

ÄLVNUMMET 3

*Forming the new River Centre of Gothenburg
with previously used materials*



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Department of Architecture and Civil Engineering
Examiner: Mikael Ekegren
Supervisor: Björn Gross

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CHALMERS
UNIVERSITY OF TECHNOLOGY

Karin Gester, 2020
Chalmers University of Technology
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Master's Programme in Architecture and Urban Design
Building & Tectonics

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ABSTRACT

Älvrummet is a visitor’s centre with the purpose of informing and educating the people of Gothenburg about the urban development around the river Göta Älv. Although it is called Älvrummet, the exhibition has little to nothing to do with the river itself. Since 2018 Älvrummet has also been almost invisible to those who don’t know where to look for it, since it is hiding within an office building on Lindholmen.

This thesis presents a design proposal for a new building for Älvrummet, a solitaire building with a distinctive appearance that is available to more people - both those that seek for it and those that just happen to pass by. By making Älvrummet a floating building it can be moved along the river and dock to different places along the quay. This makes it more visible and accessi-

ble at the same time as it finally makes sense of its name.

Furthermore, this thesis explores the possibility of designing with previously used materials and suggests a design proposal that consists mainly of such. The architecture of the building aims to tell the story of the materials at the same time as the story of the materials helps to give the building a history already from the beginning.

The outcome of this thesis is a floating building made from almost only previously used materials that invites the people of Gothenburg to step out onto the river to learn more about the urban development, look at the view or just buy a cup of coffee. Either way, the architecture tells the story of the past, the present and the future of the muddy ditch we call Göta Älv.

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PERSONAL BACKGROUND

2018-2020	Chalmers University of Technology Master's programme in Architecture and Urban Design Material & Detail Studio Housing Inventions Studio Sustainable Building Competition Studio Wernstedt competition course From idea to existing building course
2019	Chalmers University of Technology Project commission Design for refurbishment of Betonghallen for Tracks learning environments
2017-2018	Bonava Sverige, Stockholm Architecture Internship Multifamily housing projects
2014-2017	Chalmers University of Technology Bachelor's programme in Architecture and Engineering

BACKGROUND & PURPOSE

The purpose of this thesis is to design a new building for Älvrummet using previously used materials.

The visitor centre Älvrummet works as a meeting place for information and education about the urban development around the river Göta Älv. The centre is run by Älvstranden Utveckling, the municipal company responsible for developing the area around the river - from ports and industrial areas to urban areas.

In 2007 Älvrummet opened for the first time on Kanaltorget with a 10 year temporary building permit. The building itself had a quite iconic visual appearance (see fig. 6) that many people could recognize. When the permit ended in 2018 Älvrummet moved to a space on the ground floor of the building Navet on Lindholmen and the exhibition was adapted to the new space.

The main subject of the exhibition in Älvrummet is a 60 m² physical model of Gothenburg in scale 1:400, which was first built in 1993 to be exhibited

in Vita Hallen and has since then been moved around and expanded gradually to become the size it is today.

In the current location of Navet, Älvrummet is not as visible as it was before, which leads to one of the reasons for this project: to design a new building for Älvrummet that is visible to the public.

The two topics of the project is to design a building that is visible and inviting to the public, and to design a building with previously used materials.

The main reason for the latter is environmental sustainability and the fact that the building- and construction sector emits 40 % of the world's greenhouse gases (källa). Because of these sustainability issues, reusing materials and finding materials through urban mining (källa) instead of getting brand new things all the time has become more and more popular. I therefore wanted to explore this subject and investigate how far I could take it.

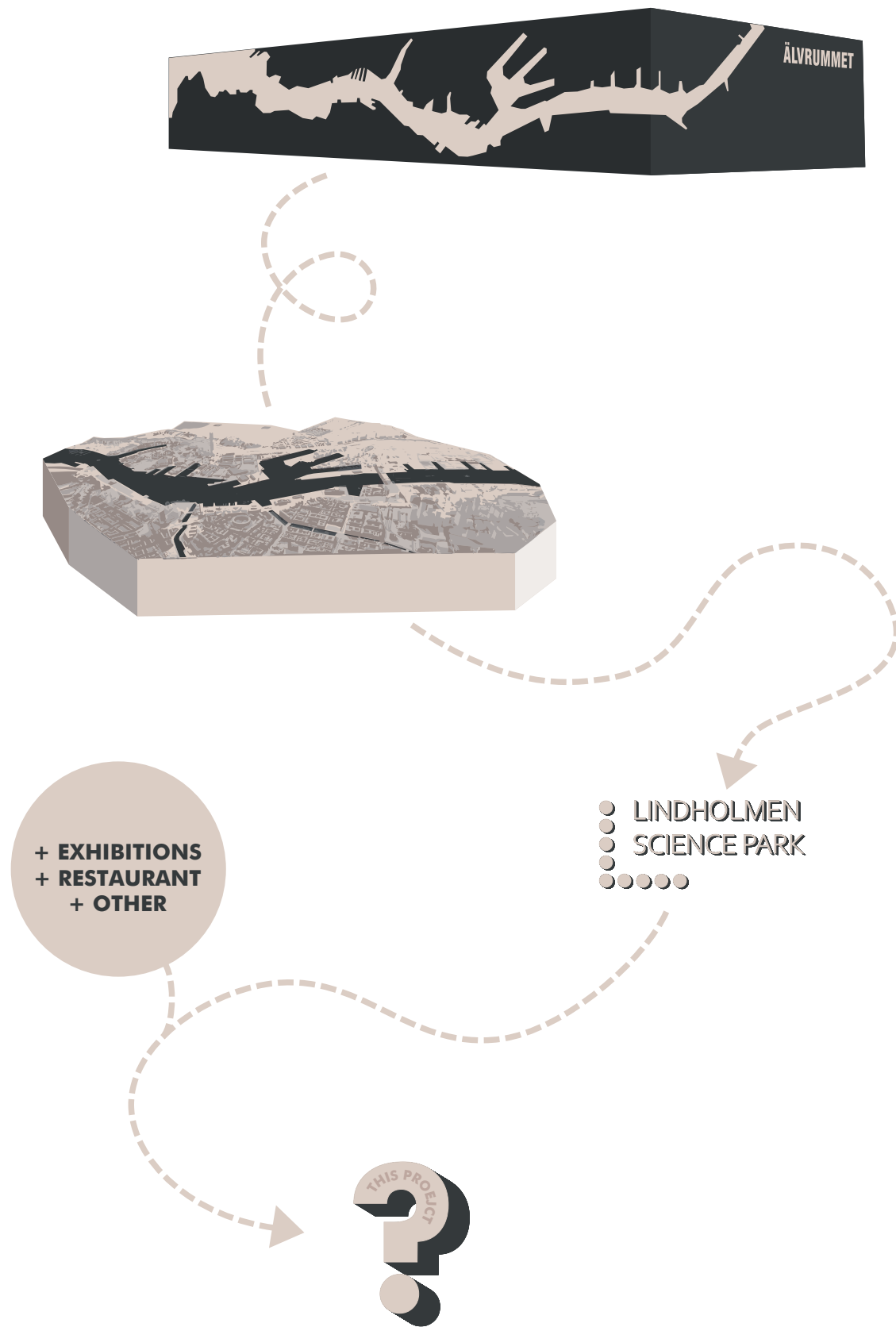


Figure 1. Illustration of the background of the project

THESIS QUESTIONS

How can designing with previously used materials inform and create a building for the public?

How can the historical and present character of the river be translated into a building for the public?

METHOD & DELIMITATIONS

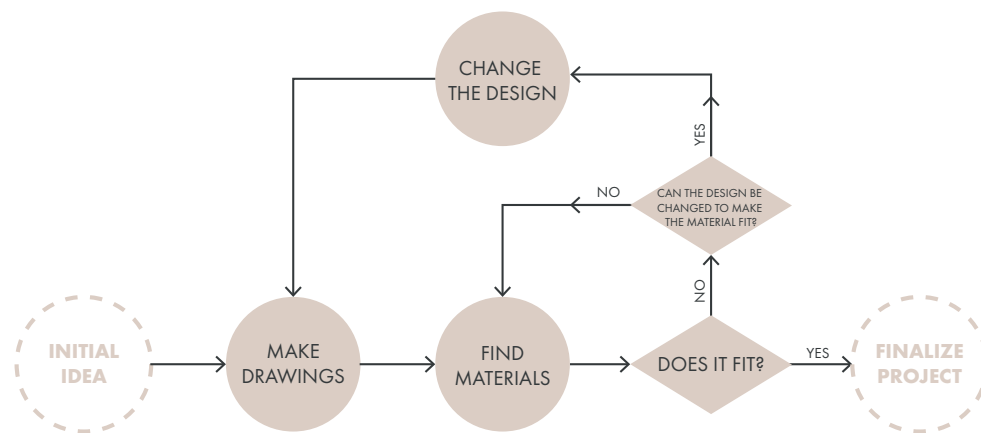


Figure 2. Flowchart for process of designing with previously used materials

Method

This thesis will be based on the concept of research by design. That means that research will be made through sketches, drawings and by evaluating and reflecting upon whether the sketched design answers the thesis questions.

To work with research by design, the most important method of this project is to sketch. Both in plan, section and in 3D with both digital and physical models. The outcome of the project, however, does not include much of the sketching process. The process has although led to the decisions that were made in the final design, which makes the process a part of the project.

Since this project deals with designing with previously used materials, the process of sketching is a bit special. The process has been to first sketch roughly, then find materials that as closely as possible fits into that, then change the sketches and drawings to fit those exact materials. Then when looking for other materials, changing the design and the

drawings again to fit those, and so on. This iterative process is also explained in Figure 2.

Delimitations

This project works with the concept of reused (or previously used) materials to the farthest extent possible within the time of the project and the availability of the materials. The materials specified in the project are such that are for sale or are part of buildings that will be demolished or refurbished. Whether they otherwise (if not used for this building) would become waste or not is not of importance.

The collection of materials is done simultaneously with the sketching and designing. This is so that what materials to look for is clear, but also so that the design can be customised to fit the exact materials found. If this project was to be built in reality, a storage space would be necessary so that the found materials could be bought and stored until they were to be used.

READING INSTRUCTIONS

This booklet is divided into five parts; 01. Introduction, 02. Theory & discourse, 03. Context, 04. Design proposal and 05. Conclusion. It is organised so that it is possible to look at and understand the design proposal without reading the other chapters. However, to get a deeper understanding of the discourse of the project, reading the second and third chapter is recommended. The first three chapters are best understood if read from beginning to end, while the design proposal chapter can be peeked at wherever. The proposal is a floating building that can be moved around and is depicted at different sites in the drawings.

GLOSSARY

Reuse	To reuse material and parts for another purpose than the original.
Recycling	Breaking down material or parts to it's raw materials to manufacture new products.
Urban mining	Finding metals (and other materials) in the built environment instead of (as traditionally done) from mines.
GHG	Greenhouse gases, including carbon dioxide (CO ₂), methane (CH ₄), halogens (F, Cl, Br, I, At) and nitrous oxide (N ₂ O).
Virgin materials	New materials.

REUSING MATERIALS

Reusing materials, or ‘återbruk’ as it’s called in Swedish, is a term that has been used in the Swedish language since 1972 (Svensk ordbok, 2009) but the concept of using things and materials again and again is something that people have done for many centuries (Waste Management: Reuse, 2020). According to Swedish law (Miljöbalken 2 chapter. 5 § and 15 chapter. 10 §) energy and resources should be economised by reducing waste, reusing material, recycling material and recycling energy before going to waste, in that order.

According to SCB, the emissions of green house gases from the construction and real estate sector stood for 19 % of the total emissions in Sweden 2017, and has only increased since (Åfreds, 2020). To be able to reduce the emissions, using previously used materials instead of virgin materials could be done in a bigger scale than it is today.

There probably isn’t enough materials to reuse to accommodate for all the new buildings and infrastructure projects that are going to be built, but to the furthest extent reused materials should and could be used. In every case of a new construction architects, engineers and developers should start by looking for materials that already exist,

before using virgin ones.

Reusing materials can be done in different scales, where reusing entire buildings and/or structures saves the most energy, followed by moving structural elements to a new construction site or disassembling structure and other parts to use in different new buildings comes as second and third options.

Therefore, when planning for a new building where there was none before, finding a structure that can be moved there as a whole or finding pieces that can assembled together to become a structure is the way to go. One could look at it as if instead of just picking or ordering material from manufacturers, they should look for them within the existing stock; in buildings that are going to be demolished, in recycling centres and what hopefully will become more and more common in the future: re-purposing stores that collect materials from old buildings.

There is also another big advantage of reusing materials - the building will have a history already when it’s brand new. There will be a history in the walls of the building, something to look at, talk about and learn from that doesn’t come with buildngs made with virgin materials.

REUSING VS. RECYCLING



Reusing and recycling construction materials both save energy compared to manufacturing new materials, but reusing saves in average 60 % more GHG emissions than to recycling, depending on the material (Gorgolewski, 2018).

Figure 3. Illustration of the EU waste hierarchy.

CIRCULAR DESIGN

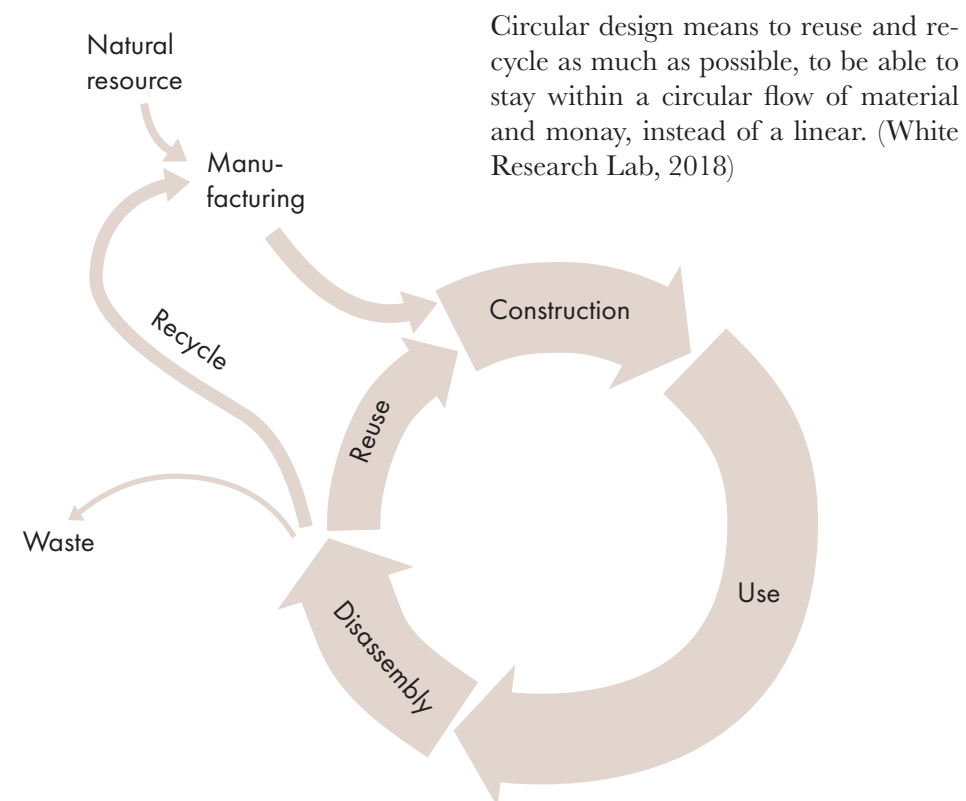


Figure 4. Illustration of circular design

WHAT IS MORE SUSTAINABLE?

The main reason to use previously used materials is to minimize the environmental impact that the building has. But there are other approaches to and concepts for decreasing the environmental impact of a building. The five following points are common approaches.

1. Using material with the smallest environmental impact.
2. Using non-toxic and sustainable materials.
3. Using clean energy on the construction site.
4. Minimize the energy need for operating the building.
5. Creating robust architecture that can stand for a long time and accommodate different functions through time.

This project will mainly focus on the first and fifth approach, but the second and fourth are also somewhat consid-

ered. The third point is something that is out of the hands of an architect and will therefore not be included in this project. However, if this was a real project that was to be built, using clean energy to transport and construct should be of high importance to the developer.

All of the previously mentioned approaches to create a sustainable building are however not only applicable in one way. There is not one solution or one option but different aspects has to be weighted against each other. For example, when looking for reused materials it's possible that some can only be found quite far away from the building's site. Then the impact of the transport to get the materials has to be weighted against the impact of manufacturing new materials. This is quite hard to do accurately enough within the frame of this project, so there will only be rough estimates for the chosen materials.

REUSING SKETCHING MATERIALS

Throughout the process of this project, stationary materials for sketching, building models and presenting have all been reused.

The sketch book and all printed material for supervisions has been made by using the back sides of printer papers that were thrown in the recycling bins at Chalmers.

Physical models were built with card-

board from old boxes and small bits that were left in the trash in the Architecture workshop.

The presentations of the project has been made digitally and no paper or other materials has been needed for that.

This booklet is the only thing that is not printed on reused paper, but on recycled.

