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Master Thesis

Spring 2024

eketrähallen

sustainability in architectural tectonics
by example of a contemporary market hall in gothenburg

Chalmers University of Technology

Department of architecture and Civil Engineering

Master Thesis in Architecture
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Ekertähallen
sustainability in architectural tectonics
by example of a contemporary markethall in Gothenburg

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abstract

This Master Thesis intents to explore the relationship of tectonic architectural design and the sustainability ambition of architectural design as it is prevalent in the 21st century. The findings of this investigation will be represented in a design proposal of a contemporary market hall, functioning as form of visualization, as well as proof of concept.

The basis of the investigation is formed by a definition of terminology of the two to be compared subjects.
Here in, the term tectonic, derived from the Greek word „tekton" for carpenter/ builder, describes an additive design principle focused on detail oriented problem-solving of design challenges. This systematic approach is manifested in design outcomes with a characteristic legibility of structural hierarchy.

The current interpretation and implementation of sustainable architectural design is based on academic research, aiming to strategize amongst other things, against global challenges like the destruction of ecosphere, threats to societies through poverty, hunger and lack of healthcare, as well as the need for equal development opportunities for everyone in an at this point, fully globalized world.

Initially I would like to hypothesize, that both principles of tectonic design and sustainable architectural design share a need for a practical problem solving approach for a precise and uncomplicated design outcome. Throughout the thesis, I intent to explain why I believe this to be true.

keywords
tectonic, sustainability

individual introduction and ambition

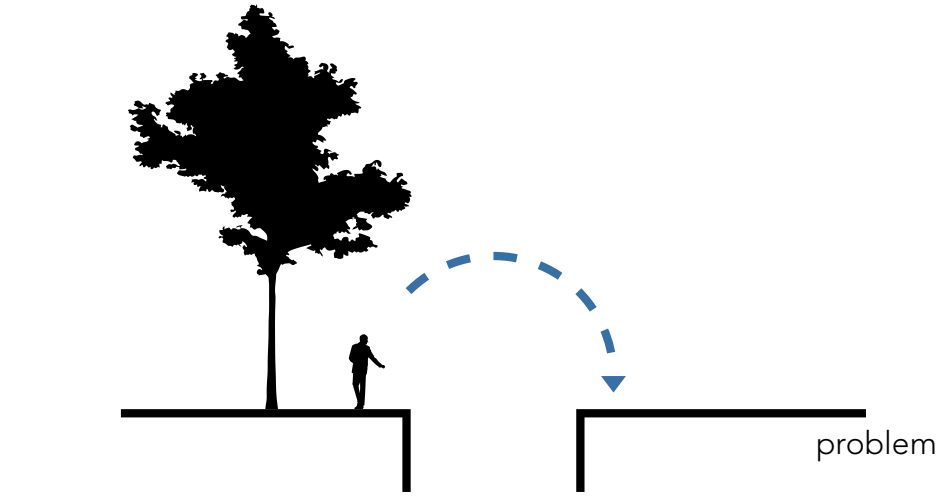
In my Masters Thesis i want to reflect upon the skills that i aquired during my time of study and work and create a design proposal that represents them.

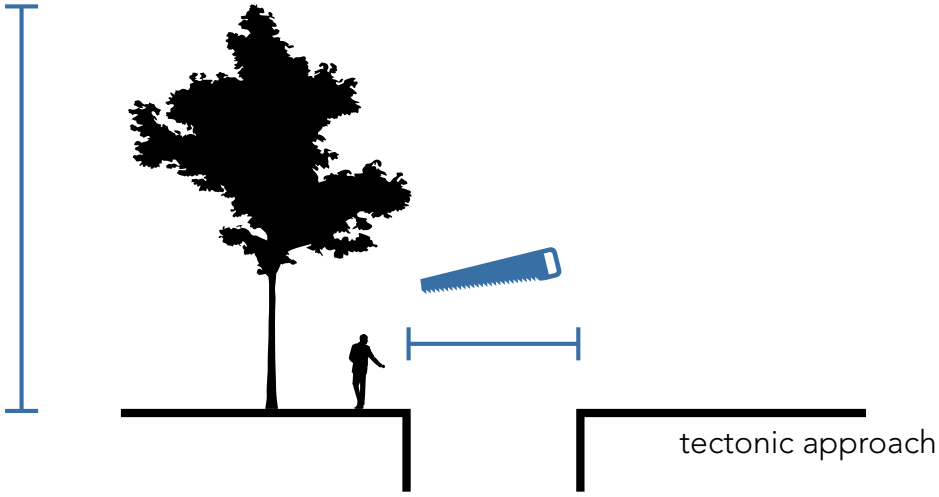
During my study of architecture in Stuttgart, Berlin and Gothenburg, i refined two major areas of skill. My design studios were always either Urban Design focused or encorporated wooden constuction at their core. Examples of these are a conversion of a former industrial area to a housing area in Stuttgart, a design proposal for a „Super Block" in Barcelona and a Hybrid Urban Landscape in Gothenburg on the Urban Design side. Encorporating wooden construction, i designed a swimming hall with an organically shaped, cantilevered wooden gluelam roof in Stuttgard and a wooden beam and column skeleton based housing block by the river in Gothenburg. Especially during my Masters in Gothenburg i gained an appreciation and responsibility to sustainable architectural design and construction.

While working for an architecture office in Berlin for currently 5 years, i've been involved in all phases of construction, from initial design sketches to construction site management. The projects were almost exclusively commercial retail buildings, specifically supermarkets for a large german chain. This work has given me a valuable perspective on the realities of working with a corporate client and how to advance more sustainable building practices within the constraints of budget and legislation.

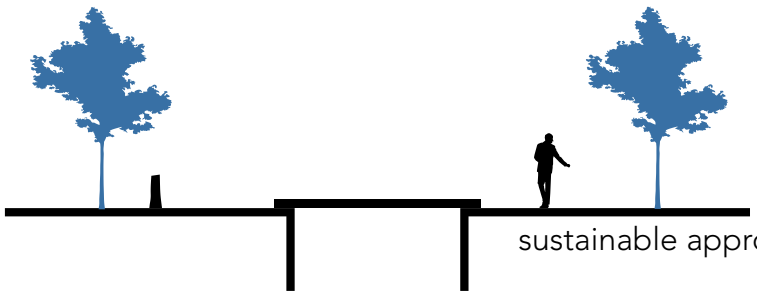
keywords:
urban design, wooden construction,
commercial architecture

content


problem


tectonic approach


solution


sustainable approach

1 | theoretic background

concept

Tectonics is one of the most essential topics in architectural theory that refers to various qualities of architecture. It resembles the integration of structure and construction, the application of technical aspects and the attention to detail creativity in a harmonious and systematic way that reflects the cultural and aesthetic qualities, and relates to different aspects of skills, methods, materials and proportions (Al-Alwan & Mahmood, 2020). In its most essential form, tectonic design refers to the identification of a design problem, a strategized approach for solving it utilizing available resources, tools and skills in the most efficient way and a design solution representing these parameters in a transparent way.

There are many definitions of what makes a building sustainable with respect to social, economic and environmental issues (commonly referred to as the 'triple bottom line'); social in terms of adding to the quality of life for people, economic in terms of enhancing wealth, and environmental in terms of reducing the impact that buildings have on the natural environment (Grierson & Moultrie, 2011).

In my thesis I will identify the tectonic design characteristics in my design proposal and investigate them towards a sustainable execution.

research questions

1. What are the commonalities between tectonic design and sustainable design principles?

2. **How can a building design benefit from utilizing commonalities of tectonic and sustainable design principles?**

methodology

research for design

Setting a guiding design principle consisting of a combination of architectural tectonics and sustainable design practices. This will result in a set of basic rules dictating how space and structure will be shaped. The guiding principles will be justified by their adequacy for the contemporary context.

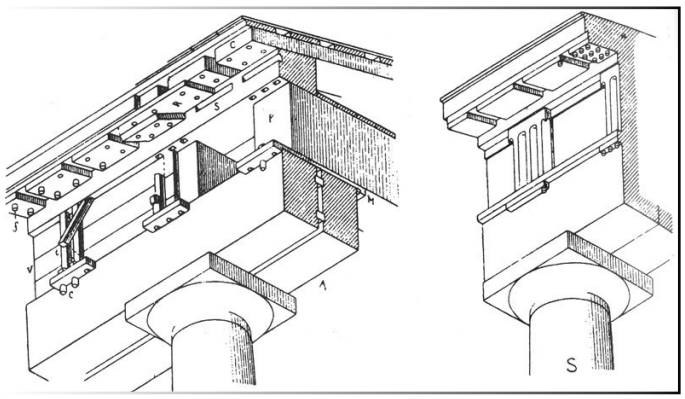
research by design

A balanced evaluation, investigating if the design outcome in fact meets the design ambition by utilizing the design principle. If needed, highlighting points of improvement or points of conflict between design ambition and design outcome.

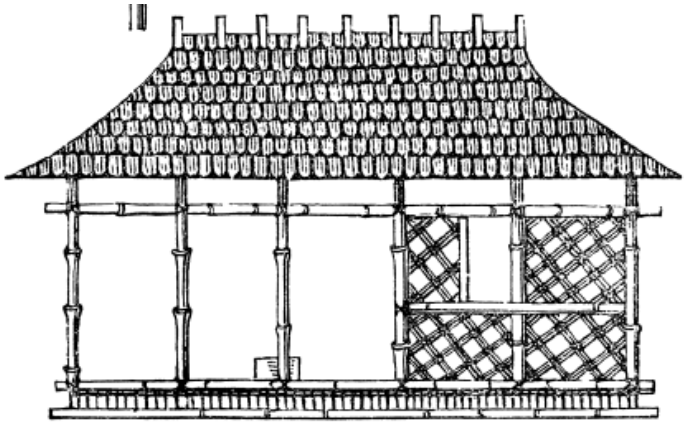
delimitations

The thesis is rather utilizing the study of research on the historical context of tectonics and the contemporary relevance of sustainable design to support a design task, than challenging them for the developement of alternative and new methods of architectural practice.

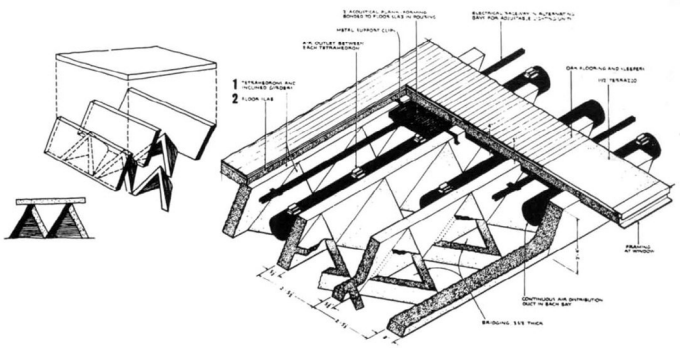
I believe this approach to be more supportive of a design outcome that is complete in it’s execution and at the same time theoretically possible to actually realize. By achieving a design adhering to a well founded design phylosophy as in building tectonics with the contemporary relevance of sustainable design i believe to be able to make the biggest contribution to the advancement of my personal skill, as well as my contribution to the architectural profession.



Tectonics according to Bötticher: Structural hierarchie in helenistic architecture, here represented by the drawing „Derivation of the Doric from wood construction“ by Auguste Choisy **(Figure 1)**



Tectonics according to Semper: Cultural representation trough crafted composition of material, here represented by his drawing of a „carribean hut“. **(Figure 2)**



Tectonics according to Frampton: The modern study of tectonics as rational joining of material, here represented by a detail axonometry of Louis Kahns Yale University Art Gallery. **(Figure 3)**

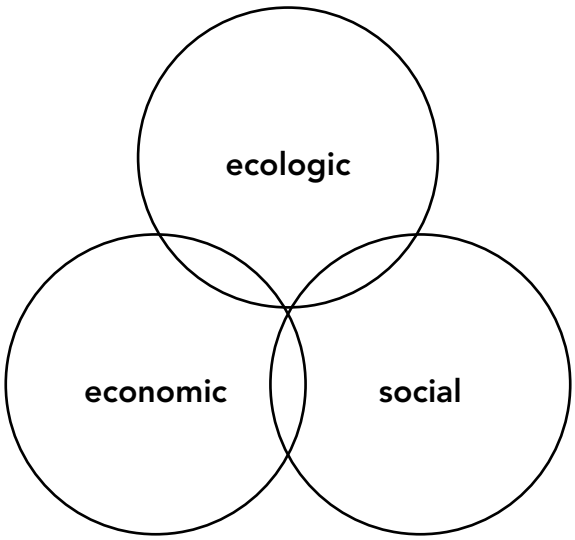
tectonics

The notion of tectonics as a design principle is present in architectural history and theory for nearly 200 years and was first popularized by Karl Bötticher and Gottfried Semper.

Karl Gottlieb Willhelm Bötticher (1806 - 1889) was a German historian and architect greatly influenced by ancient Greek architecture, about which he wrote the book „Die Tektonik der Helenen". At the core of his understanding of tectonics lies the interpretation, that he Greeks had perfected a rational system of design tectonics analogous to nature's own creative ways. Tectonics insured that every architectural detail was designed to be a true expression of its own inner structural, functional and material „essence," as well as an integral component of an overall design. (Kutschow, 2018). Succinctly, Bötticher's understanding of tectonics is a theory of composition of the physically built.

Gottfried Semper (1803 - 1879), likewise a German architect and art theoretician, shares Böttichers rooting of tectonics in the laws of nature and that it is to be understood as creating space by means of motionless and heavy masses of material (Semper, 1856 -1859, as cited in Herrmann, 1984). His interpretation of the meaning of tectonics though is much further reaching than Böttichers, philosophizing it's cultural relevance through implication in other artforms. According to Semper, tectonics deals with the product of human artistic skill, not with its utilitarian aspect but solely with that part that reveals a conscious attempt by the artisan to express cosmic laws and cosmic order when molding the material (Semper, 1856 -1859, as cited in Herrmann, 1984).

Kenneth Frampton (1930 -) architect, historian and critic successfully transported the concepts on tectonics of Bötticher and Semper in his 1995 book „Studies in Tectonic Culture" into the present by reinterpreting them in a more palatable way. He identified the main factors of tectonic as object, details, joint, material, construction, structure, and interaction. Tectonics from Frampton's perspective should take environmental issues and local culture in its consideration (Al-Alwan & Mahmood, 2020). This is a very practical hierarchy and instruction on the application of tectonics today.



self-contained concept of sustainability

1 no poverty	**2** zero hunger	**3** good health and wellbeing
4 quality education	**5** gender equality	**6** clean water and education
7 affordable and clean energy	**8** decent work and economic growth	**9** industry, innovation and infrastracture
10 reduced inequalities	**11** sustainable cities and communities	**12** responsible consumtion a. production
13 climate action	**14** life below water	**15** life on land
16 peace, justice and strong institutions	**17** partnerships for the goals	

17 SGD's according to the 2030 Agenda

sustainability

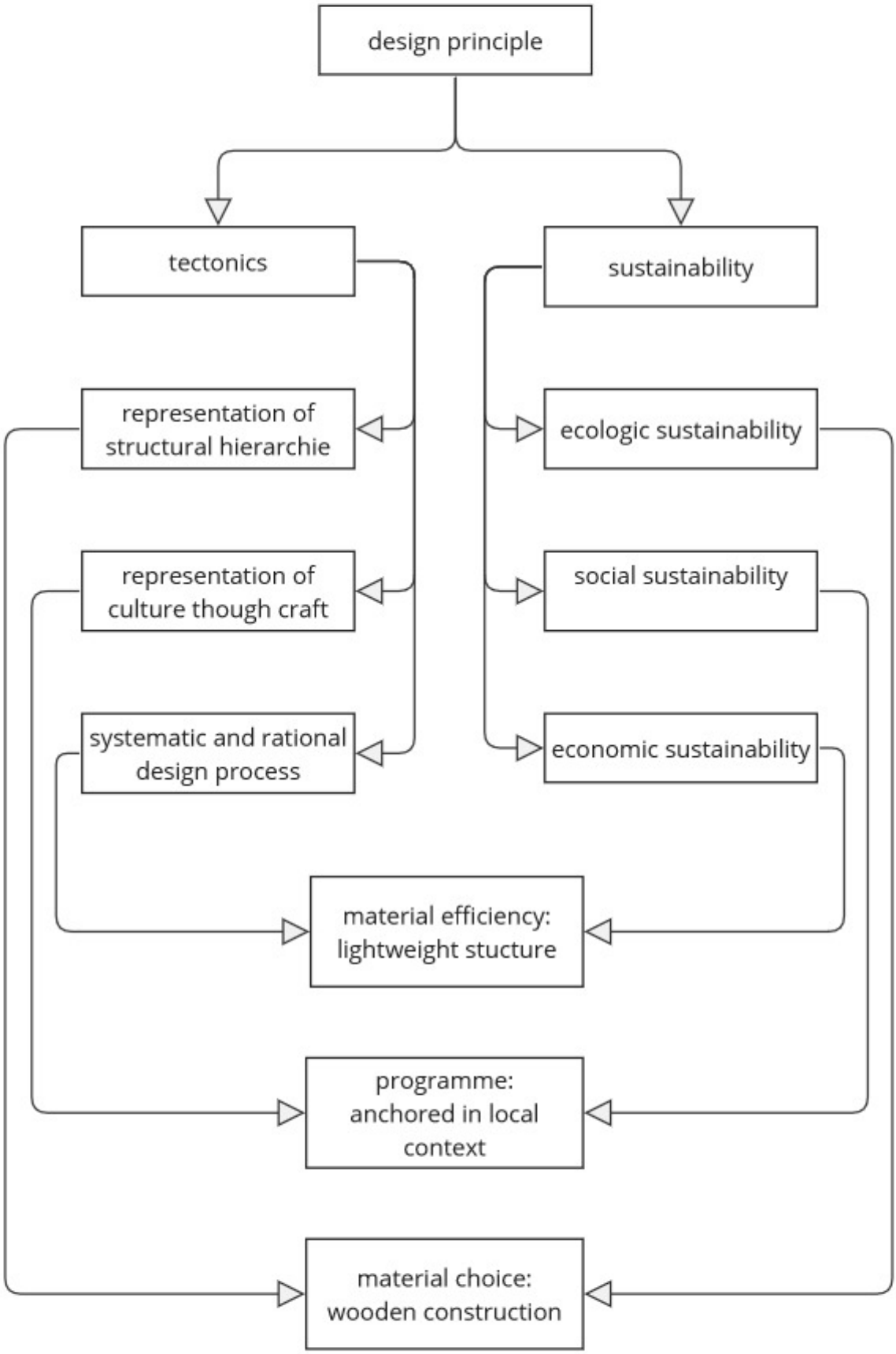
Sustainable design and development is a currently omnipresent term and being discussed not only in architectural practice, but in global politics, industry and commerce and all academia. Depending on the implication, varying interpretations of the meaning of sustainability are relevant. At the root though, the current progress towards more sustainable development for humanity as a whole was initiated through the United Nations Brundtland Commission, which in 1987 published the pioneering report titled „Our Common Future" containing the following definition:

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

In further detail, I would like to adopt and understanding of sustainability based on the principle of three dimensions of sustainability (economic, ecologic, social) also described in the 1987 Brundtland report. This principle describes the pillars that sustainable development rests on, illustrating it's prerequisites in a comprehensive and self-contained way.

Ecologic sustainability describes the ambition to limit the freedom of human activity by the boundaries necessary too maintain a global ecosystem capable to sustain itself and thereby us humans. Economic sustainability describes the practice of managing the consumption of resources to not only meet human needs but also reach a reasonable balance between generations alive today and those to come (Hedenus et al., 2018). Social Sustainability describes the thriving for a societal framework that allows for a harmonic coexistence of people. Equality of rights, freedom of expression of personality and a sense of community belonging are important building blocks of a sustainable social construct.

The most recent iteration of the UN's goals for future sustainable development were compiled in the 2030 Agenda and adopted by all member states in 2015. Key aspect are the 17 Sustainable Development goals (SGD's), significant for their successful communication and global relevance. Some of the SDG's can be directly implicated in architectural design and provide an insight in the respective priorities for sustainably shaping our built environment.



design principle hierarchy

design principle

In order to synthesize a design principle intended to inform and rationalize the design decisions i will take for my design task, I will compare the key takeaways of my interpretation of tectonic and sustainable design, forming a symbiotic collaboration of the two. In this design principle, sustainable design manifests the quality of outcome, while tectonic design is used to inform the quantity of outcome.

I interpret the SGD's most related to architectural design to be 11: „Sustainable cities and communities" and 12: „Responsible consumption and production" Goal 11 aims to make cities and human settlements inclusive, safe, resilient and sustainable (United Nations, 2015). I intend to portray this goal in form of targeting a social, economic, and ecologic sustainability issue. Goal 12 can be applied to in further detail inform the realization of goal 11 with ecologic sustainability issues. I intend to target social sustainability issues through economic incentives.

Employing tectonics to solve these sustainability goals, I intend to solve the social sustainability prerogative of working towards an inclusive urban environment through the possibilities to portray cultural representation in architecture, letting a building function as a stepping stone to bridge social gaps or conflicts.

Ecologic sustainability will be targeted through the synergy of material choice motivated by a low carbon footprint, as in wooden construction and the representation of vernacular crafting culture, likewise realized in timber construction.

Economic sustainability is represented through the tectonic principle of systematic structural hierarchy, resulting in a material-efficient design result. Material efficiency, while contributing to cost efficiency, also benefits the reduction of a buildings carbon footprint.

What will the design outcome of this principle be?

A material-efficient wooden construction targeting social sustainability issues positioned in the local cultural context.

design task

I am going to design a contemporary market hall in Gothenburg.

Initially, this aligns well with my personal experience. I have designed commercial architecture before and will be able to realize a proposal in an efficient wooden construction that is tailored to the local context.

