



SANTOS

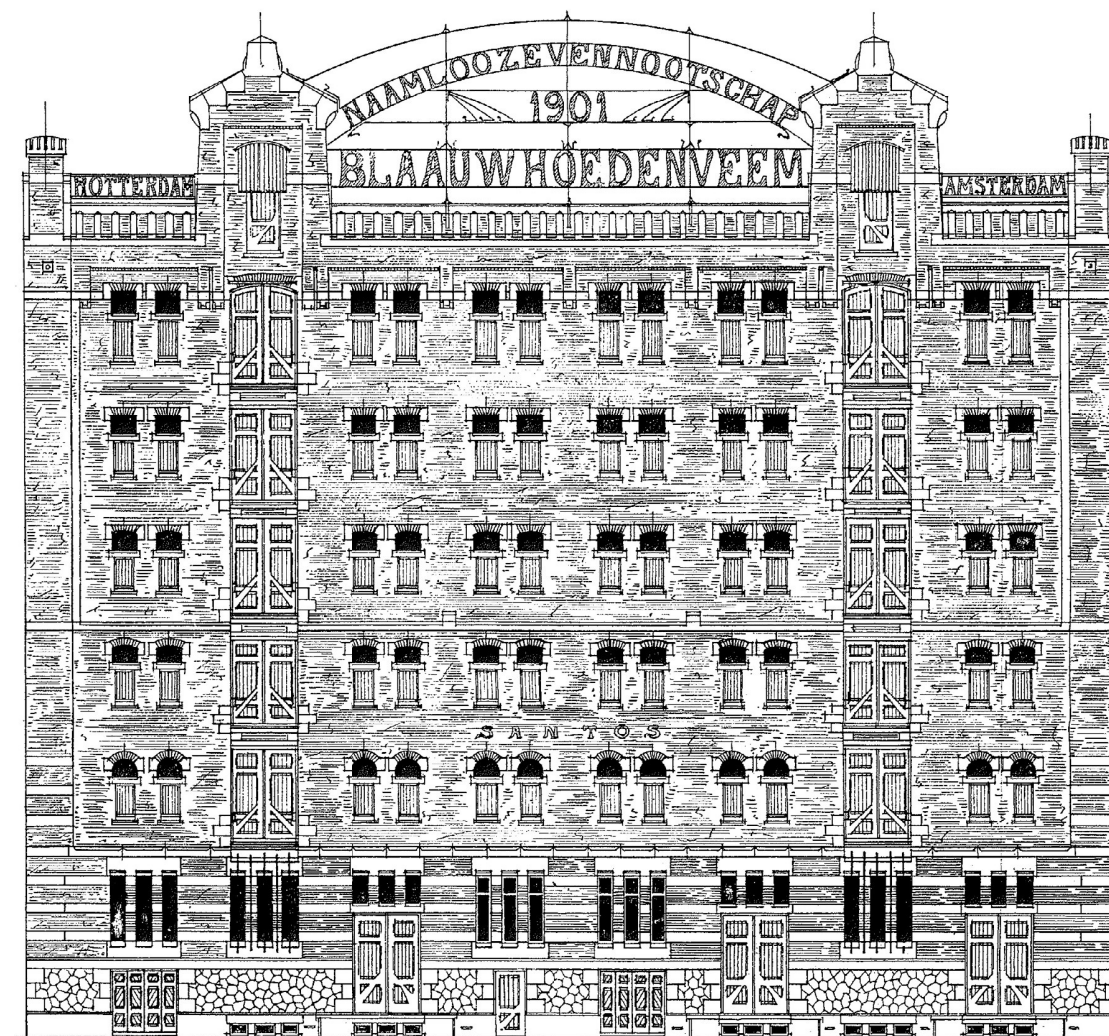
an analytical report of a historical warehouse on architecture, building technology and cultural values

ARCHITECTURAL, TECHNICAL AND CULTURAL VALUE EXPLORATION

WAREHOUSE SANTOS

BREDE HILLEDIJK 95 / RIJNHAVEN Z.Z. 6

ROTTERDAM



HERITAGE & ARCHITECTURE

APRIL 2017

COLOFON

This report is part of the graduation program of the studio Heritage & Architecture of the Technical University of Delft.

Students:

Jacqueline van der Aart	4219449
Miguel van den Berge	1256688
Daan Deen	4410696
Inés Hemmings	4516540
Lukas Jespers	1396757
Hester Slager	4161831
Romana de Vries	4215710

With special thanks to:

- Ir. A.C. de Ridder
- Ir. W.L.E.C. Meijers
- Ir. F.W.A. Koopman
- N.J. Clarke
- Dr. S.A. Stroux

READER’S GUIDE

The exploration of the architectural, technical and cultural values of the warehouse Santos is composed out of three main parts:

- a. the description of the architectural characteristics of the building consisting of a historical, current and future analysis.
- b. an elaboration of the technological aspects of the building consisting of a cultural and historical analysis of the past, a physical analysis of the current and future structural developments.
- c. an analysis of the cultural values of the building framed within a matrix based on the literature of Riegl and Brandt which was specifically designed for this part by N.J. Clarke.

All written text in this report is elaborated with different illustrating material like historical photos, images, diagrams, axometric drawings, floor plans, sections and sketches.

Illustrations are always referred to a short source description which is linked to a complete list of sources at the end of the report.

In the case that no short reference can be found it concerns an image or photograph by one of the students.

In the text itself direct sources are mentioned which link to a list of literature at the end of the report.

TABLE OF CONTENTS

	page		page
1	Introduction and general information	4	Technical analysis
1.1	Case and research goals	4.0	Introduction
1.2	Methodology	4.1	Building method
1.3	General information Santos	4.2	Technical time-based perspective
		4.3	Load bearing structure and stability
2	Historical background and direct urban context	4.4	Roof & drainage
2.0	Introduction	4.5	Materials
2.1	Coffee: from bean to cup	4.6	Masonry
2.2	Historical urban context	4.7	Installations
2.3	Timeline Katendrecht		
2.4	Current urban context, Katendrecht	5	Cultural values
2.5	Sections	5.0	Introduction
2.6	Street profiles	5.1	Chronomapping
2.7	Vistas	5.2	Mapping of cultural values
2.8	Transport		
2.9	Future masterplans	6	Sources
2.10	Neighborhoods	6.0	Sources
2.11	Conclusion		
3	Architectural analysis		
3.0	Introduction		
3.1	Timeline Santos		
3.2	The architects J.P. Stok and J.J. Kanters		
3.3	Architectural style		
3.4	Warehouse typology		
3.5	Skin		
3.6	Organisation		
3.7	Lightning		
3.8	Damages		
3.9	Interior		

1 INTRODUCTION & GENERAL INFORMATION

1.1 CASUS AND RESEARCH GOALS

This booklet is an exploration of the architectural, technical and cultural aspects of the warehouse Santos. As described in the reader's guide this booklet consists of three main parts (the architectural, technological and cultural analysis) which form the basis for a future redesign of the building. We choose to structure this booklet not in a chronological order but in an order of scale from direct urban context to the standard sized brick used to build the façade. Of course the historical time frame is interwoven within this structure whereas no monument can be described and analyzed without placing it in a historical context. Each chapter is designed in such a way that it follows the research process of collecting, mapping and evaluating the data.

1.2 METHODOLOGY

The general research strategy for the Rotterdam Harbor Graduation Studio proceeds in a systematic way, starting from big scale analysis and narrowing down to detailed analysis. It takes different time periods in consideration and opposes the historical, the present and the future, to facilitate comparisons and correlations.

All material for the report is gathered from archives, the TU Delft library, the SANTOS report, online sources and photos extracted from the internet as well as personally taken at the site.



1.3 GENERAL INFORMATION SANTOS

Address:	Brede Hilledijk 95 / Rijnhaven Z.z. 6, Rotterdam
Status:	national monument nr. 513940
Year of construction:	1901-1902
Client:	N.V. Blaauwhoedenveem
Architect:	J.P. Stok Wzn. i.s.m. J.J. Kanter
Original function:	warehouse
Owner:	OBR, municipality of Rotterdam
Architectural condition:	reasonable
Exterior:	mostly intact, parts have been removed
Interior:	modified on a single component

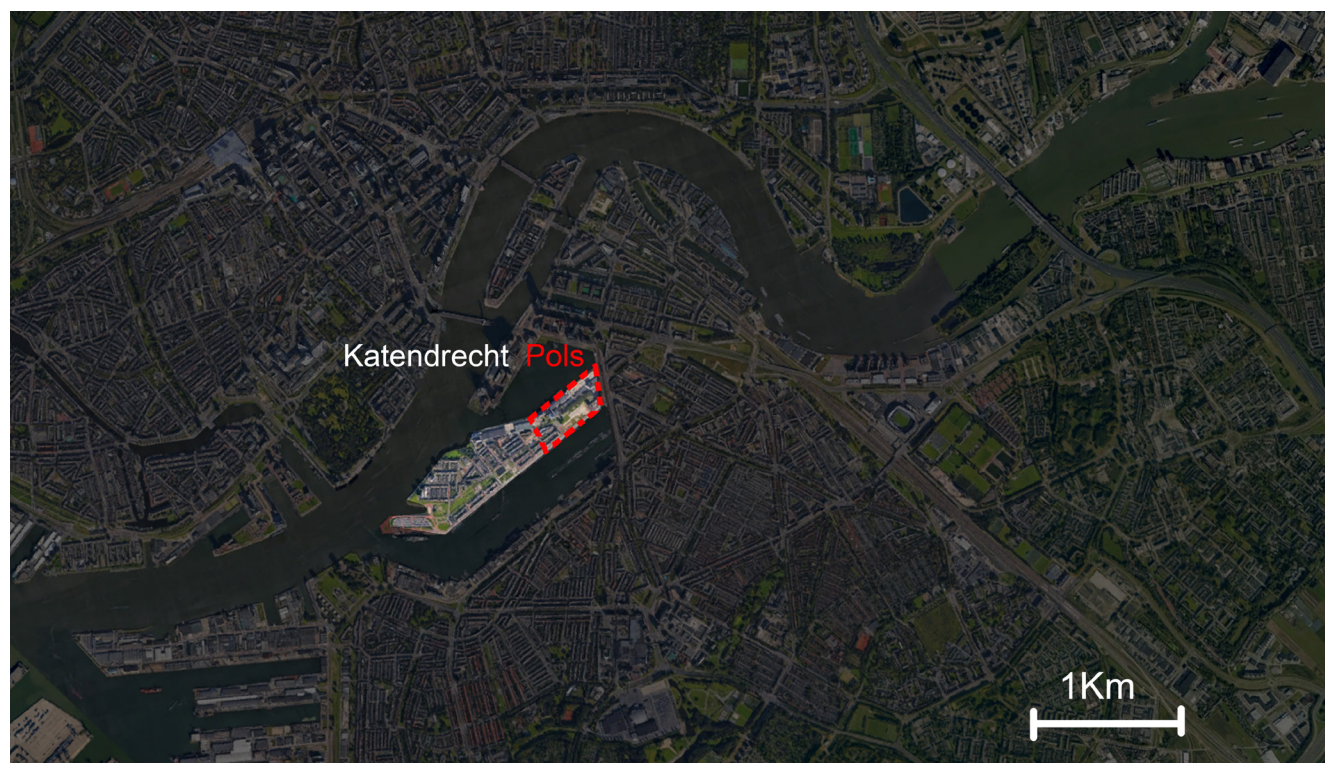
2 HISTORICAL BACKGROUND & DIRECT URBAN CONTEXT

2.0 INTRODUCTION

The second chapter of this rapport on Santos will discuss the historical background of the warehouse and furthermore, it will focus on how the direct urban context relates to Santos. The borough Katendrecht in Rotterdam was constructed just before the 19th century and it was originally planned to be used as a harbour, which it did for a long time. As well as Katendrecht, Santos, does not serve its original purpose anymore and it has been through a lot of changes. These changes will be described and illustrated throughout this chapter. Firstly, the reason of the construction of the coffee warehouse will be described together with the history of Katendrecht itself. Then, the urban context of Katendrecht will be discussed in terms of climate, topography, landscape, morphology, typology and interactive spaces. Furthermore, the sections, street profiles and vistas will illustrate how Santos connects to its direct context. This part will also give some insight in the direct context of Santos in the future. Then, the transport around Santos will be discussed in terms of infrastructure, public transport, waterways, hiking and biking and traffic density. Lastly, the future masterplans will be explained and the chapter concludes with an indication of urban values. This future development is bundled under the name of: The pols of Katendrecht. 'Pols' is the dutch word for wrist and refers to the narrow landing of the harbour onto the mainland highlighted in red (picture 2).



1. Satalite picture of the city of Rotterdam

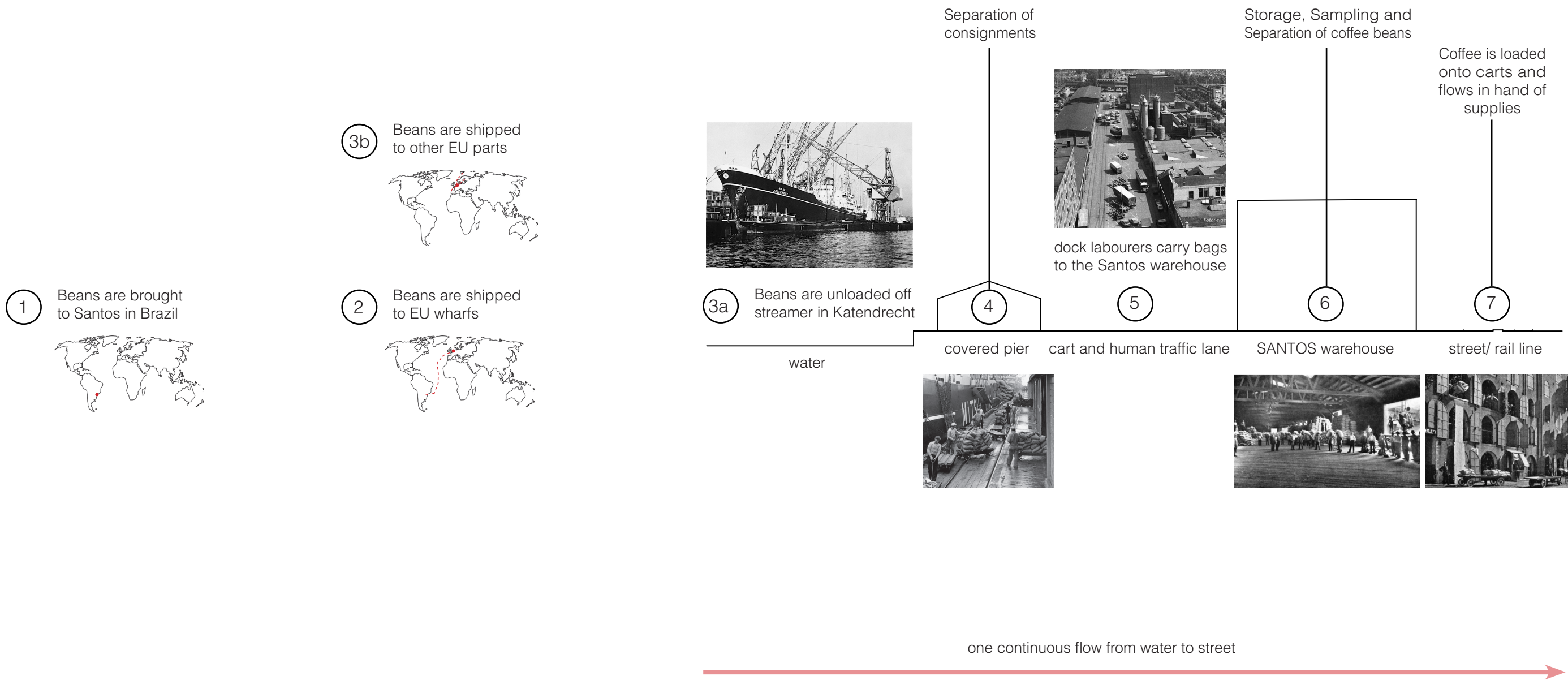


2. Satalite picture of the city of Rotterdam with Katendrecht highlighted in white and the 'Pols' in red.

2.1 COFFEE

2.1.1 FROM THE BEAN TO THE CUP

Santos with the function as a coffee warehouse was one stop in this journey or transition from Santos (Brazil) to Rotterdam (NL). The process from 3a to 7 underpins the strong relation of the warehouse to the water front.



2.2 Historical urban context

Originally Katendrecht was a small settlement in the outskirts of Rotterdam where mainly wealthy citizens had their country house. When the Maashaven and Rijnhaven were created this settlement was almost completely destroyed and replaced with harbour activities and housing for the workers. Because of this change in occupants and the inflow of sailors which came to shore in this area the functions this district housed changed.

First in 1911 the local sailors had a large strike which resulted in a large import of Chinese workers which were housed in this district. Asian people and shops were characteristic for Katendrecht in that time but were later forced out by the municipality when they became obsolete.

In the period which followed the area developed itself as a recreational area for the sailors which had only a short amount of time ashore to enjoy themselves. Because Katendrecht was situated on the edge of Rotterdam away from the city's residential area it was regarded as an outcast and gained an atmosphere of lawlessness. Local bars and clubs thrived and accommodated the famous prostitution scene of that time.

Among other things this was one of the main reasons why the area remained lawless in the period of German occupation (1940-1945). The soldiers were not allowed to visit this area due to the fear of them gaining infectious diseases. An interesting fact was that the Germans imposed laws against playing music which was considered to belong to the negro-people. With this area being restricted to the occupying force it became a safe haven for the local jazz-scene and a sign of resistance.

After the war ended the harbour activities slowly pulled out of the area which resulted in a lot of vacancy, lesser employment opportunities and a diminishing flow of visitors. In recent years the area is changing again. New bars and restaurants are opening which like to use the atmosphere left behind by this rugged history. But also large development projects are joining this development which will change the area into a densely populated and commercial and residential district of Rotterdam.



1. Historic spirit of the neighbourhood



2. Sign saying it's not allowed for German soldiers to enter



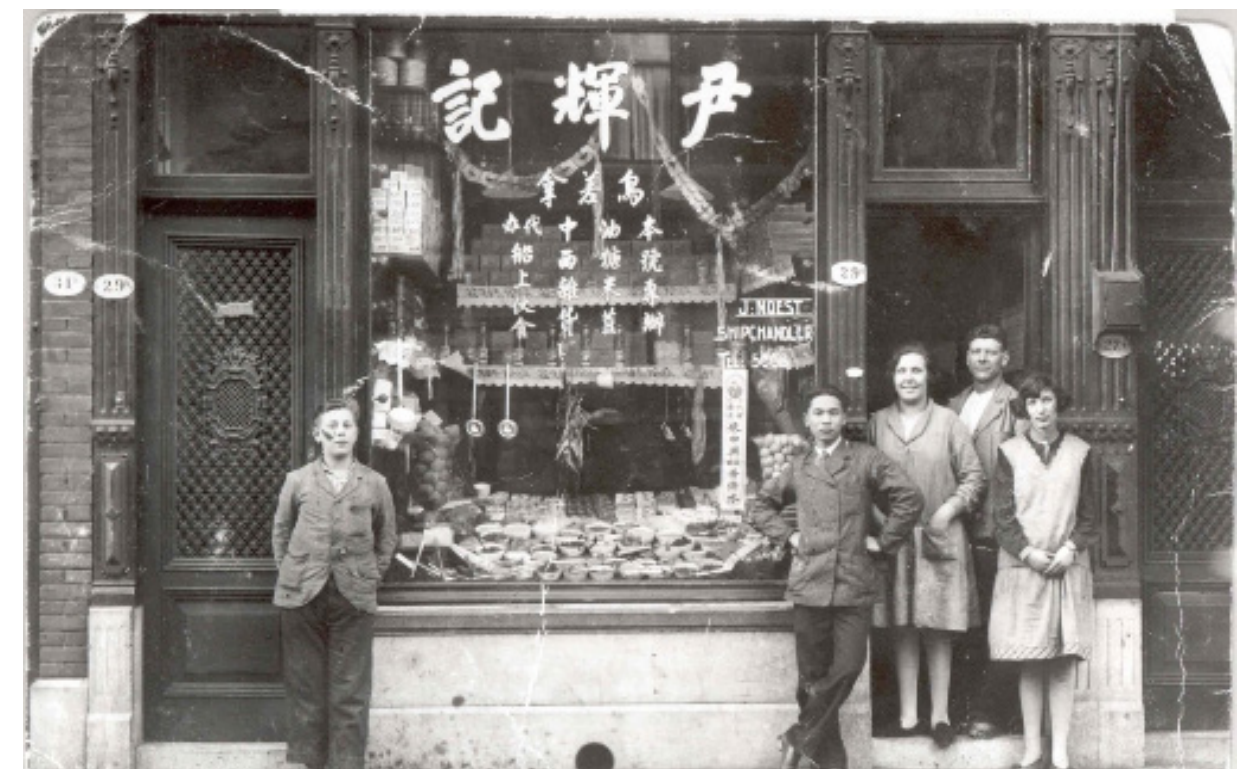
3. Historic picture of Jazzdancing Belvédère in 1943



4. Advertisement remembering the 'fun times' in Katendrecht



5. Historic picture of sailors walking along the bars and clubs of Katendrecht



6. Historic picture of a family in front of their store specializing in Chinese goods

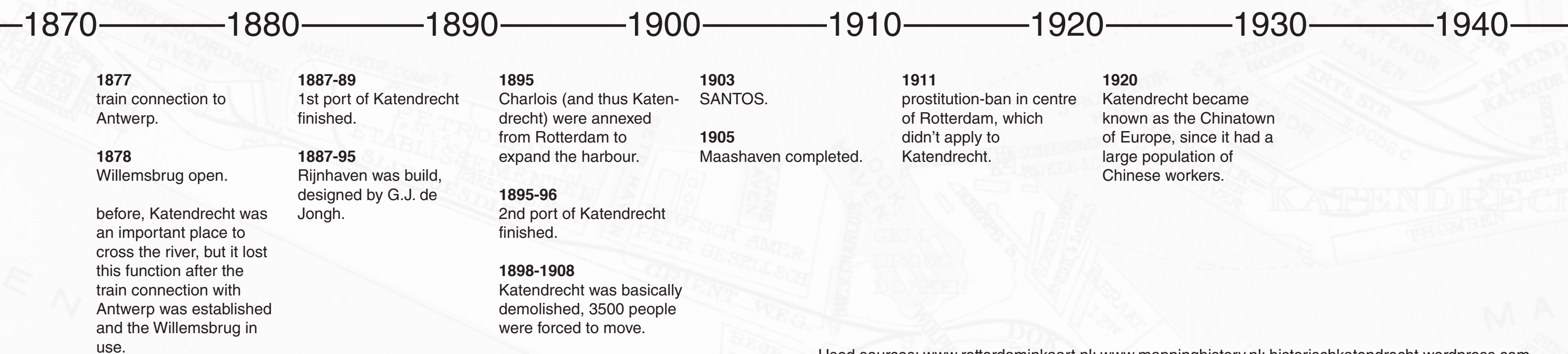
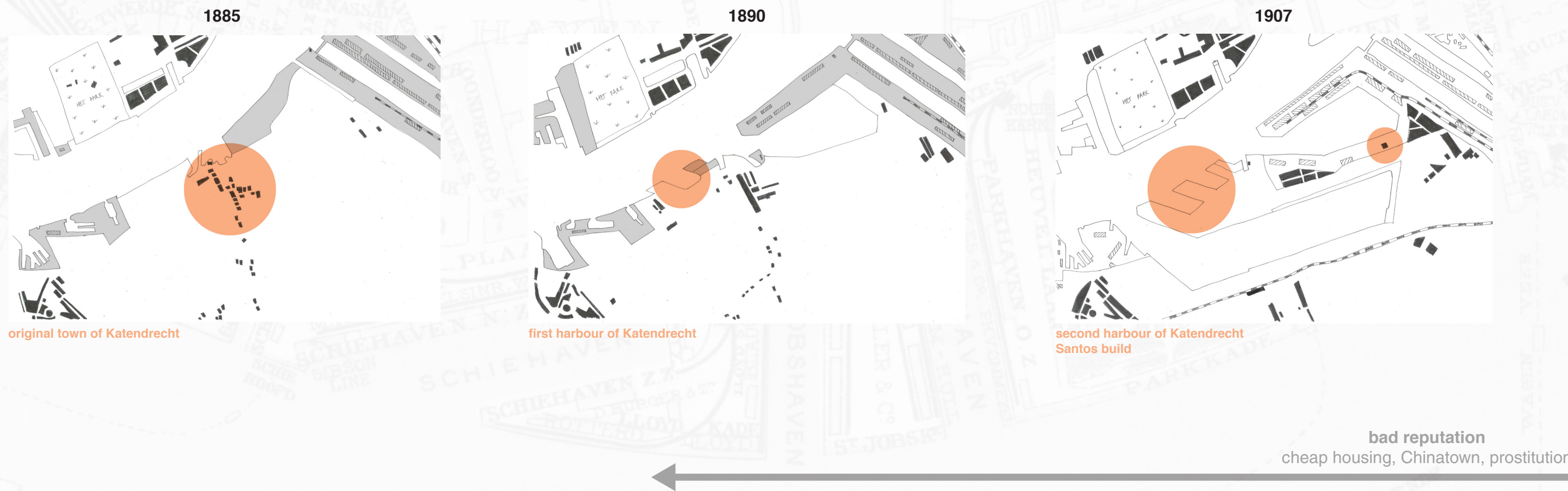
Used sources: 2. Picture of an old sign in Katendrecht. Retrieved at 28-03-2017 <http://anderetijden.nl/aflevering/235/Verboden-voor-Duitsers>

3. Picture of Jazzclub Belvédère Retrieved at 28-03-2017 Private collection of P. Troost <http://www.belvedererotterdam.nl/za-9-juli-belvedere-75-jazzclub/>

4,5. Pictures of Katendrecht as a sailors district. Retrieved at 28-03-2017 from <https://www.tattoobob.nl/geschiedenis-katendrecht/1976-%27De%20Kaap%27%20Wereldberoemd>

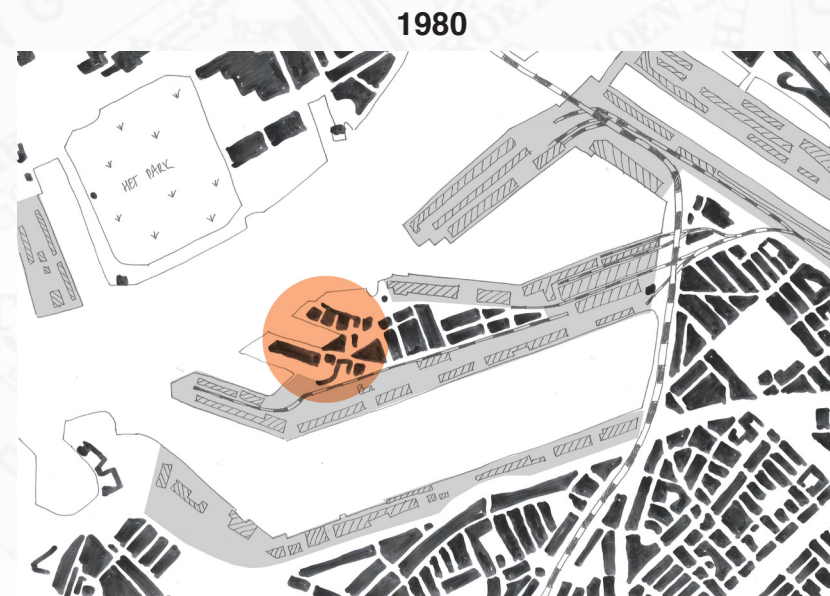
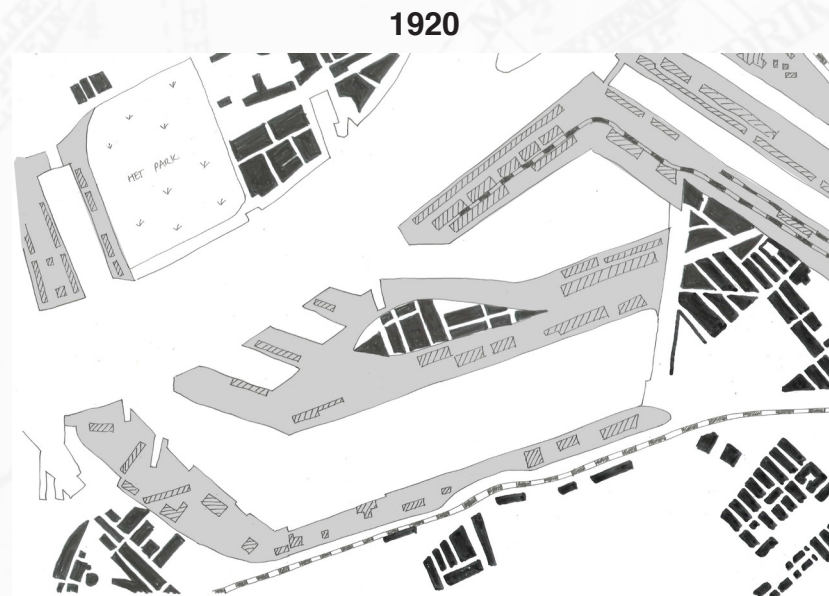
6. Picture of a Chinese store. Retrieved at 28-03-2017 <http://fotos.serc.nl/zuid-holland/rotterdam/rotterdam-28230/>

2.3 TIMELINE SANTOS

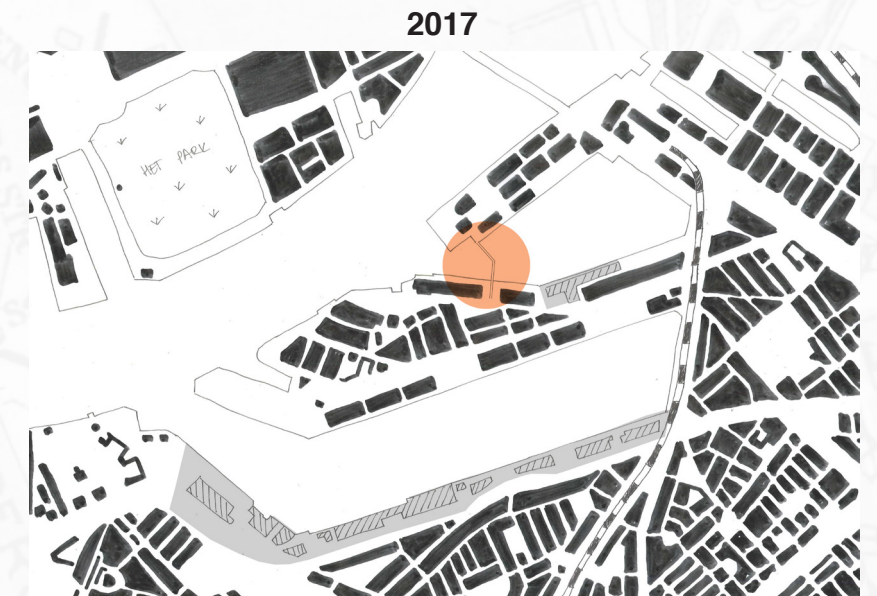


development Katendrecht, drawings by H. Slager

Used sources: www.rotterdaminkkaart.nl; www.mappinghistory.nl; historischkatendrecht.wordpress.com rotterdamwoont.nl & [wikipediapage on Katendrecht](https://en.wikipedia.org/wiki/Katendrecht)



expansion of housing on Katendrecht
(influenced by ownership changes)



bridge between Katendrecht & Kop van Zuid



1950 — 1960 — 1970 — 1980 — 1990 — 2000 — 2010 — 2020 —

1940
bombing of Rotterdam.

almost no German
control in Katendrecht,
became a popular
jazz-centre.

1944-5
quay of Katendrecht was
bombed, 1500 houses +
industry was lost.

1968
Metrostation 'Rijnhaven'
in use.

1972
121 brothels.

1974
urban renewal
Rotterdam, changes in
ownership lead to
large-scale renovation +
new buildings. the
port-functions moved
elsewhere.

1985
1st port of Katendrecht
was filled up,
2nd port of Katendrecht
was made smaller.

2004
"Pact op Zuid", plans to
revitalize Rotterdam Zuid.

2008
SS Rotterdam takes up
permanent residence.

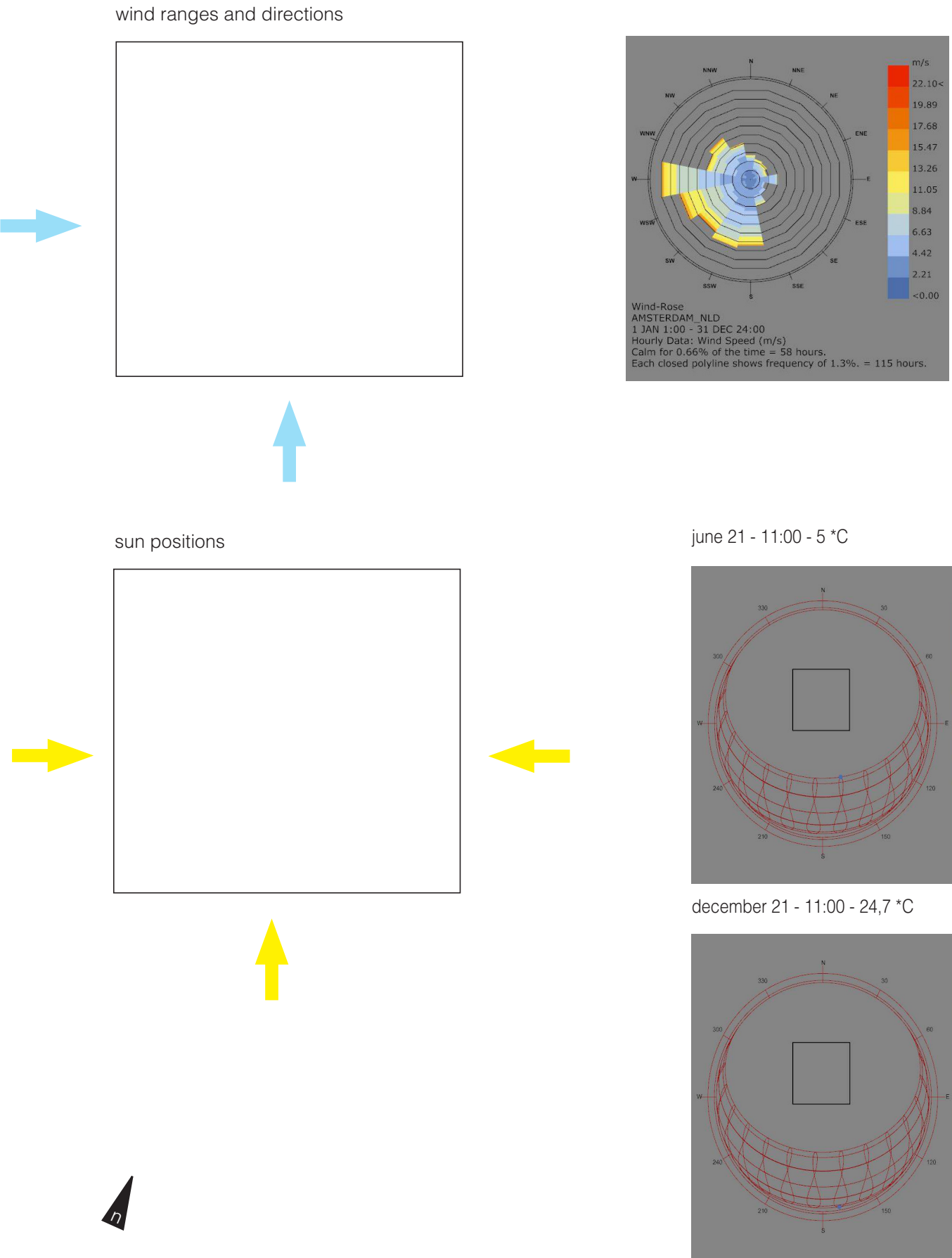
2010
Katendrecht is no longer
seen as a problematic
neighbourhood & proved
twice to be the safest
neighbourhood of
Rotterdam.

2012
Rijnhavenbrug
completed.

2.4 CURRENT URBAN CONTEXT

2.4.1 CLIMATE

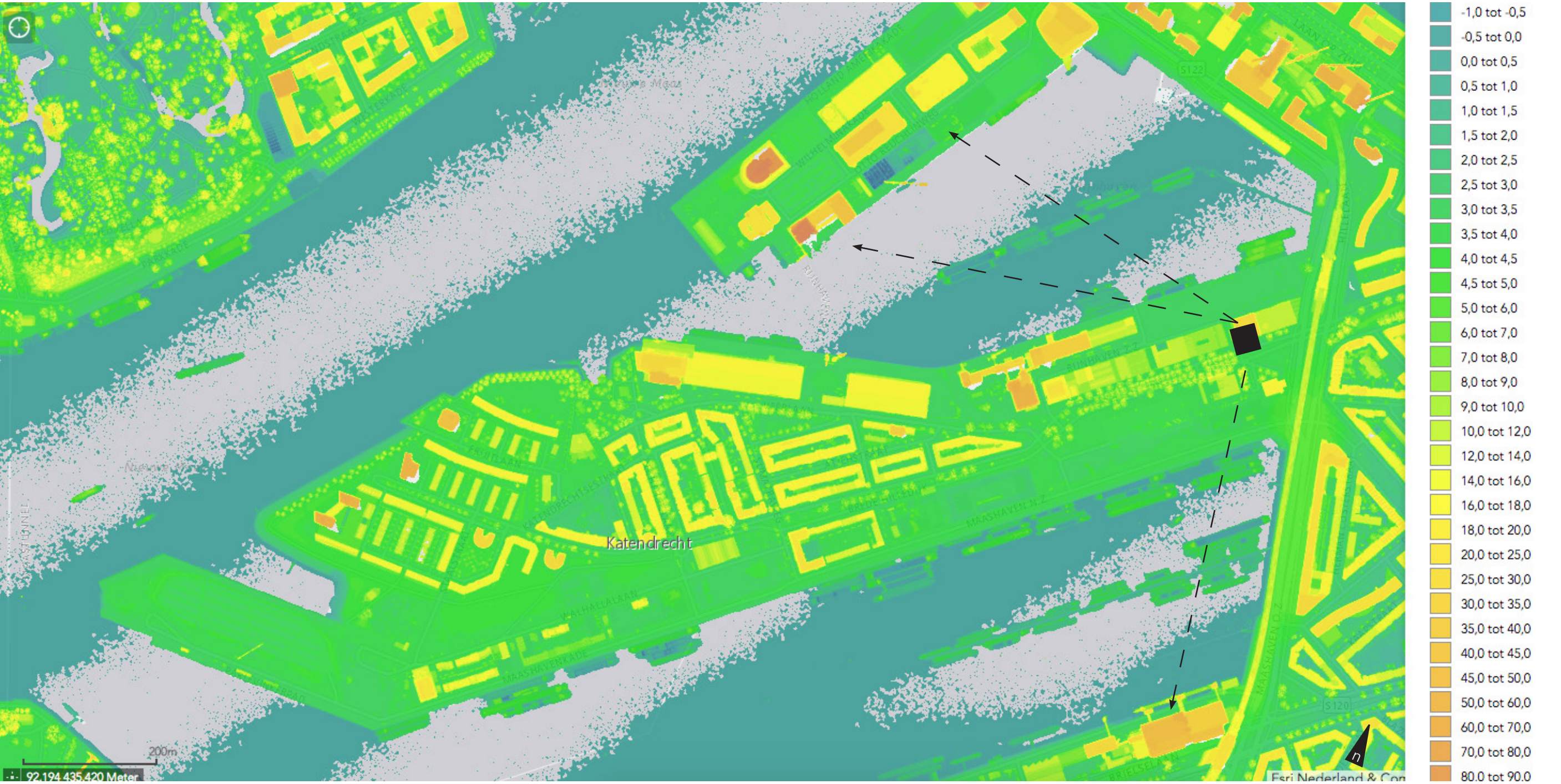
The main wind directions are the South and the West which indicates that SANTOS' system of cross-ventilation works from South to North, rather than the other way around. The heavy winds from the West most probably caused the large cracks in the facade, in addition to the construction and vibration of the lift. The sun hits the building from East, South and West, whereas temperatures up to 35 degrees hit the South facade in summer. This explains why there is more biological growth on the north facade - less sun means longer drying time which leads to formation of algae.



2.4 CURRENT URBAN CONTEXT

2.4.2 TOPOGRAPHY

This map demonstrates that SANTOS (26m) is the highest building in its immediate surroundings, while the view towards the South and the North are especially dominated by Maassilo (>50m) and the Wilhemintoren by OMA (>100m).



2.4 CURRENT URBAN CONTEXT

2.4.3 LANDSCAPE

SANTOS is surrounded by two docks to the North and South and a stripe of vegetation to the South, embedded within the urban fabric of Katendrecht.



water

green

main roads

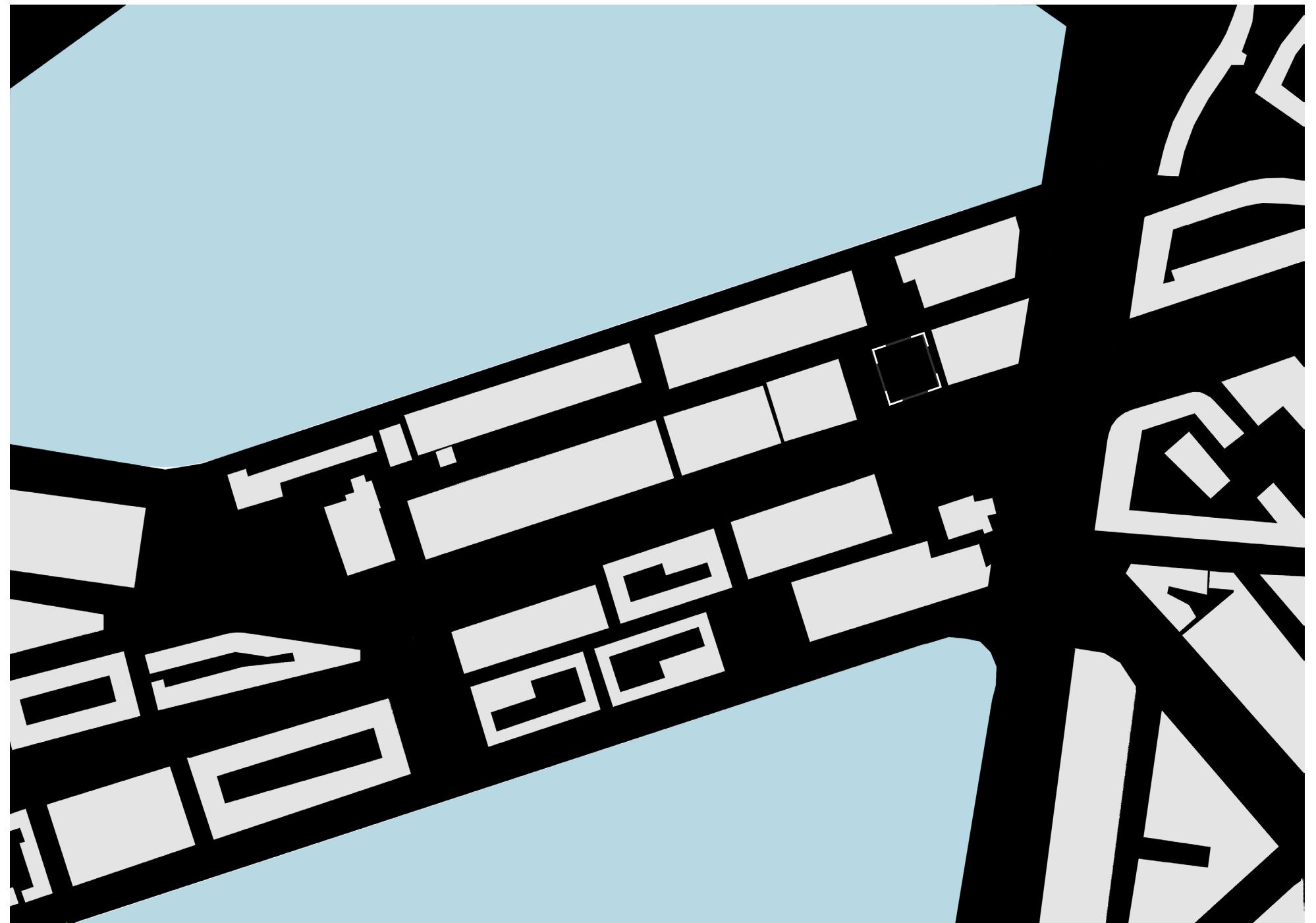
— — railway



2.4 CURRENT URBAN CONTEXT

2.4.4 MORPHOLOGY

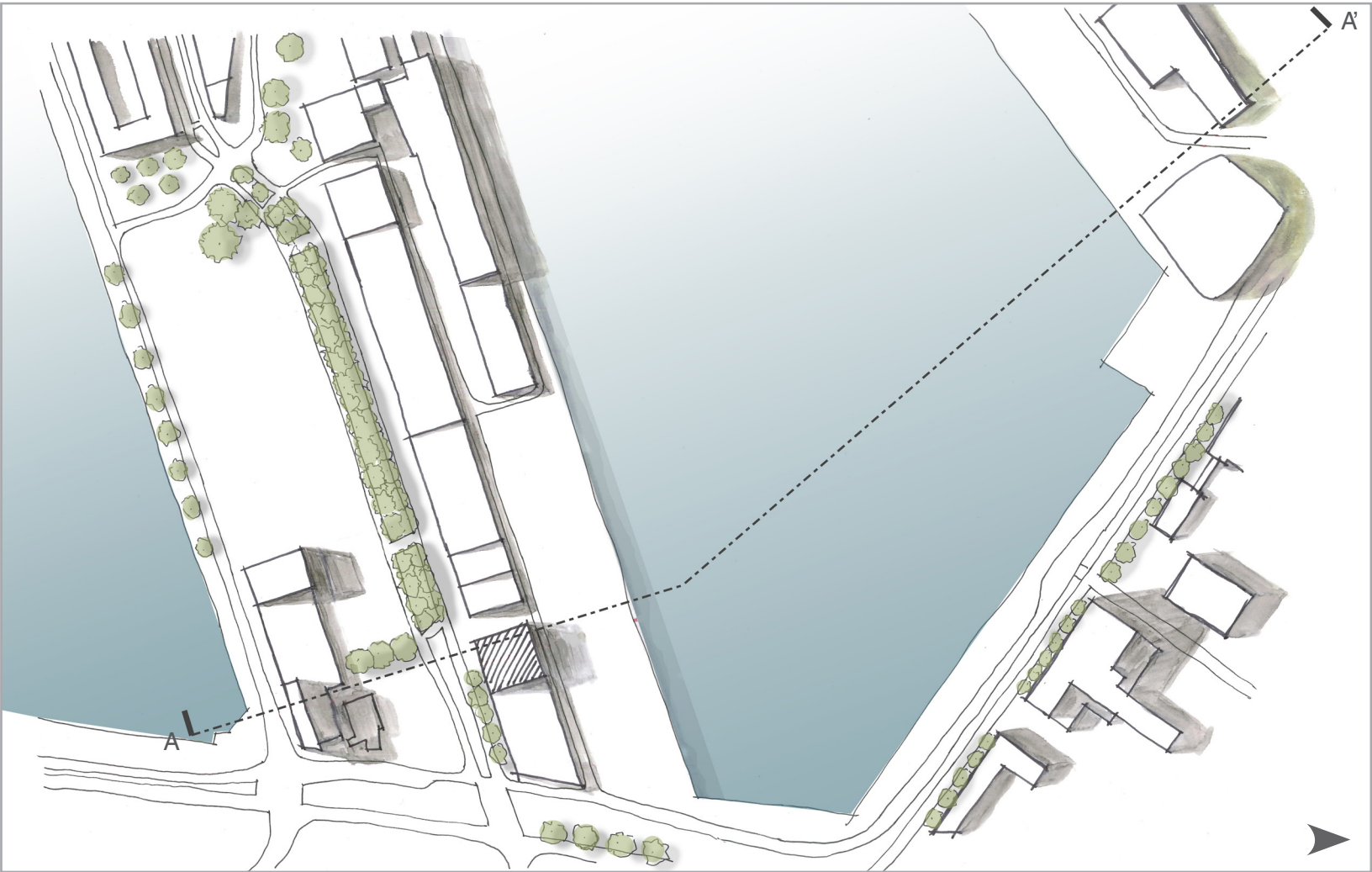
This map inverts the building masses and the street network to direct importance on how the streets and public spaces are (inter)connected.



2.5 SECTIONS

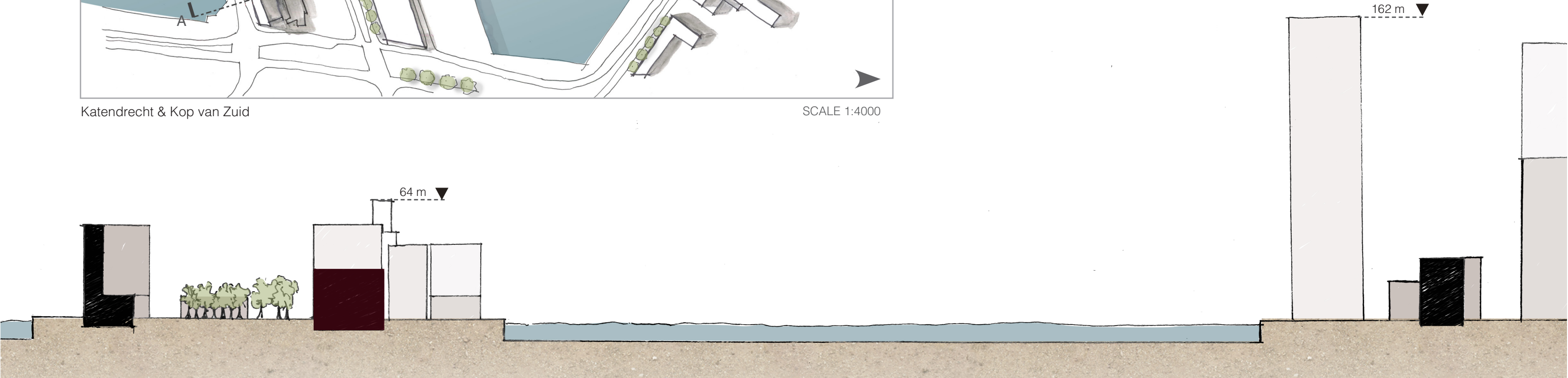
Section harbor area

When comparing Katendrecht to Kop van Zuid, it becomes evident that the buildings in Kop van Zuid are a lot taller than the ones in Katendrecht. The buildings surrounding Santos are somewhat comparable in height to the Santos building.



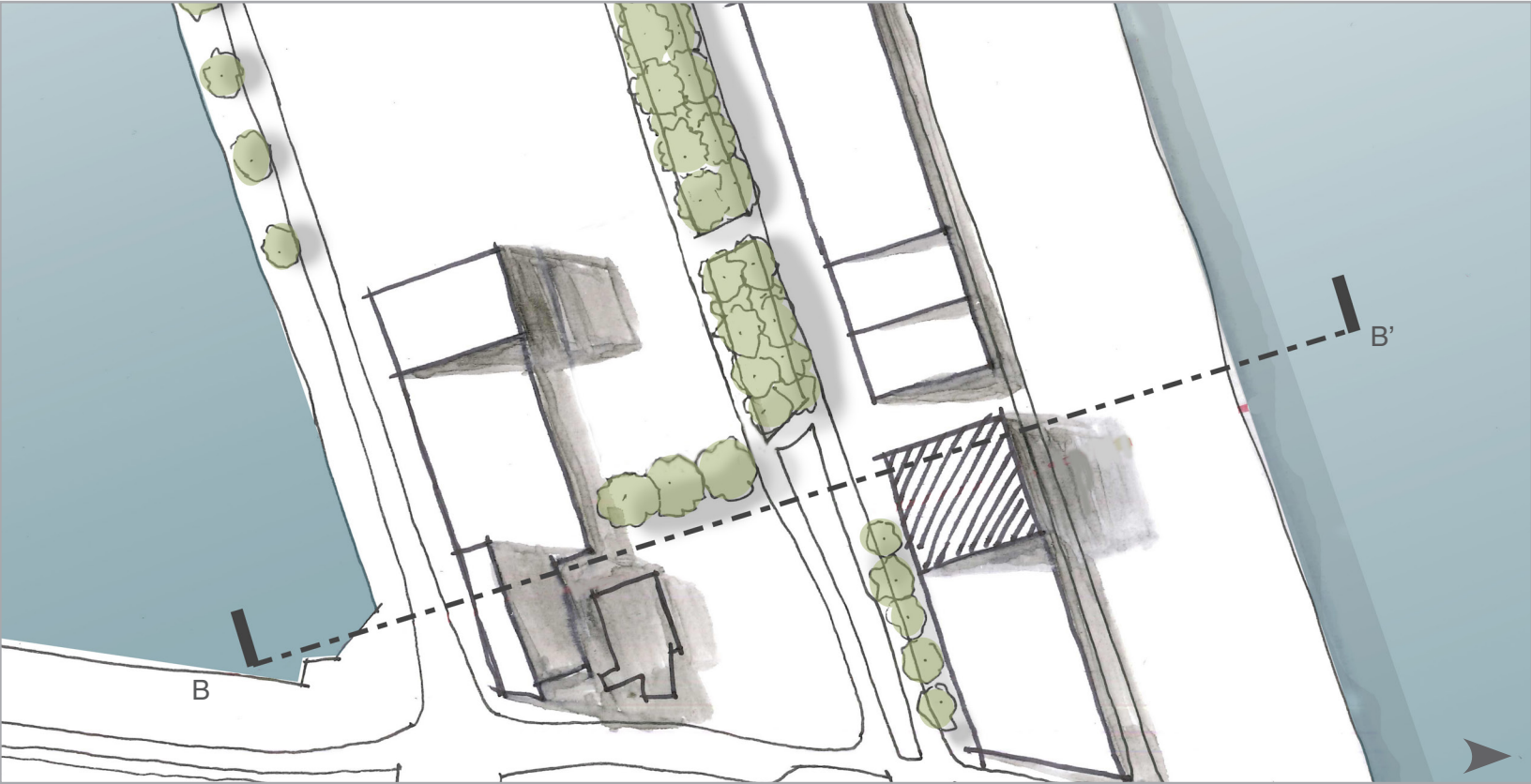
Katendrecht & Kop van Zuid

SCALE 1:4000



Section AA'

SCALE 1:2000

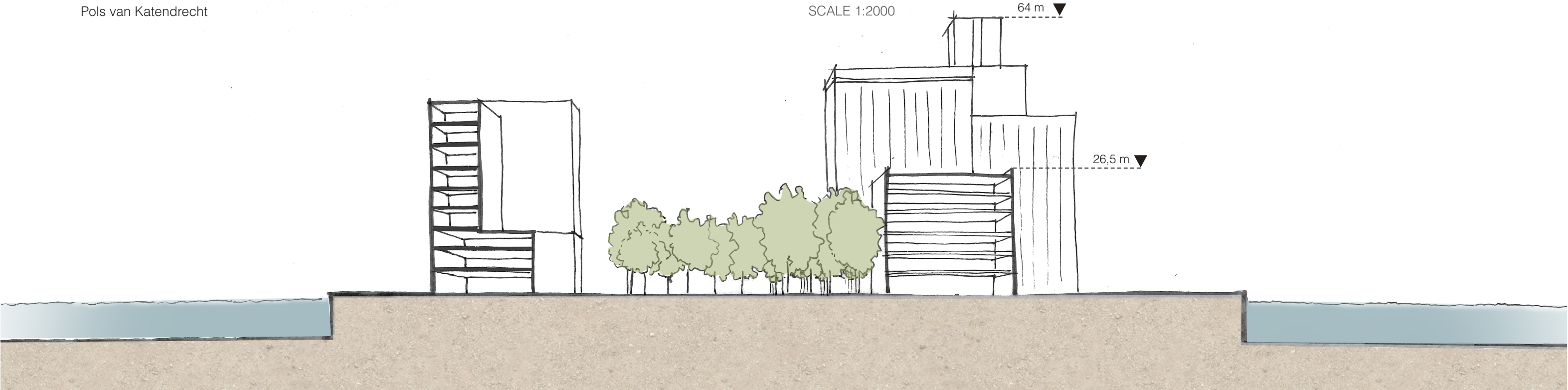


Pols van Katendrecht

SCALE 1:2000

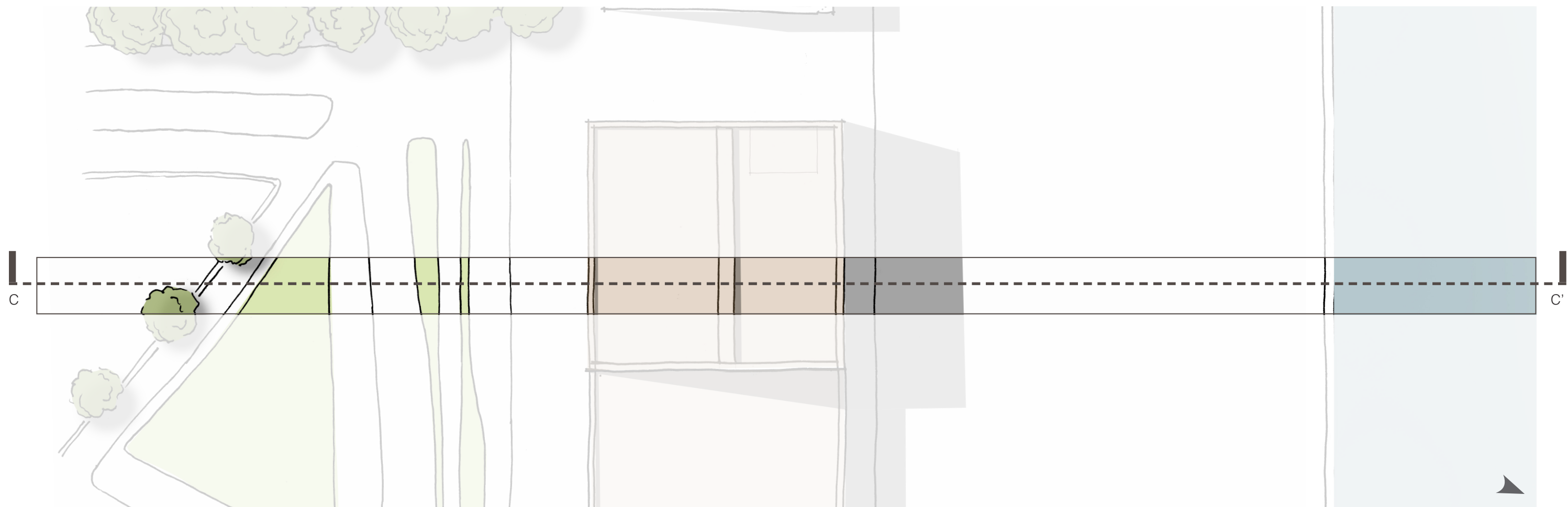
Section Pols Katendrecht

Currently, Santos is one of the smaller buildings on the Pols of Katendrecht, though it is comparable to the heights of the buildings surrounding it. Santos is certainly not the smallest building on the Pols, because the buildings next to it (garages, shops) are mostly lower. However, future plans for Katendrecht suggest that a lot of new buildings will be a lot higher than the current situation. The heights will be more comparable to the buildings on Kop van Zuid.



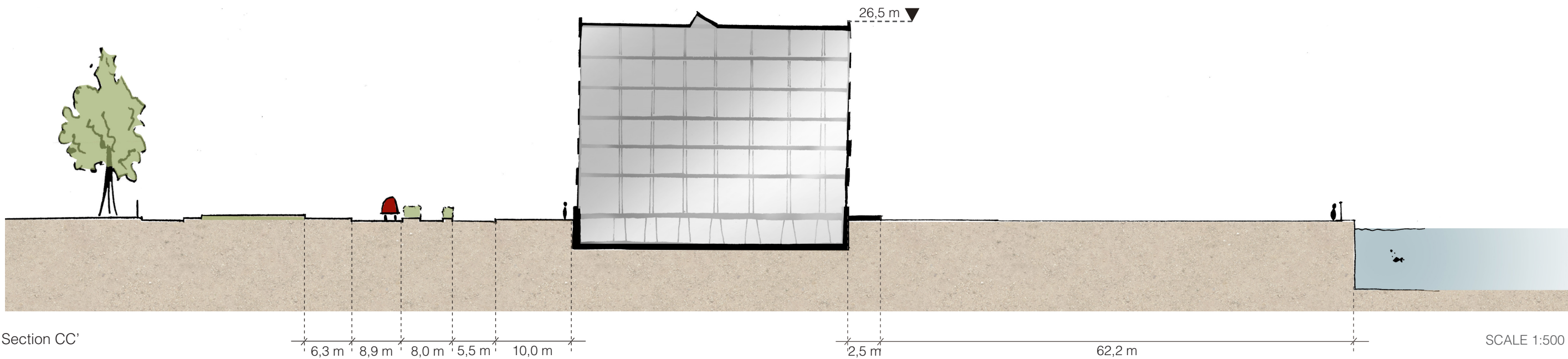
Section BB'

SCALE 1:1000



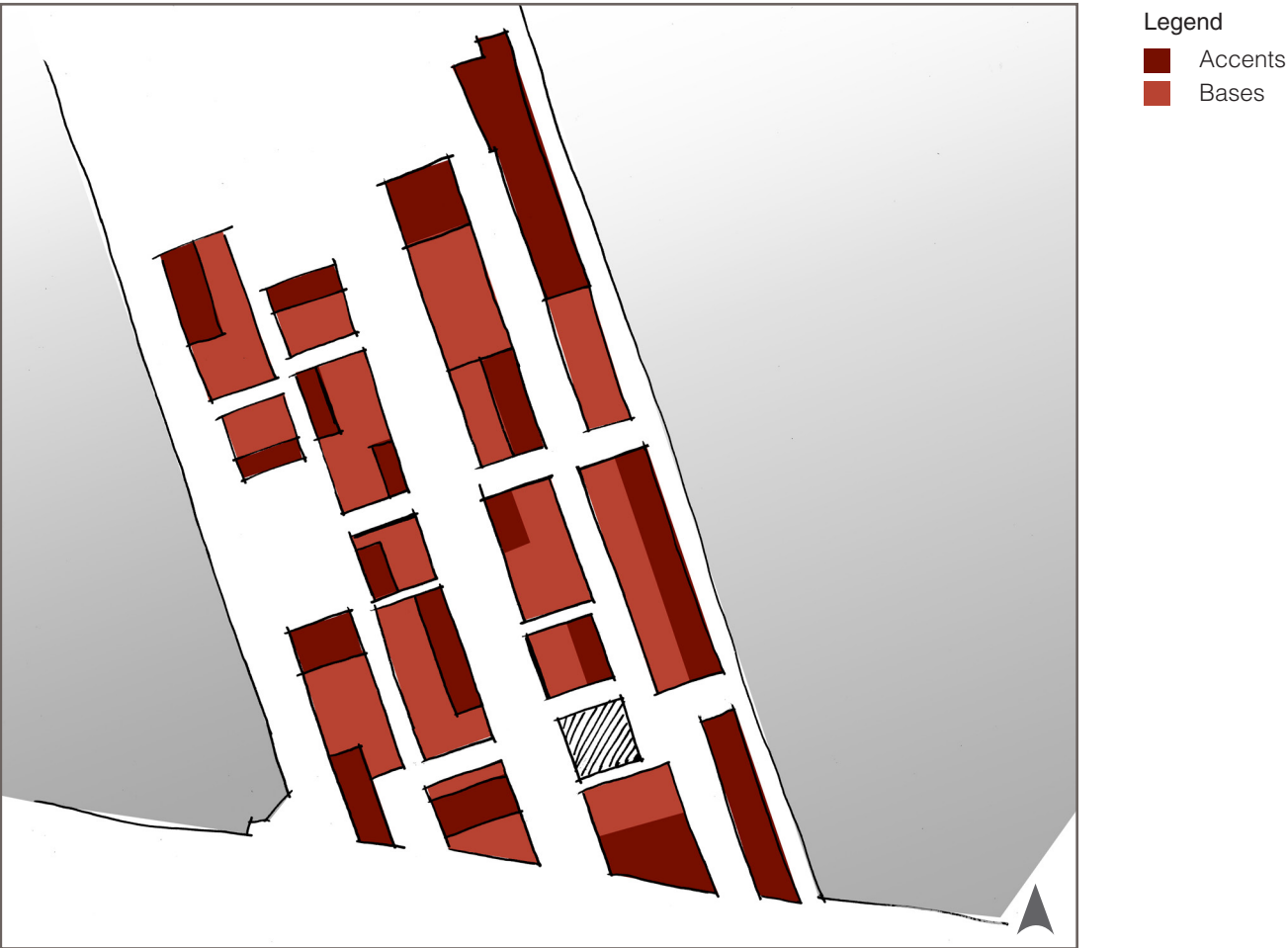
Context of Santos

SCALE 1:500



Section CC'

SCALE 1:500

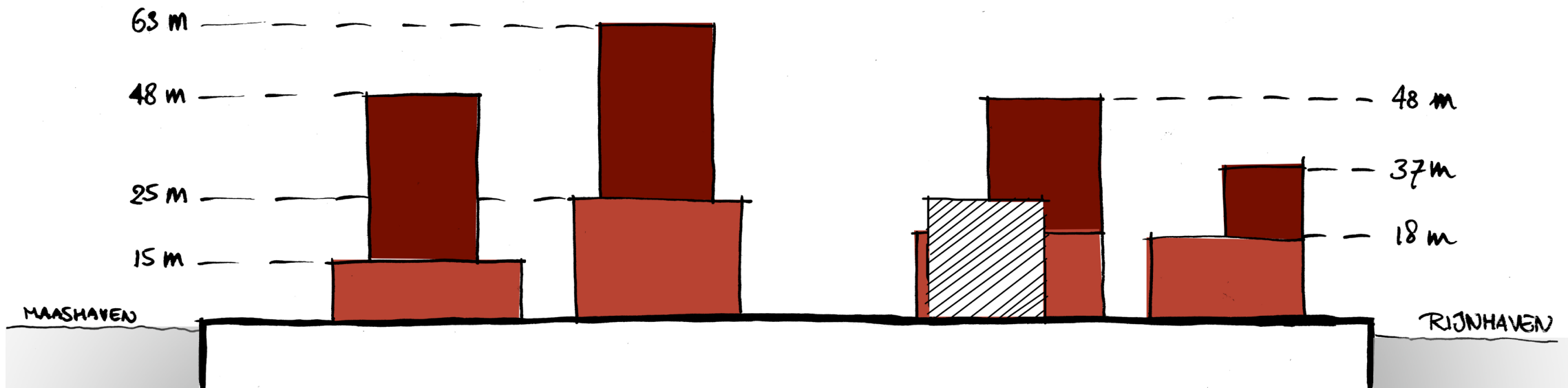


Future plan for the new buildings on Katendrecht

When looking at the future plans for Katendrecht, it is clear that a lot is going to change around Santos. The municipality of Rotterdam has defined rules for the height of new buildings that can be build in Katendrecht. The rapport of the municipality explains the map on the left here, by discribing the old harbor buildings on Katendrecht as iconic buildings. These include the Codrico Latensteijn building and Santos. The rules are based on the assumption that these buildings have to stay iconic.