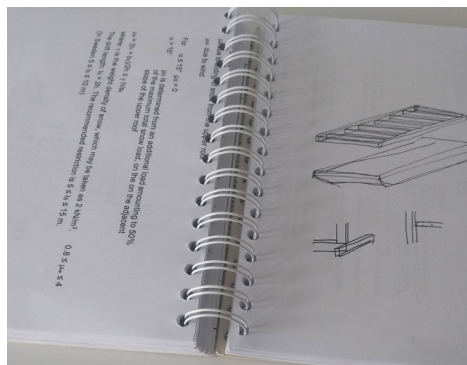


Figure 5. Sketch book made from reused paper

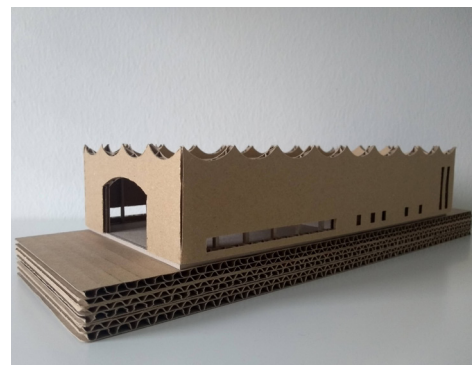


Figure 6. Early model of the building made from reused cardboard



Figure 7. Print outs of reference projects on reused paper

03. CONTEXT

THE PURPOSE OF ÄLVNUMMET



Figure 8. Älvrummet modell översikt. (Älvrummet, 2019a). Used with permission.

The visitor centre Älvrummet works as a meeting place for information and education about the urban development around the river Göta Älv. The centre is run by Älvstranden Utveckling, the municipal company responsible for developing the area around the river - from ports and industry to urban areas.

In 2007 Älvrummet opened for the first time on Kanaltorget with a 10 year temporary building permit. The building itself had a quite iconic visual appearance (see fig. 6) that many people could recognize. When the permit ended in 2018 Älvrummet moved to a space on the ground floor of the building Navet on Lindholmen and the exhibition was adapted to the new space.

The main subject of the exhibition in Älvrummet is a 60 m² physical model of Gothenburg in scale 1:400, which was

first built in 1993 to be exhibited in Vita Hallen and has since then been moved around and expanded gradually to become the size it is today.

The future for Älvrummet is uncertain, at least in the long run. As long as the areas along the river are being developed, which is estimated to be done in around 2050, the centre will have the same function as it has today. After that, however, Älvstranden Utveckling will no longer exist and the model will no longer serve the same purpose. In 30 years, a physical model might not be as relevant as a medium to exhibit a city and its development, but it might be a nice way to exhibit history. If the model will still be in Älvrummet or somewhere else, the building could still be used for a similar or totally different purpose.

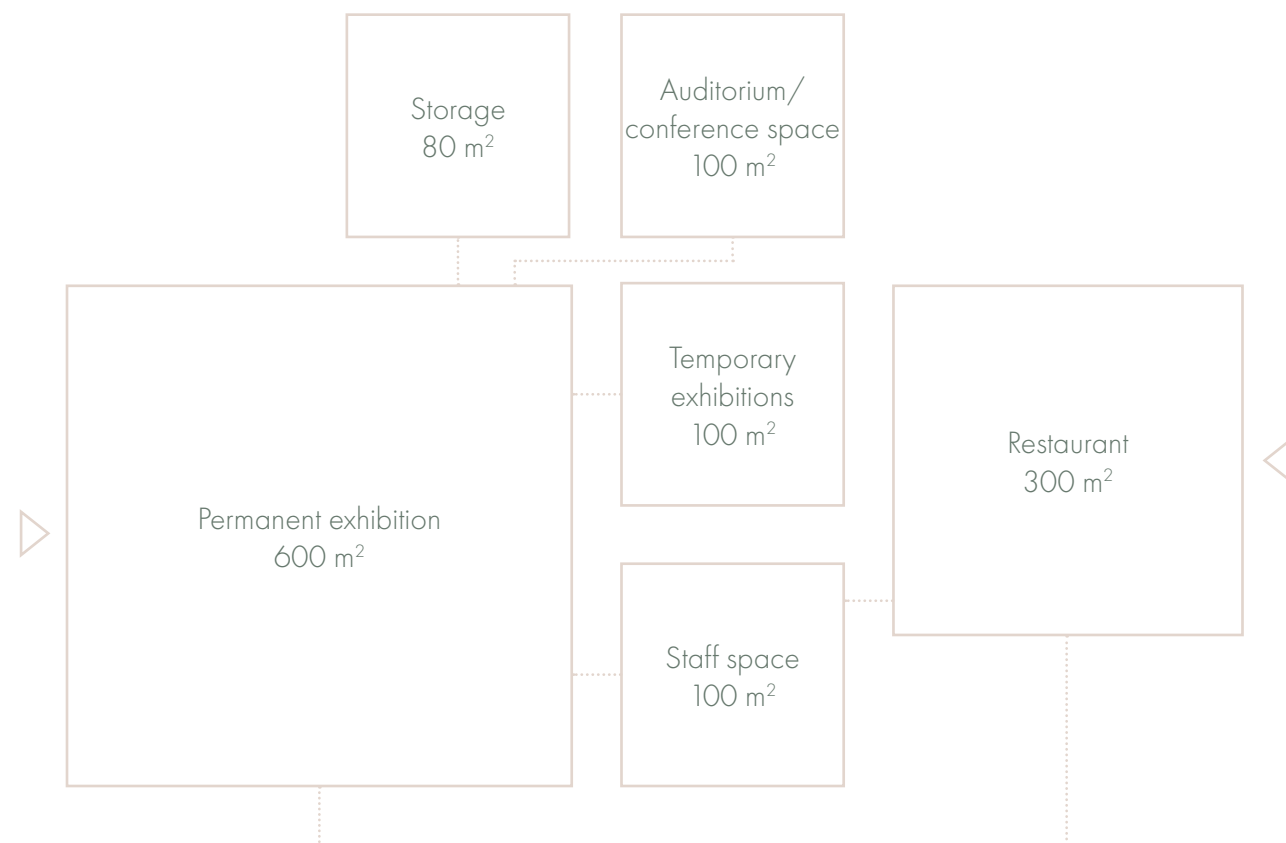


Figure 9. Älvrummet exteriör. (Älvstranden Utveckling, 2017). CC-BY.



Figure 10. Älvrummet modell översikt 3. (Älvrummet, 2019b). Used with permission.

SPACE PROGRAM



AVAILABILITY & ACCESSIBILITY

As almost all businesses and activities, Älvrummet would gain from being situated in a prime location where many people walk by, is easy to reach and has a big exposure. The first building on Kanaltorget (see fig 6) had quite a lot of exposure as people that came over Göta Älvbron saw it very clearly. Although not many people walked down by Kanaltorget, but almost everyone in Gothenburg knew what it was and where it was.

The current location is almost the opposite. It's not very visible, either from up close or far away, but a lot of people pass by it. This has its downsides too, though. When there are guided tours or lectures in Älvrummet, they can be disturbed by the other activities going on around or people crossing the room to get to Pressbyrån.

The goal with this project is to make a

building for Älvrummet that is both visible and accessible. It also has to be near the river and preferably have a view of the other side of the river somehow.

The struggle with placing it near the river is that it doesn't get very many people passing by as the river area is quite undeveloped today. The two most visited places close to the river are probably Lindholmen and Stenpiren, so those are good options.

Making a floating building that can be moved to different locations along the river would make the building both more visible to more people and more accessible as it's closer to more people (in turns). It would also make a lot of sense to have the river centre on the actual river.

See the site analysis in figure x for the three chosen places that live up to (almost) all the requirements.

GÖTA ÄLV



Figure 11. Site plan of Göta Älv, 1:40 000

Göta Älv runs from lake Vänern and out in Gothenburg into the Kattegat sea. The area along the river in central Gothenburg has long been only industry and home of the Gothenburg Port, which has divided the city. In recent years the shipping business that is still going on has been moved to the out-

er port (outside of Älvsborgsbron) and most of the industries are no longer in business. Both river banks are now under development to become vivid urban areas and different places have come different far in that development. Most of the length along the banks is still very undeveloped and quite empty.



Figure 12. Göta Älv, Göteborg. (Jönsson, 2017). CC-BY.



Figure 13. Götaverken. (Älvstranden Utveckling, 2019). CC-BY.

JUBILEUMSPARKEN



Figure 14. Allmänna bastun. (Törnros, 2019). Used with permission.

Jubileumsparken is a park both on land and in the water in Frihamnen. It's built to celebrate the 400th jubilee of Gothenburg in 2021, but the park started construction already in 2014 in a small scale and is right now (2020) undergoing big changes, expanding both in the water and on land. The most prominent

feature of the park is the common sauna (see fig. 11) designed by Raumlaborberlin. It uses reused corrugated steel sheets for the facade, and it's built on an existing dolphin that was used to anchor ships back in the days. There are also changing rooms, a green house and a cafe that are made with reused materials as well.

THE PREVIOUSLY USED MATERIALS

Most of the materials used in Älvrummet will be previously used. Following is a library of the materials. The biggest source of materials is the office building

Kromet 1 in Gothenburg that is going to be torn down. The other materials are sourced from other demolished buildings or via online listings.

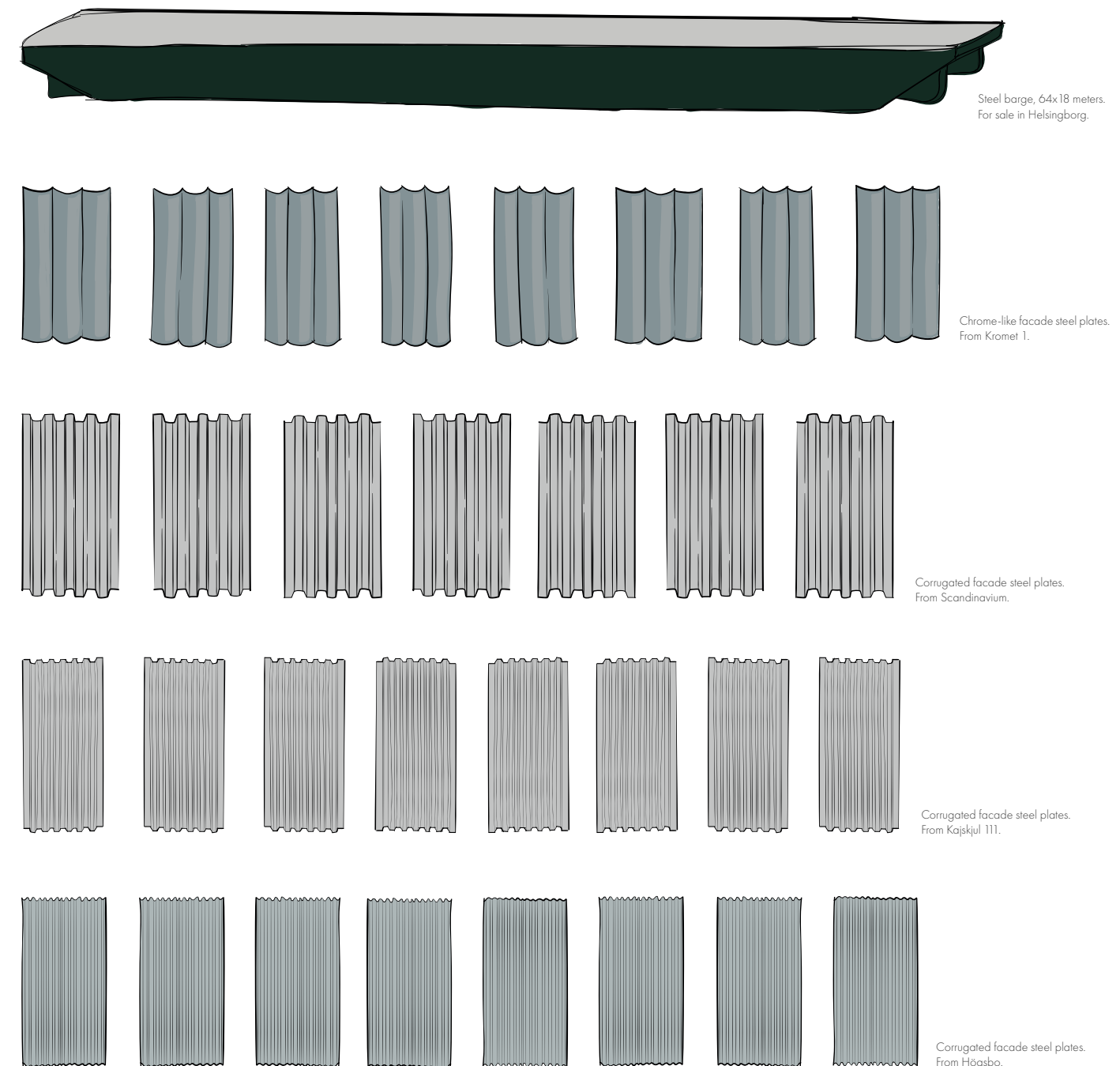
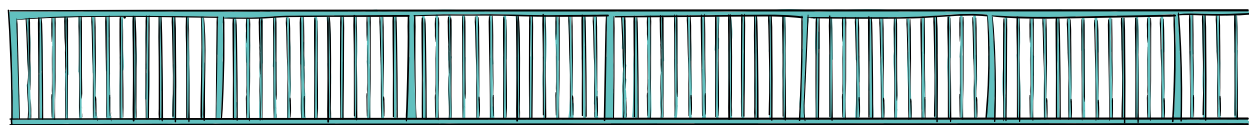


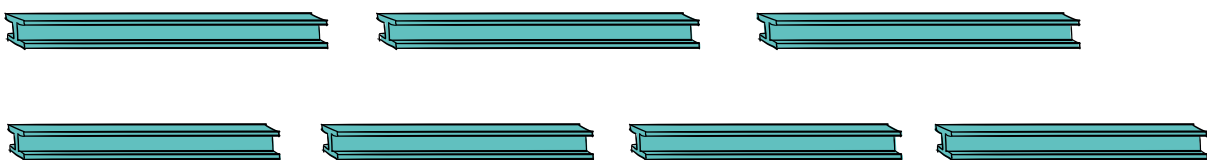
Figure 15. Material library



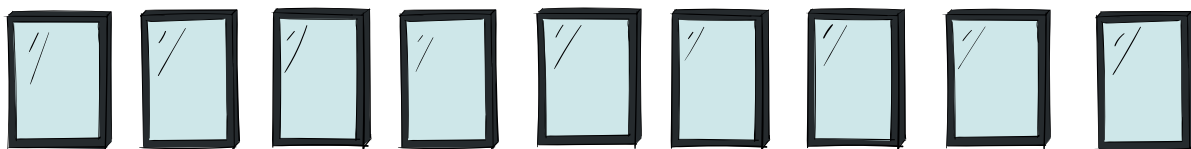
Trapezoidal roof steel plates.
From Högabo.



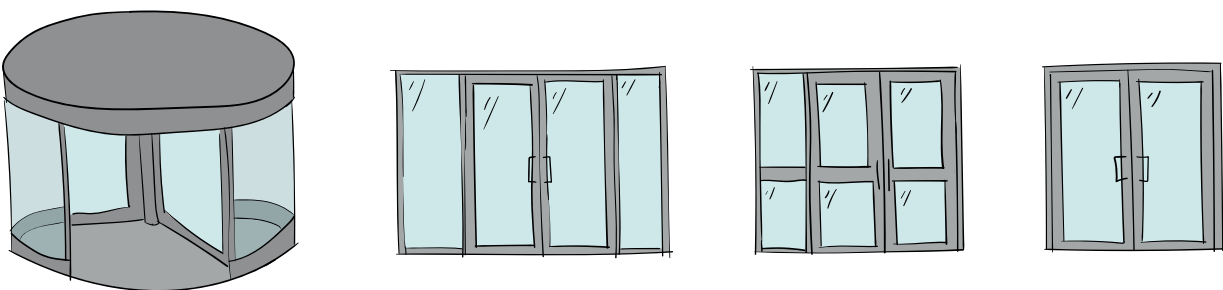
Railing.
From Göta Älvbron.



H-beams.
From Göta Älvbron.



Windows.
From Kromet 1.

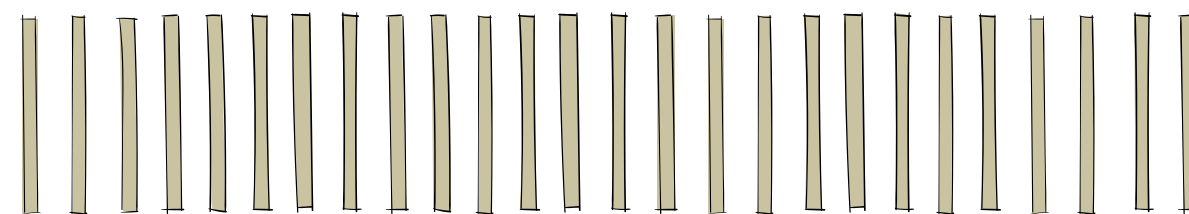


Various glass doors.
From office building in
Stockholm.

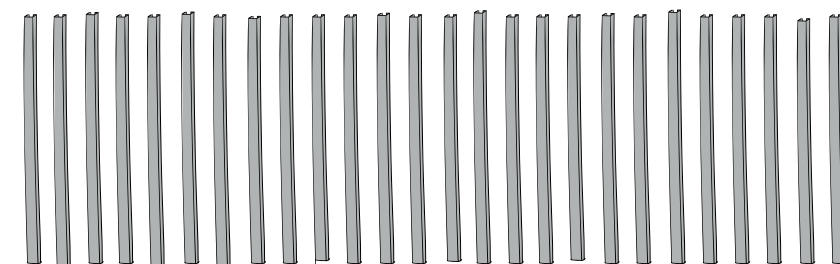


Carpet.
From Kromet 1.