Furthermore, this design task is a good match for my synthesized design principle. A larger building such as for example a market hall with 2.000m²/ 15.000m³ will generally be more structurally efficient than a relatively smaller building, like for example a housing unit with 1.500m²/ 6.000m³. This is due to Galileo's square-cube law, stating that the surface encompassing a volume increases at a lesser rate than the volume itself. In other words, the market hall will have a better ratio of usable building volume to building structure (encompassing surface) than the housing unit would. Additionally, a large building allows for a structural organization in repeating axes, enabling the utilization of systematic prefabrication and modular construction, again contributing to material, time and cost efficiency.

As described in the design principle, a material efficient wooden construction is a well suited contributor to ecologic sustainability by reducing a buildings carbon footprint. Continuous development of this construction method in recent years allow for free spanning widths characteristic for market halls. I will be choosing a wooden truss structure over a glulam beam structure, as it is more material efficient and displays it's functional principle through its appearance, coherent with tectonic principles.

Lastly, I believe a market hall to bear great potential in influencing the urban social fabric in which it sits. It is a public building open every day of the week that does not require entrance regulation. It is therefore open to everyone without discrimination. It's economic identity makes it a destination rooted in everyday needs, from the purchase of everyday goods to leisure activities like dining. With a programmatic approach providing economic opportunity to individuals through for example flea market space as well a entrepreneurs through small shops and primary producers like farms, a market hall can be both economically resilient and promote ecologically sustainable consumer behavior.

exterior view **(Figure 4)**

interior view **(Figure 5)**

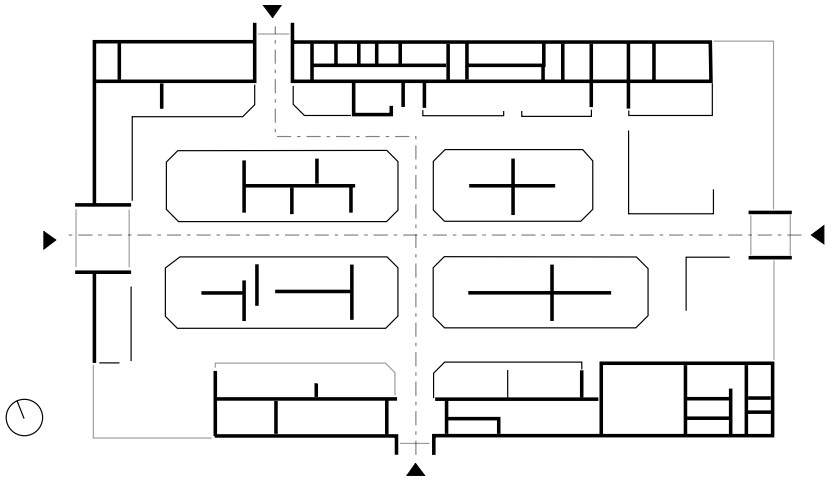
reference

Temporary Market Hall, Stockholm
Tengbom

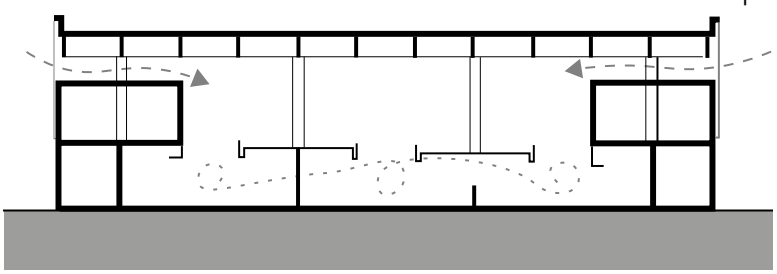
The reference project is chosen for its contemporary execution of a sustainable market hall in the Scandinavian context. In this case, for the renovation period of the historic Östermalms food hall, the architects at Tengbom planned a temporary market hall on an adjacent Östermalms Square. This market hall was later disassembled and rebuild in another location as a sports hall.

The roof construction consists of a structural grid of glulam elements joined by bolted steel profiles and held up by multi part wood columns. This construction method is sustainable on two levels: It is created from wood with an inherently low carbon footprint and also allows for easy reassembly for the alternate use concept as sports hall. Through this very practical construction method, focused on trimming all excess to save money on this temporary solution, the buildings structural hierarchy is visible in details from the roof structure over to the facade, representing tectonic design principles in an honest and humble way.

Though very well representing the sustainable tectonic design principle, my design proposal will have to differ from this one in terms of thermal performance and comfort, as it will not be a temporary measure.



floorplan



section

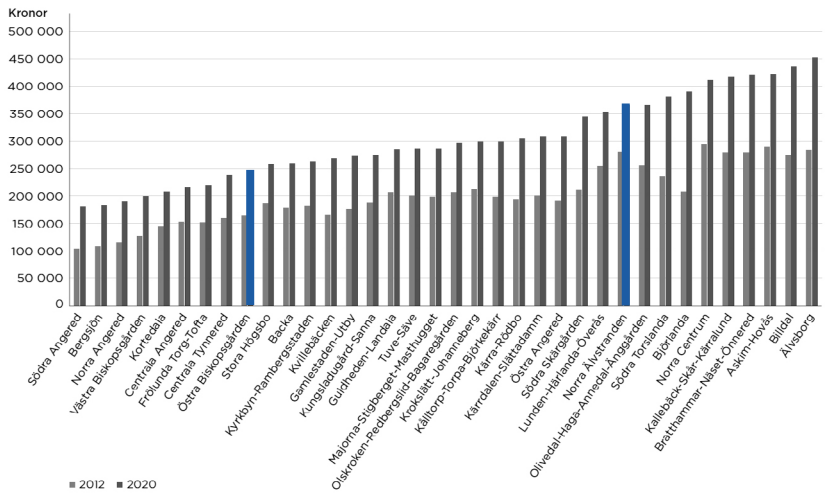

Västra Biskopsgården
Norra Älvstaden

gothenburg

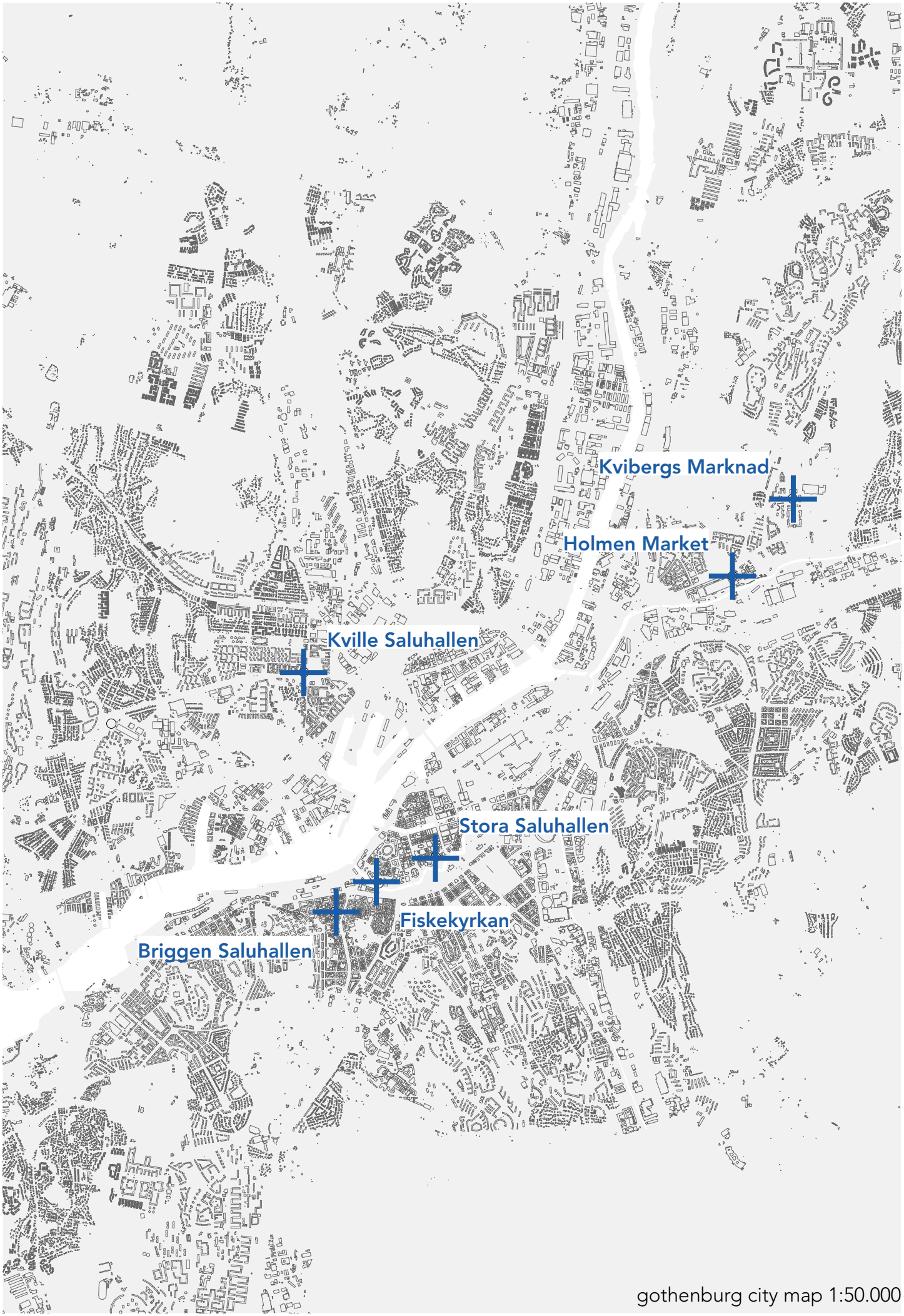
An understanding of contemporary issues or tensions in rural or urban societal contexts is a common point of departure for architecture aiming to improve the local societal fabric. Addressing such an issue allows for a quality in identity and can be objectively researched and argued for. Topics of political discussion can be an indicator for relevant issues. Specific issues can be investigated through data collection or data evaluation as in statistic research.

Subjecting sociologic and economic sustainability alike, the issue of urban socioeconomic segregation, describing the residential segregation of population groups based on occupation, income, or education, can develop into an existential problem for disadvantaged groups. A lesser availability of economic resources can result in restriction of movement within the city, potentially limiting access to available basic resources, healthcare, education or leisure activities. This in turn can result in alienation between population groups, eroding the cohesion of urban society.

I am intending to improve the cohesion of Gothenburg as an urban society by identifying a socioeconomic gap and placing my market hall as a steppingstone within it, appealing to different socioeconomic groups and providing a place for exchange and encounter without economic discrimination. For this, I first identified the adjacent neighborhoods of Biskopsgården and Norra Älvstaden with a large economic differential. I choose to position the market hall on the gap between these neighborhoods.



Average disposable income for Gothenburgs secondary city districts **(figure 6)**



gothenburg city map 1:50.000

profile

Gothenburg already has an accumulation of market halls of contrasting character. From diverse food being sold in the saluhallen and specific food in Fiskekyrkan, diverse goods in Kvibergs Marknad to second hand goods in Holmens Market. This diverse offering of goods attracts a wide variety of customers of different socioeconomic backgrounds. I intend to combine these different profiles in my proposal for a markethall.

Stora Saluhallen

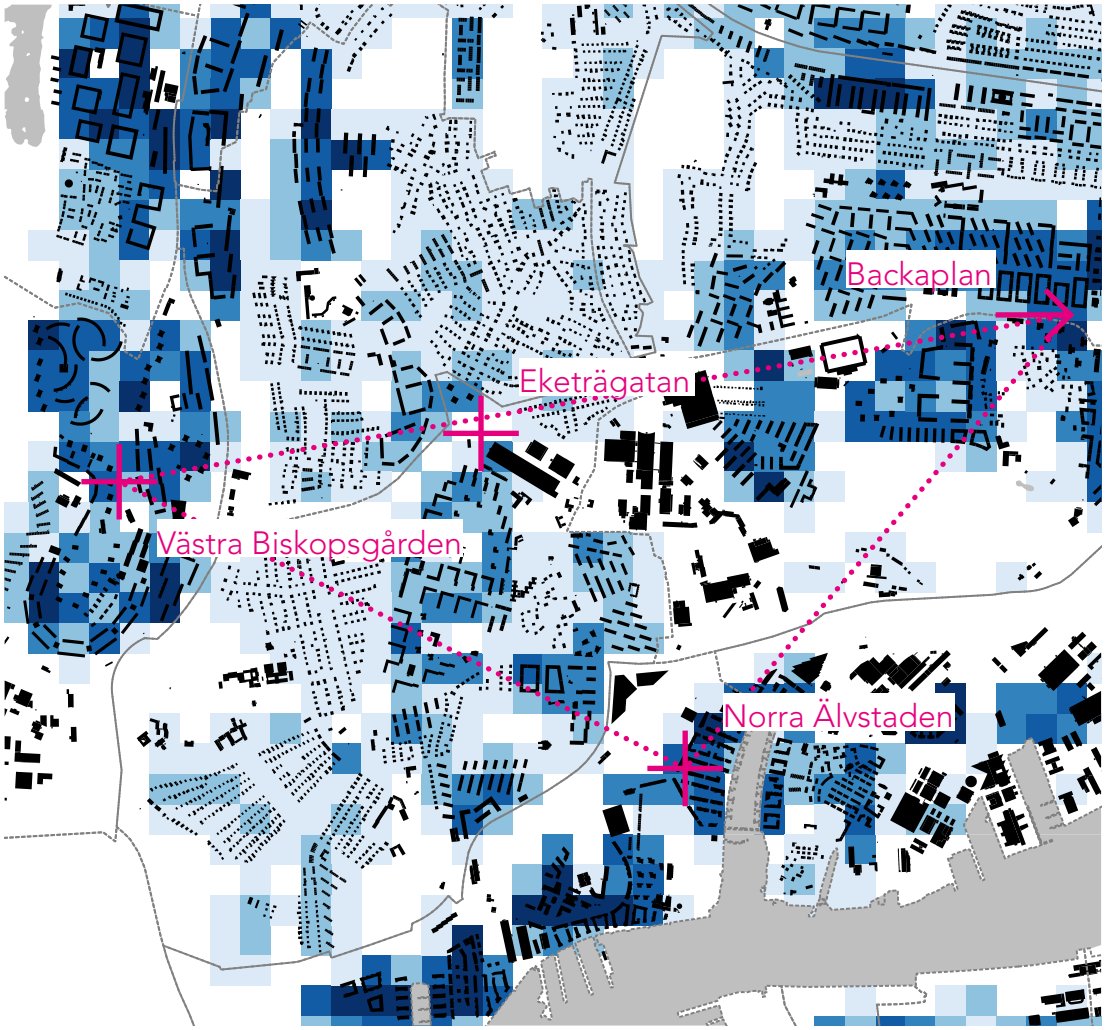

Kvibergs Marknad

Holmen Market


Briggen Saluhallen


Fiskekyrkan

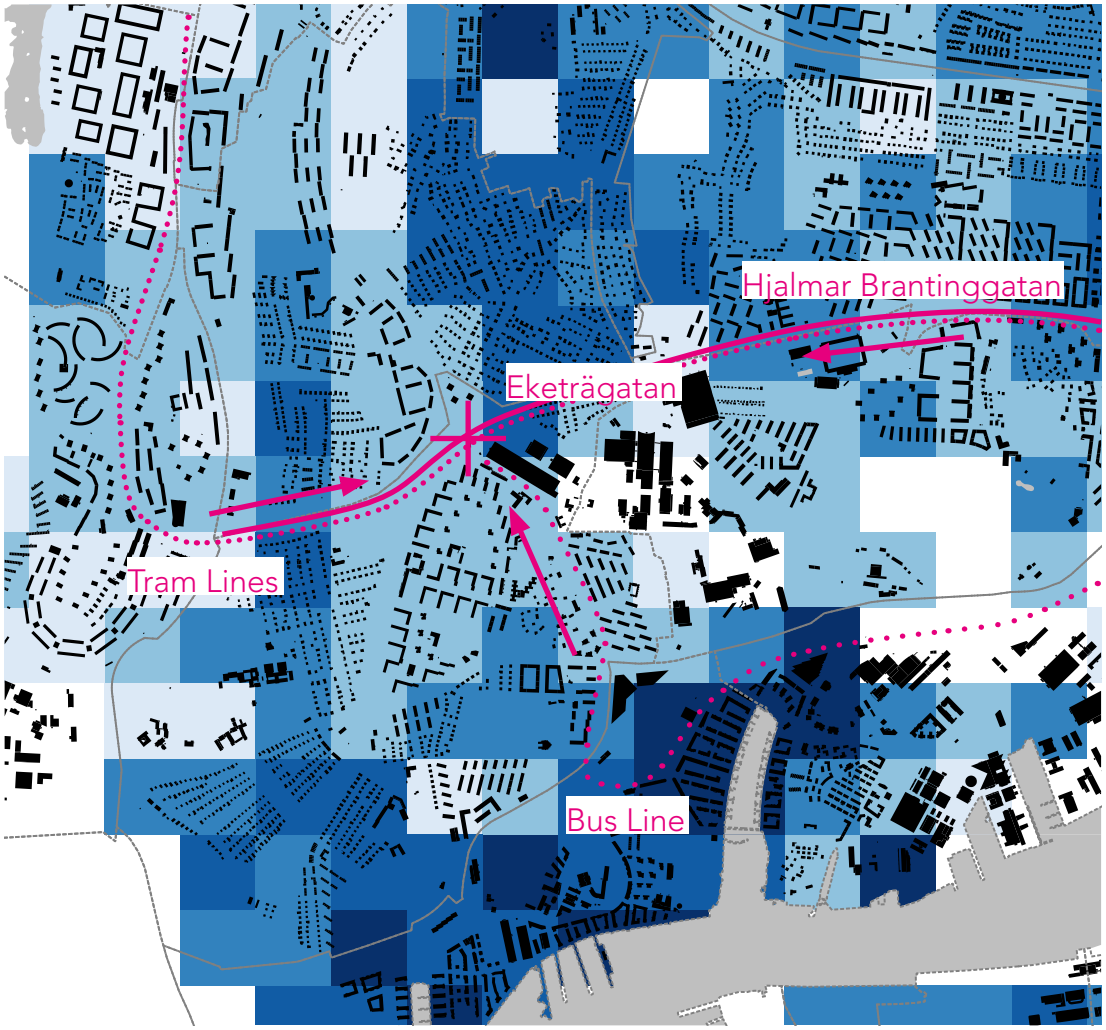

Kville Saluhallen



population density
in pers/ 10.000m²

- 1 - 50
- 50 - 100
- 100 - 150
- 150 - 250
- 250 - 500

situation map
1:25.000



median household income
in SEK

- 0 - 200.000
- 200.000 - 250.000
- 250.000 - 300.000
- 300.000 - 350.000
- 350.000 - 450.000

situation map
1:25.000

analysis

On the two maps on the left I am analyzing the areas of interest Biskopsgården and Norra Älvstaden for population density and average income distribution, as these together are relevant indicators of socioeconomic development. Together with the currently developing area of Backaplan, this forms a triangle with its very own characteristics at each corner.

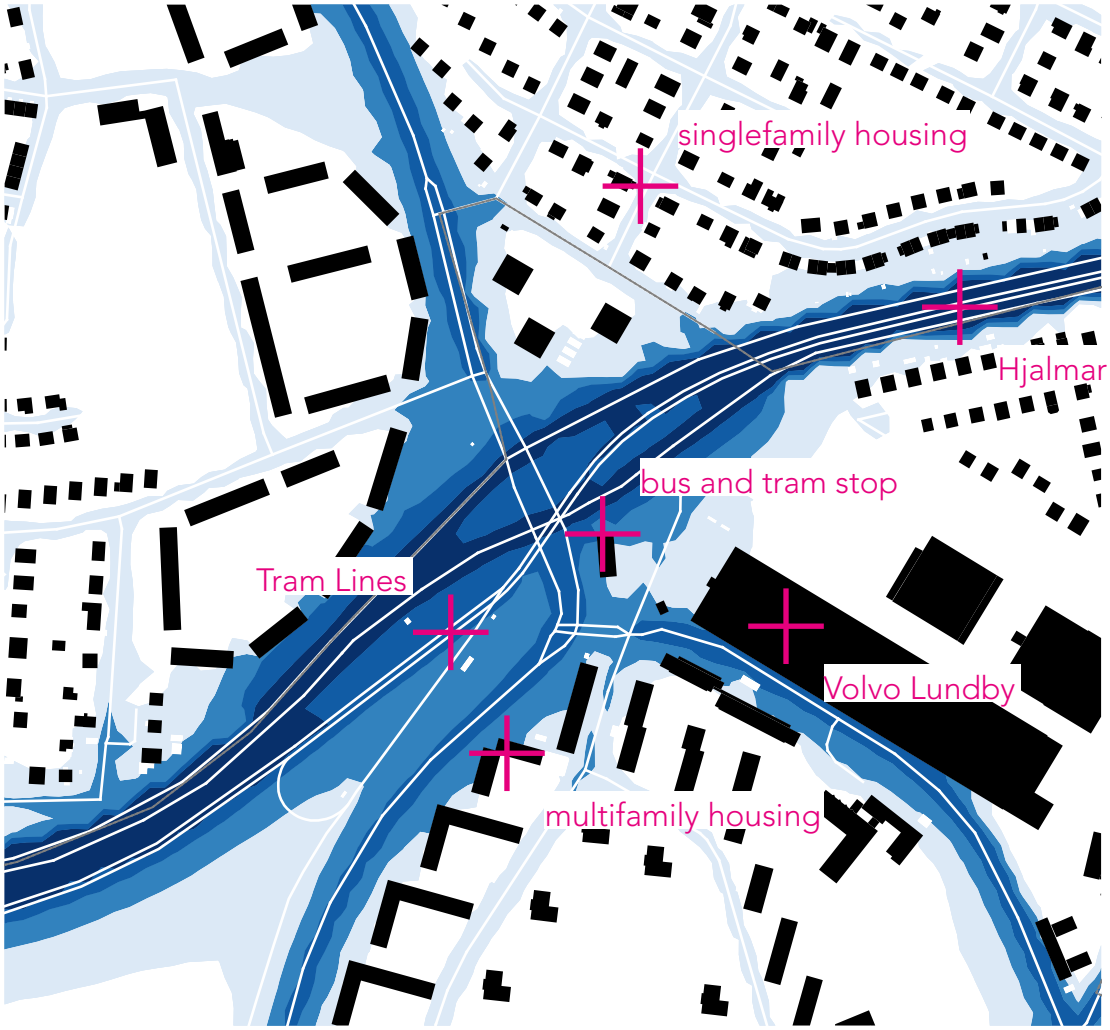
Biskopsgården is an area currently experiencing social struggles. It has a high population density and its inhabitants with one of Gothenburg's lowest average disposable income experience a strong influence of criminal activity. Gothenburg's police has characterized Biskopsgården as a vulnerable area. A positive point of significance for Biskopsgården is the connection to the city center via the tram lines 1, 5, 6, 10 and 13, also connecting to the area of Backaplan via Hjalmar Brantinggatan.