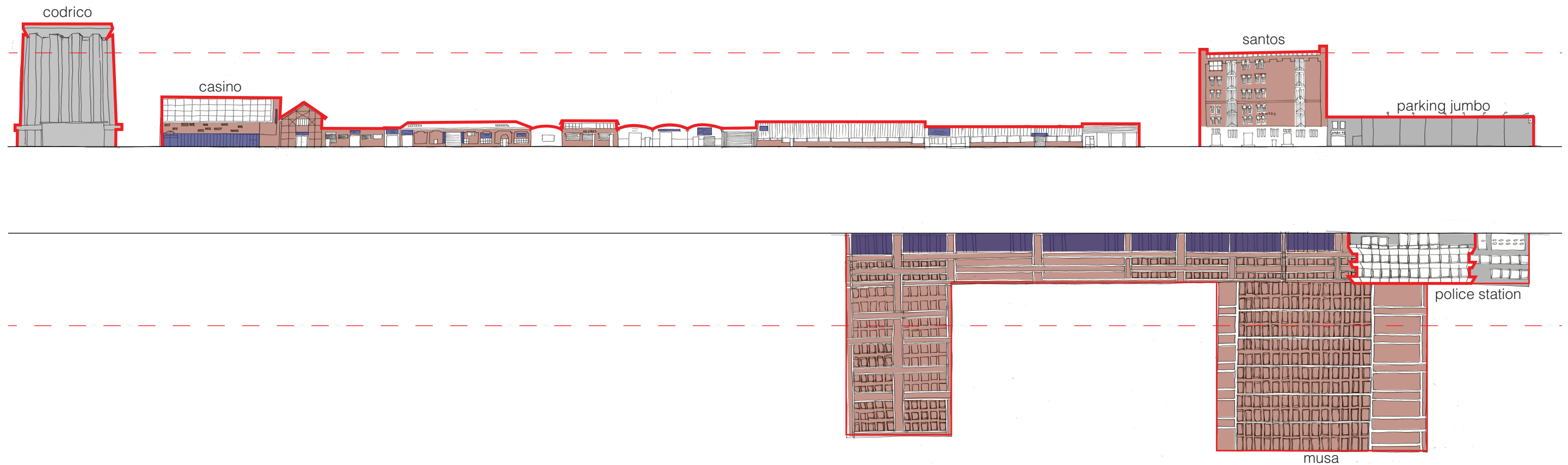
The buildings in the same strip as Santos are to be lower than Santos, with a maximum height of 18 meter. However, that only counts for the base of the buildings. There can be 'accents' on top of the base of 63 meters that can take up to 50% of the surface of the base. The strip next to the Rijnhaven can have a height of 18 meters as well with accents of 37 meters.

Thus, in the future, Santos will become a lot less visible and will lose its prominent role on the Pols of Katendrecht.



Maximum heights of future buildings on Katendrecht

2.6 STREET PROFILES



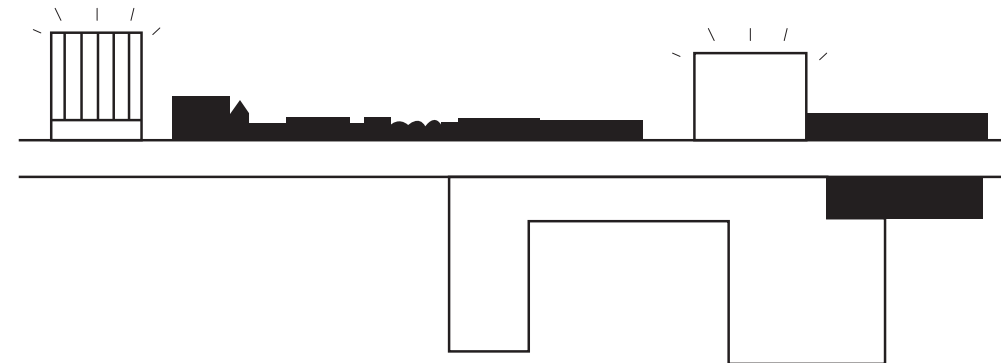
CURRENT SITUATION

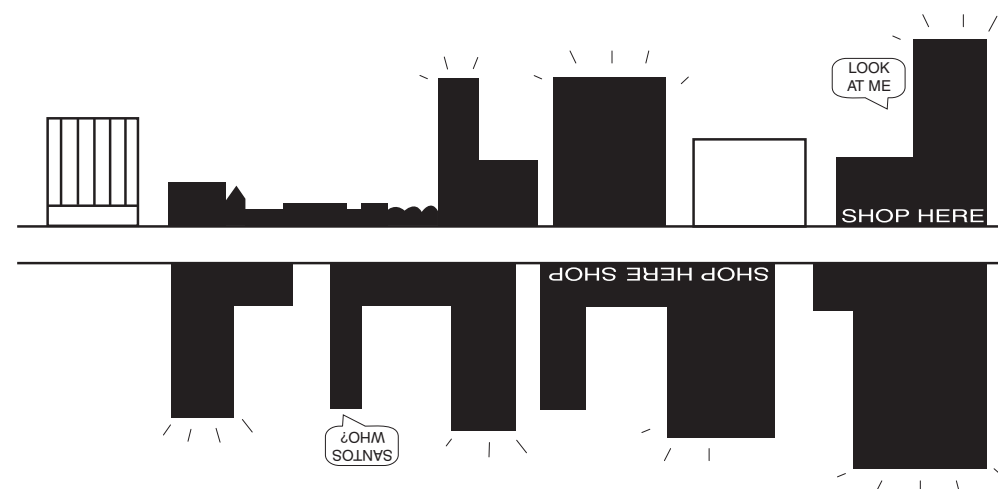
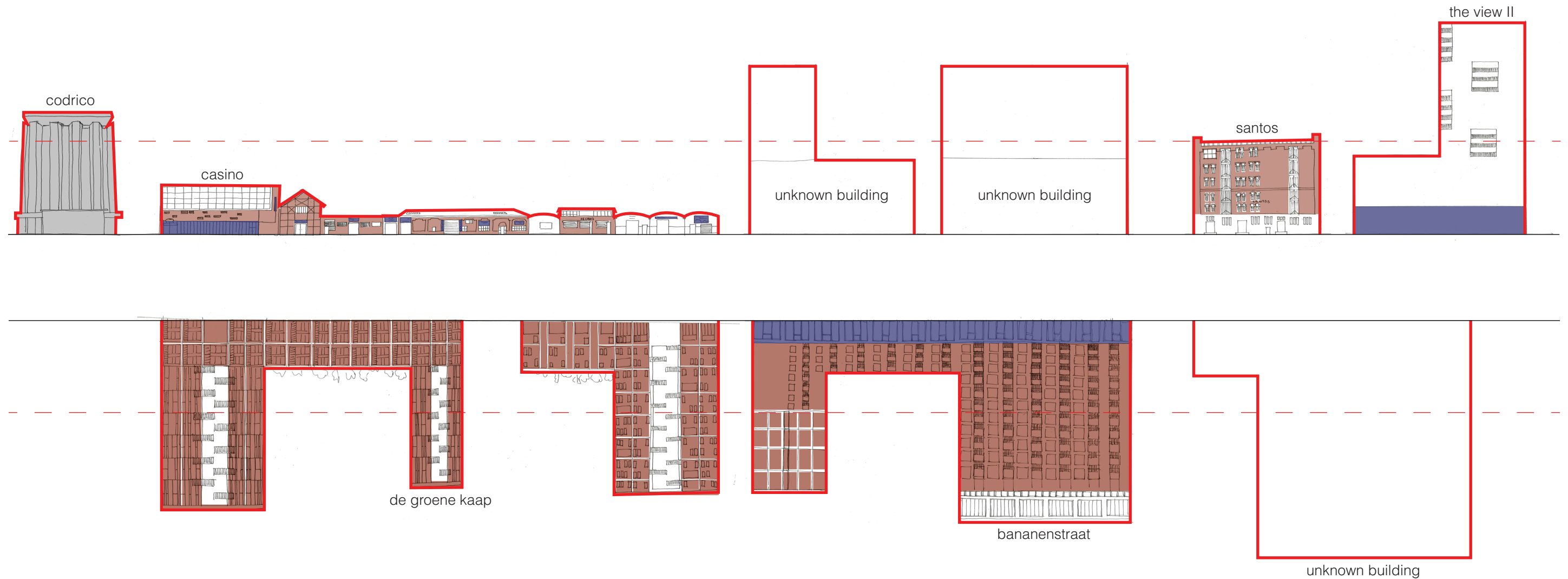
Currently, Santos is one of the higher buildings in Katendrecht Pols, together with Codrico and the newly build Musa (which is placed one street further). You could say that these two make the up the **landmarks** of Katendrecht Pols.

Most of the other buildings in the street are 1 to 2 storeys high, and they include a large number of garages.

Materialisation

The materialisation varies, but there is a lot of brick in the neighbourhood. The newly constructed Musa is also made out of brick, and its facade is accentuated with (natural stone) lines, which fit well to the facade of Santos.





NEW SITUATION

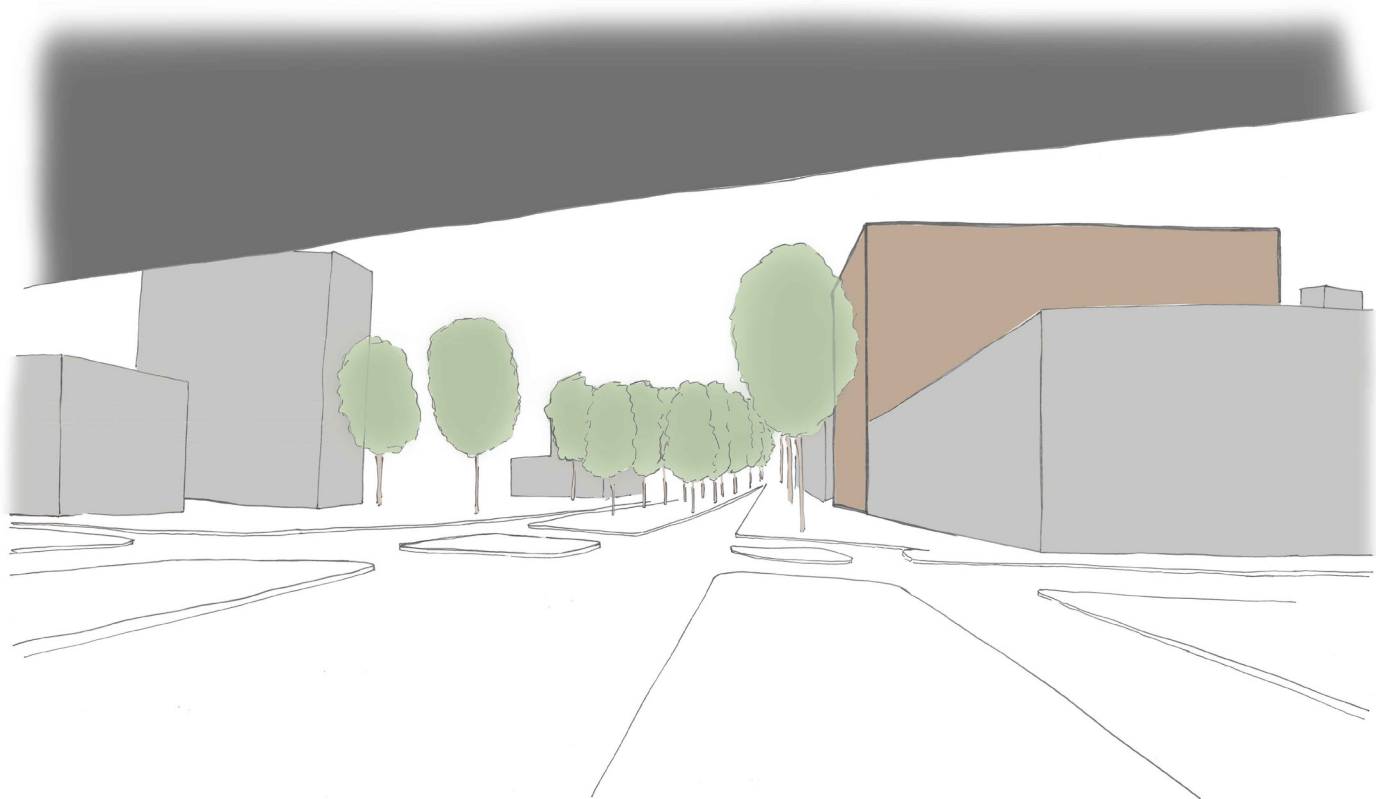
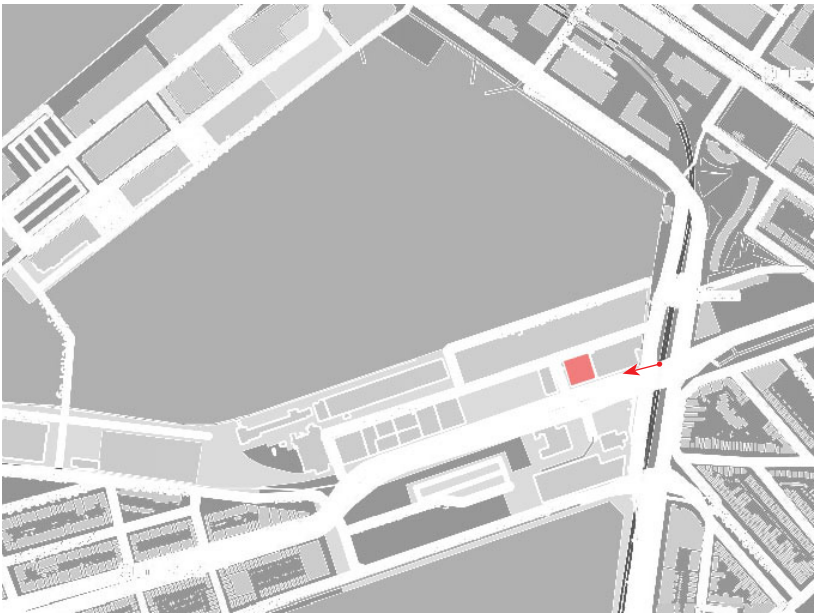
In the new plans, **Santos actually becomes one of the smaller buildings** in the Brede Hilledijk. Santos will be higher than the base of these new buildings, but the added accents will be almost double its height. These buildings house mostly dwelling & hotel functions, with mixed use in the plinth.

Materialisation

Continuing the ideas behind Musa, the new building are also constructed in **bricks** combined with a **pattern of white lines** (natural stone). The bricks vary slightly in colourization, to avoid creating a very monotone assembly. The building that diverges from the brick material, is the building right next to Santos (The View II). In the plans as they stand now, this will be a very airy building with a lot of glass and a white finish, similar to The View I that will be located behind Santos.

2.7 VISTAS

If you approach Santos from the Afrikaanderbuurt the view to the building is blocked by the metro line. If you get closer to the building you can see more and more of Santos and its surrounding. So, from the Afrikaanderbuurt Santos is not an eye-catcher or anything like that. This will even be less in the future, because the building in front of Santos will be higher than now.

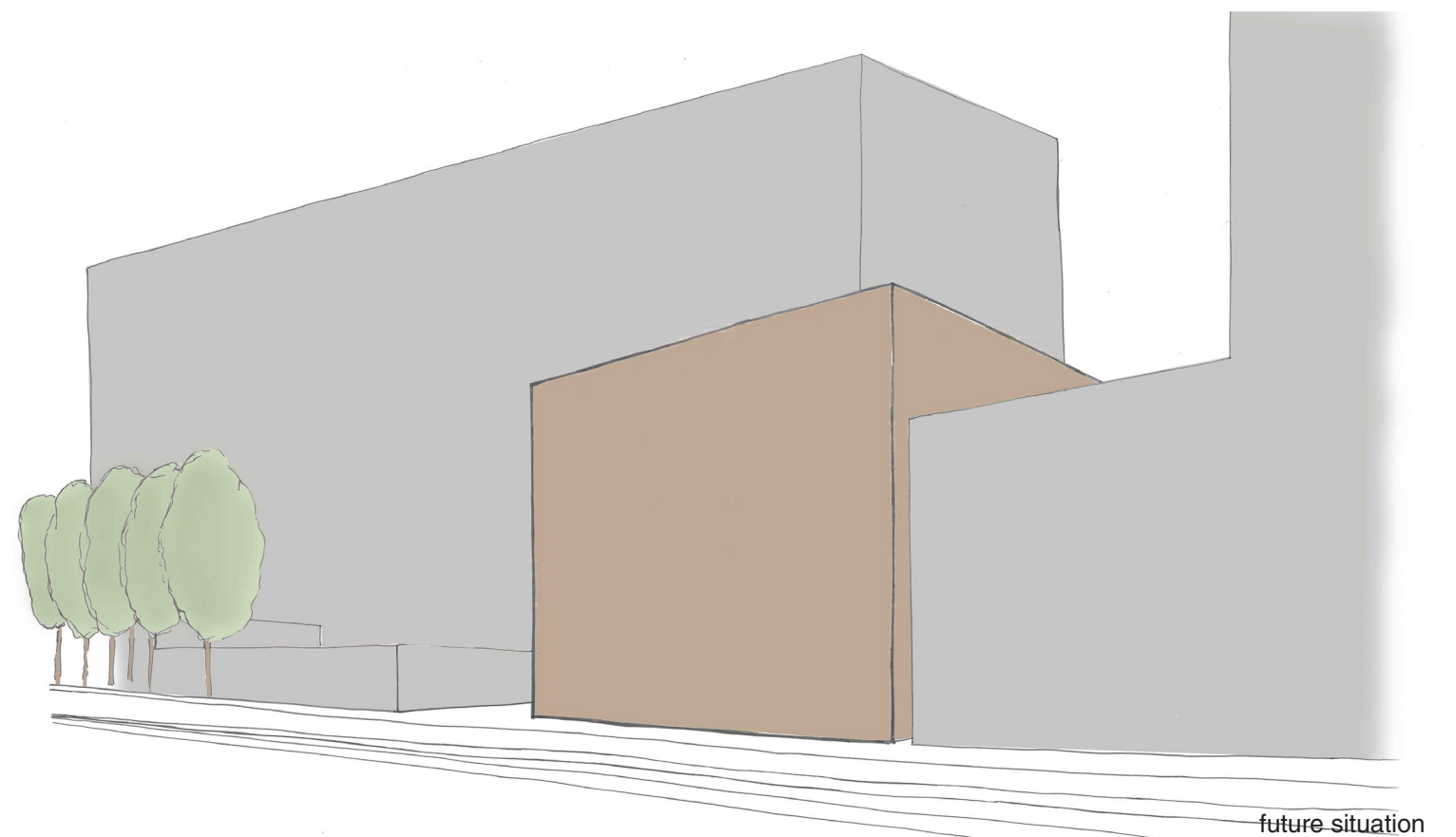
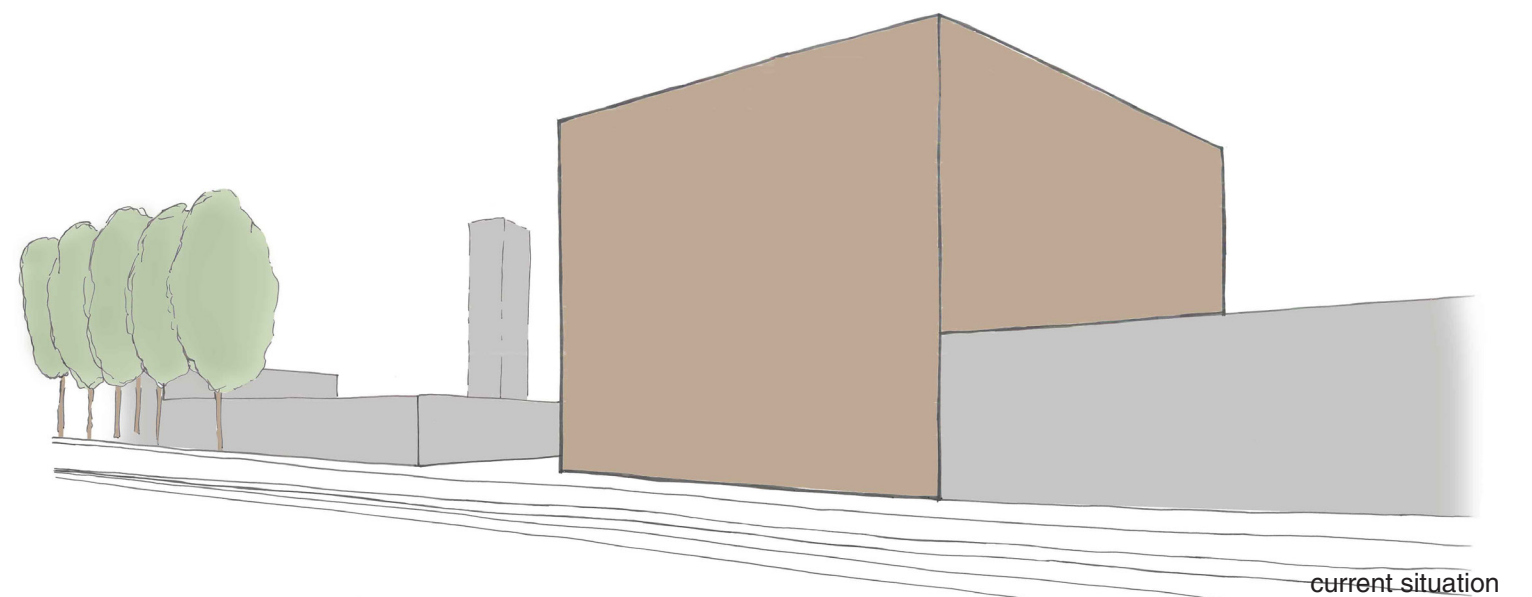
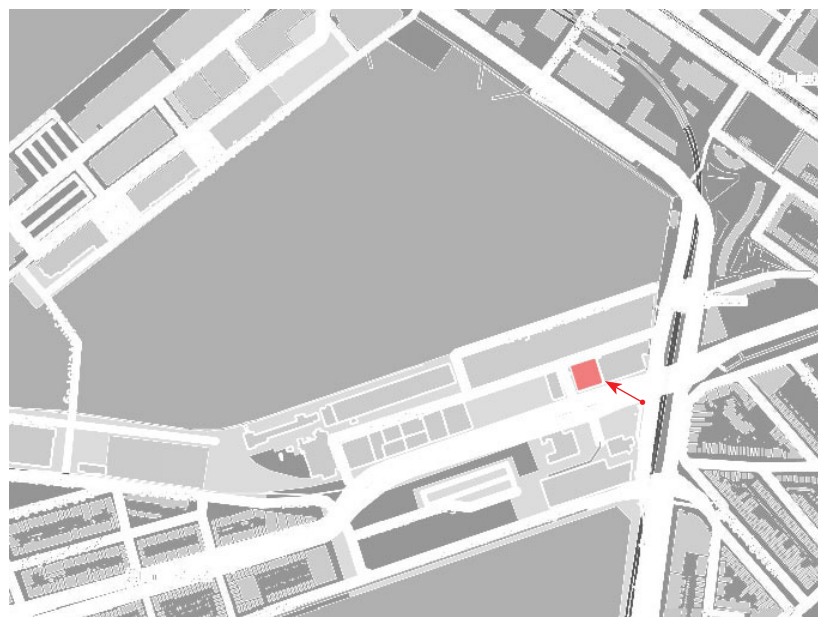


current situation



future situation

When you look at Santos from the front you can see the change in volume of the buildings around Santos quite well. In the current situation you can immediately notice Santos because of its volume, while in the future the buildings around Santos will rise and will make Santos less noticeable.



When you walk from Katendrecht to Santos you can notice a few things. First of all, the road is almost like a boulevard with the straight lines of the road and the buildings on the left side. In addition, the trees surrounding it give this street the atmosphere of a boulevard. Because of these trees, the view to Santos is blocked, which makes it difficult to notice the building. In the future there will be high building placed next to Santos what makes it more difficult to notice the building as well. Another future change that fits to the topic of the boulevard street is the line of buildings on the right side. This will be in a more straight line and is therefore more boulevard like than before.

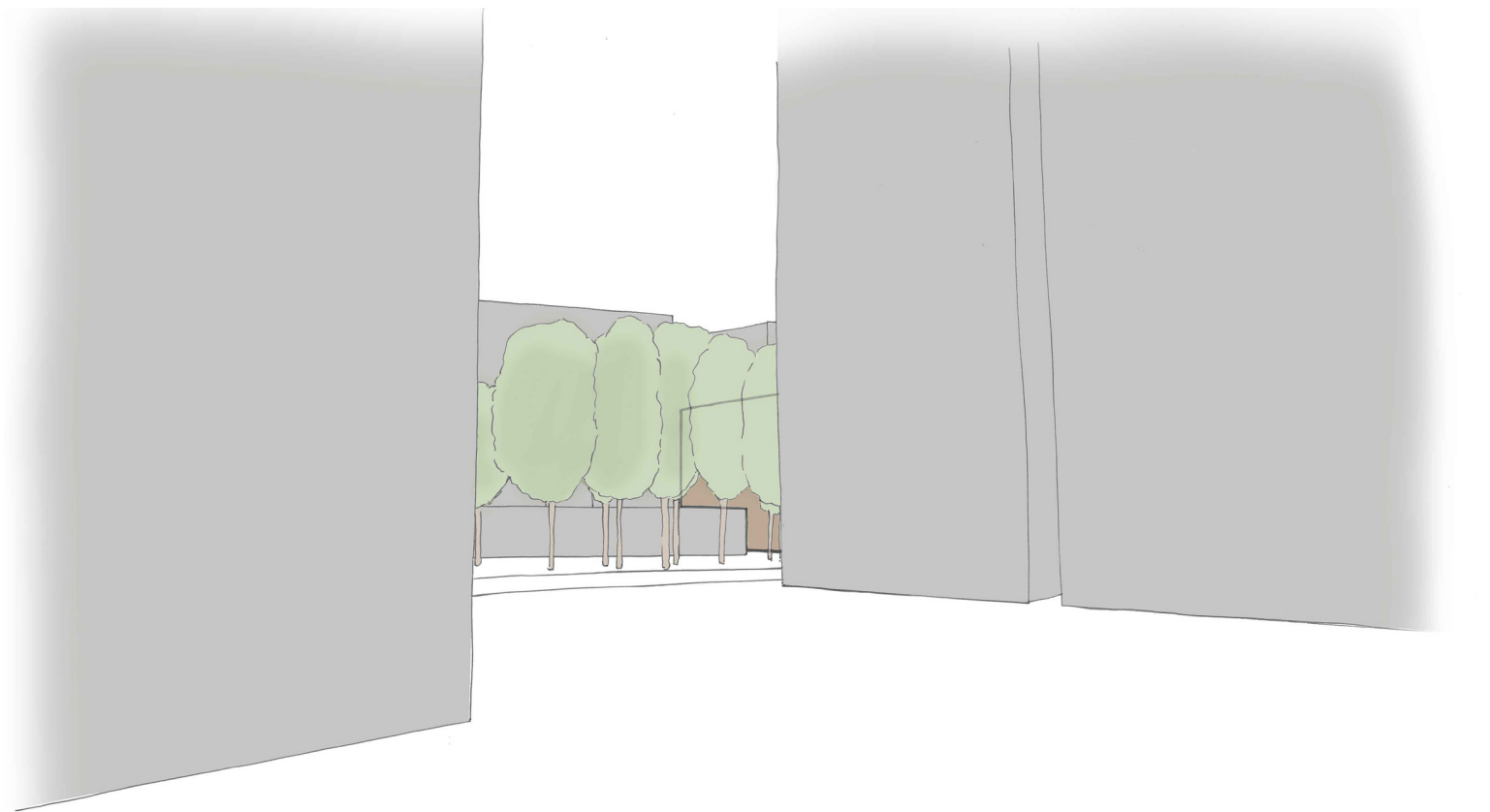
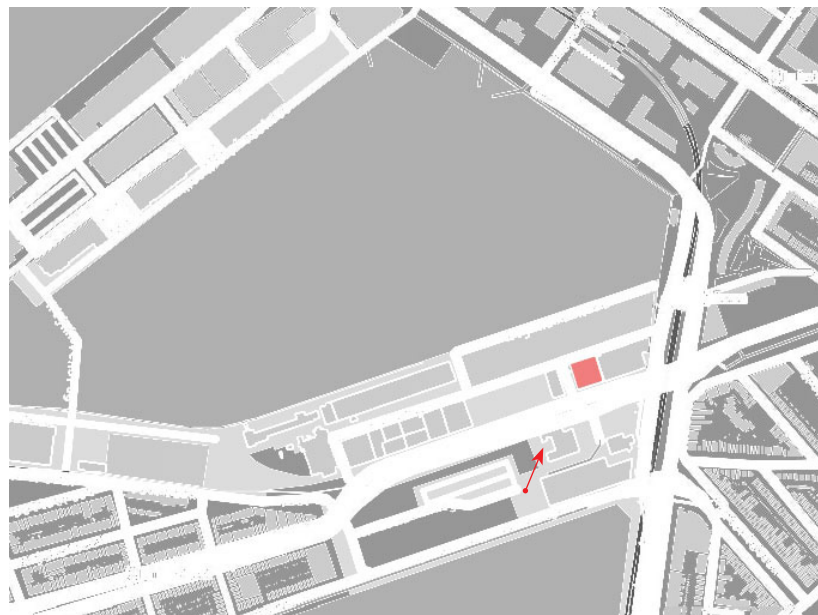


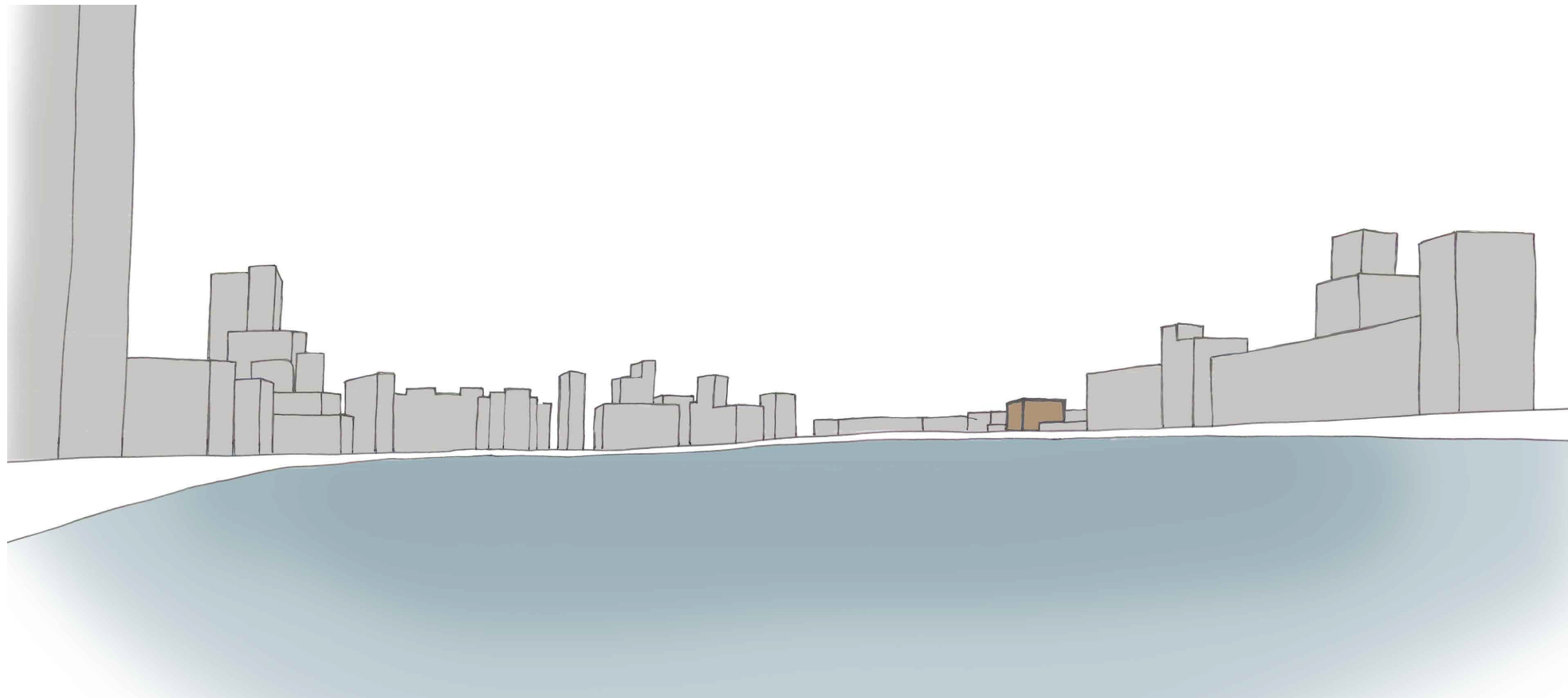
current situation



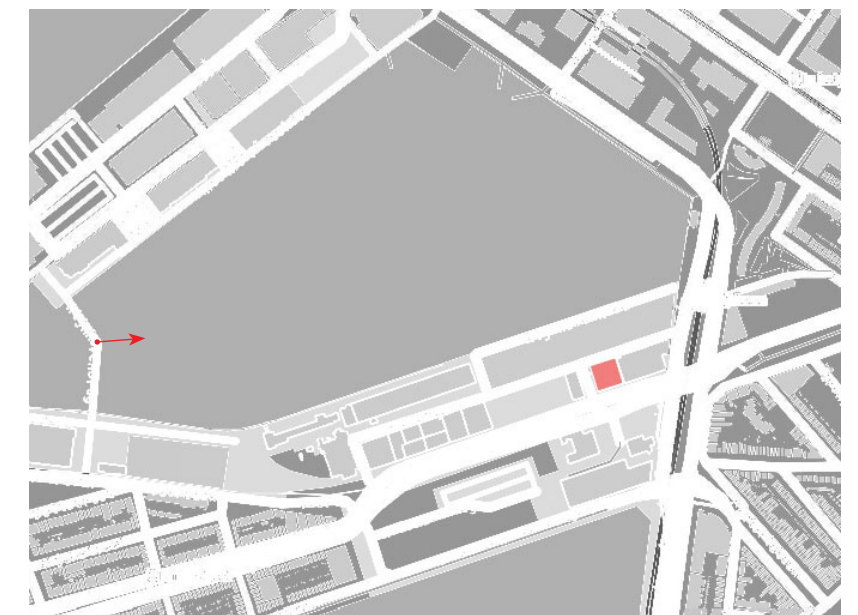
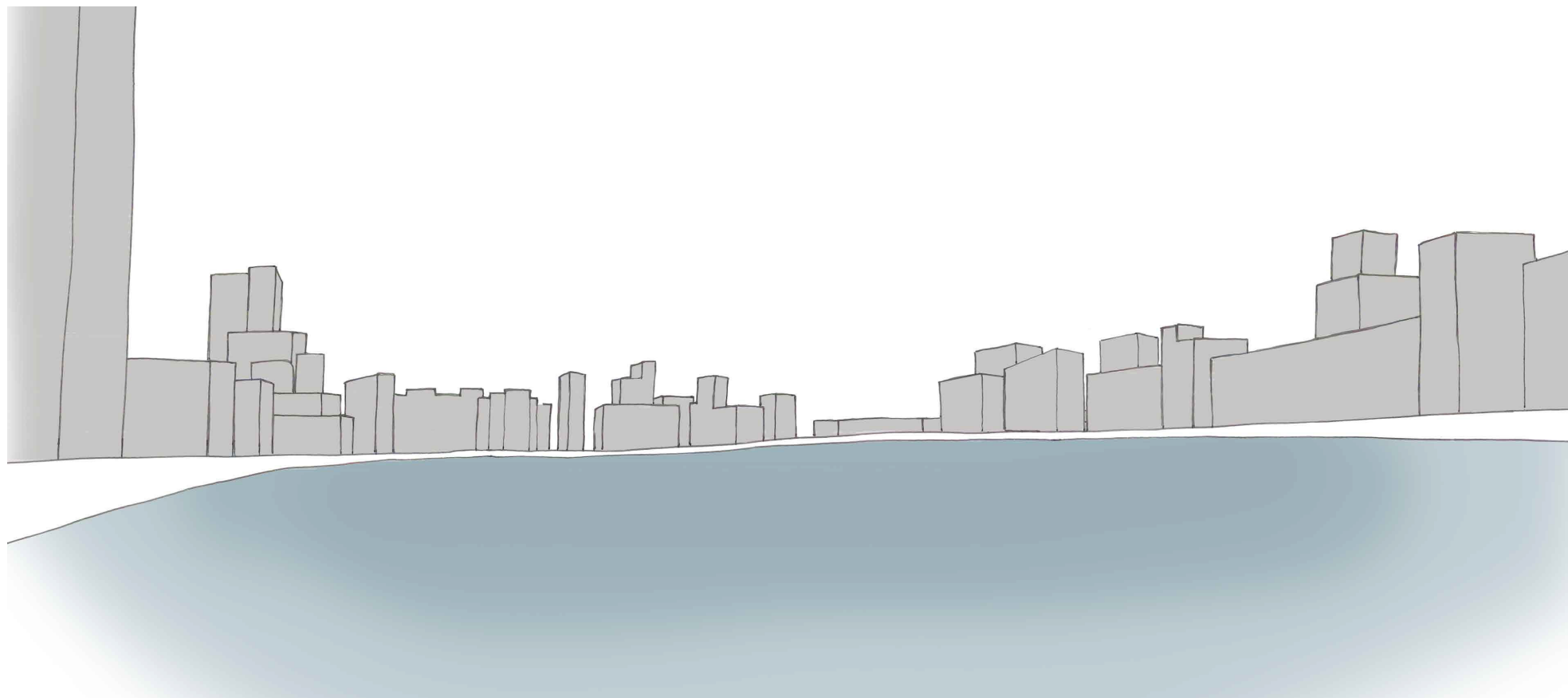
future situation

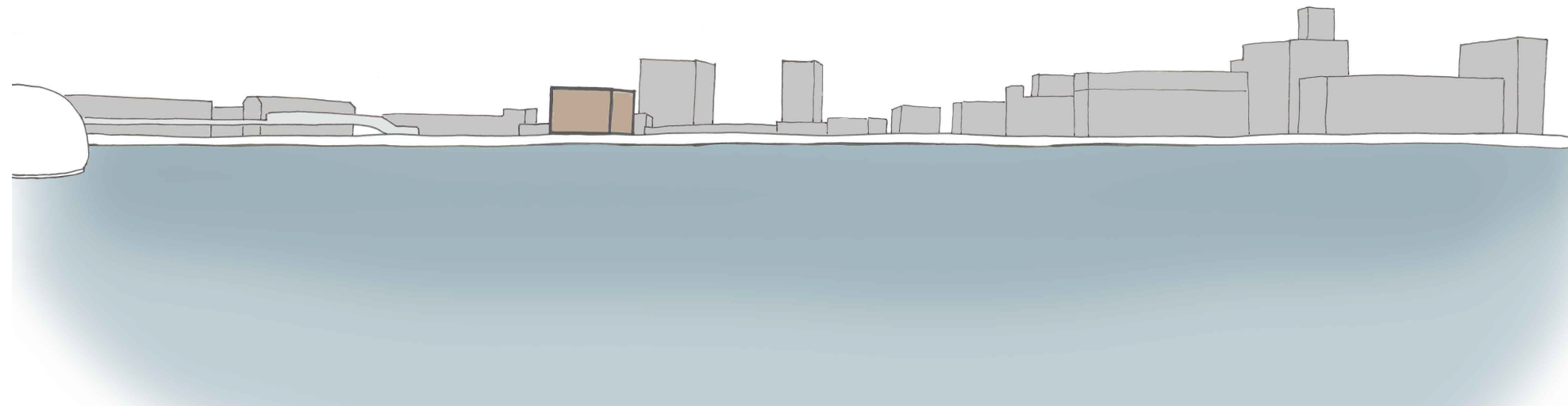
In the next view there will be a big difference between the current and the future situation. In the current situation you can see that the line of trees in front of Santos is interrupted. So when you look at the building from a more front view there are no trees that can block the view towards Santos. Due to this interruption of the trees and the bigger volume of Santos compared to the buildings around it, Santos will be seen really well. In the future situation there will be built a lot of higher buildings around Santos. Because of this new volumes and of their heights Santos will be noticed less than in the current situation.





The Rijnhaven is surrounded by buildings with a different height, which give the buildings a jazzy silhouette. Another important element to notice in the current situation about the buildings around the Rijnhaven is the height of these buildings compared to Santos and the buildings around Santos. The buildings around Santos are quite low, which make it possible to notice Santos from this place. In the future situation there will be a high building between Santos and the water, what make it not possible any more to see Santos from the Rijnhavenbrug.

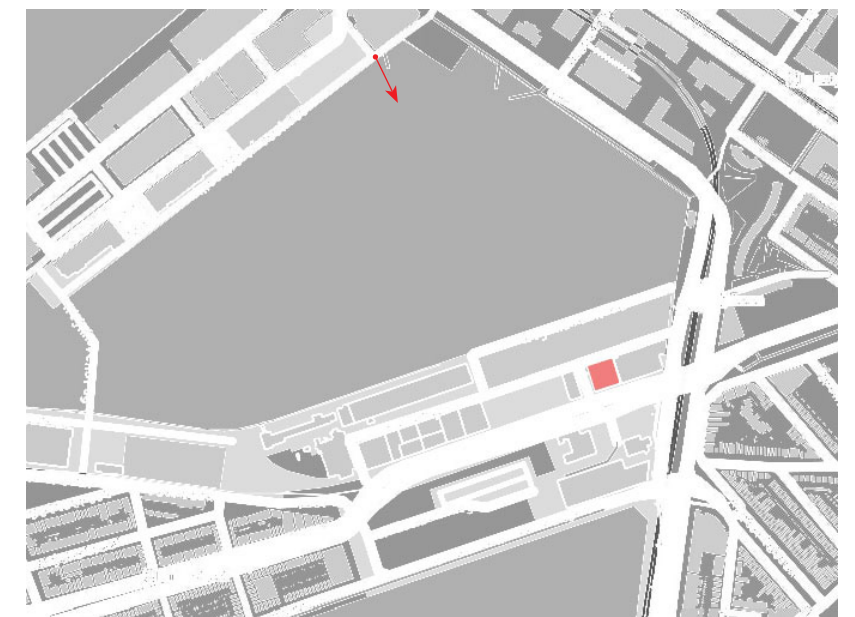
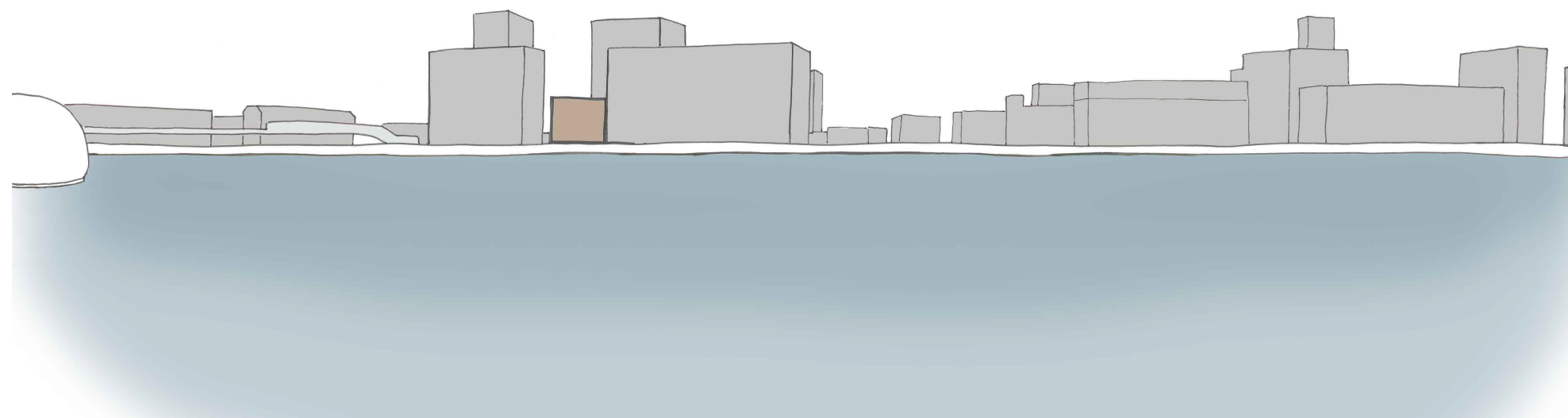




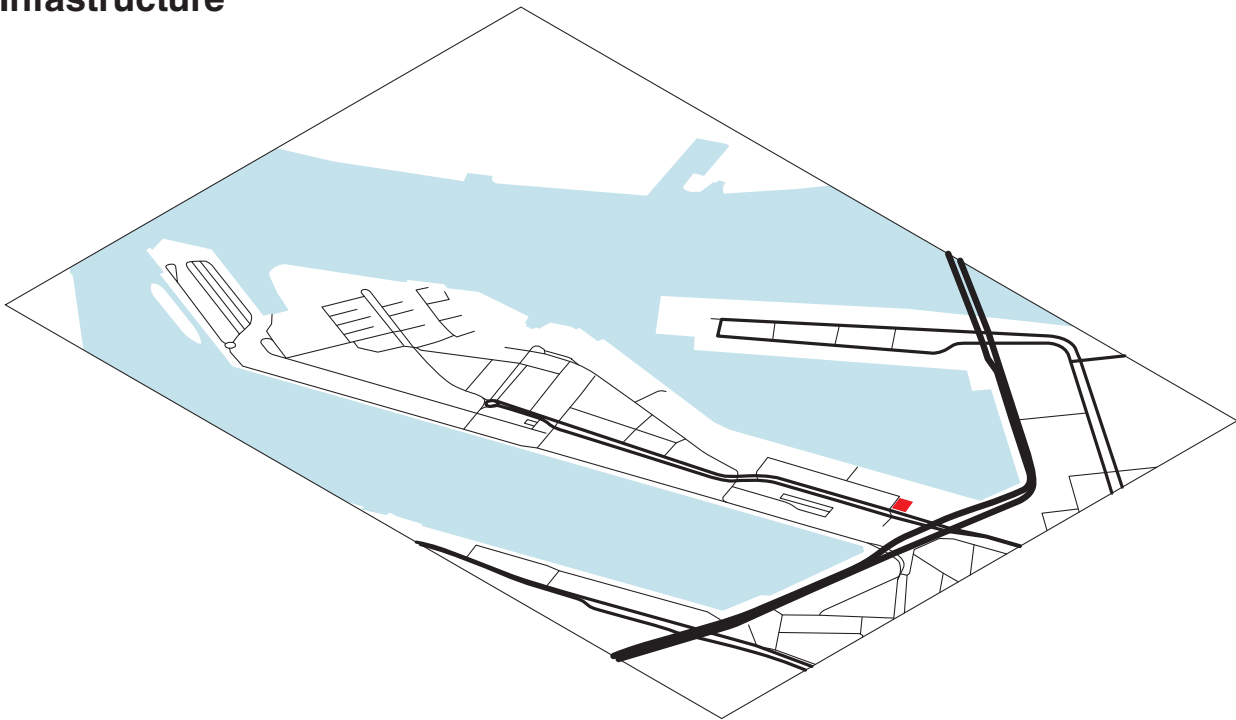
This is view from the Van der Vormplein where Santos is an eye-catcher because of its location and volume. This will change in the future when buildings will arise around it with much more height. In the future plan you can also notice that the new buildings will not be placed between Santos and the water, what gives Santos an opportunity to make a connection with the water.

CONCLUSIONS

There will be changed a lot in the surrounding of Santos. All the new buildings will be much higher than Santos and therefore make Santos less visible than it is right now. Beside that the extra volumes will block some views that you can have now. So Santos will be less visible than it is right now, but this doesn't have to mean that Santos will not be a building that people wouldn't notice.



2.8 Transport
Infrastructure



Distances to centre

15 min. / 4 km

Distances to highway

20 min. / 7 km
A13 / A20

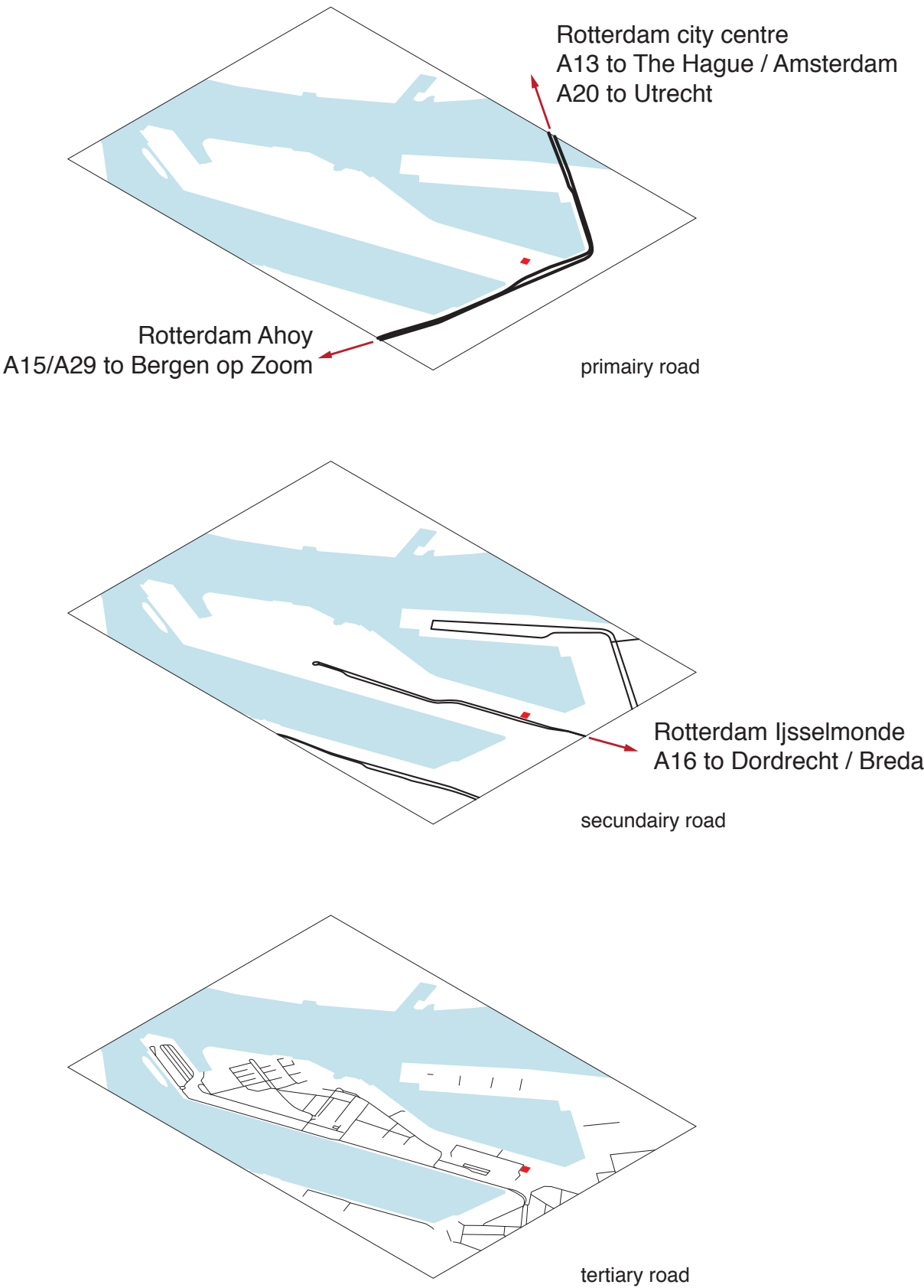
11 min. / 5 km
A15 / A29

13 min. / 5 km
A16

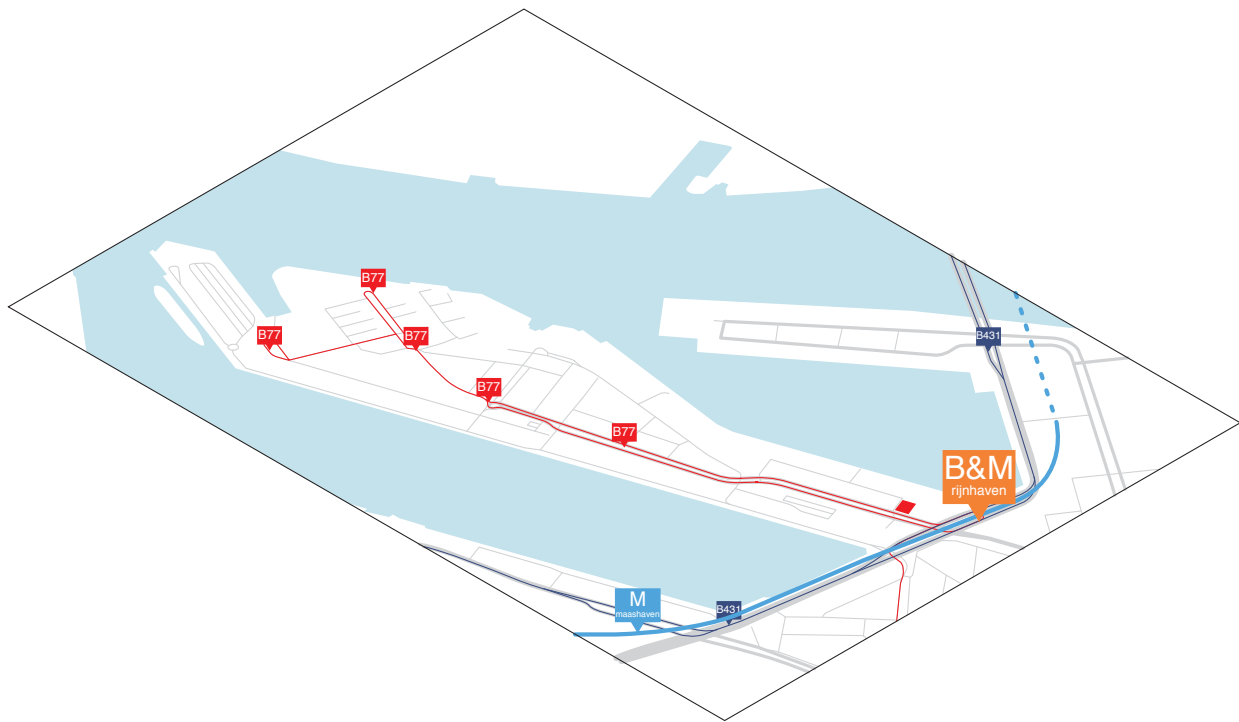
Conclusion

Santos is very well situated when it comes to road connection. The primaire road (Hillelaan) is a good connection to the centre of the city (moving over the river Maas) and the southern ring road of Rotterdam connecting Rotterdam with cities as Bergen op Zoom.

The secondary road is connecting Santos to the eastern ringroad which is connected to the cities Dordrecht and Breda, it also connects the city with Katendrecht



Public Transport

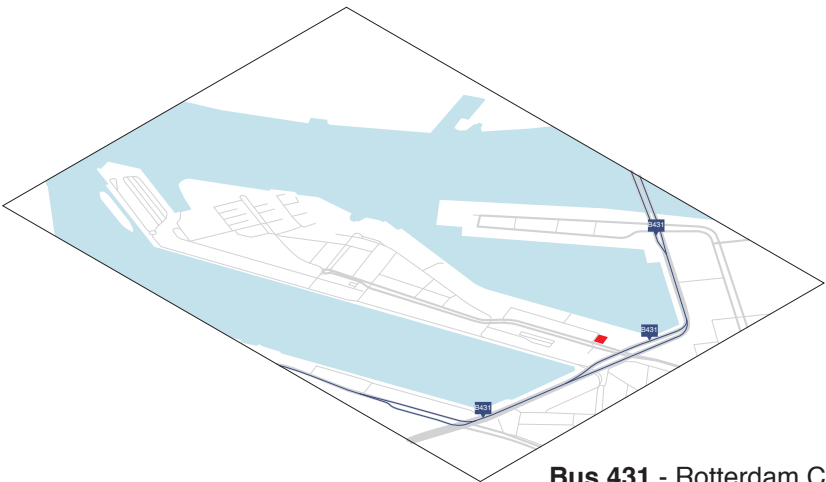


Distances to centre

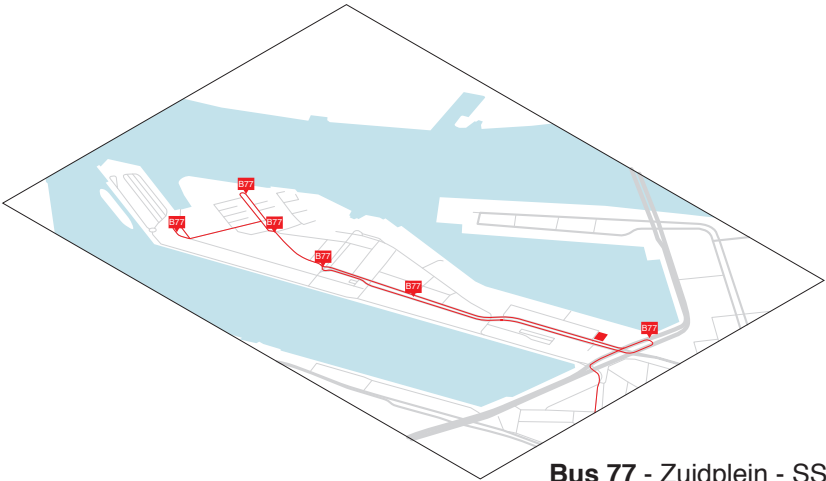


Conclusion
Metro and busstop Rijnhaven is situated only two minutes from Santos. The metro brings you within 11 minutes to the central station that can connect you with the national railroads.

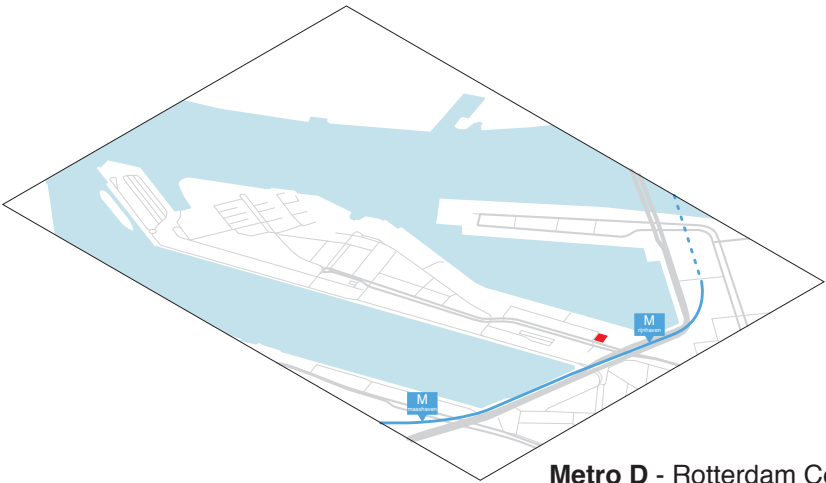
The bus is less useful when going to the city centre. But traveling further south into Rotterdam or going into Katendrecht bus 77 is the way to go.