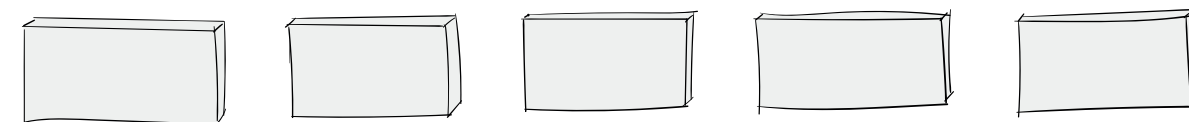
Figure 15. Material library



Wood planks, different dimensions.
Cut down to lengths of 1200 mm.
From various places, including from
single use pallets.



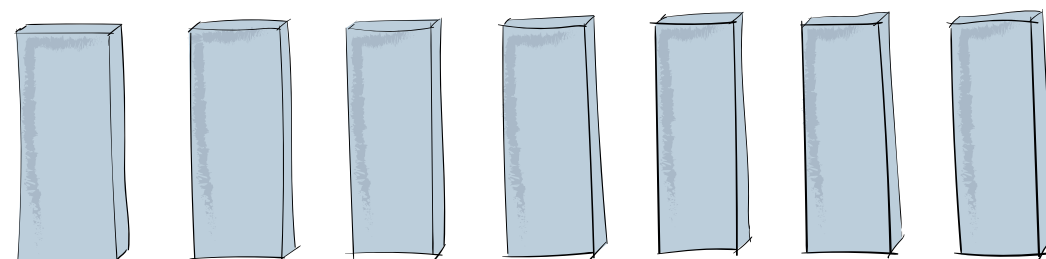
Steel pillars for interior walls.
From Kromet 1.



EPS insulation.
From Älvängen.



Loose wool insulation,
made from old textiles.



Insulation batts,
made from old textiles.

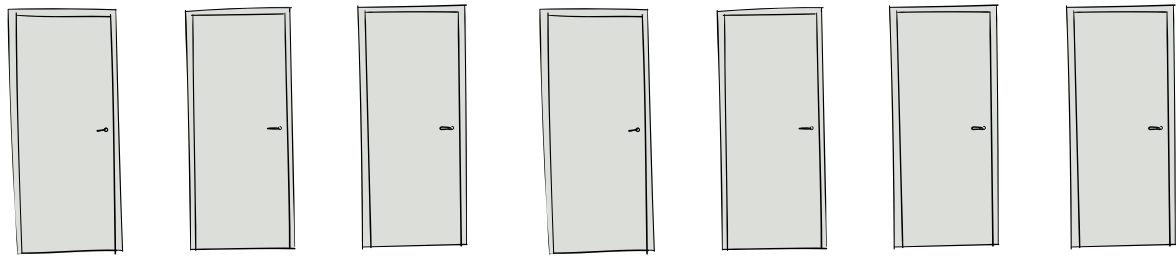


Ventilation fittings.
From Kromet 1.

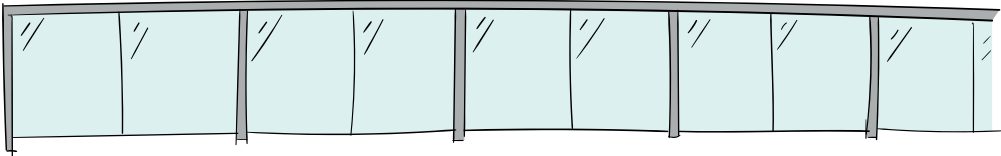


Electrical fittings.
From Kromet 1.

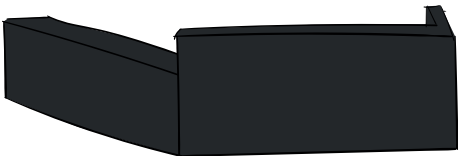
Figure 15. Material library



Interior doors.
From Kromet 1.



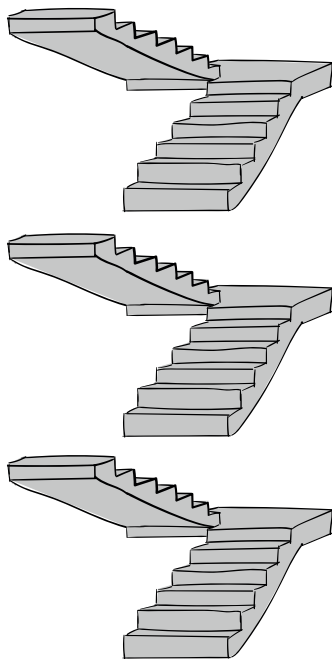
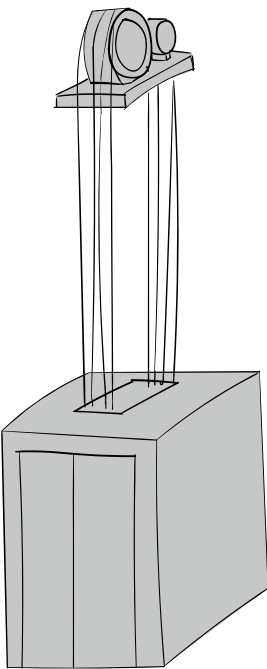
Glass railing.
From Högsbo.



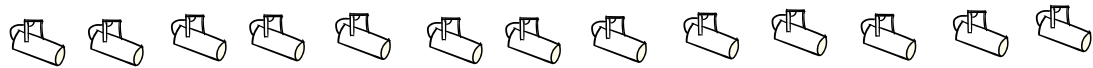
Reception desk.
From Älvrummet on Lindholmen.



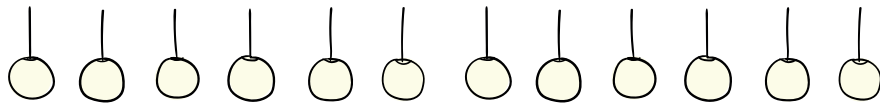
Plywood wall cladding.
From Älvrummet on Lindholmen.



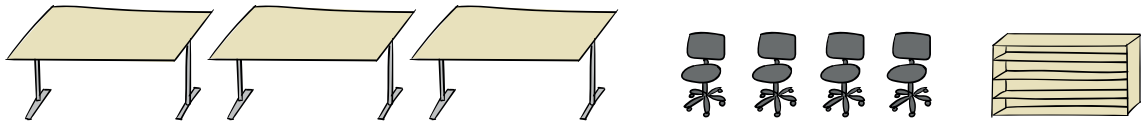
Elevator and stairs.
From Kromet 1.



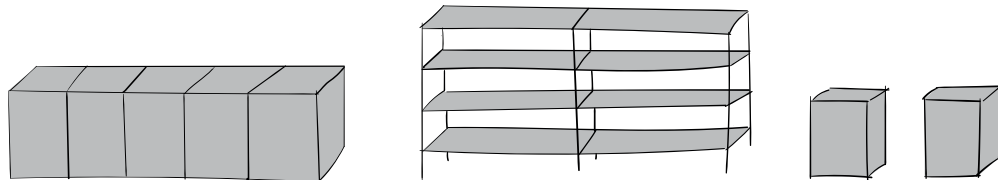
Spotlights.
From Stockholm.



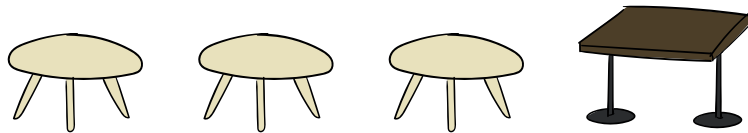
Pendant lights.
From Stockholm.



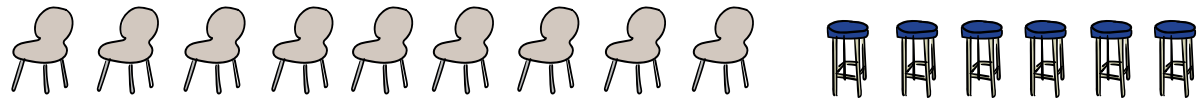
Office furniture.
From Kromet 1.



Restaurant kitchen.
From Malmö.



Restaurant tables.
From Borås.



Restaurant chairs.
From Stockholm.

Figure 15. Material library

Figure 15. Material library

BUILT REFERENCES



Figure 16. Arctia HQ. (Huisman, 2013). Used with permission.

Arctia Headquarters, Helsinki
K2S Architects, 2013

Office building for Finnish icebreaker company Arctia. A floating building situated in the port of the companies icebreakers. The building is floating in a concrete pontoon and is not made to be moved, so the bridges to the pontoon are permanently secured to the quay. This, together with the very distinct volume of the building gives it a very sleek look.



Figure 16. Hub 67. (Tate, 2015). Used with permission.

Hub 67, London
LYN Atelier, 2014

Hub 67 is a community centre built to last three to five years, but is still standing. It was made of 80 % reused material from the 2012 London Olympics. The structure is made from metal frames from cabins that were used as changing rooms during the games. Extra insulation, more windows and another facade was added, also made from parts from the games. The local community made some parts of the interior together to make the building sympathetic but also to enrich the area. (LYN Atelier, 2016)

CONCEPTS

Concept: Previously used materials

The building will consist mainly of previously used (reused) materials. Many of them comes from around

Gothenburg and will be recognizable to the public.

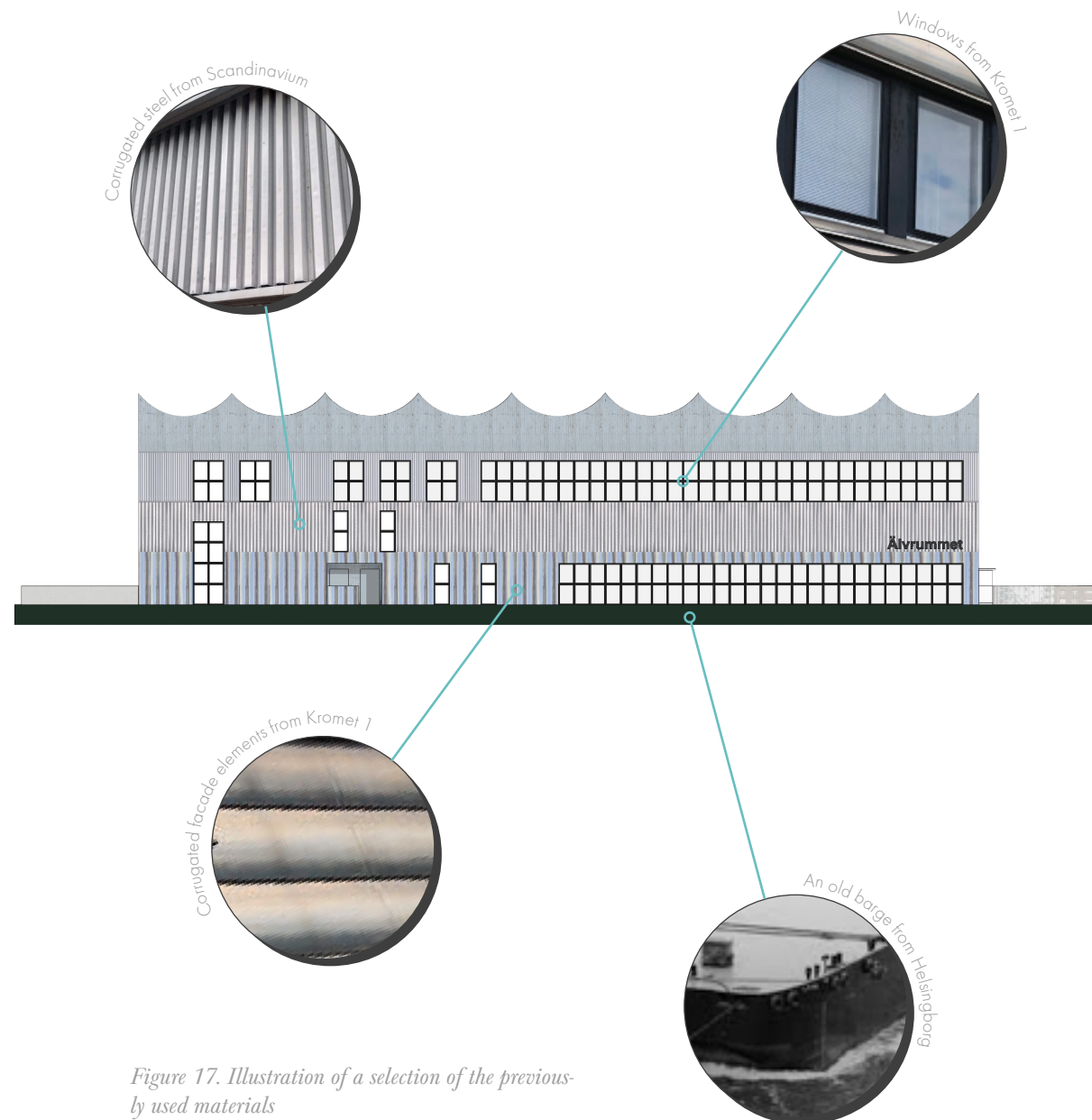


Figure 17. Illustration of a selection of the previously used materials

Concept: Floating and moving around

The building will be floating on the river and can be moved around on the river. It will have three main places that it will visit regularly, Jubileumsparken

being the “home port” and the two other places hosting Älvrummet for a couple of weeks or a month at a time.



Figure 18. Illustration of concept: moving the building between the sites.



POSSIBLE SITES

-  Public transport hub (/many people passing by)
-  Älvsnaabben (public transport ferry)
-  Calm water
-  Wavy water
-  Unavailable water (due to bridges or shallowness)

The three main factors in choosing sites for Älvrummet are that the water is calm, Älvsnaabben passes by and there is already a lot of people there.

The chosen sites are therefore Jubileumsparken (1), Lindholmen (2) and Stora Bommen (3). Although Jubileumsparken does not have Älvsnaabben passing by, it's still chosen because of the fact that the concept of both the building and the exhibition is the same as of the park (reused materials and urban development), there are a lot of people there already and in the future when Frihamnen is more developed, Älvsnaabben will have a stop there.

Figure 19. Site plan for choosing sites, 1:15 000.