Norra Älvstaden on the other hand is a high profile, recently developed housing area with modern housing complexes directly by the water. The average disposable income of this area is one of the highest in Gothenburg. A Location for my architectural intervention in the Middle of Biskopsgården, Norra Älvstaden and Backaplan promises the best accessibility for all residents. Situating it along Hjalmar Brantinggatan is of particular interest, as it already has a good connection to the public transportation network.

Following Hjalmar Brantinggatan from Biskopsgården to Backaplan, i am choosing the area around Eketrägatan tram and bus stop as my site.

This site is of high infrastructural significance and promises a good quantity of passing foot traffic, as it is also the location for the Volvo Lundby business park, contributing with a large potential customer base to the economic success of the market hall. It is located an equal distance from the neighborhoods of interest and has a certain amount of vacant space. The issue that needs to be addressed with this location before conceptualizing the building itself though, is the excessive space currently dedicated to road infrastructure.

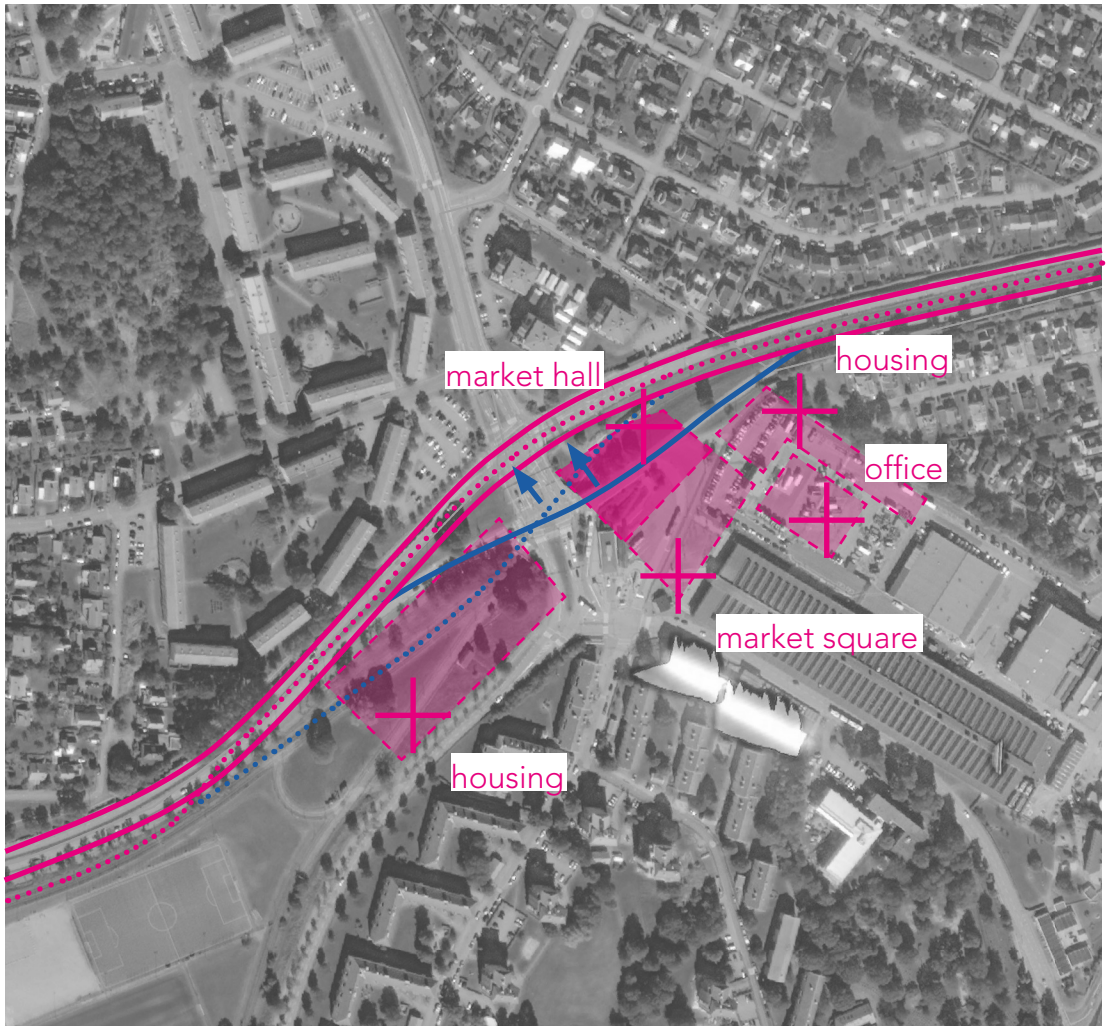
Slightly reducing the capacity for road traffic can simultaneously promote pedestrian, bicycle, and public transport and open up space for the residents of the area to enjoy, instead of avoid due to noise and air pollution.



Noise emission
in dB

- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70

site map
1:5.000



- **current road course**
- **current tram course**
- **future road course**
- **future tram course**
- **future building lots**
- **future market hall lot**

ortho photo
1:5.000

site concept

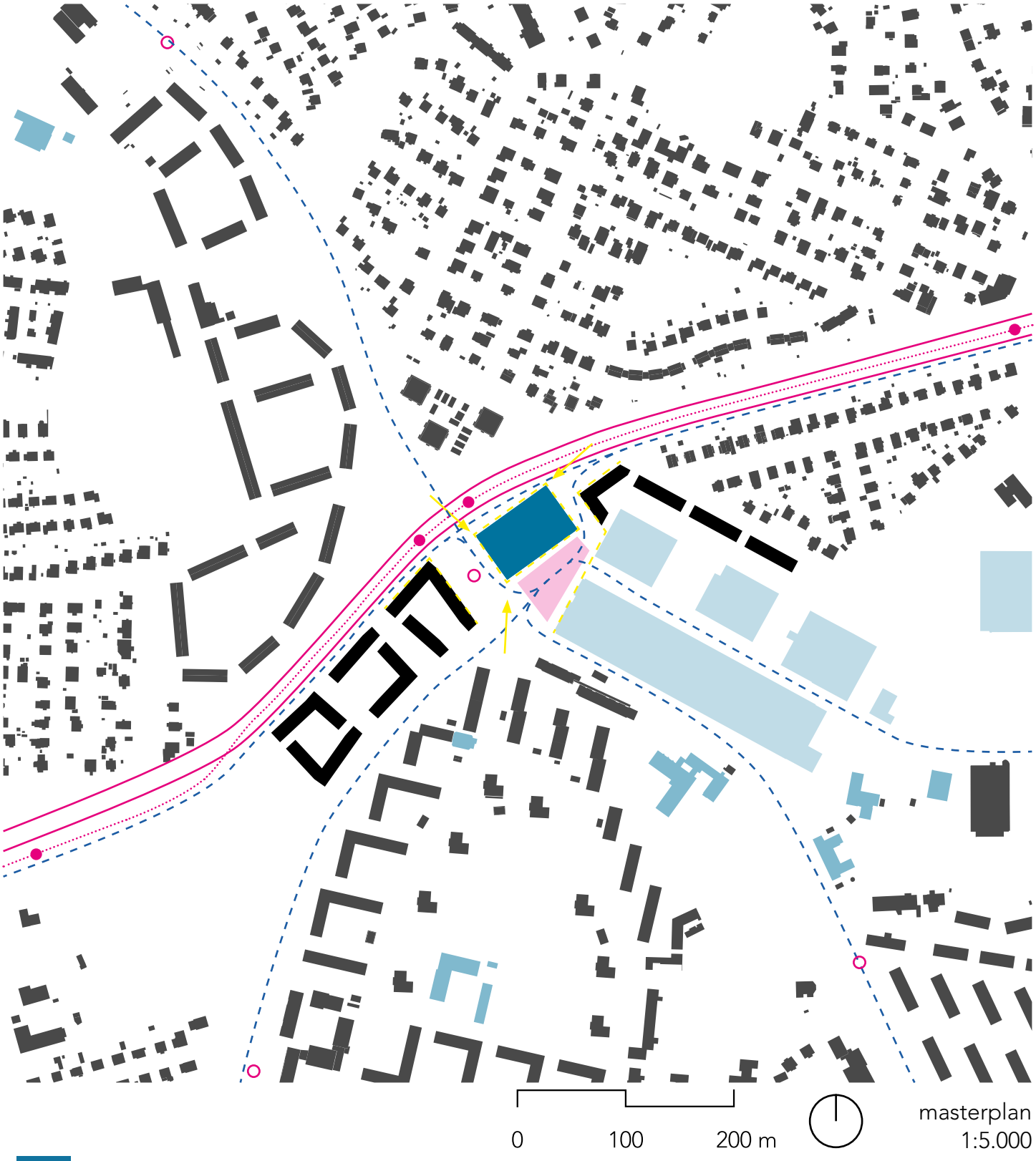
Currently, the site of Eketrägatan is defined by excessive traffic infrastructure, emitting harmful levels of noise and separating the adjacent residential areas. Reorganizing the traffic infrastructure allows for building lots in addition to the market hall that can provide a noise sheltered market square in the strategic center while also framing the market hall and square. Additional housing units serve the urban densification and with affordability in mind combat socioeconomic segregation. Also including office space in the site's program balances the local economic profile and adds purchasing power to the benefit of the market hall. The market hall will sit prominently on the intersection of Hjalmar Brantinggatan representing the locations new identity while also harboring the previous administrative function for public transport.

Volvo Lundby

tram and bus stop

singlefamily housing

multifamily housing


0
100
200 m
masterplan
1:5.000
market hall
new housing
current housing
public building
commercial building
market square
hjalmar brantinggatan
tram
tram stop
bus stop
bike- and pedestrian lanes
important sightlines
framing of the urban space

masterplan

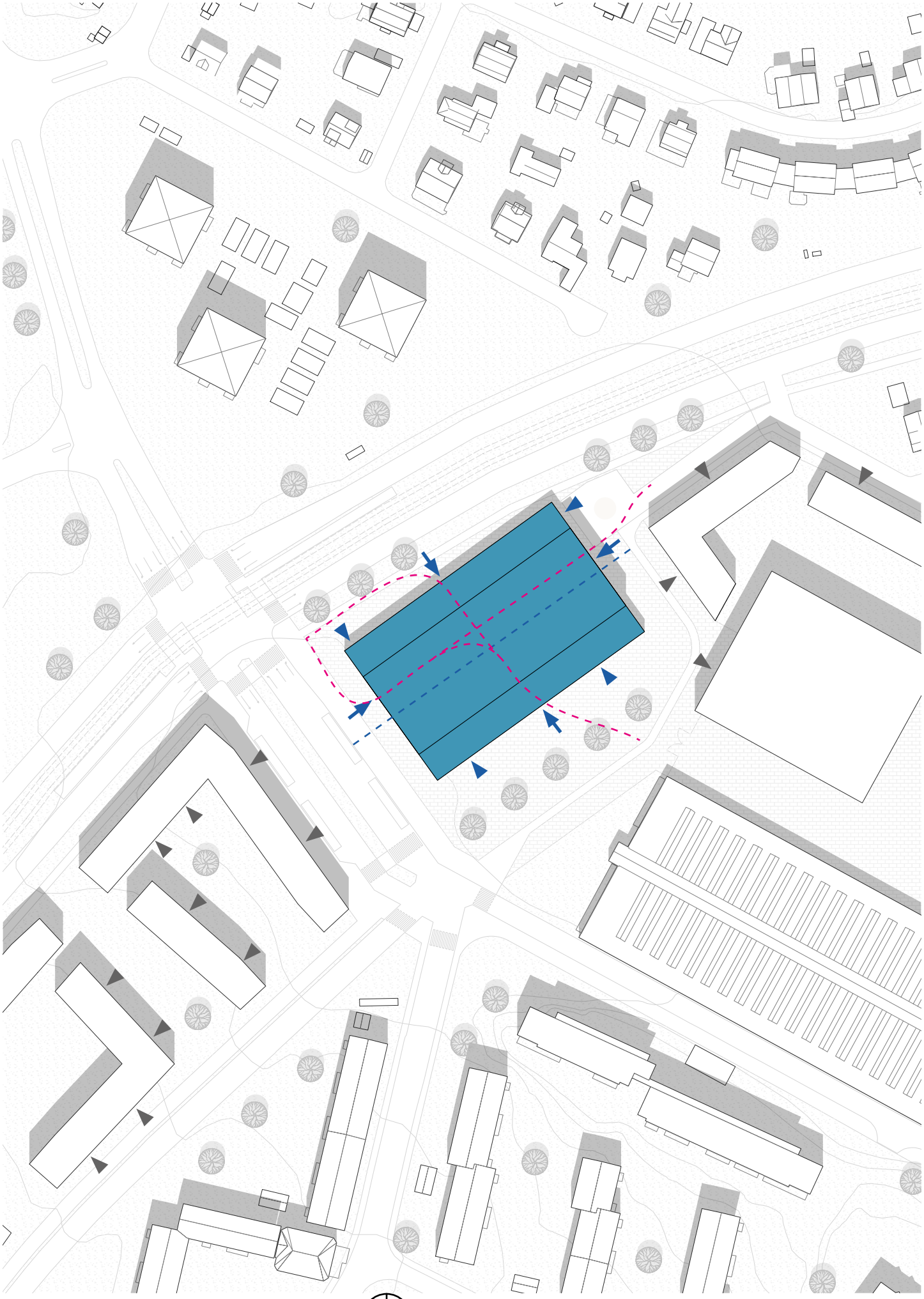
The map on the left shows the urban design scale masterplan for the market hall at Eketrägatan tram- and bus stop.

For this context, I will from now on refer to the project by its title: Eketrähallen.

The road infrastructure has been reorganized in order to allow for more open space to work with. All previously existing roads have been kept, but their layout has been modified. Public transportation infrastructure has been maintained in function, though it is now more accessible due to less obstruction from road infrastructure. Bicycle and pedestrian paths have been extended and better interconnected, overall improving the accessibility of the site through ecologically sustainable modes of transportation.

First step in framing the site for Eketrähallen is the completion of the Volvo Campus through an additional office building, creating an ally between itself and the old factory building, ending on the market square with direct sightline of the market hall. To the north, the framing of the market square continues through a line type housing complex, transitioning the single family housing area to the north-east over to the industrial and office buildings of the Volvo Campus. The line typology of these buildings allows for noise sheltered backyards away from Hjalmar Brantinggatan. The same motivation resulted in the block type housing buildings to the south-west of Eketrähallen. The blocks were split up in angles and lines to allow for better accessibility through the blocks for the residents, simultaneously blending in to the context of adjacent multifamily housing units.

Finally, the positioning of Eketrähallen on the site completes the framing of the south-oriented, noise sheltered market square. Three of the buildings corners are the visual target following three major roads towards the building. Each of these corners portrays a part of the character of the building defining its identity. The corner visible when coming from Backaplan is visible when passing by car, bike or tram, and therefore sticks out from the adjacent housing for good visibility and recognition. The corner to the north-west of the building interacts with the public transportation infrastructure and harbors the main entrance. Here, the highest pedestrian traffic is to be expected. The southern corner is the target when approaching from the south by foot or bike, introducing the inviting qualities of the market square.



site plan
1:1.000

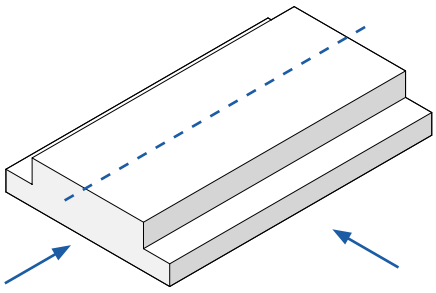
site plan

Eketrähallen is oriented in an axis alongside Hjalmar Brantinggatan, providing noise shelter through it's volume, while also allowing for a flow lengthwise through the building, mirroring the movement of pedestrians and cyclists outside. Placed as a solitaire on the market square, access to the building from all sides is possible and utilized for public entrance. In addition to these main entrances, the public transport office on the north west corner, utility rooms on the northern facade, delivery to storage on the north east corner and shops and restaurants on the southern facade all have access through independent entrances and don't disturb what happens inside the market hall.

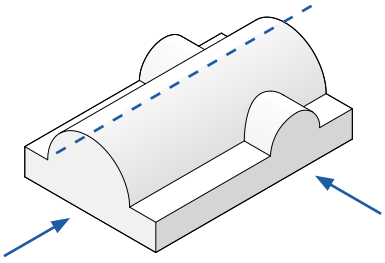
In addition to allowing free movement across the site, the generous square allows for weekly markets, events and leisure activities to take place.

typology

For the typology, I'm choosing a contemporary interpretation of the historic market hall theme with the vaulted ceiling and wings. I choose this theme for its representative outward presence, open air like interior experience and clear geometric structuring, aiding my structural design principle and floorplan conception.

