KATOENVEEM

MERWE-VIERHAVEN, ROTTERDAM

MSc III Heritage & Architecture
Architectural, Building Technology & Cultural Value Analysis
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INTRODUCTION

This report is part of the MSc Heritage and Architecture graduation studio. The report is about the building Katoenveem, which is located in Rotterdam.

We study the Katoenveem, an old cotton warehouse in the harbour of Rotterdam, because we want to know why Katoenveem was established, how it developed and what its meaning is in order to know the historical and cultural values so that we can make evidence based and well thought out design choices for redevelopment of the Katoenveem, within the existing historical context.

The report will give an overview of findings from our research, presented in the first four chapters of the report. The main research questions are:

- Understanding its establishment: Why was Katoenveem established?
- Exploring the development of the urban context: What is the urban context of Katoenveem?
- Studying the architectural language of the building, what it is and why and how it developed: What is the architecture of Katoenveem?
- Researching the structural elements and services: What is the building technology?

To conduct the research, various methods are used, both quantitative and qualitative: archival research, including historical publications, plans, photographs, literature, drawings and photographs of the current state . Various scale levels and timelayers are explored. The collected data was analyzed and interpreted. Conclusions are presented in both written and drawn form.

The research is fundamental to conduct the value assessment, which is presented in the final chapter of this report. Different elements and time-layers of the Katoenveem are valuated, which is then translated in value maps. Understanding the cultural value of the building enables us to value and position our own design choices for future development of the Katoenveem within the existing context, while keeping in mind the historical context.

In short, this report is the first step in our graduation project, centered around the question:
How can the Katoenveem be adapted to accommodate a new function and at the same time keep its historical and cultural values?

GENERAL

This chapter offers an overview of general information concerning the Katoenveem in Rotterdam. In this chapter we will answer the following research question: *Why was Katoenveem established?* In order to answer this question, we will explore the following aspects: the people responsible for the establishment of Katoenveem, the background of the architect responsible for the design, the timeline of Katoenveem, the typology of the building and a comparison with buildings of the same typology. We will also look into the development of the global trade in cotton. The trade in cotton is inherently connected to the initial function of the building, as the name of the building (literally 'Cotton warehouse') already reveals. The answer to the research question of this chapter will enable us to understand how the context on a larger scale and of the time period have influenced the circumstances of the establishment of Katoenveem.

ESTABLISHMENT OF KATOENVEEM

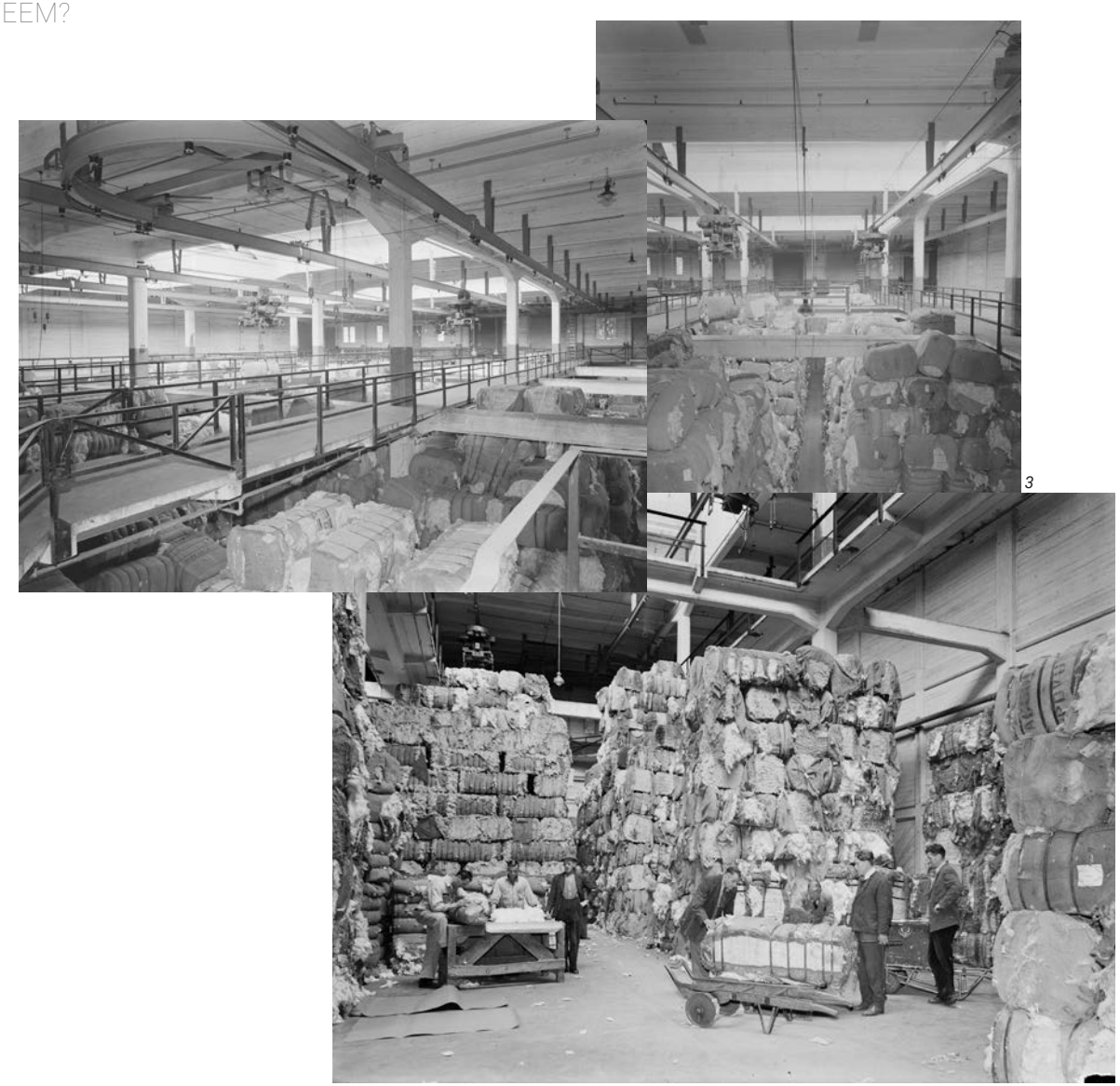
WHO IS RESPONSIBLE FOR THE ESTABLISHMENT OF KATOENVEEM?

In 1915 a few entrepreneurs took the initiative to build a cotton warehouse.[1] On the 20th of November 1915 these entrepreneurs started the Katoenveem Joint Stock Company. They divided the Standard Capital of the new enterprise into 25 shares each with the same value. These 25 shares were divided over 6 different "Veems": [2]

Veem	amount of shares
Blauwhoedenveem	10
Handelsveem	4
Hollandsveem	4
Leydscheveem	1
Het Nederlandsche Veem	2
Pakhuismeesteren	4

Normally Veems would have their own warehouses. But storing cotton together with other merchandise raised objections because of the fear for spontaneous combustion of the cotton. Therefore the Veems were forced to combine and to construct warehouses specially destined for cotton storage.[2] The company needed an architect to design this special warehouse.

The Blaauwhoedenveem owned most shares of the Katoenveem Joint Stock Company.[2] In 1894 J.J. Kanters designed a commercial building annex house for one of the directors of Blaauwhoedenveem. Also in 1901 J.J. Kanters, together with J.P. Stok, designed warehouse Santos for Blaauwhoedenveem. It can be assumed that Blaauwhoedenveem, having most shares and good experience with Kanters, commissioned J.J. Kanters as the architect of the Katoenveem. J.J. Kanters designed the warehouse, it was fully completed in the beginning of 1920.[1]



3

1 Stenvert, R. (2005). Stichting Katoenveem. In Bouwtechnische Verkenning Katoenveem. Utrecht, Nederland: BBA.
2 Van Dam, H.H. (1919). The cotton warehouse of "Katoenveem". In: The Pioneer for the shipping, industry and trade of the Netherlands and her colonies. Nr. 3. Page 65-70. Amsterdam, Netherlands.
3 Dijk van, F.H. (1952). Het interieur van het pakhuis van bedrijf Katoenveem aan de Keilestraat. [Picture]. Via Gemeente Rotterdam (Stadsarchief). Rotterdam, the Netherlands.

THE ARCHITECT

WHO WAS THE ARCHITECT OF KATOENVEEM?

Before J.J. Kanters designed Katoenveem he designed multiple other buildings, of which other warehouses in Rotterdam. Nowadays designs of J.J. Kanters are considered to be of monumental value. Thus Katoenveem is said to be important within the (warehouse) oeuvre of the architect J.J. Kanters. Because of that and the cultural-historical, architectural-historical, typological and building-historical value it is of monumental value and registered as a national monument. [6]


[2]

J.J. Kanters and A.C.M. Peters got their first son called Philip Pierre Kanters. He was born on the 19th of October in 1898.

First son

1898

T.L. Kanters was the first architect of the family. Multiple sons became architects as well. In 1895 T.L. Kanters changes the name of his firm to 'T.L. Kanters en Zonen' (translated: T.L. Kanters and sons).

'T.L. Kanters en Zonen'

1895

T. L. Kanters established a society called 'Bouwkunst en vriendschap' together with other architects.

Society 'Bouwkunst en vriendschap'

1885

T.L. Kanters marries Anna Maria Corsina in 1867. Together they have multiple children.

Marriage

1867

Around 1909 the firm 'T.L. Kanters en Zonen' is continued by T.L. Kanter's fourth son Deodorus Cornelis Kanters (born 21-04-1875, died 27-04-1934)

Overtake of Deodorus

1909

In 1910 J.J. Kanters, the architect of Katoenveem, started his own firm. Apart from the warehouses mentioned in this timeline he also designed other buildings such as houses.

Own firm

1910


[5]

The building Katoenveem was completed in 1920. It is designed by J.J. Kanters. He worked together with contractor 'Van Waning', who was specialized in building with concrete.

Katoenveem

1920

1842

T. L. Kanters

In 1842 Theodorus Lourens Kanters is born. He starts his working life as a carpenter but later becomes an architect.

1869

J.J. Kanters

Jan Jeronimus Kanters is born on the 23th of November in 1869. He is the second son of T.L. Kanters and A.M. Corsina.


[2]

1895

Marriage

J.J. Kanters marries Ambrosina Carolus Maria Peters in 1895. The marriage takes place in Antwerp.

Study, society & work

Jan Jeronimus Kanters probably studied at the 'Academie of Beeldende kunsten & technische wetenschap'. Later on het joined the society 'Bouwkunst & Vriendschap' which was established among others by his father. He probably worked at J.P. Stok his firm for a few years.

1903

Warehouse Santos

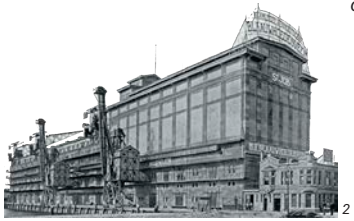
The warehouse Santos is designed by J.P. Stok and J.J. Kanters. It was commissioned by Blauwhoedenveem.


[4]

1914

Jobsveem

The warehouse Jobsveem (Sint Job) is completed. It is designed by J.J. Kanters for 'Handelskantoor Bestevaer'.


[2]

1920

Passing away

J.J. Kanters died quite suddenly at the age of 50 on February 15 in 1920

1923

Overtake of Philip Pierre

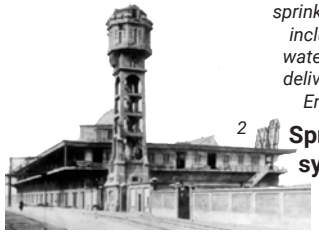
In 1923 J.J. Kanter's eldest son, Philip Pierre Kanters, took over the firm of J.J. Kanter.

Illustration: 'Timeline regarding J.J. Kanters' by E Stoffels (2020), based on:
1 Adema, T., Hoope, J. & Plevier, R. (2009). Katoenveem analysis and values. Delft, Netherlands: Technical University Delft
2 Groenendijk, P., & Citroen, H. (2008). Jobsveem rotterdam : Een gebouw in beweging 1912-2008. Rotterdam, Netherlands: 010 Publishers
3 Rijksmonumenten. (2014). Pakhuis Sint Job in Rotterfdam. Retrieved from: http://rijksmonumenten.nl/monument/524321/pakhuis-sint-job/rotterdam/
4 Van Der Heide, I. (n.d.). Santos. Retrieved from: http://www.irisvanderheide.nl/santos.html
5 Smit, J. (1931). Gezicht op de opslagplaatsen van het Katoenveem aan de Keilestraat. Via Stadsarchief Rotterdam.
6 Rijksdienst voor Cultureel Erfgoed. (2002). Monumentnummer: 524363 Katoenveem, Keilestraat 39 3029 BP te Rotterdam. In Rijksmonumentenregister. Amersfoort, Netherlands.

KATOENVEEM OVER TIME

HOW DID KATOENVEEM DEVELOP OVER TIME?

To understand why the Katoenveem building is in its current state it is necessary to look at developments from the start of the building until today. This timeline shows building developments and destructions, periods of degression and progression and ownership.



2

In 1918 the sprinkler system, including the water tower, is delivered from England [2]

Sprinkler system

1918

On September 5 in 1919 a serious fire took place in section E of the Katoenveem [2]

Fire

1919

5

The company suffered a loss from 1923 to 1926.[2]

Degression

1923

Because of the reorganization of the shares a small profit was made [2]

Profit

1927

4

In 1939 de Second World War started

World War II

1939

1915

Katoenveem Joint Stock Company

On the 20th of November the Katoenveem Joint Stock Company was established[1]

1919

First bales of cotton

The first bales of cotton were stored in May 1919 [2]

1921

Transport device

The transport device was ready at the end of November 1921 [2]

1925

Fire

A fierce fire took place on December 6 in 1925 in section D of the Katoenveem [2]

1926

Reorganisation

Because of the degression a reorganization of the shares was implemented [2]

1928

Degression

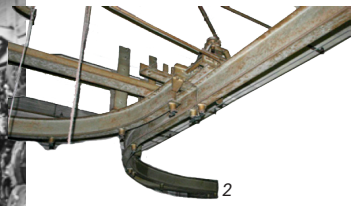
Until just before the Second World War the company suffered small losses every year [2]

<1931

Destruction

Around or before 1931 the New Orleans warehouse and Galveston warehouse were demolished. They were both owned by the Holland Amerika Lijn. Both steel bridges connected to Katoenveem were demolished in the process.[2]

2



2

'Timeline of events regarding Katoenveem' by E. Stoffels (2020), based on:
1 Van Dam, H.H. (1919). The cotton warehouse of "Katoenveem". In: The Pioneer for the shipping, industry and trade of the Netherlands and her colonies. Nr. 3. Page 65-70. Amsterdam, Netherlands.
2 Stenvert, R. (2005). Stichting Katoenveem. In Bouwtechnische Verkenning Katoenveem. Utrecht, Nederland: BBA.
3 Smit, J. (1931). Gezicht op de opslagplaatsen van het Katoenveem aan de Keilestraat. Via Stadsarchief Rotterdam.
4 Unkown. (1940). Bombardement op Rotterdam. [Picture] Retrieved from: https://www.nationaalarchief.nl/beleven/onderwijs/bronnenbox/bombardement-op-rotterdam-1940#collapse-4711
5 Pothoven, B. (2016). 400 Jaar opgeslagen: 1916-2016. Onderzoeksbureau Stad en Bedrijf. Breda, Netherlands: NPN Drukkers.

KATOENVEEM OVER TIME

HOW DID KATOENVEEM DEVELOP OVER TIME?

11

As a result of the bombing of Rotterdam on May 14 in 1940 many construction drawings were lost, including those of the Katoenveem. [2]

A fire took place in part of the building on August 13 in 1963. The building itself didn't suffer much but the installations did.[10]

The post-war catch-up demand declined and at the same time there was a rise of synthetic fabrics. This led to degression of the textile industry and the closure of the Katoenveem in 1964.The two cranes along Keilehaven are removed. [2]

6

Company A.C. Sterba BV took over Katoenveem somewhere between 1964 and 1995. It is a company for storage, delivery, loading and unloading and other processes that have to do with goods.[4]

A new building shed was constructed in 1990 to add outside storage and extend office space.[12] This was done on the location of the original shed which was removed in 1966.[2]

In 1995 Van Lieshout established Atelier van Lieshout (AVL). Shortly after the establishment AVL needed more space so they rented Katoenveem from A.C. Sterba BV. Whether A.C. Sterba BV also occupied part of Katonveem is unclear.[4]

6

9

Bombing

1940

Fire

1963

End of Katoenveem

1964

A.C. Sterba BV

unknown

Construction

1990

Atelier Van Lieshout

>1995

1945

Profit

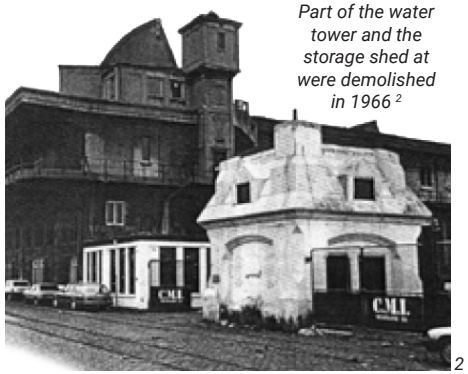
After the war a period of reconstruction followed. The Katoenveem made a profit again[2]

2

1966

Destruction

Part of the water tower and the storage shed at were demolished in 1966 [2]

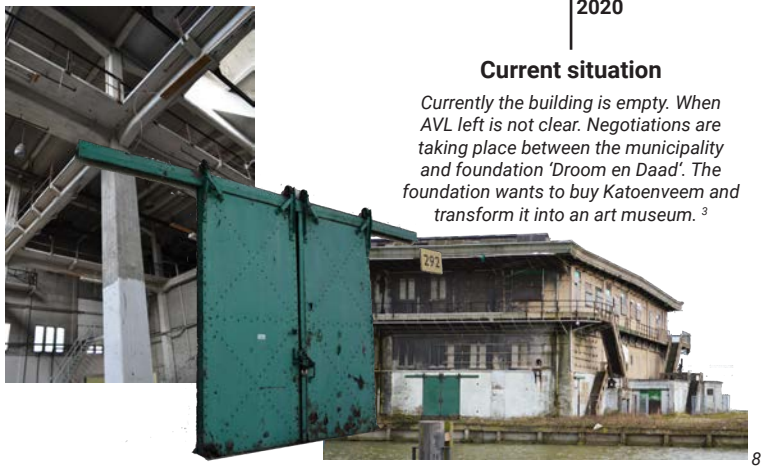


2

1988

Destruction

The water tower, concrete wall and director's office are now completely demolished.[7]



8

2020

Current situation

Currently the building is empty. When AVL left is not clear. Negotiations are taking place between the municipality and foundation 'Droom en Daad'. The foundation wants to buy Katoenveem and transform it into an art museum. [3]

'Timeline of events regarding Katoenveem' by E. Stoffels (2020), based on:
2 Stenvert, R. (2005). Stichting Katoenveem. In Bouwtechnische Verkenning Katoenveem. Utrecht, Nederland: BBA
3 Berkelder, N. (2019). 'Katoenveem kan grootste kunstruimte van Nederland worden'. In Algemeen Dagblad. Retrieved from: https://www.ad.nl/rotterdam/katoenveem-kan-grootste-kunstruimte-van-nederland-worden~a7d0f95d/
4 Havenbedrijf Rotterdam N.V. (2005). Fruit-port. Rotterdam, Netherlands: Drukkerij Maasstad.6 Allen, J., Betsky, A., Laermans, R. & Vanstiphout, W. (2007) AVL for dummies. Rotterdam, Netherlands: NAi Publishers.
7 Rijksdienst voor Cultureel Erfgoed. (2002). Monumentnummer: 524363 Katoenveem, Keilestraat 39 3029 BP te Rotterdam. In Rijksmonumentenregister. Amersfoort, Netherlands.
8 Stoffels, E. (2020). Katoenveem current situation. [Picture] Rotterdam, Netherlands. 9 De Kok, V. (2011). Picture Atelier Van Lieshout at Katoenveem. 10 NV Katoenveem. (1964). Verslag over het boekjaar 1963. Rotterdam, Netherlands.
11 Hartog, H. (1963). Brand in Katoenveem. [Picture]. Rotterdam, Netherlands.12 Gemeente Rotterdam. (2011). Pandkaart Keilestraat 39. Rotterdam, Netherlands.

WAREHOUSE TYPOLOGY

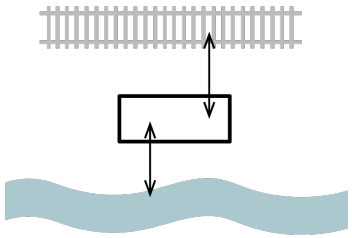
WHAT ARE TYPICAL FEATURES AND DEVELOPMENTS OF WAREHOUSES ?

This chapter aims to create a better understanding of Katoenveem within the warehouse typology. Therefore it is necessary to look at the typical features and development of warehouses.

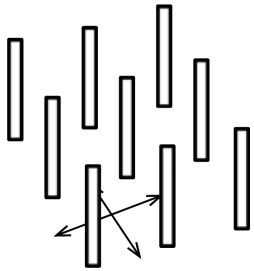
By researching warehouses around the world typical features can be determined. The typical features of warehouses are based on shape, location, structure and innovation.[1] These four features have in common that they are all based on functionality.

For the development of warehouses the research was focused on warehouses located in Rotterdam, specifically those designed by J.J. Kanters. This scale is used because these developments and warehouses had the biggest impact on the design of Katoenveem. The first warehouse in the harbour of Rotterdam was built in 1855. Back then the harbours still had strong connections with the urban environment. Therefore the warehouse had to meet certain conditions for height and style. The warehouses had to have ornaments to fit into the urban environment. Later on the harbour and its warehouses moved further away from the urban areas, as explained in the chapter 'Development of the port', and thus less restrictions applied.[2] These warehouses designed by Kanters show developments in construction techniques and reduction of ornaments over time. However it also shows similarities such as small windows, decorated lintels, large mostly sliding doors and repetition or functionality. Furthermore all three of them meet the previously mentioned typical features of a warehouse.

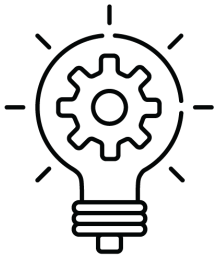
SHAPE
A rectangular shape for functionality



LOCATION
Along a river or near railways to receive the goods



STRUCTURE
Repetition of the structure and a free design of the groundplan for functionality



INNOVATIVE
Innovative constructions and technical services 1

3

SANTOS

Architect(s):	J.P. Stok & J.J. Kanters
Location:	Brede Hilledijk 95, Rotterdam
Completed in:	1903
LxWxH:	34.5x32.4x24.5
Original function:	Warehouse for coffee
Architectural style:	Pure eclecticism
Construction:	Brick, steel and wooden floors

4

JOBSVEEM

Architect(s):	J.J. Kanters & Fr. Eriksson
Location:	Lloydstraat 22, Rotterdam
Completed in:	1914
LxWxH:	130x25x24.6
Original function:	Warehouse for goods
Architectural style:	Influenced by rationalism
Construction:	Cast iron, reinforced concrete, brickwork and wooden floors

5

KATOENVEEM

Architect(s):	J.J. Kanters
Location:	Keilestraat 39, Rotterdam
Completed in:	1920
LxWxH:	138x43x12
Original function:	Warehouse for cotton
Architectural style:	Influenced byfuncitonalism
Construction:	Concrete (hennebique)

Illustration: 'Four typical features of a warehouse' by E Stoffels (2020), based on: 1 Gretti, G. (2014). The Warehouse Typology. Retrieved from: https://archiscapes.wordpress.com/2014/11/23/warehouse-illustrated-history-archetype/
2 de Winter, P. (1982) Havenarchitectuur, een inventarisatie van industriele gebouwen in het Rotterdamse havengebied. Rotterdam: Rotterdamse Kunststichting Uitgeverij
3 Rijksmonumenten. (2014). Pakhuis Santos in Rotterdam. Retrieved from: http://rijksmonumenten.nl/monument/513940/pakhuis-santos/rotterdam/
4 Rijksmonumenten. (2014). Pakhuis Sint Job in Rotterdam. Retrieved from: http://rijksmonumenten.nl/monument/524321/pakhuis-sint-job/rotterdam/
5 Rijksmonumenten. (2014). Katoenveem: Pakhuis. Retrieved from: http://rijksmonumenten.nl/monument/524363/katoenveem:-pakhuis-tegenwoordig-bevindt-zich-hier-atelier-van-lieshout/rotterdam/

TYPOLOGY

ARE THERE ANY REFERENCE PROJECTS SIMILAR TO KATOENVEEM?

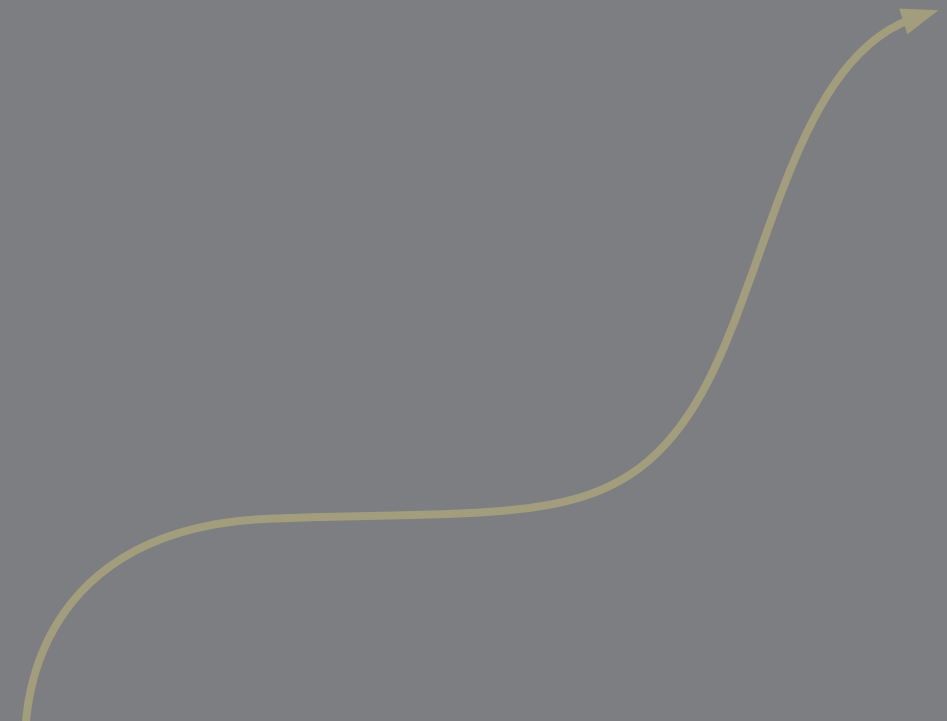
1 The Magazzini del Cotone, Genoa, Italy

2 Katoenveem as seen from the entrance to Keilehaven, Rotterdam, Netherlands

There are not many reference projects similar to the Katoenveem in Rotterdam, as it is the only existing example from its time period.
A building that is similar due to its former function and electrical system is the Maggazini del Cottone in Genua, Italy. This building, built at the end of the 19th century, used an electrical system to transport goods from ships and indoors, with 7 electric wall cranes, 12 raised cranes positioned on rails and 7 freight elevators[3]. There is no information about any electrical system inside the building, which means that workers had to carry loads inside the building themselves. Later on, in 1926, an additional building was constructed next to Magazzini del Cottone specifically for the storage of cotton. The building was also connected to a railway system. After WWII the two buildings were used only for the storage of cotton, and connected by metal bridges. The building was renovated from 1992 on and is used for various cultural and recreational activities.
Compared to the Magazzini del Cottone, the electrical system worked differently and was more advanced. Katoenveem had 2 electric wall cranes, but worked with hoists on rails, that carried the load all the way inside the building to a desired location. This means that workers did not have to carry any goods themselves, but only had to guide them. Another difference between the two buildings are the overhangs or balconies present at Katoenveem, which were part of this electrical transportation system that had to be hung from the ceiling. The balconies were also used by the workers to guide the cotton bales between inside and outside. Magazzini del Cottone has smaller balconies or openings in the wall to bring in the goods from outside. Also, construction method for the buildings is different, as the Magazzini del Cottone has a cast iron construction, while Katoenveem uses reinforced concrete (see chapter structure).
Katoenveem was built 20 years later than Magazzini del Cottone, and thus more advanced technologies could be used for constructing the building, but also newer systems could be integrated inside the building.

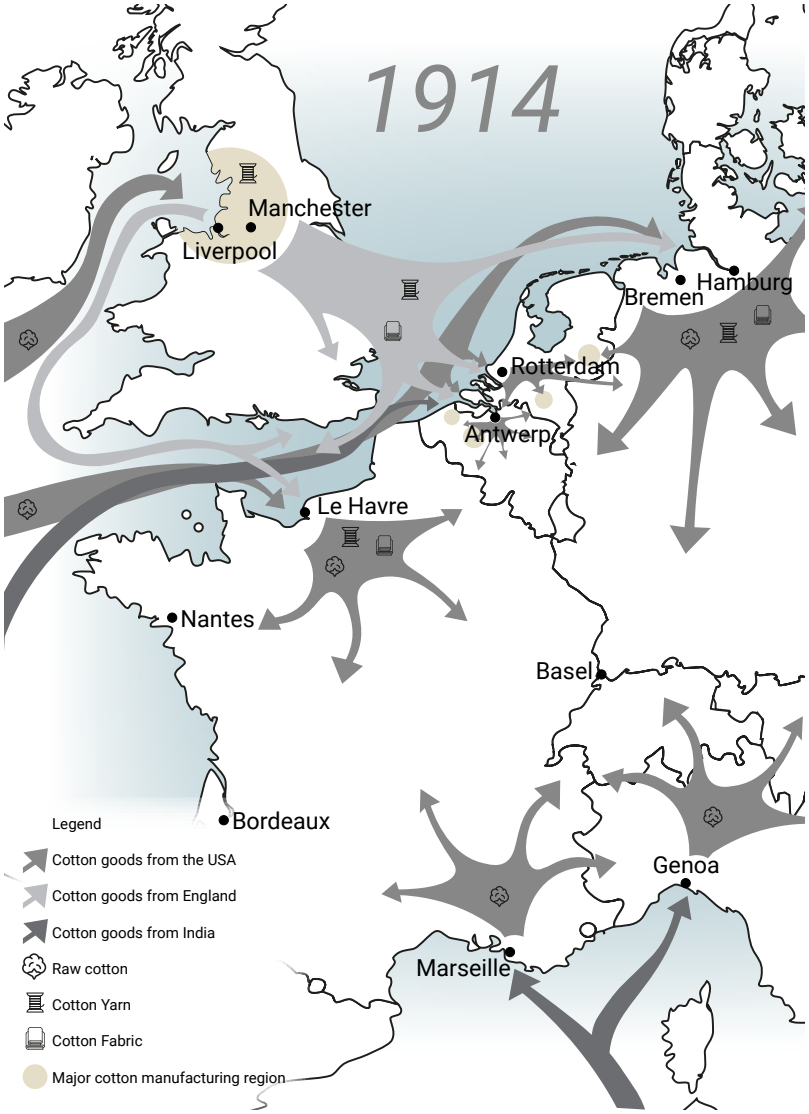
1 The Magazzini del Cotone, Genoa, Italy; source: Goloso, M. (2020, 23 January). Magazzini del Cotone, Genova [Photograph]. Retrieved on March 14, 2020, from https://www.genovagolosa.it/magazzinidelcotone/
2 Fototechnische Dienst Rotterdam. (1923). Keilehaven met het Katoenveem aan de Keilestraat [Photograph]. Municipal Archive Rotterdam, invenory number XIV-325, Rotterdam, The Netherlands
3. Contributori di Wikipedia. (2020, 16 February). Magazzini del Cotone. Retrieved on March 14 2020, from https://it.wikipedia.org/wiki/Magazzini_del_Cotone

GLOBAL CONTEXT

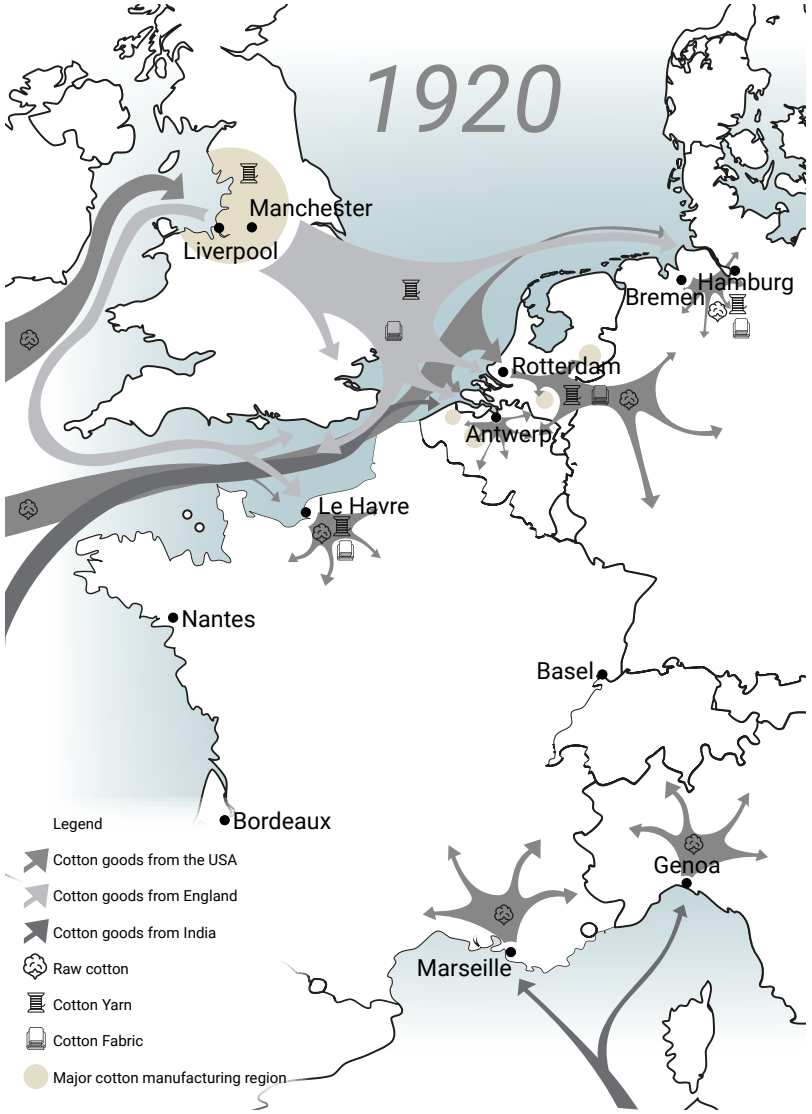


GLOBAL CONTEXT

WHAT WAS THE COTTON TRADE LIKE IN THE NETHERLANDS AND NEIGHBOURING COUNTRIES AROUND 1914 - 1920?



1



2

WWI (1914-1918): The production of cotton goods in countries like Germany plummets because of a UK naval blockade. This is a huge blow for Germany, as their economy is heavily dependent on cotton manufacturing. Furthermore, in an Anglo-Dutch agreement from 1916[3] the Dutch agreed reduce their deliveries to Germany by 50% of their import. This followed the skyrocketing imports to the Netherlands at the beginning of the war, which in 1915 is about 15 times the amount of 1914. The Netherlands continue to import larger amounts of cotton than before, in 1920 it's about 6x more than in 1914. This does not mean that the Dutch economy remained unaffected by the war: especially towards the end of WWI, the Dutch economy had a difficult time due to many trade-restricting measurements between mainly England and Germany[4]. At the same time, many European countries with a small market in cotton seize their chance and significantly increase their trade in this commodity. The Indian market starts to shift towards Asia; Marseille, Genoa and Antwerp do not receive as much Indian cotton as before. By 1920, countries like Germany are ravaged. France also does not receive its previous amount of goods. It is clear why the Veems in Rotterdam saw the opportunities of this situation. This is most probably why Katoenveem was established. (see Annex 1)

1 'Cotton trade in Europe in 1914' by I.Louer, based on: Wikimedia Commons. (2008, 16 June). *File:Blank map of Europe in 1920.svg* [Illustration]. Retrieved on March 31, 2020, from: https://commons.wikimedia.org/wiki/File:Blank_map_of_Europe_in_1920.svg
2 'Cotton trade in Europe in 1920' by I.Louer, based on: Wikimedia Commons. (2008, 16 June). *File:B*lank map of Europe in 1920.svg [Illustration]. Retrieved on March 31, 2020, from: https://commons.wikimedia.org/wiki/File:Blank_map_of_Europe_in_1920.svg
3 Phillips, C. (2018, 23 November). Organization of War Economies (Great Britain and Ireland) | International Encyclopedia of the First World War (WW1). Retrieved on March 31, 2020, from: https://encyclopedia.1914-1918-online.net/article/organization_of_war_economies_great_britain_and_ireland
4 CBS. (2018). Honderd jaar goederenhandel in beeld. Retrieved April 7, 2020, from https://longreads.cbs.nl/im2018-1/honderd-jaar-goederenhandel-in-beeld/

GLOBAL CONTEXT

WHAT WAS THE HINTERLAND OF ROTTERDAM'S COTTON TRADE IN 1920?

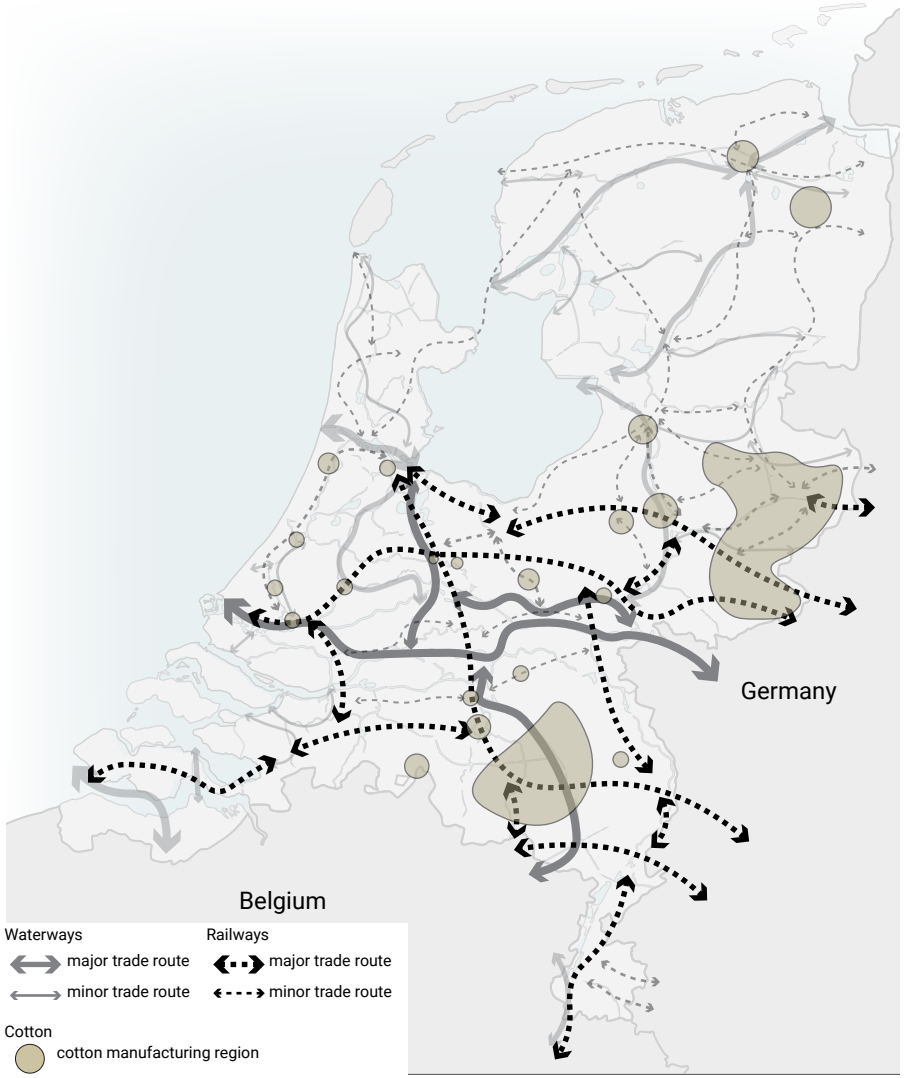
The industrial revolution, new technological developments and globalizing trade instigated a rapid development of infrastructure. Especially new railways and canals were swiftly built, as connectivity was crucial for economic success.
In the Netherlands, especially the railroad network extended rapidly. Specifically for the cotton trade new connections were made towards and within the Twente region, to deliver cotton for manufacturing in that area.

For Rotterdam, however, the railway connection towards Germany was most important and therefore extensively used for both import and export. For trade with Belgium, mostly the waterways were used. Germany and Belgium have always been the major trading partners for the Netherlands.

Along the routes towards Germany and Belgium, the two biggest cotton manufacturing regions of the Netherlands are located: Twente and the area around Eindhoven. Most of the other 'cotton cities' are located on strategic intersections of the infrastructural networks as well.

Around 1920, when cotton trade became more and more important for Rotterdam and Katoenveem was established, the city actively competed with some other European cities that had traded in cotton for a much longer time and on a much bigger scale (see annex 1). Cities like Bremen and Hamburg also counted Twente a part of their hinterland, while Eindhoven can be easily reached from Belgium. This highlights the importance of the presence of a good railway system in Rotterdam, especially around Katoenveem (see chapter movement). An optimal connection with the hinterland is the key to success.

(see annex 1 for more information)



1

1 'The hinterland of the Rotterdam cotton trade', image by I.Louer (2020)

CONCLUSION

GENERAL

ANSWER RQ

Why was Katoenveem established?
As a consequence of outbreak of the First World War, the cotton markets in Europe shifted. During the war the Netherlands, as a neutral country, was able to continue their trade while other countries experienced big economic setbacks. Germany's main cotton ports, Bremen and Hamburg, are impaired due to a UK naval blockade. Likewise, the position of Antwerp's port has weakened. With those two main rival ports weakened, the position of the port of Rotterdam improved.

In order to conquer a part of the cotton market an attempt was made in Rotterdam to have cotton transports conducted via Rotterdam. A well-equipped cotton warehouse was a prerequisite for this. Because of the fear for spontaneous combustion of the cotton the building had to be specifically designed and involved high costs. To divide the costs several Veems worked together to establish a cotton warehouse meeting high safety standards. Architect J.J. Kanters, who designed warehouses before, was commissioned to design the building. In conclusion the establishment of Katoenveem is a result of the improved position of the Netherlands in the global cotton trade around 1920 and the initiative and teamwork of entrepreneurs from several otherwise competitive Veems.

URBAN CONTEXT

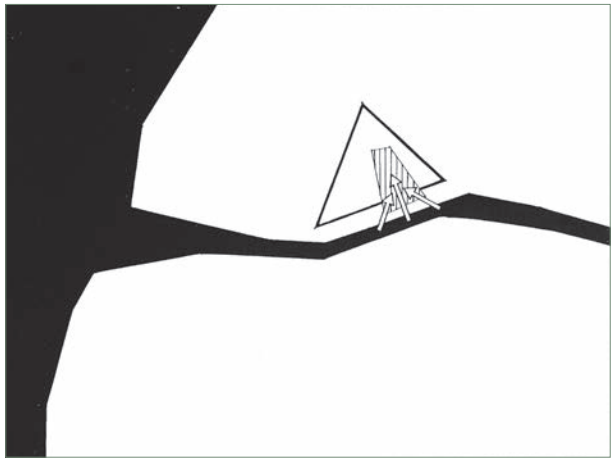
In this chapter we study the urban context in which the Katoenveem is situated. We study this in order to discover what the boundary conditions and opportunities are that could influence possible design strategies for the adaptive reuse of the Katoenveem building. Therefore we aim to answer the following research question: *what is the urban context of Katoenveem?* The urban context is subject to change over time, being influenced by for example political, technological, social or economic developments. In order to understand how certain developments have affected the Katoenveem and its position in the city of Rotterdam we will not only analyse the current and future situation but also the developments through time. This analysis will take place on different scale levels. Thus in this chapter the historical, current and future urban context is analyzed.

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

< 1850

1



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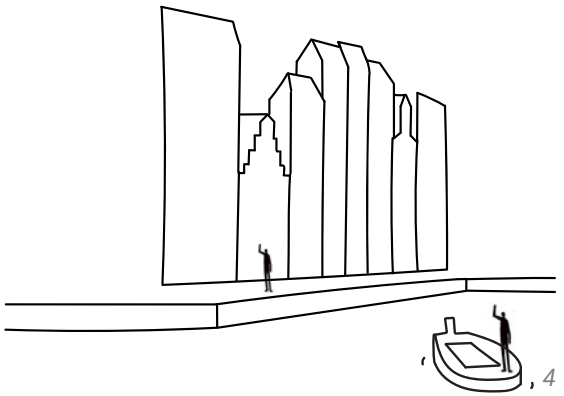
Early developments of the Rotterdam Harbour were due to several reasons. First of all: the geography, Rotterdam was located on the banks of the Maas. The depth of the Maas offered the possibility for larger ships to dock. This was something which was not possible in Amsterdam. Furthermore, Rotterdam was a stopover on the Amsterdam – Antwerp route. And later, the harbour got an enormous boost when the United Provinces fought the Spanish throne for independence. Since Amsterdam had an allegiance to the Spanish King, the Provinces were in need of a reliable Port. During the 19th century the harbour again got an boost from the industrialization, Rotterdam appeared to be ideally located for transhipment activities.[5]

Around 1850 Rotterdam was an entrepot port.[5] The port was enclosed in the city. The goods were stored and traded within the city. The relation between the port and the people of Rotterdam was very strong, only a gangway separated them. The quay was, therefore, an important element of the public space in the middle of the nineteenth century.



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1Ter Horst, J. (1999). Rotterdam 1850.[Illustration]. Retrieved from: Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books
2 Misch, A. (1999). Structure of the port city: Entrepôt port. [Illustration]. Retrieved from: Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books
3 Unknown. (ca. 1808 – 1812). Geldersekade, Oudehaven. [Illustration]. Retrieved from: Stadsarchief Rotterdam
4 Kuiper, A. (2020). Quay important element of the public space. [Illustration]
5 Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

1850 - 1900

x 1000 inw.

540
510
480
450
420
390
360
330
300
270
240
210
180
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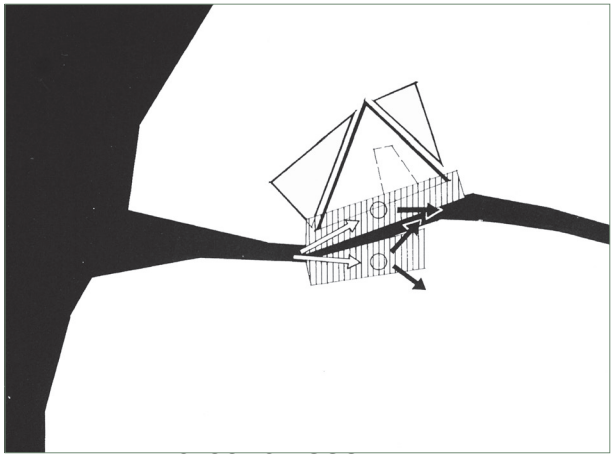

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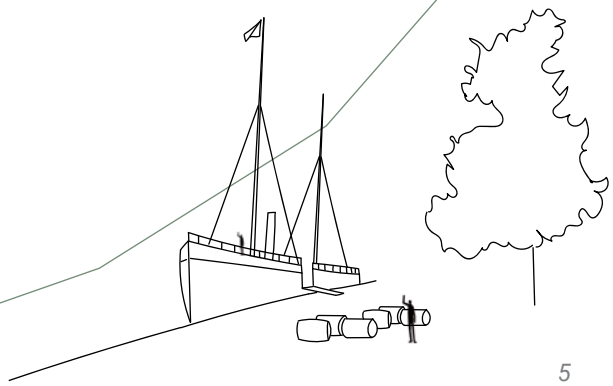
4

The economist Kondratieff's came up with the so-called 'long-wave theory', he divides the nineteenth and twentieth centuries into five phases. In 1846 – 1892 was the infrastructural era; the expanded and developing urban structure is absorbed into an evolving regional and national urban system.[6] During this period, Rotterdam harbour became a transit port.

The port alongside an open city. The flow is of goods passes the city instead of reaching the final destination on its transportation route. The division between the city and port has begun.

Ships are increasing in size and it is becoming more and more difficult to maintain an the city and the port as a whole.

The port was no longer laid out in the city, but next to the city and became a link in a long transportation chain. Between 1880 - 1900 Rotterdam experienced an unprecedented growth of the port, a strong increase in the number of inhabitants and massive housing construction.[4]



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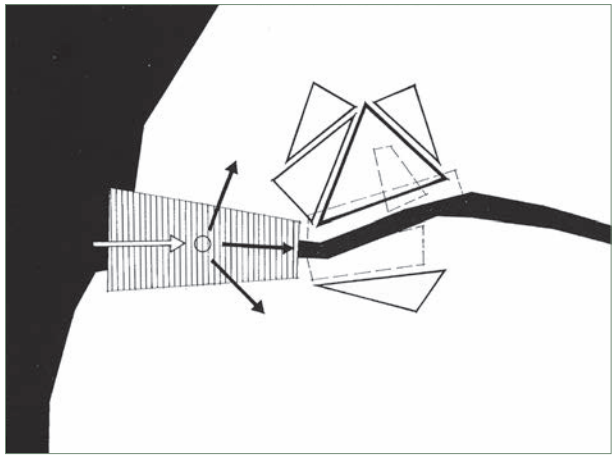
1Ter Horst, J. (1999). Rotterdam 1900.[Illustration]. Retrieved from: Meyer, H. (1999). City and Port. Utrecht, Nederland: International Books
2 Misch, A. (1999). Structure of the port city: Transit port. [Illustration]. Retrieved from: Meyer, H. (1999). City and Port. Utrecht, Nederland: International Books
3 Unknown. (ca. 1880). The Boompjes [Photo]. Retrieved from: Stadsarchief Rotterdam
4 Waardenburg, R. (1968). Rotterdam in de jaren 1880-1900. Rotterdam, Nederland: Brusse
5 Kuiper, A. (2020). Quay important element of the public space. [Illustration]
6 Meyer, H. (1999). City and Port. Utrecht, Nederland: International Books

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

1900 - 1950

1



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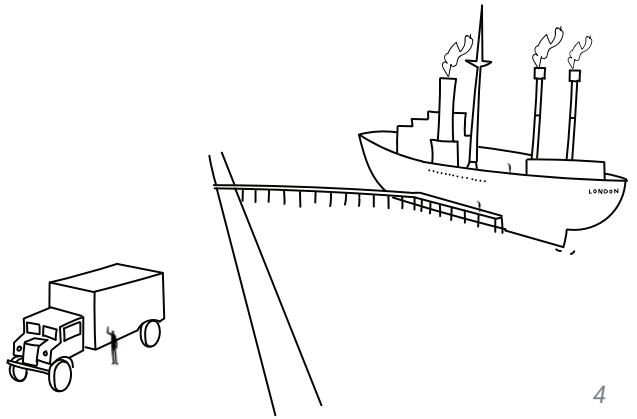
During the period 1893 – 1948 there was an increase in (auto) mobility; along with the reinforcement and concentration of economic activities, which laid the basis for the formation of metropolitan districts.[4] This increase went hand-in-hand with the development of transit ports into industrial complexes.

The disappearance for the port as depot and the dominance of the transit function meant that the port provided the city with little added value. Therefore, there became a change in policy, which reflected in a new approach to the relation between city and port: they should not develop as separate spatial entities.

Although a physical distance between the port and the city was accepted, the policies argued for an urban community which is more involved in the affairs surrounding the port. The petrochemical industry were results of this new way of thinking.[5] The Urban Development decided that the city should be a coherent cityscape of traffic infrastructure, mass-produced housing, and open space.[5] One of the major interventions was an urban route, realized in 1930. On request of several port-related companies the Maas Tunnel was designed.

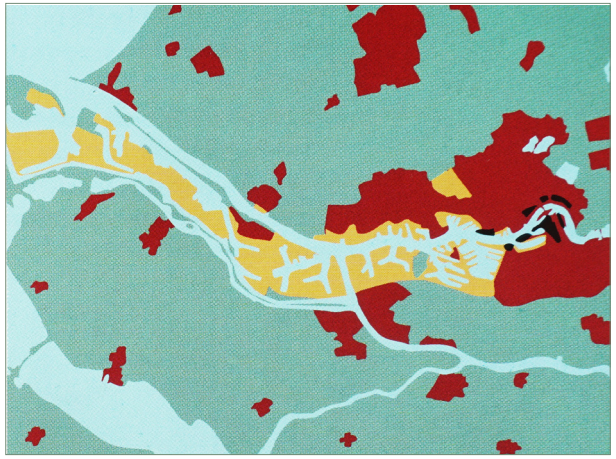


4

1Ter Horst, J. (1999). Rotterdam 1950.[Illustration]. Retrieved from: Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books
2 Misch, A. (1999). Structure of the port city: Industrail port alongside a functional city. [Illustration]. Retrieved from: Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books
3 Van Dijk, F.H.. (1957). Waalhaven [Photo]. Retrieved from: Stadsarchief Rotterdam
4 Kuiper, A. (2020). Quay important element of the public space. [Illustration]
5 Meyer, H. (1999).*City and Port*. Utrecht, Nederland: International Books

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

1950 - 2000



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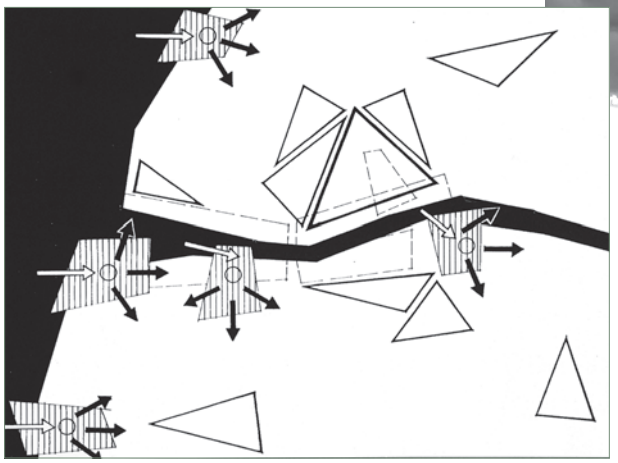

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3

The city and the port were drifting apart. An attempt to reinforce the connection, the Euromast was built at the Floriade event.[5] With the construction of the Europort in 1962, the port became the largest in the world.[5] The downside was many nature reserves, villages and farms had to be demolished in order to make place for the new industries.

There was a growing distrust of the ever growing 'dirty' industry.[5] In 1979 the port came up with an event to bring the port closer to the people, this event is now know as the Wereldhavendagen.
In 1985 the Port Authority presented the idea of Rotterdam port as a mainport. Therefore the city had to adapt as well, Rotterdam began to invest in high-quality housing and space for innovative businesses, culture and education.[5]

With the development of larger ports into 'main ports', the distribution port no longer has the linear character of the transit port, but consists of various specialized distribution hubs, which together form a network.[6] The port was rediscovered by the city as a part of the urban landscape; the city is rediscovered by the port as a potential nerve center for logistic organization and telecommunication.[6] It resulted in places where to port could be felt again in the city.[5]

1Ter Horst, J. (1999). Rotterdam 1990.[Illustration]. Retrieved from: Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books
2 Misch, A. (1999). Structure of the port city: Distribution port and network city. [Illustration]. Retrieved from: Meyer, H. (1999). *City and Port*. Utrecht, Nederland: International Books
3 Van Rijn, H. (2012). First containership that used the ECT in Rotterdam in 1967. [Photo] Retrieved from: www.marinetraffic.com
4 Klein, H. (1966). Euromast. [Photo]. Retrieved from Nederlands Fotomuseum
5 Steenhuis, M., ed. (2016) . *The Port of Rotterdam*. Rotterdam, Nederland: nai010

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

NOW

1

2

3

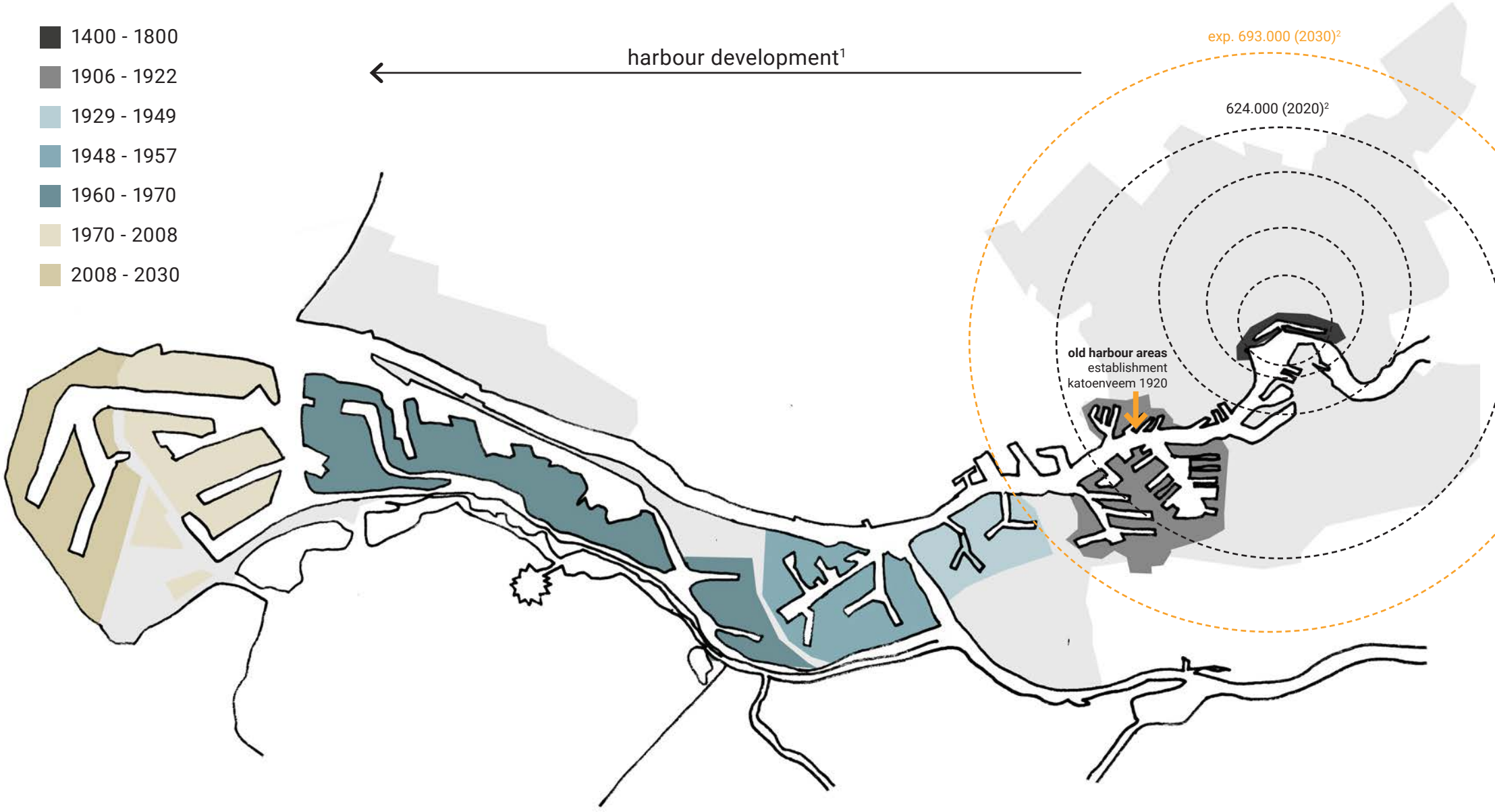
Rotterdam transformed form an enclosed towards an open system. The physical relationship between the city and port had been confronted with an ongoing process of alienation, not to mention an enormous increase in scale.[4] Rapidly growing dimensions of modern steamships, desirable connections to railroad yards, and the altered nature of port activities were new conditions that required a new type of port.

Nowadays the city and port are an increasingly interwoven network. The city has lost its compact shape and its orientation toward the historical city center and the harbour developed more towards the west. Together they form an urban landscape. The old harbour areas pop up as an strategic position as part of the new urban landscape. They form a connection between the residential function and traffic function, between local network and global network.[4]

1 Langer, T. (2015). Harbour scale nowadays. [Photo] Retrieved from: www.portofrotterdam.com
2 Wessels, J. (unknown). Harbour 'visable' in the city. [Photo] Retrieved from : www.portofrotterdam.com
3 ANP. (2018). Rotterdam as a residential city. [Photo]. Retrieved from: www.nu.nl
4 Meyer, H. (1999). City and Port. Utrecht, Nederland: International Books

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

WHAT IS THE RELATION BETWEEN CITY AND PORT OVER TIME?



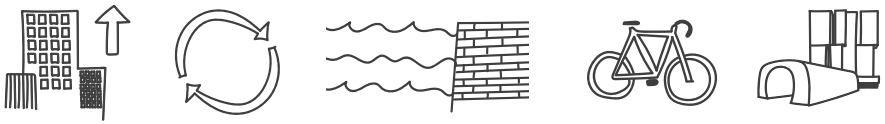
1 Kuiper, A. (2020). Rotterdam's Port development. An overvieuw in history. [Illustration]. Retrieved information from: www.portofrotterdam.com
2 Kuiper, A. Population growth. [Illustration], Retrieved infromation from: https://onderzoek010.nl/

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

PLANS OF THE MUNICIPALITY

As described in the development of the port and city, Rotterdam has undergone significant changes in the past 200 years. Partly due to the increase in scale, the port has moved to the west and disappeared from the city view. The city is changed from a working city into a residential city. As a result, old warehouses and even entire ports no longer serve its original function and have been left behind. The ambition of the municipality is to focus on the development of the knowledge and service economy and on an attractive living environment for highly educated, creative workers and middle and high incomes.[1]

7



these symbols can be found in the map on the next page

2

To meet the demand of the growing number of inhabitants, the municipality wants to densify, not only within the city centre but also in old harbour areas. In the next 20 years, the municipality wants to build about 50,000 homes.[1]

3

Cultural heritage strengthens the image of the city, especially on the old port sites. Areas (along the river) where new and old merge and where the atmosphere still remains of the rich industrial past, attract businesses and residents.[1]

4

Along the rivers, the municipality wants to combine water storage capacity with creating attractive residential environments.[1] This addresses both the new water task and the problem of low-valued residential environments.

5

Improving the inner city network of cycling and walking connections and improving public space must also contribute to making Rotterdam an attractive city to live in.

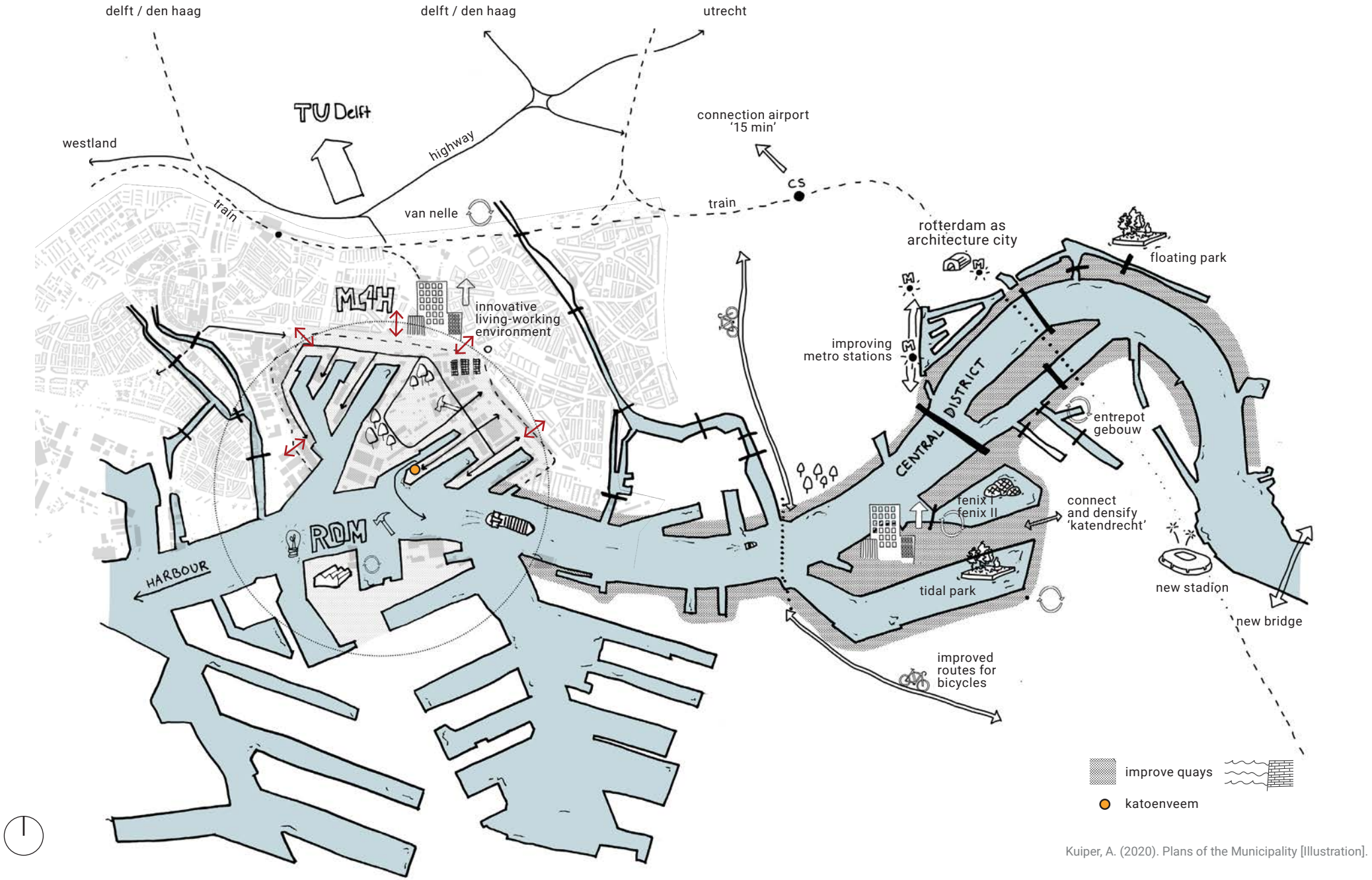
6

In the past years, Rotterdam is become known as a modern architecture city. This led to an increase in the architectural quality of the buildings, to the development of a rich architectural climate and to the establishment of a large number of architectural firms in the city.[1]

1 Gemeente Rotterdam. (2007). *Stadsvisie Rotterdam 2030*. Retrieved from: https://www.rotterdam-centraldistrict.nl/documenten/STADSVISIEROTTERDAM_2030_dec2007.pdf
2 Heijmans. (2019). Het populaire Katendrecht krijgt er met Havenkwartier maar liefst 200 luxe woningen bij. [Illustration]. Retrieved from: www.ad.nl
3 RDM. (unknown). RDM terrein. [Photo]. Retrieved from: https://www.rdmrotterdam.nl/
4 De Urbanistem. (2014). Getijdenpark. [Illustration]. Retrieved from: https://www.rotterdam.nl/wonen-leven/getijdenpark/Getijdenpark.pdf
5 Van den Broek, I. (2018). Witte de Withstraat, Rotterdam. [Photo]. Retrieved from: https://indebuurt.nl/rotterdam
6 Oosterhuis, J. (2014). Rotterdam Centraal. [Photo]. Retrieved from: https://nl.wikipedia.org
7 Kuiper, A. (2020). Strategy symbols. [Illustration].