SUGGESTED SITES

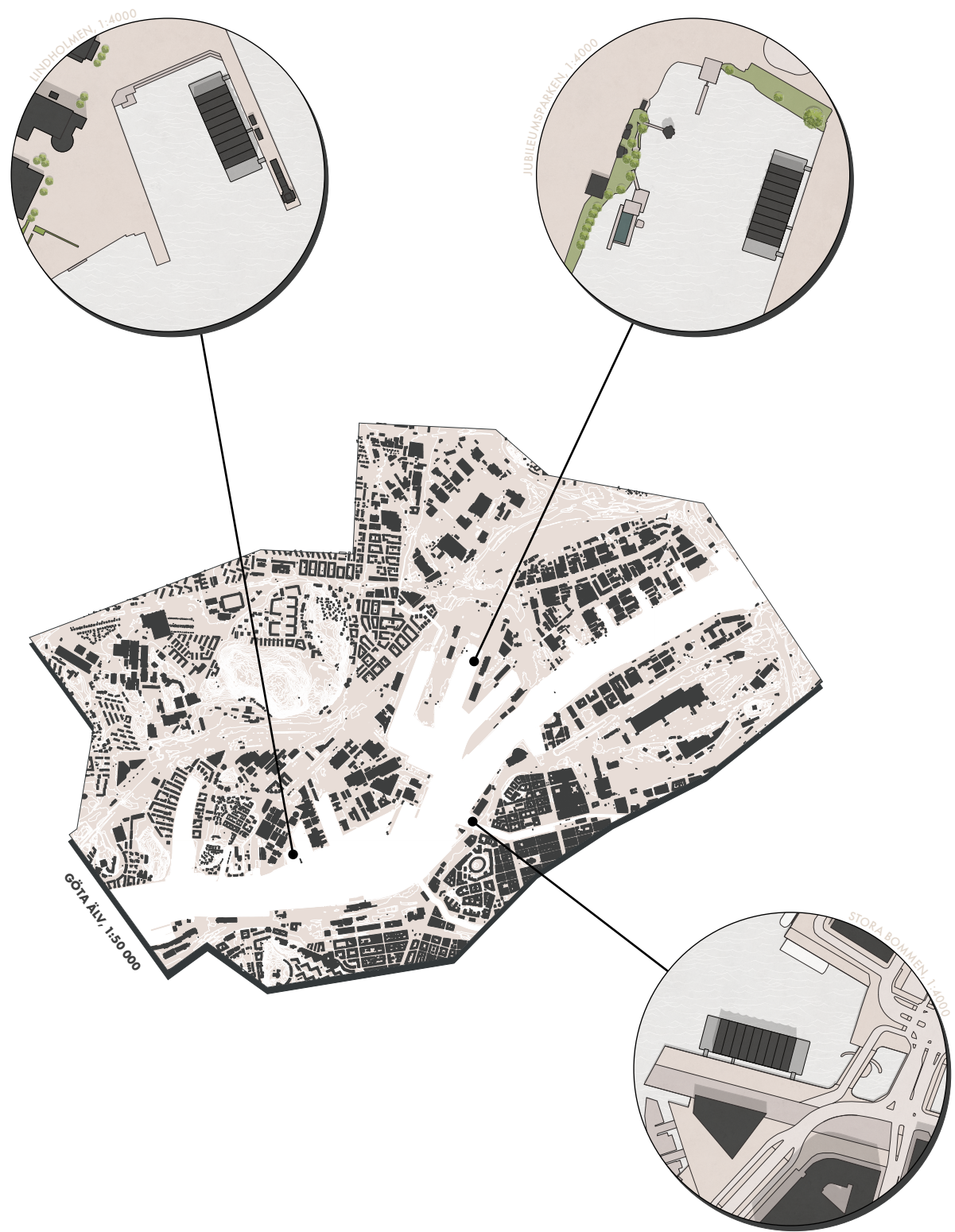


Figure 20. The three proposed sites in relation to the river Göta Älv

SITE MODEL



Figure 21. Site model in scale 1:10000 with Älvrummet in Jubileumsparken

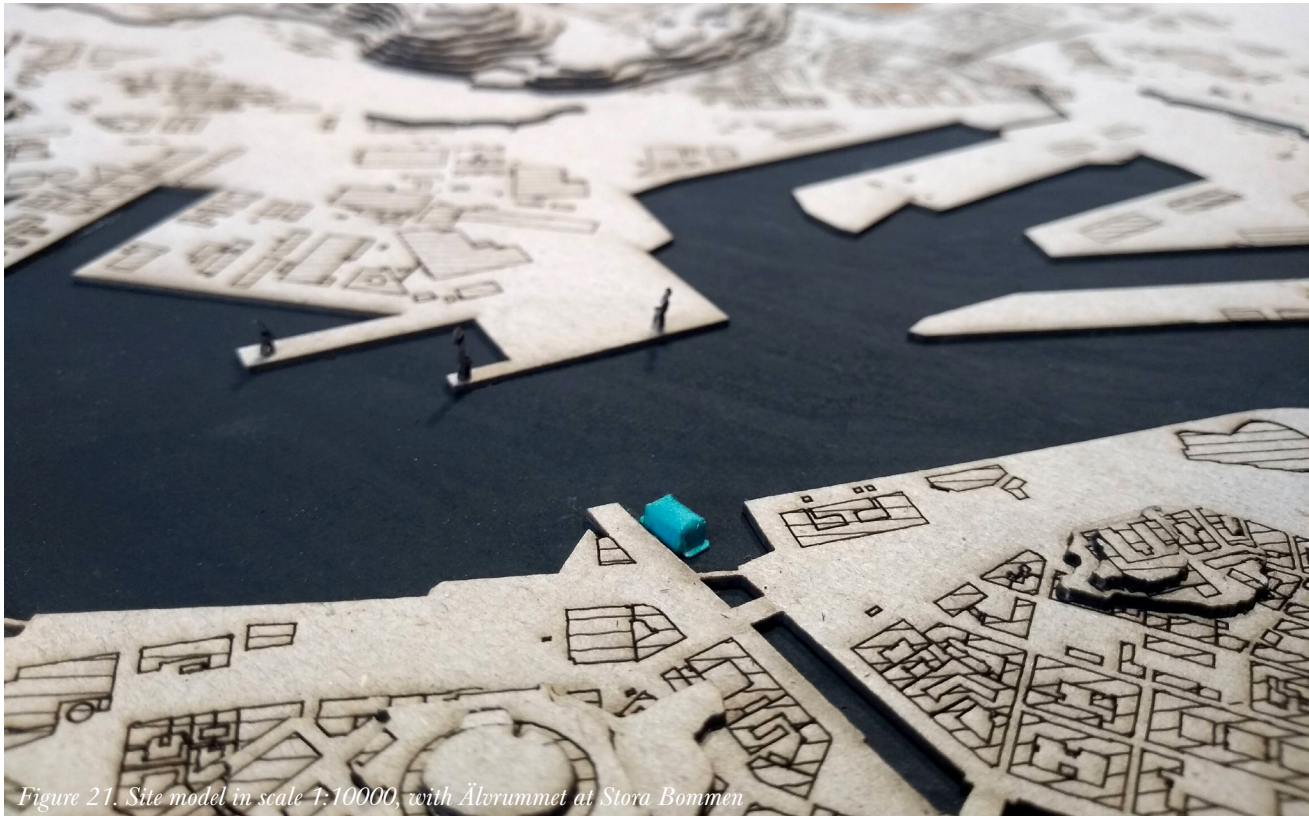


Figure 21. Site model in scale 1:10000, with Älvrummet at Stora Bommen

JUBILEUMSPARKEN



Figure 23. Site plan of Jubileumsparken, 1:1000



JUBILEUMSPARKEN

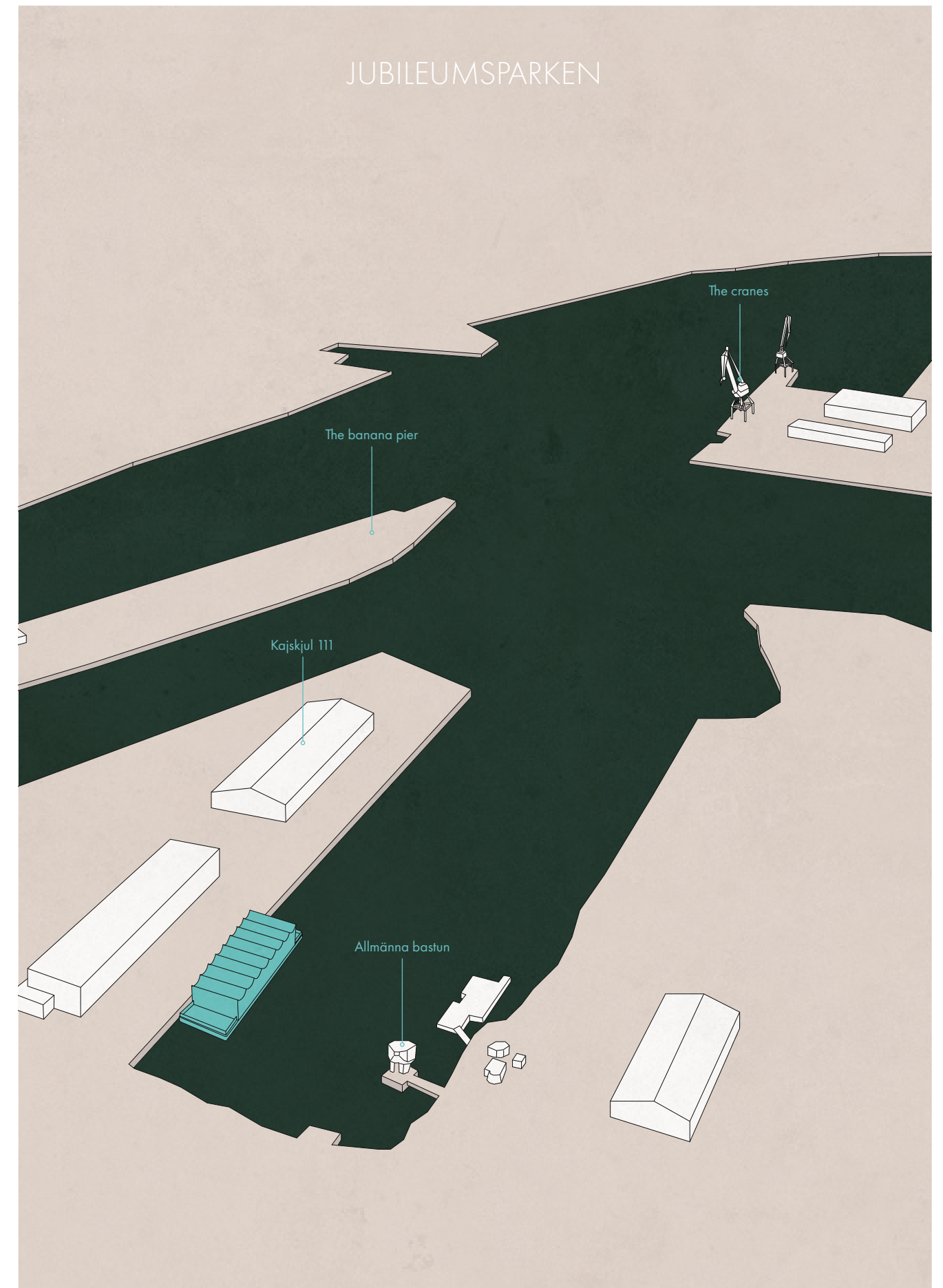


Figure 24. Aerial perspective of Jubileumsparken

LINDHOLMEN

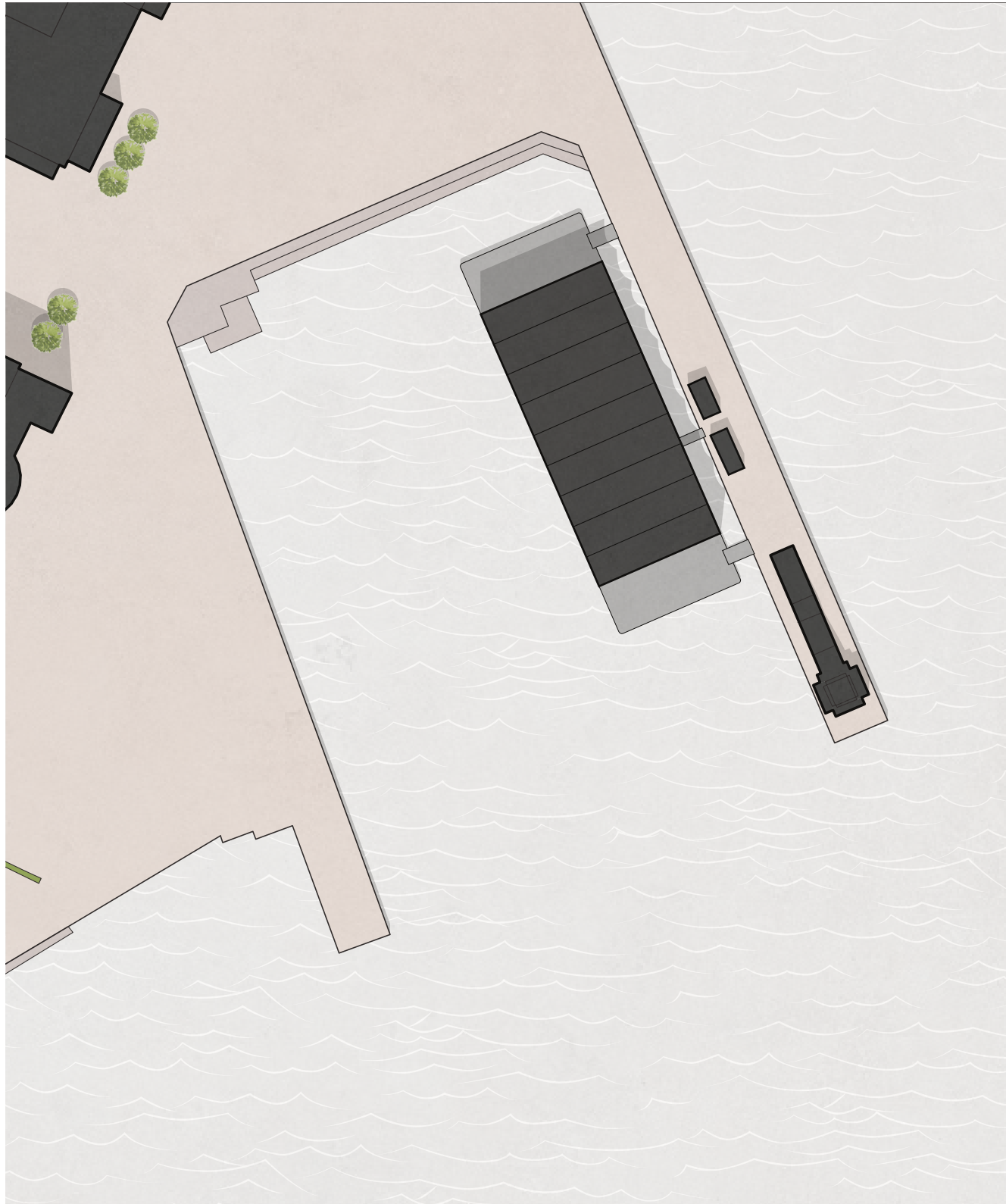


