Garden Gate

Making the practical link between urban farming and office vacancy by transforming the Hofpoort with the use of urban farming into a thriving and succesful building

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Preface

This report in front of you is part of my graduation project for my MSc in Architecture followed at the studio the Veldacademie at the Technical University in Delft. Aside from this report my final result is a design for the transformation of a vacant office building, the Hofpoort in Rotterdam, with the help of urban farming and according the results of this report. The redesign of the Hofpoort with the help of urban farming will be stating an example of how urban farming and vacant office buildings can interconnect, helping both vacancy and food awareness.

A special thanks goes out to my instructors at the faculty of Architecture, Anke van Hal, who helped me with this report and my research, Mark Pimlott, for his guidance through the design and Bas Gremmen, for technical advice.

fi von Brunner, 2013

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Fig. 1.01 Vacant office floor - the Hofpoort
own picture

1 Introduction

In this chapter I will explain my graduation project and this report; the project goal, the problem statement, and the design of research.

For my graduation project I have chosen 2 different topics or issues, number one is urban farming and number two is office vacancy. I believe that as a solution for both issues it would be good to connect both, so they could help each other. Both issues are very actual at the moment. Most of the time people give the ongoing crisis as a cause of these subjects. But most of the time it's more than just the crisis. Office vacancy has more than one causes, the changing office trend, the on going production of newly build offices and the low amount of redevelopments and transformation projects of the vacant office stock (Zuidema et al, 2010). Urban farming is also seen as a result of the crisis, but it could also be the solution as well. "It is possible to think of urban agriculture, to an extent, as a response to scarcity. In the modernizing and developing societies of the global south, it has often been seen as a response to crisis. However, it is not being recognized as a way of presenting scarcity by introducing closed-loop, no-waste cultivation systems into cities, reducing food miles, providing urban heat island mitigation and creating visual amenity. There are also substantial public health and educational benefits." (Bohn et al, 2013).

First I will explain my project goal and my chosen location and building. I will follow with explaining the importance of urban farming and why it is so important that we start reconnecting with our food again and growing food locally. After I will explain the issue of office vacancy followed by the design of research with my main research question, subquestions and the structure of the rest of the report.

1.1 Project goal

Urban farming is in uplift, becoming more popular everyday, there seems to be a worldwide trend going on. People all over the world are wanting to participate. From a small basil plants in the kitchen to growing food in the garden or on the balcony and keeping chickens. It is also happening on a more commercial scale with farms on top of buildings, on wastelands throughout the urban fabric or inside vacant buildings.
For urban farming, and feeding the inhabitants of a city you need square meters. Within an inner city centre you simply don't have those square meters, unless if you go vertical. But most of the time in the city centre you don't have space to built new vertical farms. With the many vacant square meters of office space nowadays this seems to be a perfect match. But it is hardly ever put into practice. It is something new, therefor it may take a risk to invest in. But studies have shown the urgency of bringing food back into the city and with the technical solutions we have nowadays there shouldn't be any problem with growing food inside vacant office buildings, especially in Holland where growing food inside is not something new (Dutch greenhouses).

The goal of my research is to make the practical link between office vacancy and food awareness. Doing so by giving a vacant office building a new function with urban farming and researching what is needed when transforming a vacant office building with urban farming as a leading topic into a thriving and successful building again.
I have chosen the Hofpoort in the city centre of Rotterdam to use as an example of transforming a vacant office building. I've chosen this building for it's location. Rotterdam has a big and blooming urban farming movement. Several initiatives concerning urban farming are successful in Rotterdam and therefor it would be a good location for a project like this, since it can connect and work together with all the already existing initiatives.
The building itself has a rich history, being a office building of the Shell, a world wide known oil company. Architecturally it has put a mark on the city, visibly by being one of the high rise buildings in the central district, but also in it's history with a building stop right after the completion of the building. This makes it a good building for a project like this, it's well known and iconic for the city.

1.2 Problem statement

I will begin with the issue of urban farming, explaining the issue and relevance to current events, the possible methods of solution and how the problem relates to the location in Rotterdam. Followed by issue number two, the office vacancy.

1.2.1 Issue one: Urban farming

Urban farming is getting more popular everyday. This may be because people are getting more aware of food, ecology and energy. There are several reasons why this is important. First I will define urban farming and urban agriculture (defining the issue) followed by the reasons why it is an important subject (relevance to current events) and the benefits of urban farming (the solution). I will finish with the urban farming and Rotterdam (relevance location).

Urban farming
Urban farming is a good way to create food awareness and solving many problems. The benefits of urban farming are environmental, social, livability, educational, health, economic and infrastuctural, I will go deeper into the benefits at page 16-17. First I will define urban farming and urban agriculture.

When you look up agriculture and farming in the dictionary you find:

ag▪ri▪cul▪ture | agri k l ch r|
noun
the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.

far▪ming | färmi ng |
noun
the activity or business of growing crops and raising livestock.

You could say that farming is the activity and agriculture the science of it all. In the end it is referring to the same: the growing of crops and raising livestock.

Urban farming has several definitions depending on the angle of perspective, but in the basics it means, "growing, processing and distributing of food and other products through intensive plant cultivation and animal husbandry in and around cities" (Bailkey and Nasr, 2000). Urban agriculture isn't only about growing food crops and fruit trees, but it also embodies the breeding of animals, like fish, bees, pigs, poultry and other edible animals. But the definition used by the International Development Research Centre is a finer definition. They use the word agriculture instead of farming, because it emphasizes the whole sience and not just the activity. Their definition of urban agriculture emphasizes the fundamentals that have made urban agriculture what it is today.

"an industry that produces, processes, and markets food, fuel, and other outputs, largely in response to the daily demand of consumers within a town, city or metropolis, on many types of privately and publicly held land and water bodies found throughout intra-urban and peri-urban areas. Typically urban agriculture applies intensive production methods, frequently using and reusing natural resources and urban wastes, to yield a diverse array of land-, water-, and air-based fauna and flora, contributing to the food security, health, livelihood, and environment of the individual, household, and community." (Smit et al, 2001).

Urban agriculture, and therefor urban farming (the activity), is about the cultivation of soil for growing crops and feeding, breeding and raising livestock within a city, not only to produce food, but also for producing products like wool or cotton for clothes. But it is not only for producing but urban farming could also contribute to recreation. Urban farming is there for people to enjoy in every way, food, products and well-being.

Why urban farming

It is important to change the way we look at food. Through the modern time, industrialization and our mega cities we have lost our connection with food. We buy everything at supermarkets like the Albert Heijn. Nowadays the majority of the population lives in (mega) cities, we started living away from our food production. Most of the people are unaware of how to slaughter a chicken for dinner or how to grow potatoes or harvest other vegetables. We buy everything pre-packed at the supermarket.

Our food is being produced far away from where we live, this makes our food focussed on transportation needs and therefor dependent on cheap oil and energy sources. Our food

Fig. 1.02 Brooklyn New York Rooftop Urban Farm
Cyrus Dowlatshahi for Brooklyn Grange


100 CAR INDOOR PRE-OWNED SHOWROOM

travels thousands of miles before it ends up on our plates even when it is possible to grow our food in the nearby surroundings, all because of money and economy.
By the time it's 2050 we will inhabit the world with about 9 billion people. To grow food for this many people we would need extra farm land the size of Brazil plus an extra of 20%. We don't have that amount of land left (Despommier, 2011).

Water scarcity is a world wide problem only becoming bigger and bigger. Our water is damaged and polluted by our agriculture, we use 70% of our fresh water on earth for the irrigation (Despommier, 2011). The introduction of pesticides, preservatives and fertilizers after the second green revolution during the seventies has only increased the agricultural impact. This happened through agricultural runoff, which is leftover irrigation water, polluted with these pesticides, preservatives and fertilizers. This water is spreading into our rivers and streams, ending up in the ocean, destroying undersea life.

We are destroying earth's biodiversity by our desire of cheap, industrial food. We have changed landscapes, like the rainforest, into arable land, changing it's natural purpose. We want to harvest as many times as possible, making the earth and ground tired and empty of nutrients.

Our health is changing because of the way we feed ourselves. A lot of people eat fast food, take out and tv dinners. Food full of additives, fat, sugar and salt. Resulting in life-threatening diseases like obesity, heart failure and diabetes. This all could change if we would eat fresh, healthy and wholesome food.

Al the problems described above can be solved with taking food back into the city. Urban farming is a solution for it all.

General benefits of urban farming

Urban farming seems to have several benefits for the cities and it's inhabitants. It could benefit 'the economy, environment, and well-being of those active in the industry, as well as residents who enjoy its products' (Smit et al, 2001). I will shortly explain a few benefits of urban farming within a distinction of seven urban impacts. These urban impacts can be used to indicate the key dynamics of an urban farming project.

Environment

"Urban farming could contribute the ecological sustainability of a city by enhancing the environment, improving urban management, contributing to waste management and conserving resources" (Smit et al, 2001). Urban farming could enhance the environment because it enriches the biodiversity, it could reduce temperatures, improve the air quality, reduce noise and create a sense of well-being. Biological waste could be used with urban farming. "It contributes to natural resource conservation, turns waste from a problem into a resource, reduces the public cost of waste management because the private sector

gets involved, and provides a better living environment."(Smit et al, 2001). "Urban farming conserves resources by reducing the pressure to convert deserts, mountain slopes, and rain forests into cropland and cut woodlands for fuel. As we face oceans bereft of fish, appropriate aquaculture around cities has a major role to play in reducing over fishing and maintaining biodiversity in the oceans by producing fish on land and reducing pollution"(Smit et al, 2001).

Social

"Urban farms and gardens offer space for people to meet, beautify the neighborhood and join campaigns for social and political change" (Cohen et al, 2012). Open spaces could become more attractive by introducing urban farming and improve the quality of the neighborhood and solve the anti-social behavior that is sometimes presence in low-income neighborhoods. Urban farming could improve youth development and create safe spaces and strengthening the social cohesion within a neighborhood. Food is an expression of cultural identity and a carrier of social intercourse. That makes food an ideal binder between estranged groups within a neighborhood. A urban farm founder quoted in Five Borough Farm (Cohen et al, 2012) that urban farming is about "meeting your neighbor, having seniors interact with young people, [enabling people] to understand that we're not isolated and living in silos"

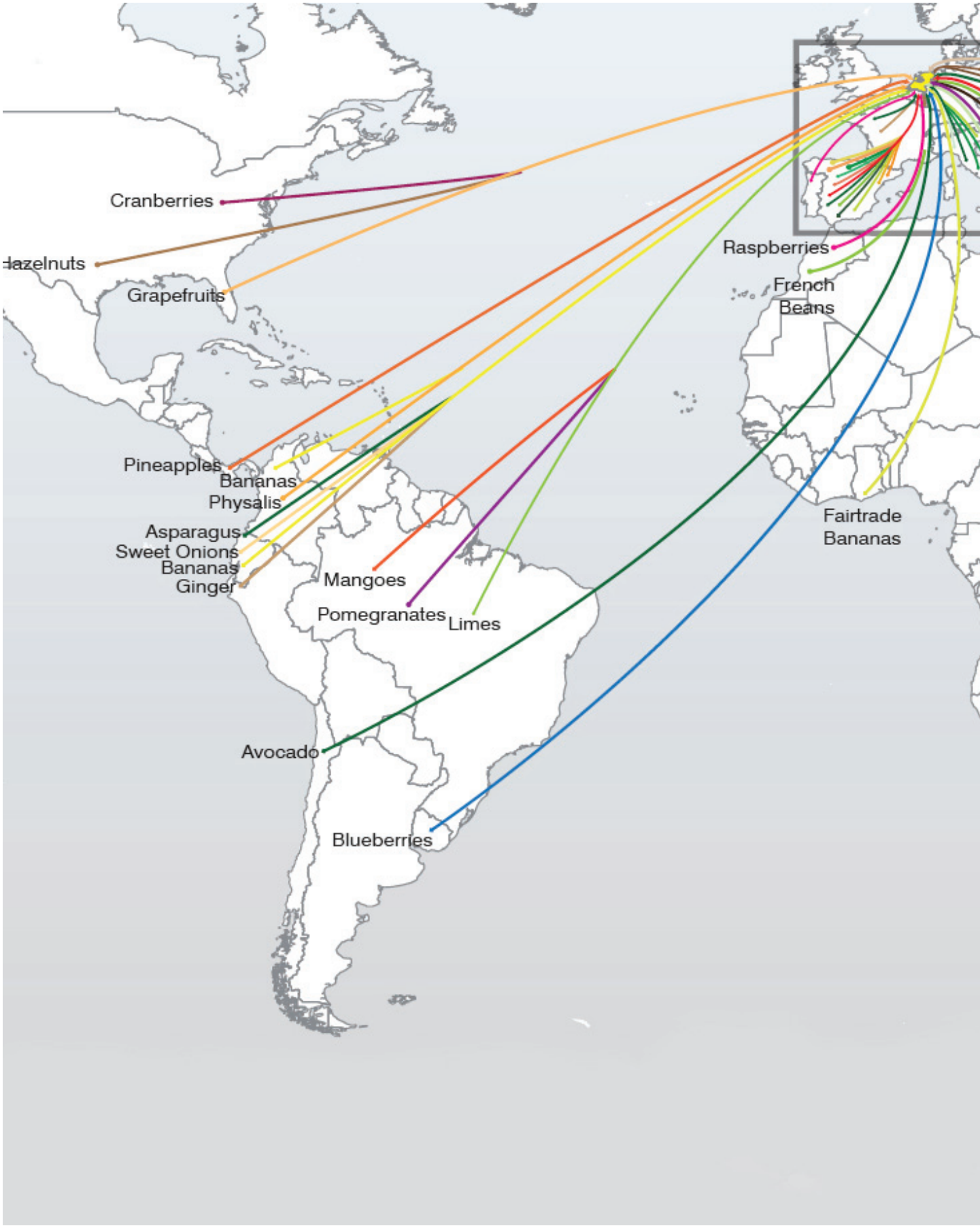
Urban farming is also known as a possibility to improve food security. It may not seem to be a problem in the Netherlands. But when you realize that our whole food system is depended on oil and transport you could understand the risk this takes. With these long food chains it is easy for something to go wrong, with the outcome that the end of the chain isn't reachable. If you produce food in your own country and nearby or in the city, you shorten this chain, making it less possible for catastrophically errors. In the Netherlands we already produce a lot of food, not far away from the cities, but the market of these businesses is oriented towards the EU and the rest of the world instead of their own people in their own country.

Livability

Urban farming could contribute to recreation in the city; improve the city's livability. Urban farming could be mixed with other functions; in this way the scarce space in the city will be used in it's full potential. With urban farming in green places throughout the city, you improve the livability by stimulating local economy, beautifying the city scape, binding groups within a neighborhood and providing facilities contributing in the recreation. Creating a more happy neighborhood, resulting in healthier inhabitants.

Education

Urban farming is a great way to introduce people with food production. Most inhabitants of the big cities don't know where their food comes from. Urban farming can play a big role in making them more aware. Children could learn how to grow their own food in activities organized together with schools. By joining their parents with the projects, the behavior of


Cranberries
Hazelnuts
Grapefruits
Raspberries
French
Beans
Pineapples
Bananas
Physalis
Asparagus
Sweet Onions
Bananas
Ginger
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Pomegranates
Limes
Fairtrade
Bananas
Avocado
Blueberries

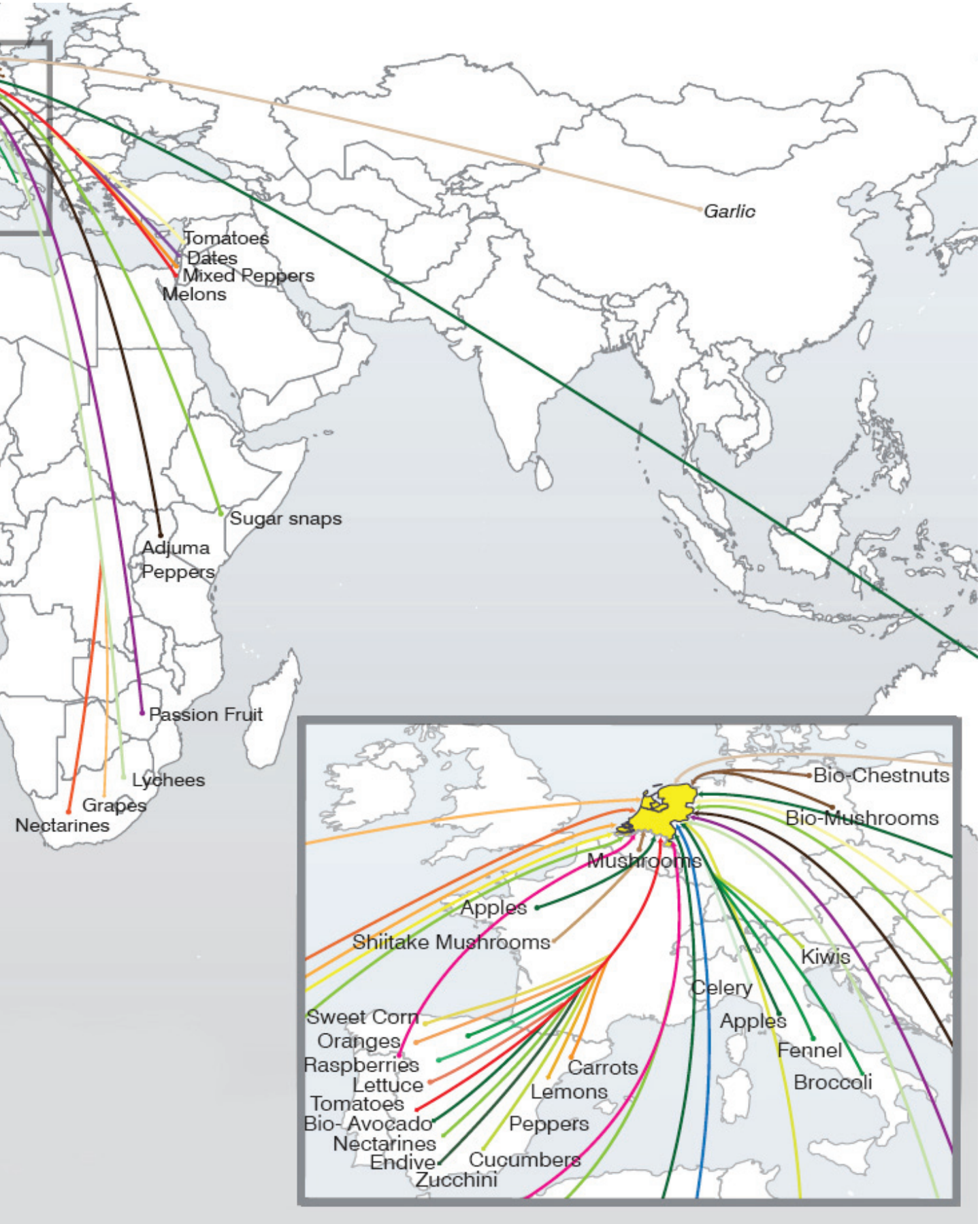

Fig. 1.03 Food Miles Map
Except Integrated Sustainability

the consumers could be changed into a more ecological behavior with awareness for the nature. The children are the future.
Urban farming could help with introducing new skills to the inhabitants of a neighborhood. It could also facilitate in helping with the development of new growing techniques.

Health

Health is a metropolitan problem and urban farming could help with providing healthy food for a long and happy life without life-threatening diseases. Food can be produced within city borders with high nutritional value, consumed right after harvest. By producing food within the city, you could cut out the middle man, and making food cheaper and easier available. Urban farming could also help with food-health literacy and have a positive outcome on the public.
By making the people healthier with locally produced wholesome food you could reduce the city's expenses for the health care of their inhabitants. The municipality and the people will save money on health care.

Economy

Creating urban farms within the city, you create new working spaces. "Commercial farms, community farms and institutional farms all typically hire staff." (Cohen et al, 2012). This is a big benefit because of the on-going crisis and high unemployment rates. It will also save the municipality and the state money on expensive unemployment allowances, because more people will be able to have a job again. An urban farm could be used as a social working place for poorly educated people, teens or disabled people. "Numerous farms and gardens hire teens to manage farms or run markets. In these positions, young people learn general job-readiness skills, as well as skills that can be applied to agricultural, environmental, and food careers." (Cohen et al, 2012).The urban farm is also a good place for the immigrant. Food is an easy way of helping people to re-connect to the city and it's inhabitants. Urban farming is a way of local economic stimulation and promotes a viable business model. Urban farming can provide affordable food, making it easier for the consumer to buy.

Infrastructure

The infrastructural benefits of urban farming could be the improvement of the food infrastructure. With urban farming you could reduce the food miles and transportation of the products when the market is locally oriented. With reducing food miles, you save on transportation costs, making the healthy, wholesome produced food cheaper for the consumer/city's inhabitant. "The farther away food production gets from urban center, ..., the larger its ecological footprint. (Despommier, 2011).

Urban farming and Rotterdam

The municipality of Rotterdam has policy goals that are in line with urban farming. They are shown in the figure 1.1, divided within the people-planet-profit strategy. They policy

goals are divided between economy (profit), ecology (planet) and social (people). Outside the circles are the global policy goals shown. The focus of the municipality of Rotterdam is on [1] improving the health of the inhabitants, [2] the strengthening of the sustainable (local) economic development, and [3] the improvement of the spatial quality within the city (Food & the City, 2012).

[1] The improvement of the health of the inhabitants of Rotterdam is necessary, because the average 'Rotterdammer' has a worse health than the average Dutchman. The life expectance of the 'Rotterdammer' is about 1,5 years lower than the average Dutchman. This can be explained for 21-29% by the poor life style of the 'Rotterdammer' and the bad air quality in Rotterdam. The food they eat is one-sided with fast food and ready meals. This results in overweight; almost 50% of the inhabitants of Rotterdam are overweight (OGZ nota, 2011).
[2] The municipality of Rotterdam aims to strengthen the sustainable (local) economic development by making healthy food more available by example through farmer markets or direct sale. By removing several links within the distributive trade, the farmer can get a higher income, with the consumer getting fresher and attractive food for an affordable price. The municipality also wants to stimulate agricultural entrepreneurship within the city and at the border.

[3] The improvement of the spatial quality within the city will be done through stimulation initiative within the urban agriculture by facilitation them. The municipality also wants to improve the green structure within the city by constructing fruit and vegetable gardens to create a greener living environment.

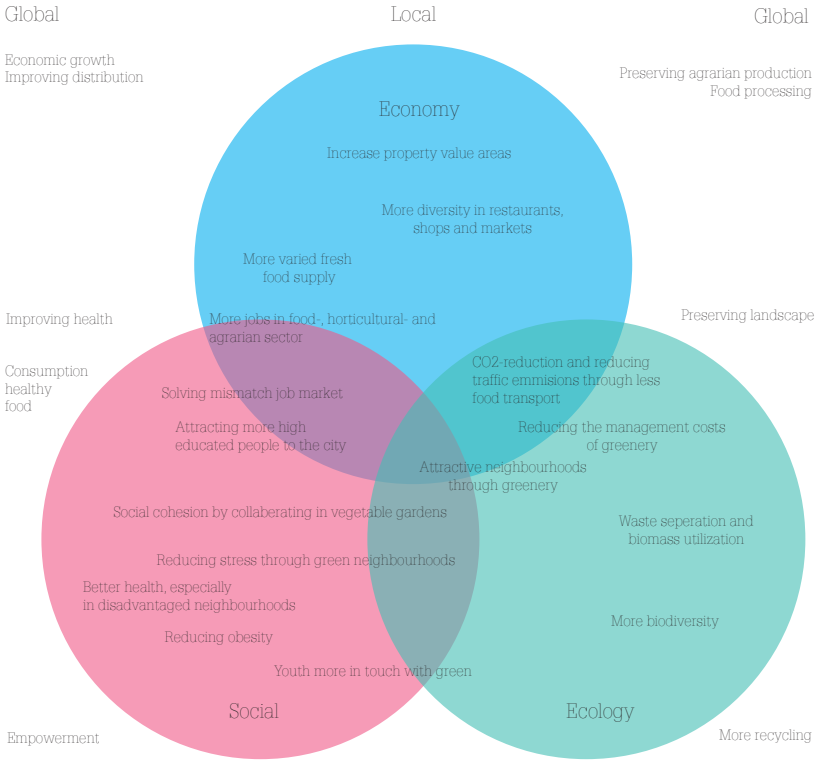

Fig. 1.04 Policy Goals Municipality of Rotterdam
Own illustration based on a illustration of Food & The City, 2012

1.2.2 Issue 2: Office vacancy

In the Netherlands there is 7.164.000 m2 of office space vacant. Currently, with the total stock of 49.129.000 m2 of office space, this means that 14,6% of the total office space is vacant (DTZ, 2013). On the first of June this year the newspapers published the amount of 'hidden' vacancy, which is office space that is not in use, but rented by companies and organizations. On top of the 7.164.000 m2, there is another 6.089.925 m2 of 'hidden' vacancy according to consultancy AOS Studley reported by 'Het Financieele Dagblad' (01-06-2013). Most of this vacant office space has been vacant now for more than three years, which means that it is defined as structural vacancy (Hek, 2004). This is a different type of vacancy than the frictional vacancy, which is needed for seasonal concurrence, caused by friction between supply and demand. The percentage of frictional vacancy is mostly between 5 – 8% a little bit higher than the amount of companies and organizations that move in a year, which is about 4%.

Explanations

The explanations for the vacancy in office space lie with several reasons. It started with the economic downturn in 2008. Many businesses gone bankrupt and they had to leave their offices. Not enough new businesses arose to fill in the empty offices, resulting in a growing number of vacant square meters of office space. The demand was lower than the supply. It is important to state that in the commercial real estate, which is about 65% of the Dutch office stock, there doesn't need to be a direct strive to find a match between demand and supply, though indirectly, a match does equal a balanced office market (Remøy, 2010). Another reason for the vacant office space is the changes in the way we work. The typology of the office building started with the Uffizi in Florence from 1581, recognized by architecture historians. Even though buildings housing offices already existed in the medieval times. From the industrial revolution on there came a demand for the office building, because factories needed spaces for their coordination and administration since the industry was growing greatly. The development of the office building as a typology started in the USA, followed by Western Europe. Most of the offices were build owner-user, but when the office business began to grow, the businesses rather invested in their core business than the building, the commercial real estate market arose. From this moment on the buildings needed to be standardized and flexible for multiple organizations and businesses. However, there are recent studies that show that different organizations demand different offices. Another new development within the office building market is the new way we work, this makes us need different type of buildings. Within this 'new way of working' people have become more flexible. The office workers nowadays all have a laptop; therefor a own personal place isn't needed anymore. Further more, people are sometimes even working from home for a few days a week, this makes the amount of working spaces less. This results in smaller offices with open floor plan with different flexible working stations.

Methods of solution

There are several methods to deal with vacancy (NVM Business, 2010):
further exploitation
renovation
transformation
demolishment

With further exploitation you should think about lowering the rent, to make it more attractable to rent and use the vacant office space. By renovation you renew the office, make it use able for the new standards of offices with the 'new way of working'. Transformation means giving the building a new function. And with demolishment you withdraw the building from the market.

Transformation is a good solution if the building is structurally vacant and the current function seems to be out-dated, but technically it is still in good shape. This seems to be commonly occurring in the office market. Transformation is feasible if the building can be functional, technical and financial made fit for a new use, and it should be achievable within the existing legal structure (Remøy, 2010).

Rotterdam

The problem of vacant office space is also occurring in Rotterdam. At the moment the office vacancy is 878.000 m2, with a total stock of 4.744.000 m2 this means a percentage of 18,5% is vacant. Compared to 2012 this is an increase of 6.8%. Wouter van Stipthout stated at the debate 'de bouwbubbel van Rotterdam' on June 21 2013, that this amount would only increase more every year. It is a serious problem, with the 'new way of working' growing in interest among the office workers, the problem is only growing more and more.

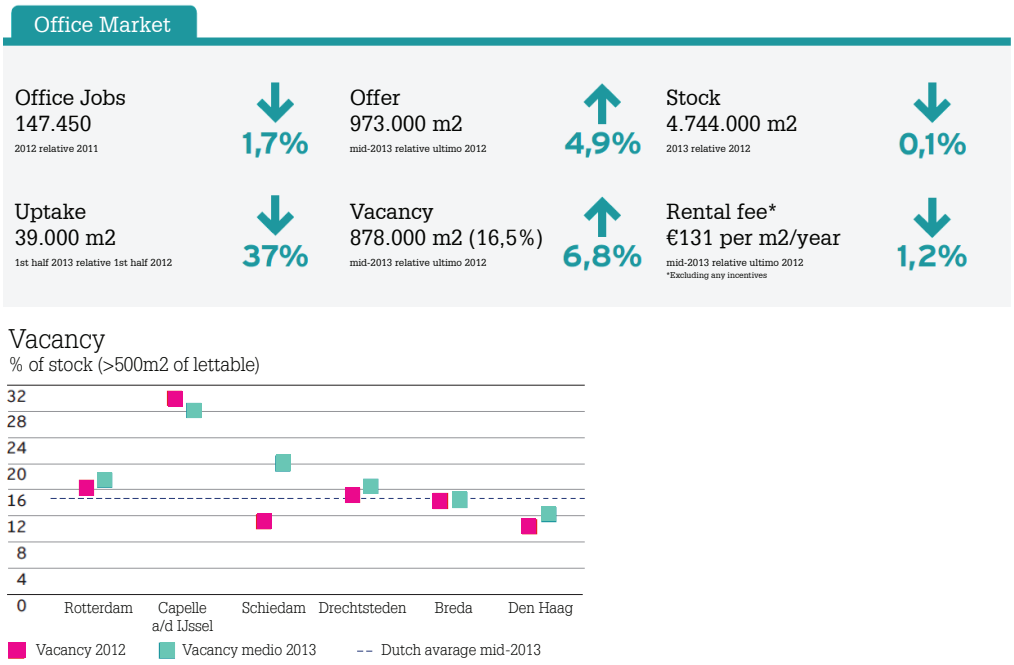

Fig. 1.05 Office Vacancy
DTZ 2013

1.3 Design of research

Research question
How can you make the relationship and connection between office vacancy and urban farming in transforming the Hofpoort in Rotterdam into a thriving and successful building?

To answer this main question it is first needed to answer some sub questions. I have divided these between the chapters of this report.

2 The building & Location
What are the most important characteristics of the Hofpoort?
What are the strengths and weaknesses of the surrounding neighbourhood(s) and how could urban farming play a role in improving these weaknesses?

3 Urban Farming - inspiration
Which different types of urban farming exist today?
What can we learn form urban farming worldwide and could be an inspiration for this project?
What can we learn from urban farming in the Netherlands that we could be useful in this project?
How is the urban farming movement in Rotterdam, why is it the right city to have a project like this?

4 Indoor cultivation - deepening
What kind of techniques are useable for urban farming inside office buildings and which one is the best for the Hofpoort to use?

5 Sustainability - deepening
What is possible for water-recycling within a building and could be used for the Hofpoort?
How can you make a closed loop system which takes care of the biological waste of the farms and building and could be used by the Hofpoort?

6 The Transformation
What is possible in and around the Hofpoort?
Which people (or groups of people) will be using this project?
What needs to be transformed for making the Hofpoort suitable for the urban farm(s)?

Fig. 1.06 Postcard of Hofplein
Archive Rotterdam

02

Building & Location

2 The building & Location

In this chapter I will answer sub question one and two, namely 'What are the most important characteristics of the Hofpoort?' and 'How could urban farming benefit the location of this project?'. To answer these questions I will start with analyzing the building, the history, construction, facade design, climatic design and functional layout. The second part of this chapter will be the location analysis, that I did using a living fields analysis.

2.1 Building Analysis

History

Until 2000 the building was know as the 'Shell Tower', named after the company that the building was designed for by ZZDP architects in 1975. Since 2000, after Shell left their building in Rotterdam, the building got renamed the 'Hofpoort' after the portal that once stood there. It was one of the ten portals of the city and was built on the same location. The portal stood there from the 14th century till 1833 and was names after the 'Hof van Weena'. In 1833 the portal got broken down, because it was in the way for the increasing traffic. Later in 1955 the 'Hofplein' got built, a big traffic square, still existing, with a big fountain in the middle.

When the Shell Tower got built it never got the same enthusiasm as many of the other high-rise buildings in the centre of Rotterdam got. It even resulted in a high-rise office building stop. The building even elicited the alderman Mentink the famous statement that it was the 'last erection of the big capital'. This high-rise office building stop was short term, now people see the Shell Tower as the beginning of the densification of the city centre of Rotterdam.

Construction

The tower, 25,20 x 44,20 meters, is made on a grid of 1800mm making one-person offices possible, which was very common in that time. The construction consists of a core with the elevators, stairs and sanitary for stability with floors on columns. This is a type of building that was very common during the 1970-1990.

The building can be divided in several elements, the podium (low-rise), the parking garage, the kiosk elements and the high-rise. All these elements had their own function at the time it was built. Now after Shell left the building, most of the spaces are turned into office spaces and some of the kiosk elements are broken down.

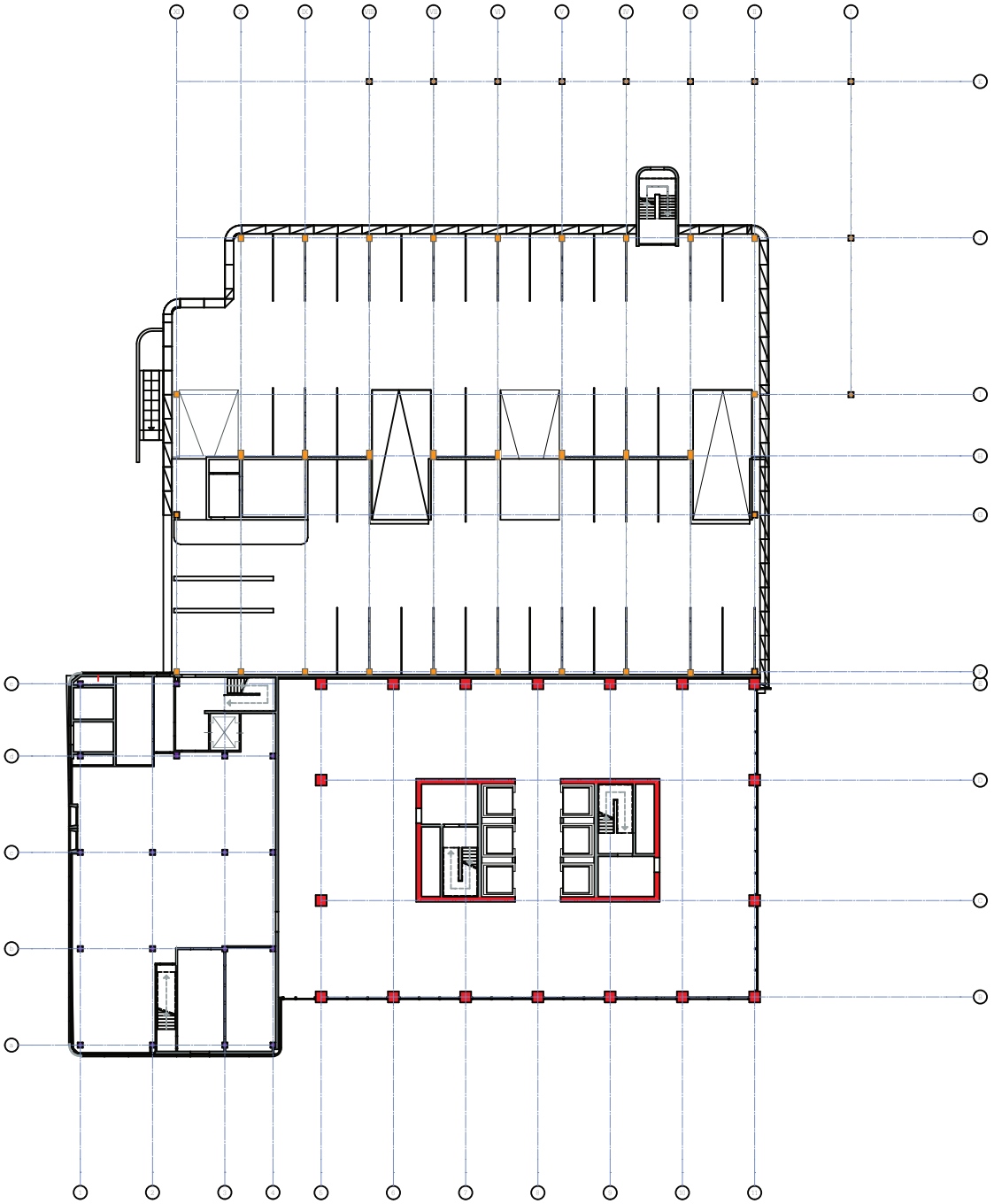

Fig. 2.01 Three different constructions, three different parts
own illustration

Fig. 2.02 Construction Built Hofpoort Tower
Archive Rotterdam

Facade

The façade of the building is a key element in the iconic building. It has a robust look with the heavy concrete prefab elements. The windows lie deep in the façade, creating big shadows inside. The façade is made of insulated prefab concrete elements with a size of 5400mm x 3400mm. The windows have isolating and sun reflecting glazing, very common in the 1970s.