DEVELOPMENT OF ROTTERDAM AS A PORT CITY

PLANS OF THE MUNICIPALITY

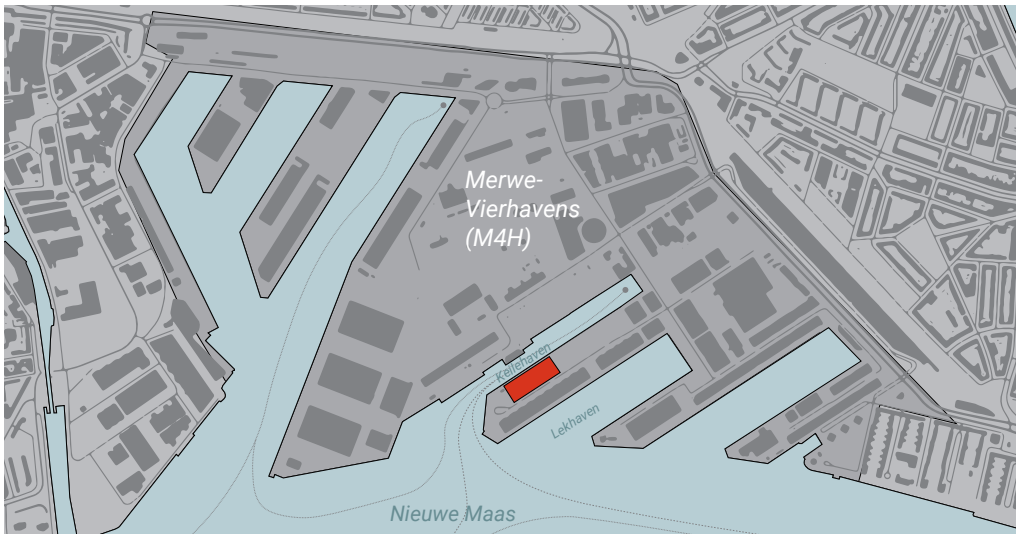


Kuiper, A. (2020). Plans of the Municipality [Illustration].

LOCATION

WHERE IS KATOENVEEM LOCATED AND WHY THERE?

1 Location of Katoenveem within the municipality of Rotterdam

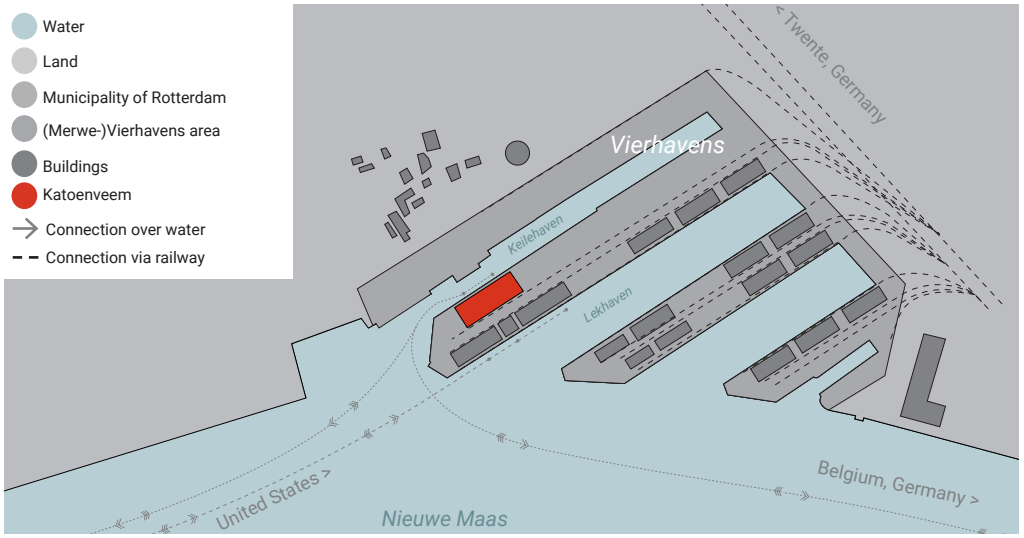


2 Current location of Katoenveem within Merwe-Vierhavens (M4H)

Katoenveem is located in the city of Rotterdam, next to the river Nieuwe Maas. It is part of the area nowadays called 'Merwe-Vierhavens', and is situated between the port of Keilehaven and Lekhaven.

The location in a newly constructed harbour area (see chapter development of the port), next to the water, was very advantageous for the transshipment and storage of cotton. The site could be reached over water from two sides and thus enabled the organization of the arrival and departure of ships and the loading and unloading of the goods in an orderly way (see chapter movement). The benefit of this location was further enhanced by the presence of railways, which connected the site directly to the hinterland (see chapter global context). The location of Katoenveem was therefore strategic from an infrastructural and at the same time economic perspective.

Nowadays, the connectivity of the site has changed, as the railway was removed in 1985. The area is now rather inaccessable (see chapter current situation M4H).



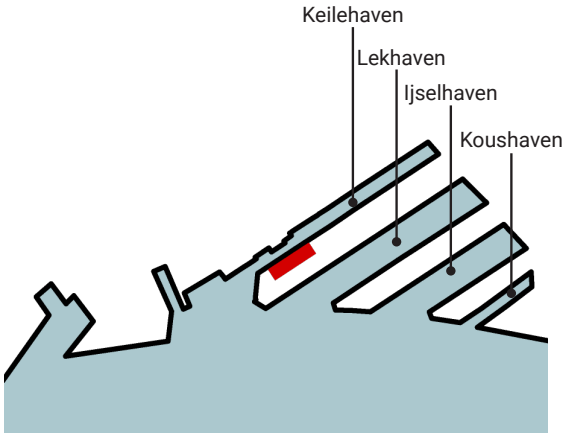
3 Location of Katoenveem in Vierhavens around 1920

Images 1-3 by I.Louer (2020), based on:
1 Google Maps. (n.d.). Untitled. Retrieved April 8, 2020, from https://www.google.com/maps/
2 Vertrekhal Oranjelijn. (n.d.-a). Kaart Vierhavengebied, 1919 [Illustration]. Retrieved April 7, 2020, from http://www.vertrekhaloranjelijn.nl/historie/1993/367#328

DEVELOPMENT OF MERWE-VIERHAVEN

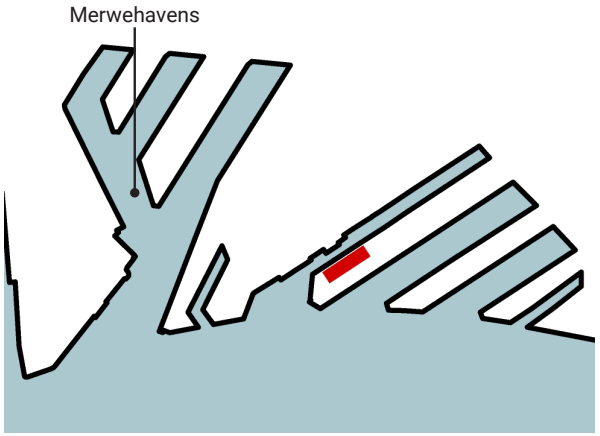
HOW DID THE PORT AREA OF M4H DEVELOP?

Katoenveem is located in an area which nowadays is called ‘Merwevierhavens‘. It was not always like this. The images on this page show the developments of the quays over time.



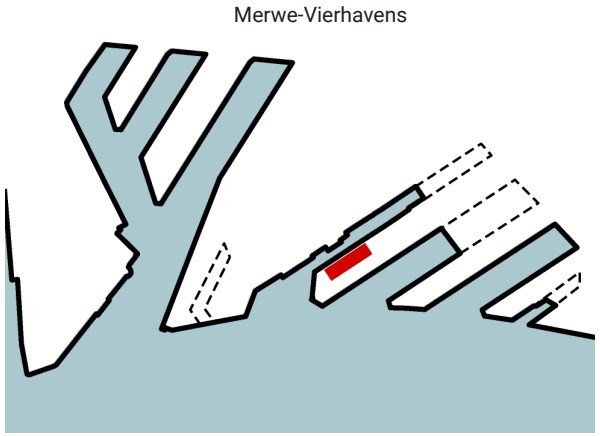
1916-1930

In 1916 a new harbour area called ‘Vierhavens‘ is realised. The area owes its name to the four ports located in this part of Rotterdam. Ijselhaven was built for general cargo, which meant the quantity was not specified by weight or size but per piece. This meant that the loading and unloading process was very labour intensive. Therefore ships were in the port for weeks. Lekhaven was used for general cargo and as a passenger terminal. Keilehaven was for industry while Koushaven was a small retail harbour.



1930-1992

In 1930 the ‘Merwehavens’ were completed on the west side of the Vierhavens. This harbour area was also built for general cargo, mostly fruit was stored and transported.



current situation

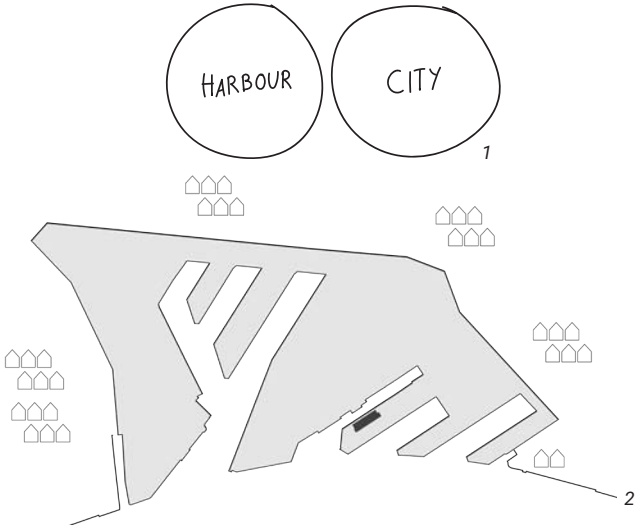
The port activities moved more to the west and thus the harbour activities on this location declined. From 1992 some parts have been muted. This created space for the establishment of new companies in combination with new housing, catering and other urban functions. However currently it is still mostly occupied by industries and companies. Nowadays Merwehaven en Vierhavens are seen as one area and are called Merwe-Vierhavens (M4H).

Illustration: ‘Developmentof the port’ by E Stoffels (2020), based on:
Kadaster. (n.d.). Topotijdreis. Retrieved from: http://topotijdreis.nl/
Vertrekhal Oranjelijn. (2019). Vierhavengebied. Retrieved from: http://www.vertrekhaloranjelijn.nl/historie/voorgeschiedenis/vierhavengebied/

CURRENT SITUATION MERWE-VIERHAVEN

WHAT IS THE CURRENT SITUATION OF M4H?

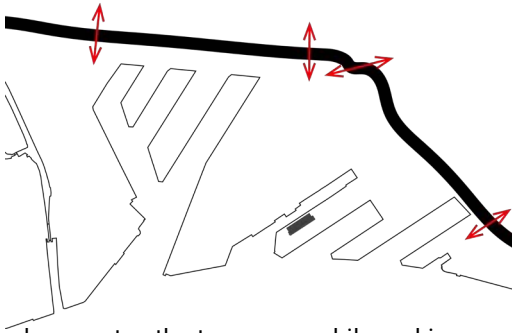
Merwe-Vierhaven is currently an rather inaccessible area. Large enclosed plots do not make the port easy to visit. There are not many access roads and the area is primarily designed for cars and trucks. However, the area has a lot of potential, it is located between the residential areas of Rotterdam and Schiedam and it is located close public transport with good connections. The challenge is to integrate the harbour area with the city.



1

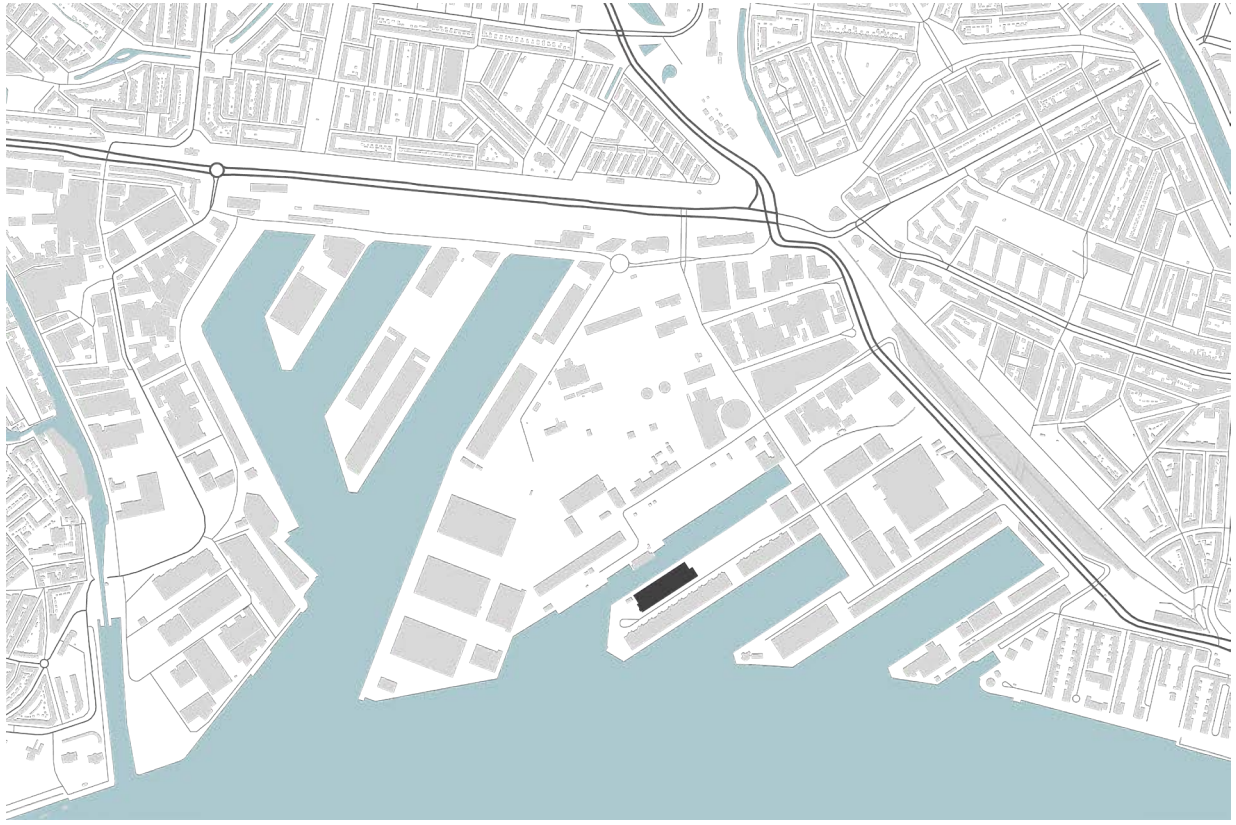
2

Located in an industrial area between residential areas



2

The road seperates the two areas while making access difficult



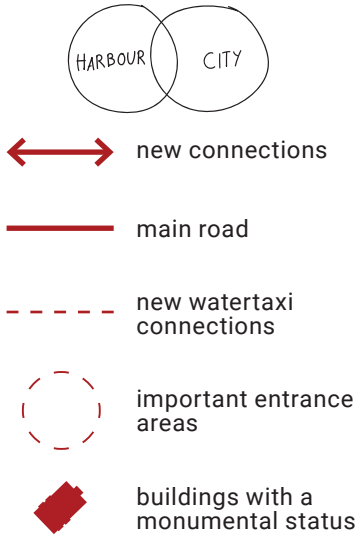
1

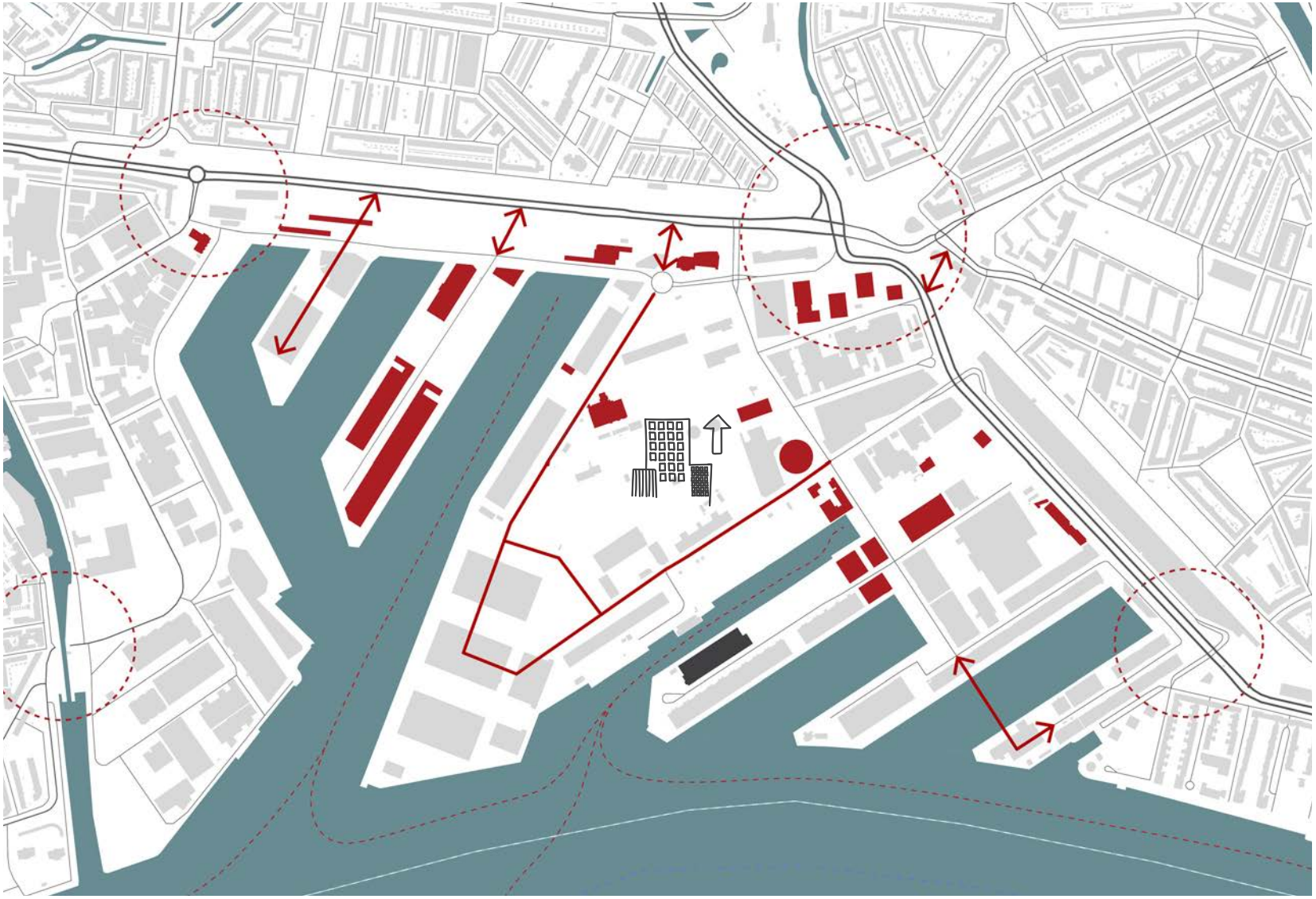
1 Kuiper, A. (2020). Current situation Merwe-Vierhaven. [Drawing]
2 Stoffels, E. (2020). Current situation Merwe-Vierhaven. [Drawing]

FUTURE OF MERWE-VIERHAVEN

WHAT ARE THE PLANS OF THE MUNICIPALITY?

In 2030, Rotterdam wants to be the most important port city in Europe in terms of knowledge and innovation. What is needed for this is expanding the creative sector and investing in education.[1] This is the reason that the RDM site and the Merwe-Vierhaven (M4H) are being transformed into the Makers District. The municipality and the Port Authority have proposed a strategy to transform the old port area with a rich maritime and industrial history into a new part of Rotterdam to live and work.[1] To integrate the harbour area with the city several infrastructural interventions will be made.





2

1:10.000

1 Gemeente Rotterdam. (2007). *Stadsvisie Rotterdam 2030*. Retrieved from: https://www.rotterdam-centraldistrict.nl/documenten/STADSVISIEROTTERDAM_2030_dec2007.pdf
2 Kuiper, A. (2020). Vision Municipality Rotterdam Merwe-Vierhavens. [Illustration]

CURRENT SITUATION MERWE-VIERHAVEN

WHAT ARE THE CURRENT GREEN STRUCTURES?

Greenery is part of the urban context. Some of the nearby greenery has a relation to the history of Katoenveem. The analysis of green structures helps with understanding the relation between Katoenveem's history and current context.

One of the largest nearby green structures is 'Dakpark'. Dakpark has a connection to the harbour history because it is built on the location of the formerly existing train marshalling yard. This train marshalling yard has been removed. Nowadays there are shops on the ground floor with a park on the roof.

Another nearby green structure is the 'Voedseltuin'. As of 1 September 2011 the first Food Garden has been realised on a vacant lot. This lot is located on the muted part of Keilehaven. The intention is to expand the project and realise more food gardens.[4] This is part of 'de groene connectie' (the green connection), a plan for a green loop in the area.[5]


1


2


1


3

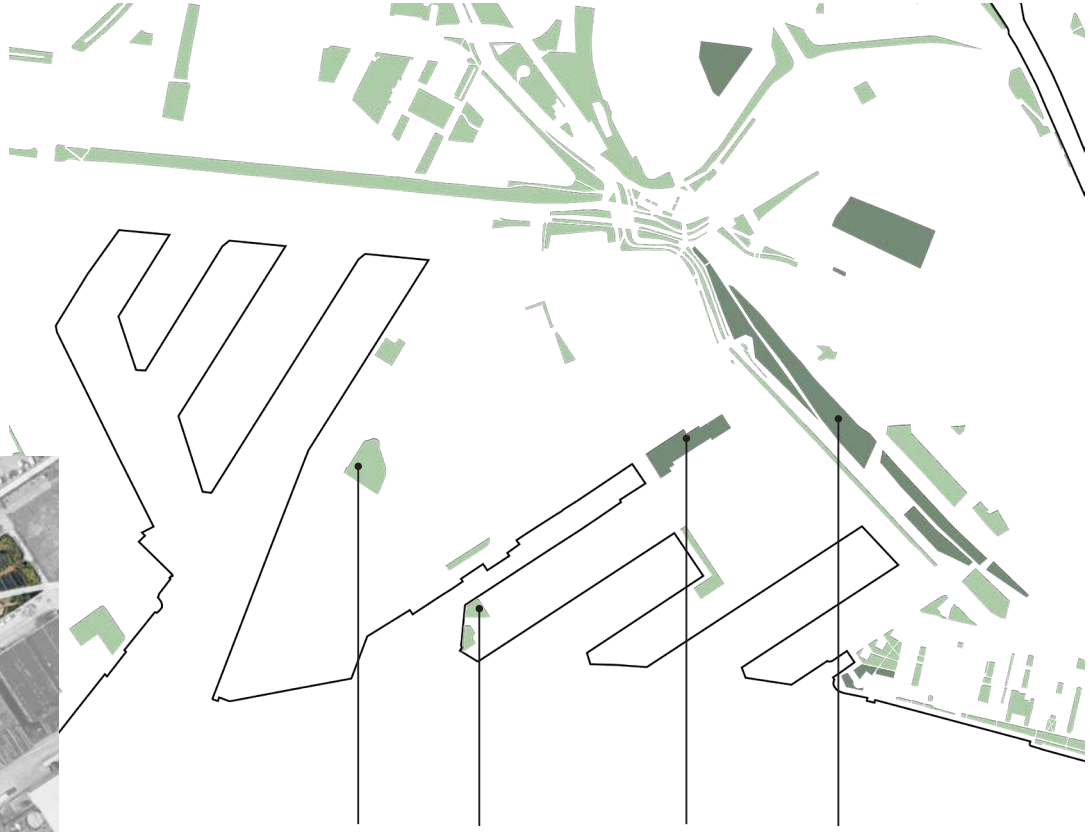


Illustration: 'Greenery in the area' by EE Stoffels (2020), based on:
1 Google Maps. (n.d.). Area around Katoenveem. Retrieved from: https://www.google.com/maps/@51.9057409,4.4292738,2106m/data=!3m1!1e3?hl=nl
2 Unkown. (n.d.). Dakpark Rotterdam. [Picture]. Retrieved from: https://www.rotterdamarchitectuurprijs.nl/2014/dakpark.html
3 Unkown. (n.d.). Man werkt in voedseltuin. Via Keilewerf. Retrieved from: http://www.keilewerf.nl/de-voedseltuin
4 http://www.degroeneconnectie.nl/
5 https://www.voedseltuin.com/

CURRENT ACCESS

WHAT IS THE CURRENT INFRASTRUCTURE TO ACCESS KATOENVEEM?

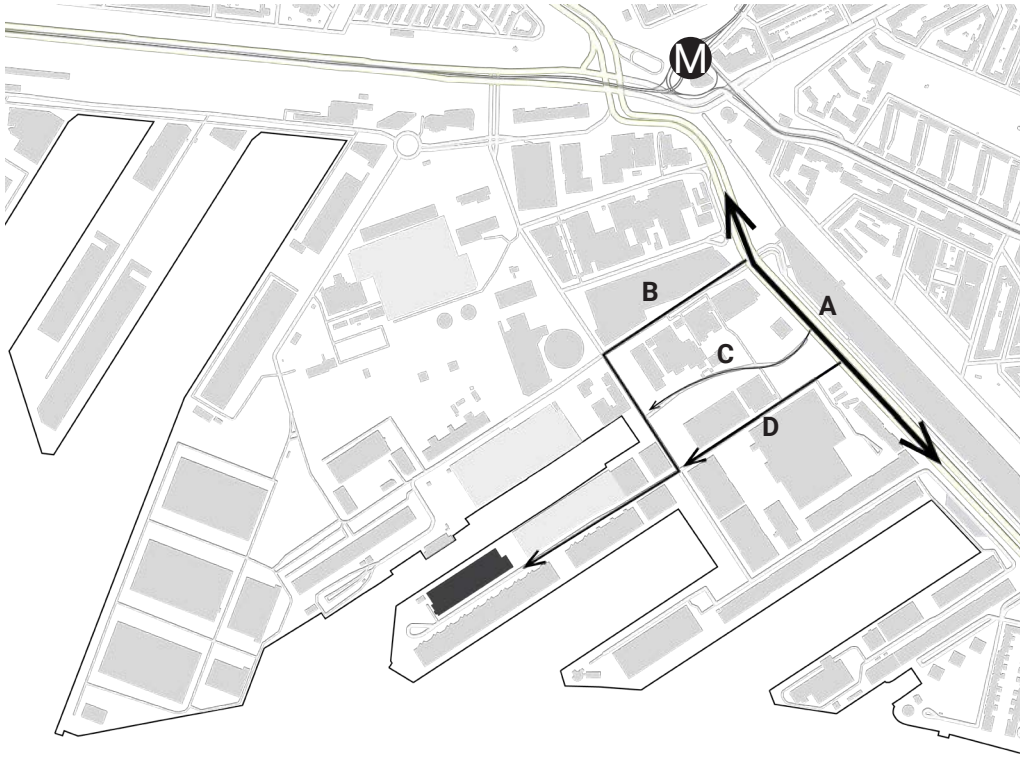
Currently Katoenveem can be accessed through different streets. The main street in the area which provides access is the Vierhavensstraat (A). Along this street many shops and a park (Dakpark, see green structures) are located. It is a two way street with a berm in the middle, meaning that cars coming from the south have to turn around and access Katoenveem the same way as people coming from the north. This means that everybody who wants to access Katoenveem by means of a motor vehicle has to go through Keileweg (B). People who want to access Katoenveem by means of slow traffic, such as pedestrians or cyclists, can also go through a path (C) or Keilestraat (D). Furthermore there is a public transportation station called 'Marconiplein' located 1.3 kilometres away from Katoenveem.

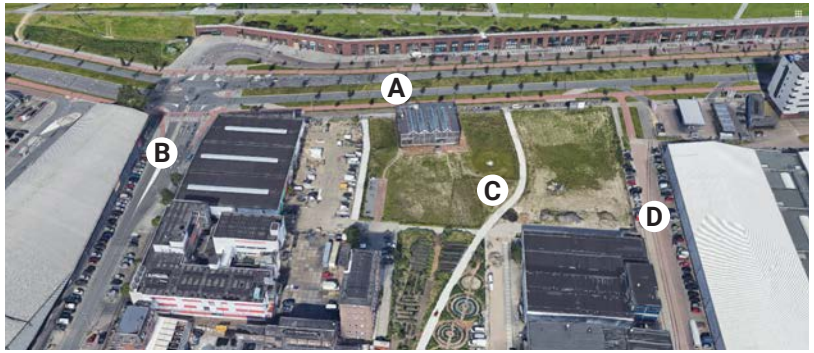
The Vierhavensstraat (A) does not contain any clearly visible elements of the history of the harbour.

Along Keileweg (B) some old warehouses are located. These warehouses used to be located along the water. Since Ijselhaven was partly muted (see development of the port) these warehouses are located along streets.

When accessing Katoenveem by the path (C) the 'Voedseltuin' (food garden) can be experienced. This is part of the 'Rotterdam Makers District' future plan.[1]

Along Keilestraat (D) old train tracks are still visible in the pavement. The tracks are not used anymore but serve as a physical reminder of the harbour history.





by E Stoffels (2020), based on:

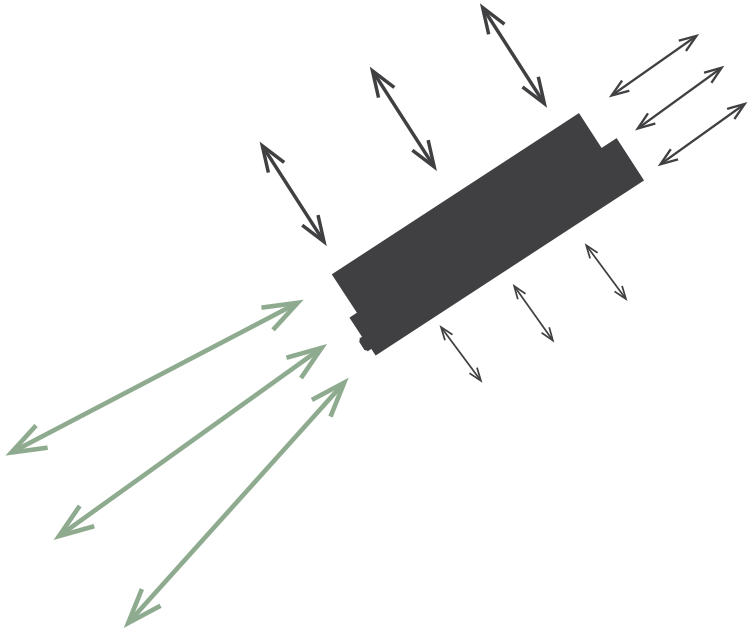
1 M4H Rotterdam. (2017). Rotterdam Makers District. Retrieved from: https://www.rotterdammakersdistrict.com/images/RDM_makersdictrict_brochure.pdf

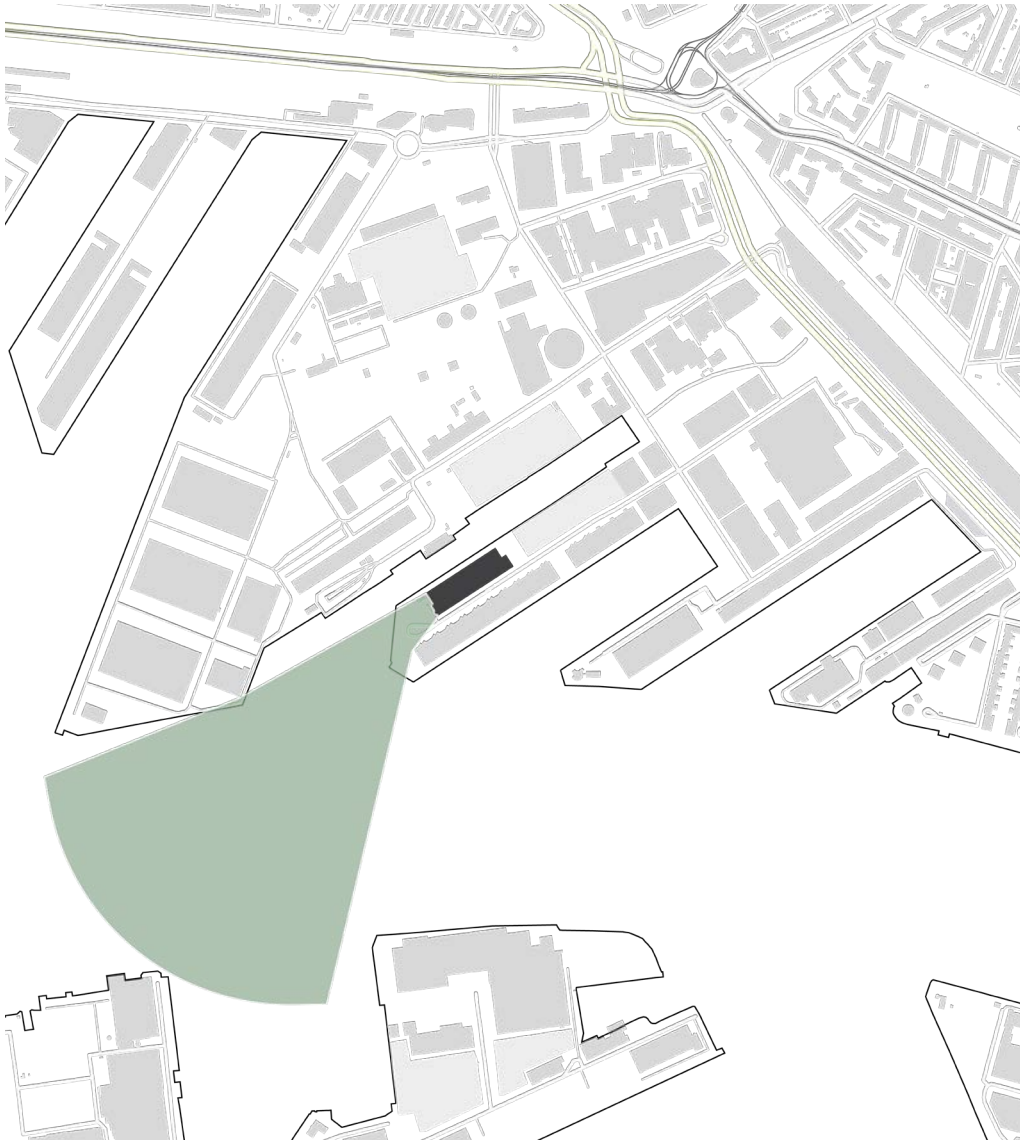
CURRENT SIGHTLINES

WHAT ARE THE CURRENT SIGHTLINES OF KATOENVEEM?

Katoenveem is surrounded by relatively large buildings. The building opposite of the street is longer and thereby blocking part of the view from Katoenveem to the water and vice versa. On the other side of Lekhaven there is no public space apart from the dead end street. However it is possible to look through some fencing and see part of Katoenveem (see picture). Because of buildings on the north and east side of Katoenveem, in combination with a small street profile, these sides are only visible from nearby.

2





1

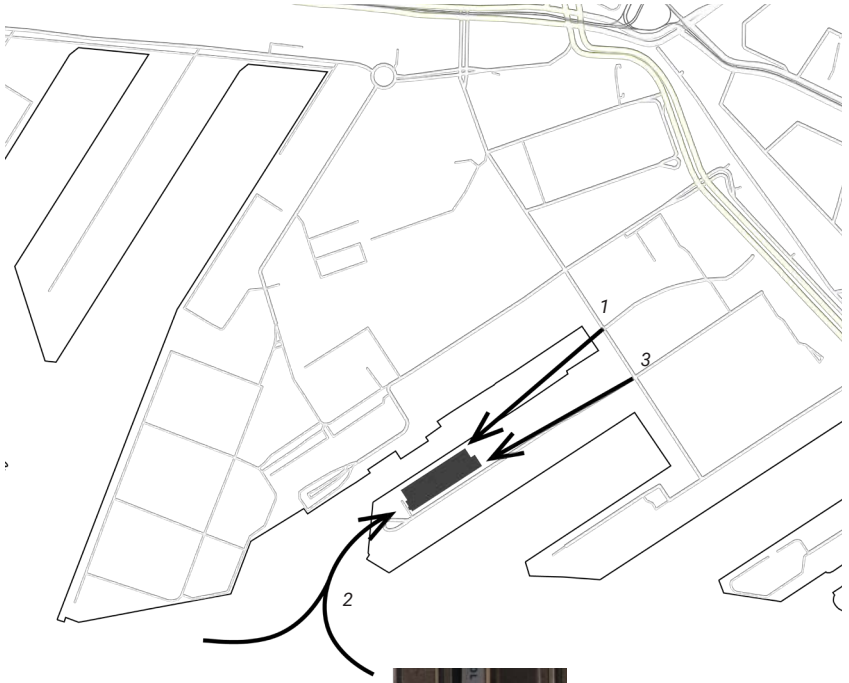
Illustration: 'Sightlines Katoenveem' by E Stoffels (2020), based on:
1 openstreetmap.org
2 *Stoffels, E. (2020). Katoenveem current situation. [Picture] Rotterdam, Netherlands.*

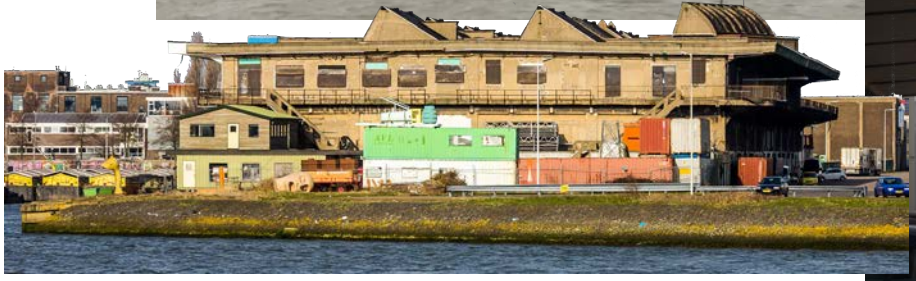
ACCESS SIGHTLINES

WHERE DO YOU HAVE A FIRST VISUAL CONNECTION WITH KATOENVEEM WHEN VISITING?

When visiting Katoenveem people will form a first impression. These are the first sightlines when visiting the building. This is for different modes of transport: either by foot or bike[1], by boat[2] or by car[3].

1





2

3

Illustration: 'Sightlines katoenveem from access points' by E Stoffels (2020), based on:
1 Spook, Z. (2020). Aanzicht Katoenveem. [Picture].
2 Spekking, R. (2016). Katoenveem Keilehaven. Retrieved from: https://commons.wikimedia.org/wiki/File:Katoenveem,_Keilehaven,_Rotterdam-8202.jpg
3 Boon, C. (n.d.). Aanzicht Katoenveem. [Picture].

SPATIAL SEQUENCE

WHAT IS THE SPATIAL SEQUENCE WHEN APPROACHING THE KATOENVEEM?

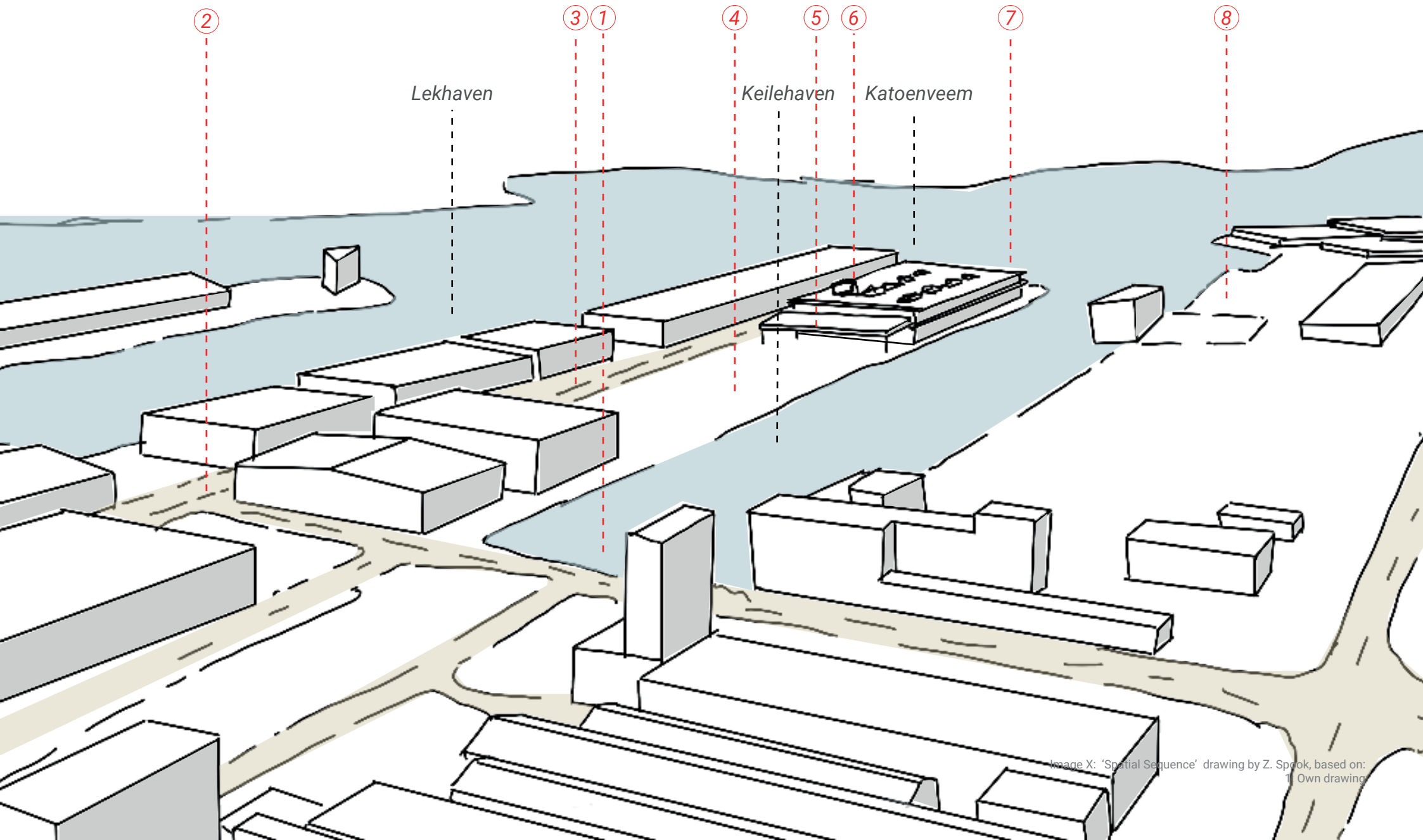


Image X: 'Spatial Sequence' drawing by Z. Spook, based on:
1. Own drawing

SPATIAL SEQUENCE

WHAT IS THE SPATIAL SEQUENCE WHEN APPROACHING THE KATOENVEEM?

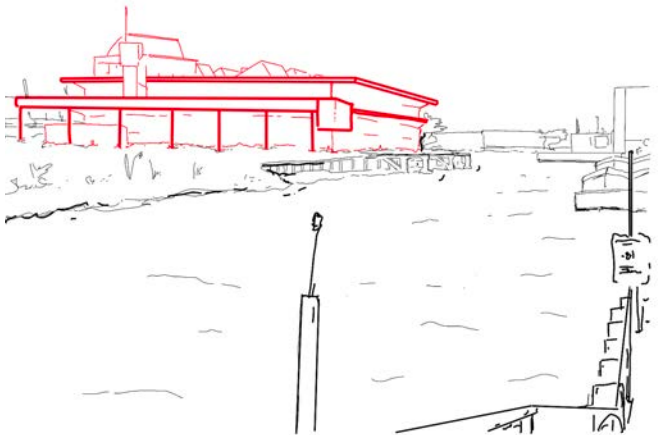


Image 1: Spatial sequence 1

Image 2: Spatial sequence 2

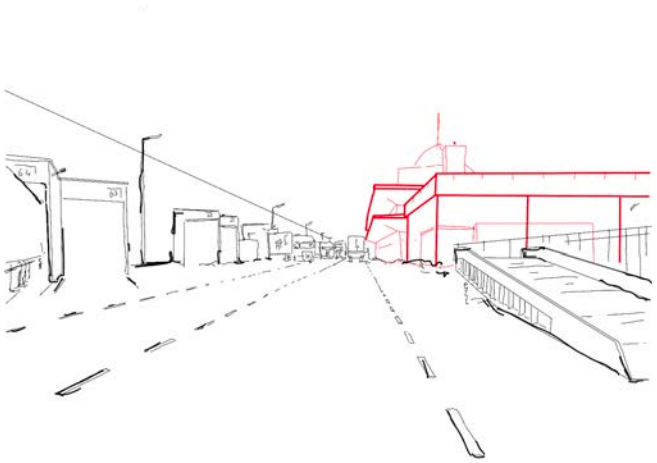


Image 3: Spatial sequence 3

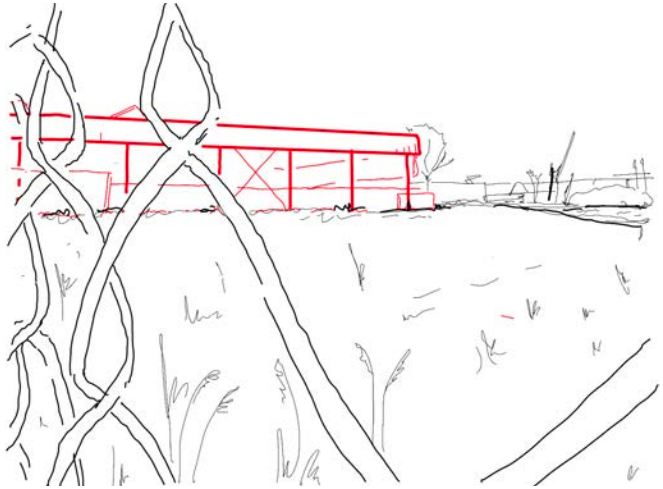


Image 4: Spatial sequence 4

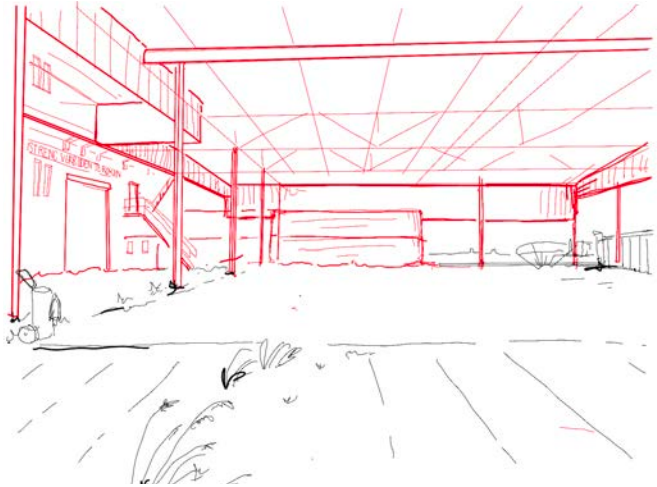


Image 5: Spatial sequence 5

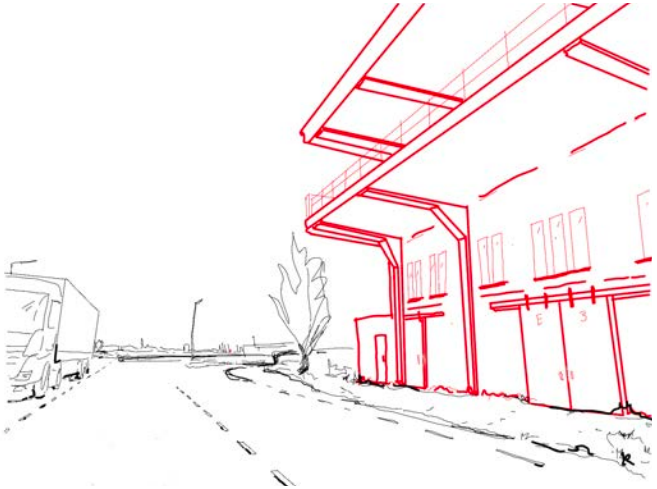


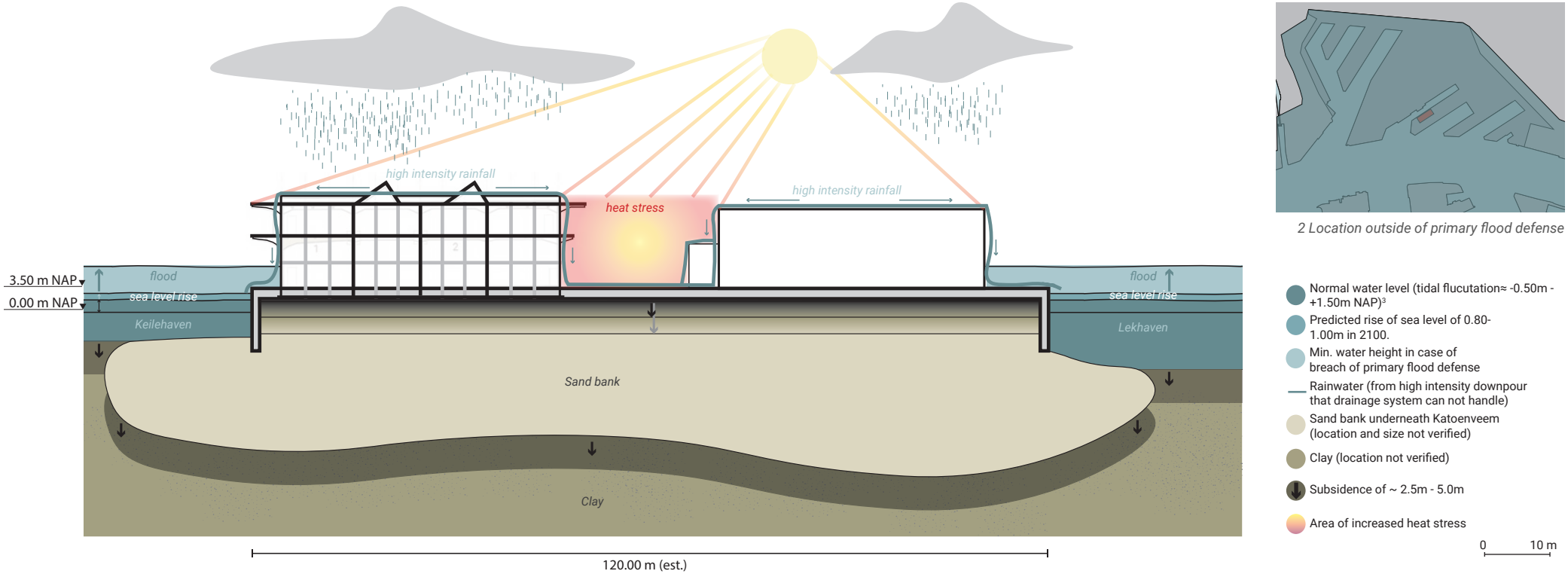
Image 6: Spatial sequence 6

Images 1-6: 'Spatial Sequence 1 t/m 6' a drawing by Z. Spook, based on:
1. Own photographs

CLIMATE CHANGE

CLIMATE CHANGE

WHAT ARE THE CONSEQUENCES OF CLIMATE CHANGE FOR KATOENVEEM?



1 Consequences of climate change for Katoenveem

2 Location outside of primary flood defense

There are many aspects of climate change that could be of influence on Katoenveem.
One aspect is the prospect of higher water levels around the site. There are several reasons why the water level will change:

- The estimated rise of the sea level for 2100 is about 0.8-1.0m due to melting of land-based ice.
- Increased winter discharges (and decreased summer discharges) of the Rhine and Meuse due to higher temperatures and changing air circulation.[4]
- Increase in frequency and intensity of rainfall and heavy storms.

At the same time, current predictions for rainfall already show that most areas around Katoenveem will not be able to cope with large amounts of water in case of a extreme downpour, which will occur more often. Higher sea level also means an increase in percentage of salt water invading the land. This poses a serious threat to not only freshwater supplies but also to the flora and founa in the region.

Katoenveem is located outside of the primary flood defenses. The area is still protected by the Maeslant-storm surge barrier from floods, but in case of a breach, all of the site would be covered by a min. 5m high layer of water. The risk of this happening will increase. This is also connected to the prediction concerning subsidence. Although Katoenveem is located on a sand bank of the river, the soil around the building and underneath the sand bank is mostly clay. The predicted subsidence is about 2,5 - 5,0m until 2050. This further increases the risk of flooding of the area.
Lastly, higher temperatures will increase the urban heat island effect. The high percentage of paved surfaces in the area already causes higher temperatures than is desired.

The municipality of Rotterdam is anticipating these changes in the Waterplan for the city.
See annex 2.

1 'Conseqences of climate change for Katoenveem' by I.Louer
2 'Location outside of primary flood defense' by I.Louer
3 Rijkswaterstaat. (2020). *Vaarwegen in Nederland*. Retrieved from http://www.vaarweginformatie.nl/fdd/main/download?fileId=1942534
4 Veelen, P. van, Boer, F., Hoijtink, R.,Laan, T. van der. (2010) *Veilige en goed ingepaste waterkeringen in Rotterdam*.Retrieved from https://library.wur.nl/WebQuery/hydrotheek/2077330, p.22
5 KNMI. (2015). *De KNMI'14-klimaatscenario's voor Nederland*. Retrieved from http://www.klimaatscenarios.nl/images/Brochure_KNMI14_NL.pdf

ANSWER RQ

What is the urban context of Katoenveem?
The three main aspects that have influenced the urban setting through over time are as follows: 1. Because of the favourable position of Rotterdam on a crossing of trade routes, it is ideally located for transshipment activities. 2. The depth of the Maas offered the possibility for larger ships to dock. 3. The possibility to expand along the river was always present. Initially the harbour was located within the city, but the expanding urban structure and at the same time technological advancement and increased ship sizes in need of even bigger docks caused the port to move away from the heart of the city. The growth of the harbour went hand-in-hand with the expansion of the city. This was an opportunity for tremendous growth, but at the same time caused the city and port to drift apart. To counter this trend, Rotterdam developed into a main port, consisting of various specialized distribution hubs. A new relationship of mutual benefit between the city and port was formed, creating an interwoven network.
Merwe-Vierhavens, where Katoenveem is located along Keilehaven, was constructed between 1906-1922. Due to rapid (technological) developments, upscaling and the growth of a global economy this newly constructed harbour area did not suffice anymore for the main port activities. In this changing context, the area around Katoenveem became a less important place for harbour activities and started to decline, while the port kept on expanding.

Nowadays, the area of Merwe-Vierhavens is cut of from the city in infrastructural and operational sense. Currently interventions are planned that will reconnect the area with the city. At the same time, Katoenveem remains positioned in a rather strategic location in the whole city, due to expanding urban surroundings. Its location, initially outside the (former) main port in the city center, now becomes more centralised. This, together with the vicinity of residential areas is the starting point for new opportunities for the site. One of the obstacles to overcome is the prospect of climate change and with it the threat of rising water levels that could change the cityscape.

CONCLUSION

URBAN CONTEXT

ARCHITECTURE

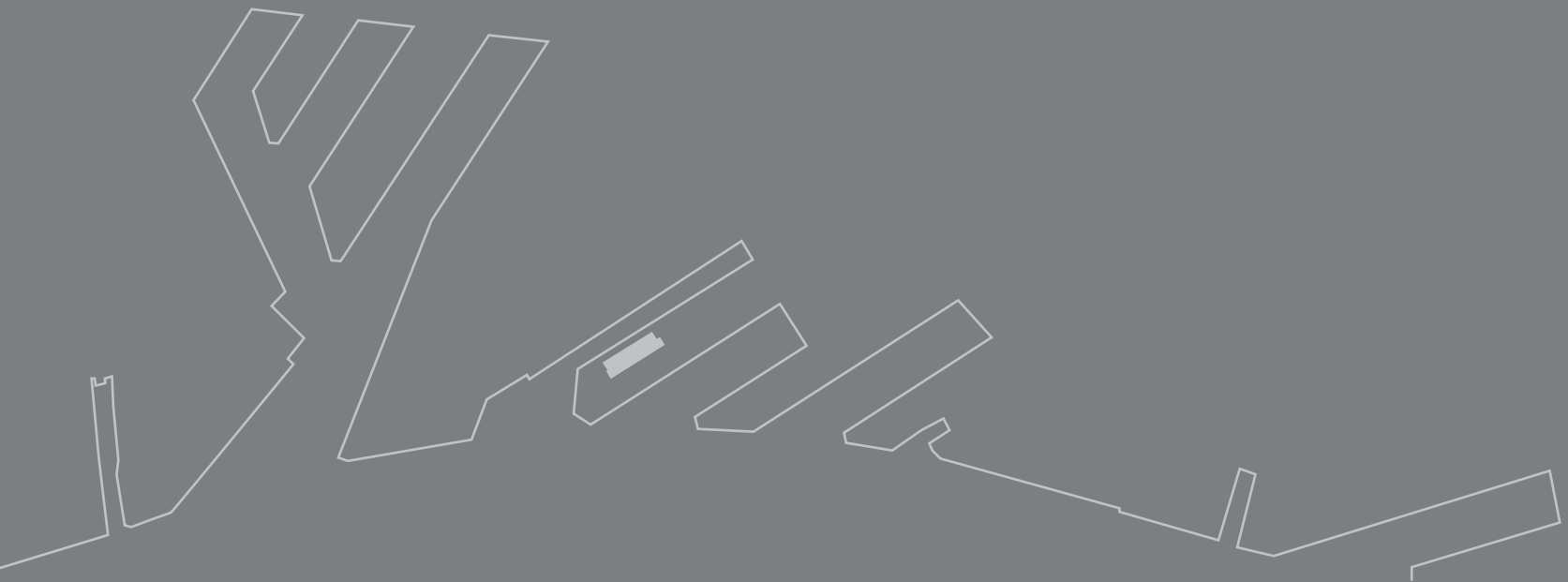
In this chapter we study the architectural expression of Katoenveem. We do this because we want to know what the architecture of Katoenveem is, in order to position our own design choices within the current architecture of Katoenveem, so that the historic character of Katoenveem can be preserved in a sustainable redesign, that adapts to the needs of the future.

We do this by researching what the reason behind different design choices is, and by analyzing why and how the building and site changed over time. The chapter focuses on five main themes: *site, organisation, structure, skin* and *interior.*

Our research will construct of observations, analytical drawings and schemes, archival research and literature research.

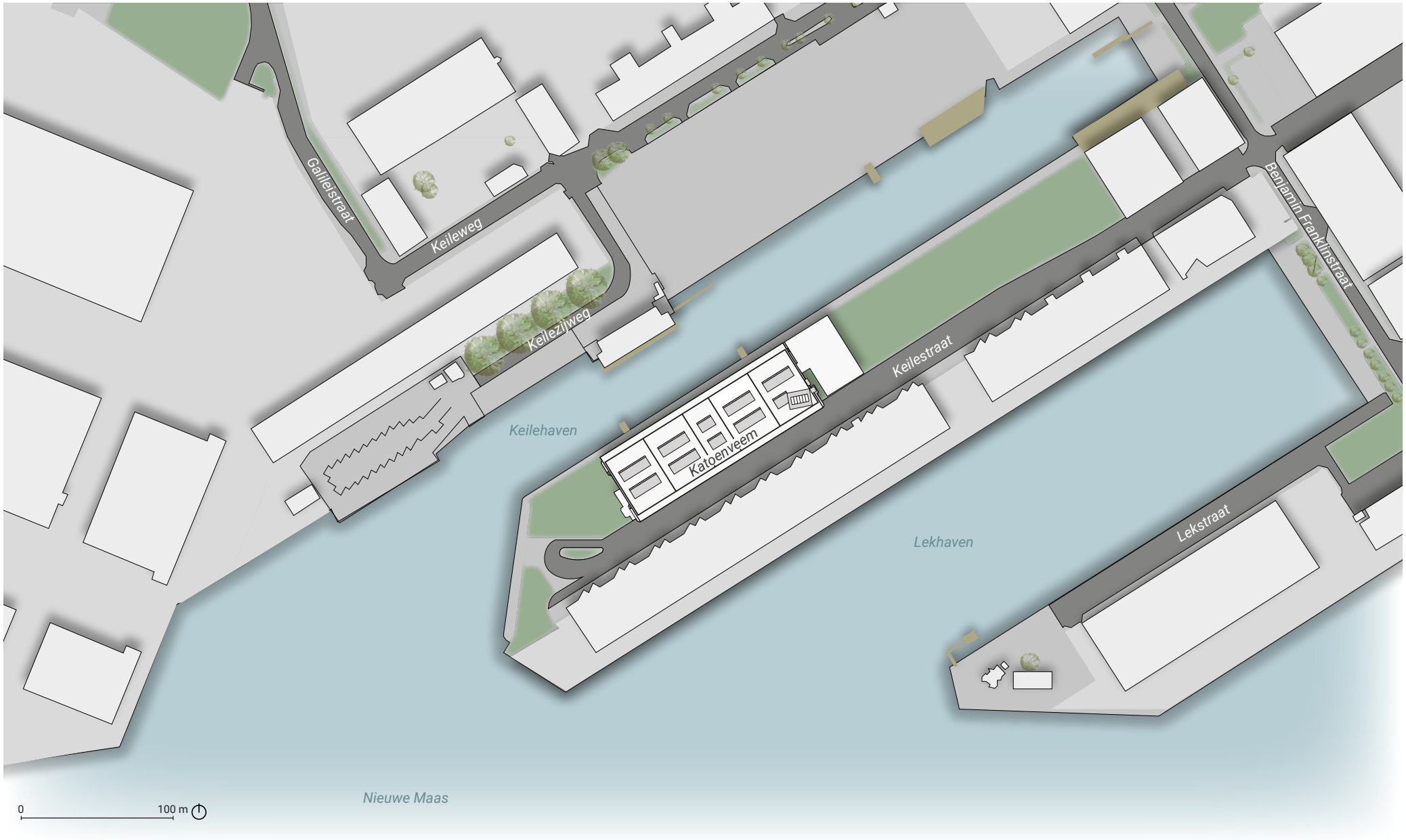
This architectural study is part of a thorough analysis on different scale levels, done get a deep understanding of the Katoenveem Building in order to make an evidence based, fitting redesign.

SITE



SITUATION

HOW IS KATOENVEEM SITUATED IN THE LOCAL CONTEXT?



Katoenveem in the local context, image by I.Louer

DEVELOPMENT

HOW DID THE SITE AND BUILDING CHANGE FROM 1920 UNTIL 1930?

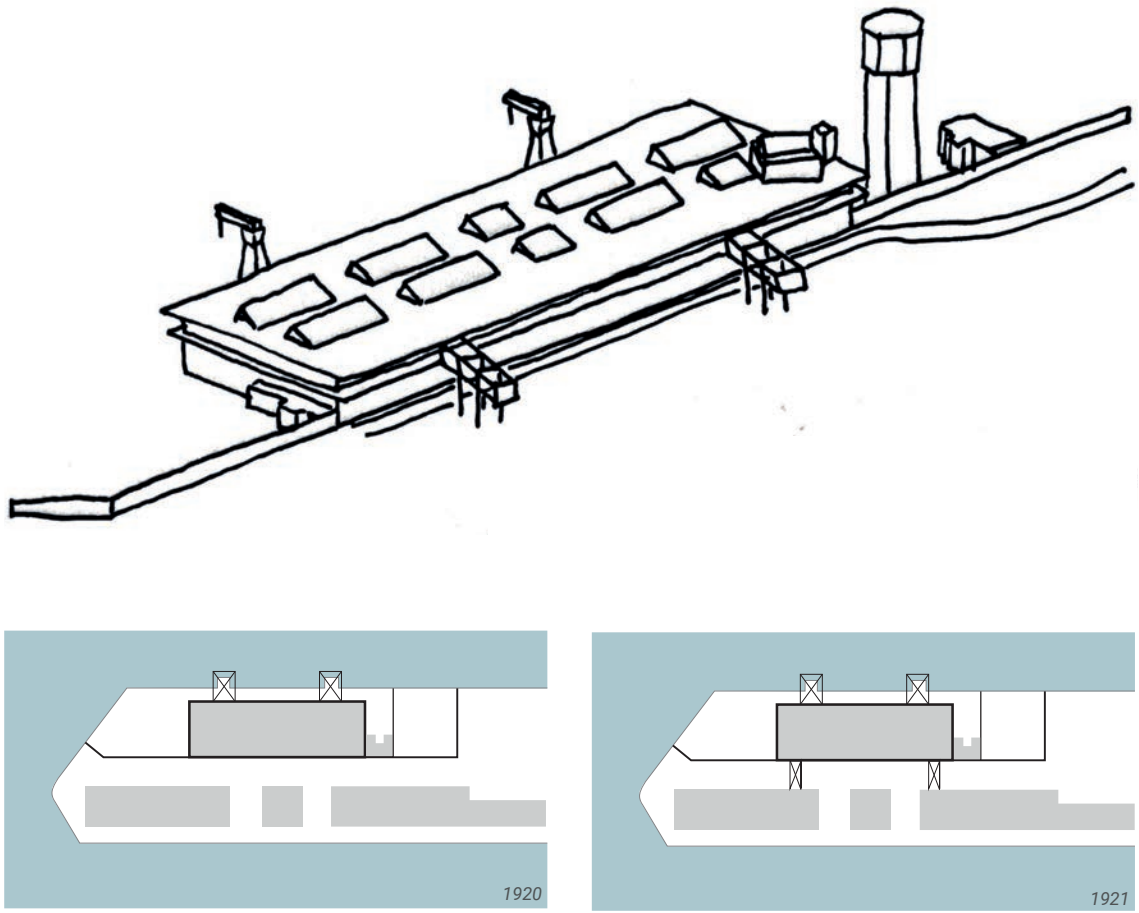


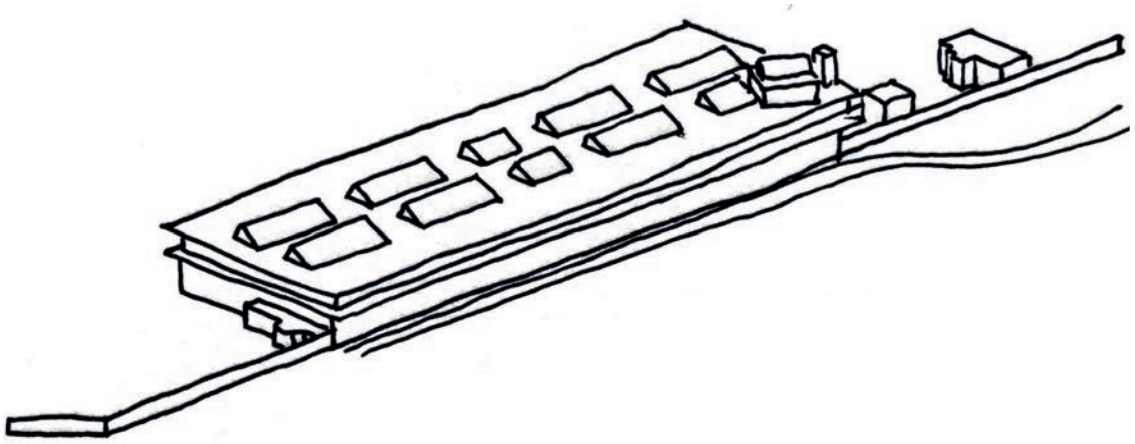
Image 1: Building Development 1920 - 1921

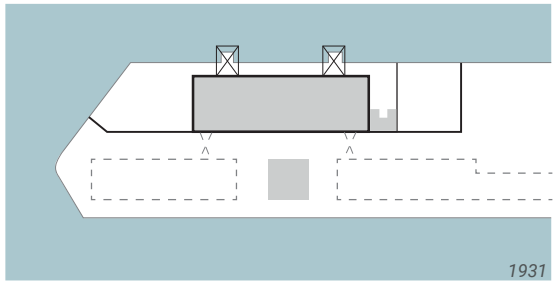
In 1915 the Katoenveem Joint Stock company was established by a collective of six entrepreneurs.
In 1916 Bloewhoedenveem commissioned J.J. Kanters to be the architect for the collective cotton storage.
The warehouse was constructed between 1919 and 1920.
In 1921, two steel walking bridges were added to connect Katoenveem to the neighbouring warehouses at the Lekhaven: New Orleans and Galveston. Both warehouses were owned by the Holland Amerika Lijn.
Because the Lekhaven was much deeper than the Keilehaven, this connection was needed to allow large sea ships to reach the Katoenveem.
The connection between both harbours finalised the circulation and transport systems.
Katoenveem.
The connection between both harbours finalised the circulation and transport systems.