Figure 25. Site plan of Lindholmen, 1:1000



LINDHOLMEN

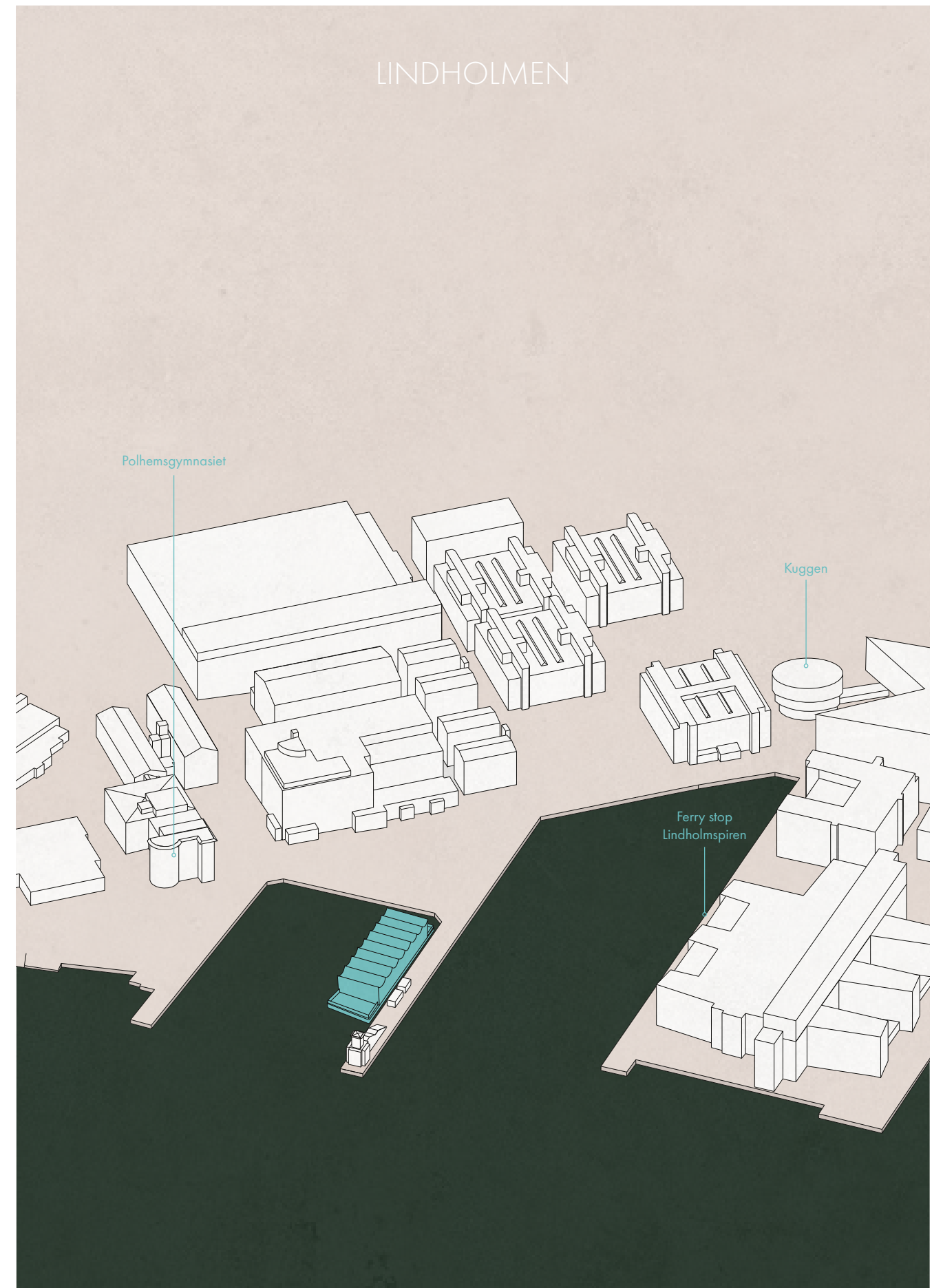


Figure 26. Aerial perspective of Lindholmen

STORA BOMMEN

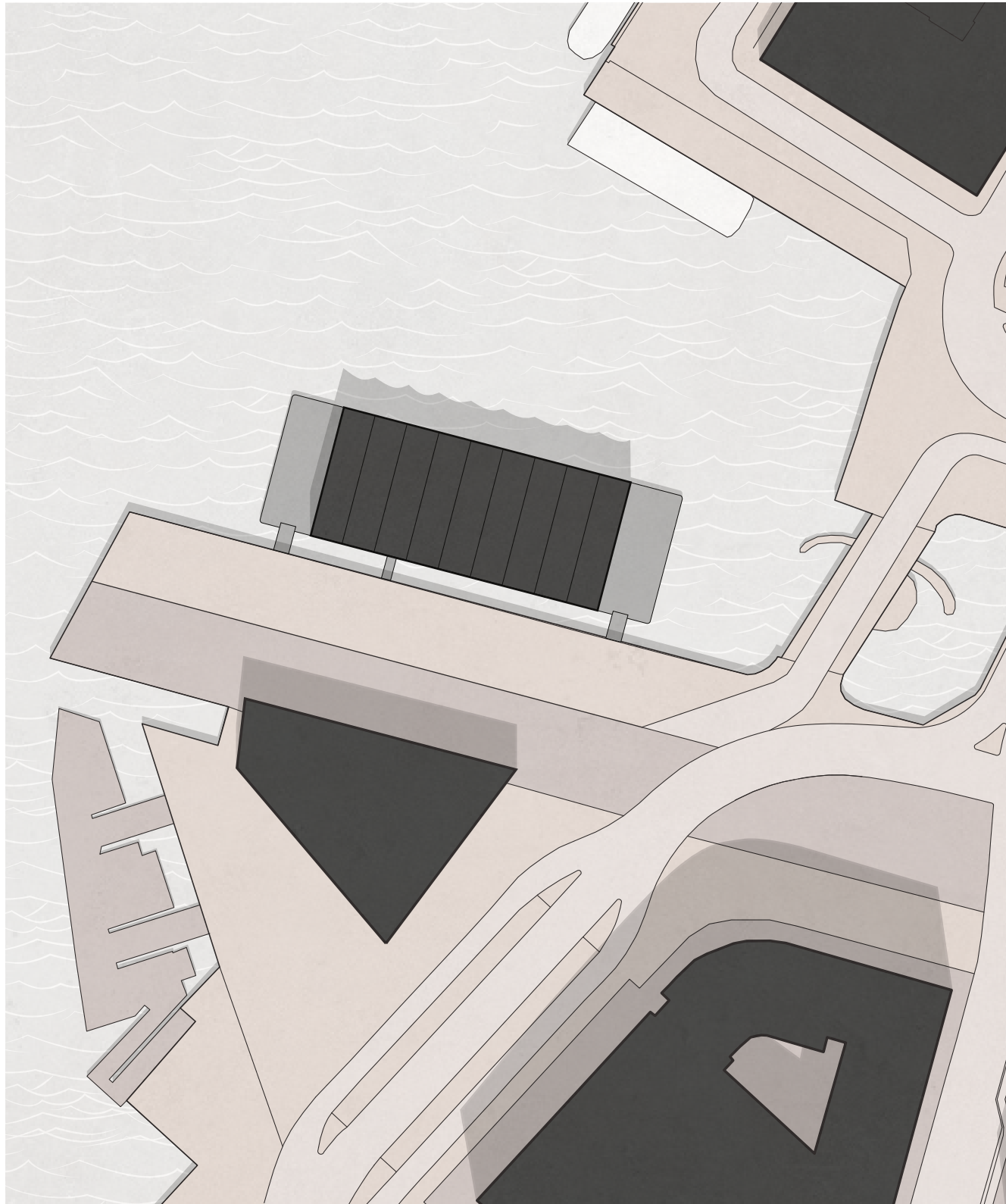


Figure 27. Site plan of Stora Bommen, 1:1000

STORA BOMMEN

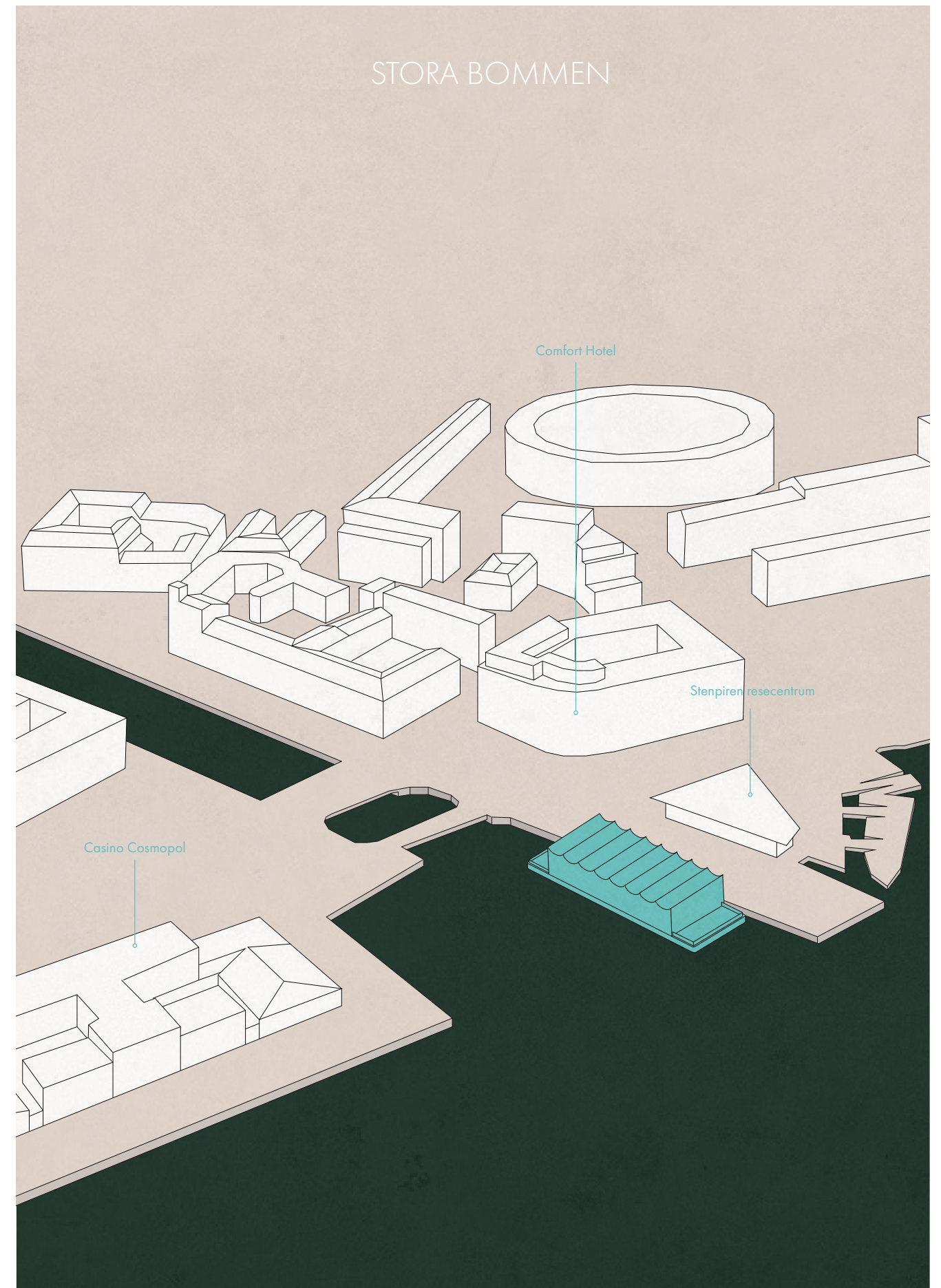


Figure 28. Aerial perspective of Stora Bommen

THE BUILDING

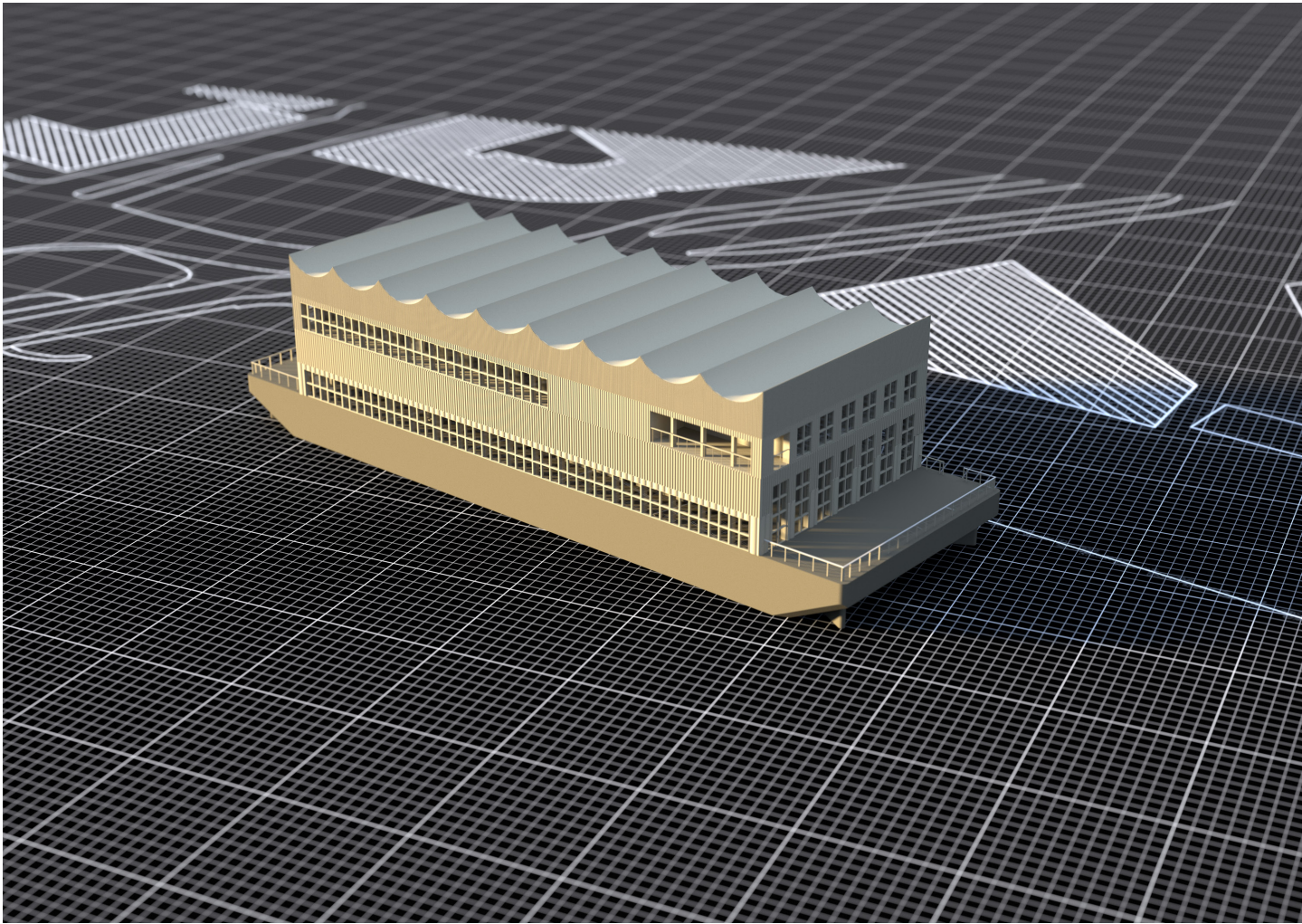


Figure 29. Model in scale 1:1000 at Stora Bommen

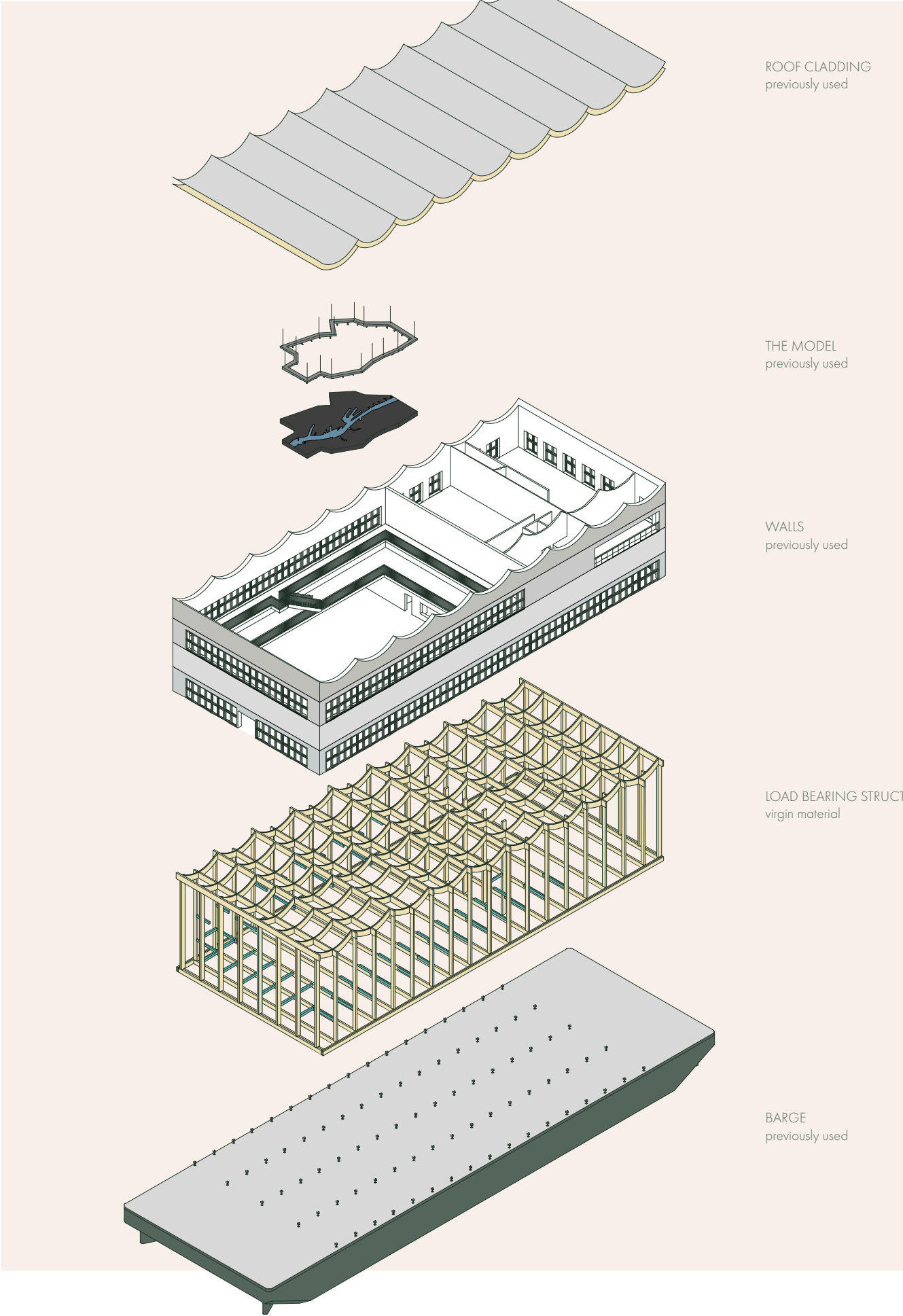
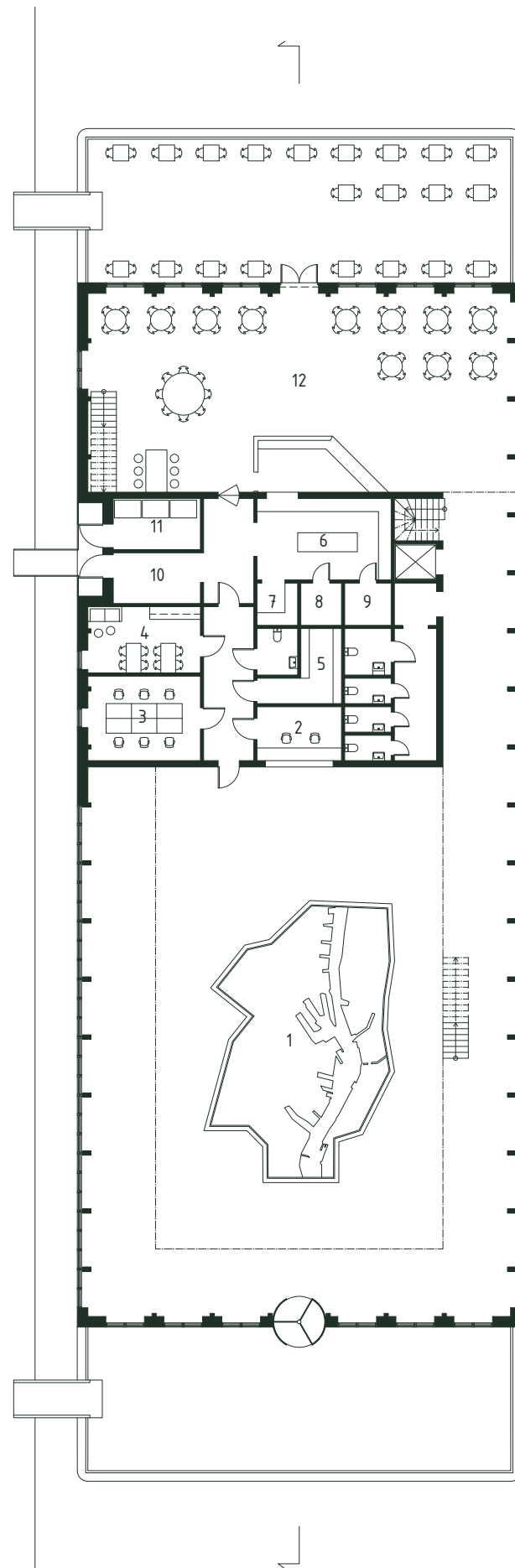
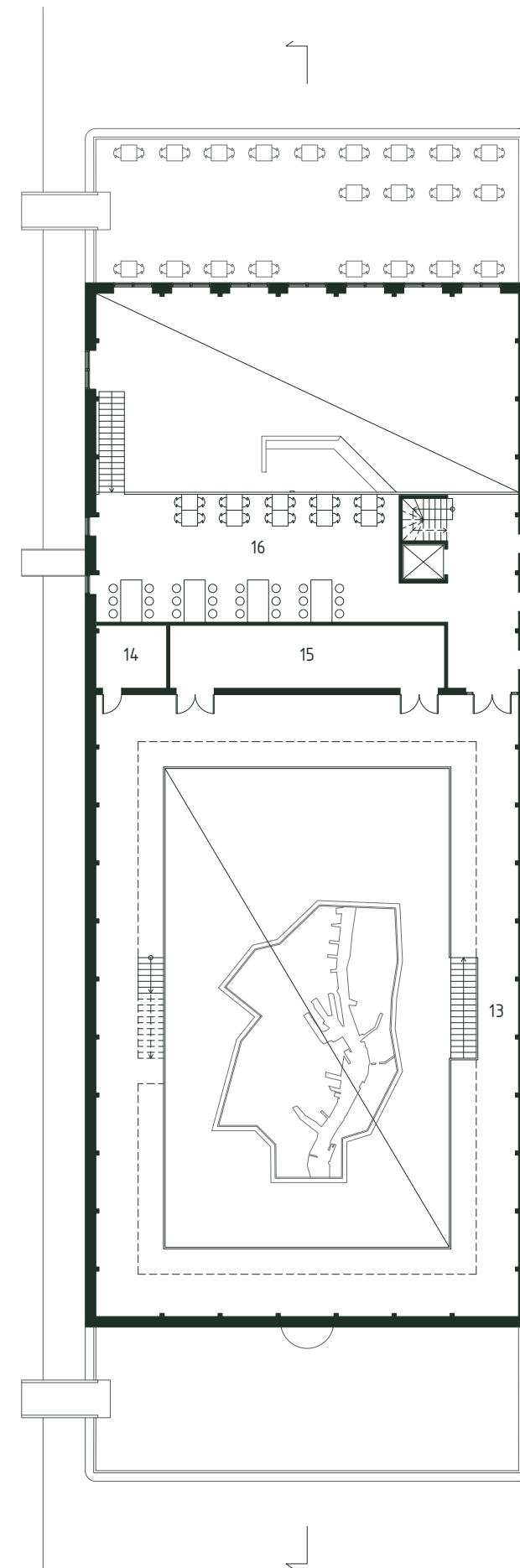


