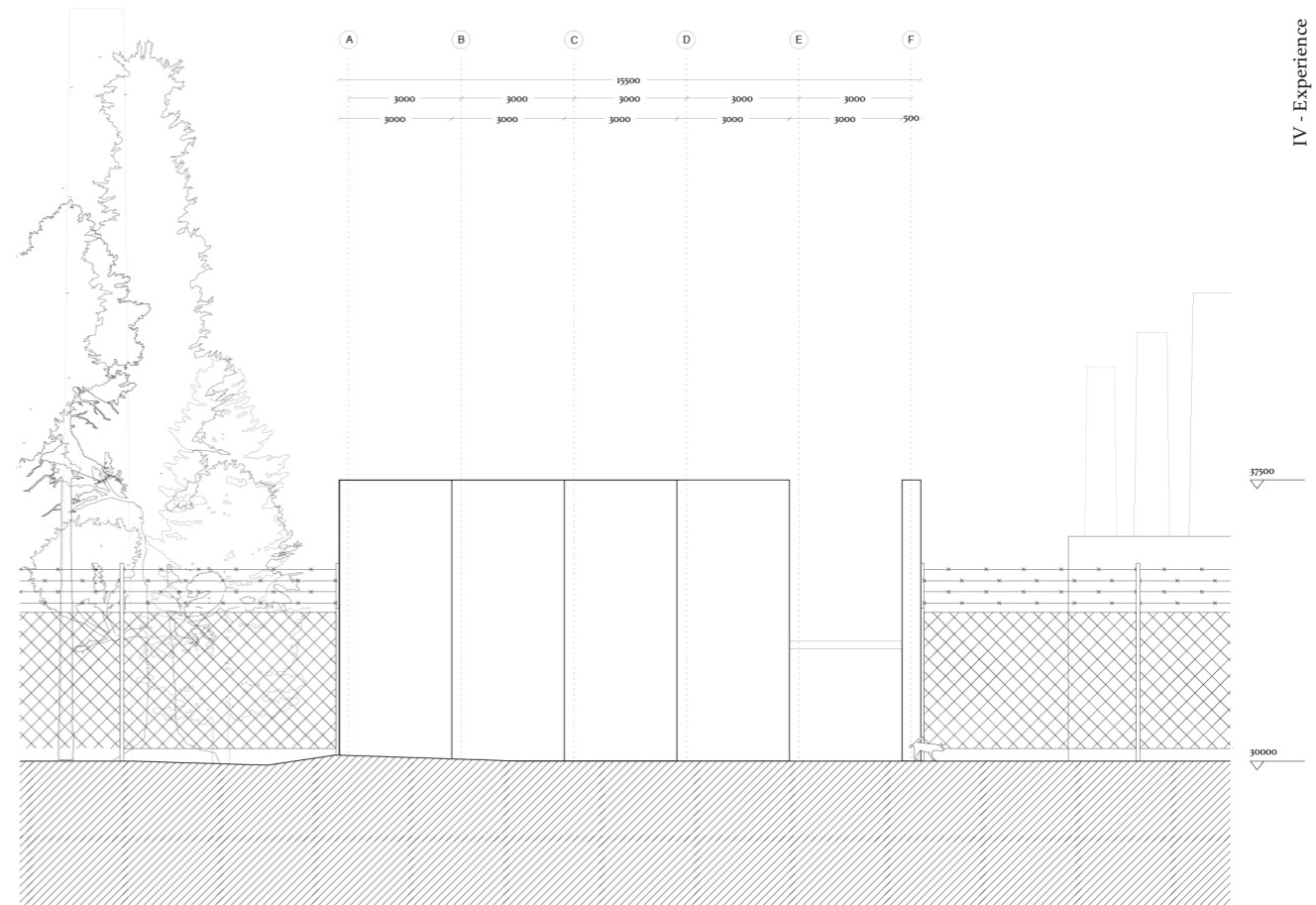
While inside, the direct context of the pavilion can be experienced. When it rains, water enters the pavilion along the walls.

The rocky soil of the surrounding area is expressed inside by exposing rocks that are too high to overcome by the concrete poured as a leveling surface.



2 BORDER

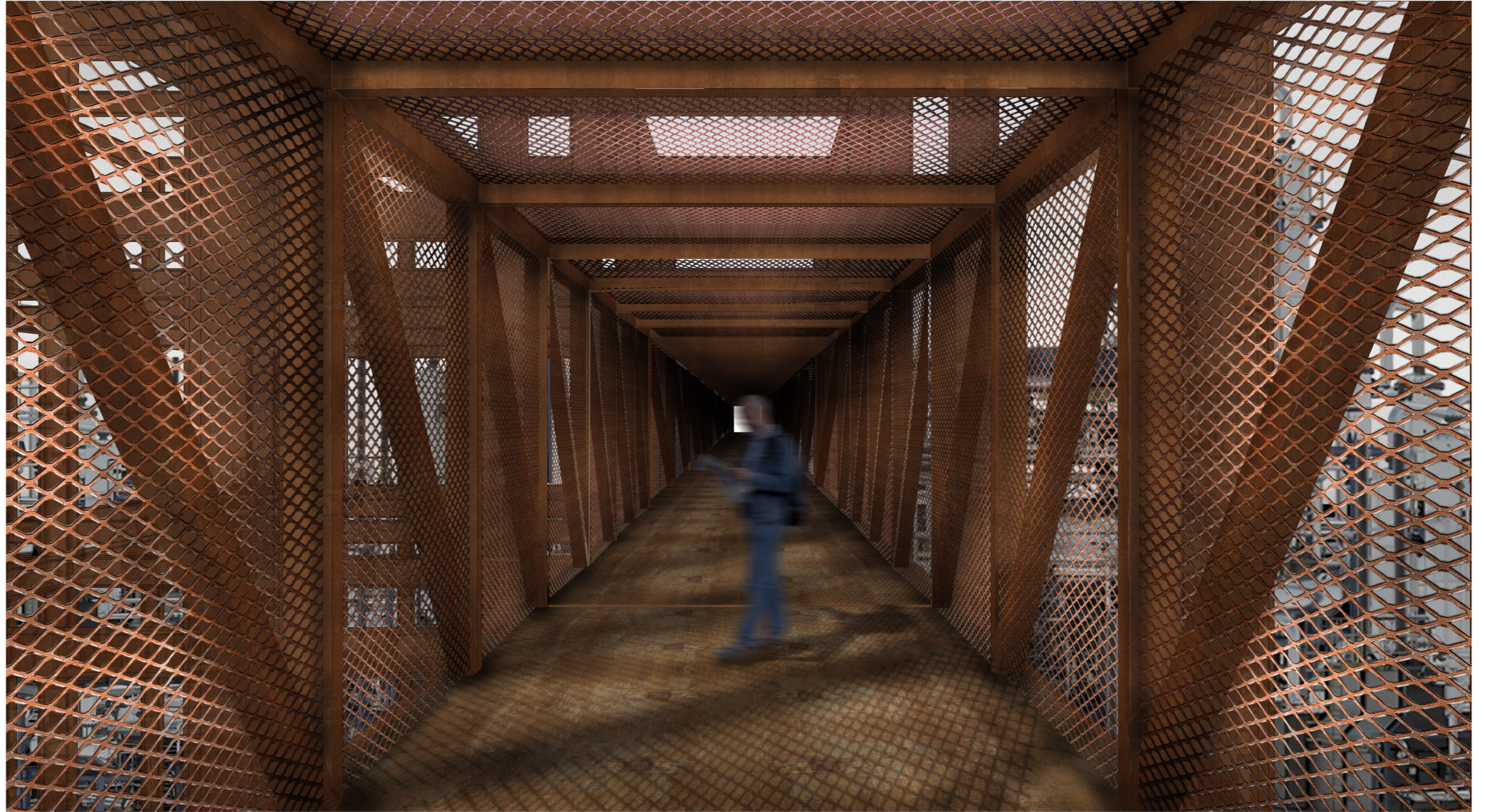
After meandering over forested and mossy soil, the visitor arrives at the concrete slabs that could be seen from the first platform.