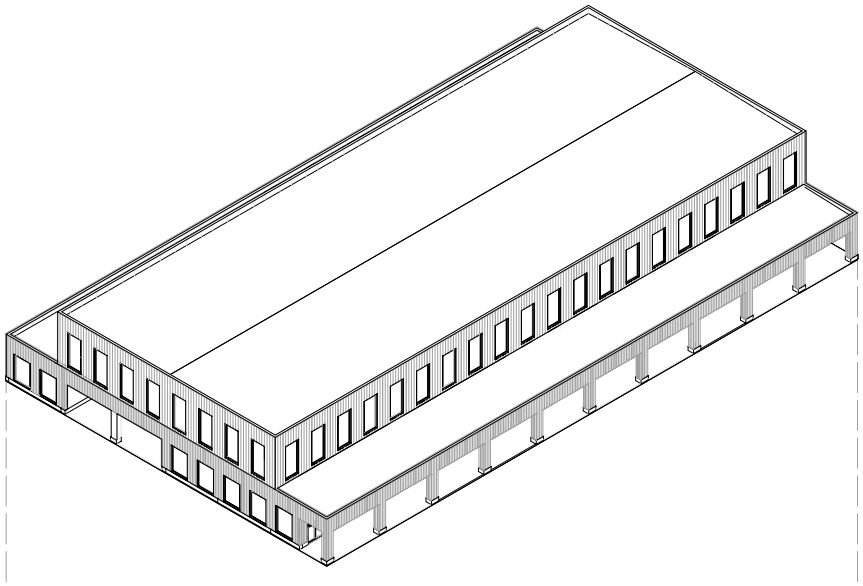


Eketrähallen

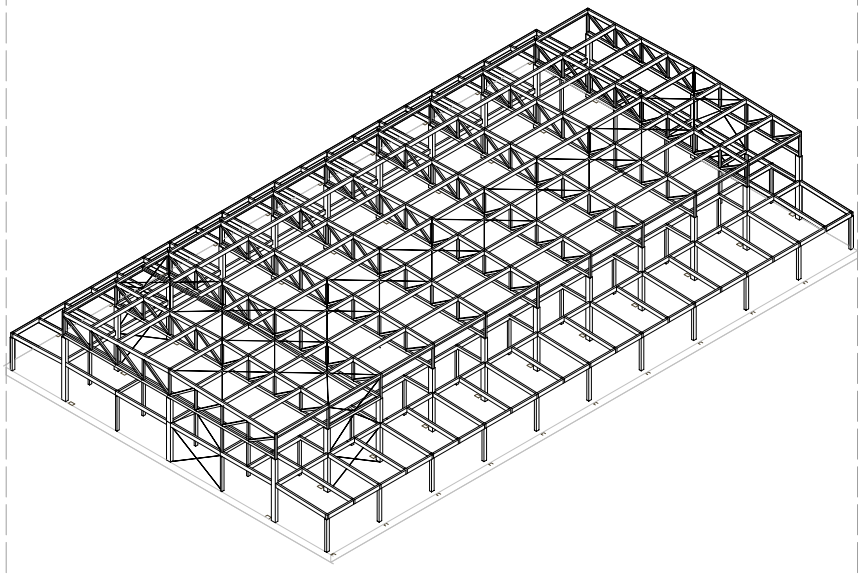


Stora Saluhallen

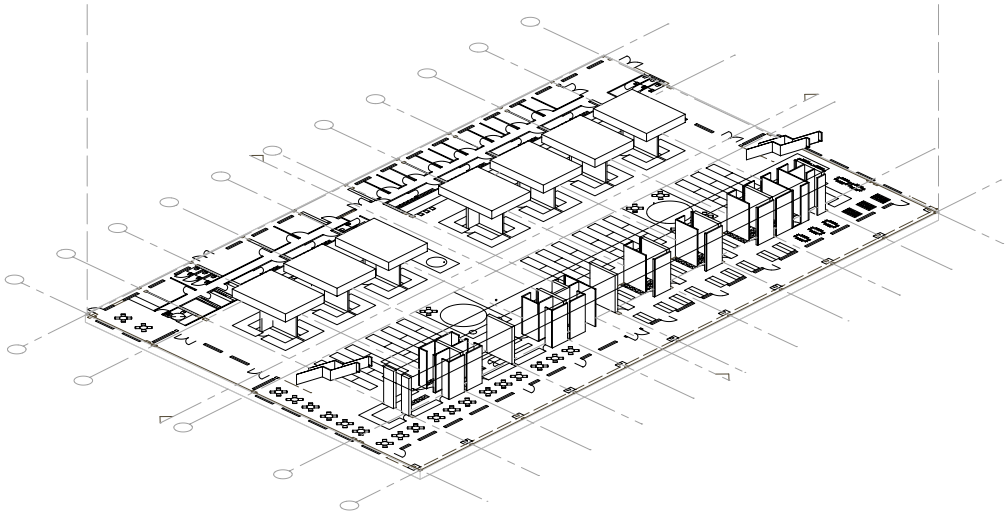
typology study 1:1.000



facade



structure



program

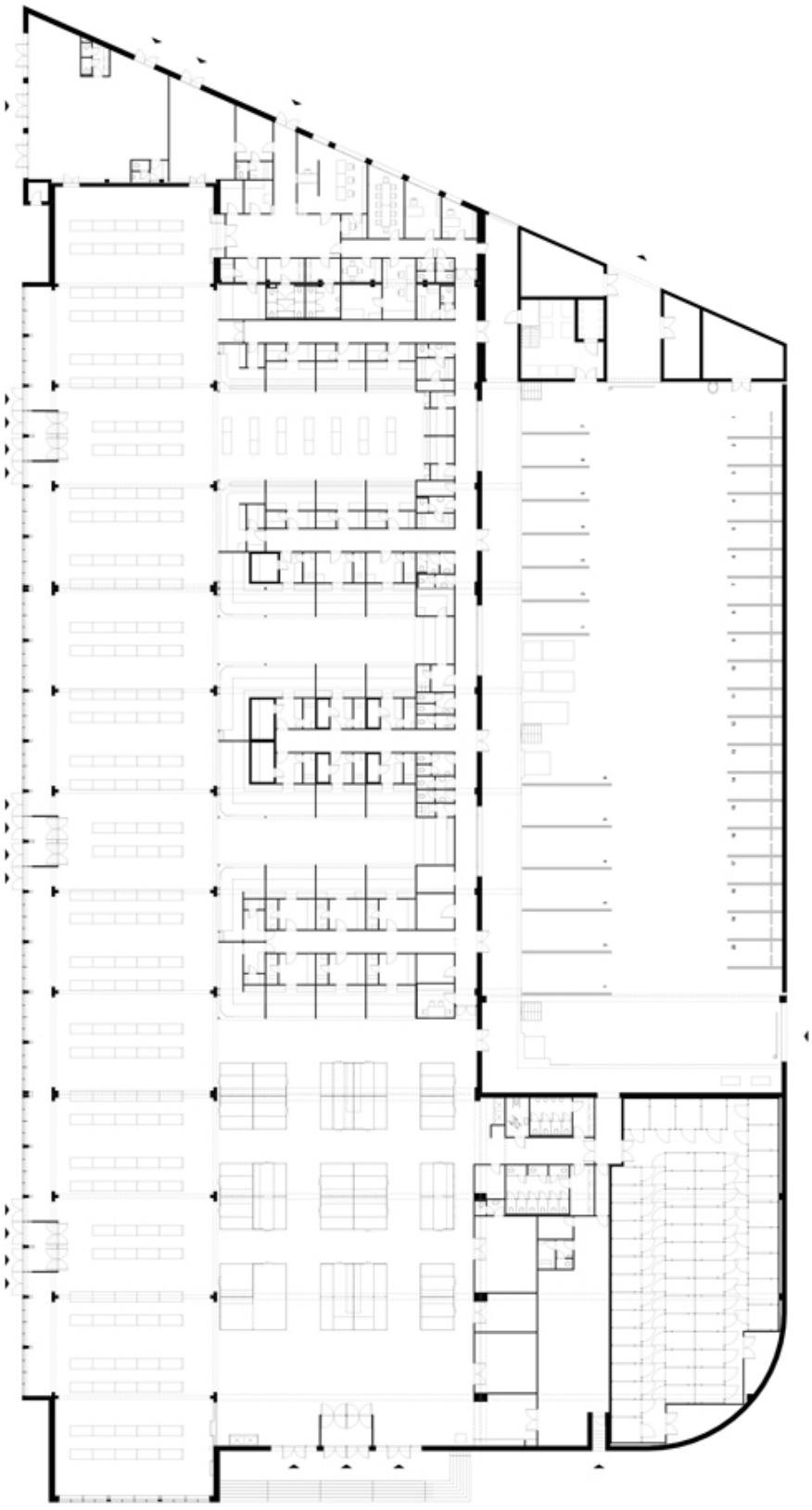
3 | Building

introduction

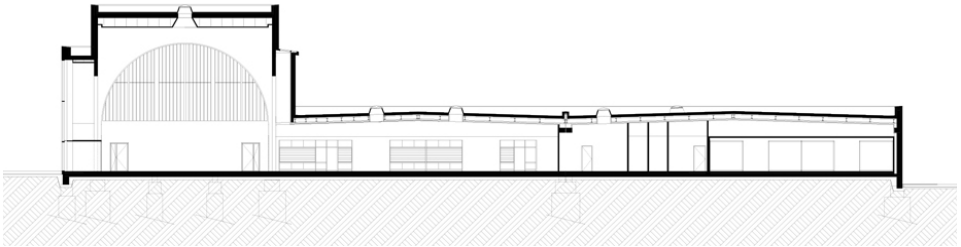
Having now laid the groundwork for introducing the construction of the building „Eketrähallen" through substantial context analysis, i will refer back to my design principle to inform the separate phases of building design and their respective focus.

The program is the buildings functional representation of the local context. It builds on the analysis and bridges the representation of social sustainability ambition allowing for an ecologic and economic structural realization.
The Structure represents the tectonic sustainability principle through material choice and efficiency and connects the functional cultural representation of the program to the aesthetic cultural representation of the facade.

The design principle should support this approach of building design and the design approach in turn should validate the design principle. The building should be deemed purposeful if by the end, this ambition is met.



floorplan



section

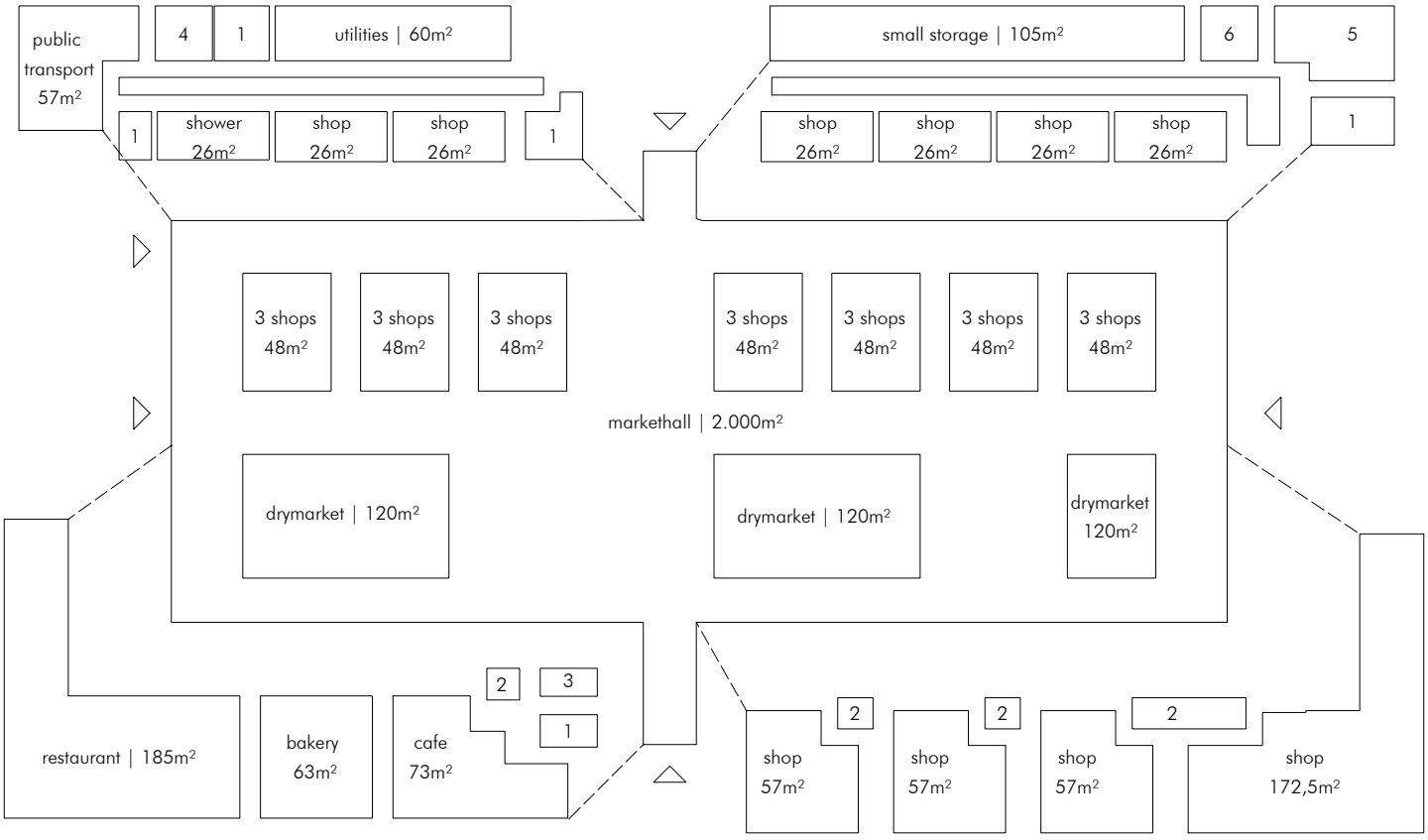
program reference

New market hall of Pécs
GETTO plan

This reference is chosen as a programmatic reference. it compares to my intended design in being single floor with a main market hall with a tall ceiling and utilityrooms organized to the side. I will incorporate the small individual market stands in the main market hall that could be used for flea markets, for small local vendors that change frequently or even moved out quickly to make space for an event or gatherings. Additionally, long term market stands for for example cooled products like meat and dairy or fresh foods will be incorporated with storagage and prep rooms as they are here. Lastly, good visual connection throughout the building and an open inside-outside relationship will be picked up to guide the visitor into and throught the building.

exterior view **(Figure 7)**

interior view **(Figure 8)**



1 bathroom
2 storage
3 elevator
4 administ ration
5 delivery
6 recycling

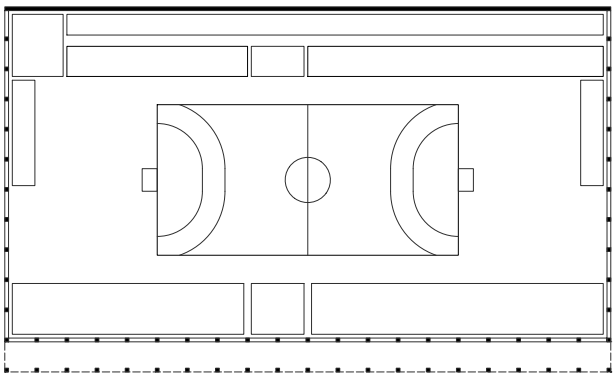
program 1:500

program

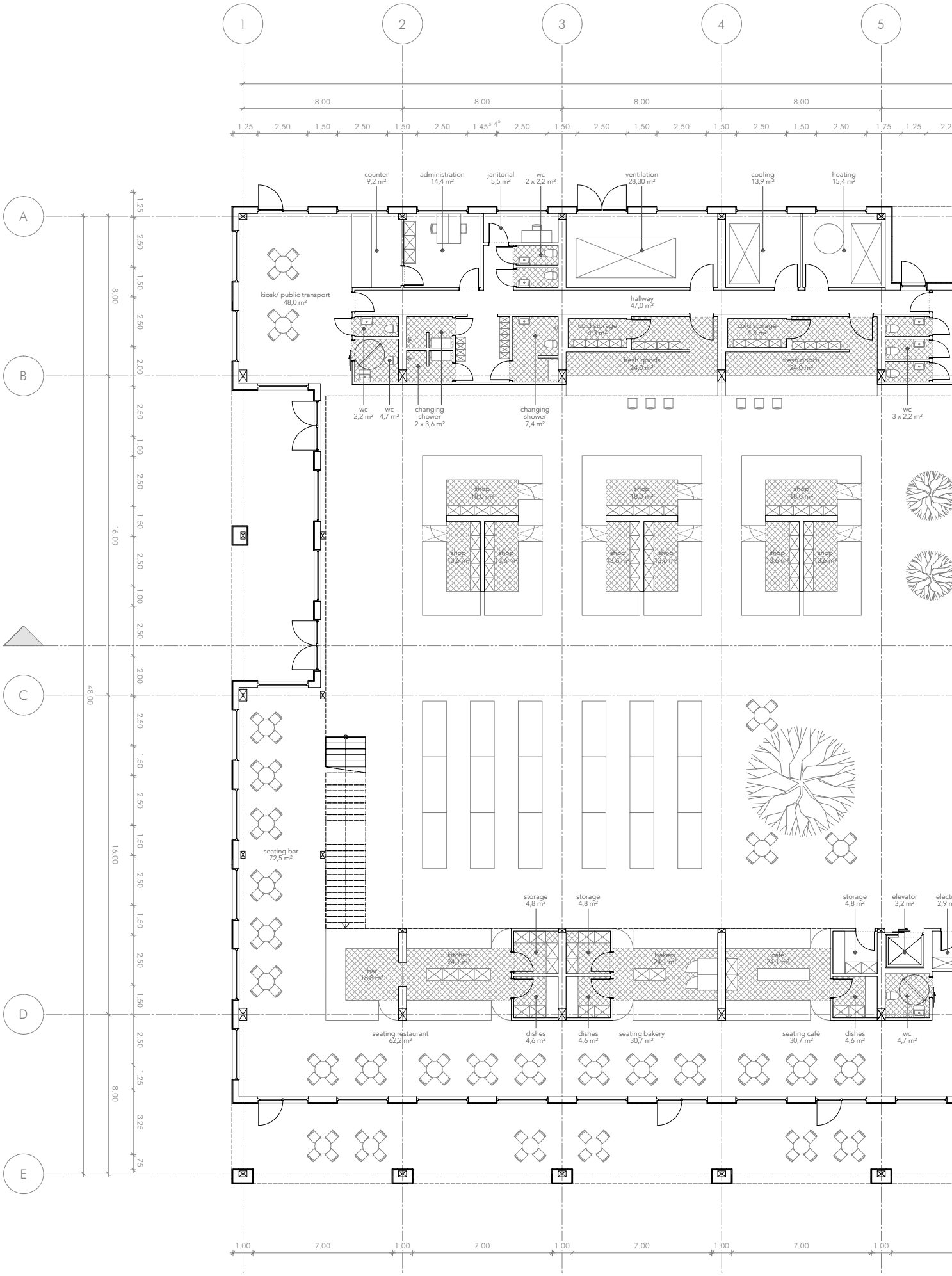
The programme is targeted to be a meeting space for residents of Biskopsgarden, Norra Älvstaden and Backaplan. In order to accomplish that, there needs to be a diverse offering of producs to appeal to different groups of people and a floorplan layout that allows adaptation to different use cases. Also a more ecologically sensetive program compared to the concepts of „fast fashion“ and throwaway economies is promoted.

Layout-wise the markethall is inspired by classical markethall for their identity potential, as well as by modern day markethalls, encoporating proven functionalities and display themselves as resiliant and adaptable.
The theme of the classical markethall should generate a feeling of welcomeness that is globally present in market contexts. It is also a question of reassurance: Here you have a human counterpart, someone to talk to who can explain things to you and to whom you can return and complain if something was not to your liking. Personal contact can seem more appealing than the small letters on ordinary food packaging stating the contents and nutritional value (Lee, 2009).

Specifically, the market hall encorporates a variety of different size shops appealing to differnet type vendors and diversifying the program. Even for people not intending to purchase goods, the market hall can be enjoyed through the cafe or restaurant. Here, the outside relationship to the market square promotes an open atmosphere year round.



alternate program 1:1.000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A
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C
D
E
counter 9,2 m²
administration 14,4 m²
janitorial 5,5 m²
wc 2 x 2,2 m²
ventilation 28,30 m²
cooling 13,9 m²
heating 15,4 m²
kiosk/ public transport 48,0 m²
hallway 47,0 m²
cold storage 4,3 m²
fresh goods 24,0 m²
wc 2,2 m²
wc 4,7 m²
changing shower 2 x 3,6 m²
changing shower 7,4 m²
wc 3 x 2,2 m²
shop 18,0 m²
shop 13,6 m²
seating bar 72,5 m²
storage 4,8 m²
elevator 3,2 m²
kitchen 24,1 m²
bar 16,8 m²
bakery 24,1 m²
café 24,1 m²
seating restaurant 62,2 m²
dishes 4,6 m²
seating bakery 30,7 m²
seating café 30,7 m²
wc 4,7 m²
8.00
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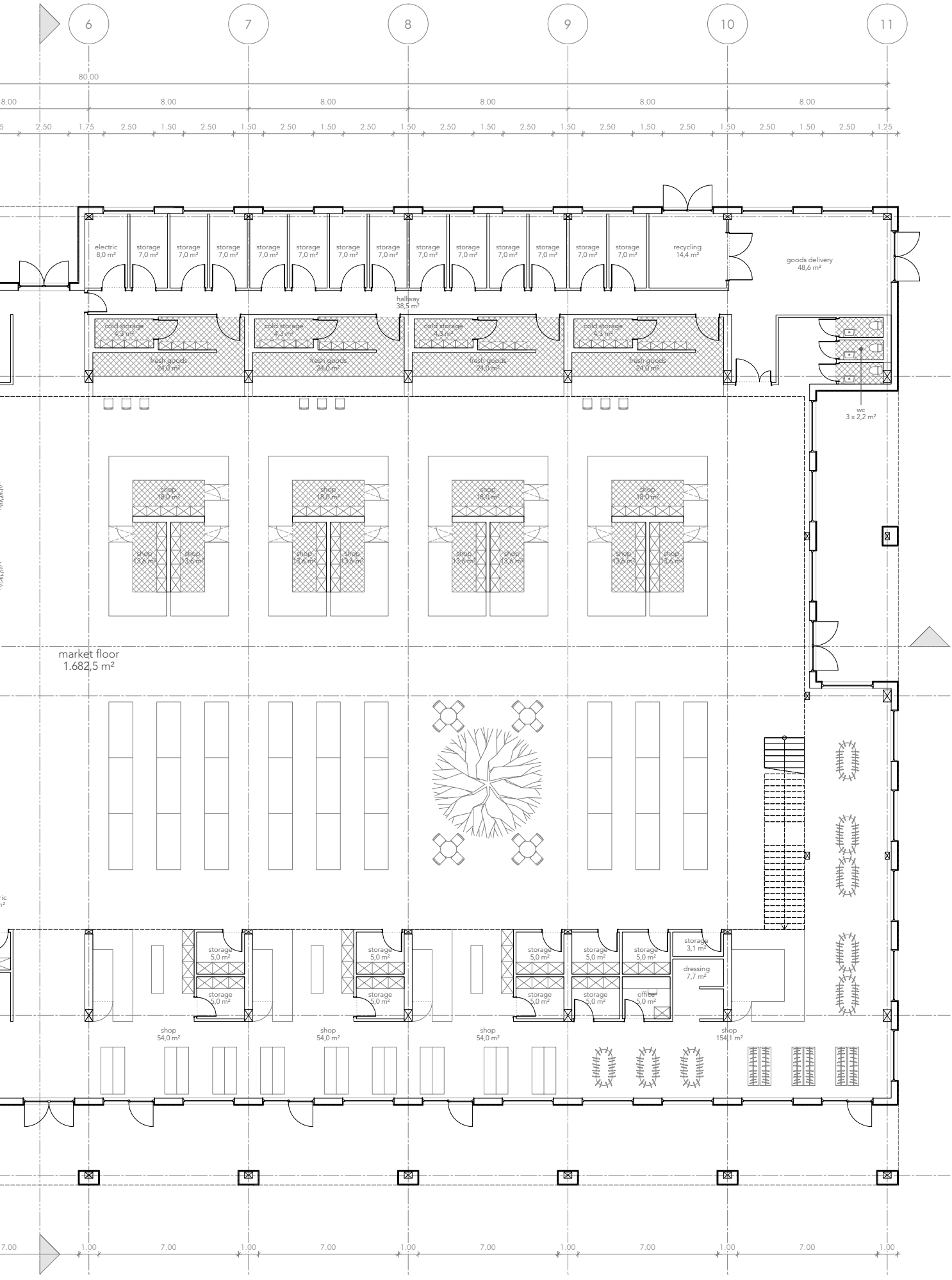
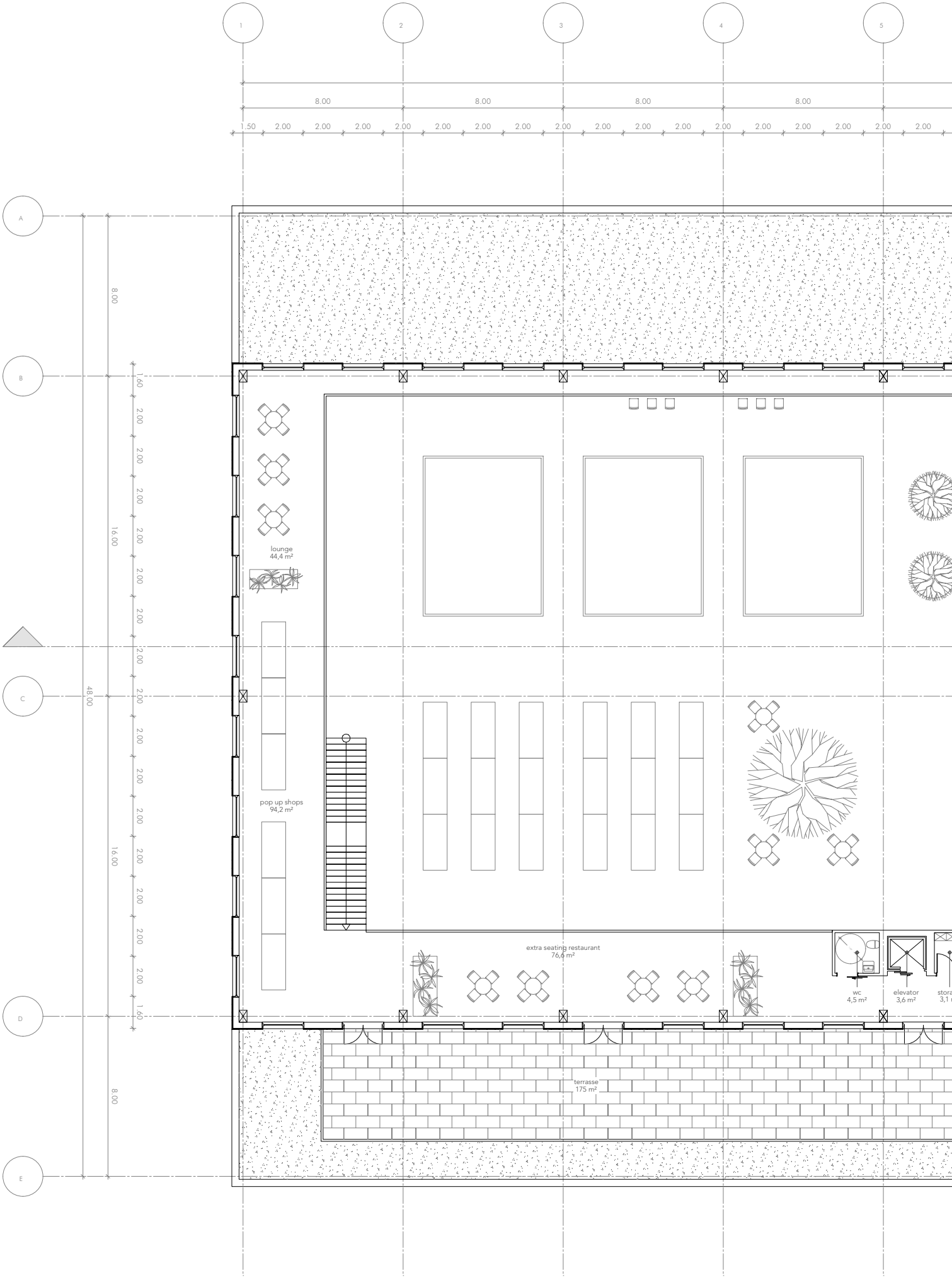
48.00