Figure 30. Exploded view, 1:500



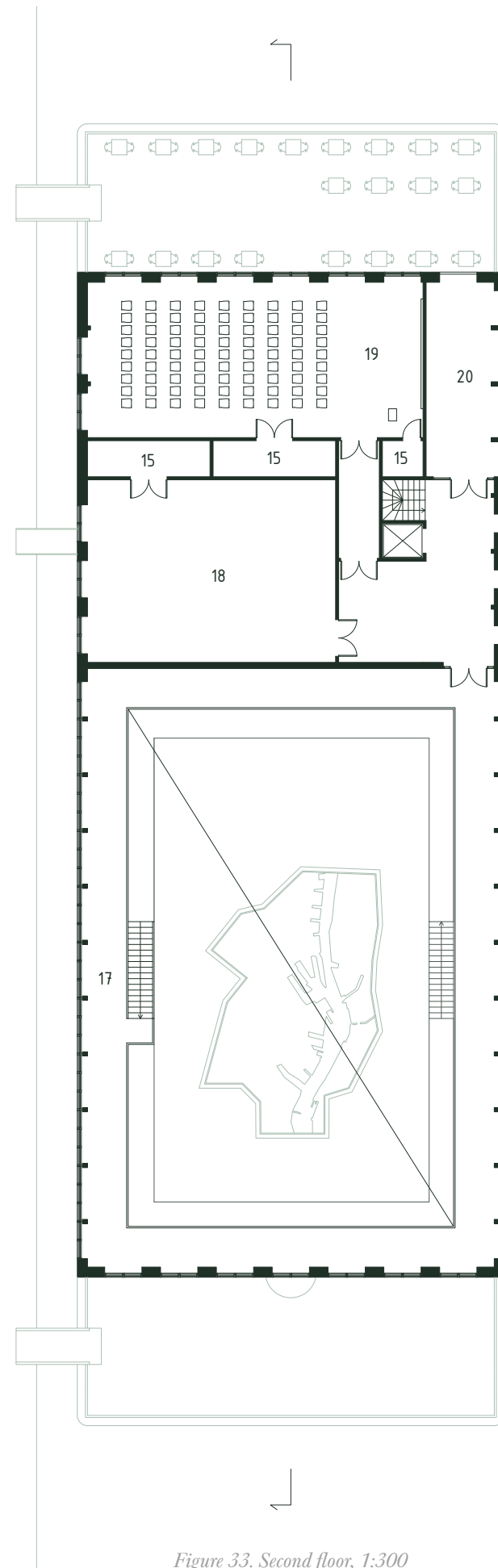
- 1. Main exhibition hall
- 2. Reception
- 3. Office
- 4. Staff lunch room
- 5. Staff changing room
- 6. Restaurant kitchen
- 7. Washing-up
- 8. Pantry
- 9. Cold storage
- 10. Loading/storage
- 11. Recycling room
- 12. Restaurant

Figure 31. Ground floor, 1:300



- 13. Exhibition mezzanine
- 14. Technical
- 15. Storage
- 16. Restaurant mezzanine