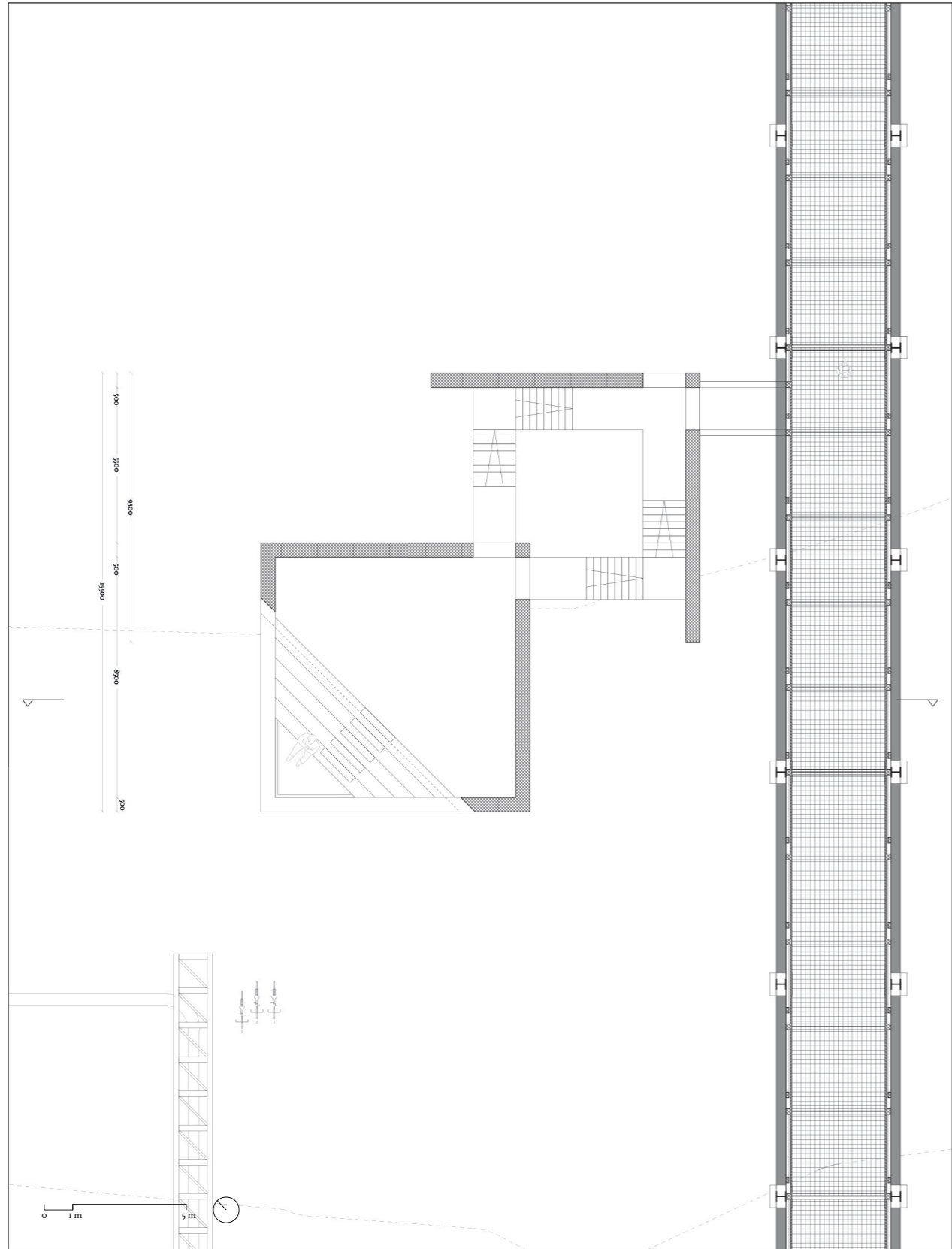
Entering

Between the concrete slabs, a brownish steel path appears. The visitor becomes curious, and is naturally led inside the refinery. While barely noticing, the visitor enters strictly fenced off ground.



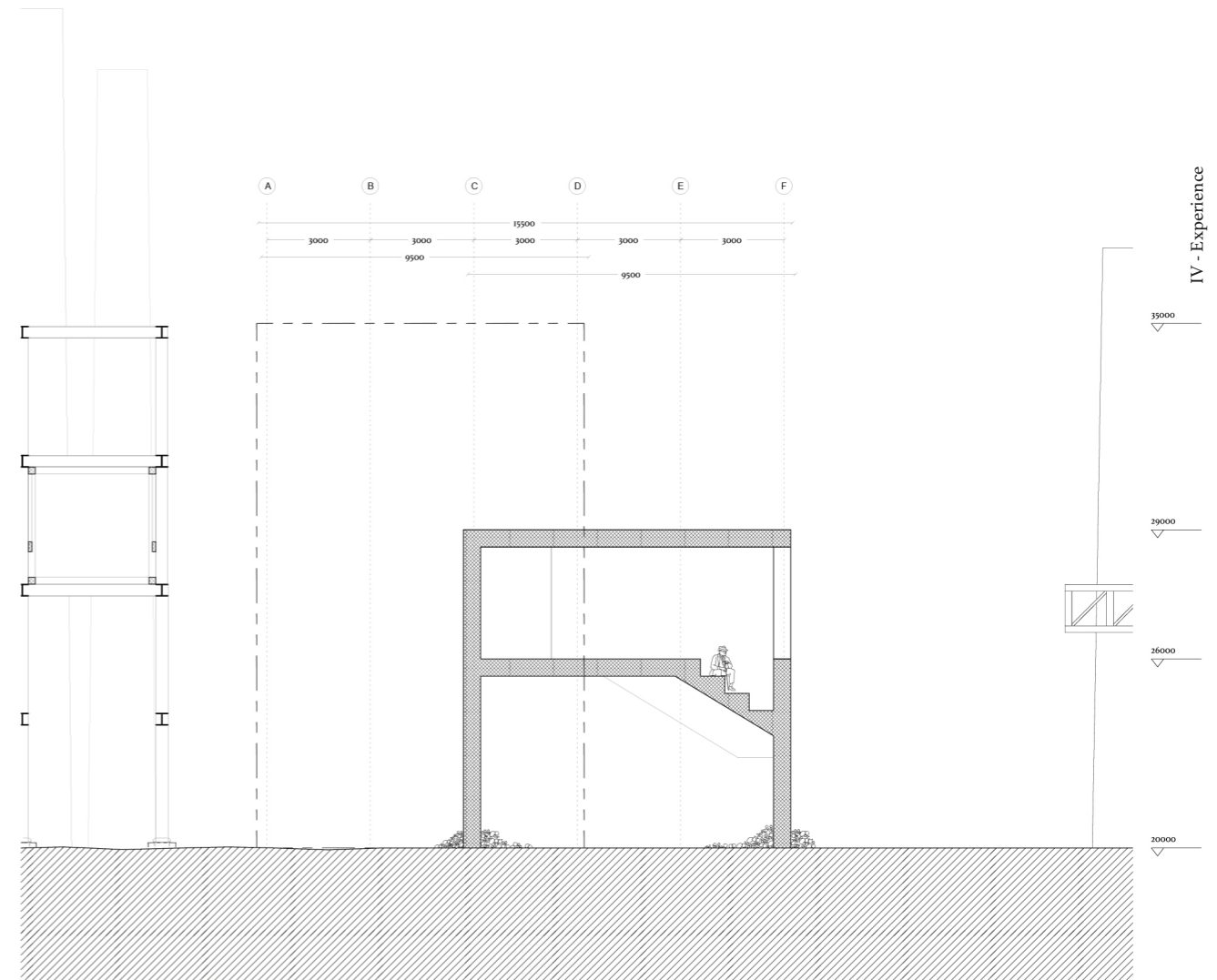
Path

Inside the cage that stretches onto the end of the refinery, the visitor is indirectly exposed to reality. This is how the country makes its money, how thousands of people work, and how huge amounts of CO₂ are being emitted. But luckily it can now be processed, and stored in the bottom of the North Sea..



3 VIEWPOINT

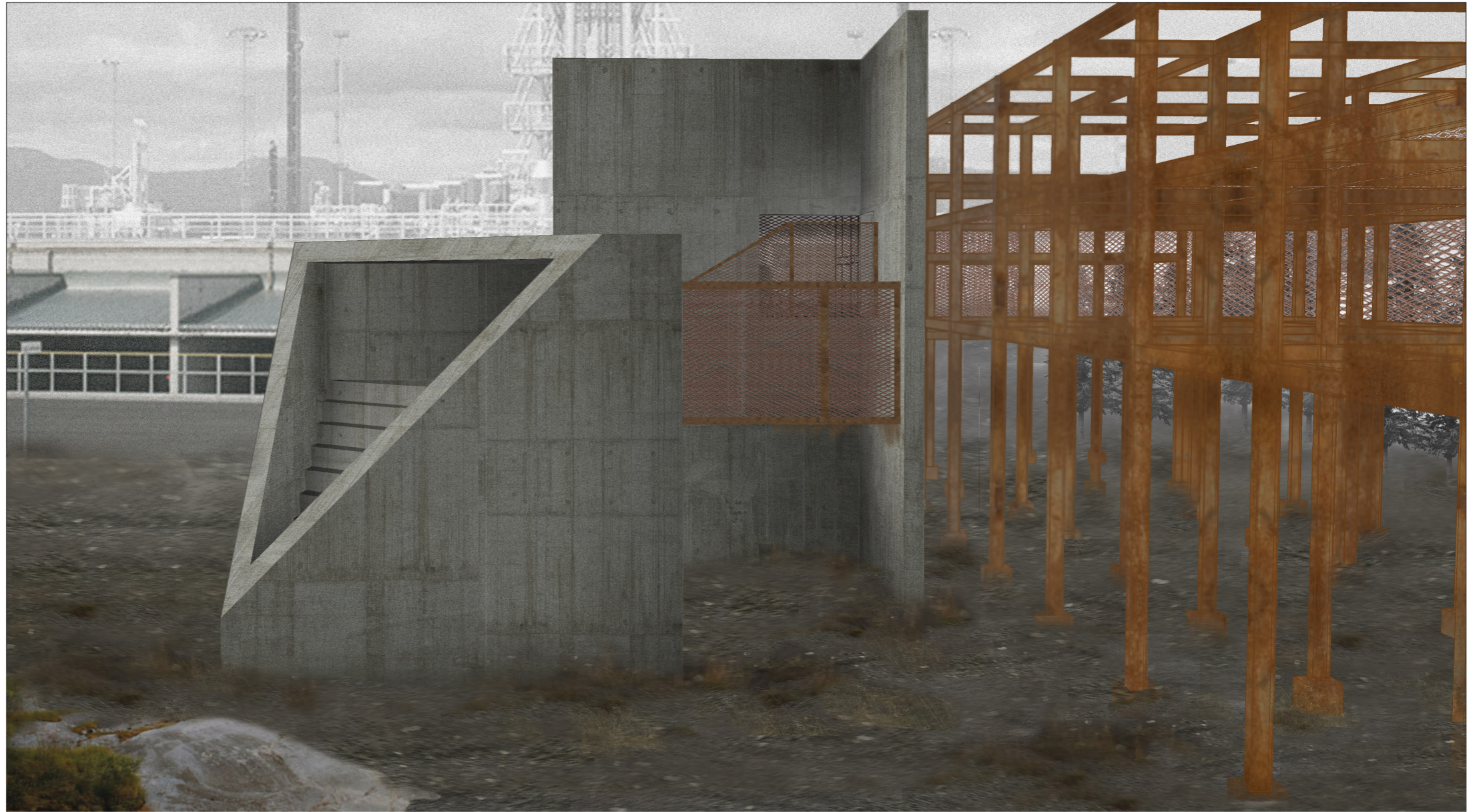
The TCM is the symbol for positive progress, and the main reason for Mongstad's status as pioneer when it comes to sustainability. From node three a clear view over the TCM is forced.