Climate

The office floors have no operable windows. Ventilation, cooling and heating is done mechanically. This is very common for office buildings from that time, but nowadays people prefer to have more natural ventilation and a more sustainable solution.

Functional

The building was designed as an office building. The podium of the building held the central facilities like the lobby, the media room, the canteen and the mail order space as well as the parking garage for 306 parking spots. The tower was for the offices of the company. The top floors were the archive and the technical floor.

Conclusion

The answer on the first question, the most important characteristics of this seventies office building, are the robust and heavy concrete prefab elements of the facade. This is a feature of the building that, according to my opinion, should be kept as much as possible, since this and the tower of this vacant office building are iconic to Rotterdam and the time it was built. It is building history that is important to the city's legacy.

2.2 Living fields analysis

To understand how urban farming could benefit the surrounding neighborhood of the Hofpoort we first need to research the neighborhood. With the help of a living fields analysis, a method that I have learnt at the Veldacademie, I will get more in-depth with the area and it's inhabitants. I will be able to state what the weaknesses are and what the strengths are of the neighborhood. .

Location

The Hofpoort is located at walking distance (< 10min) of the Central Station and the city's centre shopping district as well next to the office district. It is located on the South side of the railway track and on the Northeast side of the Hofplein. Hofplein is a big roundabout that controls city's traffic in and around Rotterdam. The Hofpoort is located at the border of the Stadsdriehoek neighborhood. Close to CS kwartier and Cool. On the North side you have the neighborhoods Provenierswijk, Agniesebuurt, Oude Noorden and Rubroek. The Hofpoort is located just South of the district boundary between Noord en Centrum. The location of the Hofpoort is easily accessible in the city centre of Rotterdam, making it a building and location that you can easily access.

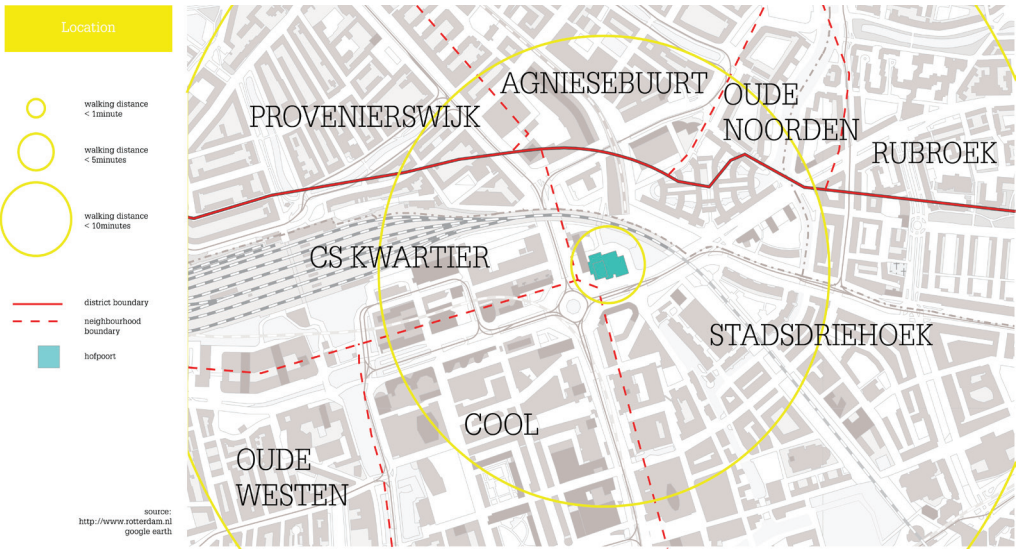

Fig. 2.03 Living fields Analysis - Location
own illustration

Work and income

The total population of the 8 neighborhoods (Provenierswijk, Agniesebuurt, Oude Noorden, Rubroek, Stadsdriehoek, CS Kwartier en Oude Westen/Cool) is 62.338 inhabitants, with a total of 4663 of them unemployed, that makes 7,5% of the total amount of inhabitants of these 8 neighborhoods. Compared with the whole city of Rotterdam this is 1,6% higher. Quality jobs are needed in the neighborhood.

The average disposable income (standardized) of the 8 neighborhoods is €21.700,00. This is the same as for the whole city of Rotterdam. The average disposable income of the Netherlands is €22.100,00, this is 1,8% higher. Agniessebuurt, Oude Noorden and Oude Westen/Cool are the lowest income neighborhoods (€19.200,00 - €18.400,00 - €18.900,00). The inhabitants of the CS Kwartier have the highest average disposable income, €31.400,00. Only the CS Kwartier seems to score high on an sufficient income.

With a high unemployment rate and a low disposable income in the surrounding neighborhood it's seems necessary to create new jobs and accessible wholesome healthy food. Urban farming could play a big role in this, since it creates jobs and it can provide the neighborhood with wholesome healthy food at low or no price through a community farm. By creating jobs it could save the municipality money on unemployment benefits, since the unemployed inhabitants would have a chance on a new job within their own neighborhood.

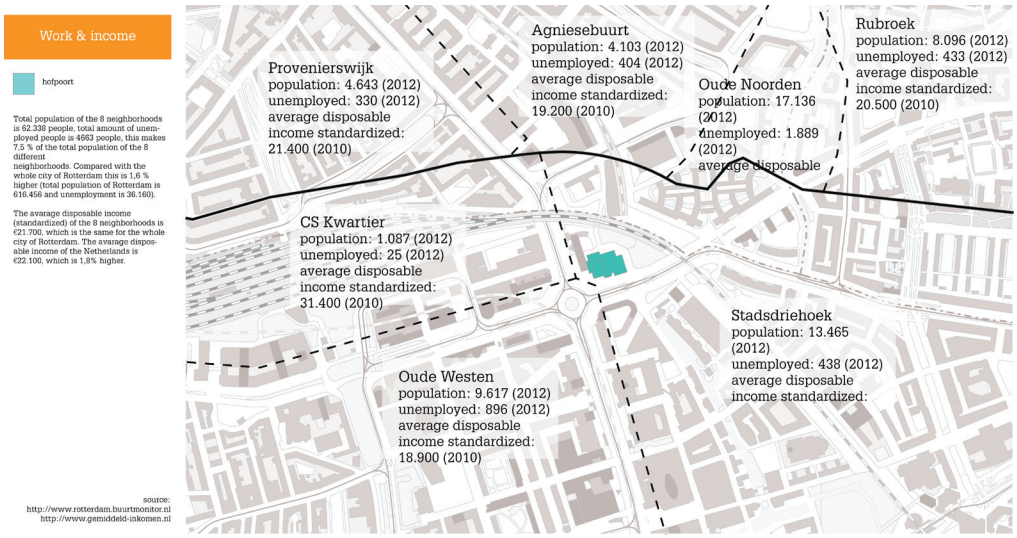

Fig. 2.04 Living Fields Analysis- Work & Income
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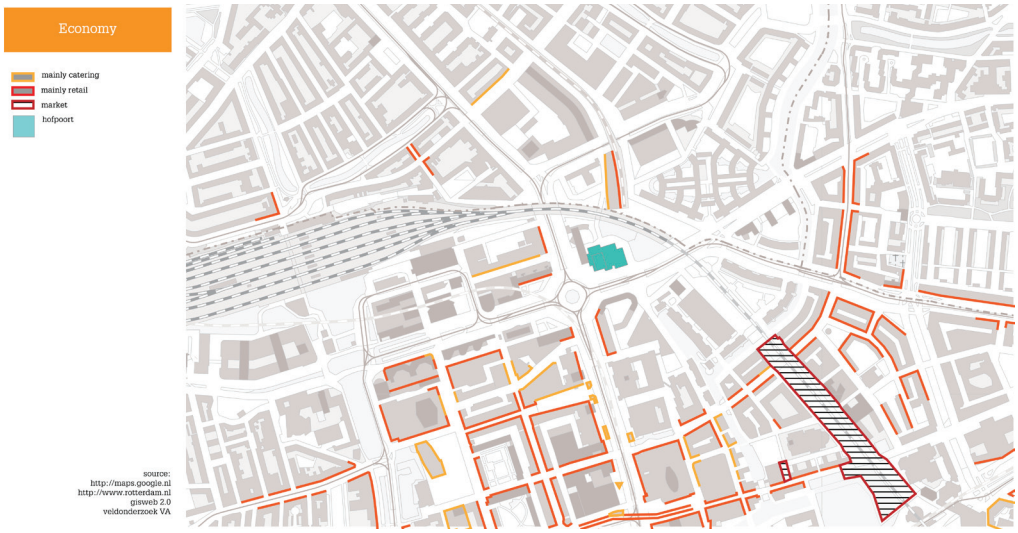
Economy

On the South of the Hofpoort you have the shopping district of the city with mainly retail streets. The Hofpoort seems to be at the transition area between shopping district and more living areas. Nearby the Hofpoort there is a big marketsquare, the Binnenrotte. The market is there every Tuesday and Saturday from 8.00 till 17.30. It is a diverse market with food related market stalls and many clothing related market stalls. At the Wijdekerkstraat there's a books market every Tuesday and Saturday from 8.00 till 16.00. From April till September there is a Sunday's market at the Binnenrotte. Here you can buy clothes, flowers, fish and many more things.

The Hofpoort could function as a connection between the working/recreation area of the city and the more living part. The Hofpoort could also become part of the existing markets in the city or the city's market network.



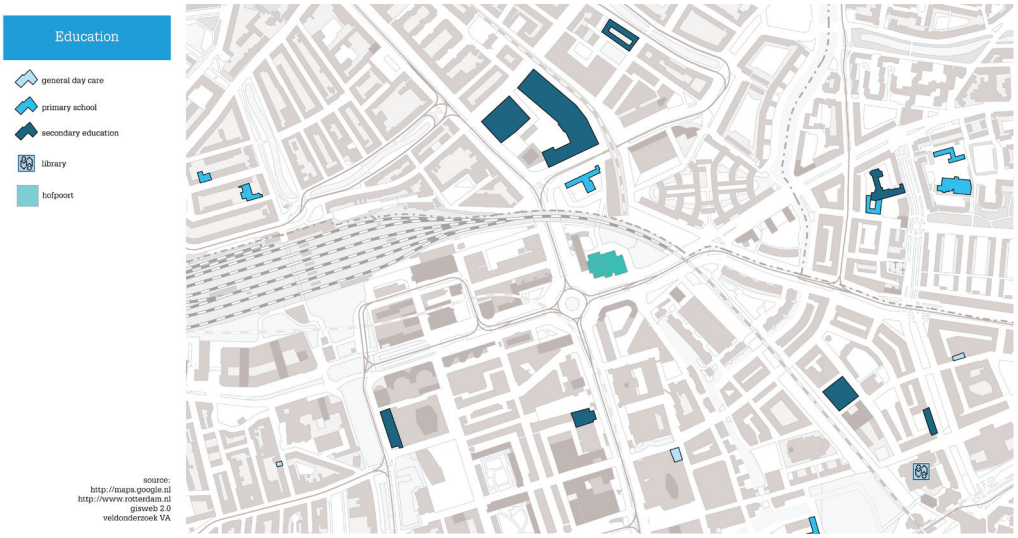


Fig. 2.05 Living Fields Analysis- Economy
own illustration
Fig. 2.06 Living Fields Analysis - Education
own illustration

Education

Close to the Hofpoort there are many different kind of schools. Just North of the Hofpoort you have a primary school, het Spoor, and next to that you have the Grafisch Lyceum Rotterdam. On the Northeast of the Grafisch Lyceum there is a catering business school. More in the city centre you have a few university buildings, like the Vrije Universiteit and CodArts.

In the direct surroundings there are educational facilities that could benefit from an educational urban farm, they could participate in a community farm or intern at the farm(s) or hospitality facilities.

Food index

In the food index you again can see that the Hofpoort is on a transition area. On the South of the Hofpoort there are many different food related shops, companies, restaurants and cafés. When you go more North it gets less. Within the city centre there are many restaurants and cafés.

There could be connections possible between the food related businesses and the Hofpoort, in using each others products as well as recycling the businesses waste at the Hofpoort.

Fig. 2.07 Living Fields Analysis - Food Index
own illustration

Health care

Around the Hofpoort there are a numerous amount of dentists, neighborhood info centres and general practitioners. All these businesses could benefit from an urban farming centre in the neighborhood.

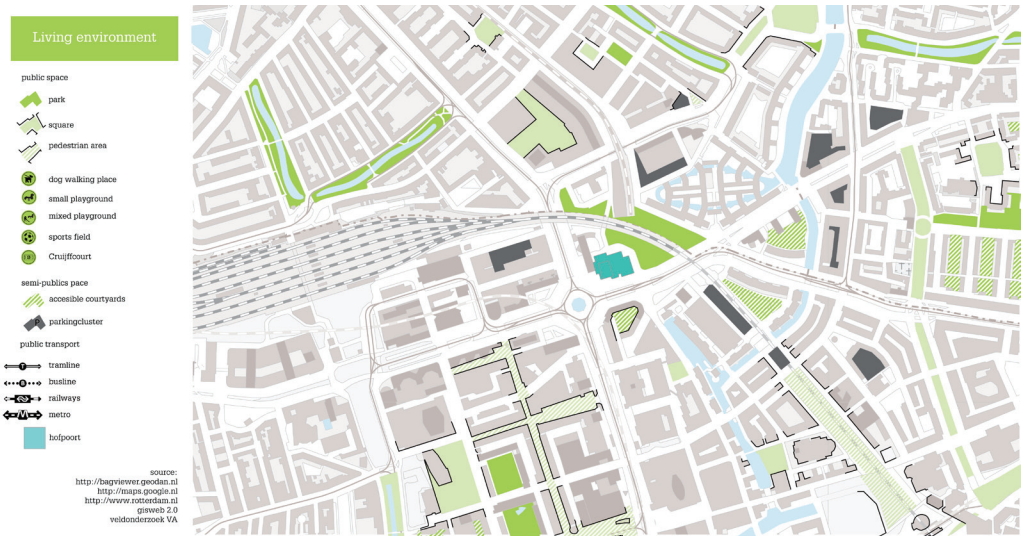
Office buildings

The Hofpoort is on the border of a big office building district. There can be made a distinction between two subareas: the Weena area (Delftsteplein, Hofplein and Weena) and the Coolsingel/Blaak area (Beursplein, Blaak, Coolsingel and Aert van Nesstraat). The majority of the office buildings in these areas were constructed after the WOII. The areas show a mixture of low profile post-war buildings with large footprints and modern high-rise buildings from (mainly) the eighties and nineties (Van Dijk, 2012). The Hofpoort is part of these office buildings, it is an iconic example of that times architecture and the city's history.

Fig. 2.08 Living Fields Analysis - Health Care
own illustration
Fig. 2.09 Living Fields Analysis - Office Buildings
own illustration

Living environment

Around the Hofpoort there is a green space, but at the moment it is undefined. There are plans for the future to transform it in a park with sporting area and urban farming. Nearby the Hofpoort there is a large pedestrian area, this is where all the shops are located. The Hofpoort area could become part of the already existing living environment with a new urban farm. The Hofpoort is located near tram lines, bus lines and the metro. One tram stop is even right in front of the Hofpoort and one of the metro stations is not even a 5 minute walk away from the Hofpoort. This illustrated the good location of the Hofpoort.



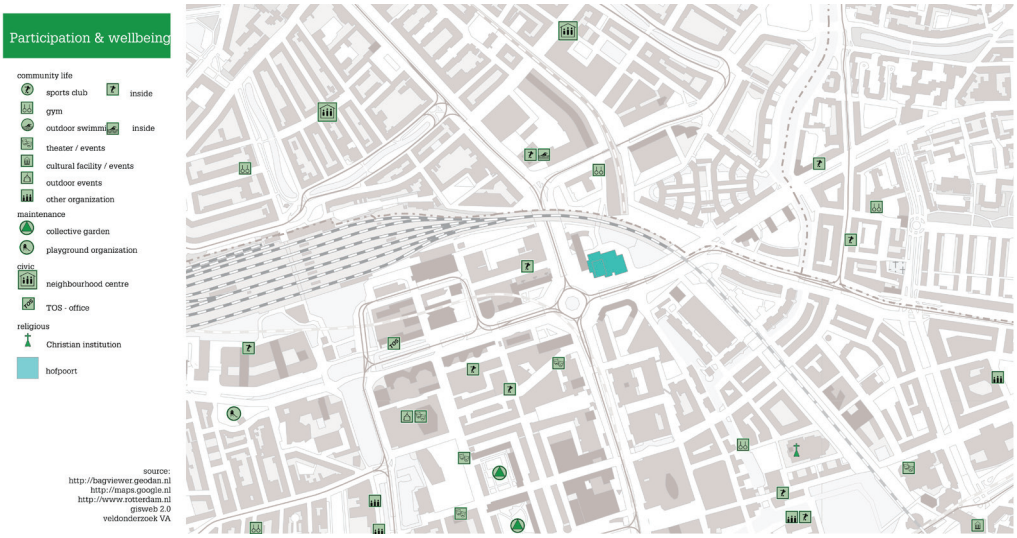
Housing

As said before, the Hofpoort is on a transition area between city life (shops, offices etc.) and a more living neighborhood. It is next to neighborhoods that are dominantly living areas. The neighborhoods Cool and Stadsdriehoek are dominantly mix-used areas. There are many people living around the Hofpoort, they could all benefit from an urban farm centre in the neighborhood to learn about healthy food and buy and grow locally produced food.

Fig. 2.10 Living Fields Analysis - Living Environment
own illustration
Fig. 2.11 Living Fields Analysis - Housing
own illustration

Participation and wellbeing

Within a walking distance of the Hofpoort there are a few inside sports clubs, neighborhood centers and cultural facilities. There is also an indoor swimming pool just North of the Hofpoort. All these facilities could benefit from the Hofpoort being in their neighborhood promoting a healthier lifestyle.



Social index

When looking at the social index of the different neighborhoods you see that most of them are rated between 5,0 and 5,9 (vulnerable). Stadsdriehoek/CS Kwartier and Cool/Nieuwe Werk/Dijkzigt have a social sufficient rate (6,0 till 7,1). Especially the neighborhoods North of the Hofpoort have a lower social index, especially in the capacity angle. Among all neighborhoods the social angle scores low. When looking at the average scores of the 7 neighborhoods combined the social index scores a 5,5, which means it is vulnerable. They score especially low on sufficient language proficiency, sufficient income, perceived social bond and sufficient work and educational level. All these aspects could be improved with the introduction of an urban farm in the area. The urban farm could provide quality jobs, a community garden could provide food and activity for lower income families. The Hofpoort could function as a place where there can be language courses, possibly combined with food. By making the Hofpoort or at least a part of the Hofpoort open and social towards the neighborhood it is possible that it would improve the social bound and cohesion.

Health

Health seems to be a growing problem among metropolitan cities. This is also going on in Rotterdam. Looking at the social index, three neighborhoods around the Hofpoort are dealing with a low rate between 3,9 and 4,9.

The urban farm of the Hofpoort would promote a healthier lifestyle by providing wholesome and healthy food, locally produces. Besides providing food, the Hofpoort could function as a place for information about a more healthier lifestyle.

Fig. 2.12 Living Fields Analysis - Participation & Wellbeing
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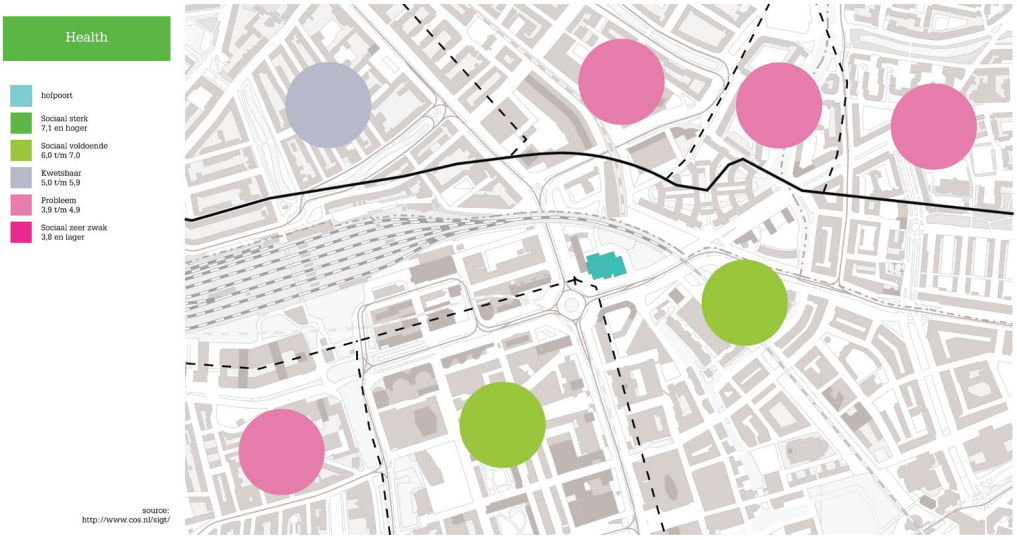


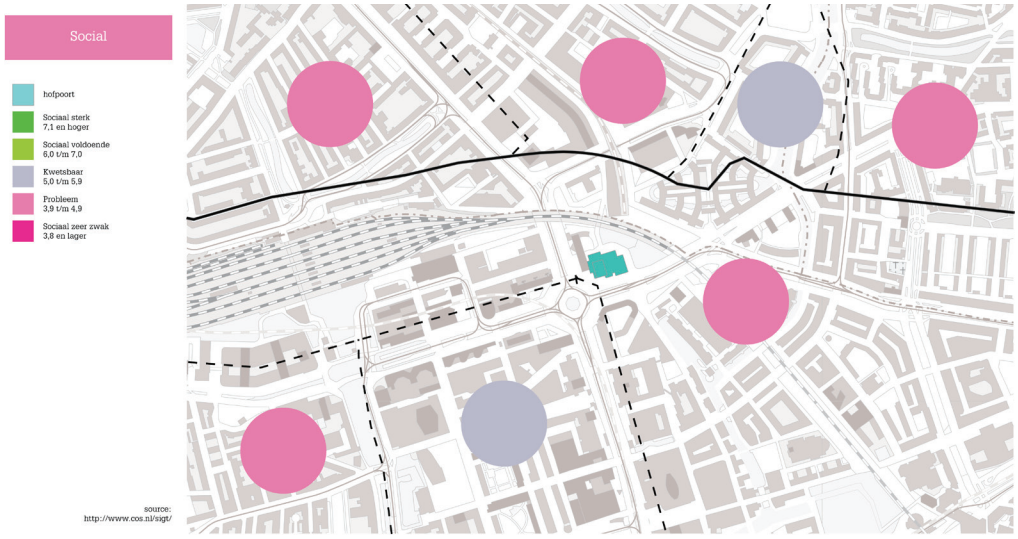


Fig. 2.13 Living Fields Analysis - Social Index
own illustration

Fig. 2.14 Living Fields Analysis - Health
own illustration
Fig. 2.15 Living Fields Analysis - Social
own illustration

Social

Within the perceived social bond angle of the social index all the neighborhoods around the Hofpoort are rated low to vulnerable (3,9-5,9). CS Kwartier/Stadsdriehoek, the neighborhood of the Hofpoort, scores 4,7, a problem rate. A building like the Hofpoort with an urban farm inside could help the inhabitants of the neighborhoods to become proud of their neighborhood and they would want to stay in that area.

Conclusions

The answer to the second sub question is illustrated in the table above. The strengths of the surrounding neighborhoods are the easily accessible location (walking, biking, public transport and car), that the location is on a transition space between work/economy and housing (opportunity) and that there are many food related businesses surrounding the location of the Hofpoort. The weaknesses of the surrounding neighborhoods are insufficient language proficiency, insufficient income, low health rate and a low perceived social bond. These weaknesses could be solved with the transformation of the Hofpoort. To increase the language proficiency a good addition to the Hofpoort would be workshop space, where there would be space for language course as well as urban farming course, perhaps even combined. A community farm is a great function that can help improve the perceived social bond. A community farm can bring the people from the neighborhood together, creating social bonds between different people, young and old. This farm could also help benefit the inhabitants of the neighborhood in their health, by providing wholesome, healthy and locally produced food and by educating them on the importance of wholesome and fresh food for their health. The community farm, but also a shop or restaurant or commercial farm, will provide in quality jobs, which will help low income families and the high unemployment rate.

Strength	Weakness
-easy accessible -transition location -many food related businesses	-low income -insufficient language proficiency -low percieved social bond -low health rate

Fig. 2.16 Strength & Weakness Conclusion
own illustration

03

Urban Farming

Fig. 3.01 War Gardens Pamflet
Library of Congress

3 Urban farming

Urban agriculture is not something that is new, but has been practiced for many years now. Throughout Europe allotment gardens are common ever since the industrialization and the fast urbanization that came during the 19th century. Many allotment gardens were the lifesavers during the WOII, including the 'victory gardens' in the US.
Urban farming is a movement that aims to grow food (vegetables and fruits) in cities and is growing nowadays as a respond to the crisis that we are living with.
In this chapter I would like to answer the questions about urban farming that could help to inspire my project. First I will anser wich different types of urban farming that are existing today. I will follow with case studies of urban farms to answer the questions about urban farming world wide and in the Netherlands, what we can learn from them that could be usefull for my project. I will finsih with exploring the urban farming movement in Rotterdam, to explain why Rotterdam is a great city for a project like the transforming the Hofpoort into a thriving and succesful building with the help of urban farming.

3.1 Types of urban farming

To answer the question what types of urban farming could be possible in and around the Hofpoort it is important to first understand the different types of urban farming that exist. There are two ways to help understand the different types of urban farming that can help with choosing the type of urban farming possible for in and around the Hofpoort. One differentiation is stated by the 'Urban Agriculture Network' (Smith et al, 2001) and the second by the 'Five Borough Farm' (Cohen et al, 2012). After explaining both I can make a good distinction in what type of urban farming could be possible in and around the Hofpoort.

3.1.1 Urban Agriculture Network types of urban farms

There are five common components that make a distinction within the urban agriculture according the 'Urban Agriculture Network' (Smith et al, 2001):
- Location
- Type of activities; food; non-food
- Land tenure
- Scale and type of production systems
- Product destination

Location
Spatially there is a distinction between intra-urban and peri-urban. Intra-urban agriculture refers to the agriculture that is occurring within the inner city, the core of the city or also referred to as the central or business district of the city. Measured by the population size, density threshold, municipal boundaries or the official city limits. The peri-urban refers to

the outer skirts of the city, the suburban area or as sociologists call them 'rurban'. The peri-urban is closer in contact with the rural areas. The boundary of this peri-urban area seems difficult to decide since many authors use different measures according to Mougeot (2000). The boundary of the peri-urban area varies depending on the reach of the urban influences and sometimes this boundary is set depending on the time it takes for non-residential farmers to go to their farm or for the product to come to the urban market.
The location of the Hofpoort is in the inner city or core of Rotterdam next to the Central Station. The Hofpoort is located within the intra-urban agriculture.

Type of activities

Within agriculture you have different types of activities divided in horticulture, aquaculture, arboriculture, poultry and animal husbandry. Horticulture means the cultivation of gardens, also stated as simple agriculture without many tools. Aquaculture is farming of fish and aquatic plants, which is the same as hydroponics, where plants are grown in a liquid nutrient, combining this with the breeding of fish, you get aquaponics. Arboriculture involves the cultivation of trees. Poultry and animal husbandry is the breeding of poultry, pigs, cows and other edible animals.
Agriculture means farming; the occupation, business, or science of cultivating the land, producing crops, and raising livestock. But agriculture is more than just food production, it's also about the pre- and postproduction, as of the waste-recycling process. Agriculture sometimes also means the production of non-food produce like ornamental or agro industrial (e.g. tobacco).
Possible activities for the Hofpoort could be horticulture and aquaculture inside the building, even combined would be very possible. Arboriculture, poultry and animal husbandry is not as suitable for inside farms, since you would need more space in square meters but also in height. The outside farm would be a great place for horticulture and possibly arboriculture. Poultry and animal husbandry need more square meters and are therefor not that suitable for the wasteland plot between the Hofpoort and the train track.

Land tenure

The areas are defined by different elements, like whether it's on-plot or off-plot, what the development status is of the site, whether it's built-up or open space. If the urban farm is an indoor farm or an outdoor farm. Another category to take in consideration is the modality of tenure and the official land use category.
The Hofpoort is a built-up space where an indoor farm would be possible as well as an outdoor farm at the wasteland plot between the building and the train track. The building is fully developed, but the in between space of waste land isn't developed at all.

Scale and type of production system

The differentiation in scale and type of production system is between non-commercial, market oriented and other forms like guerrilla gardening and the community garden. Examples of the non-commercial farm are micro-farms or institutional gardens, market

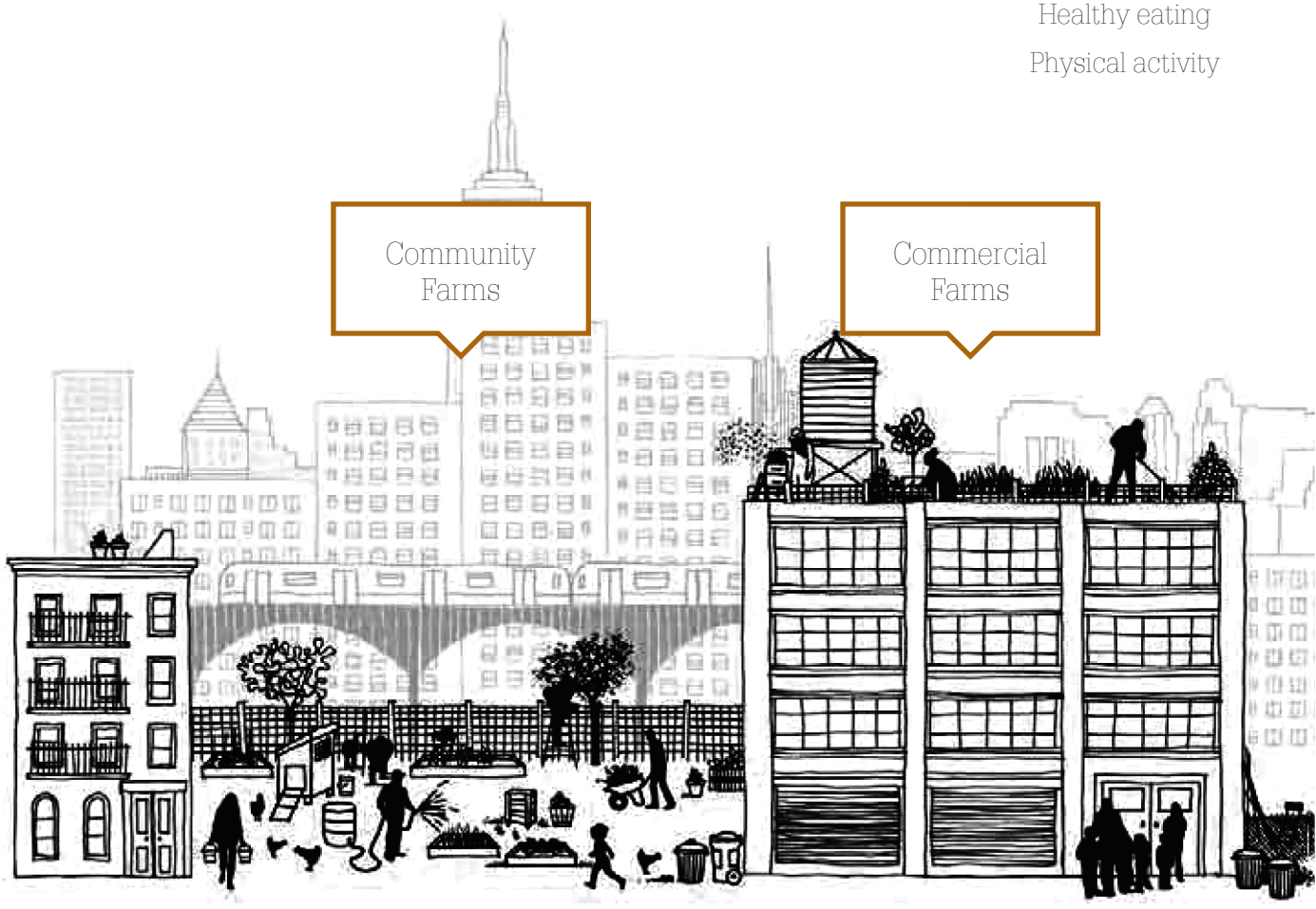
Fig. 3.02 Hydroponics
www.hydroponics.name

URBAN AGRICULTURE

urban agriculture involves many different types of food producing spaces, stakeholders, and policies, and contributes to many benefits.

Health

Access to healthy food
Food-health literacy
Healthy eating
Physical activity



People

Local residents
Volunteers
Community organizations
Students
Visitors
Market customers

Soil & Compost

Self-produced
Purchased
Donated

Supplies

Seeds
Fertilizer
Tools
Construction Materials
Water
Electricity

Fig 3.03 Data Farming This Big City - Urban Agriculture
Five Borough Farm

Benefits

Social

Empowerment + Mobilization

Youth Developement & Education

Food Security

Safe Spaces

Socially Integrated Aging

Economic

Local economic stimulation

Job Growth

Job Readiness

Food Affordability

Ecological

Awareness of Food Systems Ecology

Stewardship

Consercation

Storm Water Management

Soil Improvement

Biodiversity + Habitat Improvement

ey Stakeholders

mers and Garderners

overnment Officials

pport Organizations

Funders

Financial Resources

Sales of produce

Grants

Donations

Fees for services

Support Services

Technical assistance

Advocacy and policy work

Environmental education

Networking events

Access to land and rooftops

oriented urban agricultural businesses are small or large scale commercial agricultural, horticultural or stock breeding businesses or multi- functional businesses combining different kinds of agriculture with or without recreational functions.
The inside farm of the Hofpoort is great for a commercial farm and the outside farms is very suitable for a community farm. The farms would be more small scale and multi-functional businesses combining different kinds of agriculture with recreational functions.

Product destination

There is also a differentiation between the destinations of the products produced within the urban agriculture. This could be for own use or commercial use. Self-consumption is mostly with non-commercial farms and other forms like the community garden. Market oriented farms produce products for commercial use. The market of the commercial used urban farms can be different as well. The business could have a market oriented local, EU oriented or globally oriented.
The inside farm of the Hofpoort is commercially local market oriented, the outside farm is also locally oriented, but for own-use for the neighborhood.

The Hofpoort

There could be two types of farms at the Hofpoort, both intra-urban agriculture with a local product destination. One farm is inside the building and the other is outside. On the waste land between the building and the train track. Other differences are that the inside farm is commercial and market oriented and the outside farm is non-commercial for the neighborhood. The inside farm could consist of horticulture and aquaculture combined, outside is more suitable for horticulture and possible arboriculture.