Image 1: 'General development of direct context, from 1920-2020' by Z. Spook, based on:
1: H.H. van Dam, "The Cotton warehouse of KAtoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.
2: M. Endermand & R. Stenverts, Bouwhistorische verkenning Katoenveem Rotterdam, Utrecht, 2005, 14
3: Hoeve, J.A. van der & R. Stenvert, Lloydstraat 30, Rotterdam Jobsveem: bouwhistorische opname, (rapport) Utrecht 2003

DEVELOPMENT

HOW DID THE SITE AND BUILDING CHANGE FROM 1931 UNTIL 1965?





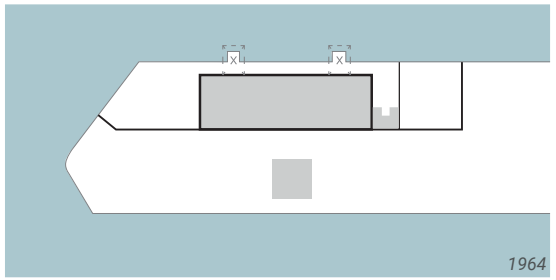


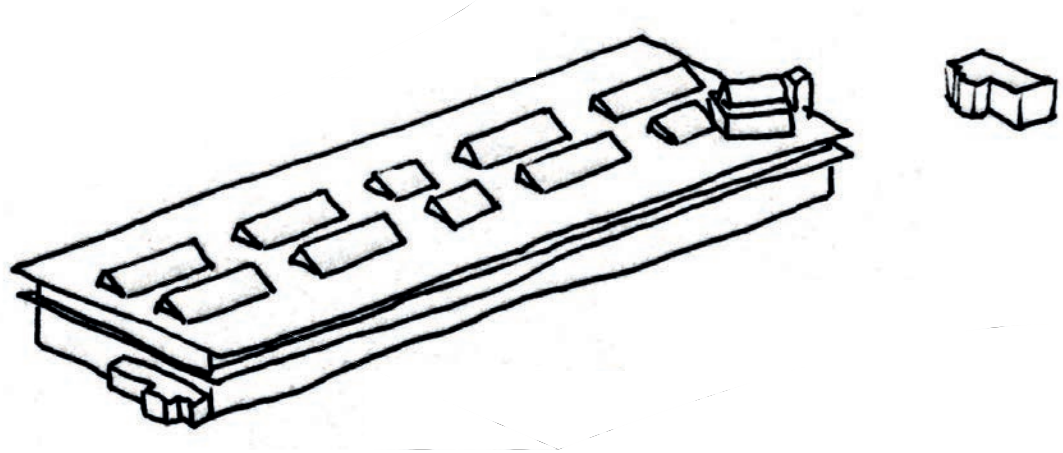
Image 1: Building Development1931-1966

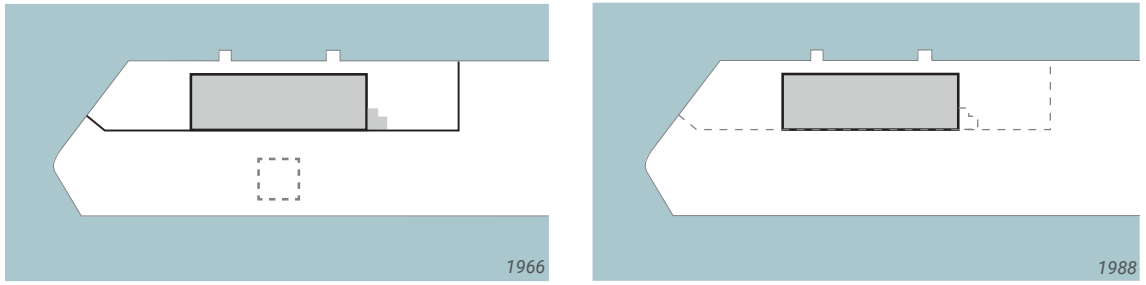
In the years shortly after construction, the Katoenveem suffered some big losses. And in 1929 it was decided that when it came to the transportation of cotton, the Rotterdam harbour was no mach for the large railway network of Bremen. As a result of this, both warehouse Galveston and warehouse New Orleans were demolished. No exact dat was found but at least before 1931. After the second World War the cotton business progressed a little bit. But shortly after, the demand shifted from cotton to synthetic textiles.
The Katoenveem loses it's function in 1964 and already in 1957, the two cranes of the waterfront of Keilehaven were demolished. The piers are still there in the current situation.

Image 1: 'General development of direct context, from 1920-2020' by Z. Spook, based on:
1: H.H. van Dam, "The Cotton warehouse of KAtoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.
2: M. Endermand & R. Stenverts, Bouwhistorische verkenning Katoenveem Rotterdam, Utrecht, 2005, 14
3: Hoeve, J.A. van der & R. Stenvert, Lloydstraat 30, Rotterdam Jobsveem: bouwhistorische opname, (rapport) Utrecht 2003

DEVELOPMENT

HOW DID THE SITE AND BUILDING CHANGE FROM 1966 UNTIL 1987?





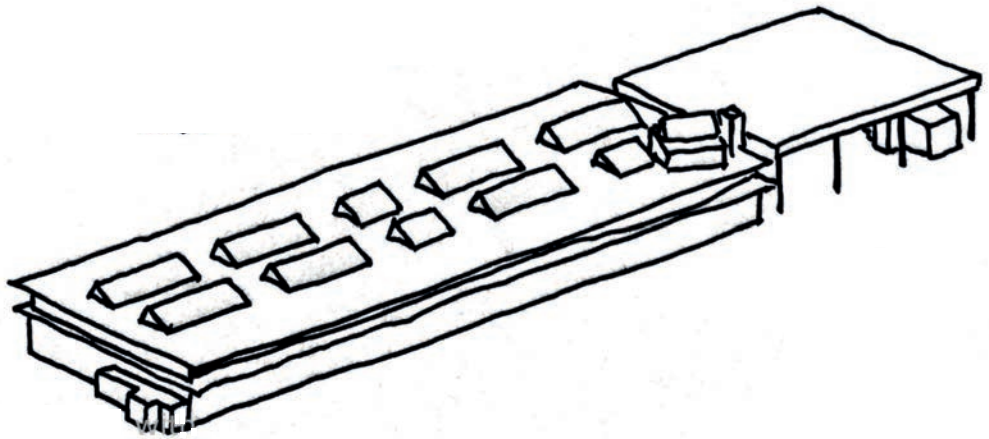
In 1966 The water tower was demolished up until 6 meters. In 1988 the concrete wall and remaining parts of the water tower are demolished. As well as the remaining shed and directors offices.

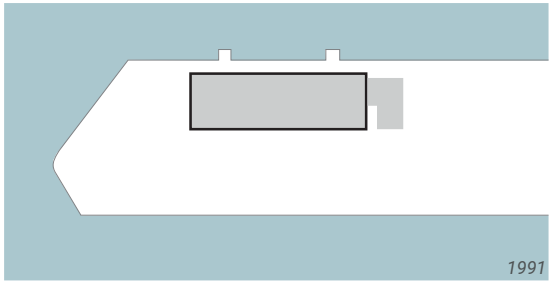
Image 1: Building Development1966 - 1988

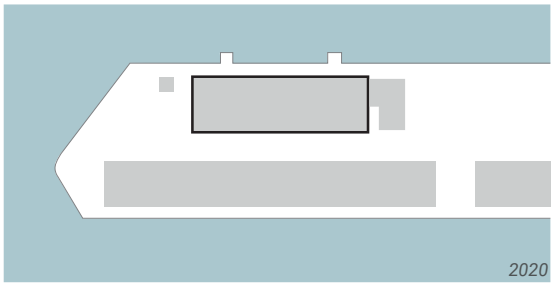
Image 1: 'General development of direct context, from 1920-2020' by Z. Spook, based on:
1: H.H. van Dam, "The Cotton warehouse of KAtoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.
2: M. Endermand & R. Stenverts, Bouwhistorische verkenning Katoenveem Rotterdam, Utrecht, 2005, 14
3: Hoeve, J.A. van der & R. Stenvert, Lloydstraat 30, Rotterdam Jobsveem: bouwhistorische opname, (rapport) Utrecht 2003

DEVELOPMENT

HOW DID THE SITE AND BUILDING CHANGE FROM 1988UNTILL 1999?







When the Katoenveem was no longer a storage for cotton, it served a few different temporary functions. More information about this can be found in the timeline in the beginning of this rapport.
The biggest change on site was the construction of a large new distribution centre: The Rotterdam Fruit Wharf. This warehouse was built in 1997 and has no functional relation to Katoenveem.
In 1999 a large roof for outside storage is constructed.

Image 1: Building Development1988 - 2020

Image 1: 'General development of direct context, from 1920-2020' by Z. Spook, based on:
1: H.H. van Dam, "The Cotton warehouse of KAtoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.
2: M. Endermand & R. Stenverts, Bouwhistorische verkenning Katoenveem Rotterdam, Utrecht, 2005, 14
3: Hoeve, J.A. van der & R. Stenvert, Lloydstraat 30, Rotterdam Jobsveem: bouwhistorische opname, (rapport) Utrecht 2003

TIME LAYERS

WHAT ARE THE CHANGES, EXTENSIONS AND ADDITIONS OVER TIME?

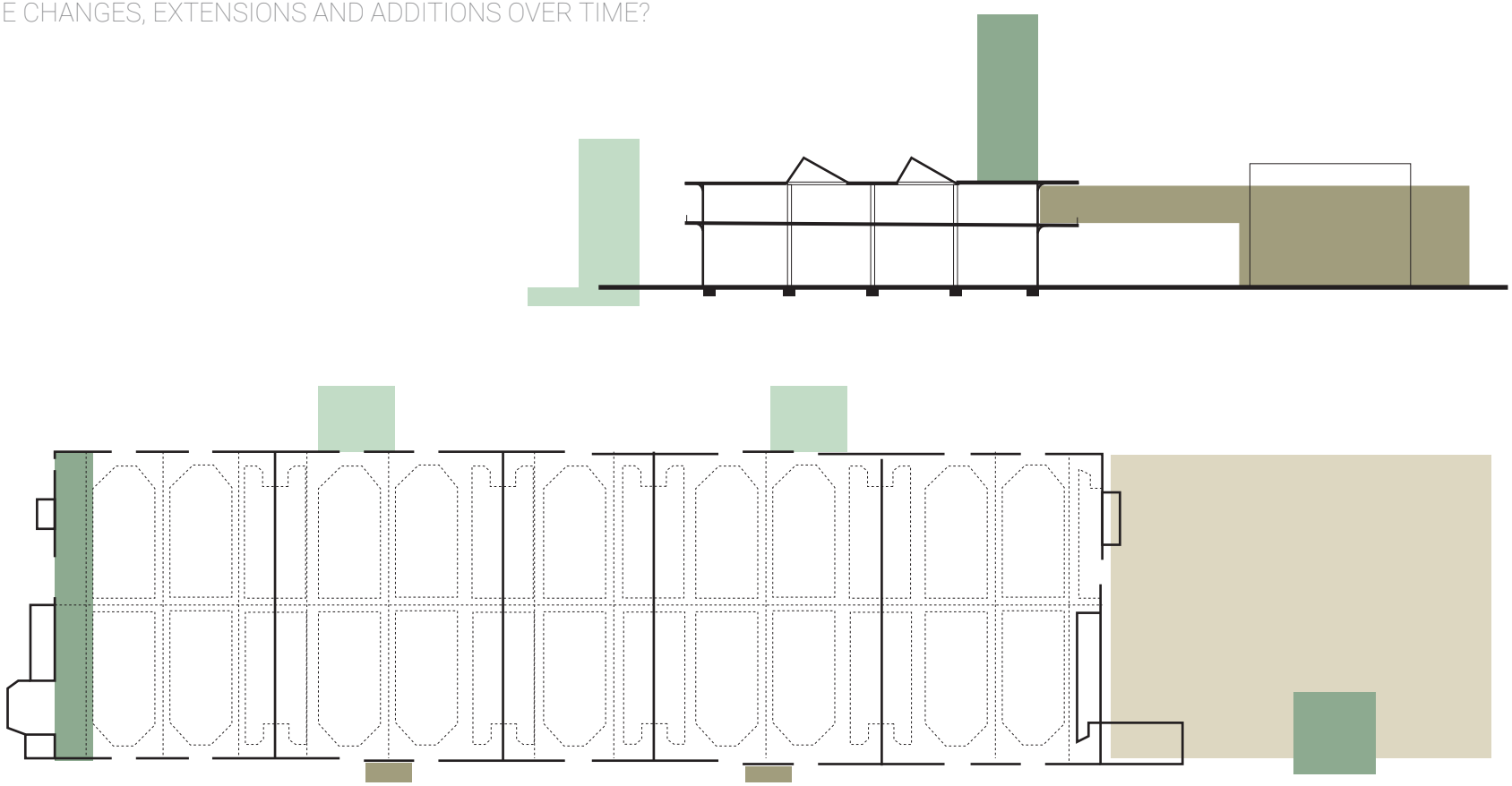


Image 1: Katoenveem, most significanct changes from 1921 untill 1999

1920-1931

1931-1966

1966-1988

1988-current situation

Image 1: 'Katoenveem most significant changes from 1921 untill 1999' by Z. Spook, based on:
1: H.H. van Dam, "The Cotton warehouse of KAtoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.
2: M. Endermand & R. Stenverts, Bouwhistorische verkenning Katoenveem Rotterdam, Utrecht, 2005, 14
3: Hoeve, J.A. van der & R. Stenvert, Lloydstraat 30, Rotterdam Jobsveem: bouwhistorische opname, (rapport) Utrecht 2003

SITE DEVELOPMENT

TO WHAT EXTENT CAN YOU EXPERIENCE THESE CHANGES IN THE CURRENT SITUATION?

Image 1: Katoenveem 'Scars' of Building Development

Image 2: Katoenveem 'Scars' of Building Development

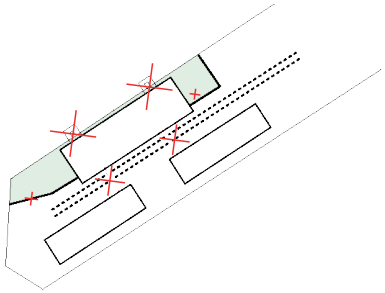
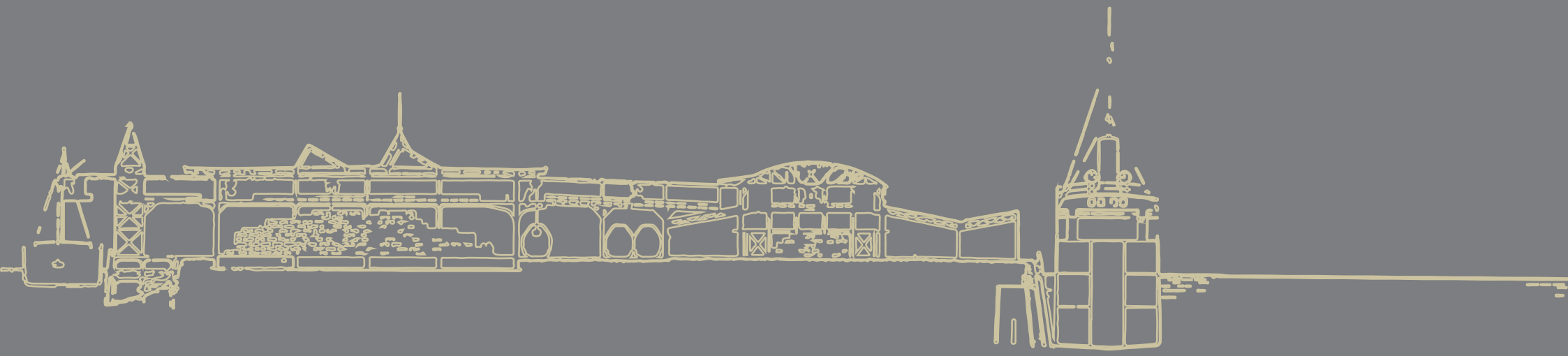


Image 3: Diagram of Cut-off Building parts

Most elements that were crucial in the buildings functionality, are adjusted or cut-off over time. The changes leave rough 'scars' on the solid base. Without these parts the Katoenveem is unable to perform it's original function properly. This contributes to the sober atmosphere at the site

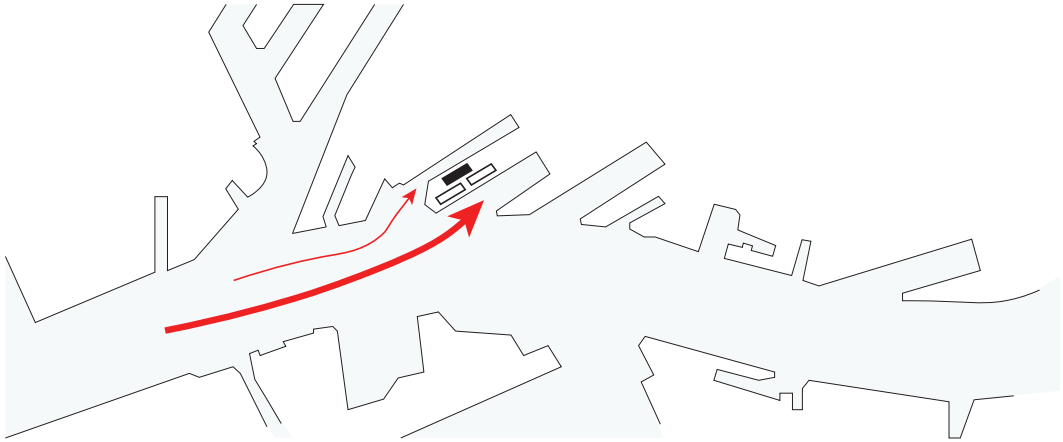
Image 1: ' Katoenveem 'Scars' of Building Development' photograph by A. Loef
Image 2: ' Katoenveem 'Scars' of Building Development' photograph by Z. Spook
Image 3: 'Diagram of Cut-off Builiding parts' drawing by Z. Spook

ORGANISATION



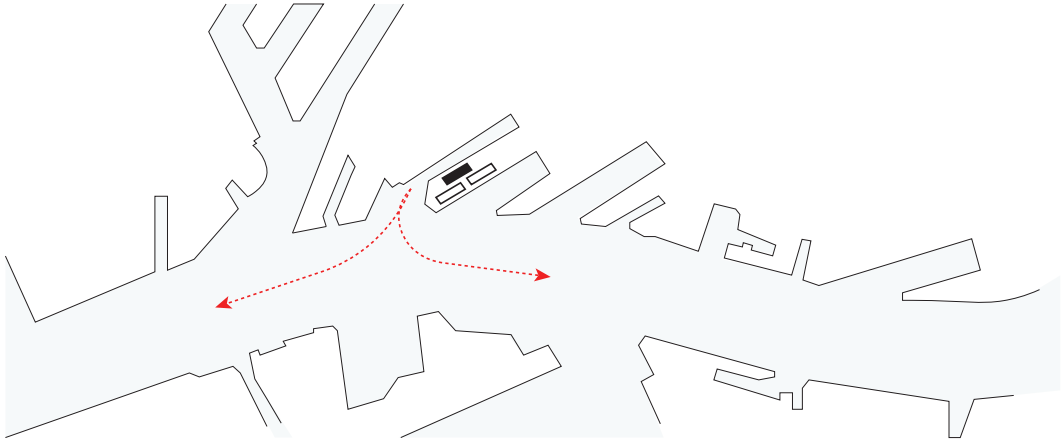
MOVEMENT

WHAT WAS THE FLOW OF PRODUCT THROUGH THE HARBOUR?



1

Small import flow: from England via the Keilehaven to Katoenveem.
Big import flow: from England via Lekhaven and Galveston or New Orleans warehouse to Katoenveem.



2

First export flow: from Katoenveem via Keilehaven to Belgium.
Second export flow: from Katoenveem via Keilehaven to hinterland.

Image 3: Katoenveem in Use

At the beginning of the 20th century, 65% of cotton processed in The Netherlands came from Liverpool, England.
In Rotterdam the Cotton was stored temporarily and checked for quality.
The main route was via the North-sea. The large sea-ships then entered the deep Lekhaven and transhipped the cotton via the warehouses of Holland Amerika Lijn, to the Katoenveem.
The small ships could enter the shallow Keilehaven, and reach Katoenveem directly.

After storage and selection the cotton was either translocated to the railway system (this will be discussed in the next pages) or to small ships sailing further inland or to Germany and Belgium.

Export flows
Import flows

Image 1,2: 'Import and Export flows' drawings by Z. Spook, based on:
1: M. Enderman and R. Stenvert, Bouwhistorische verkenning Katoenveem, Keilestraat 39 Rotterdam, Utrecht(2005), p 6-7)
Image 3: 'Katoenveem in use', photograph of Rotterdamsstadsarchief, retreived on16-02-20

MOVEMENT

WHAT WAS THE FLOW OF PRODUCT THROUGH THE RAILWAY SYSTEM?

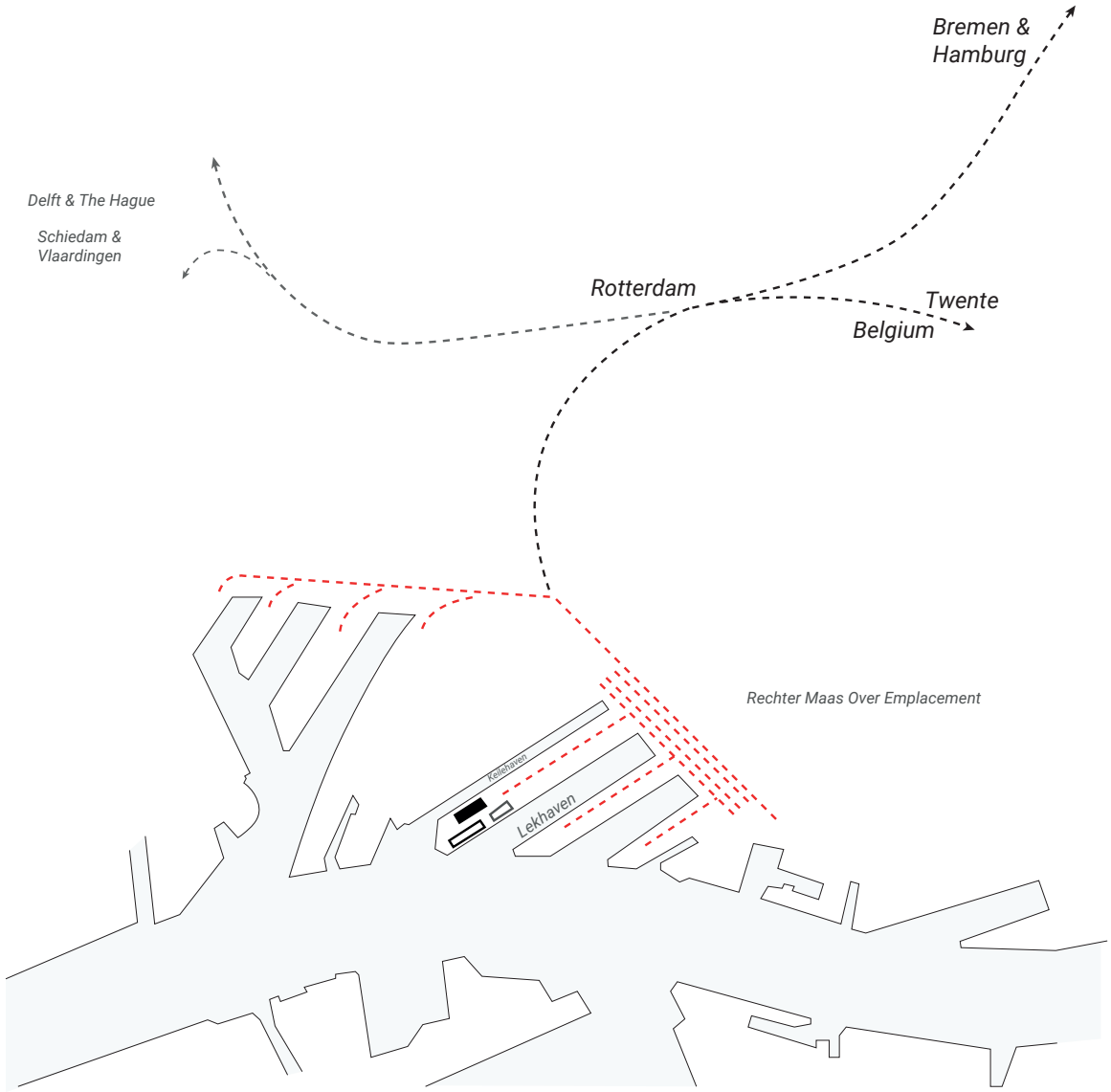


Image 1: Railway system from 1908 until 1985

Havenspoorlijn Rotterdam West
Regular railway network

Besides it's good water connection, the Katoenveem was also integrated in a large railway network.
At the time there was a deviation between railway for regular passengers and for goods related to the harbour. This harbour specific railway system was called Havenspoorlijn Rotterdam West. This first negotiations to establish Havenspoorlijn Rotterdam West started in 1898. In 1908 the harbour railway was officially opened.
The system consists of four emplacements. The one closest to, and used by Katoenveem, was the Rotterdam RMO (Rechter Maas Oever).
Twente was one of the important area's for cotton trade in The Netherlands. However, the good connection between train stations in Hamburg, Bremen and Twente remained an issue for Rotterdam. Because of this, Katoenveem suffered some big losses in the build-up to the second world war.
The harbour railway system came to an end in 1985. This happend when competing with the regular transport system became too difficult and the big textile factory's in Twente closed [1]. Katoenveem was already out of business when this happened.

Image 1: 'Railway system from 1908 until 1985' drawing by Z. Spook, based on:
1: https://nl.wikipedia.org/wiki/Havenspoorlijn_Rotterdam_West, retrieved on 31-03-2020

MOVEMENT

WHAT WAS THE FLOW OF PRODUCT ON SITE?

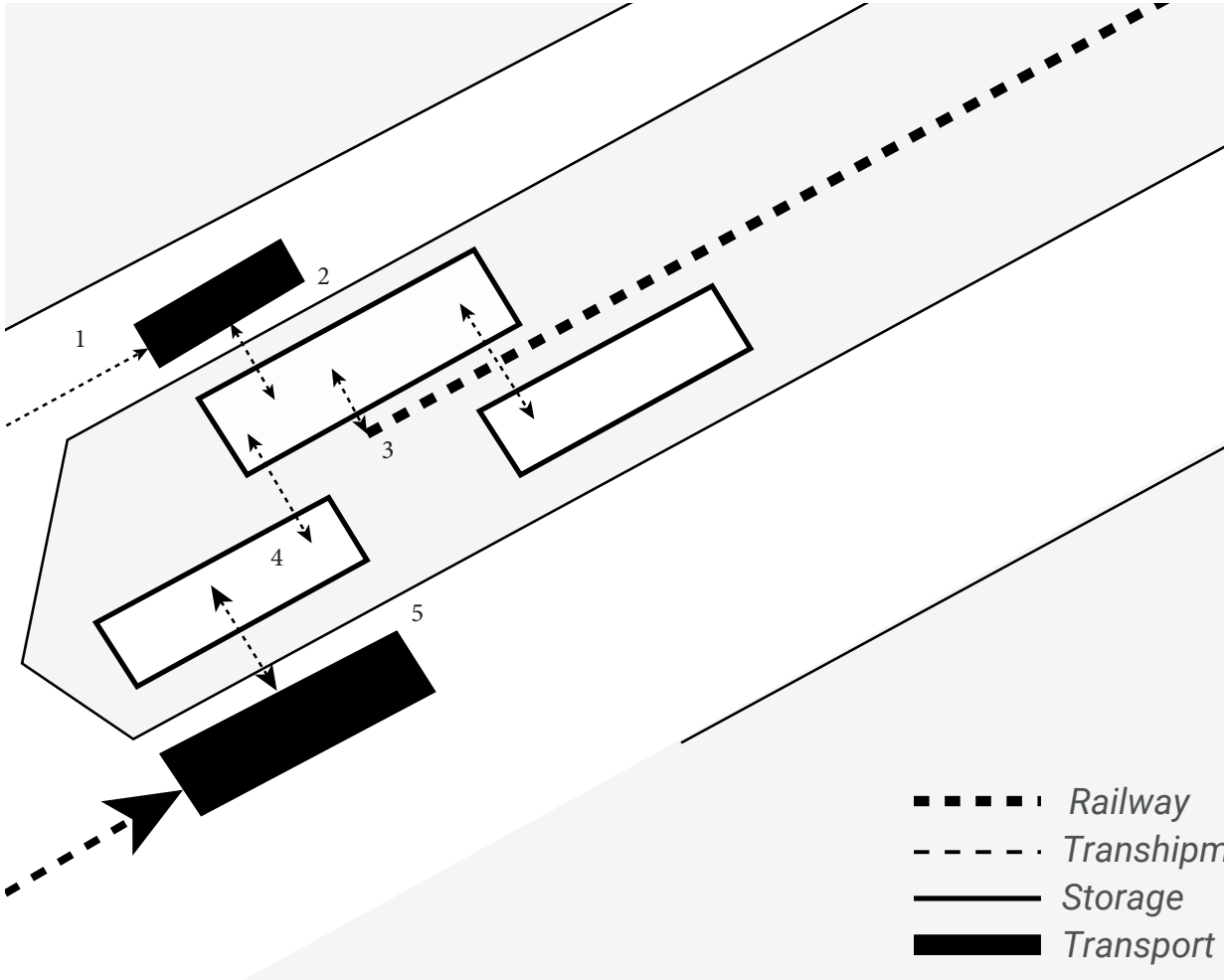


Image 1: General flow of product from 1921 to 1964]

Small ships enter the shallow Keilehaven from the North sea and inlands [1]. Two large cranes situated at the waterfront, then carry the carried the cotton bales on to the transport system [2]. This system is called Conveyor, and will be explained in chapter Building Technology.
The cranes lifted about 12-15 bales at a time. Because of this, Katoenveem was able to process an average of 2000 bales per day. After the cotton was selected and checked for quality, the product was transferred to trains to move the product further land inwards or to neighbouring countries[3]. The warehouses across the street were used for temporary storage [4]. They were key in the transhipment system to connect Katoenveem to the deep Lekhaven [5]. The Lekhaven was more suitable to welcome large sea ships, where as the Keilehaven couldn't .[1,2,3]

Image 1: 'General flow of prooduct' , drawing by Z. Spook, based on:
1: Plevier, R., Adema, T., Hoope, J., Katoenveem Analysis & Values AR3AR02, Delft: TU Delft (2009).
2: M. Endemm, R Stcnverg (2005), 13.
3: M. Enderman md R. Stenvert, 'Bouwhistorische verkenning Katoenveem', Bowhistorische verkenning Katoenveem Keilesraat 39 Rofteredam, Utrecht (2005),

MOVEMENT

WHAT WAS THE FLOW OF COTTON ON SITE?

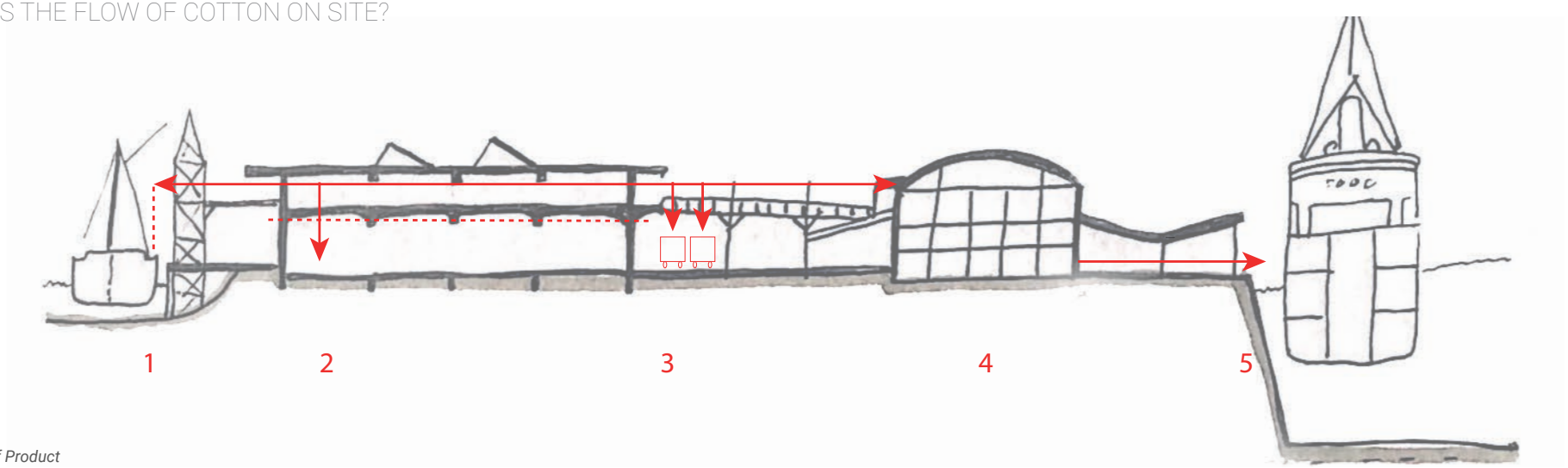


Image 1: Flow of Product

Image 2: 1. Arrival/departure cotton

Image 3: 2. Storage

Image 4: 3. Transhipped to railway system

Image 5: 4. Transhipped to/from HA-lijn warehouses

Image 6: 5. Arrival/departure cotton

Image 1: 'Flow of prooduct' , drawing by Z.Spook, based on:
1. M. Ende¡mm md R. Stenvert, 'Bouwhistorische verkenning Katoenveem', Bowhistorische verkenning Katoenveem Keilesraat 39 Rofteredam, Utrecht (2005), 9
Image 2 : '1. Arrival/departure cotton', photograph by Rotterdamsstadsarchief retreived: 16-02-20
Image 3 : '2. Storage', photograph by Rotterdamsstadsarchief retreived: 16-02-20
Image 4 : 'Transhipped to railway system', photograph by Rotterdamsstadsarchief retreived: 16-02-20
Image 5: 'Image X: 4. Transhipped to/from HA-lijn warehouses', photograph by Rotterdamsstadsarchief retreived: 16-02-20
Image 6 : '5. Arrival/departure cotton', photograph by unknown, based on:
1: http://www.oud-rotterdam.nl/ retrieved on: 20-03-2020

MOVEMENT

WHAT WAS THE FLOW OF COTTON INSIDE THE COMPARTMENTS?

Image 1: Cotton Storage

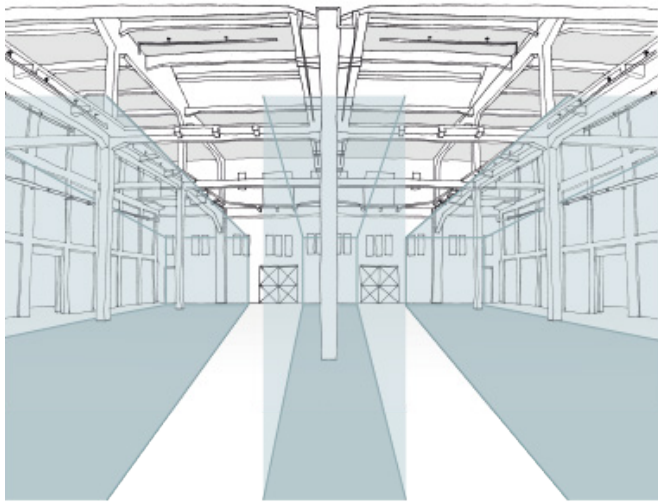


Image 2: Diagram of Cotton Storage

Image 3: Organisation of Storage

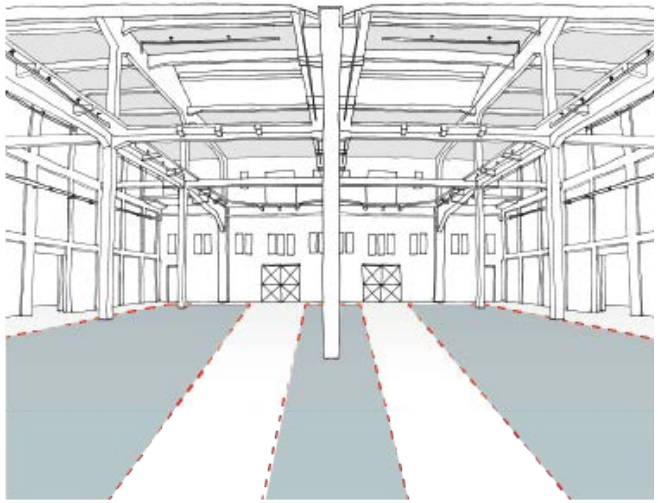


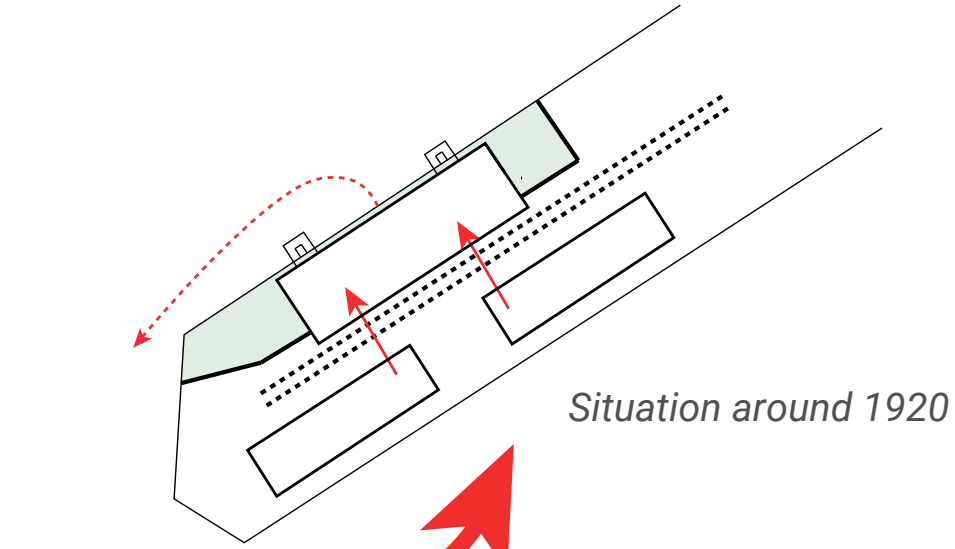
Image 4: Diagram of Organisation of Storage

The cotton was stored inside five different compartments. Where each bale must go, was determined by ownership and a careful quality selection.
Each compartment stored three rows of piled product. Little white tiles on the floor indicated the area of one row.
The middle compartment only consisted of two rows, as it was smaller in size.

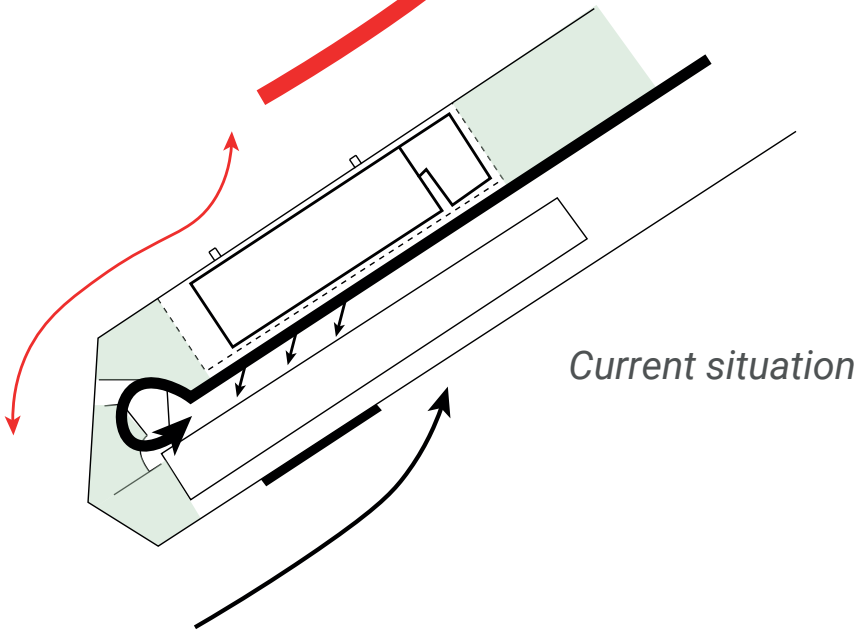
Image 1: 'Cotton Storage', Photograph from Rotterdamsstadsarchief, retreived on 16-02-20
Image 2: 'Diagram of Cotton Storage', drawing by Z. Spook, based on:
1: photograph of C. van Boon
Image 3: 'Organisation of Storage', photograph of C. van Boon
Image 4: 'Diagram of Organisation of Storage ', drawing by Z. Spook, based on:
1: photograph of C. van Boon.

MOVEMENT

HOW DID THE GENERAL FLOW CHANGE?



Situation around 1920



Current situation

Besides the surrounding water, the two pier's on the North side of the building are one of the few remaining elements with a relation to the historic harbour trading business.
Based on the observations that are made via Google Maps and the site visit, the Keilestraat is still a busy and important place for the transhipment of goods. The Katoenveem however, does no longer participate in this flow of goods. The drawing shows that the Lekhaven is mainly used by the wharf of the other side of the water. The Keilestraat is now full of trucks that regulate the import and export for the Rotterdam Fruit Wharf.

Image,1: 'Diagrams of product flow', drawing by Z. Spook, based on:
1: Google maps

ROUTING

WHAT WAS THE FLOW OF COTTON INSIDE THE BUILDING?

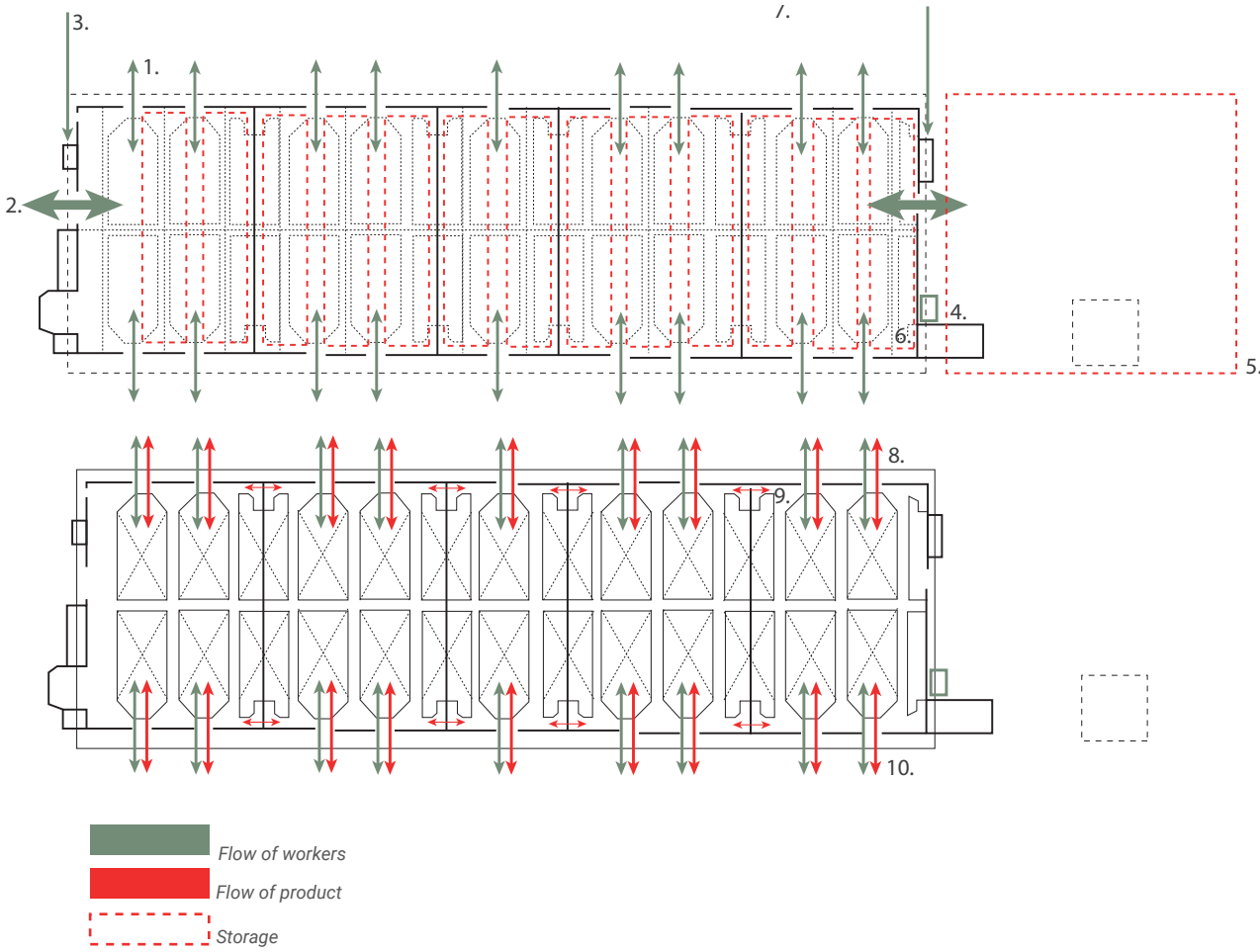


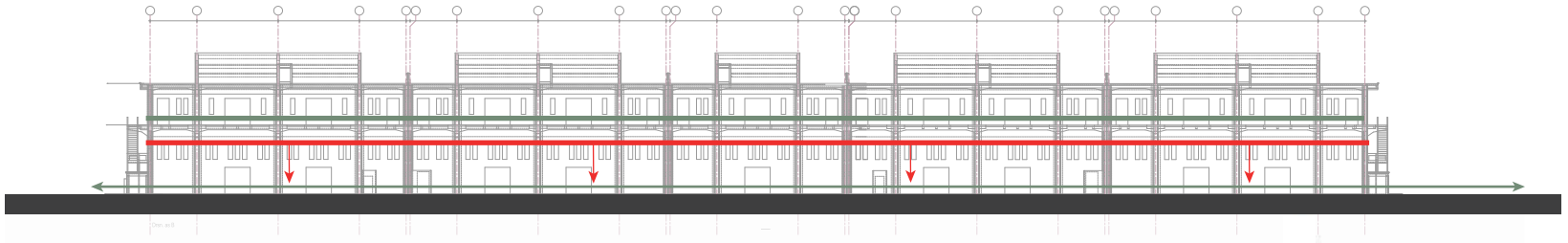
Image 1: Different flows through the building

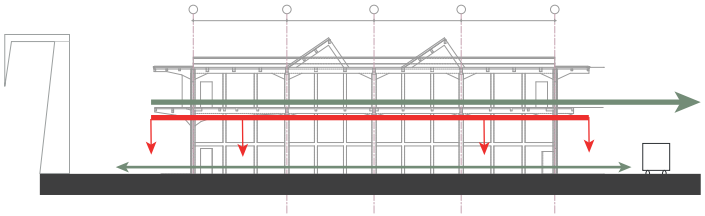
The smallest bales were carried inside manually by the workers. They carried the cotton through the large green steel doors on ground level [1]. The largest doors, on the East and West side of the building were used to bring in large equipment and machinery [2].
The two stairs outside of the building were a direct route to the loading balcony's [3].
The bales that could not be carried by hand were lifted by cranes [7] and transported inside through the many facade openings on the first floor [8]. An electric elevator was another way for vertical transport [4]. When inside, the cotton was moved horizontally from one compartment to the other, through steel shutters [9]. The storage was then organised by little white tiles, as we will discuss in the next chapter [6].
The steel bridges, connected to the HA-lijn warehouses, were used when the product came from, or needed to go to the large sea ships [10].
Sometimes, the cotton was first stored outside temporarily [5], before being carried onto the transport system [1].

Image 1: 'Different flows through the building' drawing by Z. Spook, based on:
1: M. Enderman and R. Steinvert, 'Bouwhistorische verkenning Katoenveem Keilestraat 39 , Rotterdam, Utrecht (2005), 16.

ROUTING

WHAT WAS THE FLOW OF COTTON INSIDE THE BUILDING IN RELATION TO THE PEOPLE?





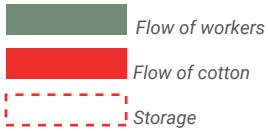


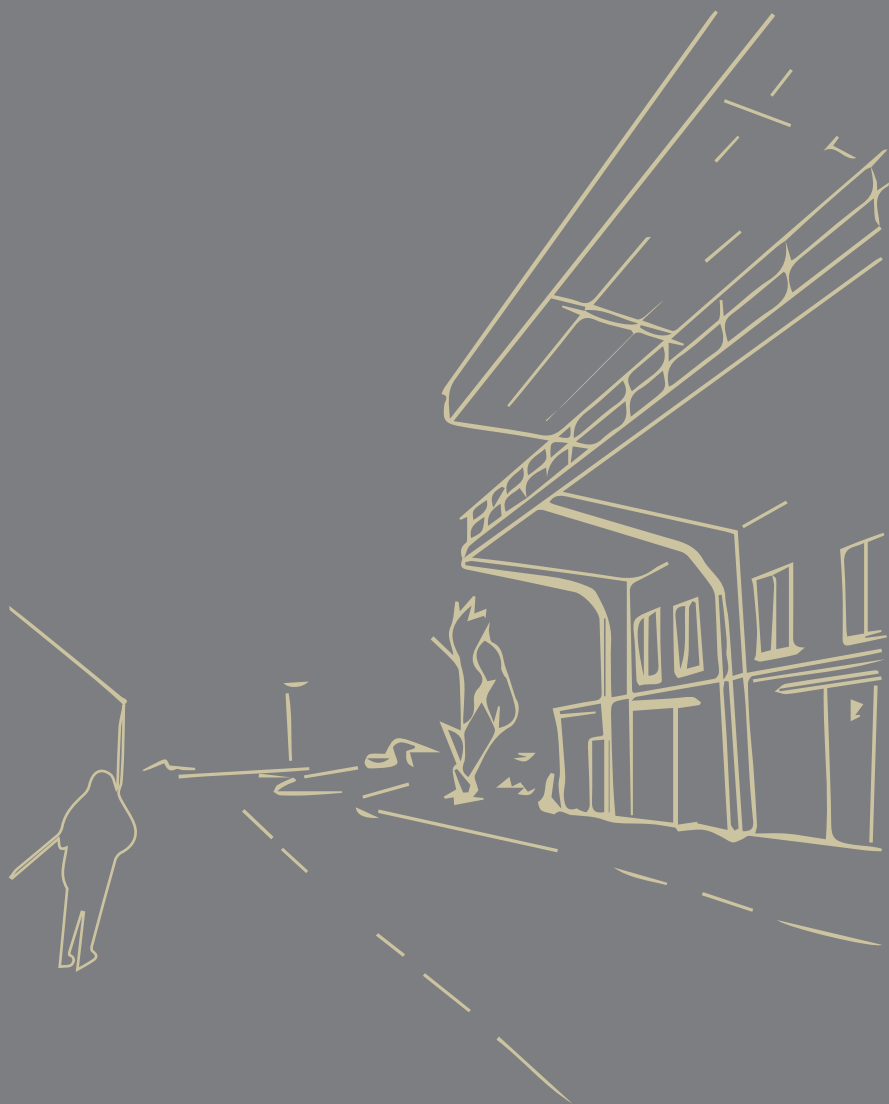
Image 1: Different flows through the building

As mentioned before, many additions and extensions were attached to Katoenveem. The cranes, the Conveyor system, the steel walking bridges and the piers were all part of a so called 'moving system'. Katoenveem needed all these additions to operate and function properly. This system owes it's succes to the use of innovative electrical technology. However, the building did rely strongly on the people working there. They operated the system by pushing the buttons for each move individually.

The workers were also needed for sampling and selection, which was done by hand.
This deviation between 'flow of people' and 'flow of machinery' flow inside the building, is also visible in routing and organisation [1].

Image 1: 'Different flows through the building' drawing by Z. Spook, based on:
1: M. Enderman and R. Steinvert, 'Bouwhistorische verkenning Katoenveem Keilestraat 39 , Rotterdam, Utrecht (2005), 16.

SPACIAL STRUCTURE



ORIENTATION

WHAT IS THE ORIENTATION OF THE BUILDING?

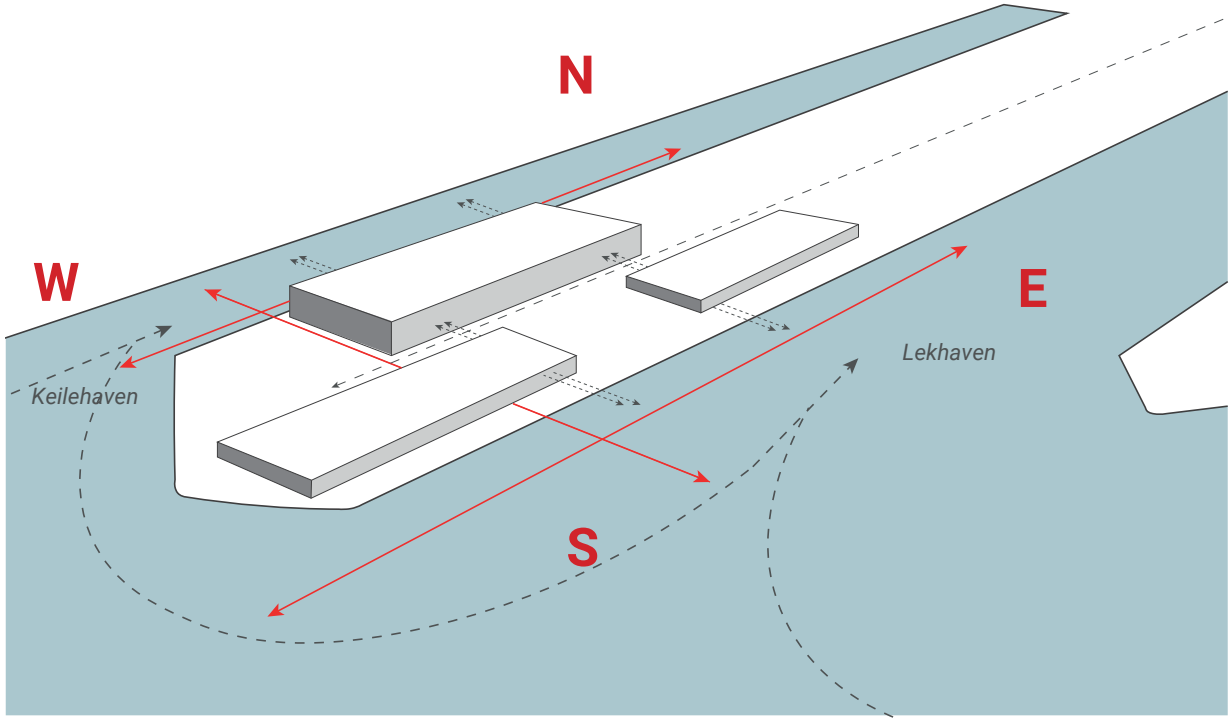


Image 1: Orientation with regards to the harbour

As mentioned earlier, Katoenveem is a very functional building, completely designed for efficiency.
Because of this, the building needed as much facade as possible facing the waterfront of both the Lekhaven and Keilehaven. The elongated shape is a direct result of the functionality of the building in relation to the harbour.

Image 1: 'Orientation with regards to harbour connection' drawing by Z. Spook, based on:
1: Google Maps

MASS & SHAPE

WHAT IS THE MASS / SHAPE OF THE BUILDING?

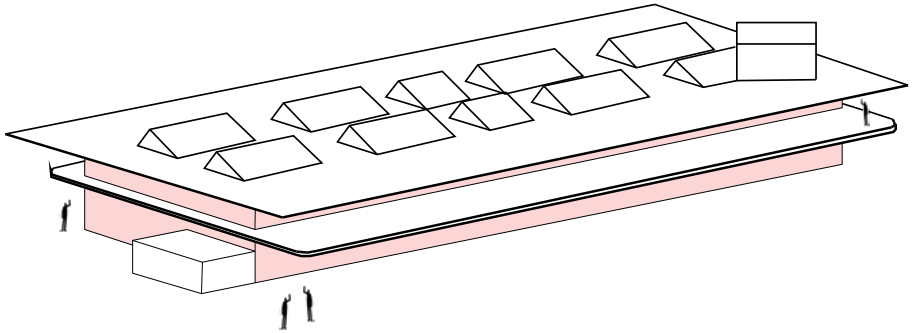


Image 1: Mass / Scale

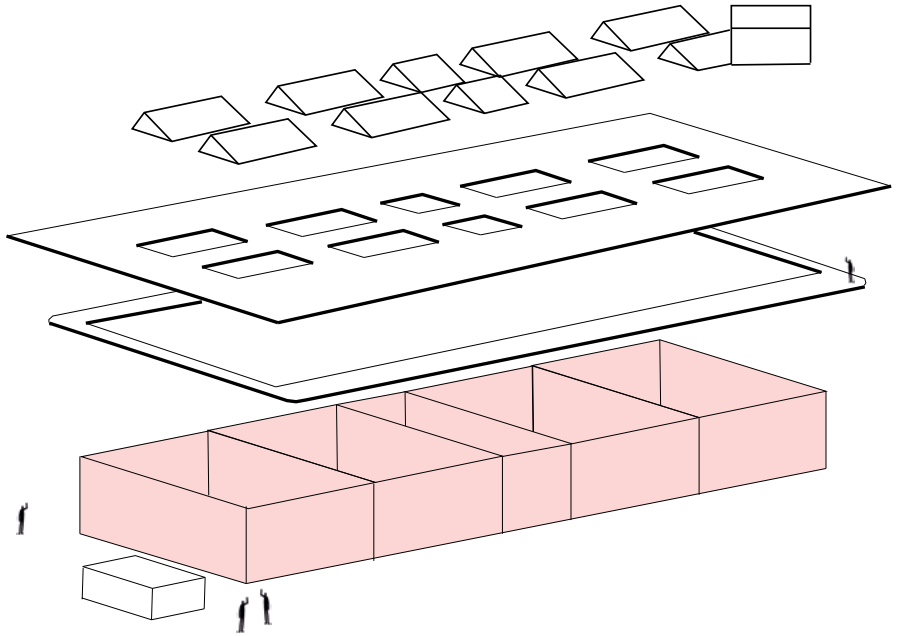


Image 2: Proportions in exploded view,

Image 1 shows the large size and scale of the building. The exploded view shows us that the mass is mainly determined by the repetition of compartments as one giant storage box. All other elements relatively small in comparison to this.

Image 1: 'Mass/Scale' drawing by Z. Spook, based on:
1: Own drawing
Image 2: 'Proportions in exploded view' drawing by Z. Spook, based on:
1: Own drawing

MASS & SHAPE

WHICH BUILDING ELEMENTS WERE PART OF KATOENVEEM, AND WHICH ARE STILL PRESENT?

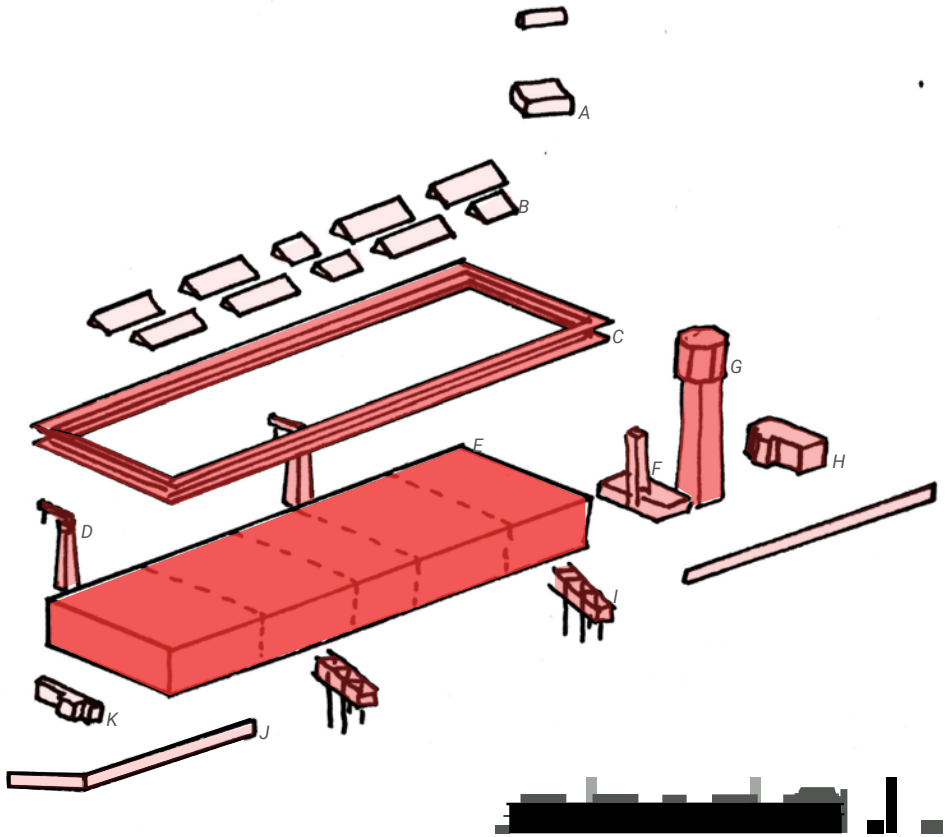


Image 1: Building Elements and contour in Original Situation

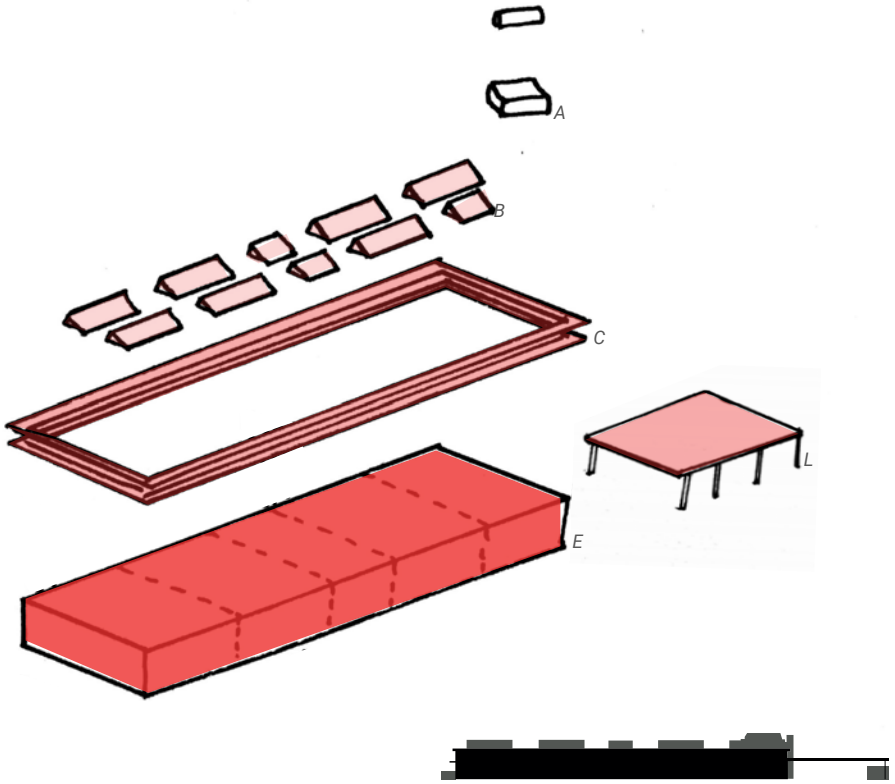


Image 2: Building Elements and contour in Current Situation

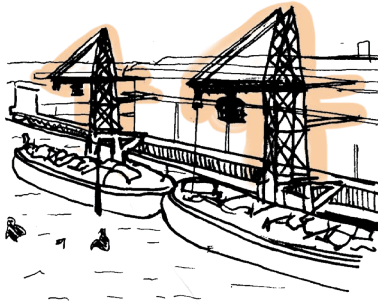
Image 1 shows that over the years, the Katoenveem has lost a lot of its 'add-ons'. This was due the the fact that it lost its function. As a result of this the giant storage box became even more significant for the mass / shape of the building.

A: Sample room
B: Skylights
C: Overhang and balcony
D: Cranes
E: Storage
F: Office and elevator
G: Watertower
H: Pomp building
I: Steel walking bridges
J: Concrete wall
K: Offices
L: Roof for outside storage

Image 1: 'Building Elements in Original Situation' drawing by Z. Spook, based on:
1: Own drawing
Image 2: 'Building Elements in Current Situation' drawing by Z. Spook, based on:
1: Own drawing

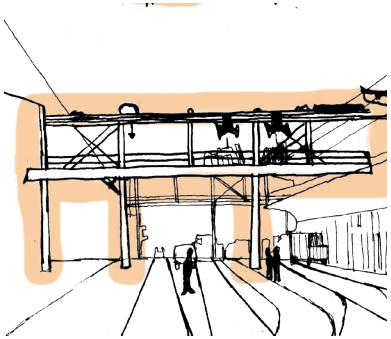
REMOVED ELEMENTS

WHICH CHARACTERISTIC ELEMENTS ARE ABSENT OUTSIDE KATOENVEEM?