Figure 32. First floor, 1:300



- 15. Storage
- 18. Exhibition hall
- 19. Auditorium
- 20. Balcony

Figure 33. Second floor, 1:300

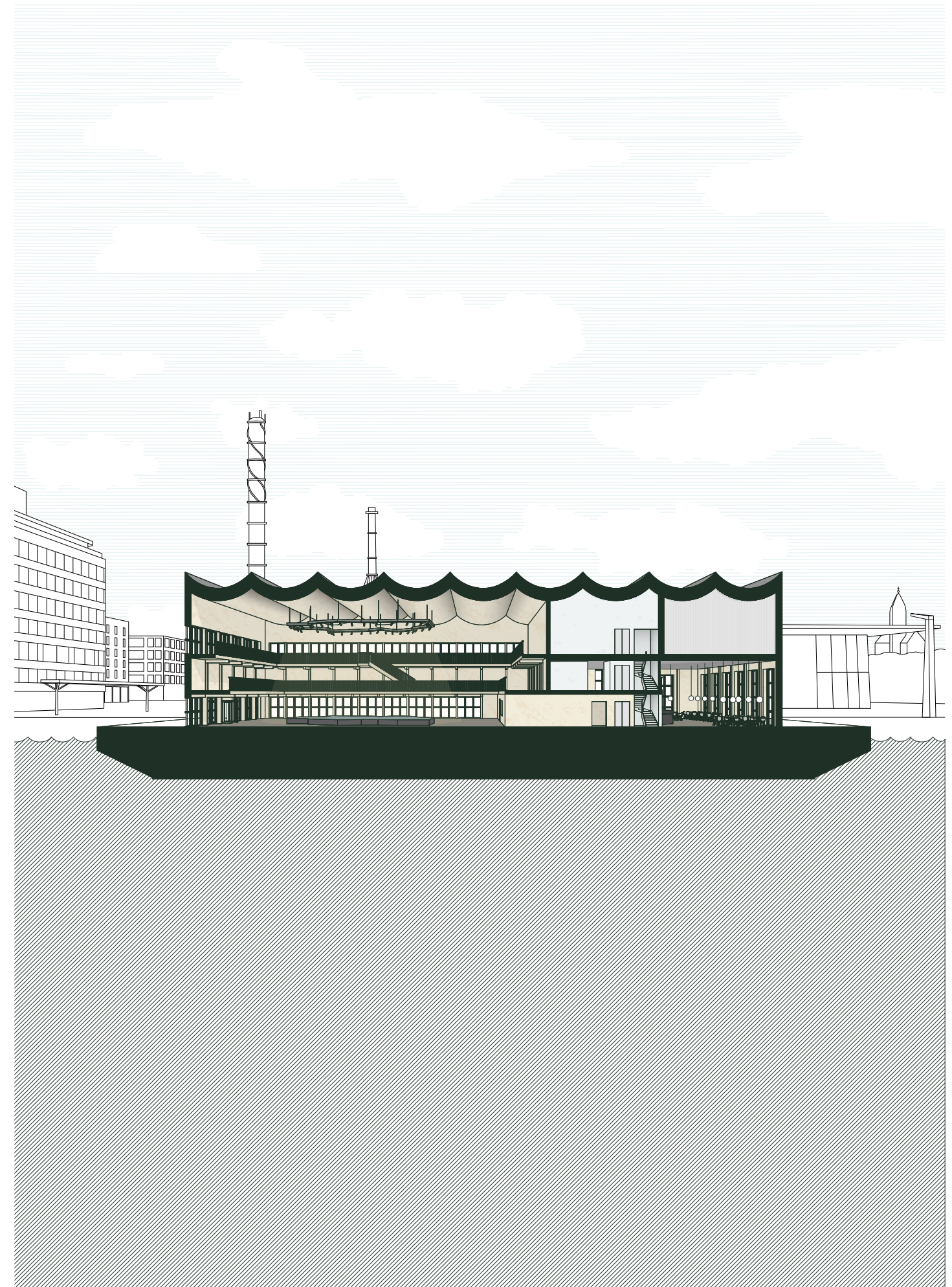


Figure 34. Section at Stora Bommen, 1:400

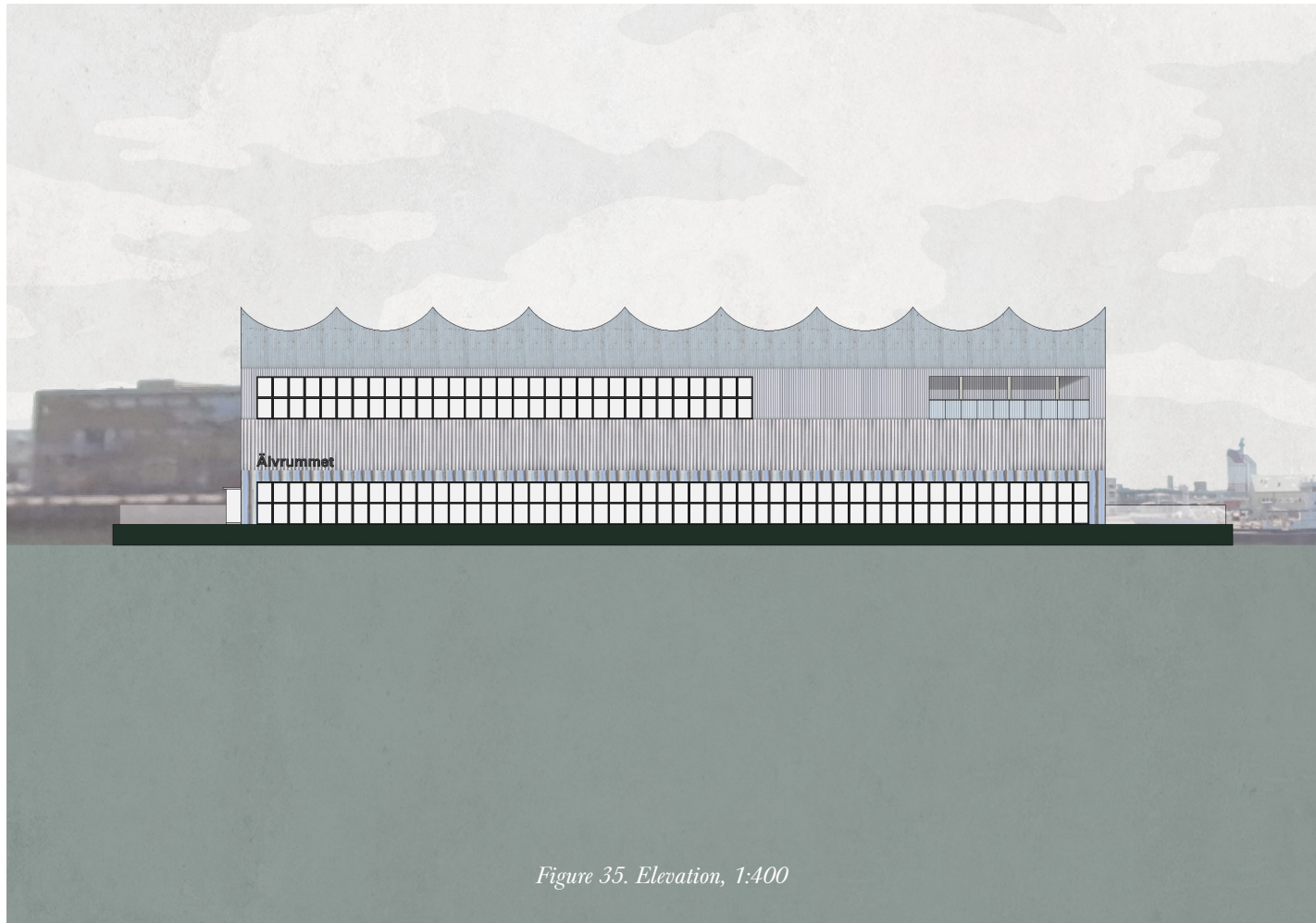


Figure 35. Elevation, 1:400

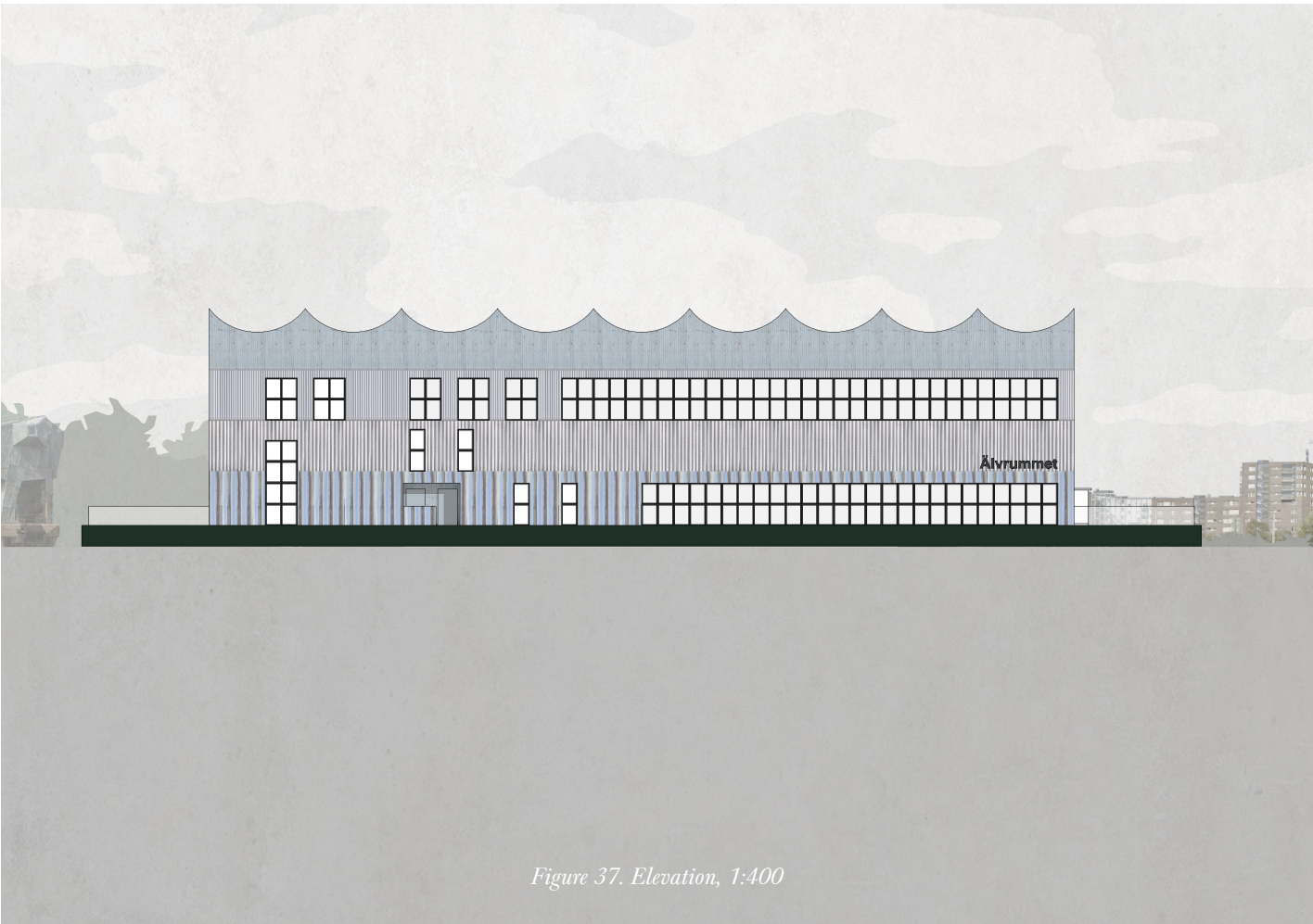


Figure 37. Elevation, 1:400



Figure 36. Elevation, 1:400



Figure 38. Elevation, 1:400

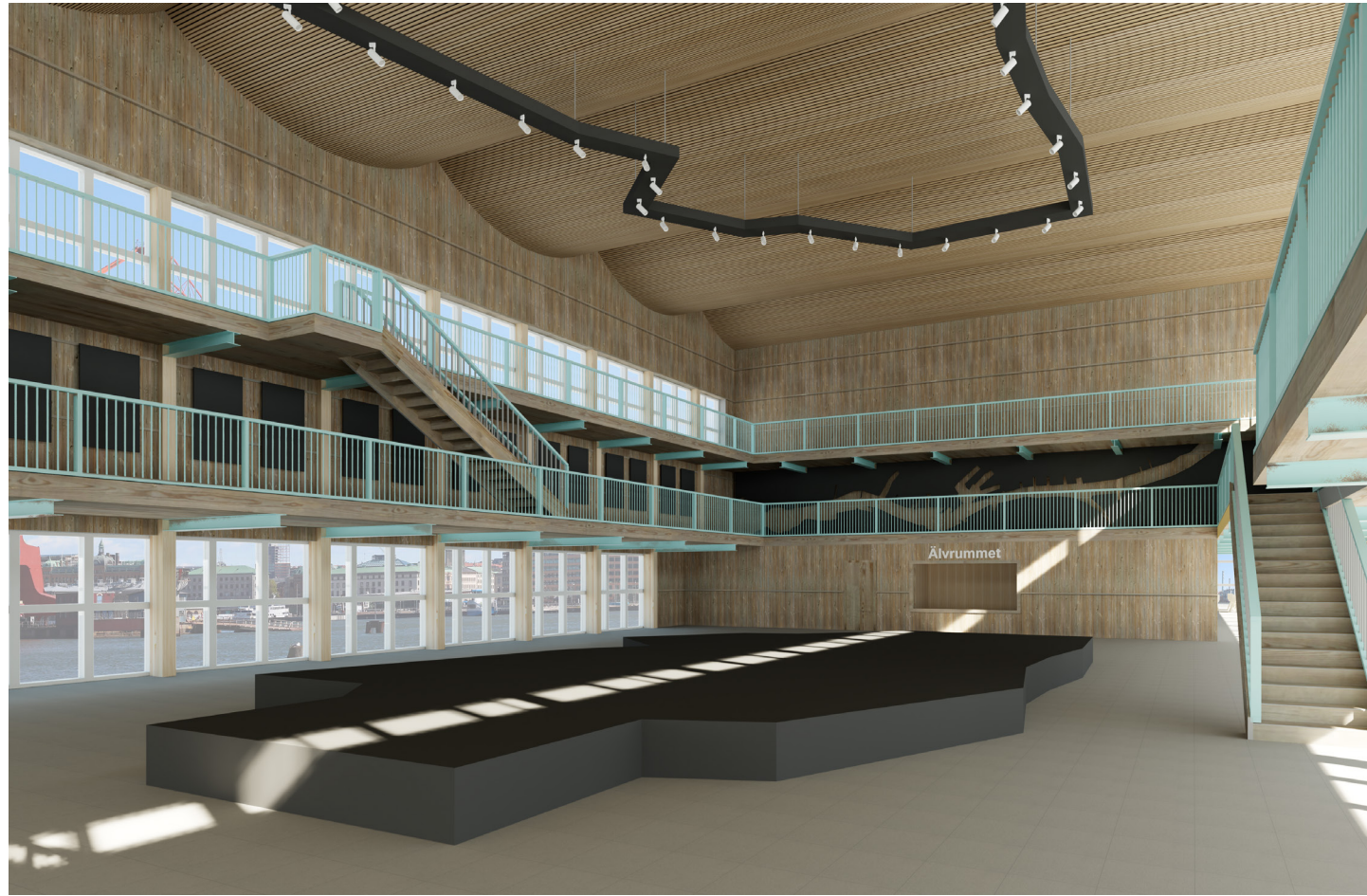


Figure 39. Interior perspective from exhibition hall

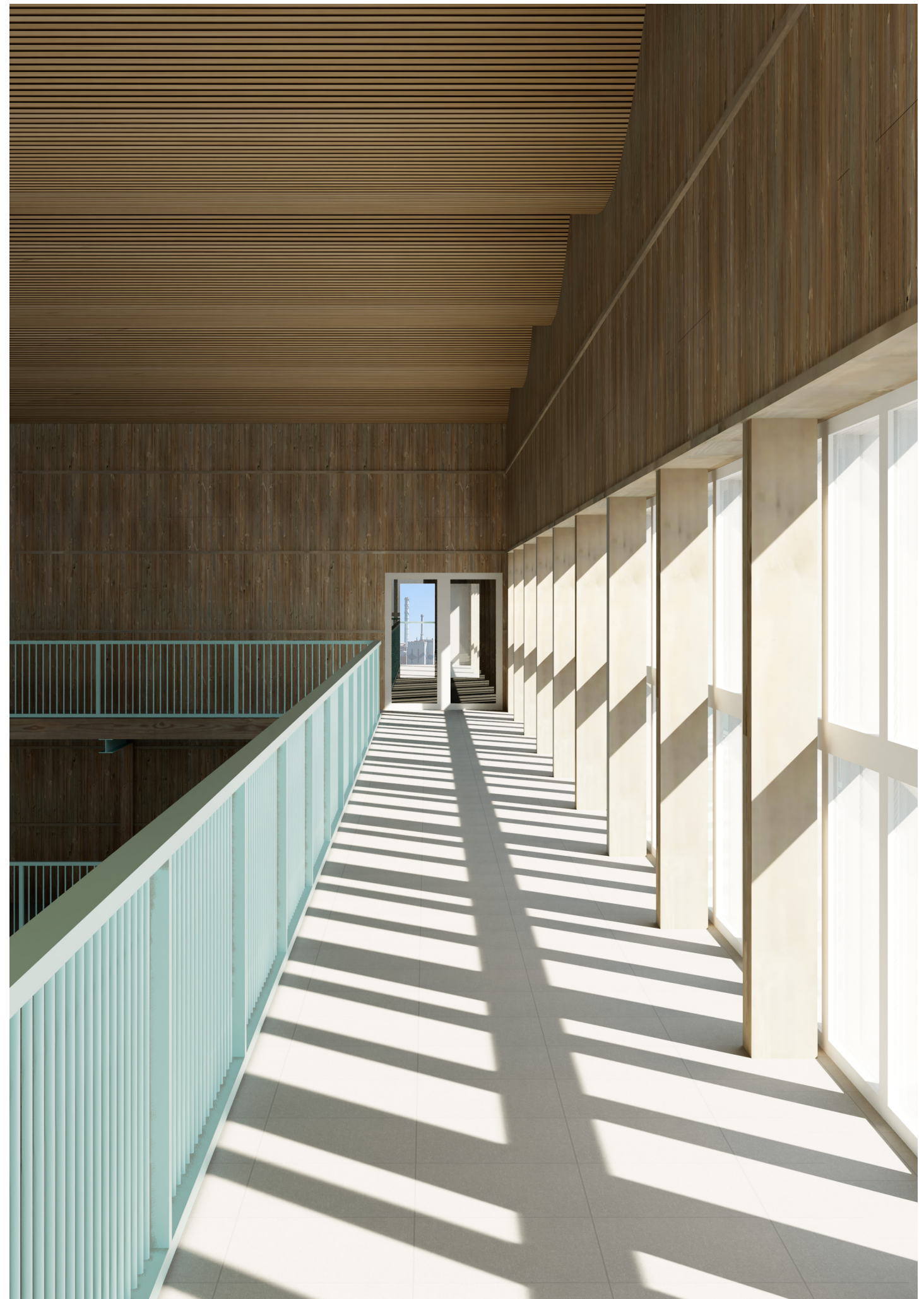


Figure 40. Interior perspective from second floor mezzanine

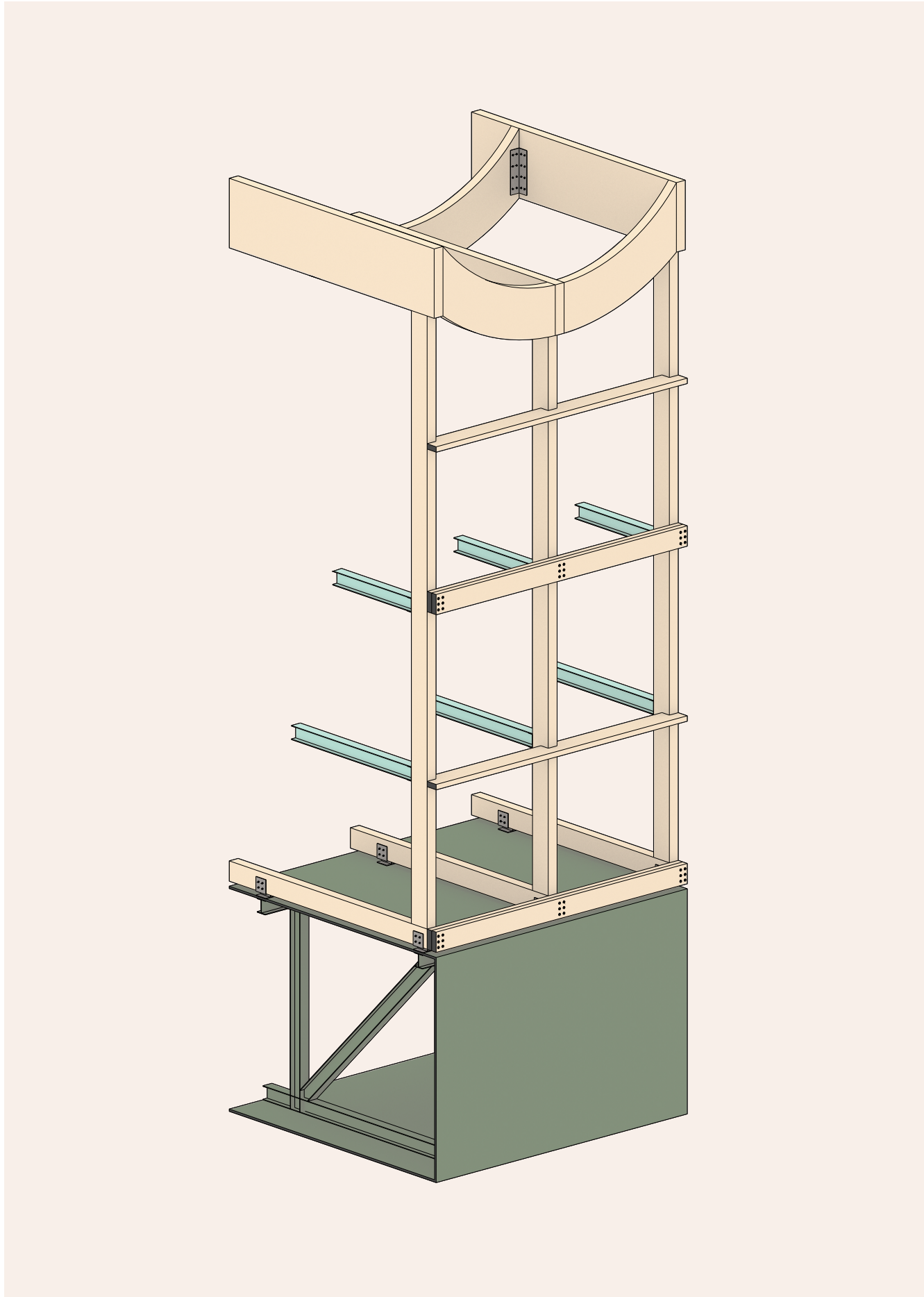


Figure 41. Structure, axonometric view, 1:100



Figure 42.
Detail elevation, 1:50

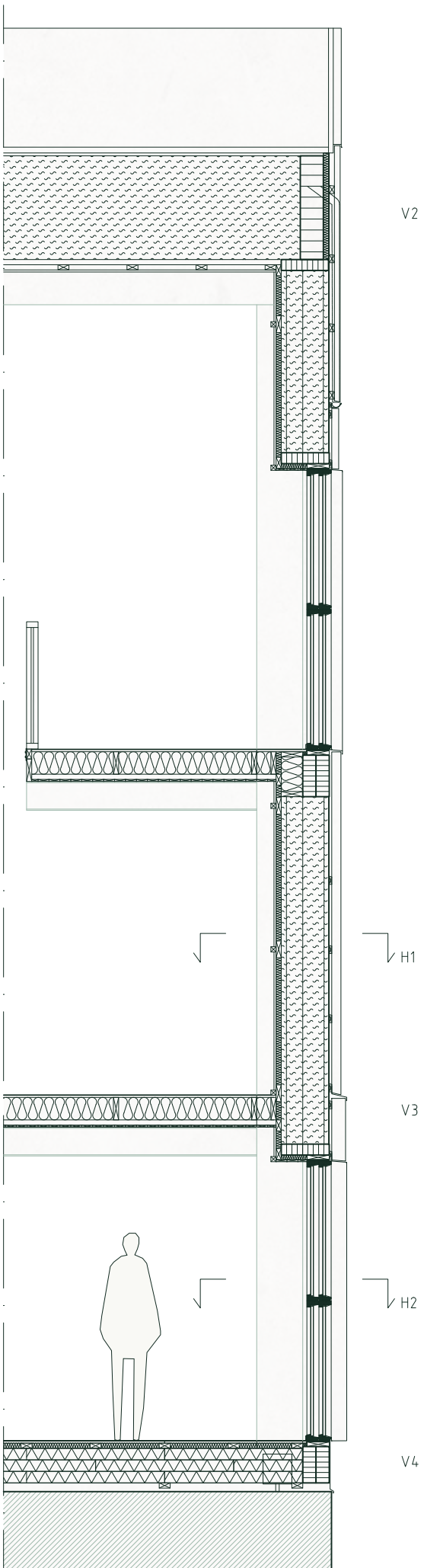


Figure 43.
Detail section B, 1:50

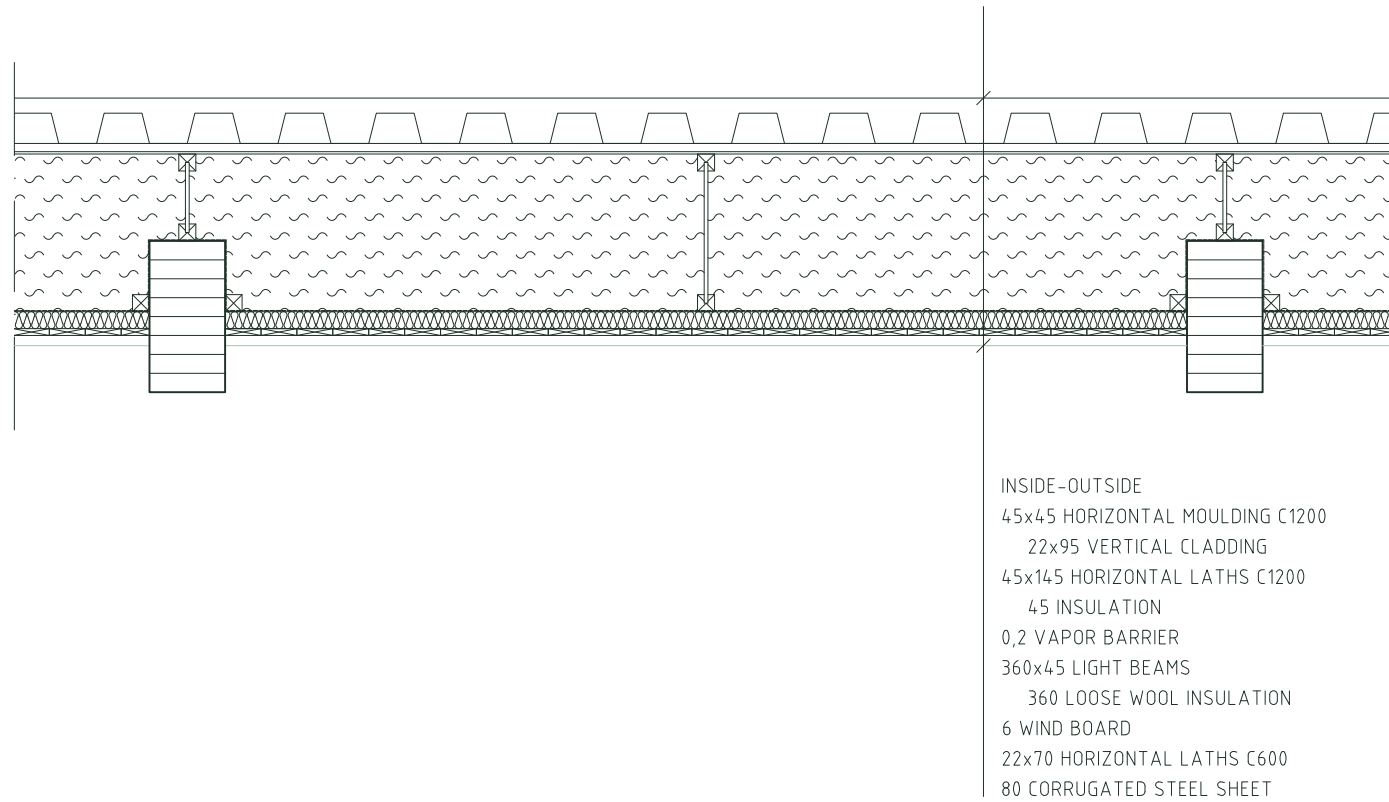


Figure 44. Detail H1, 1:20

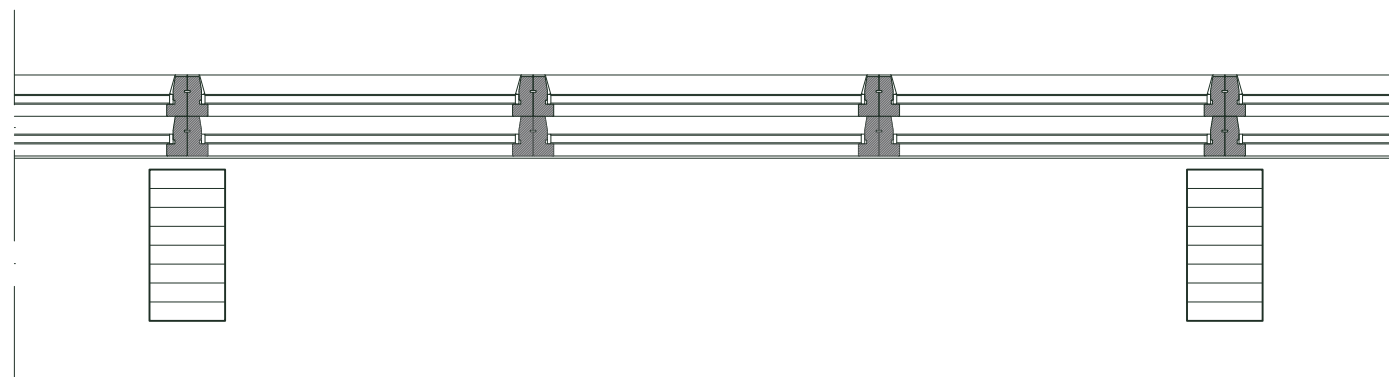


Figure 45. Detail H2, 1:20

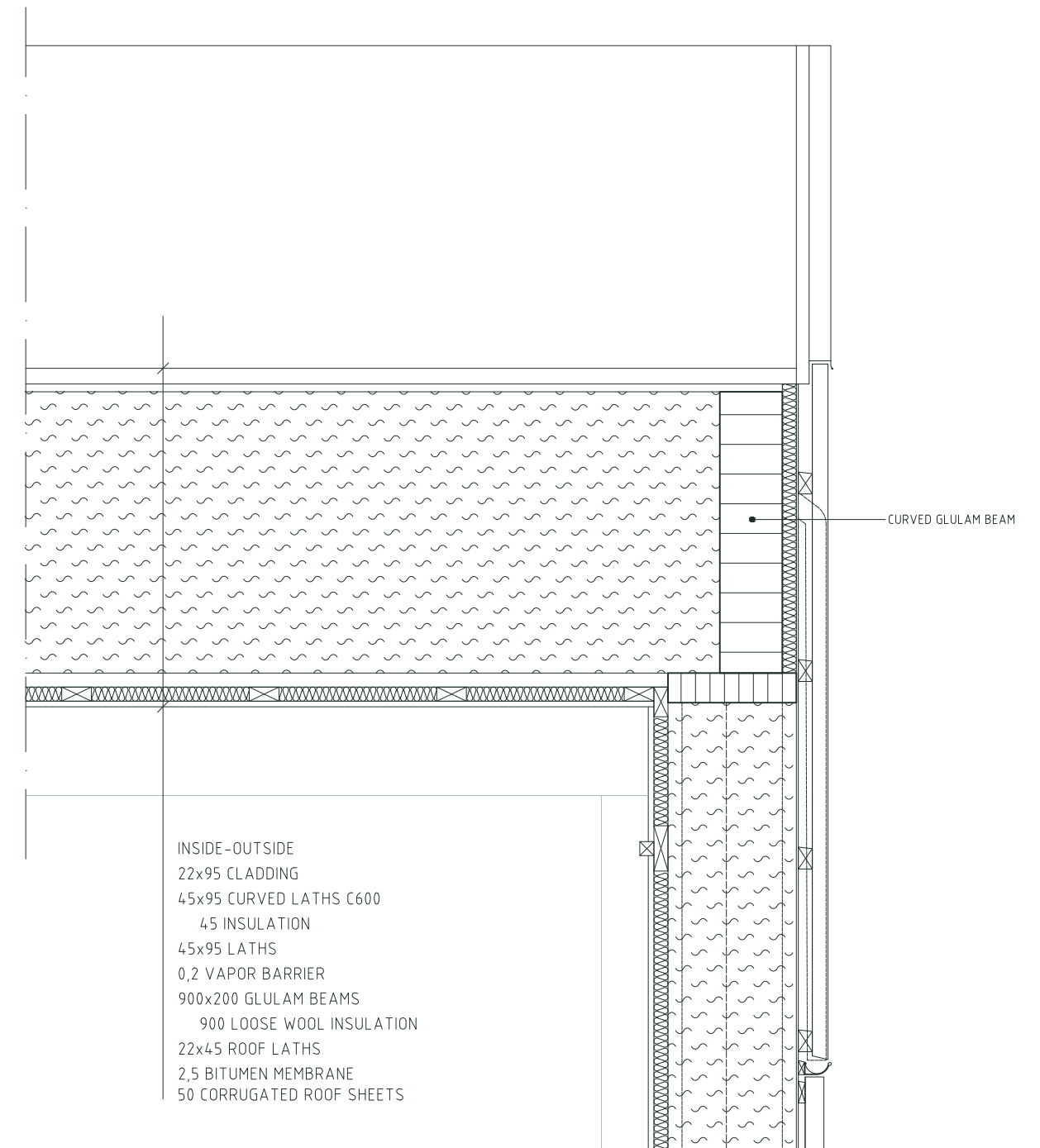


Figure 46. Detail V1, 1:20

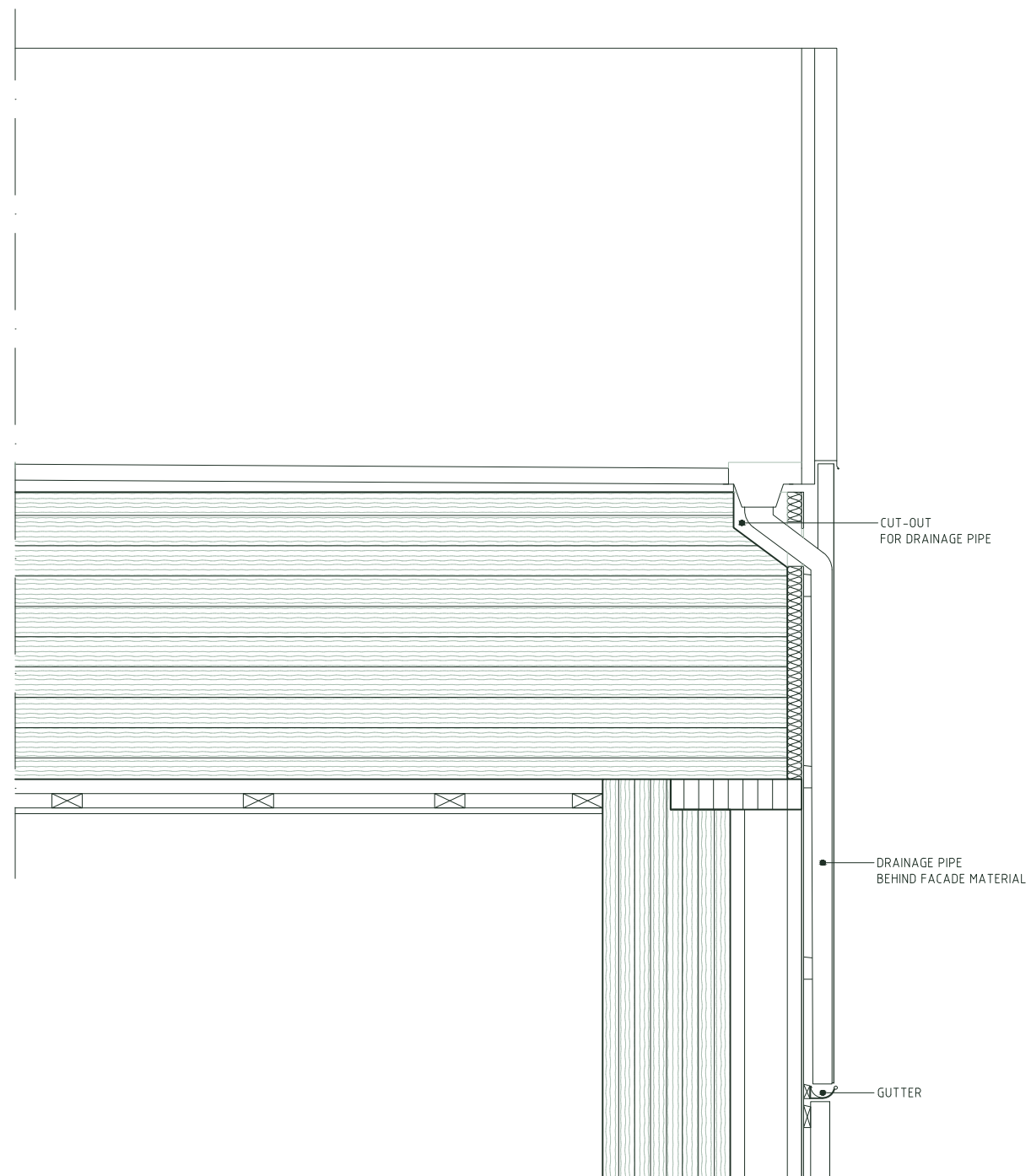


Figure 47. Detail V2, 1:20

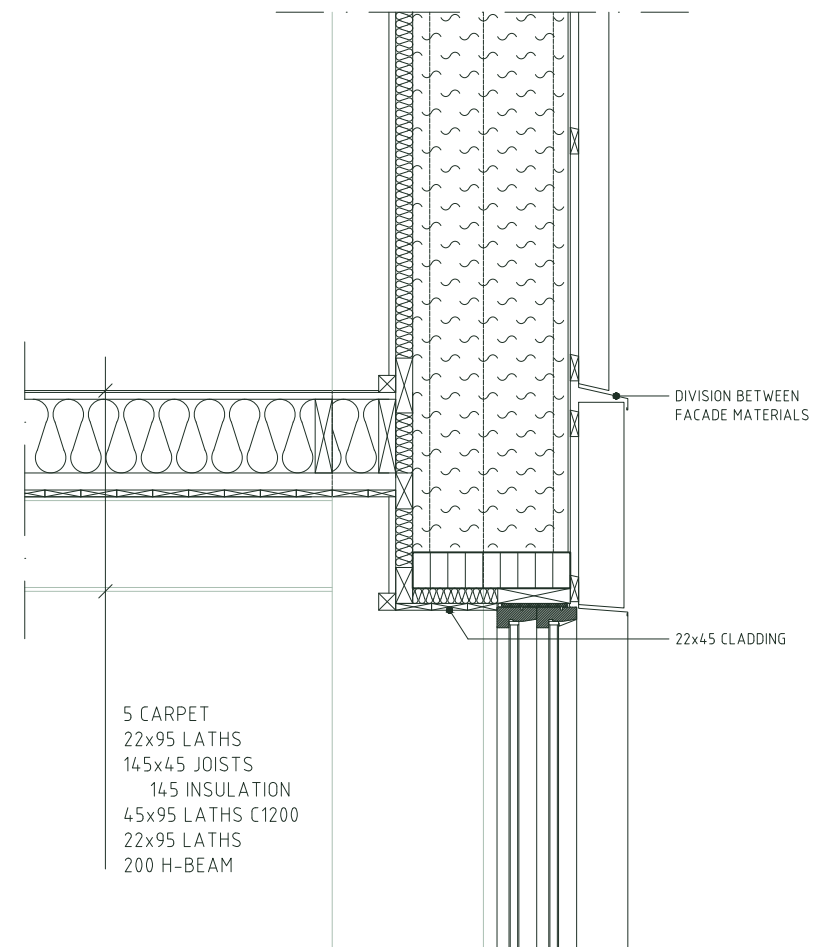


Figure 48. Detail V3, 1:20

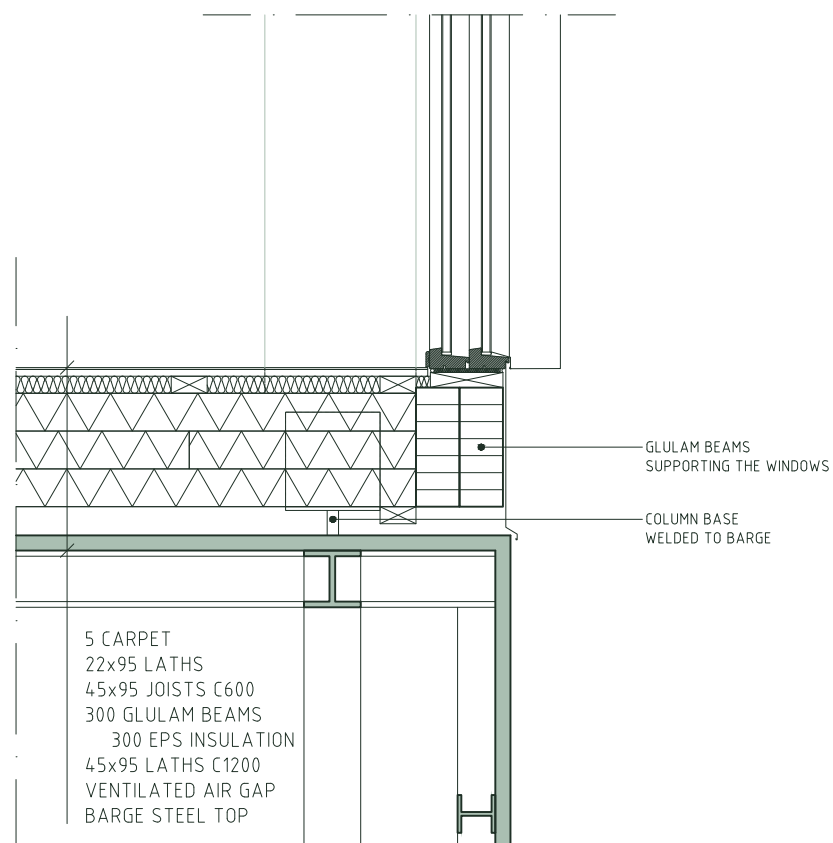


Figure 49. Detail V4, 1:20

05. CONCLUSION

REFLECTIONS

The goals of the project were to explore working with reused materials, creating a building that is accessible to and liked by the public, and that can be recognised from a distance. All of these goals were fulfilled, in my point.

Exploring how to work with reused materials has been the main focus, and I've come to the conclusion that in theory it would be plausible to design a building of this type using almost only reused materials. In practice, however, it's a different thing. To be able to follow the building code when reusing material can be difficult since many of the materials has no guarantee of durability or declarations of any sort. There are of course ways to test strength, toxicity and other parameters and establish them, but it can be expensive and take time. There are today a few companies that work with marking the materials they use in their new construction in different ways to make sure all the information and data of the materials are passed on to when the materials might be reused. When this is more common in the built environment, reusing will be easier, cheaper and faster than it is today.