3.1.2 The Five Borough Farm types of urban farms

The book 'Five Borough Farm' (2012, Cohen et al.) talks about four different kinds of urban farms;

- Institutional Gardens & Farms
- Commercial Farms
- Community Gardens
- Community Farms

Institutional Gardens & Farms

Institutional gardens and farms are affiliated with an institution like a school, hospital or prison. School gardens exist to teach children about growing food, some schools have extensive urban agricultural programs. In New York there are prisons that have urban agriculture mostly to provide therapy, with food produce as secondary outcome. With most of the institutional gardens and farms food production is not the first priority, but merely a support of their primary goals. An institutional garden or farm is not a suitable urban farm

for the Hofpoort, since the function of the Hofpoort is not a school, hospital, prison or other kind of institution. I have no intention to transforming the Hofpoort into an institution like this.

Commercial Farms

Commercial farms are market oriented and want to make a profit. They will try to get the highest possible yield, for the highest possible profit. This is the main distinction with community oriented farms and gardens. Most of the commercial farms do have the same goals as the community oriented farms, besides the profit. These goals could be promoting a healthier lifestyle or creating a better environment. The Hofpoort could possibly have a commercial farms. This is a great way to create a profit but also to help with other goals like a healthier lifestyle. It is also great for local economy.

Community Gardens

Community gardens are typically run by a small group of volunteers from the surrounding neighborhood. These gardens will not only grow food, but flowers and other plants as well. These gardens provide space for all different activities for the neighborhood and are there for recreational reasons. Most of the gardens are at vacant plots and left over space within the housing areas of a city. The Hofpoort, especially the wasteland between the building and the train track, would be great for a community garden. It could help rehabilitate the social bond of the inhabitants of the neighborhood and help with youth developement and education. But to have a focus on health and accesibility of wholesome and locally produced food the focus of the community garden should be more on growing food than on other plants or flowers.

Community Farms

Farms like this are mostly communal growing spaces that are run by a non profit organization. The farm consists of growing spaces that are managed by volunteers. The main goals of community farms next to producing food are the social development and the elaboration of the neighborhood. This is a great possible farm construction for the Hofpoort, the focus is on food, but a by product is the developement of the neighborhood and creating a social bond.

The Hofpoort

The Hofpoort could have a commercial farm inside the building and a community farm on the wasteland between the building and the train track. The commercial farm is market oriented and wants to make a profit. The community farm would be run by a non profit organization and should be managed by volunteers. The community farm focusses on the neighborhood and it's inhabitants, creating a social bond and helping to increase a better health among them.

3.1.3 Conclusions

The answer to the question what different kinds of urban farming exists today can be done in two different ways, one explained by the Urban Agricultural Network (UAN) and onw by the Fiive Borough Farms (FBF). The difference between the UAN and the one of the FBF lie mostly in the fact that the UAN uses what makes the difference and the FBF uses four different kinds of farms. UANs differentiation reaches a broader sense of urban farming an FBFs has framed the differentiation between four kinds. UAN uses the location, type of activity, land tenure, scale and type of production systems and product destination for the types of urban farming. FBF uses institutional gardens & farms, commercial farms, community gardens and community farms to make the distinciton. When combining both of the explanations together you can create the best defined urban farms. The Hofpoort has the possibility of two different kinds of urban farms, both intra-urban agriculture. One is inside the building and one is outside on the wasteland plot between the Hofpoort and the train tracks. The farm inside the building is market oriented commercial farm with a goal to make profit. The outside farm is a community farm led by a non-profit organization. Both farms are locally oriented. The inside farm is great for a combination between horticulture and aquaculture. Outside is more suitable for horticulture and possibly arboriculture.

3.2 Urban farming worldwide

Urban farming is already happening everywhere, to understand how it works as a business I will explain two examples more thoroughly. This will help answering the question what we can learn from urban farming worldwide. The first is 'Lufa Farms' in Montréal, Canada, a commercial rooftop farm. The second is 'the Plant' in Chicago, USA, an old meat packing plant transformed into a food business incubator with vertical farm. I have chosen two examples that incorporate a building with the urban farming. This will be more relevant for my research than a community garden, since I want to use urban farming to transform a building.

3.2.1 Lufa Farms, Montréal

Lufa Farms or Fermes Lufa is a commercial farm business located in Montréal that grows vegetables in a 2.880 m2 greenhouse on top of a two-storey office building. They started with their sales to local consumers in April 2011, after putting their first seeds in the ground on February 28, 2011. Its greenhouse structure was the world's first commercial-scale rooftop greenhouse.

The farm produces for almost 2000 people in and around Montréal. They harvest in the morning and in the afternoon, between 15:00-18:00 you can pick up your products at different spots throughout the city. Within 24 hours the vegetables are with the consumers, without the many middle businesses and miles our food normally takes to get to our plates.

How it works

The consumer selects on the website the basket that suits their requirements. There are three different baskets to choose from. The small one feeds 1-2 persons and costs $22/ week (±€16). This basket has at least 8 different varieties. The medium sized basket feeds 2 persons with at least 10 varieties for $32/week (±€23). The biggest basket, the large, has at least 12 varieties feeding 3+ persons for $42/week (±€30). After choosing the right size you can customizes your basket with by example choosing extra tomatoes. The consumer then picks their pick up location. There are over 100 different pick up points throughout the city. All have their own delivery/pick up days. The spots vary from universities to clothing boutiques to offices to coffee shops. After picking up the basket the consumer has fresh food, grown with love. They know where it came from and how it's been made. Through the community blog and at the pick up locations the consumers connect with each other and share inspiration, knowledge and recipes.

About the farm

The greenhouse has been constructed from galvanized steel, aluminium and glass. And the main structure was up in about three weeks. Before the construction there has been a 4 year research where they had to develop poly-culture systems that allow growing multi-crops in the same greenhouse. Multi-crops that achieve the same yield as monoculture crops would do. They had to develop their own water circulation techniques and microclimate management software. The whole farm is being managed by software.

The farm captures rainwater en re circulates irrigation water. They do this to avoid placing additional demands on the city water supply. The farm uses a hydroponic cultivation method; this reduces the

amount of water needed enormously. By circulation 100% of the irrigation water, the greenhouse doesn't load the municipal drainage system and the nutrients aren't lost in the lakes and rivers.

Lufa farms only uses biological control to take care of harmful pests like insects and mites. Therefor all products from Lufa Farms are free from synthetic pesticides, herbicides and fungicides. They release beneficial insects, like ladybugs, into the greenhouse to fight crop-harming pests.

Lufa Farms uses rooftop farms, because good farmland is disappearing rapidly. By rooftop farms you can take back arable land lost to development. Concurrently you give people within the city access to healthy, high in nutrition food. The Lufa Farms slogan is 'Our vision is a city of rooftop farms'.

Even though Lufa Farms uses natural gas for their heating and cooling, their rooftop farm uses significantly less energy than similar ground-level greenhouses. This is because they never refrigerate anything and since the consumers all live nearby, they reduce on shipping. They explain their energy savings some more on their website in four parts:

"First, the heating demands of greenhouses occur almost exclusively during the night. Night-time temperatures in cities tend to be much higher than in the country due to the thermal mass of city buildings and roads and due to the heating of city homes and offices.
Second, we employ energy curtains. These semi-transparent curtains, which are automatically deployed on cold evenings, help insulate the greenhouse and reduce heat loss at night. This results in a significant energy-use reduction.
Third, our customers are urban residents who live and work close to our greenhouses. Since we deliver to drop-points around the city, harvest our produce on the same day it's delivered, and minimize packaging, we drastically reduce the energy that is traditionally used to package, ship, refrigerate, and store the produce that you'll find in an average supermarket.
Fourth, the combined transpiration of the plants in the greenhouse–collectively an enormous evaporative surface–cools the air and helps to reduce the heat island effect created by the typical black tar roof. This lowers the energy needed to cool the building underneath our greenhouses during hot summer days."

Contributors

Lufa farms contributes with local producers. Lufa Farms can, by doing this, provide a larger product range and it gives the opportunity to display the wide variety of food that grows and is produced in the Ouebec terrier.

Urban impact

Infrastructure

Lufa farms rooftop greenhouse reduces on shipping and food miles, because they produce nearby their clients.

Economic

Lufa Farms economic benefits consider the new employment they have created, job growth. Lufa Farms is also a healthy local business that produces healthy food at affordable prices.

Environment

The environmental benefits are that they are energy saving, taking back arable land lost to development, reducing food miles and water saving. Lufa Farms is also a biological farm, where they don't use synthetic pesticides, herbicides or fungicides. Together with the water circulation system they reduce agricultural runoff.

Fig. 3.04 Lufa Farms Montreal
Fadi Hage - Flickr

Health

Lufa Farms contribute by making healthy food available and creating communities where knowledge and recipes are being shared. This is also the social benefit of Lufa Farms.

Overall it is a very successful urban rooftop farm in Montréal, Canada.

This project shows that an urban farm can be successful in a commercial sense, but also successful in a way that it is good for the environment, because they are energy saving, reducing food miles, saving water and they take back arable land lost to development.
It is good to collaborate with local contributors to increase the product range. By using subscriptions they never harvest to much food and can guarantee the freshest products for their clients. This also dismisses the use of a refrigerator, lowering the ecological footprint. This are all things that could be great to incorporate in the farms of the Hofpoort.

3.2.2 the Plant, Chicago

The Plant in Chicago is a new kind of organization in an old building. The building, an abandoned meat packing facility, is transformed into a green food business incubator with world's first 4 story vertical farm.

The developer's, John Edel, goal is to bring large-scale net-zero-waste food producing right into the middle of the city.
To start the project John created a community of local people whom all where interested in some way. He and others taught them skills and from there they started with the renovation and transformation of the building. To do so they re-use everything. For instance evaporators became fan coils for heating and cooling. Doors and walls that got deconstructed were re-used somewhere else. The old smokehouses of the meat packing facility became bathrooms or offices.

Besides the 4 storeys high vertical farm the Plant houses small food businesses. It is an incubator for green businesses like a bakery and a micro-laboratory. The Plant encourages local entrepreneurs to start their business at the factory. The Plant hopes to bring high quality healthy food to the community and make skilled jobs in an economically blighted area. The Plant has at the moment already 125 good quality jobs created.

It has an anaerobic digester, made of waste, to create it's own energy for heating and cooling the building. Making its ecological footprint smaller.

The Vertical Farm

The vertical farm works with an aquaponics system combined with LEDs. It is continuously re circulating water and bacteria to feed the crops convert the fish waste. The staff and IPRO students from IIT designed the whole system. They used as many low

and no cost materials. It is their goal to test the limits of implementing large-scale systems on a limited budget so that their farming methods will be financially viable to repeat anywhere.

The fish and filtration tanks are built up from donated up cycled food-grade IBC totes. They have three breeding tanks of almost 12.000 litres with each 600 tilapia and 287m2 of plant growing beds. They produce arugula, lettuce, herbs and other salad greens. Staff and volunteers manage the system, they divide the produce between each other. There is also produce sold year round at the largest farmer market of Chicago.

The breeding tank, now in its fourth design iteration, has two chambers. There is also a algae cultivation tank for nutrient scrubbing and fish feed production. One breeding tank is linked to two plant grow beds. Male and female tilapia breeders produce in between 50-500 tilapia each spawn. In the near future the Plant would like to start experimenting with prawns.

The staff is testing with various lighting systems above the plant growing beds. At the moment they are using a donated mix of T-8 fluorescents and induction lights, both stationary and on light-movers. They are testing if these lights are the best to use. The Plant grows their plants most of the time at night, since the electricity costs are lower. Plants need a dark period once a day and since

the building doesn't have big, bright windows it is possible to change night and day for the plants and therefor reducing the costs of the farm.

The whole thought behind the Plant is to be an open source system, making everything and all the knowledge available and accessible for everybody. They test it; you can use their results.

Outdoor farm

Besides the indoor aquaponics farm the Plant also developed an outdoor farm. They transformed large portions of parking lot into arable land. They have transformed now about 4000 m2 of parking lot into urban farmland. Architects Ryan Wilson and Marcus de la Fleur designed an outdoor plan with incorporated swamp like land, permeable pavement, rain gardens and other techniques to manage and capture rainwater on site.
In the planning are organic vegetable and fruit production land. They intend to make growing space for the tenants who want to grow their own crops. Eventually they even want to develop greenhouses on the land and on the rooftop of the building.

Fig. 3.05 The Plant Chicago
Plant Chicago - Fl ickr

Tenants

At the moment the Plant has seven businesses in house.
Arize Artisan Kombucha is a brewery that brews kombucha, a fermented tea.
Green & Grills llc produces and sells vegetables and fish sustainable farmed using aquaponics. Nature's Little Recyclers is an urban vermiculture green tech venture.
Pearless Bread and Jam is a bakery that specializes in whole-grain, naturally leavened breads and seasonal small-batch jams. Pleasant House Bakery is a family owned bakery and café specialized in traditional and modern savory pies and speciality sweets.
Skygreens aquaponics creates indoor aquaponics systems.
And the Urban Canopy is a business creating sustainable and just agricultural systems.
The Plant is still offering spaces to rent out for businesses in a dynamic, sustainable environment. At the moment they are even developing a shared kitchen, which can be shared and rented out by food producers and educators on a as needed basis.

Tours & events

The Plant offers public tours every Thursday to Saturday. The tickets cost $10, - and can be purchased on the website or at the door. Next to the public tours they also offer private group tours for a minimum of $80, -. The Plant also offers several events at a cost like aquaponics workshops, building workshops and weatherization workshops.

Urban impact

Social

The Plant's social impact lie in the fact that John Edel was able to create a local community with whom he transformed the building. A community that works together, exchanges knowledge and friendship.

Economic

John was able to create, already, 125 good quality jobs, that means job growth in the neighborhood. He also shows to everybody that with little needs it is possible to create an aquaponics farm. He also promotes local entrepreneurs to start their business within the Plant.

Education

The Plant is an open source knowledge system, making it possible for everybody to learn. Another educational benefit are the given workshops and tours to learn about the Plant and sustainable agriculture.

Environment

Environmentally the Plant has a goal to be a large-scale net-zero-waste food production. Everything in the Plant has been re-used or made from recycled elements and the anaerobic digester makes energy out of the city's waste.

Infrastructure

The Plant wants to make fresh and healthy food available for the community and by doing it within the city it reduces food miles.

Livability

The Plant creates interactive spaces for people and provides space for edible green as a livability benefit.

Good about the Plant and useful for the Hofpoort is that the Plant has a goal to be a large-scale net-zero-waste food production. This would also be great for the Hofpoort. It uses an anaerobic digester to make closed loops and make waste equals food. The Plant shows that it is possible to create quality jobs, something very important for the Hofpoort and it's neighborhood. The Plant also has other tenants to create profit besides the aquaponics farm, but this also makes the Plant an incubator for new green businesses.

3.2.3 Conclusions

Both project discussed are very successful and helpful to answer the question what we can learn from urban farming worldwide and could be an inspiration for this project.
The most important thing that we can learn is that it does works and that it is a good solution that we could very well use here in Holland. A good aspect that learnt from Lufa farms is that it doesn't use refrigerators, because they harvest it just before the consumer buys it. Fresh from farm to consumer within one day. This can only work if you would have the buying system that they have. For the Hofpoort I would say this could be done partly, I believe that the Hofpoort should also use a shop where the products can be sold individually without a subscription. Another good aspect is that they contribute with other local food producers, increasing their range of food products, meeting the wishes of the consumer. The consumer can buy all the local products at one spot. The Hofpoort, with it's central location, would be a great spot for a shop or local distribution centre for all (or a lot) locally produced products, ranging from by example potatoes from the local farm to jam from a sweet grandmother in Rotterdam South.
The Plant really worked on closing waste cycles with their anaerobic digester, this would also be a great addition to the Hofpoort, especially since the digester generates energy which can be used for growing the plants. As an addition to their aquaponics farm they have an outside farm as well. The area between the train tracks and the Hofpoort would be very suitable for an outdoor farm as I have mentioned before. And another good thing that the Plant does, is that it created 125 quality jobs in a neighborhood with a high unemployment rate, just as the surrounding neighborhood of the Hofpoort. This project shows that urban farming generates quality jobs. Besides being a farm and a building for green businesses, the Plant also shows that urban farming can be used as an commercial attraction to generate more profit. This could as well be very possible with the Hofpoort project.

3.3 Urban farming in the Netherlands

Just like in the rest of the world urban farming gains popularity in the Netherlands. Reasons for this include concerns about the environmental problems like the food miles, lack of diversity and the on-going crisis, which resulted in a lot of unemployment and low-income families. People are becoming more aware of health issues and the price of wholesome fresh food is fairly high. This results in buying prefabricated food, high in fat, salt, sugar and additives. Diets like that contain a high level of these ingredients can result in life threatening and chronicle diseases like diabetes and obesity. These diseases are becoming a bigger problem in the Netherlands (CBS, 2013), people are getting more aware of this problem and therefor want new ways of producing healthy, wholesome fresh food are being designed. It is good to see what's going on in Holland, to answer the question what could be usefull for this project. First I will explain a bit more about the difference between urban farming in Holland and urban farming worldwide. This is due to the small size of our country. Then I will explain one of the Dutch initiatives that has great similarities with my project for the Hofpoort. This will make it easier to see if there is something to learn for my project.

The difference between urban farming in Holland and worldwide
In the Netherlands there's a bit of a difference compared to the rest of the world concerning the definition of urban agriculture. This is because the Netherlands is a small country with several big cities in the West. Together these cities form a metropolis with agrarian land in between. These peri-urban areas with Dutch conventional farmers and growers would be considered urban agriculture, even though the market of these farmers is oriented towards the EU and the rest of the world. Therefor the Dutch ministry of agriculture seems to define urban agriculture only to agriculture within the city limits, intra-urban agriculture. The agriculture within the metropolis could be seen as a metropolitan agriculture; this is a new term used for farmers and growers who are located close to large cities but their product destination is oriented to the world market instead of the immediate cities. The market of the Dutch metropolitan or peri-urban agriculture should be shifted from the world or EU to the Dutch and local market. This will shorten food chains and miles, increase the oil demands and will help with the availability of locally produced wholesome food. The Hofpoort, with it's central and visible location, could be a great first step in making locally produced food awareness bigger and help with this vision.

Dutch initiatives

There have been many different kinds of initiatives throughout the Netherlands concerning urban farming. They vary from small initiatives that grow mushrooms with coffee grounds (MushroomWall) to edible community gardens (Eetbare tuin Zuiderpark). They all have different urban impacts ranging from social, economic, education, environmental, health and infrastructure (the different benefits).

I will explain one project briefly and one project more intense, namely Zuidpark Urban Farming Rooftop in Amsterdam. It was a vacant office building that has been transformed into an office-complex with an espresso bar, professional meeting facilities, a co-worker community and a rooftop urban farm. It has similarities with the Hofpoort therefor it could be interesting to study this project. The briefly discussed project is the MushroomWall in Amsterdam, I want to explain this some more to show different kinds of possible urban farming in the Netherlands. Not only rooftop farms or farms on wastelands, but also a smaller project that uses coffee grinds from restaurants and cafes to grow mushrooms, creating a closed no-waste loop.

Fig. 3.06 Zuidpark - Urban Farming Rooftop Zuidpark
Fig. 3.07 Zuidpark - Urban Farming Rooftop Zuidpark

3.3.1 Zuidpark Urban Farming Rooftop

Zuidpark is the old head office of the Vroom & Dreesman, a leading department store in the Netherlands, along side the A10, the ring high way around Amsterdam. After two years of vacancy Jan Huijbregts, real estate entrepreneur and owner of the Zuidpark complex, decided that the building needed a rigorous transformation. The Zuidpark complex got totally renovated, made sustainable and attractive for new tenants. The old office building complex has been transformed into an office complex with a new business case, including an espresso bar, professional meeting facilities, a co-worker community, an electrical taxi power station and a rooftop urban farm. The concept succeeded and after two years most of the space was rented.

A new concept

Jan Huijbregts created a new business model for Zuidpark with sustainability, social relevance and social responsibility as leading topics in such a way that it would also pay the bills.
The office complex got several facilities to make it more attractable for it's tenants. These facilities are by example a trendy coffee bar, professional meeting facilities, a co-working community and the largest rooftop garden farm in Europe. Especially the farm is an important factor in the complex's attractiveness. The tenants and their staff use the rooftop farm to meet and work. They use the garden to walk around, have their lunches or for small meetings. They also meet the other tenants there and new contacts can be made. They also have the opportunity to get their hands dirty and help with the gardening. The harvest of the garden is for the restaurant in the complex. They use as much of the rooftop garden harvest as possible completed with other locally produced products.

The rooftop farm

The roof of the former expedition building needed only small reinforcements to make the roof suitable for a rooftop farm, only a steel roof and extra thick insulation were added on top of the existing structure. The existing structure of strong steel beams and less strong concrete floors in between became the organization of the rooftop farm. The actual kitchen garden is in planters exactly on the steel beams of the structure. In between those planters are beds with sedum vegetation alternated with concrete pavement.

There are two sizes of planters on the roof. The high ones, placed a long side the edge of the roof, contain 50 cm of vegetable garden substrate, the lower ones are 20 cm high. They contain sixty to seventy different kinds of vegetables and fruits, making it a diverse kitchen garden.

Urban impacts

Social

The rooftop garden has a big social component, especially visible during lunch hours or moments of harvest. It connects the people within the building of the different businesses, creating social relevance and social responsibility.

Infrastructure

Urban farming and this urban rooftop farm is an answer to saving energy on transport, reducing long food chains and a scale reduction that makes the people more aware.

Economic

The urban rooftop farm and the new business concept made it possible to turn the vacant office building into a successful and fully leased office complex. It attracts a new type of tenant, one that understands the importance of sustainability, ecology and energy.

Education

The urban rooftop farm educates the tenants and other people awareness about food, health and the environment.

Conclusion

What we could learn from this project is that by creating a new (office) complex with a focus on sustainability, ecology and energy it does attract a new kind of business that wants to be associated with this ideal. It is also good to see, that the employees of the different businesses in this complex make great use of the rooftop farm. It helps with spreading the awareness of our food, health and the environment. All subjects are important for the project of the Hofpoort as well.

3.3.2 MushroomWall

The MushroomWall is an Amsterdam based project by Stuurlui in progress that started in June 2012. It is a project that uses a vertical system of recycled PVC pipes in narrow city alleys throughout Amsterdam with mushrooms growing out of them. Since these alleys have a reasonable cool and moist climate, without direct sunlight, they seem to be well-suited places to harvest different kinds of mushrooms. to make these mushrooms grow, they use used coffee grounds, transforming waste into food and making this visible by locating the project within the public space.

Restaurants nearby the alleys are adopting these pipes. At these restaurants the coffee grounds are being collected and used in the pipes as fertile ground for the mushrooms. The chefs of these restaurants maintain and harvest the mushrooms and use them to serve in the restaurant.

Conclusion

What's inspirational from his project, that could be useable for the Hofpoort, is that they use used coffee grinds to grow mushrooms, making closed circles of waste and food. And by using recycled PVC pipes, they make sure not to create new waste for this project. The Hofpoort could be a great spot for a mushroom farm, a specialized farm that uses used coffee grounds to grow mushrooms.

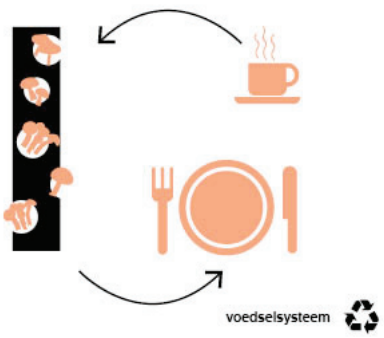


Fig. 3.08 MushroomWall
www.destuurlui.nl

3.4 Urban farming in Rotterdam

The urban farming movement is big in Rotterdam. There are a lot of initiatives going on that are doing something with urban farming, an actually garden, exchange of knowledge, market or restaurants are a few examples. I have made a map (shown on page 60) with all the initiatives on it, together with a list. I will explain two inspirational initiatives with the help of the seven different urban impacts. This will help to show that there are many urban farming initiatives in the surroundings of the Hofpoort. This will show that Rotterdam is the right city for a project like this in the Hofpoort. There is a big movement that this project could be part of.

3.4.1 The initiatives

The list:

1.	WdWPentfarm	Heemraadsingel 221
2.	Uit je eigen stad	Marconistraat 37-39
3.	Rotterdamse munt	wasteland Laan op Zuid
4.	Polydome Rotterdam	Stadhuisplein 15
5.	Urban Edibles	The Hub - Heemraadsingel 219
6.	Bijen op de Bieb	Hoogstraat 110
7.	COOLzaad	Rockanjestraat 13J
8.	Creatief Beheer	West Kruiskade 30A
9.	Dakakker Schieblock	Schiekade 189
10.	De Tussentuin	Gaffelstraat
11.	Ghandituin	Gordelweg 131
12.	Hotspot Hutspot Lomba	Dumasstraat 263
13.	Hotspot Hutspot Skibroek	Asserweg 461
14.	Moestuinman	Oudedijk 227
15.	Nu Hier	Braakliggend terrain tussen Schotterbosstraat/ Almondestraat/Zomerhofstraat
16.	Oogst met mij mee/ Kook met mij mee/Stichting Proefhof	Vijferhofstraat

Rotterdamse Oogst:

17.	Zaait	Deliplein
18.	Varkenshuis	Veerlaan 90
19.	Markt	Noordplein
20.	Festival	Heemraadsplein
21.	Eigen gemaakt	Ergens in Rotterdam
22.	Standslandbouw Schiebroek	Schiebroek
23.	Stadstuin Frederikshof	Frederiksstraat
14.	Transition Town Rotterdam	Netwerk
15.	Voedseltuin	Keilestraat 9
16.	Wollefoppengroen	Rotterdam-Zevenkamp

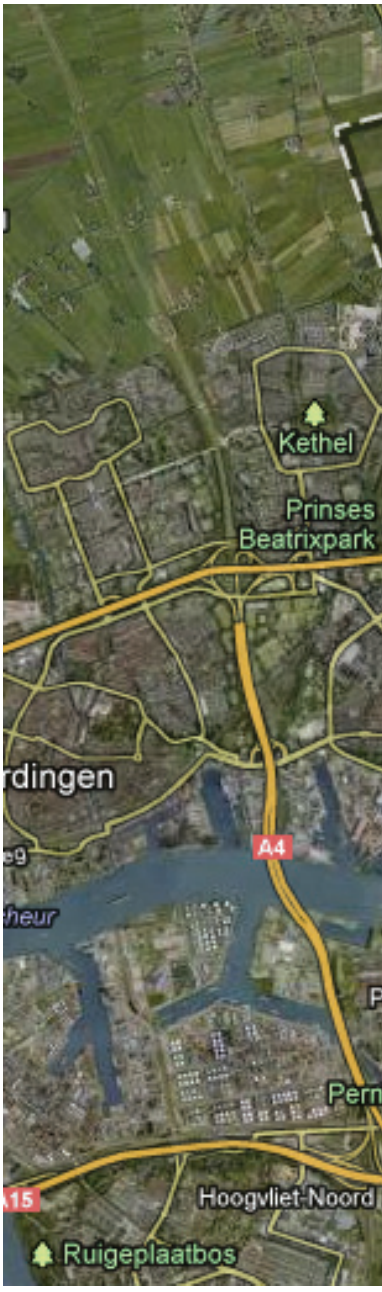


Fig. 3.09 Initiatives Map - Rotterdam
Map made with GoogleMaps

Fig. 3.10 Uit je eigen stad - Rotterdam
Urban Sprinkle

Uit je eigen stad / From your own city
Rotterdam
Since October 2012
In progress
Infrastructure – Economic – Liveability – Health

Uit je eigen stad is an urban food concept where you can buy products and eat at the restaurant products that are produced at their own land. The goal of the restaurant is that 25% of the used products is of own production, the other 75% is of local produced products. Ever since they opened, the restaurant has been very popular. This makes it, for now, not yet possible to reach the goal of 25%. But they hope this will be reached once the production is fully up and running.
Fruit, vegetables and herbs are grown on their land, chickens are walking around freely and fish is being breed in an aquaponics system. The initiators of 'uit je eigen stad' are hoping to develop the concept of a local food production chain throughout different urban locations in the Netherlands, so local food hubs are emerging in various cities.

What could be used from this example in the Hofpoort is the idea that you would use as much as possible of the products in the restaurant/cafe from the own farm, you would use the rest of the products that are produced locally at other farms. You could use a radius of 50 km (contains most of the Randstad).The Hofpoort and Uit je eigen stad could use each others products in their restaurants. Therefor helping each other.

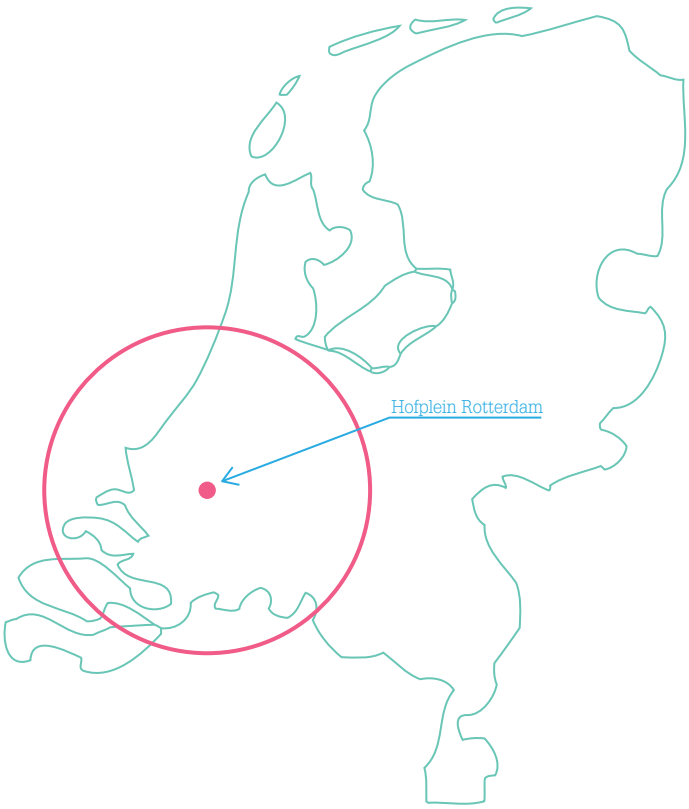


Fig. 3.11 Map with Rotterdam and 50 km perimeter
Own illustration

Dakakker Schieblock
Rotterdam
Since 2012
In progress
Education – Environment – Liveability – Social

The 'Dakakker Schieblock' is an initiative of ZUS architects in co-operation with Rotterdams Milieucentrum and Binder Groenprojecten. It's a 1000 m2 rooftop garden, built as part of the 'Luchtsingel', winner of the 'Rotterdams Initiatief 2012'. They've planted the garden mostly as a test site and model for other rooftop garden initiatives. The intention is that they learn about the possibilities of the rooftop garden.

Every Friday it's volunteer day. Everyone can sign up and come help working on the roof. They also organise several educational activities. The Schieblock is an office building on the demolition list, but at the moment it's temporarily being transformed into a cultural hub, initiated by ZUS architects and CODUM (project developers). People working there use the rooftop garden during their breaks. The pavilion at the garden can also be leased for meetings.

The Dakakker is next to the Hofpoort, therefor it would be easy and great to co-work with this organization. For the community farm it is usefull to use certain days for voluntary work days, to incorporate the neighborhood in this project.

This project is part of a bigger project, the 'Luchtsingel'. This project has as goal to re-activate Hofplein with a timer 390 meters long pedestrian bridge as catalysts. Besides the bridge and the Dakakker, they have made a plan for park Pompenburg, the wasteland between the Hofpoort and the train track. Part of this park is destined as urban farming. The fourth part of this project is the roof of the Hofbogen, the landing spot of the bridge.

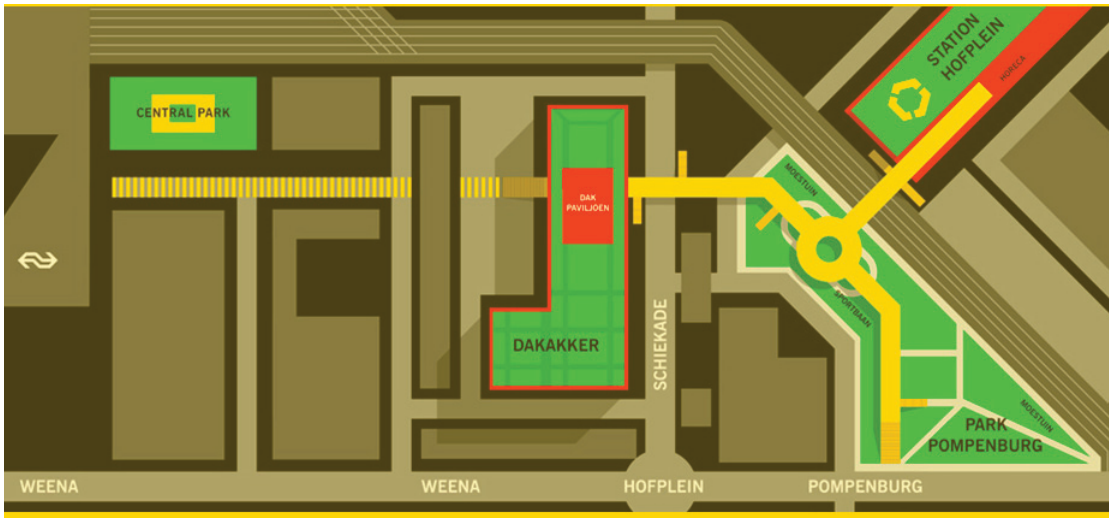


Fig. 3.12 Plan Luchtsingel by ZUS
www.luchtsingel.org

Fig. 3.13 Dakakker Schieblock
www.luchtsingel.org

3.4.2 Conclusion

This section was to answer the question 'How is the urban farming movement in Rotterdam, why is it the right city for a project like this?. There are many different urban farming initiatives in and around Rotterdam, making it a big movement. Therefor it is a good city for a project like this, the Hofpoort could connect with other initiatives, like the two I have described; Uit je eigen stad and Dakakker. Combining multiple initiatives makes the initiatives stronger together and they could benefit from each other. More people together make bigger changes. Therefor the city of Rotterdam and the Hofpoort are a good choice for a project like this. Especially with the 'Luchtsingel' project right at the same location. The ideas of this project should be taken in consideration when designing the transformation of the Hofpoort, especially because the locations intertwine with eachother. Both projects, the Luchtsingel and the Hofpoort, could benefit from each other.
The Luchtsingel will attract people, those people could as well be people that could make use of the Hofpoort and it will also work the other way around.
Even though the Luchtsingel has a design for Park Pompenburg, I believe I need to reconsider their design for my project, since the emphasize of my project is urban farming, this should also be the main focus of the park or garden. The design of ZUS has a focus more on a recreation, relaxing park with a bit of urban farming. But it is important to take the Luchtsingel in consideration when designing the wasteland between the Hofpoort and the train track.
Other inspiration to take from these two casestudies are that it is good to use local products in the restaurant of coffee bar from other farms in perimeter of 50 km around the Hofpoort. And to incorporate the neighborhood it is wise to have certain voluntary days for the community farm. This could be done in coorporation with the Dakakker or Rotterdams Milieucentrum.

Fig. 3.14 Dakakker Schieblock
www.luchtsingel.org

04

Indoor Culti-vation

4 Indoor Cultivation - deepening

Because the Hofpoort is a building that could be perfect for indoor cultivation as urban farming I will explore this subject some more in this chapter. There are many 'new' techniques available to make it easier to farm in a city without soil, making it easier to farm inside a (existing) building. I will examine the following types:
- Aeroponics
- Hydroponics
- Aquaponics

First I will explain the key basics of plant growth, which will help to understand the indoor cultivation techniques. After explaining the three different techniques I will conclude with the best technique that could be used in the Hofpoort.

4.1 Basics

For growing plants there are three basic needs: light, water and air. These are the needs no matter the growing technique.