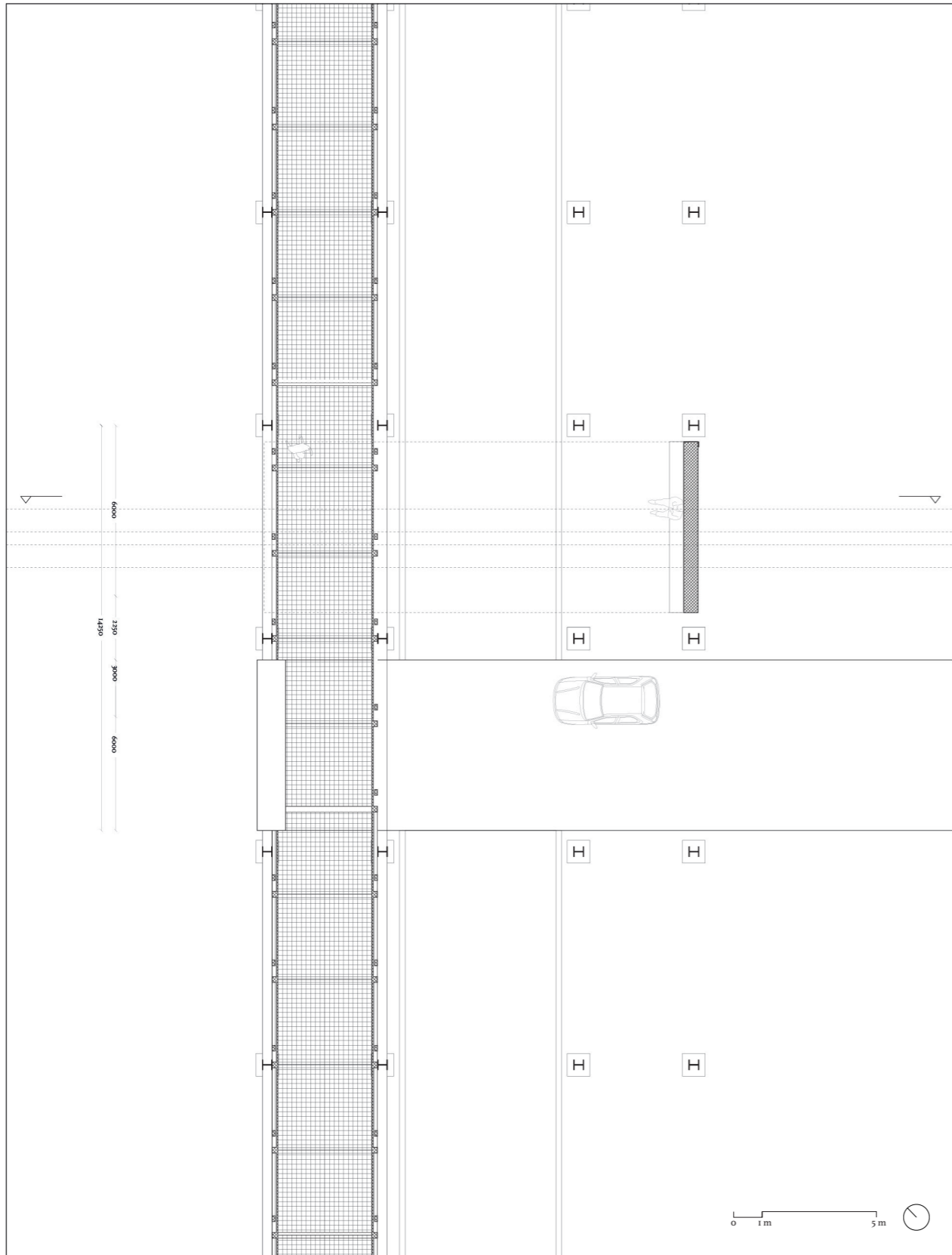


TCM view

The TCM can clearly be seen from node three. The visitor can descend and reach closer to the industrial structures. If preferred one can have a seat on the concrete construction. The shiny steel structures, movement and plumes of smoke form a striking contrast with the passive, monolithic nature of the third node.