Bus 431 - Rotterdam Central Station - Honselersdijk Bloemenveiling
one way only



Bus 77 - Zuidplein - SS Rotterdam



Metro D - Rotterdam Centraal - De Akkers
Metro E - Den Haag Centraal - Slinge

Waterways

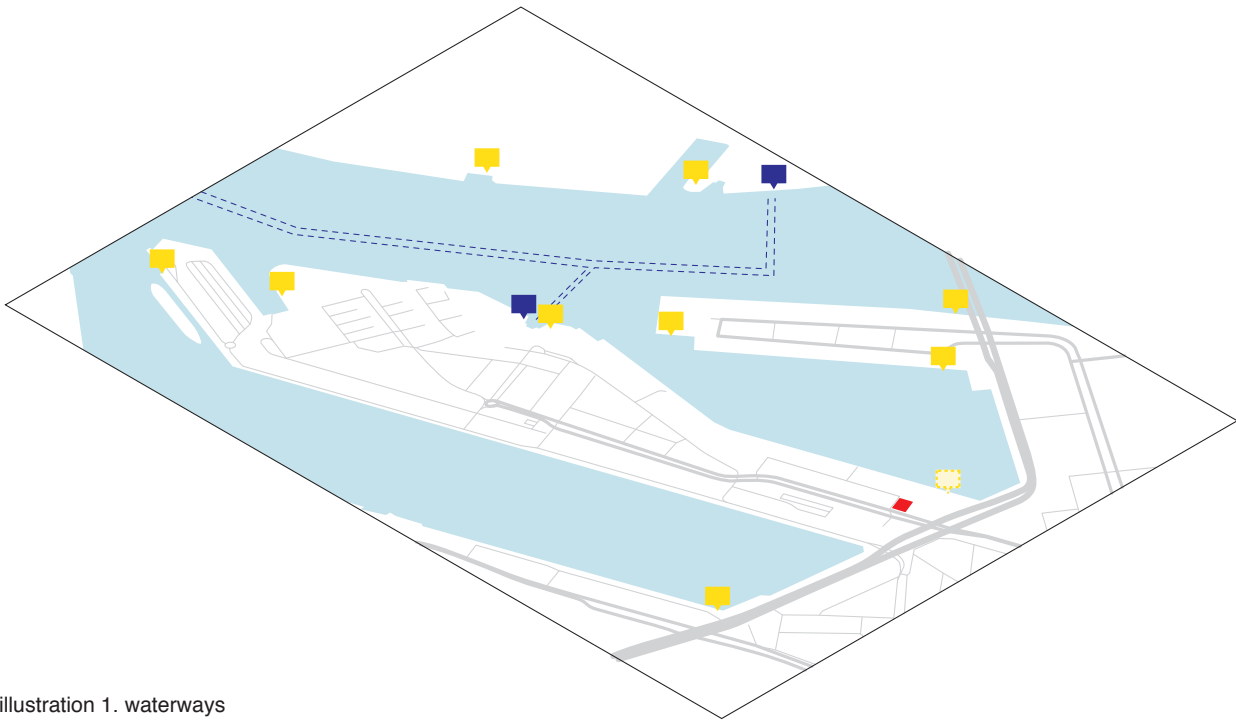
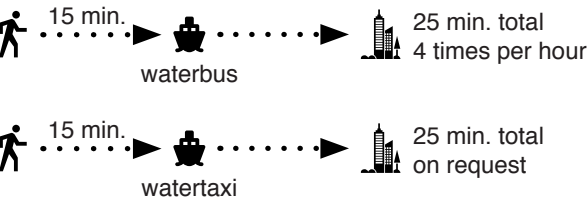
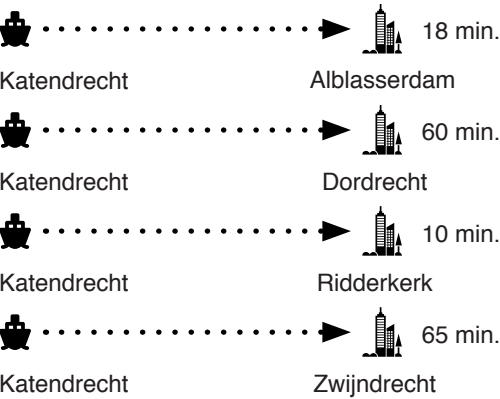


illustration 1. waterways

Distances to centre



Waterbus



Conclusion

The waterbus and the watertaxi are very fast ways to get to the other side of the Maas or even to other cities. But the time it takes to get to the waterbus takes to long, so going to the city centre by public transport would be better. Other cities on the Maas (Alblasserdam, Ridderkerk, Dordrecht, Zwijndrecht, Papendrecht & Sliedrecht) are accessible by the waterbus.

The watertaxi is on request.

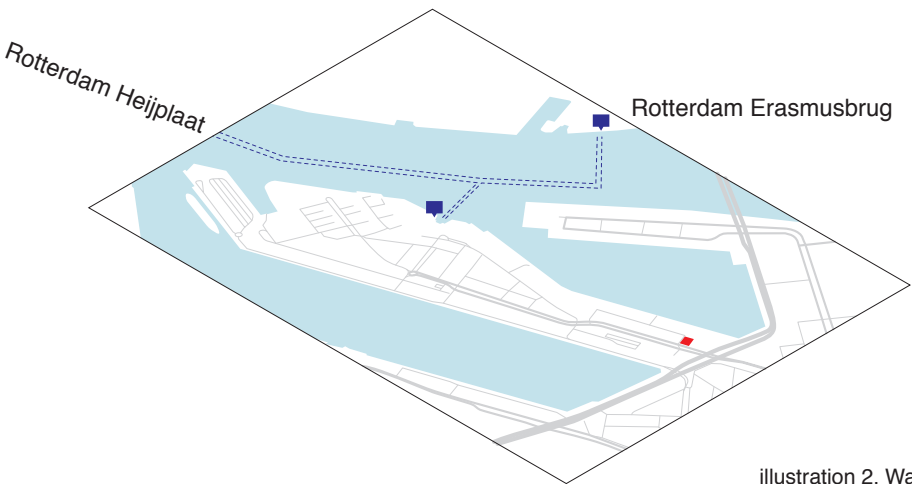


illustration 2. Waterbus

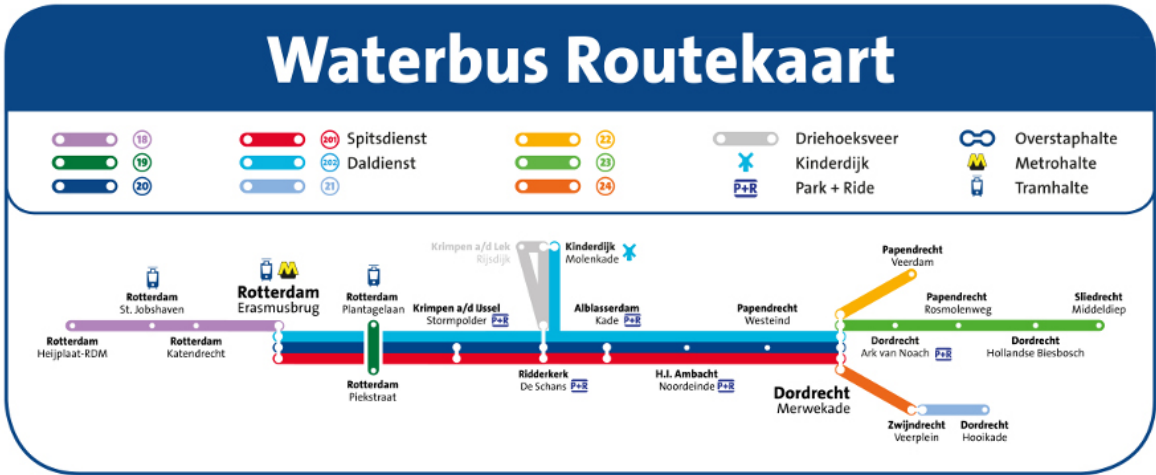


illustration 3. Waterbus chart

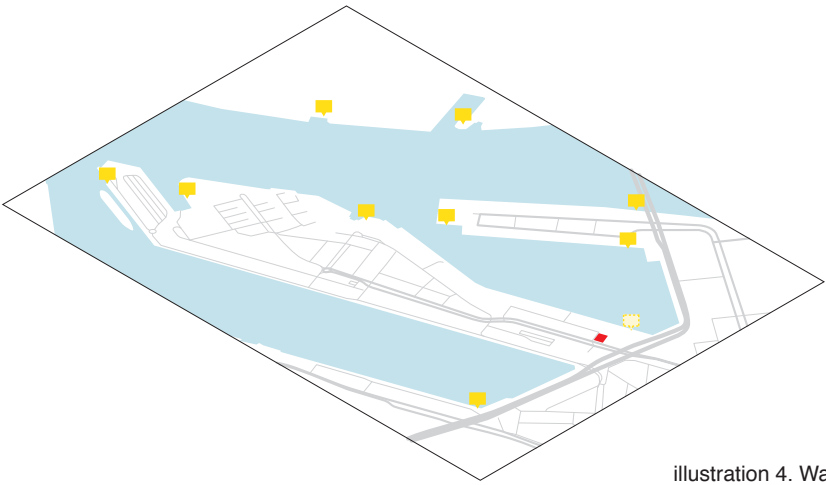
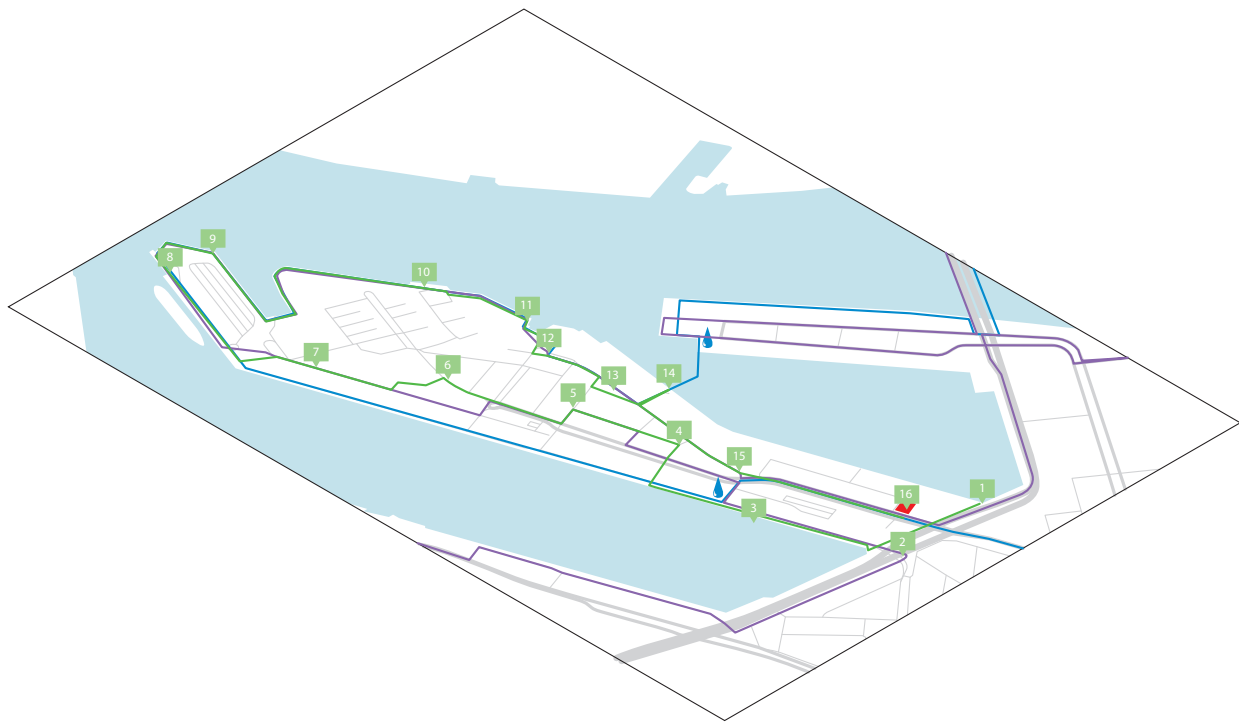


illustration 4. Watertaxi

Hiking & biking



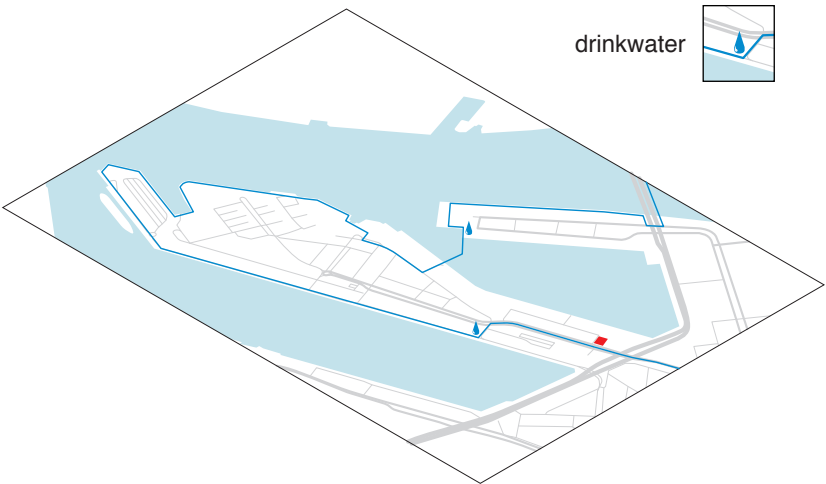
..... 35 min.

..... 60 min.

Conclusion
On Katendrecht (and Rotterdam in general) are at least three routes that pass Santos. With Rotterdam rent you pass Santos, and the same goes for Pierrewaaien. With the iTour Santos is actually a part (and the end) of the route.

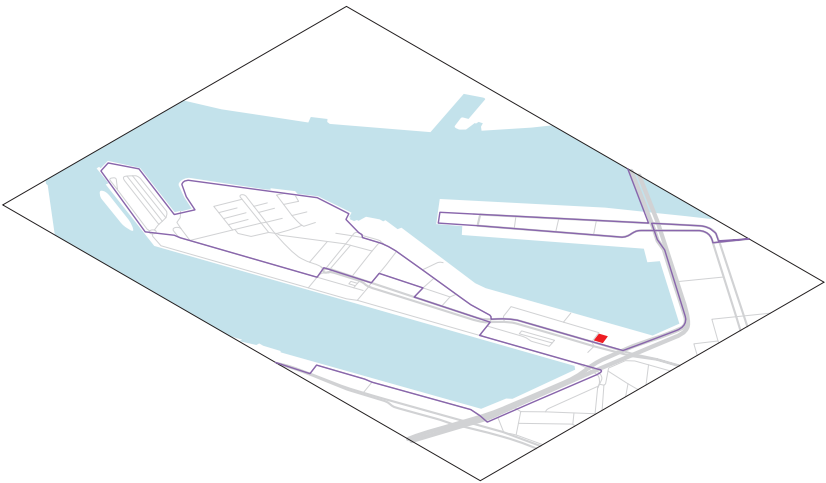
Walking to the city centre takes only a bit more than half a hour. This is also because of the Erasmus bridge that is closeby and connecting Rotterdam south with the centre.

Making Santos also quiet accesible when wanting to walk from or to the centre.

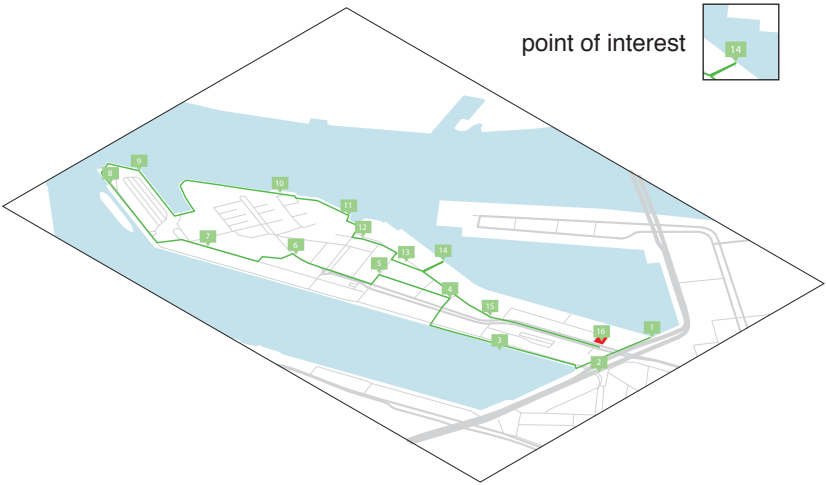


drinkwater

Rotterdam Rent
Rotterdam rent is a series of routes you can follow to practice your marathon skills. The longest version (21,8km) takes you next to Santos and over Katendrecht.



Pierrewaaien
Pierrewaaien is a series of hiking routes over along the city harbors of Rotterdam. On this hiking trial you also pass Santos as the beginning of the part in Katendrecht.



point of interest

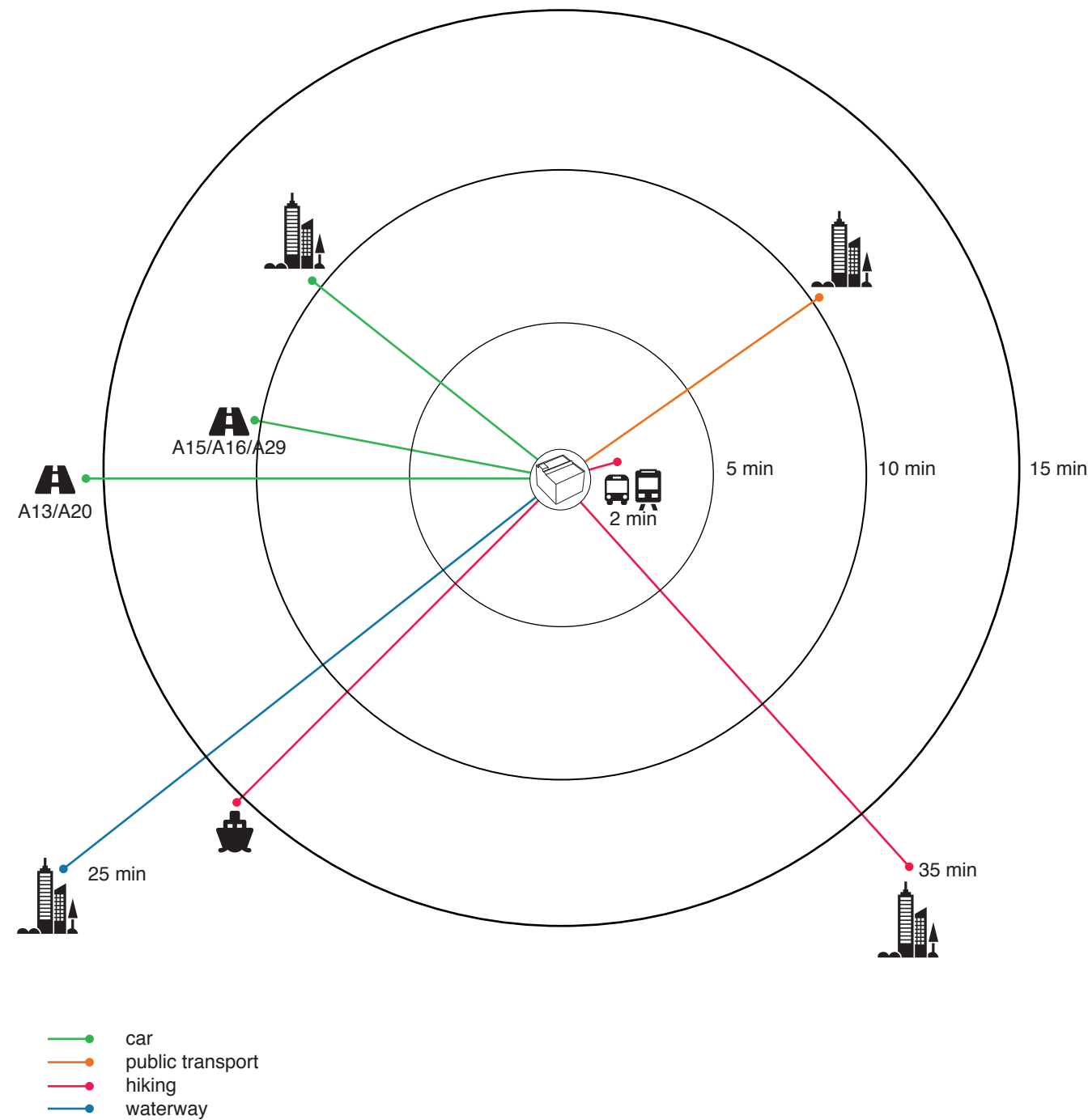
iTour
Ah hiking trial that is based on the history of Katendrecht. You'll walk passed different points of interest. Santos is the last (16) point of interest in this route.

Transport in time

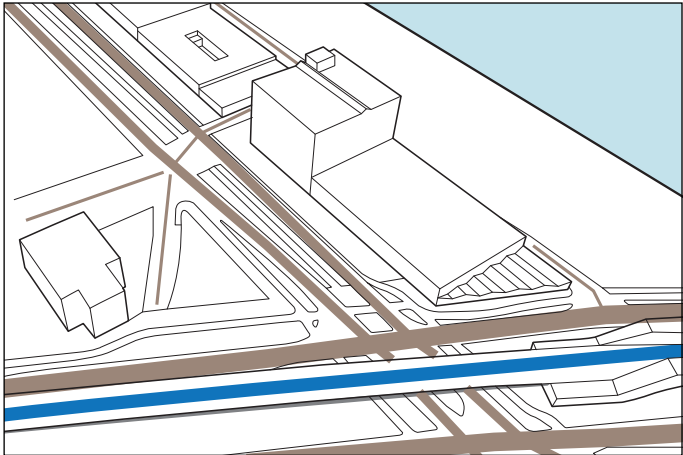
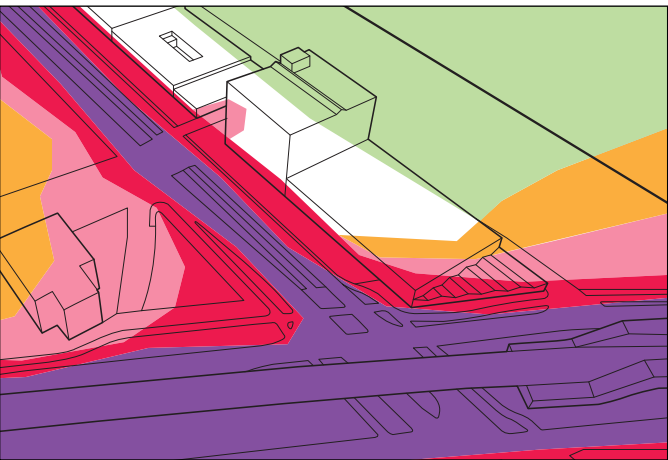
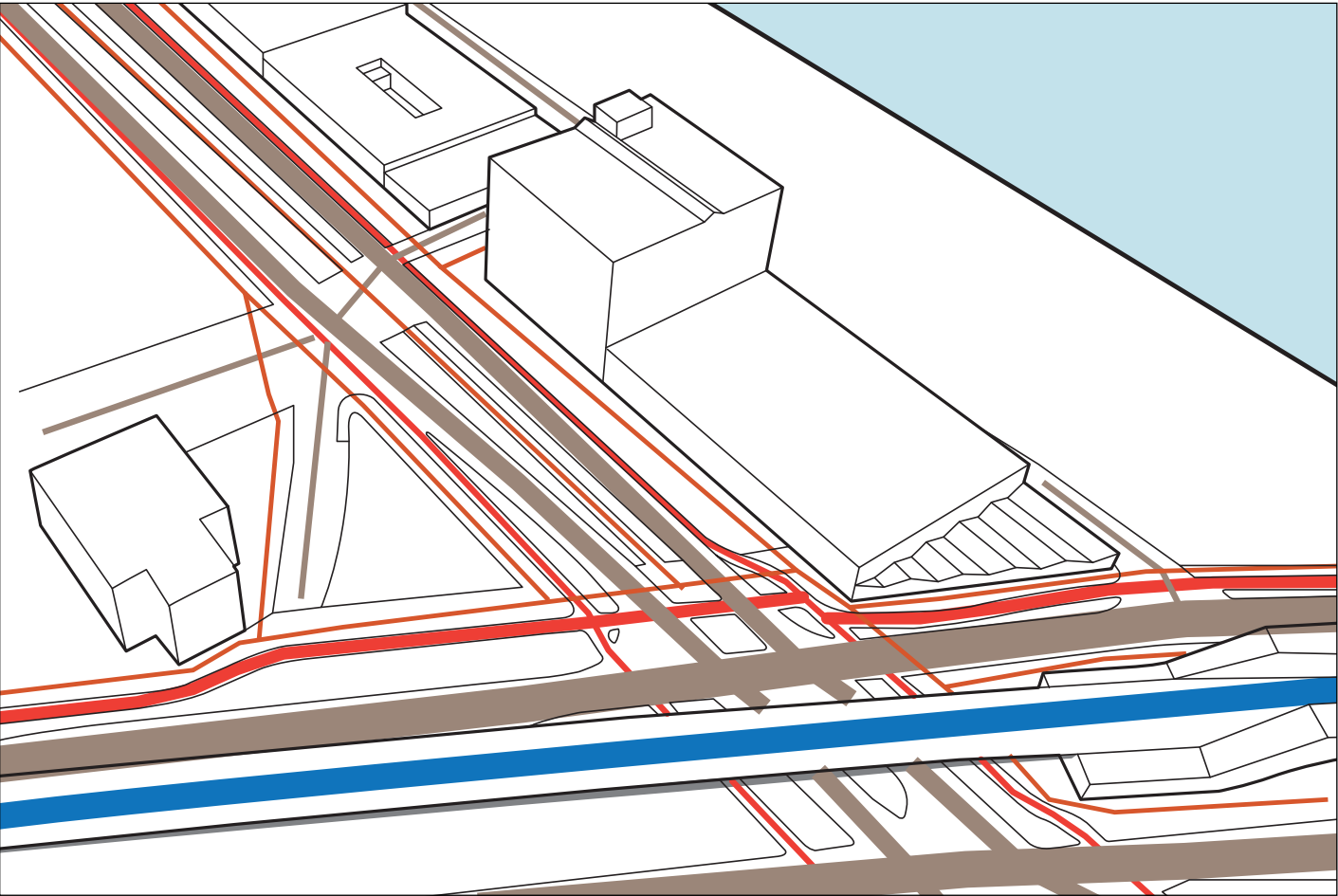
Conclusion

When it comes to connectivity of Santos with the city and it's surroundings it's actually very good. Either by car, public transport or walking you can reach different parts of the city in around 15 minutes. By car you can reach the ringroads that are surrounding Rotterdam in 15 minutes and the center in around 10 minutes. If we take a look at the public transport Santos is also on a very good position. The Rijnhaven Metro stop has a direct connection with the city centre and the central station and you'll reach the center in 11 minutes. This Rijnhaven metro stop also has two busstops which give you extra possibilities to get to different parts of the city.

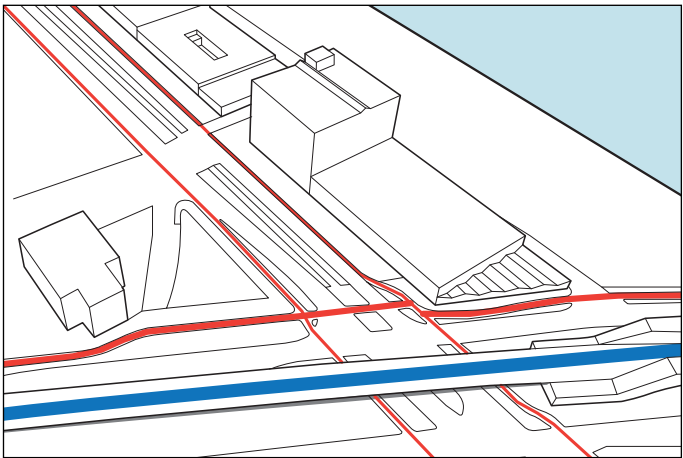
When it comes to walking Santos is part of different routes that you can follow through Rotterdam. Also walking to the city center is possible, yet the metro would be a better solution.



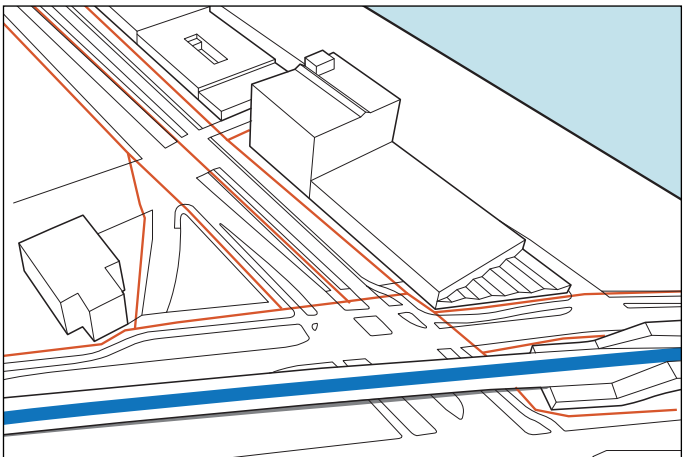
Traffic density - current situation



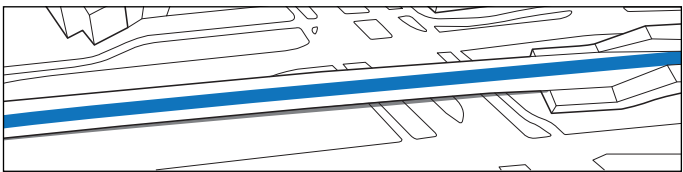
Motorized traffic
The most dominant of all the traffic around Santos. They define the streets and the noise level (together with the metro). This is a result of the connectivity the street has with the rest of the city and country.



Bike
Bike have there own designated streets seperated from the cars. They aren't dominant in this setting.

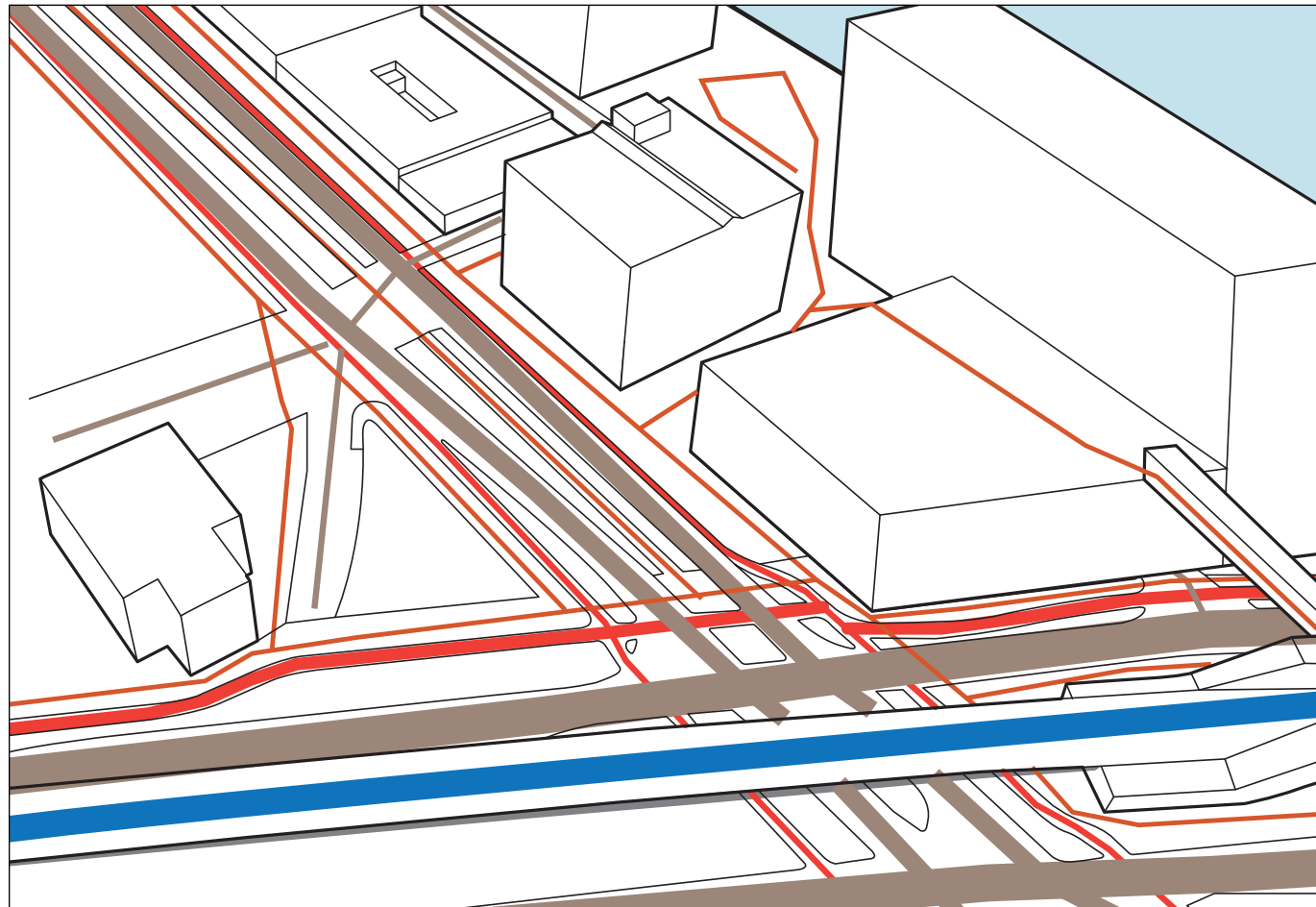


Pedestrian
Pedestrians are the least dominant of all the traffic. This is strange because the metro/bus station is close by so there is quiet alot of pedestrian traffic in the region.

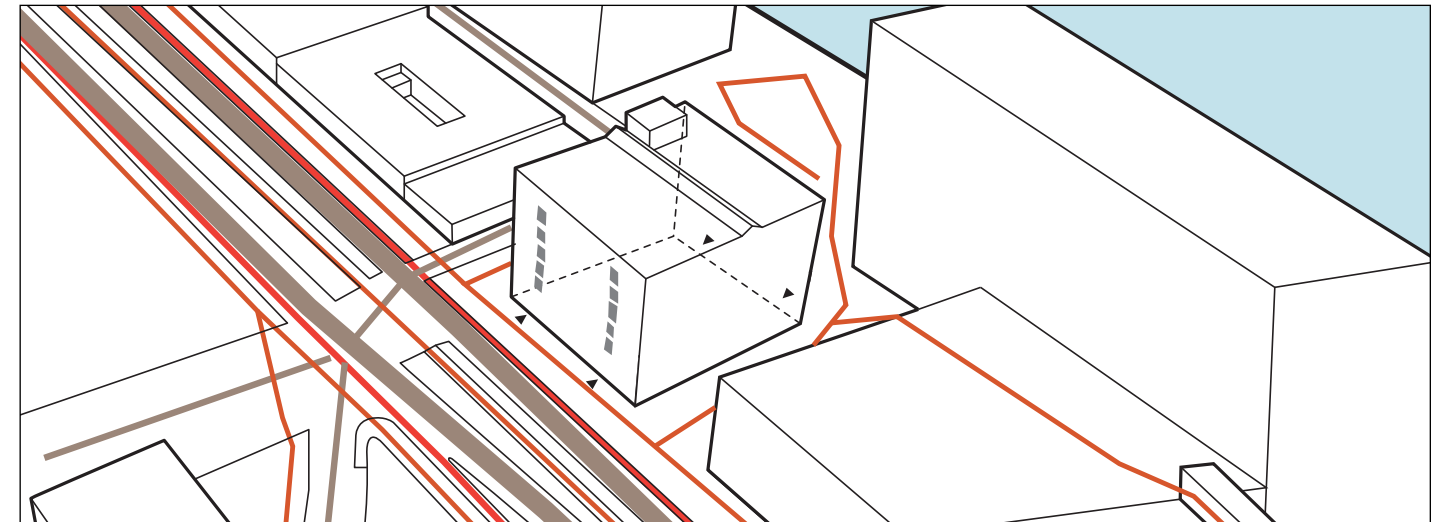


Metro
The metro is elevated from the rest of the traffic and is has therefor a different relation. It seperates traffic directions in two streets instead of one.

Traffic density - possible new situation



Entrances - possible new situation



Santos is on a double situation. On the south side you have a relative busy street with cars, trucks, busses, bikes and pedestrians. While on the other side you have an open space with pedestrian traffic and maybe some bike traffic. That's for the facades with entrances already existing. The two blind facades also have a different traffic density. The south west facade has a street which isn't that busy but still has car traffic and bike traffic.

Conclusion

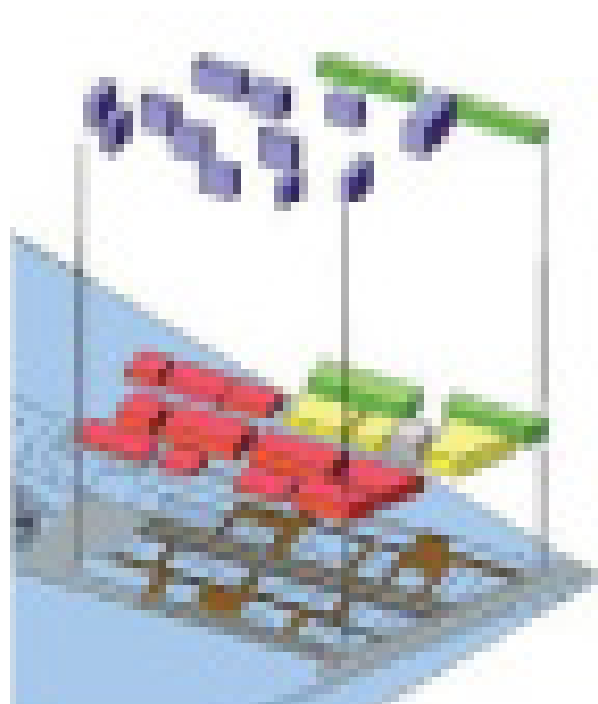
In the possible new situation the traffic flow doesn't change that much. The main change comes for the pedestrians that they don't need to cross the street anymore when they come from the metro. There is a pedestrian bridge planned. Also around Santos there is more pedestrian traffic instead of no traffic. This is also mainly because of the separation of the Santos with its surrounding buildings.

2.9 Future masterplan

When we look at what the future holds for the area it's obvious a big change is coming. Mainly at the narrow entrance of the harbour called the 'pols' (wrist). The plans consists of mostly demolishing the old buildings, creating a new more dense and high-rise urban fabric then previously existed. Within these new developments Santos will have an ever more important part to play in the preservation of Katen-drechts history as a transit port.

The vision of the municipality is it can become a cosmopolitan area for leisure, design, food and lifestyle. A wide array of shops, bars, café's, art galleries and restaurants will be placed in the plinth of the proposed urban plan. Also functions giving the area a nightlife will be added. The mid- and top- section of the buildings will house a mix of apartments and offices. For the residential part of this plan there will also be supporting functions like a supermarket, schooling, daycare and so on.

It becomes clear that a vast effort will be made to improve, rebrand and restructure this area into an attractive neighbourhood for living, working and recreation.



1. The Katendrecht pols future program



2. The Katendrecht pols masterplan

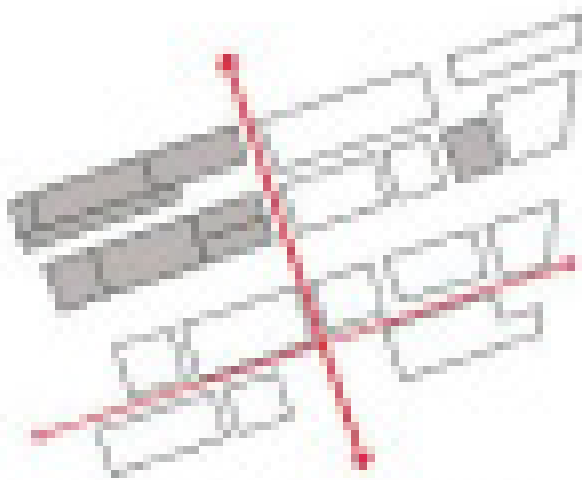
- | | |
|---|--|
|  Mix comercial/work/living |  Living/workspace |
|  Commercial |  Intimate streets |
|  Mix services and living | |



3. Representation picture of the South quay of the Katendrecht pols masterplan



4. Representation picture of the North quay of the Katendrecht pols masterplan



5. Diagram of two newly created corridors in the masterplan

Used sources:
1. Future programm of Katendrecht. Lecture from the municipality of Rotterdam on Katendrecht pols area urban renewal 16-02-2017. Armentarium Delft.
2, 5 Future plan of Katendrecht. Lecture from the municipality of Rotterdam on Katendrecht pols area urban renewal 16-02-2017. Armentarium Delft.
3, 4. Representations of the future plan of Katendrecht. Retrieved at 28-03-2017 <http://www.stedebouwarchitectuur.nl/nieuws/100317/entree-van-katendrecht-krijgt-een-nieuw-gezicht>

The View

230 dwellings, Hotel & commercial space

Looking out over the Rijnhaven this mixed use building will get a sheltered bridge linking it with the metro station. Standing around Santos this development project will influence the direct context of Santos the most.



5. Representation pictures of the View

De Banenstraat

375 dwellings 1500 m2 commercial space

Opposed to Santos on the Brede Hilledijk 'de Banenstraat' will be created. The english translation is 'Job-street' and is reflected in it's program of office space and apartments for higher educated tennants. The plinth hosts a mix of leisure and retail space.



6. Representation pictures of the Banenstraat

De Groene kaap

450 dwellings, max. 4.000 m2 commercial space

Further allong the Brede Hilledijk the Groene kaap will be realised. These closed building blocks with tower accents will have a mixed program of residential and commercial functions. The connected large roof gardens characterises the project and is there for called 'the Green cape.



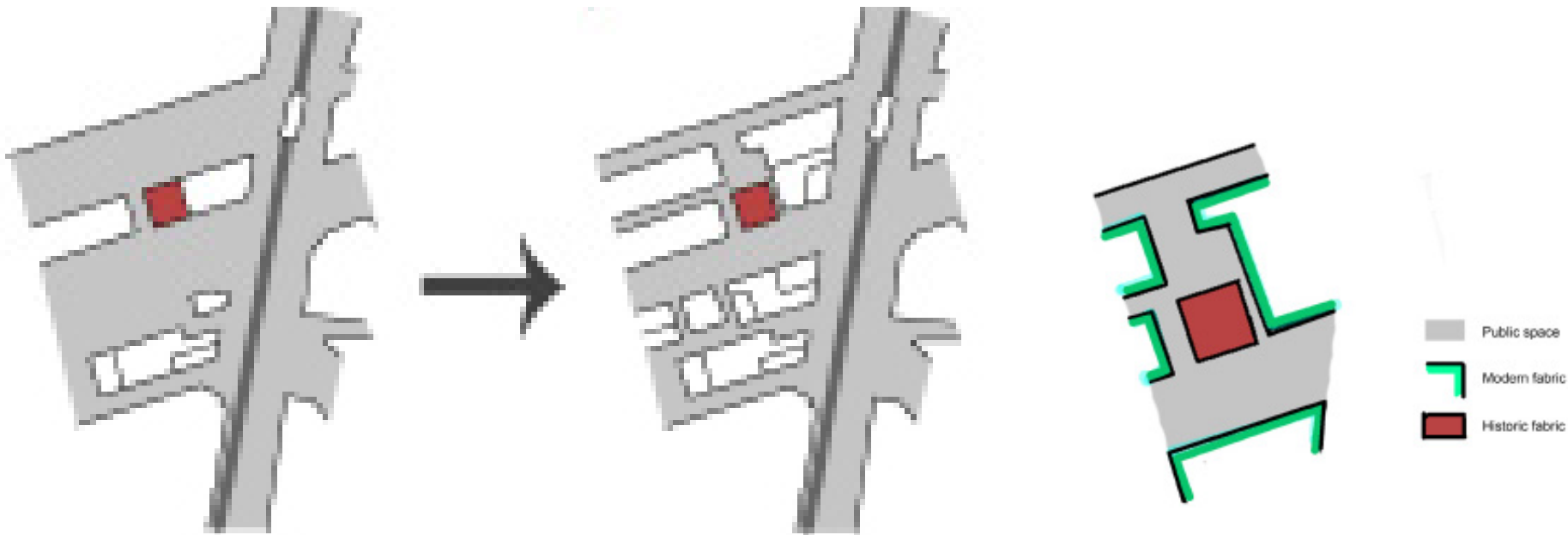
7. Representation pictures of the Groene kaap

Use of sources:
5. Representation pictures of the View. Lecture from the municipality of Rotterdam on Katendrecht pols area urban renewal 16-02-2017. Armentarium Delft.
6. Representation pictures of the Banenstraat. Lecture from the municipality of Rotterdam on Katendrecht pols area urban renewal 16-02-2017. Armentarium Delft.
7. Representation pictures of the Groene Kaap. Lecture from the municipality of Rotterdam on Katendrecht pols area urban renewal 16-02-2017. Armentarium Delft.

Conclusion

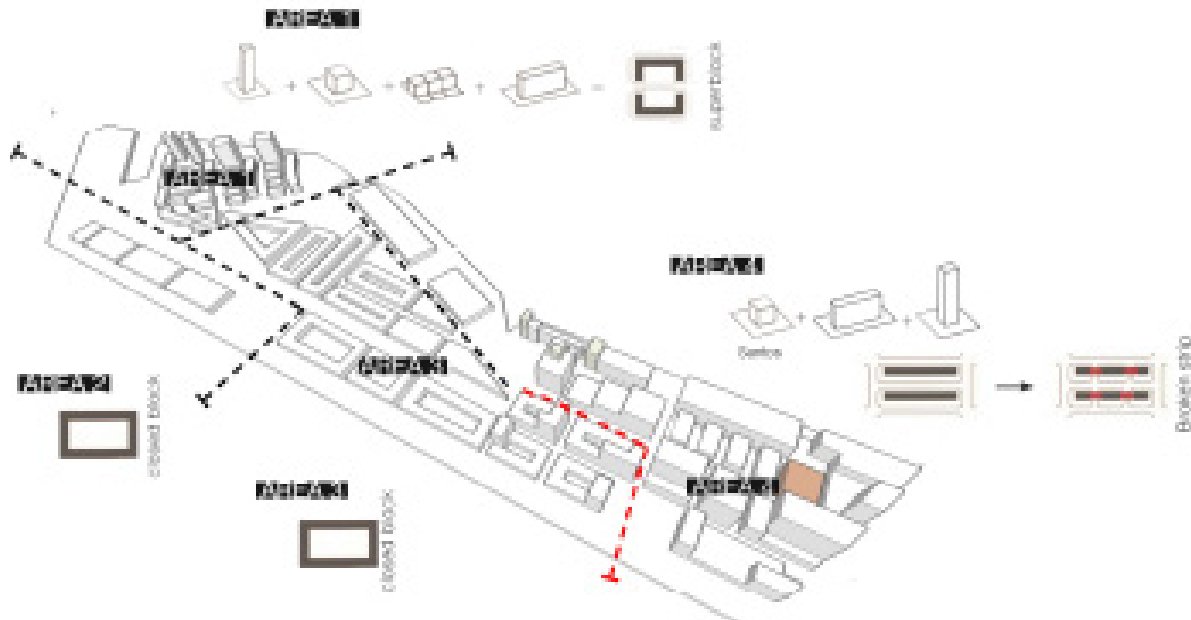
The main reason why the proposed masterplan is of such importance to the design process of Santos is that it's context will rapidly change and impose a totally different urban fabric than the current situation. Only a few buildings will remain that commemorate the district's history like Santos. Staying within the original 4-stroke organisation is one of the few aspects of the historical urban setting which will also be conserved in the future masterplan. But the great increase in built mass, the large increase of occupants and the change of use of this area will alter its view and atmosphere and is therefore important to integrate in a future vision for Santos.

The open view of the harbour will be partially blocked in the future. A square will lie in front of Santos which never was there before. Instead of being the tallest building in the strip it will become the lowest. The future plan demolishes the connecting building which means it loses its neighbour and becomes free-standing. In short; a radically changing context.

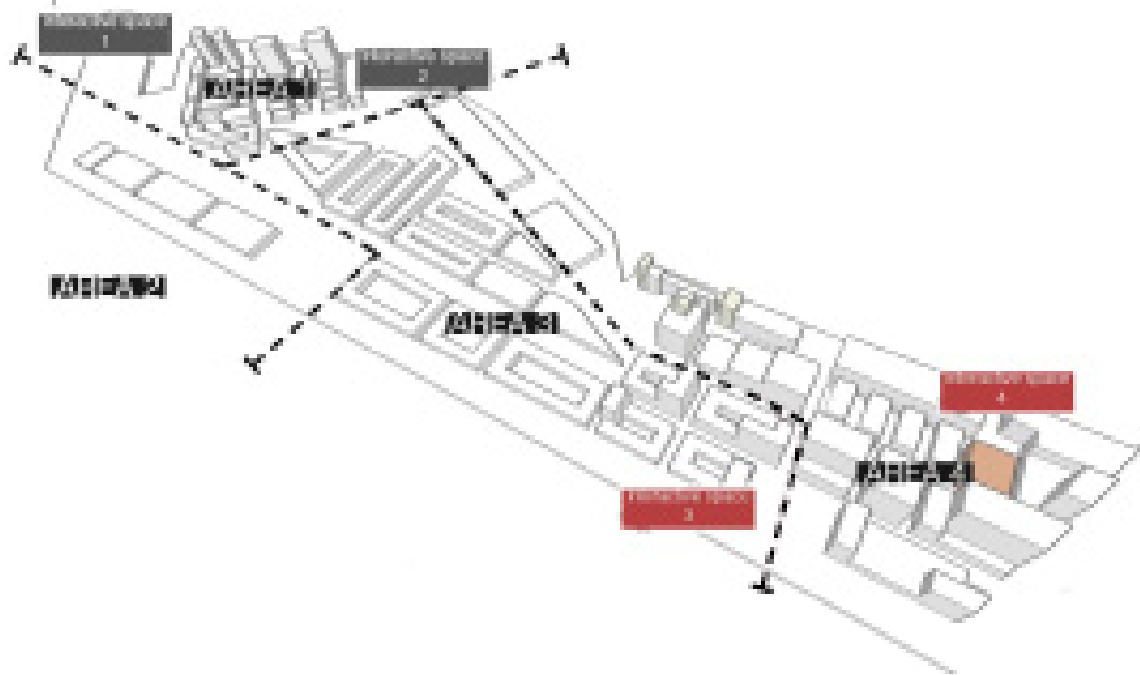


8. Diagram of the development of the urban fabric around Santos based on the municipality's masterplan

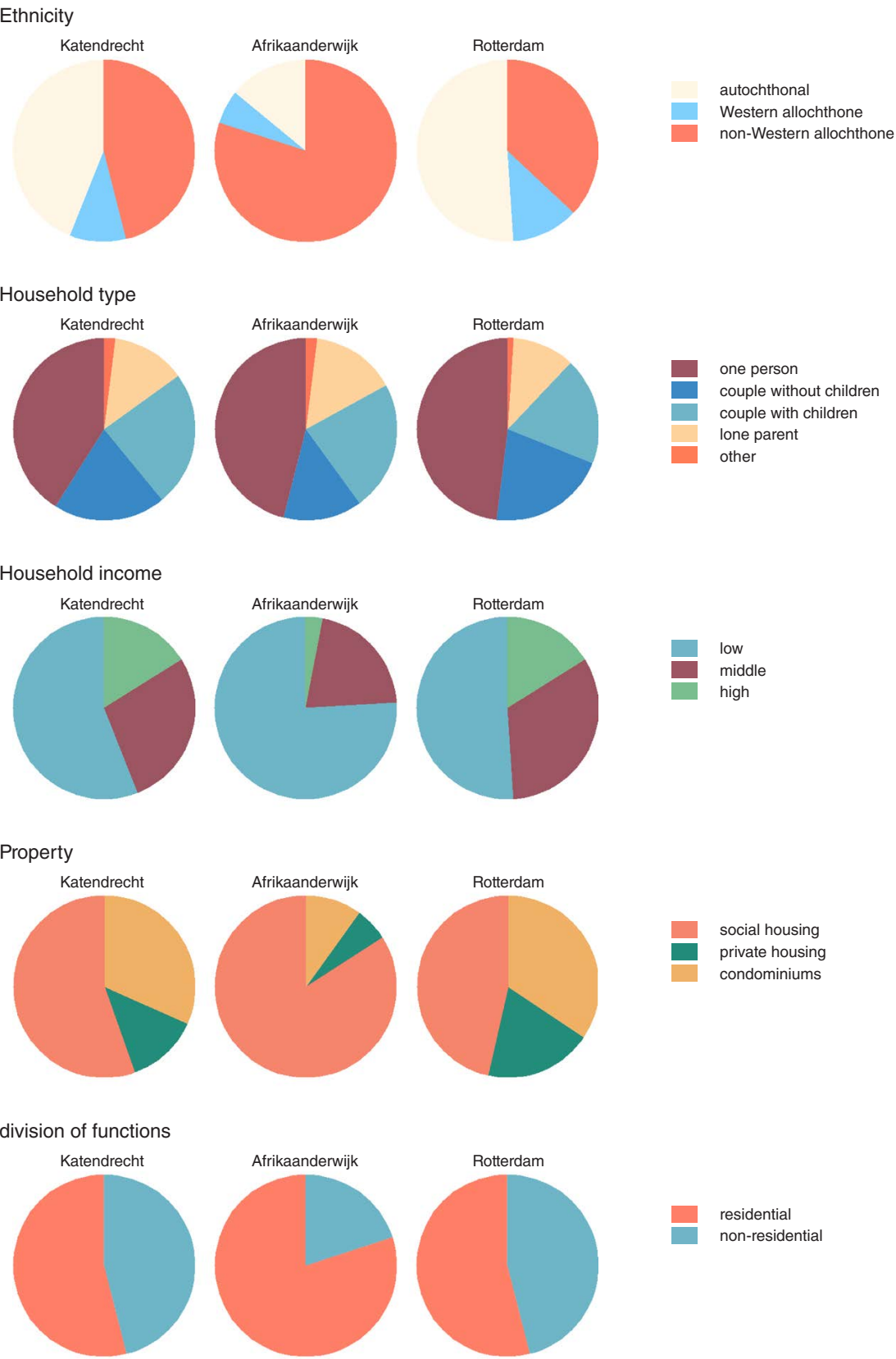
9. Diagram of the proposed masterplan resulting in Santos being enclosed by modern urban fabric.



11. Diagram of the future division of neighborhoods according to typology



10. Diagram of the future adding and redevelopment of the public space in close proximity to Santos



2.10 NEIGHBOURHOODS

Santos is situated on the edge of the neighbourhood Katendrecht. On the other side of the metro line, you can find an area called the Afrikaanderwijk. Because of the metro line, Santos is not visibly connected with this area that much. But people from there will probably also visit this part of Katendrecht, for example for the supermarket situated next to Santos, so an analysis of the kind of people who lived here will give a better understanding of the situation.

Katendrecht has strongly developed the last few years. With that, the neighbourhood changed from a problem area to one of the most popular and safety areas in Rotterdam. In 2016 there lived around 4.600 people in Katendrecht. There still live people who already lived there before the developments and also new residents moved to this area. Therefore the difference in cultural background, income and education level varies a lot.

The Afrikaanderwijk is these days different in a few aspect, while in the begin both areas were neighbourhoods for the people who worked in the harbour. The Afrikaanderwijk was one of the first multicultural neighbourhoods of the Netherlands and still, it is an area where most people got another cultural background. The income and education level is relatively low.

In the diagrams on the left, you can see the difference in a few topics of the kind of people who live in Katendrecht and the Afrikaanderwijk. Besides that, there is also a diagram of the average of Rotterdam of that same topic. One aspect to notice when you compare the diagrams is that Katendrecht is in most of the topics close to the average of Rotterdam. The Afrikaanderwijk, on the other hand, have some outliers. Especially the ethnicity, household income, property and division of functions in this area differs a lot from the average.

On the 15th of march 2017, there were elections in the Netherlands. For the different polling stations, the NOS (a dutch news company) showed a map, made by Stichting Politieke Academie, with the results. When you look at this map for the area Katendrecht, Kop van Zuid and the Afrikaanderwijk you will notice big differences. There is almost no place in Rotterdam where, in such a small area, this division is so big.

Conclusion

Katendrecht is changed in its composition of the population, now it is almost equal to the average of Rotterdam. The Afrikaanderwijk have still a lot of issues. Most of the people got a low household income and live in social housing. The difference in people can also be noticed when the different polling stations will be compared. This differences can be seen as a multicultural society, but can also give problems when people stop understanding each other or when one group will push away from their area to make a place for the other.



2.11 INDICATION OF URBAN VALUES

To conclude, it can be said that Katendrecht is what it is because of its past harbour function. That is what brought housing and harbour activity to the area and with that came liveliness. It gave the area an atmosphere that still can be felt around Santos and at the waterside. This past function gives a historical value to the whole of Katendrecht and specifically to Santos. It was a 'lawless', 'recreational area' for sailors. Currently, it is slowly changing to a densely-populated area.

Within its urban context, Santos can be valued for its height, because when it was build, it was the highest building there. Also, now it is the highest building in its street profile of the direct surroundings. This gives value to Santos, because it is a prominent building and it stands out. However, this will change soon, because of future plans to build a number of large buildings around Santos. In that way, it is less visible and it will not attract attention in the way it does now.

Futhermore, the past function of Santos and its context made sure that it was well connected from the water and from the land to transport the goods to further destinations. This is still value that can be used for future functions in Santos.

3 ARCHITECTURAL ANALYSIS

3.0 INTRODUCTION

The following architectural analysis aims to provide insight on the building’s developement embedded within the context of Rotterdam. It analyses the building’s design language, its influences, its typological and functional background as a warehouse for coffee.

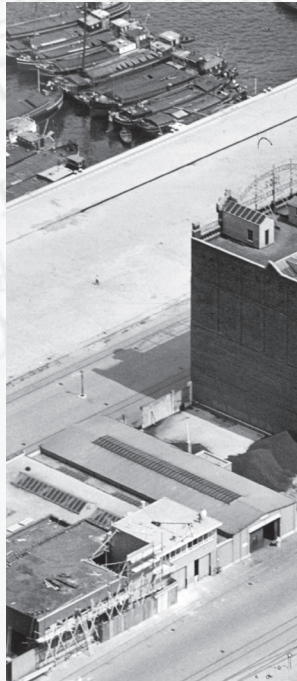
Furthermore it gives the reader a damage analysis and provides possible solutions.

3.1 TIMELINE SANTOS

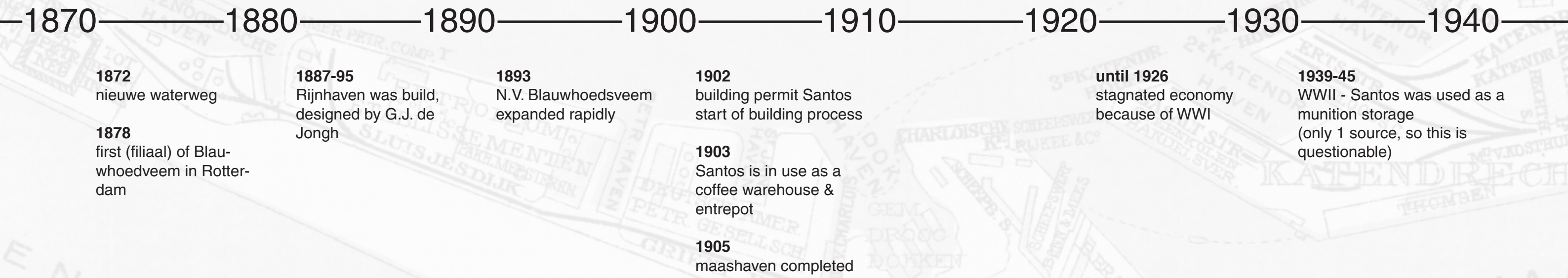
before 1917



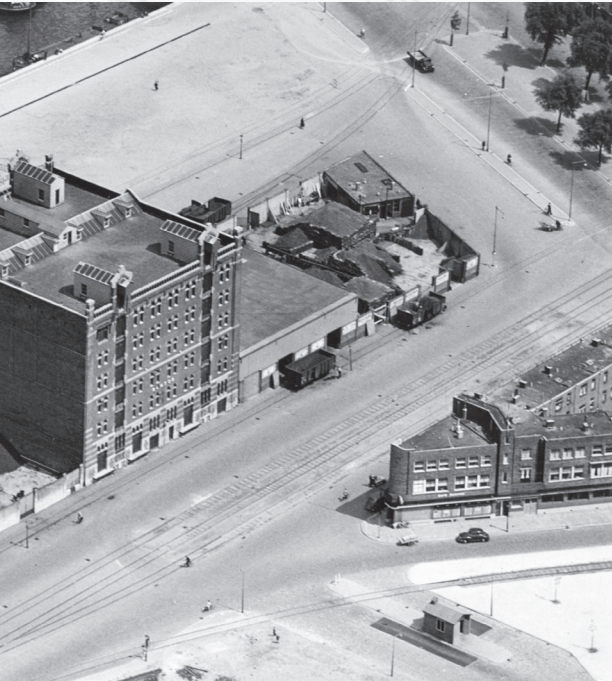
the south-facade of Santos in use. in the background you can see additional storage facilities by the company Wambersie & Zn.



birds-eye, additional buildings are some kind of



1950



Buildings on 1st row are gone, and on both sides of the building raw material storage facilities (coal?).

1963



south facade

1980-90



south facade, during this time there was a tank station attached to the west side of the building. wench houses are gone.

2017



south facade, with the Jumbo parking garage on the east side.

1950 — 1960 — 1970 — 1980 — 1990 — 2000 — 2010 — 2020 —

1954

new elevator added

1954-59

Santos rented out to the koninklijke landmacht

1959

Blauwhoedveem chose to rent Santos (unsuccessfully) instead of selling.

1954-63

ornamental crown was removed somewhere in this period

1970

wench houses were removed

1975

Santos was sold to Blauwhoed B.V. which sold it to Handelsveem

2000

Santos listed as Rijksmonument

2003

Santos listed in the monumentenregister
Rijksdienst voor Cultureel Erfgoed

2008

start ECC between Santos & rijnhaven

2009

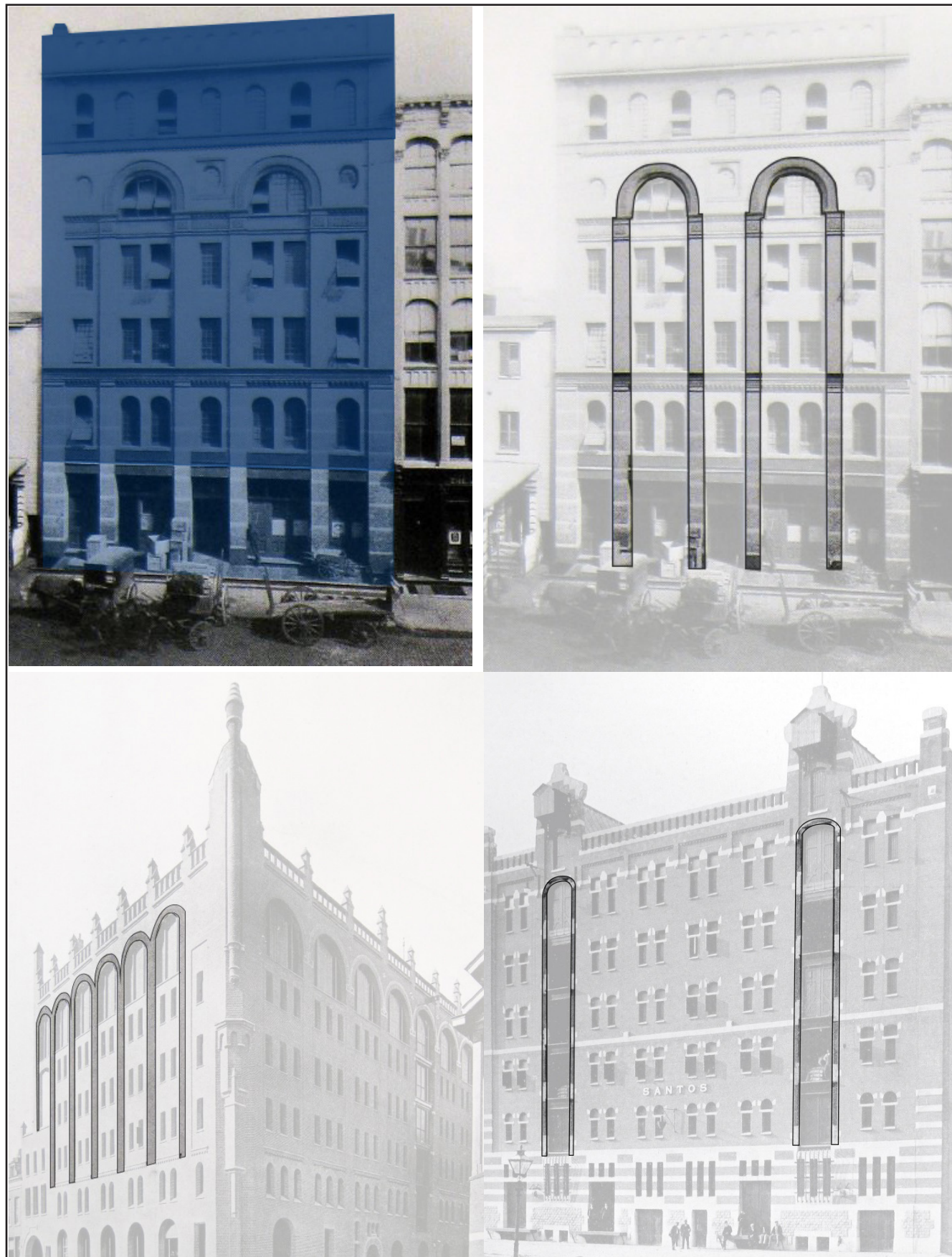
refurbishment 3th floor into office space (?)