floorplan groundfloor 1:250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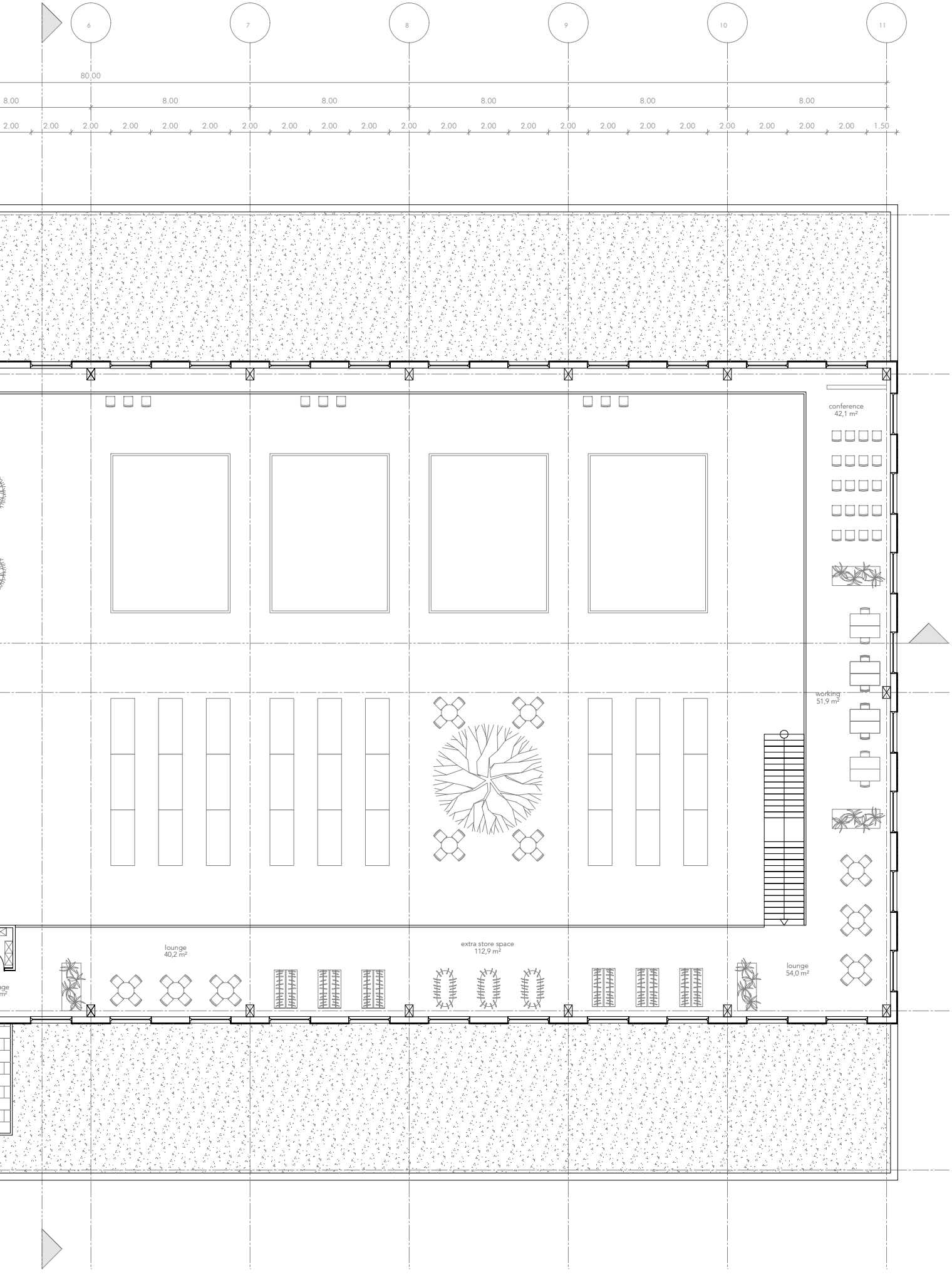
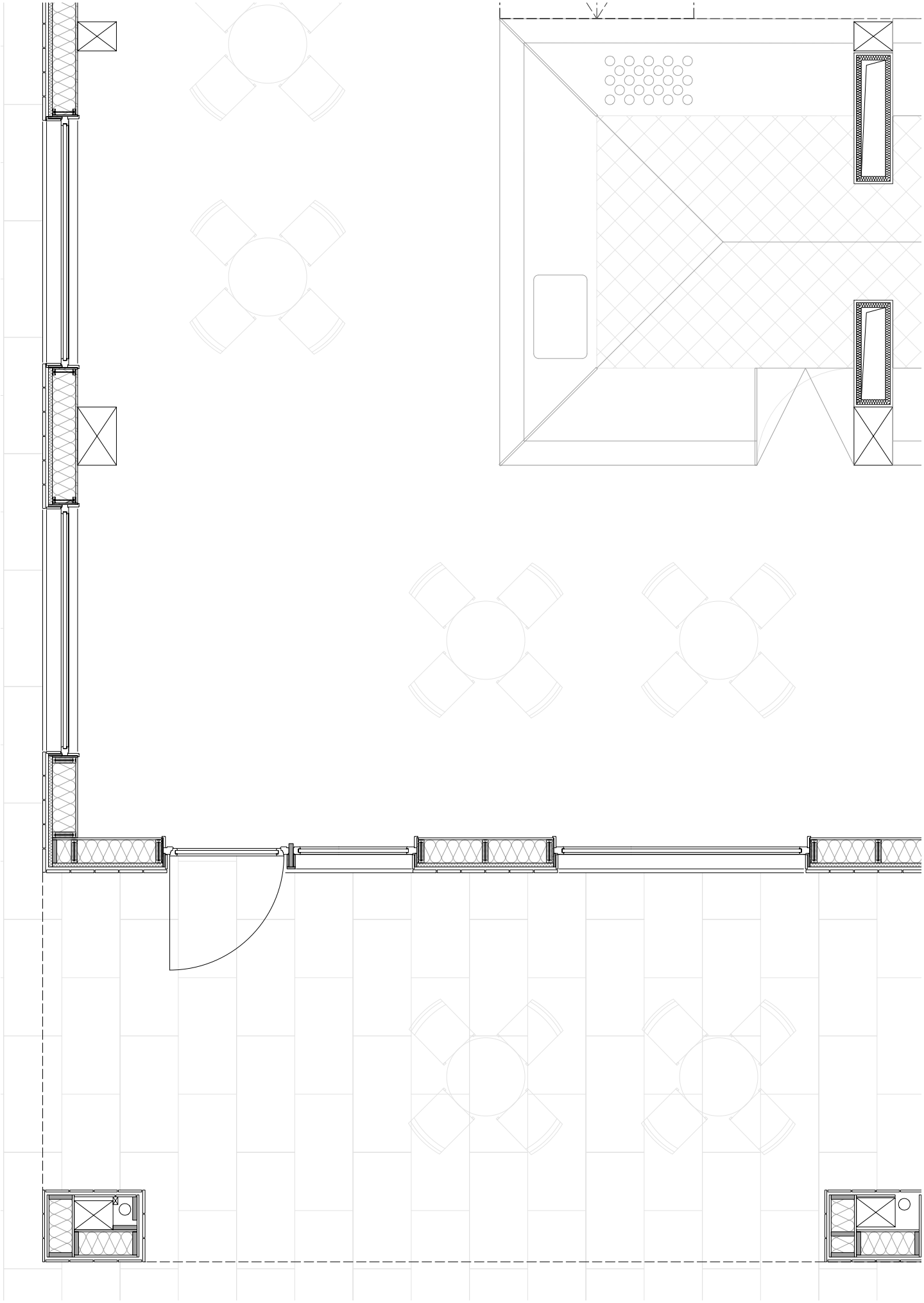
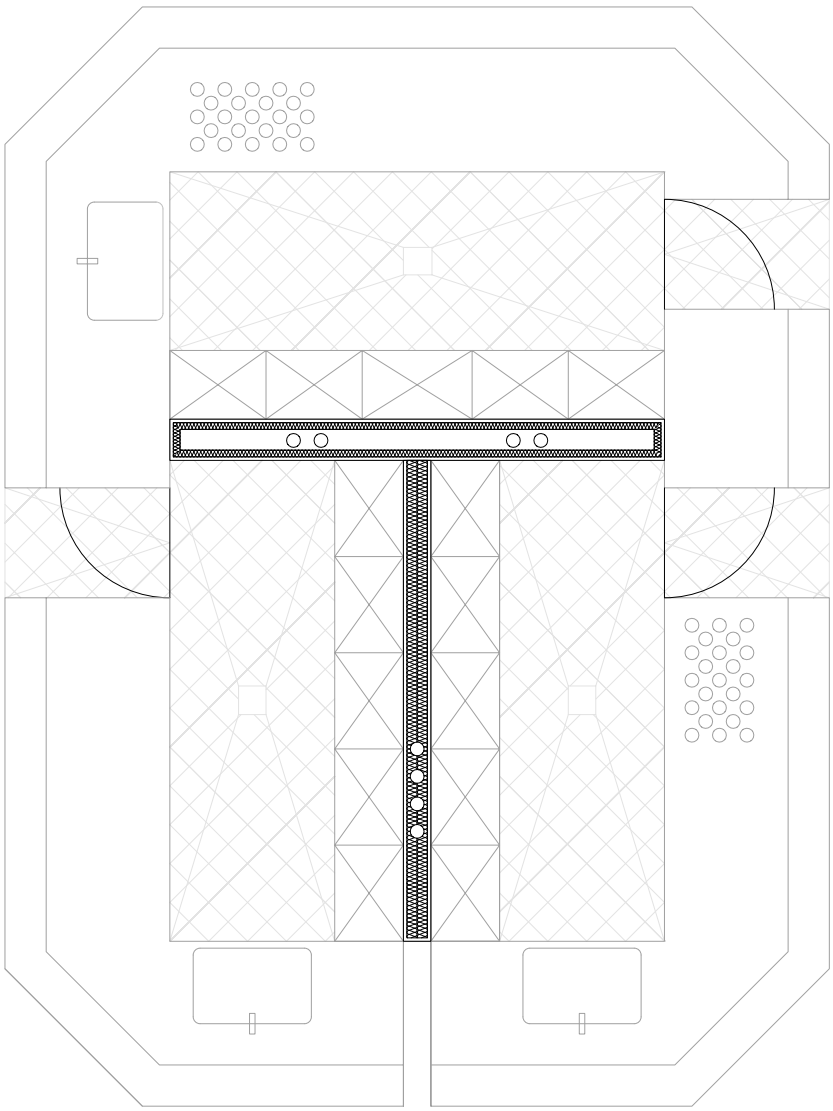
lounge
44,4 m²
pop up shops
94,2 m²
extra seating restaurant
76,6 m²
terrasse
175 m²
wc
4,5 m²
elevator
3,6 m²