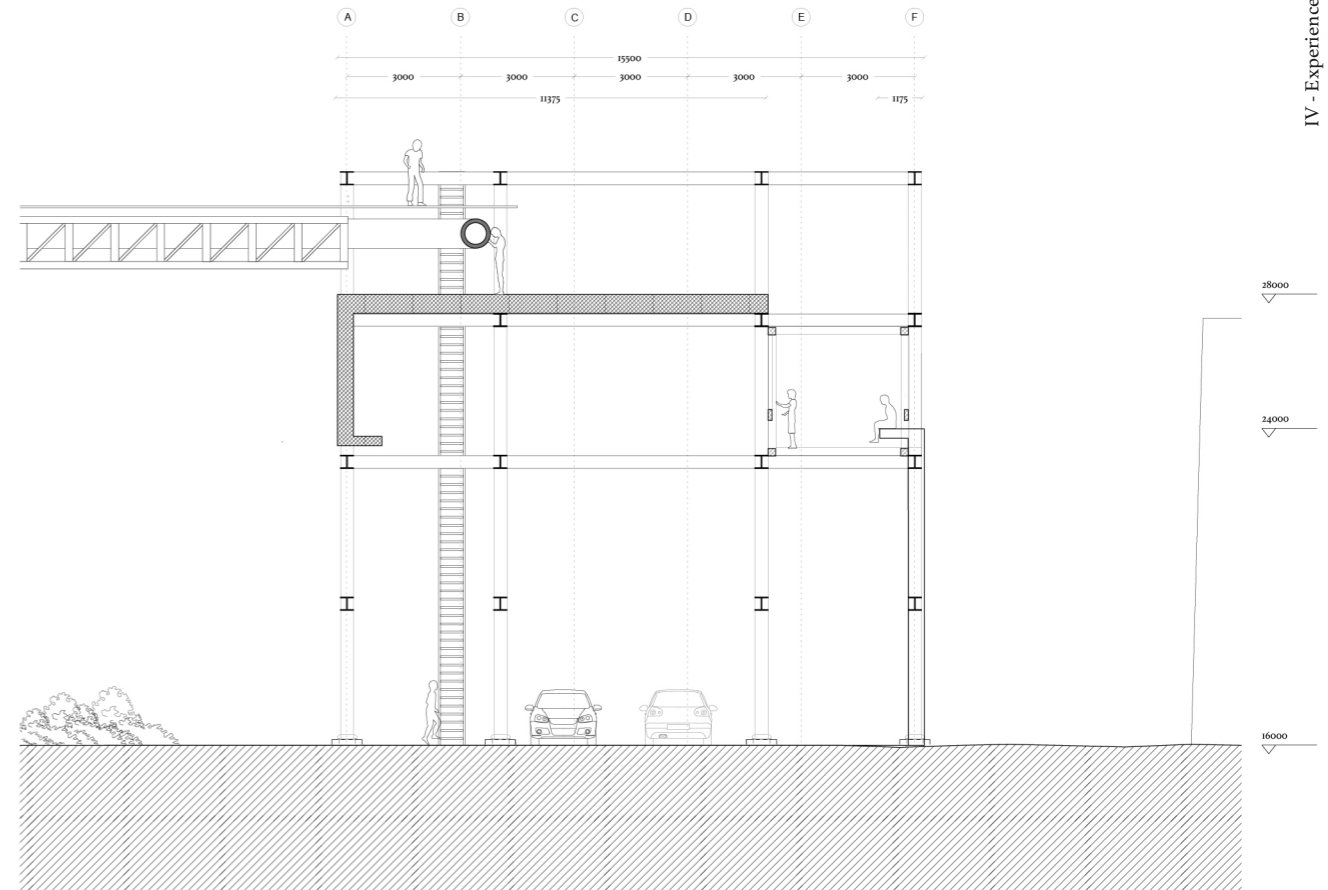


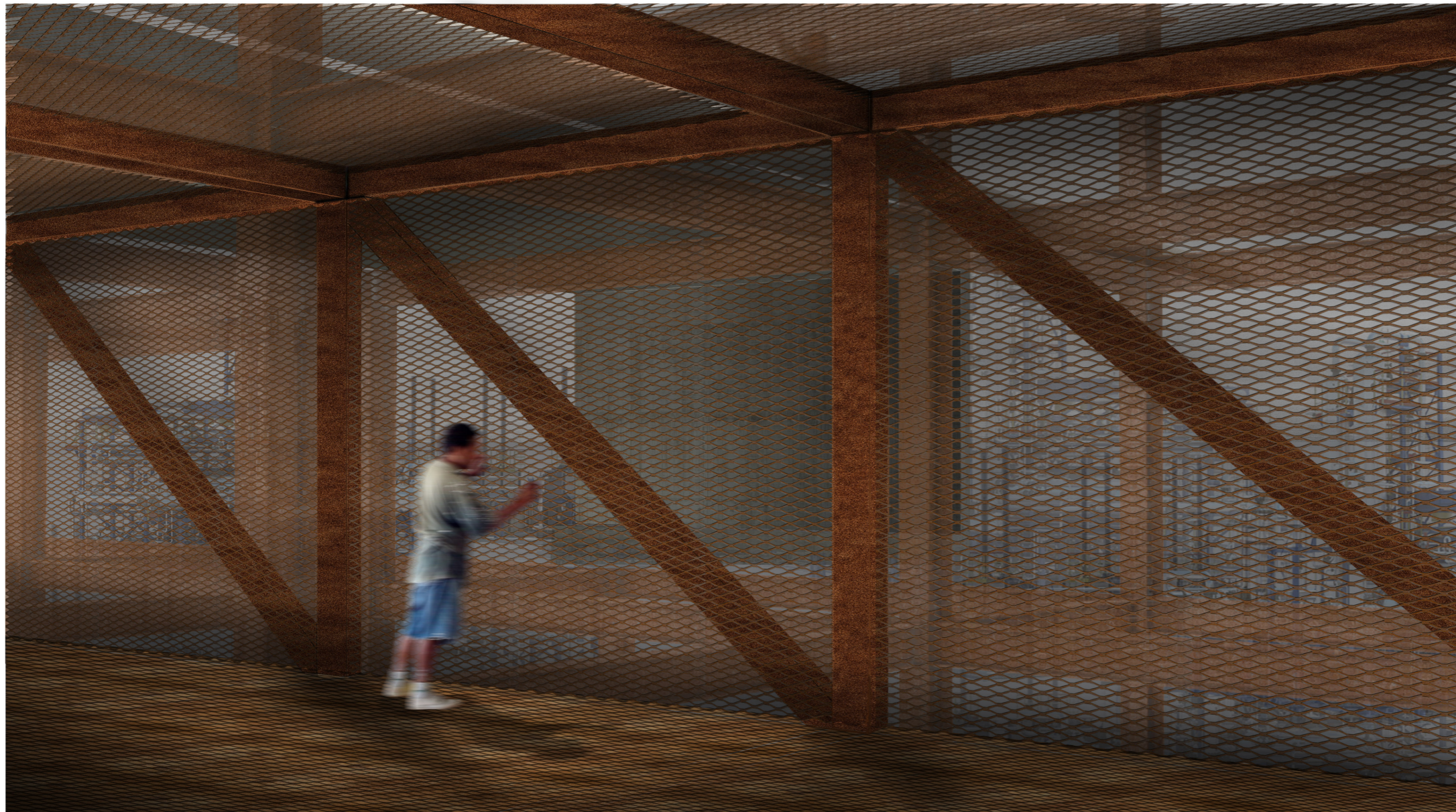
The viewpoint
What the viewpoint looks like from the outside.



4 JUNCTION

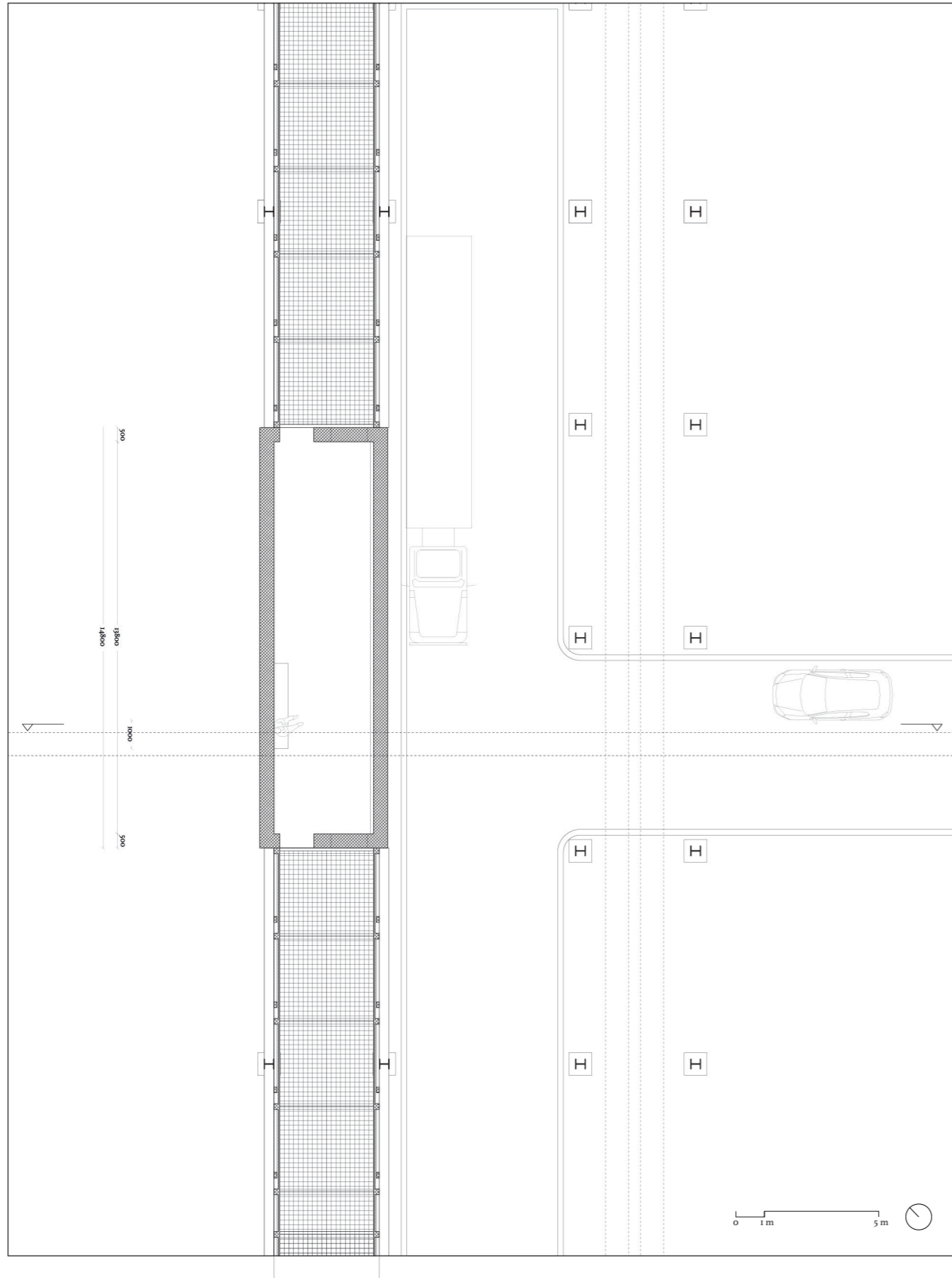
Along the line the visitor is in an enclosed space at all times.
 At this point in the project the visitor is invited to take place on a modest concrete bench, from which he or she will be able to realize what's going on around them: heavy work, done by hundreds of people.