Light

The plants need light for photosynthesis; you could use growing lights, instead of the sun, that replicates the suns UV rays.
A growing light consists of 3 parts: the lamp itself, a reflector and the ballast. The lamp could have blue light (metal halide), which is good for vegetative growth. The light could be red (high pressure sodium) that is good for growing fruit or flowers or the lamp could have a dual spectrum for whole life cycle (LEDs). The reflector of the lamp is there to protect and direct the lamp. Depending on the size and the design you could change the effect of the intensity of the light or the area that's being lit.
The ballast is needed to start the lamp and regulates it, containing electrical components.

Nutrient enriched water

The nutrient enriched water feeds the plants, it is their source of the mineral elements they need. The core nutrients needed for plants to grow are nitrogen, phosphorous and potassium. Generally you would have two types of mixed nutrients for different stages of growing. One would be for the growing of the young plant and the other is for the flowering and fruiting stage of the plant.

Air

Almost 75% of the requirement for growing a plant comes from the carbon dioxide in the air, making the air one of the most important aspects of growing. If you grow inside a greenhouse or building you would need a fan and filter system for circulation. The fan and filter system will control the air circulation as well as the quality of the air concerning the humidity and plant odour.

4.2 Aeroponics

Aeroponics is the process of growing plants in a misty air environment without the use of soil or an aggregate medium. The roots of the plants are in a tank filled with flowing plant nutrients. The circumstance of these thanks allows roots to find the best condition regarding oxygenation and moisture. This gives the plants a better nutrition assimilation resulting in a faster development of the plants.

Aeroponics vertical farm

You can create a vertical farm using the aeroponics system by stacking the tanks on each other. The nutrients will drip down through these 'growth stakes' and you could recirculate them for even less water usage. Most of the plants need direct exposure of sunlight, at least during the first growing stage. After this period direct exposure is not important any longer. To make to most out of these 'growth stakes' it is useful to periodically change the tanks position within the piles. The youngest should be places on the top, the oldest on the bottom. With the rotation periodically repeated, you get the most constant production without interruption, creating a nonstop production cycle.

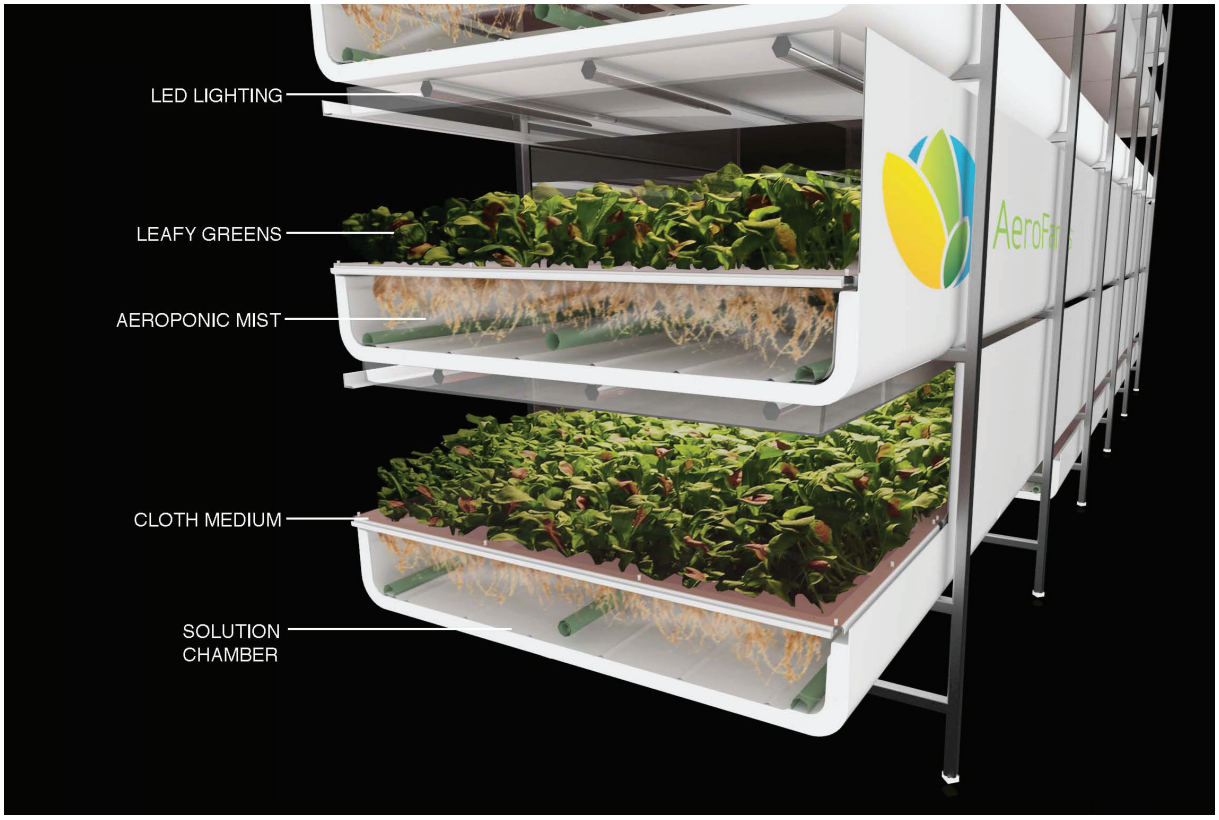
A greenhouse or at least an anti-hail coverage should cover the aeroponics system. When using greenhouses you ensure optimal climatic controlled production resulting in high yields. Using aeroponics combined with greenhouses limits your use within the city to rooftops and no used open spaces.

The aeroponics system could be used in the Hofpoort. This system makes it possible to grow inside a building and you can stack several units on top of each other, making the best use of the space. The only problem within the Hofpoort would be the lacking of sunlight, but this can be solved with LEDs.

Aeroponics with LEDs

You could also use the aeroponics system together with LEDs (light emitting diode). This way you aren't dependant on sunshine. Aerofarms is a manufacturer of a system that uses aeroponics in combination with LEDs. Their system uses a cloth as a carrier for the plants from seeding to harvest. The cloths profits according the manufacturer are the durability, reusability, increased cleanliness and sanitation, and the efficient harvest of a dry and clean product.

Aerofarms uses LEDs for their longer life expectancies and total lower cost of ownership. The LEDs can be made into linear and rectangular shapes, making it more able to a complete harvest consistency in a vertical farm. Another great reason for choosing LEDs over HPS (high pressure sodium) lighting is their ability to target specific wavelengths of light. According to Aerofarms this allows reduced energy consumption, integrated pest management and nutritional enhancement of the plants. The LEDs also make it possible to place them closer to the plants, allowing a greater vertical stack-ability.



Using aeroponics with LEDs would be a great solution for the Hofpoort. It helps with growing inside an empty office building without soil and direct sunlight.

Benefits

The benefits of an aeroponic system with LEDs like the system used by Aerofarms are:
The integrated pest management and pesticides, herbicides and fungicides free;
The reduced contamination risk;
The cleanliness and dryness of the produce at the harvest, this extends the shelf life. With 1-2 weeks for conventional agricultural harvest leafy greens to 3-4 weeks for leafy greens harvest with an aeroponic system with LEDs;
No agricultural run-off and low water use because of the recirculation of the water with nutrients;
Lower impact on the environment;
The usability for urban renewal by it's indoor stack ability;
The shorter growth cycle. For plants in conventional agriculture this is 35-70 days, in a greenhouse it is 25-50 days and in an aeroponic system with LEDs this cycle is only 18-21 days, depending on the kind of vegetable;
The higher yearly yield. Conventional agriculture has an average yearly yield of 1,95 kg/m2, greenhouse farmed crops have an average yearly yield of 29,29 kg/m2 and the aeroponics system with LEDs has an average yearly yield of 146,47 kg/m2.

Fig. 4.01 Aerofarm - aeroponics system with LED
www.aerofarms.com

Aeroponics and the Hofpoort

Aeroponics could quit possibly be a technique that could be used in the Hofpoort. It is a technique with many benefits (described above). With the use of LEDs it is a great technology to use for vertical farms and indoor farms.

4.2 Hydroponics

Hydroponics is a system that uses nutrient enriched water, sand, gravel or another inert medium for growing plants. The nutrient solution is directly applied to the root zone of the plants. This way the plants don't need to work as hard as they normally would, therefor the plants can grow faster and bigger. Hydroponics makes a year round harvest possible and uses low water because of the recirculation of the nutrient enriched water. There are no soils borne pests so the plants aren't subjected to pesticides. There are five basic hydroponic systems.

Wick system

This is a passive type of hydroponics. This means that there aren't any moving parts. With the help of a wick the nutrient enriched water is drawn into the growing medium from the reservoir. An air pump supplies air to an air stone, which supplies oxygen to the water for the roots of the plants. This system does not work well with large plants that use a lot of water, since the wick might not provide enough nutrient solution to the plants.

Water culture

This is another simple version of a hydroponics system. Floating in a tank filled with nutrient enriched water is a platform, mostly made from Styrofoam. This system also uses an air pump with air stone, for the supplies of oxygen to the roots to the plants. Especially leaf lettuce plants will do well with a system as this one, since they are water-loving plants. This system does not work well with large plants or long-term plants.

Ebb and Flow (flood and drain)

With the ebb and flow system you flood and drain the growing tray. This is normally done with a submerged pump, connected with a timer.
When the pump is turned on, the nutrient solution will flow from the reservoir into the growing tray. When this solution meets a certain predetermined level or a certain time, the pump will shut down and the water will flow back into the reservoir.
This system works well with a variety of plants and different types of growing mediums. A disadvantage of this system is that it is vulnerable when the pump or timer fails. When the cycle is interrupted it is possible that the roots dry-out. Therefor it is recommended to use a growing medium that retains more water.

Drip systems (recovery/non-recovery)

This might be the most widely used system. A timer controls a submerged pump. When the pump is turned on, nutrient solution is pressurized through a main line and forced out of a drip emitter onto the base of each plant. In a recovery drip system the run off is collected and re circulates back into the reservoir. This makes the water use low and prevents agricultural run off. The non-recovery is not a circular system, but therefor need less maintenance.

Nutrient Film Technique (N.F.T.)

This system has a constant flow of the nutrient solution; therefor the nutrient pump does not need a timer. The nutrient solution is pumped slowly over the roots, afterwards is flow right back into the reservoir. Usually there's no growing medium needed, the roots are exposed to air and hang directly into the nutrient solution. This system is a very vulnerable system, since the roots dry-out very easily if pump failure occurs.

The ebb and flow system would be the best system to use in the Hofpoort, since it is possible for a wide variety of plants and has the lowest risks of failure. Besides it is also consists of a closed loop system, making no waste water and no agricultural run-off as well as a lower amount of water needed.

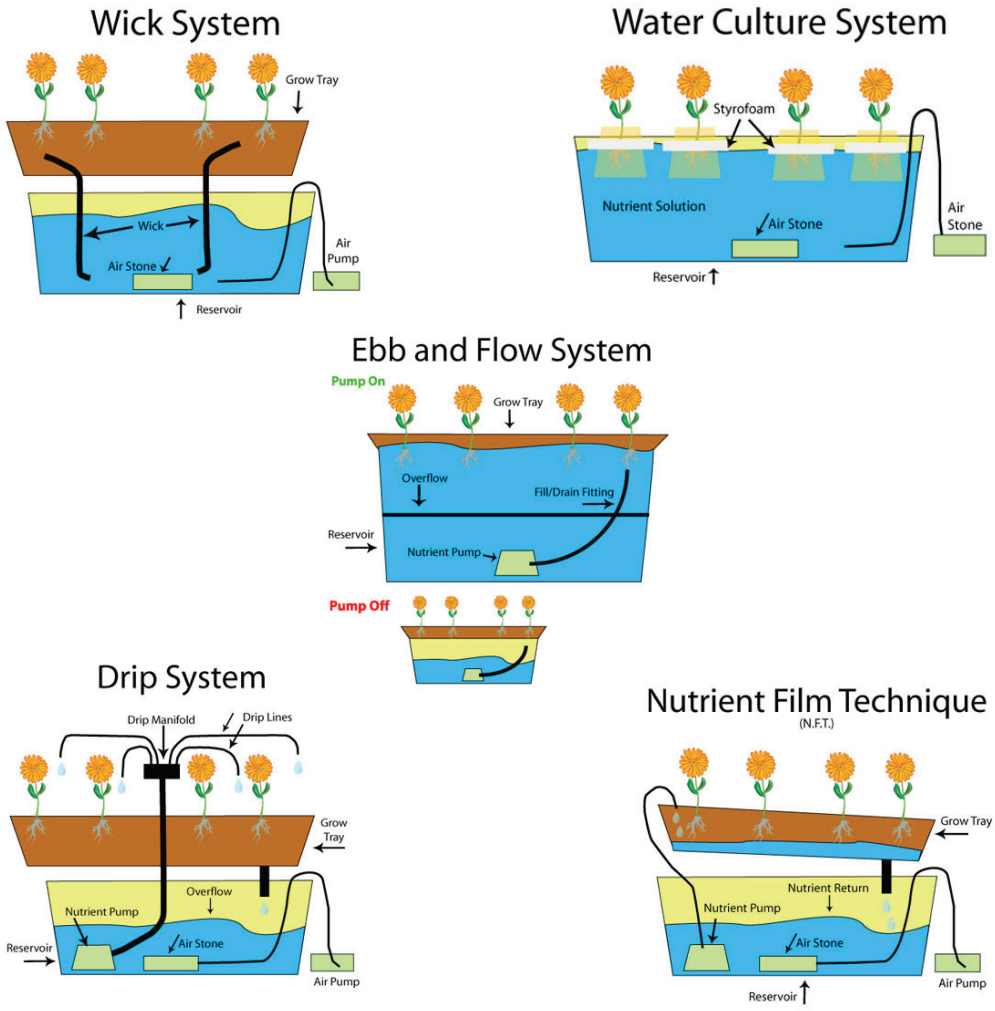
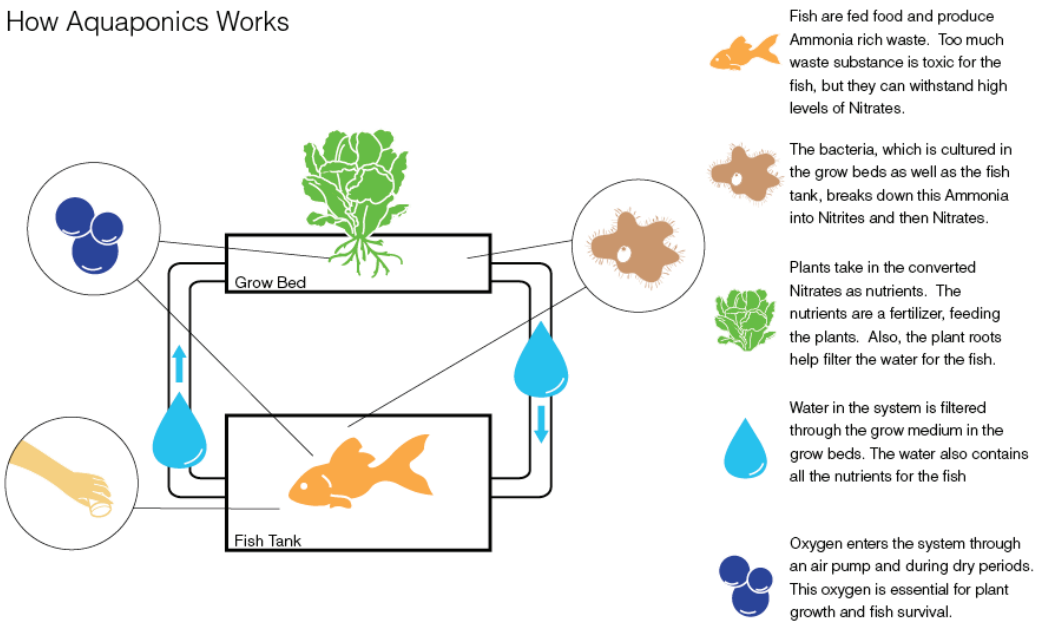


Fig. 4.02 Different hydroponics techniques
www.hannainst.com

Benefits

The key benefits of a hydroponics system with lighting are:
Reducing soil-borne pests;
No water waste and no agricultural run-off;
Low impact on the environment;
Hydroponic plants produce a high yearly yield;
Hydroponic systems are reliable on a regular and consistent harvest;
Hydroponically grown plants are larger and richer in taste;
When using LEDs as lighting you could reduce energy costs.



Hydroponics and the Hofpoort

Also the hydroponics growing technique is very useable within the Hofpoor. It is a technique that re-uses water and has a high yearly yield. With the use of LEDs it is very possible to use this technique within an existing building, without lot's of sunlight. When using the ebb and flow system you could harvest a wide variety of plants, making your product range wider, pleasing your customers.

Fig. 4.03 How Aquaponics works
www.aquaponic.be

4.4 Aquaponics

Aquaponics is a combination of hydroponics and aquaculture. It is a system where you breed fish together with growing plant without soil. It is a circular system where the waste of the fish becomes nutrients for the plants and vice versa. The plants also serve as a filter for the water the fish live in. Aquaponics produces sustainable, ecological, fresh and healthy food.
The aquaponics system should at least exist out of one fish tank and one plant growing bed. On this growing bed the plants grow on a substrate like hydro grains or another inert medium (like with hydroponics). This tank will fill itself with water from the fish tank through a flow system with pumps. Nitrogen fixing bacteria and worms break down the by-products from the fish water, which the plants then filter into nutrients for the fish. The water flows back, clean and rich in nutrients to the fish tank. Fish that are suitable for the aquaponics system are trout, tilapia and bass. (www.aquaponicsideasonline.com) There are a few different aquaponics systems: floating raft system, ebb and flow system and aquaponics NFT system. I will explain each one.

Aquaponics floating raft system

This is a system with a floating platform with plants just like the hydroponic water culture system. The water is pumped from the fish tank through a normal and/or swirl filter to the growing bed tank with the floating platform. The water here gets filtered and flows back into the fish tank.

Aquaponics ebb and flow system

The ebb and flow system works with a pump in the fish tank that pumps water into the growing bed where the water gets filtered by bacteria and the plants. The water keeps filling the growing bed until a certain point. When that is reached the pump is turned off and water slowly flows back in to the fish tank, where the whole cycle starts over.

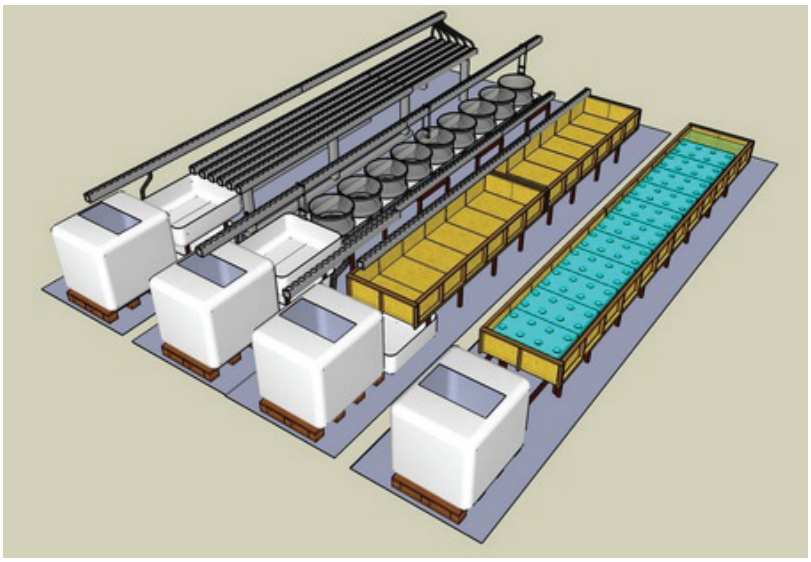


Fig. 4.04 Aquaponics systems
www.aquaponics.eu

Aquaponics NFT system

This system works almost the same as the floating raft system. The only difference is that the plant don't sit in a floating platform but inside special grow tubes.
For the aquaponics system it is also the ebb and flow system that would be the best to use, since it can be used with a wide variety of plants. It would even be better to use in a bigger farm more systems, each for their own plants that works the best. This way you can broaden the product range and you spread the risks of failure through different types of systems.

Benefits

The key benefits of aquaponics are:
Reduced water usage by re circulating;
Faster growth of plants;
Bigger and healthier produce;
No need for an artificial fertilizer;
You have a good year round yield;
No need to dispose the fish waste or use an artificial filtration system;
It reduces the damages of pests and disease, since you won't have agricultural run-off.

Aquaponics and the Hofpoort

Aquaponics is a great technique to use in the Hofpoort, with the biggest plus compared to the other techniques the fish cultivation. With aquaponics you have the broadest product variety plus all the other benefits like; reduced water usage, high yearly hield, faster growth and no need for artificial fertilizers and pesticides.

4.5 Conclusion

When looking at all the different useable techniques it would be best to use an aquaponics system in the Hofpoort, since with this system you do not only grow plants (vegetables and fruits) but you could also breed fish, which broadens the product range of the farm. You could also show the other techniques as an example in the Hofpoort, but the commercial farm should consist of only aquaponics, since this is the farm that besides being an example also wants to create a profit. The hydroponics and aeroponics could be more about being a showcase on the possible techniques in urban farming inside buildings without the use of soil. Since the farms and the growing will be inside the Hofpoort it would be necessary to use LEDs for all the different types of systems and techniques.

For the aquaponics farm in the Hofpoort a mix of the three different system would be preferably to produce the highest possible chance on a good yield. It is also great to show the public all the different systems as well. Using these different systems together also makes it possible to grow a wider variety of food, since not all plants will be useable with every system.

Fig. 4.04 Hydroponics systems
www.aquaponics.eu

05

Sus-
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5 Sustainability

When you use a building for indoor cultivation it is important to look at the sustainability of the building. What happens with the water and how do you cope with the different waste flows. The questions that I will answer in this chapter are: what is possible for water-recycling within a building and how can you make a closed loop system which takes care of the biological waste of the farms and building? First I will examine the water subject followed by the energy and waste issue. I will conclude the chapter with the best closed loop systems for the Hofpoort concerning water and energy and waste.

5.1 Water

Water is an aspect that is important to take in consideration when dealing with an urban farming project, especially with the clean water scarcity nowadays. We see this consideration as well in the case studies shown in the urban farming chapter. They recycle the water they use in the farm. This is what happens when using a technique like hydroponics or aquaponics. But, especially with a project like the Hofpoort, it is important to take notice of the water used in other parts of the building. What happens with that waste water? Is there another solution for reusing it and filtering it in a natural way? Could this happen on site? Just a few questions about the water treatment within a building that I've researched.

The living machine or solar aquatic system

The living machine or solar aquatic system are different names, but they basically mean the same. It is a system that is based on the principle of the wetland ecology. Through a series of tanks with plants and aerobic micro-organisms water gets filtration treatment for making it suitable for re-using. The cleaned water can be re-used for toilets and plant irrigation making the building use less water than it would normally would. There are many examples worldwide and I will explain two. First is the living machine treatment system of the San Francisco Public Utilities Commission in the USA second is the Centre for Interactive Research on Sustainability of the University of British Colombia in Vancouver Canada.

San Francisco Public Utilities Commission

I have chosen this building as an example because the living machine system of this building integrates the buildings lobby with the front walkway and sidewalk, making this system very visible from the inside and outside of the building. I believe visibility of these systems are very much important to create certain awareness with the public.

The system consists of a primary tank, where the waste water is collected and pre-treated before it flows into the stage 1 wetland cells. Within these cells there is a micro-ecosystem created that removes nutrients and solids from the waste water. Before going to the final

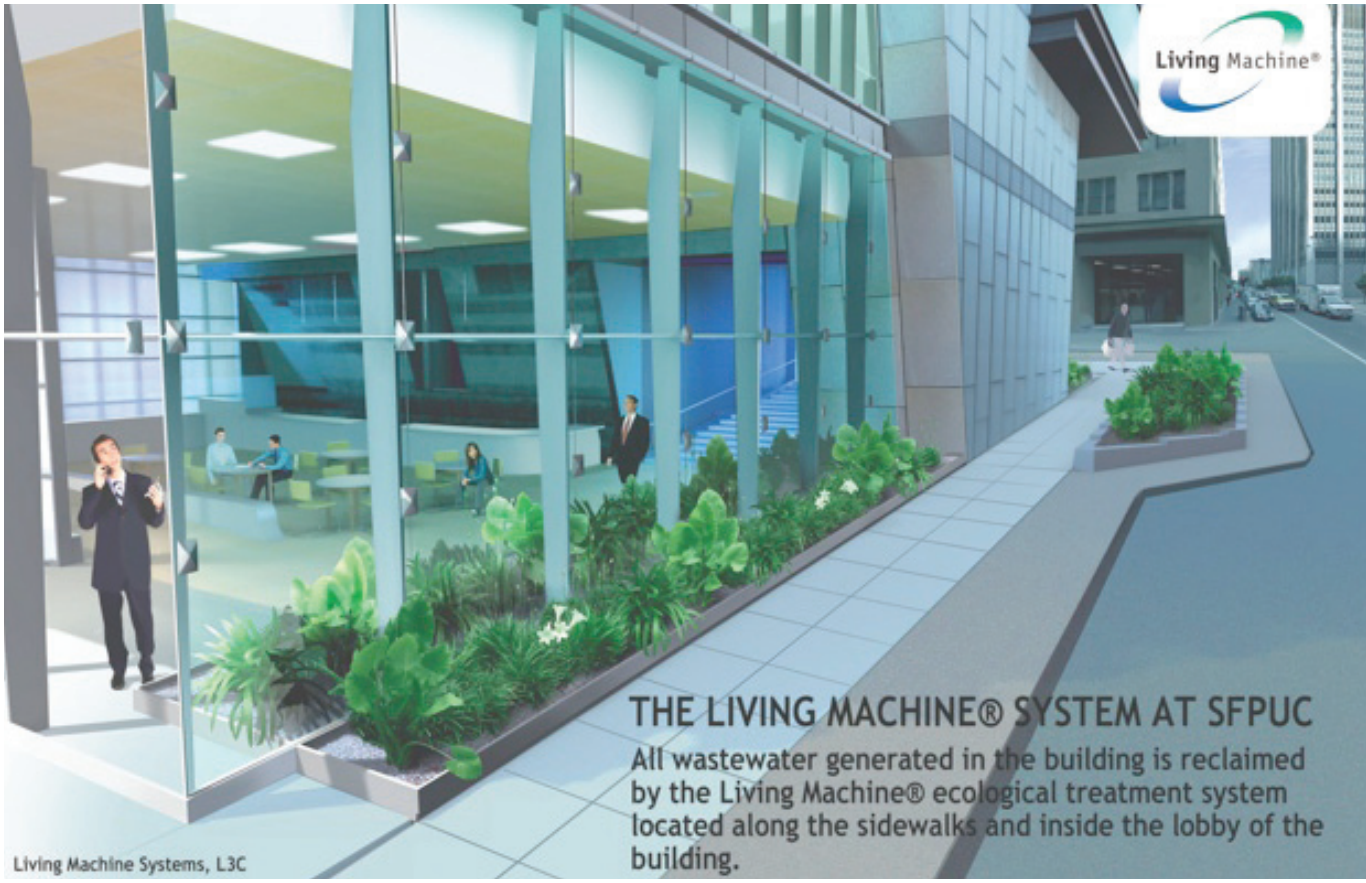

Fig. 5.01 5.02 The living machine system San Fransisco
www.livingmachines.com

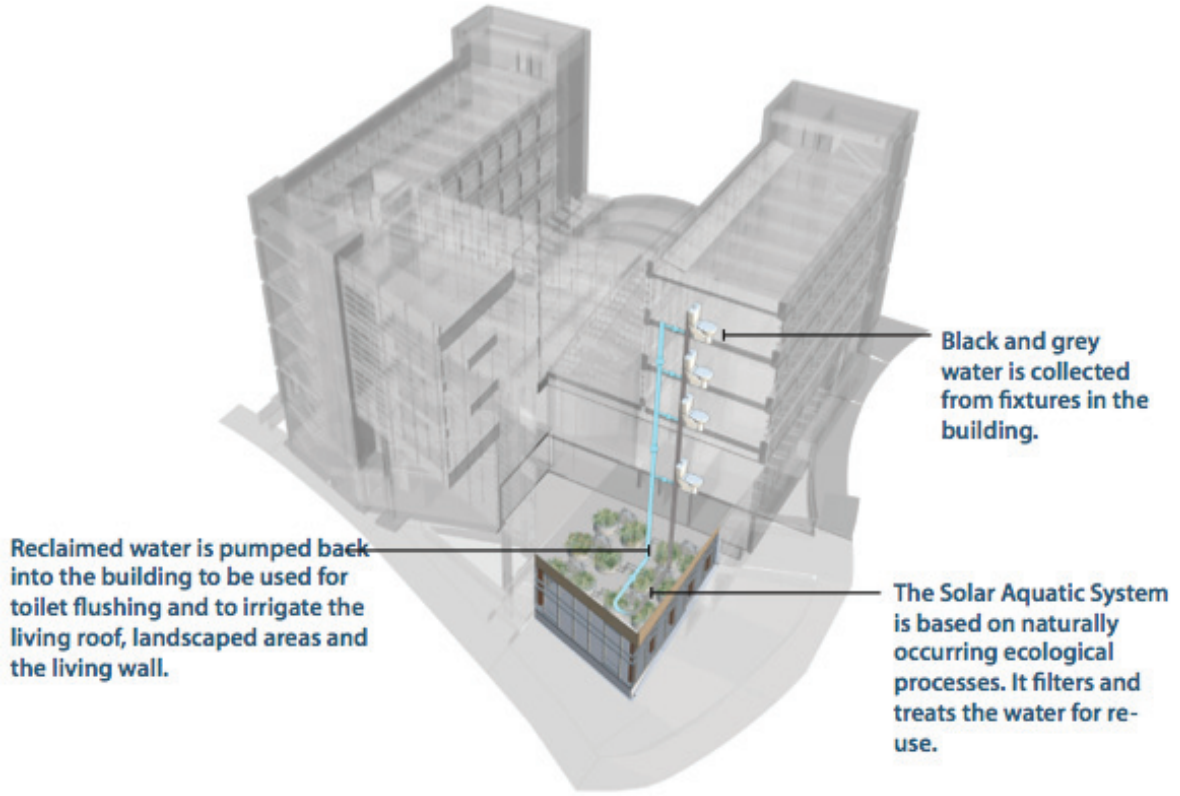

Fig. 5.03 5.04 Waste water system - CIRS Vancouver
www.cirs.ubc.ca

polishing stage it go's through the second stage wetland cells where the water gets filtered a second time. In the last stage the water gets the last filtration and disinfection before it can be re-used for flushing toilets and plant irrigation.

The benefits of this system with this project are (www.livingmachines.com):

- The building will save approximately 750.000 gallons (more than 6,5 million liters) of water per year, providing an additional 900.000 for non-potable uses off-site;
- The system will provide attractive exterior foliage and a safe, pleasant public space;
- Will accept all wastewater generated by the building's employees and produce high quality water to flush toilets and for future off-site irrigation;
- The building's green design is projected to save the SFPUC $118 million in reduced costs

This water system and the way it has been used, visible inside and outside the building is a great way to showcase the water filtering system and could be very useable for the Hofpoort. It creates visibility and enhances the outdoor space of the Hofpoort. A system like this would be very suitable for a project like the Hofpoort.

Centre for Interactive Research on Sustainability

I've chosen this example also because of it's visibility, it is located in an isolated glass walled room situated at one of the corners of the building. CIRS is one of the greenest buildings on earth and wants to be an example on how a building could cope with waste, energy and water. CIRS uses an solar aquatics system for their reclaimed water system.

On the building's website you can find a technical manual of the systems description (www.cirs.ubc.ca):

- All the wastewater from the building is collected in the collection/buffer tank;
- In the blending tank bacteria is added to digest the biological waste;
- The wastewater, along with some bacteria, is then moved through a series of aeration tanks. This are open tanks populated with filtering plants. The plants absorb a small amount of the nutrients from the sewage and process carbon dioxide, whole most of the work is done by bacteria on the root systems below the surface;
- In the Gravity Clarifier is where the bacteria (sludge) settle in the bottom, being separated from the clarified water. The bacteria is then pumped back into the blending tank;
- The clarified water moves through a sand filter that mimics how water filters through a column of soil;
- Then the water moves through an area of constructed wetlands to remove fecal coliform and metals through contact with bacteria and plants;
- Next step is the ultra-filtration system, where water is filtered to a very high degree through screens of micron fibers;
- After filtration comes disinfection with ultra-violet lights;
- The cleaned, reclaimed water moves to storage tanks and is then pumped into the building for use as irrigation and toilet flushing.

The benefits of this system are (www.cirs.ubc.ca):

- Visibility of sustainability;
- The use of natural processes;
- Engagement of inhabitants;
- Processing waste without odor;
- Sequesters and reapplies nutrients;
- Creating a self-perpetuating system.

This project also shows the water treatment system to the public, which is very useable for the Hofpoort.

Conclusion regarding water

These two examples show that it is possible to reuse and filter waste water on site on a (mimicked) natural way, one that could very well be visible. This is something that could be of great strength for my project as well, since it will help with creating the visibility of a new function in a old vacant office building. A solar aquatic waste water system would be a good addition for the Hofpoort. To create high visibility it would be best used in the way it's been used in the first project, with water cells flowing inside and outside, this will create a nicer public environment as well.

5.2 Energy & waste

Energy and waste are, just as water, important to take in consideration when dealing with a transformation or new design of a building. As shown in the Plant in Chicago an anaerobic digester could be a great solution. Therefor I've put some research on this system to see if it would be a good addition for the Hofpoort and my project.

Anaerobic digestion

An anaerobic digester breaks down organic material into methane and carbon dioxide (bio gas) and fertilizer. The biogas can be used to create electricity through a turbine generator. With this process you create steam of about 450°C, this heat could be used for heating or cooling of a building.

An anaerobic digester system consists of the digester, a storage pool, a biogas generator, a desulfurizer and hydrator and a biogas storage. According to the manufacturer Puxin Biogas you can treat within a digester of 100m3 per day:

- 2300 kg fresh pig manure or
- 3100 kg fresh cow manure or
- 1400 kg fresh chicken manure or
- 1700 kg fresh human manure or
- 1000 kg food waste or
- 1000 kg grass

The digester produces:

- Electricity: 8 kWh, 16 hours a day
- Biogas: total 100m3/d
- Biogas production rate: 1m3/dm3

But what do these number really mean? To understand weather the anaerobic digester would produce enough energy for the lights of a urban farm I've done a calculation. The power consumption of a LED light string of 1 meter is between 0,9-3,5 W, according the color of the light. In such a string of 1 meter you would have about 10 LEDs. Lets say you would have a aquaponics farm unit of 6 meters length with 3 stories. You would need 4 strips on every story. So 3 x 4 = 12 strips of 6m = 72 meters. This gives 3,5 W x 72 m = 252 W, this gives when lighting 12 hours a day: 0,252 W x 12 hr= 3,0 kWh consumption. Per day you will have 8 kWh x 16 hr = 128 kW per day. This means that you will be able to power 43 of these aquaponics elements.