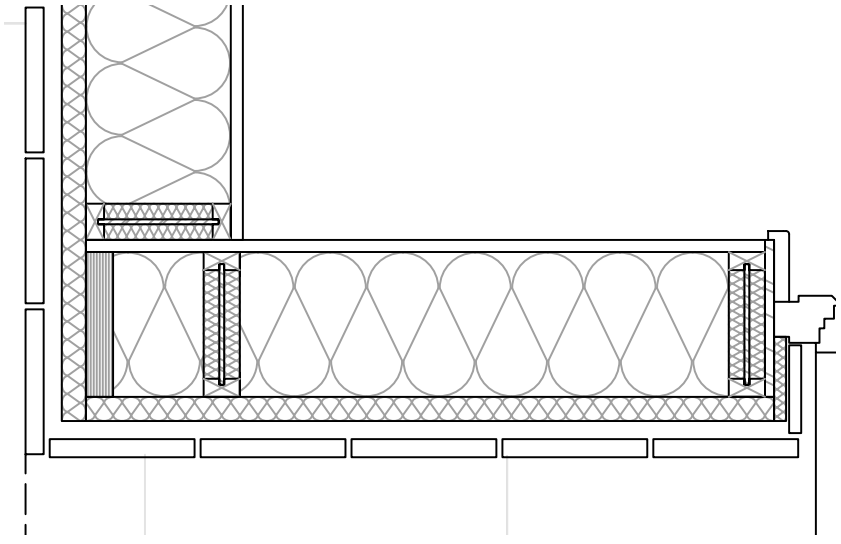
floorplan gallery 1:250



floorplan detail 1:50

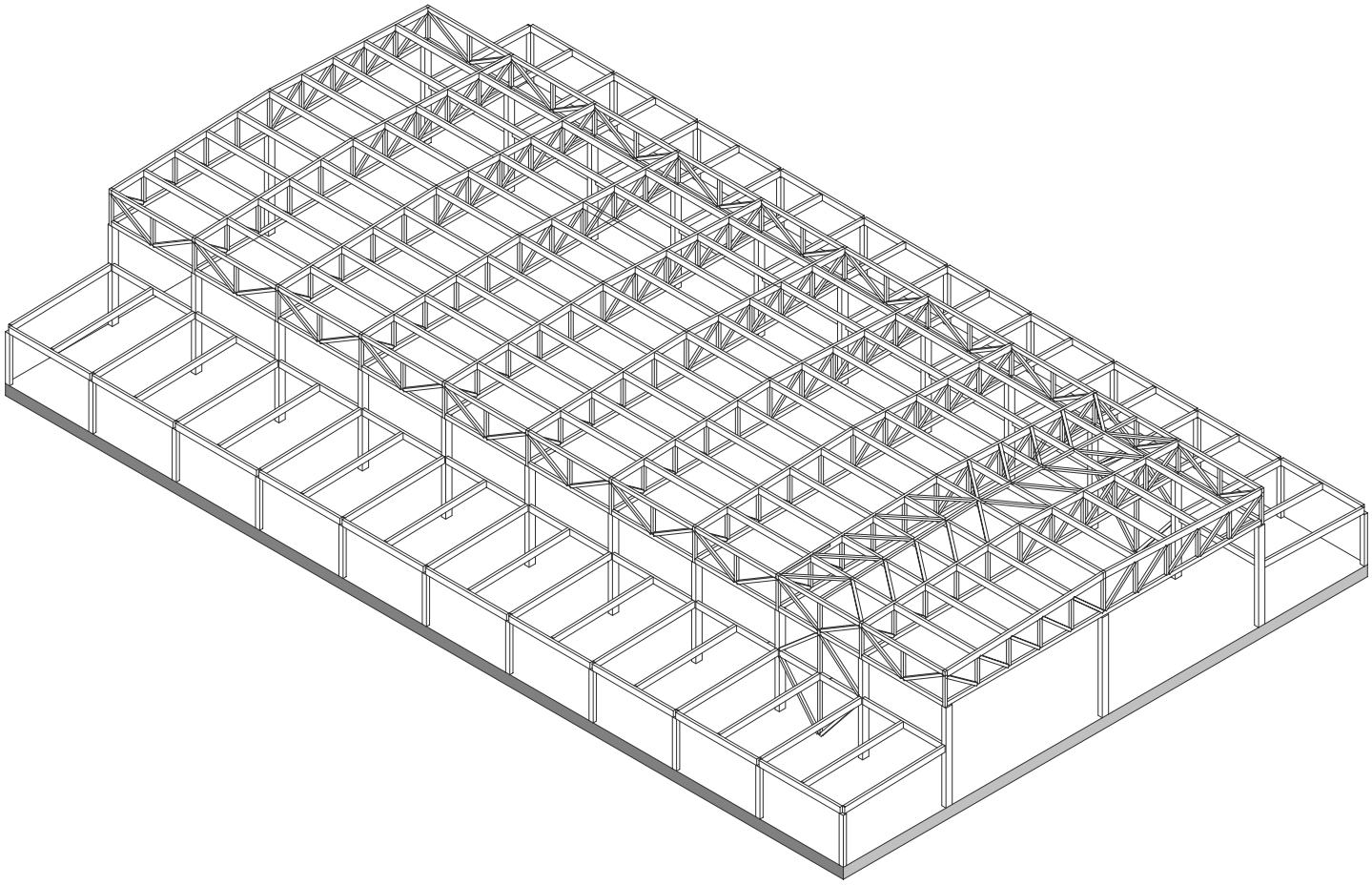


market stand 1:50

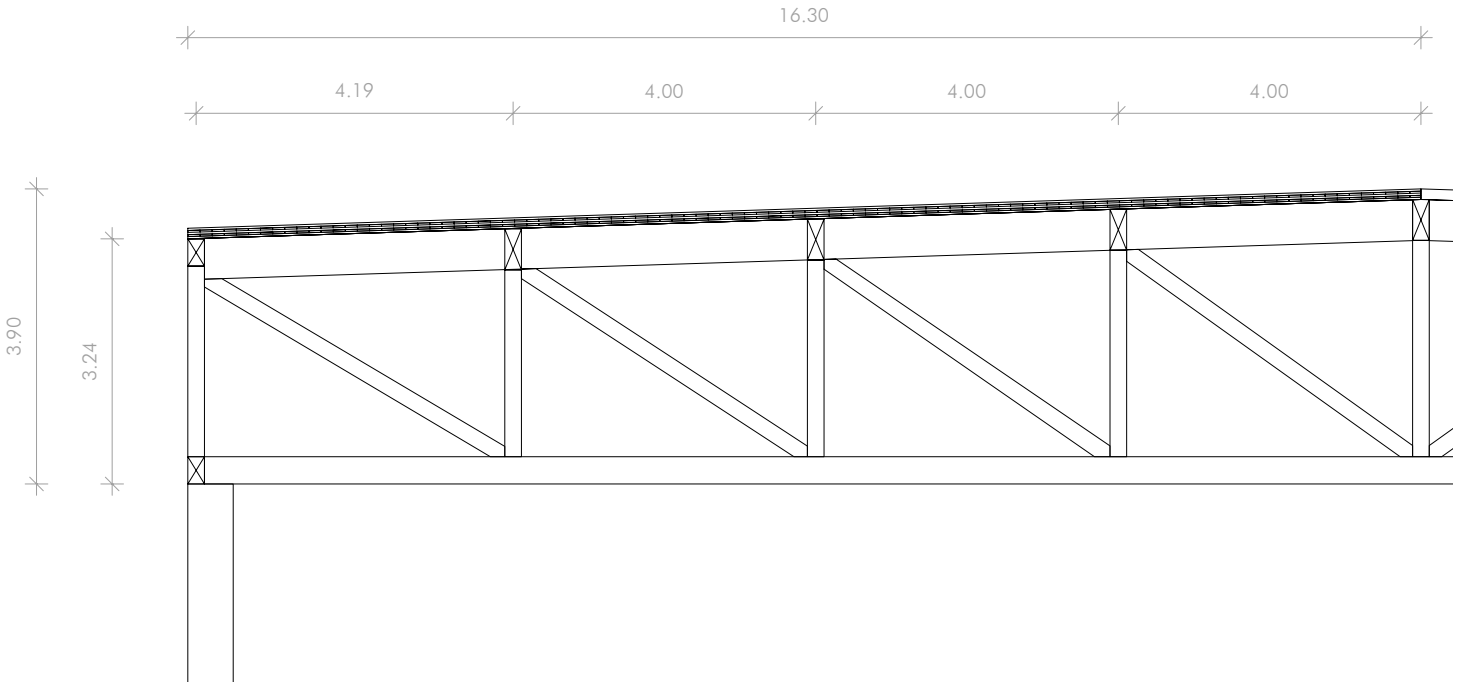


corner detail 1:20

interior perspective

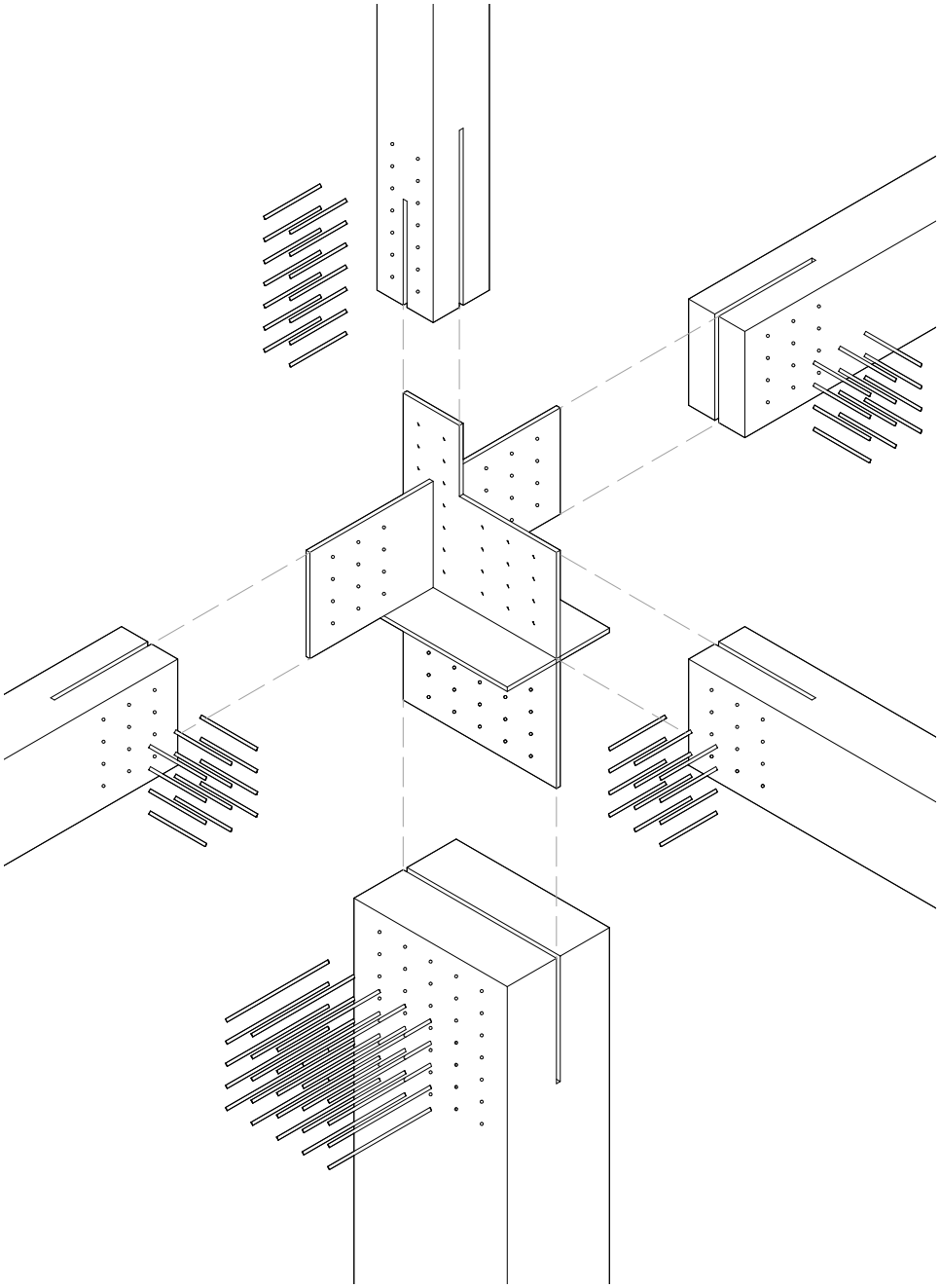


structural system of wooden trusses and columns 1:1.000

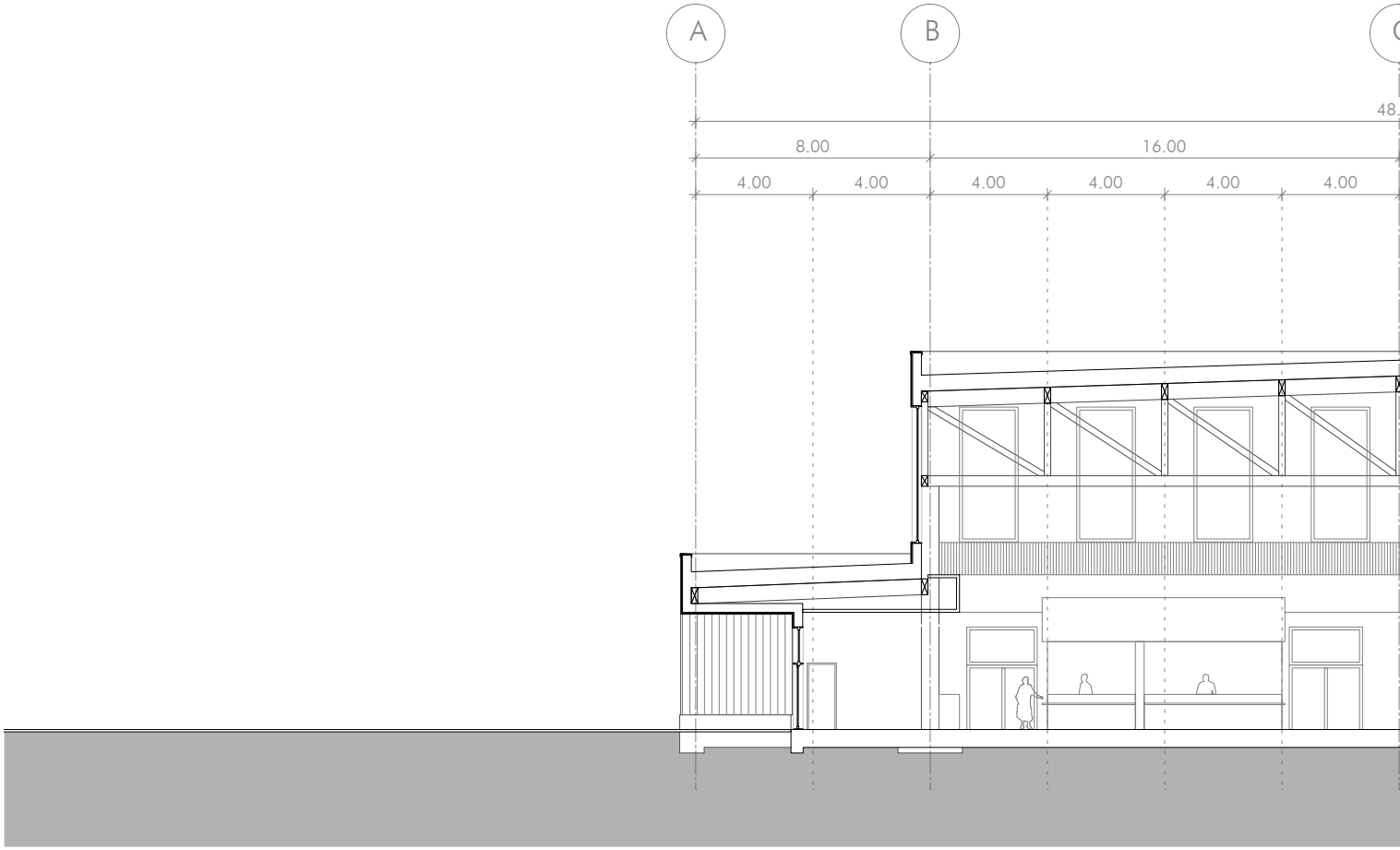


half roof truss, 1:100

Structural concept



corner truss joint 1:10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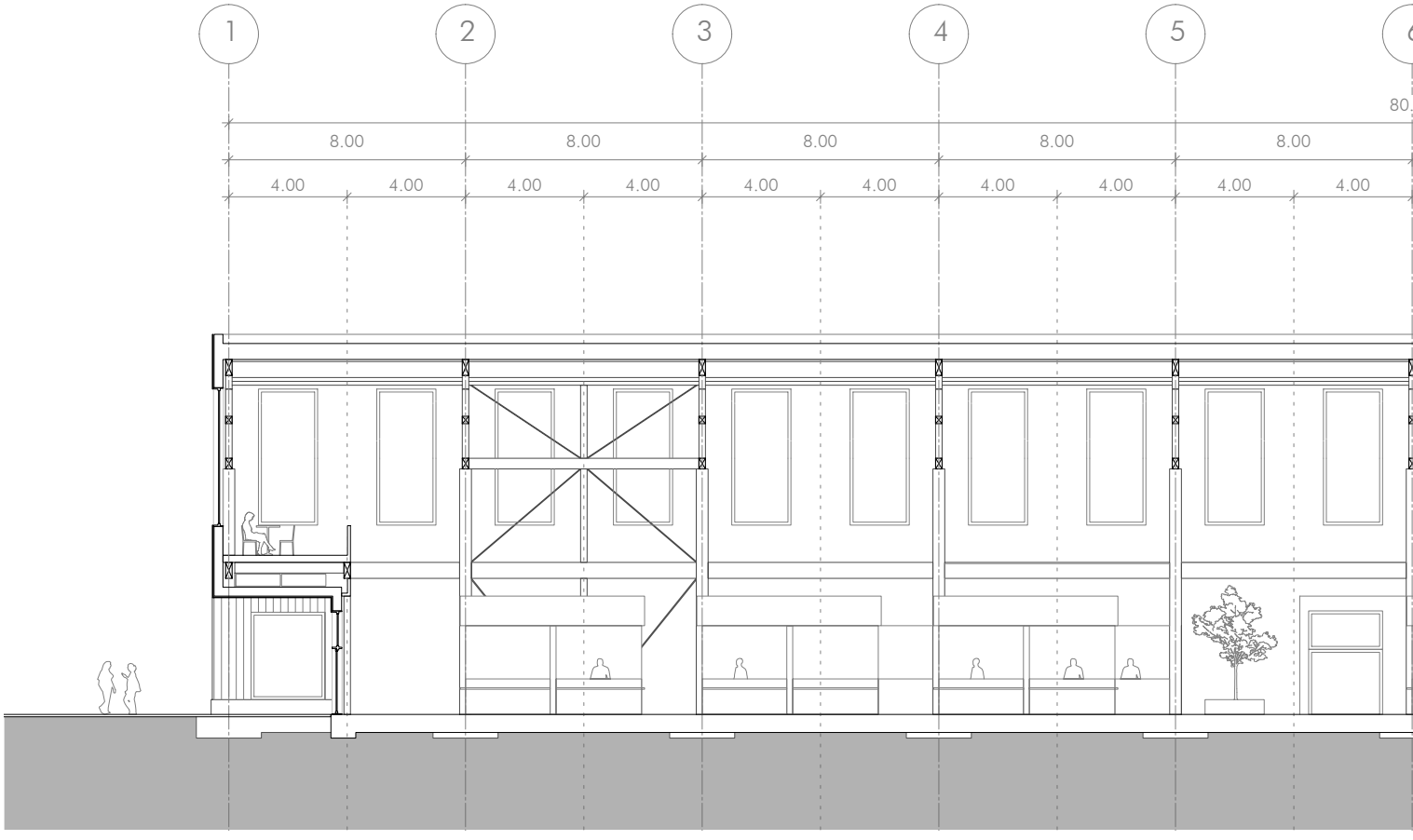
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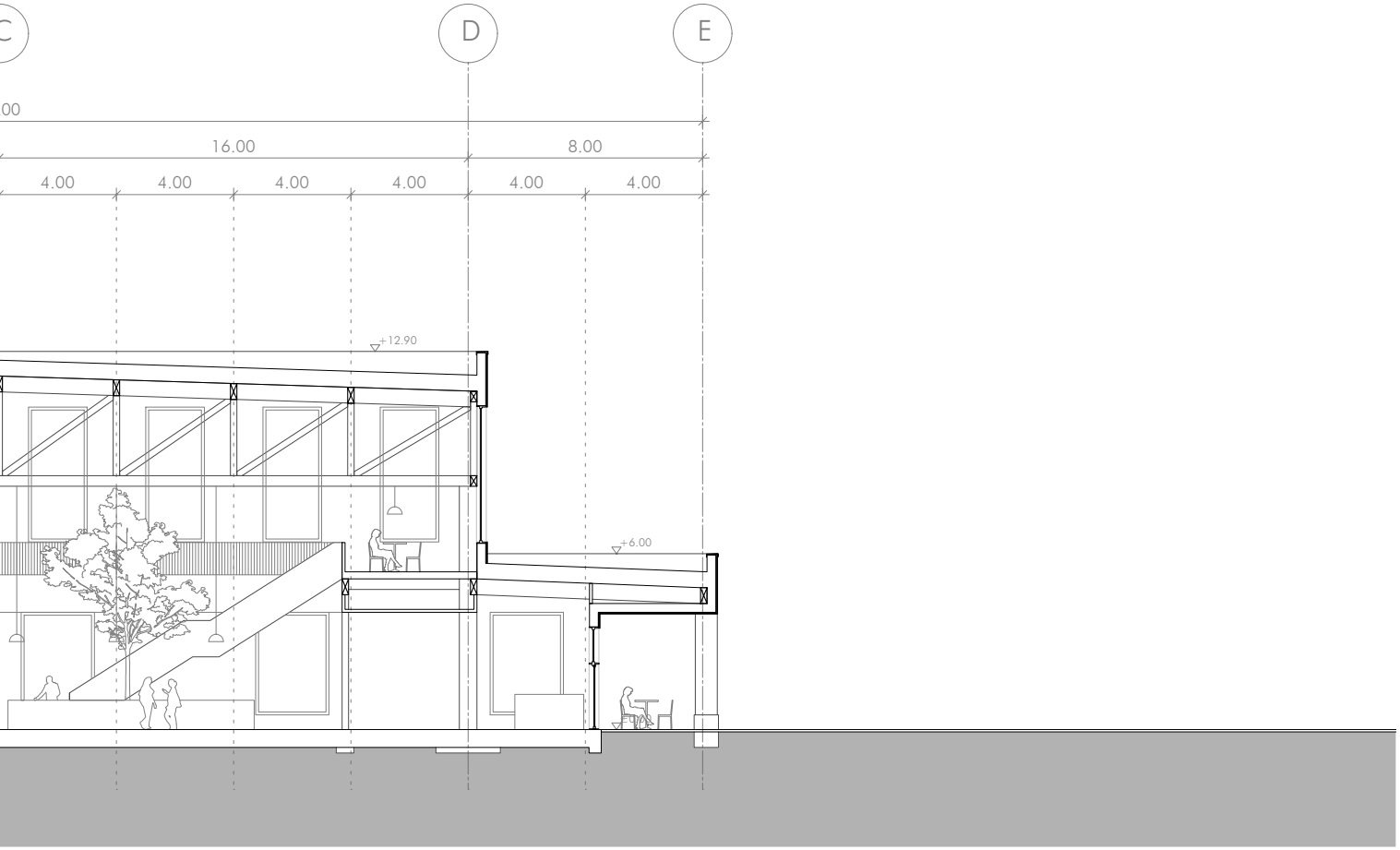
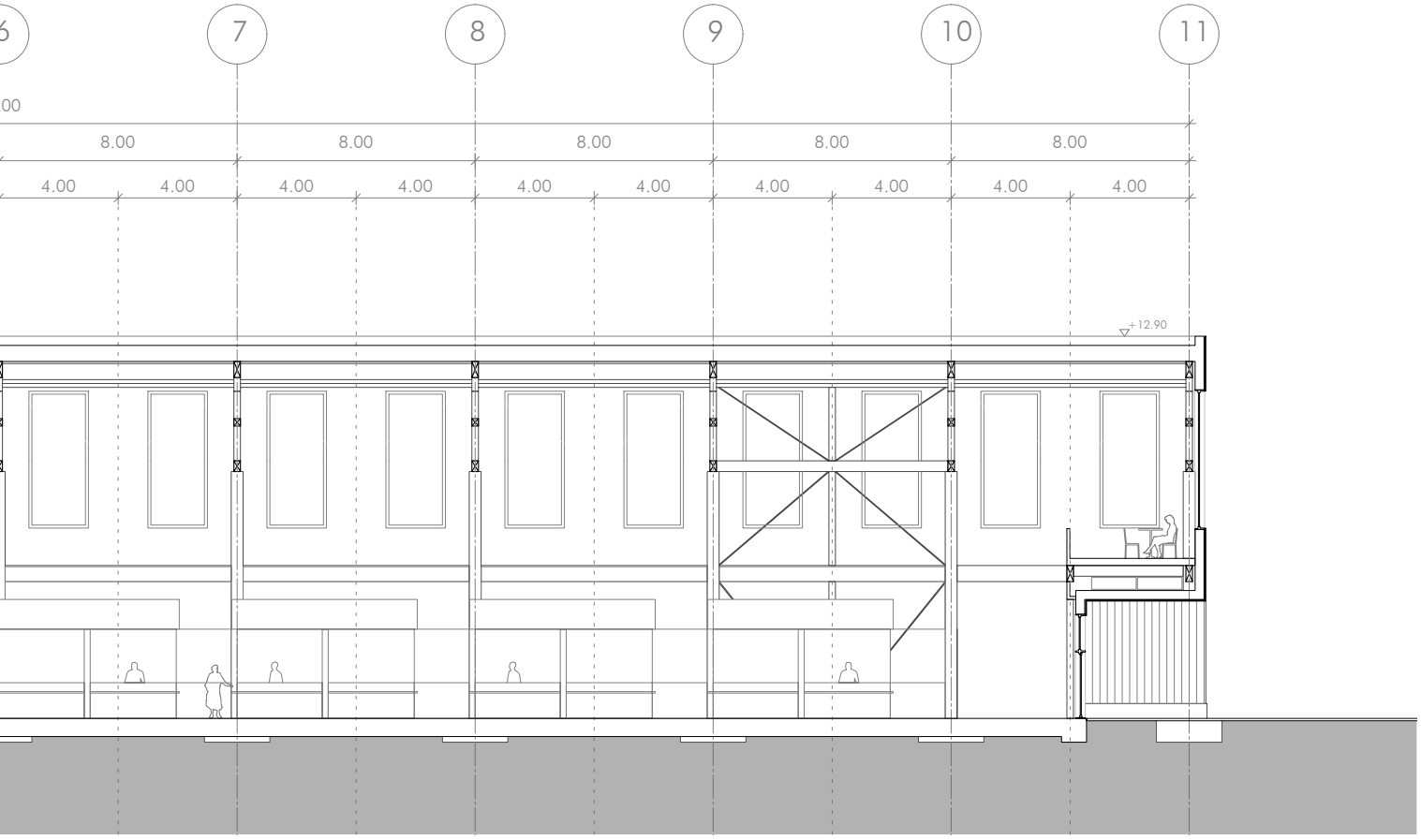
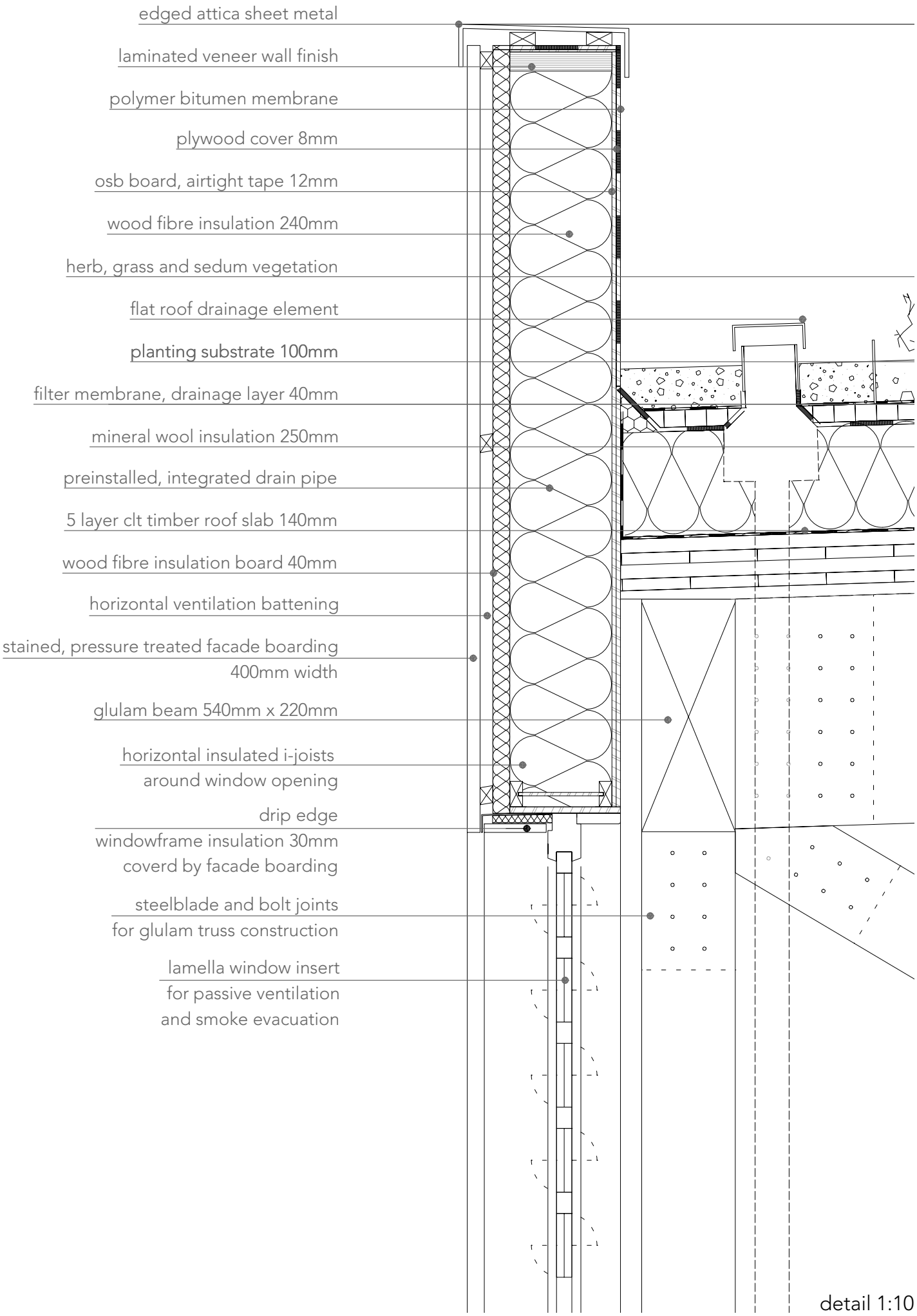