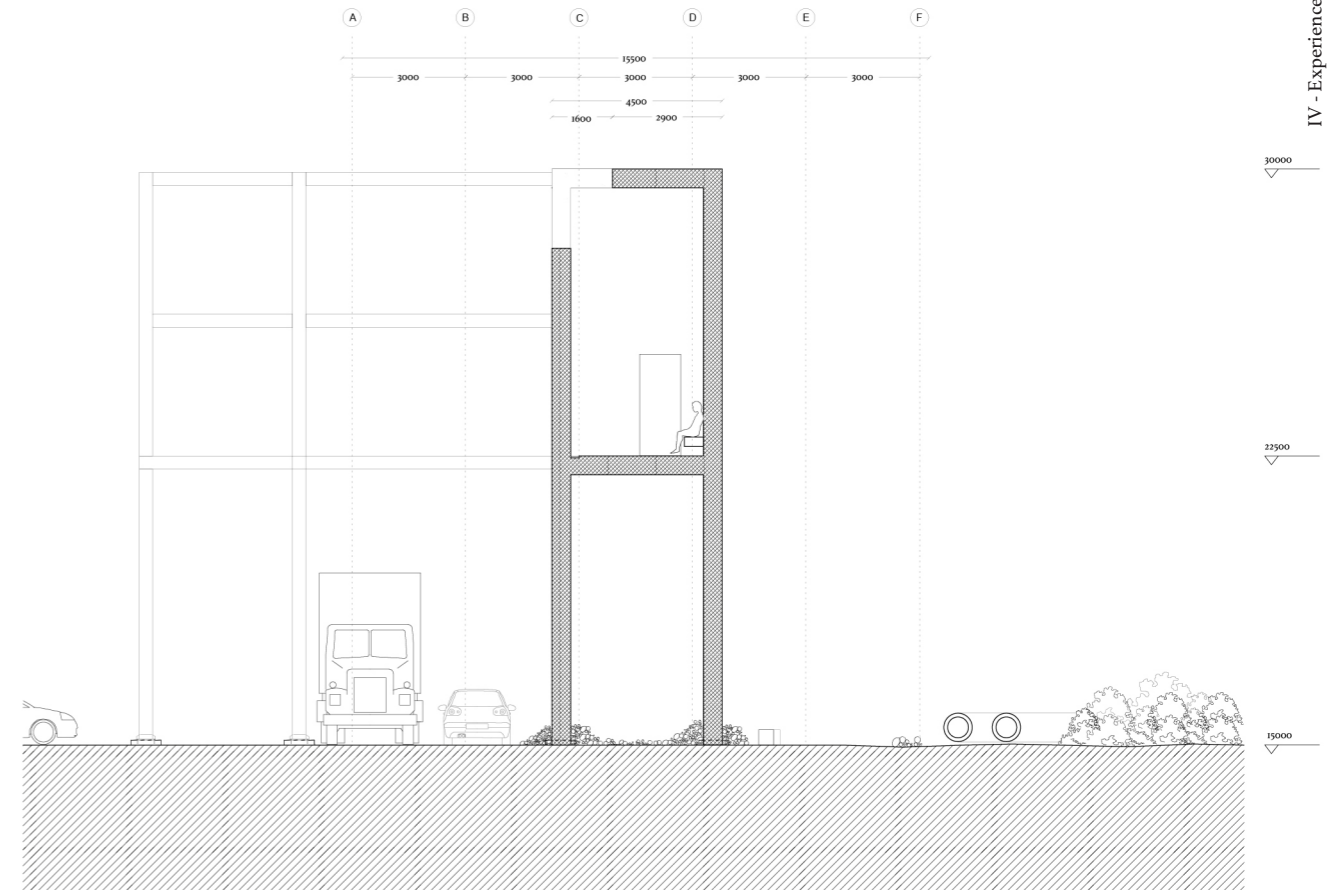
Reality check

From the concrete intervention halfway through the refinery a critical view is gained on what is going on around the visitor. It is at this point too, that flows of visitors and maintenance workers, cars and pipelines intersect.



5 WALL I

Symbol for the pollution emitted in Mongstad is the most polluting structure on site: a 120 m high chimney. At the fifth concrete intervention along the line the visitor enters a dark space, and the view is attracted to a hole in the wall/ceiling.





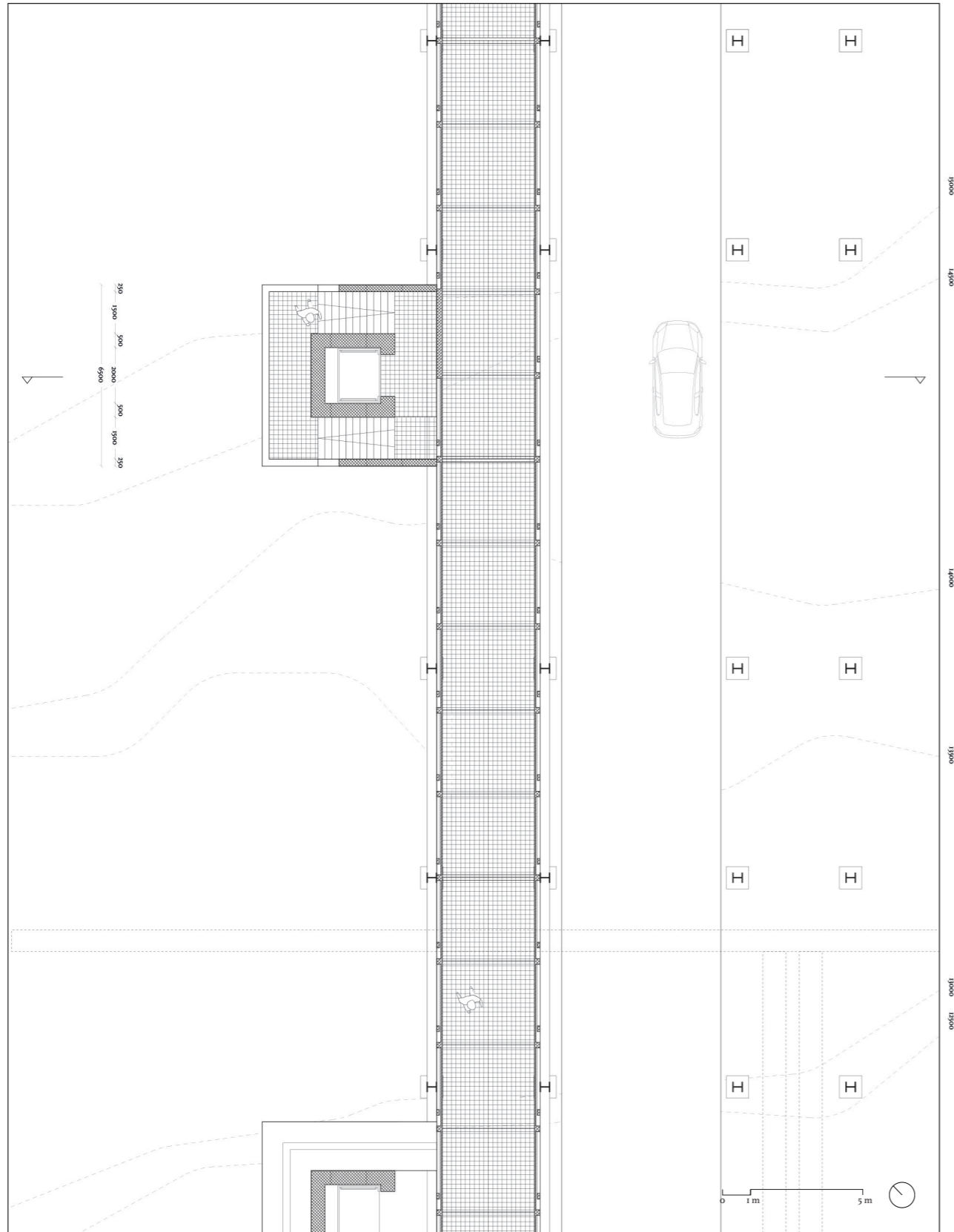
Attraction

In the dark 'cave' that the fifth node is, the visitor is attracted to the only source of direct light in the space. The visitor can take place on the concrete bench, and get a clear view on the 120 m high chimney.



Chimney

Through this hole the only things visible are the top of the chimney and, if in service, polluting clouds coming from it.

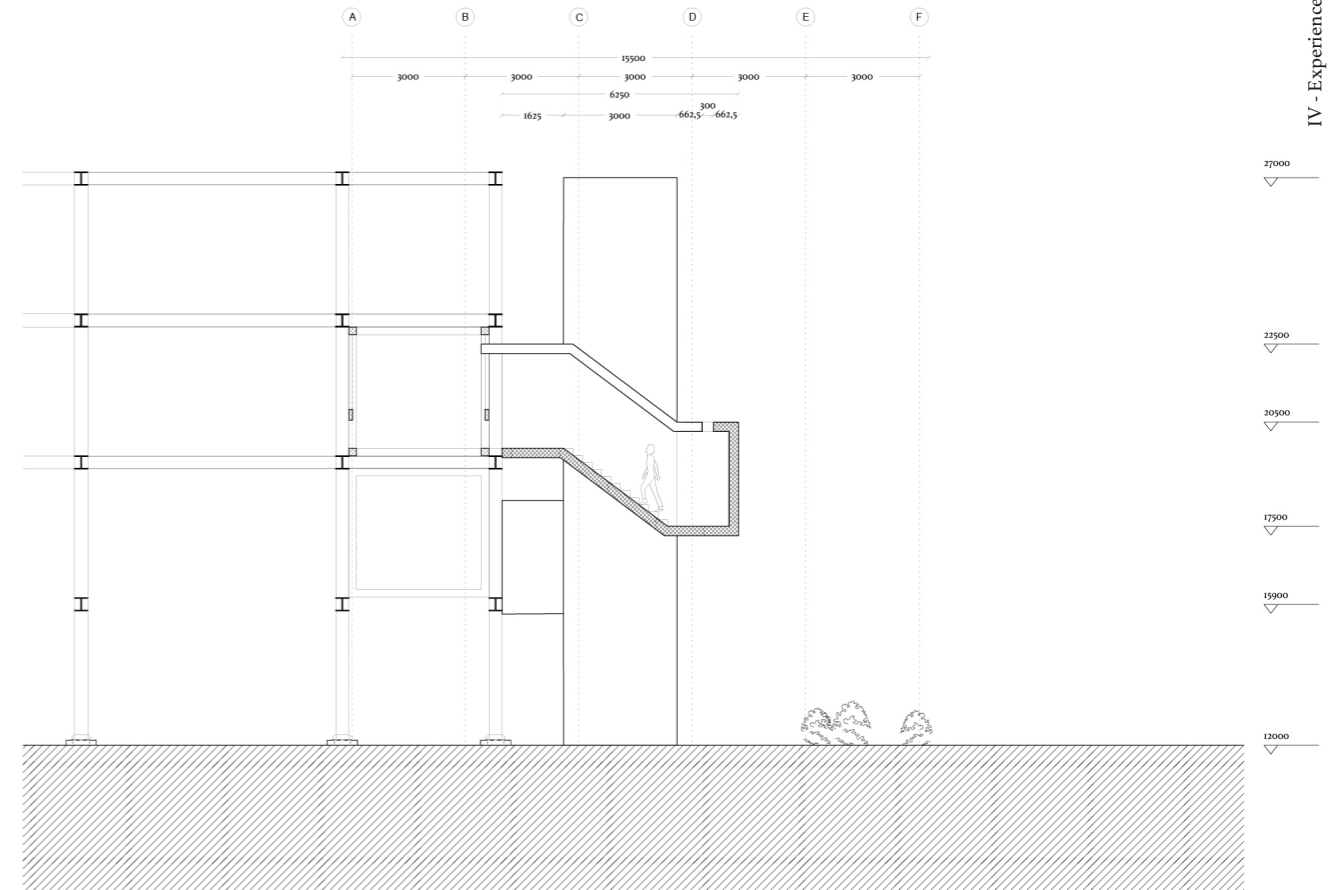


6 STAIRCASES

A set of stairs makes the project continue while covering height distance. A total of 4 staircases brings the visitor down 15 metres in total.