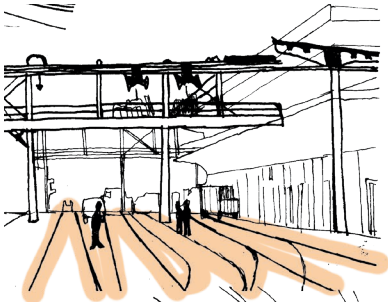
1. Freight Cranes

The steel freight cranes were used to load the goods onto the smaller ships that arrived into the Keilehaven. Similar cranes were probably used at the side of the Lekhaven to offload the bigger ships into the two warehouses located there.
The freight cranes were demolished after 1966, when the building lost its function.



2. Transportation bridges

These bridges formed the connection between Katoenveem and New Orleans and Galveston warehouses located at the Lekhaven. They were used for the transportation of cotton bales and served as walkways for the workers [1].
There was a loading system for goods wagons as well.
The bridges were demolished around 1931, together with the warehouses.

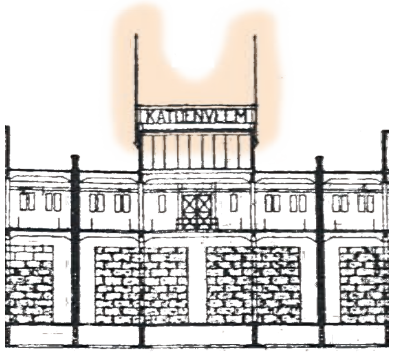


3. Train tracks

The train tracks were used by trains with freight wagons that transported the cotton destined for export.
The train tracks were removed when at some point in time the road was renewed, most probably after 1966.

4. Water tower

The watertower served as an important element in the fire safety of Katoenveem, as it was connected to the sprinkler system in the building. The water tower was demolished in 1966.
The pedestal of the water tower was demolished much later, in 1988[2], together with the small office building located next to the watertower.



5. 'Katoenveem'-sign

In a historical facade drawing of the building[3] a sign 'KATOENVEEM' located in the middle of the roof is visible.
The sign existed, although no information is available on when it was removed from the roof of Katoenveem

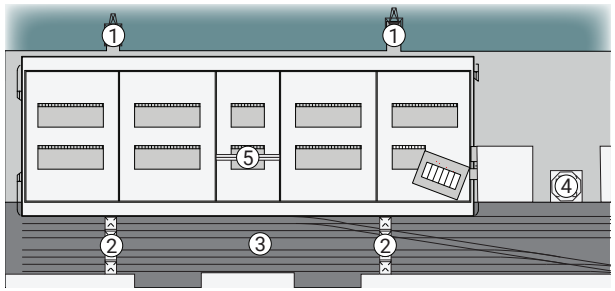


Image 1-5 'Characteristic elements absent outside of Katoenveem', by I.Louer

1 Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA, p. 35
2 Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA, p. 38
3 Van Dam, H. (1919). "The Cotton warehouse of Katoenveem", in: The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), p. 69

SCALE

WHAT USED TO BE THE SCALE OF THE BUILDING ON COMPARISON TO WHAT IT IS NOW?

To research the difference in building scales over time we analysed photographs. This way we study the size of surrounding elements in comparison to the Katoenveem.

In both drawings of the historic situation, the Katoenveem has a quite prominent position and size. The third and fourth image show the growth of surrounding elements over time. As told in the previous chapter; harbour development, warehouses and buildings in general got bigger over time, industrial machinery and even the passing ships are much larger (as mentioned in chapter: Harbour development).

As a result of this the Katoenveem is of a smaller building scale now, than it was in the late 1900's.

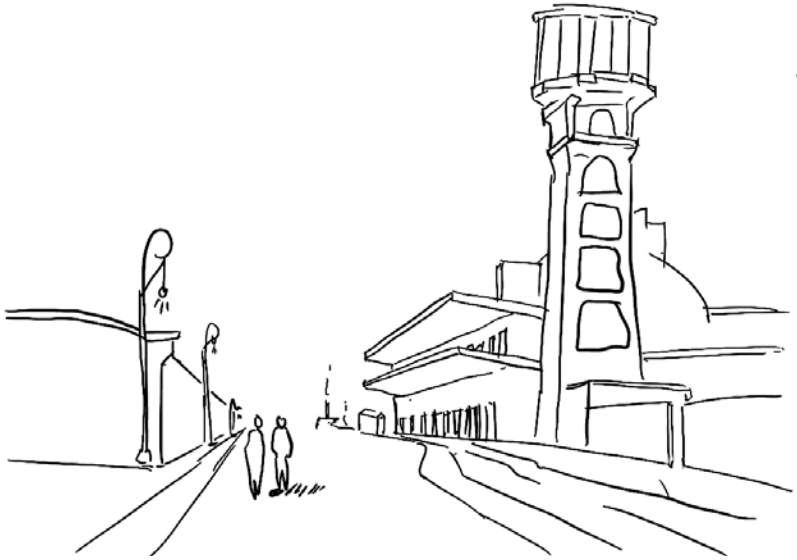


Image 1: Builiding Scale around 1932

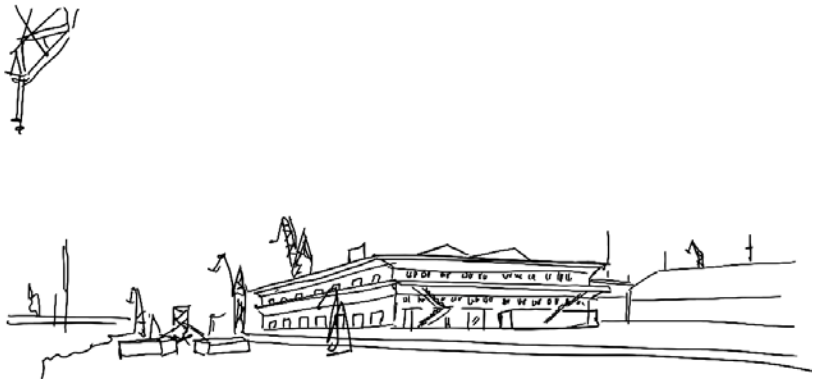


Image 2: Builiding Scale around 1930

Image 3: Builiding Scale in Current Situation

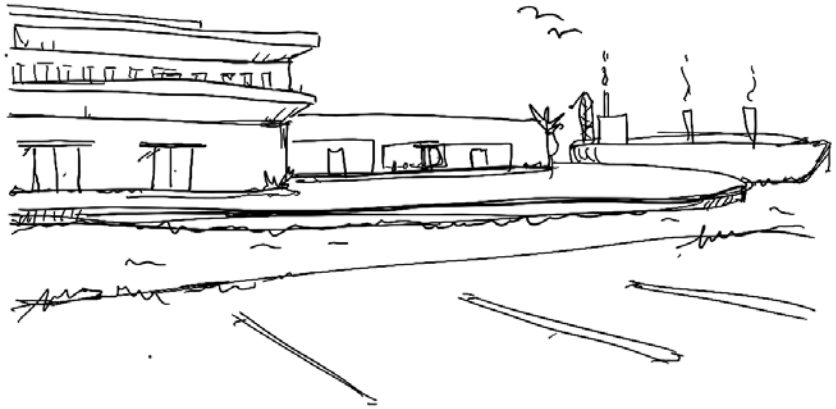


Image 4: Builiding Scale in Current Situation

Image 3,4: 'Building Scale in current situation' by Z. Spook, based on:
1: Own photographs.
Image 1,2: 'Building Scale around 1930' by Z. Spook, based on:
1: Photographs of Archive of Municipality.of Rotterdam

SCALE

WHAT IS THE HUMAN SCALE?

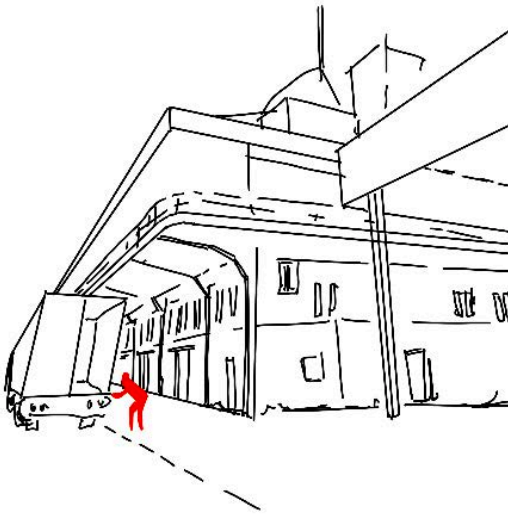


Image 1: Human scale exterior 1

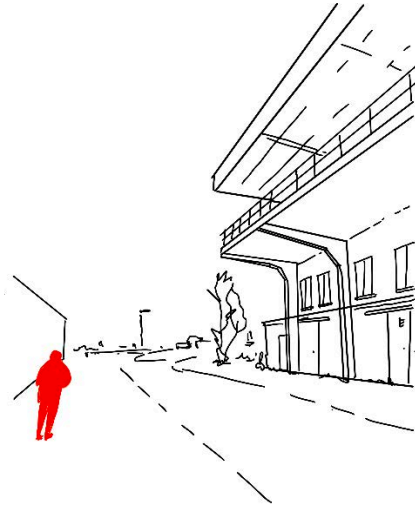


Image 2: Human scale exterior 2

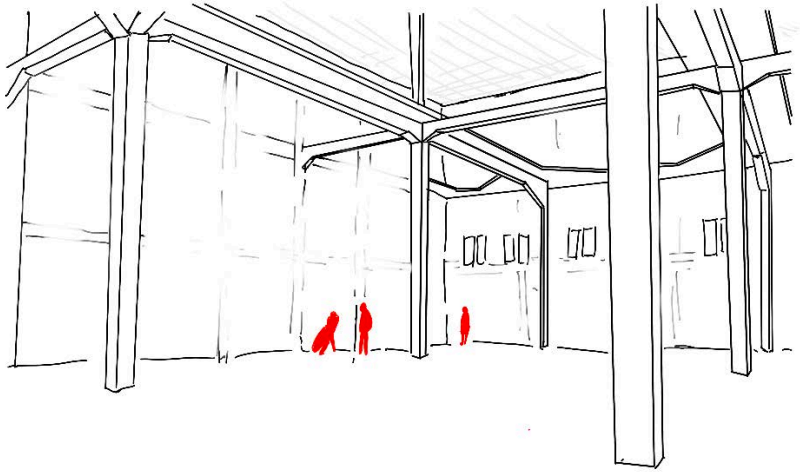


Image 3: Human scale interior

The study of the human scale is done by researching photographs. In chapter ‘Skin’, we research the human scale in comparison to the facades further.
The images show a different scale on the interior and exterior of the building. The large balcony and overhang on the exterior break up the space a little bit. As where in the interior, you only experience a huge open spacious environment, in which people feel very small.

Image 1,2 & 3: ‘Human Scale’ drawings by Z. Spook, based on:
1: Own photographs site visit
2: Photographs of C. van Boon

SCALE

WHAT IS THE SCALE OF COTTON BALES?

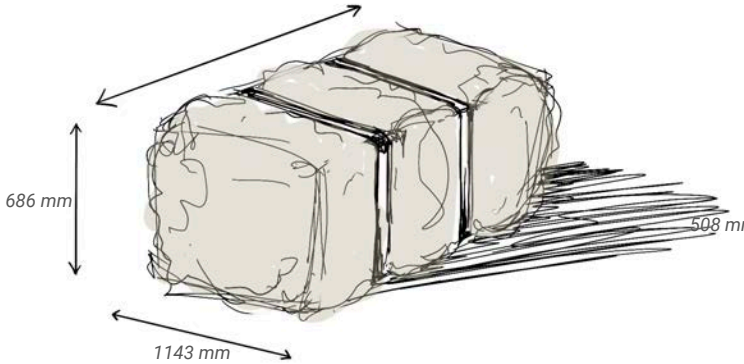


Image 1: American Cotton

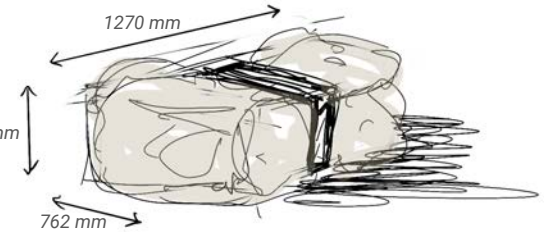


Image 2: Egyptian Cotton

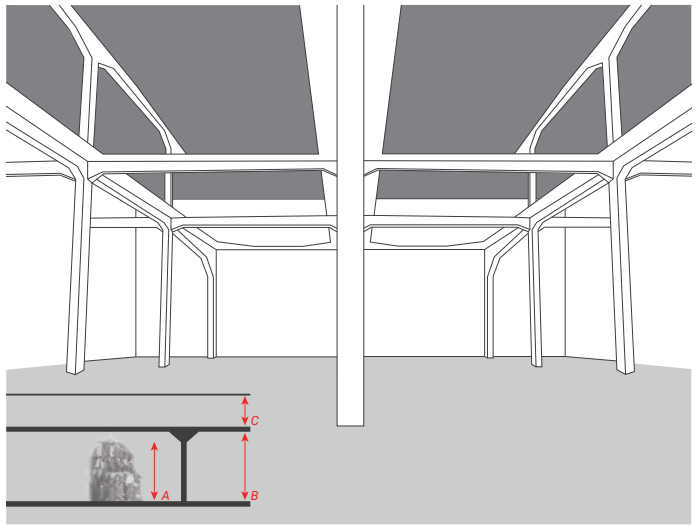


Image 3: Interior dimensions related to cotton

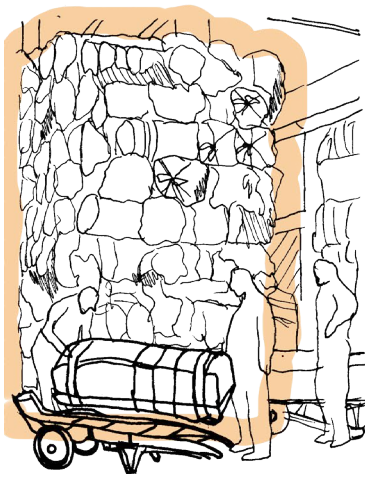


Image 4

COTTON BALES

The Katoenveem is build especially to be a warehouse for cotton storage. The scale of the cotton played a big rol in determining the dimensions of Katoenveem.

First we look at the size of a single bale. The size dependent on the heritage of the import. American bales were larger than bales coming in from Egypt.
All the bales however, contained more or less the same amount of cotton. The size of the bale was determined by de quality of the product and the way it was pressed into its shape. The pressing machines and their standards differ per country [1].

The historic photo (Image X) shows rather roughly pressed bales. This had to do with the samples that were taken from each bales.

COTTON STORAGE

The Katoenveem used a really innovative electrical transport system; the conveyor system.

Because of this the workers were able to store the cotton in piles up to seven metres. Image X (on the next page) shows the structure of columns and beams in relation to this maximum height of piles.

On the ground floor the dimensions follow the scale of cotton and on the first floor the dimensions are determined by the human scale.

Since this is a very efficient and functional building, no extra height was needed and added [2].

Image 1: 'American Cotton' drawing by Z.Spook, based on:
1: Johnson, W. H., & Himbury, W. H. (1926). Cotton and its production. London: Macmillan and Co.
Image 2: 'Egytian Cotton' drawing by Z. Spook, based on:
1: Johnson, W. H., & Himbury, W. H. (1926). Cotton and its production. London: Macmillan and Co.
Image 3: 'Interior Dimensions in Relation to Cotton', drawing by Z. Spook, based on:
1: http://rijksmonumenten.nl/monument/524363/katoenveem:-pakhuis-tegenwoordig-bevindt-zich-hier-atelier-van-lieshout/rotterdam/
2: https://www.watertorens.eu/torens/Rotterdam/Keilestraat%202/Beschrijving%20monument.html
Image 4: Louer, I. (2020). Cotton bales. [Illustration]

SPATIAL SEQUENCE

WHAT IS THE SPATIAL SEQUENCE WHEN ENTERING THE KATOENVEEM?

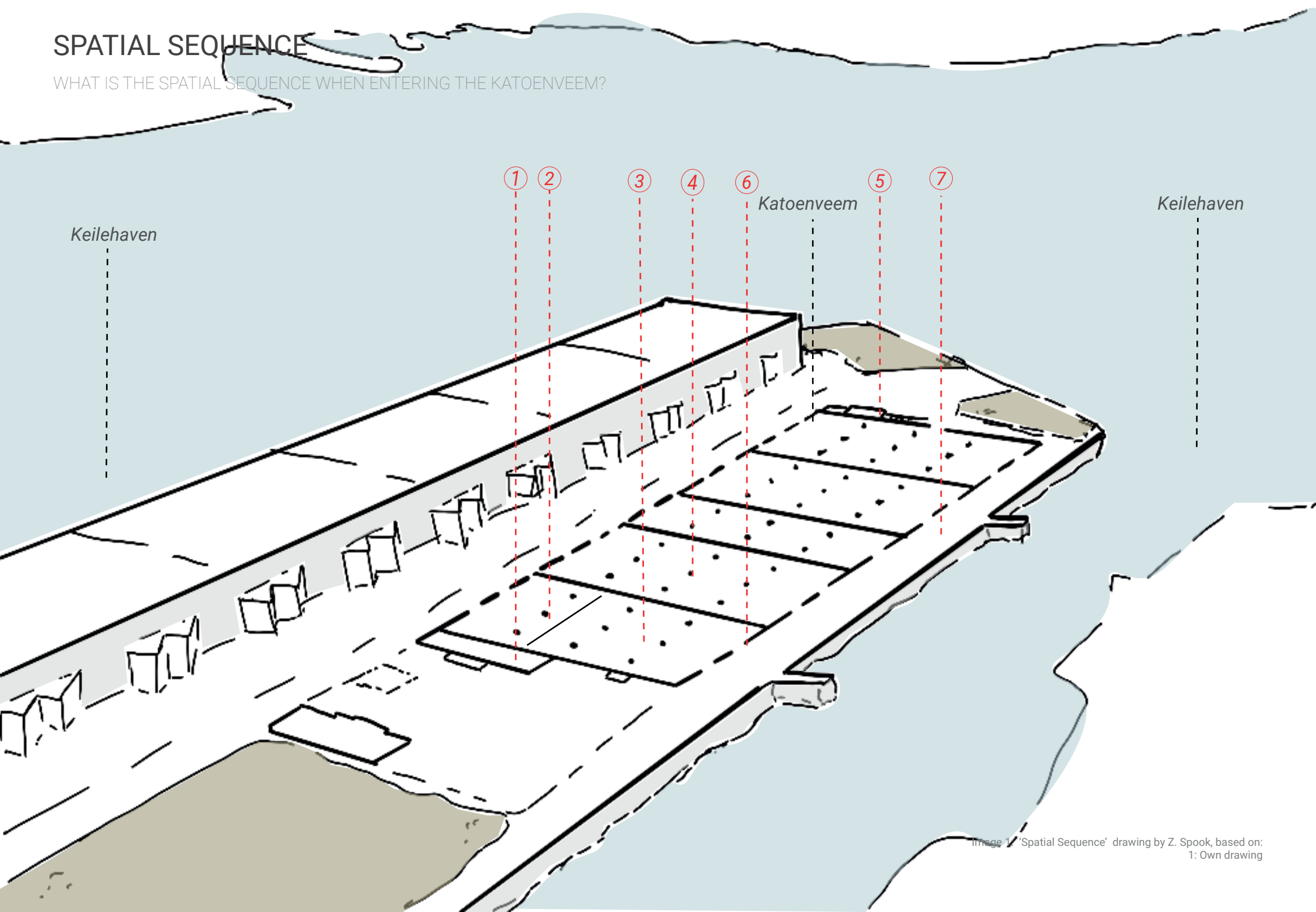


Image 1: 'Spatial Sequence' drawing by Z. Spook, based on:
1: Own drawing

SPATIAL SEQUENCE

WHAT IS THE SPATIAL SEQUENCE WHEN ENTERING THE KATOENVEEM?

Up until this point in our research, we were unable to collect any information and photographs of the interior of most of the building extensions. We hope to visit the building later in the studio and complete this part of the study.

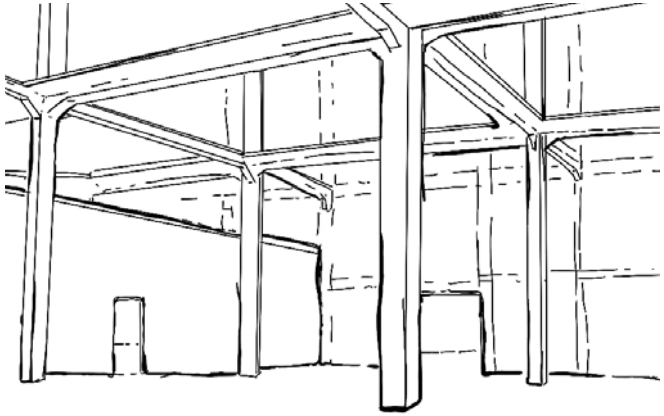


Image 1: Spatial sequence 1/2/5

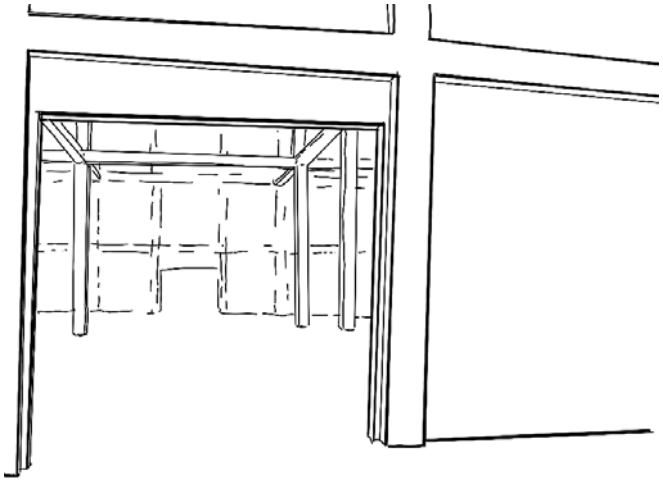


Image 2: Spatial sequence 3

Image 3: Spatial sequence 4

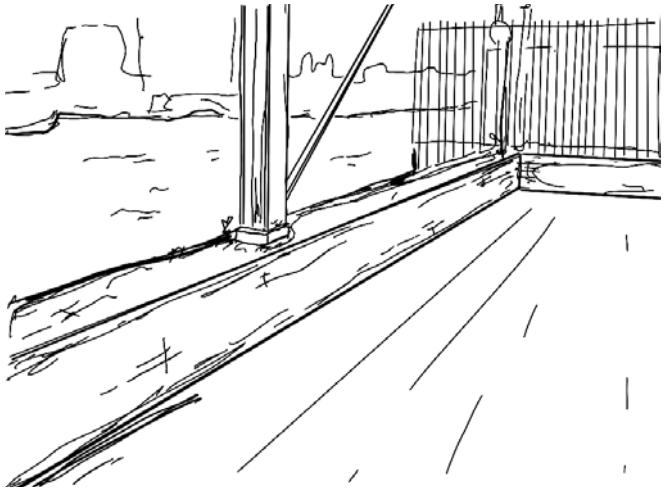


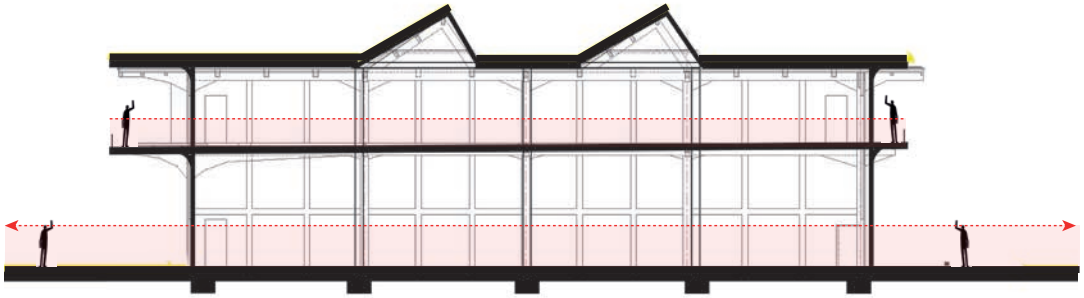
Image 4: Spatial sequence 6

Image 5: Spatial sequence 7

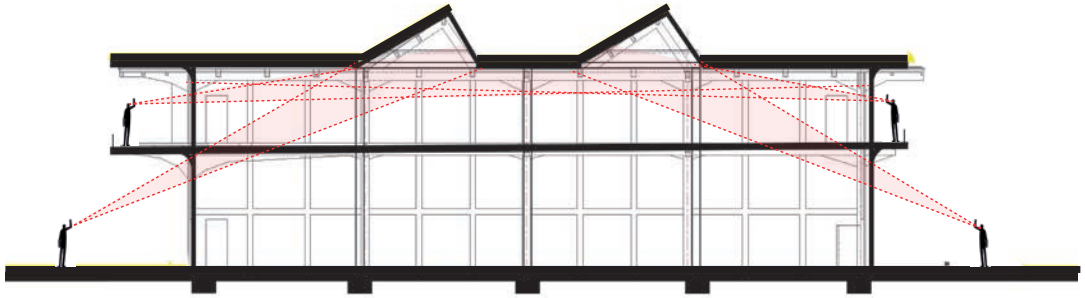
Images 1-5: ‘Spatial Sequence 1 t/m 7’ a drawing by Z. Spook, based on:
1. Own photographs
2. Photograph by C. van Boon
3. Photograph by A. Loef

INSIDE / OUTSIDE

WHAT IS THE RELATION BETWEEN THE INSIDE AND OUTSIDE?



1 Physical connection between inside and outside, Drawing by Zora Spook



2 Visual connection between inside and outside, Drawing by Zora Spook

To research the buildings relation between inside and outside, a devotion must be made between the physical and visual relation. The many openings in the facade create a strong physical relation with the outside. This is a result of the original function of the building. The visual connection however, is a different story. Since all the windows are above eye-level, there is a poor relation between the inside and outside. This makes sense in combination with the historic design requirements for warehouses. So, even though the Katoenveem is a very introvert building, it used to have a strong relation with the outside environment.

Image 1: 'Physical connection between inside & outside' drawing by Z. Spook, based on:
1: Own drawing
Image 2: 'Visual connection between inside & outside' drawing by Z. Spook, based on:
1: Own drawing

INSIDE / OUTSIDE

WHAT IS THE RELATION BETWEEN THE INSIDE AND OUTSIDE?

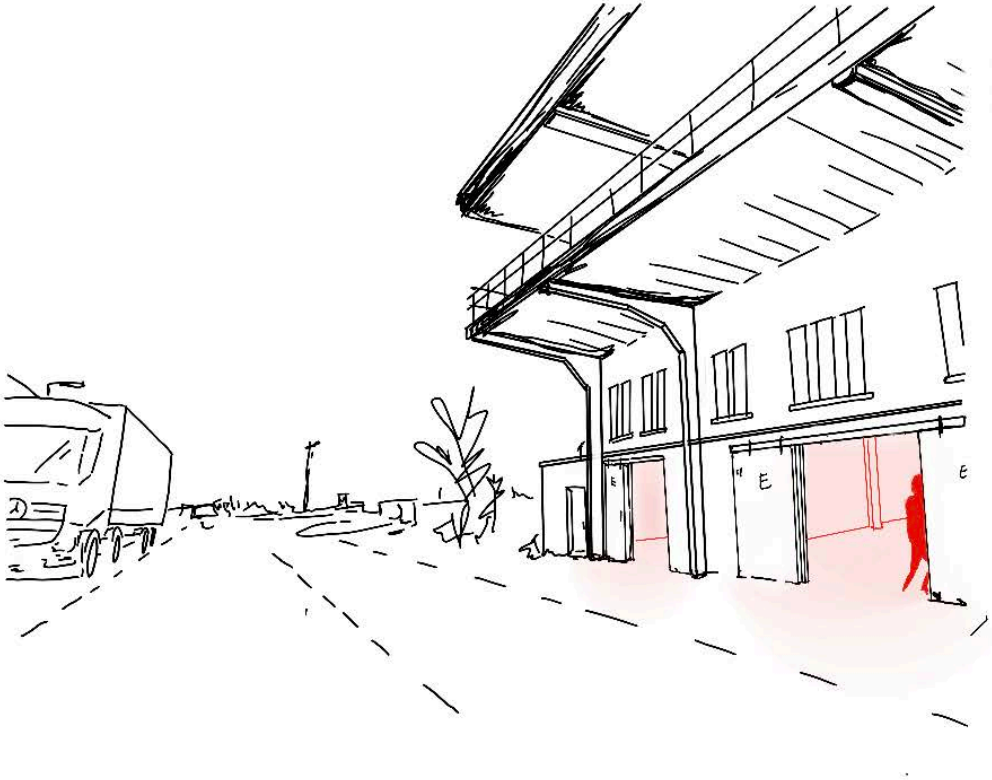


Image 1: Inside/Outside

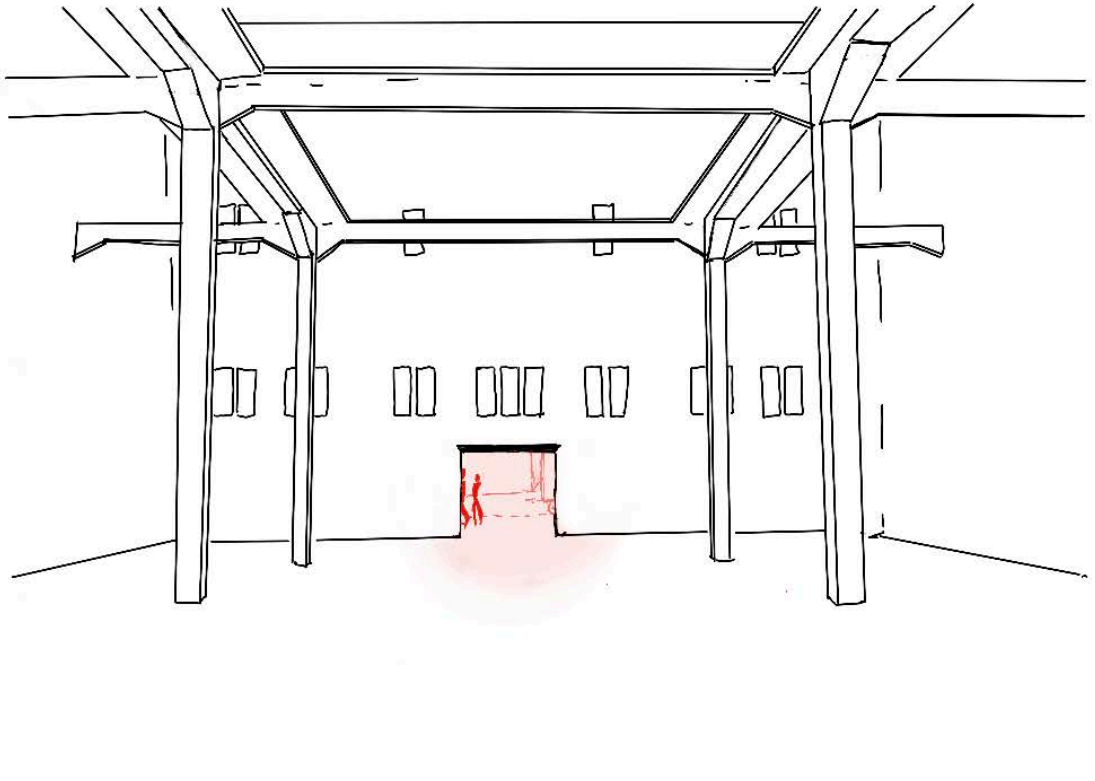
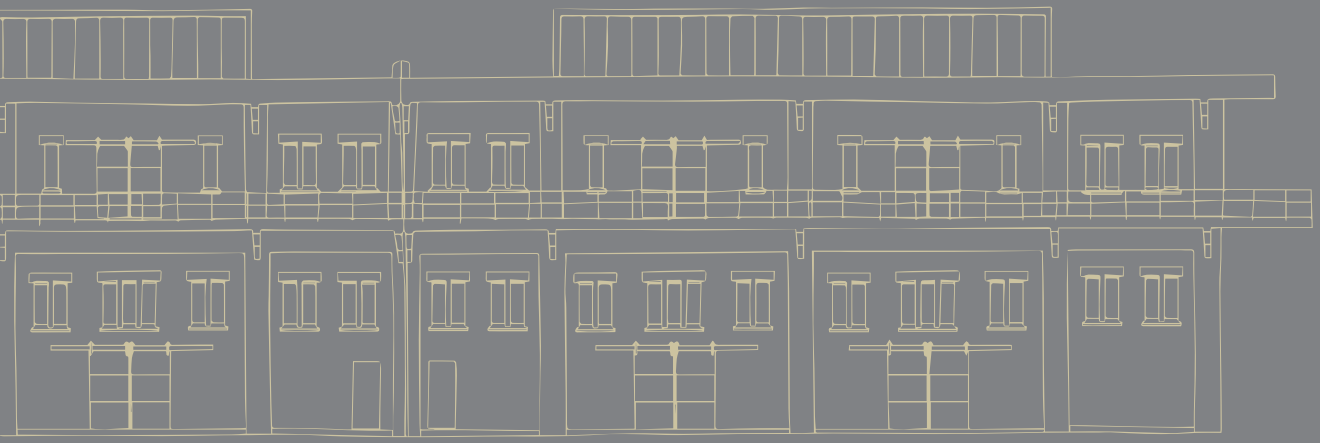
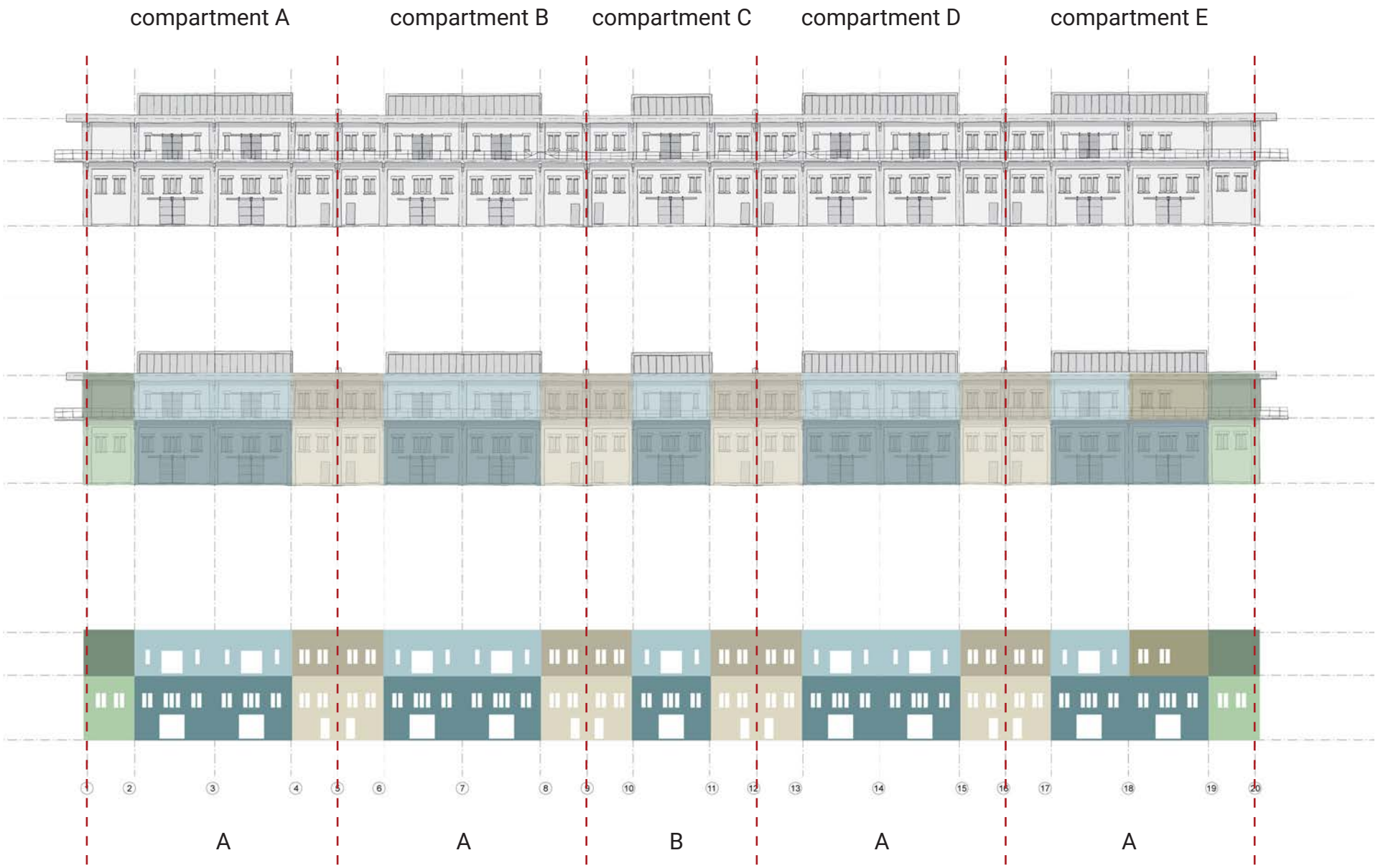


Image 2: Inside/Outside

Image 1: 'Inside / Outside' drawing by Z. Spook, based on:
1. Own drawing
Image 2: 'Inside / Outside' drawing by Z. Spook, based on:
1. Own drawing

SKIN





Kuiper, A. (2020) . Rhythm of the facade. [Illustration]

SKIN

HOW CAN THE BUILDING BE UNDERSTOOD WHEN LOOKING AT THE SKIN?

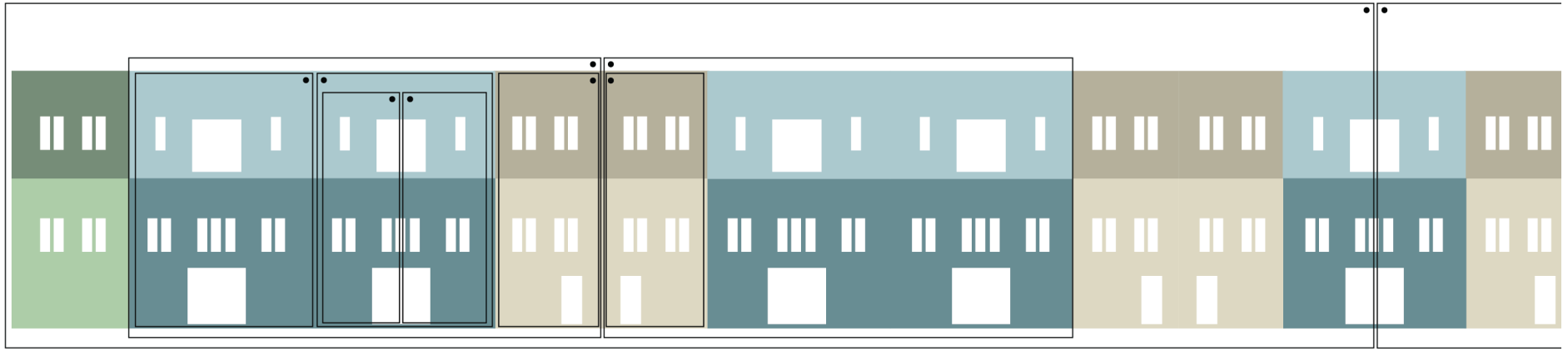
By looking at the facades in different ways and different layers, a lot can be learned about the building. All the openings in the facade have been chosen in order to facilitate the process of the Katoenveem in its best form. The placement of the doors corresponds directly to the conveyor system that transports the cotton through the building. The rhythm in the facade is organised with consistency. Identical building blocks have been used to make the composition of the longitudinal façades (north and south). At the opposite heads of the building the same consistency has been used, however elevators, stairs and new entrances have broken this pattern. The roof has a consistent rhythm and expression as well, only interrupted by the sample room angled on top.

1:200

Kuiper, A. (2020). Dimensions of the facade. [Illustration]

SKIN

IS THERE SYMMETRY IN THE FACADE?



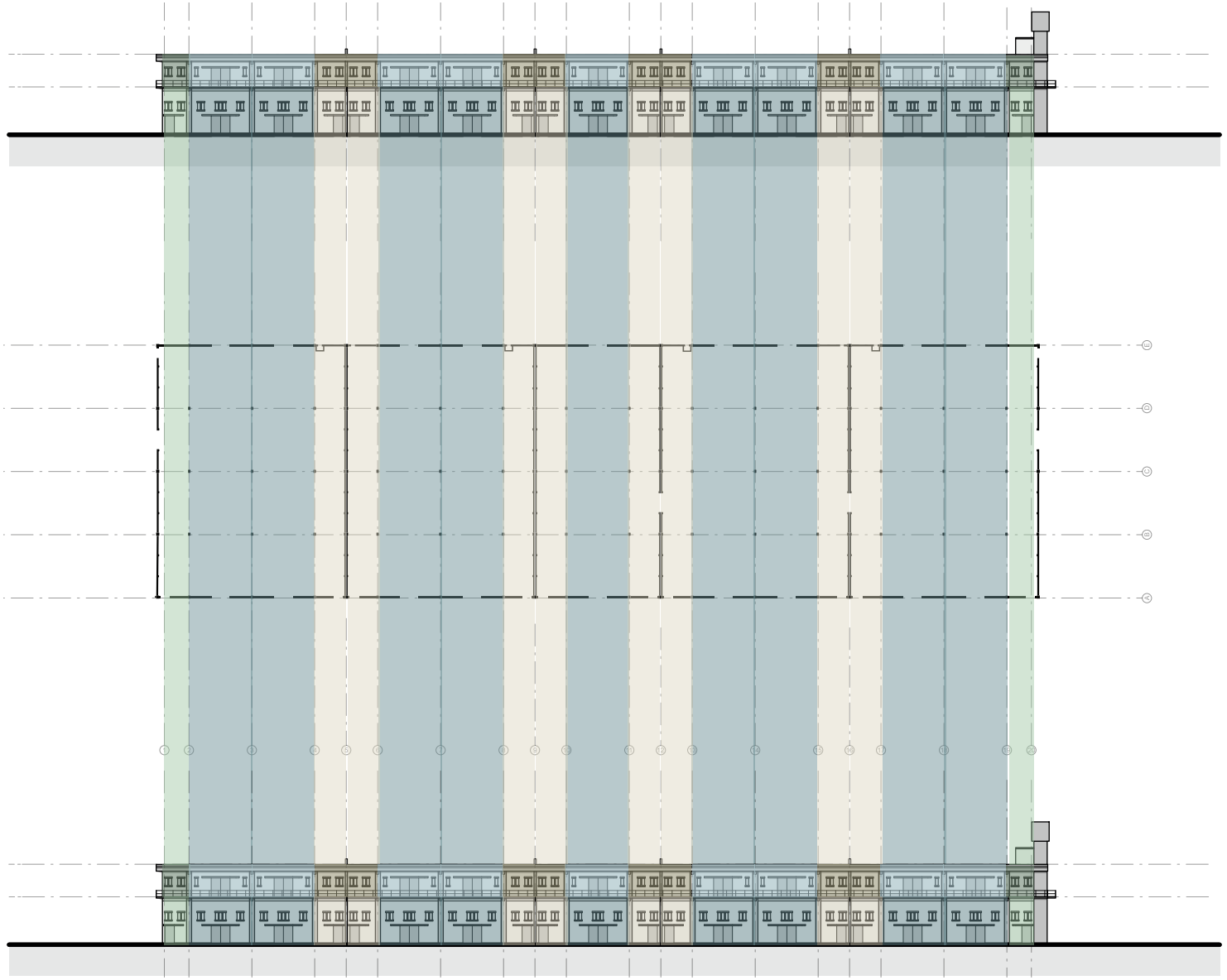
mirroring part

1:200

Kuiper, A. (2020). Mirroring parts. [Illustration]

SKIN

HOW DOES THE FACADE EXPRESSES THE STRUCTURE?



We can see that the grid clearly determines how the facade is separated in different parts.The grid sizes split the facade into smaller elements, which is further explained in the skin pages. The repetition of grid size create rhythm and symmetry along the longitude facade. The dilatation lines make the compartments more visible on the outside. One compartment consists of two primary grid sizes and two secundaire grid sizes. The middle compartment has one primary grid size.

1 Van Straalen, L. (2020). Grid and facade. [Illustration]

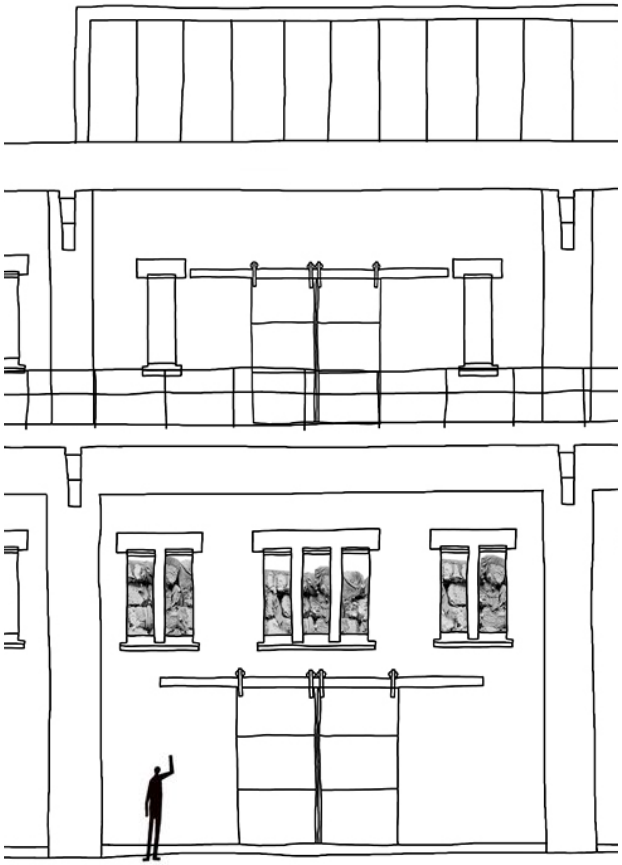
SKIN

HOW ARE THE DIMENSIONS OF THE FACADE IN COMPARISON WITH THE HUMAN SCALE?

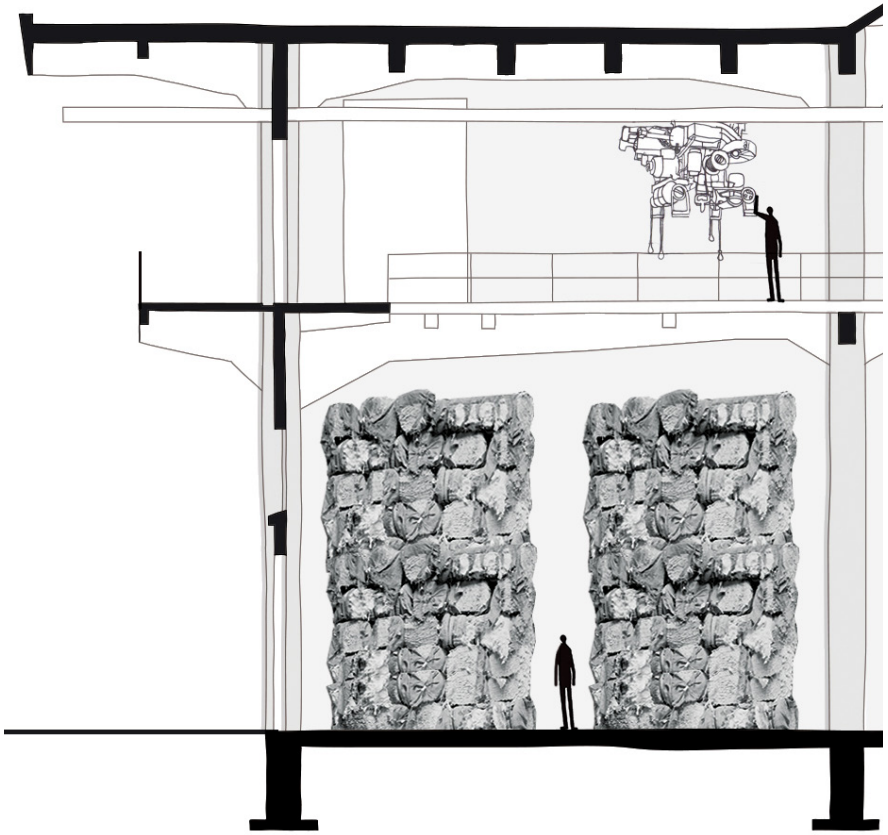
The ground floor has a height of approximately 7.5m, this height originated from the dimensions of the stacking of cotton bales. The first floor (approximately 4.5m) was used by employees to control the conveyor system.

There are relatively few windows in this building. In addition, these windows are also placed high in the building, making the building not very transparent. The assumption can be made this design consideration was probably made to protect the cotton.

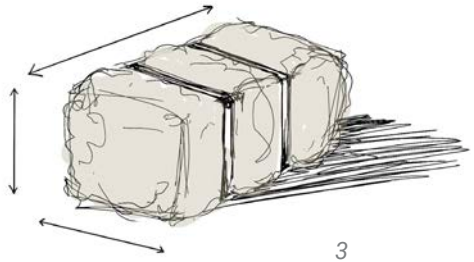
To conclude, the design choice for the dimensions of the facade arises from the function of the building. The dimensions are on an industrial scale, not on a human scale.



1



2



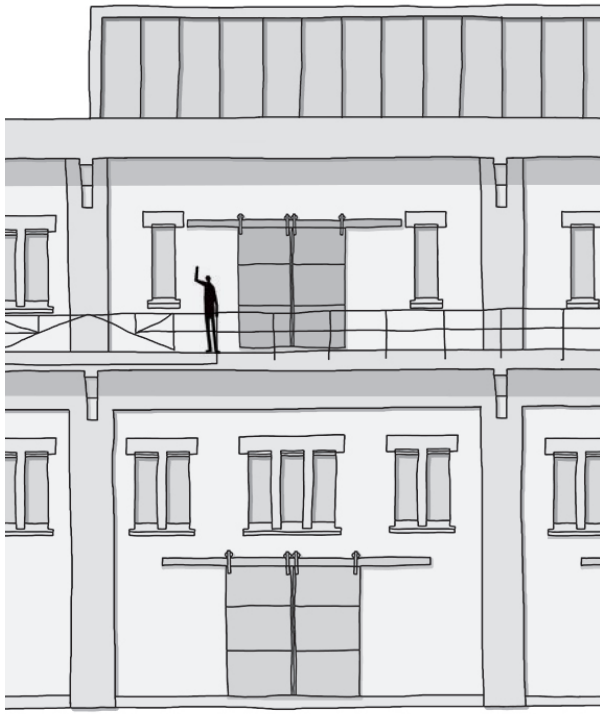
3

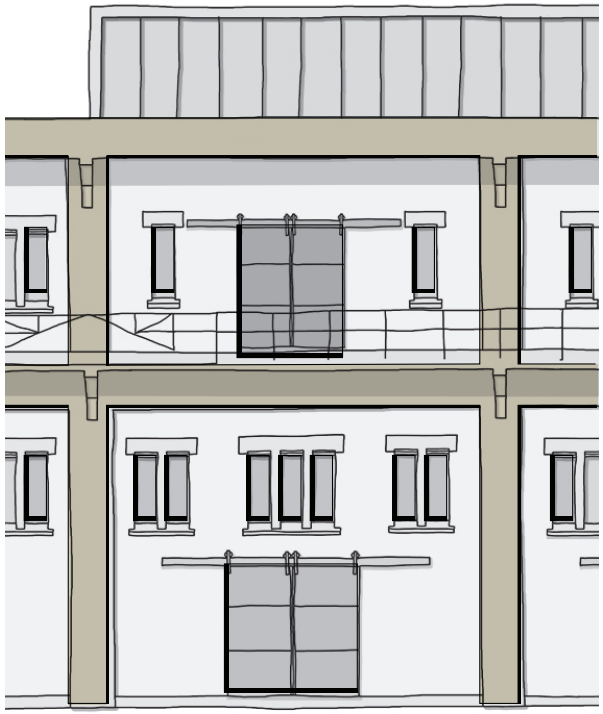
1 Kuiper, A. (2020). Section de of the north facade. [Illustration]
2 Kuiper, A. (2020). Detail of the north facade. [Illustration]
3 Spook, Z. (2020). Cotton bale. [Illustration]

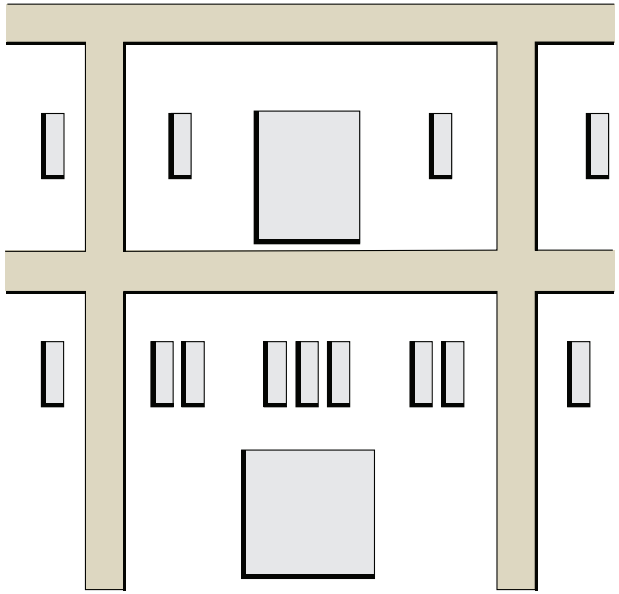
SKIN

HOW DOES THE CONSTRUCTION EXPRESS ITSELF IN THE FACADE?

The contrast visible in the facade is formed by the way the concrete is poured. Due to its industrial character, the design considerations of the architect are mostly functional driven. For example, the main load-bearing construction is robust dimensioned in comparison to the rest of the facade. Places that have no load-bearing function are slimmer. This creates a depth difference in the main supporting structure and the walls with no supporting function. The window frames are made of concrete and cement and recessed in the facade. On the exterior Kanters designed details around the windows to imitate a natural stone lintel. The detail was not needed for functional reasons thus it is an intended ornament.







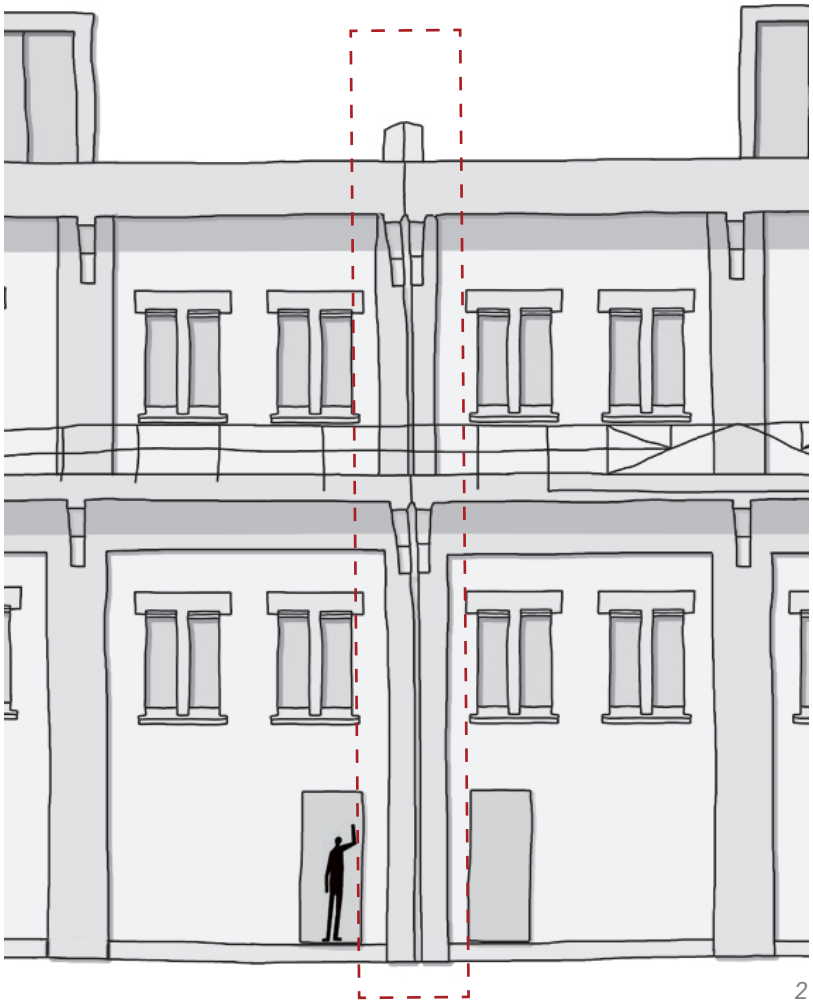
Kuiper, A. (2020). Contrast in facade analysis. [Illustration]

SKIN

HOW DOES THE CONSTRUCTION EXPRESS ITSELF IN THE FACADE?

The building consist of five compartments (A, B, C, D, and E), the partitions walls serve as dilations walls. Each compartment has its own walls, therefore on the place of the dilations, the walls are double. In between these walls is a void. The compartment walls extend above the roof construction and the cavity in between them is also visible. Every compartment has its own drainage.

1



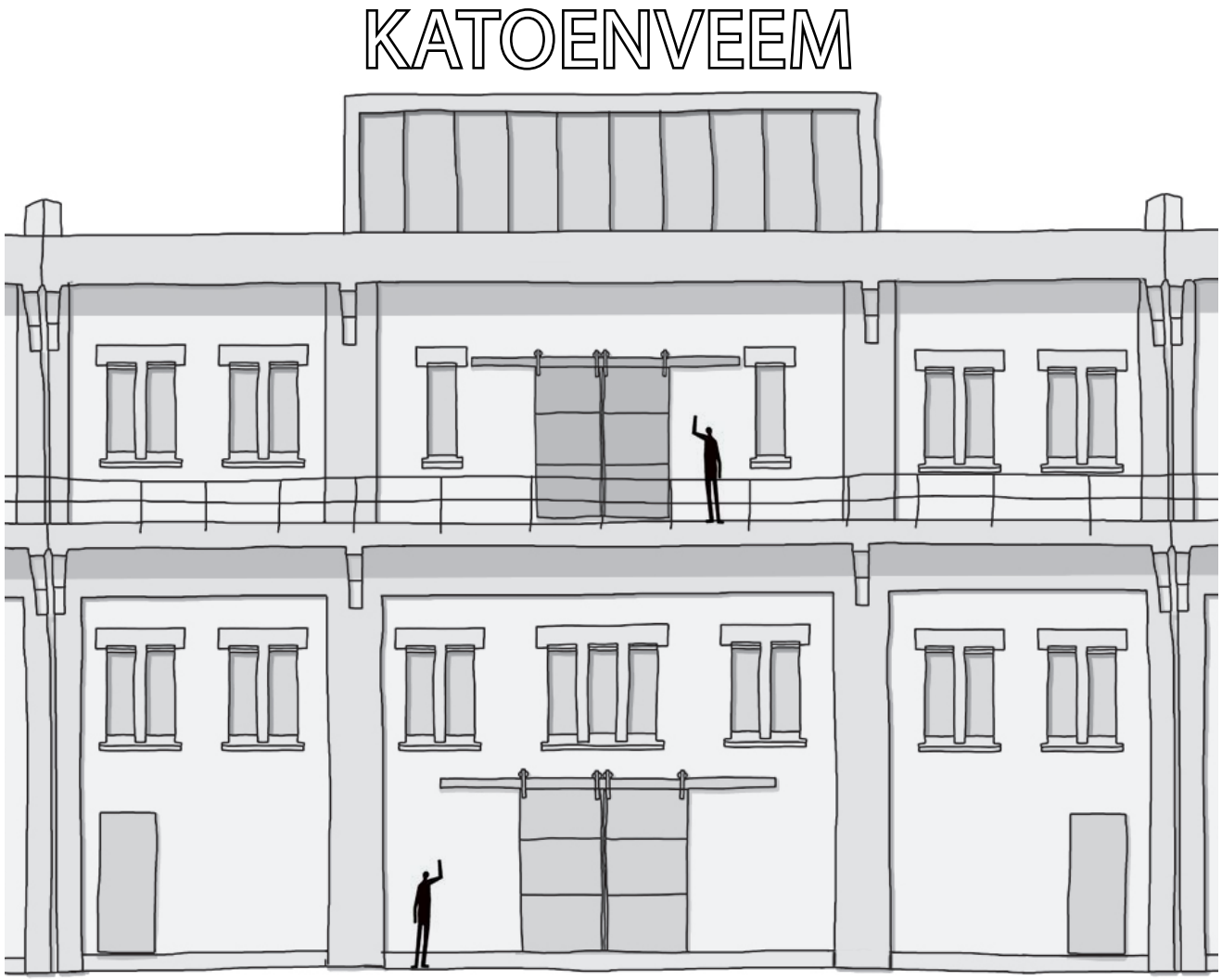
2

1 Kuiper, A. (2020). North facade details. [Photo]
2 Kuiper, A. (2020). Detail of the north facade. [Illustration]

SKIN

WHY IS THE MIDDLE COMPARTMENT SMALLER?

The question ‘Why is the middle compartment smaller?’ remains unsolved. However a few assumptions can be made. The first assumption is that the combination of the optimal compartment size with the parcel size led to one compartment having to be smaller. Another option is that the smaller middle compartment related better to the building that used to be on the opposite of the street. A third assumption is that the middle compartment was designed to emphasize the symmetry of the building. Lastly it is possible that it was done for representative reasons, thus that the middle compartment being smaller was a form of monumentality or ornamentation.



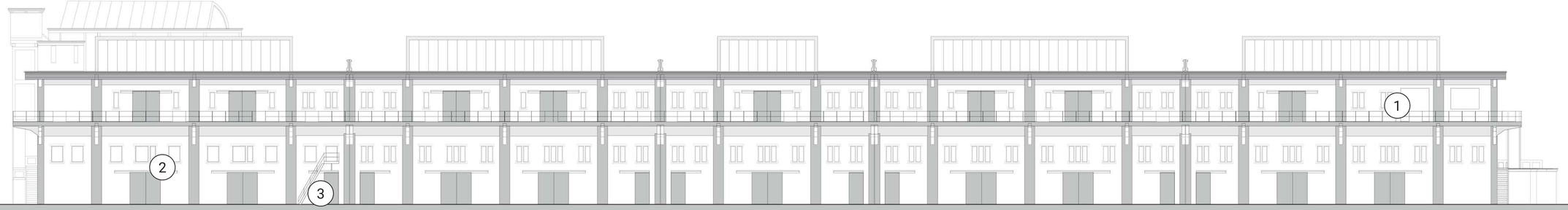
Kuiper, A. (2020. Middle compartment. [Illustration]

SKIN

CURRENT SITUATION NORTH FACADE

1. Unknown situation
2. Non original windows
3. Newly added staircase

(research will be explained in annex 3)



1:200

Kuiper, A. (2020). Current situation north facade. [Illustration]

SKIN

OWN INTERPRETATION OF THE ORIGINAL SITUATION NORTH FACADE

1:200

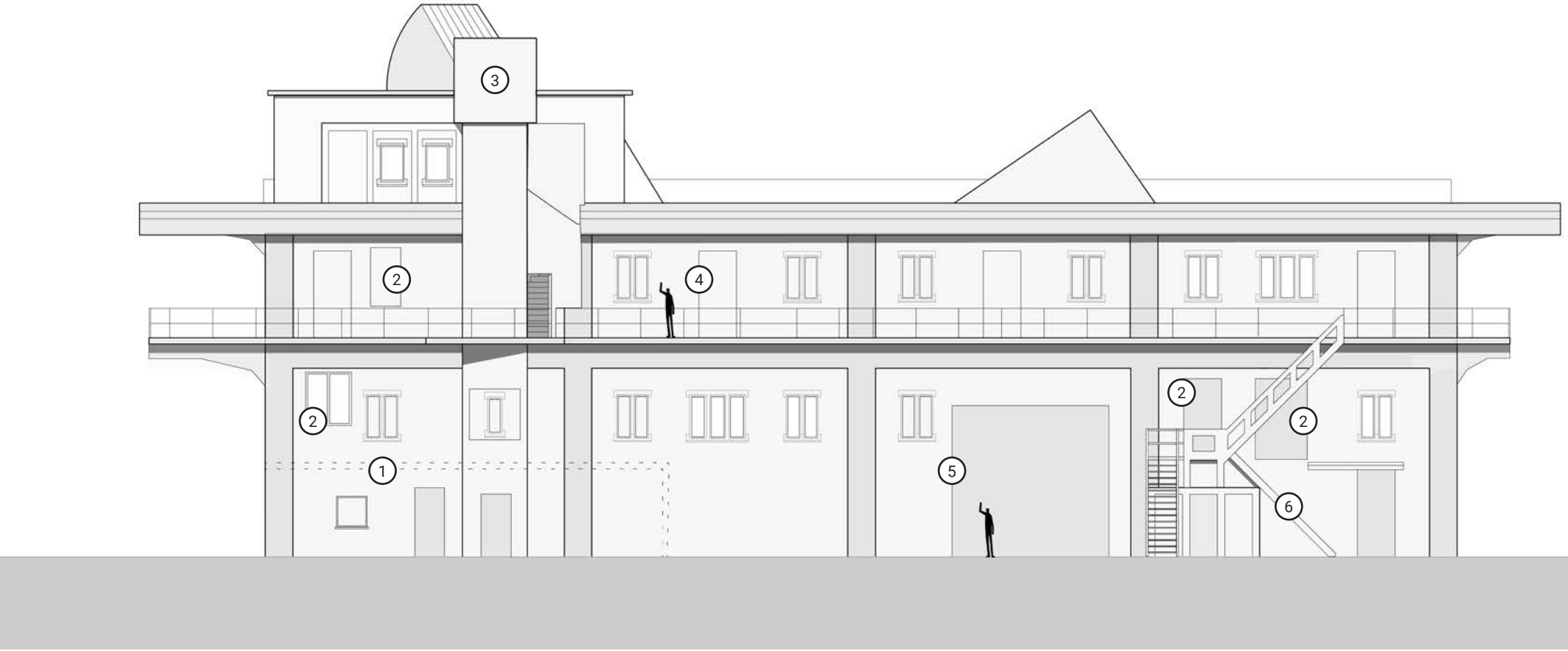
Kuiper, A. (2020). Own interpretation north facade. [Illustration]

SKIN

CURRENT SITUATION EAST FACADE

1. Demolished office building
2. Non original openings
3. Elevator shaft with spiral staircase
4. Sealed openings
5. Non original garage door
6. Heavily damaged original staircase

(research will be explained in annex 3)



1:200

Kuiper, A. (2020). Current situation east facade. [Illustration]

SKIN

OWN INTERPRETATION OF THE ORIGINAL SITUATION EAST FACADE

1:200

Kuiper, A. (2020). Own interpretation east facade. [Illustration]

SKIN

CURRENT SITUATION SOUTH FACADE

1. Door cut into existing steel doors
2. Replacement of existing steel doors by roller shutter
3. Newly added office window opening
4. Closed openings

(research will be explained in annex 3)

1:200

Dimentions are not verified.