2012

halt ECC, for unknown period of time, will now continue as 'The View'

2017

plans for development Santos as designcenter + housing by Stillwerk



3.2 THE ARCHITECTS J.P. STOK AND J.J. KANTERS

American influences

One of Stok's biggest sources of inspiration was American architecture. As mentioned before, an important design that had the same function as Santos and had aspects of the American School was the v.d. Lugt warehouse in Rotterdam. The façade of the v.d. Lugt warehouse seems to be inspired by the American 'warehouse' in Duane Street NY by Cook & Babb architects. This warehouse in Duane street was also divided in three zones: a plinth zone, a middle zone with round arches and windows and an attic zone, just like Santos. This is shown in image 6.

The v.d. Lugt building was dominated by monumental round arches, just like the warehouse in Duane Street, as illustrated in image 7. However, it was more vertically orientated and it consisted of a much flatter façade architecture. That emphasised the mass and it gave expression to the use of it as a warehouse. Only around the loading doors and the attic the architect used much more relief. It is possible that the style of Berlage influenced the choice for the relief there, as Berlage used it to emphasise the strong and clearly readable contours. Furthermore, the solution for the corners on the roof with the abstract tower would be coming from American influences (the corners of the Insurance Exchange in Chicago by Burnham & Root).

Other works of Stok from around 1900 are multiple shops in Rotterdam, a big office/storage building next to the Maashaven, an orphanage in The Hague and a couple of industrial buildings in Rotterdam. All of these buildings are rich in decoration in the facades, and aspects of the American School are visible as well as aspects of the Art Nouveau. Furthermore, the facades are assembled from surfaces of natural stone, horizontal strips, lintels and corner blocks that are combined to explicit façade patterns. This is in contrast to a fillings with pointing between the bricks. An interesting aspect to Santos is the plinth of the office building of the Badische Actien Gesellschaft which had a warehouse function. The façade of this building was made from a lintel and cornerstones jointed natural stones band pattern.

Thus, it can be concluded that Stok was highly influenced by his American contemporaries. This can be seen by the bows that re-occur in his buildings and from the division of the facade in three parts.

Image 6: Warehouse Duane Street, NY: (top left) division of the facade into the plinth, the middle and the attic zone

Image 7: Monumental round arches, respectively (from top right to down left and right): Warehouse Duane Street (New York), v.d. Lugt warehouse (Rotterdam) & Santos warehouse (Rotterdam).

Source: Bergé, W. G. M., Denslagen, W. F., Dröge, J. F., van Drunen, A. H., Laman, M., Meischke, R., . . . Temminck Groll, B. I. (1993). *Jaarboek Monumentenzorg* 1993. Zwolle: Waanders Uitgevers.

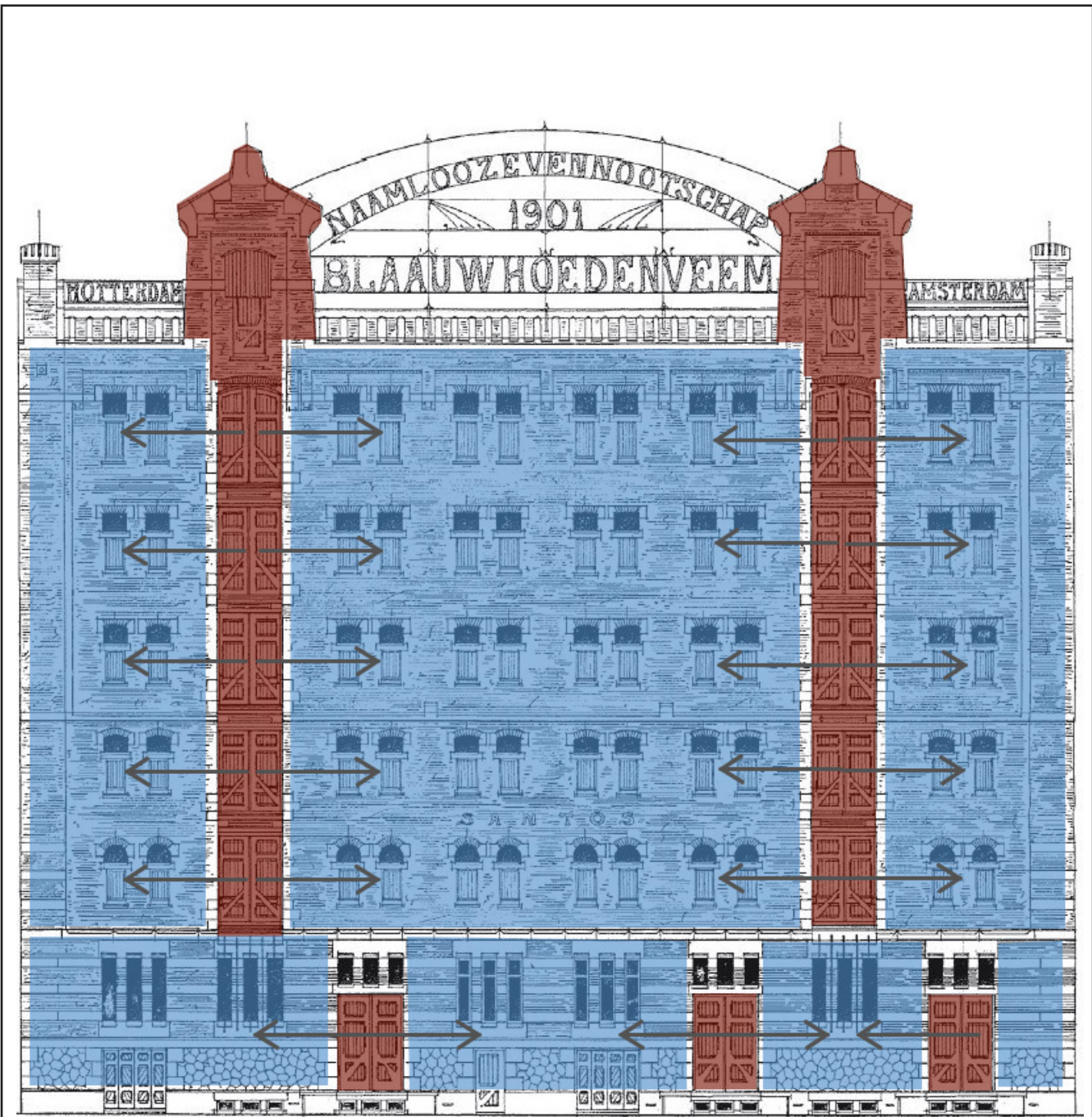


Image 1: Division of the facade of the loading doors in relation to the storage space on either sides of the doors.

- Legend
- Loading doors
 - Storage space
 - ➔ Direction of movement of the goods

3.3 ARCHITECTURAL STYLE

Honesty in expression

In the description of Santos as a nation monument, Santos is solely described as having a sober eclectic style. However, there are more aspects that are important to describe the style of Santos.

Mainly caused by Stok's influences, Santos was portrayed as a building that was honest in its expression. This honesty becomes explicit when relating the function to the expression: the function of a warehouse is expressed in its closed square mass. This honesty is also shown in later works of Stok. It could be that the architects wanted to relate to the warehouse-architecture of the South of Rotterdam and the early rationalism of Berlage.

The floorplan and façades are also constructed in a rational manner. On each floor, there are two big loading doors in the façade that are more or less related to the circulation zones and the storage spaces on either side. This zoning is also visible in the façade, as shown in image 1. The masonry is as bald on the inside as on the outside. This is coherent with the function of the building, but it is also coherent with the wish to let the walls 'speak': 'Saxa loquuntur'.

Original image from: van Velzen, H.J., van Winsen M.R. (2011). Bouwhistorische verkenning Pakhuis Santos. Rotterdam: Flexus Architectuur Welstand Cultuurhistorie. Drawing by: J. van der Aart

Classical composition

The facade of Santos is composed in a classical way. Within the square that makes up the contour of the building, there is a division between the plinth, the middle and the attic zone. In image 2 this division in the facade of Santos is visible.

This classical composition of the façade is closely related to the other buildings of Stok. The best example of that is the warehouse of v.d. Lugt, designed by Stok. This warehouse was built in 1898 and unfortunately, it burned down in 1902. When looking at the facade of the warehouse of vd Lugt, the attic, the middle and the plinth are also recognizable, as shown in image 3. The division is one of the main aspects of the Beaux-Arts style. The Beaux-Arts influences also show in the explicit horizontal ending of the façade in the corners. However, this is expressed in a modern way with an accurate pilaster that joins the plinth in the corner.



Image 2: Santos: division of the facade into the plinth, the middle and the attic zone



Image 3: Vd Lugt: division of the facade into the plinth, the middle and the attic zone

Legend

- The attic zone
- The middle zone
- The plinth zone

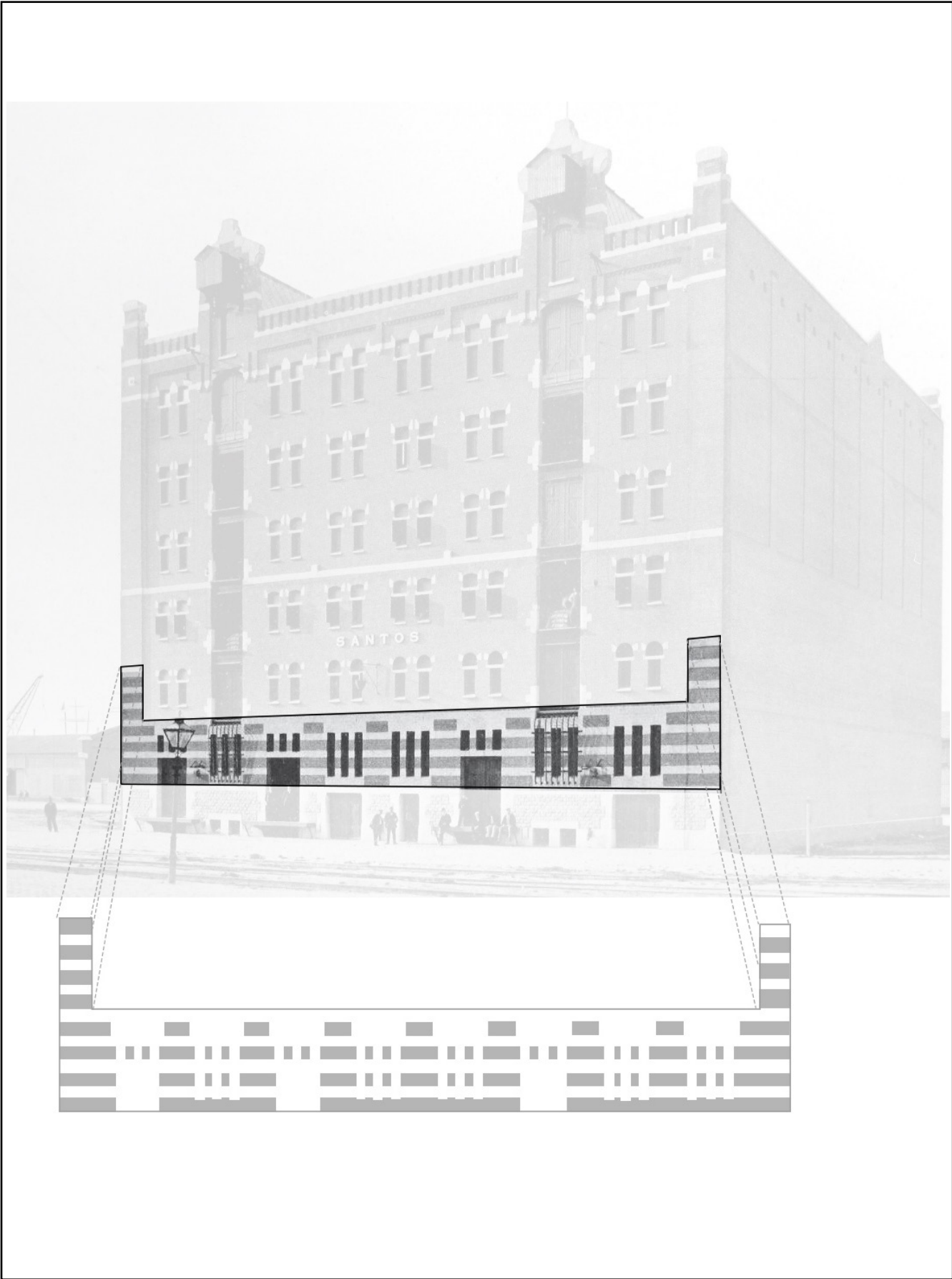


Image 5: Ashlar stone stroke-pattern

Eclectic style

The eclectic style of Santos shows in the façade, where there are multiple style-aspects applied. The rustic pattern with coarse blocks can be considered as a neo-Romanesque detail. Moreover, in the plinth and in the corner-pilasters, there is an ashlar stone stroke-pattern that, together with the lintel, results in a façade pattern that is definite. This pattern is made visible in image 5.

This aspect of Santos is closely related to earlier facades made by Stok and is also applied in the Art Nouveau and by other architects that build eclectic in the end of the 19th century. The Art Nouveau influences is also shown in the tops of the winch houses and how they connect to the end of the north and south façade, as shown in image 4.



Image 4: Art Nouveau winch houses

Conclusion

The north and south facade of Santos are eclectically composed and have lots of ornaments and extra details. Santos has a façade architecture that is much richer then what was customary for other warehouses from the same time. Thus, it can be concluded that the architects considered that design of the façade as an assignment that rose way beyond the strictly functional design.

Orginial images from: van Velzen, H.J., van Winsen M.R. (2011). Bouwhistorische verkenning Pakhuis Santos. Rotterdam: Flexus Architectuur Welstand Cultuurhistorie. Drawings by: J. van der Aart

3.4 Warehouse typology

The storage of goods in a shelter is a very old human endeavour and there for a choice has been made to start this typological research from the point in time the storage buildings have some common qualities. First an analysis will be made about the typology on an urban level to understand the connection a warehouse has to its surroundings. Secondly we will investigate the development of the building typology and place Santos within this typological context.

This example of Roman storage facilities at the southern riverbank in Rome was built around 100 BC (picture 1). The warehouses called 'horrea' are placed alongside the river in different lanes. The first type which is positioned on the 2nd row is a one-story long stretch of connecting vaults made out of columns for the storage of goods. The second type is found in the 3rd lane which has a more compact shape and has two lanes of multi-storage sheltered storage connected to a courtyard. This was mainly cost effective because the warehouse didn't need to pay for the prime locations along the quay's.

In the diagram (picture 3) it becomes clear that the size of the first type that the intentions are to store in bulk and to store goods for a brief period. The close connection to the riverside makes it ideal for storage and reloading cargo for further transport by ship. A long stretch of public space is used along in front and back of the warehouse to load/unload large quantities of cargo.

The second type is called 'horrea Galbae' and is a lot smaller in size and is less ideal for bulk transport but it can presumably be assumed because of its higher placement it had better storage conditions than the first type. With the use of the enclosing walls it is a more safe storage and better equipped for distribution of goods on a smaller scale to the city. The loading/unloading happens here internal within the structure, and the goods journey continuous by wagons or manual labor.



1. Reconstruction of Rome's southern riverbank with the warehouse Galbae highlighted in white around 176 BC



3. City map of Rome southern riverbank around 193 BC. Diagram of the use of warehouse position

Conclusion

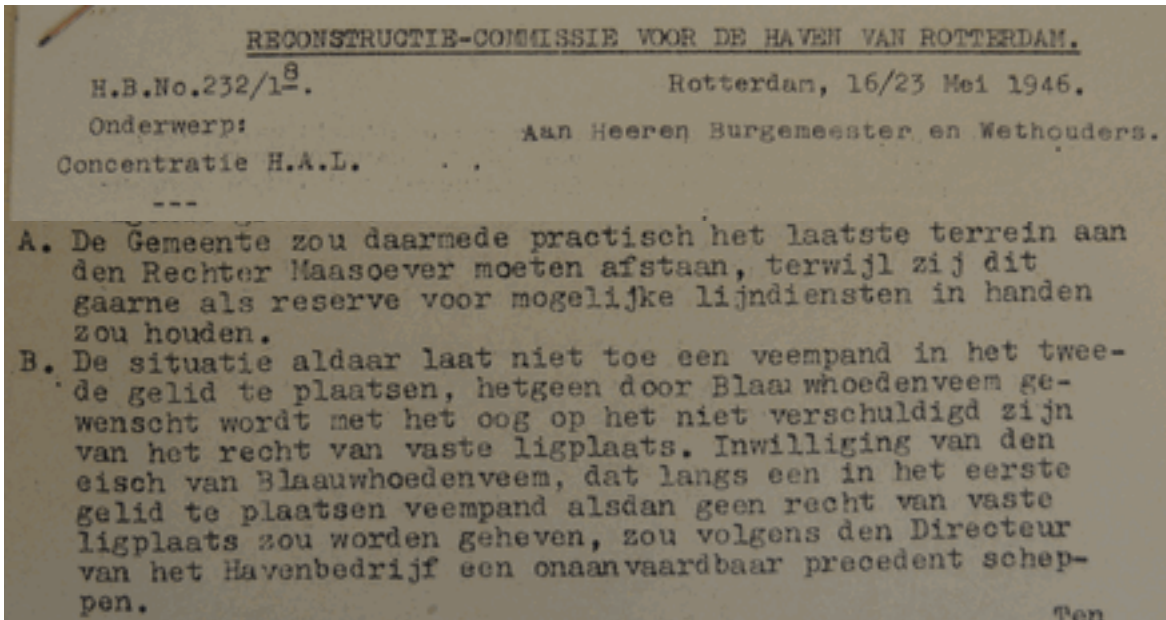
When reflecting back with this information to Santos, the transportation systems of the 1st and 2nd row show similar systems and shapes. Close to the water for short-term bulk transport wich can continious the journey aswell on sea and land. The 2nd row building for long-term storage and further transport by land or local distribution. Lesser acessability on the ground floor and allot of elevated storage capacity wich provide safe and stable conditions.

The great advancement in the development of the harbour typology can be seen in the widened harbour wich allows large ships to turn. Also the superior connection to other infrastructure is a significant development, the introduction of trucks and trains as transportsystem is of great importance in this system. Finally the great advancements in cranes wich handle greater loads in a faster pace make this harbour for the early 20th century modernly build and equiped.

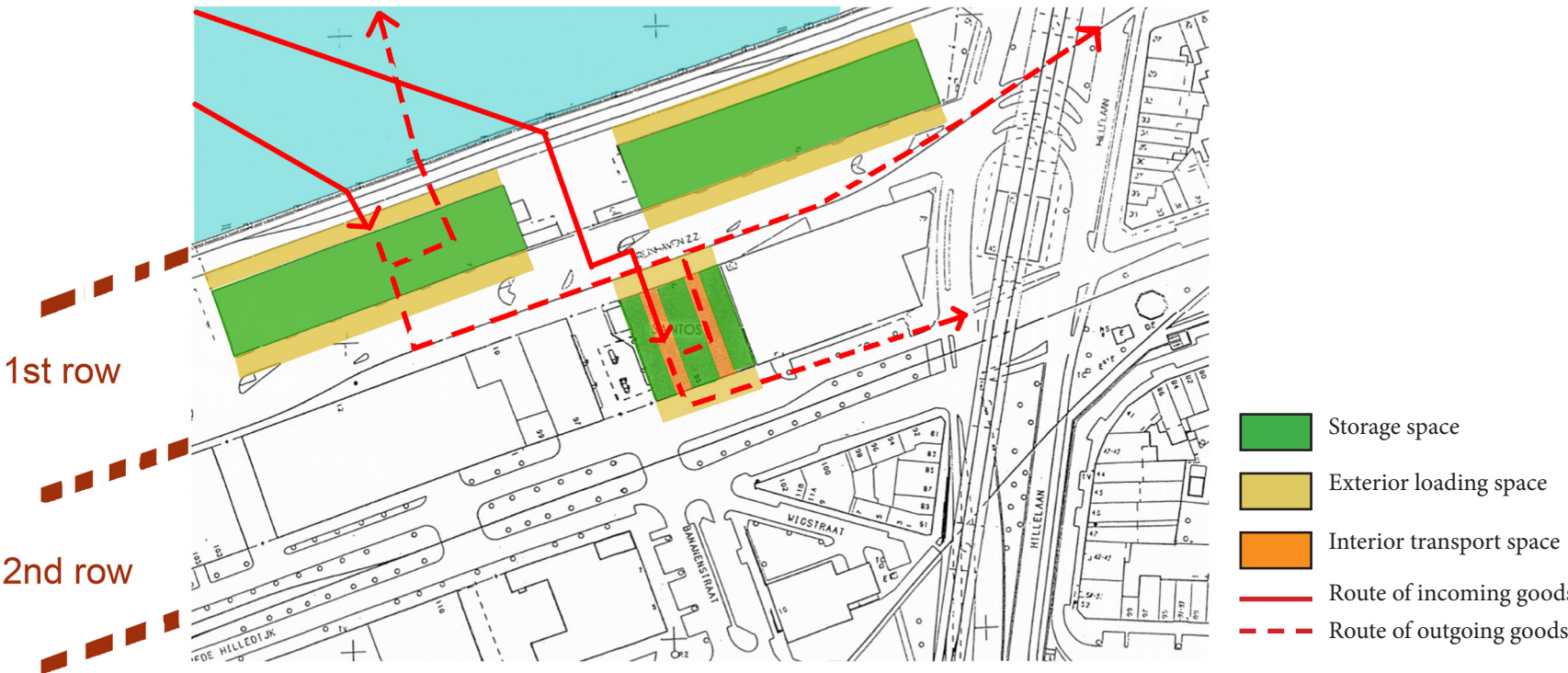
This second row placement typology is mostly of economical motivation. This was found in some correspondence from the reconstruc-tion-comission for the harbour of Rotterdam which was founded to redevelop the bombed harbour (picture 4). It becomes clear that the municipality wanted the location of Santos on the Rijnhaven because of a future vision that didn't include the activities of the Blauwhoeden-veem. This gave the Blauwhoedenveem a powerfull positions in the negotiatons where they managed to secure the 'last' available location on the right bank of the river Maas. Still the Blauwhoedenveem had some worries about the increase in costs due to the new locations 1st row placement.



3. Historical aerial photograph of the Rijnhaven in 1964



4. Correspondence about the exchange of locations and explanation of the Blauwhoedenveems wish for a second row placement.

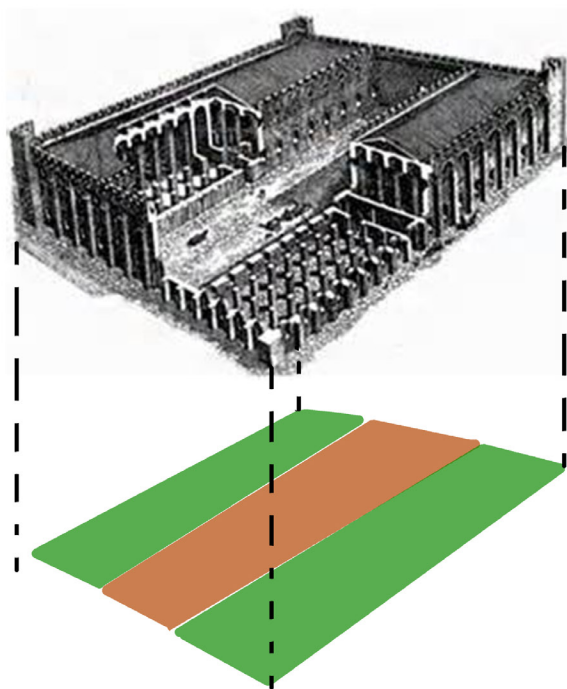
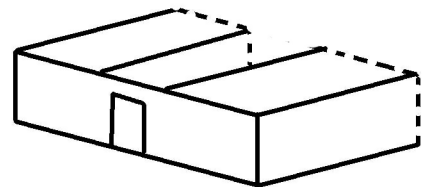


5. City map of Katendrecht 1996. Diagram of the use of warehouse position

Used sources: 3: Aerial photograph of the Rijnhaven. Retrieved at 20-03-2017 from <http://fotos.serc.nl/zuid-holland/rotterdam/rotterdam-45967/>
4: Correspondence form the reconstruction-comission for the harbour of Rotterdam, 16/23 May 1946, From the municipal archives of Rotterdam.
5: City map of katendrecht. Blokboek, Veroudering en Hergebruik, Faculty of architecture, TU Delft, 2009

6. Horrea Gli, Milan, date unknown

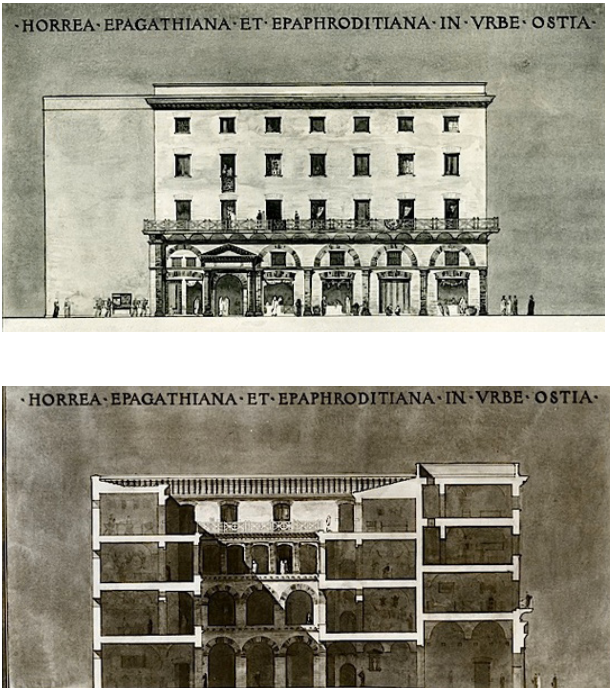
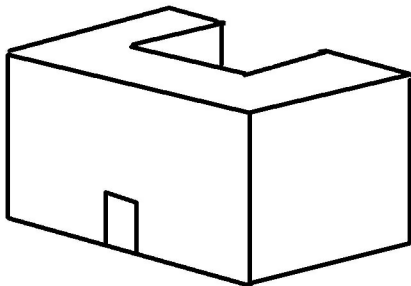
Development of the type:
Two strips of storage boxes get a surrounding wall creating an internal street for the distribution of goods.



Storage space
Interior transport space

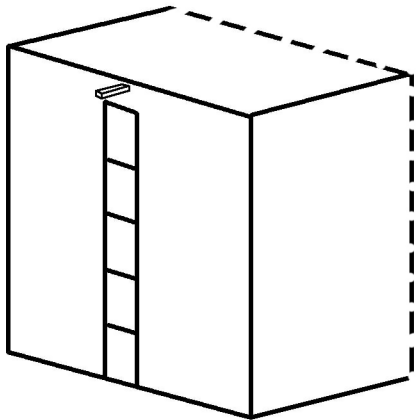
7. Horrea Epaphroditiana, Rome, 1st century BC

Development of the type:
Multiple stories are added to decrease cost/land and add elevated storage space. On the ground level some shops are attached to distribute the goods.



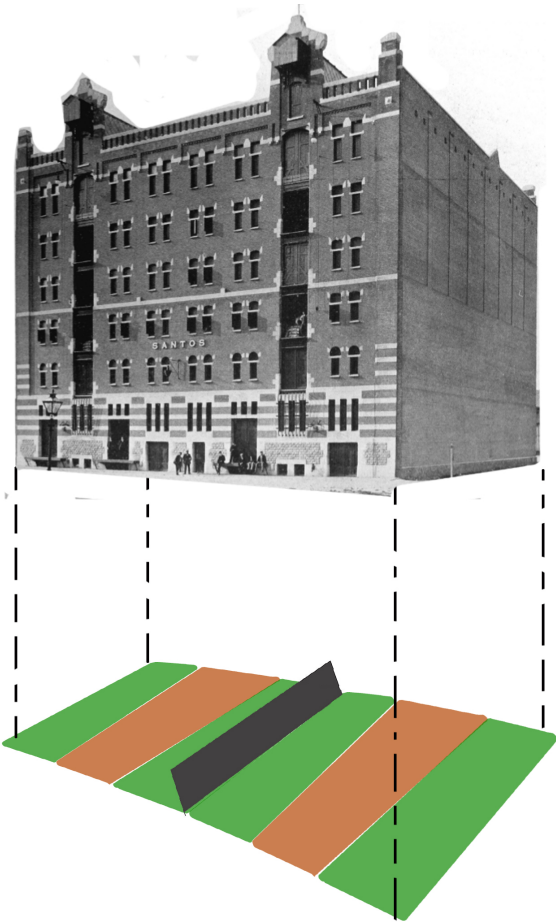
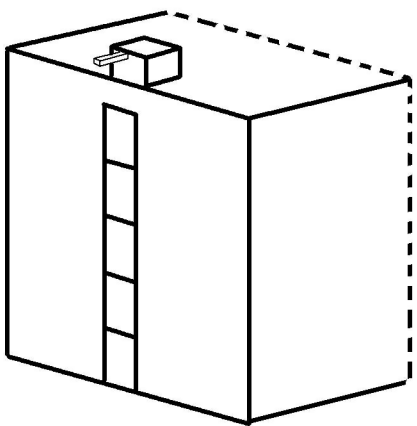
8. Warehouse on Calandstraat, Rotterdam, 1855

Development of the type:
Multiple stories are added and a manual transport system is integrated in the building. The space in front of the building is used for loading.



9. Santos, Rotterdam, 1901

Development of the type:
A mechanical transport system is integrated in the building allowing a more efficient and less labor intensive loading system.



Used sources: 6: Dawing of Horrea Gli. Retrieved at 15-03-2017 http://milanoarcheologia.beniculturali.it/?page_id=4542

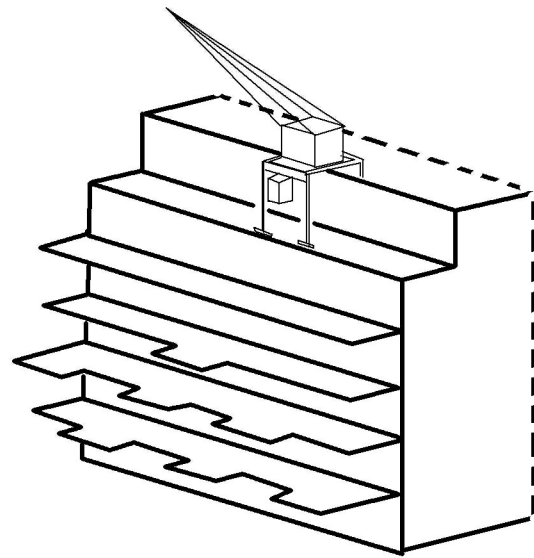
Used sources: 7: Drawings of Horrea Epaphroditiana. American Academy in Rome Collection, Fellows Work Collection Retrieved at 15-03-2017 <http://aarome.idra.info/positions/125>

8: Picture of Warehouse on the Calandstraat. van der Lugt, R. , Havenarchitectuur: een inventarisatie van industriële gebouwen in het Rotterdamse havengebied, 1982, Rotterdamse Kunststichting Uitgeverij, Rotterdam

9: Picture of Santos from the south side before 1917. Graafland, J.A. Stok, J.P. Stok W.Z.N., architect Rotterdam: uitgevoerde gebouwen, Bussum, 1917 (From the series of: bibliotheek voor de moderne architectuur ch.4 no.1)

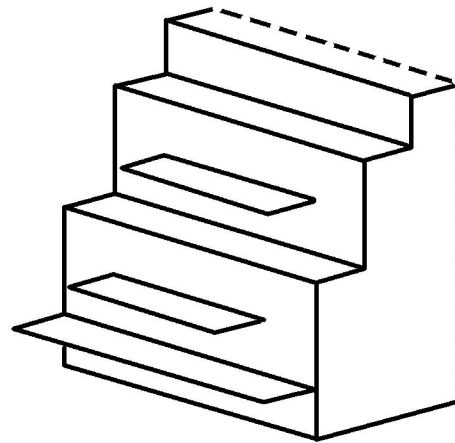
10. Sint-jobs veem, Rotterdam, 1914

Development of the type:
The integrated mechanical transport system becomes movable along the edge of the roof.



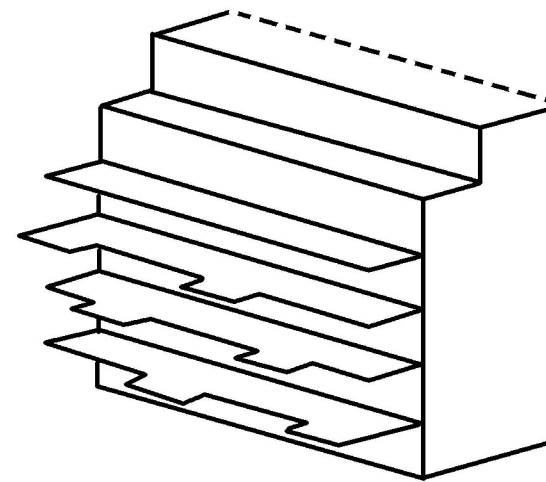
11. Warehouse China-Japan-Korea-Siam, Rotterdam, 1947

Development of the type:
Custom designed cantilevers to optimise the mechanical transport flows.



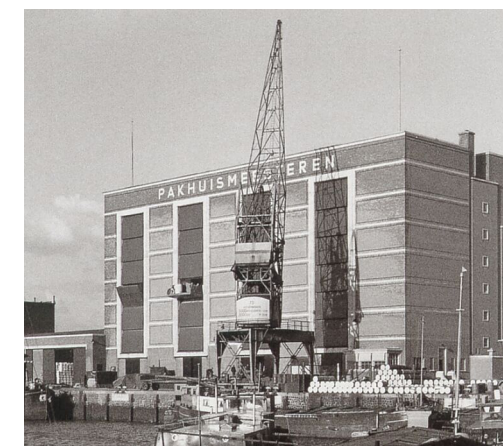
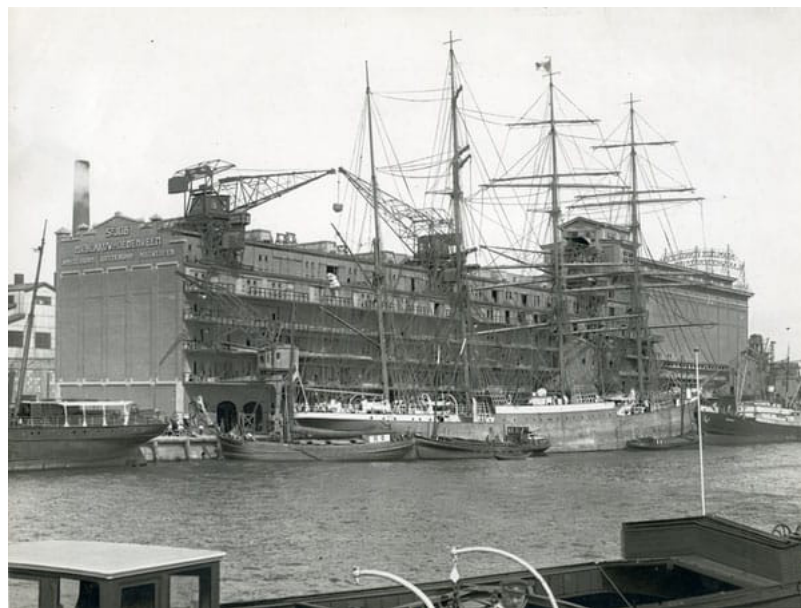
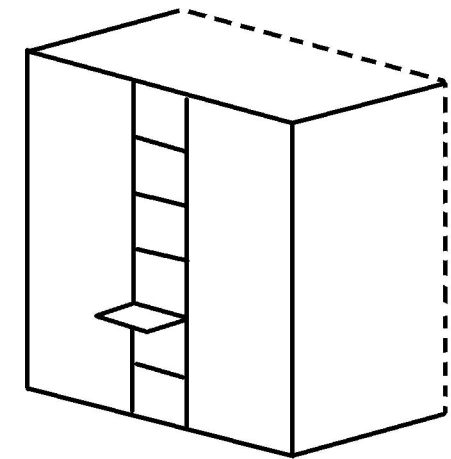
12. Warehouse de Molukken, Rotterdam, 1948

Development of the type:
Custom designed cantilevers to optimise the manual transportation flows.



13. Warehouse de Eerstelling, Rotterdam, 1950

Custom vertical loading dock system integrated in the building to optimize functionality.



Used sources: 10. Picture of Sint-jobs veem. Retrieved at 24-03-2017 <https://www.vopak.nl/onze-historie>

11: Picture of warehouse China-Japan-Korea-Siam. van der Lugt, R., Havenarchitectuur: een inventarisatie van industriële gebouwen in het Rotterdamse havengebied, 1982, Rotterdamse Kunststichting Uitgeverij, Rotterdam

12: Picture of warehouse de Molukken. van der Lugt, R., Havenarchitectuur: een inventarisatie van industriële gebouwen in het Rotterdamse havengebied, 1982, Rotterdamse Kunststichting Uitgeverij, Rotterdam

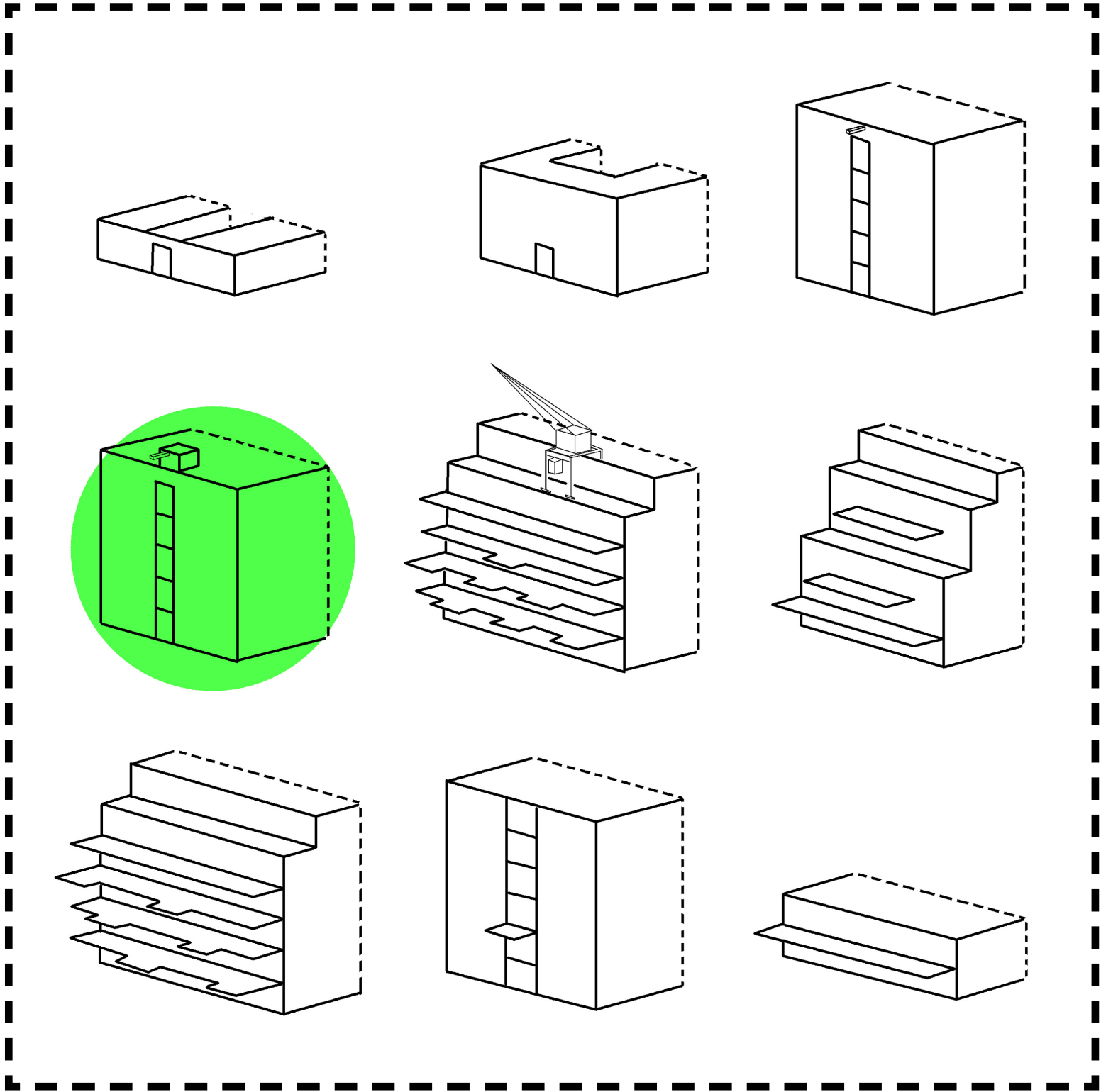
13 :Picture of warehouse de Eerstelling. Retrieved at 24-03-2017 <http://www.delastdrager.com/historie/>

Conclusion

Looking at the typological development gives insight in the workings of warehouses and the development the type went through and the similarities it still has with the archetype. But more importantly it shows the position of Santos within this story. It tells about the important development from manual transport systems to mechanical and provides the step towards the movable mechanical transport system.

Many examples are taken from harbour buildings in Rotterdam to emphasise on its 'family' and the still remaining readability of the development of the warehouse type in the early 20th century. Santos stands in a long line of advancements which were of great importance to the prosperity and growth of the city in that time and only a few examples of this early period still exist.

This raises questions about the currently missing winch houses on Santos. Because it is the main typological development does this influence the rarity of this early modernised warehouse typology and should they be placed or referred back to?



14. Diagram showing the placement of Santos within the evolution of the warehouse type

Use of source: Altered drawing of warehouse typology. van der Lugt, R., Havenarchitectuur: een inventarisatie van industriële gebouwen in het Rotterdamse havengebied, 1982, Rotterdamse Kunststichting Uitgeverij, Rotterdam

3.5 SKIN

3.5.1 MATERIALISATION

BRICK

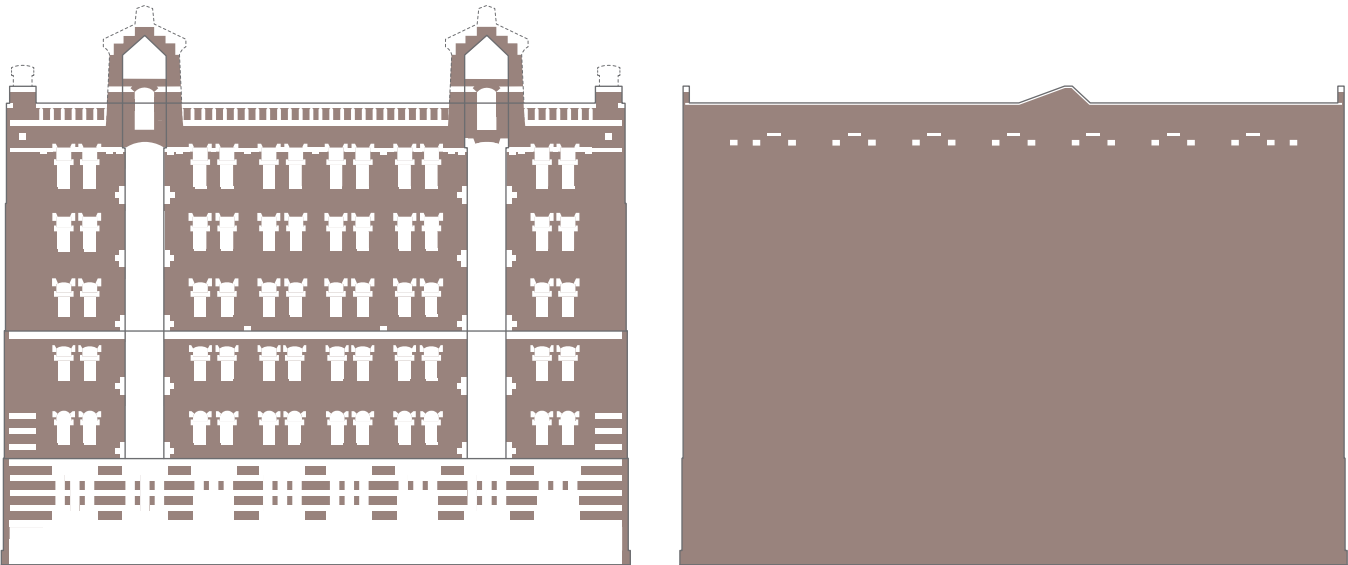
Brick makes up a large part of Santos' facade. It creates a neutral **base** on which the more eclectic elements (like the natural stone ornaments) of the facade can shine. This is the case for the north and south facades, the other two facades are made up (almost) entirely of brick (picture 1).

The bricks are in some occasions used for ornaments (picture 2) and for the detailing above the windows (picture 3).

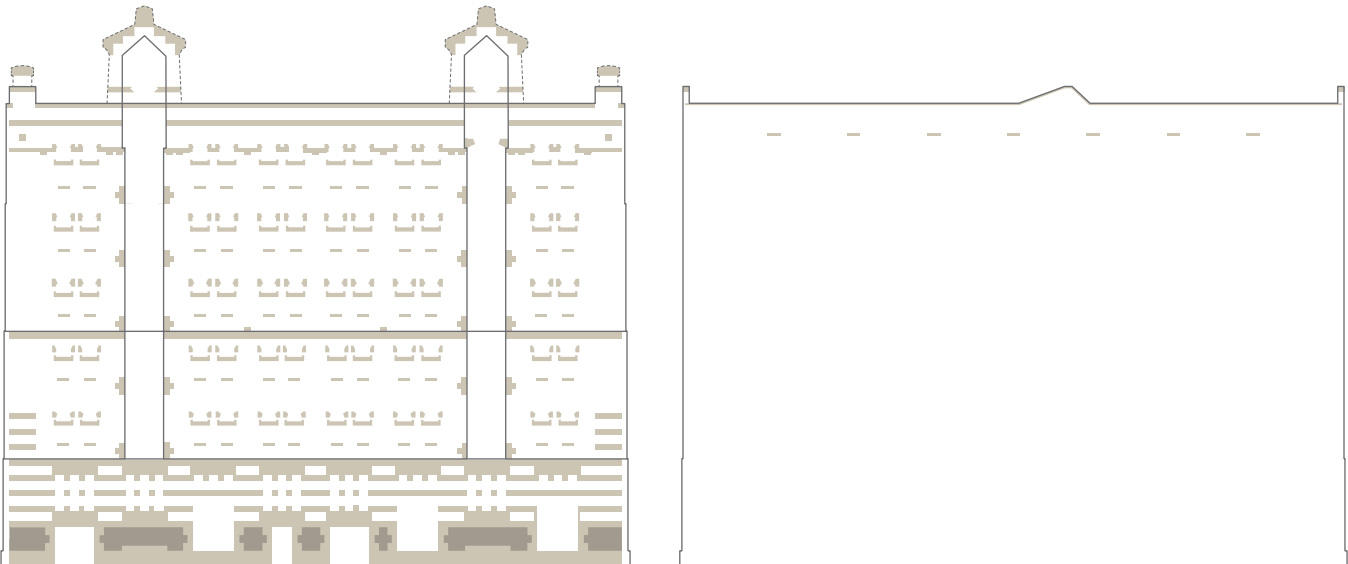


NATURAL STONE

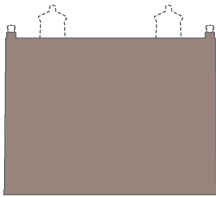
As we can see, the natural stone makes up another large part of the building. These lighter accents have a very ornamental function, and are creating the strong **horizontal lines** in the plinth (picture 4), the middle and the crown of the building. Natural stone also **accentuates** the doors and windows (picture 3), and is in some occasions used for smaller ornaments (picture 5).



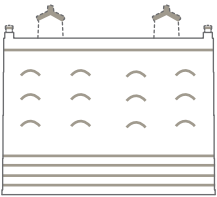
red brick



natural stone - limestone
natural stone - sandstone



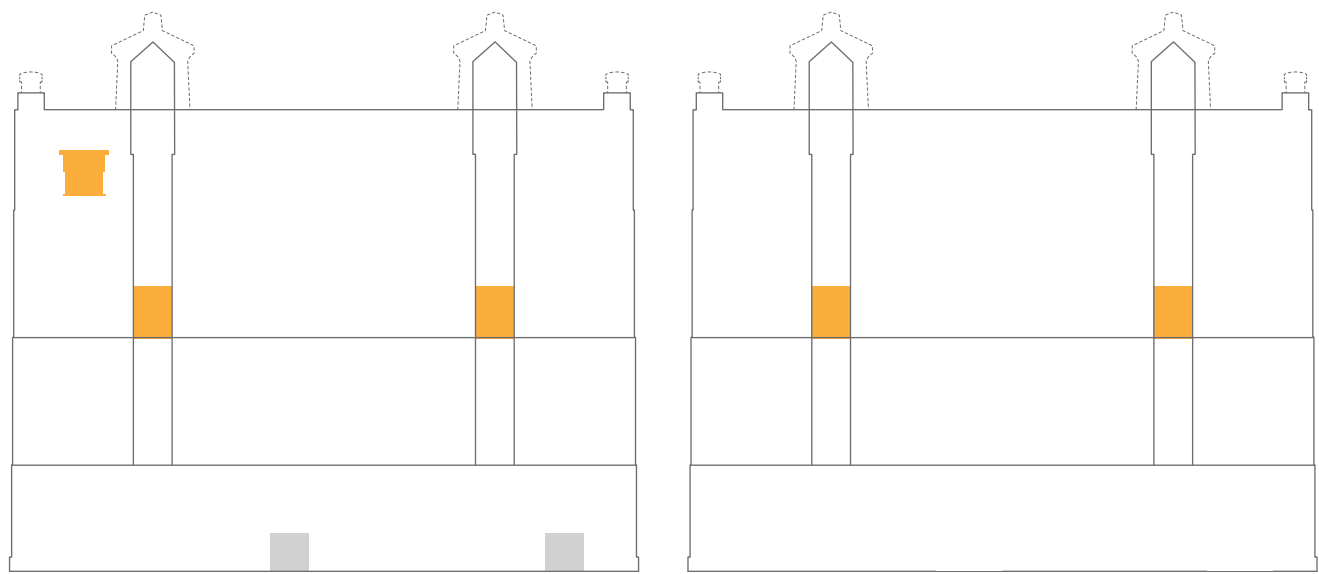
brick base



horizontal lines
& accents



- original wooden doors & shutters
- intended wooden doors & shutters (gone)
- metal doors & iron bars
- white painted doors



- added windows
- concrete

WOODEN (LOADING) DOORS & SHUTTERS

The wooden loading doors form two strong vertical lines, which is strenthened partly by their materialisation, but also by the fact that they lie slightly deeper in the facade. The vertical line is continued into the wench-houses, which used the same materialisation. By the removal of these wench-houses, the vertical line became less prominent, but still a strong element in the facade.

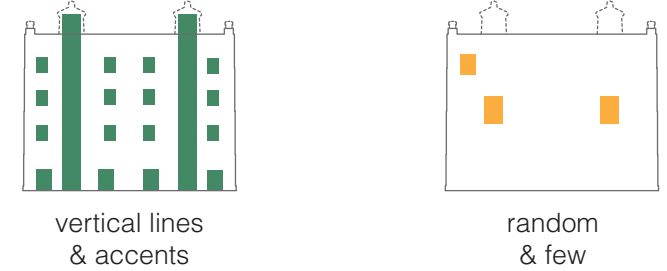
The craftsmanship of the doors gives them a Art Nouveau-esque look (picture 1), which fits the overall style of the facade well. However, in the current situation the loading doors on the south side are covered by a metal door (picture 5), and thus not showing this craftsmanship.

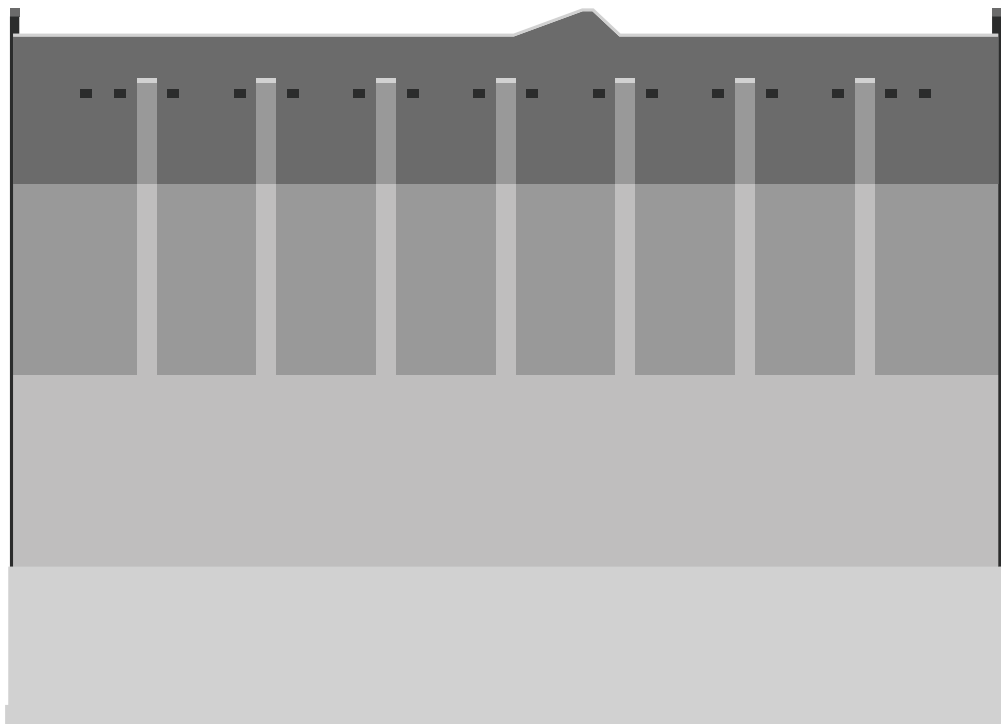
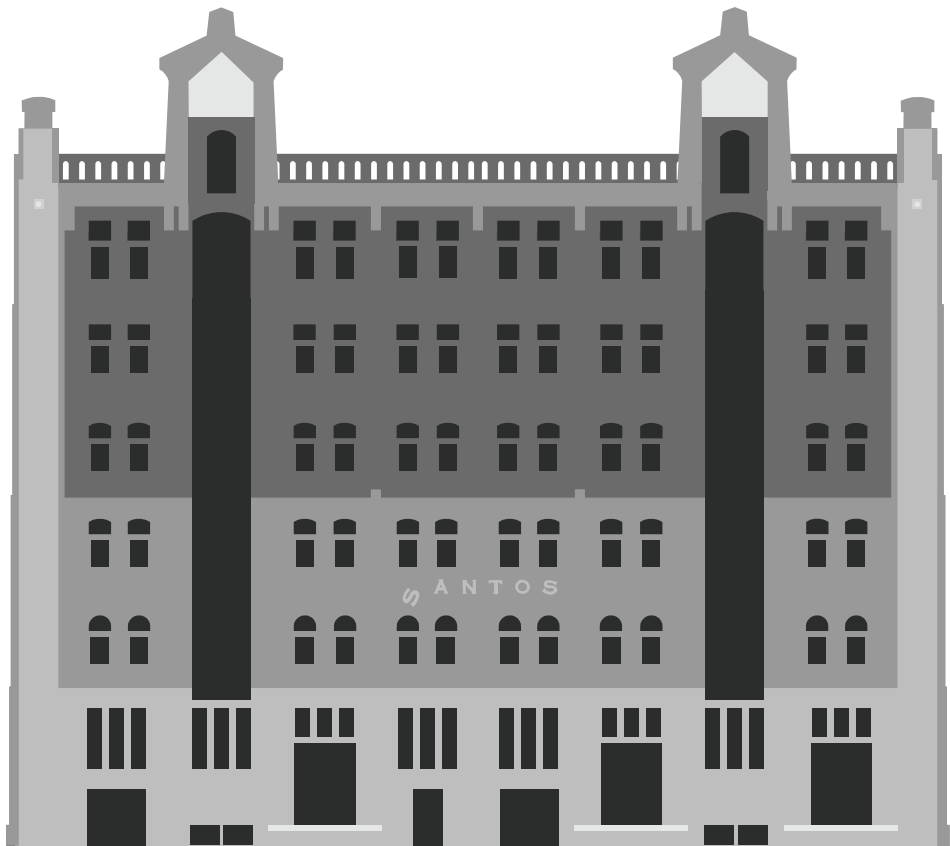
The shutters are similar (and thus visually connected) to the doors. On the upper floor, these shutters are taller because of the floorheight on that level.



ADDITIONS

Throughout the years, some additions were added to the building. These all involve the idea of getting more natural light into the building. There's only a small number of additions: 4 loading doors were turned into windows (picture 4), and two windows were changed into one larger window on the south side.





3.5.2 TEXTURE

FRONT FACADES

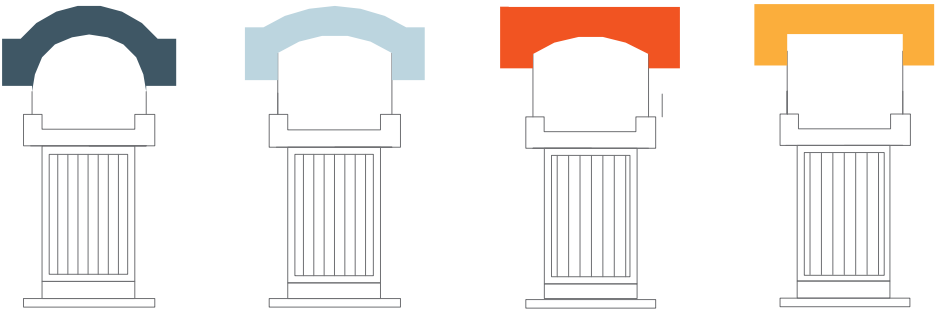
The relief in the facade is used as a subtle way of accentuating the composition.

The plinth literally stands out, and together with the two posts on both sides of the facade it creates a **frame** for the building.

The loading doors do the opposite, they are laid back in the facade, and through the use of shadow create those **strong vertical lines**.

SIDE FACADES

On the east & west facades, there's also relief. Contrary to the two front facades, this relief is mainly economical. The building wall becomes thinner as the building gets higher, because there's less load to carry. In the places where the inner construction meets the wall, the thickness of the wall is continued.



3.5.3 WINDOWS

There are five different types of windows in the facade: 4 very similar types with different detailing at the top, and the vertical windows in the plinth.

MIDDLE PART

In the mid part, there are four different types of craftsmanship at the top of the windows. On the first floor, they used **round arches**. The second and third floor use **segmental arches**, but these vary slightly from each other. The two upper floors use **jack arches**.

A reason for this division might have been that the architect wanted to visualize the load on the different floors through these windows (van Velzen & van Winsen, 2011).

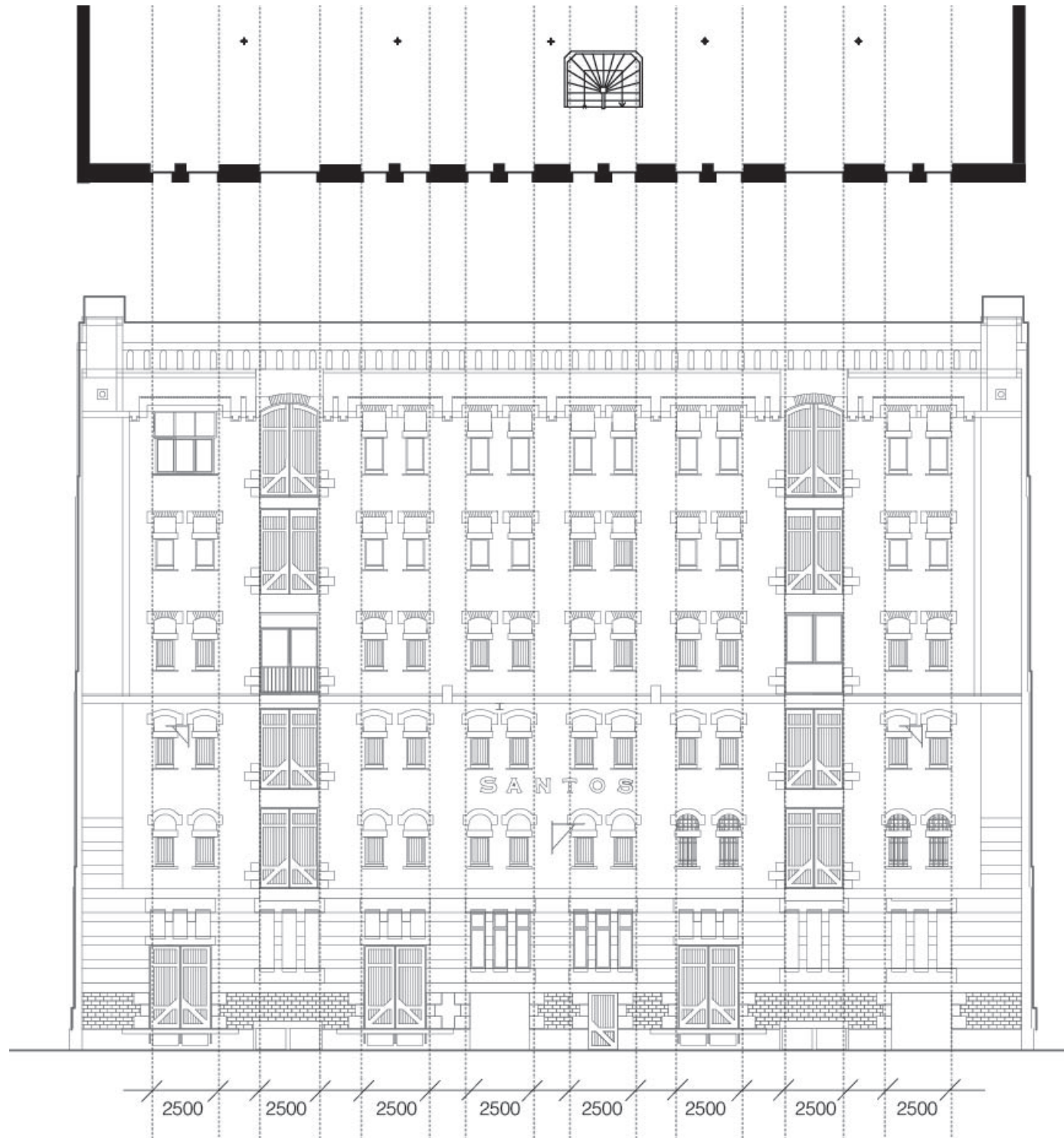
PLINTH

To differentiate the plinth even more, a completely different set of windows was used. These windows are **vertical slits**, without much detailing.