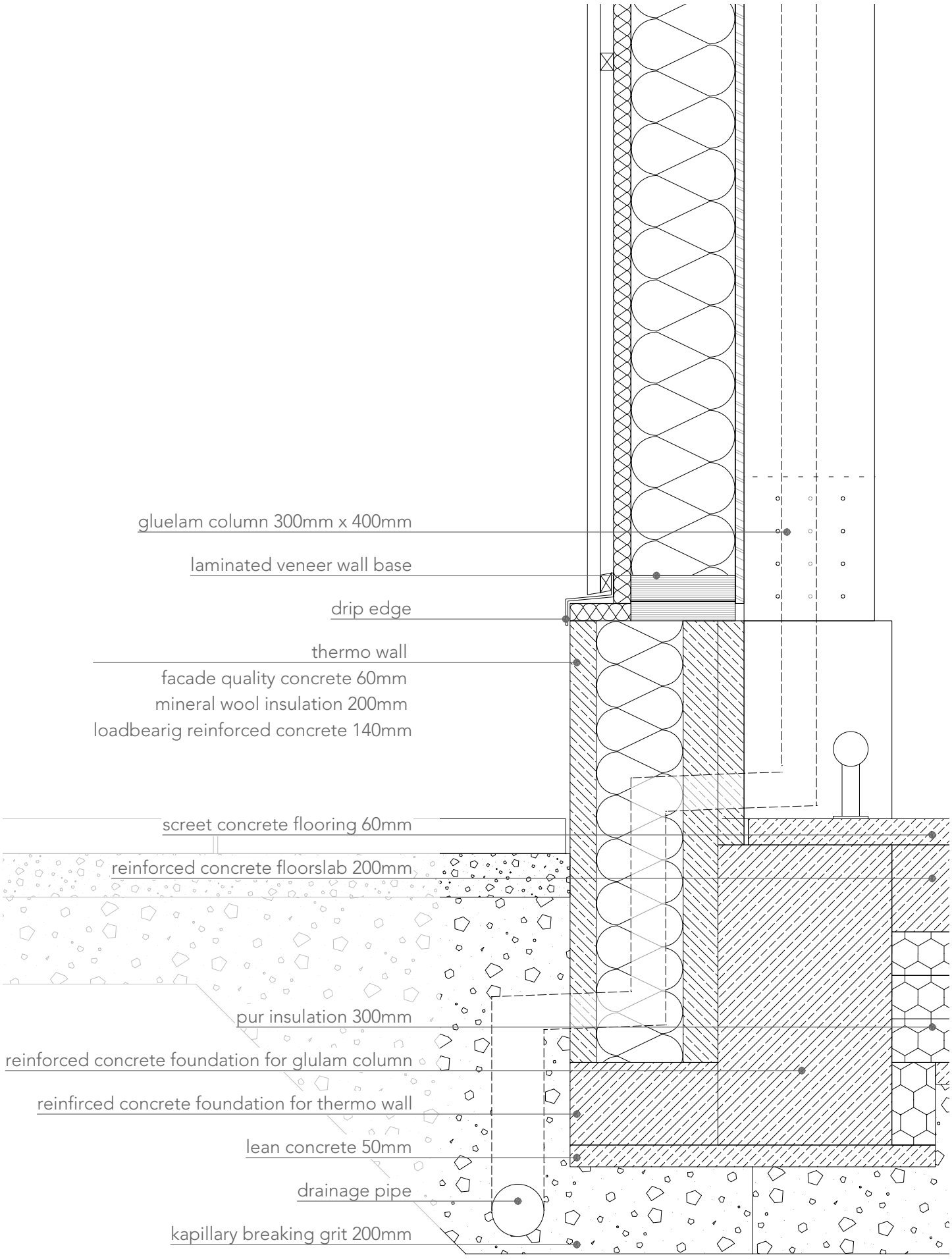
section aa 1:250



section bb 1:250

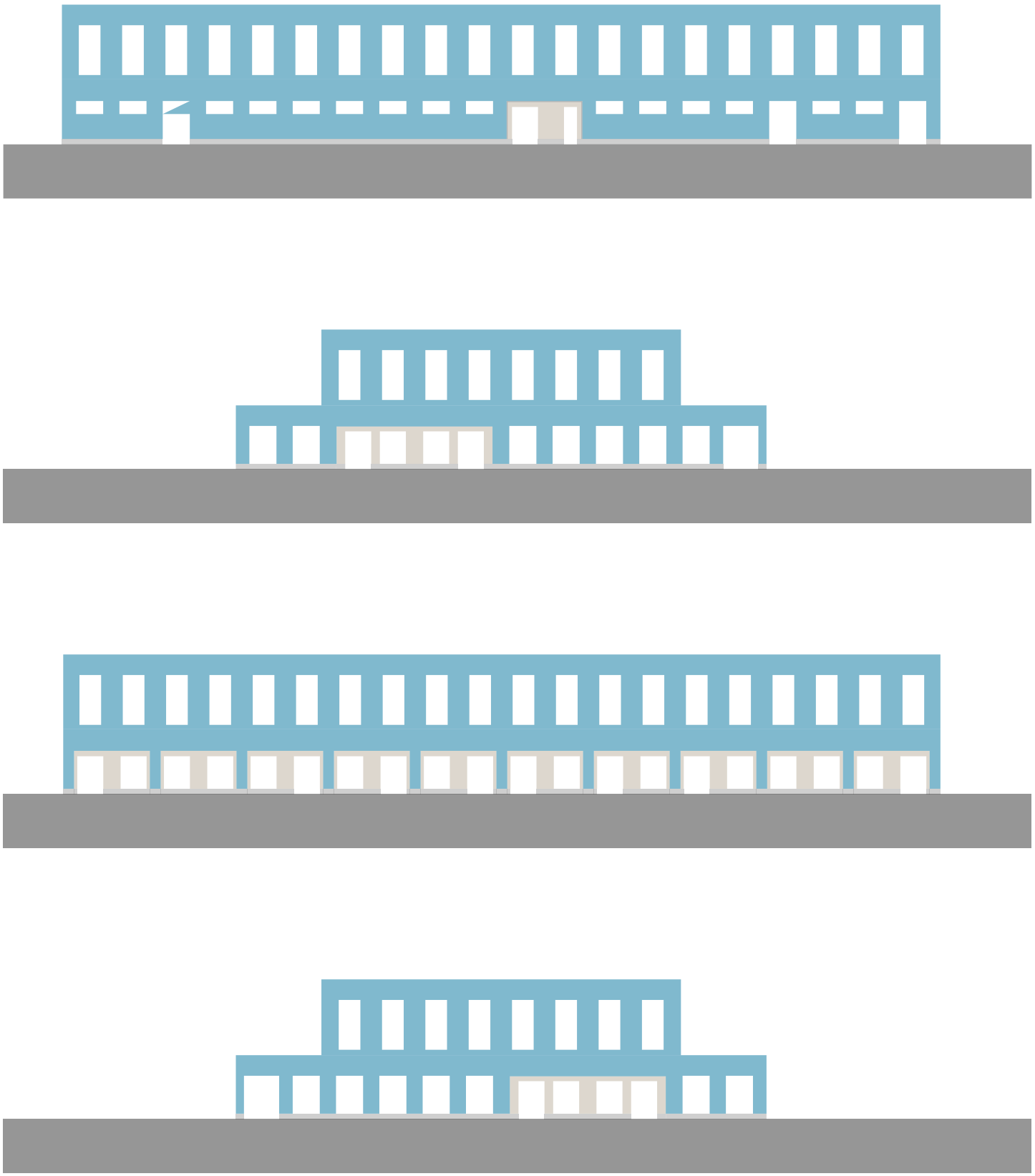

edged attica sheet metal
laminated veneer wall finish
polymer bitumen membrane
plywood cover 8mm
osb board, airtight tape 12mm
wood fibre insulation 240mm
herb, grass and sedum vegetation
flat roof drainage element
planting substrate 100mm
filter membrane, drainage layer 40mm
mineral wool insulation 250mm
preinstalled, integrated drain pipe
5 layer clt timber roof slab 140mm
wood fibre insulation board 40mm
horizontal ventilation battening
stained, pressure treated facade boarding
400mm width
glulam beam 540mm x 220mm
horizontal insulated i-joists
around window opening
drip edge
windowframe insulation 30mm
coverd by facade boarding
steelblade and bolt joints
for glulam truss construction
lamella window insert
for passive ventilation
and smoke evacuation

detail 1:10

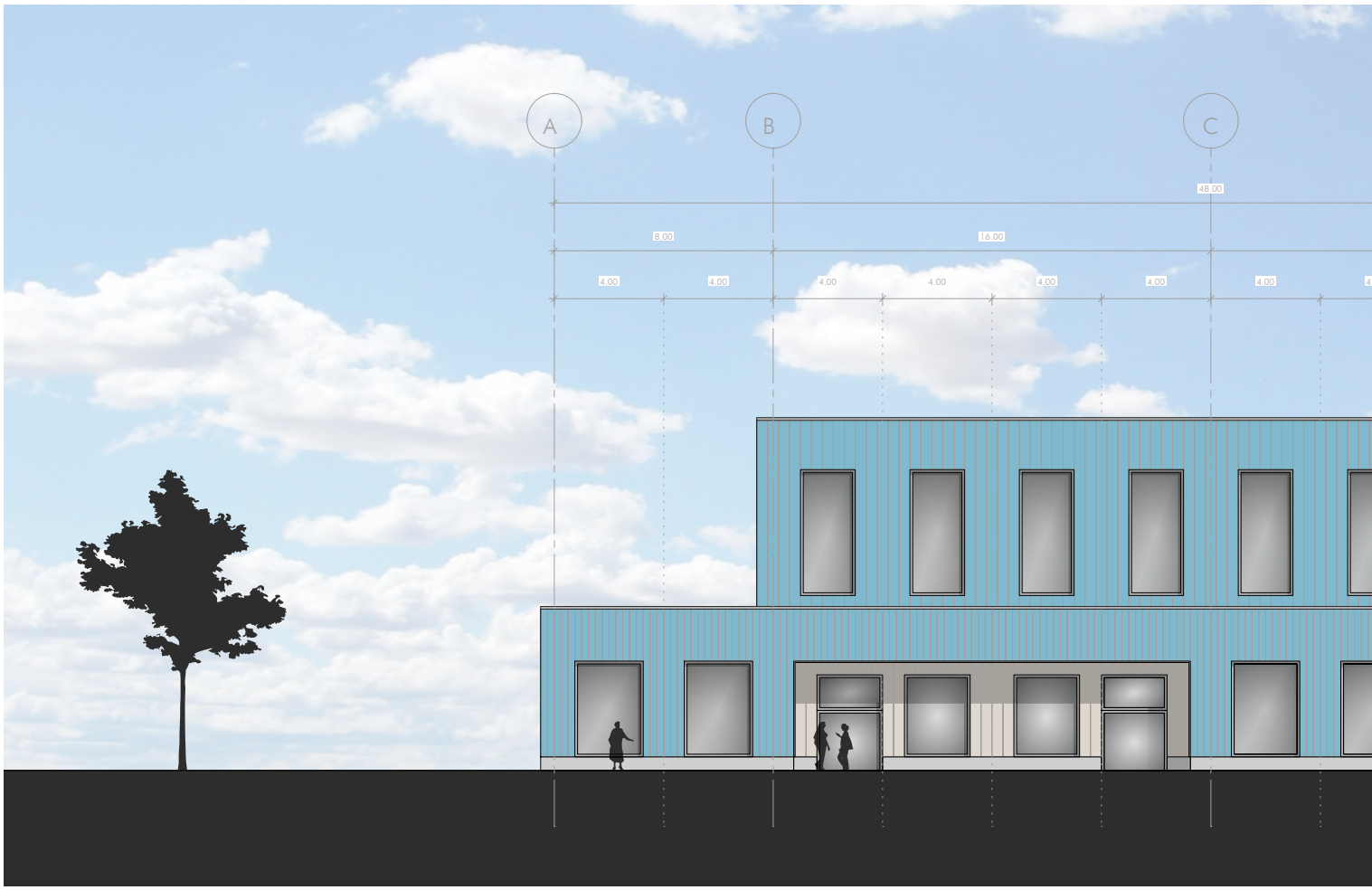

gluelam column 300mm x 400mm
laminated veneer wall base
drip edge
thermo wall
facade quality concrete 60mm
mineral wool insulation 200mm
loadbearig reinforced concrete 140mm
screet concrete flooring 60mm
reinforced concrete floorslab 200mm
pur insulation 300mm
reinforced concrete foundation for glulam column
reinfirced concrete foundation for thermo wall
lean concrete 50mm
drainage pipe
kapillary breaking grit 200mm

interior perspective

Facade



elevation concept 1:500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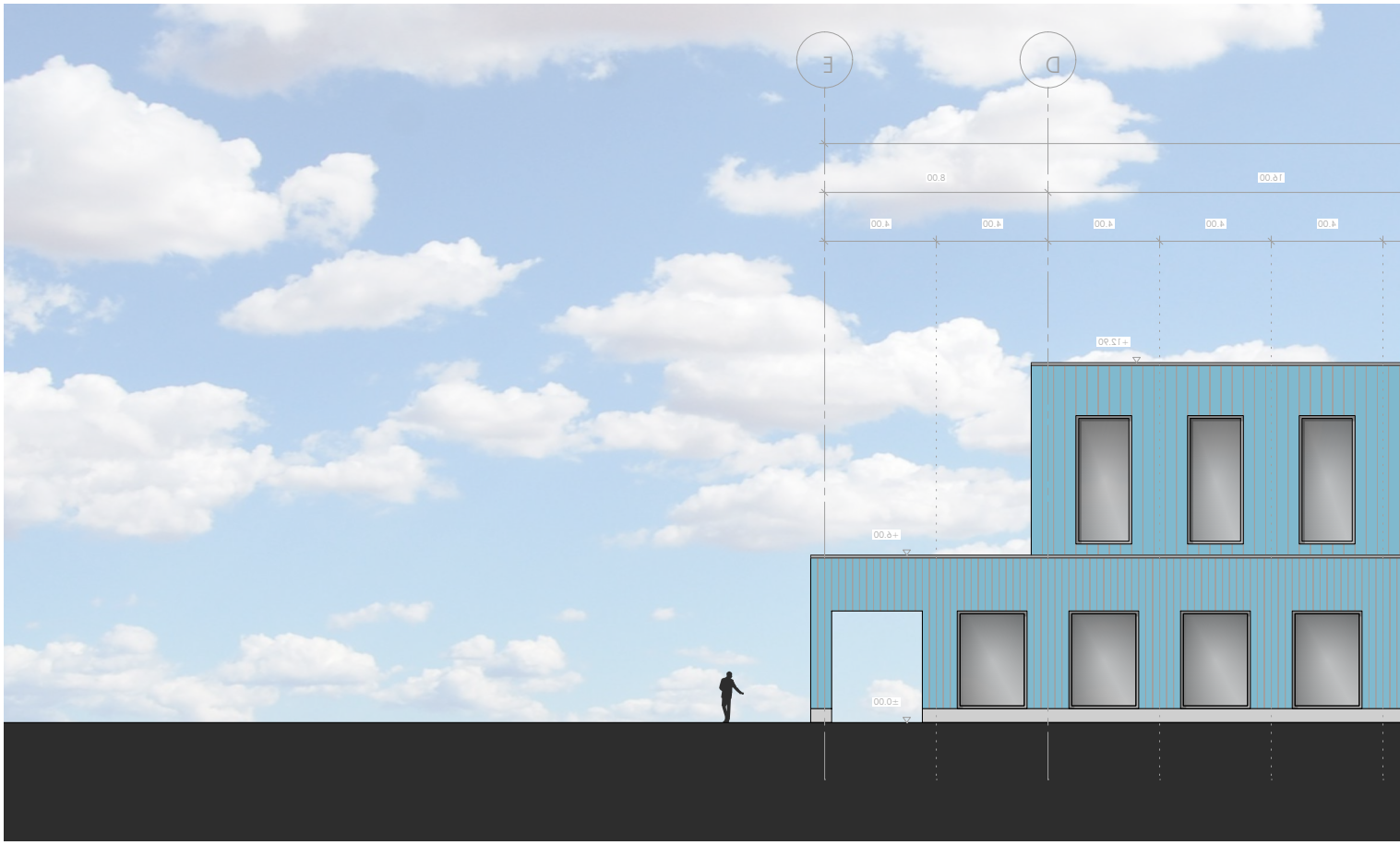
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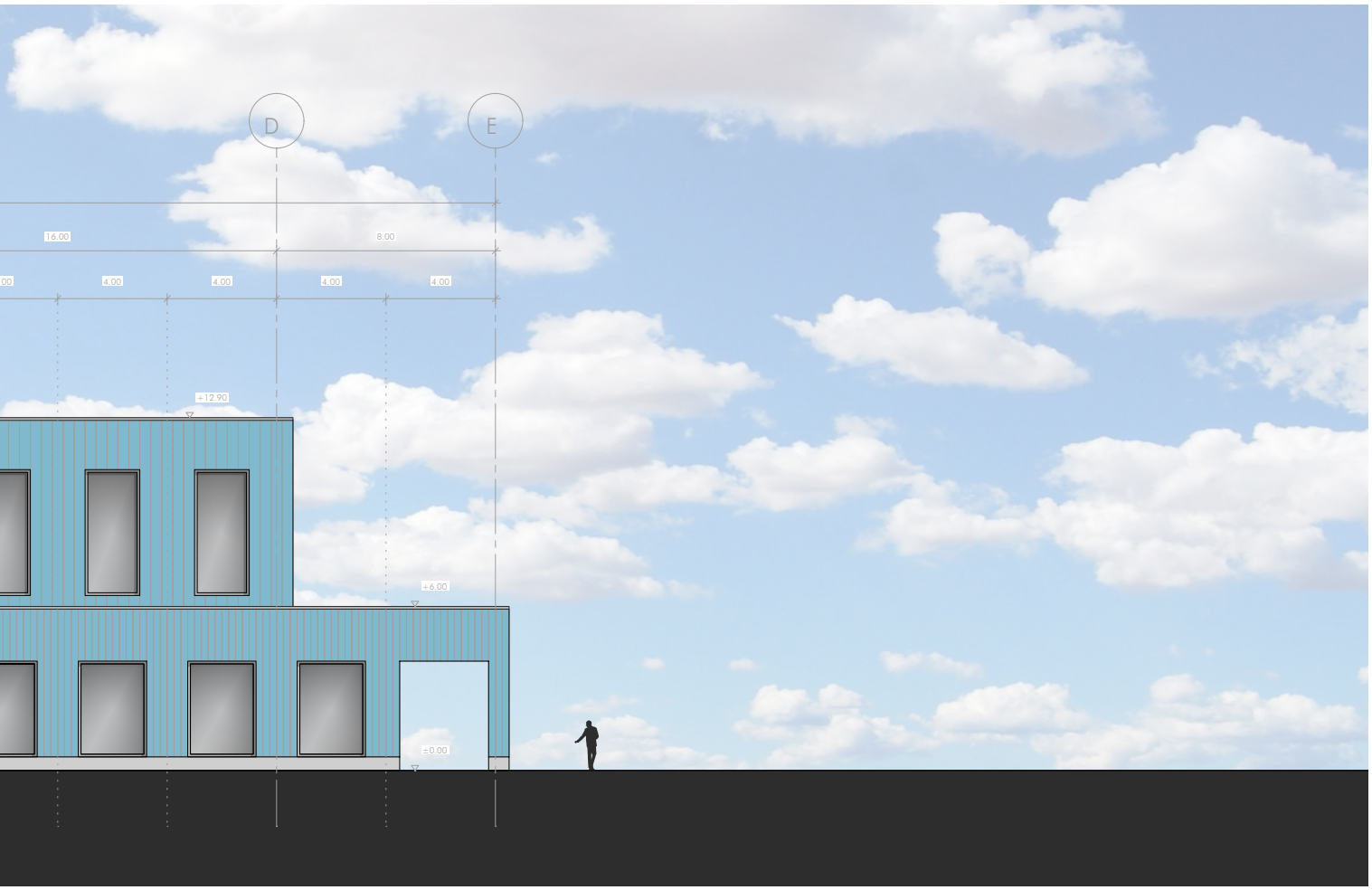