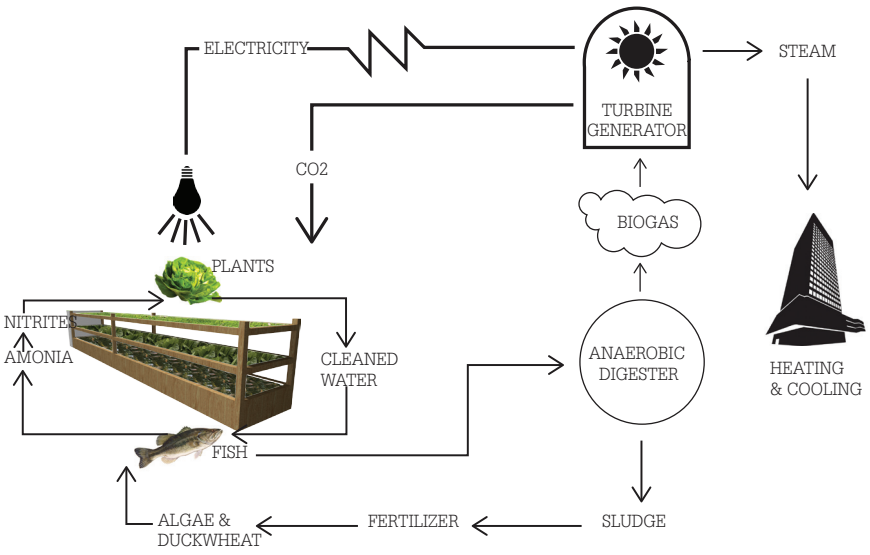

Fig. 5.05 Anaerobic Digester Puxin Biogas
www.puxinbiogas.en.alibaba.com
Fig. 5.06 Closed Loop System
Own illustration

1000 kg of food waste might sound a lot, but when you consider that about 25-35% of the food bought gets thrown in the waste you will get faster to the 1000 kg then you would think. But probably the food waste of the Hofpoort won't be 1000 kg per day, but to optimize the anaerobic digester it could function as the digester of the whole neighborhood. Restaurants and cafes nearby could give their biological waste to the Hofpoort. Perhaps they could get free vegetables and fruits in return.

Conclusion regarding energy and waste

An anaerobic digester would be a great addition to the Hofpoort and this project. It will be an investment, but it will pay off it's return in electricity and heating and cooling of the building. Besides these benefits it will make the building and project more sustainable as well. Lowering its ecological footprint. Looking at the size of the project it would be best to use an anaerobic digester with a size of 100m3. This a size that generates enough electricity for an aquaponics farm with a reasonable size. The Hofpoort it self might not generate enough food waste for the digester, but this can be solved to cooperate with neighboring businesses and farms. For the program of requirements this means a size of two tanks with a size of 100m2 is needed, plus a technical room space. The place of the digester tank and storage tank could very well be visible for the public, making the system transparent and improving the awareness on waste and food. The other parts could be placed in a technical room, which will probably be placed in the basement of the building.

5.3 Conclusion

The answer to the question; could it be possible to make closed loop systems within the building is yes. There is one system concerning the water and one that helps with the energy and waste.
A solar aquatic waste water system would be a great addition to the Hofpoort. It is a system that filters and re-uses waste water with the help of plants and natural processes. It is a very visible sustainability aspect and can help with creating awareness about water and the environment to the inhabitants of the city and the users of the building. An anaerobic digester is a great system that uses waste to transform it into electricity and CO_2, which helps the plants to grow. Especially for a (urban) farm it is a great addition to the project. Therfor it is a good system for the Hofpoort.

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The Trans-for-mation

6 The Transformation

From the foregoing follows that urban farming can be a great way to transform a vacant (office) building. There are multiple examples of (vacant) buildings that have been transformed with or into urban farming. From my research, described in the previous chapters, it is possible to conclude with some core features that could work for a project like the transformation of the Hofpoort with urban farming. I will first sum the conclusions of the previous done research followed by a numeration of the core features for the Hofpoort derived from these conclusions. Then I will follow with a more deeper discussed description of these elements and their requirements. Next I will give a description of the possible users of this project and their interests within this project and the building. I will end this chapter with placing these core features and functions in the building. I will discuss the best useable places for the functions considering the conditions these features need as well as the conditions that the users might need.

6.1 Research conclusions

- For the Hofpoort it is important to keep it's main characteristic feature, the iconic and robust tower and facade.
- When you look at the location and the neighborhood it is important to improve the language insufficiency, this can be done through workshops, therefor making it important that the Hofpoort has space for workshops. It is also important to create quality jobs, this can be done through the farm, but a shop and restaurant/cafe can generate jobs too. A shop or restaurant can help creating additional profit for the building. By creating a community farm it is possible to improve the social cohesion which is needed and it makes local produced wholesome food available for lower income families.
- The Hofpoort has space for two different kinds of farms; an inside commercial farm and an outside community farm. Both are locally oriented, but the biggest differences in type of farm is that the focus of the commercial farm is to make a profit and the focus of the community farm is to create a social bond and interaction and the availability of wholesome food.
- To increase the product range it is preferable to collaborate with contributors. Local farms in and around Rotterdam with a range of 50 km.
- It is important for the Hofpoort to have a focus on sustainability, ecology and energy, this will attract a new kind of tenant for the rentable offices in the tower.
- With a focus on sustainability, ecology and energy it is wanted to make closed loop systems. This is possible with the use of an anaerobic digester. For a project this size it is good to use a digester with a size of 100m3. To make use of this digester at it's fullest it is recommendable to cooperate with local (food) businesses to generate enough food waste and energy.

- One floor of the tower should be transformed into a co-working floor, space for the self employed professional, seeking for a flexible working space. Here the professionals can interact with other professionals. This will also help with additional profit.
- For the commercial farm it is best to make use of an aquaponics farm, this creates a broader range of products that can be sold. To create a higher chance on a high yield it is recommendable to make use of different growing techniques together.
- To use a solar aquatics waste water system for the water treatment would be a great addition to the Hofpoort, this system should be made visible inside the building as well as outside, creating a public space.

6.2 Core features

The core features of the 'Hofpoort' derived from the research described in the previous chapters are:

- indoor commercial aquaponics farm
- indoor commercial mushroom farm
- outdoor permaculture community farm
- solar aquatics waste water system
- anaerobic digester
- grocery shop
- espresso bar & bakery
- workshop spaces
- multiple rentable venues
- co-working floor
- office space

I will discuss them here consecutively.

Product	Price in store	Price/Kilo	Annual Yield KG	Yearly Profit
Tilapia	*280kg €5,03*	*€17,90*	*190,5 kg*	*€3.422,20*
Tuinkers	*20g €1,00*	*€50,00*	*186,8 kg*	*€9.340,00*
Sakura Cress	*20g €1,75*	*€87,00*	*186,8 kg*	*€16.345,00*
Krop Sla	*500g €0,79*	*€1,50*	*217,7 kg*	*€343,96*
Romaanse Sla	*500g €1,69*	*€3,38*	*217,7 kg*	*€735,82*
Roma Tomaten	*750g €2,49*	*€3,32*	*217,7 kg*	*€722,76*
Aardbeien	*400g €3,49*	*€8,72*	*217,7 kg*	*€1.899,43*

Source: Albert Hein & HGC Hanos + Bioponica soil-less farming eco-systems

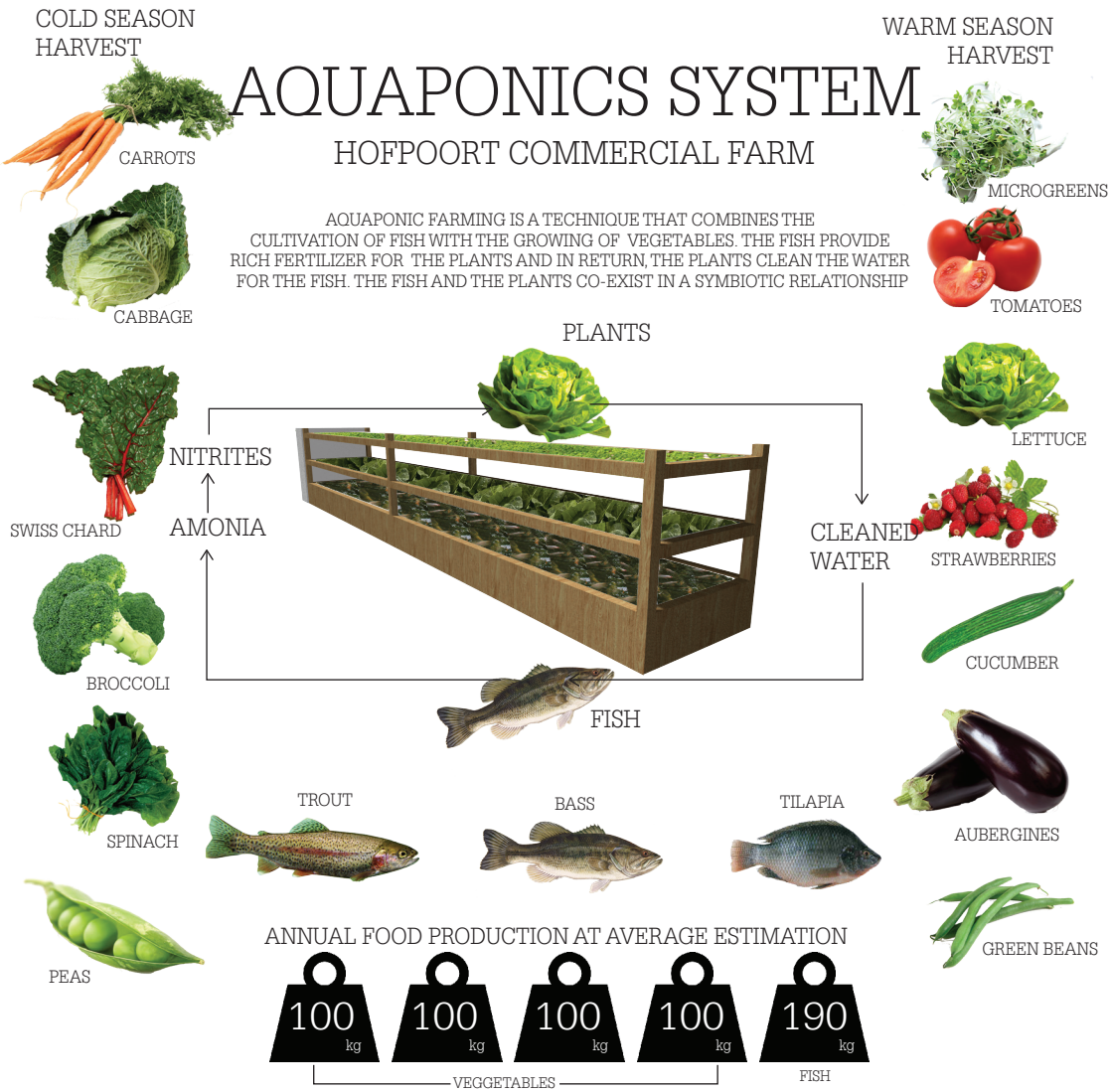
Fig. 6.01 Product/Price/Profit Scheme
Own illustration

Indoor commercial aquaponics farm

The farm will produce vegetables, herbs, fruits and fish. To use as much space as possible it is best to use a system that stacks the elements of the farm. I have done a small research on aquaponics system suppliers and found Bioponica. Bioponica is a company that produces these stackable elements. One of their products is the 'Bio Incubator 4:2:2-20', which would be a great system to use. The system consists of three levels; bottom fish, middle for vegetables and top level for cress and other micro-greens. The systems is 165,1 cm high with a length of 609,6 cm and a width of 152,4 cm. Annually this system will produce 190,5 kg of fish, 186,8 kg of micro-greens and 217,7 kg of lettuce and other vegetables. In the figure below I have put normal or average prices for fish or vegetables next to the yearly yield and calculated the yearly profit of one system. The profit depends on the grown product as you can see. The price of one system is €5.342,74. This is earned back within a year depending on which products have been farmed.

Since this system will be inside it is recommended that LED lighting is used to gain the highest yield possible. Easy to use would be a LED string, since it would take up less space, it's light weight and is easily mounted into the aquaponics systems. The Philips Green Power LED String would be a great addition to the aquaponics system and will help to generate a highest possible yield.
Depending on the fish breed you farm the water needs a controlled temperature, for tilapia this is between 28-30 degrees, for rainbow trout it should be around 15 degrees and for bass you need the water temperature to be 13-18 degrees. Since the Netherlands has a colder climate the bass or trout would be better choices, since it would mean less warming or heating of the water during the year.
The products grown in the aquaponics farm will be sold in the shop and be used in the espresso bar and bakery. Products can also be sold to neighboring restaurants and cafes.

Fig. 6.02 Mushroom Gallery - Olson Kundig Architects
www.olsonkundigarchitects.com



Indoor commercial mushroom farm

The mushroom farm uses the old coffee grind of the espresso bar and other coffee bars/ restaurants in the neighborhood to grow mushrooms on. It will mostly grow shiitake and oyster mushrooms, with specials from time to time. Further research shows that after about 4 weeks you can harvest fully grown mushrooms. To grow the mushrooms will grow at it's best at a temperature between 18-25 degrees. They like a lot of water and humidity, but it is depending on the stage of growth the mushrooms are in. Therefor a controlled water supply system would be very suitable for the mushroom farm. Because of the humidity it is could be usefull that the mushrooms would have their own space within the space, like done by Olson Kundig Architects shown below. The mushrooms will be sold in the shop and in products in the restaurant/espresso bar/bakery. The farm will also sell home grown sets, to grow your own mushrooms at home. The farm will create jobs.

Fig. 6.03 Aquaponics Scheme
own illustration

Outdoor permaculture community farm

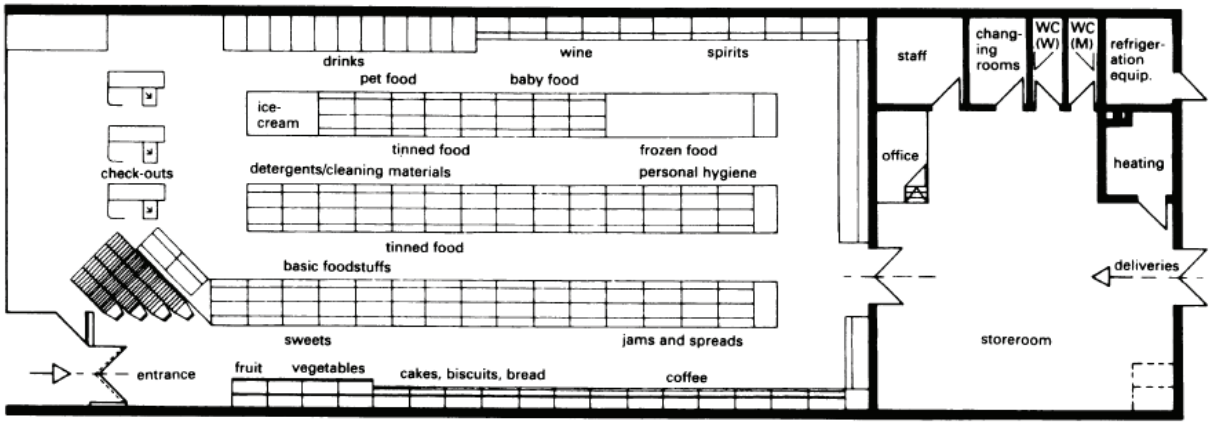
The permaculture farm will be situated outside the building on the grounds between the building and the railway. Further research shows that permaculture is an appropriate way of growing vegetables and fruits on this wasteland. The farm can be enjoyed to walk around or to actually help gardening. The farm will also have a chicken run. This farm will mostly be used for a more social goal, than actually selling produce, since yearly yield won't be as high as in the aquaponics farm. This could function as a permaculture garden for the community. The inhabitants of the neighborhood with low incomes or unemployment could really benefit from a community farm. It could function as a daytime activity for volunteers, learning about the growing food at the same time. This farm or garden could become part of the city's living environment and function as a recreational garden as well. With involving the neighborhood with this project through a community farm you create the social cohesion that seems to be missing in the neighborhood, something we could conclude from the living fields research (chapter 2.2). This community farm could become great part of the urban farming education for schools. The farm would have a local product destination, all the harvest should be available for the inhabitants of the neighborhood and the volunteers. The farm could have harvest parties and markets, where the harvesting could be sold at relative low prices. The farm and the land could be a great location for this.

Solar aquatics waste water system

On the ground floor at the lobby space, divided between the inside space and the outside, will be a solar aquatics waste system situated. This is the best spot because of it's visibility inside and outside the building. Inside the waste water system can become part of the interior and outside part of the exterior. The solar aquatics system will simulate the natural purifying process of freshwater streams, meadows, and wetlands. Through several different tanks the wastewater will be filtered. The treatment of the water would usually take up two to four days. By placing the water filtering inside and outside, this system is visible from the exterior. The filtered water will be used for the farms and the flushing of toilets and cleaning. The size of a waste water system is dependent on many factors. I will not go in to this that deep, but I will assume the Hofpoort will need the same capacity as the San Francisco Public Utilities Commission (5.000 G/day or 18.927 L/day), perhaps a bit less, since the square meters of the Hofpoort are less than that of the building in San Francisco.

Anaerobic digester

The anaerobic digester is to help create food (electricity and heat) out of waste (food waste). This system will help make a closed loop system. It will generate electricity that is needed for the LED lighting of the aquaponics farm. The anaerobic digester will be 100m^3 to create enough energy as I discussed in the previous chapter. Since the food waste of the Hofpoort building itself might not be enough, food waste from neighboring restaurants and cafes could be collected for this anaerobic digester as well. The restaurants/cafes could get food from the farms in return.



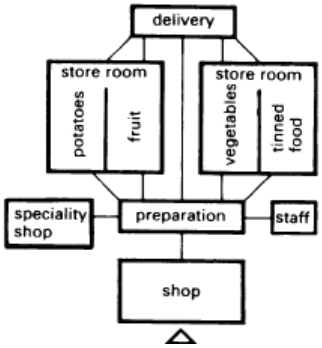


Fig. 6.04 Layout Supermarket
Fig. 6.05 Relation Scheme Vegetable and Fruit Shop
Neufert, 2000
Fig. 6.06 Villa Augustus
Rene Verjans

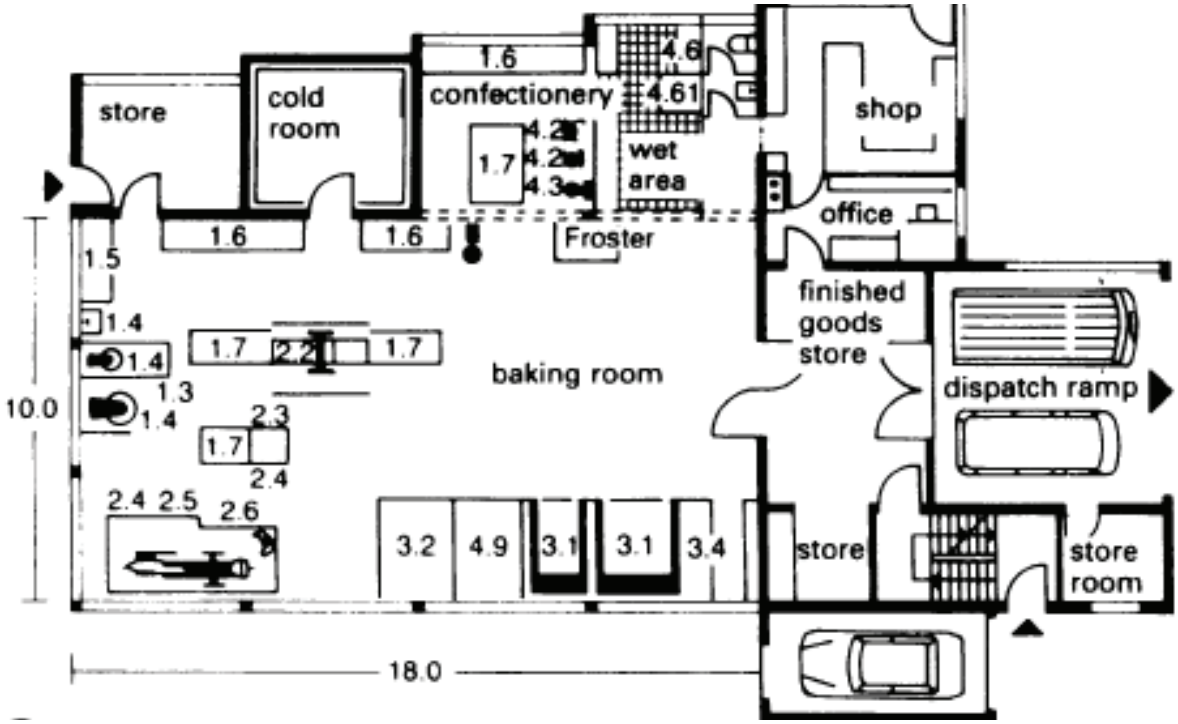


Fig. 6.07 Villa Augustus
Atelier GROENBLAUW Amar Sjauw en Wa
Fig. 6.08 Baking Room Layout
Neufert, 2000

Grocery shop

The shop will be the core were the products of all the farms will be sold. It will also sell products from farms and food producers around in the Randstad (50 km from Rotterdam). Therefor the shop will be the distribution point in Rotterdam for locally produced food and food related items. Making it a very special daily selling point instead of weekly of monthly (farmer's) markets. The shop will create jobs. The shop will need cabinets and other display objects to show the products that are for sale. It would also need a cash register. When you look at the lay out of the shop, you shouldn't of a big super market layout, it's more a vegetable and fruit shop lay out. The difference is that the shop doesn't only sell vegetables and fruit, but other products as well. Besides the product difference the lay out of the shop is within a building and not a building on it's own. You could compare it to the shop of Villa Augustus in Dordrecht. Which is a shop where you can buy vegetables, fruit and bread of their own land and making, but also other things. Besides being a shop, you can drink a coffee there or eat a sandwich as well. It is more than just a grocery shop. The shop for the Hofpoort should be like this, combined with the espresso bar and bakery. The size should be big enough to sell the own products and other products from local farms, and it should be at least 1/3 of the espresso bar. The espresso bar is bigger than the shop.

Espresso bar/bakery

The espresso bar/bakery will be the heart center of the building. It is the place where all the different users can come together. It is located at the ground floor and there for in contact with the outside. The espresso bar/bakery will use as much as possible of the ingredients of the farms and other local farms and food businesses. The espresso bar/ bakery should be working together with the shop, since they use the same products. The espresso bar should be able to place around 100 people. Big enough so people from the office tower could use it, but also people from outside the building. The espresso bar should have a bar where they make the drinks and keep small snacks like cake and cookies. Sandwiches and other food should come from the separate kitchen and bakery. The bar is also the cash register of the shop, making the shop and the espresso bar more one. The

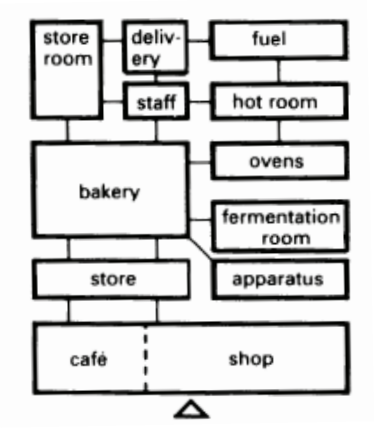


Fig. 6.09 Villa Augustus
www.villa-augustus.nl
Fig. 6.10 Bakery Relation Scheme
Neufert, 2000

espresso bar should have clusters of different kinds of seating, so customers can choose what kind of atmosphere they like, e.g. sitting at a large table with a lot of people you don't know or more privately at your ow table. This makes it possible for people to work at the bar, but also relax or interact with other people.
The bakery (and kitchen) has it's own relation scheme, where there's a division between different areas, like storing, baking or cooling. It is important that, even though the bakery/ kitchen is separated it is still in visual contact with the store and espresso bar, like it has been done in Villa Augustus in Dordrecht.

Workshop spaces

The workshop spaces will facilitate language courses, cooking classes and farming courses (and all combined). It is where people can meet each other and learn about food awareness and about each other. The workshop space is also available for renting for events, helping with extra income for the building. The workshop space should have 10 cooking islands for the cooking classes for 10-50 people. It should as well have a more classroom styled space for about 30 people for language courses and other classes. Beside these spaces, the workshop should also have an own entrance, lobby/relax area and own toilet facilities.

Multiple rentable venues

The building will contain several rentable venues, varying from meeting rooms to a big lecture room. The rooms are available for the office workers of the building and outsiders. These rooms and spaces will help with extra income for the building. Sizes will depend on the available space. But there should be at least one room with the capacity of about 200 people and several smaller rooms for meeting of 10 people.

Fig. 6.11 De Kookfabriek Rotterdam
Pitch Communicatie & PR

Co-working floor

The co-working floor is an office floor where small businesses and zzp'ers are able to rent a working space for an hour, day, week, month, year. There are no long and expensive contracts. The co-workers will meet other co-workers with whom they can share knowledge. When you are a starting business it is possible to pay a lower price in exchange for working in one of the farms. Other paying possibilities are donating money for the transformation (e.g. paying 1000 euros will get so many hours 'free' working at the co-working floor). These floors consist of big tables with working places, pantries, printing facilities, some more private working places and a place for interaction and meeting, this

could be combined with the pantry.

Offices

The other floors of the tower are available for business to rent, a part of the floor, the whole floor or several floors. The employees from the businesses renting floors are free to use all the facilities in the building concerning farming.

Fig. 6.12 Spaces Den Haag de Rode Olifant - co-working office
www.spaces.nl

6.3 Target groups

To help create a relationship scheme I need to answer the question; which people (or groups of people) will be using this project? In this section I will describe three different kinds of target groups. These groups are the people that could make use of the (new) functions of the Hofpoort building, the future users. With the help of a brainstorm session (29-05-2013, TU Delft) I mapped out all the three target groups who could be part of the urban farm and the Hofpoort. At the brainstorm session I asked the question which connection they thought that could be made with food, in such a way that everybody could win something. The people of the brainstorm session included Annemieke Blaha, graduating student architecture, and Martijn Waasdorp, a graphical designer. Seperately I have also asked the same question to experts that I have consulted; Berit Piepgras (architect), Jan Westra (Priva) and Peter Luscuere (Professor installations TU Delft). From these possible connections that were made I have made three different target groups and I will explain these different groups through a few examples that arose during the brainstorm session. I will make use of people, planet and profit division and use this to describe the interests of the different target groups. The stakeholders can be divided between three groups; the tenant, the social user and the buyer/recreational user. Within these groups I will explain 3 possible examples of these groups and their interests. I will treat them succesively beginning on the next page.

6.3.1 People

This are the 'social' users of the project. This are mostly people from the neighborhood that would benefit from the Hofpoort. Possible examples are low-income families, seniors and pupils, food related students or immigrants.

Low-income families in co-operation with the food bank

The low-income families could work at the urban farm to get in exchange for their time free food (profit). By working at the urban farm the low-income families contribute to a more sustainable environment (planet). By having healthy, fresh and clean food the health of the low-income families could become better (people). The working of the low-income families at the urban farm should be in co-operation with the food bank, the place where they normally would get their food.

Senior with the pupil

By providing an inter generational program seniors could get interaction with young pupils and both generations could learn something from each other (people). By teaching young pupils and seniors about the environment and ecology whilst urban farming, you create more awareness for the planet (planet). A part of the harvest could be sold at the shop or restaurant, this could get a higher profit, since the maintenance cost could stay low with the voluntary work of the seniors and pupils (profit).

The food related student

By providing a working space for an internship for food related students, they could learn and develop themselves for their future (people). They would be working with the urban farm, therefor contributing to a more sustainable environment (planet). The costs for hiring a student is lower than a professional, therefor more money could be invested in the urban farm from the profits (profit).

The immigrant with insufficient language skills

The immigrant seeking for better language skills could use the building for language course at the workshop space (profit). Here they would have a language course combined with a food course of farming course, making is a more approachable workshop/course to go to. Here the immigrant can meet other people (people) and learn the Dutch language and more about food and farming (planet).

For this group of users the community farm is very important. This farm should give space to alle the different groups who want to use it. The workshop spaces are very important to, because this gives space inside the building for these groups. Since these two functions are important it would be preferable that they are in contact with each other, so that the two functions and space can interact.

6.3.2 Planet

This is a group of people who have a higher ideal and want to help change the world that we know today. People who are conscious of the problems we have to deal with concerning food, energy, waste, water and ecology.

The workshop student

The workshop student would use the building for participating within workshops giving at the farm or at one of the businesses at the building. These workshops could vary between an aquaponics workshop to a cooking workshop. With participating within a workshop you get involved with other (like-minded) people, creating an interactive place (people). The workshop will be considering the planet and it's environment (planet). With the workshop you create an income for the business owner, but you also enrich the knowledge of the student (profit).

The food buyer

The food buyer will use the building for doing its grocery shopping. The food buyer will mostly be living nearby the 'Hofpoort'. The food buyer is participating in the shop, creating a lively atmosphere at the building (people). They food buyer spends his/her money at

the shop and gets great, healthy and fresh food in return (profit). By buying food at this shop the food buyer contributes to a greener environment including reducing food miles (planet).

The tourist

The tourist will use the building to recreate during free time. The tourist will come to the building to learn about eco friendly urban agriculture (planet). The tourist will pay for a tour at the farm (profit). Tourist coming to the 'Hofpoort' will create an interactive place (people).

For this group of people the ground floor of the building is important. This is where they will enter the building. This should also be the place where the espresso bar and the shop should be. Central and easily accessible and visible from the outside. The workshop student will mostly use the workshop spaces that are located near the community garden. They should be easily visible from the outside.

6.3.3 Profit

For profit you can incorporate the users that are the tenants of the building. They want to radiate a way of living that has a consciousness towards our planet, energy, waste, food and water.

Espresso bar owner

A restaurant of café owner could use a part or one of the urban farms in the 'Hofpoort' to work and harvest produce to sell. He would lease this urban farm at a low price (profit) in exchange he needs to share his knowledge and experience with everyone who would be interested (people). By using the urban farm in the 'Hofpoort' the restaurant or café owner reduces food miles and contributes to other sustainable issues (planet). The restaurant or café will attract more people coming to the 'Hofpoort', making the building an interactive space (people).

Starting self-employed professional (ZZP-er)

The just started self-employed professional could rent a working space at the co-working floor at the 'Hofpoort' at a lower cost; in exchange he/she would need to work at the urban farm (profit). By working in the urban farm, the self-employed professional helps to contribute to a more sustainable environment (planet). With all the self-employed professionals working together in the urban farm and together with staff members of the urban farm, you create an interactive space were everyone can connect with each other (people).

Corporate business

The corporate business would rent a part or a whole or several floors of the office tower (profit). They would want to have their office in this building because they are aware of the problems today concerning food, energy and waste (planet). They like to present

themselves this way to their clients. Therefor it is a plus for them to be in a office building that has such goals and ideals. The employees of these businesses would take part of the hubs that have been created in the building (the espresso bar, the healing garden etc). At these places they will meet other employees from other businesses and therefor creating an interactive space (people).

The shop-owner

The shop-owner sells the produce from the urban farms, fresh and healthy food and products made of the harvest, like jams, juices and cakes. The shop could also sell products from other farms in and around Rotterdam (50 km), all locally and sustainably made. The shop will attract people to the building. A shop like this could help improve the health of the inhabitants of the city, for making whole, healthy food available (people). The shop-owner can earn extra money for selling not only the products from the farm(s) of the 'Hofpoort', but also from other farms in and around Rotterdam (profit). By providing one big selling point of locally produced food, you could reduce food miles and CO2 emissions, because all the customers now can buy the produce near by in stead of going to the farmers just outside the city (planet).

This group of people need the building to have a special/certain look and quality. They want to radiate this certain way of living and with that belongs a look. It requires te use of natural materials, with sustainability, ecology and energy in mind.
All these scenarios involve urban farming with other target groups, making it a more viable transformation and business case. As Van Hal (2008) states that companies may only make a difference through cooperation with other parties.

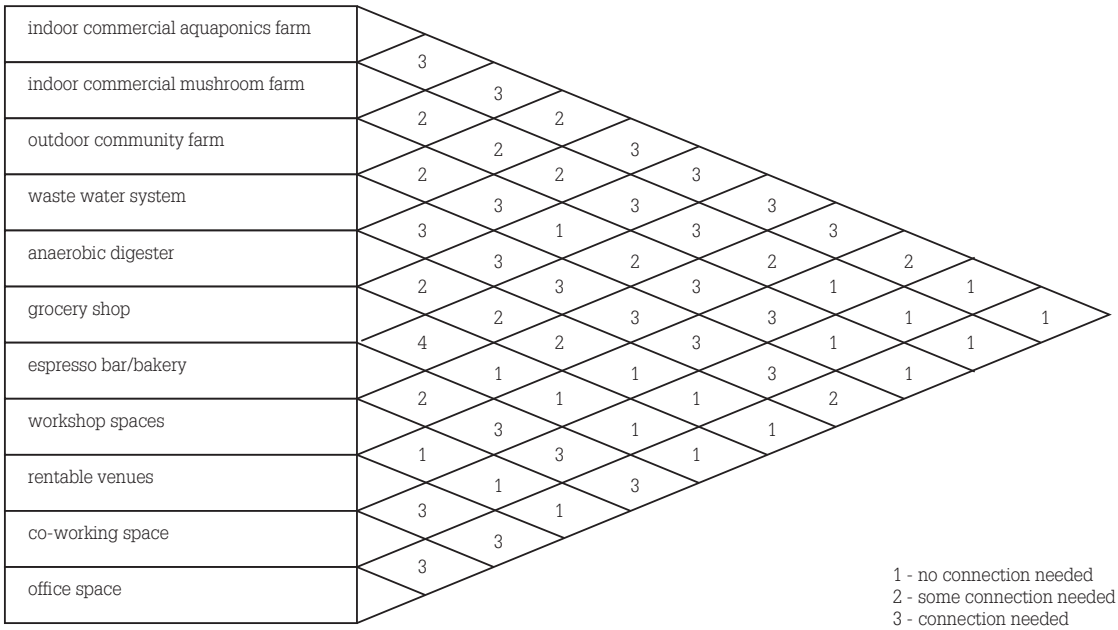


Fig. 6.13 Relation scheme
Own illustration

6.3.4 Conclusion

The answer to the question, which people (or groups of people) will be using this project are divided in three groups: the tenant, the social user and the buyer/recreational user. Stated above are all their interests and these can help creating a relationship scheme. This scheme is shown below.
I will elaborate on the most important relations within this scheme. When looking at the different types of users and their needs it is important to make a connection between the community garden and the workshop spaces, a visible and functional connection. This is needed mostly for the social types of users. The planet type of users require visibility of the shop/cafe and want a certain look. This look is also wanted by the profit users of the project. They want natural materials that radiate a certain kind of living (that of the sustainable way).

6.4 Functions and the building

In this section I will place the different functions and features that derived from my research into the building. I will go through the different parts of the building, starting with the situation and outside space followed by the building itself divided between the podium & garage, the lower part of the building, and the tower. To make it easier to place the features in the building, I've made a relation scheme shown in the figure below.

6.4.1 The situation

Looking at the situation of the Hofpoort you see there is a big strip (6.585 m^2) of undefined waste land between the Hofpoort and the train track. This undefined waste land could be the perfect position for a community farm or garden, especially with the 'Luchtsingel' of ZUS. In the plans of ZUS for Pompenburg urban farming gets 1.200 m^2 for my project I would like to double that amount, to make the impact greater. The residual amount of square meters is for community based activities, like sports, which is also part of the plan of ZUS.

6.4.2 The building

For the transformation of the Hofpoort I have divided the building in two; the podium (ground floor to fourth) and the tower. The podium would especially be useful for an urban farming function, the tower would be more suitable for office (related) functions.

The podium & garage

The podium is a perfect space for more public functions, therefor the urban farm function would be very suitable for this part of the building, especially the parking garage since this

part of the building has been built for cars and therefor there was no demand for (a lot) of daylight. This would therefor be a perfect spot for an aquaponics farm with LED light. This kind of farm has the biggest diversity in products (not only vegetables and fruits but also fish), making it the best choice for a commercially oriented farm. The part of the building below the tower is very suitable for public functions that are a addition the farm. This is the shop, the espresso bar/bakery, an entrance/lobby.

In order to make the parking garage into a aquaponics farm there do need to be made some changes. At the moment the parking garage is an 'outside' space, since it does not have a closed facade. There are two ways to close the facade. You could close the open parts of the facade in line with the facade or you could choose to create a buffer space and make a boundary away from the facade. The latter is a choice that makes it easier to insulate the space, since you could use a high insulation material from top to bottom. When closing within the facade, you would also have to insulate the existing facade. Therefor I will chose the second choice. This option also creates a buffer space, half inside and half outside that could be used to store special plants or as a outside break space for the employees of the farm and the visitors. The two floors of parking garage are 2.776 m^2 together. One aquaponics unit takes in 9,2 m^2 and you would probably need about 6 m^2 of working space per unit. Besides the working space next to the units, you would needs some more working space (for handling, packing etc.), probably about 1/3 of the total space. This would mean that you could place 120 aquaponics unit considering the square meters. But considering the shape of the space and the load bearing structure you will be able to place about 80 units.