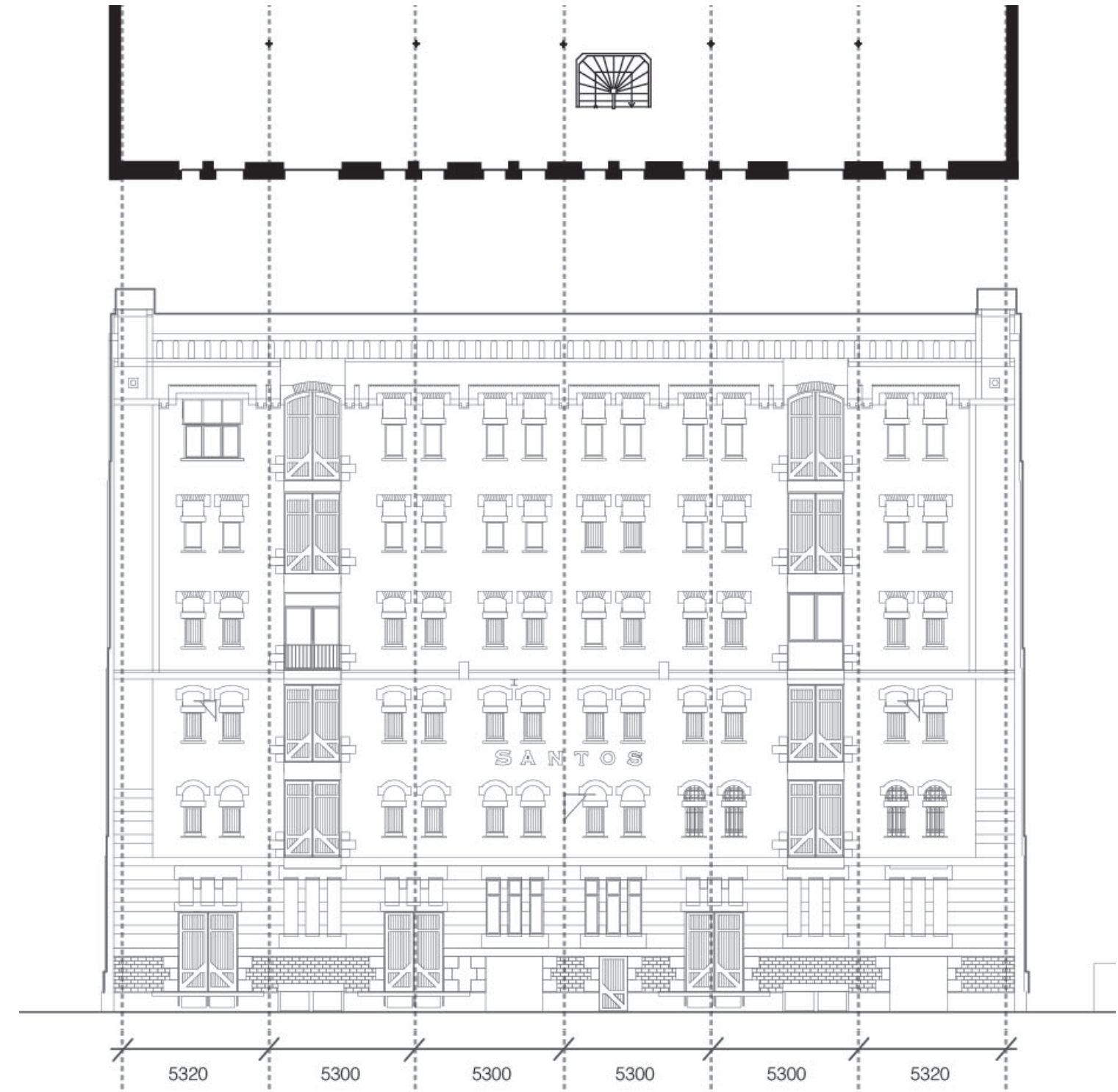
These windows are placed underneath the loading doors, and thus accentuate the vertical line even further. At the same time, their vertical shape goes against the horizontal direction of the plinth, and thus creates visual interest.

3.5.4 INSIDE/OUTSIDE AND RYTHM

When looking at the relationship between the outside facade and the inner column construction, there seems to be no clear connection. The rythm in the facade-division has no connection to the placement of the columns inside and visa versa.



division of the facade compared to the floorplan and construction, 1:200

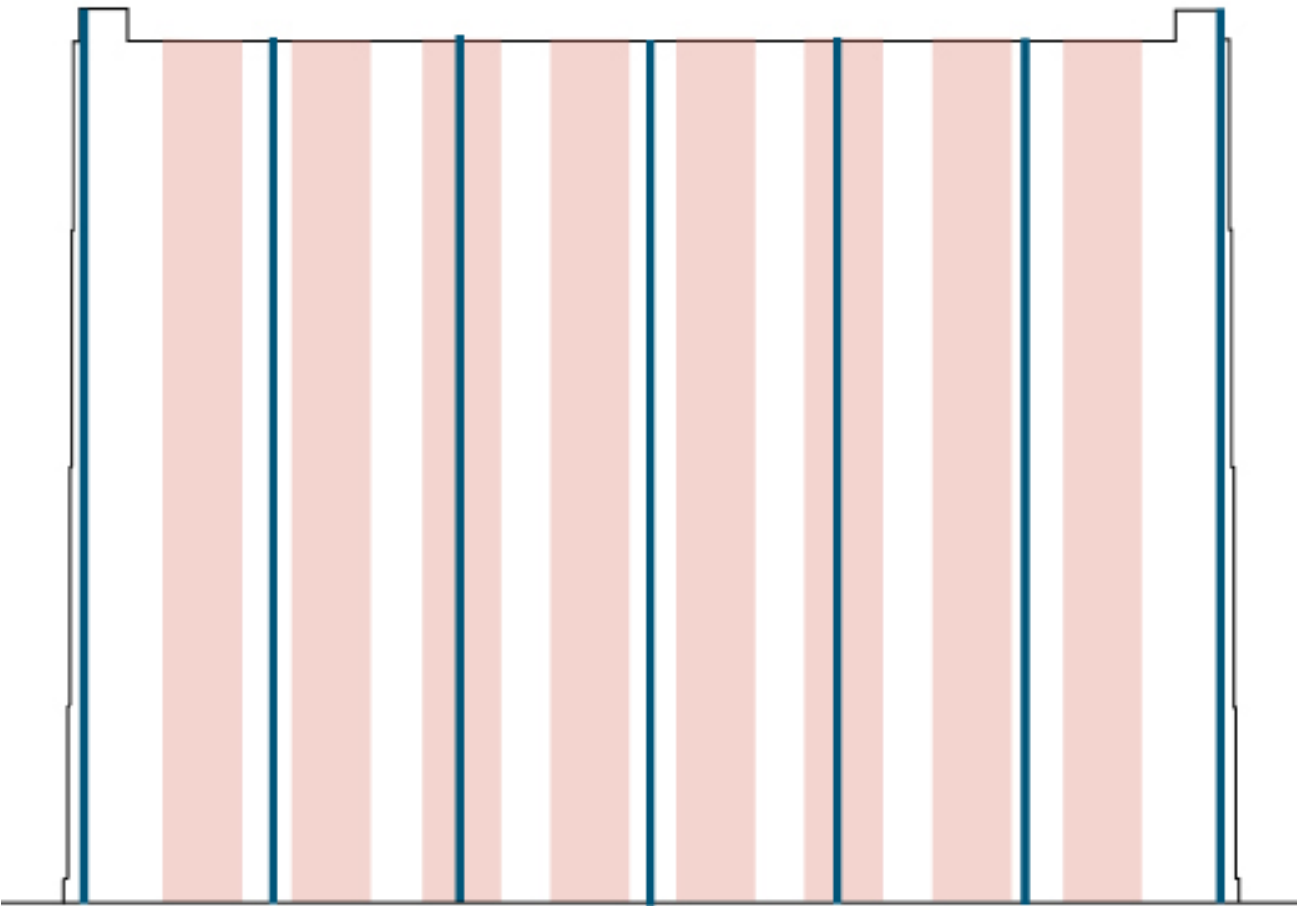


Rythm of the construction reflected upon the facade

Conclusion

When looking at the facade in a vertical way, it is divided into eight vertical strokes that consist of windows and doors. In between these strokes, there are seven in strokes of equal width. There are seven rows of columns present and these rows do not consider the window strokes as element that are to be avoid.

Thus, there is no clear connection between the steel construction inside and the division of the north and south facade. The construction is solely functional and it considers the routing it the building and it optimises the storage space. The facade is constructed in a symmetrical way.

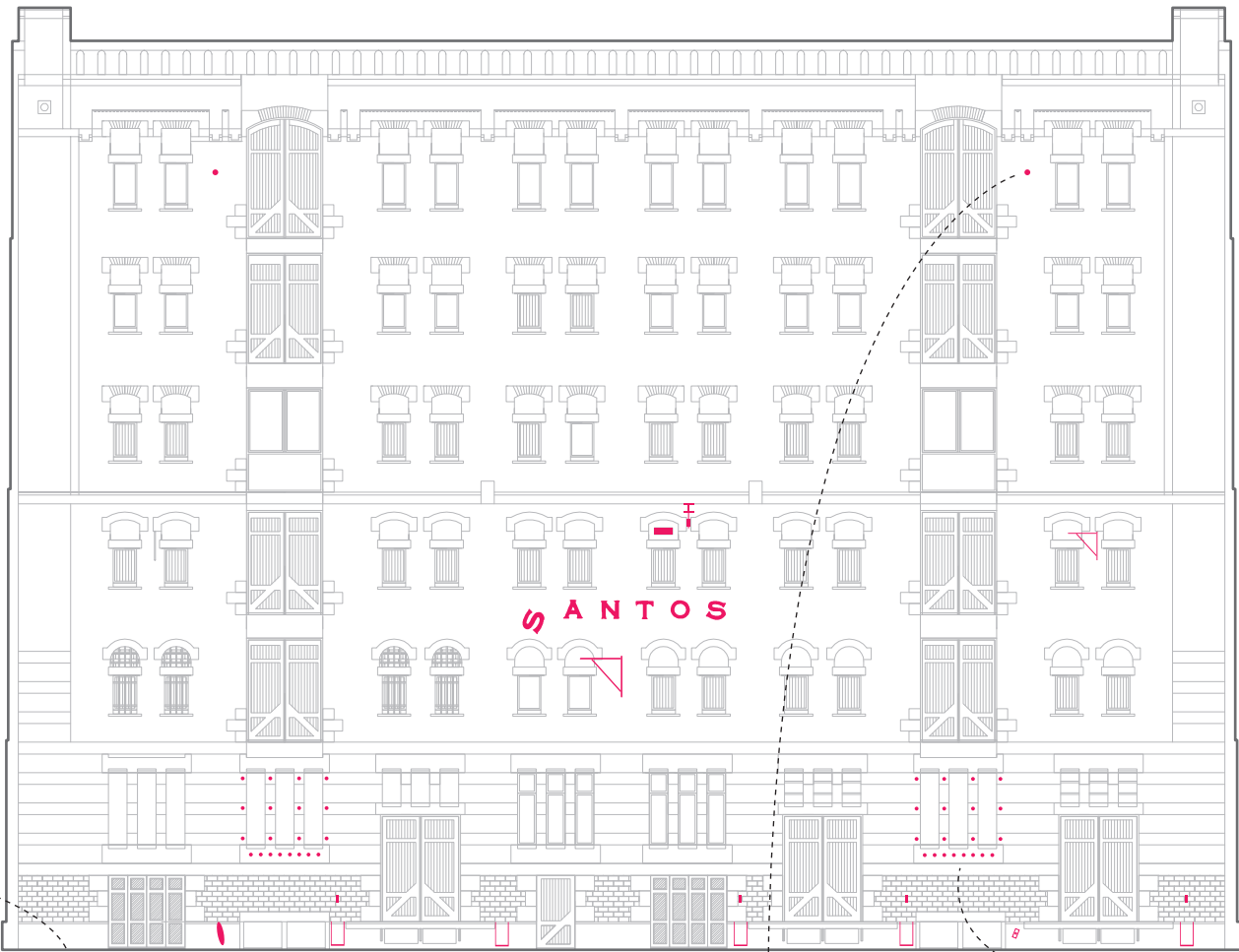


Windows and doors-stroke

Indication of columns behind the facade

Legend

3.5.5 TRACES IN THE FACADE



1. T-shaped metal piece to which ropes can be attached. possibly used for the ropes from the wenchies.



2. traces of an element that was once attached to the wall. possibly the same T-shaped pieces as #1.



3. small metal clasps, located right above #4.



4. metal element. ?



5. Santos lettering in metal + pulley on top and an iron hook that held a lamp at the bottom.



6. hook that held a lamp.



7. Santos had lamps that could be moved to the required loading door, this might be traces of such.



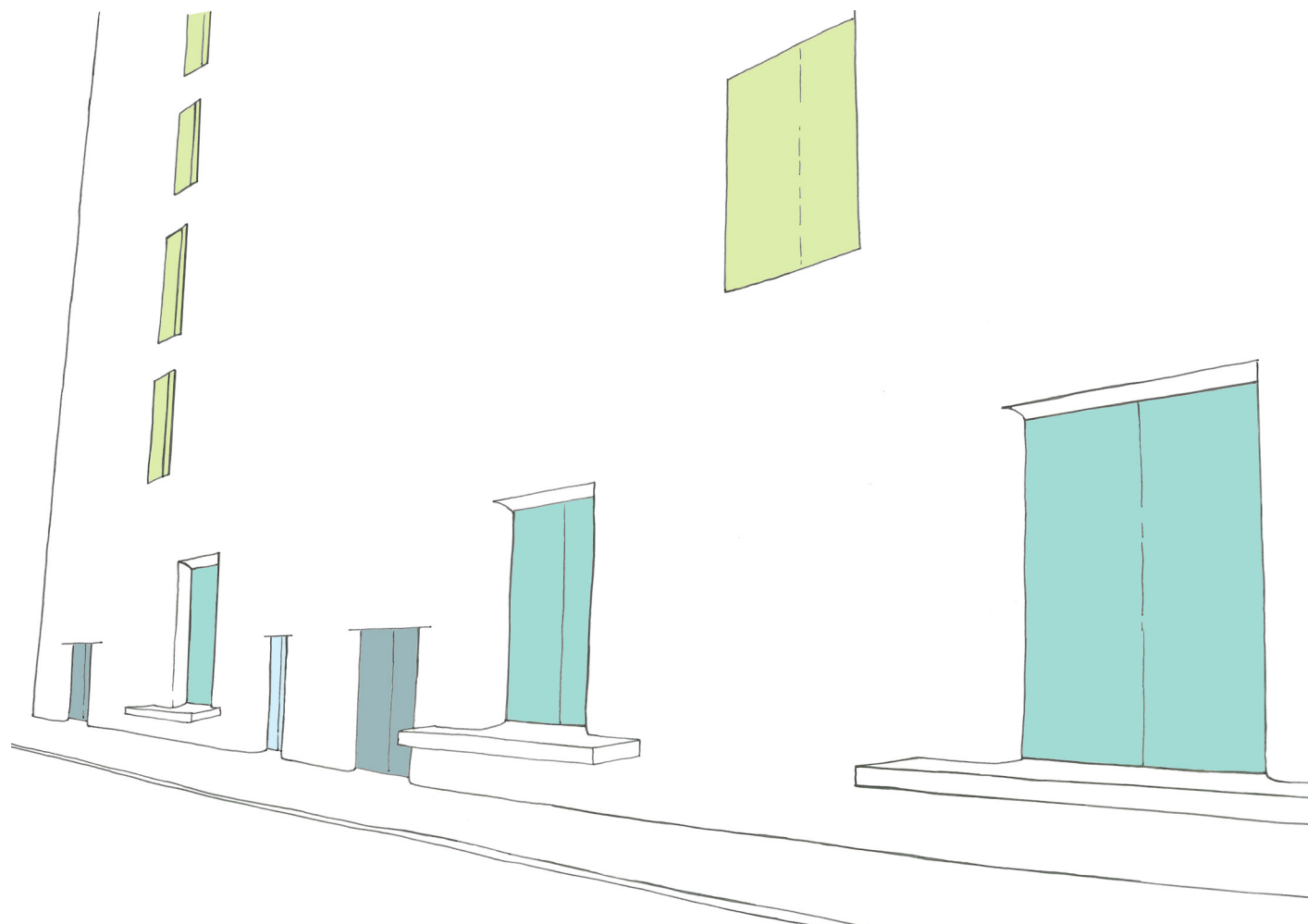
8. traces of removed iron bars.

traces in the facade, 1:200
text & illustrations by H. Slager, pictures by L. Jespers, J. van der Aart & google streetview.

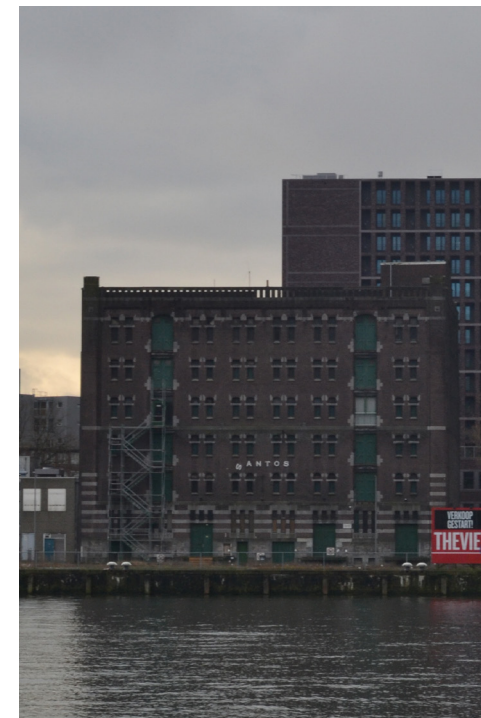
3.6 ORGANISATION

3.6.1. ENTRANCES

Santos has two main facades with entrances, these are orientated on the north (Rijnhaven) and south (Brede Hilledijk). In these facades you can find different doors that lead to the different floors. You can divide the different doors into four types; the doors that lead to the basement, the ground floor, the higher floors and to the staircases. Most of the doors are used to bring the goods inside, the only door that was used for the people who worked there is the door to the staircase.



Impression position different doors (Rijnhaven)

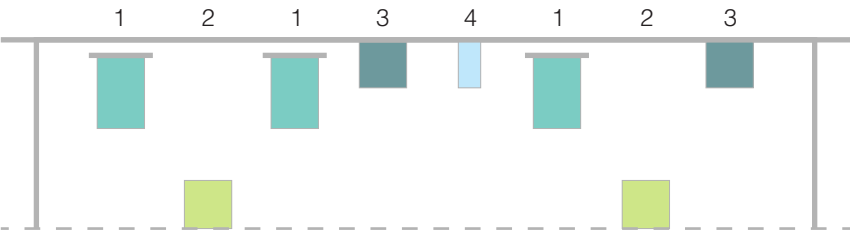


Santos from the Rijnhaven, overview hole facade (own photo, 06-03-2017)

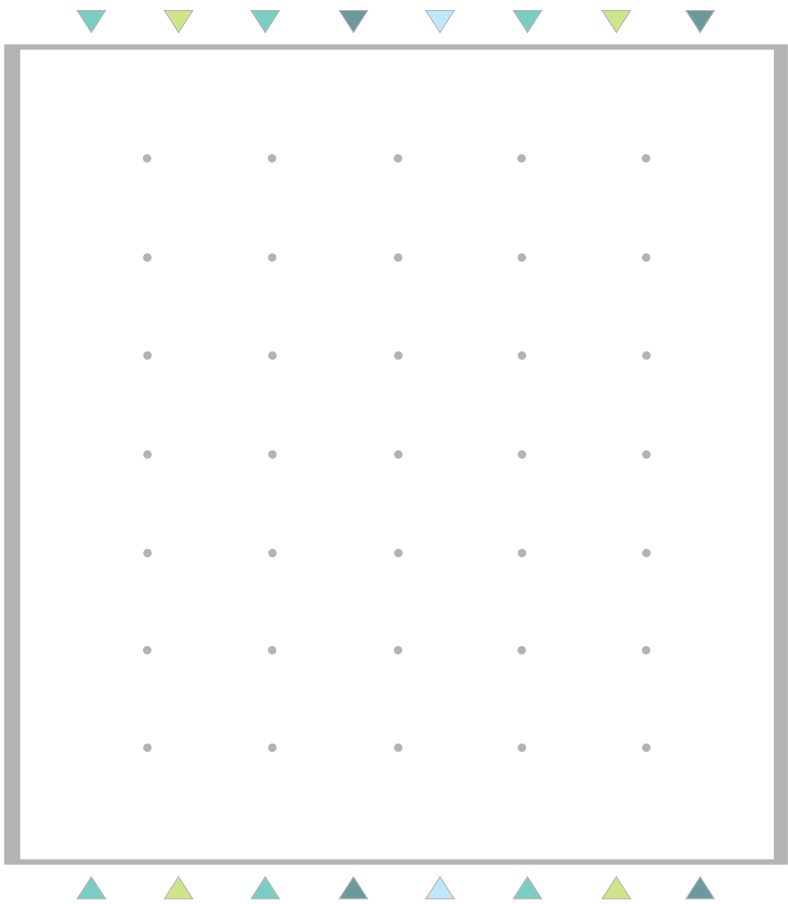


Santos from the Brede Hilledijk, different doors in the facade. The two doors to the basement are closed (own photo, 12-03-2017)

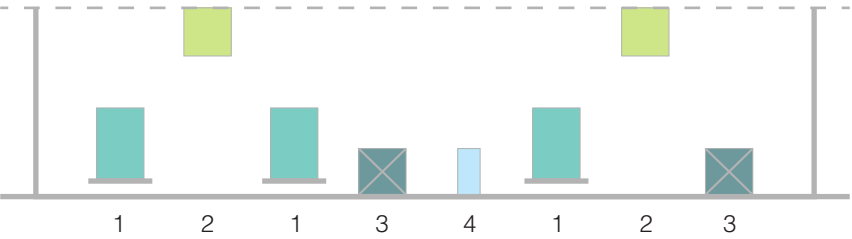
In the facade of Santos, you can find a lot of different doors, most of them are above the level of the sidewalk. Therefore most of them can't be used as an entrance for people right now. The ground floor in Santos is a little higher than the height of the street outside. In the new design, this has to be taken into account.



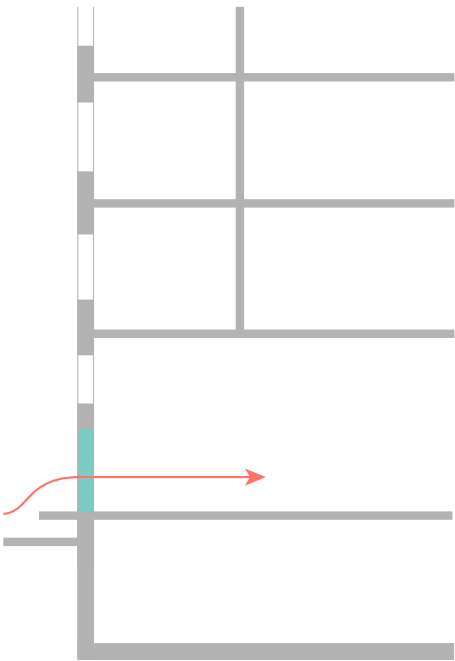
Elevation Rijnhaven



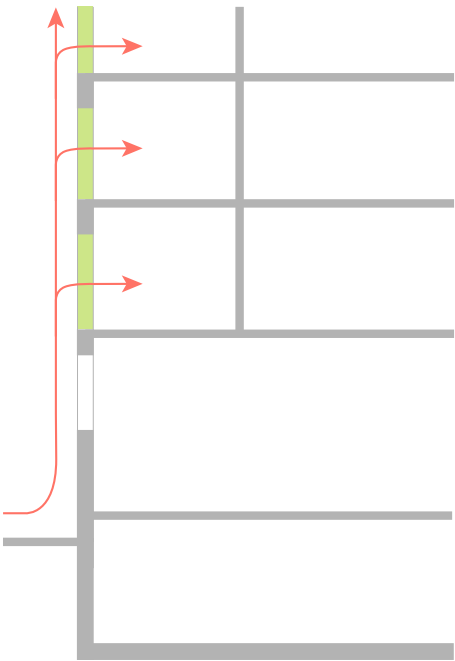
Plan different entrances



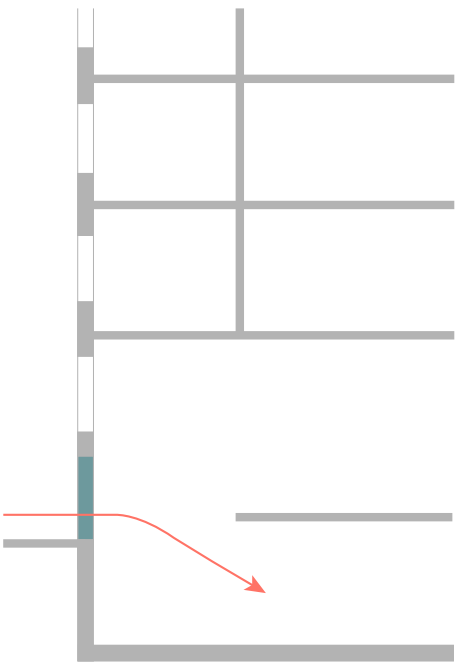
Elevation Brede Hilledijk



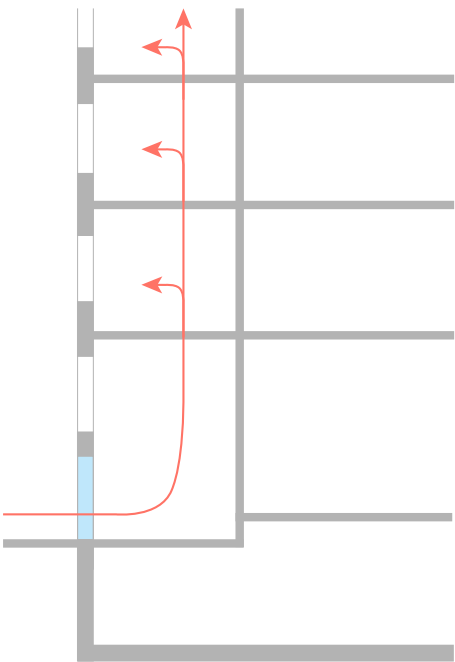
1. Loading and unloading doors ground floor



2. Loading and unloading doors 1st - 5th floor



3. Loading and unloading doors basement

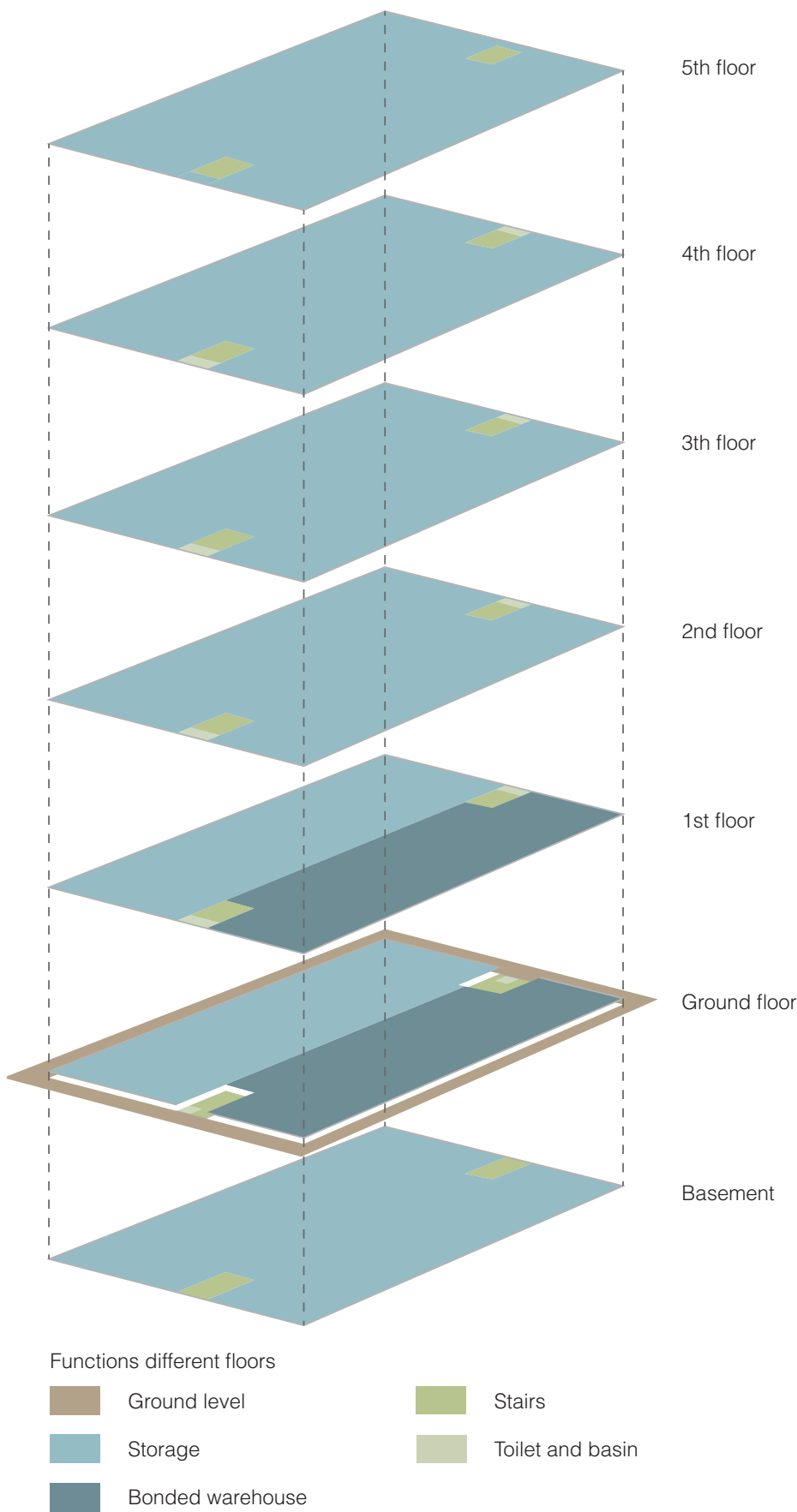


4. Door to the staircase

- Teal square: Loading and unloading doors ground floor
- Light green square: Loading and unloading doors 1st - 5th floor
- Dark teal square: Loading and unloading doors basement
- Light blue square: Door to the stairs

3.6.2 FUNCTIONS

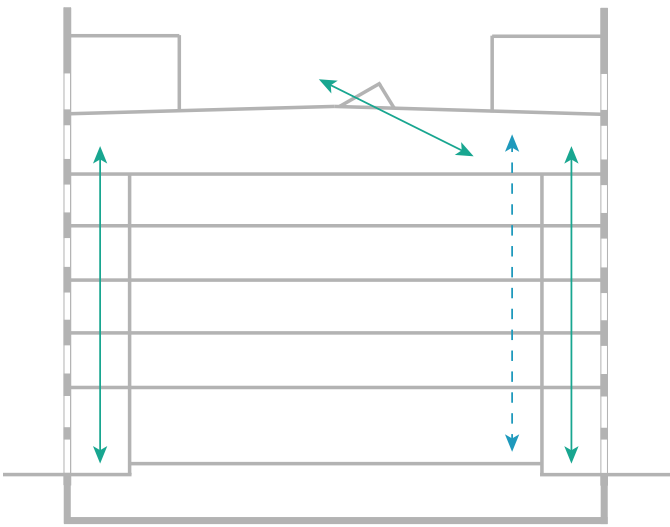
Santos is built and used as storage, so most of the space is meant for this function. Because the 2nd till the 5th floor got the same function the floor plans and facades are similar. The staircases are used for the stairs, but also the toilet and basin are situated in this area. So this area was really meant for the people who worked in the building.



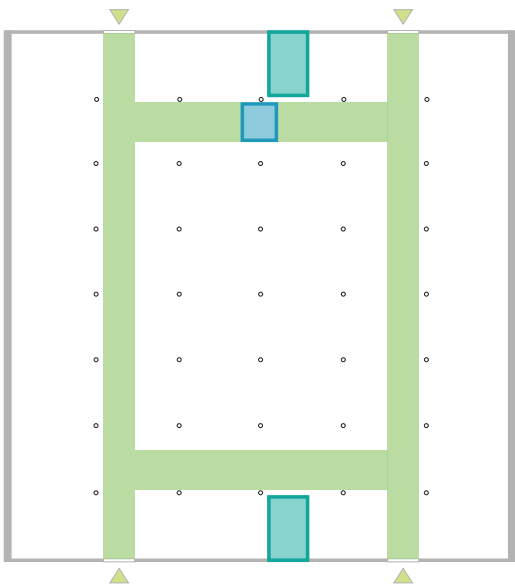
3.6.3.ROUTING

1903-1954

In the period from 1903, when it was just built, to 1954, Santos was used as a storage. Because of its function, the routing was an important aspect of the building. The goods were lifted by winches and an elevator. Inside the building, there were also some gaps in the floor to bring the goods from one floor to the one below. These gaps are now closed, photos of this you can find on the page of the routing between 1970 and now. There are two stairs that the workers could use to go to the different floors. When they would like to go to the roof they used a stair on the 5th floor, like you can see on the right picture below. The horizontal routing was the same on every floor and was related to the doors, the elevation points and the column system. In this way, the routing was a coherent system.

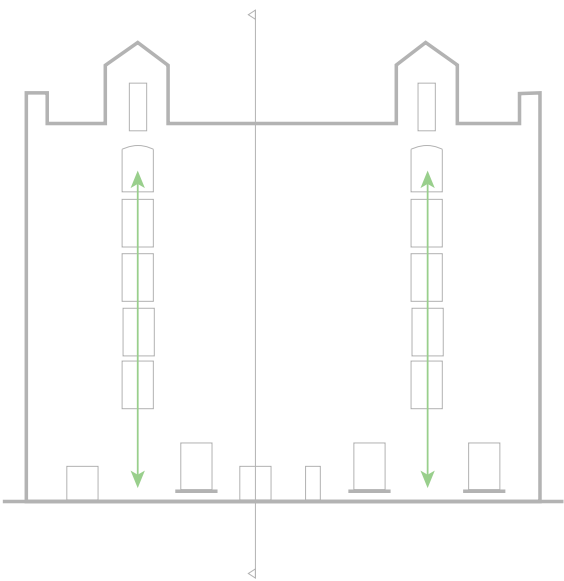


Vertical transport of people (section)

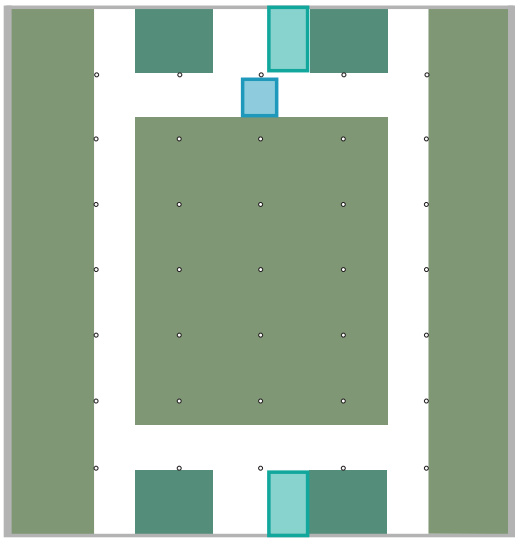
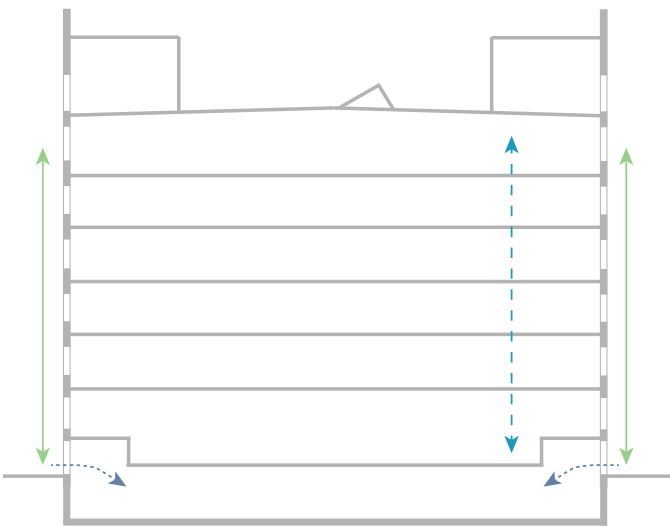


Horizontal circulation 2nd-5th floor

- ↔ Winch
- ↔ Elevator
- Entrance to the basement
- ↔ Stairs
- Stairs
- Elevator
- ▲ Loading and unloading doors
- Walking path
- Storage space
- Probably storage space



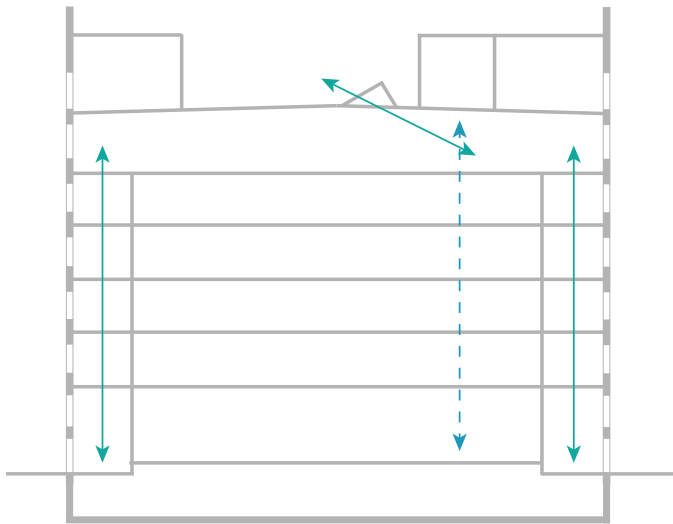
Vertical transport of goods (left: elevation Brede Hilledijk, middle: section)



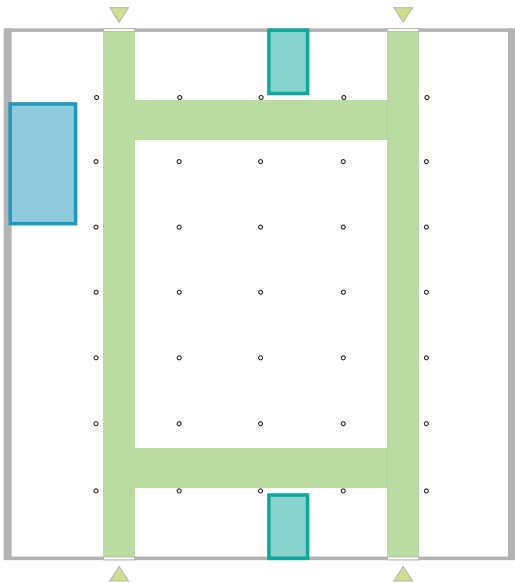
Storage space 2nd-5th floor

1954-1970

In 1954 the Dutch land forces hired Santos to use it as a storage, in 1959 they moved to another place. From that moment till 1975 the owners, Blaauwhoedenveem, tried to rent spaces to people to use it in a commercial way. However, this wasn't successful. So in 1975 they sold it to the company Handelsveem. During the above described period, various changes were made to the building. In 1954 the elevator has been replaced by one at the west facade. Because of this change, there were some small changes in the routing as well. The most important is the relation between horizontal and vertical routing. Instead of an elevator in the middle of a horizontal path, it now was moved to the end of this path.

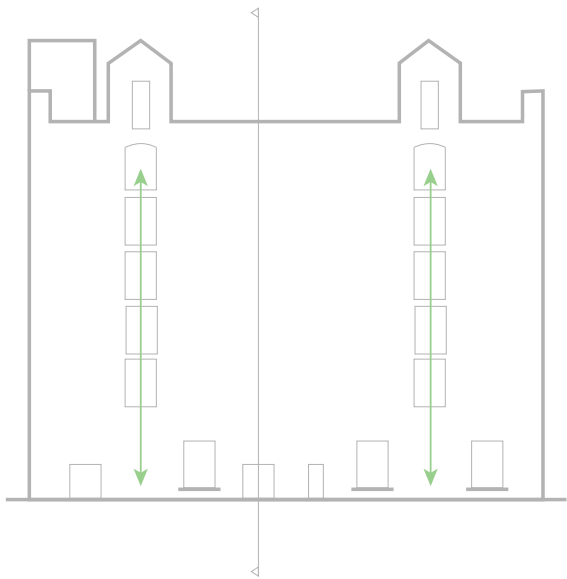


Vertical transport of people (section)

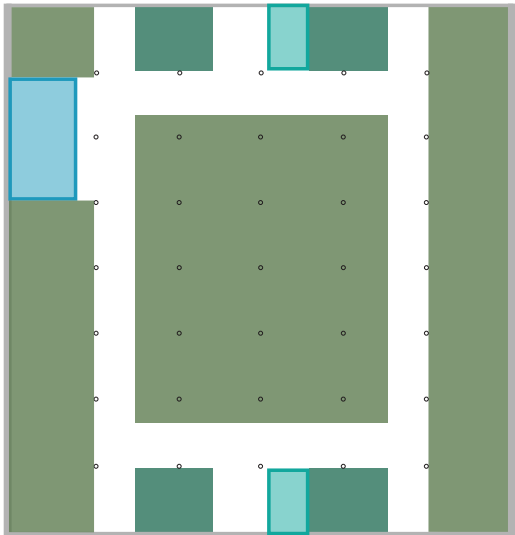
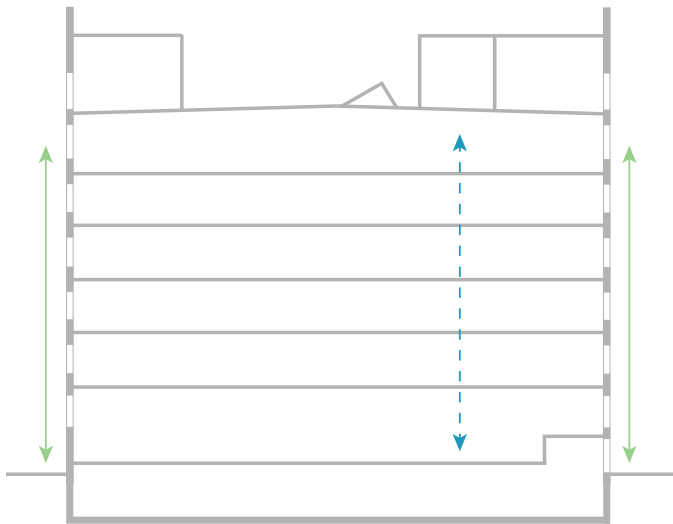


Horizontal circulation 2nd-5th floor

- ↔ Winch
- ↔ Elevator
- ↔ Stairs
- Stairs
- Elevator
- ▲ Loading and unloading doors
- Walking path
- Storage space
- Probably storage space



Vertical transport of goods (left: elevation Brede Hilledijk, middle: section)



Storage space 2nd-5th floor

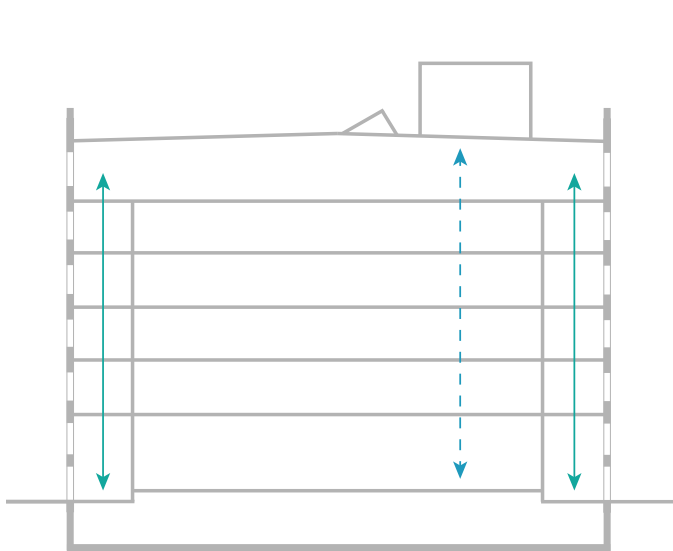
1970-now

In 1970 the Winch houses on top of Santos were demolished. Because the building wasn't used for storage since the year 1959, these winches were not necessary anymore. Furthermore, the doors to the basement were closed. The date of this change isn't known, so maybe this was already the case when Santos was used as storage.

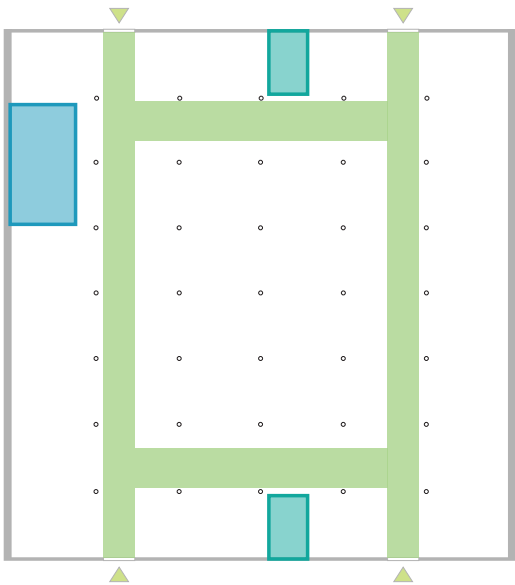
The horizontal movement is still visible in the building, like you can see in the photos below.

CONCLUSIONS

During the years the functions in Santos have changed, with corresponding changes in the building as well. The vertical connections for the goods have become less important over the years. Therefore it isn't that easy any more to bring goods to the basement and the first till fifth floor. The vertical connections for people have not changed. Also, the horizontal routing between the stairs and doors is still recognisable and useful. Because of the clear and useful horizontal and vertical connections for people the building can be used for different new functions.

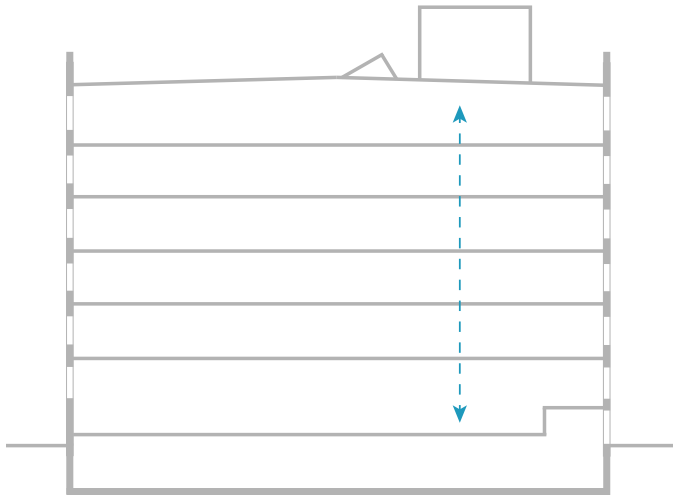
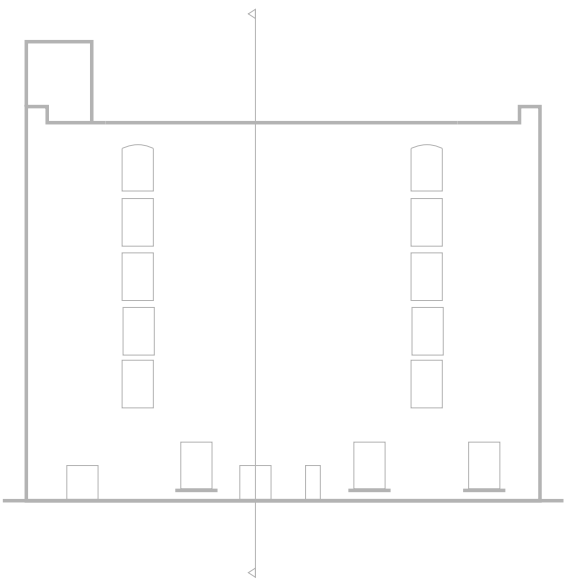


Vertical transport of people (section)

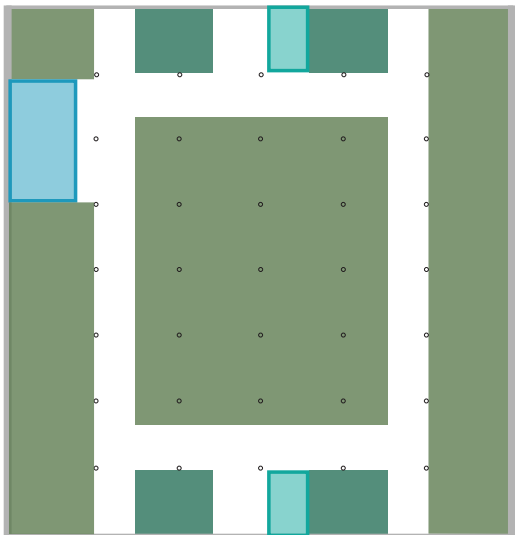


Horizontal circulation 2nd-5th floor

- ↔ Winch
- ↔ Elevator
- ↔ Stairs
- Stairs
- Elevator
- ▲ Loading and unloading doors
- Walking path
- Storage space
- Probably storage space



Vertical transport of goods (left: elevation Brede Hilledijk, middle: section)

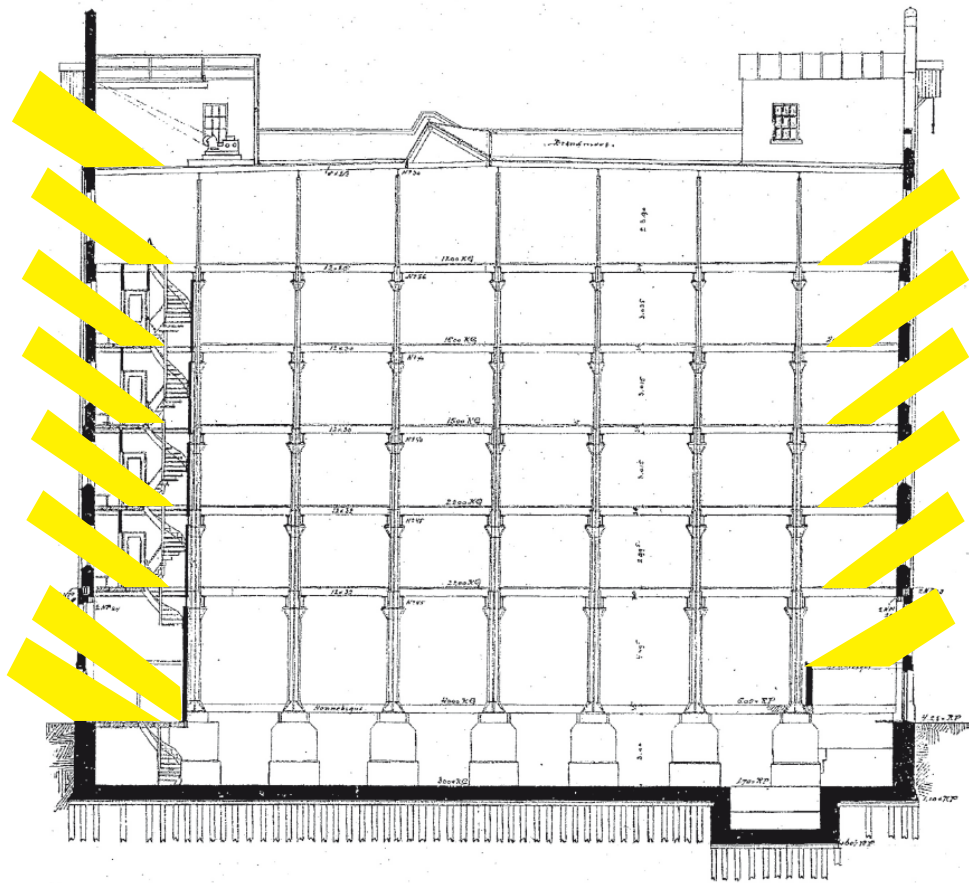


Storage space 2nd-5th floor

3.7 LIGHTING

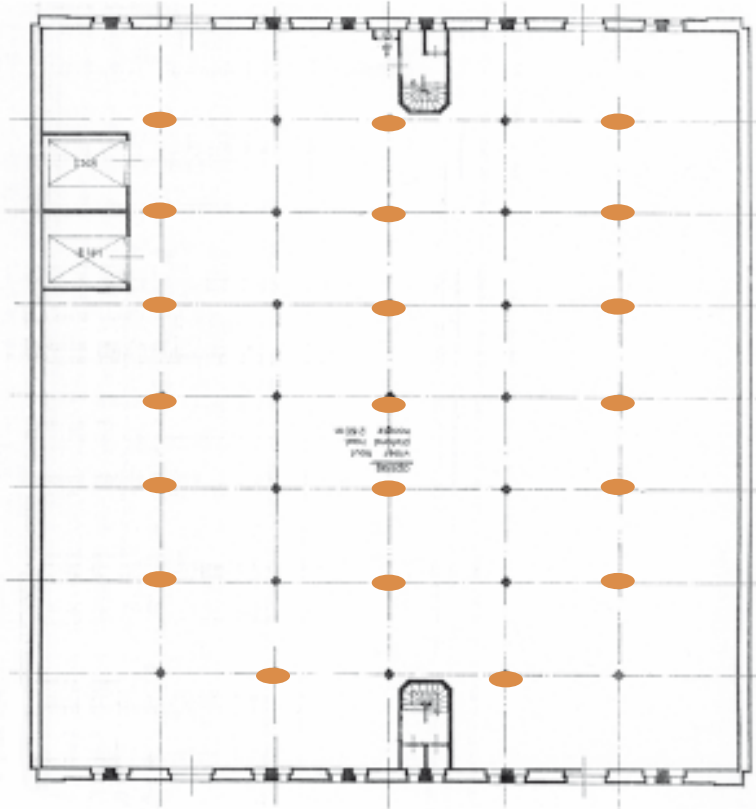
3.7.1 NATURAL & ARTIFICIAL

The natural light that penetrates the building from both South and North, illuminates the interior to up to five meters - the core of the building is rather gloomy and required artificial lighting.



Cross-section

 natural light (max 45 degrees) penetrates up to 5 m max



Exemplary Floorplan

 artificial light

3.8 DAMAGES

3.8.1 MATERIALS

In the overall picture, SANTOS is in a good condition, while on a more detailed level it needs some maintenance.



SANDSTONE

No acid reaction, so no transformation

soiling & patina

algae, absorbs deposit of pollution
Damages underneath windows on North and South facade probably due to soiling because there the rain can not clear the bricks

scaling

e.g. material changes colour due to iron

fading

stylolites

e.g. material changes colour due to iron

(BLUE BELGIAN)
LIMESTONE

Can contain certain layers of minerals & react with acid water - flushed water leaves certain type of pattern

soiling

especially close to door and window frames

mechanical damage

e.g. splitting, cut incision, exfoliation, scaling

leaching

white deposit

biological growth

along limestone layer around building

scaling

weathering of stone
what can be done about it: 'cathodic protection' as corrosion control/make a hole to get it out or replace it

crust

acid reaction (as a chemical conversion of lime in gypsum)

BRICK

Damage due to moisture and salt. Sources of water from basement, rising damp and roof. Present salts due to groundwater, rain & sea

chromatic alteration

plus exfoliation of mortar

deposit

e.g. material changes colour due to iron

moulds

chipping

especially around windows/frames

cracks

push-out of pointing

probably due to salt crystallization and frost

METAL

exterior: cut steel elements in facade
interior: Hennebique System columns in basement - Spalling of concrete and corrosion of reinforcements (RH air)

corrosion

reinforcements in corroded due to carbonation and RH air

GLASS

exterior: broken glass windows

CONCRETE

exterior: chipping (also as a consequence of corrosion)

3.8 DAMAGES

3.8.2 CRACKS

In the overall picture, SANTOS is in a good condition, while on a more detailed level it needs some maintenance.

exterior: East & West facade
interior: plaster floors

damage patterns due to:

- > addition of lift, built in 1954
- > vibration of lift
- > vibration from removing winch houses
- > beam collition
- > repointing
- > overloading
- > expansion of walls due to climate/sun
- > big difference of load distribution in walls

different shapes of cracks

solutions:

- + construct new wall
- + as it is a weekness in structure, superficial approaches to repair will always fail.
An alternative would be to to insert corrosion resistant metal reinforcement (usually stainless steel) into bed joints to redistribute strain and therefore stress over a wider area, thus reducing the risk of failure.
- + another one would be to cut out cracks and substitute a formed joint, but this is major work and may not be acceptable visually or in terms of cost.

note: The successful repair of cracks in masonry structures requires a fundamental understanding of the reasons for the cracking. Intervention must respect the structure, and it is important to assess the likelihood of progressive movement. An appropriate repair will accommodate future movements in the wall, but may require stabilisation works if it is to



3.8 DAMAGES

3.8.3 WATER

In the overall picture, SANTOS is in a good condition, while on a more detailed level it needs some maintenance.

WATER

in basement

! clear water problem in basement -> could not be used at the moment

hypothesis:

- leveled water fluctuates throughout the year and penetrates inside
- the connection between walls and floors is not well maintained and so ground water enters the building throughout the years.

consequence:

1. high water level
2. mold growth
3. efflorescence/crypto-florescence: water carried salt into bricks
4. rising damp - bricks - structural damages

suggested actions:

- + use pump to retain the already existing water bed
- + observe how the water penetration takes place, within a period of 1-3 months. this allows to discard the possibilty that the flooding is due to rainwater.

- > after the pumping, observe wheather there are dampness, stains and/or cracks in the floor that would indicate the water table is pushing.
- > check the condition of the weak points of the foundation, specially the wall floor joints.
- > look at the symptoms of leakage to localize the points where the water enters the cellars
- > drill the brick to examine the salt penetration

other possible solutions:

- + place a water tight layer throughout the whole cellar with a stripe at sides of walls,
- + place mechanical interruption in foundation blocks
- + desalinate walls

think of what you want to do with the building:

- > use ground floor and take measurement or leave it and accept that building can only be used from ground floor upwards?



3.9 INTERIOR



- General**
- 1. Wooden beams
 - 2. Brickwork, same as outside
 - 3. Rainwater drainage inside
 - 4. Partial painted brickwork
 - 5. Wrought iron beams
 - 6. Concrete floor topping



- Structure first 3 floors**
- 1. Fire protected wrought iron posts (damaged)
 - Wrought iron post
 - Straw/reed layer
 - Iron/steel mesh
 - Concrete layer
 - 2. Wooden beams
 - 3. Fire protected wrought iron beams (intact)

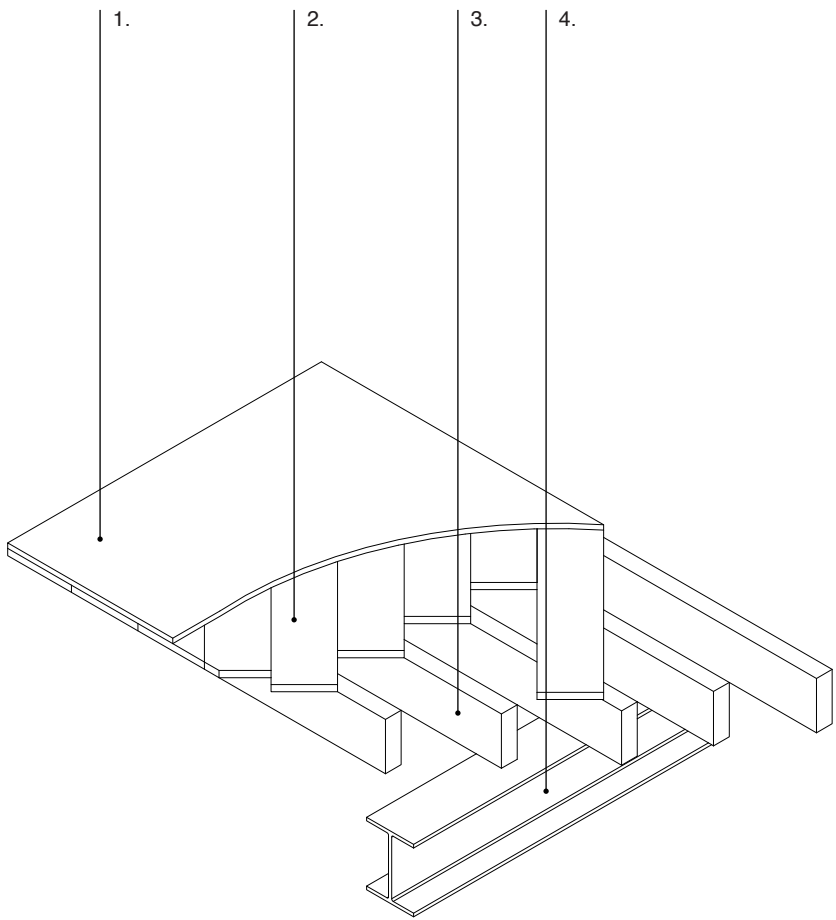


- Structure first 3 floors**
- 1. Fire protected wrought iron posts (damaged)
 - Wrought iron post
 - Straw/reed layer
 - Iron/steel mesh
 - Concrete layer
 - Steel cladding, making sure it isn't damaged any further.