At the start of the project the goal was to use a load bearing structure made from previously used material as well. During the process it became more and more complicated to find such material that would fit on the barge and was able to reate the volume concept that I

strived for. Therefore I decided to use a wooden structure, that is the next best material to use after previously used. If there was more time, it might have been possible to find previously used pillars and beams that would work.

The goal to create a building that is accessible and liked by the public is harder to judge whether it was fulfilled. Making the building float to be able to move it around is a way to make it more accessible and visible to the people of Gothenburg, but at the same time it makes Älvrummet less accessible in the way that not as many people pass by it in their daily commute or stroll through town. The river is quite inaccessible today since there are very few places to cross and the river fronts are not very developed. This is changing though, and placing Älvrummet on the river might help making the river more vivid. Most of the people visiting Älvrummet are school classes and participants of meetings happening there, so they will keep visiting the building wherever it is placed. And to further attract people, the restaurant and the rooftop terrace has been added.

To design a building that is liked by the public is of course extremely hard, since the opinions always are split. But to make something that fits in to its context, is recognisable and that is built from actual parts of Gothenburg's history, I think I've done the best I can.

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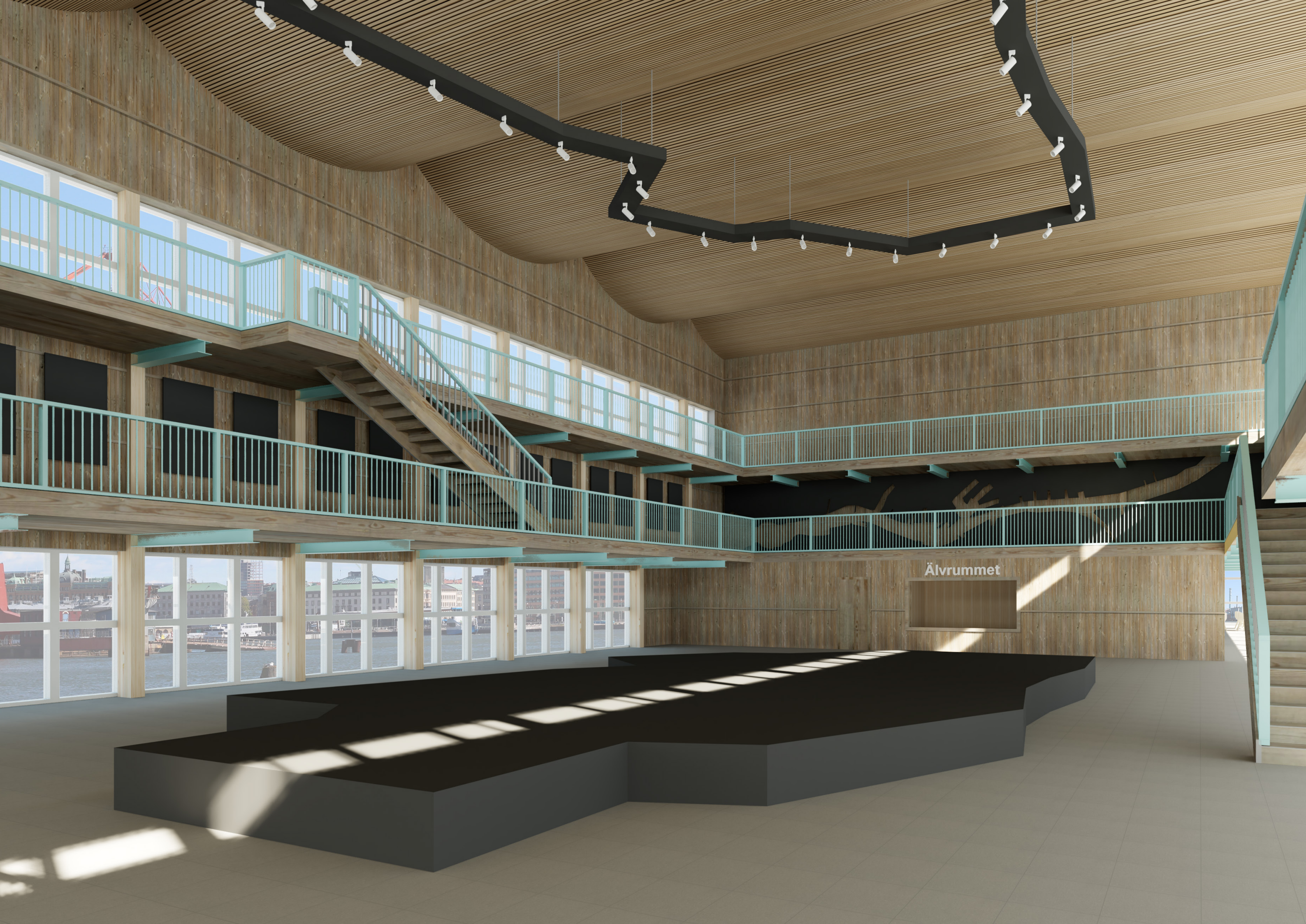
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Älvrummet