The ground floor of the building is a very important floor, because this is the part of the building that interacts with the public realm of the city. For a project like this it is important that the building communicates with the public space. Therefor it is very important that this floor is very transparent and makes the new function of the building visible. This could be done is several ways. One important part is making the facade transparent and opened up towards the public space. Another good visible function would be a solar aquatics waste system, flowing from the outside to the inside like its been done in the Centre of Interactive Research on Sustainability building in Vancouver Canada. This way you make the filtration of water visible for the public, but as well creating a nice outside space with plants to enjoy. What also needs be visible from the outside is the anaerobic digester. This shows how you could make food from waste. It is a perfect example of closing (waste) circles within buildings. A perfect spot would be on the corner towards the train racks, since it is direct contact with the community garden and the road and tunnel towards the 'Hofbogen', restaurants that could help with recycling their biological waste in exchange for food. It would also be very visible from the 'Luchtsingel', a pedestrian bridge connecting Rotterdam North and Rotterdam city centre.

The first floor is a good place for the rentable venues. There is a great space with a size of almost 350 m^2, this could be a wonderful spot for a multi-functional room. A space that is possible for different types of activities. This space will give place to 200 people, but could as well be divided in smaller spaces for small meetings.

The kiosk parts of the buildings would be a great space for workshop space. The kiosk part of the building is a great place for this, because it is adjacent to the community farm, also a district level function. The workshop spaces could interact with this farm and together they could work as a whole. To make the kiosk space suitable for a new function of workshop space you would have to demolish the existing facade and interior space. The structure could still be of great use. Important would be to make the space open towards the garden, making it very transparent and part of each other. Visibility is very important for the ground floor functions.

6.4.3 The tower

The tower is the perfect place for office related functions. The space is straight forward and simple. You have the core with the elevators and staircases and around you have open space for office related activities. These office floors are for looking for a new kind of tenant. A tenant that has a high interest in sustainability, waste, ecology and energy. A tenant that wants to radiate this towards his clients and the world.

Another tenant for these office floors could be the flex working or co-working space. One or more floors should be dedicated to this new kind of working. Especially nowadays with a high amount of professional self-employed people in the city. They are looking for a working spot that they can rent for a hour, a day, a week, a month or several months. A working place that is flexible for them to use. One of more of these co-working floors would be a great addition to the Hofpoort. To transform the office floors for a function like these, you would need to make it up to date. It is an interior design transformation. The space would need flexibility, since the tenants are different and may never be the same. You would have spaces where these self-employed people could meet each other and interact with each other. But there should also be spaces where you could work more privately.

07

Con-
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7 Conclusion

In this chapter I will answer all the subquestions and main question and I will conclude my report with a program of requirements for my design of the transformation of the Hofpoort with urban farming as a main topic in transforming the building into a thriving and successful building. This program of requirements is the outcome to my research.

With a program of requirements like this it is possible to make an effectual coupling between office vacancy and urban farming within the Hofpoort building. This program and my design for the transformation of the Hofpoort are an example of placing a new function, urban farming, in a vacant office building, de Hofpoort.

First I will answer the questions, then I will explain the program of requirements, followed by a reflection with the first part where I place the program of requirements next to my design for the transformation of the Hofpoort, to see weather all the requirements are in the building. In the second part of the reflection I will reflect on the relationship of this project to the wider social context of urban farming.

7.1 Questions & Answers

2 -The building & Location

What are the most important characteristics of the Hofpoort?
The concrete prefab facade elements and the tower of the Hofpoort are the most important characteristics of the Hofpoort. These are elements that should be taken in consideration when designing the transformation of the Hofpoort.

What are the strengths and weaknesses of the surrounding neighborhood(s) and how could urban farming play a role in improving these weaknesses?
The strengths are the easily accessible transistion location of the Hofpoort by foot, public transport, bicycle and car. The second strength of the surrounding neighborhood(s) are the many food related businesses that could possibly work together with the Hofpoort.
The weaknesses and the possible urban farming solutions are first the low income (quality jobs and providing tools for growing your own food at the community garden/farm), second the insufficient language proficiency (language workshops in collaboration with urban farming), third the low percieved social bond (a community farm/garden for social bonding) and fourth the low health rate (education on health and food and the availability of wholesome healthy food).

3 - Urban Farming - inspiration

Which different types of urban farming exist today and which are possible at the Hofpoort?
Urban Agricultural Network:

- location
- type of activity
- land tenure
- scale & type of production systems
- product destination

Five Borough Farm:

- institutional gardens & farms
- commercial farms
- community gardens
- community farms

The Hofpoort has the possibility of two different kinds of urban farms, both intra-urban agriculture. One is inside the building and one isoutside on the wasteland plot between the Hofpoort and the train traks. The farm inside the building is market oriented commercial farm with a goal to make profit. The outside farm is a community farm led by a non-profit organization. Both farms are locally oriented. The inside farm is great for a combination between horticulture and aquaculture. Outside is more suitable for horticulture and possibly arboriculture.

What can we learn from urban farming worldwide and could be an inspiration for this project?

The most important thing that we can learn is that it, urban farming, does work and that it is a good solution that we could very well use here in Holland. Lufa Farms shows that you shorten the food miles and gives fresh food from the farm to the consumer within one day (subscription system). They also contribute with other local farms and producers to increase their variety of products. The Plant shows how you could make closed energy and waste cycles and that with urban farming you could create quality jobs. Besides being a farm and green business incubator the Plant is also a commercial attraction, generating more profit and education.

What can we learn from urban farming in the Netherlands that could be useful in this project?

From Zuidpark we can learn that by creating a new (office) complex with a focus on sustainability, ecology and energy it does attract a new kind of business that wants to be associated with this ideal. The MushroomWall shows how you could use coffee grinds to grow mushrooms, making food from waste. This could very well be a great addition to the Hofpoort project.

How is the urban farming movement in Rotterdam, why is it the right city to have a project like this?

There are many different urban farming initiatives in and around Rotterdam, making it a big movement. Therefor it is a good city for a project like this, the Hofpoort could connect with other initiatives, like the two I have described; Uit je eigen stad and Dakakker. Especially with the 'Luchtsingel' project right at the same location. The ideas of this project should be taken in consideration when designing the transformation of the Hofpoort, especially because the locations intertwine with eachother. Both projects, the Luchtsingel and the Hofpoort, could benefit from each other. The Luchtsingel will attract people, those people could as well be people that could make use of the Hofpoort and it will also work the other way around.

4 - Indoor Cultivation - deepening

What kind of techniques are useable for urban farming inside office buildings and which one is the best for the Hofpoort to use?

There are three different growing techniques that are useable for urban farming inside office buildings:

- Aeroponics
- Hydroponics
- Aquaponics

All the three techniques should make use of LED lights when there's low direct sunlight. It would be best to use an aquaponics system in the Hofpoort, since with this system you do not only grow plants (vegetables and fruits) but you could also breed fish, which broadens the product range of the farm. You could also show other growing techniques in the Hofpoort as an example, but the commercial farm inside the Hofpoort should consist of an aquaponics farms with the use of LED lights to increase the best yearly yield.

5 - Sustainability - deepening

What is possible for water-recycling within a building and could be used for the Hofpoort?

The San Francicsco Public Utilities Commission building and the Centre for Interactive Research both show that it is possible to reuse and filter waste water on site on a (mimicked) natural way, one that could very well be visible. This is something that could be of great strength for my project as well, since it will help with creating the visibility of a new function in a old vacant office building. A solar aquatic waste water system would be a good addition for the Hofpoort. To create high visibility it would be best used in the way it's been used in the first project, with water cells flowing inside and outside, this will create a nicer public environment as well.

How can you make a closed loop system which takes care of the biological waste of the farms and building and could be used by the Hofpoort?

An anaerobic digester would be a great addition to the Hofpoort and this project. It will be an investment, but it will pay off it's return in electricity and heating and cooling of the building. Besides these benefits it will make the building and project more sustainable as well. Lowering its ecological footprint. Looking at the size of the project it would be best to use an anaerobic digester with a size of 100m3. This a size that generates enough electricity for an aquaponics farm with a reasonable size. The Hofpoort it self might not generate enough food waste for the digester, but this can be solved to cooperate with neighboring businesses and farms. For the program of requirements this means a size of two tanks with a size of 100m2 is needed, plus a technical room space. The place of the digester tank and storage tank could very well be visible for the public, making the system transparent and improving the awareness on waste and food. The other parts could be placed in a technical room, which will probably be placed in the basement of the building.

6 - The Transformation

What is possible in and around the Hofpoort?

What is possible are the core features that came from the research that I have done. These core features are:

- indoor commercial aquaponics farm
- indoor commercial mushroom farm
- outdoor permaculture community farm
- solar aquatics waste water system
- anaerobic digester
- grocery shop
- espresso bar & bakery
- workshop spaces
- multiple rentable venues
- co-working floor
- office space

Which people (or groups of people) will be using this project?

There are three groups that will be using this project: the tenant, the social user and the buyer/ recreational user.

What needs to be transformed for making the Hofpoort suitable for the urban farm(s)?

For the outside permaculture farm, the wasteland needs to be transformed into a community farm with farm land and space for other community related activities.

The aquaponics farm is situated at the two top floors of the parking garage. Since this space is now open, there should come a second facade to create an inner climate that is suitable for growing plants. For the mushroom farm there should be made a space within the space with it's own climate that is suitable for the mushrooms to grow (humidity and temperature).

7.2 Program of requirements

The research helped to form a program of requirements for the project of the Hofpoort. I will explain this by starting with the principles of the project, followed by the ambition. Then I will elaborate on the program of requirements.

Principles/starting points

The 'Hofpoort' is a presentation and perception of the entire food chain, from the food production to processing and waste.
The 'Hofpoort' reduces long food chains and food miles.
The urban farm transformation with emphasis on sustainability creates a new boost of for the empty office building the 'Hofpoort' that will attract a new kind of tenant.
The 'Hofpoort' will apply to different kind of needs coming from the neighborhood, namely the insufficient language proficiency, insufficient income, insufficiently perceived social bond, the unemployment and the low health rate.
The involvement of the entrepreneur and the local residents is vital to make it a successful project.

Ambition

To make the urbanites aware of food, it's origin and the importance of eating wholesome and healthy locally produced food. Done through tasting, learning, working with and enjoying the sustainable local food chain.
Food is also used as a connector between people and as an active stimulus to the development of a local thriving economy, creating jobs and making the local urbanites bonded with their neighborhood and the building.
Using food and sustainable food production as an incubator for vacant office buildings.

Program of requirements

Outside

- community permaculture farm - 2400m^2
- sport facilities and park - 4000m^2
- waste water treatment system (partly) - 18.927 L/day

The wasteland between the building and the train track needs to be transformed, this can go together with the development of the 'Luchtsingel', the project of ZUS.

Ground floor

- entrance/lobby - 200m^2
- espresso bar - 500m^2
- bakery - 350 m^2

  Entrance/lobby, espresso bar and bakery all work together and should have great relation with each other, physical or visual. The bar should seat at least 100 persons and have several seating possibilities.
- workshop space - 500m^2

  including cooking islands 10, classroom 30 people, toilets, lounge
- waste water treatment system (partly) - 18.927 L/day
- anaerobic digester 100m^3
- parking - 43 places

First floor

- rentable venues - 1 x 350m^2 big venue, 4 x 30m^2 meeting rooms

  The big venue can place 200 people, the meeting rooms 10 people.
- parking - 80 places

Second floor

- information center with hydroponics farm - 1021m^2

  This in included toilet facilities, elevators and stairs, storage.
- office space for the farm and organization of the building - 100m^2
- media room - 200m^2
- commercial aquaponics farm - 1388m^2

  Aquaponics units and working space - 40 units

Third floor

- commercial aquaponics farm- 1388m^2

  Aquaponics units and working space - 40 units
- commercial mushroom farm - 1021m^2

  Mushroom cultivation space, working space and storage space, including core
- office space - 100m^2

Fourth floor

- roof terrace garden - 2947m^2

Firfth floor

- co-working floor - 710,5m^2

  Including working places, private working places, pantry, social place and printing facilities.

Sixth floor - Twenty-Fourth floor

- rentable office floors - 710,5m^2 per floor

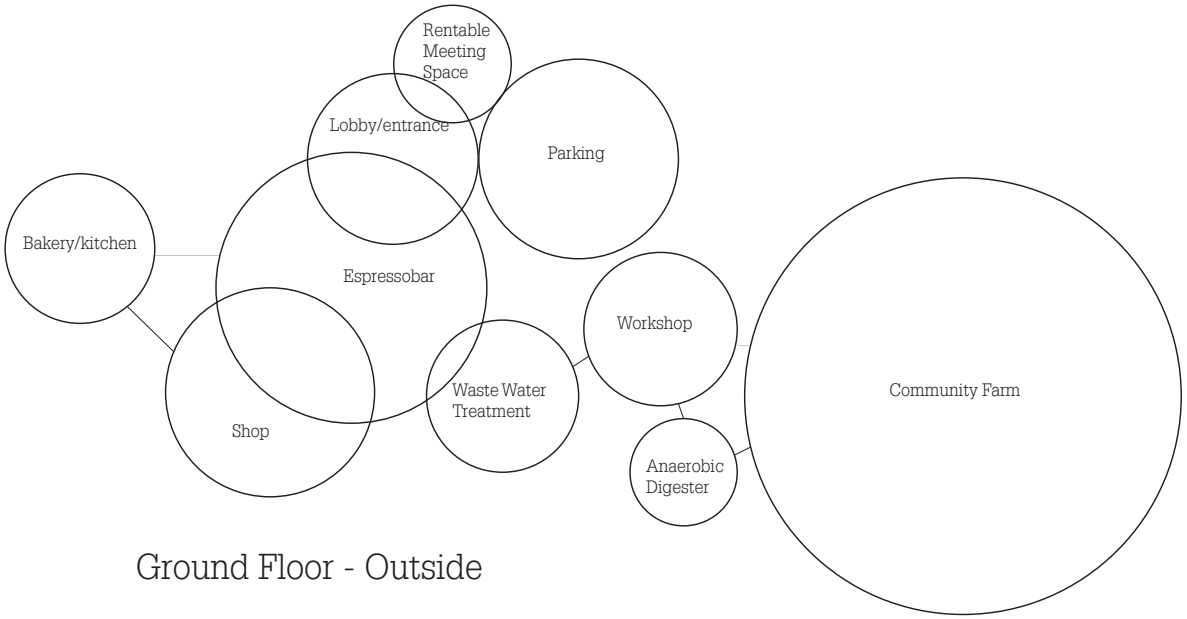
7.3 Reflection

When looking at my final design for the transformation of the Hofpoort all the required elements/function are situated in the design. All are situated at the preferred floor and make connections when those are wanted. I will take you through the design per floor by function. After I will elaborate on the relationship of this project to the wider social context of urban farming.

7.3.1 Research & design

For each floor of the podium of the building I have made a relation scheme. In these schemes you will see the different connections between the function. The functions are in circles, the size is equal to the importance of the function and the size of the function. When two circles are interchanging each other this means the functions are flowing over in each other. When the circles touch, it means the functions lie close to each other, but are divided by means of walls. If the circles have a line in between them, it means that the functions have a visual connection.

The ground floor is the floor where most of the action is going on. On this floor several

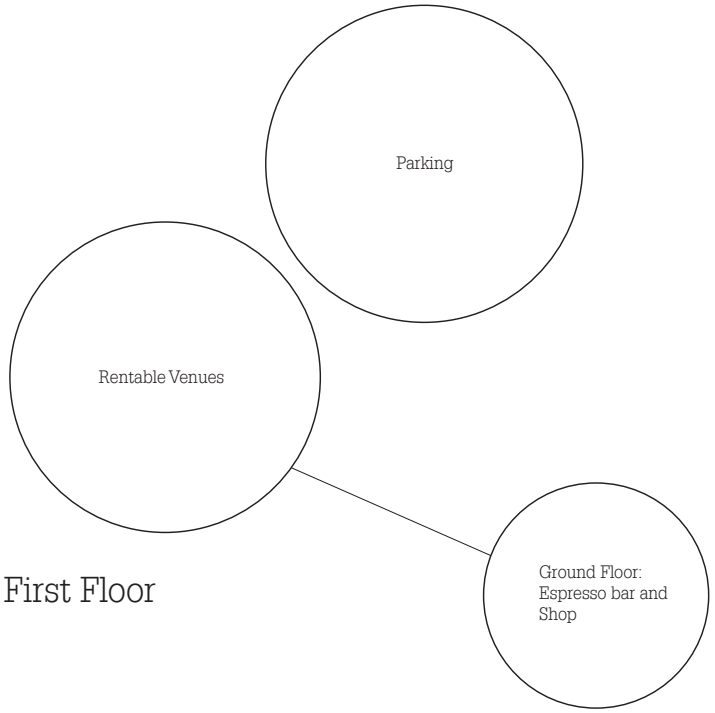


Ground Floor - Outside

functions and features of the project come together and work together. The espresso bar is the most important function of the ground floor of the podium. It is the space where you enter the building and the shop is part of it. The espresso bar is the place in the building where everyone can come together. It is the part of the building where the different users can cross paths. The bakery/kitchen is visually connected with the espresso bar and shop. It is a function that is part of and works together with the shop and espresso bar.
The waste water treatment forms a connection between the espresso bar/lobby and the workshop. It is a visual connection, not an actual one. The workshop itself is visually connected with the community farm and the anaerobic digester.

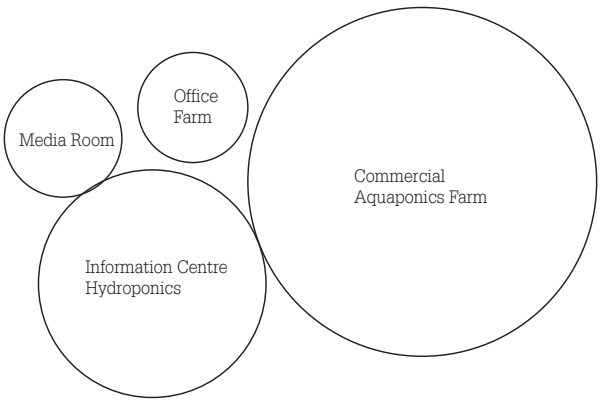
Fig. 7.01 Relation Scheme Ground Floor
Own illustration

The first floor is visually connected with the ground floor espresso bar and shop. The functions on this floor are rentable venues.



First Floor

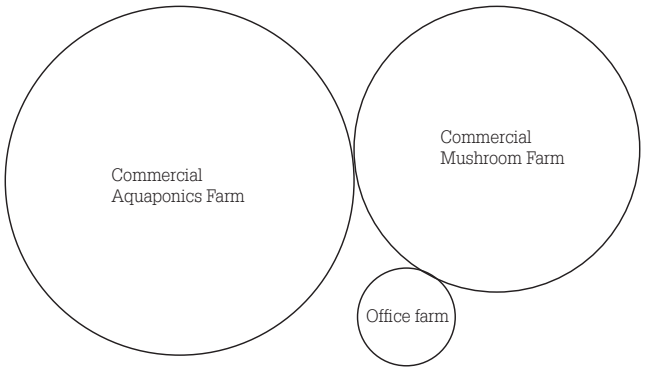
The second floor parking garage is transformed into a commercial aquaponics farm. The farm is connected with the information centre through a door. The media room is in the information centre, but has it's own space. The farm's office is located at this floor as well.



Second Floor

Fig 7.02 7.03 Relation Scheme First & Second Floor & Third Floor
Own illustration

The third floor consists of the aquaponics farm that is connected through a door with the commercial mushroom farm with their office.



Third Floor

The fourth floor is a roof top terrace garden and the fifth floor (tower) is a co-working space. The other floors are rentable office space.

When we compare these relation schemes with the relation scheme showed below we see that most of the required connections have been made. There is only no visual or direct connection between the farms and the shop and espresso bar. This is due to the size of the functions and the space of the building.

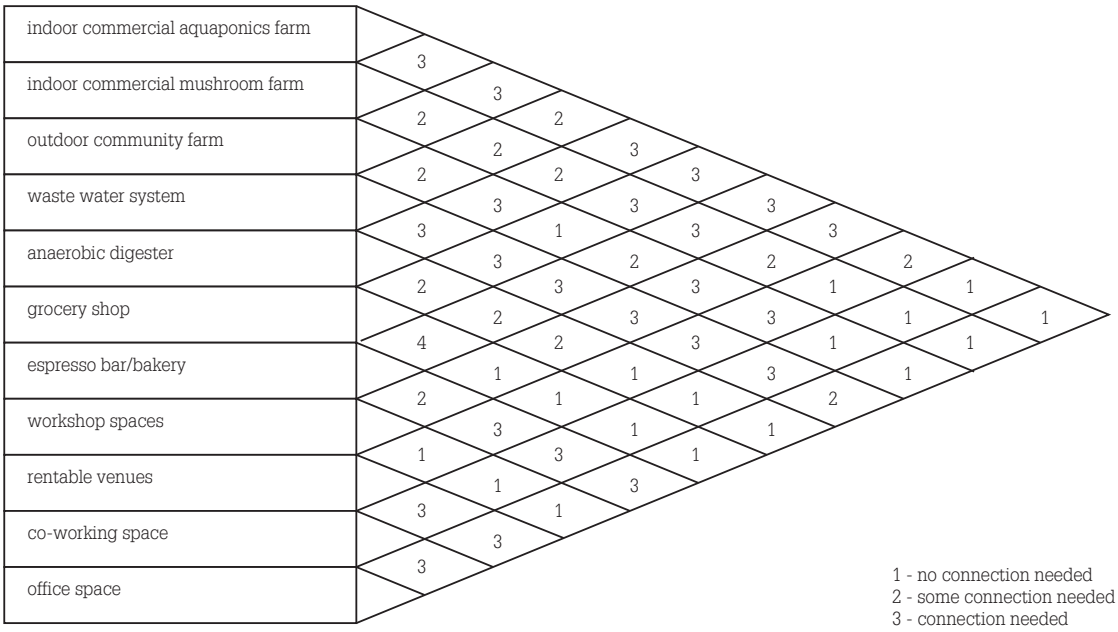


Fig. 7.04 Relation Scheme Third Floor
Fig. 7.05 Relation Scheme total
Own illustration

7.3.2 Research & context

Urban farming is a very actual phenomenon. It is not something new, but lately it is a subject that is arising more and more. People are looking for different ways to get food back into our cities. My project is researching one of those ways. I researched if it is possible to get food back into our cities through the use of urban farming in a vacant office building. Office vacancy is another very actual subject, very much so in Rotterdam with an office vacancy rate of almost 15%.

This research shows a possibility of claiming a vacant office building and creating urban farming inside the office building and generating new tenants for the office floors.

Further research could be done in researching other possibilities of urban farming and reclaiming the vacant space within the city. How could urban farming benefit other buildings and functions or could there be buildings with only urban farms?

Urban farming is the future, we are getting too much separated with food and farming, therefor placing farms in the city and in vacant office buildings is a great solution, for the vacancy as well. It helps to revalue the cities properties.

Biblio-
gra-
phy

Bibliography

Bailkey, M. and J. Nasr (2000) *From Brownfields to Greenfield: Producing Food in North American Cities*. Community Food Security News. Fall 1999/Winter 2000:6

CBS (2013) *Gezondheid en zorg in cijfers 2013*. Den Haag/Heerlen: Centraal Bureau voor Statistiek

Despommier, D. (2010) *The Vertical Farm Feeding the World in the 21st Century* New York: St. Martin's Press

De Graaf, P. (2011) *Ruimte voor stadslandbouw in Rotterdam* Rotterdam: Paul de Graaf Ontwerp & Onderzoek

DTZ Zadelhoff v.o.f. (2013) *Factsheet Kantorenmarkt Nederland Compleet 2013,* Utrecht: DTZ Zadelhoff

Hek, M., J. Kamstra and R.P. Geraedts (2004) *Herbestemmingswijzer, Herbestemming van bestaand vastgoed,* Delft: Publikatieburo Bouwkunde

Kickert, C. (2011) *Naar een levendige binnenstad Loopstromen van de Rotterdamse Hoogbouwbewoner* Rotterdam: Veldacademie

Koren, D. and M. Koopmans (2010) *Voedsel voor de stad Een veldonderzoek* Den Haag: Stroom Den Haag

Miazzo, F. and M. Minkjan, (ed.) (2013) *Farming the City Food as a Tool for Today's Urbanization* Amsterdam: Trancity*Valiz

Neufert, E. and Neufert, P. (2000) *Neufert Architects' Data* Wiley, John & Sons Incorporated

Remøy, H. (2010) *Out of Office A Study on the Cause of Office Vacancy and Transformation as a Means to Cope and Prevent,* Amsterdam: IOS Press

Steel, C. (2011) *De Hongerige Stad Hoe voedsel ons leven vormt* Rotterdam: NAi Uitgevers

Smit, J., J. Nasr and A. Ratta (2001) *Urban Agriculture Food, Jobs and Sustainable Cities* The Urban Agriculture Network, Inc. with United Nations Development Programme

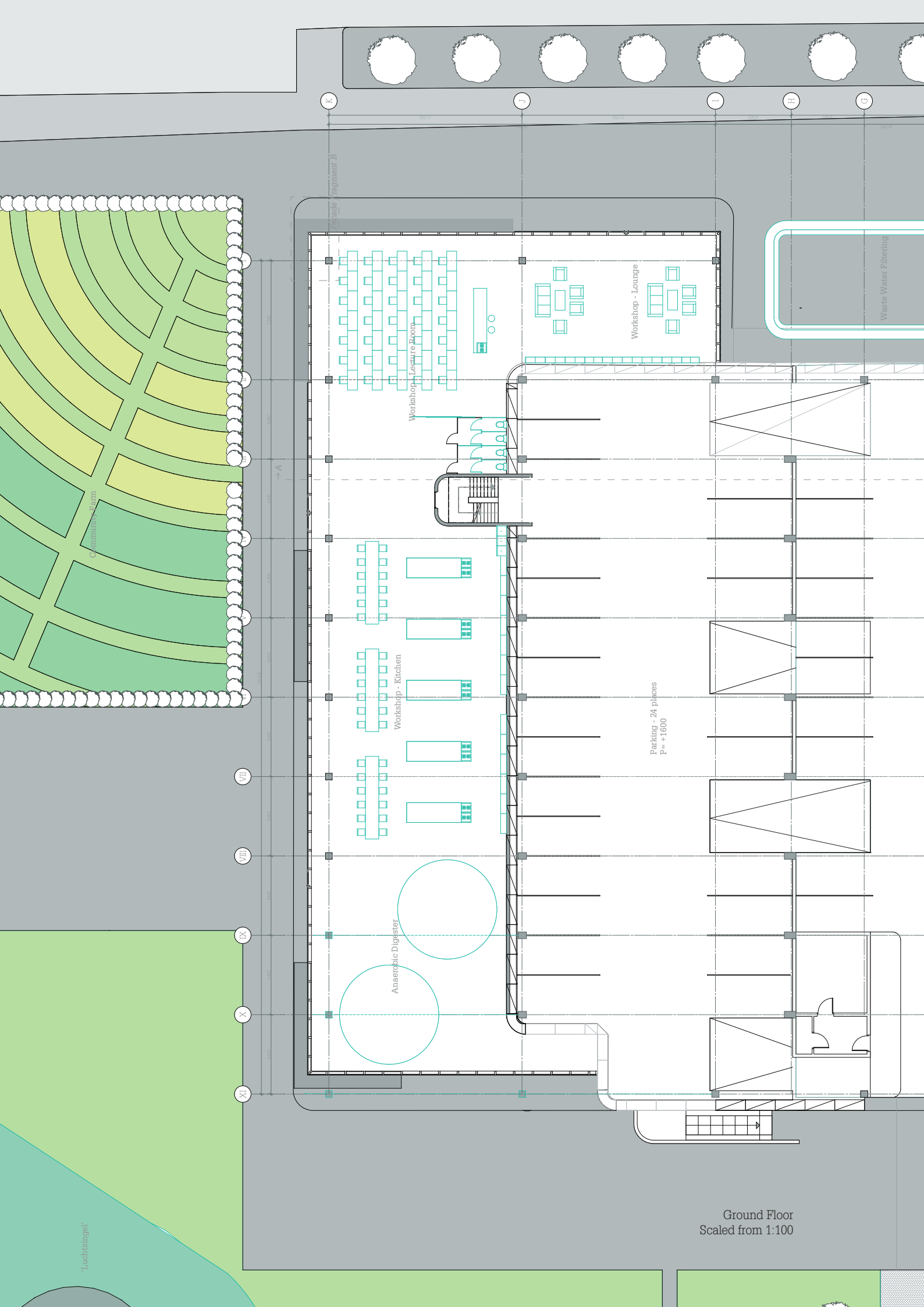
Van Der Sande, B. (2012) *Food for the City A Future for the Metropolis* Rotterdam: NAi Uitgevers/Stroom Den Haag

Vreugdenhil, J. and F. Van Westeren(ed.) (2009) *Foodprint Stadsgids Den Haag* Rotterdam: NAi Uitgevers/Stroom Den Haag

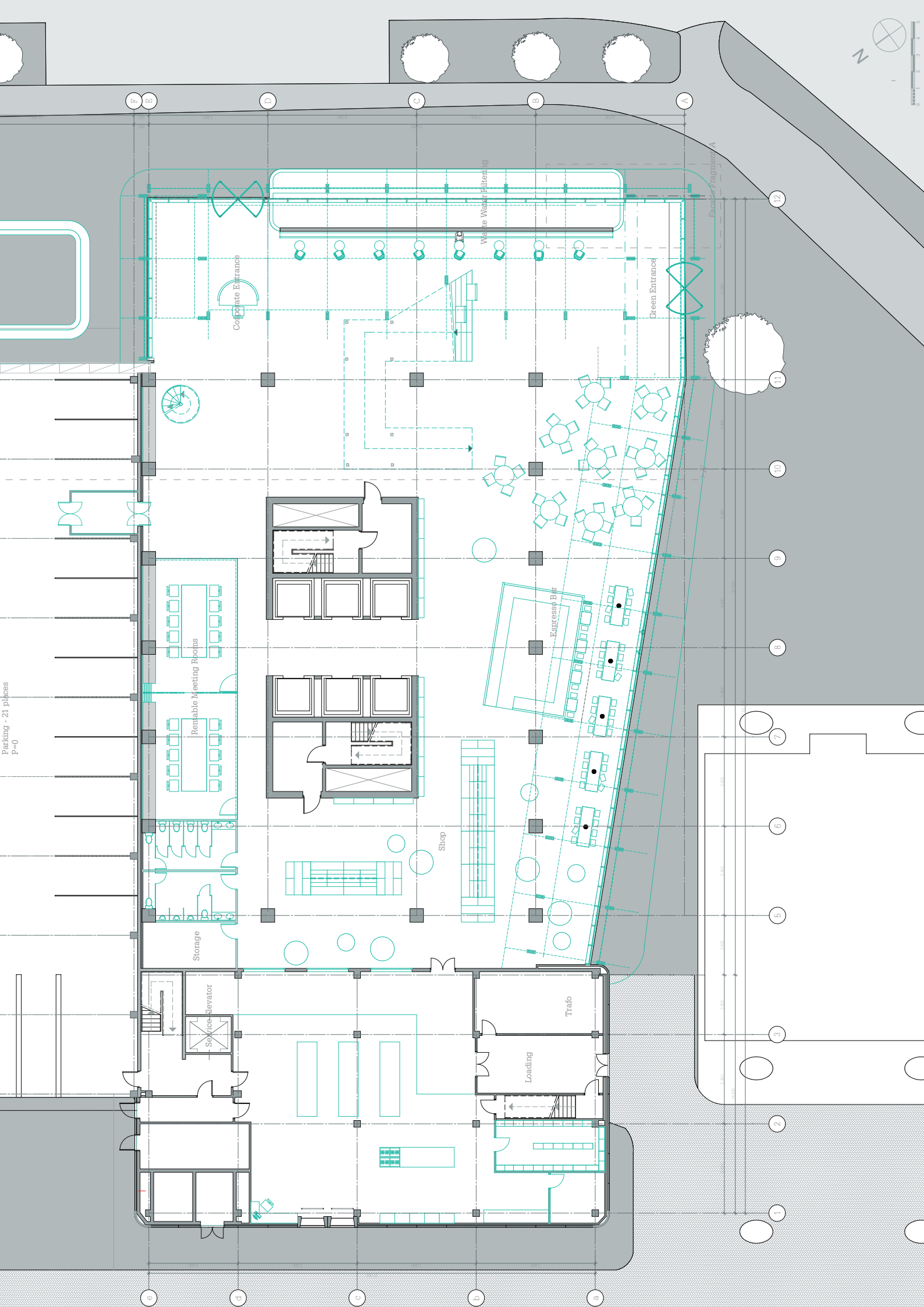
Websites

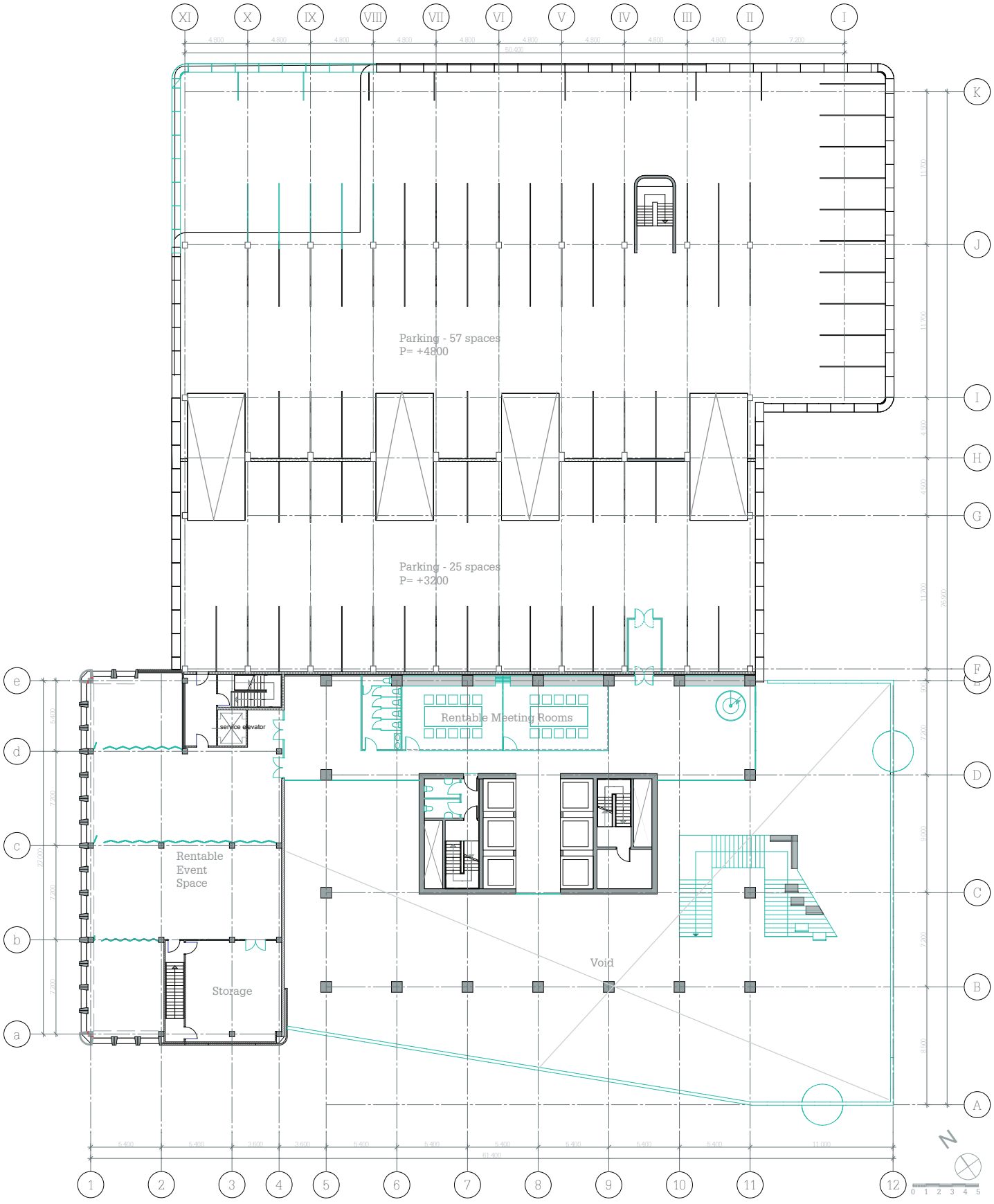
http://www.aerofarms.com
http://www.greenhorticulture.co.uk
http://www.lufa.com
http://www.theplant.com
http://www.simplyhydro.com
http://www.luchtsingel.org
http://www.ah.nl
http://www.hanos.nl
http://www.destuurlui.nl
http://www.groundcondition.nl
http://www.bioponica.net
http://www.lighting.philips.com
http://www.aquaticcommunity.com
http://www.growveg.com