Floor & ceiling

- 1. Steel plate for transport (protecting the concrete)
- 2. Concrete floor (painted to display storage sights)
- 3. Damaged concrete floor (displays diagonal floorboards)
- 4. Diagonal placed wooden floorboards
- 5. Wrought iron beam
- 6. Wooden beams
- 7. Electric wiring insight



Layering floor & ceiling

- 1. Concrete layer
- 2. Diagonal placed wooden floorboards
- 3. Wooden beams
- 4. Wrought iron beam



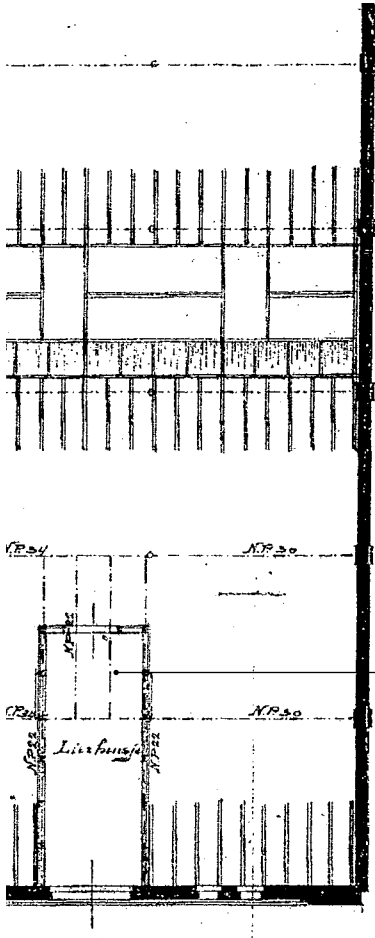
Windows

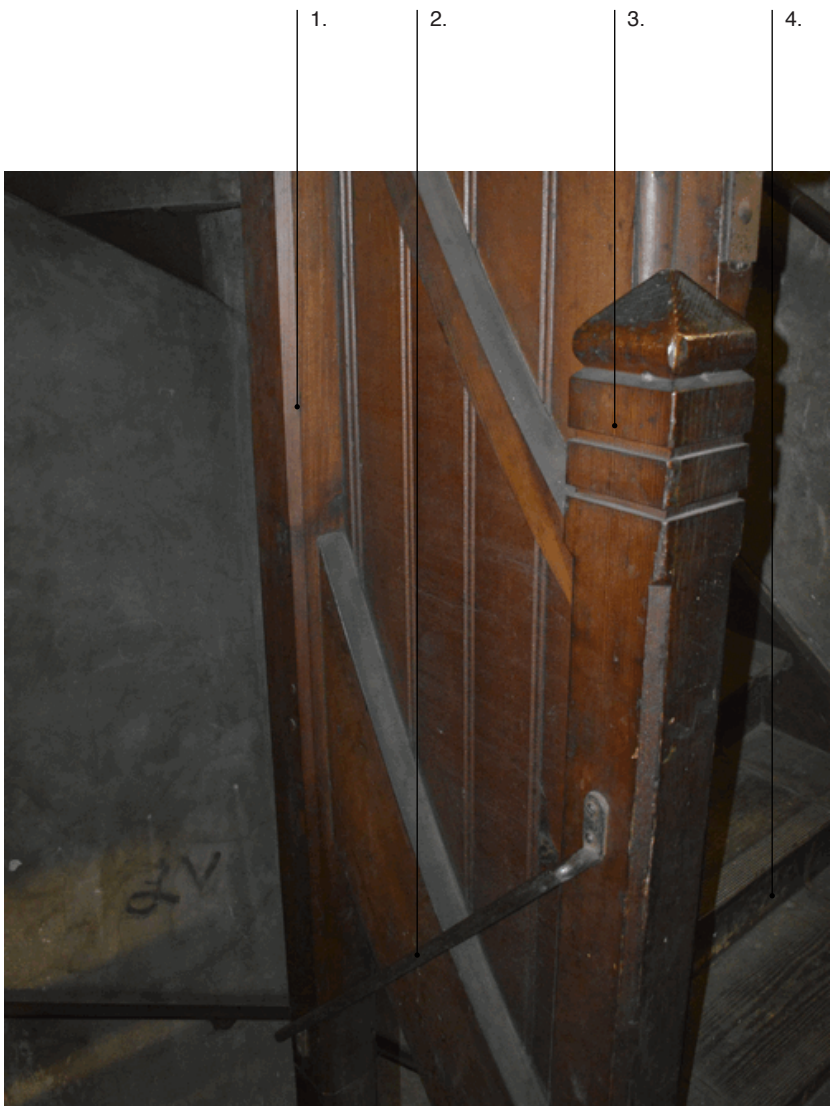
- 1. Brick arch, same as the outside
- 2. Blind window
- 3. Rounded bricks
- 4. Wooden hatch (possible original)
- 5. Wooden frame (against trespassers?)



Structure first 3 floors

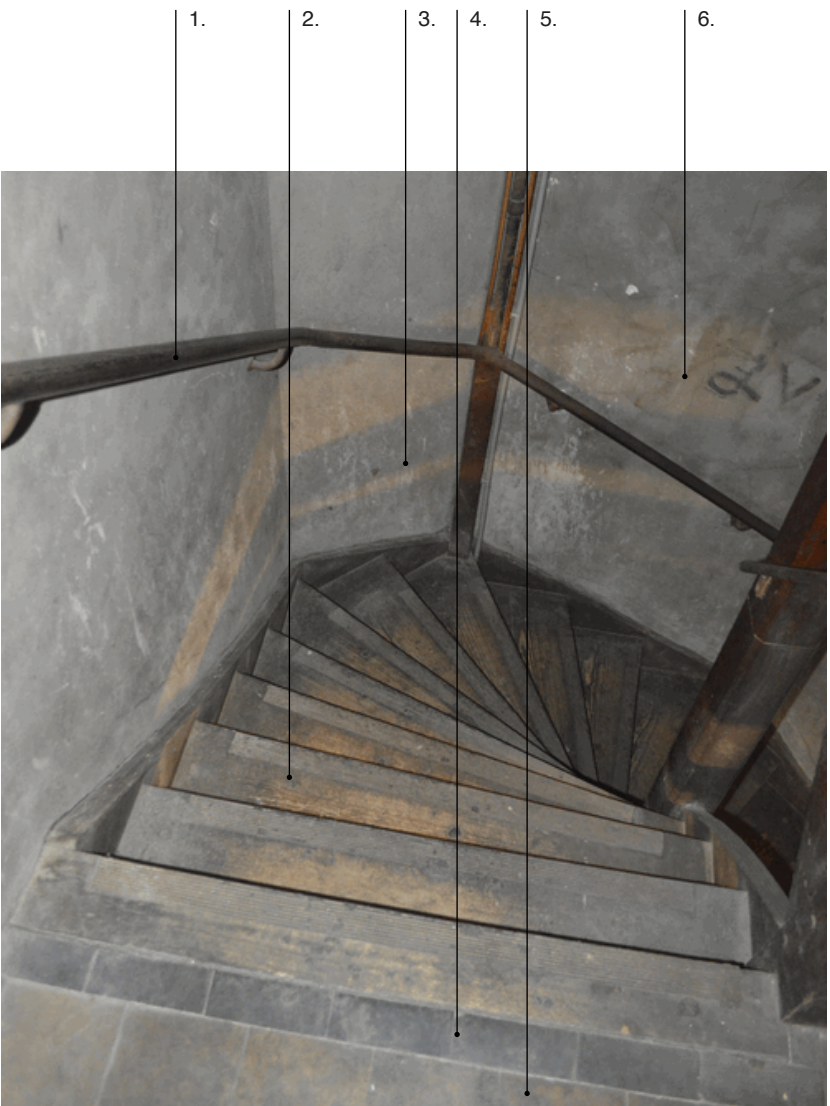
- 1. Wrought iron beam (to support the winch houses)
- 2. Wooden doors (for loading goods, possible original)
- 3. Brick console to support wrought iron beam
- 4. Wrought iron beam (to support the winch houses)





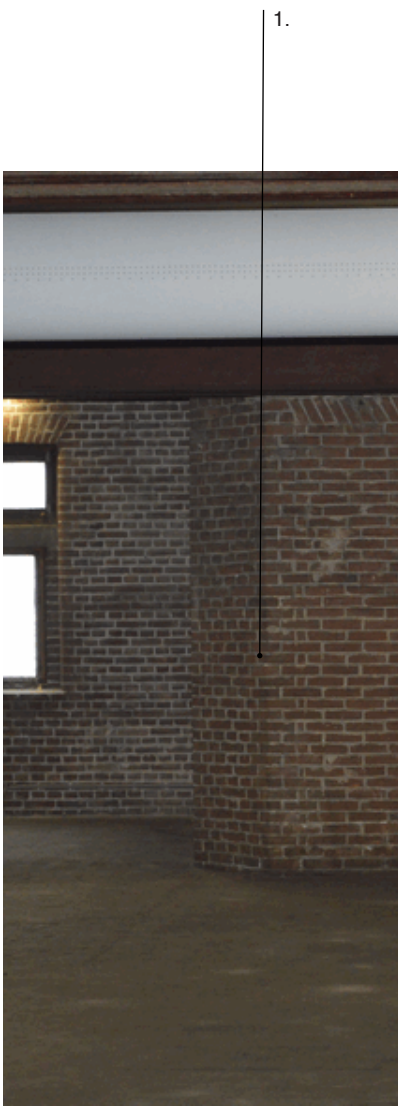
Stair

- 1. Wooden post with 'verjonging'
- 2. Iron railing
- 3. Wooden post with 'verjonging' and decorated top
- 4. Wooden riser (closed wooden stair)



Floor & stair

- 1. Iron railing
- 2. Wooden step with end marking (anti-slip)
- 3. 45 degree wall (space-saver)
- 4. Black small tiles, marking end of the floor
- 5. Yellow tiles
- 6. Stucco or concrete layer on brick



Exterior staircase

- 1. 45 degree wall (space - saver)



Basement

1. Brick base
2. Different brick (natural stone?)
3. Brick floor (underwater)
4. Hennebique floor



Staircase

1. Electric wiring insight
2. Wooden hatch
3. Build in sink
4. Wooden plank door
5. Stucco or concrete over brick



Supervisorhouse groundfloor

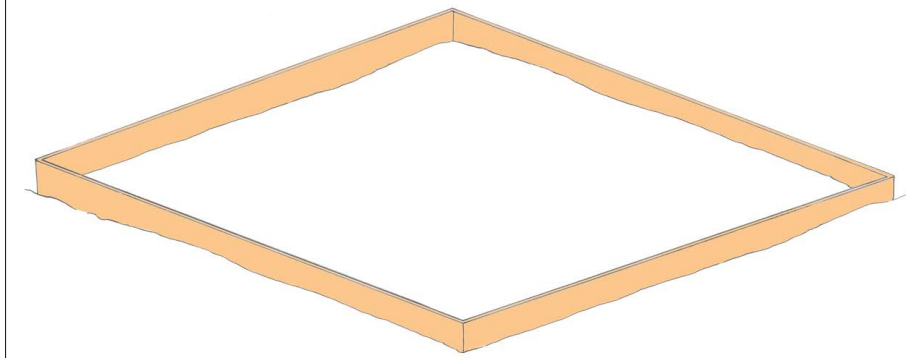
1. Wooden open stair (same as staircase in design)
2. Brick base with stucco and painted
3. Wooden extension (actual supervisor house)
4. Concrete (Hennebique floor)
5. Closed opening with yellow brick

4 TECHNICAL ANALYSIS

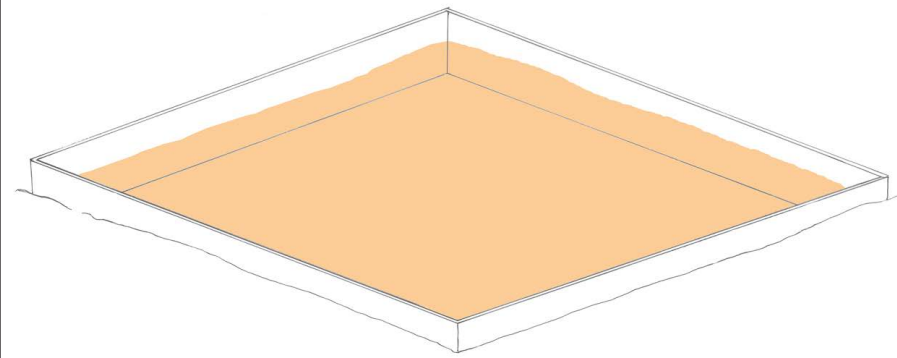
4.0 INTRODUCTION

The following technical analysis aims to provide insight on the building’s construction system embedded in a broader context and its structural and technical facilities that are still present up to today. Furthermore it illustrates all used materials and their system behind it.

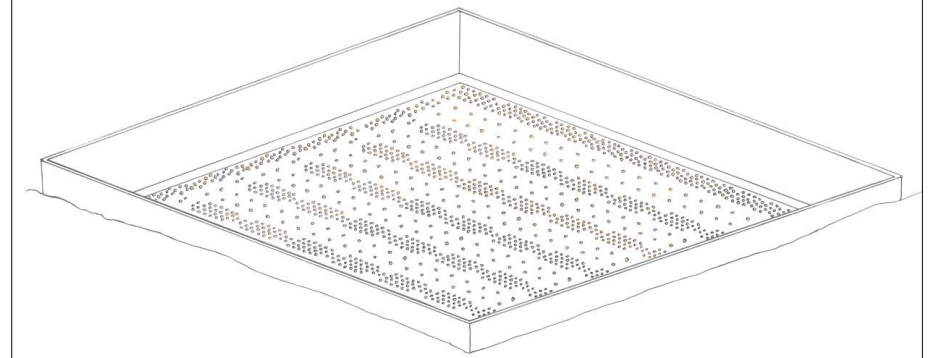
1. wooden sheet piling



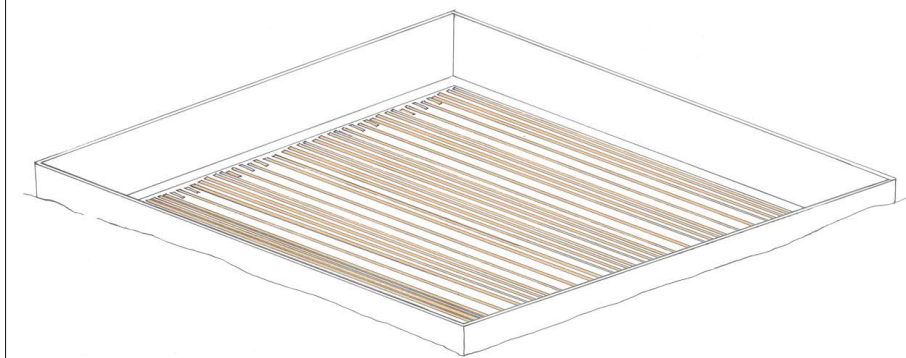
2. excavation and pumping out water



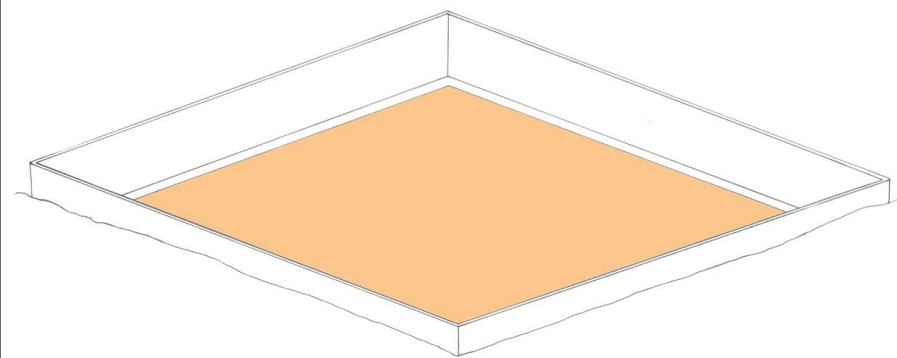
3. foundation



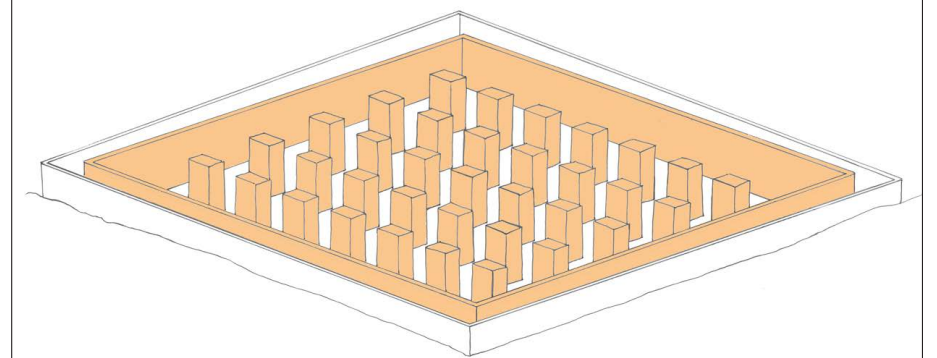
4. beams on top of the foundation



5. brick floor basement on top of wooden shelves



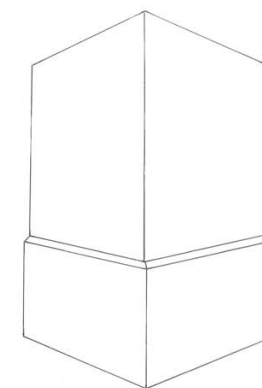
6. brick columns and outer, brick walls basement



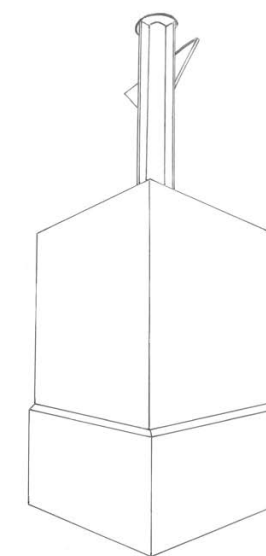
4.1 BUILDING METHOD

The different floors in Santos are quite similar. Because of that, the building method of these floors is similar as well. The exceptions you can find in the basement and the fifth, top floor.

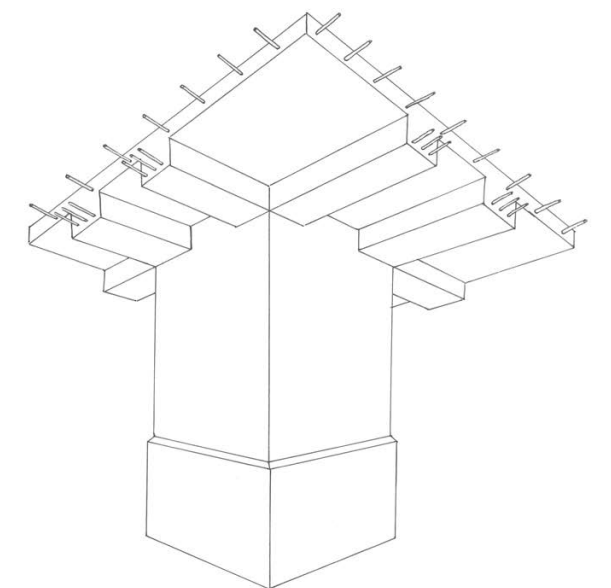
Before the building could start a sheet piling (in that time of wood) had to be placed (1). After that, the ground and water had to be taken out (2). Afterwards, the foundation could be placed, this happened with a steam engine (3). To continue with the beams, wooden shelves and the brick floor of the basement (4 and 5). The wrought iron columns of the ground floor are placed on top of the brick columns of the basement (6 and 7). After that, the Hennebique based system will be constructed (8). In the steps 7 till 12 you can see how the general floors (ground floor till the fourth floor) are built.



6. brick column of the basement

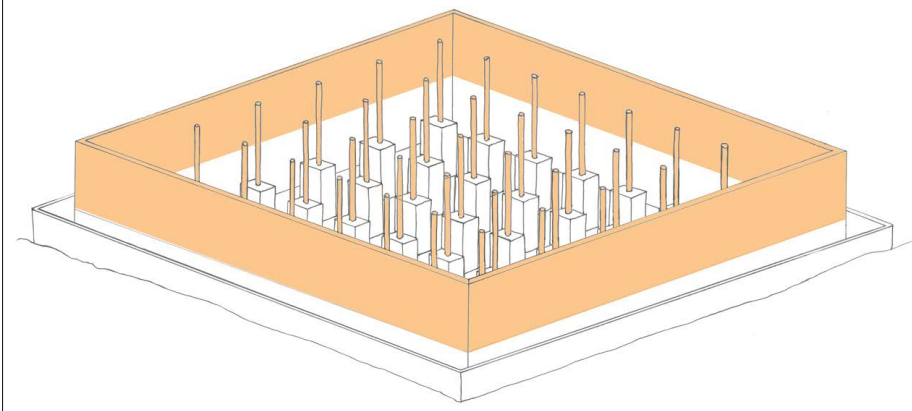


7. iron column of the ground floor

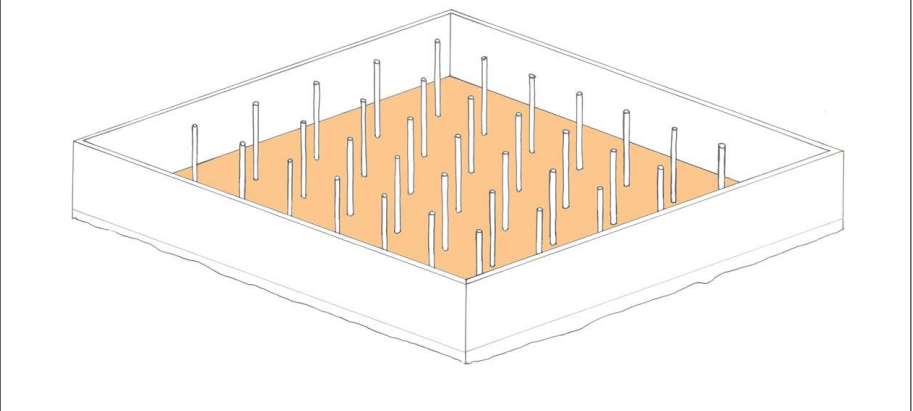


8. Hennebique based floor of the ground floor

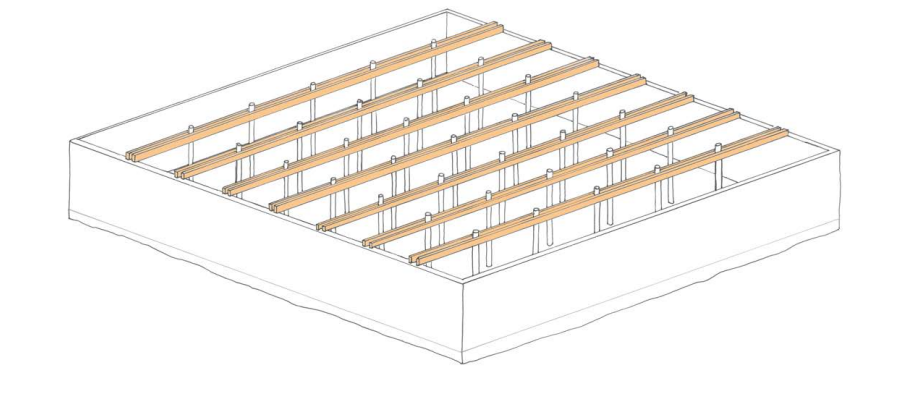
7. iron columns and outer, brick walls ground floor



8. floor ground floor (Hennebique based system)



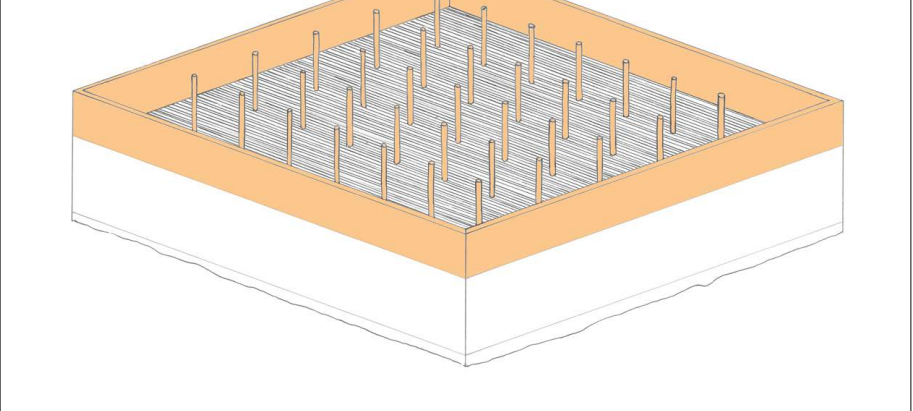
9. iron beams



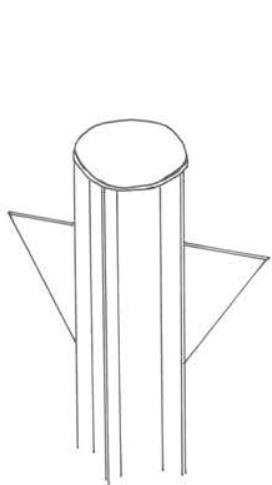
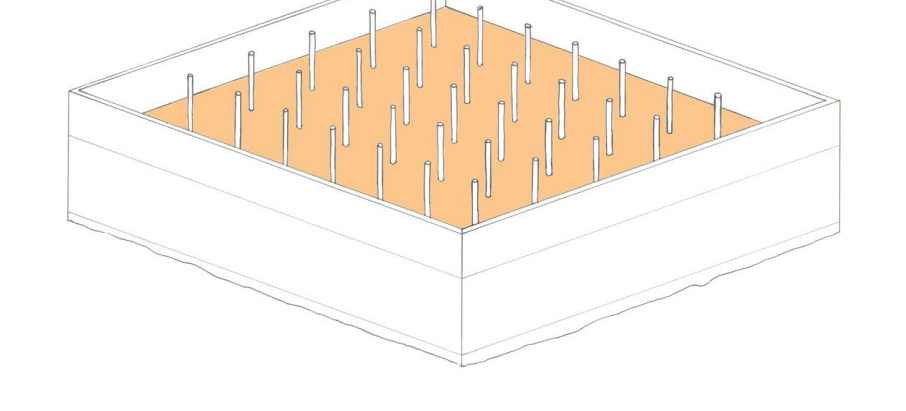
10. wooden beams



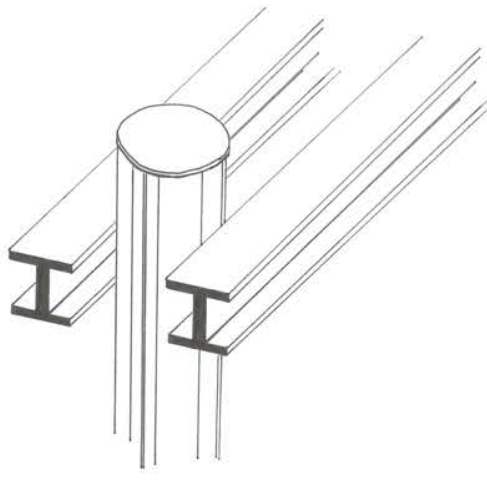
11. iron columns and outer, brick walls first floor



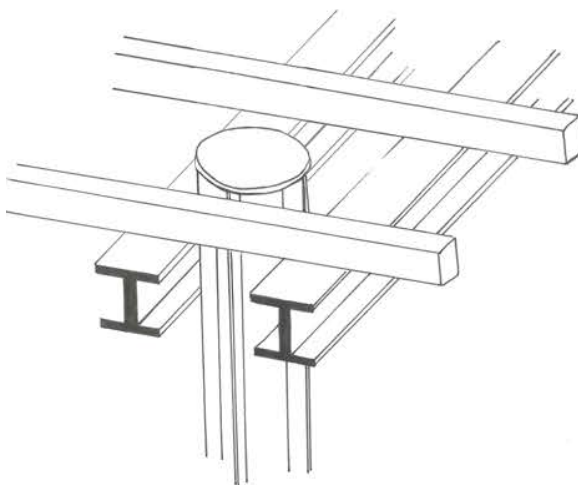
12. floor (wood and coal tar) first floor



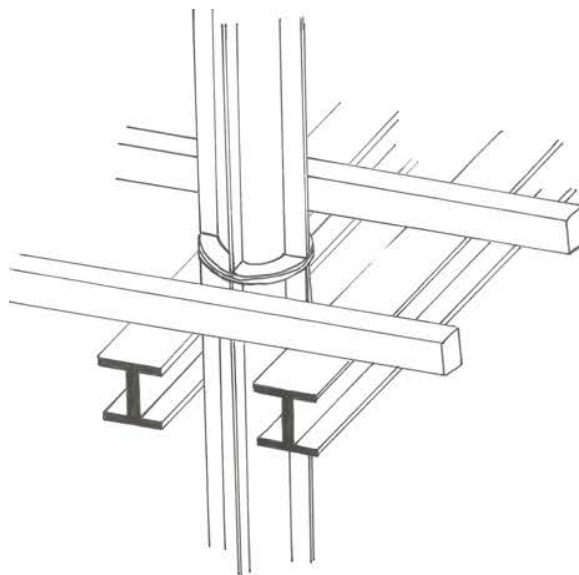
7. column ground floor



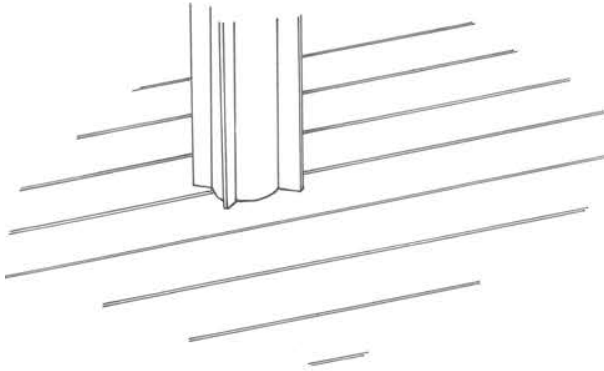
9. iron beams



10. wooden beams

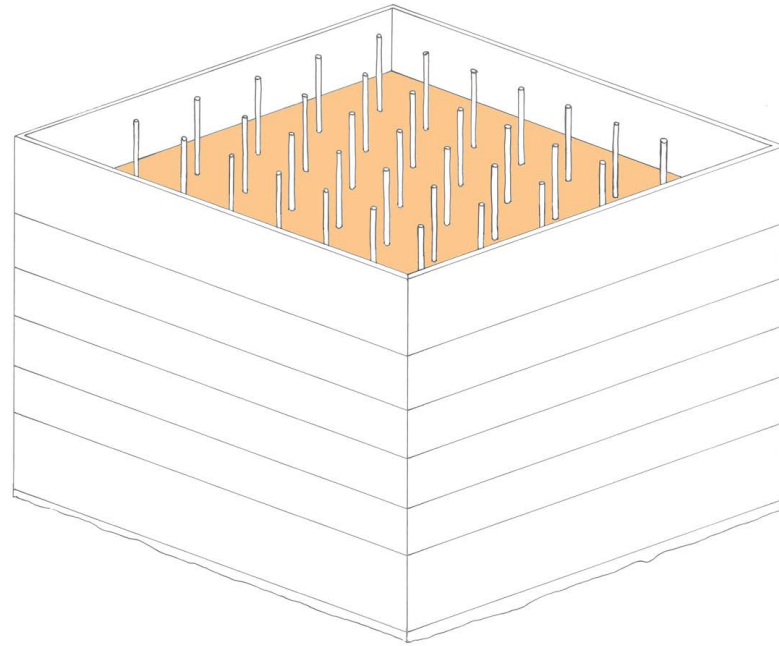


11. column first floor

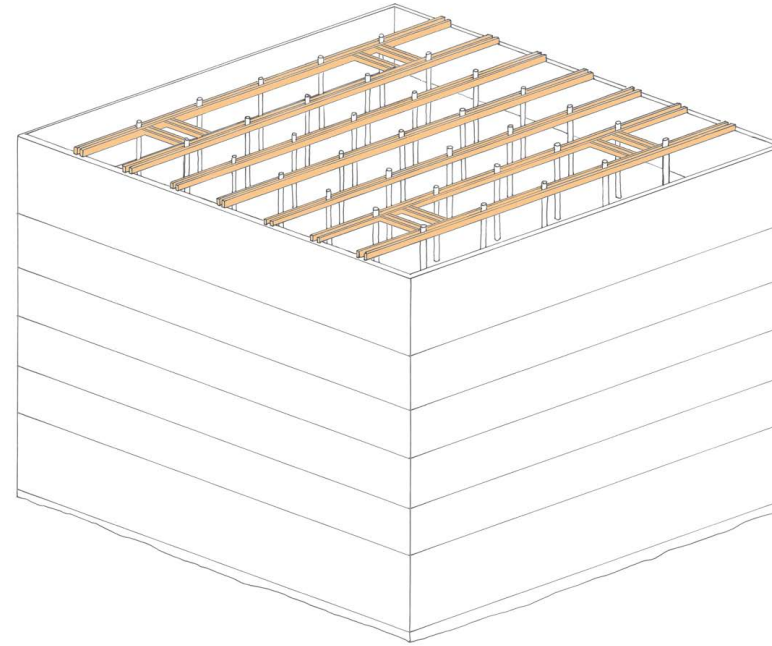


12. floor first floor (wooden planks, on top of this there will be coal tar, a bitumen like material)

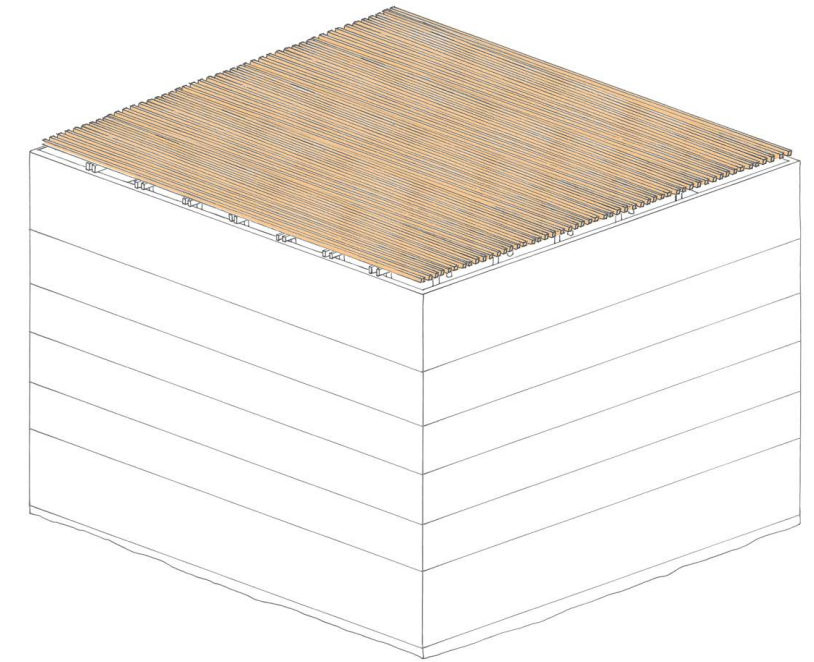
13. floor (wood and coal tar) fifth



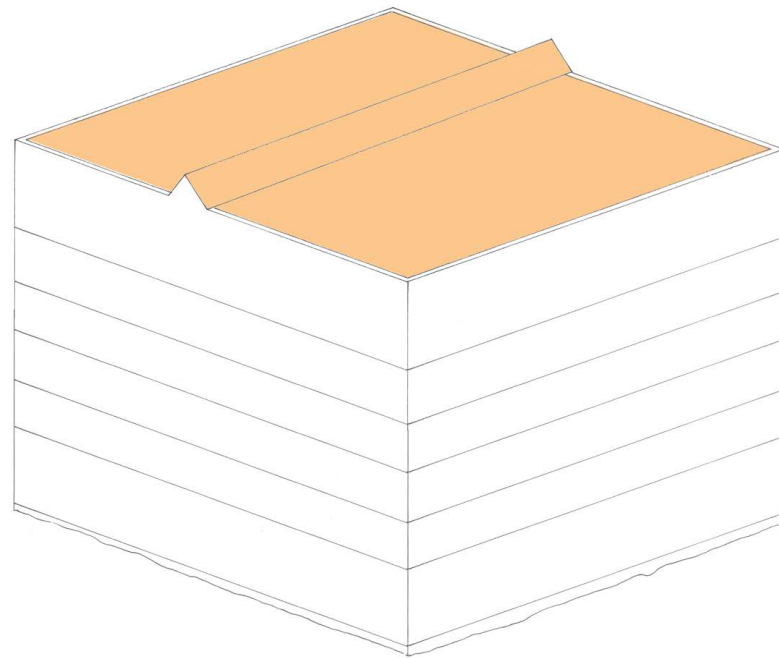
14. iron beams



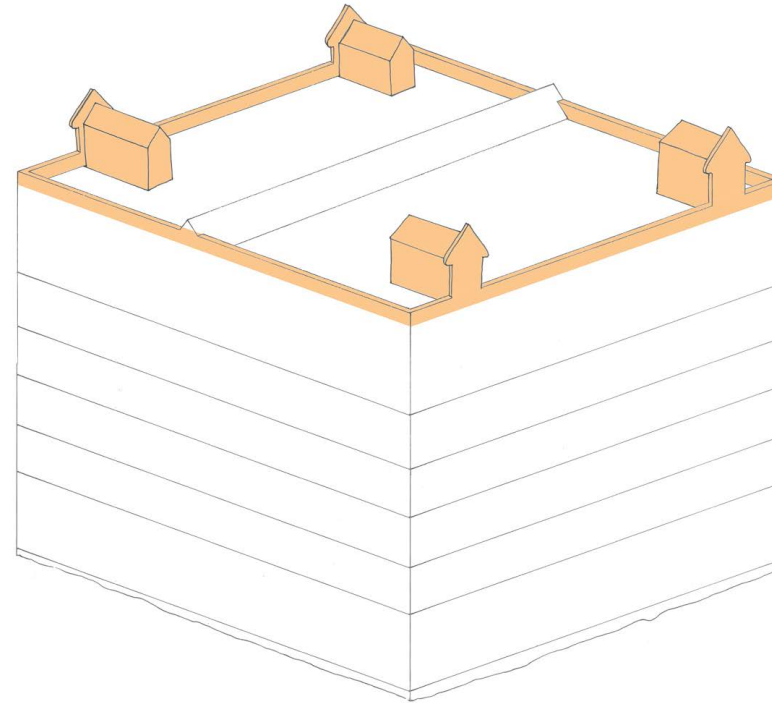
15. wooden beams



16. roof



17. winch houses and brick balustrade



The beams on the fifth floor have some extra beams underneath the winch houses to carry the extra load of the houses and the winches inside (14).

CONCLUSION BUILDING METHOD

Santos was at the time it was built the highest warehouse of Rotterdam. This was possible because of the building system that was used. Especially the iron Phoenix system (described in 4.2.1) made this height achievable. Another important aspect of the building method is the repetition of the different floors. From the ground floor till the fifth floor, the building method is completely the same. The only difference is that the columns and outer, brick wall get smaller to the top. The basement and roof are also an exception of the building method. In the basement, the used materials are different than the used materials on the other floors (more about the different materials you can find in chapter 4.5). For the roof some extra iron beams underneath the winch houses were necessary.

4.2 TECHNICAL TIME-BASED PERSPECTIVE

4.2.1 THE PHOENIX SYSTEM

PHOENIX STEEL CORPORATION

The phoenix column system was produced by Phoenix Steel Corporation, a company that was always up-to-date with the latest technology in iron work. The company had two large inventions.

1. **the Griffin Gun** (1855), which used the more durable wrought iron instead of cast iron. This gun was produced in large numbers for the army in the American Civil War.
2. **the Phoenix column** (1862), a hollow cylinder composed of four, six or eight wrought iron segments riveted together. The hollow inside could be filled with concrete-like substances. This resulted in a column much higher (and stronger) than the solid cast iron columns that were common at the time.

Alan Burham (architect) stated that the Phoenix column was better than cast-iron columns since it could be riveted. This became important in 1880, when tall and narrow buildings became more common, and one had to start addressing windbracing.

The production of Phoenix columns came to a halt in 1919, when the competition from I-profiles and steel wide flange beams (similar to I-profiles) became too large.

EARLY APPLICATIONS OF THE SYSTEM

In the beginning, the Phoenix column was mainly used for infrastructure that had to bear heavy loads. Some examples are the Second Av. Elevated Line in New York City, and the Kinzua Viaduct (railway bridge) in Pennsylvania. This line of use continued through the years, and became very succesful. The Phoenix Bridge Company ultimately closed in 1962.





THE PHOENIX SYSTEM IN AMERICA

The phoenix column system played an important role in the construction of some noteworthy buildings in New York and other American cities

- 1. World Building (also known as the Pulitzer Building), NY, 1890
20 storeys high. the World building was the **highest building in NY for 4 years.**
- 2. Commercial Cable Building, NY, 1897
18 storeys high.
- 3. Old Colony Building, Chicago, 1893
17 storeys high. when built it was the **tallest building in Chicago.**
the building combined the Phoenix system with portal arches to deal with wind bracing.
- 4. City Hall, Philadelphia, 1901
with its 167m height, it was the **tallest inhabitable building in the world for 7 years** (only surpassed by the Eiffel Tower and Washington monument).

PHOENIX SYSTEM
=
RECORD HIGH BUILDING

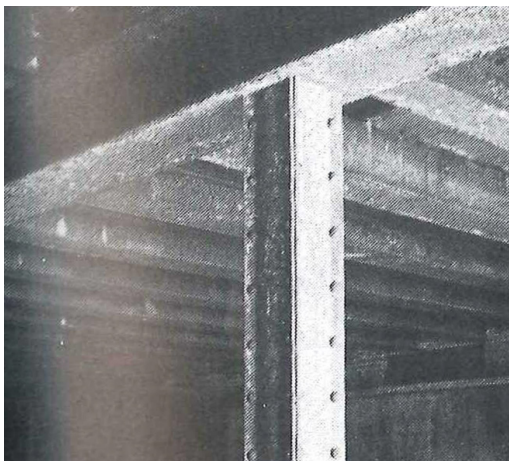
Given this background, it is not strange that Santos also became the tallest warehouse of Rotterdam at his time, and it could have been that the architect specifically sought out a construction system that would be able to construct such a height.



Breestraat 90, Leiden, 1905
Mercur, Zwolle, 1883/1909
Kleine Berg 33, Eindhoven, 1890



Café de Kroon Amsterdam 1900
Stroopfabriek, Groningen, 1914



SIMILAR SYSTEMS IN THE NETHERLANDS

There is no specific record of any Phoenix columns being used in Dutch buildings, however, there are some examples of similar systems: [kwadrantkolommen]. This system, according to Oosterhoff (p. 138), was **‘barely or not at all’ used in the Netherlands**. Some examples are a café in Amsterdam (De Kroon, picture 4) and stroopfabriek Scholten in Groningen (picture 5). This first examples uses the [kwadrantkolommen] mostly decorative, but in the second example they have a similar constructive function as they do in Santos. However, aesthetically speaking, they are no match for Santos.

There are also a couple of instances in which a similar system is used in the facade. This applies to four monuments, that use the columns in a Art Nouveau-esque storefront (pictures 1, 2 & 3).

All of these examples were constructed in the late 19th & early 20th century, a similar timeframe as that of Santos and the Phoenix System.

CONCLUSION

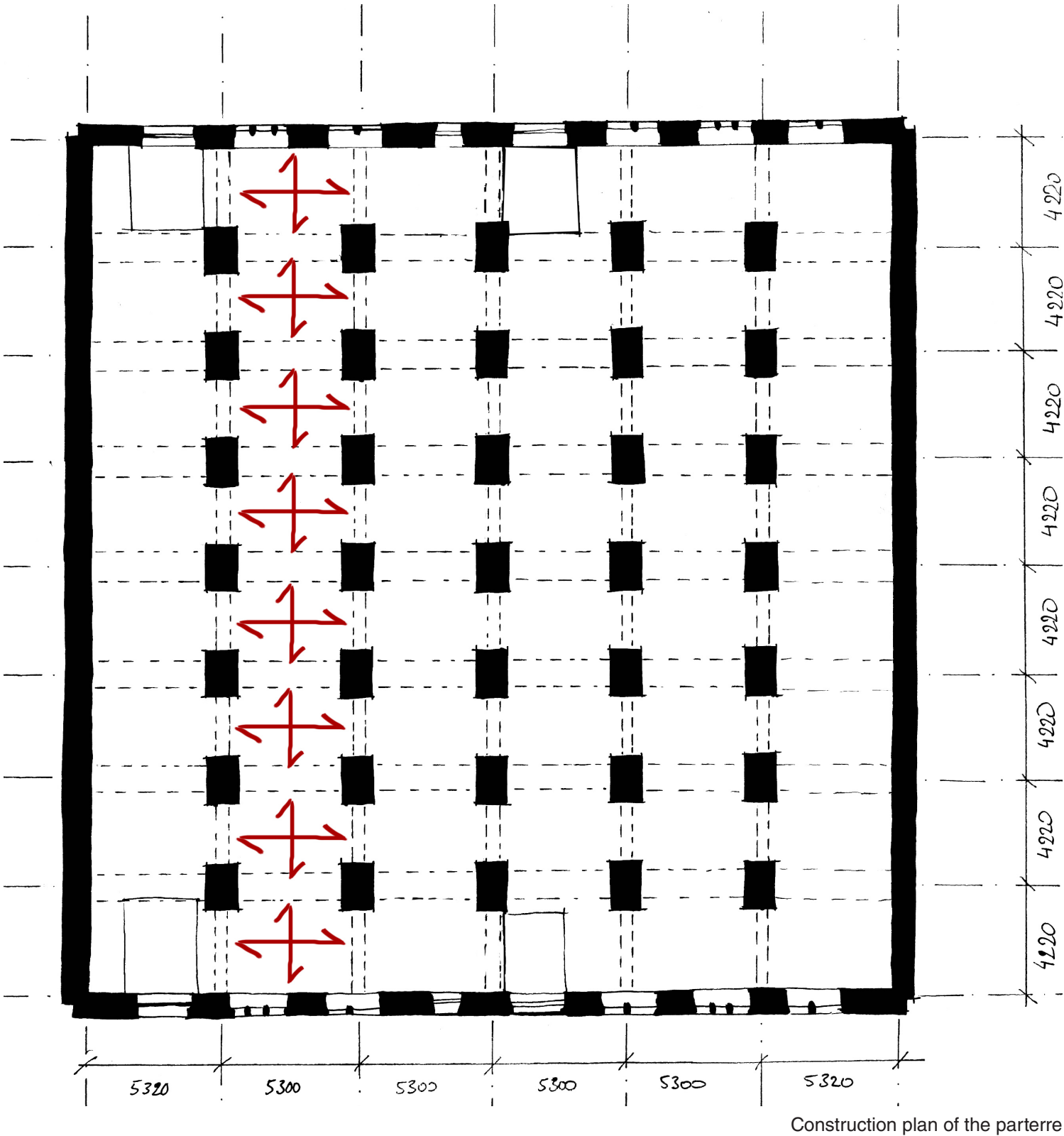
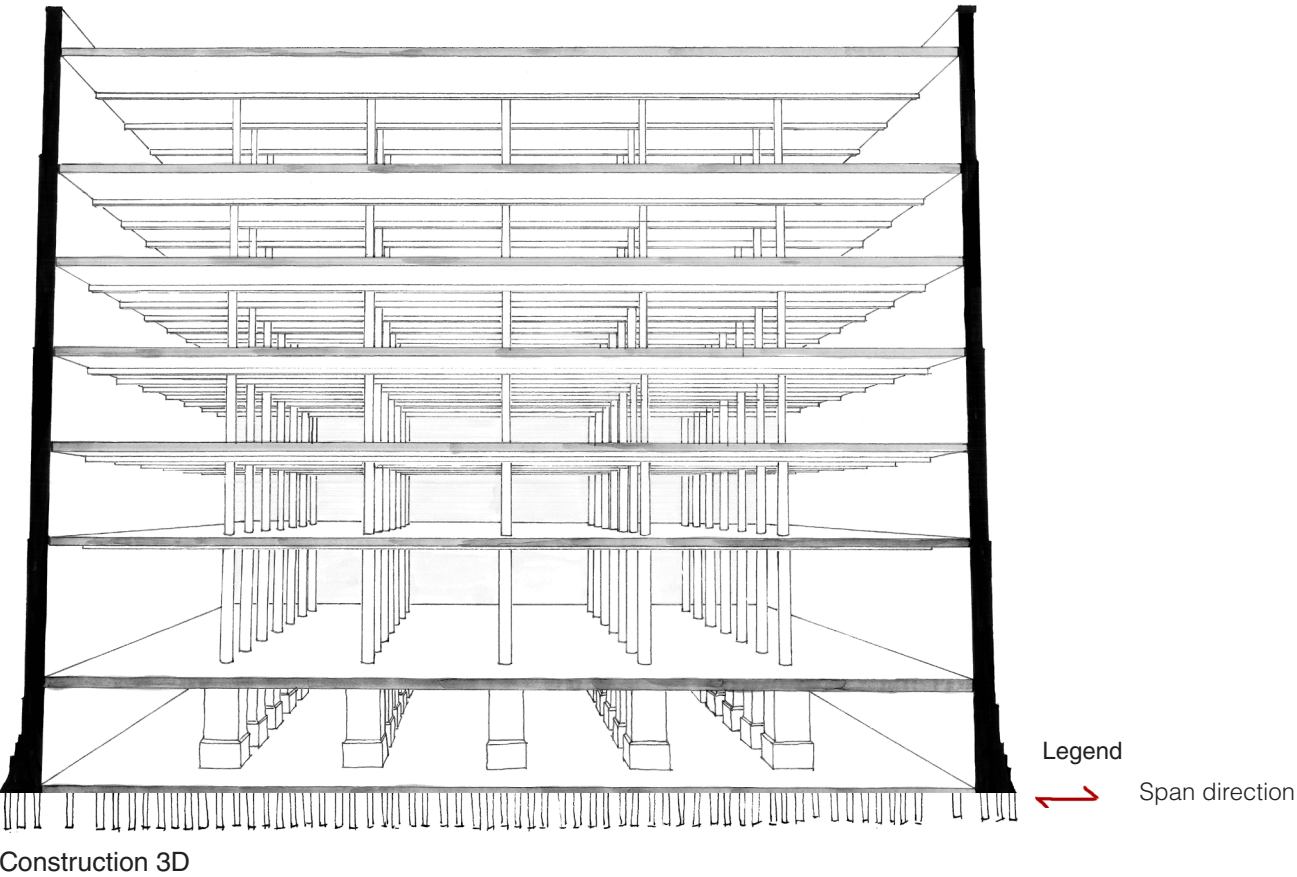
Given the scarcity of Phoenix systems (or similar systems) in the Netherlands, the construction of Santos is quite rare and thus valuable.

Addition 19/05/2017: However, after the intitial research we have found a couple more instances of a similar system being used in building construction. One example is on the Ezeveldslaan in Delft, which is an old university building converted to dwelling and offices, and another example are De Hallen in Amsterdam. We can thus conclude that the system might nog be as rare as Oosterhoff (p. 138) led us to believe, and that there might be more hidden instances of such a constructive system.

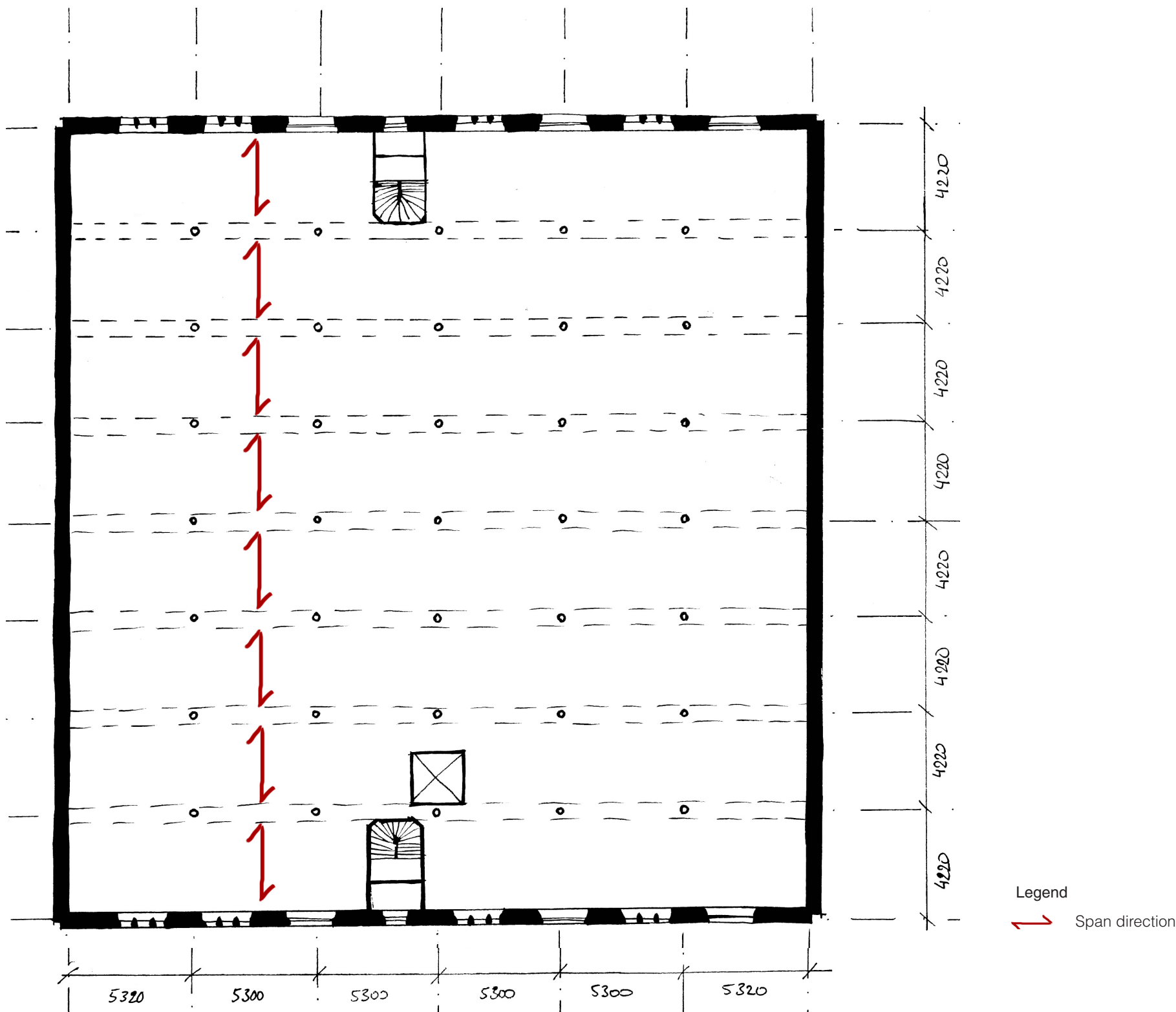
These findings make the value of the Phoenix system in Santos a little less important, but since the system has been used in a very small timeframe and doesn't occur all that much in other buildings, we can still consider it rare and thusfore of value.

4.3 LOAD BEARING STRUCTURE AND STABILITY

The construction of Santos is a essembly of all kinds of materials and therefore the load bearing construction has the same principle. The foundation is constructed of wooden poles that support concrete floor on top and the masonry bases in the basement. The floor of the parterre is made using the Hennibique system. This includes a concrete floor that is reinforced with steel and that can carry weight. Its span direction is to both sides, thus it can transfer forces to both sides. The parterre-floor is also the only floor within Santos that uses this system. The masonry wall is part of the load bearing construction also takes care of the stablilty of the building.

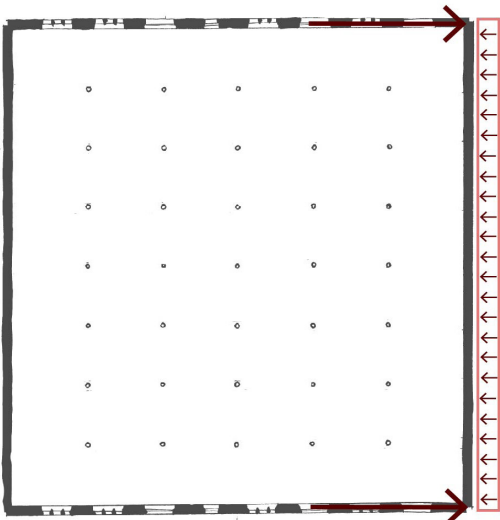


From the first floor up to the roof, the same system is used for the load bearing structure. The architects used a steel column and beam system that is bolted together. This was a specific system called the Fenix system. Together with the masonry walls, they take care of the transferring of forces to the masonry bases and finally to the foundation.

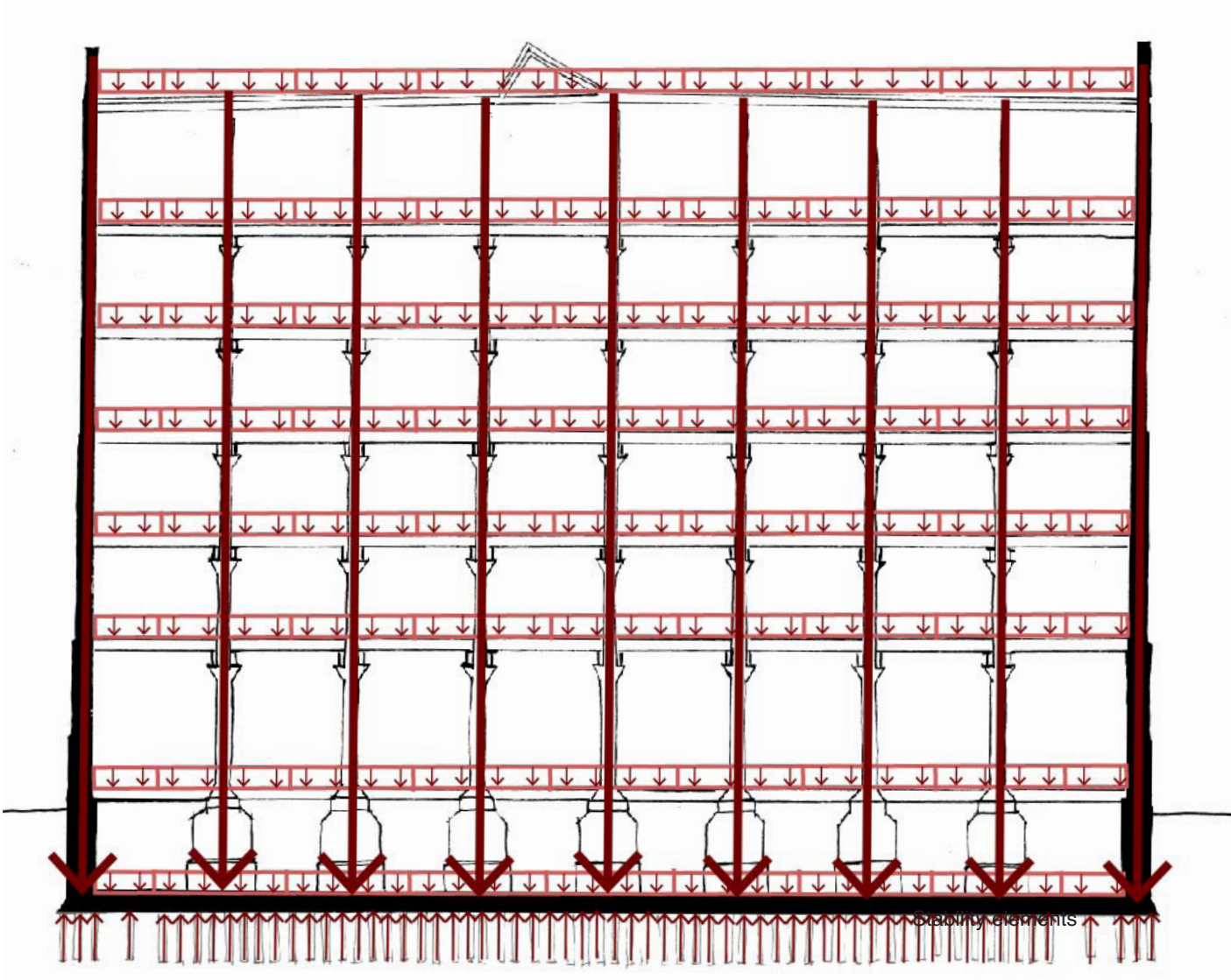


Construction plan of the second to the fourth floor

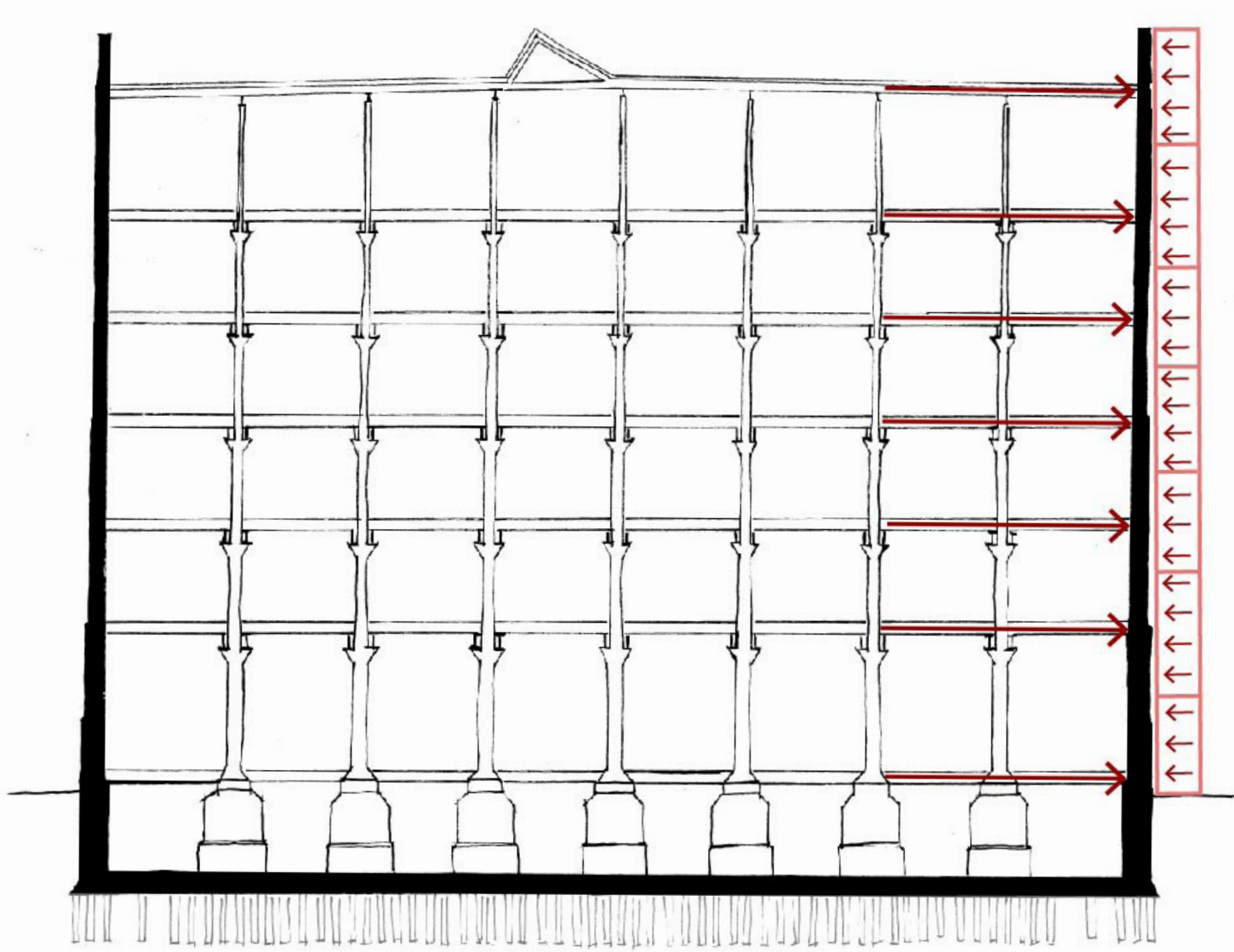
The stability in the building is regulated by the masonry walls in combination with the floors. Both of these work together as rigid planes. The vertical forces are transfered down from the floor to the beams to the columns. Due to its previous function, the warehouse mainly had a load that was quite well divided over the surface of the floors. This can also be seen in the drawing below. The wind forces (horizontal forces) are taking up by the floors together with the walls.



Plan with remittance of wind forces onto the facade



Section of remittance of the vertical forces down to the foundation poles



Section with remittance of wind forces onto the facade

Sources: - van Velzen, H.J., van Winsen M.R. (2011). Bouwhistorische verkenning Pakhuis Santos. Rotterdam: Flexus Architectuur Welstand Cultuurhistorie.