In turns, these staircases reveal and hide the view from the visitors' eye.

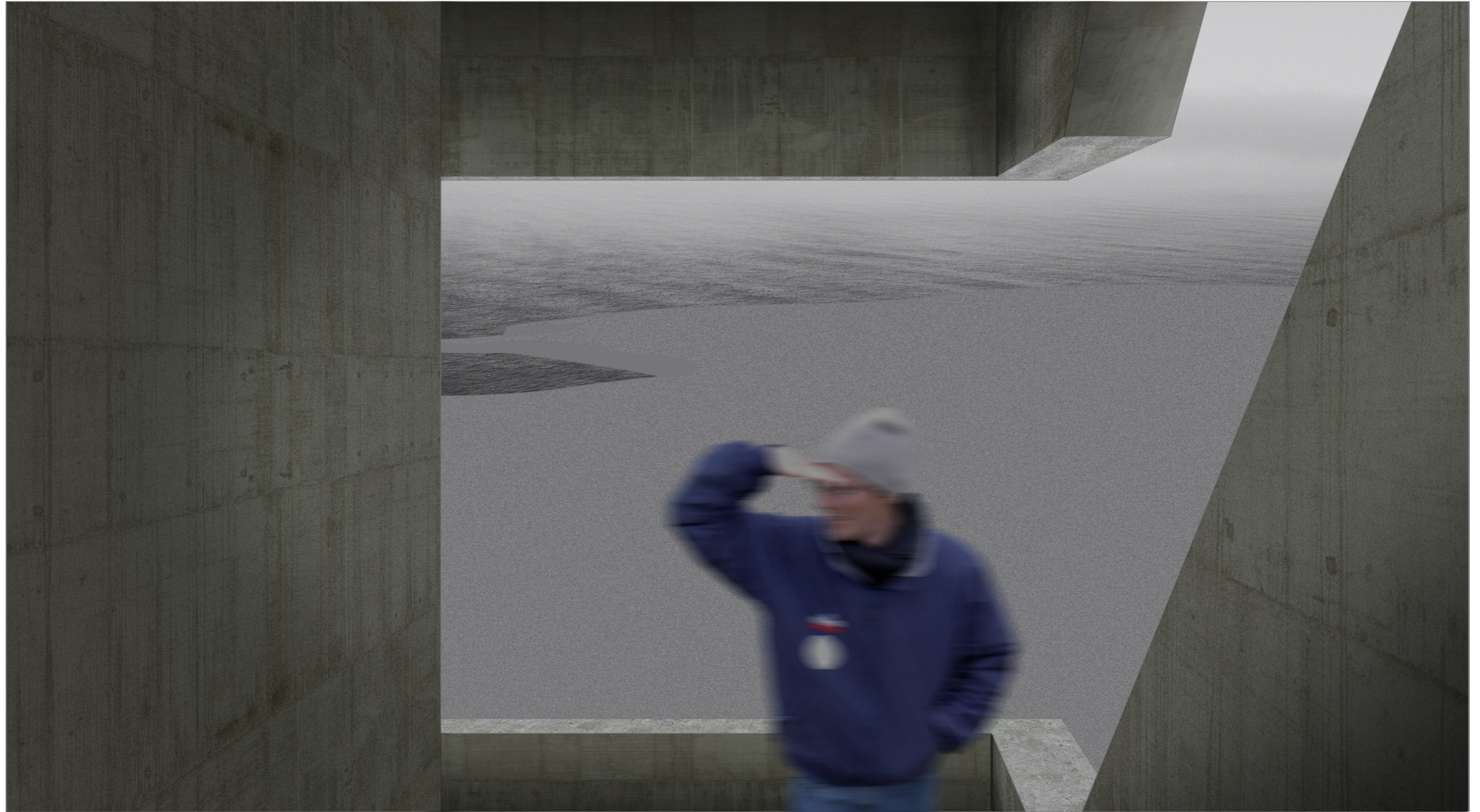
- 1: revealed - ending of industrial activities.
- 2: hidden - polluting CHP.
- 3: revealed - first views over the water on the route.
- 4: hidden - last polluting activities on site.





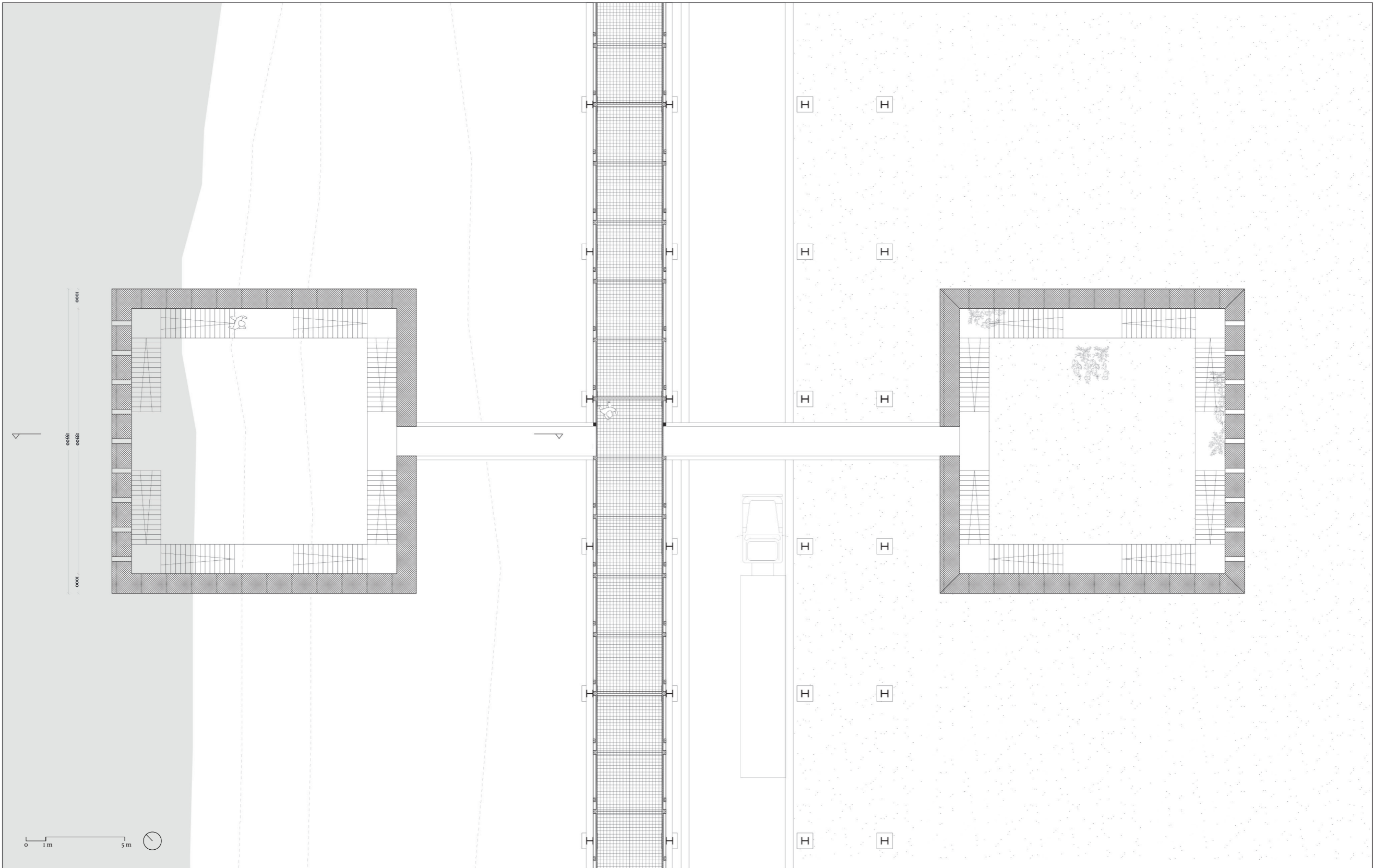
Staircase II + IV

The staircases that are closed only allow for light from above to enter. This way the visitor can still see.