Design Drawings

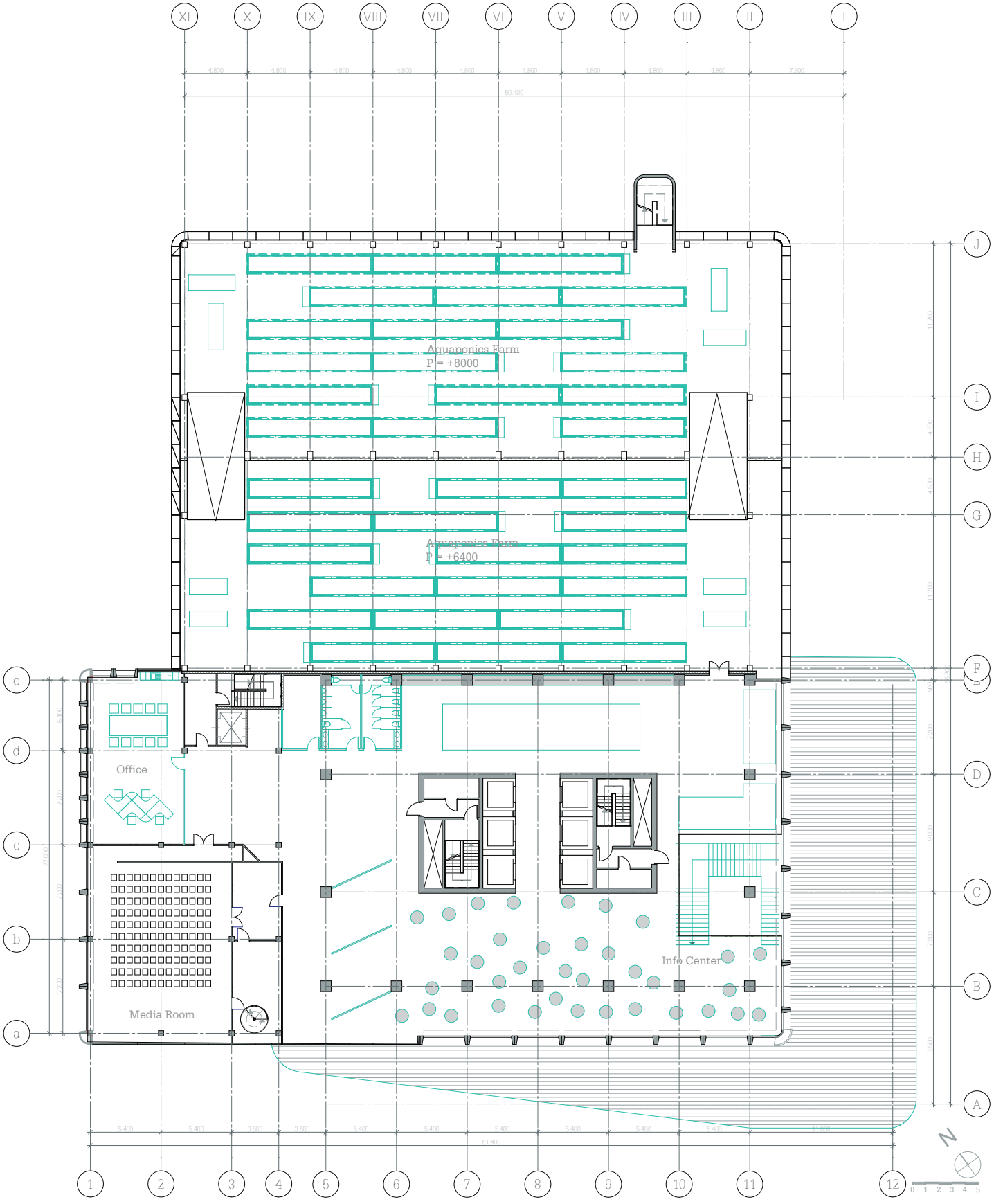


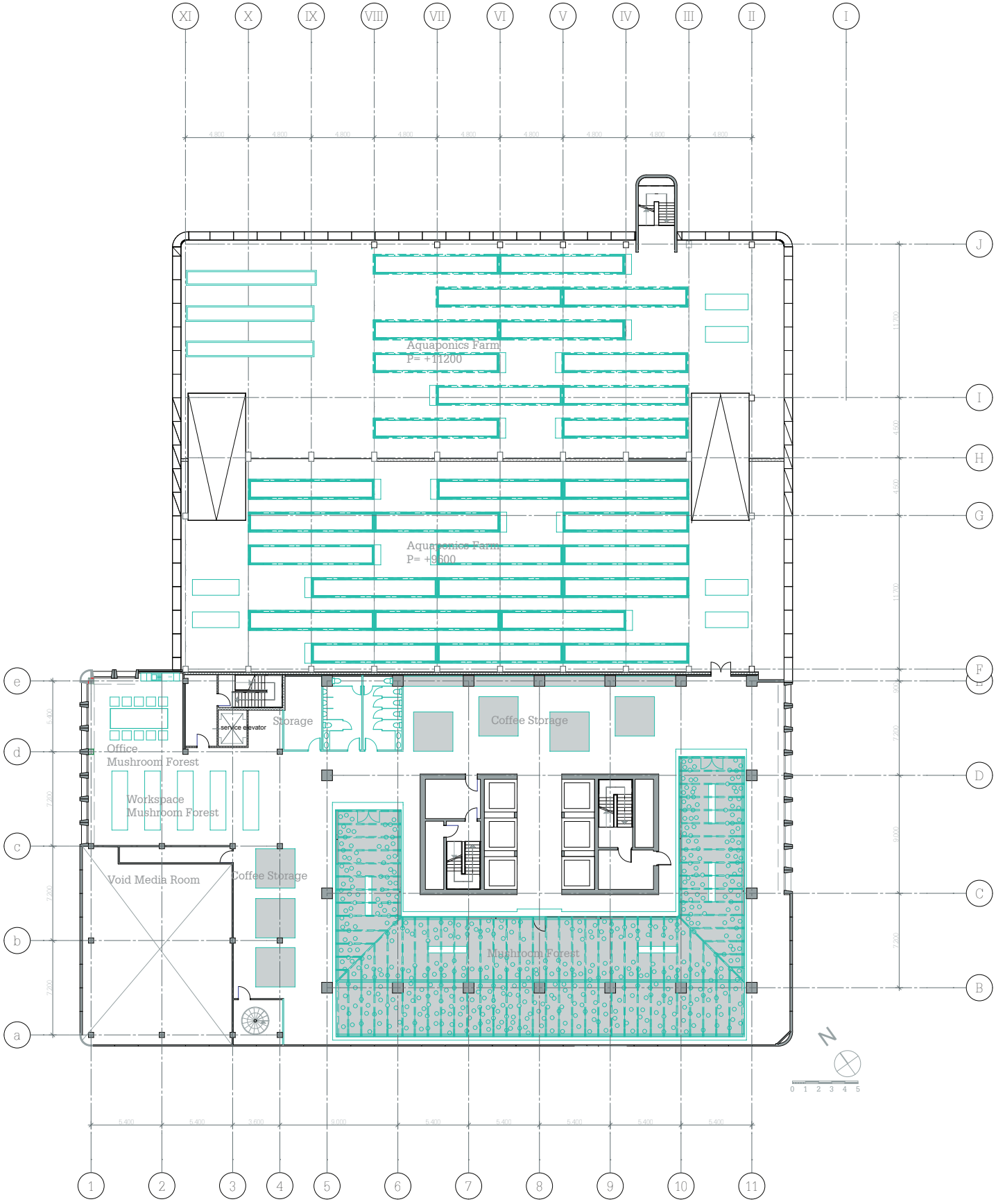
Ground Floor
Scaled from 1:100


Corporate Entrance
Waste Water Filtering
Green Entrance
Facade Fragment A
Espresso Bar
Rentable Meeting Rooms
Shop
Storage
Service Elevator
Trafo
Loading
Parking - 21 places
P=0

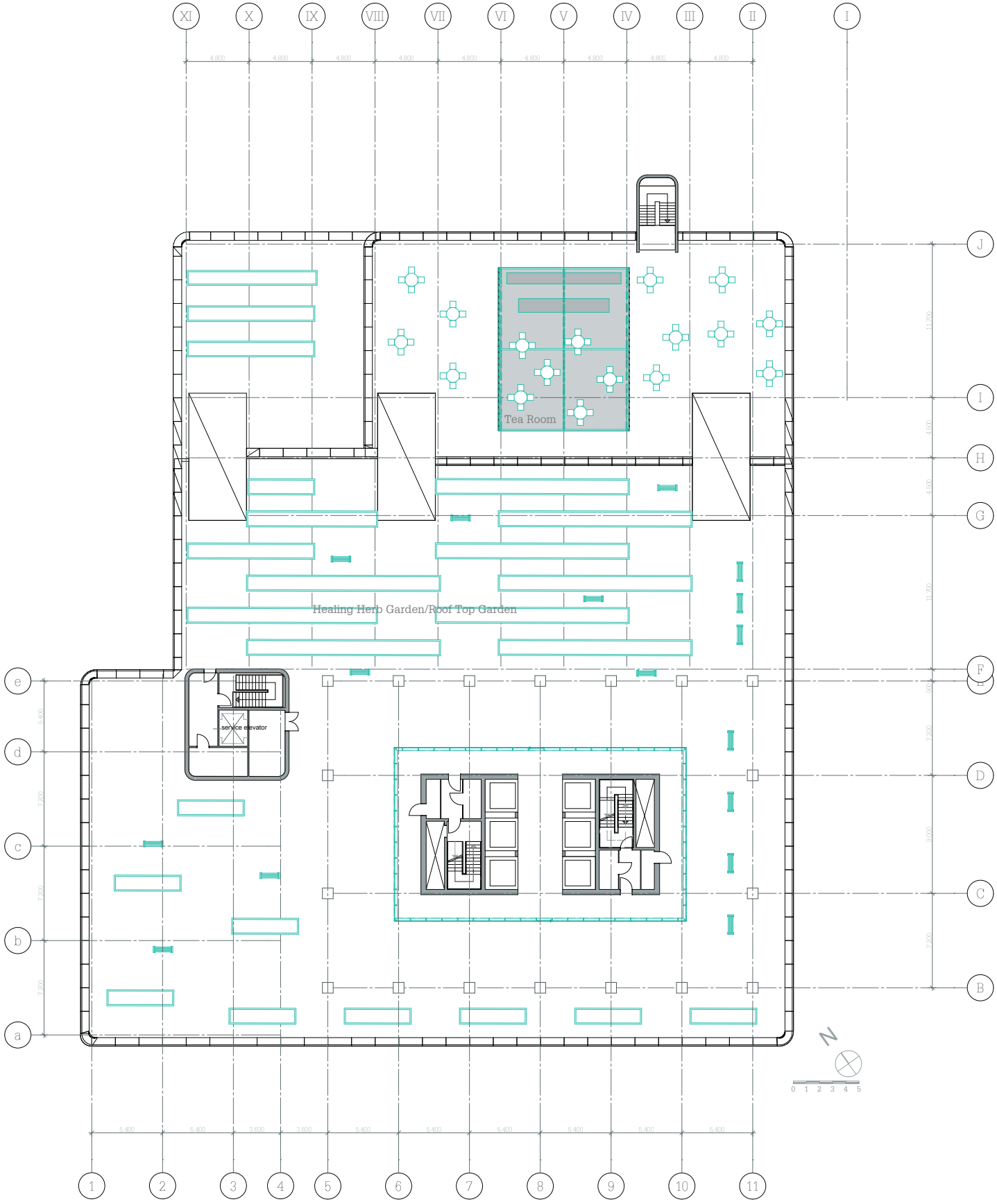


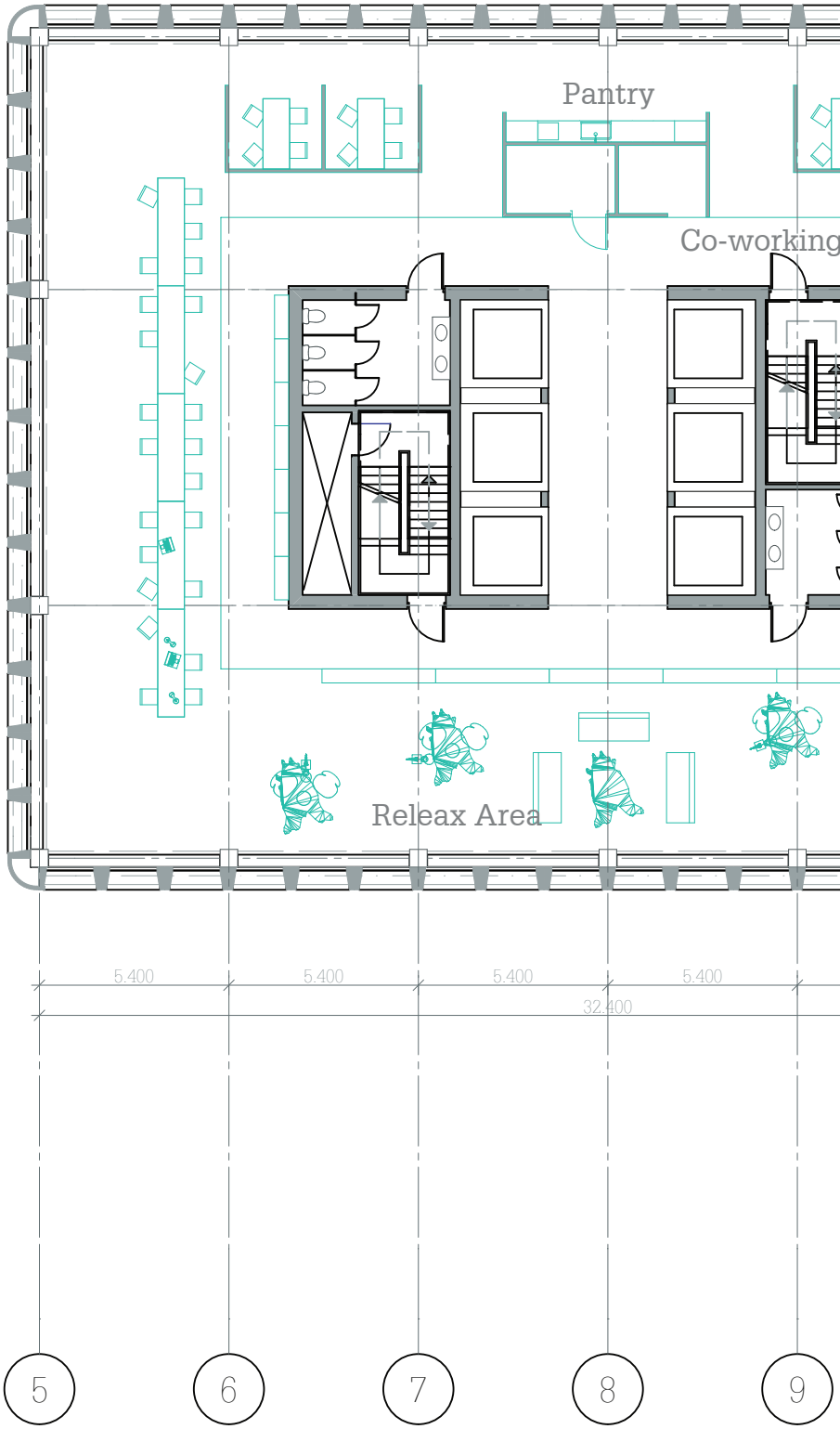
First Floor & Second Floor
Scaled from 1:200


Aquaponics Farm
P = +8000
Aquaponics Farm
P = +6400
Office
Media Room
Info Center

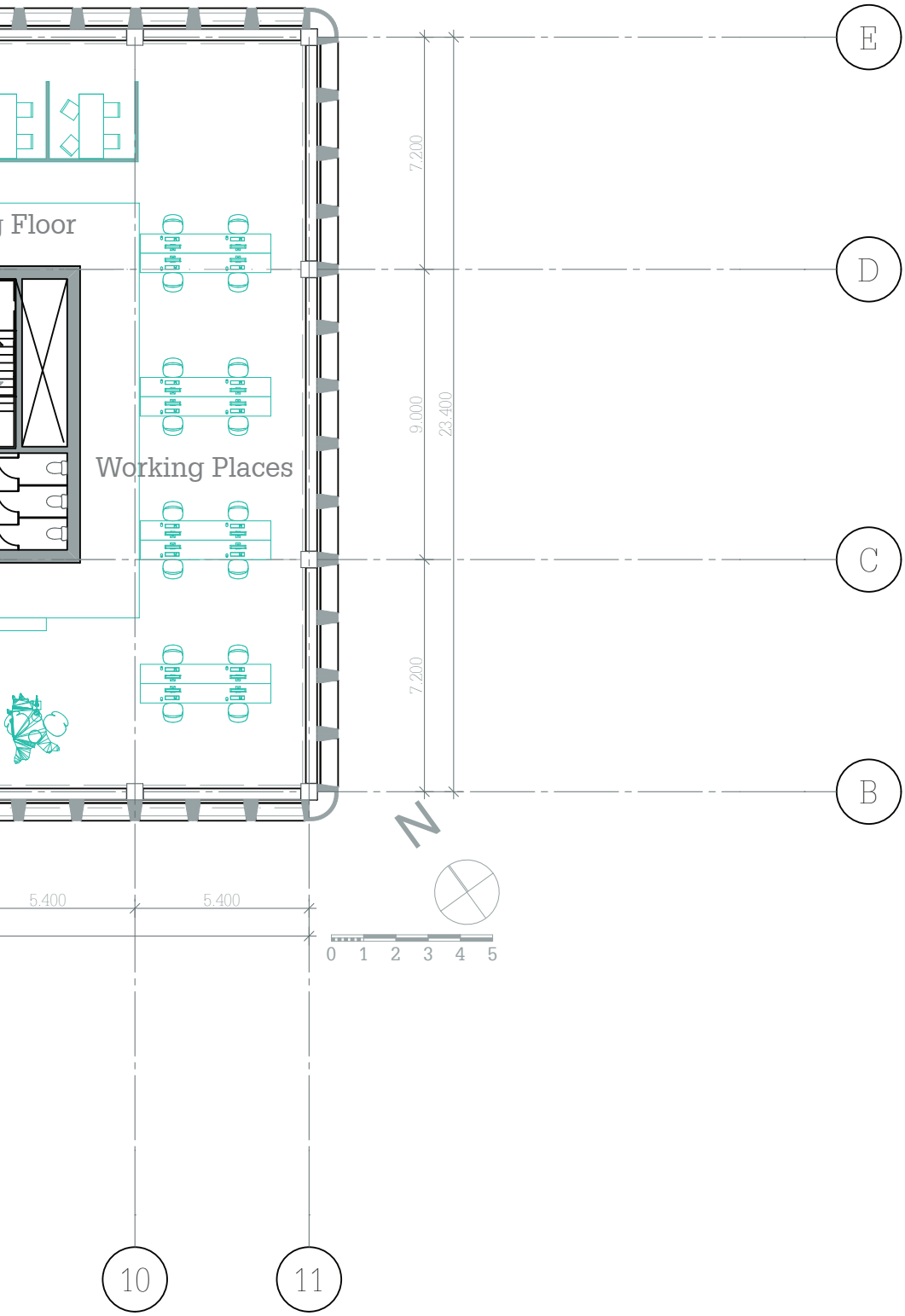


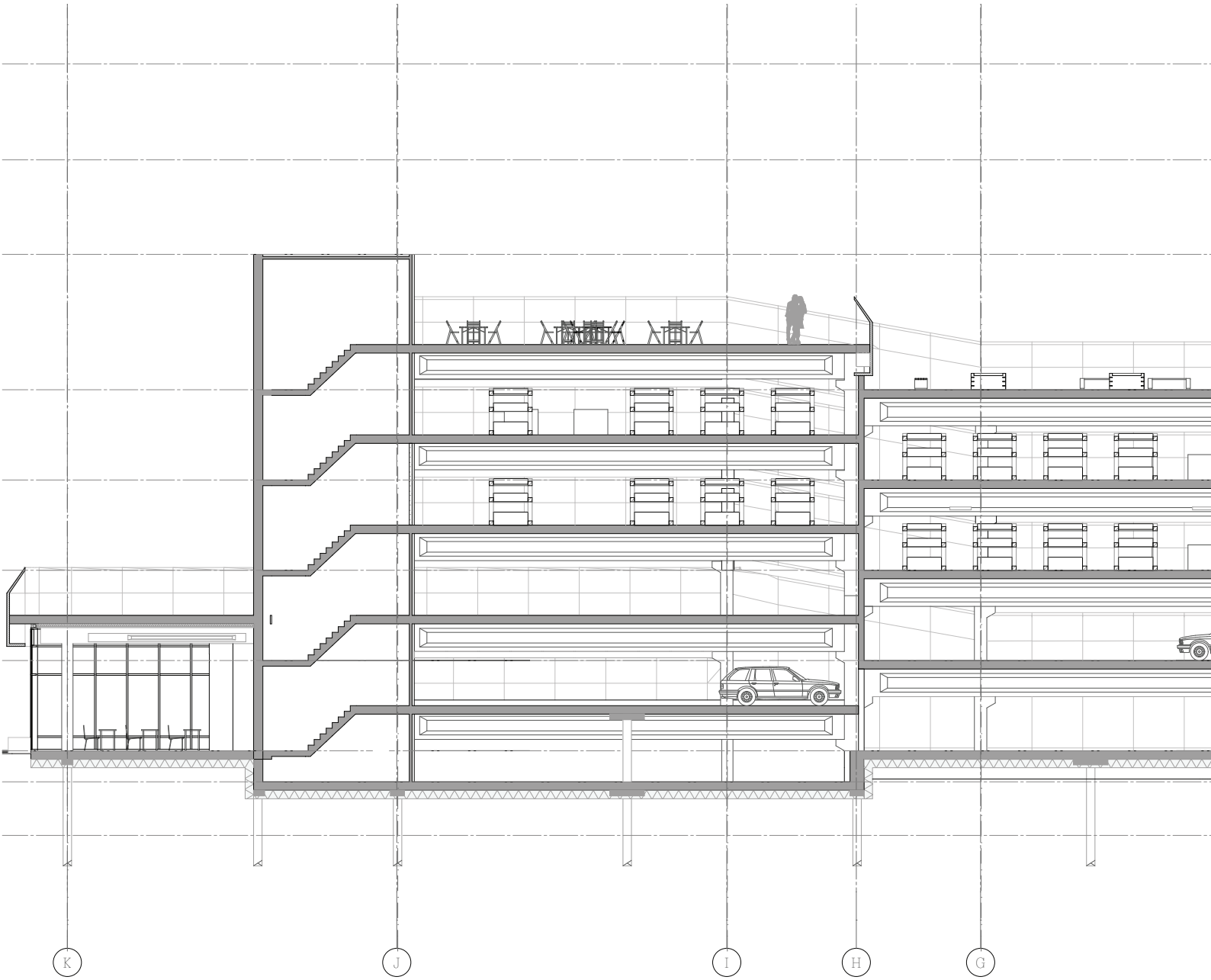
Third Floor & Fourth Floor
Scaled from 1:200


XI
X
IX
VIII
VII
VI
V
IV
III
II
I
J
I
H
G
F
E
D
C
B
a
b
c
d
e
1
2
3
4
5
6
7
8
9
10
11
Tea Room
Healing Herb Garden/Roof Top Garden
service elevator
N
0 1 2 3 4 5

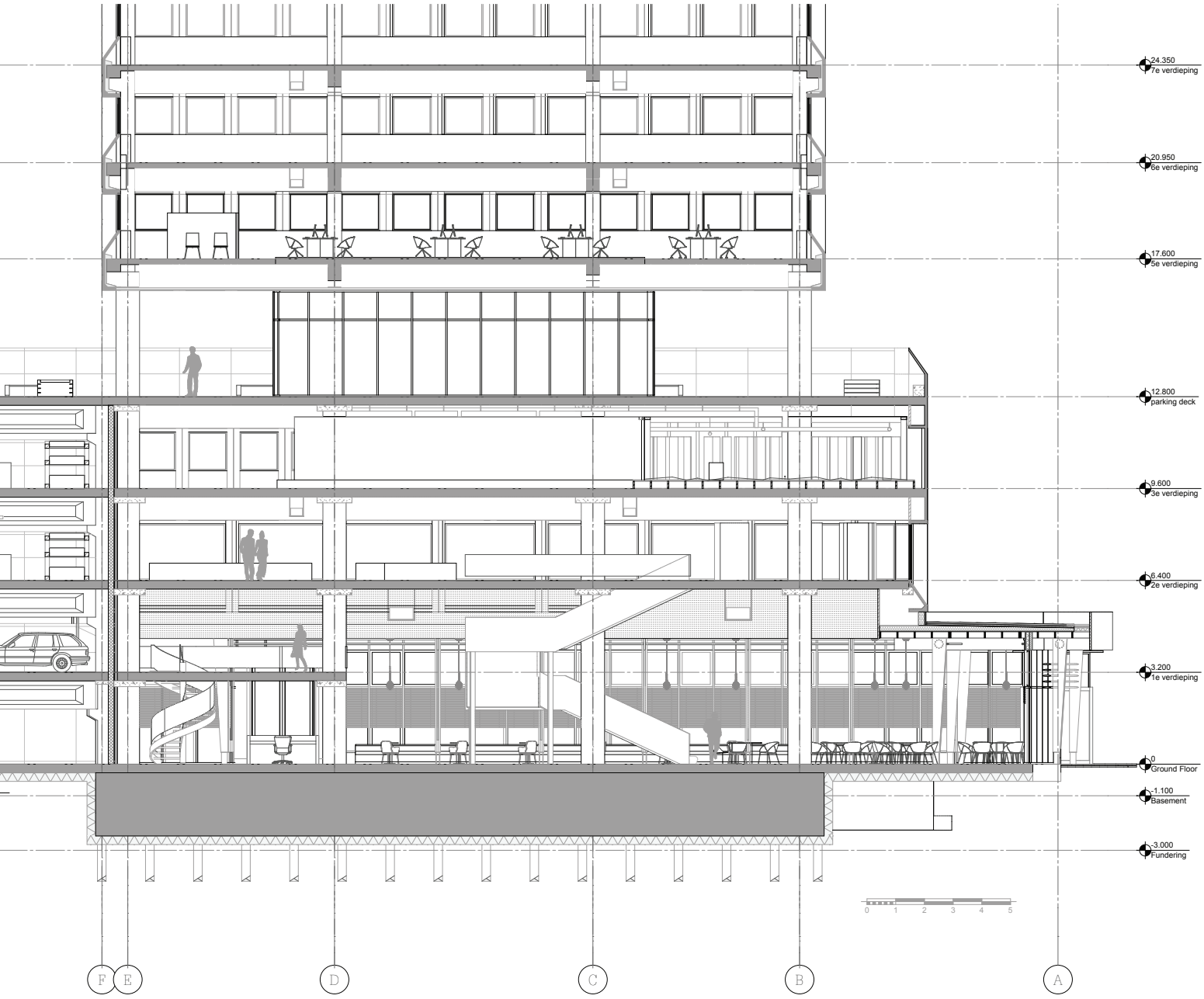


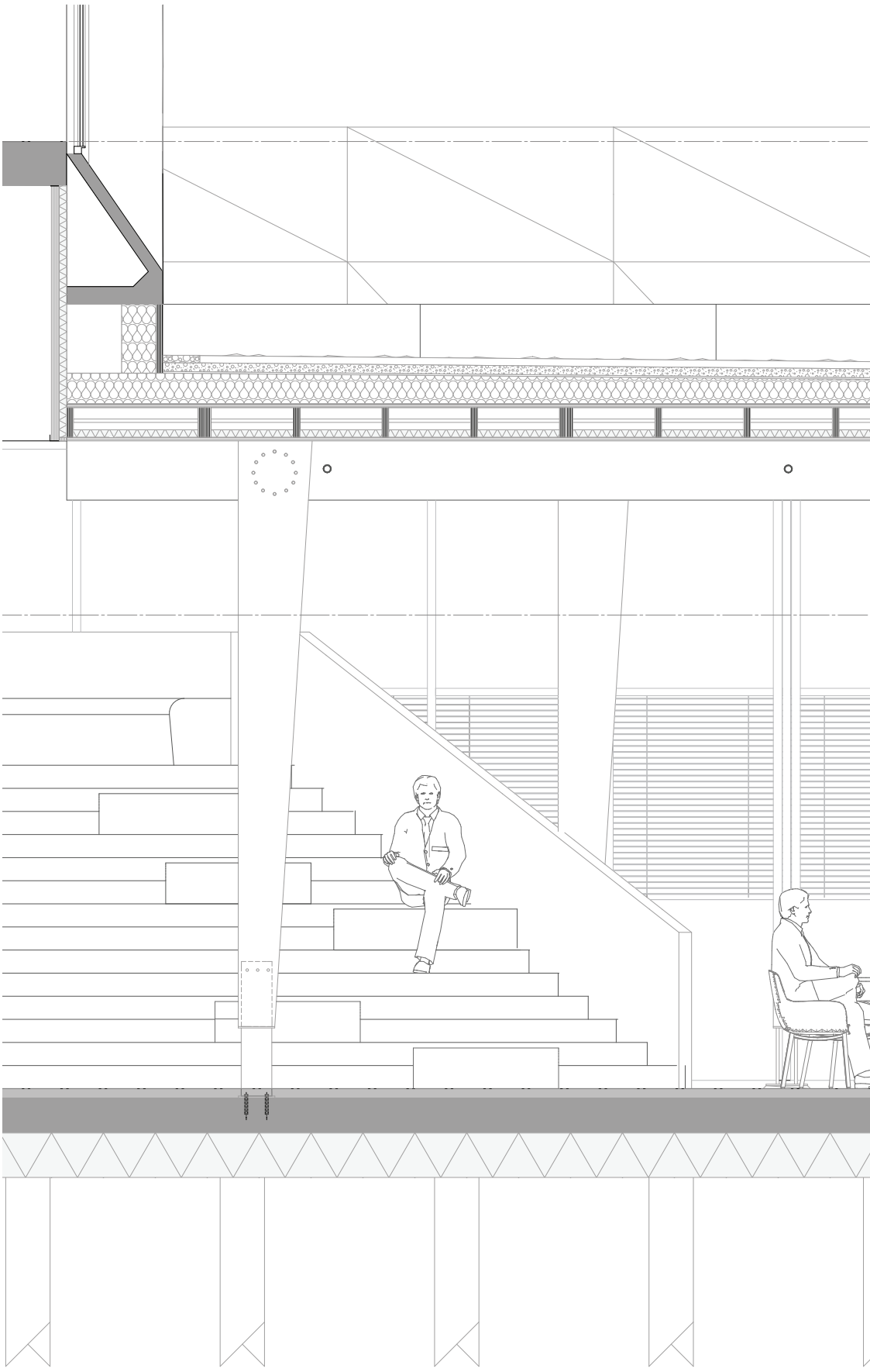
Fifth Floor
Scaled from 1:200


E
D
C
B
7.200
9.000
23.400
7.200
Working Places
N
5.400
5.400
0 1 2 3 4 5
10
11



Section AA
Scaled from 1:50


24.350
7e verdieping
20.950
6e verdieping
17.600
5e verdieping
12.800
parking deck
9.600
3e verdieping
6.400
2e verdieping
3.200
1e verdieping
0
Ground Floor
-1.100
Basement
-3.000
Fundering
0 1 2 3 4 5
F
E
D
C
B
A