Drawings by: J. van der Aart

FOUNDATION

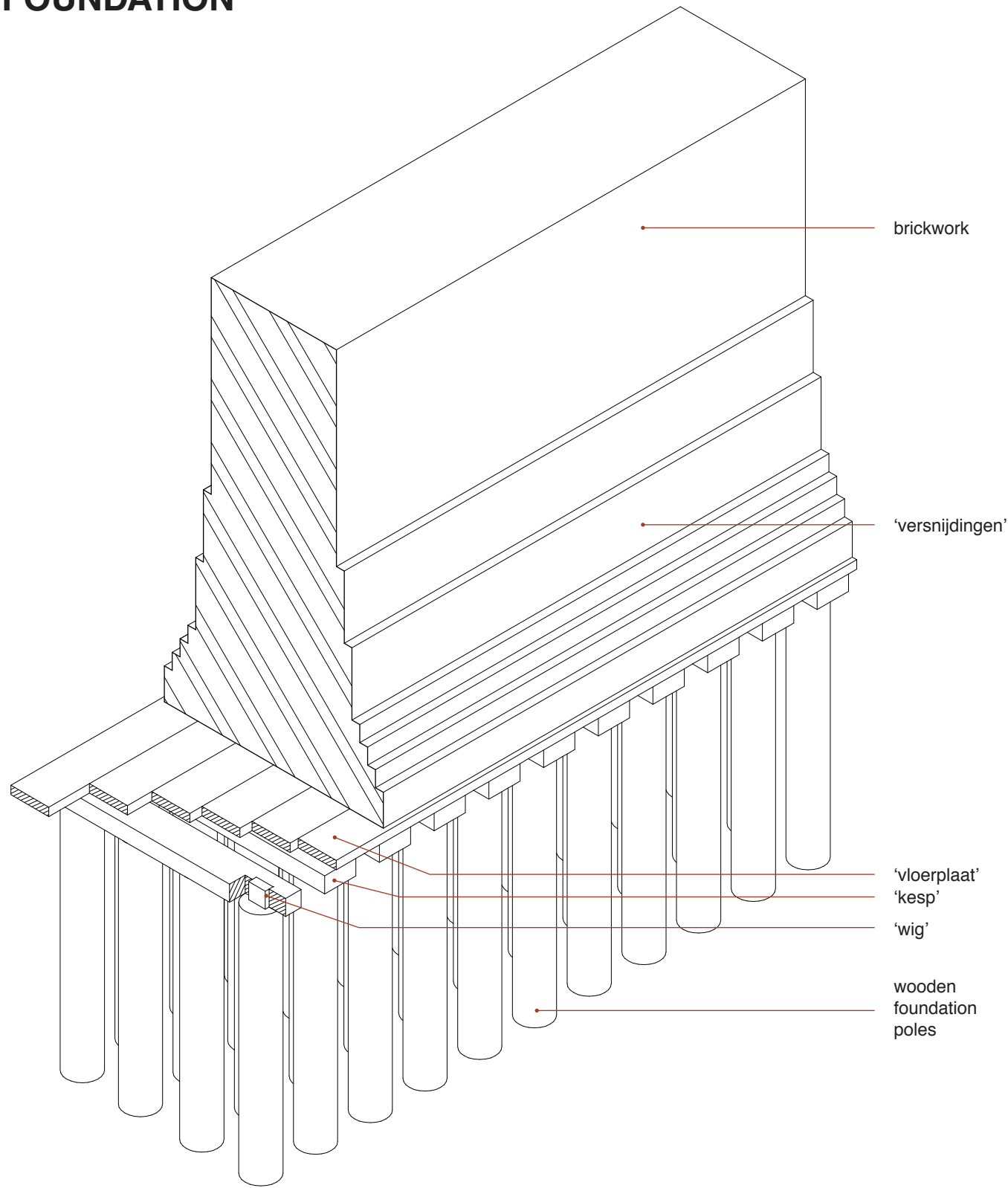


illustration 4. Foundation detail

How it's done

The ramming of the poles into the ground was done by a contraption that was used to be manned by alot of people (see 1). But as the steam-engine made it's way into the 19th century it was possible done by one of these machines (see 2). The way it works is the same, except you don't need the man power to hoist the heavy block. The heavy block is hoisted and dropped, slamming the pole into the ground until it cannot move any further.

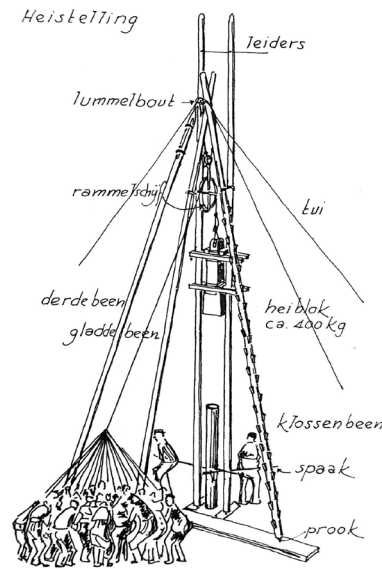


illustration 1. Foundation by labor

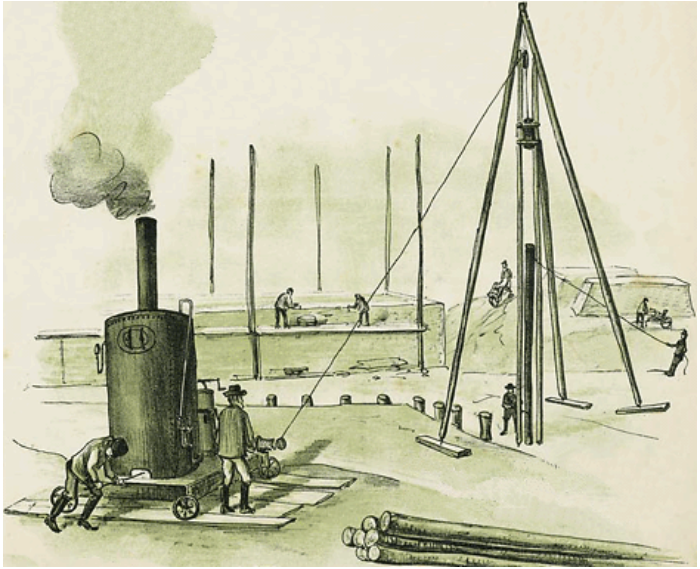


illustration 2. Foundation by a steam-engine

The wood

The wood was usually 'vurenhout' instead of 'grenenhout'. Because of it's sensitivity to bacteria that can weaken the pole in the water 'grenenhout' isn't normally used. The lenght of the poles depends on the layer of sand on which the foundation can find it's support or if can be support by 'kleef'. As of the size of the building and weight the latter is highly unlikely. To be able to support it on a layer of sand the poles need to reach this layer. There are no measurement that state how long the poles are. Normal sizes would differ between 10 and 18 meters, but a higher lenght is also possible by stacking two poles onto each other as has been done at the central station in Amsterdam, which rest on a layer of sand on a depth of 24 meters.

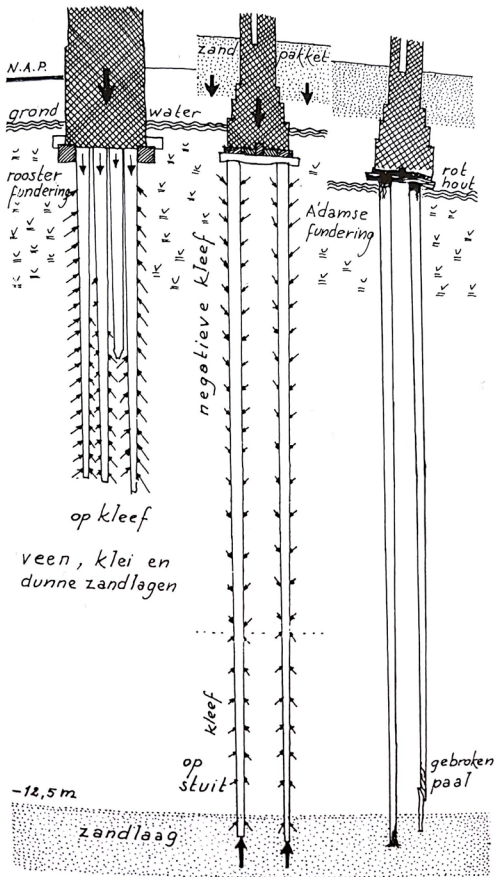


illustration 3. Foundation

RHYTHM

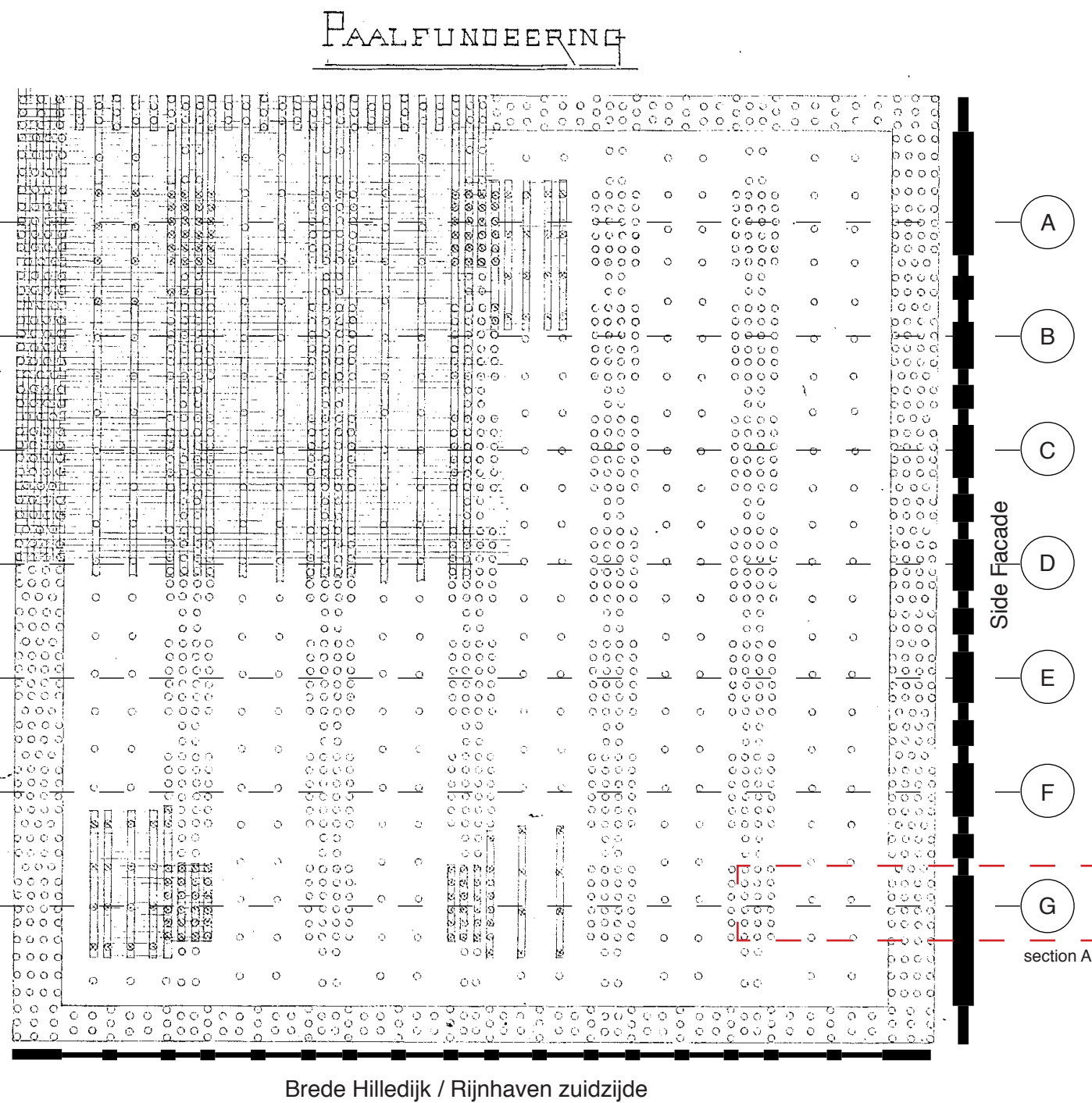


illustration 1. rythm of the poles in the facade walls

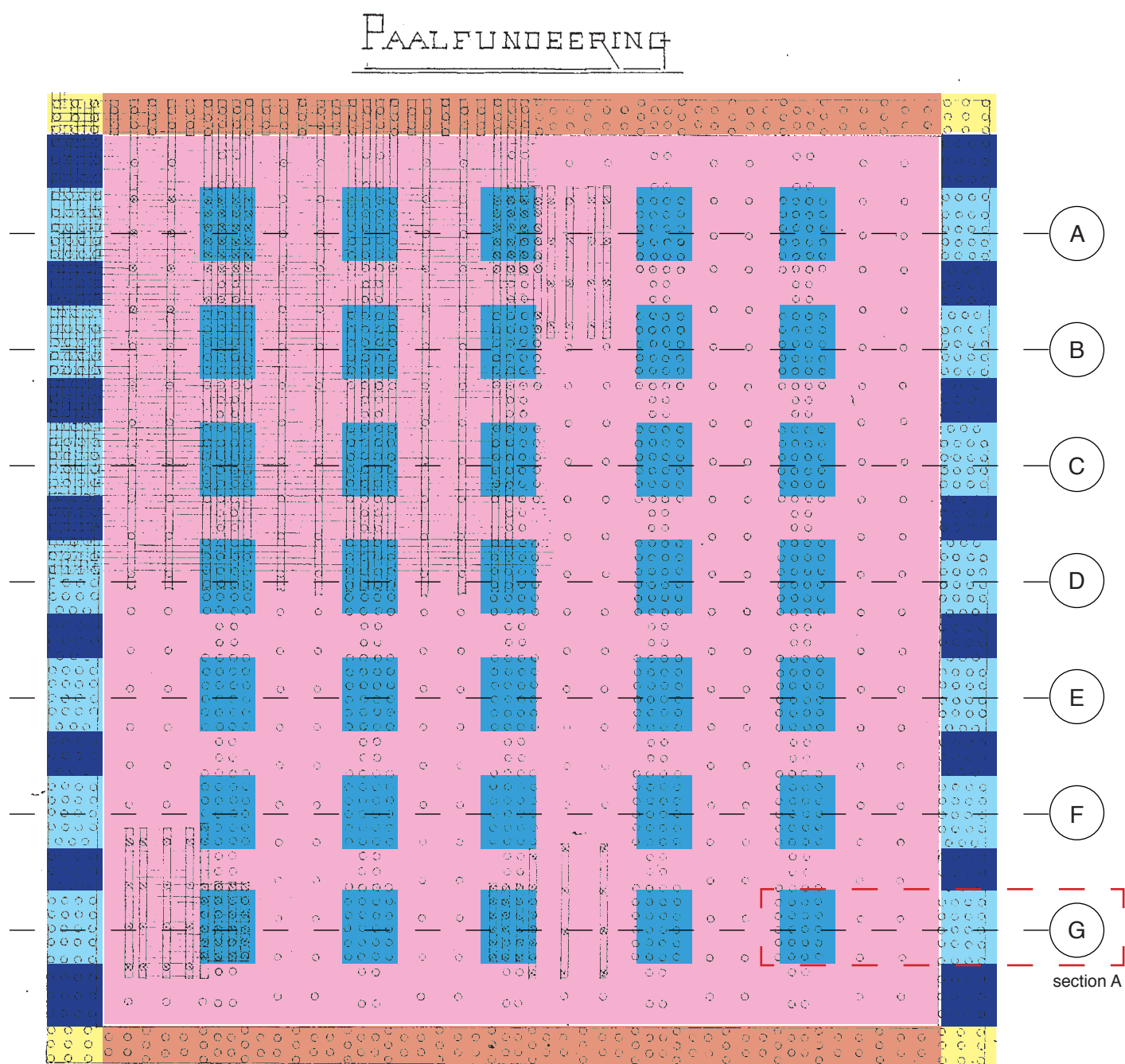
Rhythm

When looking at the foundation plan you see alot of poles. And it's looks like overkill on first sight. But when taking a closer look it's acutally very economic. Where the load needs to be transfered into the the foundation there are more poles. This is more clearly visible in the image on the next page. The front facade for example is only bearing itself and a minor extra weight so it's foundation is alot lighter than the one on the side facades.

Side facade

The side facade is the main load bearing foundation together with the multiple (35 in total) 'poer' that are in the centre. This is visible by the amount of poles. The amount of poles reflect the load bearing part.

LOAD BEARING



Load bearing

- Load bearing (24 poles per block)
- Load bearing in wall (16 per block)
- Intermediate between construction (14 per block)
- Corners and horizontal powers (9 per block)
- Front and back facade (184 per facade)
- Floor

illustration 1. load bearing foundation

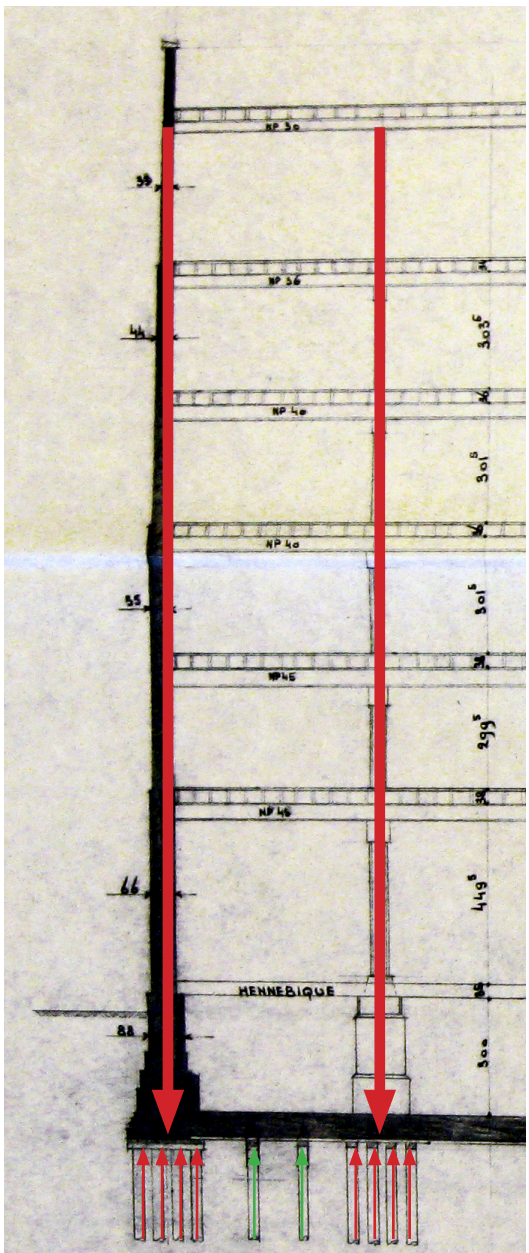


illustration 1. section A

Powers

- Load bearing construction
- Floor

illustration 1: J.P. Stok & J.J. Kanters
illustration 2: F.K. Dekker
edit illustration 1 & 2: D. Deen

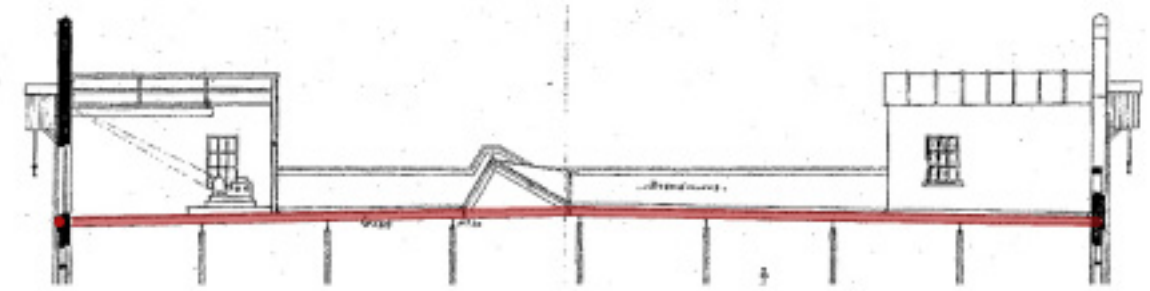
4.4 Roof structure and drainage system

Because the roof has been altered significantly through time it is interesting to look at what happened and how the roof and drainage system currently functions. Originally the roof was split up by the shed-roof structure and the winch houses were placed at the edge where the rainwater collects. Therefore it became split up and necessary to place multiple drainage points on either sides of the winch houses.

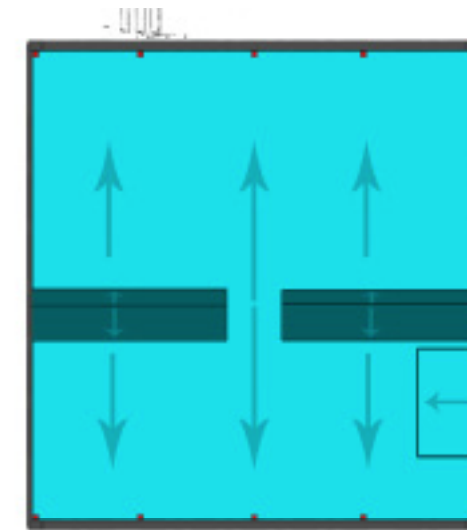
The collected rainwater is transported by vertical pipes running internally along the facade. This does raise a risk of possible water damage to the interior if a pipe leaks. Below the ground level the drainage piping runs out. Along the facade a drainage pipe links all the pipes together and leads back to the sewer system of the city.

Conclusion

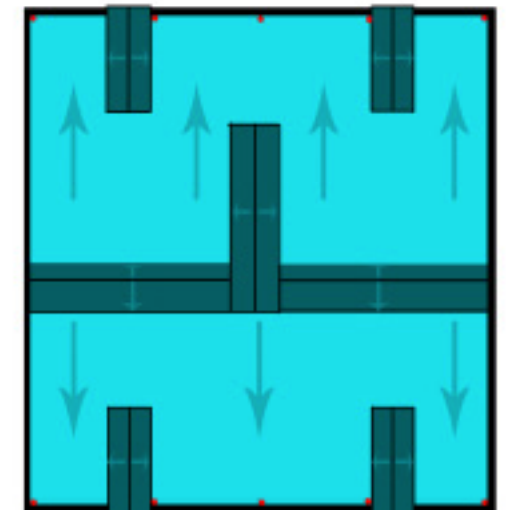
The roof structure is a combination of wooden and steel beams which are still in a decent state and are expected to be structurally sound. The water repellent layer covering the wooden roof planking also shows no points of major leakage so this is also expected to still provide decent protection. With the changes in the roof structure it is no longer needed to have as many drainage pipes as currently are placed.



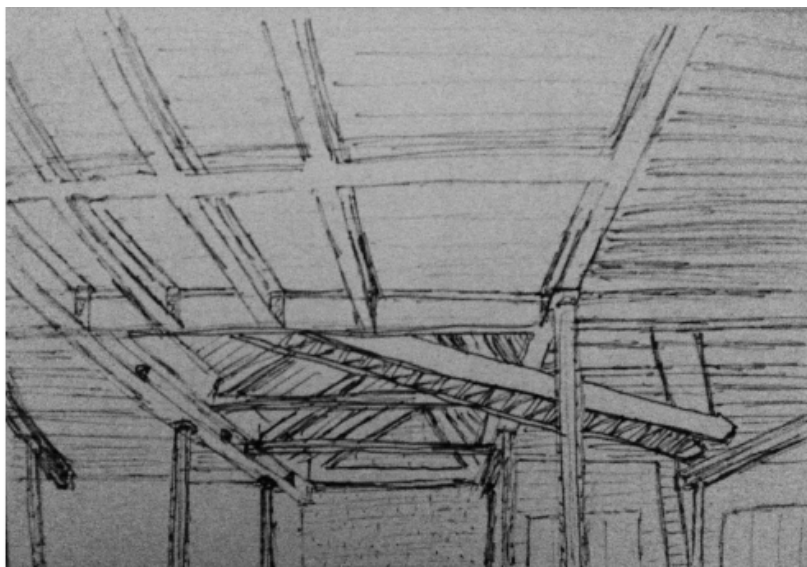
1. Section of the building with the mildly sloped roof highlighted in red



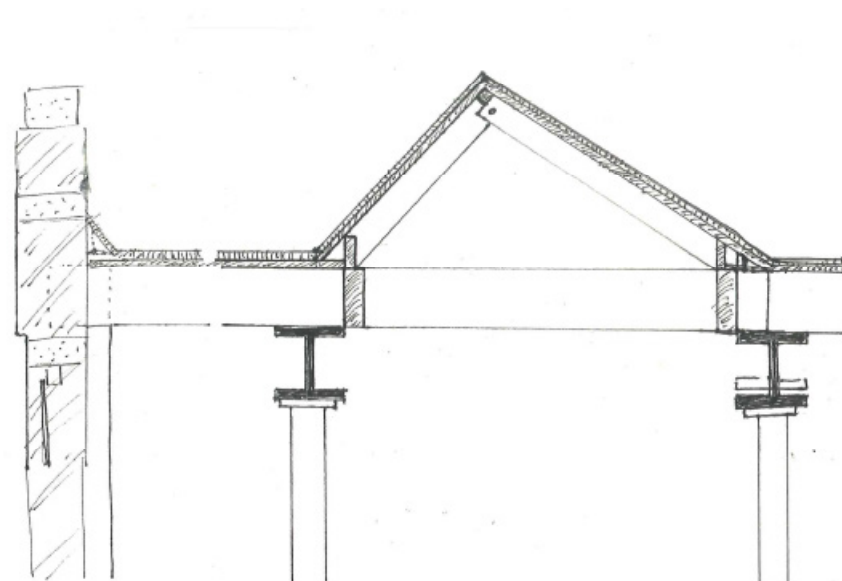
2. Current rainwater drainage system



3. Original rainwater drainage system



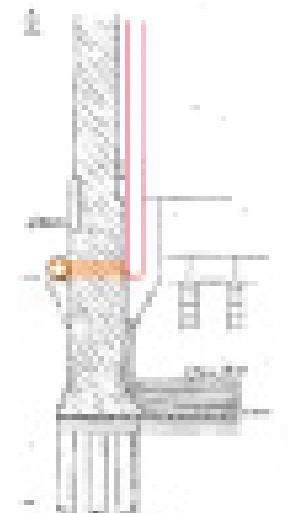
4. Drawing of the visible roof structure and hanging staircase on the 5th floor.



5. Section drawings of the shed-roof structure fully covered with a bituminous layer.



6. Connection of the drainage system to the sewer



7. Section drawings of the connection of drainage pipes

Used sources: 1,6,7 Construction drawings of Santos from 1901. Municipal archives of Rotterdam no. BW-1126-1901

2,3,4,5 Illustrations by Lukas Jaspers

4.5 MATERIALS

The building of Santos is a true example of different materials and building methods coming together in one composition. By using almost every basic material known in architecture it shows a combination of brick, concrete, wood, iron and glass. Each material is chosen and used from a pure technological point of view within the knowledge that was known in that the time it was build.

In its most simplified way we could describe Santos as a facade made out of brick, a main construction of steel, the ground floor made out of concrete, the rest of the floors and the foundation of wood and windows made out of glass. This does not explain the complexity of the way materials are used in a more detailed way. Let's take a closer look to the materials from the foundation to the roof.

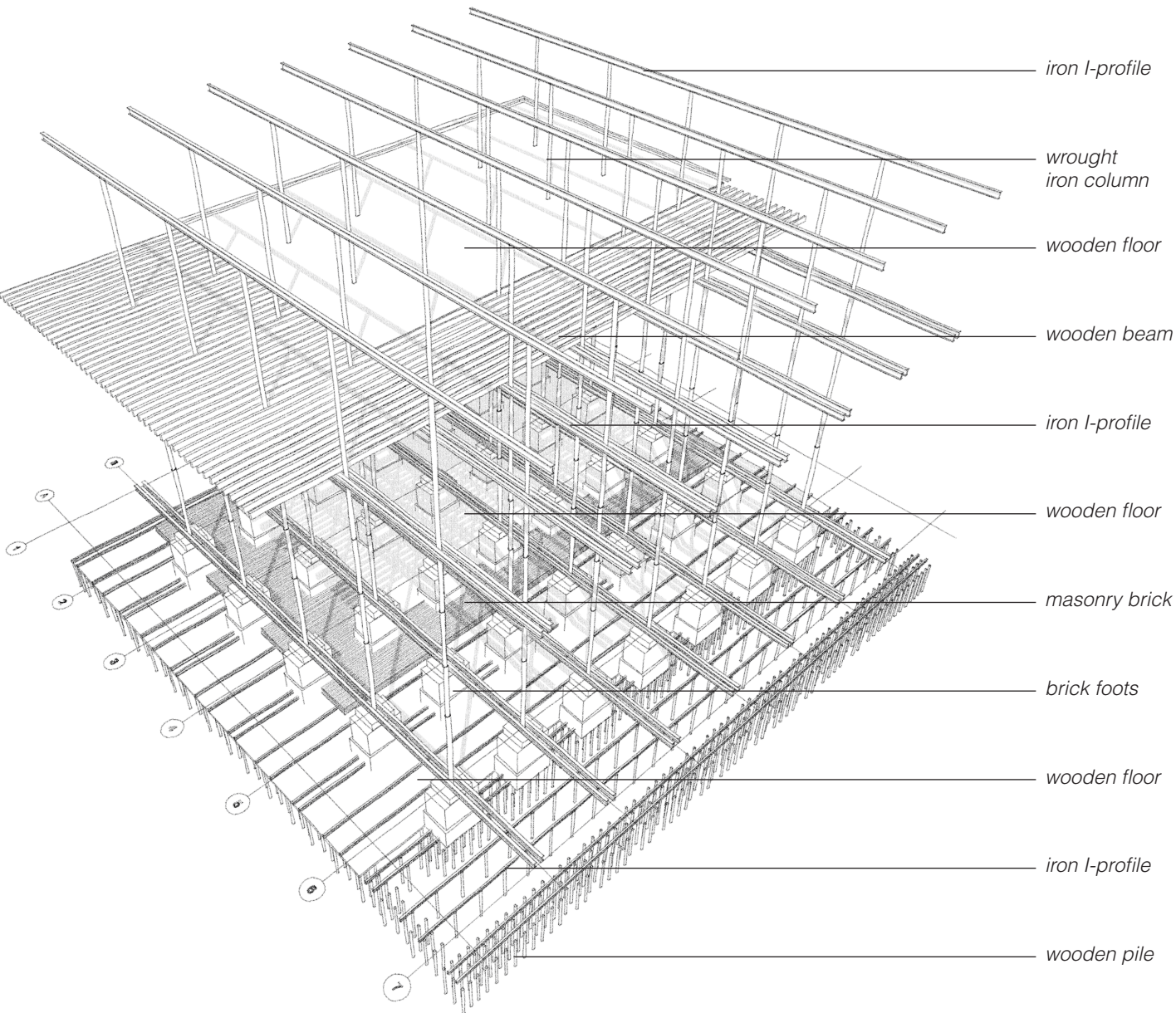
The foundation of the building is made out of a wood. As long as they are under water, the piles are unable to rot. This rotting process only happens when the wood is no longer under water and comes into contact with oxygen. The wooden piles carry the masonry foundation footings through another layer of wood fields (according to the drawings in 1901), which support the steel structure and the foundation masonry under all facades.

According to the original drawings of 1901 the basement floor carried out a solid masonry floor which is supported by means of a wooden pile foundation.

If we take a look to the concrete used in the building we find that the only concrete used in the building is the concrete in the floor systems on the ground floor, on the terraces above the facade, the elevator shafts of 1954 and the floors of the ma-chine rooms of that same year.

The foots made out of bricks support the concrete (in combination with steel) ground floor, which in their turn support the wood. As already briefly explained ear-lier the rest of the floor are supported by a steel construction which carry the wooden beams in the perpendicular axis.

The roof of the building has a wooden construction, imposed on the main structure of iron. The building owes its stability to the brick facades; the wind forces are transmitted through the timber floor to the outside walls (for further elaboration of the stability and forces of the building see chapter 4.3 on load bearing structure and stability).



4.6 MASONRY

4.6.1 BRICK MASONRY

THE STONE

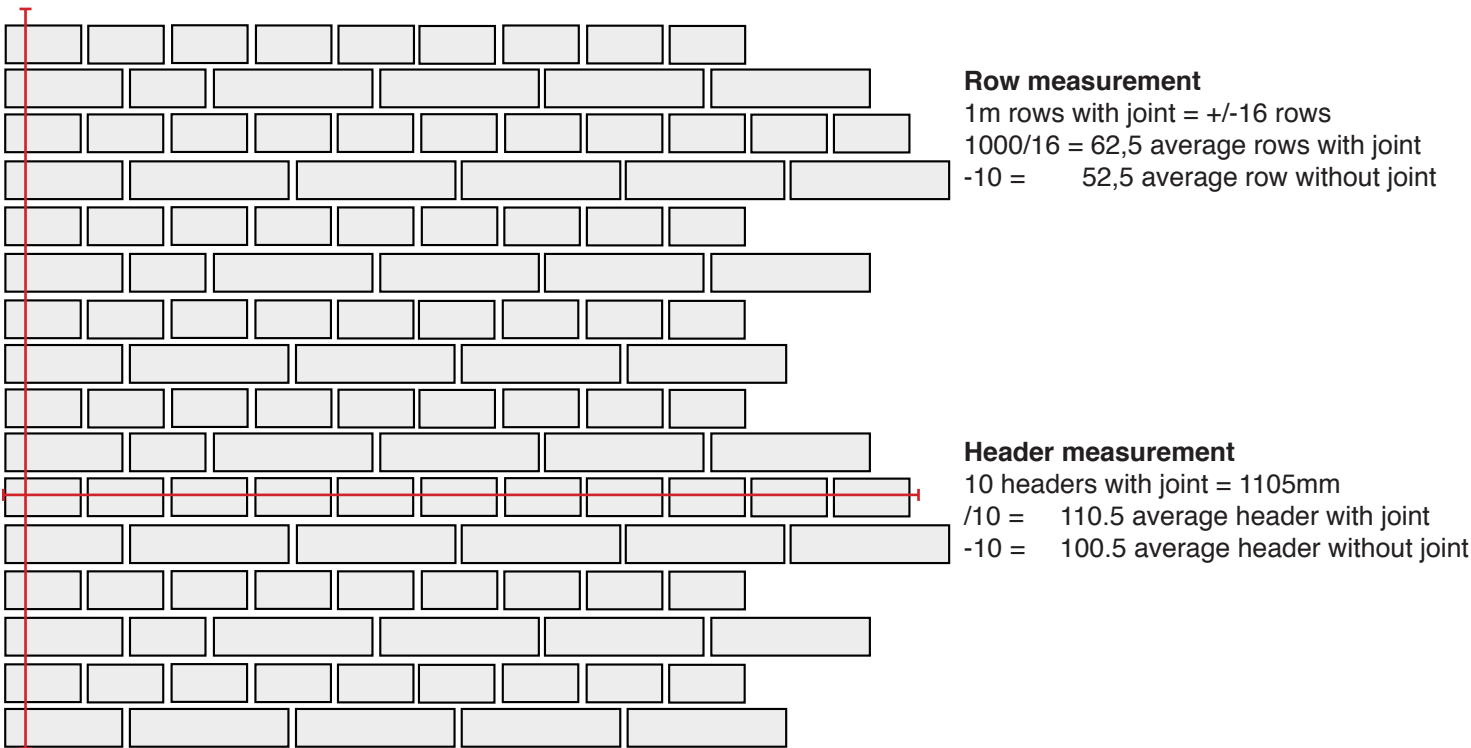


illustration 1: measurements

Used brick: Waal Stone (waalformaar)

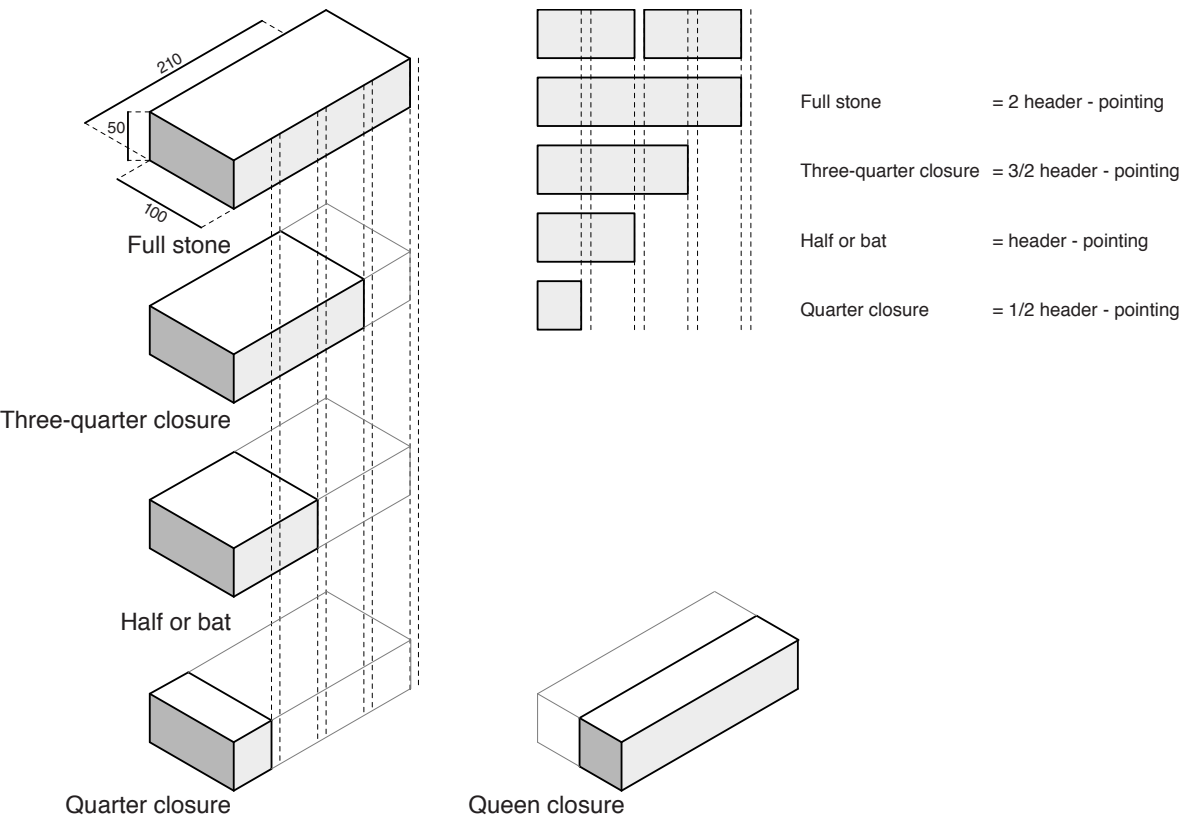


illustration 2: brick size

Single stone measurements



photo 1: width of a half stone is aprox. 100mm
pointing is aprox. 10mm thick



photo 2: height of a stone is aprox. 50mm



photo 3: width of a full stone is aprox. 210mm

Used sources:
<http://www.free-ed.net/free-ed/Resources/Trades/carpentry/Building01/default.asp?iNum=0704>

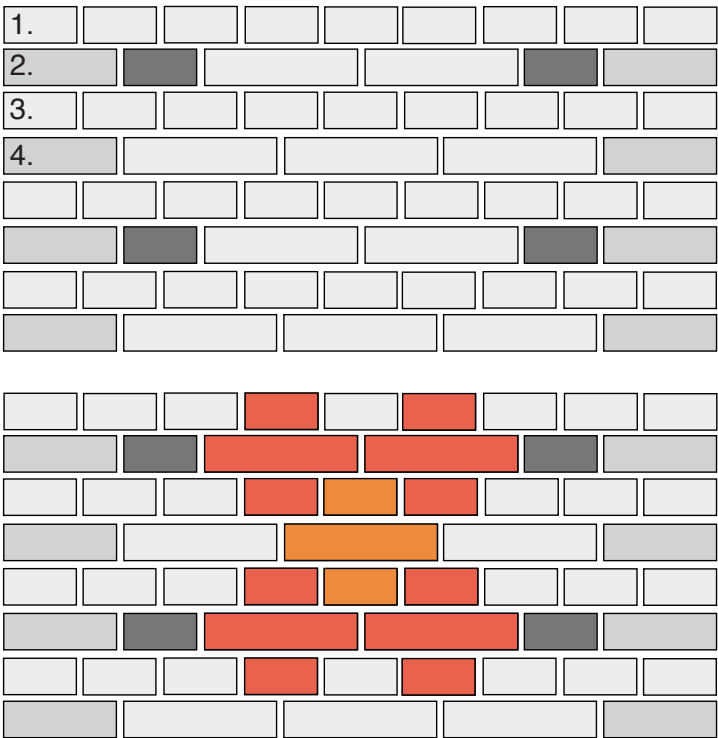
Photo's 1, 2 & 3: L. Jespers
illustrations 1 & 2: D. Deen

MASONRY BOND



photo 1: brick masonry bond in Santos

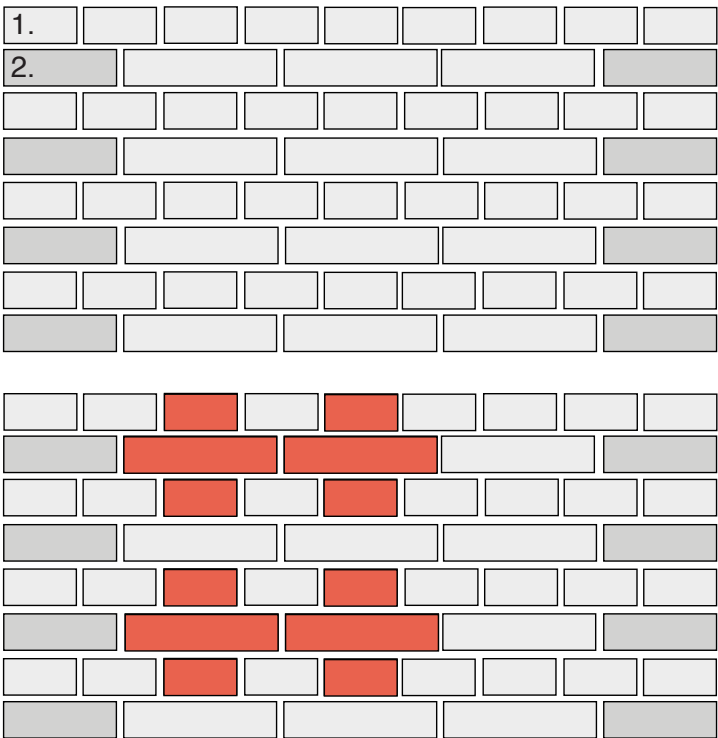
Used bond: (Dutch) cross bond



The cross bond is being used in Santos. This is recognisable by looking at how the rows are being build up. By starting (1.) with a row of headers the dimension are being set. The next row (2.) is a row of stretchers that start with a three-quarter closure followed by a header. Next (3.) is another row of headers. And finally there is the last row (4.), which start with a 2/3 stone that isn't followed up by a header. This creates a shift in the pattern and therefor it creates the cross bond.

illustration 1: dutch cross bond explained

Similaire bond: (English) cross bond



A very similar bond compared and easily mixed up with the used bond is the (English) cross bond. The main reason it's different is because it only has two distinctive rows. It's first row (1.) is just as with the used bond a row of headers. After this there is a row (2.) that starts with a three-quarter closure followed by headers. These two rows repeat itself and therefor do not create a cross pattern as shown in the used bond.

illustration 2: english cross bond explained

CORNER

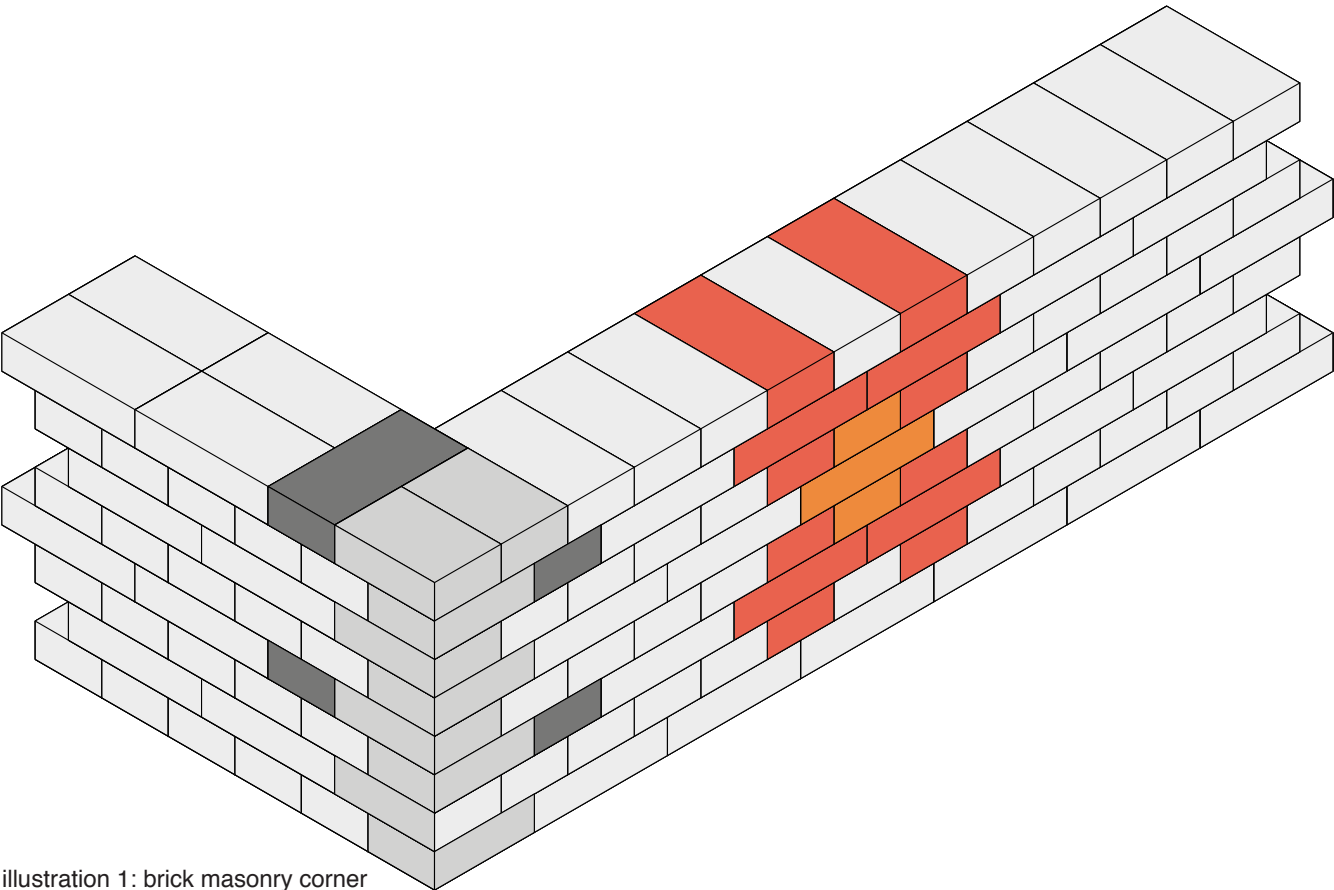


illustration 1: brick masonry corner



photo 1: 'bloktand' in santos

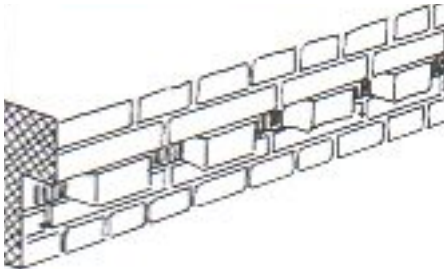


illustration 2: 'bloktand'

'Bloktand'
At the top part of Santos, the brick masonry is decorated by having every other brick sticking out of the facade.

EXCEPTIONS

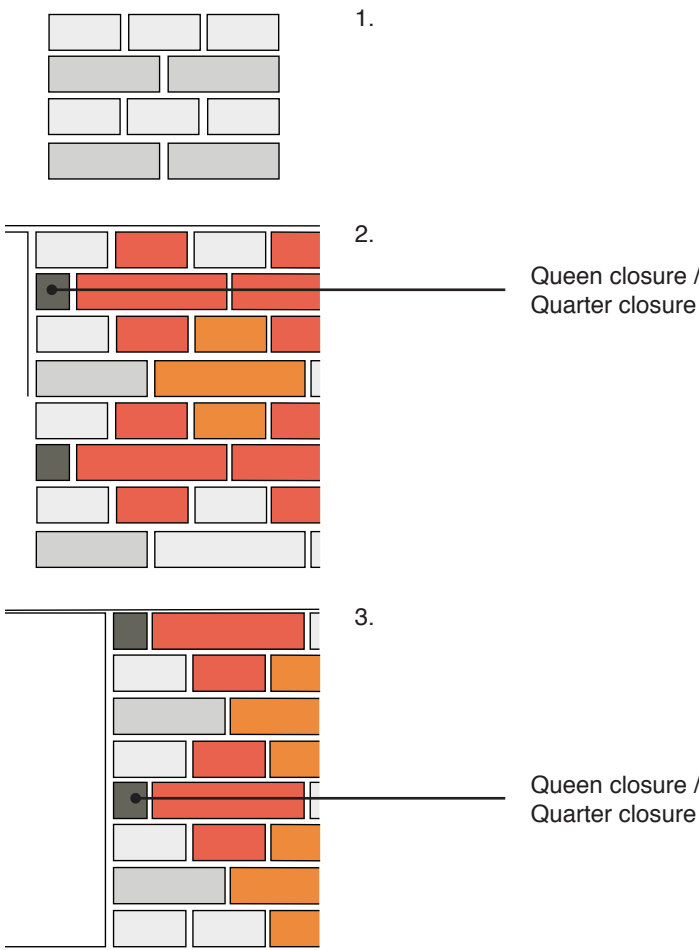


illustration 3 : brick masonry exceptions

Conclusion
Even though they might look different from a normal cross bond, they actually tried to continue the cross bond when possible. The brick masonry in between the windows (see 1.) is too small to have a crossbond and therefore here it's not possible.

photo 2: exceptions in Santos brick masonry

WINDOW

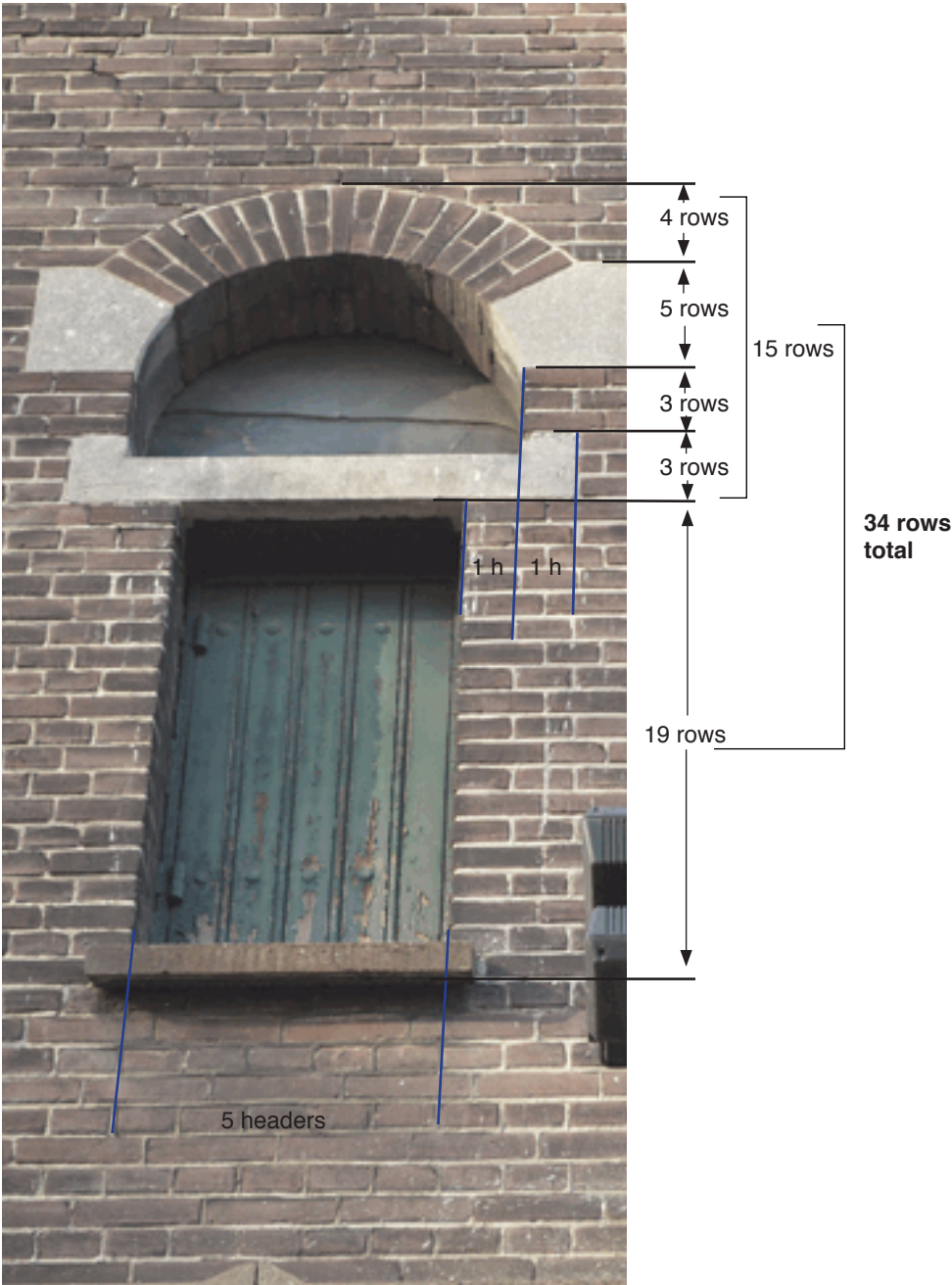


photo 1: row & headers near facade opening outside

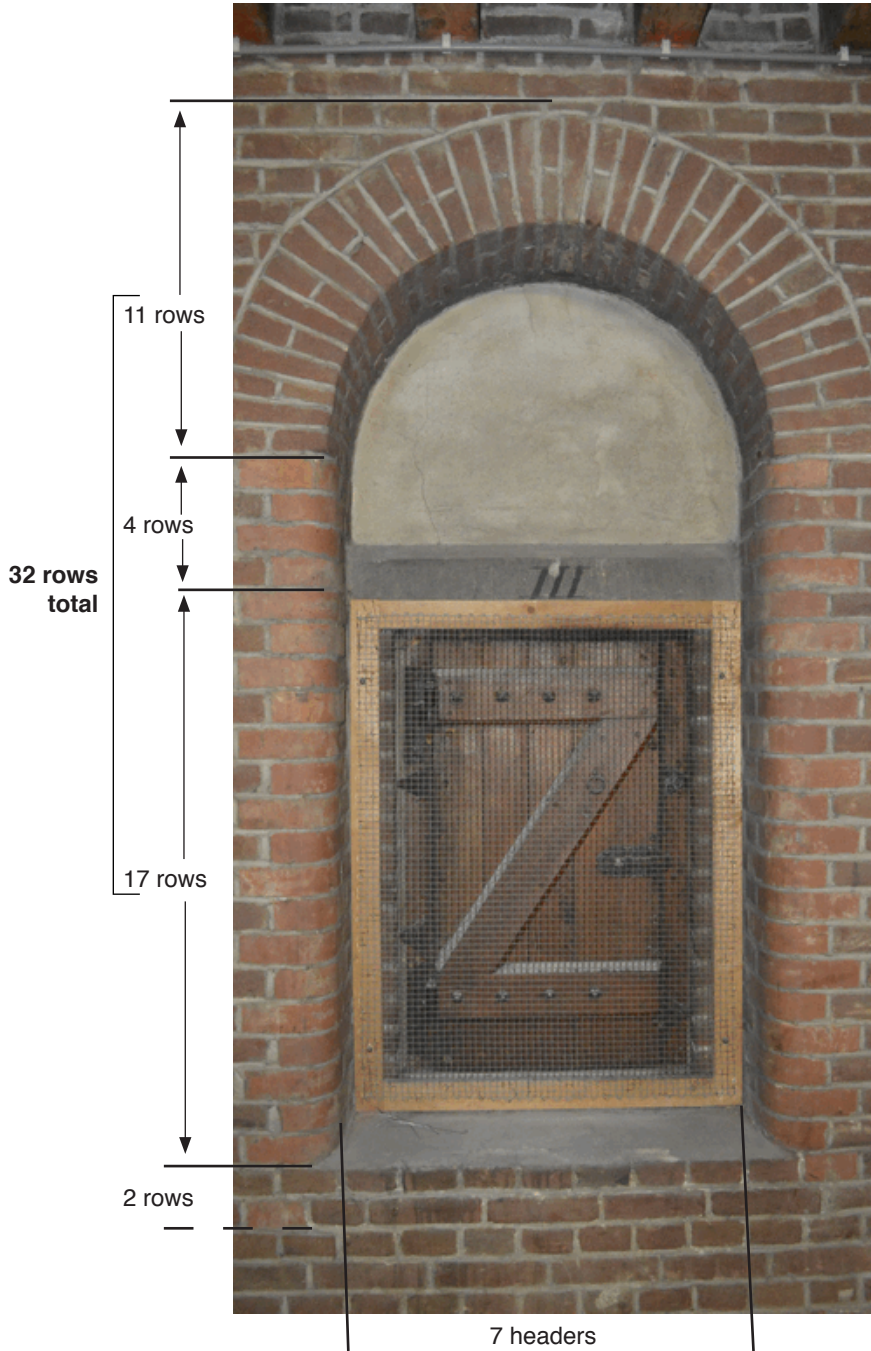


photo 2: row & headers near facade opening inside

A very similar bond compared and easily mixed up with the used bond is the (English) cross bond. The main reason it's different is because it only has two distinctive rows. It's first row (1.) is just as with the used bond a row of headers. After this there is a row (2.) that starts with a three-quarter closure followed by headers. These two rows repeat itself and therefore do not create a cross pattern as shown in the used bond.

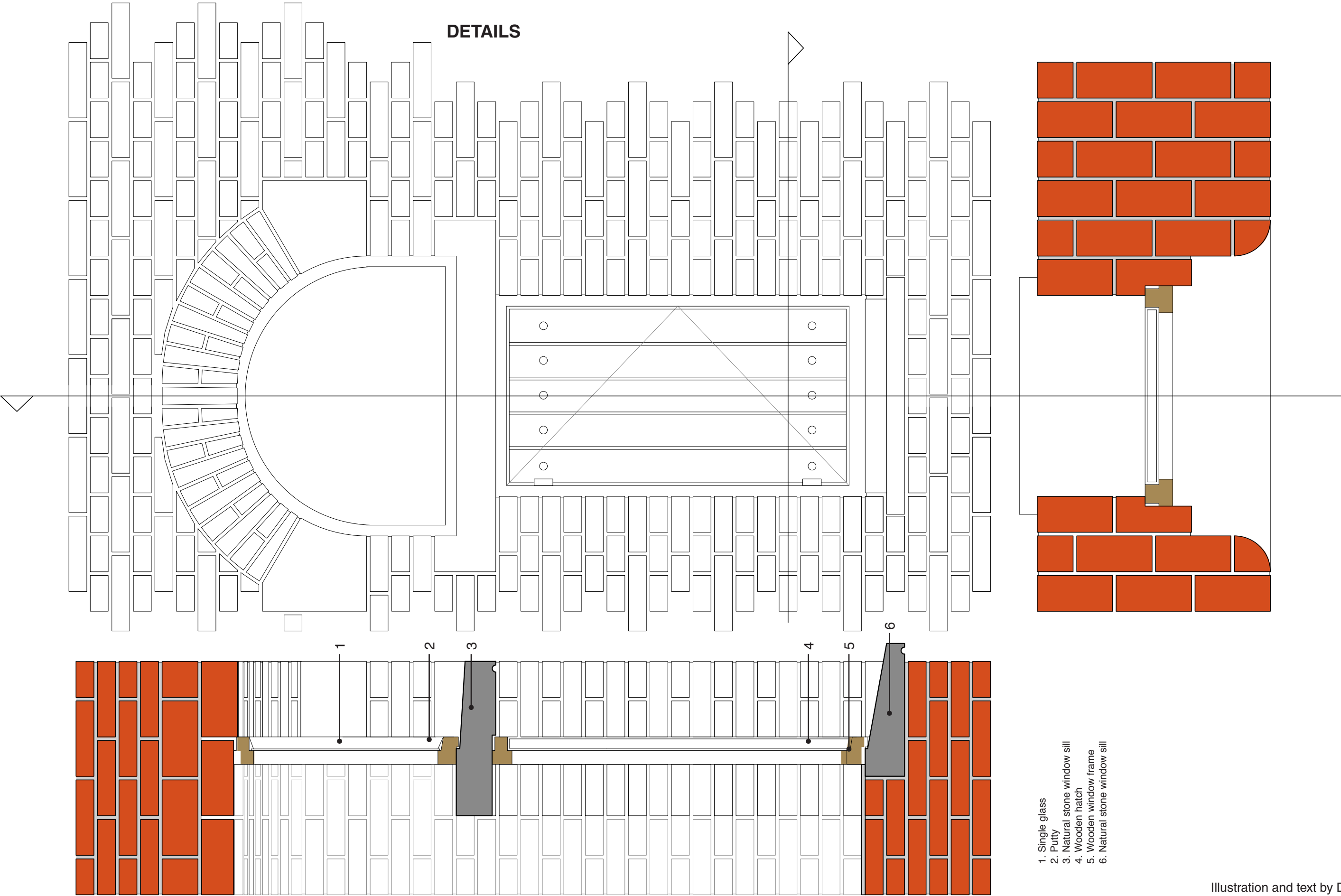


Illustration and text by D. Deen

4.6.2 Natural Stone Masonry

Used bond: Running bond

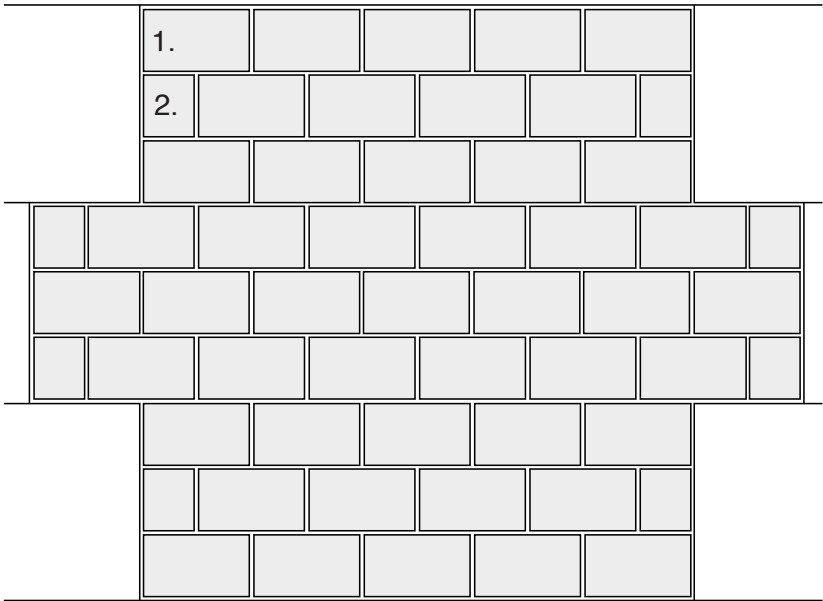


illustration 1: Natural stone masonry

The sandstone in the plint uses a different bond than the brick does. For the sandstone they’ve used a fairly simple bond, the running bond. This bond has no rows of headers or stretchers. Every row is a strecher row that shifts. The first row is only stretchers, where the second row starts with a bat to create the shift. In this case the second row also ends with a bat, but could end in a strecher. If this is the case the first row ends in a bat.