SKIN

OWN INTERPRETATION OF THE ORIGINAL SITUATION SOUTH FACADE

1:200

Dimentions are not verified.
Drawing by L. van Straalen

SKIN

CURRENT SITUATION WEST FACADE

1. Non original garage door
2. New office openings
3. Closed openings

(research will be explained in annex 3)

1:200

Dimentions are not verified.
Drawing by L. van Straalen

SKIN

OWN INTERPRETATION OF THE ORIGINAL SITUATION WEST FACADE

1:200

Dimentions are not verified.
Drawing by L. van Straalen

ARTICULATION

WHAT IS THE ARTICULATION IN THE ARCHITECTURAL EXPRESSION OF THE SKIN?

The research of articulation in the skin is done by observations during the site visit, photographs and the facade analysis. This study helps us to evaluate the architectural expression of Katoenveem.
There are four elements strongly articulated in the facade. The first one is the most obvious; the strong horizontal lines caused by the roof overhang and the balconies. Secondary to that is the pattern of depth due to the load bearing construction which is visible throughout the facade. A few extensions create some variation in the buildings direction. And lastly, there is a strong repetition of facade openings.
All these design elements are direct result of the function they had (daylight, accessibility, construction, etc.).
The articulation in the architectural expression of the skin is mostly determined by functionality.
However, to make such a non-expressive concrete building was 'not done' in the early 1900's. Therefor, ornaments are added in the facade to give the building the nessecary value. [2]
This will be discussed in chapter: architectural expression.

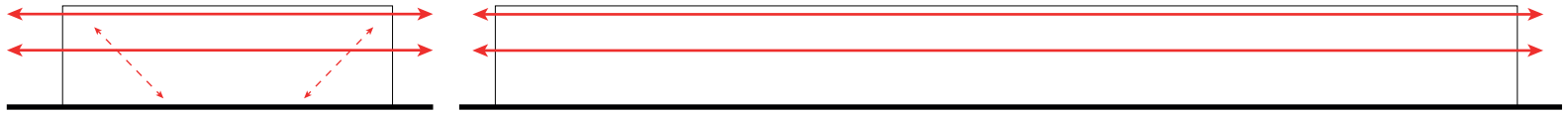


Image 1: Horzontal Lines

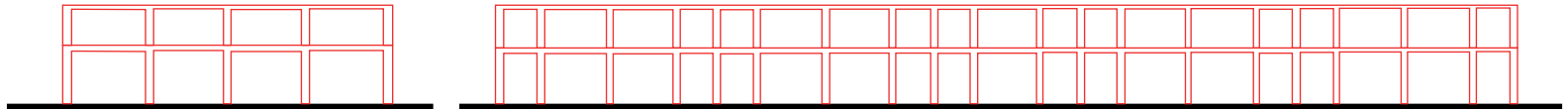


Image 2: Pattern of Depth, created by load bearing construction

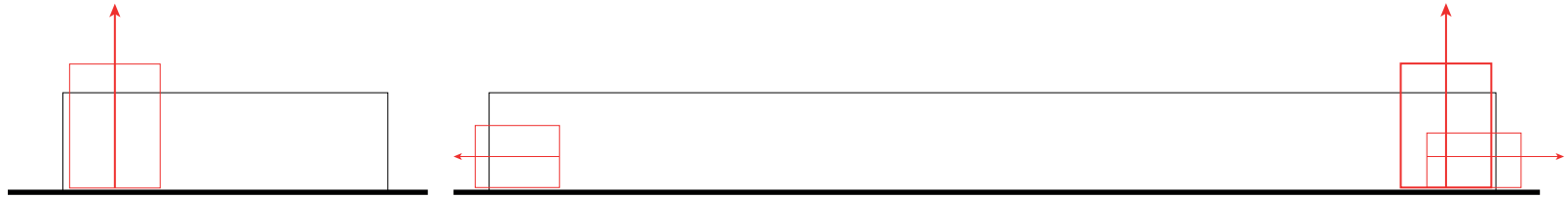


Image 3: Exceptions in Shape & Mass

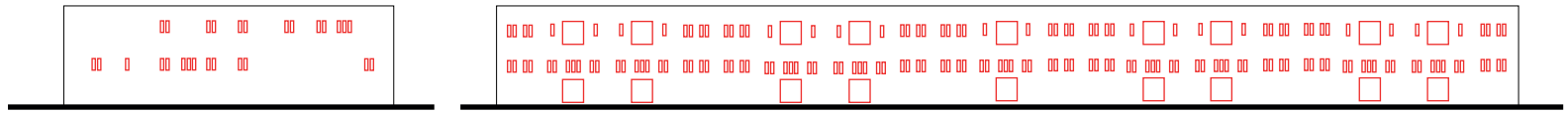


Image 4: Repetition of Facade Openings

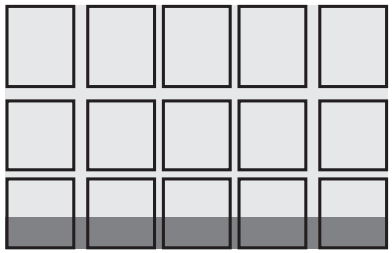
Image 1: 'Horizontal Lines', Image 2: 'Pattern of Depth',
Image 3: 'Exceptions in Shape & Mass',
Image 4: 'Repetition of Facade Openings' , drawings by Z. Spook. All based on:
1. Obervations of photographs
2. Boon, C. (2017). Katoenveem function versus aesthetics. Delft, Netherlands: TU Delft.

ARCHITECTURAL EXPRESSION

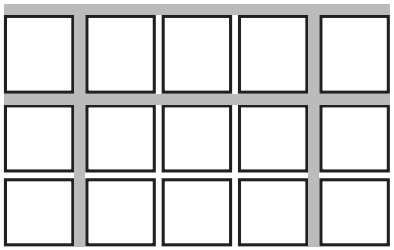
WHAT IS THE ARCHITECTURAL EXPRESSION OF THE INTERIOR?

In the late 19th century concrete in architecture was mainly used for structural elements. It was commonly disguised either by plastering or cladding with traditional materials such as brick or natural stone. This is because at the time the texture created by the formwork was seen as an aesthetic problem and therefore not acceptable.[1] Another feature of concrete that was found to be unacceptable was its grey colour. This was considered as dull and expressionless and had a lack of character when compared with traditional materials such as natural stone and brick.[2] From the 20th century and onwards the acceptance of the aesthetics of concrete started to grow. Throughout the entire world architects and engineers began to realize that concrete could create its own architectural surface style and thus that it did not necessarily needed to be covered by traditional materials.[1] However the appearance was not fully accepted yet thus concrete surface finishes were developed such as rendering, painting, tooling, sand blasting, washing out, polishing and metallisation.[1]
For industrial buildings which were located relatively far away from the urban areas the appearance of concrete was more and earlier acceptable.

The interior of Katoenveem does not contain cladding with any traditional material while all walls, columns and beams are made out of concrete. However to hide the concrete some painting was done on the interior walls of the Katoenveem.[4] When researching elements of the interior that can be interpreted as ornaments it turns out they are not. The text beneath the images explains whether or not an element was intended to be an architectural expression. Except for the painting everything was designed for functional reasons.



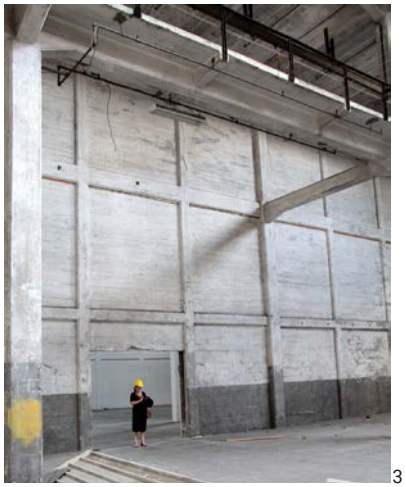
COLOUR - intended
The finish in the second hall from the west side seems to be the most original one. The walls in that hall are ochre yellow with a grey plinth on the ground floor and first floor to about hip height. The finish with such a plinth is also visible in several other rooms.[4] Why this was done is unknown but since the cotton bales were stacked much higher a functional reason does not seem likely.



DEPTH - unintended
The wall is divided into parts by columns and beams. Some of those have more depth than others. The ones that protrude more are part of the main load bearing structure. Thus this was done for structural and functional reasons and not for aesthetics.

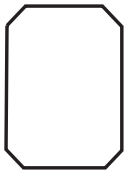
4

FLOOR TILES - unintended
Every compartment has two white lines made of white square stones laid in a row. The lines indicate the boundary of the cotton stacking place.[4] The tiles were placed for functional reasons: wear-resistant paint did not exist yet.



3

TEXTURE - unintended
The concrete was constructed with a wooden formwork which created horizontal lines on the walls. At the time this was perceived as unsightly.



SHAPE - unintended
The columns are chamfered. Originally this was done to protect the columns against abrasion from cotton bales.[4] Thus it was a functional feature which was not meant to be an ornament.

Illustration: 'Interior ornaments' by E Stoffels (2020), based on:
1 Heinemann, H. A., & Van Hees, R. P. J. (2013). Historic Concrete: From Concrete Repair to Concrete Conservation.
2 Boon, C. (2017). Katoenveem function versus aesthetics. Delft, Netherlands: TU Delft.
3 Jolanda. (2016). Fiets mee door M4H. [Picture] Retrieved from: https://rotterdamthroughmylens.blogspot.com/2016/09/fiets-mee-door-m4h.html
4 Stenvert, R. (2005). Stichting Katoenveem. In Bouwtechnische Verkenning Katoenveem. Utrecht, Nederland: BBA

ARCHITECTURAL EXPRESSION

WHAT IS THE ARCHITECTURAL EXPRESSION OF THE EXTERIOR?

Whereas the interior is almost purely functional[1], the exterior has elements that were intended to create a certain architectural expression.

Katoenveem is made out of concrete and is not cladded with traditional elements such as brick or natural stone. The lack of such traditional cladding is revolutionary within the development of concrete in architecture. However the concrete was not left unedited. The exterior was cladded with a special finish layer. The skin chapter elaborates on this layer. It can be assumed that the finish was added because the image of concrete was not widely accepted as an aesthetic yet. The lack of traditional cladding is part of the architectural expression.

Another element that creates the architectural expression of the exterior are ornaments. Throughout time opinions about the use of ornamentation have continuously been changing.[2] At the time Katoenveem was built the use of ornaments was considered 'necessary' to create a building of value. However because the building was not located near the city less restrictions regarding the exterior applied. There are two possible reasons for the ornaments of the exterior. The first reason is to make the building more appealing to the public. The second possible reason is that the architect wanted to show the possibilites of concrete in architecture. What the exact reason is remains unclear, but a combination of the two seems likely. The exterior of Katoenveem has multiple intended details and ornaments. These are among others the water tower, terrain walls, cornices, window details and beam details.

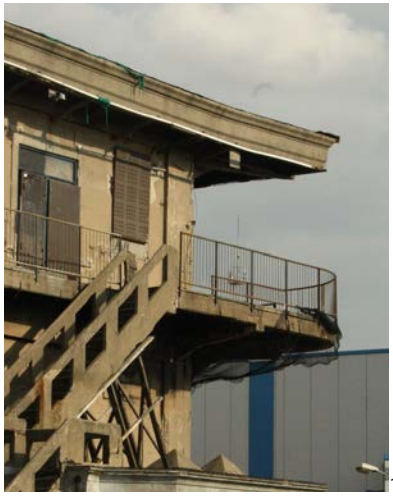
The interior architectural expression can be compared with the exterior architectural expression. The architectural expression of the interior is functional, without intended ornaments, whereas the exterior has many intended ornaments. For example the window details are only present on the exterior and not in the interior. Thus it can be concluded that there is a difference between the interior and exterior architectural expression.

WATERTOWER - intended
The water tower used to be located next to the main building. It was highly decorative and stood firmly as the focal point of the entire building. Although it had a specific function it has clearly visible ornaments.

1

DETAILED CORNICE - intended
The pumping station is equipped with a detailed cornice. But unlike the detailed windows on the main building, the windows of the pumping station have no details at all.[1] The roof of the main building also has a detailed cornice.

TERRAIN WALL - intended
The terrain used to be enclosed with a concrete wall. Unfortunately most off the wall has been torn down during the years, apart from a small piece located next to the Keilehaven at the back of the original terrain.[1]



1

1

CORNER ORNAMENT - intended
This beam has a detail for which a more complicated framework was probably needed than if it would not have the detail. Therefore it can be assumed the detail was intended as an ornament. Also in the corner a ornament was placed.

1

WINDOW DETAILS - intended
The window frames are made of concrete and cement.[2] On the exterior Kanters designed details around the windows to imitate a natural stone lintel.[1] The detail was not needed for functional reasons thus it is an intended ornament.

'Exterior ornaments' by E Stoffels (2020), based on:
1 Boon, C. (2017). Katoenveem function versus aesthetics. Delft, Netherlands: TU Delft.
2 Stenvert, R. (2005). Stichting Katoenveem. In Bouwtechnische Verkenning Katoenveem. Utrecht, Nederland: BBA

BUILDING MATERIAL - AGGREGATES

WHY DID THEY USED THIS TYPE OF AGGREGRATE?

Aggregrates:
River gravel in the Netherlands was mainly coming out of the Rhine and the Meuse. The gravel could be contaminated by the shipping activity which was mainly running on coal. The coal and ashes can change the chemical character of concrete mixture. Therefore clean gravel was essential. Characteristics of the Meuse gravel are quartz, sandstone and yellowish-brown. Rhine gravel has a flatter form compared to the Meuse gravel. [1]

In both sample photos we see quartz stones also yellowish-brown color is present. In combination with the location in the river delta suggests that this will be the origin of the gravel. If the aggregate is from the river Meuse or the Rhine could not be determined.

Binders:
The Netherlands depended on the import of portland cement. This international trade was influenced by factors like war and economical situations this could influence the availability and price. As each cement has different properties the concrete quality differs. [1]

In the period after 1900 the best product on the market was Portland cement. You had to be careful because sometimes natural cement was sold with the same name because of its similarities in characteristics.The natural cement qualities come from clay and are therefore not further sintered. Which results in variations of quality. This problem was solved by naming sintered cement more explicit. In the Netherlands they added ''artificial'' to Portland cement name (kunstcement). In the G.B.V. from 1912 and 1918 only artificial Portland cement was allowed. [1]

Picture of a concrete sample of the St Jobsveem, Rotterdam. A aggregate of gravel and different fractions kan be seen. Which are not been graded well.

Picture of a concrete sample of the Katoenveem, Rottedam. We observe a aggregate of rounded stone with white to brown color spectrum. Some stones have a more orange yellow character. The size of the aggregate is uneven. In the upper part possibly some air bubbles are seen.

1 Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland
Image 1: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland, p329
Image 2 by Audrey Loef

EXTERIOR MATERIAL

WHY DID THEY CHOOSE ARTIFICIAL NATURAL STONE PLASTER?

In the beginning of the 20th century concrete structures were rendered with artificial sandstone render (kunstzandsteenpleister in dutch). Here the plaster consists of ground natural stone as a aggregate to reproduce a natural stone look, sometimes the render is even tooled. This method of surface finishing was not often used in the beginning of the 20th century[1]. The appreciation of this rendered concrete varies between 'cheap surrogate for natural stone' and 'good solution to improve the appearance of concrete buildings'.

In Rotterdam we find two examples of a surface finish with artificial sandstone render. The plinth of the warehouse of St. Jobs design by J.J Kanters we see an imitation of natural stone by tooled texture and imitation of joints (image). Also the Hofplein railway viaduct shows the appearance of a tooled sandstone facade. [2]

The katoenveem is rendered in a sandy cement[3]. We assume that this is the same render used at the St Jobsveem. Because of the history of the constructor and architect using rendered concrete to imitate natural stone.

Image 1 - St Job Groundfloor facade underside of cantilever (source: Heinemann 2013, p.259)

Image 2 - St Job Groundfloor, Material sample (source: Heinemann 2013, p.259)

Image 3 - Detailed picture of facade material. (source: Charlotte de Boon 16-09-'16)

Image 4 - Detailed picture of window articulation at south facade (source: Charlotte de Boon 16-09-'16)

1: Verhey, B. A. (1912). Gewapend beton. Amsterdam: L. J. Veen
2: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft, Nederland
3 : Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA

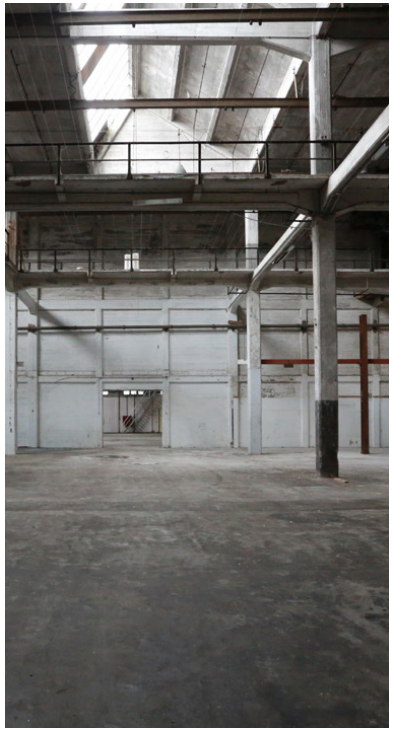
INTERIOR

DAYLIGHT

HOW DOES DAYLIGHT ENTER THE BUILDING?

The large compartments have four skylights to provide daylight, the middle, smaller compartment has two smaller skylights. The sample room on the roof has a rectangular shape. In comparison with the rest of the building, this skylight is not placed parallel to the facade but straight towards the north direction. The semicircular shape of the roof of the sample room is remarkable for the 1920s and more usual for the curved roof structures after 1950.[4] The windows in the facade on the ground floor are placed above the doors. All windows are under the shade of the cantilever balconies and roof. This way, almost no direct sunlight would go into the building, which will be further elaborated on the next pages.

The natural lighting of the Katoenveem is indirect and mild, sometimes insufficient (which is solved by artificial lighting).



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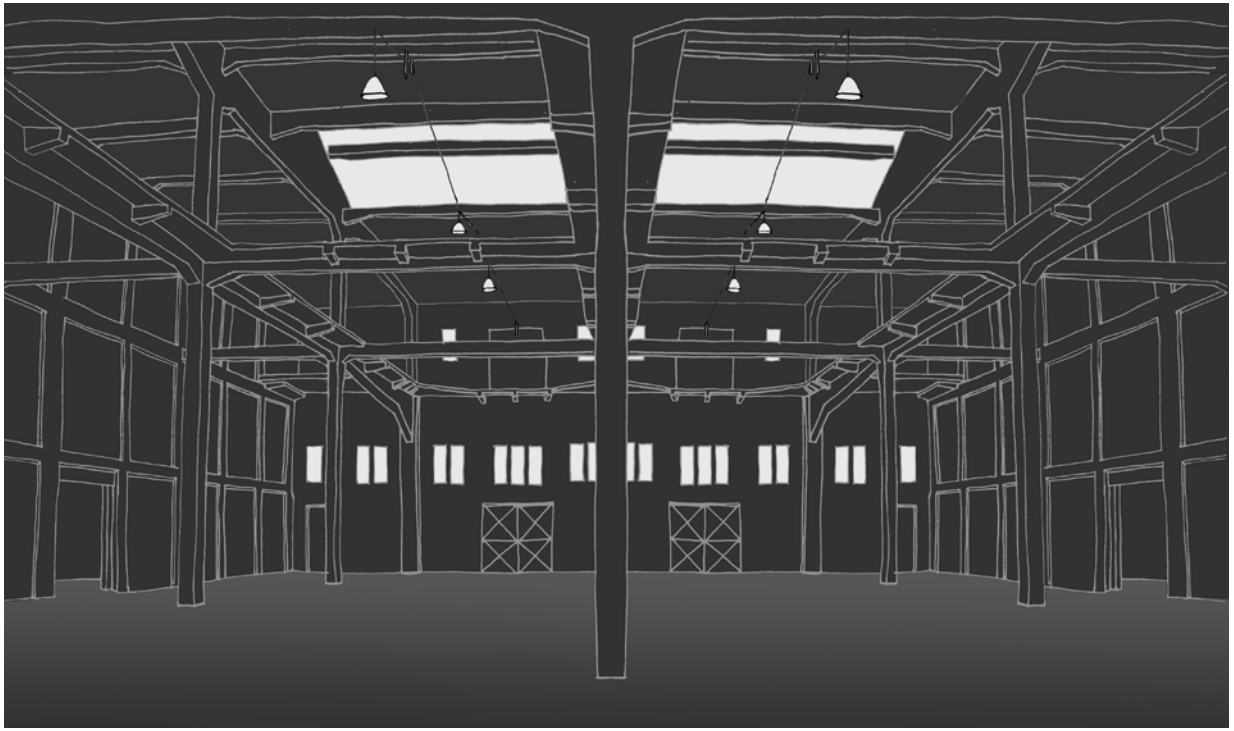
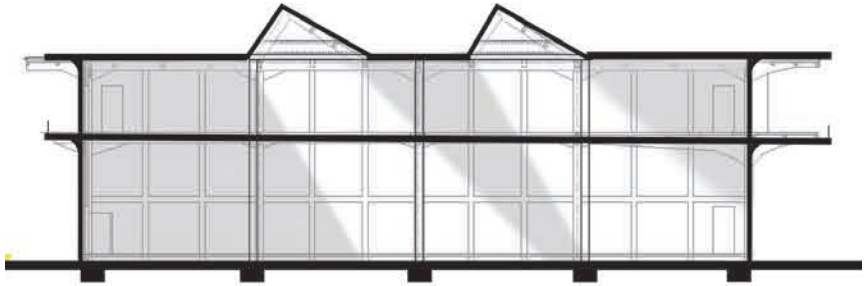


3

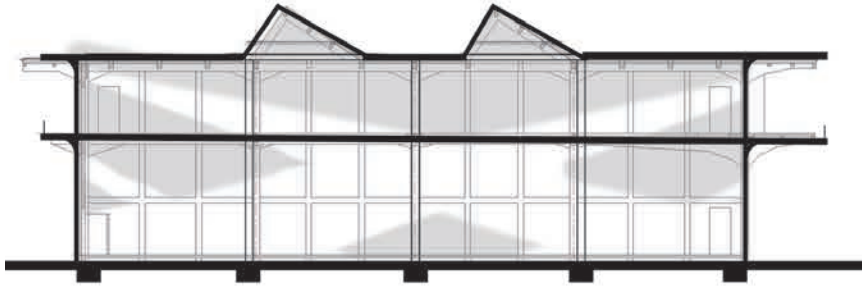
1Xihao, Y. (2017). Skylights [Photo]
2 Xihao, Y. (2017). High placed windows [Photo]
3 Kuiper, A. (2020). Daylight trough the windows. [Illustration]
4 Bureau voor Bouwhistorie en Architectuurgeschiedenis. (2005). *Bouwhistorische verkenning Katoenveem, Keilestraat 39, Rotterdam.*

DAYLIGHT

HOW DOES DAYLIGHT ENTER THE BUILDING?



Daylight entering the building through the roof



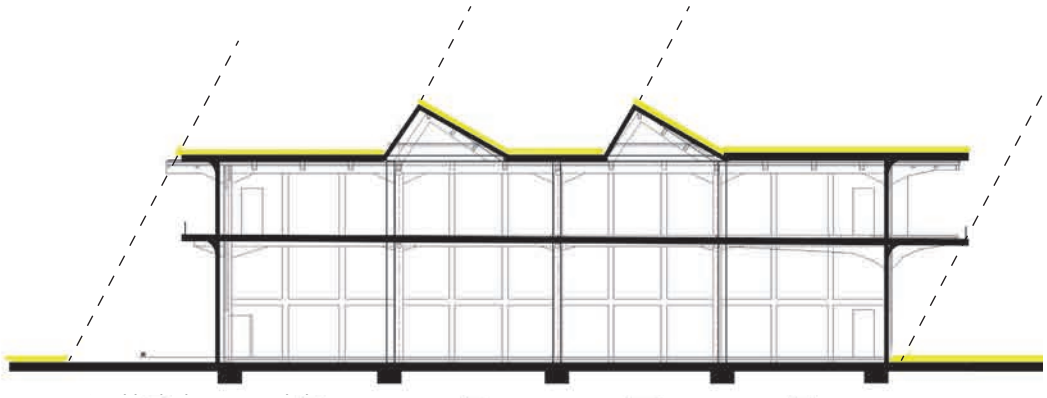
Daylight entering the building through the facade

Warehouses need as much daylight as possible to create longer and more pleasant working hours. But there is no need for nice views.
The amount of look-in has to be limited.
Because of this, daylight mainly enters the building through the large skylights. This tells us that the building is specifically designed for its function: storage.

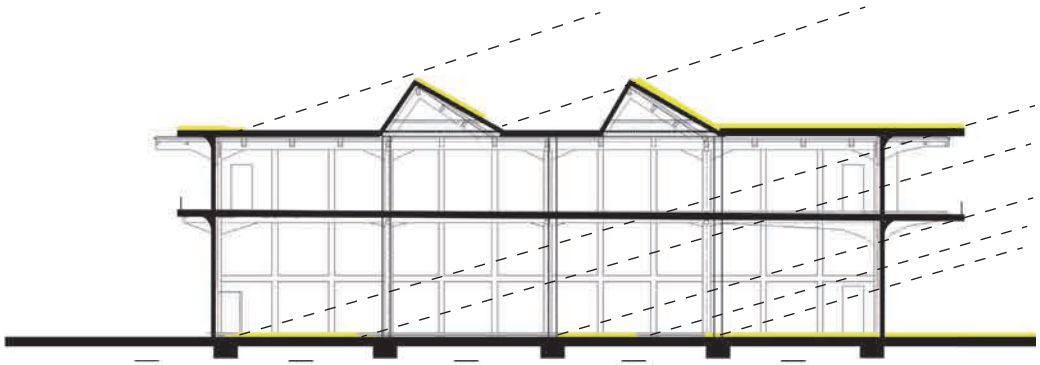
Image 1: 'Daylight through roof' drawing by Z. Spook, based on: 1: Observations
Image 2: 'Daylight through roof' drawing by Z. Spook, based on: 1: Observations

SUN RADIATION

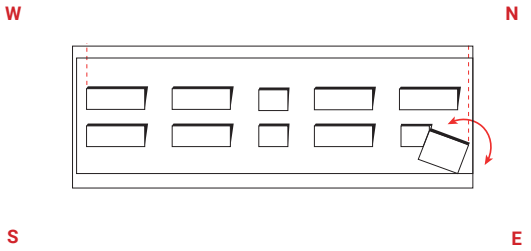
ON WHAT ANGLE DOES SUN RADIATION HIT THE FACADE?



Sunlight entering the building in summer



Sunlight entering the building during winter



The skylights are orientated North-West. Because of this, direct sunlight never enters the building through these lights direclty. The sample room (Image 1) is completely rotated towards the North to optimise consistency in quality checks. This is the same around the world.

In summer the sun hits the building at an angle of 62 degrees. Due to the overhang and balcony, there is no direct sunlight entering the building during this time.

During the winter months only limited parts of the ground floor receive direct sunlight.

The openings in the skin are designed to maximise the amount of light entering the building but to keep direct sunlight out in order to prevent the building from overheating and to provide a homogeneous soft light.

Image 1,: 'Sunlight in Summer' drawing by Z. Spook, based on:
1: Natural geographic situation
Image 2: 'Sunlight in Winter' drawing by Z. Spook, based on:
1: Natural geographic situation

DAYLIGHT

HOW DOES THE LIGHT REFLECT ON DIFFERENT MATERIALS?

Image 1: 1 Light & Material

The research of light in relation to interior materials is done by observations based on the provided photographs.

The interior of the Katoenveem is for the most part made of concrete. Image 1 shows how this material reacts to the daylight entering the building. Since there is almost never any direct sunlight hitting the interior surfaces, there are only soft shadows.

Concrete is a very matte and not very reflective material. Because of this there is a quite homogene soft light throughout the space. Which makes for a very pleasant and serene atmosphere.

Image 1: 'Light & Material, a photograph by C. van Boon

DAYLIGHT

HOW DOES THE LIGHT REFLECT ON DIFFERENT TEXTURES?

Image 1: Light & Texture

The research of light in relation to interior materials is done by observations based on the provided photographs.

As explained earlier, the space is filled with a even, soft light that really exposes the different textures of the ageing concrete and rusty steel.

Image 1: ‘Light & Texture’, a photograph by C. van Boon

DAYLIGHT

HOW DOES THE LIGHT REFLECT ON DIFFERENT MATERIALS?

Image 1: Light & Colour

The research of light in relation to interior materials is done by observations based on the provided photographs.

Because the space is filled with indirect light, entering the building through the skylights in the roof, the colours of the material stay within a small range. The soft shadows make the concrete a little bit darker in some areas.

For the most part however, This Northern light allows the concrete to just shows it's true light grey colour.

Image 1: 'Light & Colour', a photograph by C. van Boon

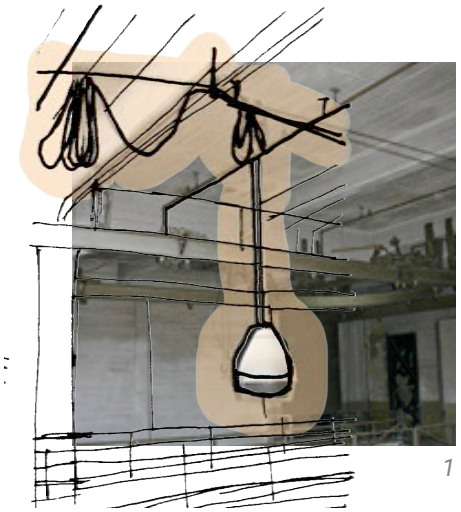
ARTIFICIAL LIGHTING

HOW WAS THE BUILDING ELUMINATED WHEN THERE WAS LITTLE DAYLIGHT?

The assumption can be made that the ‘Veem’ full of cotton, blocked the daylight from the windows. Besides, the natural lighting of the Katoenveem is indirect and mild, sometimes insufficient and therefore artificial lighting was required (see previous page).

The lighting for the hall is established on the ceiling. The lighting was powered by electricity which was generated by conduction from the rails (see technical systems). Fixtures with a metal cap are attached to the structure in regular intervals. In the middle of the wide voids larger lamps hang from cables. By a wire and pulley system, these lights can be moved in the width of the building. This was probably necessary to position the lamps optimally in relation to the stock.

The metal lamps almost certain belong to the original inventory of the building. This cannot be said with certainty for the movable lamps.[4]



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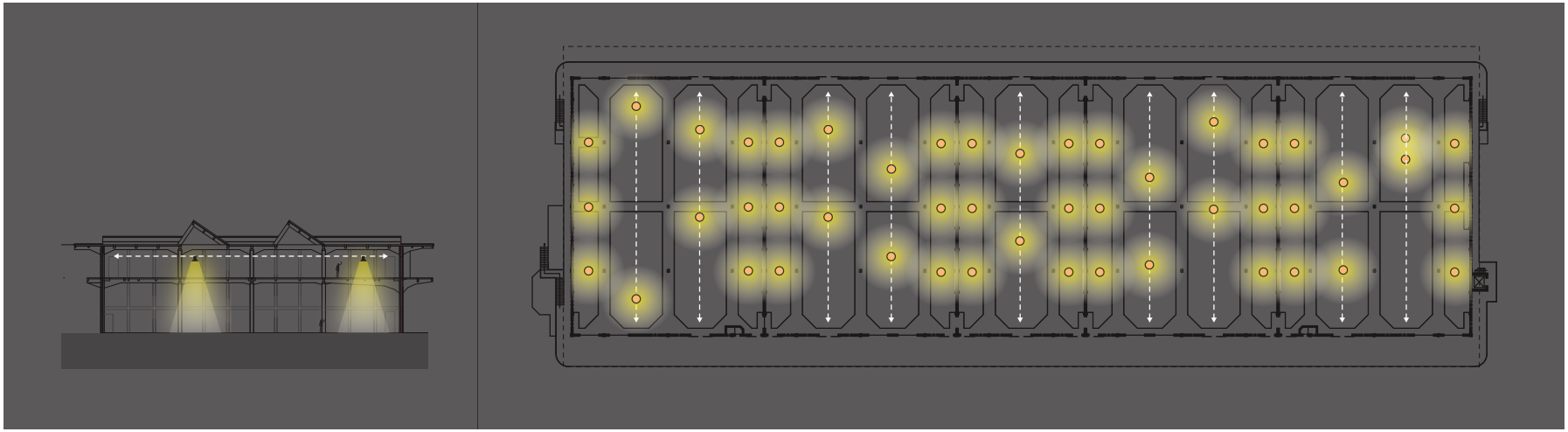


3

1 Louer, I. (2020). Moveable lamps [Illustration].
2 BBA. (2005). Lamps [Photo]. Retrieved from: Bureau voor Bouwhistorie en Architectuurgeschiedenis. (2005). Bouwhistorische verkenning Katoenveem, Keilestraat 39, Rotterdam.
3 Van Straalen, L. (2020).Position artificial lighting [Illustration].

CONCLUSION

ARCHITECTURE

ANSWER RQ

What is the architecture of Katoenveem?
When doing this research we learned that the Katoenveem is an extremely functional and efficient building. Most design decisions can be traced back to this efficiency of an industrial building. This results in a very straight forward design with a few strong features that both influence the architectural expression as well as tell a story about the historic function. It is important to look at Katoenveem from the perspective of the early 1900's, when it was very unusual to design such a sober, non-expressive building. The concept of architectural expression however, changed strongly over time. What was designed to be purely functional, now has non-intended aesthetic value.

The Katoenveem consists of a base made out of five different spacious compartments, from which the dimensions can be traced back to how the building was used and what specific product was processed. The compartments can be seen as individual buildings, held together by two large horizontal elements wrapped around: the loading balcony and the roof overhang. The repetition of facade openings and skylights unites the compartments in expression.

Both interior and exterior surfaces of the skin show a pattern of depth, caused by the load bearing construction pushing through.

The interior of Katoenveem is defined by this pattern, the spaciousness of the compartments and the flexible network of columns and beams.

Katoenveem also used to have a strong relationship with the harbour and different systems or elements on site. They were all indispensable to the performance of the building as a warehouse for cotton. In the booklet we refer to this as: the moving system.

Almost all of the elements are demolished when, or even before, Katoenveem lost its original function. Without these elements, the building is unable to function as a transhipment warehouse.

All the *why's*, give a direct answer as to how the building used to function. It tells us that the design is very specific to the original function and all the changes made over time, hasn't changed the core of the original setup. Perhaps the specificity of the design is one of the reasons why Katoenveem never had a new permanent function.

BUILDING TECHNOLOGY

In this chapter we ask ourselves the following question: *what is the building technology?* As mentioned before the Katoenveem is an early example of large industrial buildings in the development of the harbour. Due to its industrial character, the design considerations of the architect are mostly functional driven. This functional thought is the leading factor throughout every technical layer.The way in which how building technology is embodied in the Kkatoenveem has its own historical context.

Heinemann (2013, p332) asks the following questions to describe influences of the historical context: *What were the construction methods? What were the building codes and standards of that time? What was the level of sophistication of concrete technology? What was the acceptance/appreciation of concrete as a building technique? What was the availability of raw material?* The answers to these questions correspond with aspects to which heritage values can be attached.

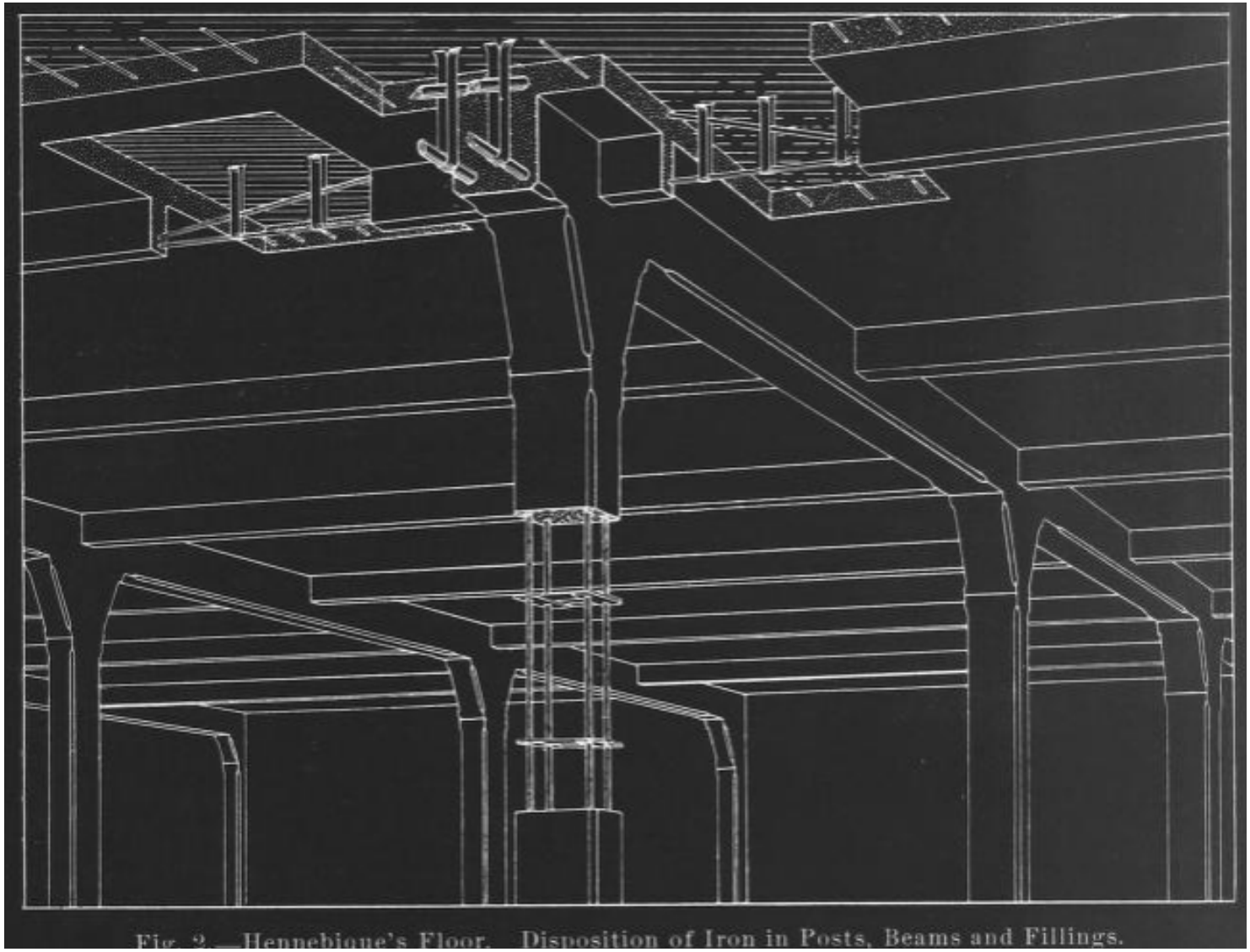
In the Katoenveem's case the architect choose reinforced concrete as its main construction material. How can this concrete structure be preserved?

STRUCTURE

HENNEBIQUE SYSTEM

WHAT IS THE HISTORY OF THE BUILDING TECHNIQUE?

An important innovation in the use of reinforced concrete as a building method came from France. François Hennebique (1842-1921) introduced the monolithic concrete structure. Until then, structural concrete elements were not combined as a whole. In 1892 the building method was patented by Hennebique. The image shows how the structural unity of the elements is combined to a whole. Important improvements were introduced in 1892, steel brackets were introduced and later in 1897 extra reinforcement was added around the columns. As a result of the patent Hennebique built a monopoly within the field of building in concrete. All the calculations and design was done in his office in Paris.[1] In the Netherlands no specific patent law existed at that time but nevertheless the Hennebique method was only introduced by 1907 when the patent was expired.



1 - Hennebique system patent

1: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland
Image : retrieved from: https://www.researchgate.net/figure/Hennebiques-construction-system_fig3_271422662 (20-02-2020)

VAN WANING & CO BETONWERKEN

WHAT IS THE HISTORICAL CONTEXT OF THE BUILDER?

In 1988 The ‘Rotterdamsche Cementsteenfabriek’ was founded by the builder-architect Jacob van Waning. Later the company was named ‘Koninklijke Rotterdamsche Betonijzermaatschappij’ van Waning & Co after earning a royal title.

In the early years of the company’s production mainly consisted of concrete sewage pipes, prefabricated concrete elements and decorative concrete products. The origin of the company can be clearly seen in the office building build in 1898 by design of the founder J. Van Waning. (image next page) As ornamentation of the building you can see a wide range of cement stone products which the factory could produce. With these products they tried to make concrete products with the appreciation level of natural stone. This was done by special colored constituents to the concrete mixture and by tooling the surface[1]

By covering existing iron columns with cement mortar the company Van Waning & Co came to reinforced concrete structures.

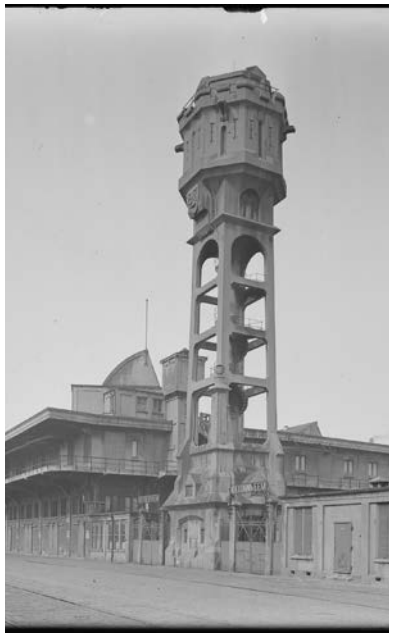
From the year 1900 they started to construct reinforced concrete structures. The early structures of the company were water towers. (image 1) In 1909 they built one of the first concrete water towers in Vianen. The open construction of the bottom part is one of the earliest examples of this typology. A successor of this construction typology is a water tower in Rijswijk constructed in 1911. (image 2)

From that moment onwards they built a variety of reinforced concrete industrial buildings. Examples are the cotton mill Eilermark (1907) close to Enschede, the Jobsveem in Rotterdam (1912) and Stoommeel fabriek De Maas in Rotterdam (1913). [2]

The company had gained a lot of structural knowledge overtime but the actual calculations on the construction was done by most of the executive architects. An good example was J. J. Kanters who the company worked together with since the St Jobveem project in 1912.[3]

1. First open structure water tower

2. Early example of a reinforced concrete watertower



3. Katoenveem’s water tower.

1 Image: retrieved: 19-03-20, https://www.watertorens.eu/torens/Vianen/index.html)
2 Image: (Heinemann, 2013, p66)
3 Image : Rotterdamsstadsarchief retreived: 16-02-20
1: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland
2: Begin jaren van gewapend beton, auteur onbekend ,Cement XIX (1967) nr. 12 p.455
3: Hoeve, J.A. van der & R. Stenvert, Lloydstraat 30, Rotterdam Jobsveem: bouwhistorische opname, (rapport) Utrecht 2003

VAN WANING & CO BETONWERKEN

WHAT IS THE HISTORICAL CONTEXT OF THE BUILDER?

1 Office building van Waning & Co

Image 1 : Retrieved: 19-03-20, http://rijksmonumenten.nl/monument/513939/cementsteenfabriek-van-waning-en co/rotterdam/)

STRUCTURE

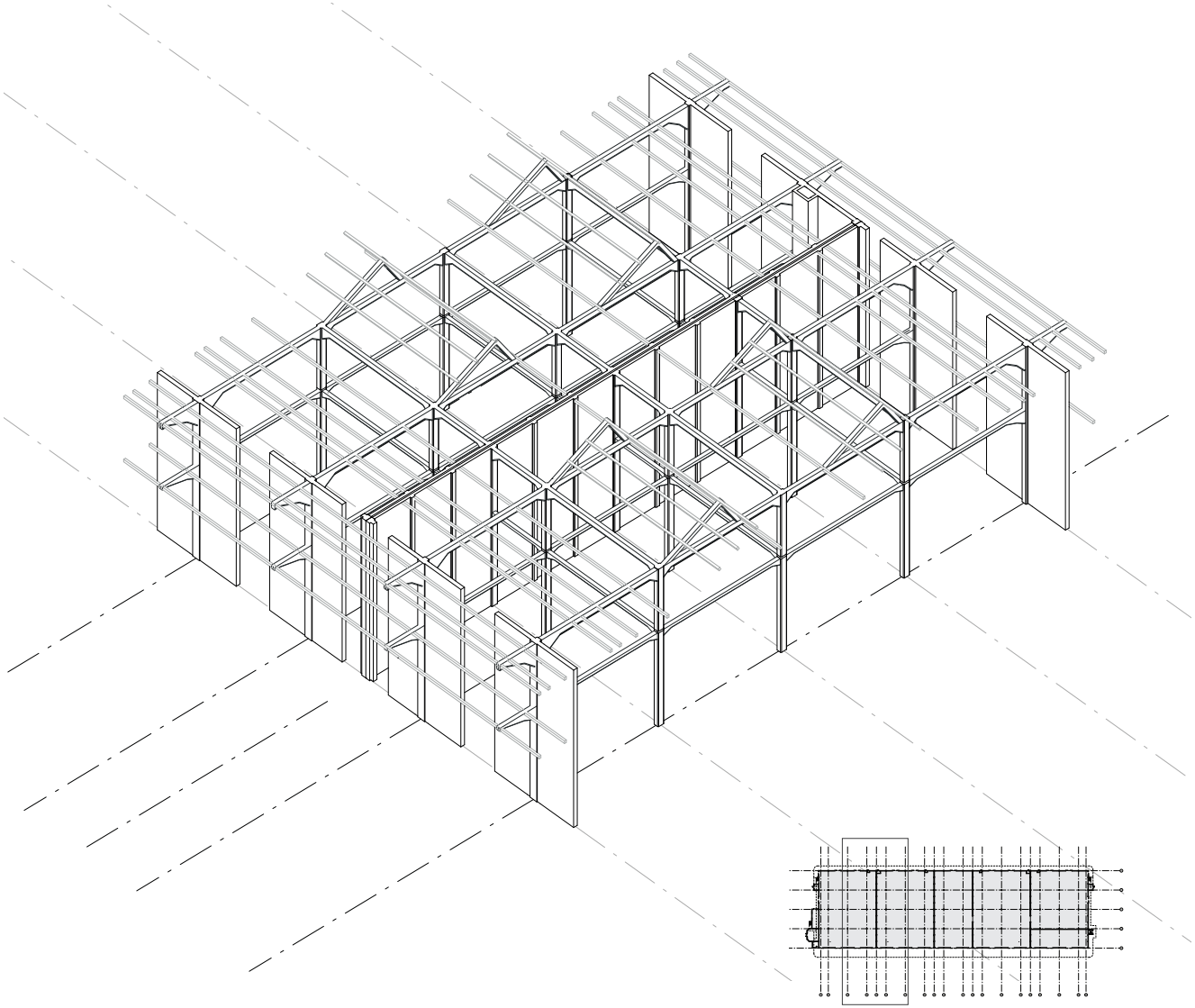
WHAT IS THE HISTORICAL CONTEXT OF THE STRUCTURAL DESIGN?

J.J. Kanters, the architect of the Katoenveem, collaborated with the constructor Van Waning & Co. at a number of buildings. Not sure is whether van Waning was the constructor of parts of the Santos building, also designed by Kanters, but due to its characteristics the assumption can be made.[2] We know for sure they collaborated in realizing the St Jobsveem (1912-1914) in Rotterdam at the St Jobs harbour. Here Kanters gained a large amount of his knowledge on making concrete structures and the functional industrial architecture

In the historical framework we see the collaboration between the architect and builder as a collaboration where a lot knowledge of concrete building was gathered. Therefore a lot of answers regarding the construction can be found in this historical context. In the timeline of projects St Jobsveem and the Katoenveem has similarities and differences in the way concrete is used.

The construction can be described as a concrete reinforcement structure which is build in the Hennebique method. The method is the main concept for designing the construction but also differs from the original Hennebique concept. We see typical characteristics in the structural system. The monolithic connections result in a complete image of concrete. Where beam column and wall are united as one stiff whole. Therefore there is no movement in the structure itself possible. The horizontal forces are directly transferred to the foundation.

J.J. Kanters could test his construction design following guidelines that developed in the early 1900. As Large cities like Rotterdam became more interested in the building with reinforced concrete the development of general guidelines for construction was initiated. In 1906 a committee was installed to start the research to calculations methods of reinforced concrete structures. Despide the amount of publications in the early 1900s the first edition of 'Gewapend Beton Voorschriften (G.B.V.) was presented in 1912.[1] In 1918 the G.B.V. was revised with improved insights on material. This resulted in the possibilities to allow 20 percent more tensions in the concrete structure which led to slimmer constructions.[2]

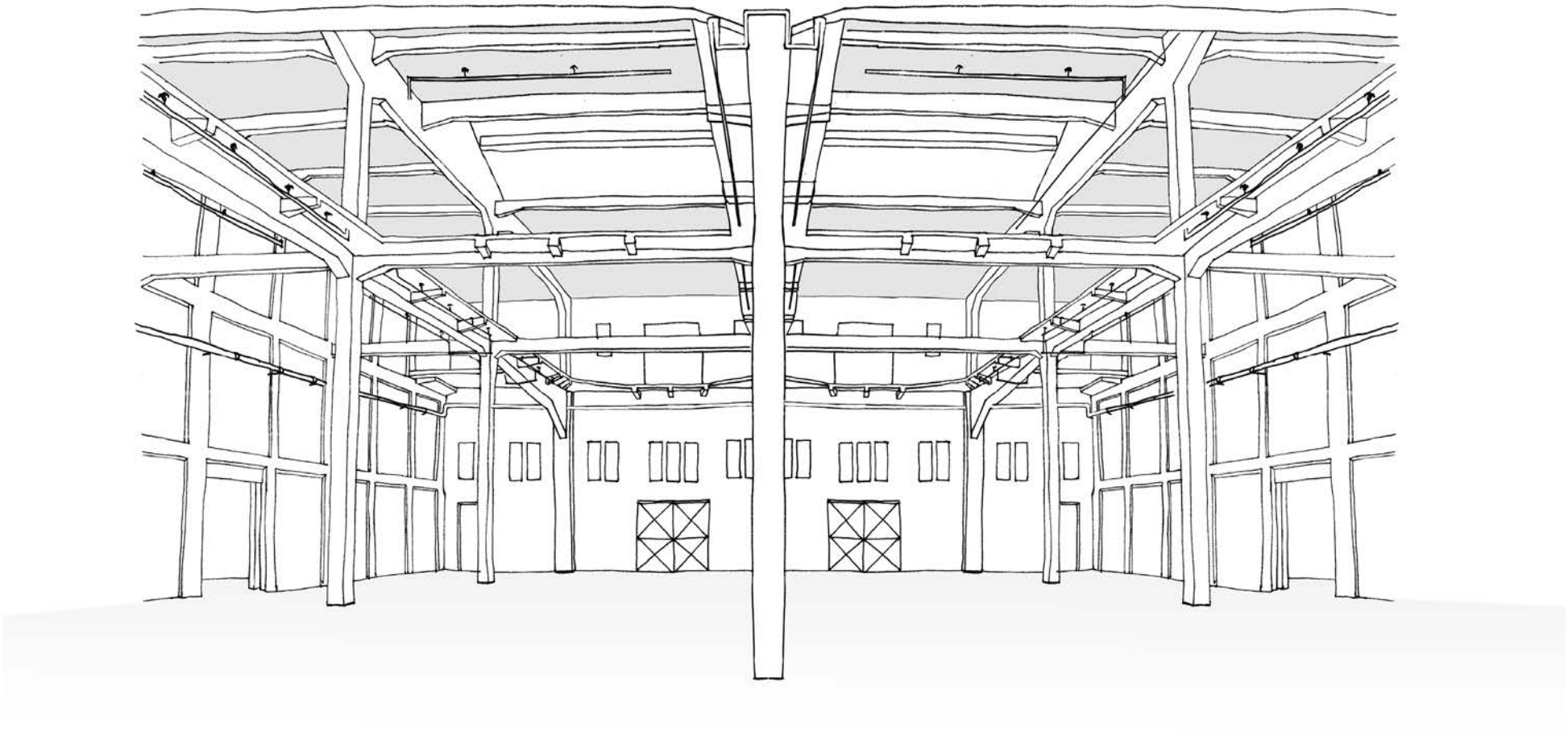


AXO - All supporting elements of the construction

1: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland
2 :Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA
Drawing by L. van Straalen

STRUCTURE

WHAT IS THE IMPRESSION OF THE STRUCTURE?

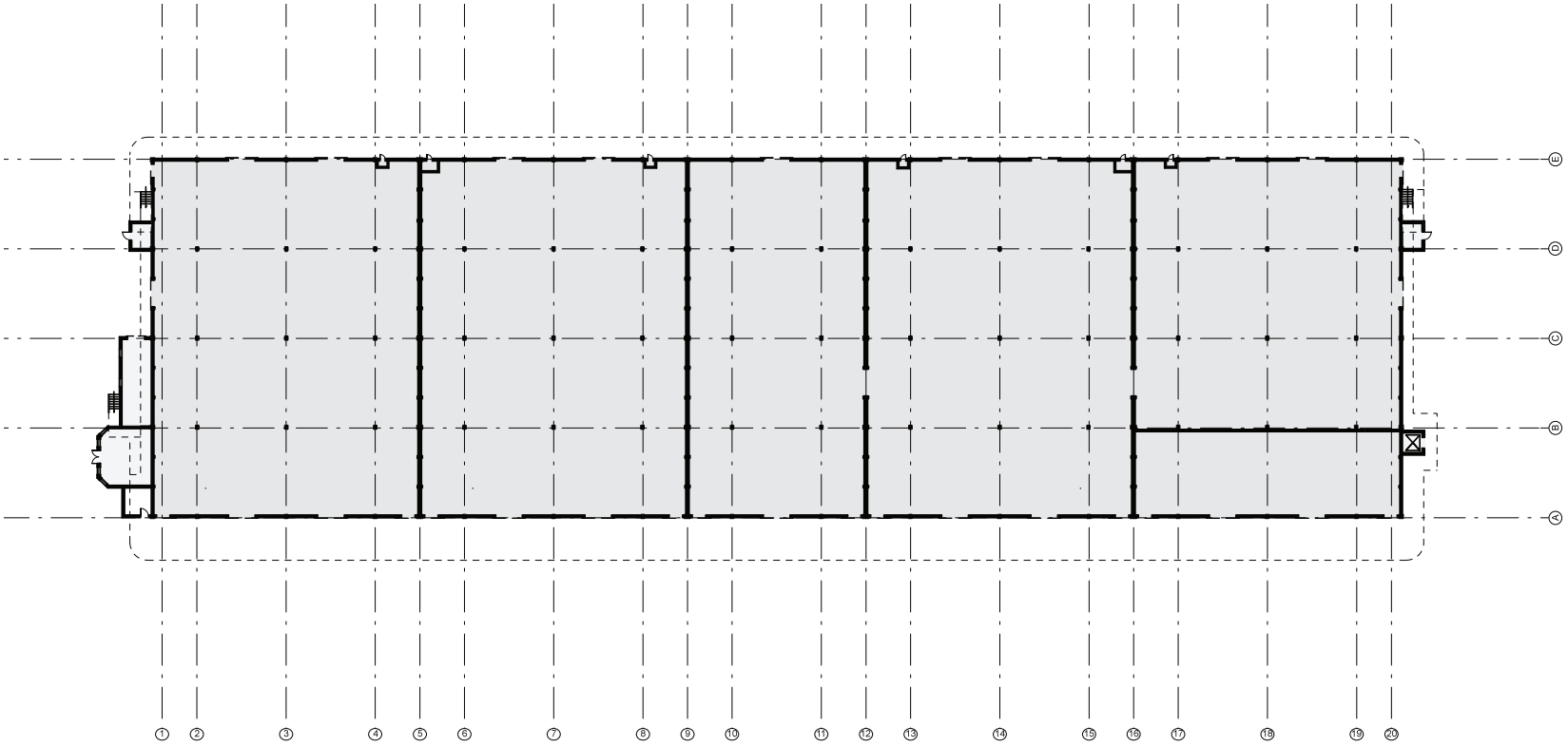


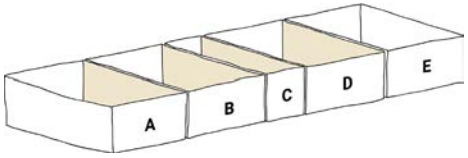
Interior view

Kuiper, A. (2020. Interior impression. [Ilustration]

COMPARTMENTS

STRUCTURAL GRID

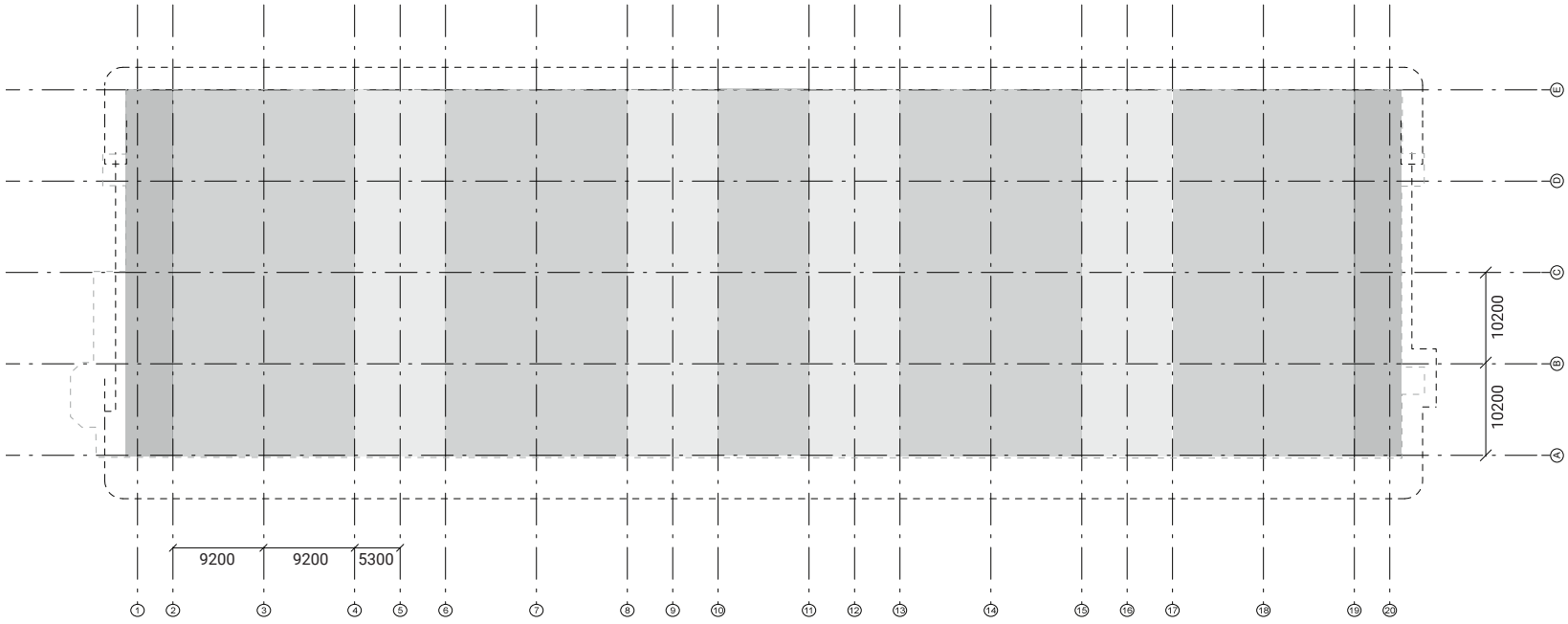




The compartment separation forms in the longitudinal direction the secondary grid lines.

GRID DIMENTIONS

WHAT IS THE SIZE OF THE GRID RELATED TO THE STRUCTURE?

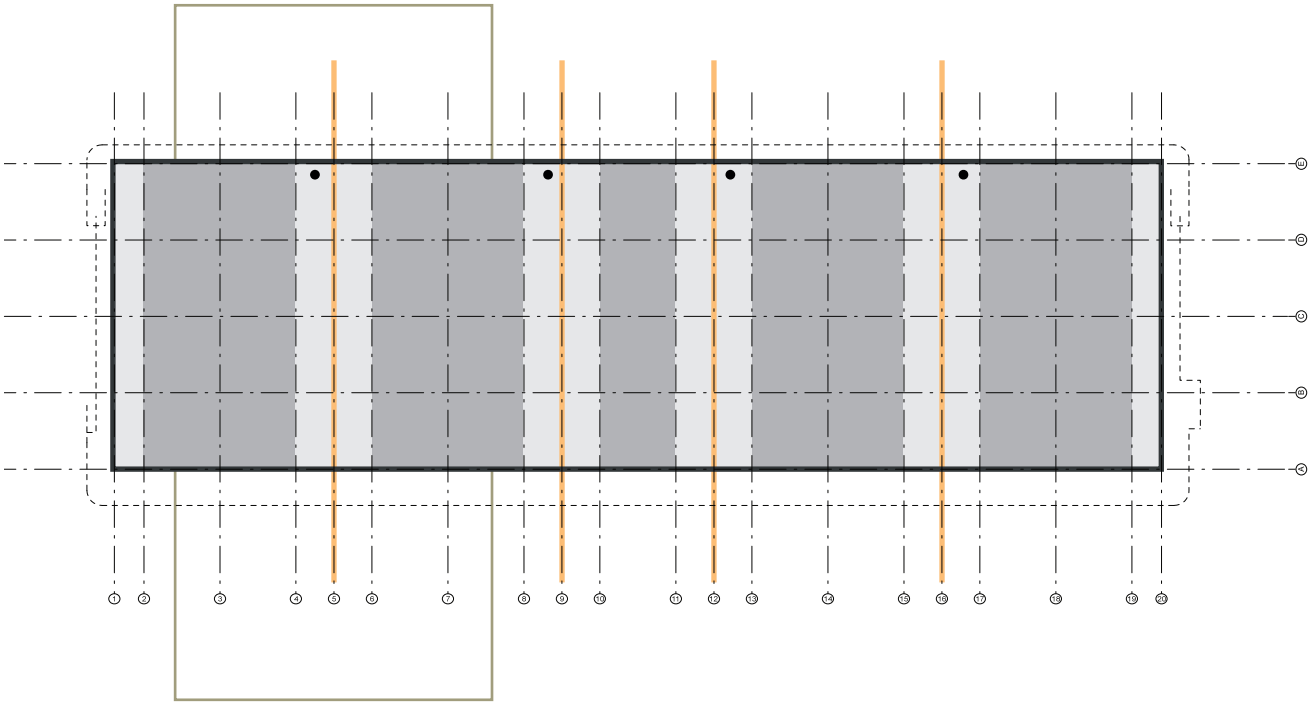


The primary grid size is 9200MM by 10200MM. The secundairy grid size is 5300MM. Grid dimensions are based on practicalities for the cotton storage

Grid system
Drawing by L. van Straalen

STRUCTURE

WHAT IS THE RELATION BETWEEN THE COMPARTMENTS AND GRID SIZES?



Location of dilatation in structural grid

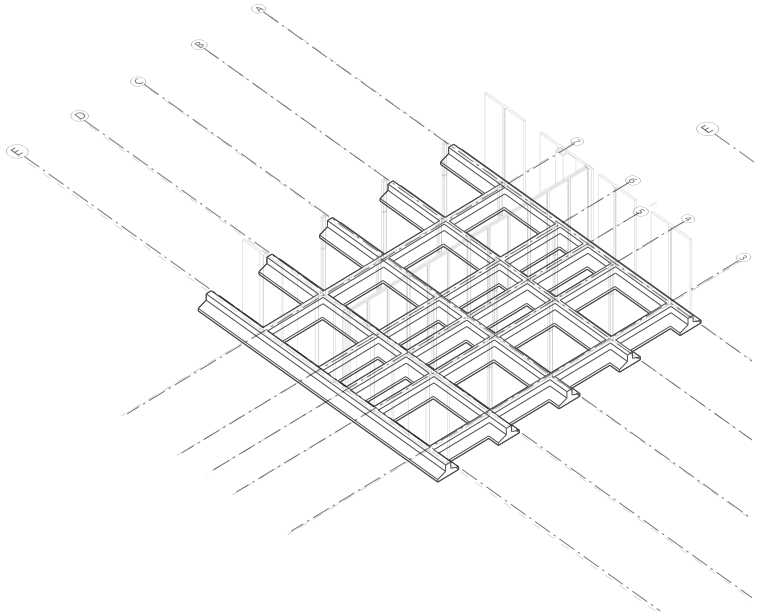
The compartment walls are constructed in such a way that they provide a fire barrier which gives the opportunity to locate the dilations on the grid lines. The dilations are in the large compartments 29.2m and in the small compartment 19.2m. This is relatively a small distance compared to other industrial buildings. The reason could be found in both building technical aspects or functional aspects in the design considerations. Building technical arguments could be stiff construction joints or shallow foundation.

Dilatation between compartments

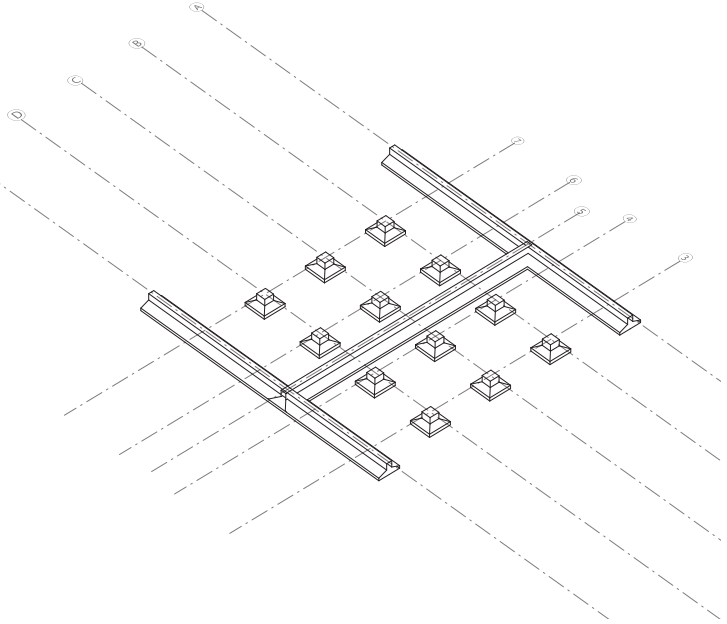
Image by Charlotte de Boon 16-09-'16
Drawing by L. van Straalen

FOUNDATION

WHAT KIND OF FOUNDATION IS USED?



Drawing 1 - T-shape foundation supporting structural grid.