Facade Fragment A
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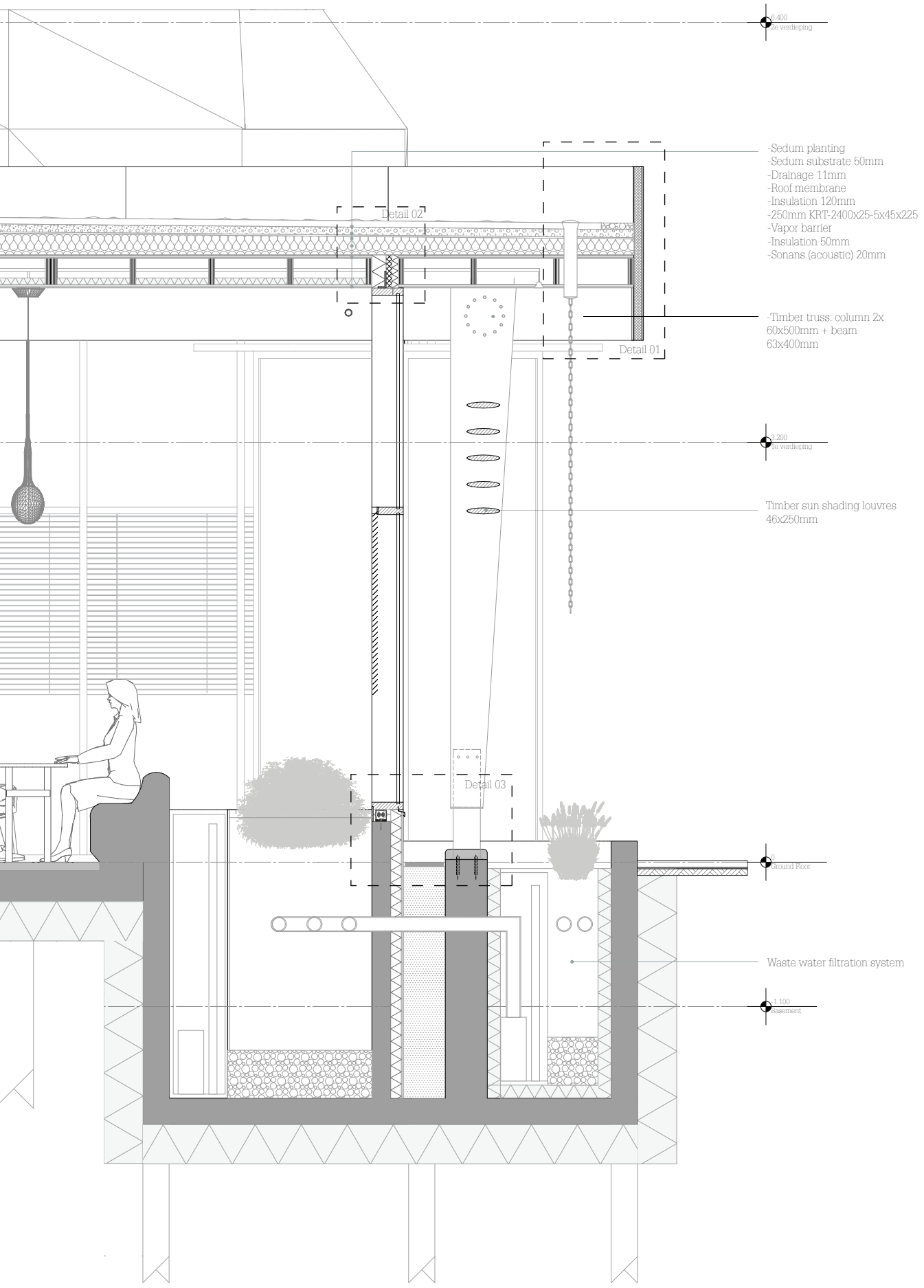
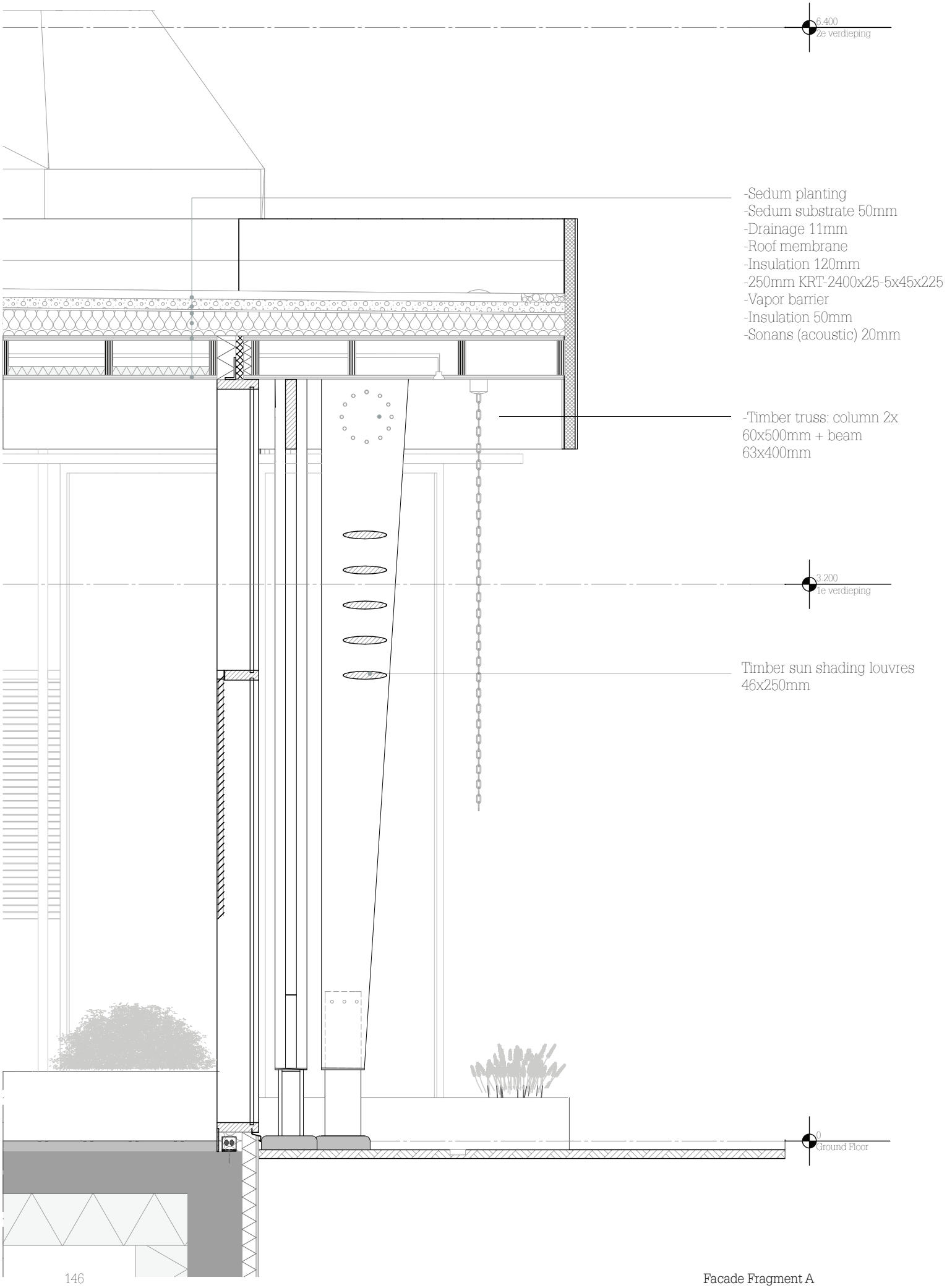

6.400
2e verdieping
-Sedum planting
-Sedum substrate 50mm
-Drainage 11mm
-Roof membrane
-Insulation 120mm
-250mm KRT-2400x25-5x45x225
-Vapor barrier
-Insulation 50mm
-Sonans (acoustic) 20mm
Detail 02
-Timber truss: column 2x
60x500mm + beam
63x400mm
Detail 01
3.200
1e verdieping
Timber sun shading louvres
46x250mm
Detail 03
0
Ground Floor
Waste water filtration system
-1.100
Basement



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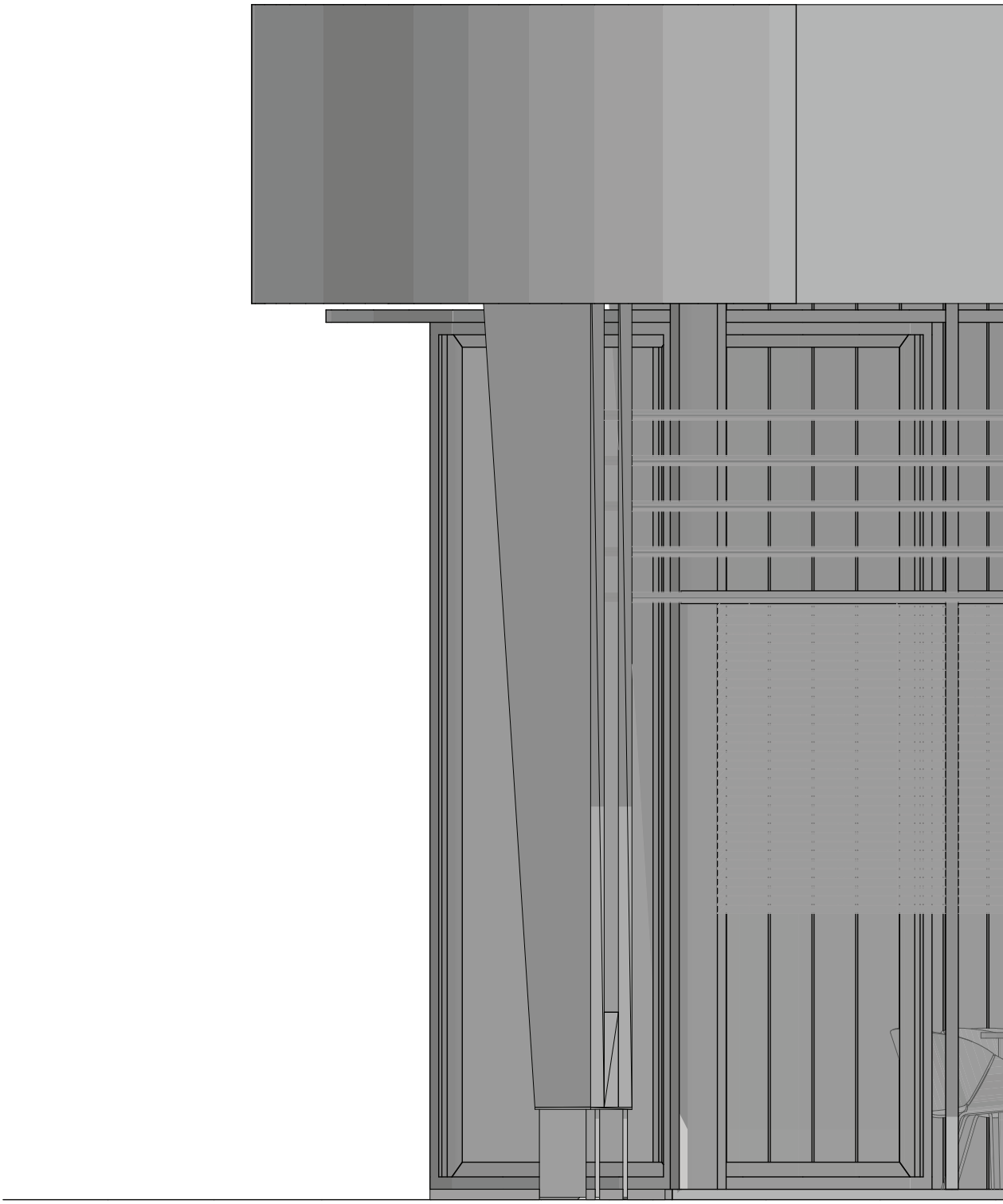
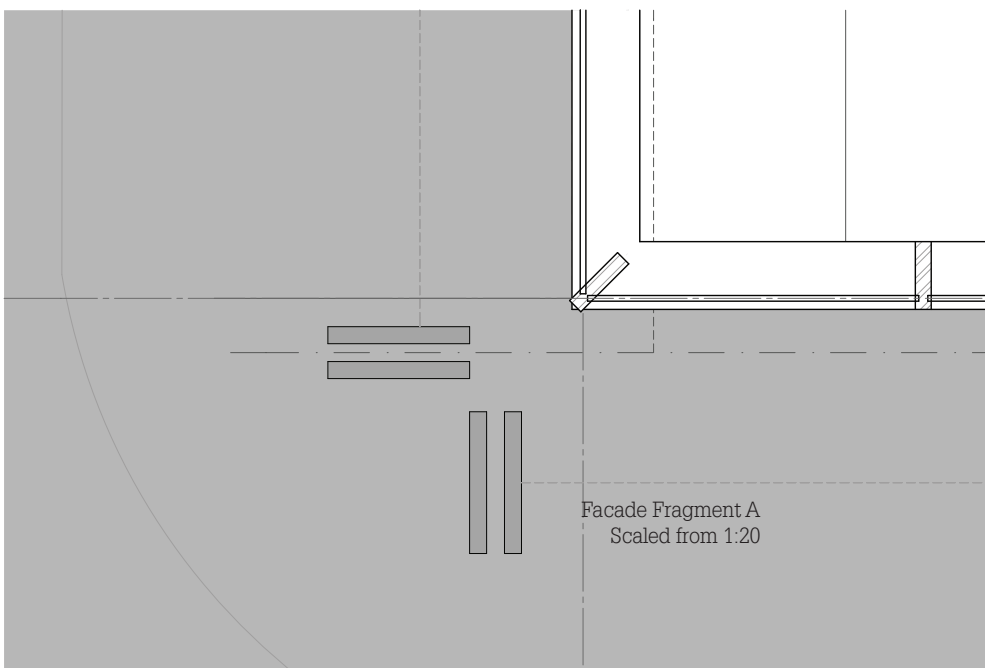
Scaled from 1:20





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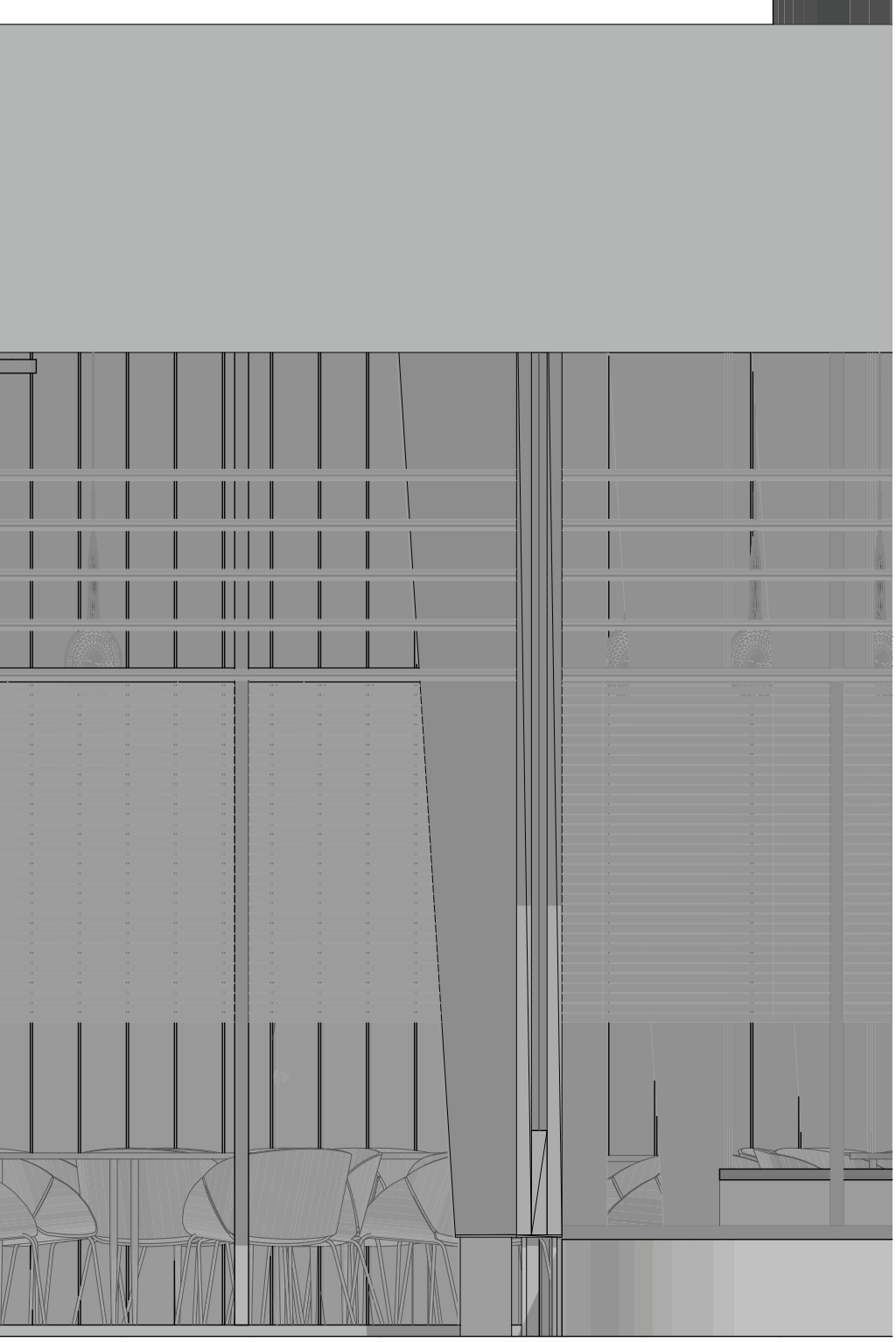
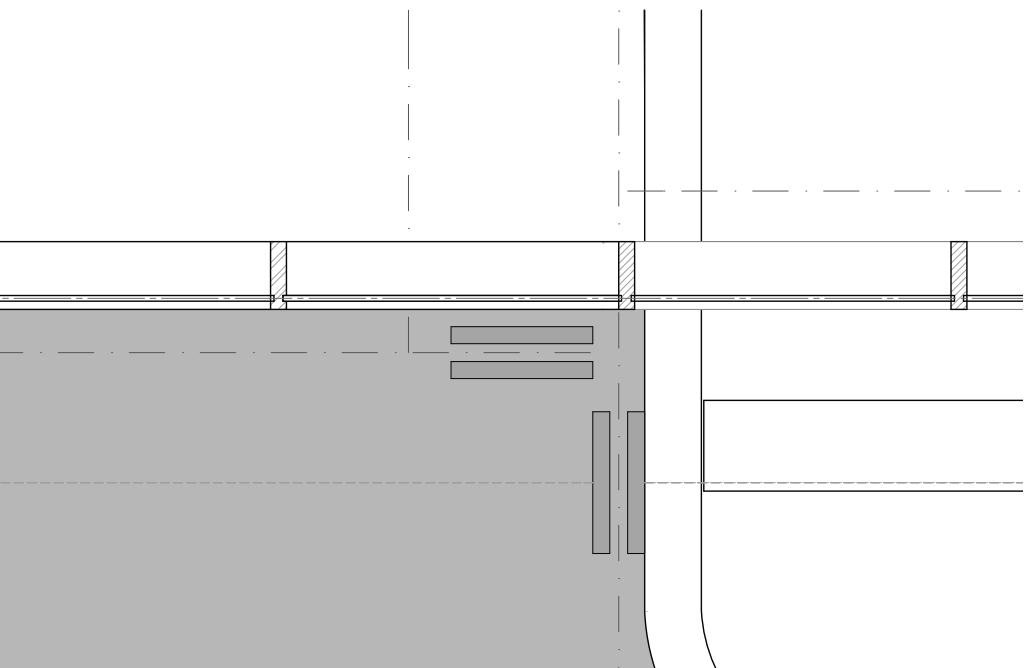
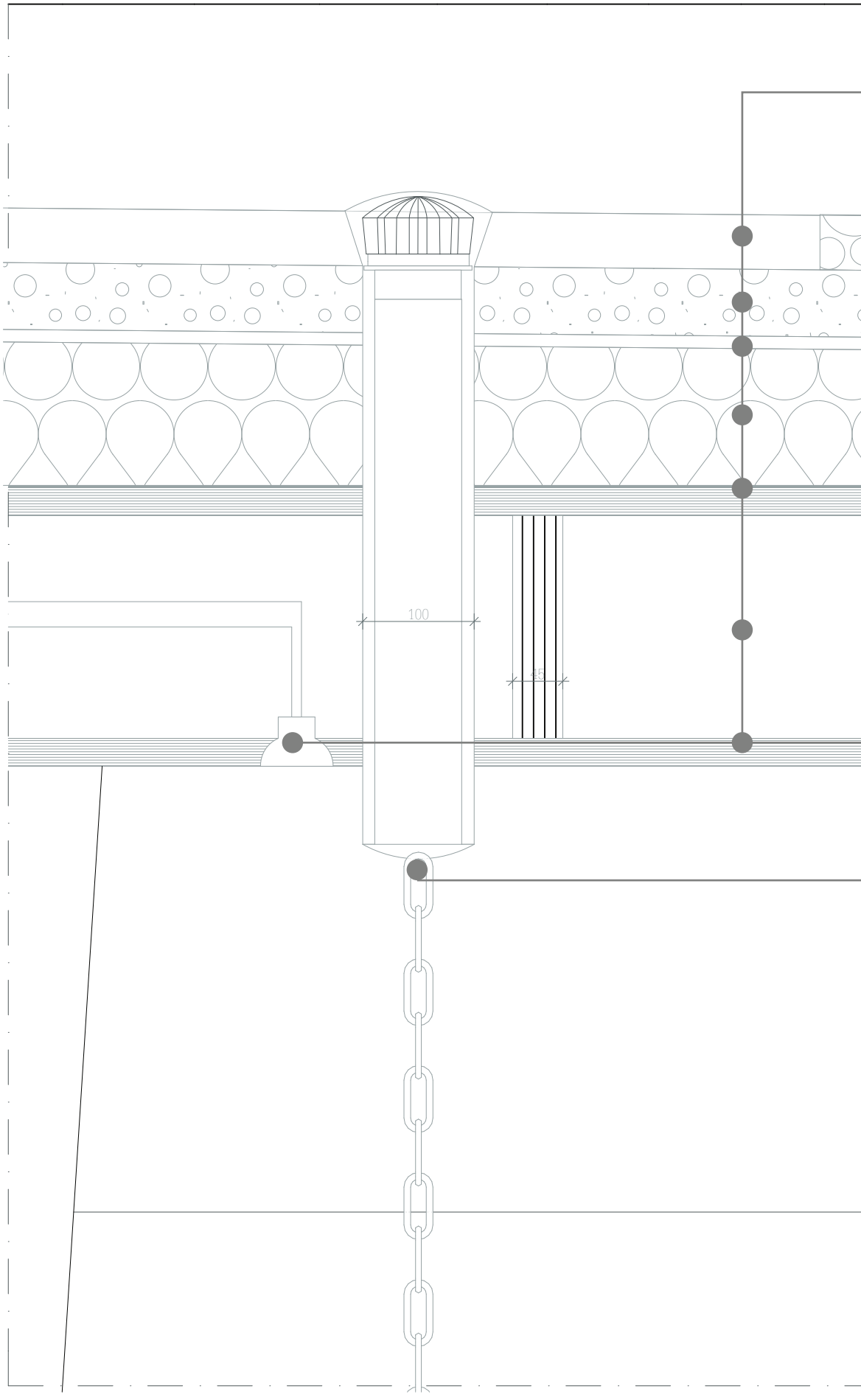
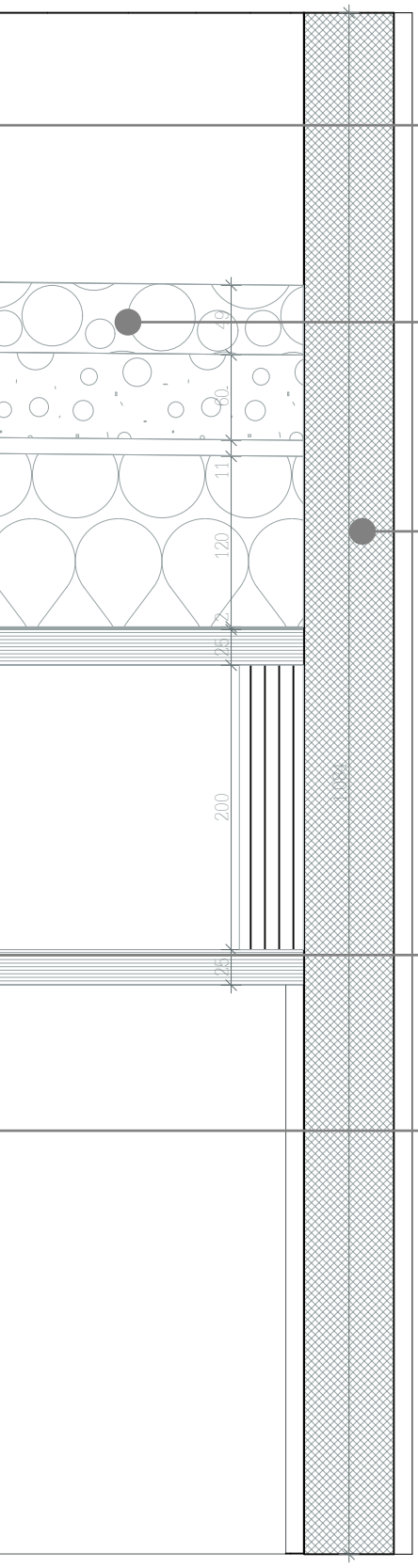






Detail Roof End
1:5



-Sedum planting
-Sedum substrate 60mm
-Drainage 11mm
-Roof membrane
-Insulation 120mm
-Vapor barrier
-250mm KRT-2400x25-5x45x225
-2400x25 laminated wood

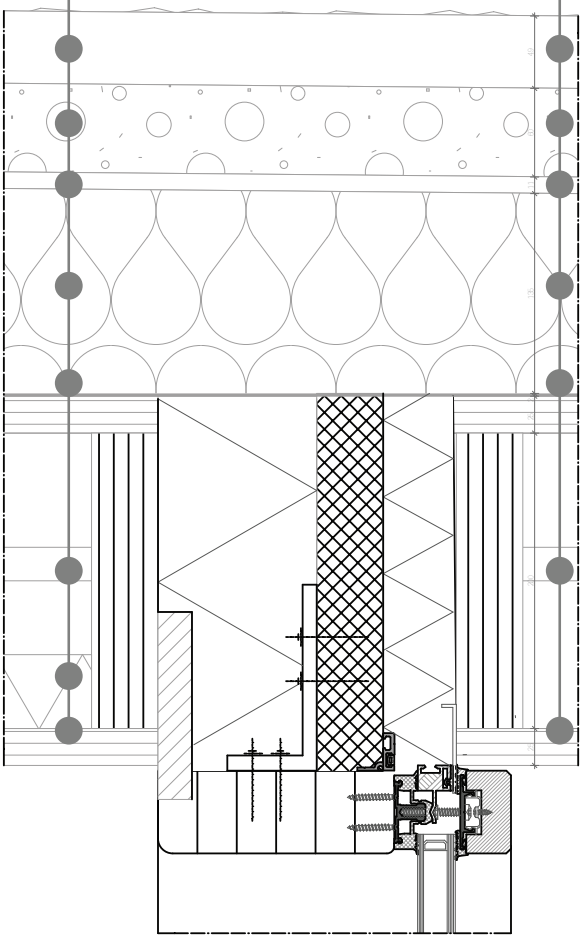
Gravel strip 250mm

Varnished hardwood

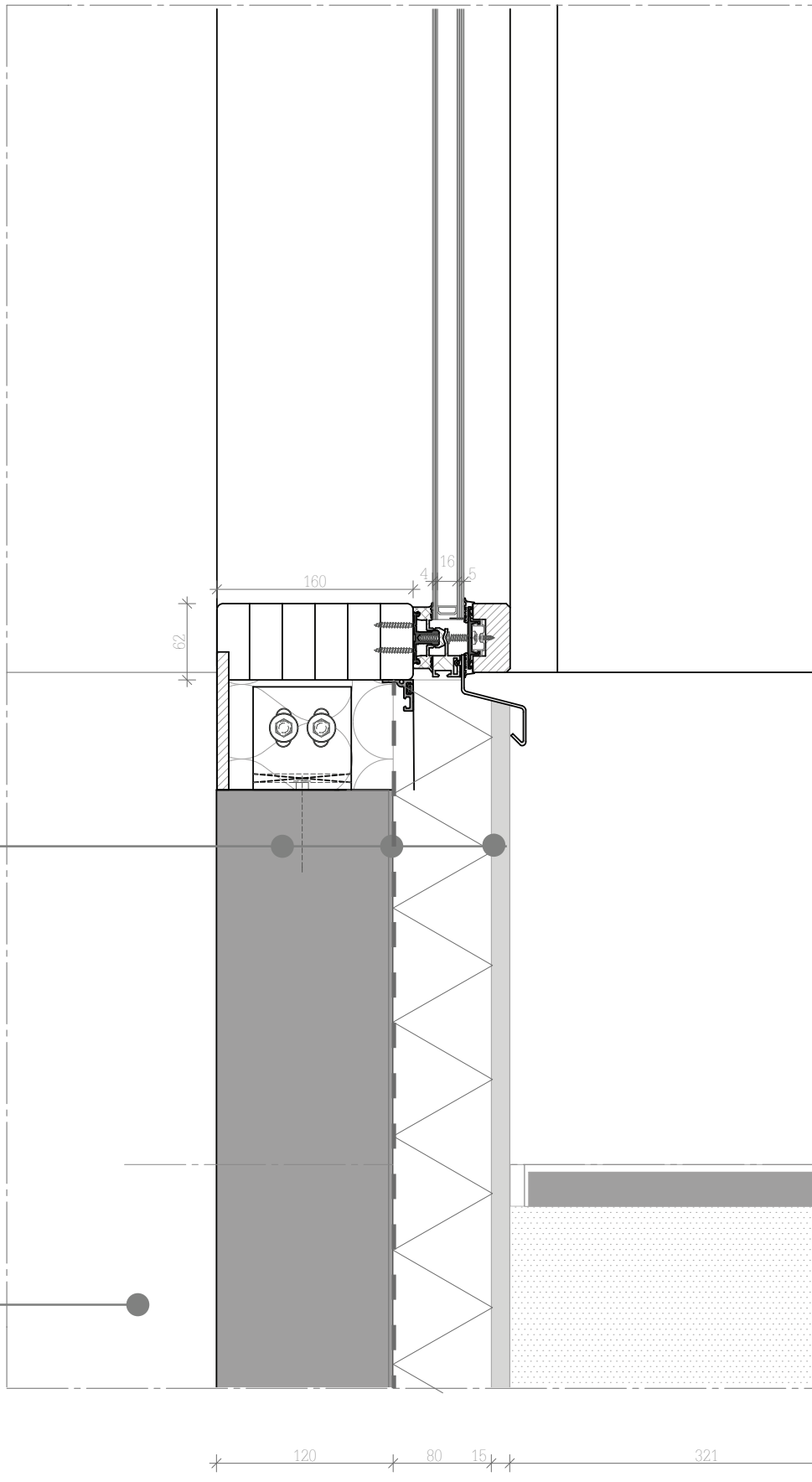
LED exterior lighting

Rainwater chain

225



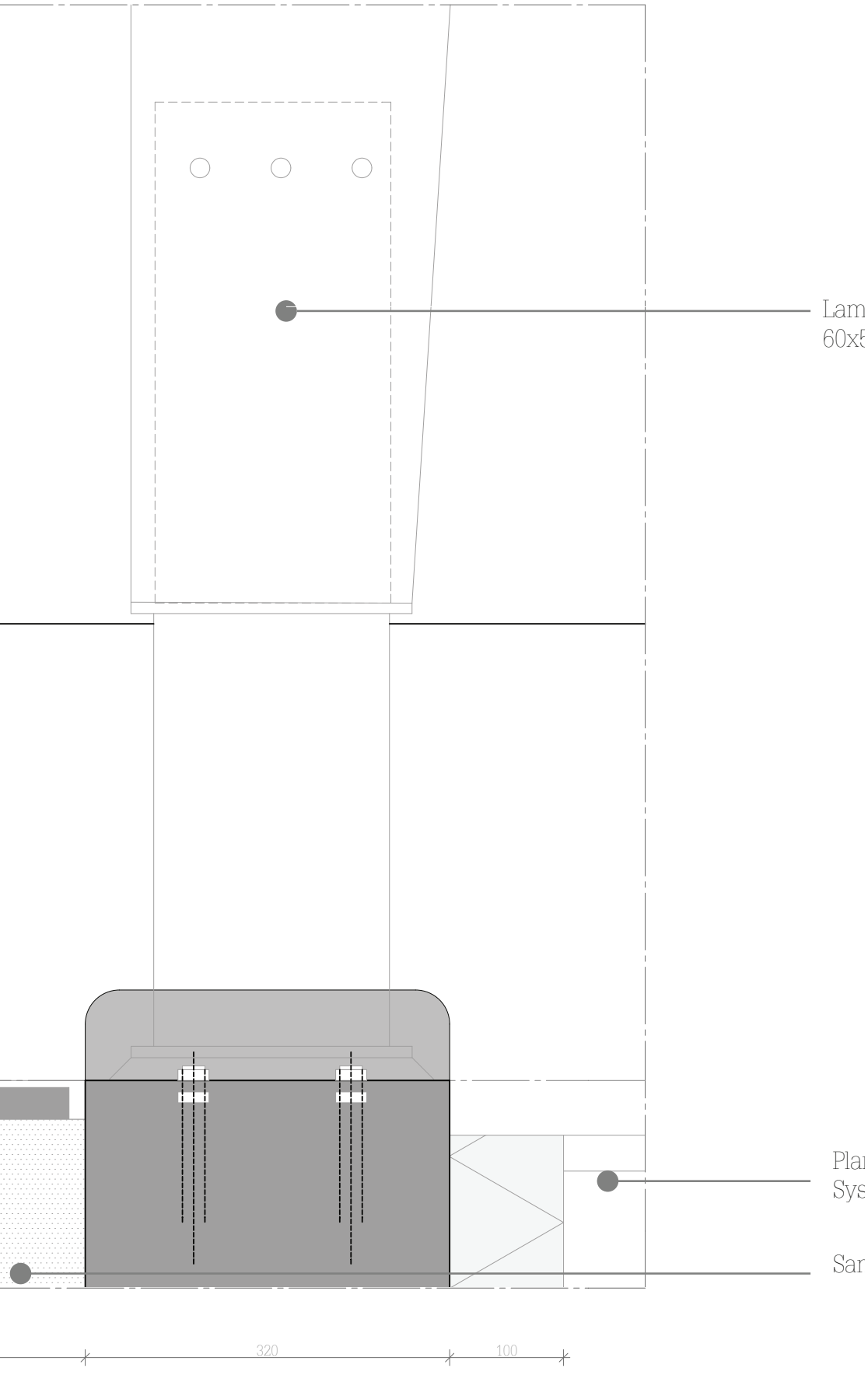
Detail - Facade /Roof
Detail - Facade Corner
1:5



-Side Plank Styrock 95mm
15mm + 80mm
-Water tight barrier
-Prefab concrete 120mm

Plant substrate (Water Filtering System)

Detail - Facade/Floor and Column
1:5

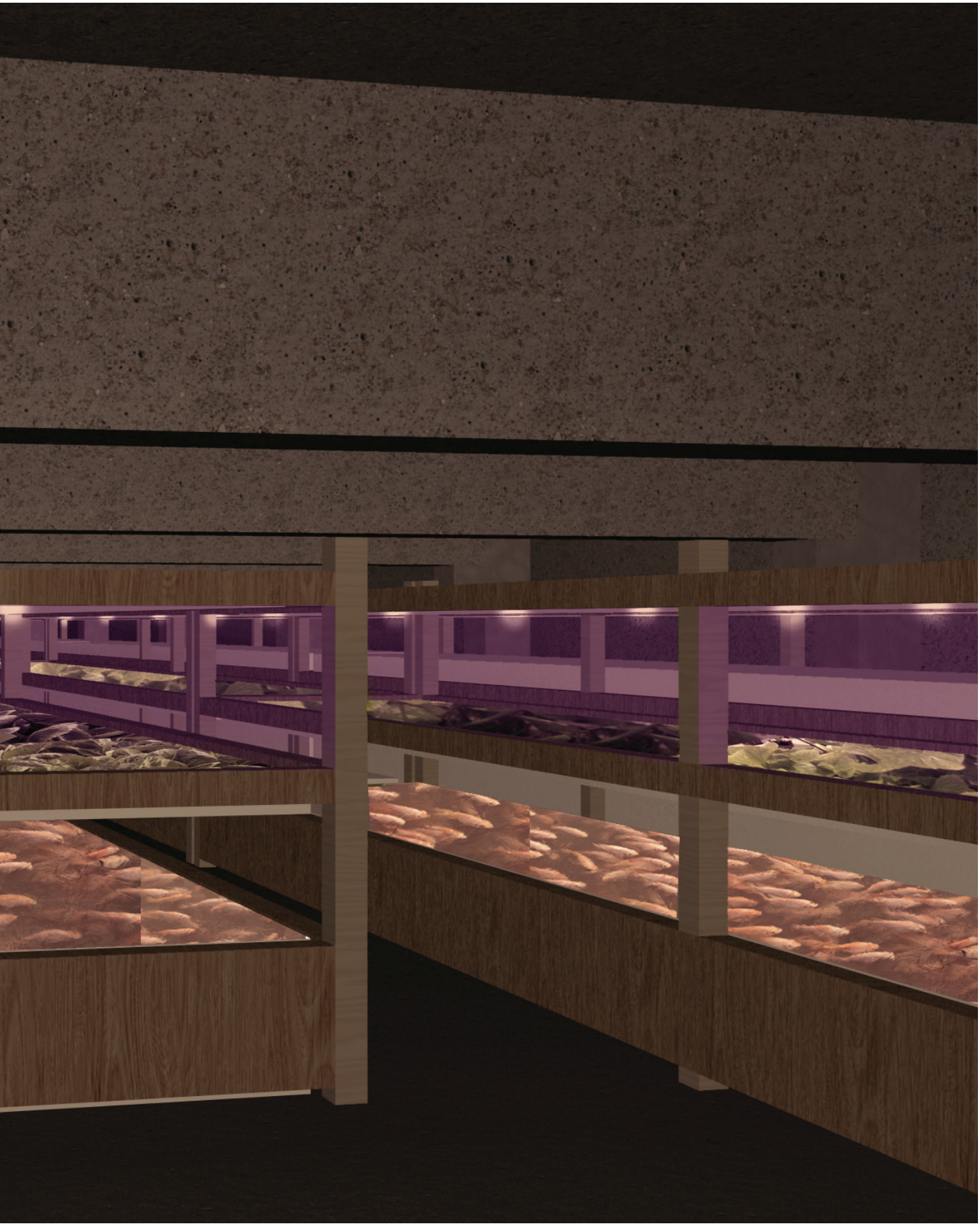

Lam
60x
Pla
Sys
Sar
320
100

Design Visuals

Shop and entrance hall/espresso bar

View from Hofplein


ANWB




HOFP


POORT

Mushroom Forest