Single stone measurements



photo 1: width of a full stone is aprox. 250mm / joint is aprox. 10 mm thick



photo 2: height of a stone is aprox. 140mm pointing is aprox. 20mm thick

Used natural stone: Cut sandstone

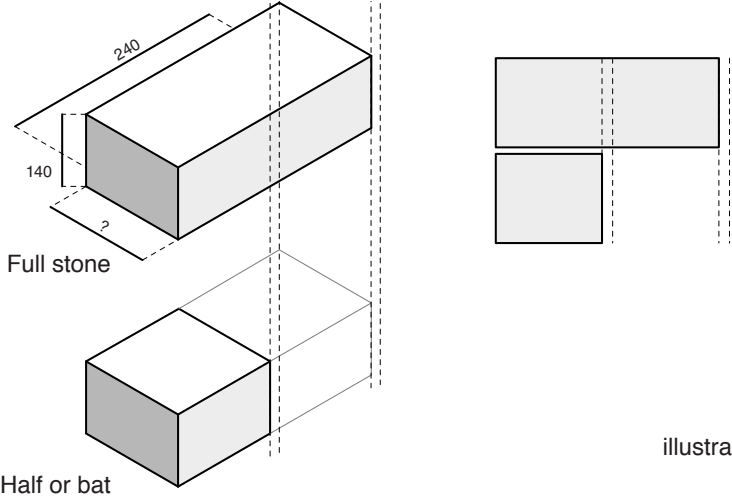


illustration 1: Stone size

4.6.3 MEASUREMENTS

HEADERS

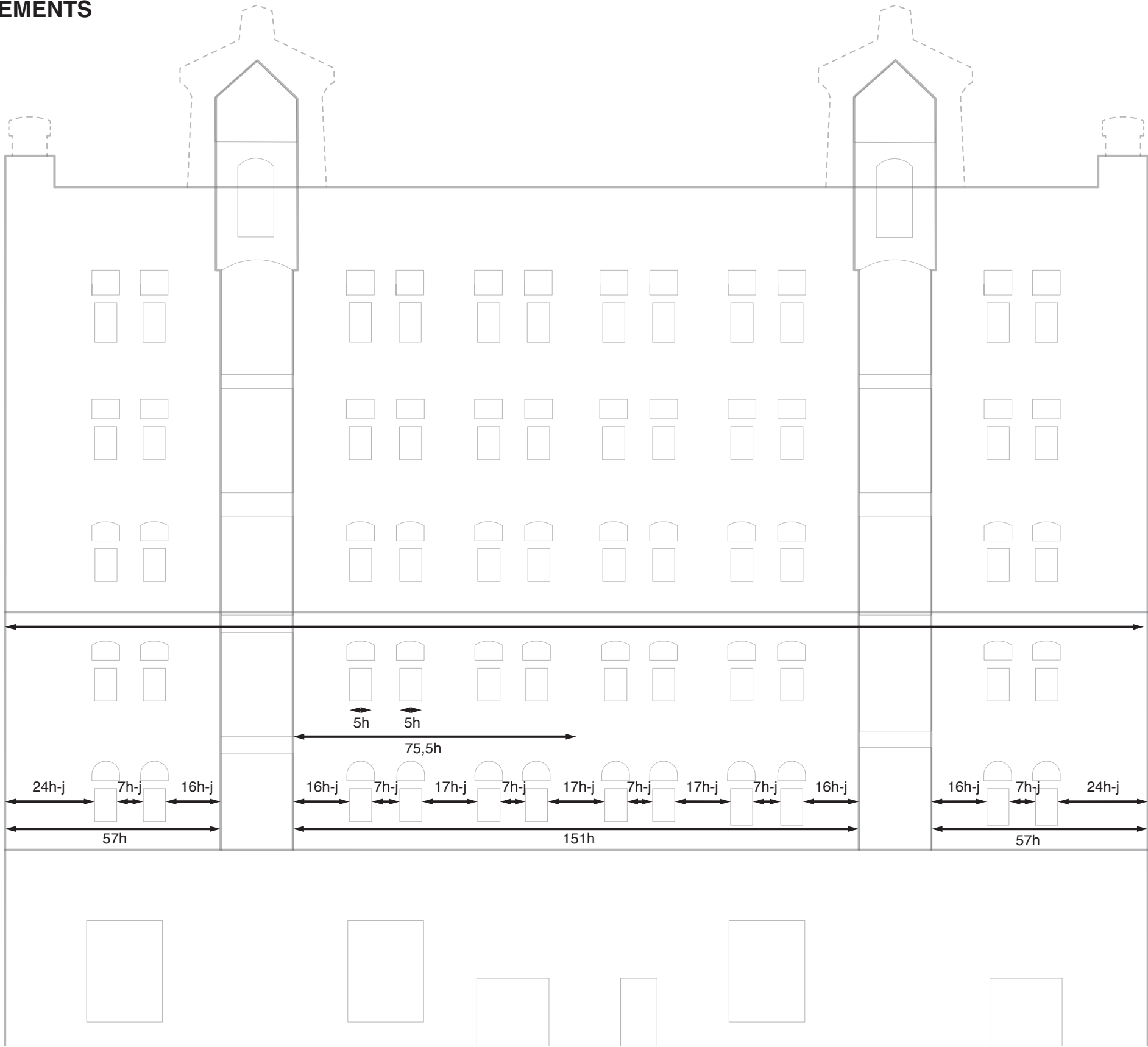


illustration 1: headers in santos

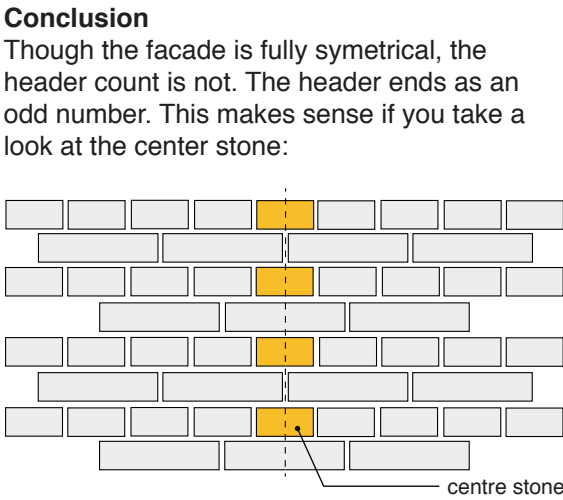


illustration 2: middle header in santos

Because of the cross bond the centre header is actually half a stone. But if we take a look at the stretchers than we see that it cuts it in half or the joint is in the middle.

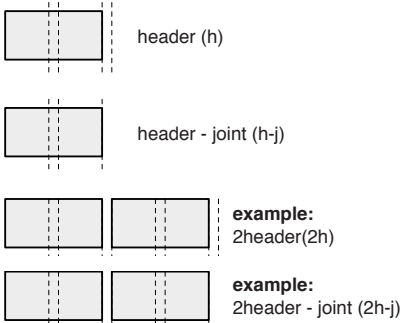
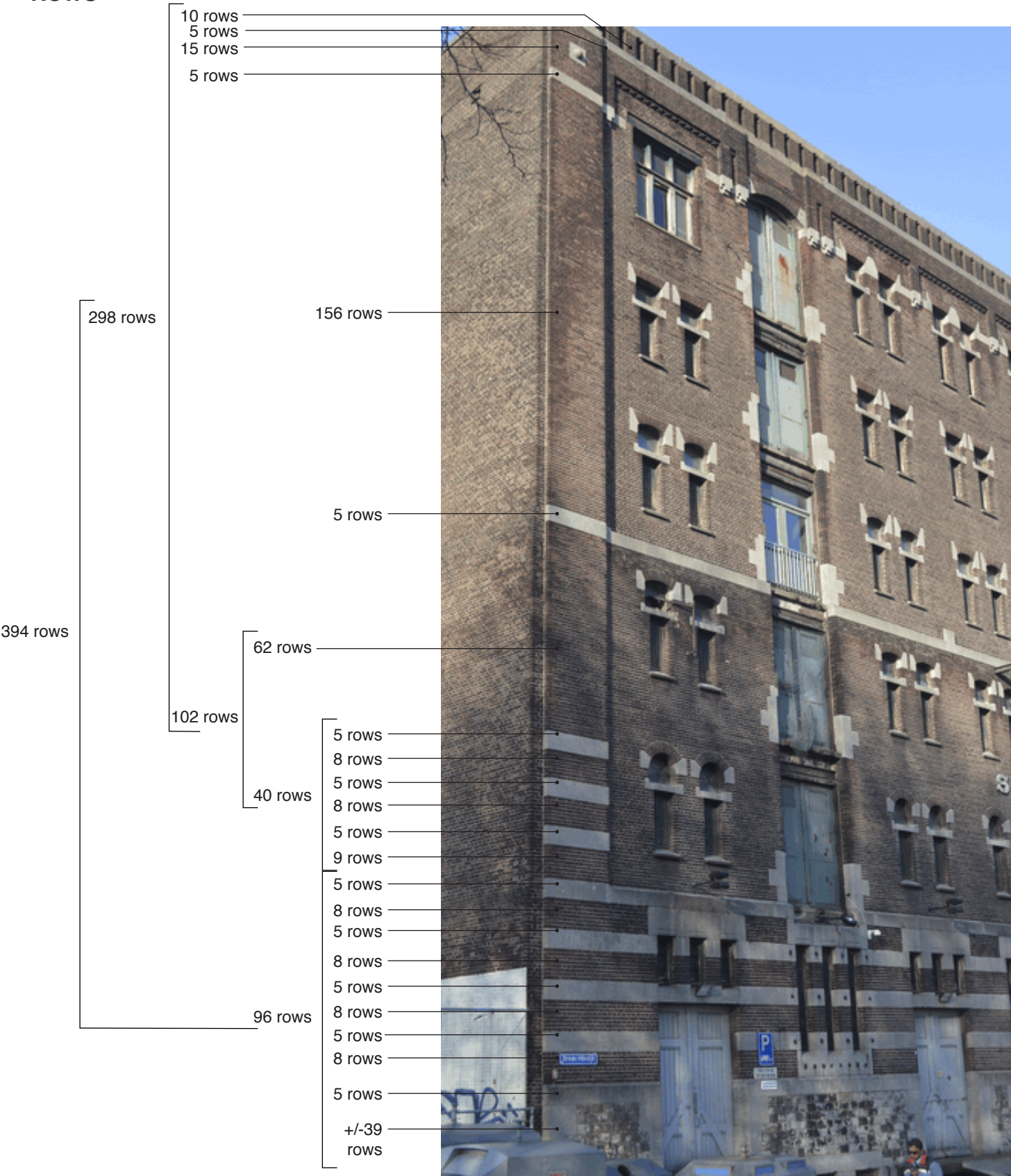


illustration 3: header & joint explained

ROWS



Conclusion

The brick is leading in the masonry. Every measurement is derived from the size of the brick. This is logical because the brick is baked in a certain size, while the natural stone is cut in size. The natural stone is mostly cut in rows of 5 bricks, but has it's exceptions in the plint.

4.8 INSTALLATIONS

There are many existing installations and features that are already incorporated in the building, which makes it much easier to get SANTOS working again.

LIGHTING

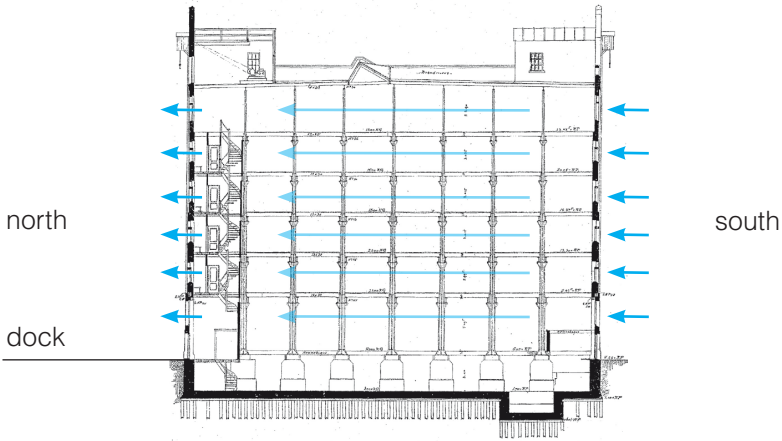
The halogenic lamps do not belong to the original structure and are therefore not considered of great importance.



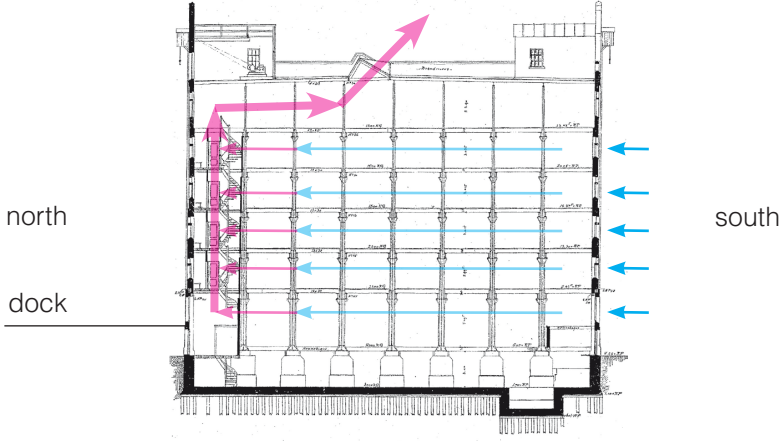
VENTILATION

Conditions for coffee storage:
Coffee beans need to be climate-controlled against humidity or extreme temperatures that would damage them. Symmetry of windows act as a natural cross ventilation to establish with equilibrium with air in warehouse.

scenario 1:



scenario 2: stack effect in staircase



ELECTRICITY

The electricity in the building still works and is currently in use.



LIFT

The lift is not in use any more.



4.10 CONCLUSION TECHNICAL VALUES

The building method for Santos is mostly a repetition of steps, except for the basement and some small differences in the roof. The construction is an assembly of all kinds of materials and the load bearing construction consists of a steel column and beam system that is bolted together. This so-called Phoenix Column System has played an important role in the construction of some noteworthy high-rise buildings in America which might explain why it was applied to Santos, as the tallest warehouse of Rotterdam at that time. (very rare and valuable)

The roof structure as a combination of wooden and steel beams is still in a decent state and expected to be structurally sound, such as the water repellent layer covering the wooden roof planking also shows no points of major leakage and still provides decent protection. With the changes in the roof structure it is no longer needed to have as many drainage pipes as there are currently placed.

5 CULTURAL VALUES

5.0 INTRODUCTION

To be able to assign valid cultural values to the building of Santos this chapter brings together all the knowledge gained from the previous studies. We used a chronomap to illustrate the transformation of the building and mapped the cultural values into a matrix. This matrix is the result of a study on two important pieces of literature in the architectural debate of heritage and monumental preservation: *The Modern Cult of Monuments: its essence and its development* by Alois Riegl (2007) and *How Buildings Learn* by Stewart Brand (1994).

Alois Riegl, the modern cult of Monuments

According to Riegl, there exist three types of monuments:

- cer
1.

Intentional monuments – Intentional commemorative value aims to preserve a moment in the consciousness of later generations.
2.

Unintentional monuments (historical monuments) – The historical value of a monument arises from the particular, individual stage it represents in the development of human activity in a tain field.
3.

Age-value monuments – Age-value in a monument betrays itself at once in the monument’s dated appearance. Age-value makes explicit a sense of the life cycle of the artifact, and of culture as a whole.

Outwardly these three classes of monuments can be thought of as contained within one another, while the scope of their memory-value widens. To the class of intentional monuments belong only those works which recall a specific moment or complex of moments from the past. The class of historical monuments is enlarged to include those which still refer to a particular moment, but the choice of that moment is left to our subjective preference. Finally, Riegl argues that the category of monuments of age-value embraces every artifact without regard to its original significance and purpose, as long as it reveals the passage of a considerable period of time.

In conclusion the horizontal axis of the matrix shows a translation of this interpretation of Riegl in the form of specific values: age value, historical value, intentional commemorative value, non-intentional commemorative value, use value, newness value, art value and rarity value. As a group we added two final values: spirit of place and story. This value reflects the emotion that a building transmit and the story it tells; something that was not really described in the literature of Riegl.

Stewart Brand, How Buildings Learn

Brand presents his basic argument in an early chapter, “Shearing Layers,” which argues that any building is actually a hierarchy of pieces, each of which inherently changes at different rates. In his business-consulting manner, he calls these the “Six S’s”.

The Site is eternal; the Structure is good for 30 to 300 years (“but few buildings make it past 60, for other reasons”); the Skin now changes every 15 to 20 years due to both weathering and fashion; the Services (wiring, plumbing, kitchen appliances, heating and cooling) change every seven to 15 years, perhaps faster in more technological settings; Space Planning, the interior partitioning and pedestrian flow, changes every two or three years in offices and lasts perhaps 30 years in the most stable homes; and the innermost layers of Stuff (furnishings) change continually.

Riegl+ → Brand+ ↓	AGE value	HISTO- RICAL value	INTENTIO- NAL COM- MEMORA- TIVE value	NON INTENDED COMME- MORATIVE value	USE value	NEW- NESS value	(relative) ART value	RARITY value	OTHER relevant values
SURROUN- DINGS/ SETTING									
SITE									
SKIN (exterior)									
STRUC- TURE									
SPACE PLAN									
SURFACES (interior)									
SERVICES									
STUFF									
SPIRIT of PLACE									

The Modern Cult of Monuments: its essence and its development, Alois Riegl (2007) and *How Buildings Learn* by Stewart Brand (1994)

the matrix, with Riegl on the horizontal axis and Brand on the vertical axis

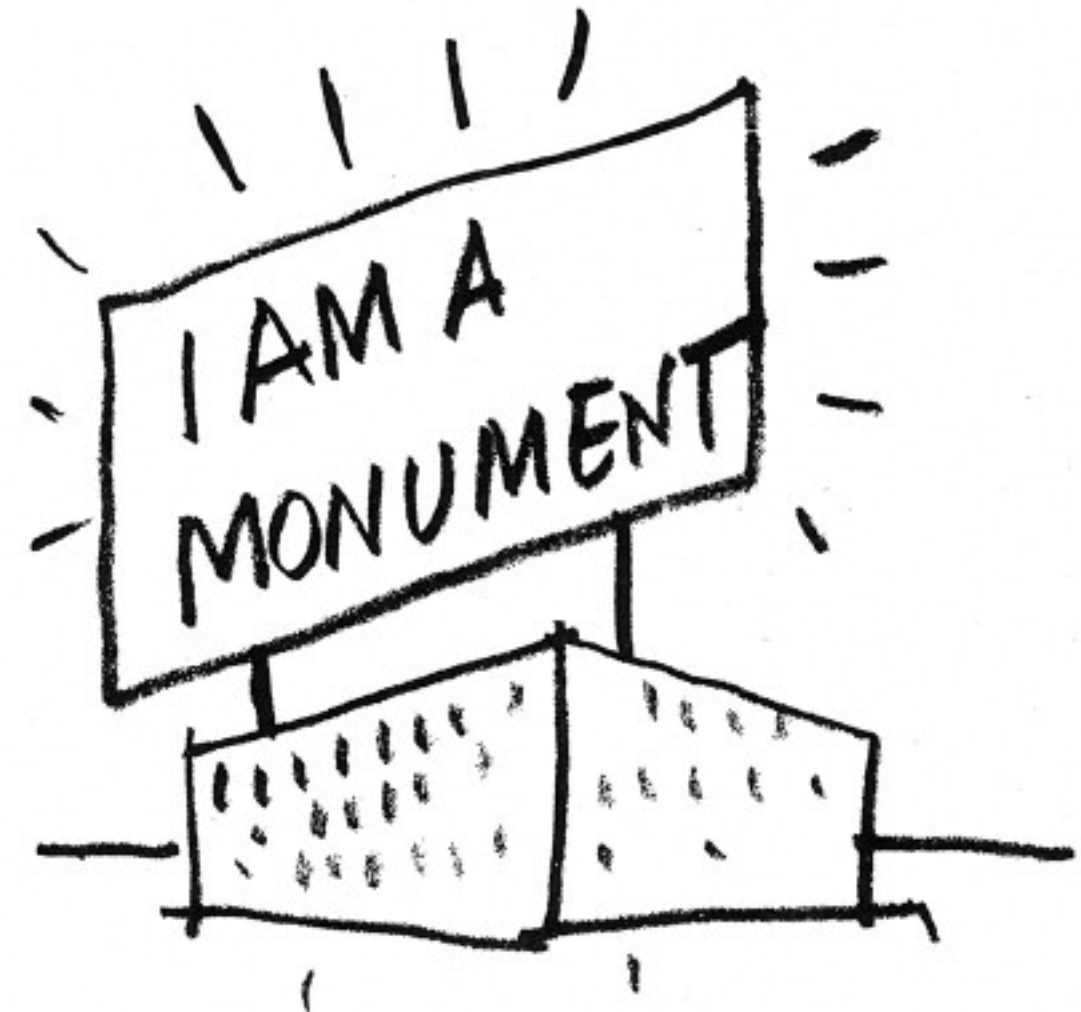
In assigning cultural value to the building of Santos we now have a matrix with two axes at our disposal. By filling in the matrix using short images, diagrams, text and photos the matrix gives an overview of all the elements of Santos that in have a specific value.

To create a hierarchy within these cultural values we acknowledge three levels of importance with each a color assigned to it: a high monumental value (red), a positive monument value (orange) and the indifferent monumental value (green).

A high monument value is assigned to those parts of the building, - elements or characteristics which form the major basis of the monumental building, which, in most cases, the most decisive face for the building. These are original building elements and features or elements that are added later, and a valuable part of the architectural history of the building have been or represent great cultural or art-historical value. Elements or building parts must retain high-value monument to remain in the condition in which they are found or to be restored to a more dignified monument status. Intervening in this parts of the building is to be avoided, and if still necessary with very big concern for the preservation of the values.

A positive monument value is assigned to those parts of the building, elements or characteristics which have a supporting role in the monumental value of the building. They don't set the building (high degree), but support and complement it. Building elements or characteristics having a positive value monument should preferably be retained in the condition in which they are or are found or they should be restored to a more dignified monument status. Intervening and modifying the building parts is possible, provided that they are well considered.

The indifferent monument value is assigned to those parts of the building, elements or characteristics that play no or only a minor role in the monumental value of the building. Building elements or characteristics with an indifferent monument value can without drastic consequences for the monumental value of the building be transformed or eliminated. Distorting elements are preferably removed or, if necessary, replaced by elements supporting the monumental value of the building.



5.1 DISTINCTIVE DESCRIPTION

The website of the ‘Rijksdienst voor Cultureel Erfgoed’ (2003), where all the cultural heritage of the Netherlands is documented, describes the warehouse Santos in the following words:

Introduction

In 1901 the warehouse ‘Santos’ was built in a **sober eclectically style**, designed by the architects J.P. Stok Wzn. and J.J. Kanters. This was commissioned by the company Blaauwhoedenveem Rotterdam for the storage of Brazilian coffee. For a long time the warehouse was **the highest warehouse of Rotterdam** with a height of 24,5 m. Furthermore, it had a **very advanced loading and unloading system**.

Description

Originally, Santos was a detached warehouse that was built on an almost square plan of 32,5 m x 34,5 m and it was and still is six levels high. The basement level is constructed in red brick placed on a rustica ashlar base with natural stone details. The windows and doors are made of wood. The warehouse can be accessed on the side of the Brede Hilledijk as well as on the side of the Rijnhaven and either of these facades are identical and symmetrically built. The warehouse is eight bays wide. The bays next to the outer bays have on the ground floor three small high windows and on the five levels above these windows, double loading doors are placed. Above the upper loading doors there is a bevelled lintel with natural stone keystones and on both sides of all the doors a natural stone detail can be found in the brickwork. In the first, third and sixth bay on the ground floor (as seen from the westside) straight double doors are placed and above those there are three small short windows. In the remaining bays three small high windows are placed. On the floors above each bay has two windows with natural stone sills and the same goes for the keystones in the lintels. On the first floor, the windows have an arc-shaped (upper) window; on the second and third floor, they have a bevelled (upper) window and on the upper floors, they have a rectangular (upper) window. On the ground floor, above the rustica base, there are layers of natural stone placed that continue on from the left to the right side to the second floor. Between the third and fourth floor there is a layer of natural stone. The façade is finished by the towering corner-lintels that have a masonry Frieze in between that accentuates the bays. On top of those, there is a masonry balustrade that leans on a natural stone layer. Originally, the coffee beans were lifted up to the different levels by means of winches. The four winch houses on the roof were removed in 1970 and replaced by a balustrade. In the period shortly after the construction of Santos, there was a cast iron construction on the roof, which mentioned the name of the firm. The side facades are blind and they show the pilasters from the third floor on and in that way these facades are also divided into eight bays. The loadbearing construction consists of riveted cast iron columns, in a grid of 4,22 m x 5,30 m. In the basement the columns rest on ashlar consoles, that are based upon a very large amount of wooden poles. The floors on the other levels exist out of wooden bind layers and planks.

Valuing

Early 20th century coffee warehouse that is of general importance due to the cultural-historical and architectural-historical and typological value.

(Rijksdienst voor Cultureel Erfgoed, 2003, n.p.)

This descriptive text is arguing why warehouse Santos is a national monument. Important values that are named are the sober eclectically style, that is was the highest warehouse of Rotterdam for a while and that it had a very advanced loading and unloading system. According to the ‘Rijksdienst voor Cultureel Erfgoed’ it is of general importance due to the cultural-historical and architectural-historical and typological value. After analyzing Santos, we can argue that we agree with these arguments. The notion of the advanced loading and unloading system (the winch houses) creates a dilemma, because it is not there anymore and at the same time it is named as an important element. Also, the fact that it once was the highest warehouse of Rotterdam and that in the future it will for sure not be even close to the highest building in its direct surroundings, creates a dilemma as well, because that was also part of the identity of Santos at that time. These and more dilemma’s, opportunities and obligations are discussed in much more detail in chapter 5.2 & 5.3.

Used source: Rijksdienst voor Cultureel Erfgoed (2003). Monumentnummer: 513940 Pakhuis Santos Brede Hilledijk 95 3072KD te Rotterdam. [Monumentnummer: 513940 Pakhuis Santos Brede Hilledijk 95 3072KD in Rotterdam]. Retrieved from: <https://monumentenregister.cultureelerfgoed.nl/monuments/513940?Province=Zuid-Holland&Town=Rotterdam&City=Rotterdam&PostalCode=3072KD&Street=Brede%20Hilledijk&HouseNumber=95>

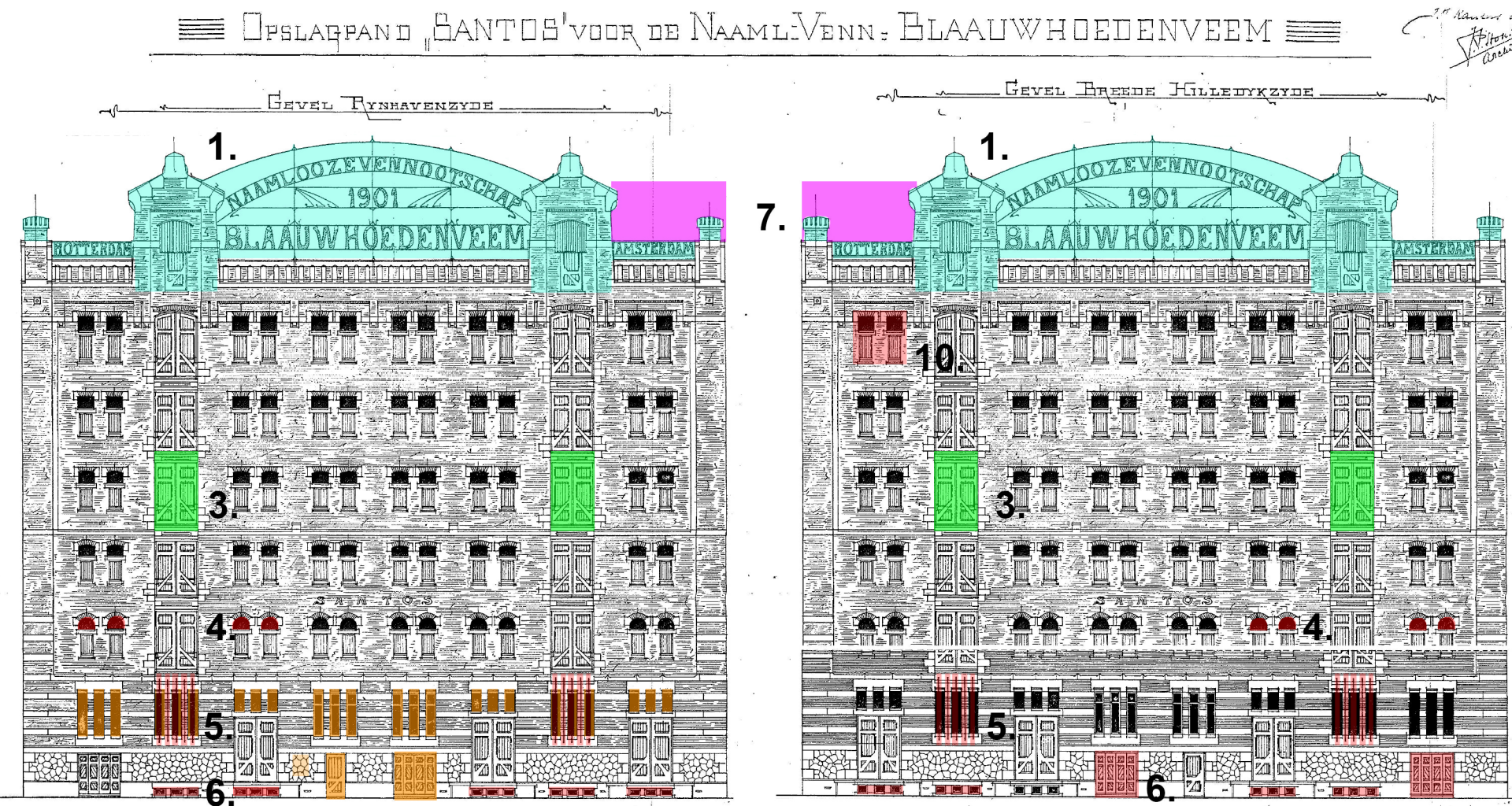
5.1 CHRONOMAPPING

Through the buildings life-span it had some larger and smaller altercations. Looking at the facades, the removal of the steel advertisement and the winch houses were the most significant changes. The reason for this was most probably the deterioration of the wooden winch houses wich were cheaper to remove than restore.

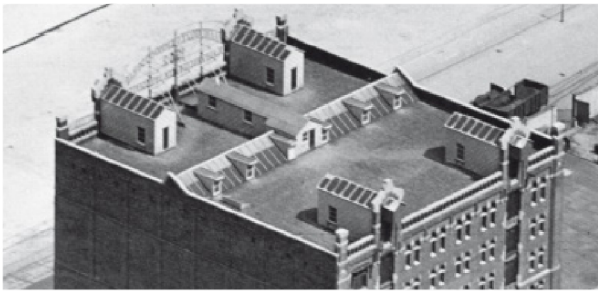
It can also be seen that in the first period after realisation from 1901-1954 there has been some changes to the windows and cellar doors on the ground level. This signals that the use of the cellar stopped within this period and some changes to the building needed to be made. Also the removal of the metal safety bars are characteristic elements wich are currently missing from the facade. Also one of the original 2 piece windows has been replaced with a diffrent 3-piece window on the 5th floor for an office.

In the last periods of the building lifespan some loading door had been replaced by window frames on the third floor due to it's recent function as showroom.

Phase 1	1901-1954	Phase 4	1974
Phase 2	1954	Phase 5	1974-2017
Phase 3	1954-1974	Undetermined	



1. Removal of which houses and advertisement on the roof



2. Removal of the stairway house and dormer widows on the roof



3. Filling of the 3rd floor door openings with glass doors and a metal railing



4. Filling of the top windows on the 1st floor with brickwork



5. Removal of the metal safety bars on the ground floor windows



6. Filling of the basement entrances and windows with brickwork and finished with a concrete plaster



10. Replaced window on the 5th floor

Used sources: van Velzen, H.J., van Winsen M.R. (2011). Bouwhistorische verkenning Pakhuis Santos. Rotterdam: Flexus Architectuur Welstand Cultuurhistorie.

When investigating the chronologic development of the interior the first main alteration to the building was between 1901-1954 when the doors and windows of cellar had been filled and the concrete floor of the partere was extended onto the facade. The next major alteration happened in 1954 when a concrete elevator was constructed along the west facade to accomodate it's new function as military storage. For this intervention the old elevator was removed and some extra brick walls on the ground floor had been added. The original recess of the elevator has been covered with a steel plate and some extra steel fortifications. Also a fireplace had been added to the top floor to provide heating for an office function.

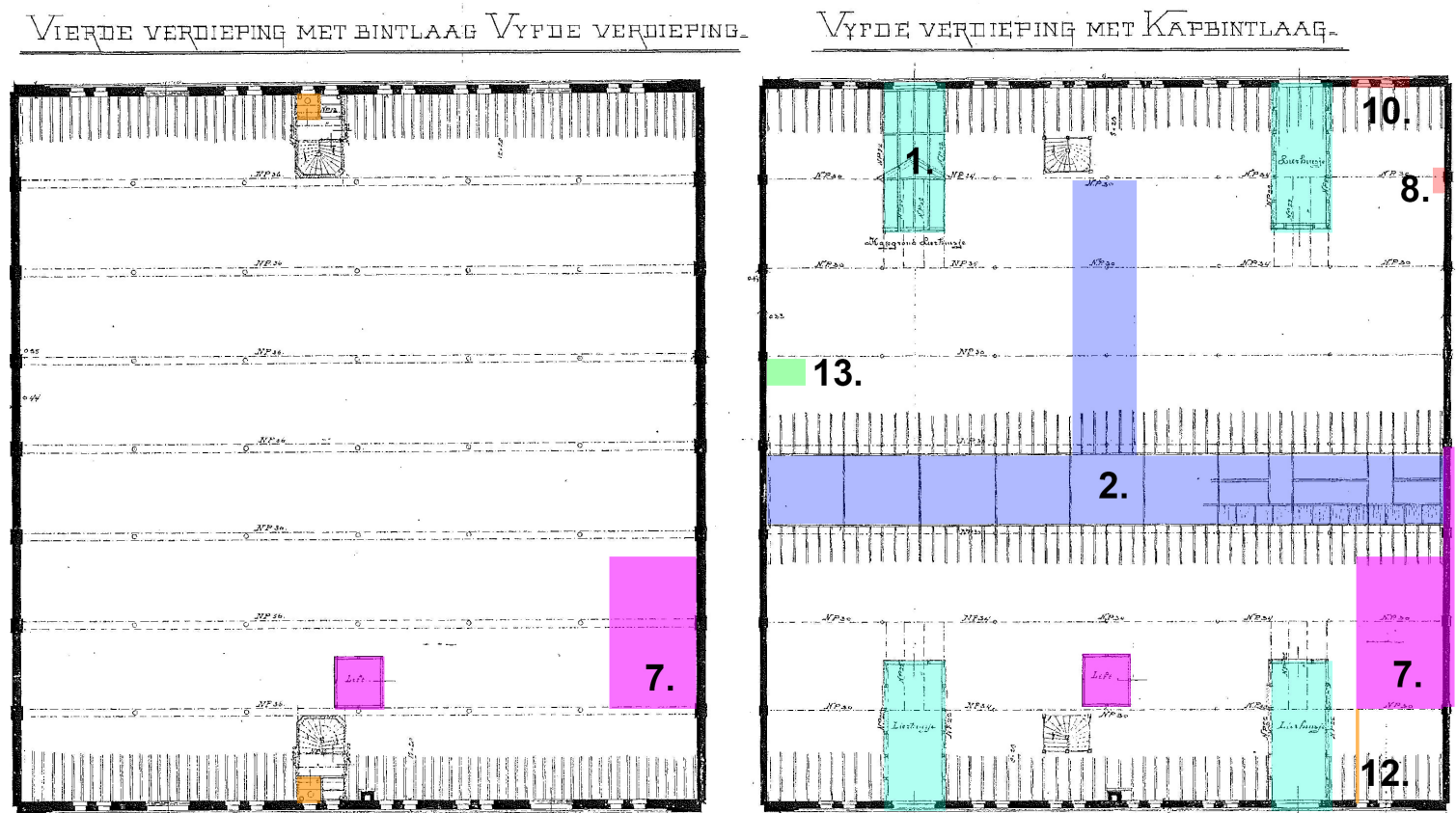
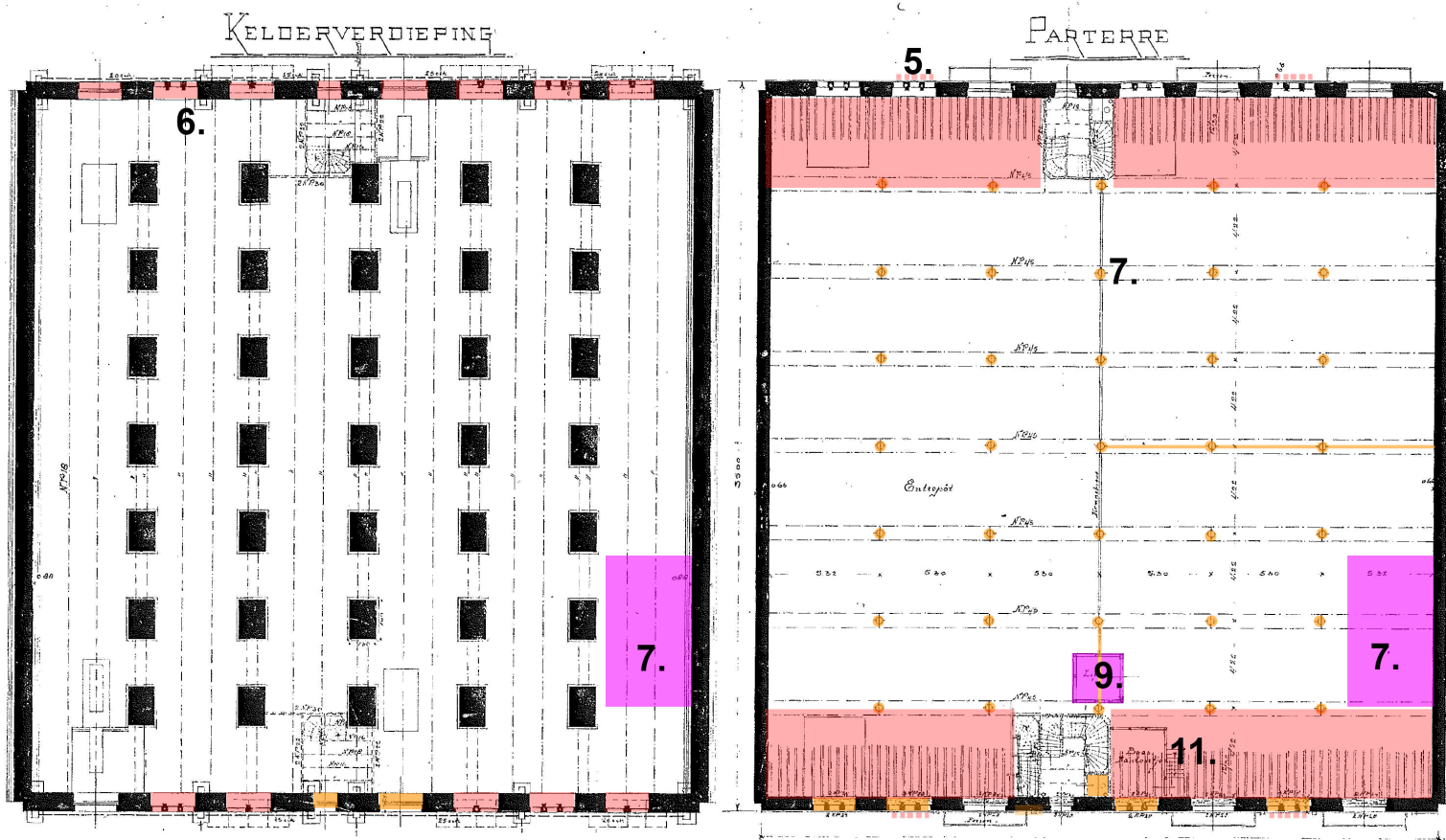
In the period between 1954-1974 the shed-roof had been altered. The extension to cover the ascend of the stairway was removed. The windows of the shed-roof had been boarded shut and covered with a bituminous layer. Probably this was again cheaper then keeping the strip of sky-lights.

Also the addition of a ventilation system demanded a small cut in the fifth floor between 1974-2017 for a ventilation shaft in regards of it's recent showroom function.

Some changes to the building were not able to be dated with the available information . For example the fire-proofing of the columns of the ground and first floor and the renovation of the toilets.

Conclusion

Most parts of the building has remained unchanged through it's life-span. The alterations that has been made were mainly of a functional reason. Secondary to this we also expect some of the parts wich are removed to have a cost saving maintenance reason.



Phase 1	1901-1954	Phase 4	1974
Phase 2	1954	Phase 5	1974-2017
Phase 3	1954-1974	Undetermined	



12. Addition of a brick wall next to the elevator



9. Removal of the old elevator and addition of new yellow brickwork walls

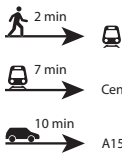
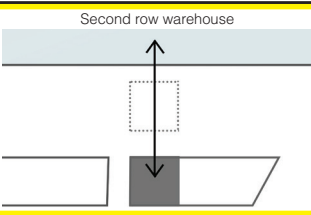
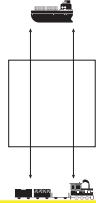
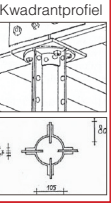
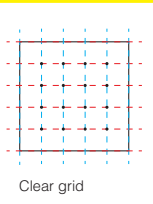
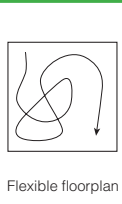
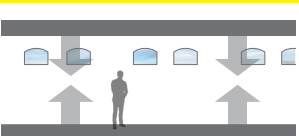
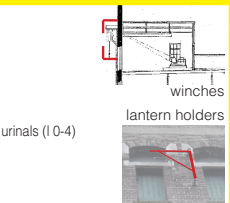
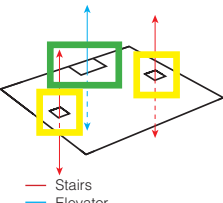
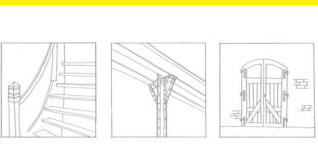
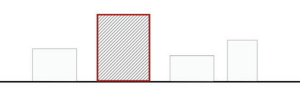


11. Expansion of the concrete floor up to the facade



13. floor and beams cut off for placement of a ventilation shaft

Used sources: van Velzen, H.J., van Winsen M.R. (2011). Bouwhistorische verkenning Pakhuis Santos. Rotterdam: Flexus Architectuur Welstand Cultuurhistorie.

	Age value	Historical value	Intentional commemorative value	Non intentional commemorative value	Use value	Art value	Rarity value  - Only joined venture of Stok & Kanter - A lot of Stok's buildings were destroyed	Spirit of place
Surroundings / setting	 CODRICO	 traintracks jazz club chinese new neighborhood	 'Ketelbinkie'	 Verhalenhuis Belvedere Jazz Club  train tracks south of Santos	 2 min 7 min 10 min Centrum A15/ A16		 Second row warehouse	
Site								 relation to water
Skin	 patina on the facade	 disappeared elements that were once very important for the look of the building.  different bricks - new lift  falling S / santos lettering				 the facade is electric, with different depths (1), repetition of the (slightly different, 4) windows, and richly ornamented (2). most of the doors (3) are still original.		
Structure	 wooden construction  fire resistance around beams	 optimized (economic) structure by setbacks					 -Kwadrantprofiel  - Composed system of materials - Hennibique system	
Spaceplan		 supervisor house			 Clear grid  Flexible floorplan		There are only a couple of warehouses with these dimensions left from the 19th century	 small windows create an introverted feel.
Surfaces (interior)	 damages 					 visible brickwork		
Services		 lift interior hooks  winches lantern holders urinals (10-4)			 Stairs Elevator	 craftmanship		
Spirit of place (the story)							- It was the highest building at the time it was build 	■ high importance ■ medium importance ■ low importance

5.2 MAPPING CULTURAL VALUES: MATTER & MEANING

5.2.1 THE MATRIX

In this explanation, we will look at the red (high monumental value) and orange (positive monumental value) elements only, because the elements that got assigned a green value, are seen as indifferent to the building's monumental value. Red and orange are of much higher importance to this monumental value.

RED, OR HIGH MONUMENTAL VALUE

As one can see in the matrix, there are two main building elements that are assigned a red, or high monumental value. These are all of the elements within the skin and the phoenix system in the structure.

The high monumental value of the skin is solely focused on the eclectic north and south facades. This eclectic-ness shows itself in various ways: the textured facade, the rich ornaments, the different windows, the strong vertical and horizontal lines, and they all contribute to the art value of the skin. This art value of the facade is one of the most important aspects of Santos - it creates a strong image that can be recognized from afar, and plays a large role in the monumentality of the building.

However, the facade also shows the age of the building through its patina. This element is filed underneath age value, again in red. It shows that the building is older than its surroundings, and that it's one of the few harbour buildings still remaining on Katendrecht. What strengthens this feeling is the Santos lettering on the front, with the 'S' falling sideways (which is filed under orange, and will be expanded on later).

Finally, there's the aspect of disappeared elements within the skin, most notably the steel advertisement and the winch houses. These two elements were very important for the noticeability of Santos back in the day (as seen on picture 1), and formed the crown of the building. The winch houses also helped with the strong vertical lines in the building. However, these elements are not present anymore. But since they were once so important for the building, their historical value is high. When transforming the building, these elements should be taken into account. The chapter on dilemma's, opportunities and obligations will further expand on this.

Structurally speaking, there's only one aspect that can be valued highly: the Phoenix column system. This American system is rather uncommon for Dutch buildings, especially when used in the construction (it is being used ornamentally in a couple cases). Because it is so uncommon, it attains a high rarity value. At the same time, it also shows traces of craftsmanship, and is a very prominent feature in the interior of the building.

ORANGE, OR POSITIVE MONUMENTAL VALUE

Elements that were assigned an orange outline can be found all over the matrix. They are important elements that support and complement the building and its context.

If we look at elements with a positive value in the surroundings and the site, than we can see that these mainly reflect the historic harbour function, traces of the past that are still there.. This happens through the train tracks, and the positioning of Santos. The fact that there are only a few of valuable elements in the surroundings and the site, and that they are all assigned the colour orange, shows us that the surroundings are not that influential on the building, and that there's not much of the old harbour spirit left in Katendrecht.

This is also shown in elements filed underneath spirit of place: the historic activity of the harbour. Back in the day, Katendrecht was buzzing with activity. For a lot of people, Katendrecht was their live - it was where they

worked long days, plus their houses were closeby. Currently, not much of this spirit is left.

The other orange, or positive values, focus more on the interior of the building, and perhaps more specifically on the historical function of the building. Inside, Santos has a very strict grid, in order to use the floor's full potential as a storage facility. The thing that goes against this strict grid, is the supervisor house on the ground floor. This exception also shows the function of the building, and the worker - supervisor relationship at the time: the supervisor was standing quite literally above the workers. Apart from this supervisor house telling the function and relations, the floors themselves do this as well. With their low ceilings, and small windows, a certain (introverted) atmosphere is created.

However, even though these interior aspects are important for the building, and help conveying the feeling of the historical activity and workers, they are not as important for the building as for example the facade, and thus fall in the orange category. The reason for this (speculating here) might be that these interior elements are mostly about creating an atmosphere of the past. However, the activity is not there anymore, and while traces from it might still be visible, we also have to accept that time goes on and the building will get a new function.

The same goes for orange elements within services: they are traces of the past, and complement the building, but they are not key elements.

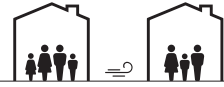
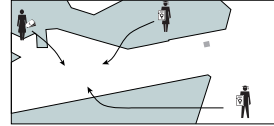
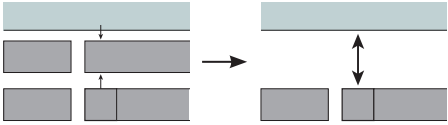
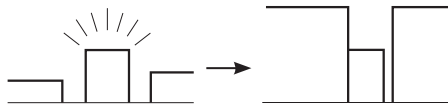
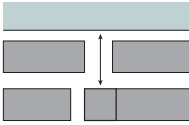
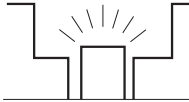
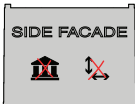
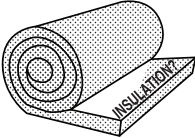
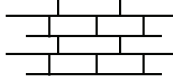
	Dilemma	Opportunity	Obligation
Surroundings / Setting	* Difference in character between Katendrecht as a functioning harbour and his current state; * A lot of new development plans to create a higher density; * The new developments focus mainly on (expansive) dwelling, this might lead to a monotonous function in the area and a decrease of liveliness.	* Because of the different characters in Katendrecht Santos can go in any direction; * The plan for Katendrecht Pols is not yet realized, so these plans can also be shaped to fit Santos in a new masterplan; * Because of the new developments Katendrecht is more attractive.	* Katendrecht Pols is historically divided in four strips, these should be warranted.
Site	* Connection with the water will be less than now because Santos is a second row warehouse; * There will be high new buildings directly around Santos what makes it less visible.	* Make a connection with the water that isn't there right now; * Santos can be an integral part of the new development and still stay visible.	* On the Brede Hilledijk and Rijnhaven side of Santos the buildings form a straight line with each other which has to keep in mind during the design.
Skin	* High valued so there can't be made changes really easy; * Small windows that are part of the facade design but which make it dark inside; * The patina of the facade shows the age of the building but the facade is not design this way; * The winch houses were important for the building but are not there any more; * The steel element on top of Santos was important for the building but is not there any more; * Very strict proportions in the facade that can be followed	* The side facades have almost no value so there can be changed a lot in these facades; * The winch houses are not there anymore, but there is an opportunity to replace it; * The steel element on top of Santos are not there anymore, but there is an opportunity to replace it; * A new intervention can follow or break with the proportions of the existing facade.	* Act carefully with the north and south facade of Santos.
Structure	* The phoenix column system is a special, rare system what makes Santos special, however it is not fire resistant and (sound) insulated; * There is a combination of materials used for the structure this can be enlarged or reduced; * The hennebique system was for Santos its time not that common yet, however it isn't a coherent overall part of the construction.	* The phoenix column system is a special, rare system that can give a special character to Santos; * There are used a lot of different materials for the structure, the new design is free in its use of material; * The hennebique system is not used as a coherent overall part of the construction there can be dealt with it in different ways; * The building was over dimensioned in terms of load bearing structure.	* There have to act carefully with the phoenix column system; * Stability of the building has to be warranted.
Spaceplan	* The supervisor house showed how Santos worked in the past, but it has not so much connection with the rest of its space. And the work hierarchy like it was in the past isn't like that any more; * The introvert feeling shows the character of the warehouse, but can be difficult to use in a new function; * The different floors are not connected at all which make it feel like different worlds but also showed how Santos functioned ; * The repetition of the floors creates order, but also monotonous repetition.	*The supervisor house showed how Santos worked in the past, therefore it can give extra dimension to the building; * The introvert feeling of the space shows the character of warehouse building; * The open floorplan gives a lot of freedom; * The current construction gives opportunity for vertical connections between the floors; * In the past, the north & south facade were always connected (in sight and the way the building functioned), this aspect can be used.	-
Surfaces (interior)	* Around the window there is craftsmanship in visible brickwork. If the building will be insulated on the inside this is probably not visible any more.	* The visible brickwork can be an asset for the interior.	-
Services	* The services are outdated but for that time it was modern and progressive. It also shows the use of the building; * The stairs are handcrafted but are not up to modern standards; * The stairs are the only connection between the different floors for new functions this is maybe not enough. If there will be extra staircases this will give a different experience than in the past; * The doors and shutters are craftsmanship but they block the natural light;	* Because Santos used modern and progressive services for its time, modern techniques can be used for the new use and make it modern and progressive again; * The handcrafted stairs give extra character to Santos; * With extra stairs the different floor will be more connected; * The doors and shutters give extra character to Santos and can be used in a different way so the natural light will not be blocked.	-
Story	* Difference in character between Katendrecht as a functioning harbour and his current state; * Santos was in the time it was build the highest warehouse of Rotterdam and was therefore seen from a wide area, but in the future there will be a lot of higher buildings around Santos that makes Santos less visible.	* Because of the different characters in Katendrecht Santos can go in any direction.	-

5.2.2 THE DILEMMAS, OPPORTUNITIES AND OBLIGATIONS

Santos is designed as a warehouse. Therefore all the choices that were made are connected with its function and thus with its appearance. When a new function will take up residence in this building there are changes needed and with these changes there will be some dilemmas and opportunities. These you can find in the table on the left.

The importance of the dilemmas and opportunities will mostly depend on the value of the different aspects. So for example when you look at the skin, valued as an essential aspect, there will be more dilemmas and these dilemmas will be, most of the time, more important than the dilemmas of for example the interior surface, valued with green. The essential dilemmas are coloured in the table on the left and will be explained a little further. The really important dilemmas are coloured red and the somewhat less important ones are orange. On the following page, there is also a visual version of the same table. The dilemmas and opportunities will be described in more detail after that.

The dilemmas and opportunities described will show that you can find these elements on different levels, from the surrounding untill the brick of Santos. In the beginning, the bigger level dilemmas and opportunities will probably show up more often than the more detailed dilemmas and opportunities. Later on, this will be the opposite. Another aspect to notice is the role of a heritage building. Most of the dilemmas are strongly connected with the fact that Santos is a heritage building. But then it will also be clear that a lot of opportunities come from this fact as well. So when Santos will be used in a rich way, this building can get an interesting place in its new surrounding.

	cultural values Dilemma	Opportunity	Obligation
Surroundings / Setting	  difference in historic & current character in Katendrecht   focus on (expensive) dwelling and by that a decrease of liveliness on the streets	   Santos as middle man between history and new use  Katendrecht is becoming more attractive because of the development	
Site	 changing connection to the water  new developments make Santos less visible  new developments give the opportunity to create a renewed connection with the water  a Santos that stands out between the new		
Skin	 monumentality / value of facades  patina  removed crown  strict proportions	 side facades  use the idea of a crown  follow proportions or be free	 be very careful with the north & south facades
Structure			
Spaceplan			
Surfaces (interior)	 inside surfaces have value, however they most likely will be covered with insulation.	 visible brickwork can create atmosphere 	
Services			
Story	  difference in historic & current character in Katendrecht	   Santos as middle man between history and new use	

DETAILED DESCRIPTION OF DILEMMAS AND OPPORTUNITIES

One of the dilemmas that are specific for Santos is the connection with the water. It is an aspect that when it is strongly connected can give a high quality to the building. But, because Santos is a second-row warehouse, the distance between Santos and the water is quite a lot so it will be difficult to make a strong relation between the two. From that perspective you can also say that Santos was never directly connected to the water, so maybe it has to stay that way.

Another design decision that has to be made is about the skin. The facade on the Brede Hilledijk and Rijnhaven side is high valued and therefore changes have to be made carefully but are probably necessary. For example, the existing windows are small and therefore give not so much light inside. Another thing to weight is the two elements that are disappeared but that were important for the appearance of Santos. These elements are the winch houses and the steel frame on top of Santos. Will you as a designer bring these elements back like they were, make a reference to it or don't do anything with it. Because of their existence, it gives opportunities to use them and give Santos its original appearance back. When thought about the existing appearance there is also another aspect of the facade which gives a dilemma. This is about the patina, over the years the materials of the skin are affected by for example weather and the use of the building. So the patina shows that Santos is an old building, on the other hand, Santos is designed as a building without patina and is probably also meant like that. When the building will be maintenance there can also be a dilemma which cleaning technique will be the best for this facade.

One of the other high valued element in Santos are the Phoenix columns. These columns aren't used that often in the Netherlands and were progressive for their time. Therefore it can give a special character to the building when these elements can stay visible. But the dilemma for the phoenix system is that they are not fire resistant and (sound) insulated. Because of that, it is probably difficult to keep these columns visible.

Another dilemma in the structure is the Hennebique system, consisting of the ground floor and a few walls on the ground and first floor. For the time Santos was built this system wasn't that common yet. But, like described before, the Hennebique system in Santos is not a coherent overall part of the construction. Because of these point of views, there can be a dilemma if the elements can be removed or not. An opportunity in this topic is that there can be dealt with this system in different ways, so there is some freedom if changes are needed.

The next dilemma to describe a little further is the supervisor house. It is located on the

ground floor on the Rijnhaven side of the building. The supervisor house showed how Santos was used and therefore it gives more character to the building. Besides that, it also showed how the hierarchy in that time was. On the other hand, this hierarchy is now not like that anymore, so people will not appreciate it when it will be reused in this way. Moreover, the supervisor house has also not a really strong connection with the rest of its space; the materials that are used are different than its surrounding and almost everything in Santos is mirrored, but this element isn't like that.

Elements that are strongly connected with the building and is in line with the mirrored aspect of Santos are the staircases. The handcrafted stairs are the only connection between the different floor and therefore play an important role in the use of Santos. Another interesting aspect of the staircase is that the toilet and basin are situated in this space. So the other spaces are completely focussing on the warehouse function. For a new function, the number of stairs is possibly not enough. Besides that, the stairs are not up to modern standards.

The above-described dilemmas and opportunities are focussing on tangible elements of Santos, while there are also a few intangible aspects that give value to Santos but on the other hand, can form dilemmas for a new use as well. First of all the difference in the character of the neighbourhood Katendrecht. In the past, this was a place what focused on the harbour activities even the houses that are there were for the people that worked in the harbour and were therefore also connected to this function. The life that the people who worked here had was hard. In Katendrecht there was, because of its function, a lot of liveliness. This is completely changed if you look at the Katendrecht these days. The harbour function is moved to other parts of Rotterdam and dwelling has filled this empty spaces. Thereby the liveliness of the neighbourhood is decreased but the safety is enormously increased and Katendrecht is one of the most favourite neighbourhoods to live. So both time periods got their qualities, for the new design for Santos there will be a dilemma which character will be used.

A second intangible dilemma for Santos will be the introvert feeling experienced from the inside. This feeling, created by the small windows and wide floorplan, are connected to the warehouse function of Santos. Therefore it can give an extra dimension to the new function. However, this atmosphere can also give a dilemma with a new function that needs more light or when this function needs smaller separate rooms instead of one big space. When a function will found that can work well in the introvert spaces of Santos there will be an opportunity in the connection with the existing atmosphere.

SOURCES

Digital

Algemeen Hoogtebestand Nederland (2012). Retrieved from: <http://www.ahn.nl/index.html>.

NOS. (2017, 16 march). Hoe stemde jouw buurt? Bekijk hier de kaart. Retrieved on 03 March, 2017, from <http://nos.nl/artikel/2165775-hoe-stemde-jouw-buurt-bekijk-hier-de-kaart.html>

Gemeente Rotterdam. (n.d.). Wijkprofiel Rotterdam 2016 - Katendrecht. Retrieved on 03 March, 2017, from <http://wijkprofiel.rotterdam.nl/nl/2016/rotterdam/feijenoord/katendrecht/?toon=alles>

Gemeente Rotterdam. (n.d.). Wijkprofiel Rotterdam 2016 - Afrikaanderwijk. Retrieved on 03 March, 2017, from <http://wijkprofiel.rotterdam.nl/nl/2016/rotterdam/feijenoord/afrikaanderwijk/?toon=alles>

Rijksdienst voor Cultureel Erfgoed (2003). Monumentnummer: 513940 Pakhuis Santos Brede Hilledijk 95 3072KD te Rotterdam. Retrieved from: <https://monumentenregister.cultureelerfgoed.nl/monuments/513940?Province=Zuid-Holland&Town=Rotterdam&City=Rotterdam&PostalCode=3072KD&Street=Brede%20Hilledijk&HouseNumber=95>

Museum Rotterdam, Stadsarchief Rotterdam & BOOR. (n.d.). Collectie Rotterdam: Stad in Kaart. Retrieved on March 2017, from: www.rotterdaminkaart.nl

Haarman, G., De Bell, W., Overhaus, W. (n.d.). Mapping History. Retrieved on March 2017, from: www.mappinghistory.nl

Stichting Historisch Katendrecht. (n.d.). Geschiedenis. Retrieved on March 2017, from: <https://historischkatendrecht.wordpress.com/geschiedenis/>

Stichting Rotterdam Woont (n.d.). Rotterdam Woont: Wijkhistorie Katendrecht. Retrieved on March 2017, from: <http://www.rotterdamwoont.nl/neighbourhoods/view/45/Katendrecht>

Bureau Massa. (2014). De Groene Kaap. Retrieved on March 2017, from: http://www.massasite.nl/massasite14/De_Groene_Kaap

Rijksdienst voor Cultureel Erfgoed. (2014). Monumentnummer: 515125. Winkel met Bovenwoning in Leiden, Breestraat 90. Retrieved on March 2017, from: <http://rijksmonumenten.nl/monument/515125/winkel-met-bovenwoning/leiden/>

Rijksdienst voor Cultureel Erfgoed. (2014). Monumentnummer 509841. Mercur Zwolle, Luttekstraat 11. Retrieved on March 2017, from: <http://rijksmonumenten.nl/monument/509841/mercur-de-mercur/zwolle/>

Monumenten.nl. (n.d.). Kleine Berg 33, Eindhoven. Retrieved on March 2017, from: <https://www.monumenten.nl/monument/59254>

De Vree, J. (z.j.). Bouwpix, bouwkundige termen. Retrieved on 03 march, 2017, from <http://www.joostdevree.nl/index.shtml>

Digitale bibliotheek voor de Nederlandse letteren. (z.j.). Fredericus Hendrikus van Leent. Retrieved on 03 march, 2017, from <http://www.free-ed.net/free-ed/Resources/Trades/carpentry/Building01/default.asp?iNum=0704>

Heiserman, D.L. (z.j.). Building Construction & Finishing. Retrieved on 03 march, 2017, Retrieved from http://www.dbnl.org/tekst/leen016toen01_01/leen016toen01_01_0015.php

RET. (z.j.). RET. Retrieved on 03 march, 2017, from <http://www.ret.nl/>

9292. (z.j.) 9292 reist met je mee. Retrieved on 03 march, 2017, from <http://www.9292.nl/>

Books and articles

van der Lugt, R. , Havenarchitectuur: een inventarisatie van industriële gebouwen in het Rotterdamse havengebied, 1982, Rotterdamse Kunststichting Uitgeverij, Rotterdam

Correspondence from the reconstruction-comission of the harbour of Rotterdam, 16/23 May 1946, File 1617_25, Municipal archives of Rotterdam.

Oosterhoff, J., Arends, G.J., Van Eldik, C.H., Nieuwmeijer, G.G. (1988). Bouwtechniek in Nederland: Constructies van IJzer en Beton, Gebouwen 1800-1940 Overzicht en Typologie. Delftse Universitaire Pers, Delft.

van Velzen, H.J., van Winsen M.R. (2011). Bouwhistorische verkenning Pakhuis Santos. Rotterdam: Flexus Architectuur Welstand Cultuurhistorie.

Bergé, W. G. M., Denslagen, W. F., Dröge, J. F., van Drunen, A. H., Laman, M., Meischke, R., . . . Temminck Groll, B. I. (1993). Jaarboek Monumentenzorg 1993. Zwolle: Waanders Uitgevers.

Lecture from the municipality of Rotterdam on Katendrecht pols area urban renewal 16-02-2017. Armentarium Delft.

Janse, J. (1993). Amsterdam gebouwd op palen. Amsterdam: Uitgeverij Ploegsma bv.