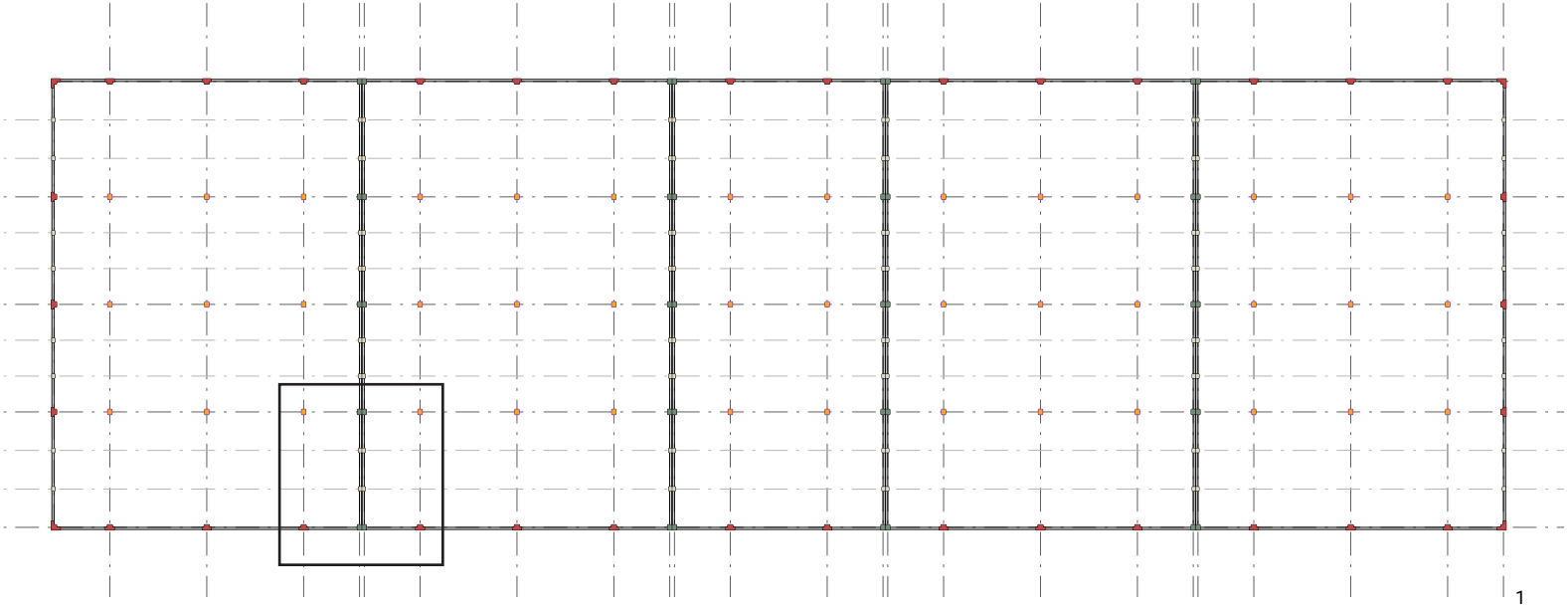


Drawing 2- T-shape and footing foundation supporting structural grid.

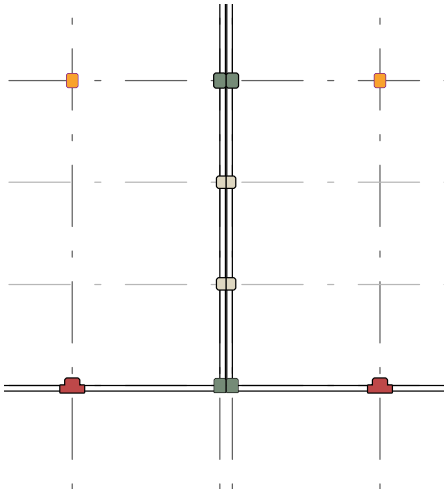
The harbour is build upon an old river sandbank this made it possible to make a shallow foundation as long it was heavy and had a large footprint. The foundation is made without any dilatation.(pioneer). How this footprint is build remains a question. Two suggestions can be done. Old diagram drawings suggest that a T shape line foundation is used (Image 1). An alternative comes from a drawings that were made along side the architectural history report, which suggest foundation on footing under the columns. Further investigation on side can answer the question.

COLUMN STRUCTURE

HOW DOES THE GRID RELATE TO THE COLUMN PLACEMENT?



1



- Column 1
- Column 2
- Column 3
- Column 4

2

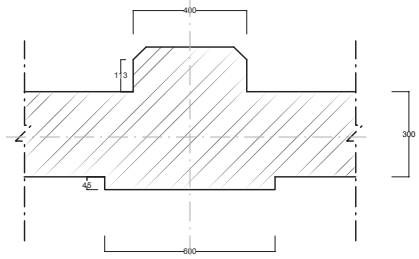
Interior exceptions in strucutral order

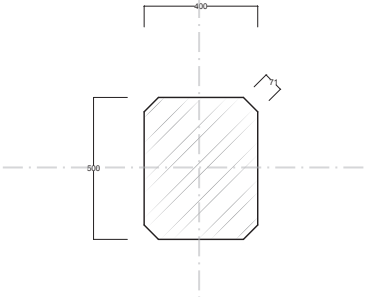
Here the column rhythm is explained by the grid size and positioning. There are four different column types, each with their own expression. The first 3 columns form the main structure as the 4th is only to support the thin compartment walls. These compartment columns are placed at their own longitudinal grid lines. These lines conflict with the roof structure seen in the picture above.

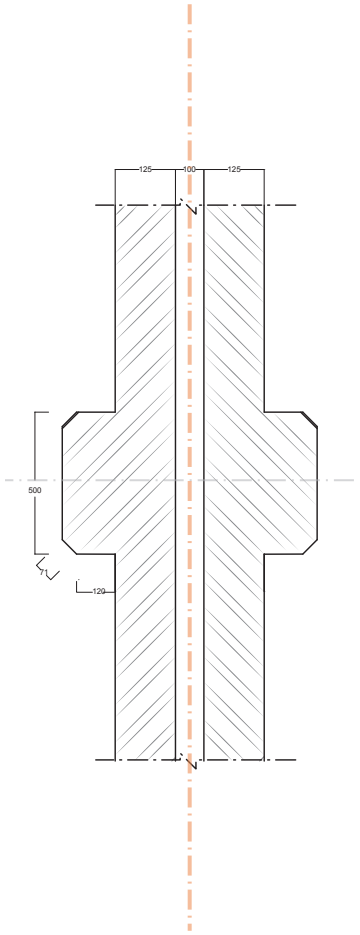
1 Stoffels, E. (2020). Location of columns. [Illustration].
2 Boon, C. (2017). Interior of Katoenveem. [Picture]..

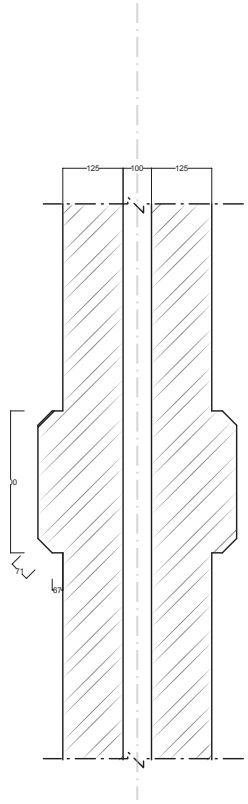
COLUMN FORMS

WHY ARE THE DIFFERENT KIND OF COLUMNS DESIGNED IN THIS WAY?









Column 1:
We see an integrated column within an outside wall segment. The width of the footprint differs between the outside and inside, also the articulation of the column is different. The inside column has cut-off edges due to its functionality but the outside has sharp edge.

Column 2:
The main column form is expressed by a cut-off edges.

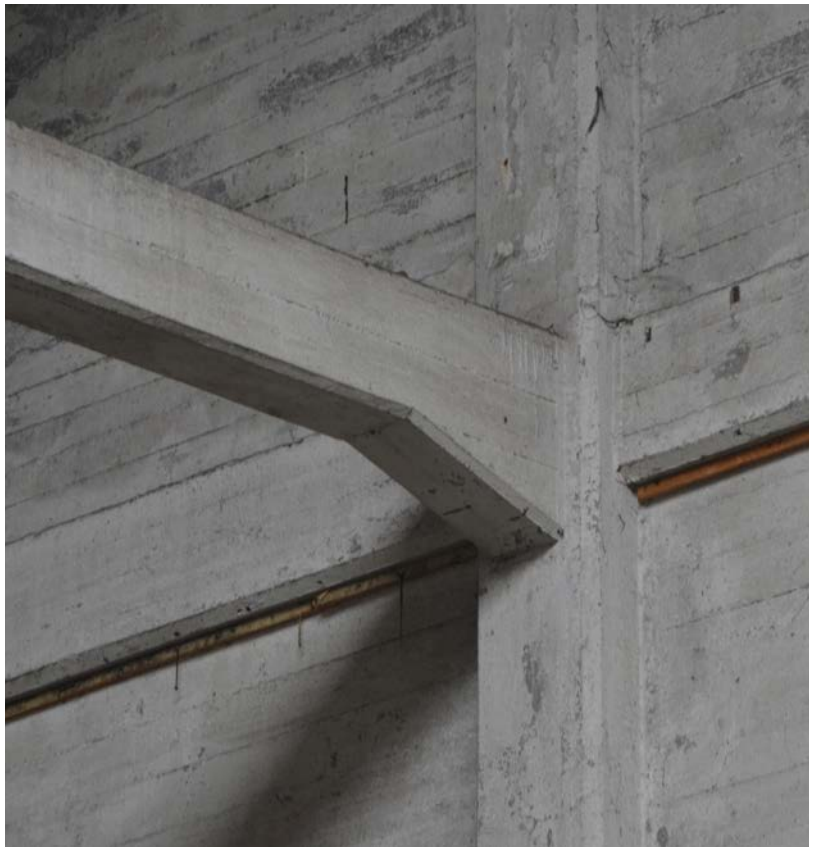
Column 3:
Represents the separation between the compartments. The void is the dilation line. The thin concrete walls needed extra support which is expressed by column grid.

Column 4:
Articulation of the supporting collumns in the compartment walls. Not on the grid.

Drawings by L. van Straalen
Dimensions are not verified

EXPRESSION

HOW ARE THE CONNECTIONS EXPRESSED IN A MONOLITHIC WAY?



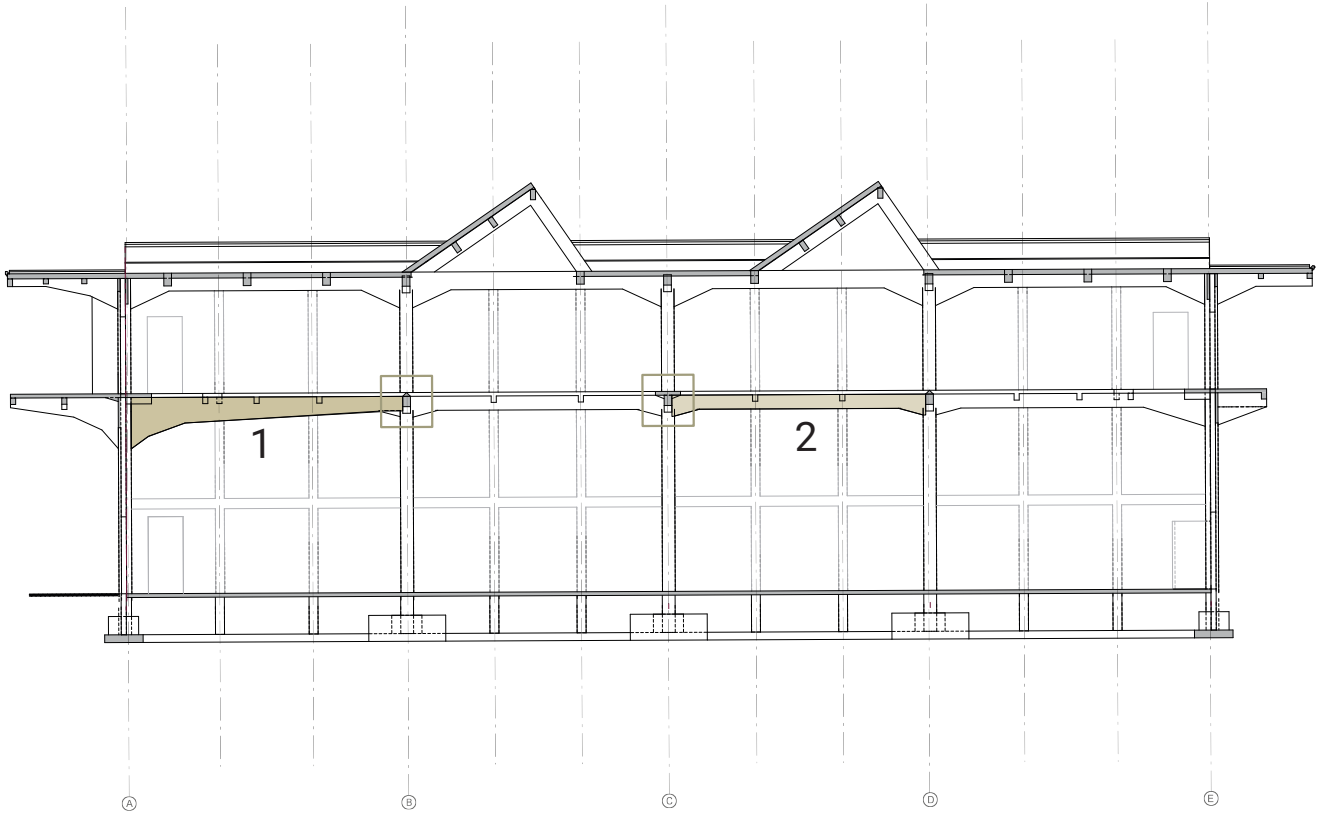
Beam compartment wall connection

Beam column connection

Images by Charlotte de Boon 27- 10-'16

BEAM

HOW DOES THE SHAPE OF THE BEAM REFLECT ITS FUNCTIONALITY?



Beam 1

The silhouette of the beam is determined by the rotational forces created by the attached balcony beams.

Beam 2

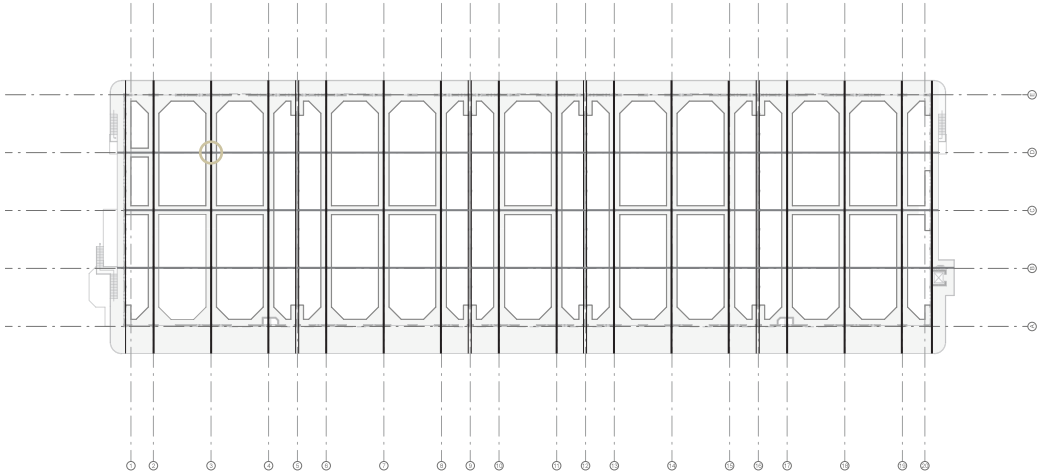
This is the most common beam in the building. The silhouette is typical for the hennebique system because of the angled enlargement at the column connection. To carry the rotational forces

Drawing by L. van Straalen
Images by A. Loef

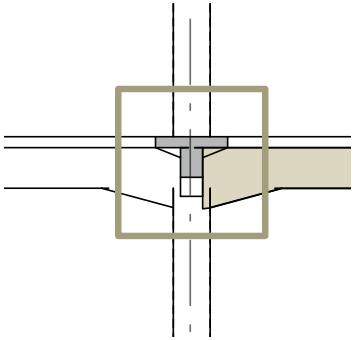
BEAM

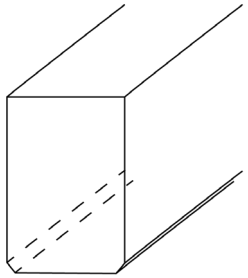
WHAT KIND OF BEAMS OCCUR?

Walkway beams and non walkway beams



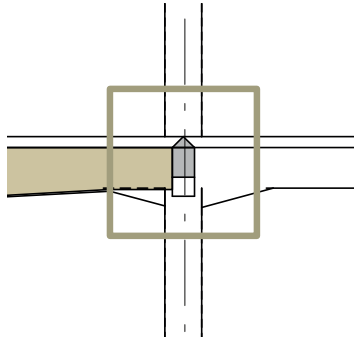
1 Walkway beams and non walkway beams

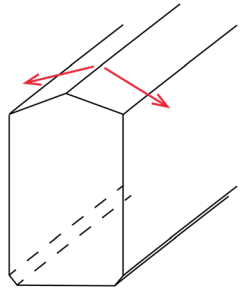




2 Walkway beam

Reinforced concrete beams support walkways.





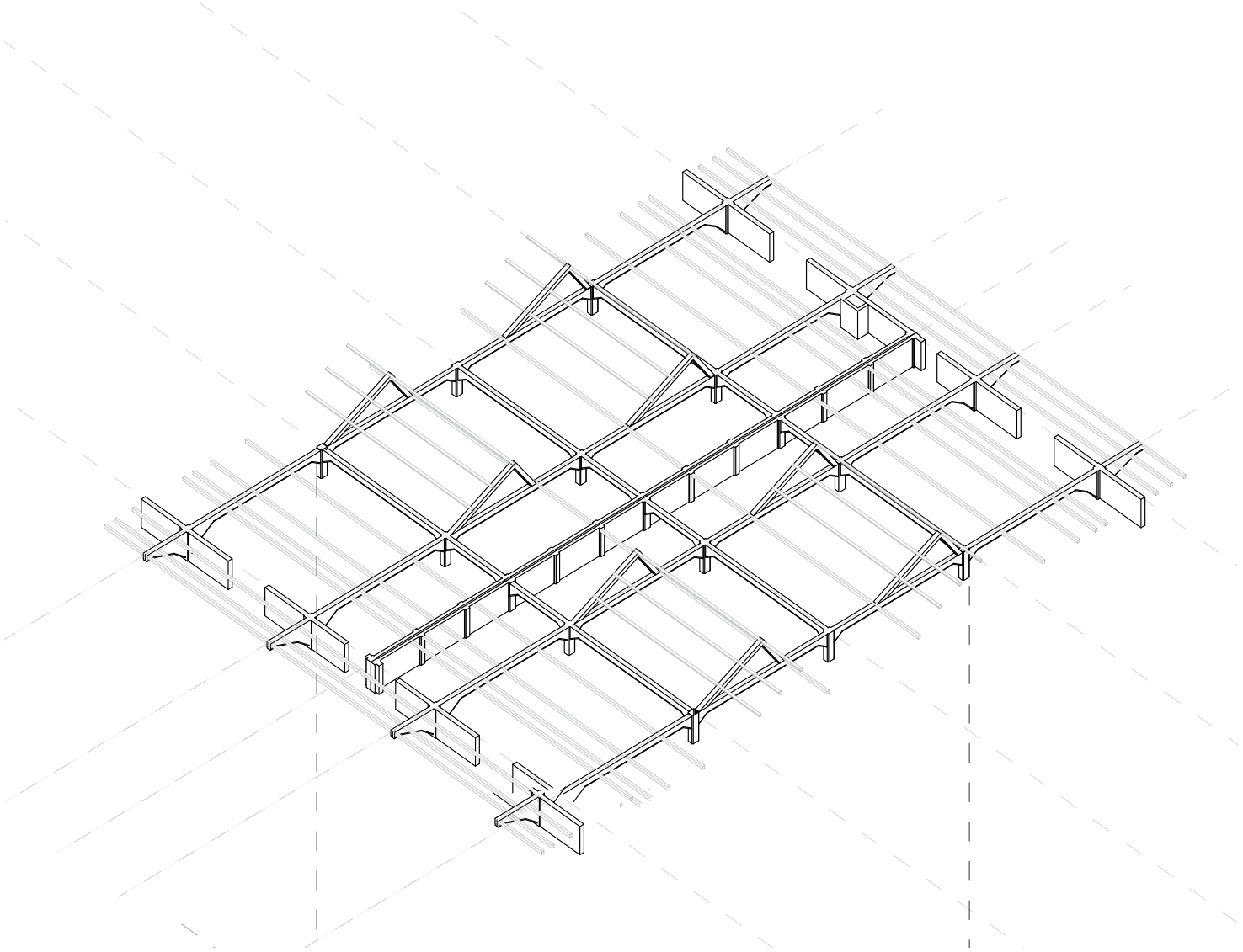
3 Non walkway beam

The beams which do not have walkways on it have a sloped (easle-spine) top. This is to prevent dust (created by the years of storing and moving cotton fabrics) from settling on top of the beams. Dust is flammable thus should be prevented. Another reason could be that the slope prevents people from walking on the beams.2

Drawing 1 by L. van Straalen Drawing 2&3 by E. Stoffels
Images by A. Loef

ROOF STRUCTURE

WHAT KIND OF ELEMENTS MAKE THE STRUCTURE?



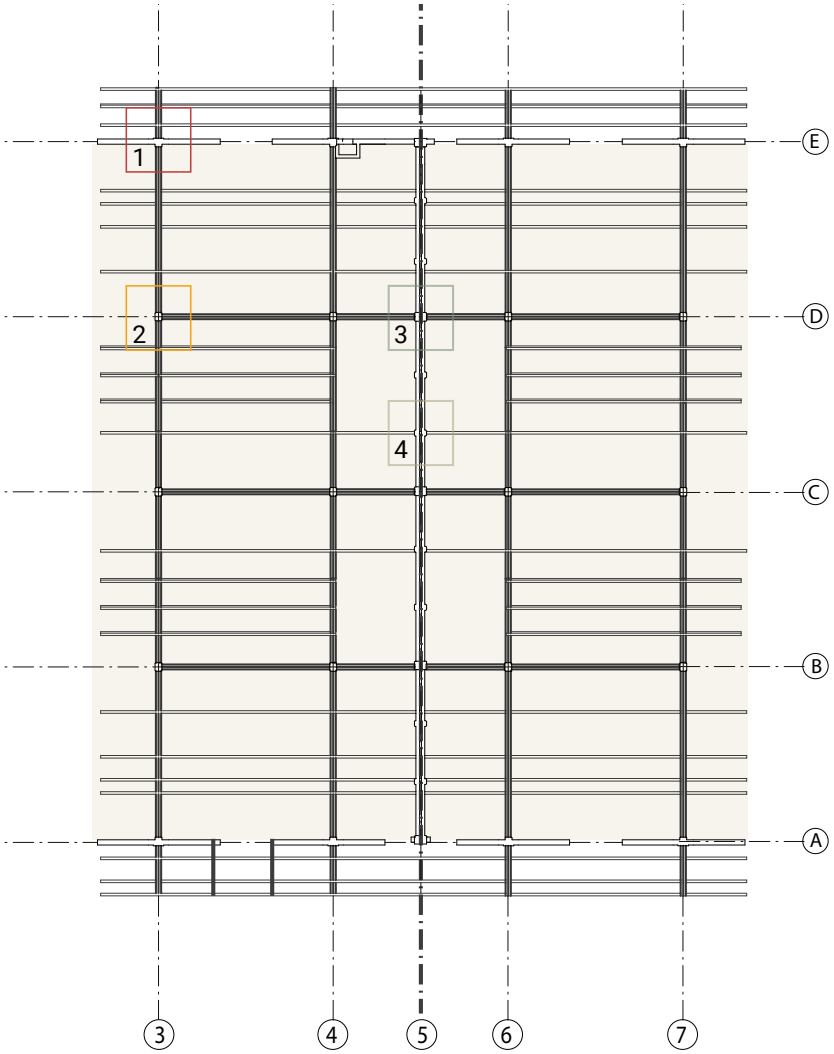
The roof structure consists of a primair structure and a secondary structure. The primairy beams follows the gridlines precisely. The supporting structure for the rooflights is integrated in the beam form. These unequal triangles lift the roof surface to allow natural light get into the building. The secondary structure is purely designed to support the conveyor system, explained in technical system chapter. The distance between the secondary beams is determined by the path of the rail. The transport system is hung on the concrete beams by steel anchors.

Axonometry of Roofconstruction

Drawing by L. van Straalen

COLUMN STRUCTURE

WHAT IS THE STRUCTURAL ORDER?



Roof structure within structural grid. Primairy beams and secundairy beams.

Exterior exceptions in structural order

In the drawing we see the order of beams that are part of the roof construction. The primary beams follow the grid in both horizontal and vertical directions. This is an exception on the typical hennebique system, described at the beginning of the chapter, where the transfer of forces is designed in only one way. Resulting in a more clear hierarchy in primary and secundaire beams. The secondary beam order is purely designed to support the conveyor system and roof lights.

On the south side of the building you can see some cross beams. This will provide the structural support to make openings in the gallery balcony, intended for the transport from the conveyor system to the trains. These openings are the only exceptions in the structural order. Conceivably, the dimensions are related to the length of train wagons.[1]

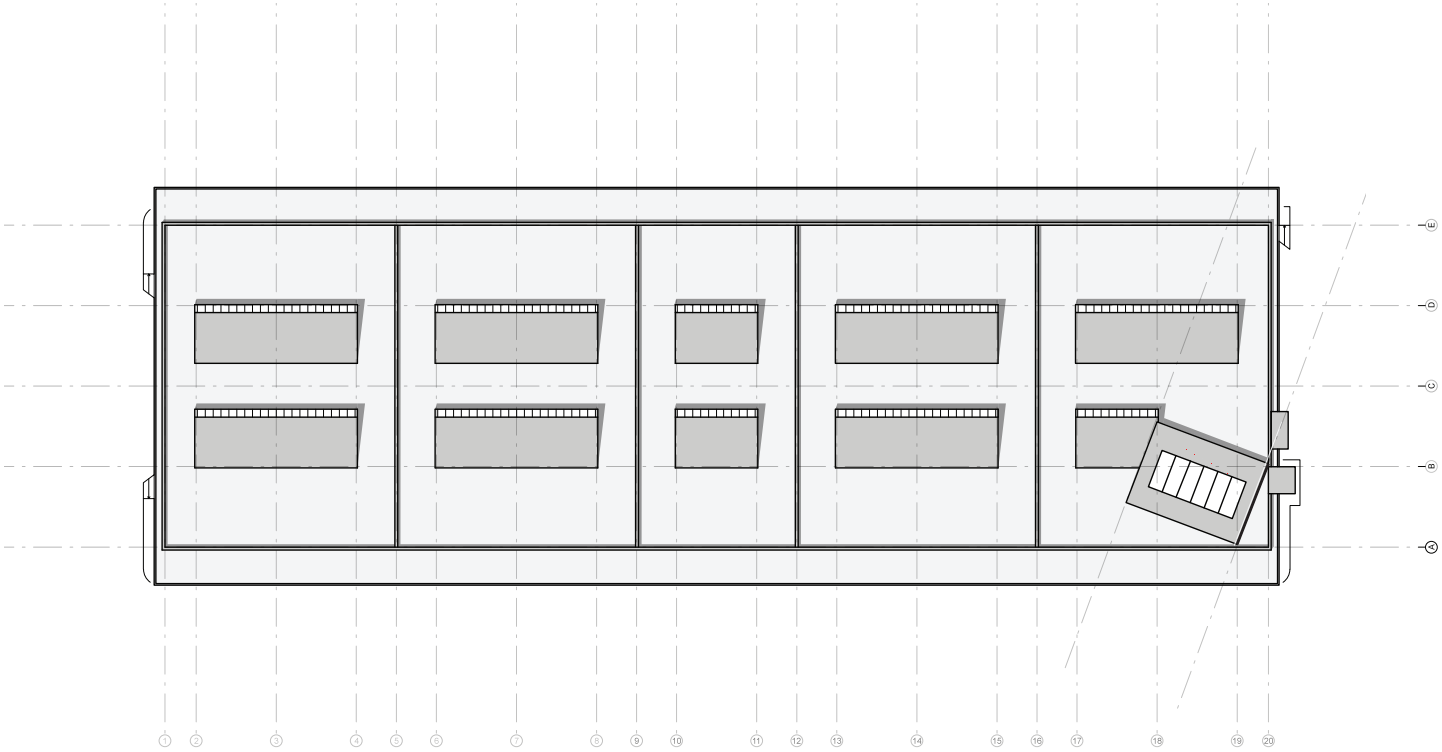
The different kind of columns used to support the beam structure are defined in the following pages.

1 :Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA

Drawing by L. van Straalen
Images by C. de Boon 27-10-'16

STRUCTURE

WHAT IS THE POSITION OF ROOFLIGHTS IN THE STRUCTURAL GRID?



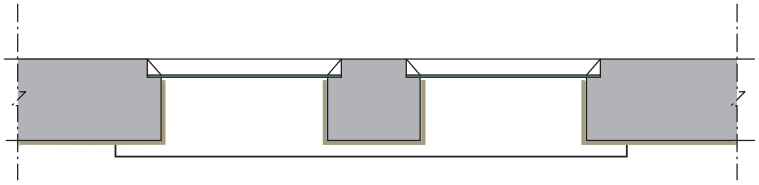
Roof scape of the Katoenveem

The roof lights are placed within the structural grid and follow the direction of the plot. The size of the roof lights is determined by the compartments. The support is provided by triangle truss structure, integrated into one whole beam.

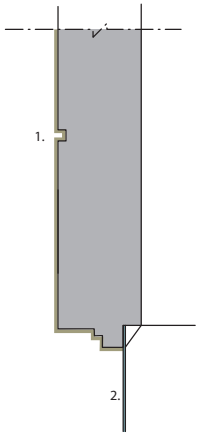
The arc form of the rooflight, where the sample room is placed, is the exception in the roof landscape of the building. It differs in orientation to the other roof lights. The sample roof is made of shell roof construction which was not very common building method for the 1920's.

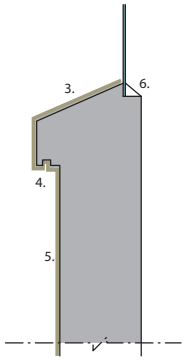
WINDOW DETAIL

HOW IS THE WINDOW DETAIL EXPRESSED?



Detail of window





All window articulation is cast within the structural formwork. The expression of the window is made by line work cast in the surface. Suggesting a lintel.

The window detail is simply made because of the fuctional character, just to close the void. The cement window frame holds the glass. The question remains if the glass can easly be replaced?

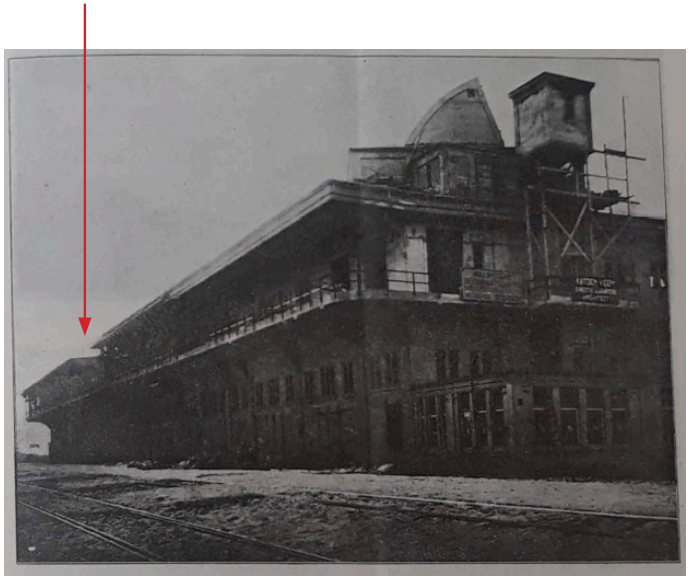
1. Articulation in concrete face. To suggest a constructive lintel.
2. Orgininal: wired glass
3. Angled windowsill - part of formed concrete
4. Water leaking gap
5. Exterior material : light cement layer 10mm
6. Cement window frame

Images by C. de Boon
Drawing by L. van Straalen

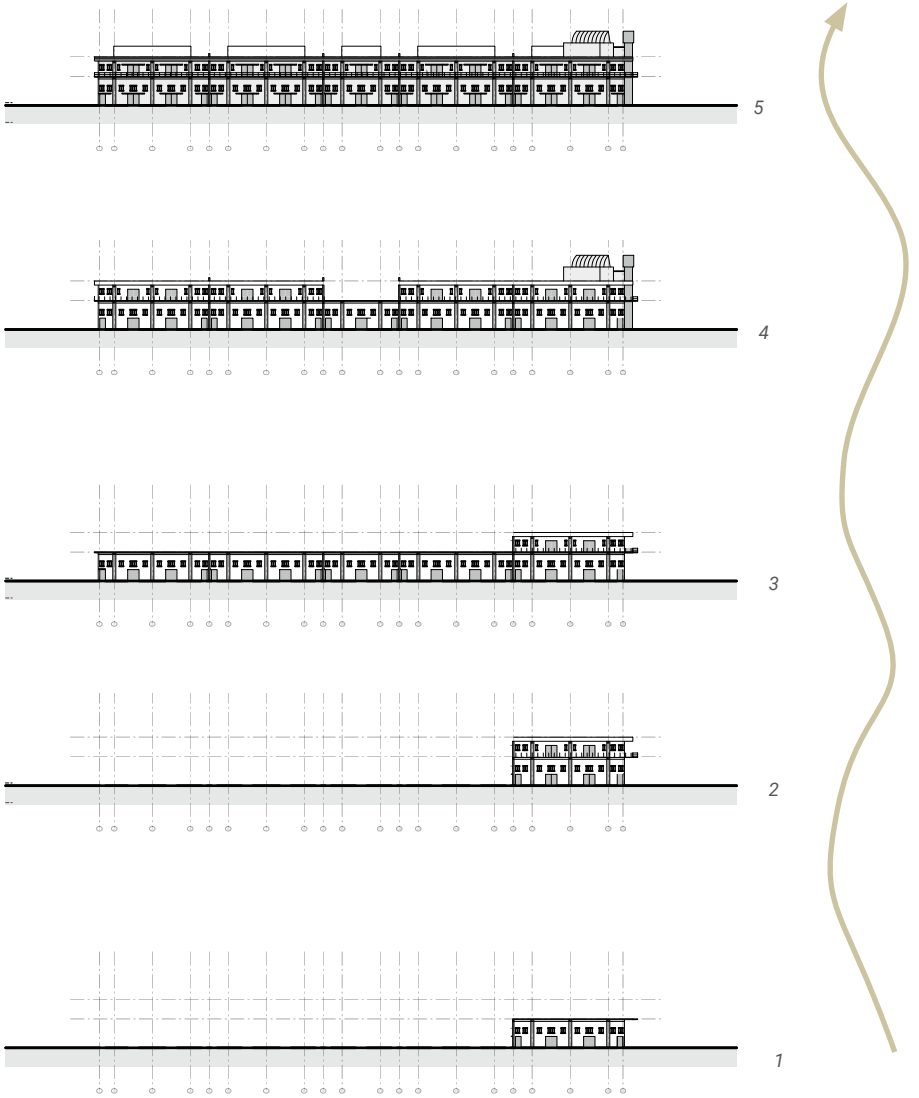
BUILDING PROCESS

HOW DID THEY STAGE THE CONSTRUCTION PROCESS?

The only sources we have on the construction phasing are two pictures. Two observations can be made. Firstly, by the gap in the upper level in compartment 3 you can conclude that the casting process was divided by compartment and level. This could suggest that the formwork was reused in the repeated compartments, which also was financially beneficial.
Secondly, in the picture on the next page you see that the formwork is made. The picture shows the building of the 3th compartment with on both sides formwork of the other compartments. The suggested building phasing is shown in the diagram.



Picture of the building site - almost completed



Drawing by L. van Straalen

Image : H.H. van Dam, "The Cotton warehouse of KAtoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.

PHASING CONSTRUCTION PROGRESS

HOW DID THEY STAGE THE CONSTRUCTION PROCESS?

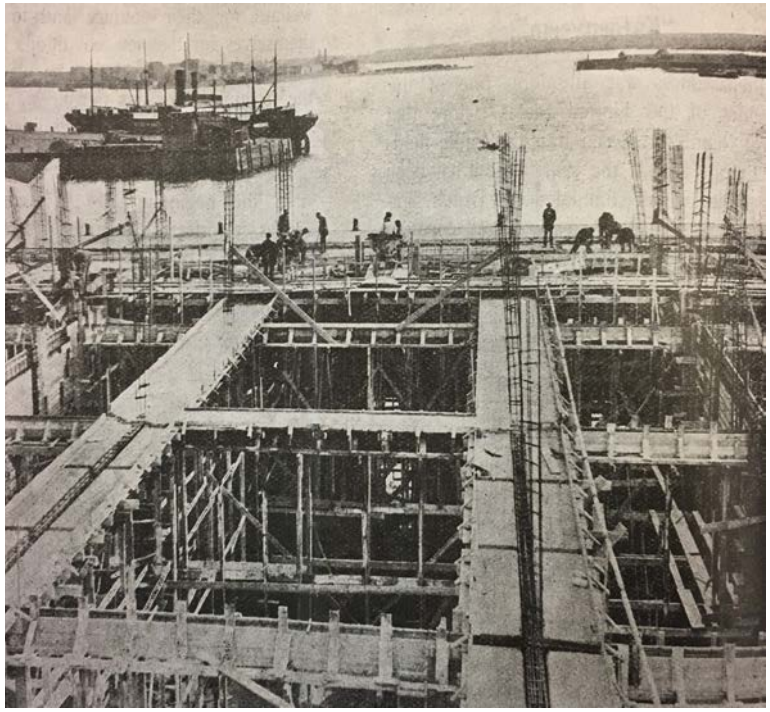
1. Foundation is made. The wall support constructed as a T shape line construction and the columns supported by foot foundation, further elaborated in the foundation page above.

2. The floor is poured on supporting sand layer.

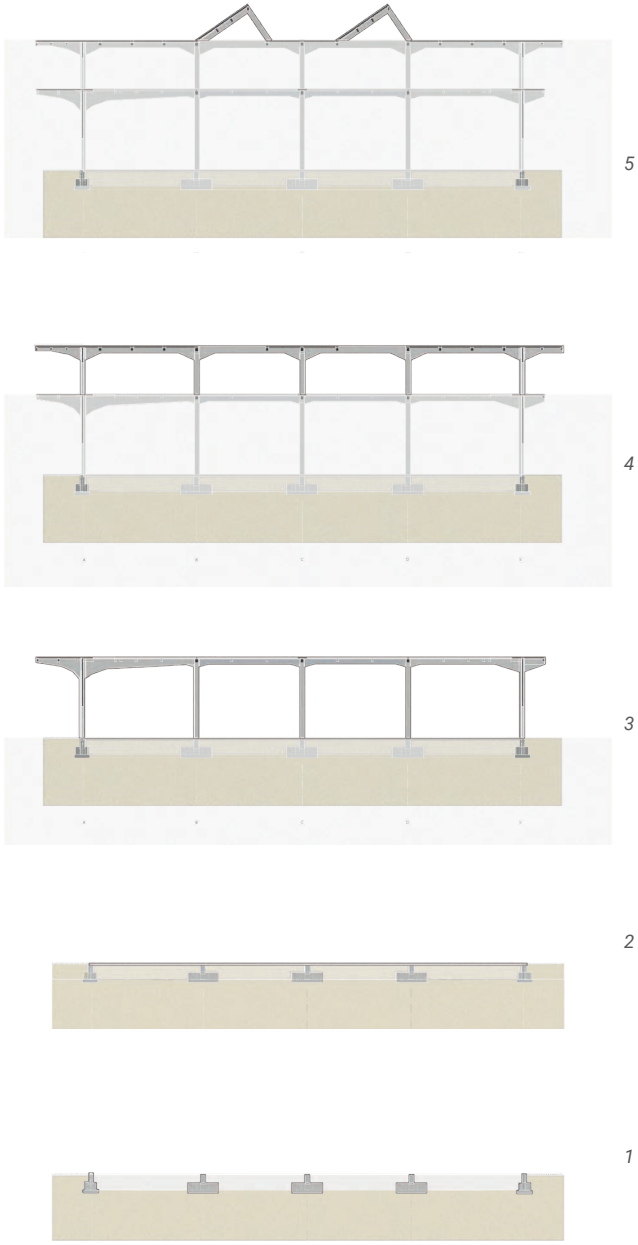
3. The 1st level is cast in place on the foundation points. The reinforcement bars for the second level are already integrated in the columns. The picture shows this stage of construction.

4. The second level is directly cast on the first level. This results in the monolithic concrete connections seen in the pictures on page 112

5. This building step is not mentioned in literature but from the formwork reasoned the angled rooflight construction could not be integrated with the formwork of the roof surface. The same argument applies to the fire barrier, electric gutter and sample room. No pictures of an clear egdes are found.



1: Picture of the building site - Concrete formwork and reinforcement steel



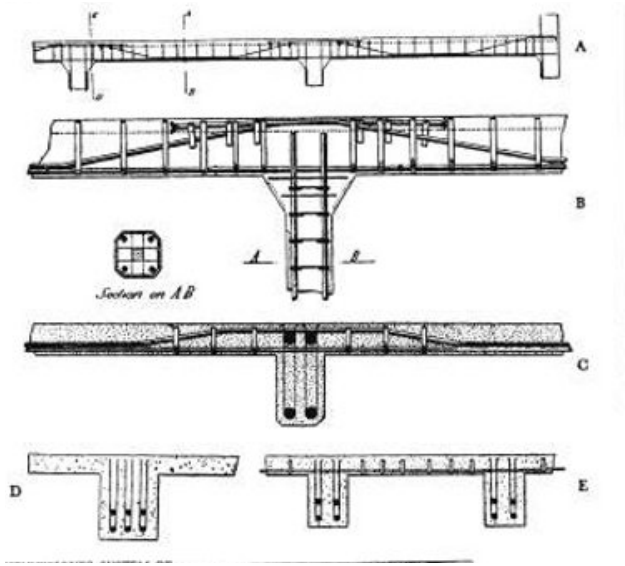
Drawing by L. van Straalen

Image 1: H.H. van Dam, "The Cotton warehouse of Katoenveem", in The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), march, 66.

REINFORCEMENT

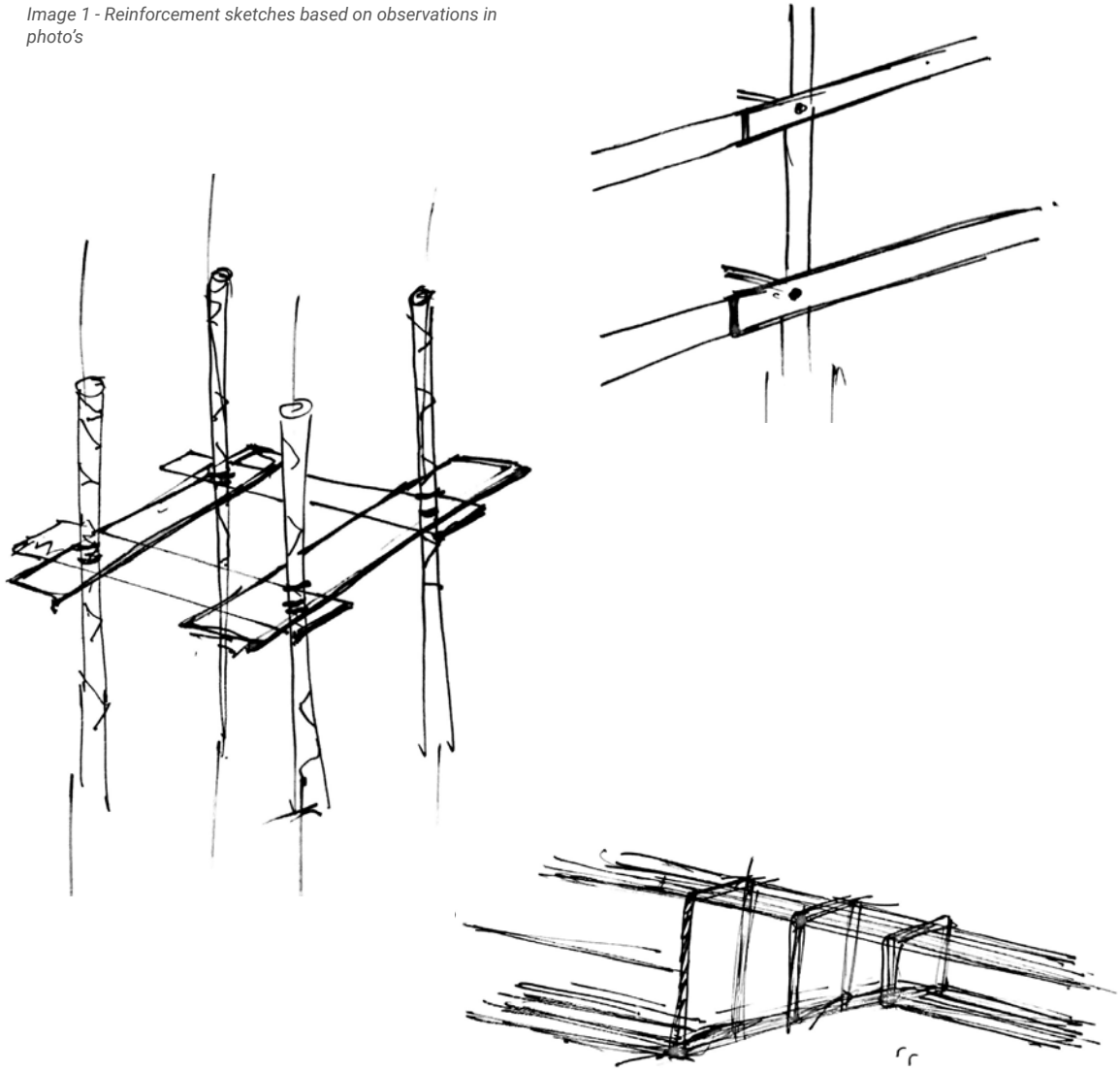
WHAT REINFORCEMENT BARS WERE USED?

The constructors full name was: the Koninklijke Rotterdamsche Betonijzer- Maatschappij v/h van Waning & Co. They had a long history of reinforced concrete. The method that was used in designing the reinforcement bars tells different stories. As mention early the main construction method was based on the Hennebique system. Here we can clearly see traces from in the column reinforcement but also in the beam, on the image 1 on the next page. The use of 'iron' stirrups in the reinforcement to hold the horizontal bars was typical Hennebique but was unusual.[1] The strips were later replace by round bars. This development you can see in the way the more specific elements were constructed. On image 3 the reinforcement of the stair is shown, you see smaller round bars in the horizontal direction. In the walls the use of stirrups in both horizontal and vertical direction are used. Common problem of the stirrup use is the embedment in the concrete resulting in the damage shown.



1 - Reinforcement in the Hennebique Patent on column beam connection [2]

Image 1 - Reinforcement sketches based on observations in photo's



1 :Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA
2: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland
Drawings by L. van Straalen

HENNEBIQUE SYSTEM

WHAT ELEMENTS SHOW THE ORIGINAL BUILDING METHOD?

Image 1 - Typical reinforcement of the Hennebique system with horizontal strips.

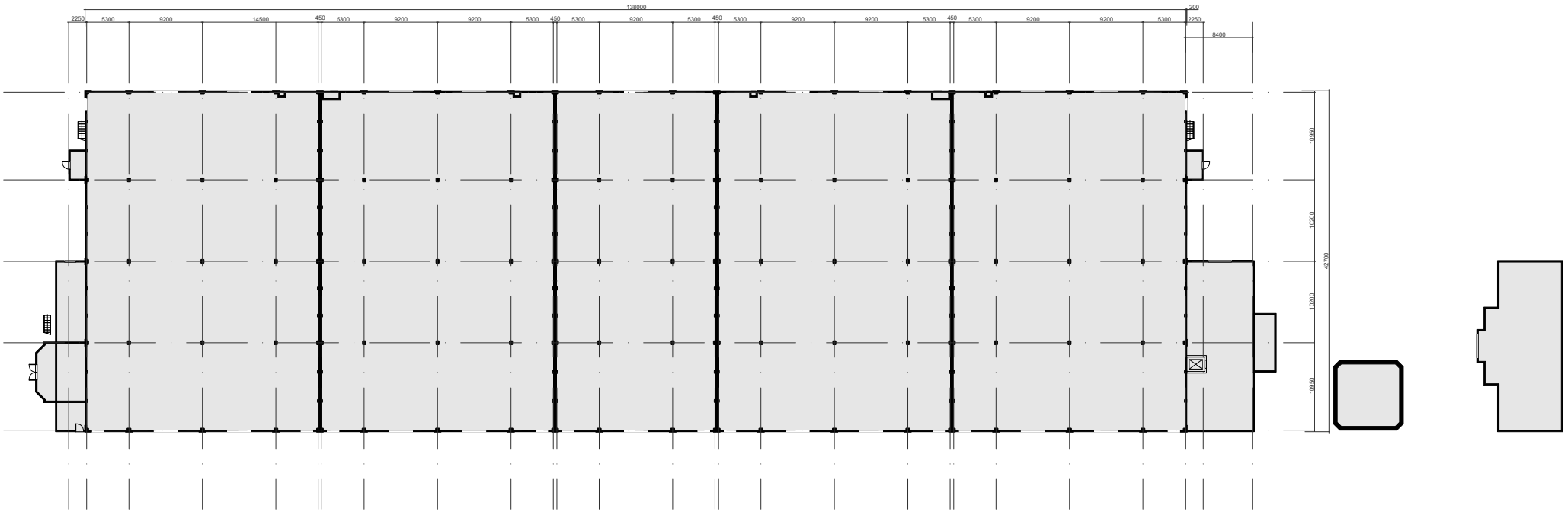
Image 2 - Wall reinforcement.

Image 3 - Reinforcement of exteriro stair.

Image 1: Heinneman,(2013).Historic Concrete From Concrete Repair to Concrete Conservation, Delft , Nederland
Image 2 : Charlotte de Boon
Image 3 : Charlotte de Boon

PLANS

WHAT WAS THE ORIGINAL PLAN OF THE GROUND FLOOR?

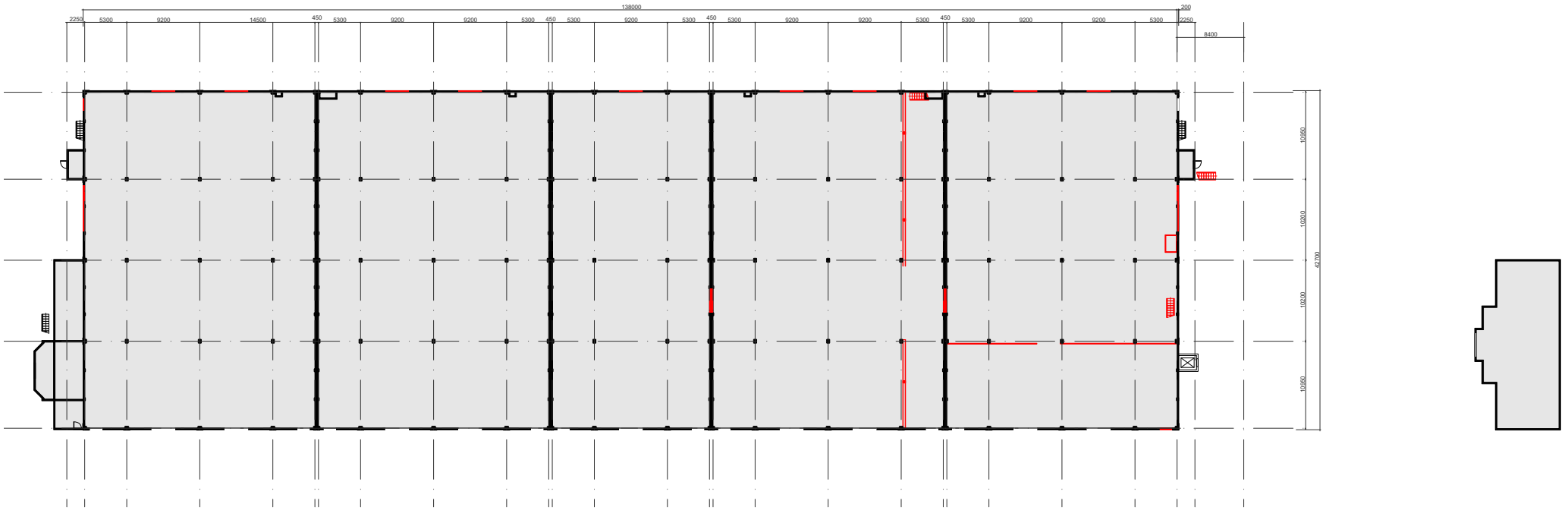


These drawings are about all buildings that were part of the original Katoenveem. The plans help to compare the original situation of Katoenveem with the current situation. The changes in the plans are based on previous research and pictures.

Illustration: Original situation ground floor, by E Stoffels (2020), based on:
plans and pictures from previous groups, Bouwtechnisch verslag, plans from Brightspace and plans from Vianen Bouwadvies.

PLANS

WHAT IS THE CURRENT PLAN OF THE GROUND FLOOR?



Most changes can be related to doors. The east and west facade have been changed because of the implementation of large garage doors. Almost all doors on the south façade are still the original ones but along the water most doors have been closed off or replaced.

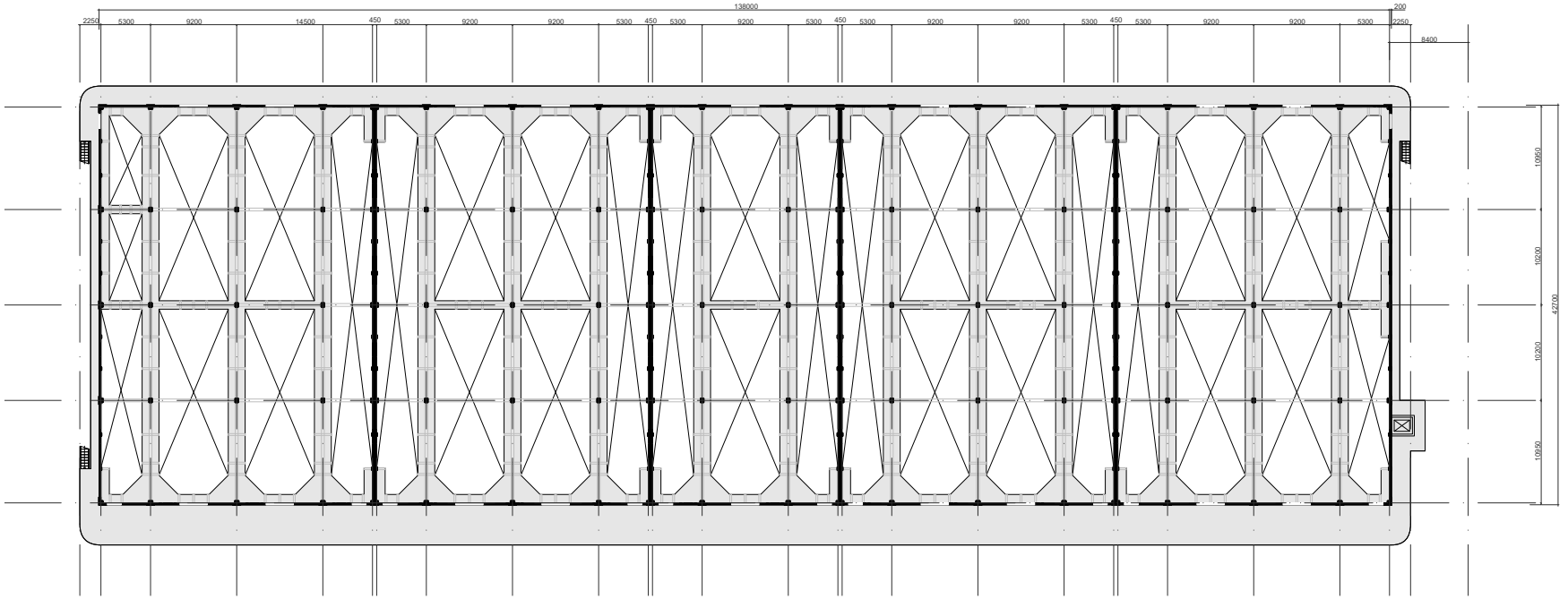
Two of the compartment walls have been partly torn down to create a passage. Besides parts being removed, there were also parts added. Steel constructions, brick constructions and wooden stairs have been added to the interior.

Part that changed

Illustration: Current situation ground floor, by E Stoffels (2020), based on:
plans and pictures from previous groups, Bouwtechnisch verslag, plans from Brightspace and plans from Vianen Bouwadvies.

PLANS

WHAT WAS THE ORIGINAL PLAN OF THE FIRST FLOOR?

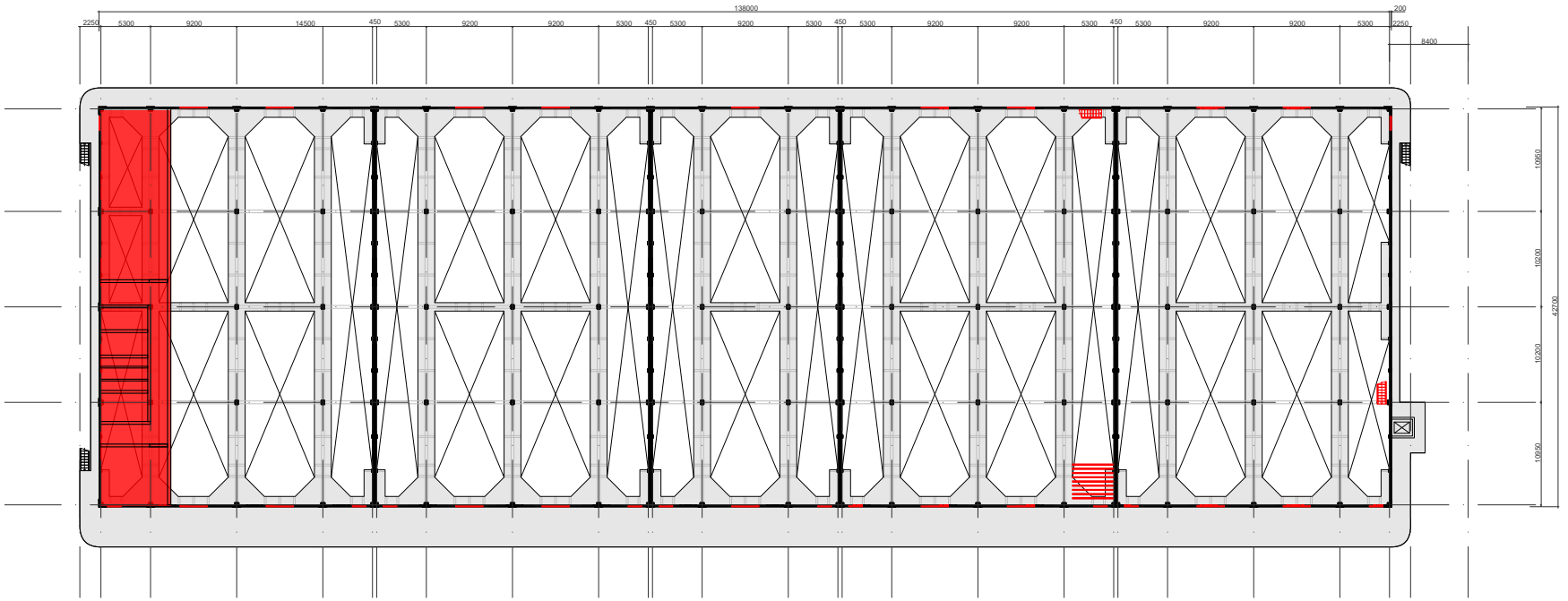


The first floor consitst of walking paths which are placed in a rhythm that matches the load bearing structure.

Illustration: Original situation first floor, by E Stoffels (2020), based on:
plans and pictures from previous groups, Bouwtechnisch verslag, plans from Brightspace and plans from Vianen Bouwadvies.

PLANS

WHAT IS THE CURRENT PLAN OF THE FIRST FLOOR?



On the first floor almost all doors have been closed off or replaced. Wooden beams have been placed over the walking paths on part of the building. Furthermore plans from 1985 (see annex 3) show an office space in the west side of the building. It includes offices, toilets, storage and a kitchen. Whether or not this is still present could not be verified because we could not visit the building.

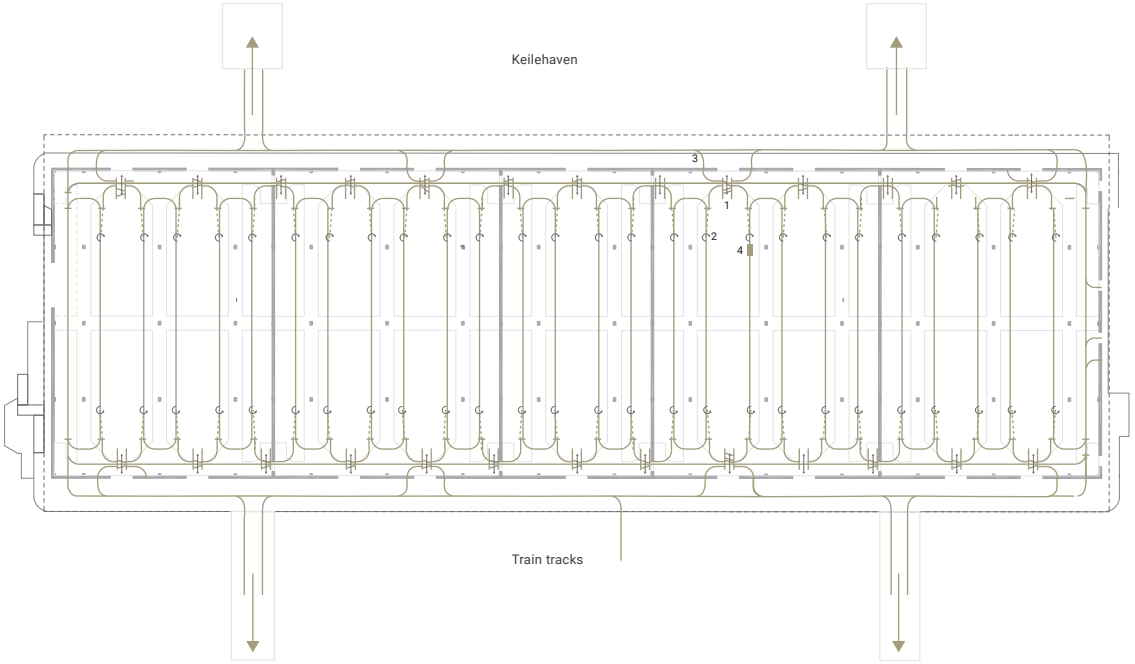
Part that changed

Illustration: Current situation first floor, by E Stoffels (2020), based on:
plans and pictures from previous groups, Bouwtechnisch verslag, plans from Brightspace and plans from Vianen Bouwadvies.

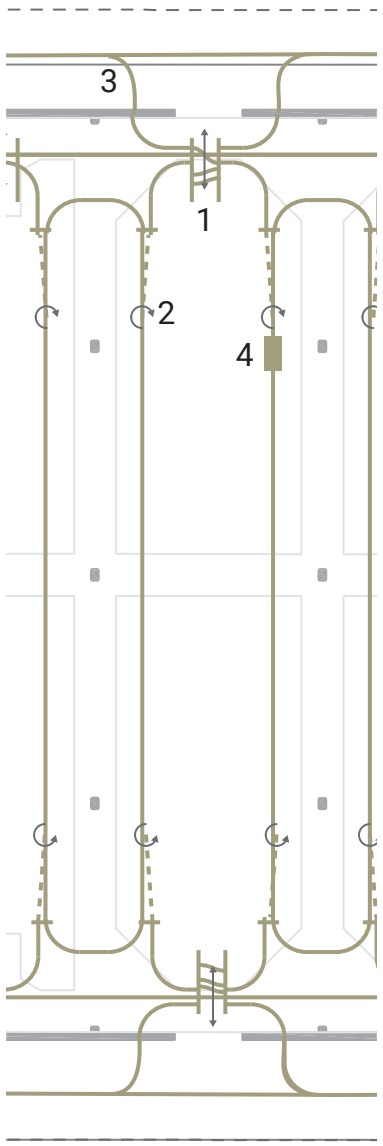
TECHNICAL SYTEMS

CONVEYOR SYSTEM

HOW DID THE CONVEYOR SYSTEM FUNCTION?



Drawing - Conveyor sytem



Drawing - Conveyor sytem changing rail possibilities

In the diagram the conveyor system is shown. This system shows how the building and the cotton storage functioned. The system distributed the cotton along the building and piled up the cotton bales. On the side along the Keilehaven the conveyor system was connected to two towers which loaded the cotton directly into and off the boats. On the road side the system was connected to bridges running to the other warehouses. Also trains could be supplied from the balcony.

The second diagram shows how the system could change the directions of the rails. There were turning points (picture 2) where the cotton could move in the longitudinal direction. Also shifts were used to move the cotton from one rail to the other (picture 1). These were operated manually

The lifting machines (picture 4) were powered by electricity which was supplied by cables that ran underneath the railway beams. These cables are no longer present in most of the building however in some places you can see traces of the electrical clamps

Conveyor SYSTEM

WHAT ELEMENTS OF THE CONVEYOR SYSTEM ARE STILL VISIBLE?

Image 1 - Rail changing system

Image 2 - Rail changing system and operating cables

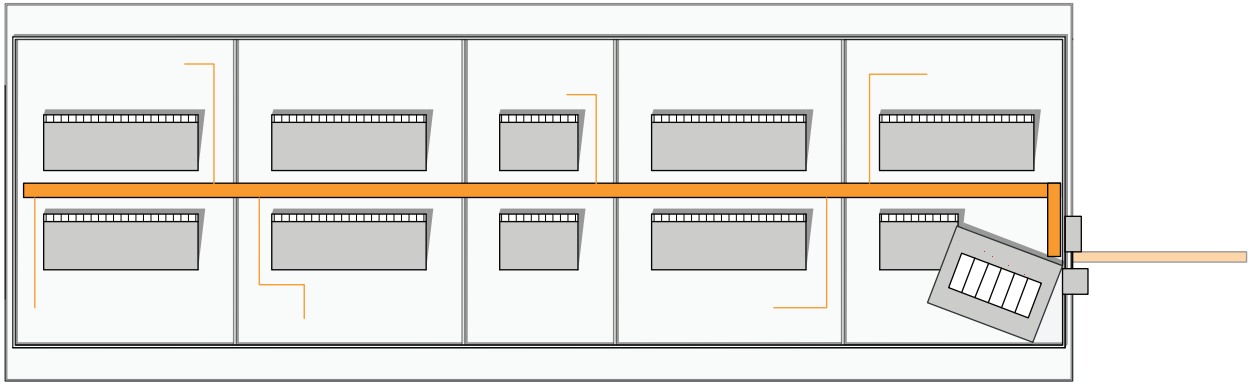
Image 3 - Rail through doors

Image 4- Electrical Motor to transport the cotton

Images by Charlotte de Boon 16-09-'16

ELECTRICITY SUPPLY

HOW IS THE ELECTRICITY DISTRIBUTED ALONG THE BUILDING?