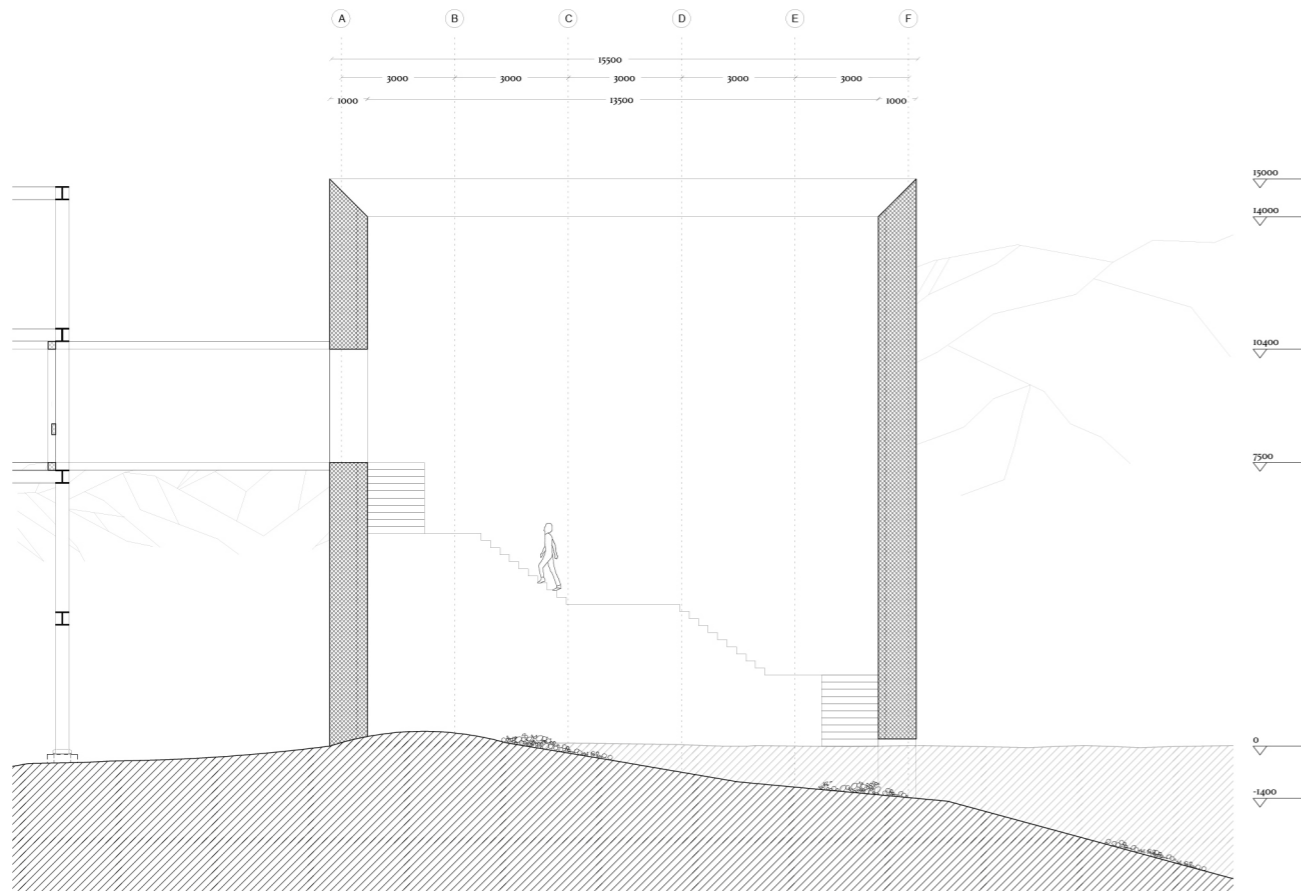
Staircase I + III

In staircase I and III views over 'positive' aspects of the site are provided. In the above image, water of the fjord can be seen for the first time in the project.



7 SAMPLE

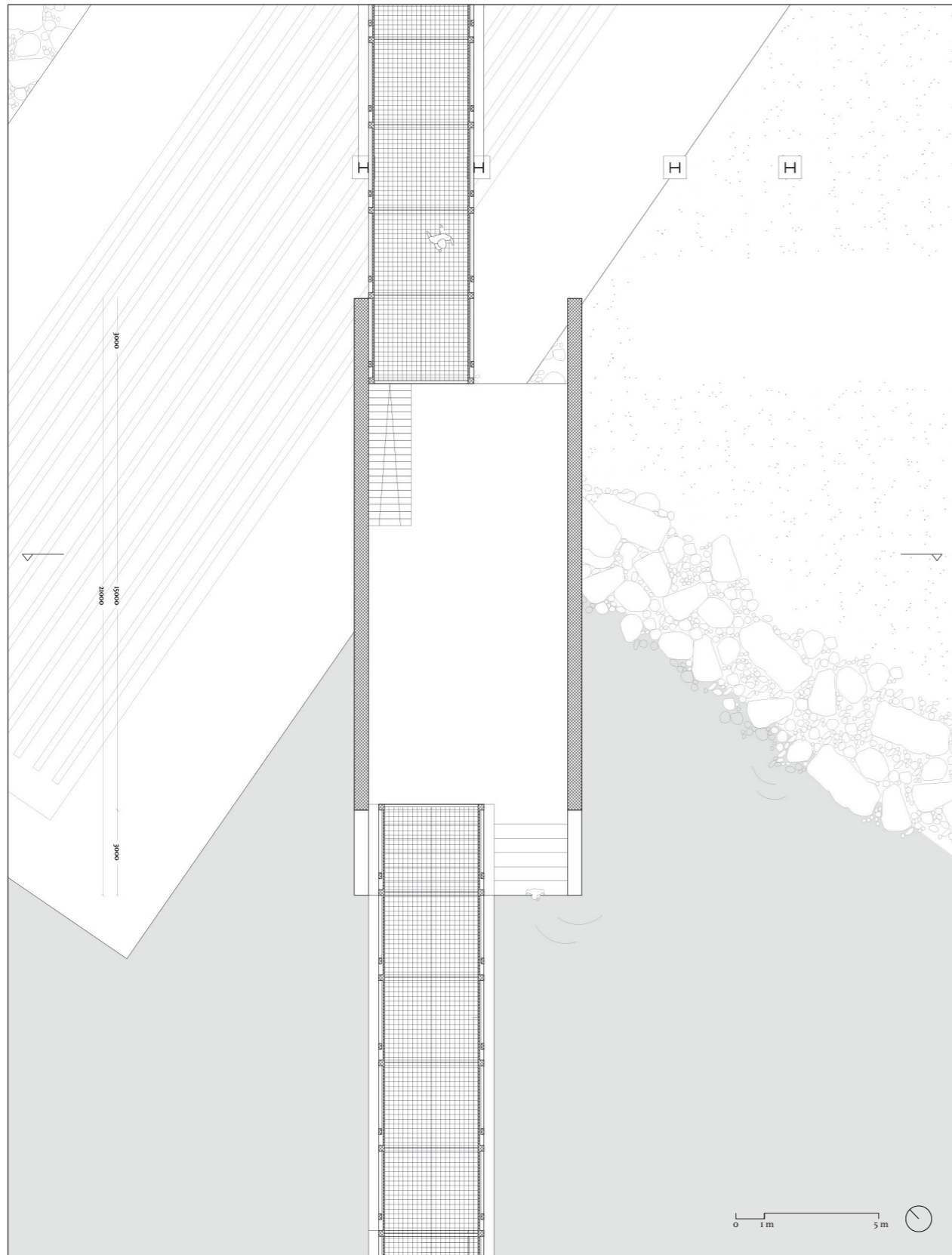
Towards the end of the line, the visitor will be able to closely experience two very different types of soil. On the West side of the line, a part of the reclaimed land is enclosed. On the Eastern part, the concrete slabs 'sample' an area where land and water meet. According to the tides the water has a certain height inside.





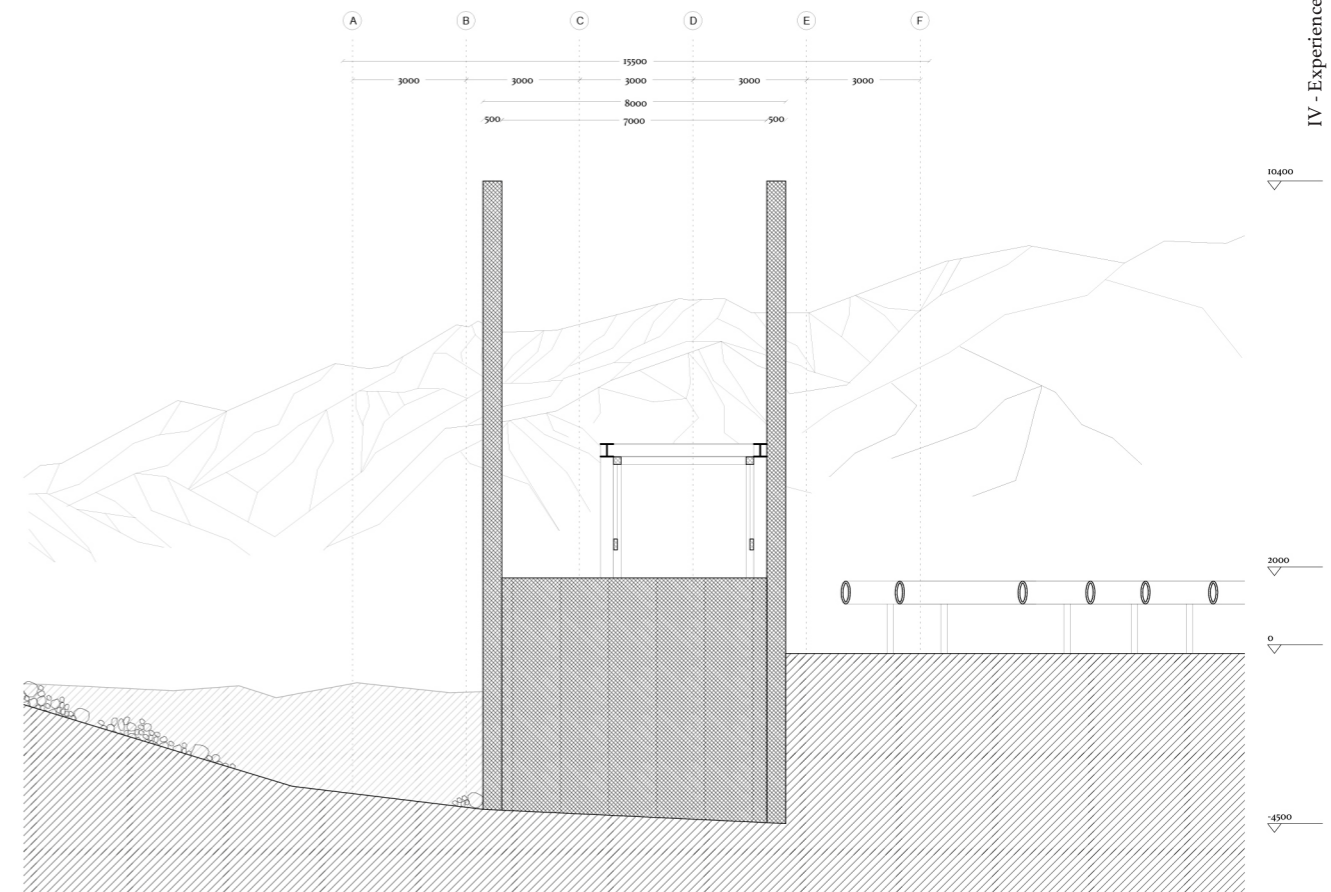
Sample II

The seventh node is an intervention where a contrast in its purest form can be experienced. The monolithic concrete wall, reaching to the sky, embraces a part of the land that has been reclaimed but is partially taken over by vegetation again.