elevation s/w 1:250

elevation n/e 1:250


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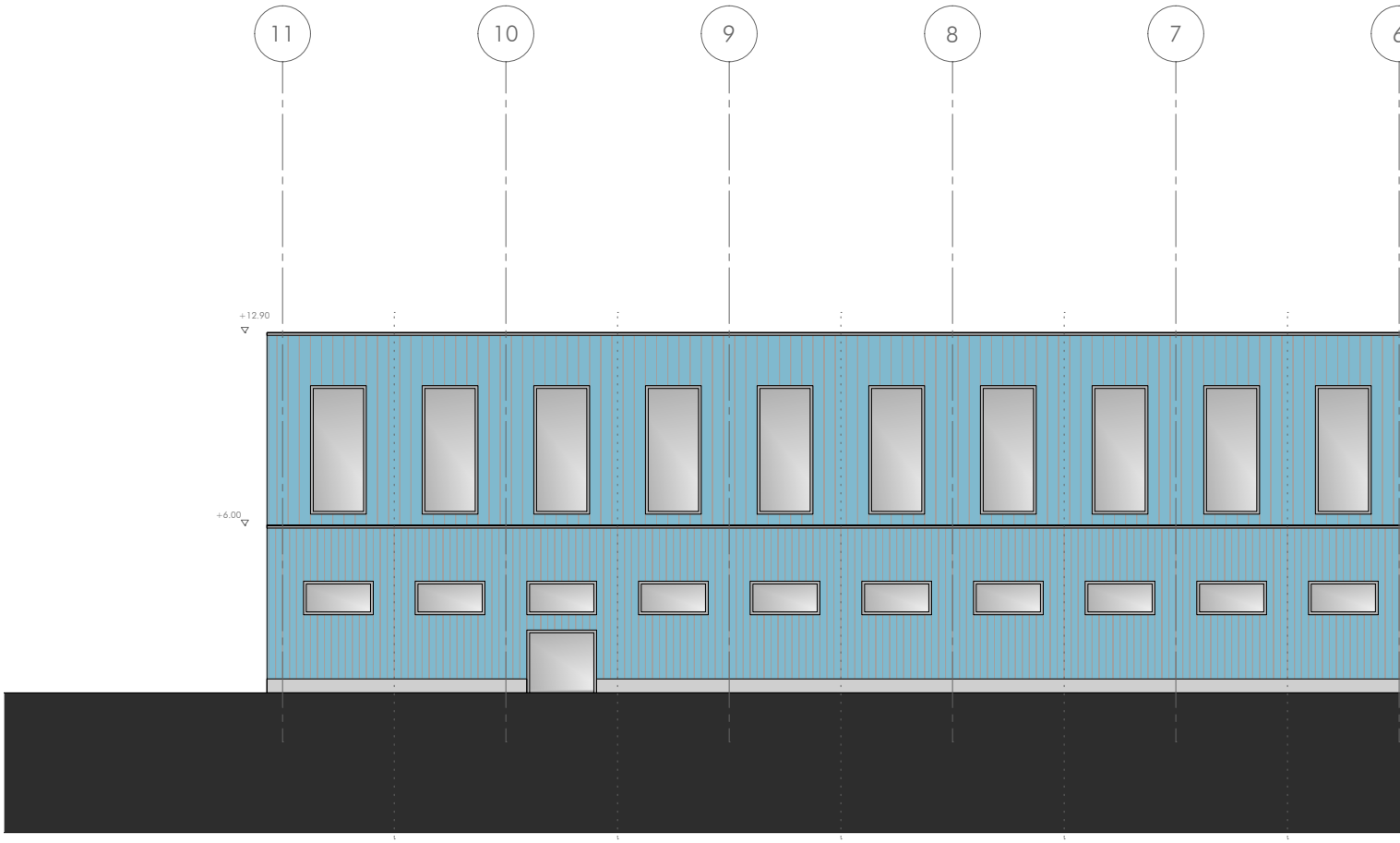
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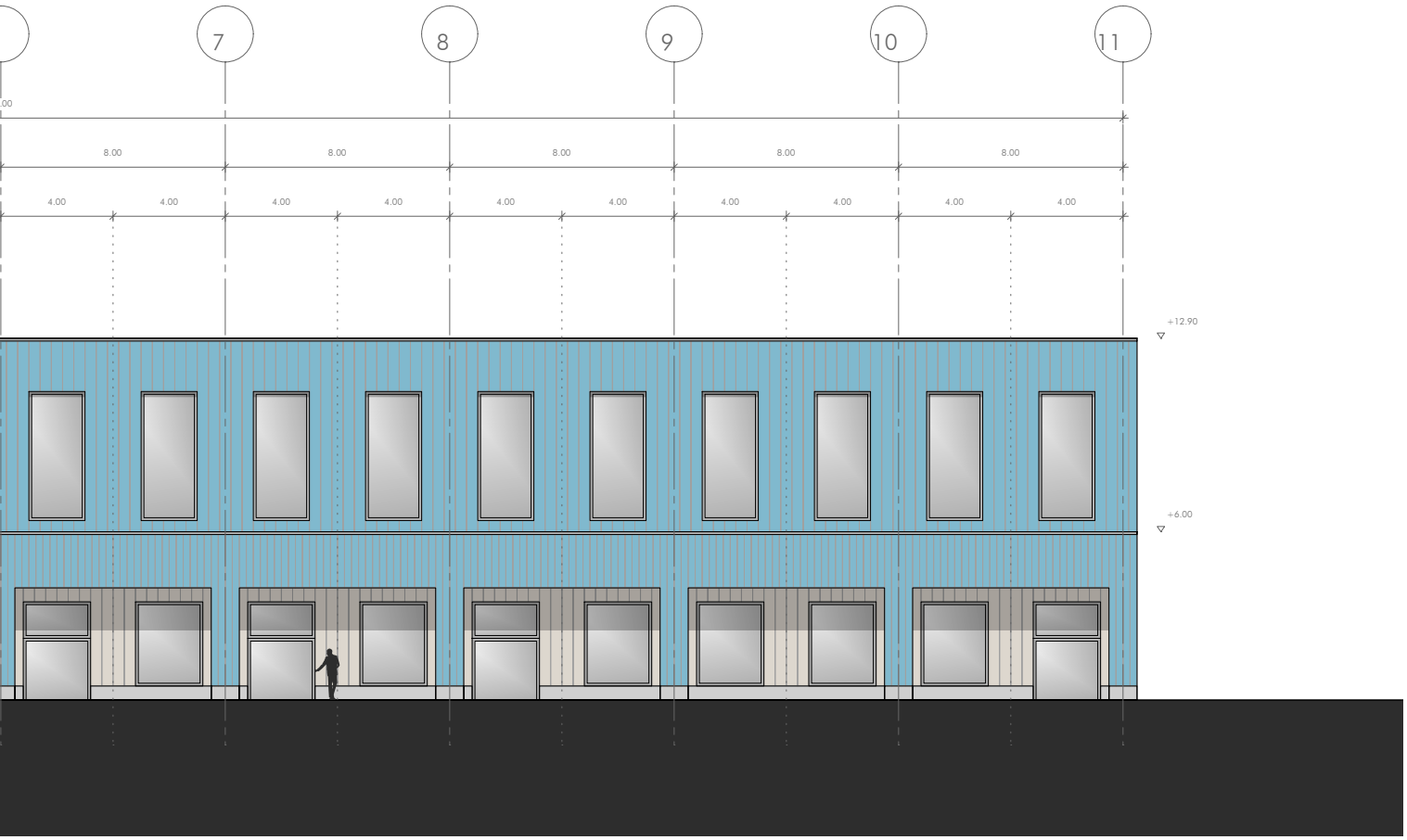
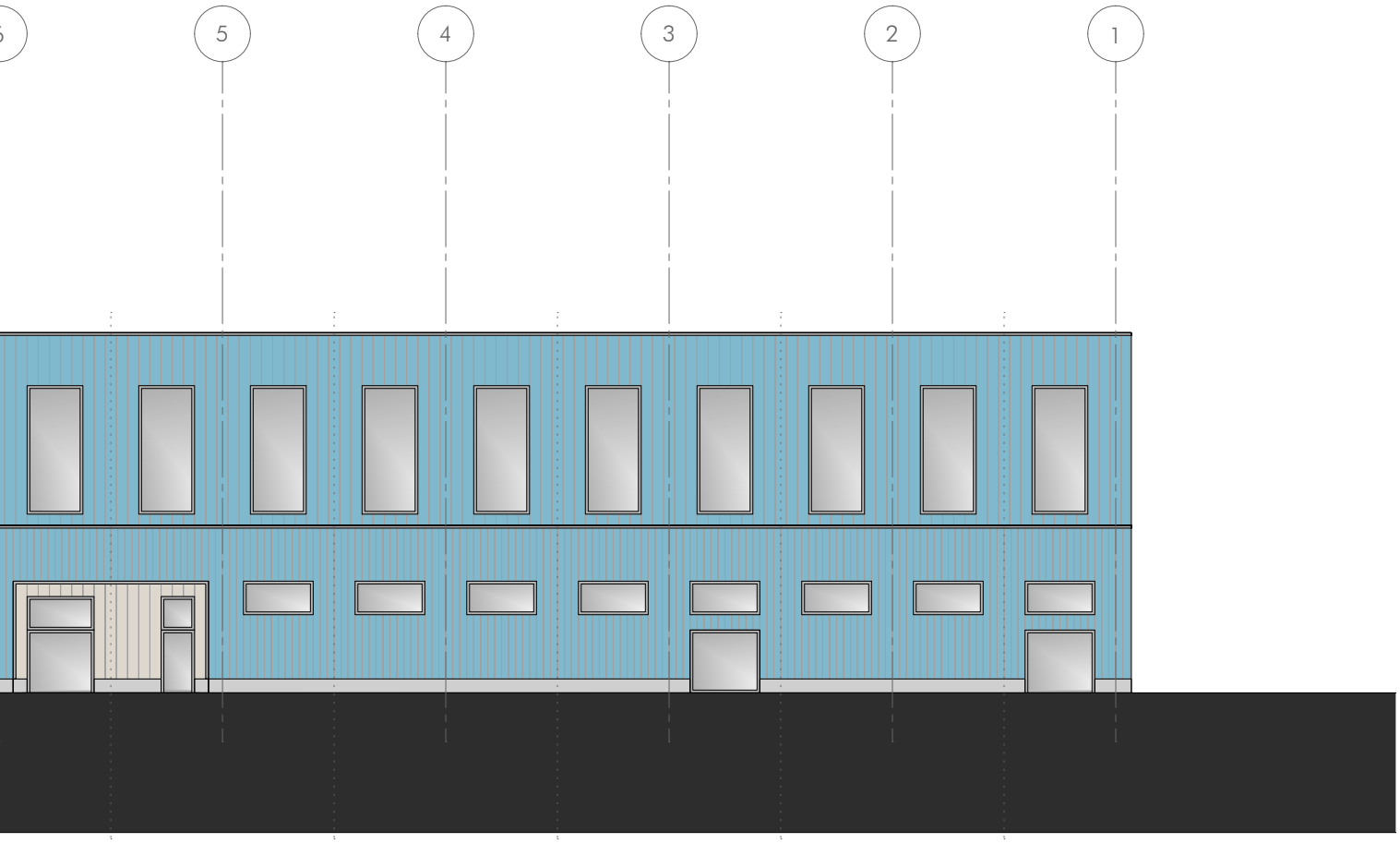


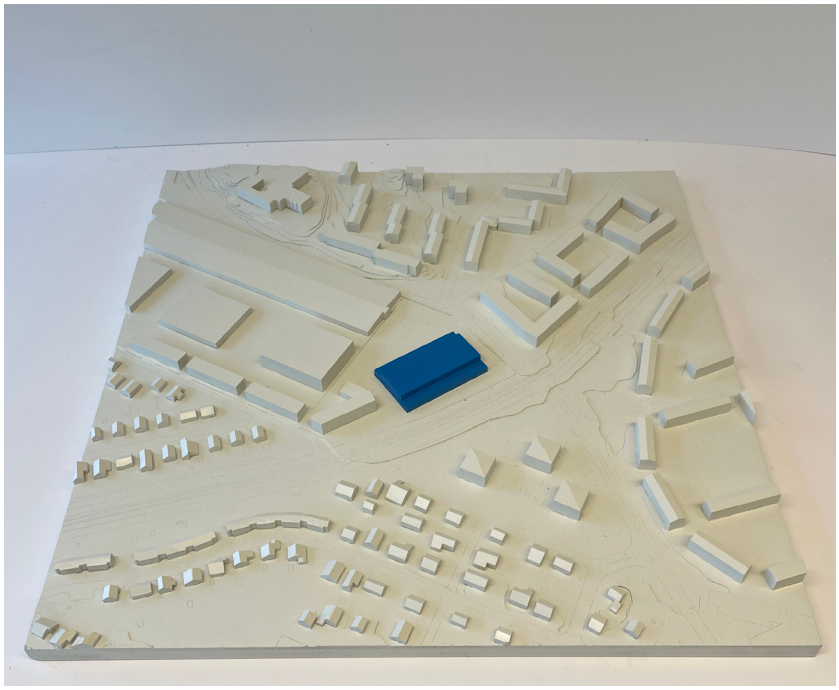
elevation s/e 1:250



elevation n/w 1:250

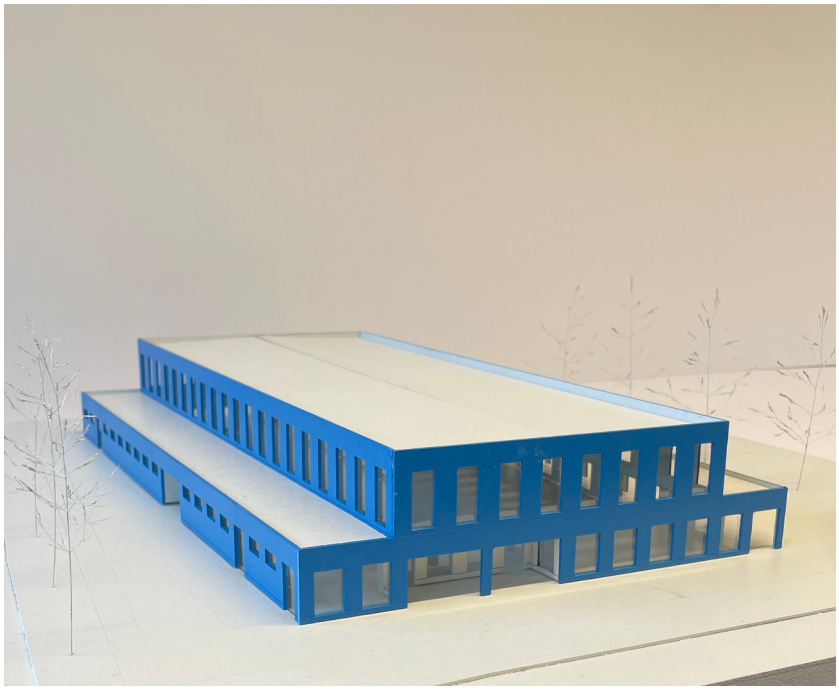
exterior perspective

exterior perspective



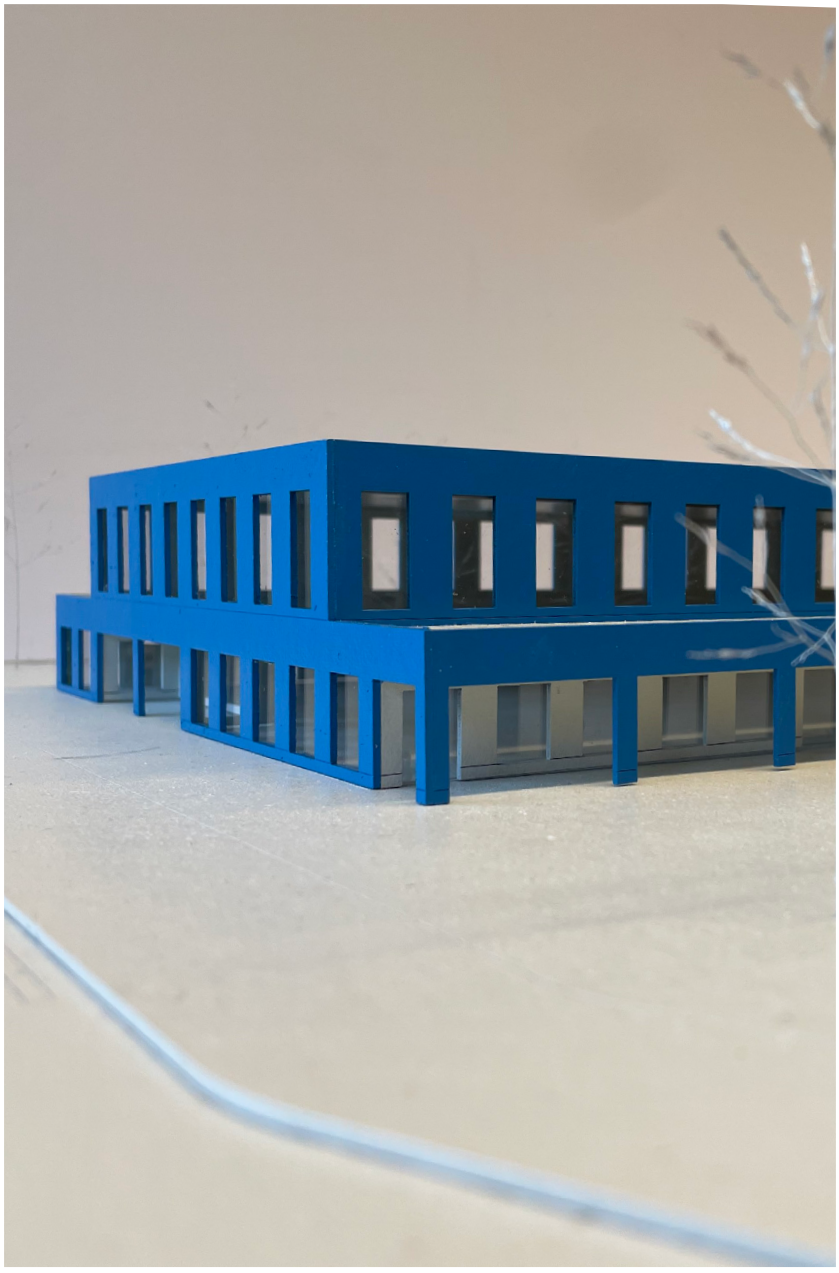
model 1:1.000

model 1:25



model 1:200

model 1:200



4 | evaluation

answering the research question

1. What are the commonalities between tectonic design and sustainable design principles?

2. **How can a building design benefit from utilizing commonalities of tectonic and sustainable design principles?**

Reflecting upon my design process, I believe the most significant similarities of the tectonic and the sustainable design to be their foundation in an implied rational and systematic approach. Even if this is not always the most apparent characteristic of the outcome, for example when looking at cultural representation in tectonics or the catering of social sustainability needs, their method towards a solution is similar, in that the smallest taken measure targets the biggest possible result. In other words, they are rooted in a drive for success through efficiency.

Where the principles differ, is in their motivation for this efficiency drive. Tectonics can be understood as a design exercise that strives ultimately for aesthetic value through optimal use of available material and craft. It is a rather introvert principle, as it can be contained in the smallest context of a single material and a single craft. Sustainable design on the other hand strives for an improvement of the status quo of the world we experience argued through scientific research of current local and global challenges. It strives for interaction and large impact and can therefore be characterized as extrovert.

In a symbiotic interpretation of the combination of these two principles, they can harmonize on the basis of their root approach and enrich each other in completing less prioritized focuses of the respective other. I believe this combination to be a relevant contemporary design principle meeting architectural ambition for aesthetic value and societal purpose.

Images

Figure 1
Choisy, A. (1899) „Derivation of the Doric from wood construction" (Drawing) in „L'Histoire de l'architecture", 1899

Figure 2
Semper, G. (1879) „The carribean Hut" (Drawing) in „Der Stil", 2 nd ed.1879

Figure 3
Kahn, L. I. (1953) „The Yale Gallery, reflected ceiling plan and section details" (Drawing) in „Louis I. Kahn", Leslie, T. (2005)

Figure 4, 5
Gerlach, F. (2016) „Saluhallen Östermalmstorg" (photo) acessed on „https://en.tengbom.se/project/temporary-food-hall/" on 05.05.2024

Figure 6
Göterborgs Stad, Jämlikhetsrapporten 2023 Skillnader i livsvillkor och hälsa i Göteborg (2023) *Figur 25. Disponibel medelinkomst per mellanområde.* *Inkomsten är beräknad per konsumtionsenhet omräknat till 2012 års siffror för att ta hänsyn till inflation. Rangordnad från lägst till högst inkomst år 2020. Källa: SCB, bearbetad av stadsledningskontoret.

Figure 7
Gulyás, A. (2022) „New market hall of Pécs" (photo) acessed on „https://www.miesarch.com/work/5533" on 05.05.2024

Figure 8
Sztranyák, G. (2022) „New market hall of Pécs" (photo) acessed on „https://www.miesarch.com/work/5533" on 05.05.2024

5 | bibliography

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By: Wolfgang Herrmann
https://doi-org.proxy.lib.chalmers.se/10.7551/mitpress/3331.001.0001
ISBN (electronic): 9780262367974
Publisher: The MIT Press
Published: 1984

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Lee, J. (2009) The market hall revisited - Cultures of consumption in urban foodretail during the long twentieth century (Dissertation) Department of Culture Studies (Tema Q) ,Department for Studies of Social Change and Culture (ISAK), Linköping University,