Along the roof an electricity gutter provides the distribution of electricity for every compartment without breaking the fire protection walls.

Drawing by L. van Straalen

FIRE SAFETY

HOW IS FIRE SAFETY INTEGRATED INTO THE BUILDING?

Due to the great fire hazard, it was necessary to invest in a costly sprinkler system. Not the hydraulically pressed cotton-bales, but particularly the cotton fabric that deposited in all corners and holes after years of transport was extremely flammable. The system increased the costs from FL. 800.000 to FL. 950.000.[1]

In 1918 the sprinkler system (with water tower) was delivered from England. The first bales were stored in May 1919. And in the same year, on September 5, 1919, there was a first fierce fire in department E. On March 25, 1921, the new sprinkler system was successfully tested and on December 6, 1925 it received its first major test in a heavy fire in department D.[1]

One year before the shutdown of the cotton store, another fire raged on August 13, 1963. To stay in control of the fire, the building had to be almost completely cleared out. After the event, the building remained out of use for quite some time. Obviously, this had negative consequences for the operating result.[2]

In 1964 the Katoenveem was put out of business. In 1966 the water tower was demolished and the sprinkler installation was no longer in use.[1]

3

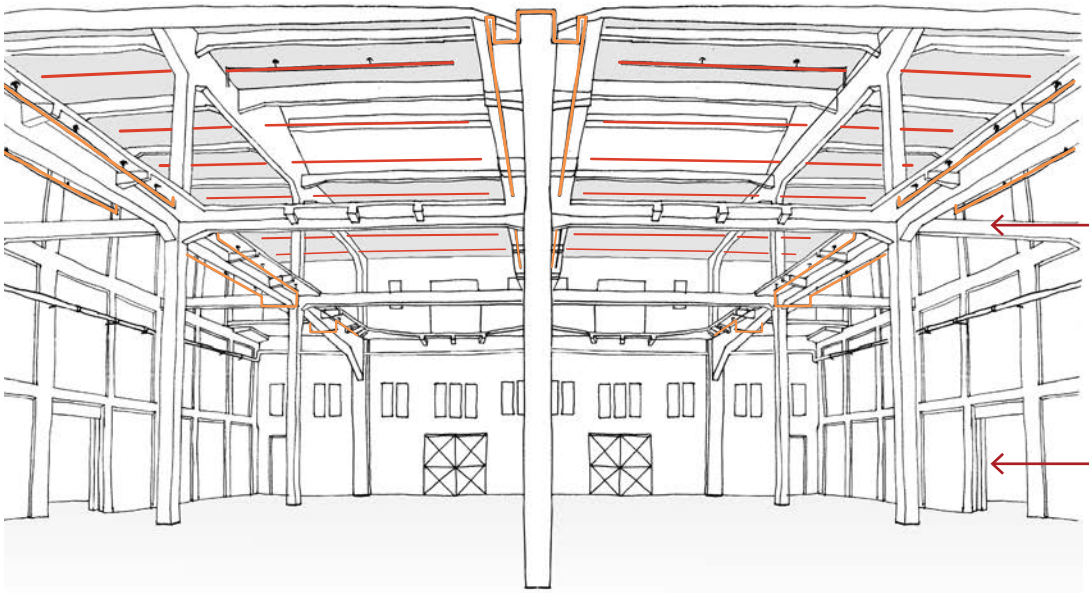
4

5

1 Bureau voor Bouwhistorie en Architectuurgeschiedenis. (2005). *Bouwhistorische verkenning Katoenveem, Keilestraat 39, Rotterdam*. Nederland: Utrecht, BBA
2 Vennootschap Katoenveem. (1963). Jaarverslag 1963. Retrieved from: Stadsarchief Rotterdam
3 Unknown author. (1897). An advertisement by Dowson, Taylor and Co limited for the Grinnell automatic sprinkler. [Illustration]. Retrieved from: Engineering magazine, LXIII (1623).
4 Unknown. (1952). Katoenveem with watertower.[Photo]. Retrieved from: Stadsarchief Rotterdam
5 Unknown. (1963). Fire Katoenveem 1963. [Photo]. Retrieved from: Stadsarchief Rotterdam

FIRE SAFETY

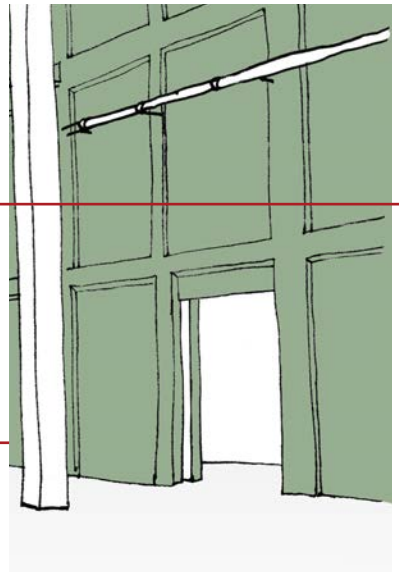
HOW IS FIRE SAFETY INTEGRATED INTO THE BUILDING?



1

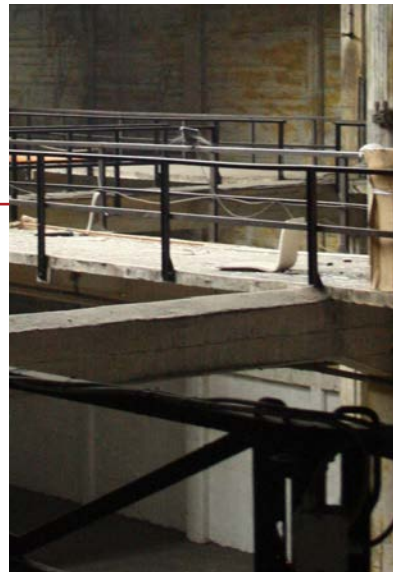
sprinkler under the roof

sprinkler under the walkways



2

The building consist of five compartments (A, B, C, D, and E), the partitions walls serve as dilations walls. Each compartment has its own walls, therefore on the place of the dilations, the walls are double. In between these walls is a void. This way the dilations walls do not serve only one purpose, with this way of construct also become five fire compartments.



3

The east-west oriented beams are provided with a saddle coping at the top. This was probably designed this way to prevent people from walking on but also less dust would remain on top.[4]

1 Kuiper, A. (2020). Sprinkler installation. [Illustration]
2 Kuiper, A. (2020) Separation wall between compartments . [Illustration]
3 Boon, C. (2017). Saddle coping. [Photo]
4 Bureau voor Bouwhistorie en Architectuurgeschiedenis. (2005). Bouwhistorische verkenning Katoenveem, Keilestraat 39, Rotterdam. [Photo]

FIRE SAFETY

HOW IS FIRE SAFETY INTEGRATED INTO THE BUILDING?

1

2

3

4

1Boon, C. (2017). Streng verbooden te rooken. [Photo]
2 Bureau voor Bouwhistorie en Architectuurgeschiedenis. (2005). Bouwhistorische verkenning Katoenveem, Keilestraat 39, Rotterdam. [Photo]
3 Boon, C. (2017). Cabinets for fire hoses. [Photo]
4 Boon, C. (2017). Fire hoses. [Photo]

DAMAGES

DAMAGES

WHAT KIND OF DAMAGES OCCURED?

a. Spalling of concrete
b. Green; Linchen, moss, Algea.
c. Wet Surface
d. Rust in reinforcement
e. Areas of salt damage
f. White paint previous concervation attempts
g. Black surface; industrial deposit of air pollution.

Damages inventory obtained by visual inspection of the building
Drawing by L. van Straalen

INVENTORY DAMAGES

WHAT ARE THE TYPE OF DAMAGES?

1 Spalling of concrete

2 Corrosion of the reinforcement

3 Cracks

4 Salt damages

5 Green damages: lichen, algae, moss

Spalling of concrete [1] is a result of carbonation induced corrosion of the reinforcement. Due to contact with water the reinforcement starts to rust [2]. This not only negatively effects the loadbearing capacity of the construction as the diameter of rebar is reduced, but also the stresses that are caused by the rust can cause the surface to crack [3]. Cracks first appear parallel to the corroding reinforcement. This later leads to spalling of concrete and further exposure of the already damaged reinforcements.[1] Since the damage is caused by a presence of water, it is important to have a flawless drainage system. There is a lot of leakage from rainwater pipes, which further accelerates the deterioration of the material. The proximity of the site to river however also affects the building due to (salt) water spray.
Water carried in small particles through the air enables salts to easily reach the building. Since the prevailing wind direction in the Netherlands is southwestern (see annex 2), wind often blows over the water towards Katoenveem and thus causes the damage to spread.
The type of damage caused by salts [4] can be different from carbonation induced corrosion, as the reinforcements shows rather 'pitted' type of damage and a rust layer is not always formed.[2] The reaction with salts does not increase the volume of reinforcement, and therefore cracks and spalling are not always present. However, the structural strength of the concrete can be severely affected.

The green deposit on the surface of the building is caused by biological growth. Micro-organisms adhere to the material of the facade and retain dirt. The presence of water sustains the micro-organism, as well as other nutrients possibly present on site. The deposit can be cleaned of the facade by physical methods (brushing it off) and prevented from reappearing if moisture sources are blocked.[3]

1 Heineman, H. (n.d.) Degradation mechanisms concrete. TU Delft: Delft, p.59
2 idem, p.61-62
3 Anonymous (n.d) Reader cleaning (AR1AR080) TU Delft: Delft

CONCLUSION

BUILDING TECHNOLGY

ANSWER RQ

In general the building is a beautiful example of the technological possibilities of the 1920s. The use of concrete and the technical services are evidences that it was an very innovative building for that time. The detailing in the concrete and the choice for a complete concrete construction make the building a rare example of industrial concrete buildings. The technological possibilities are clearly seen in the window detailing and ‘fake’ ornamentation. The way the exterior was plastered with artificial sandstone render marks a point in time were the appreciation of concrete surfaces was not (yet) fully adopted.

The leading factor of the structure are the dimensions of the grid which are based on efficient storage of cotton. The storage of cotton required a strict fire safety measures. Solutions to protect the cotton from fire can be found in every layer of the building. The main scheme of the building is separated into compartments. The compartments are secured by fire doors and extra barriers to prevent fire flashover. The technical services include an innovative sprinkler installation.

The beam column landscape is shaped by how the conveyor system is operated and the need for a visual connection between the different floors. The primary beam structure has a repeated orthogonal measurement system were the load distribution is organized in two direction. This results in monolithic connections where there is no hierarchy in beams. In the roof construction we see a secondary beam order which is entirely determined by the design of the conveyor system. And therefore conflicts with ground floor grid systems.

Out of the fact that the whole building is made out of concrete we conclude two things. Firstly, you have a very stiff building were the dilatation positions are important. Secondly, every building part can not be seen as a separate piece. In the casting process every element is merged with the whole. This makes it the adaptability difficult and you can’t value building parts apart from each other.

The exterior surfaces are in bad condition, most weathering damages to the concrete surface. The most restoration work has to be done to the balconies, with a focus on the supporting beams. The structure itself is in a good condition, especially in the interior beams give room for possibilities. The services of the building are not operational anymore but most of the remains are still visible.

In the analysis there are still some questions that remain to be answered. The exact form of the foundation is still unclear and the exact cause of the black tarnish on the exterior facade is still to be determined. The carrying capacity and distribution of horizontal forces of the structural beams and columns need further research.

CULTURAL VALUE

''Value has always been the reason underlying heritage conservation. It is self-evident that no society makes an effort to conserve what it does not value.'' [1]

The Katoenveem building is listed as a national monument. It is a historic industrial building complex located in Rotterdam. Over time the building has lost its function and is now marked for future cultural use. To realise its new function the building needs to be adapted. However, the building is marked as heritage thus the cultural value of the building must be balanced with the redevelopment. To realise this balance it is important to know what contributes to Katoenveem's value and thereby what the tolerance for change is.

Previous chapters form the first and second pillar of building archaeological research which is necessary to conduct a cultural value assessment.[2] The chapters contain research about the building complex as a primary source of data (first pillar) and archeological research (second pillar) whereby relevant archives, literature, historical maps, old drawings and photographs have been studied. The data is recorded in text and images.

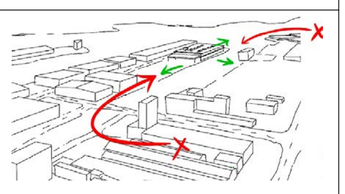
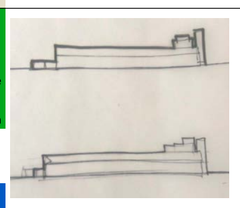
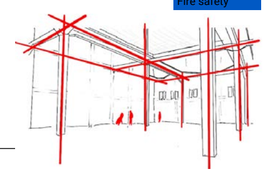
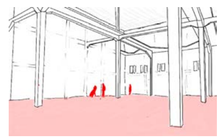
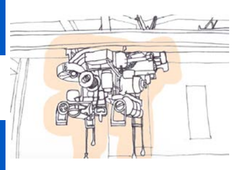
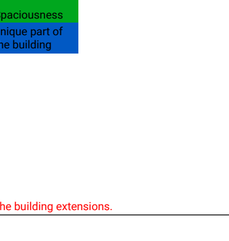
In this chapter a value assessment is conducted based on the previous research, to position our own design choices when redeveloping Katoenveem. Our main research question is: *What are the values of of Katoenveem*? To answer the research question we used multiple tools. Firstly a cultural value matrix is used. The value matrix is a tabular system introduced by Kuipers and De Jonge in the book 'Designing from heritage: Strategies for Conservation and Conversion'. The matrix relates the intangible parts of the building to the tangible values. The constituent values (intangible parts) are based on Riegl's categories, whereby 'rarity' and 'other' have been added. The physical elements (tangible parts) are ordered per 'Shearing Layer' (S-layers), a concept introduced by Stewart Brand. To Brand's layers three categories, namely 'surroundings', 'surfaces (interior)' and 'spirit of place' have been added. To make spirit of place more clear it is expressed in collages. Secondly it was decided to add an additional part that maps more intangible values, in the form of storylines. For this we were inspired by a lecture by Groeneveld and Hemmes on the 'Building Archaeological research on the Municipal Dockyard in the city of Antwerp'. Furthermore the chapter contains attributes which are still present that form a physical reference to the original function of the building. Also value maps based on original plans and facades are part of this assessment.

1 De la Torre, M. (Ed.). (2002). Assessing the values of cultural heritage. The Getty Conservation Institute. (p.7) Los Angeles, United States: The J. Paul Getty Trust.
2 Hendriks, L. & van der Hoeve, J. (2009). Guidelines for building archeological research. The Hague, The Netherlands: Cultural Heritage Agency.

VALUE MATRIX

high value
positive value
indifferent value
negative value / disturbing

Crucial
Important
Contributing
Not relevant

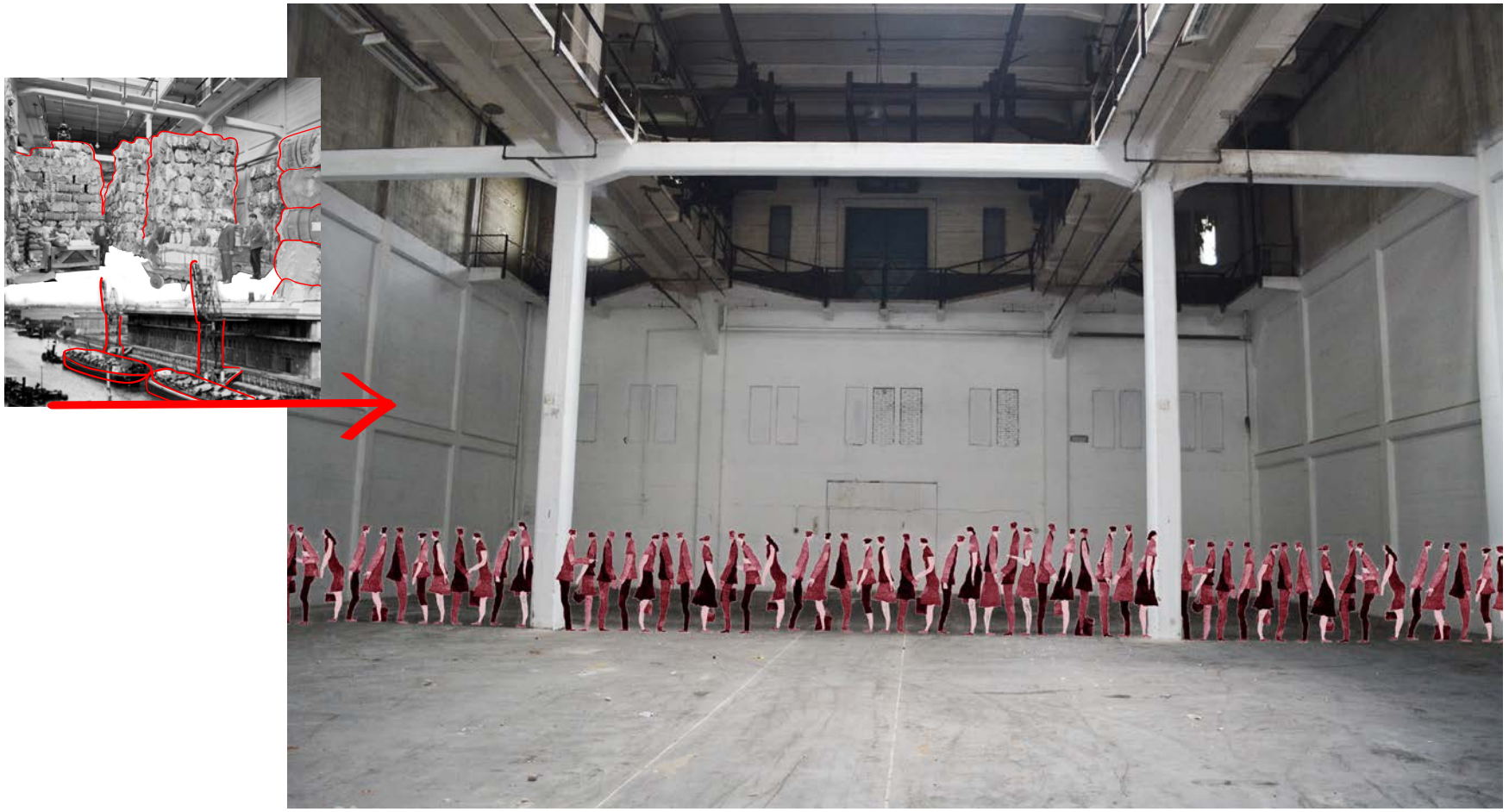
Architecture	BRAND + RIEGL +		AGE value	HISTORICAL value	INTENTIONAL COMMEMORATIVE value	NON INTENDED COMMEMORATIVE value	USE value	NEW-NESS value	(relative) ART value = expression	RARITY value [+]	OTHER relevant values [+]
Architecture	SURROUNDINGS / SETTING [+]	Harbour		Part of the Rotterdam port development between 1906 - 1922. Harbour is now part of Rotterdam's identity			Part of a worldwide network of trade. In this case cotton.		Harbour / industrial atmosphere		[see storylines]
		Railway system		Part of historic railway network. (connection is lost in current situation)							
		Infrastructure	Part of the water structure is muted, changing the original structure	Waterways were essential to historic infrastructure			Area closed off for public, no public spaces				
		Greenery									
		Quays		Orientation parallel to water			functional quays: oriented so that ships can easily go in. Lost opportunity in current situation				
	SITE	Water		Water was essential for functionality			Water has no functional relation to KV in current situation				
		view / sight lines									
		Pier		Part of transhipment system			Pier has no functional relation to KV in current situation				
Function + Organisation	SKIN (exterior)	Roof landscape		Daylight into the building, direct relation to original function			Daylight into the building, pleasant atmosphere		Horizontal lines in architectural expression		
		Roof edge					Overhang to protect balcony from rain/sun				
		Roof monsterkamer		Concrete shell construction			Orientation daylight (north)		unique orientation		
		Balcony		Part of transhipment system					Horizontal lines in architectural expression		
		Doors (green ones)	traces of aging (rust)	reflects original functionality			Flexible		colour stands out		
		Windows	negative age value because the windows have been modified						Windows with fake 'ornamental' trims		
		Material	Ageing concrete / damages	Reflects appreciation of concrete, one of the example in Rotterdam					natural stone color/texture	kunstzandsteen pleister	
	STRUCTURE	Grid size		reflects original functionality			Flexible in use		Rythm	dimensions based on cotton scale	
		Interior walls	Ageing concrete / damages				Fire safety				
		Columns and beams		Open network of beams and columns, optimise cotton storage efficiency					Complete network of columns and beams, visible in open space	Complete network of columns and beams, visible in open space	
		Construction method		Important dutch example of the hennebique system						Early example of entire concrete building	
Building Technology	SPACE PLAN	Compartments		Innovative					Spaciousness		
		Monster room							unique part of the building		
Building Technology		Daylight		Optimal daylight filtering for long and pleasant working days			Natural light inside the core of the building				
		Building extensiosn	Up until this point in our research, we were unable to collect any information and photographs of the interior of most of the building extensions.								
	SURFACES (interior) [+]	Walking bridges		were made to control the conveyor system			Short route through the building				
		walls		Tells how the building was built					Pattern of depth according to structure		
		voids (in wall)					Connection between compartments				
		materials									
		Floors		Tells story about historical use							
	SERVICES	Conveyor system		Represents functionality/use of the building			Efficient transportation system of goods			Early example of electrical rail system	
		Elevator shaft							Position value		
		Sprinkler system? / fire safety		represents use of the building					innovative water tower and sprinkler installations	especially designed for flammable cotton	
		Lighting (electrical)		Innovative at the time			Moveable				
		Drainage system									
	STUFF	Railings							the iron railings bring a material into view other than concrete		
		Doors (other than the green ones) and rolling shutters		Represents functionality and fire safety of the building			Double doors prevent fires from going from one compartment to the other				
		Lamps									
		Train Tracks		Represents how the site functioned							
		Signs					to prevent fire				
		Storage lines					efficiency visible in white tiled lines on floor				
		Wall signs									
	Spirit of place	light/dark	For sprit of spirit of place see collages.								
		open/closed									
		scale (human/goods/trains/ships)									
		recognizability									
		perception with senses (sound/smell)									

		History of Cotton Trade / Unique building	Development of building technology (concrete)	Development of the harbour	Development in typology of industrial warehouses	The Katoenveem as machine	The Katoenveem as 'Geile haven'
SURROUNDINGS / SETTING [+]	Harbour	Collaboration of several cotton traders to enable building	other warehouses in Rotterdam were "predecessors" which led to Katoenveem	Direct relation between function and harbour development	at that time Katoenveem was located on the outskirts of the city, just like many other warehouses	Connection to water.(import export of goods)	
	Railway system	No longer connected to KV		No longer connected to KV	No longer connected to KV		
	Infrastructure	During this time, the accessibilty was very good		During this time, the accessibilty was very good		During this time, the accessibilty was very good	The poor accessibility was actually a good thing during prostitution era
	Greenery	Infrastructure via water was essential for cotton trade					
	Quays	Orientation parallel to water				functional quays: oriented so that ships can easily go in. Lost opportunity in current situation	
SITE	Water			Easily reached by bigger and smaller ships	next to water and train tracks	Left-overs of 'moving system' (cranes, water tower, bridges, conveyor etc)	
	view / sight lines						The many sightlines are negative value for illegal activity
	Pier						
SKIN (exterior)	Roof landscape				The rooflandscape provided excellent lighting conditions for the storage and qualifying of cotton		
	Roof edge					The roof edge was an integrated part of the system.	
	Roof monsterkamer		Early example of shell roof construction		Shell roof provide perfect lighting conditions for sampling		
	Balcony	Balcony essential for transipping cotton efficiently				Balcony essential for transipping cotton efficiently	
	Doors (green ones)					Rhythm of openings in facade was essential for efficiency KV	
	Windows		Window sills in one concrete piece				
	Material		Technological reflection of that time				
STRUCTURE	Grid size	Grid size related to efficient storage of cotton			Grid size related to efficient storage of cotton		
	Interior walls		Fire safety				
	Columns and beams		Example of Hennebique system in the Netherlands				
	Construction method						
SPACE PLAN	Compartments	compartments specifically cotton warehouse: fire protection	Concrete fire safety walls			Compartments direct relation to functionality and efficiency	
	Monster room						
	Daylight	Optimal daylight filtering for long and pleasant working days			Optimal daylight filtering for long and pleasant working days	Optimal daylight filtering for long and pleasant working days	The daylight at KV is designed in a way that it almost exclusively comes from the roof. This is a positive value with regards to 'pottenkijkers'
	Building extensiosn						
SURFACES (interior) [+]	Walking bridges		were made to control the conveyor system				
	walls		Concrete load bearing construction creates pattern of depth in surfaces				
	voids (in wall)						
	materials		KV as an example of what is possibel with concrete				
	Floors	Tell us how storage was organised			Tell us how storage was organised	Tell us how storage was organised	
SERVICES	Conveyor system	Conveyer system optimised the trade	Innovative electrical system		innovative technical services for moving cotton	Conveyor system, walking bridges, white tiling	
	Elevator shaft		Innovative				
	Sprinkler system? / fire safety	Sprinkler system is direct concequence of cotton storage	Innovative sprinkler system				
	Lighting (electrical)		Moveable system			Moveable system	
	Drainage system						
STUFF	Railings						
	Doors (other than the green ones) and rolling shutters		Moveable system			Moveable system	
	Lamps						
	Train Tracks	Traintracks have lost their function in current situation		Traintracks have lost their function in current situation		Traintracks have lost their function in current situation	
	Signs	- missing 'Katoenveem' sign on roof and gates					
	Storage lines						
	Wall signs						
Spirit of place	light/dark	For sprit of spirit of place see collages.					
	open/closed						
	scale (human/goods/trains/ships)						
	recognizability						
	perception with senses (sound/smell)						

SPIRIT OF PLACE

SPIRIT OF PLACE

SCALE



Since the cotton and most transportation systems are gone the space feels like a vast large space. It was designed for cotton storage and transportation, not for human scale. Nowadays many people could fit into the building.

Illustration: 'People show the scale of Katoenveem', by Eline Stoffels, based on:
1 Boon, C. (2017). Interior of Katoenveem. [Pictures].
2 Tetsuo Aoki. (2010). Conversations. [Illustration]. Retrieved from: https://www.davidsongalleries.com/artists/contemporary/tetsuo-aoki/conversation/ (edited by Eline Stoffels)

SPIRIT OF PLACE

PERCEPTION WITH SENSES: DIRECT SURROUNDINGS

Plans to transform the area of Katoenveem have been made. However currently it still looks, feels, sounds and smells like an industrial area. Opposite of the building is company ‘Milieupark Delfshaven‘ where inhabitants of Rotterdam can hand in their waste free of charge. Standing at the west side of Katoenveem you can see the river Nieuwe Maas and its industrial context.

Illustration: ‘Senses when standing nearby Katoenveem’, by E. Stoffels

SPIRIT OF PLACE

PERCEPTION WITH SENSES: MAKERS DISTRICT

The area of Katoenveem is located in the Makers District. Katoenveem's direct surroundings still feel industrial but just a bit more land inwards you can experience the Makers District and its innovative and artsy character.

Illustration: Makers District Rotterdam, by E. Stoffels

SPIRIT OF PLACE

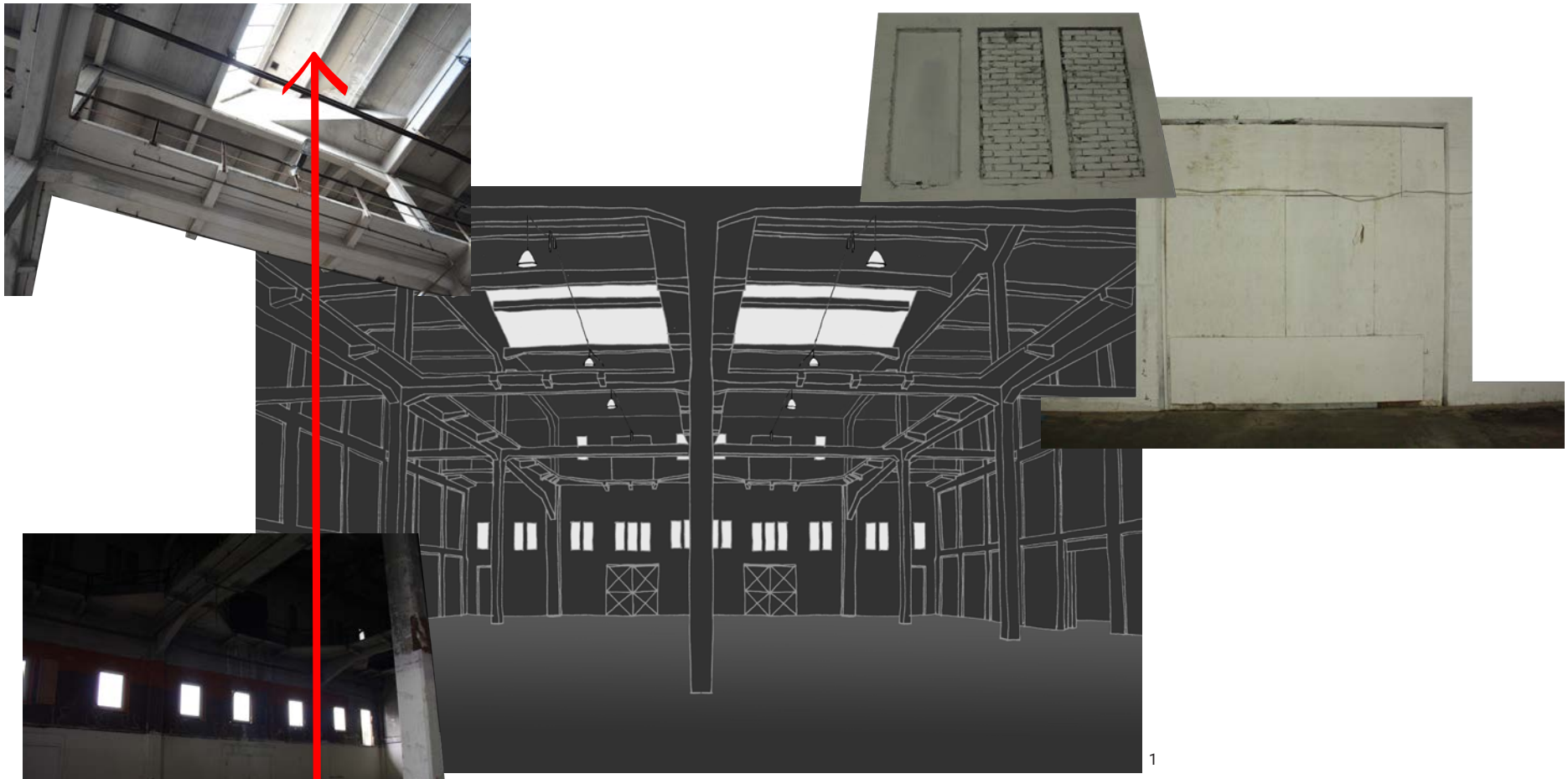
RECOGNIZABILITY

From far away the Katoenveem building can be recognized because of multiple unique exterior elements. Those are: wide balconies and roof overhang, roof elements such as the repetition of the rooflights and the ‘monsterkamer‘ and the green sliding doors. Other recognizable aspects are the repetition of the facade and structure, which you can see when you are closer to the building.

Illustration: Recognizability of Katoenveem, by E. Stoffels, based on:
1 Spook, Z. (2020). Aanzicht Katoenveem. [Picture].
2 Spekking, R. (2016). Katoenveem Keilehaven. [Picture] Retrieved from: https://commons.wikimedia.org/wiki/File:Katoenveem,_Keilehaven,_Rotterdam-8202.jpg
3 Boon, C. (n.d.). Aanzicht Katoenveem. [Picture].

SPIRIT OF PLACE

LIGHT AND DARKNESS



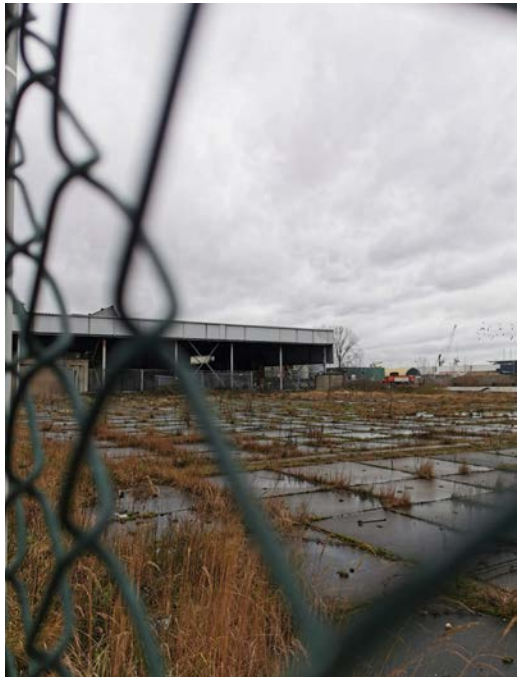
1

All compartments used to have windows in the north and south facade and all compartments have roof lights. Because of the height of the rooflights in relation to the groundfloor, it might feel dark when standing downstairs. Especially since some of the windows are closed off nowadays.

Illustration: Light and darkness inside Katoenveem, by E. Stoffels, based on:
1 Kuiper, A. (2020). Daylight trough windows. [Illustration].
2 Boon, C. (2017). Interior of Katoenveem. [Pictures].

SPIRIT OF PLACE

DESOLATED ATMOSPHERE

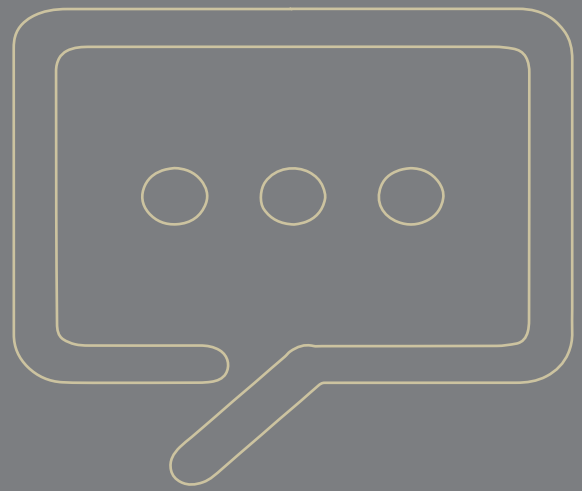





The site has flourished as an industrial area for many years, But after Katoenveem lost its original function, the building has been fairly neglected. Atelier van Lieshout was a temporary exception but Katoenveem never had a permanent function again. This resulted in the desolated and uncanny feel the building currently has.

Image 1: 'What is the current atmoshpere on site?', Photographs by:
1. C. van Boon
2. Z. Spook

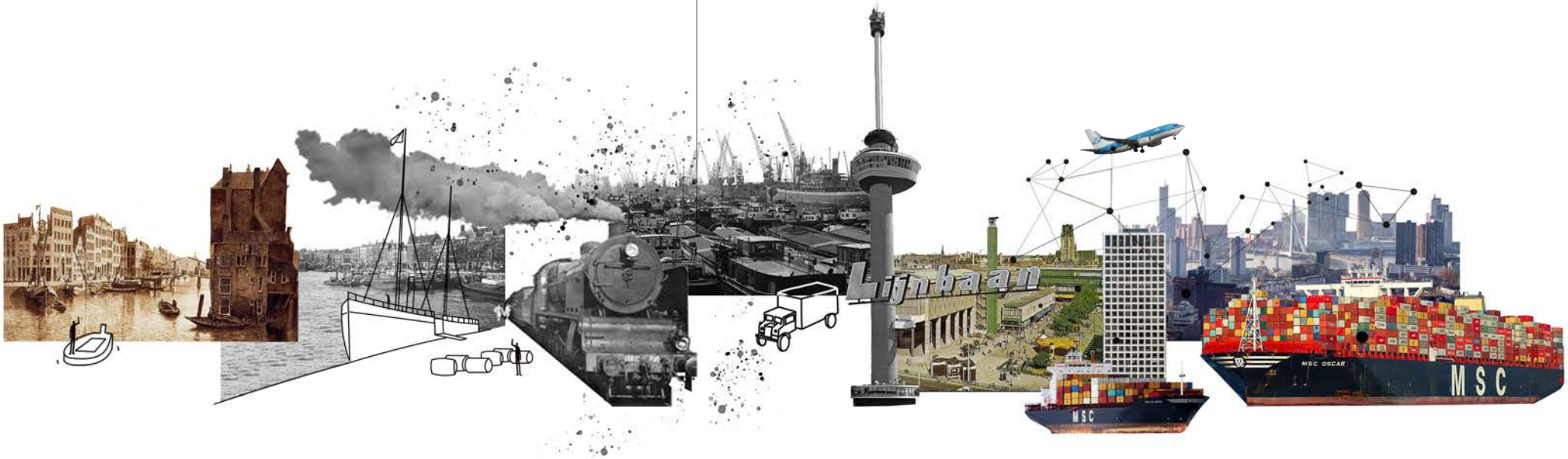
STORYLINES



STORYLINE

DEVELOPMENT OF THE HARBOUR

Establishment of Katoenveem



When Katoenveem was built many port activities used to take place in this part of Rotterdam. However over time the harbour moved towards the west and the city expanded. Thus the area lost its original function. Nowadays the Keilehaven, located in the Merwe-Vierhavens is not part of the main harbour anymore. The area is still dominated by industry, but this will also move westward over time. What remains is an area that is interesting to develop but has to be reconnected to the city. Challenges are to reconnect the area with the city and transform it to a human scale.

Kuiper, A. (2020). Collage of the development of the harbour. [Illustration]

STORYLINE

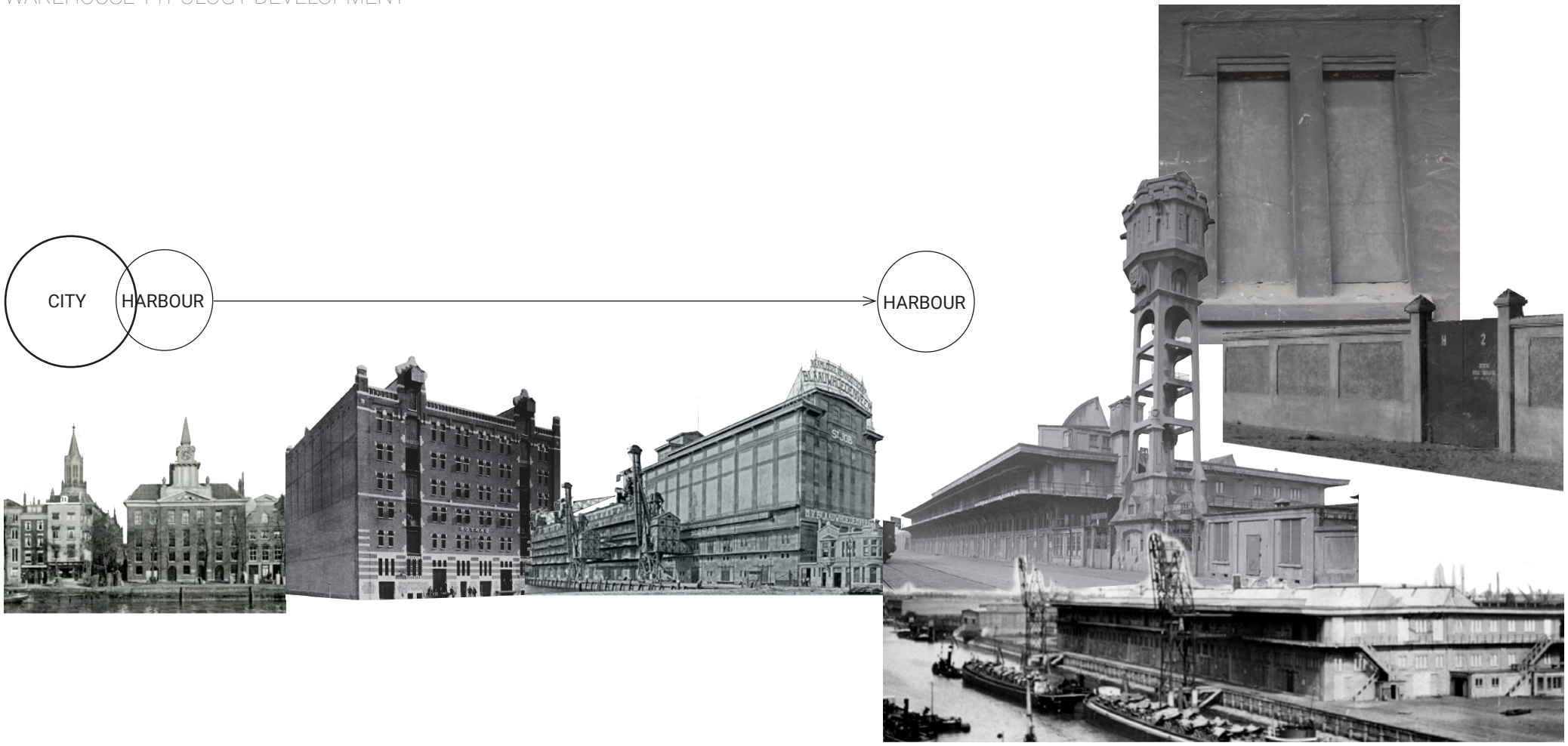
KATOENVEEM PART OF THE GLOBAL COTTON TRADE

Thanks to the establishment of Katoenveem, Rotterdam and with it the Netherlands positioned themselves in a (initially) favourable spot within the global cotton trade following the First World War.

'Katoenveem as part of the global cotton trade' by I.Louer, based on:
1. Blair, A.R.M. (1895, January 1). *File:Picking cotton, Eden, Texas (5320818446).jpg - Wikimedia Commons* [Photograph]. Retrieved on March 13 2020, from: https://commons.wikimedia.org/wiki/File:Picking_cotton,_Eden,_Texas_(5320818446).jpg
2.Cotton Aboard, 1878. (1878, December 1) [Photograph]. Retrieved March 13, 2020, from https://americanhistory.si.edu/onthewater/exhibition/4_4.html
3. Fototechnische Dienst Rotterdam (1923) Keilehaven met het Katoenveem aan de Keilestraat [Photograph]. Municipal Archive Rotterdam, invenory number XIV-325, Rotterdam, The Netherlands
4. 100% Cotton. (n.d.). [Photograph]. Retrieved March 13, 2020, from https://www.liverpoolmuseums.org.uk/whatson/merseyside-maritime-museum/exhibition/100-cotton
5. Van Dijk F.H. (1923). Het Katoenveem aan de Keilestraat [Photograph]. Municipal Archive Rotterdam, invenory number 1976-6177, Rotterdam, The Netherlands

STORYLINE

WAREHOUSE TYPOLOGY DEVELOPMENT

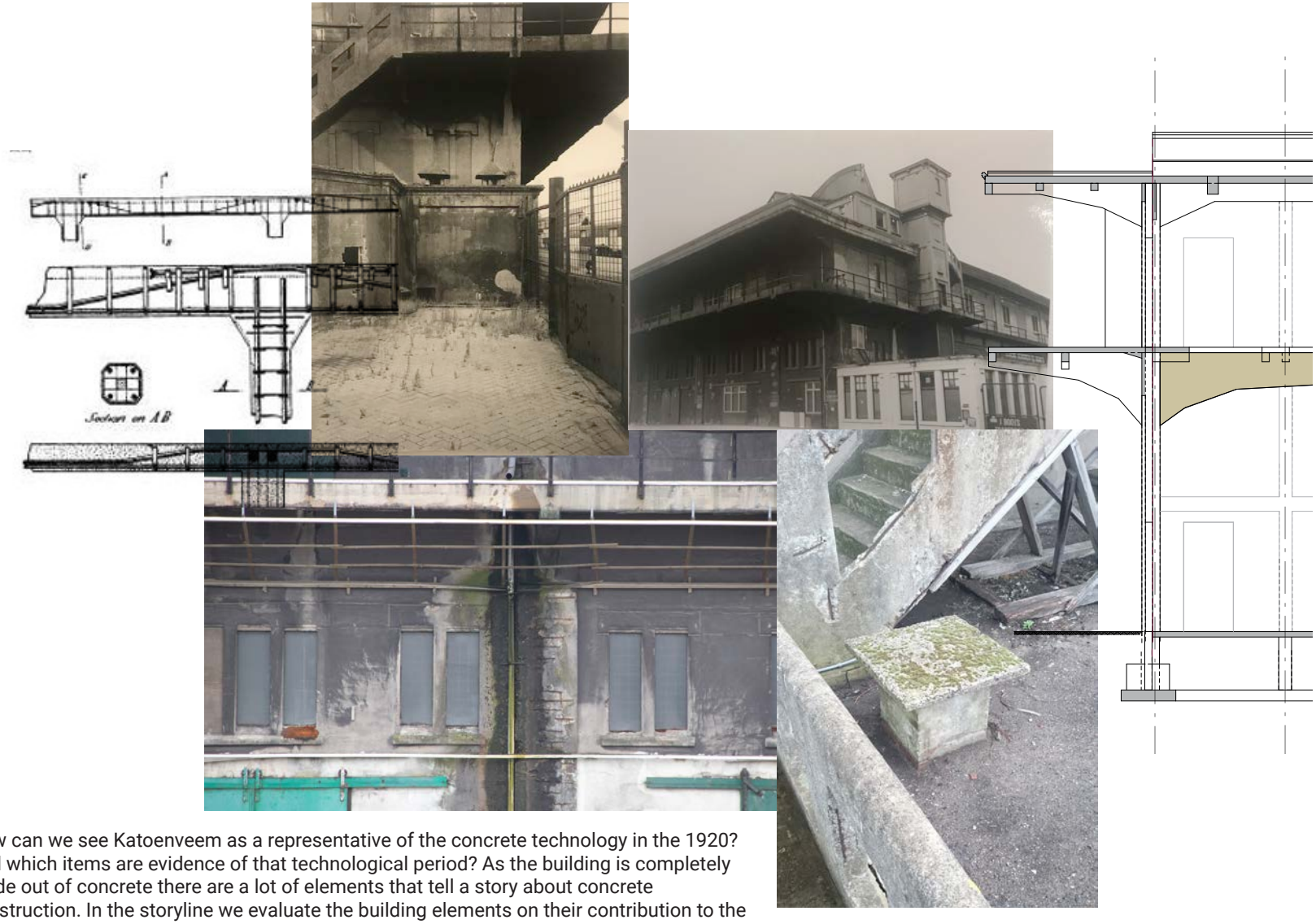


The first warehouses used to be located in the city, thus their appearance was of importance. With the harbour and the warehouses moving to the west, less restrictions of appearances applied, thus the warehouse typology developed. Katoenveem was the first warehouse designed by J.J. Kanters that was not cladded but where the concrete is visible. It does still have ornaments, just like other warehouses at the time. However those are much less obvious and made out of concrete. Nowadays warehouses are even more simpel.

Stoffels, E. (2020, April 2). Collage 'Warehouse typology development'. [Illustration].

STORYLINE

DEVELOPMENT IN CONCRETE



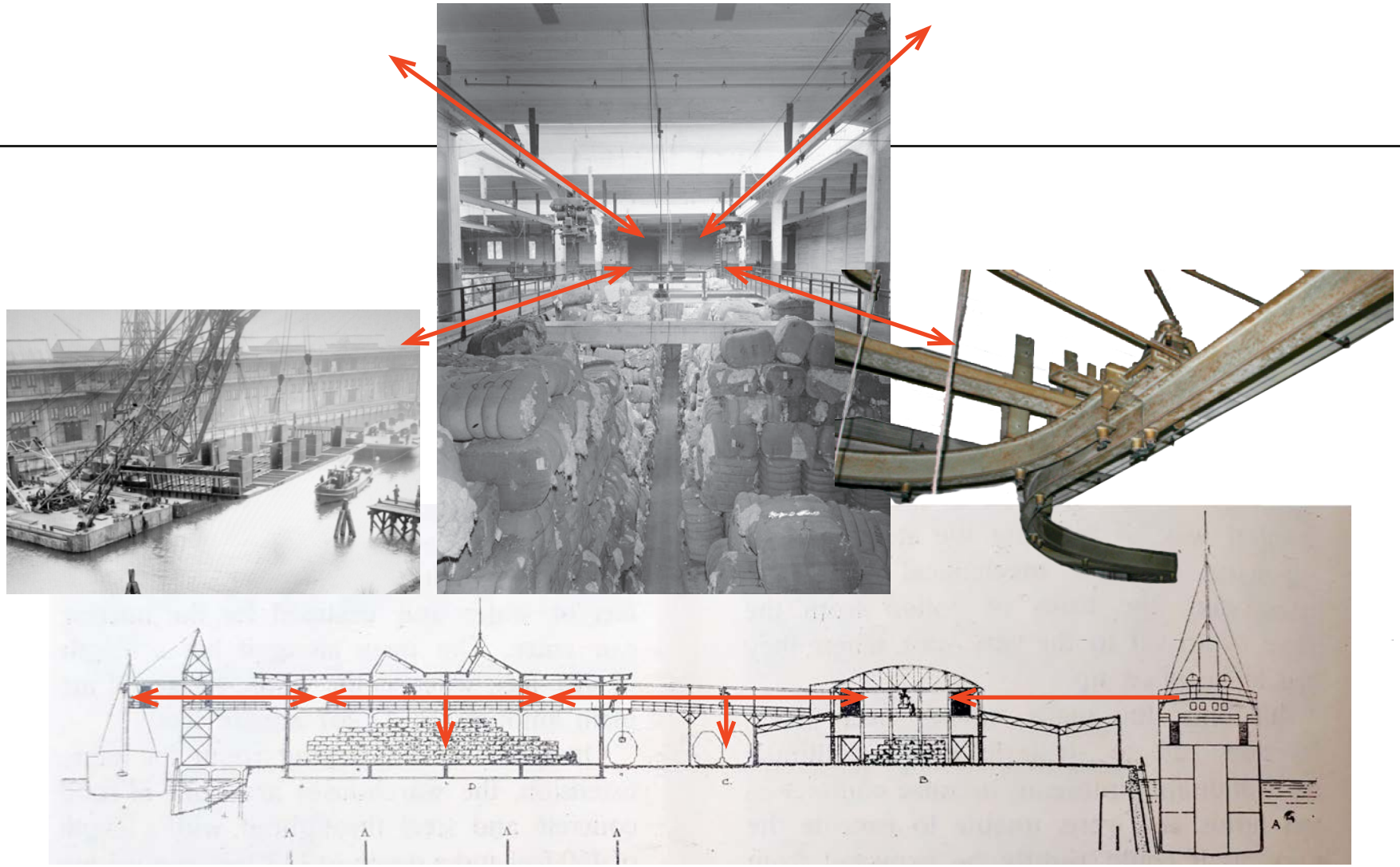
How can we see Katoenveem as a representative of the concrete technology in the 1920? And which items are evidence of that technological period? As the building is completely made out of concrete there are a lot of elements that tell a story about concrete construction. In the storyline we evaluate the building elements on their contribution to the development of reinforced concrete.

Van Straalen, L. (2020). Development in concrete. [Illustration].

STORYLINE

KATOENVEEM AS A MACHINE

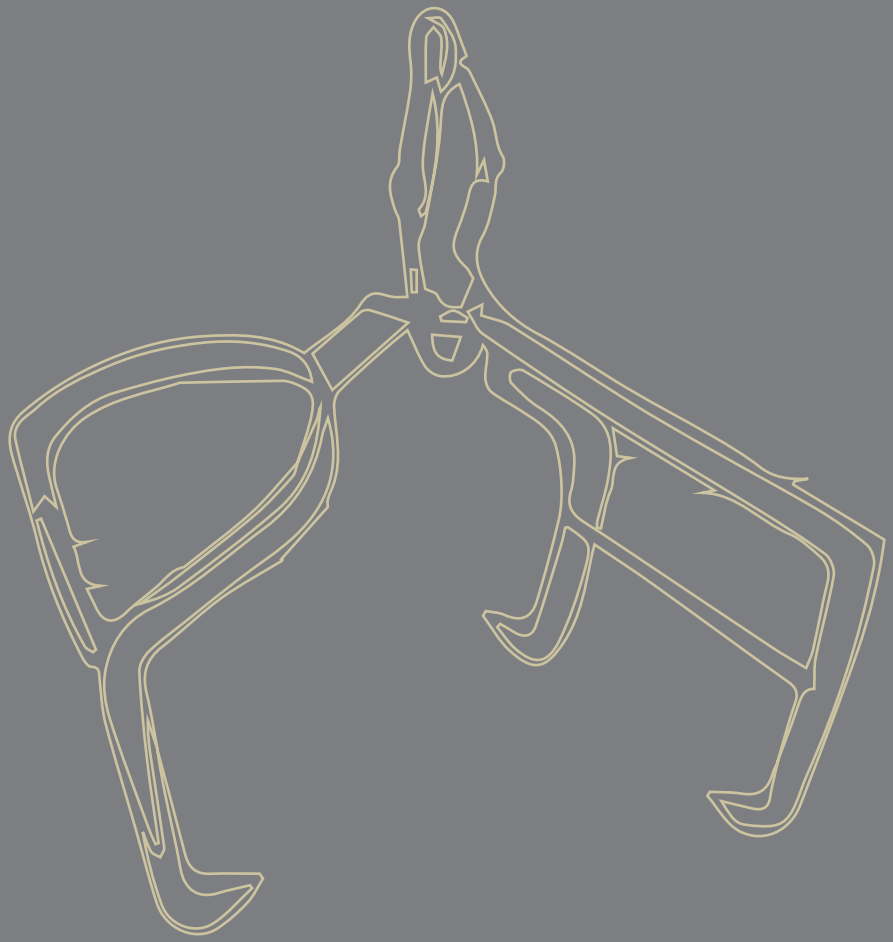
1919 — 1964



From 1919 to 1964 the Katoenveem building was used to store and transport cotton. The entire building was designed to be as efficient as possible. It worked and looked like a machine.

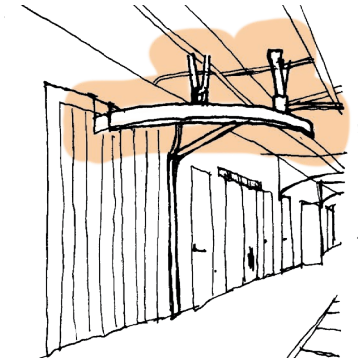
Stoffels, E. (2020). Collage 'Katoenveem as a machine'. [Illustration]

ATTRIBUTES



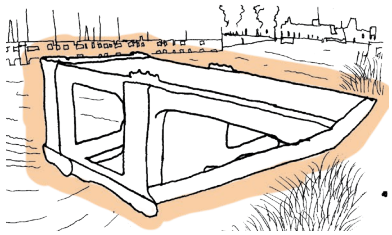
CHARACTERISTIC ATTRIBUTES

WHICH CHARACTERISTIC ATTRIBUTES ARE PRESENT OUTSIDE THE KATOENVEEM?



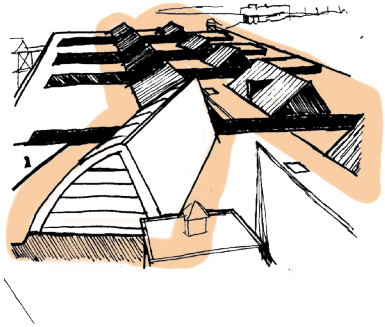
1. Transportation rails

The rails above the balconies were meant to transport bales of cotton from the ships inwards the warehouse. Possibly also connected to the two transportation bridges between Katoenveem and both the New Orleans and Galveston warehouses.



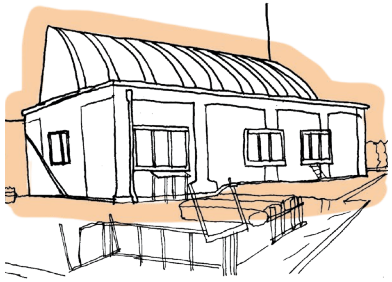
2. Piers

The piers used to be the foundation for the freight cranes in the Keilehaven, and probably also served to keep boats in place while they were being unloaded.



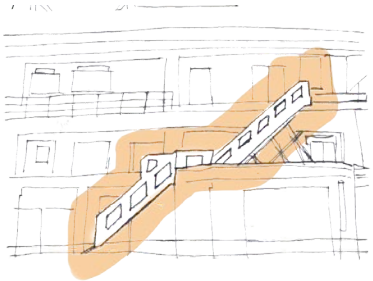
3. Roof lights

The rooflights allowed daylight to enter the building. The rooflights are oriented to the north / northwest and by their position prevent direct sun light from entering the building. It seems the rooflights did not illuminate the building well enough for the workers to do their job, as there is a system of electrical lighting present in the building. Perhaps electrical lighting was introduced to work during periods with less natural light (winter) or in order to unload ships outside normal working hours.



4. Sample room - ‘Monsterkamer’

The sample room found on the roof of the building was especially oriented to allow northern (diffused) light to enter the room. This was needed in order to examine samples of cotton and to determine whether their quality met the standard set by the USA by means of a standardised sample kit.[1]



5. Staircases and elevator

The staircases are located along the east and west facade of the building and provide the access to the balconies and the first floor of the building.

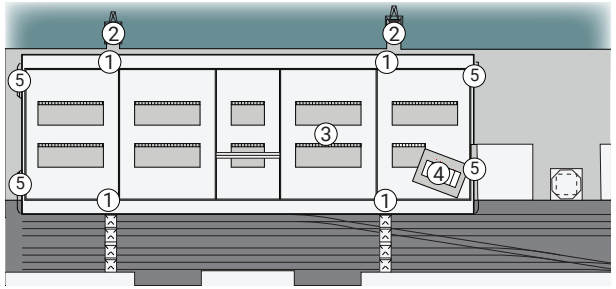
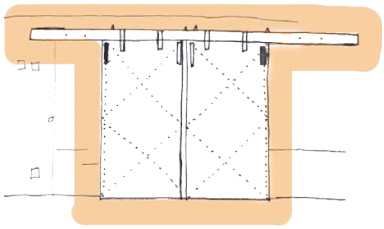


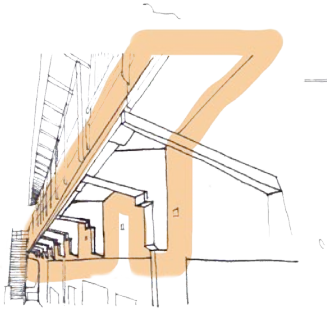
Image 1-5 ‘Characteristic attributes outside of Katoenveem’, by I.Louer

1 Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA, p. 7

CHARACTERISTIC ATTRIBUTES

WHICH CHARACTERISTIC ATTRIBUTES ARE PRESENT OUTSIDE THE KATOENVEEM?





6. Hanging sliding doors

On the exterior of both the ground floor and first floor of the building many entrance doors are present. These doors are hung upon a rail and slid to either side of the entrance in order to open. Handles and locks can be observed on these doors.

7. Windows

The windows on the ground floor are located above 2.0 m high. This means that the windows were not meant to allow people to look into the building, but rather for the workers staying inside to see light entering through these windows and thus preserve a connection to the outside.
The window trims are in fact faux, as the whole structure was cast in one go. The presence of these trims can be considered a form of ornamentation. See chapter Ornaments.

8. Wall signs

The wall signs were put in place to remind any visitor of the danger of open fire next to te highly flammable air (due to the presence of cotton dust) inside of Katoenveem.
'Smoking strictly prohibited' is repeated on the exterior facades a few times as well as inside the building.

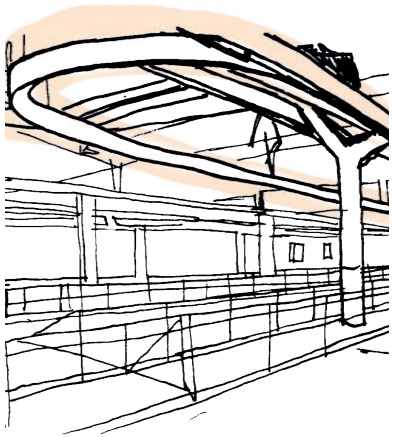
9. Balconies

The balconies were essential for the functionality of the building. The balconies vary in width, depending on which facade they are part of: the widest balcony can be found on the northwest side of the building, where goods were loaded and unloaded from boats by use of the freight cranes. On the southwest facade the goods were loaded into trains, and there the balcony is less wide. The narrowest balconies can be found along the shorter facades, and were meant for people to simply cross to the other side of the building.

Image 6-9 'Characteristic attributes outside of Katoenveem', by I.Louer

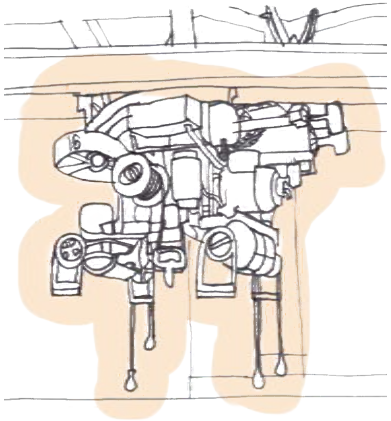
CHARACTERISTIC ATTRIBUTES

WHICH CHARACTERISTIC ATTRIBUTES ARE PRESENT INSIDE THE KATOENVEEM?



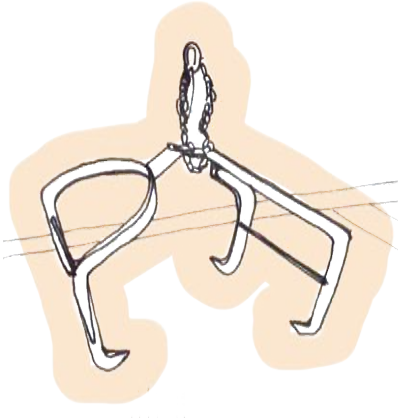
1. Transportation rails

The transportation rails are the basis of the transportation system in the building.Attached to the roof, they are present everywhere in the building.The rails leading along the facades branch out to the ouside on several places. Parallel to the shorter facades, the rails in each of the compartments of Katoenveem are placed along the columns in such a way that every part of the ground floor area designated for cotton can be reached. The rails are interconnected with each other through a smart, manually operable transfersystem.[1]



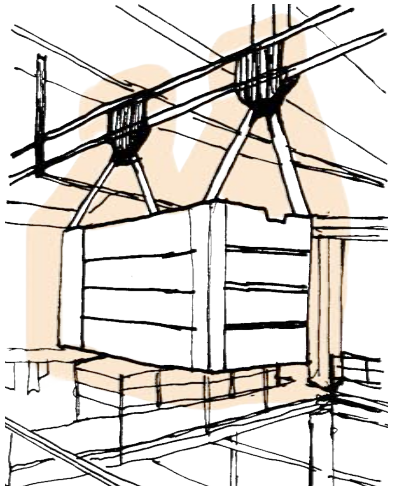
2. Hoist

These machines moved along the rails and carried the bales of cotton. They are electrically driven and for this electrical wiring was placed underneath the railing. There are seven of these hoist machines still present in the building[1].



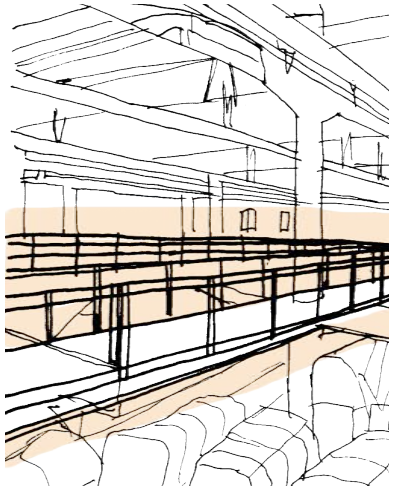
3. Lifting hooks

The lifting hooks were attached to the hoists and used to grab bales of cotton and reposition them in the building.



4. Baskets

These baskets are attached to the transportation rails and were most probably used for maintenance pursposes.[2]



5. Walkways

Part of the transportation system in Katoenveem, these bridges were used by the workers of the warehouse, as they accompanied the cotton bales being brought to a destined storage location. From these walkways there is a clear overview of the storage space.

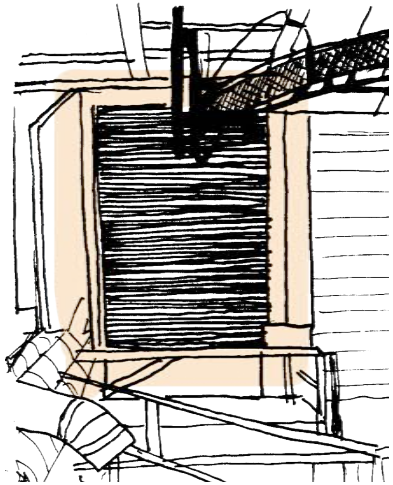
Image 1-5 'Characteristic attributes inside of Katoenveem', by I.Louer

1 Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA, p. 19

2 Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA, p. 55

CHARACTERISTIC ATTRIBUTES

WHICH CHARACTERISTIC ATTRIBUTES ARE PRESENT INSIDE THE KATOENVEEM?

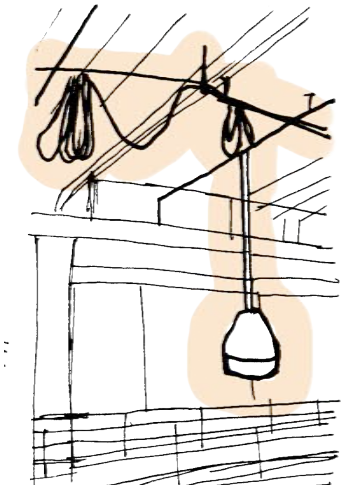


6. Iron shutter - ‘Kinnear system’

More information see chapter on Fire Safety

7. Sprinklers

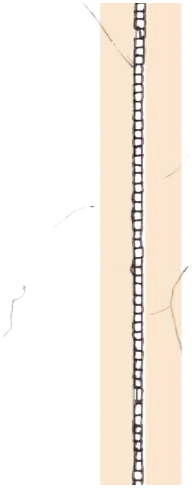
More information see chapter on Fire Safety



8. (Movable) Electrical lighting

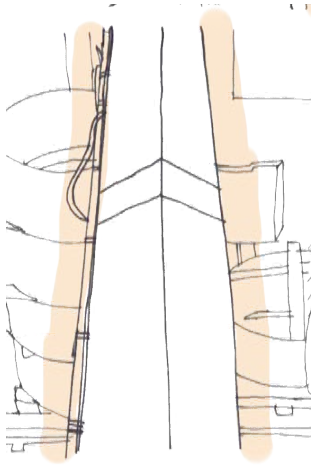
Lighting fixtures suspended with a system of wires and pulleys.

More information see chapter on artifical lighting.



9. White guidelines

The lines are made of small white tiles. These were put in place in order to indicate the location where the cotton bales should be piled up, in order to keep walkways free.



10. Tapered beams

The beams in Katoenveem are tapered. This is done to prevent people from walking on the beams and at the same time prevent the accumulation of dust.