8 BRIDGE

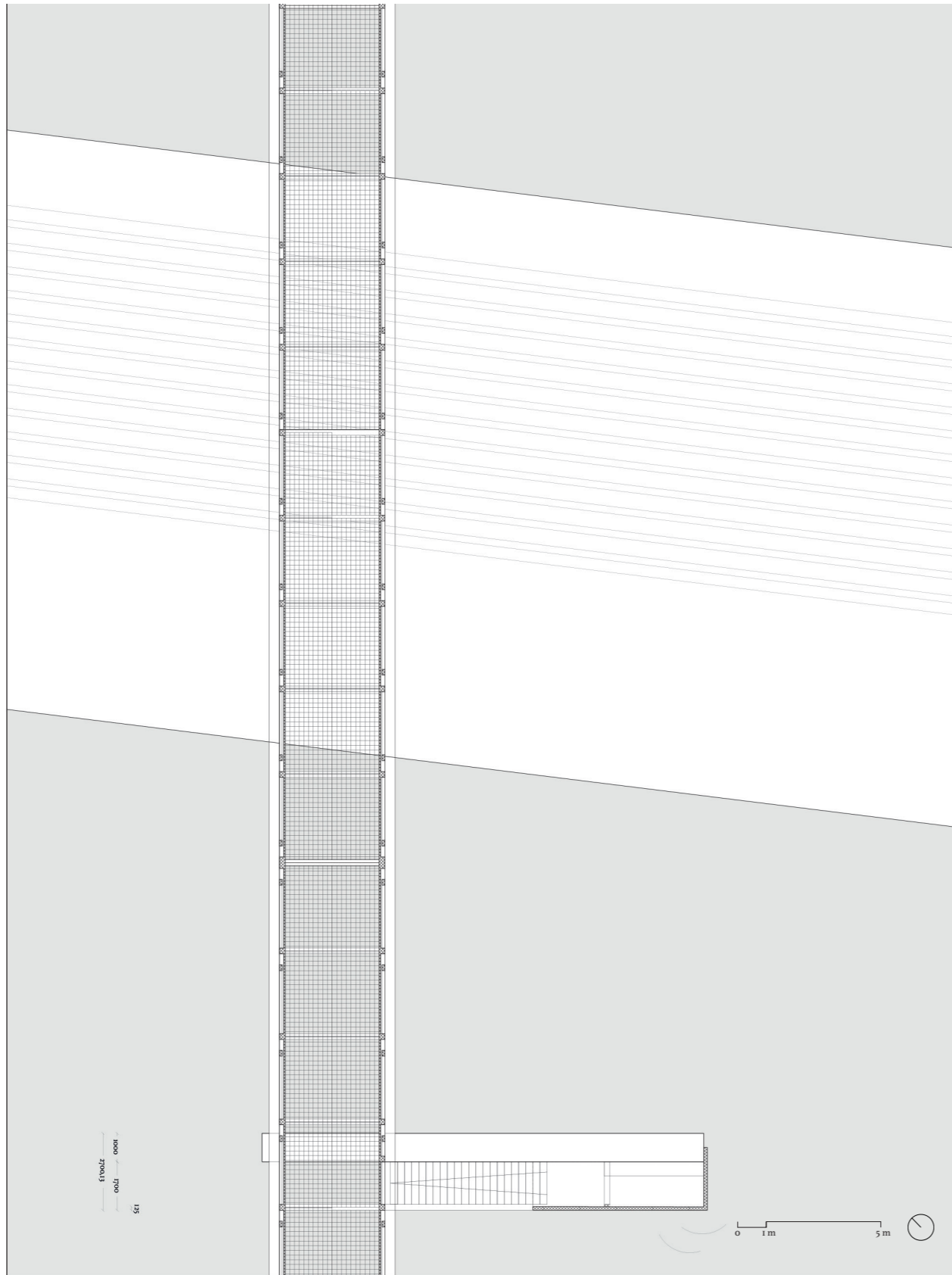
Node 8 consists of a block sided by two high walls. these walls both serve as support for the part of the module arriving from the refinery, as well as as basis for the bridge that crosses the water.





Start of the bridge

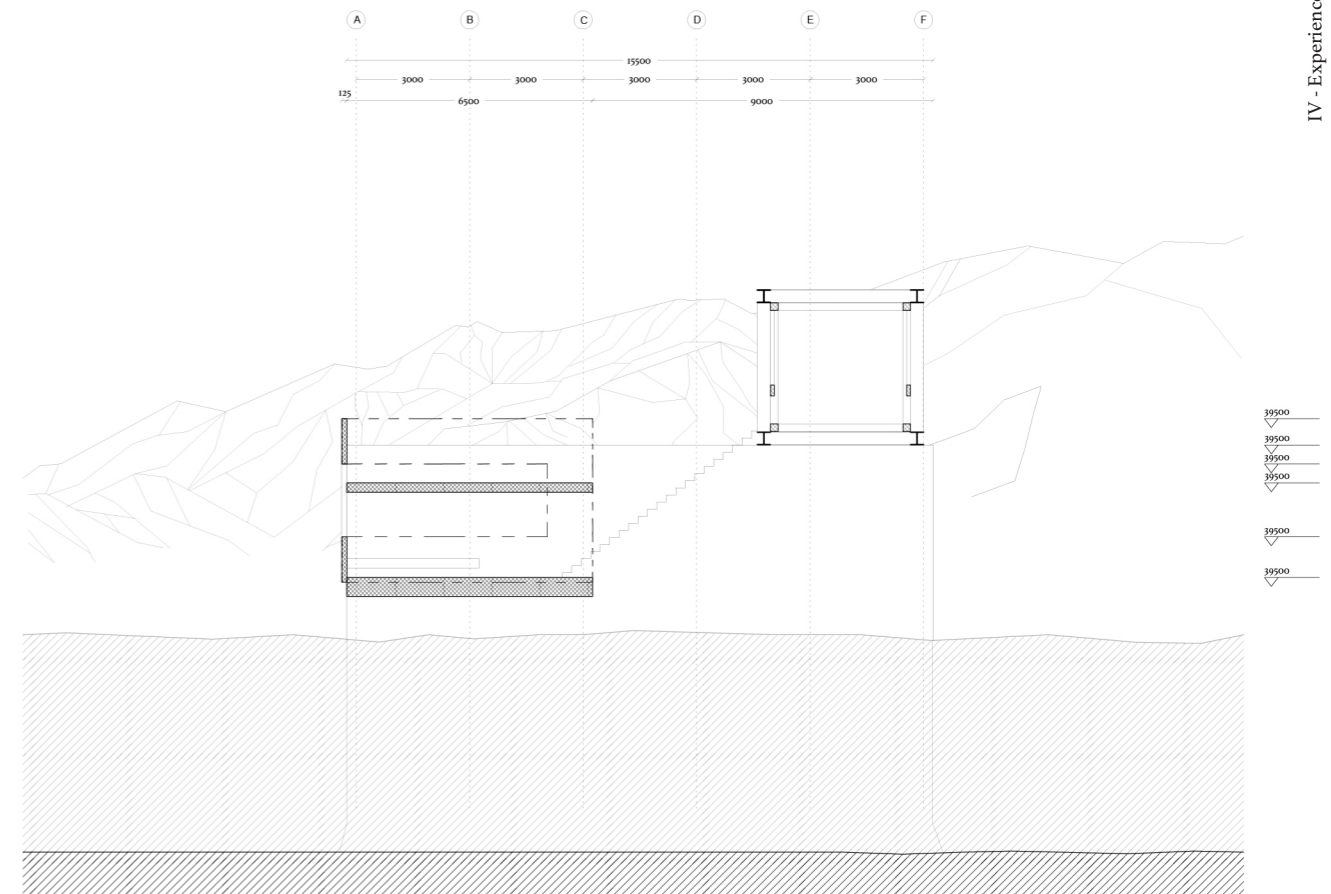
Before entering the bridge stretching over the water, the visitor's view is guided on to the beautiful landscape ahead. At the same time, the high walls framing this view, still give a strong sense of entrapment.



9 WALL II + III

The last concrete interventions carry the bridge. Besides this, they offer a shield towards one half of the surroundings, and reveal the other half.

This is done two times: the first time the visitor is forced to look back out on the refinery, and the second time only the beautiful, dramatic scenery of the Fensfjorden can be experienced





Wall II

Both walls can be descended to offer framed views. The second wall focusses the visitor's view towards the dramatic surrounding scenery.

The concrete, static wall and frame form a stark contrast with the natural, ever moving surroundings, subject to seasonal- and climatic change.