Image 6-10 ‘Characteristic attributes inside of Katoenveem’, by I.Louer

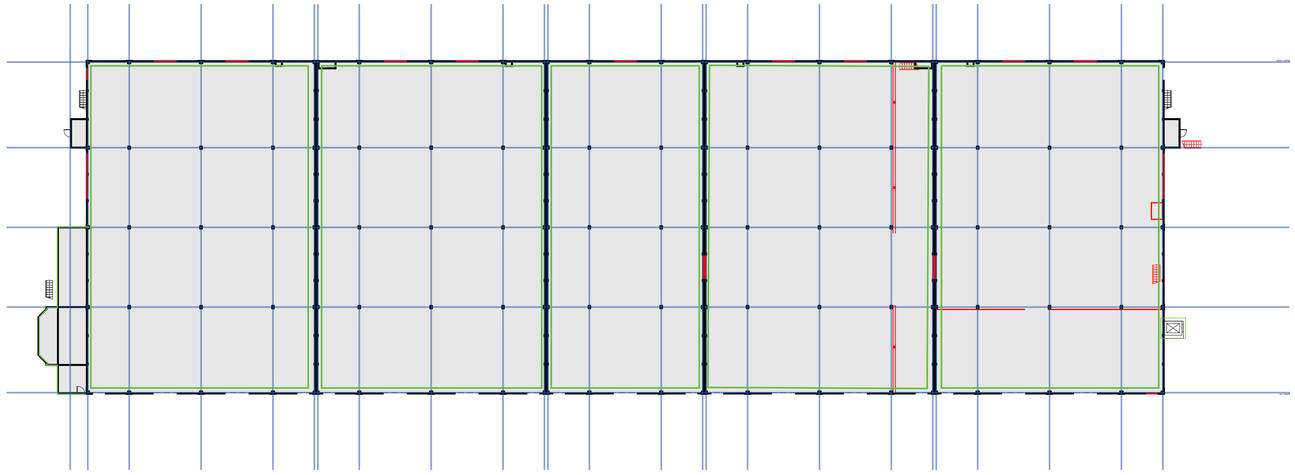
VALUE MAPPING

North - East Facade

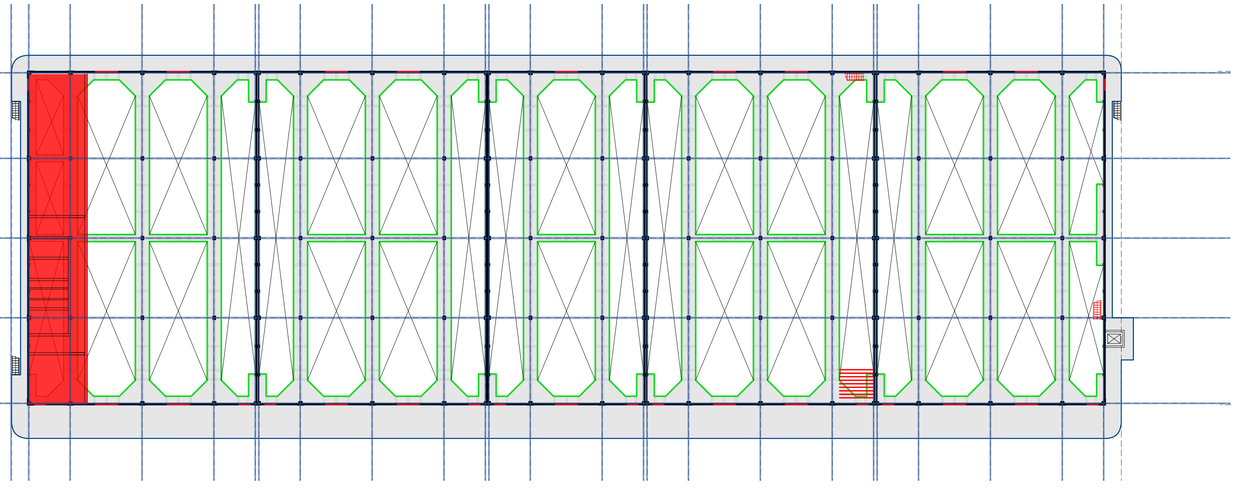
South - West Facade

South - West Facade

North - East Facade



Plan - ground floor



Plan - first floor

In the value map we marked subjective as well as objective values. Subjective values are the rhythm, direction and contour lines. Objective values are material, grid and mass. In the facade you see certain surfaces which have double values, for instance the lift tower. We value its existence positive but the current appearance is valued low. In the facade we highlighted areas were the original symmetry is present as a positive value.

Material conditions are not taken into account during the valuation process.

High value

Positive value

Indifferent value

Low value

CONCLUSION

CULTURAL VALUE

ANSWER RQ

What are the values of Katoenveem?

By using the value matrix as well as creating the collages and maps we assessed the values of Katoenveem. Hendriks and Hoeve stated: ''Usually, the report forms the conclusion of the building archaeological survey.'' (2009) Therefore it is suggested to see this entire chapter as a conclusion of the value assessment. Although all assessments are important, the value matrix and value maps are handy tools to use for the redevelopment of the building. To create the value maps data such as original plans have been compared to pictures of the current situation. This way we could see what elements have been added to the building after it lost its original function. These added elements have been assessed as low value because they are inconsequent and they disrupt the historical value of the building. All elements of the original structure, such as the walking paths, are of high value because they refer to the original function of Katoenveem. The same goes for parts of the transportation system that are still present.

Thus it can be concluded that the values of Katoenveem come from the historical and cultural story the building tells about the port, cotton trade, warehouse development and innovation such as electrical and transportation systems and the use of concrete. All these storylines are visible in the building through its original concrete structure, original exterior, functional interior and services.

1 Hendriks, L. & van der Hoeve, J. (2009). *Guidelines for building archeological research*. The Hague, The Netherlands: Cultural Heritage Agency.

FINAL CONCLUSION

OPPORTUNITIES

As the city centre of Rotterdam grows more towards the West, the location of Katoenveem becomes rather strategic within the city as a whole. The area of Merwe-Vierhaven is currently cut of from the city in infrastructural sense. Currently Rotterdam planning interventions to reconnect Merwe-Vierhaven with the urban area.
This, together with the vicinity of public areas is the starting point for new opportunities for the site.
The unique site and surrounding water provides an opportunity for the building to be re-connected to the city via important waterways.
As mentioned earlier in this booklet, the buildings design is very specific to its original warehouse function. The interior is a repetition of five vast open spaces due to this fact.
The spacious atmosphere, in combination with the open network of columns and beams, makes the building very flexible in its transformation for reuse.

The conditions and dimensions of the construction on the inside offer possibilities in case of carrying extra load.

The former openings could restore the connection with the surrounding context while showing the functional direction of the building.

The old functional relationship between the ground floor and the 1st floor could create an interesting dynamic within the new function.

The roof construction is calculated to carry the cotton transportation system. This capacity could be a reason to conduct a further research on structural capabilities.

DILEMMA'S

The biggest dilemma in designing a transformation for Katoenveem is the shift from being an industrial to a public building. This also reflects in plans for the urban scale.
The area will change in primary function, from industrial to residential. At the same time, the prospect of climate change influences possibilities for this location. The task is now to come up with design solutions that are adaptable to a largely unpredictable future.
In order to live up to the requirements of becoming a pleasant and functional building, some drastic design changes has to be made.
The introvert character and the current accessibility for instance, are typical features for an industrial building but would not work for a public one.

The main technical dilemma's are caused by interventions that are necessary to restore building parts or to establish higher building standards. These mostly interfere with spatial and architectural qualities. For example the full concrete construction result in the fact that all surfaces lack of thermal insulation. Especially age value of the surfaces and the architectural expression of the structure could potentially be harmed.

The compartments determine the spatial layout and reflect the design intentions to assure fire safety. Technically the dilatation walls can be seen as two separate functioning elements. If adjustments will be made the level of stability granted by the solid compartment walls. has to be *taken in to account*.

The level of restoration of the damages could create conflicts regarding the originality of surfaces and the connected age values.
When every aspect of a building is uniquely designed for a specific function, how can the identity of the building be kept, if you start by changing this function?
This is something architects have to ask themselves when designing the Katoenveem transformation.

ANNEX

1. COTTON TRADE
research on the world wide development of the cotton trade

2. GEOGRAPHY
climate
water level
soil
subsidence
heat stress
waterplan
the river as a tidal park

3. SKIN
research on added or changed elements

4. FLOOR PLAN
research on added or changed elements

ANNEX 1: GLOBAL CONTEXT

WHAT DID THE GLOBAL TRADE OF COTTON LOOK LIKE IN 1914 AND 1920?

Statistics
The only data available on the quantity of cotton in the trade of the beginnging of the 20th century was collected and published by the Bureau of the Census of the Department of Commerce of the U.S.A. The governments of other coutries leading in the trade (India, Egypt, Russia etc.) did publish estimates on the production, but on a irregular basis. The U.S.A. Bureau of Census also collected data from diverse other sources (trade publications or consular reports f.e.) to arrive at the numbers of world production.[1]

Cotton production
The numbers given are quantities of cotton destined to enter commercial channels of trade. In some countries the cotton produced is consumed within the same country without entering the commercial channels. For such countries it is hard to estimate the production of cotton very accurately.

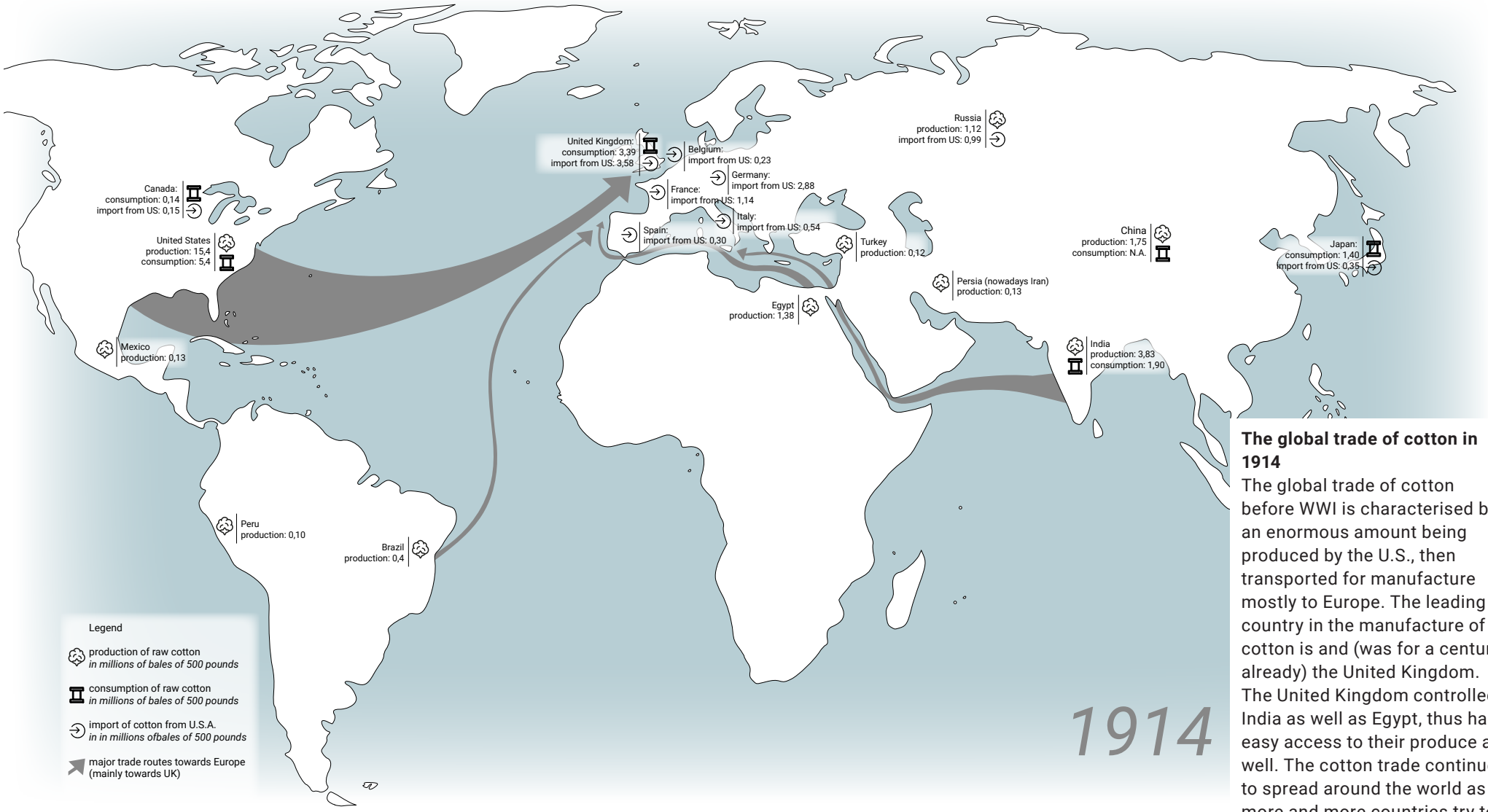
Cotton consumption
There are two ways to ascertain the quantity of cotton consumed:
1. verify the actual amount of cotton bales consumed in cotton mills per country
2. verify the amount of active spindlers in the country to compare a potential consumption per country

Because of the limited information on the actual quantity of cotton bales consumed, the comparison between the amount of active spindlers offer more insight in this matter.
However: the outbreak of WW1 in Europe (where about 65% of the cotton spindlers are located[2]) influences the accuracy of the data heavily.

Sources:
1 United States Bureau of Census, Zimmerman, H. J., & Steuart, W. M. (1915). Cotton Production and Distribution: Season of 1914-15: U.S. Government Printing Office, p.54
2 idem, p.83

ANNEX 1: GLOBAL CONTEXT

WHAT DID THE GLOBAL TRADE OF COTTON LOOK LIKE IN 1914?



The global trade of cotton in 1914

The global trade of cotton before WWI is characterised by an enormous amount being produced by the U.S., then transported for manufacture mostly to Europe. The leading country in the manufacture of cotton is and (was for a century already) the United Kingdom. The United Kingdom controlled India as well as Egypt, thus had easy access to their produce as well. The cotton trade continues to spread around the world as more and more countries try to take part in the globalized trade.

'Cotton trade around the world in 1914', own image by Irene, based on data from:
United States Bureau of Census, Zimmerman, H. J., & Steuart, W. M. (1915). Cotton Production and Distribution: Season of 1914-15: U.S. Government Printing Office

ANNEX 1: GLOBAL CONTEXT

THE FLOW OF GOODS: THE COTTON TRADE ON GLOBAL SCALE IN 1914

World's production of commercial cotton by country, *in bales of 500 pounds (~226.8 kg)*[1]	
United States	15.438.000
India	3.826.000
Egypt	1.384.000
China	1.750.000
Russia	1.126.000
Brazil	440.000
Mexico	125.000
Peru	103.000
Persia	127.000
Turkey	120.000
Other	325.000
TOTAL	**24.764.000**

World's consumption of commercial cotton by country, *in bales of 500 pounds (~226.8 kg)*[3]	
United States	5.429.000
Europe:	
United Kingdom	3.390.000
Other European	6.250.000
India	1.907.000
Japan	1.400.000
Canada	143.000
All others	1.000.000
TOTAL	**19.761.000**

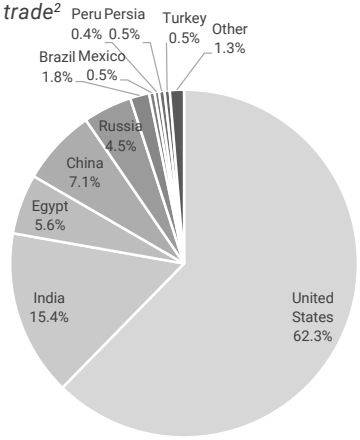
U.S.A. export of cotton per country to which exported, *in bales of 500 pounds (~226.8 kg)*[4]	
United Kingdom	3.581.501
Germany	2.884.324
France	1.139.399
Italy	537.357
Spain	297.339
Belgium	227.474
Russia	99.076
Austria-Hungary	106.511
Netherlands	35.053
Other European	63.725
Japan	353.440
Canada	150.993
Mexico	34.671
All others	11.018
TOTAL	**9.521.881**

World's active cotton spindlers, estimate[3]	
United States	32.107.000
Europe:	
United Kingdom	56.200.000
Germany	11.330.000
Russia	9.160.000
France	7.410.000
Austria-Hungary	4.970.000
Italy	4.620.000
Spain	2.210.000
Belgium	1.530.000
Switzerland	1.380.000
Sweden	360.000
Portugal	480.000
Netherlands	300.000
Denmark	90.000
Norway	65.000
Other European	200.000
India	6.500.000
Japan	2.750.000
China	1.000.000
Brazil	1.250.000
Canada	965.000
All others	800.000
TOTAL	**146.397.000**

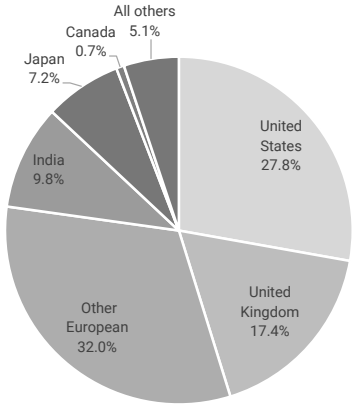
The position of the Netherlands in the cotton trade of 1920

In 1914 the Netherlands did participate in the global cotton trade, but did not play a major role in it. There were around 300.000 spindlers in the Netherlands, which is about 0.2% of the global estimate. The Netherlands imported around 35.053 bales of cotton from the U.S., which is only around 0.4% of their total export of commercial cotton.

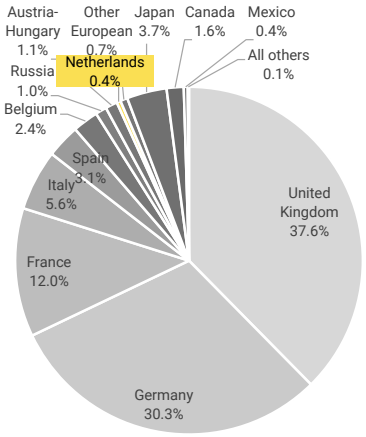
World production of commercial cotton by country, *in % of total trade*[2]



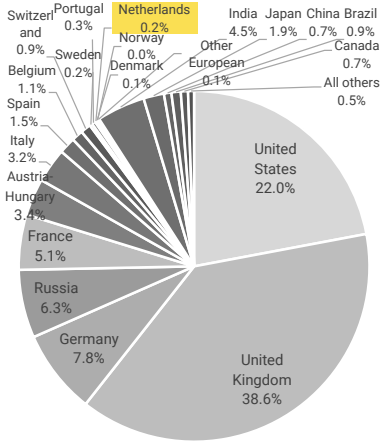
World consumption of commercial cotton by country, *in % of total trade*[3]



U.S.A. export of cotton, in % of total number



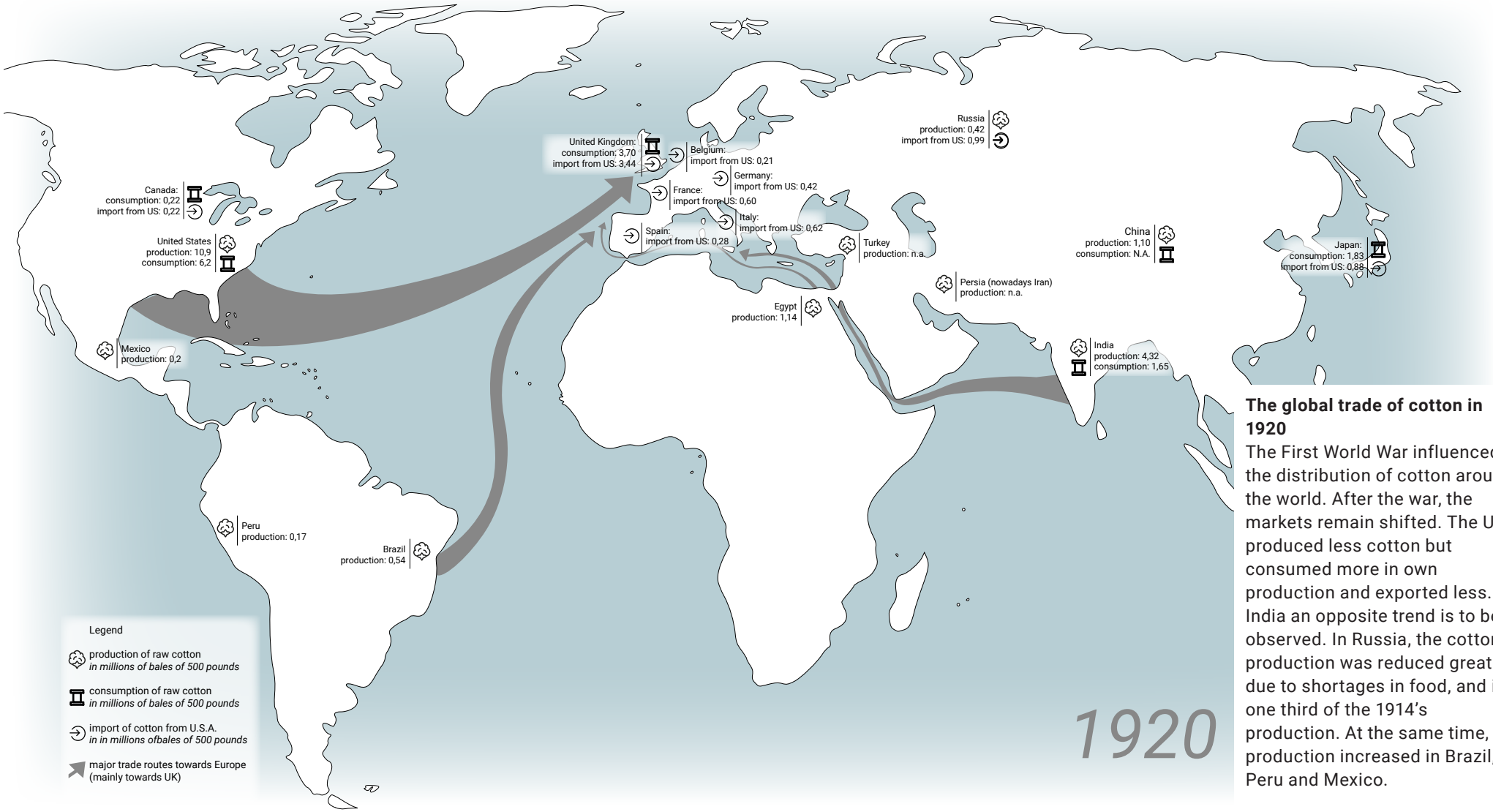
World's active cotton spindlers in % of total number[3]



Sources:
1 United States Bureau of Census, Zimmerman, H. J., & Steuart, W. M. (1915). Cotton Production and Distribution: Season of 1914-15: U.S. Government Printing Office, p.54
2 idem, p.55
3 idem, p.83
4 idem, p.78
Pie charts: own image by I.Louer

ANNEX 1: GLOBAL CONTEXT

WHAT DID THE GLOBAL TRADE OF COTTON LOOK LIKE IN 1920?



The global trade of cotton in 1920

The First World War influenced the distribution of cotton around the world. After the war, the markets remain shifted. The US produced less cotton but consumed more in own production and exported less. In India an opposite trend is to be observed. In Russia, the cotton production was reduced greatly due to shortages in food, and is one third of the 1914's production. At the same time, production increased in Brazil, Peru and Mexico.

Cotton trade around the world in 1920, own image by I.Louer, based on data from:
United States Bureau of Census, Zimmerman, H. J., & Steuart, W. M. (1920). Cotton Production and Distribution: Season of 1919-1920: U.S. Government Printing Office

ANNEX 1: GLOBAL CONTEXT

THE FLOW OF GOODS: THE COTTON TRADE ON GLOBAL SCALE IN 1920

World's production of commercial cotton by country, *in bales of 500 pounds (~226.8 kg)*[1]	
United States	10.924.000
India	4.316.000
Egypt	1.139.000
China	1.100.000
Russia	420.000
Brazil	536.000
Mexico	200.000
Peru	165.000
Other	460.000
TOTAL	**19.260.000**

World's consumption of commercial cotton by country, *in bales of 500 pounds (~226.8 kg)*[2]	
United States	6.200.000
Europe:	
United Kingdom	3.700.000
Other European	3.660.000
India	1.646.000
Japan	1.825.000
Canada	220.000
All others	1.200.000
TOTAL	**18.541.000**

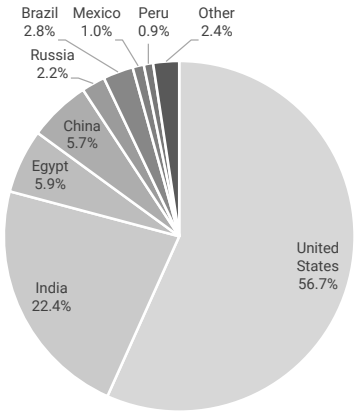
U.S.A. export of cotton per country to which exported, *in bales of 500 pounds (~226.8 kg)*[4]	
United Kingdom	3.444.794
Germany	420.758
France	596,391
Italy	617.263
Spain	275.034
Belgium	209.572
Russia	------
Austria	42.858
Netherlands	186.476
Other European	183.729
Japan	876.250
Canada	216.606
Mexico	1.141
All others	16.615
TOTAL	**7.087.487**

World's active cotton spindlers, estimate[3]	
United States	35,835,000
Europe:	
United Kingdom	56.200.000
Germany	9,400,000
Russia	7,200,000
France	9,400,000
Austria	1.300.000
Italy	4,515,000
Spain	1.800.000
Belgium	1.570.000
Switzerland	1.535.000
Sweden	670.000
Portugal	480.000
Netherlands	600.000
Denmark	115.000
Czecho Slovakia	3.585.000
Poland	1.400.000
Greece	125.000
Norway	70.000
Other European	300.000
India	6.690.000
Japan	3.690.000
China	1.600.000
Brazil	1.600.000
Canada	1.375.000
Mexico	760.000
All others	300.000
TOTAL	**154.605.000**

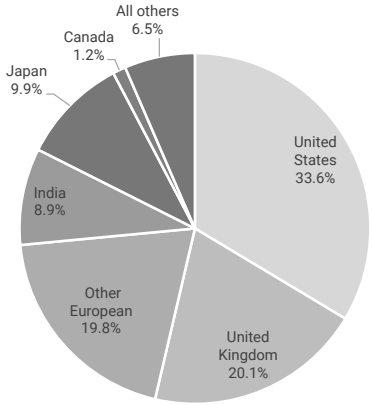
The position of the Netherlands in the cotton trade of 1920

During and after WWI the global trade of raw cotton shifts direction slightly. The Netherlands become a source of cotton for countries that were blocked from trade, like Germany. In the first year of the war, the import numbers increase 15-fold. In the years thereafter, this number is lower, but still the Netherlands take up a higher position in the global trade of cotton, importing 2,6% of US total export and doubling the amount of spindlers, compared to 1914.

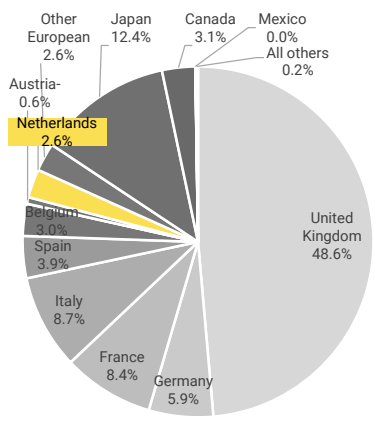
World production of commercial cotton by country, *in % of total trade*[1]



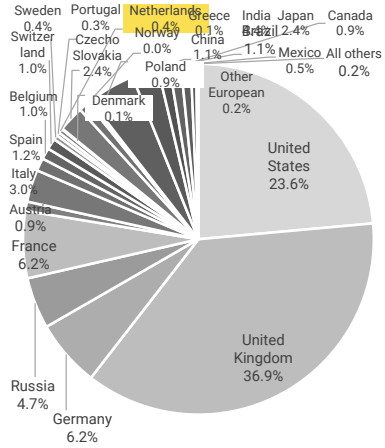
World consumption of commercial cotton by country, *in % of total trade*[3]



U.S.A. export of cotton, in % of total number



World's active cotton spindlers in % of total number[3]



Sources:

1 United States Bureau of Census, Zimmerman, H. J., & Steuart, W. M. (1920). Cotton Production and Distribution: Season of 1919-1920: U.S. Government Printing Office, p.79

2 idem, p. 83

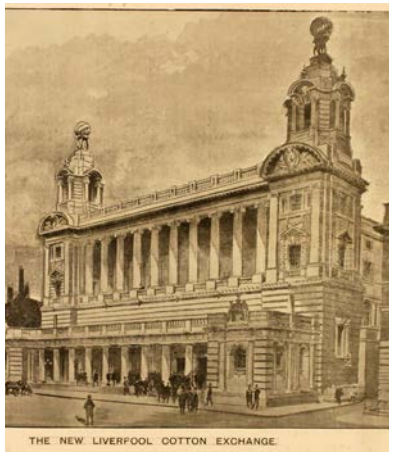
3 idem, p.84

4 idem, p.68

Pie charts: own image by I.Louer

ANNEX 1: GLOBAL CONTEXT

WHICH EUROPEAN CITIES WERE MAJOR PLAYERS IN THE COTTON TRADE OF THE 1920s?



'The Liverpool Cotton Exchange, 1905', source: To Fill, or Not to Fill. (2020, 24 January). [Illustration]. Retrieved on March 15, 2020, from source: https://liverpool1207blog.wordpress.com/

Liverpool

Liverpool is a merchantile city and its primary source of wealth was slavery. The merchants of Liverpool supported the cotton industry greatly. Liverpool flourished because of its proximity to the heart of the cotton industry. Liverpool had well established trading links with the USA. Liverpool was the only city to conctrate on all the core functions of the global cotton trade at once.[1] The Liverpool Cotton Brokers' Association was established in 1841, and was the beginning of the 'cotton futures' (cotton contracts) market. After WWI the trade with the Far East market plumeted and the following Great Depression caused even more damage. In the end, the WWII sealed the fate of the Liverpool Cotton Market[2]

'Watts Warehouse, 1856, Manchester,' source: Chetham's Library. (2016, 15 November). [Illustration]. . Retrieved on March 15, 2020, from: https://twitter.com/chethamslibrary/status/798527159807705088

Manchester ("Cottonopolis")

Already in 1860 Manchester was considered to be the most industrialized city in the world. Manchester was the place where the Industrial Revolution started, with the construction of a factory using 'water frames' (yarn-spinning machines that are put in motion by weight of water)[3]. Manchester surivived the Cotton famine caused by the American Civil War and after a period of recession before the so-called second industrial revolution and a final boom in the early 20th C. Manchester resisted competition as long as it could, until decline started around 1920 caused by the rise of Asian markets.[4]

'Bourse de commerce du Havre, 1890-1900', source: Wikipedia contributors. (2019, 10 november). Bourse de commerce du Havre [Illustration] Retrieved on March 15, 2020, from: https://fr.wikipedia.org/wiki/Bourse_de_commerce_du_Havre

Le Havre

Le Havre has a very strategic location because of its close relation to Paris and to the British. Raw cotton used to arrive to Le Havre by sea and land (from Genoa, Trieste and Antwerp), but after 1816 was only allowed to enter through ports and thus Le Havre gained control over the trade and actively competed with Antwerp and Rotterdam in the supply of other European countries.After the "Bourse de commerce" was established in 1880, the city kept up with the forefront of the world cotton trade. The city suffered economically after WWI and was occupied and heavily bombed during WWII. The economical damage was hard to repair at this point[5]

Bremen Cotton Exchange, 1902, source: Bleekrode, S. (n.d.). Bremen. Baumwollbörse. Ext. 5 [Illustration]. Retrieved on March 15, 2020, from: https://www.pinterest.at/pin/770467448727758119/

Bremen

Cotton became the most important commodity for Bremen after its first arrival there in 1788. Bremen did not have any cotton industry in its nearest proximity. They had to transport cotton towards areas like southern Germany, but also Twente through Enschede and Oldenzaal[6]. The advantage of Bremen is that it was connected with the US through immigration: the cotton trade of Bremen grew because of returning ships carrying cotton. The 'Bremer Baumwollbörse' (cotton exchange) was established in 1872[7]. They publish general terms and conditions for trade in cotton an man-made fibers, which are used for the wholesale trade of cotton around the world.

'De beurs van Antwerpen, 1531', source: Wikimedia Commons. (2020, 9 April). File:De beurs van Antwerpen in 1531.jpg - Wikimedia Commons [Illustration]. Retrieved on March 15, 2020, from: https://commons.wikimedia.org/wiki/File:De_beurs_van_Antwerpen_in_1531.jpg

Antwerp

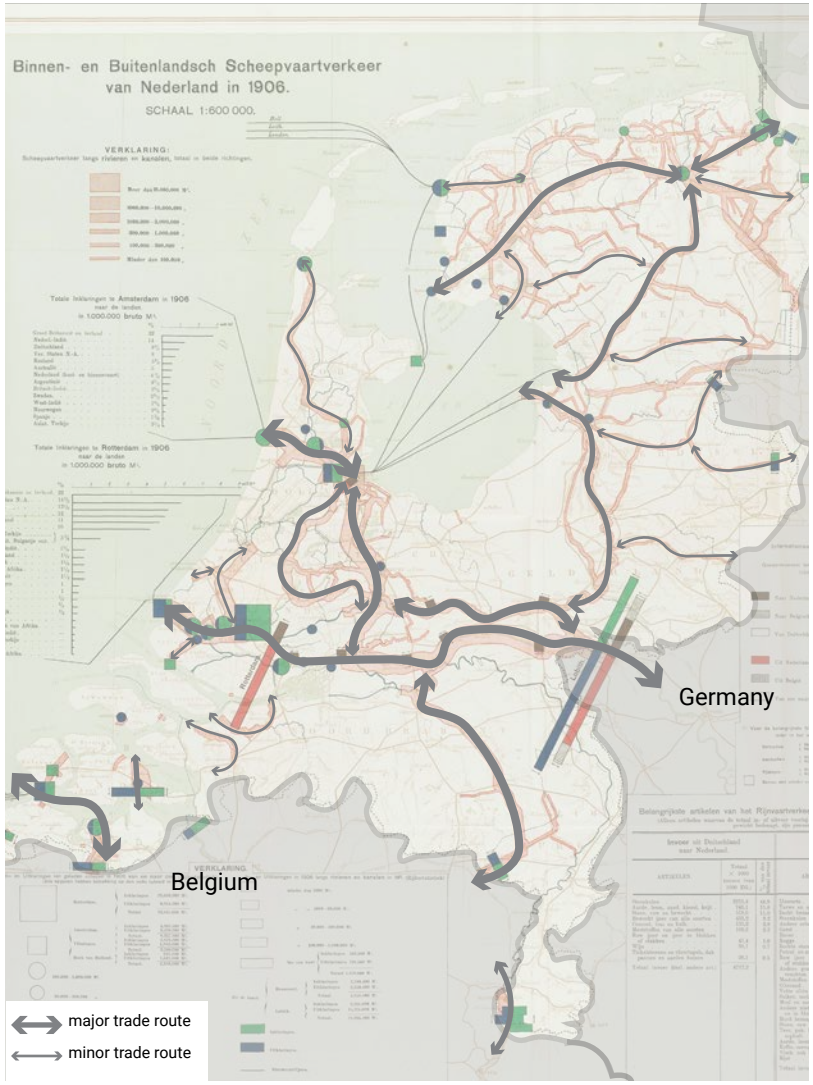
The port of Antwerp had been closed off from the North Sea because of a Dutch blockade lasting 1585-1795. The history of commodities trade in Antwerp started centuries earlier, when the first 'exchange building' is established in 1531. In order to make up for the centuries long blockade and with the hope to revive the harbour of Antwerpen, Belgium invested in the railway connections within the country as well as canals. The cotton industrialization of Belgium originated from a thriving printing industry.[8] Cotton from India arrived to Antwerp and was meant for other textile-industry cities in Belgium as well as export. Antwerpen became a centre of international transit activities as well as a centre of industrial processing of goods.

1. Beckert, S. (2014). Empire of Cotton: A Global History: Knopf Doubleday Publishing Group, p.210; 2. idem, p.71; 3. idem, p.73
4. Taylor, S., Cooper, M., & Barnwell, P. S. (2015). Manchester: The warehouse legacy: An introduction and guide: Historic England., p. 20
5. Smith, M. S. (2006). The Emergence of Modern Business Enterprise in France, 1800-1930: Harvard University Press., p.109-112
6. Enderman, M. & Stenvert, R. (2005). Bouwtechnische Verkenning Katoenveem Keilestraat 39, Rotterdam. Utrecht, Nederland: BBA, p. 6
7. Bremer Baumwollbörse. (n.d.). The history of the Bremen Cotton Exchange. Retrieved on 31 March 2020, from: https://baumwollboerse.de/en/baumwollborse/geschichte/
8. Teich, M., Porter, R., Gustafsson, B., & Porter, F. (1996). The Industrial Revolution in National Context: Europe and the USA: Cambridge University Press., p. 71

ANNEX 1: GLOBAL CONTEXT

WHAT WAS THE INFRASTRUCTURE FOR TRADE LIKE IN THE NETHERLANDS AROUND 1920?

1. Important waterways in the Netherlands of around 1920



1

2. Important railways in the Netherlands of around 1920

2

Based on information maps from 1906 it is possible to distill the most important characteristics of the trade via waterways and railways in the Netherlands.

Waterways
The Dutch waterways are extensively used for the export of goods to the hinterland. Image 1 shows that the Dutch ports mainly import goods that are then transported up the river Rhine towards Belgium and Germany. The transport towards Germany is about 20 times less than to Belgium in 1906. This ratio was probably different in 1920, when the Netherlands exported more vital goods to Germany.

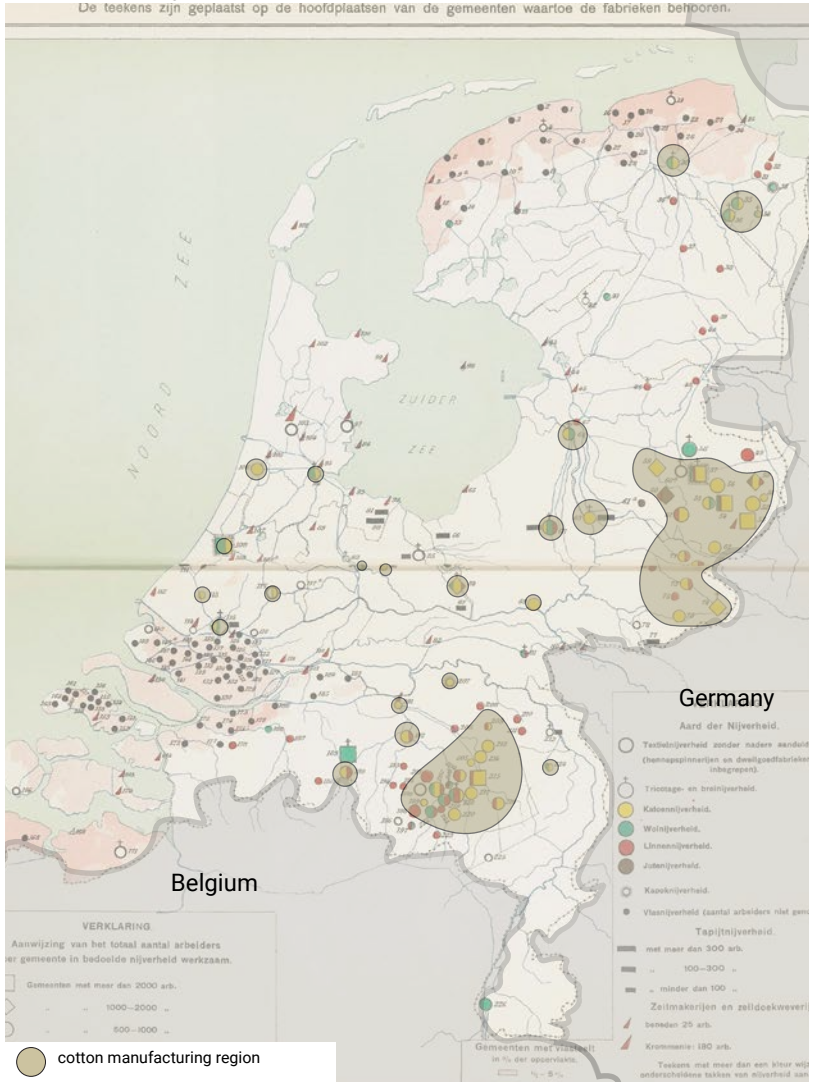
Railways
Compared to the waterways, the Dutch railways are used much more intensively to transport goods towards Germany. The railways were also the main means to import goods from Germany. The numbers given for 1906 show a larger import than export through railway, but in 1920 the Netherlands exported much more.

1 'Important waterways in the Netherlands of around 1920' image by I.Louer, based on: Everwijn, J.C.A. (1912) Beschrijving van handel en nijverheid in Nederland : Historisch-economische atlas, p.I
2 'Important railways in the Netherlands of around 1920', image by I.Louer, based on: Everwijn, J.C.A. (1912) Beschrijving van handel en nijverheid in Nederland : Historisch-economische atlas, p.II

ANNEX 1: GLOBAL CONTEXT

WHAT WAS THE COTTON INDUSTRY IN THE NETHERLANDS AROUND 1920?

Cotton industry in the Netherlands of around 1920



1

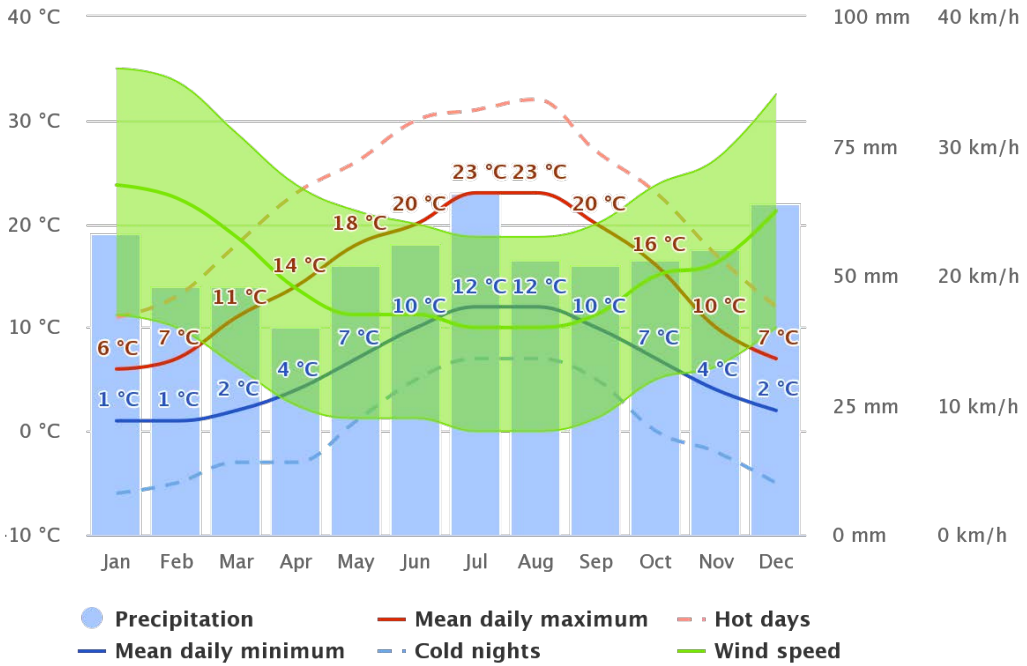
Based on this map from 1906, it is possible to discern that there are certain areas in the Netherlands that focus on the textiles industry.

Especially the area of Twente and in Noord-Brabant the area around Eindhoven manufacture a lot of cotton goods. These areas have had a textile industry since about 1830, when Belgium gained independence from the Netherlands. This was an incentive for the industrialization of the Netherlands. Twente was ideal for the establishment of cotton factories, as the wages could be kept low and the people had worked other types of textiles before. The textile industry in Twente was also stimulated by the government.
During WWI the amount of cotton spindlers in the Netherlands doubled. Likely, this increase was still concentrated around these areas.
Production increased until WWII, but because of decolonization many markets were lost. The competition from low-wage countries proved to be too much from around 1960, and most factories closed down.[2]

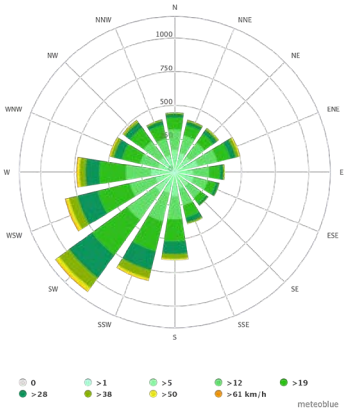
1. 'Textile industry in the Netherlands of around 1906', source: Everwijn, J.C.A. (1912). Beschrijving van handel en nijverheid in Nederland : Historisch-economische atlas , p.IV
2. Lintsen, H. W. (Ed.) (1993). Geschiedenis van de techniek in Nederland. De wording van een moderne samenleving 1800-1890. Deel III. Textiel. Gas, licht en elektriciteit. Bouw. Zutphen: Walburg Pers.

ANNEX 2: CLIMATE

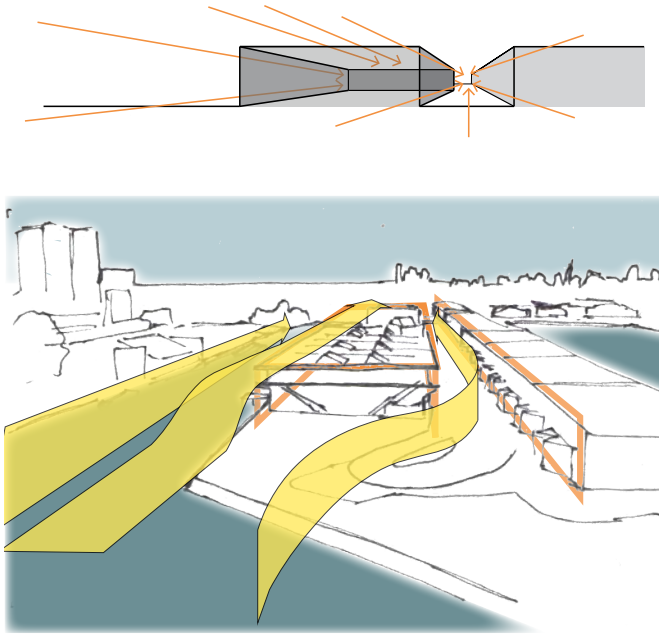
WHAT IS THE CLIMATE OF ROTTERDAM?



1 Average temperatures, precipitation and wind speed in Rotterdam



2 Wind rose for prevailing wind directions in Rotterdam in hours per year



3 Wind around Katoenveem , image by I.Louer

Rain

What is clear from the above graph is that rain is present throughout the year with a peak in July. Least rain falls in April. The average precipitation on a yearly basis is about 782 mm, which means that each square meter of horizontal space receives 782 liters of water per year, which comes down to 2.1 liters of water per day. Rainfall, however, usually comes in high peaks, not necessarily daily and often not gradually. This clearly shows how important it is to have a well functioning drainage system and water storage systems. The future predictions about increase in rainfall, together with the rise of the water level, can cause major problems for cities closely related to wate, cities like Rotterdam.

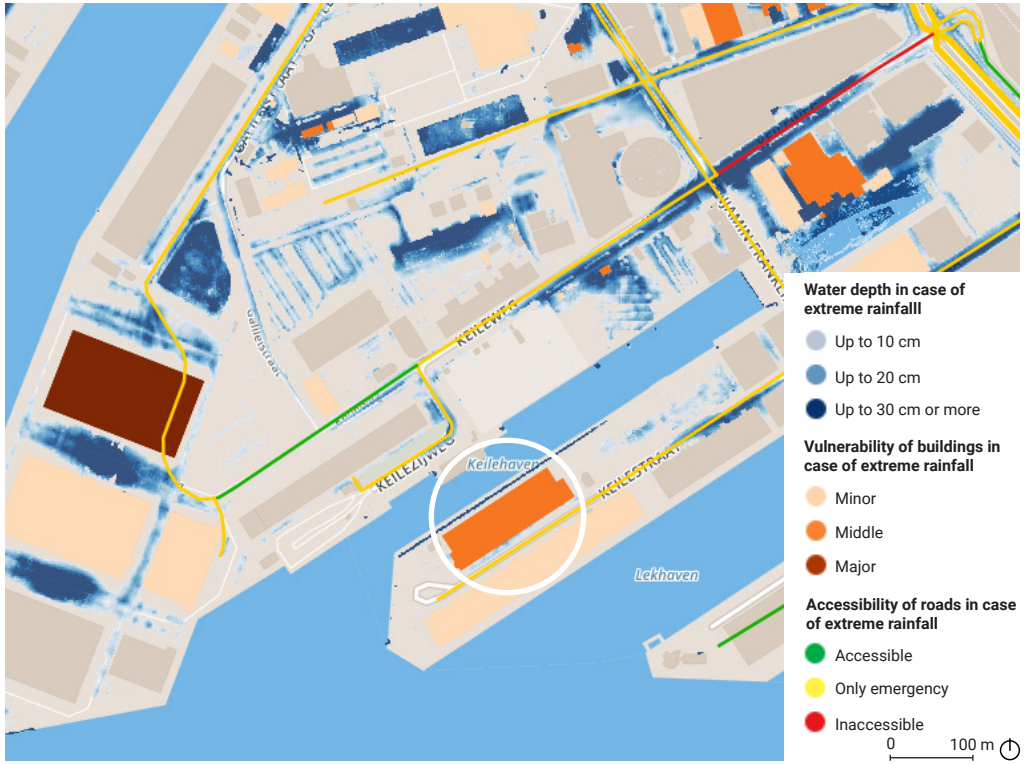
Wind

The main wind direction in the Netherlands is southwestern. For the site of Katoenveem this means that the wind blows mostly over the water towards the site. This circumstance is of influence on the wind nuisance one could experience on site. The wind accelerates in the open space above the water, and as it reaches the site of Katoenveem it splits apart and then follows the buildings longer facades and roof. The space between Katoenveem and the building at the opposite side of the street forms a tunnel, in which the wind has no obstacles and could accelerate even more. Furthermore, the wind carries particles of water, this aspect could be particularly unpleasant during winter.
As the wind carries particles of water and (sea)salt this could cause damage to the building over time, as the water and salt are catalyst for damages like corrosion of the reinforcement or biological growth on the building (see chapter damages).

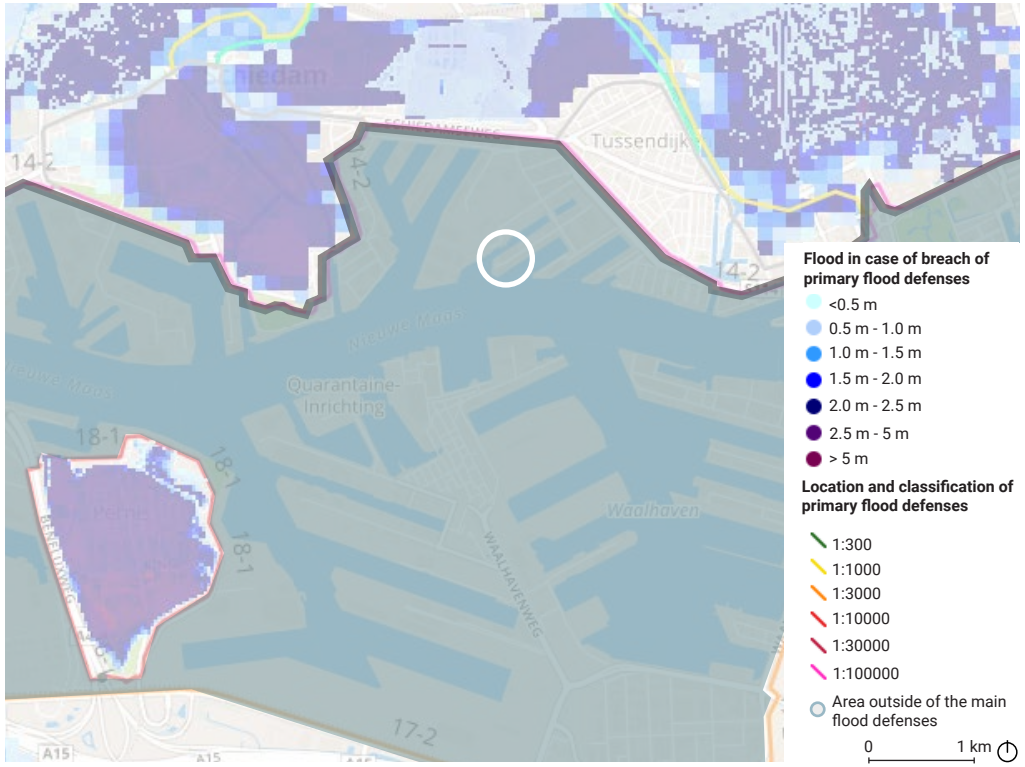
1 & 2 Meteoblue. (n.d.). Climate Rotterdam. Retrieved March 29, 2020, from https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/rotterdam_netherlands_2747891

ANNEX 2: WATER LEVEL

WHAT ARE THE CONSEQUENCES OF CLIMATE CHANGE FOR THE WATER LEVELS AROUND KATOENVEEM?



1 Water height in case of extreme rainfall and vulnerability of buildings



2 Height of water in case of breach of primary flood defenses, location and classification of flood defenses

Heavy rainfall

This map provides insight into where flooding is likely to occur after an extreme downpour of 100 millimeters in 2 hours. If such a downpour occurs, several areas around Katoenveem are threatened by a water depth of at least 20 cm. At the same time, the building itself is considered vulnerable during episodes of extreme rainfall.
The information above is based on a single event of heavy rain. Because of climate change, the chances of heavy downpours and an increased frequency thereof are much higher. The city actively anticipates these scenarios (see page waterplan).

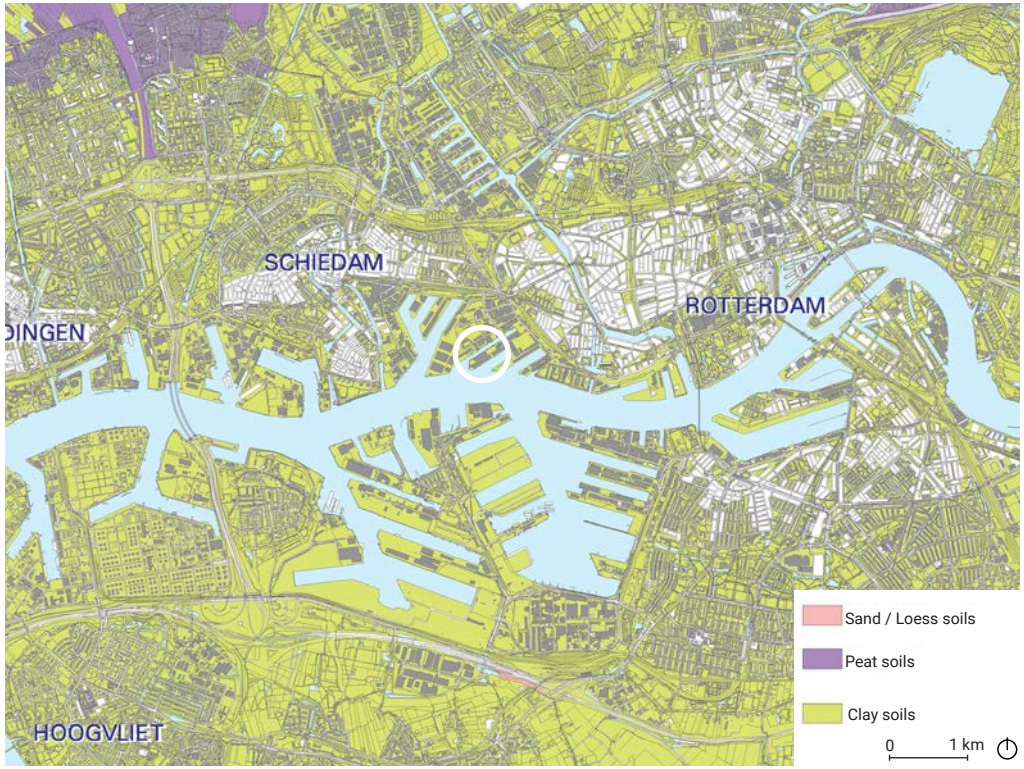
Flooding

This map shows which areas will be flooded in case of a breach of a primary flood defense (in a worst case scenario, because regional flood defenses have less extreme consequences) and the maximum water depth that can occur there. Katoenveem is located outside the main flood defense (purple line, indicates a chance of breach of 1 in 100000) and will terefore likely be flooded completely. This type of scenarios are very important to consider when it comes to the future development of the area (see page waterplan).

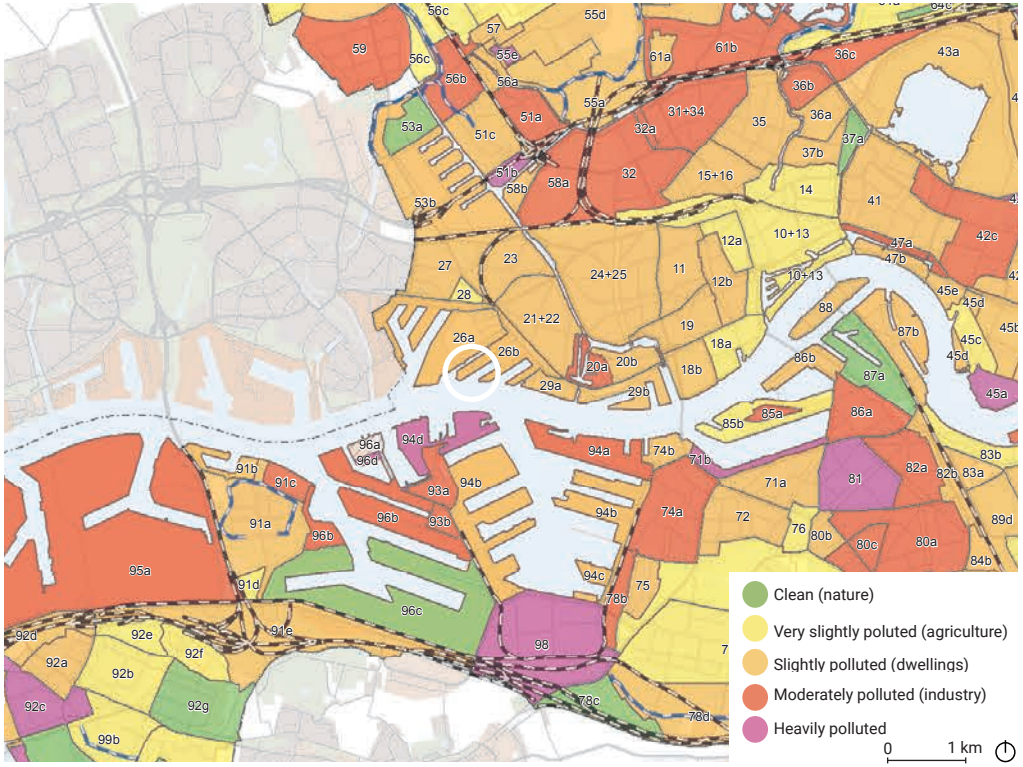
1 & 2 Provincie Zuid-Holland. (n.d.). Klimaatatlas | Zuid-Holland. Retrieved March 29, 2020, from https://zuid-holland.klimaatatlas.net/

ANNEX 2: SOIL

WHAT ARE THE QUALITIES OF THE SOIL ON SITE?



1 Soil types in Rotterdam



2 Quality of the soil in Rotterdam

Soil type

The most common type of soil around Katoenveem is clay. Clay requires the use of piles in the foundation of the building, as the load bearing layer of soil is located deep underneath a chosen location.

Katoenveem however, was not built with a pile foundation despite the presence of clay soil: *"owing to the fact that a solid mass of sand has been deposited by the current on that part of the banks of the river Meuse, Katoenveem could avoid the use of piles, and constructed its warehouses on a heavy foundation of solid concrete and steel resting upon this sand."*[3]

Pollution of the soil

The soil around Katoenveem has been classified as slightly polluted. This means that the site would be suitable for living (dwellings), with public functions and public green/ gardens. At the same time, many former harbour areas in Rotterdam are more heavily polluted. The site of Katoenveem has therefore a lot of potential when it comes to future use of the building.

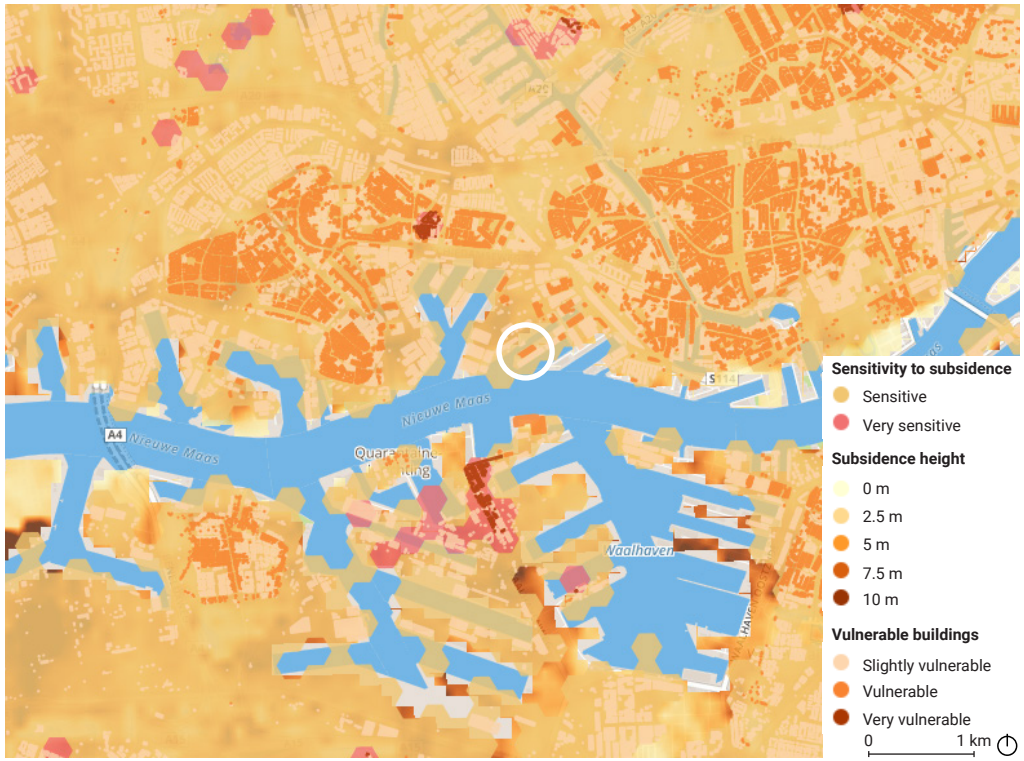
1 Ministry of Agriculture, Nature and Food Quality. (2008, April 1). *Grondsoort per perceel* [Map]. Retrieved from http://www2.hetInvloket.nl/mijndossier/grondsoortenkaart/kaarten2008/gronds08-37o.PDF

2 DCMR Gemeente Rotterdam. (2014). Nota Actief Bodem- en Baggerbeheer Rotterdam 2013. Retrieved from https://www.dcmr.nl/publicaties/nota-actief-bodem-en-baggerbeheer-rotterdam-2013-nota-actief-bodem-en-baggerbeheer-rotterdam-2013-2.html

3 Van Dam, H. (1919). "The Cotton warehouse of Katoenveem", in: The pioneer for the shipping industry and trade of the Netherlands and her colonies, 3 (1919), p. 70

ANNEX 2: SUBSIDENCE

WHAT ARE THE CONSEQUENCES OF CLIMATE CHANGE FOR THE SOIL AROUND KATOENVEEM?



1 Subsidence in Rotterdam,

Subsidence

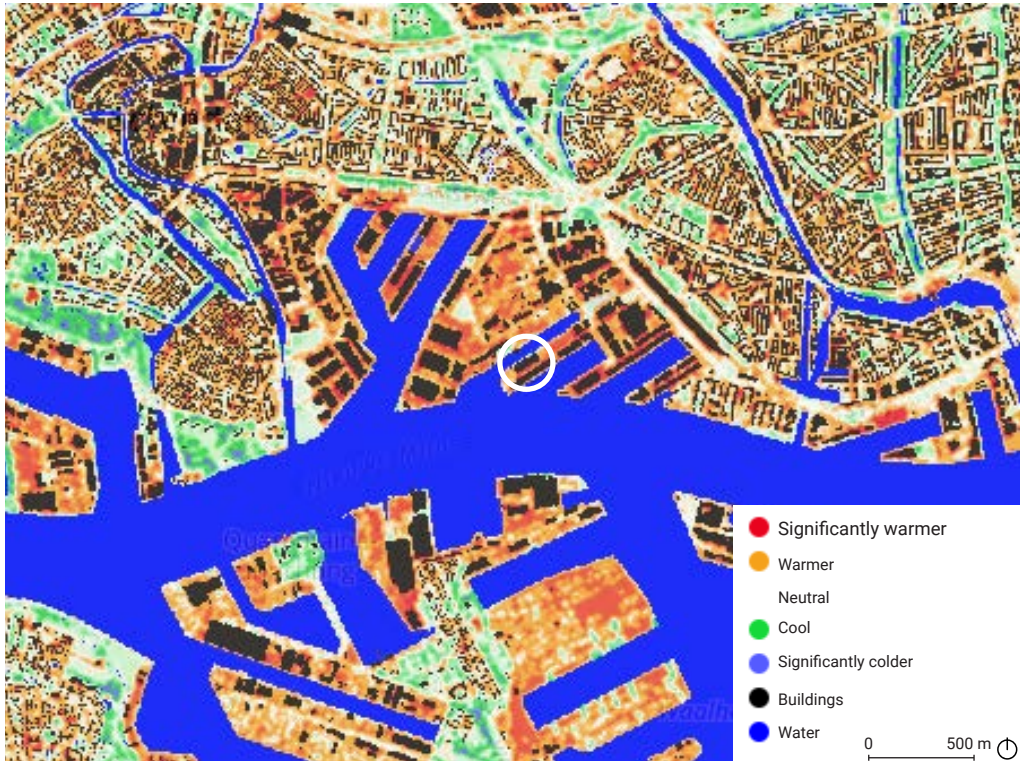
Because of the presence of a clay soil on the site, and because of the predicted drop in groundwaterlevels in 2050, there is a chance that large areas within Rotterdam will have to deal with subsidence. The light-orange colour indicates a subsidence of 2,5 meters, based on current climate change predictions.[1]

Katoenveem has been marked ‘vulnerable’ to the effects of subsidence. This should be considered when exploring possibilities for future use of the building.

1 Provincie Zuid-Holland. (n.d.). Klimaatatlas | Zuid-Holland. Retrieved March 29, 2020, from https://zuid-holland.klimaatatlas.net/

ANNEX 2: HEAT STRESS

WHAT IS THE STATUS OF URBAN HEAT IN THE CITY?



1 Heat stress in Rotterdam

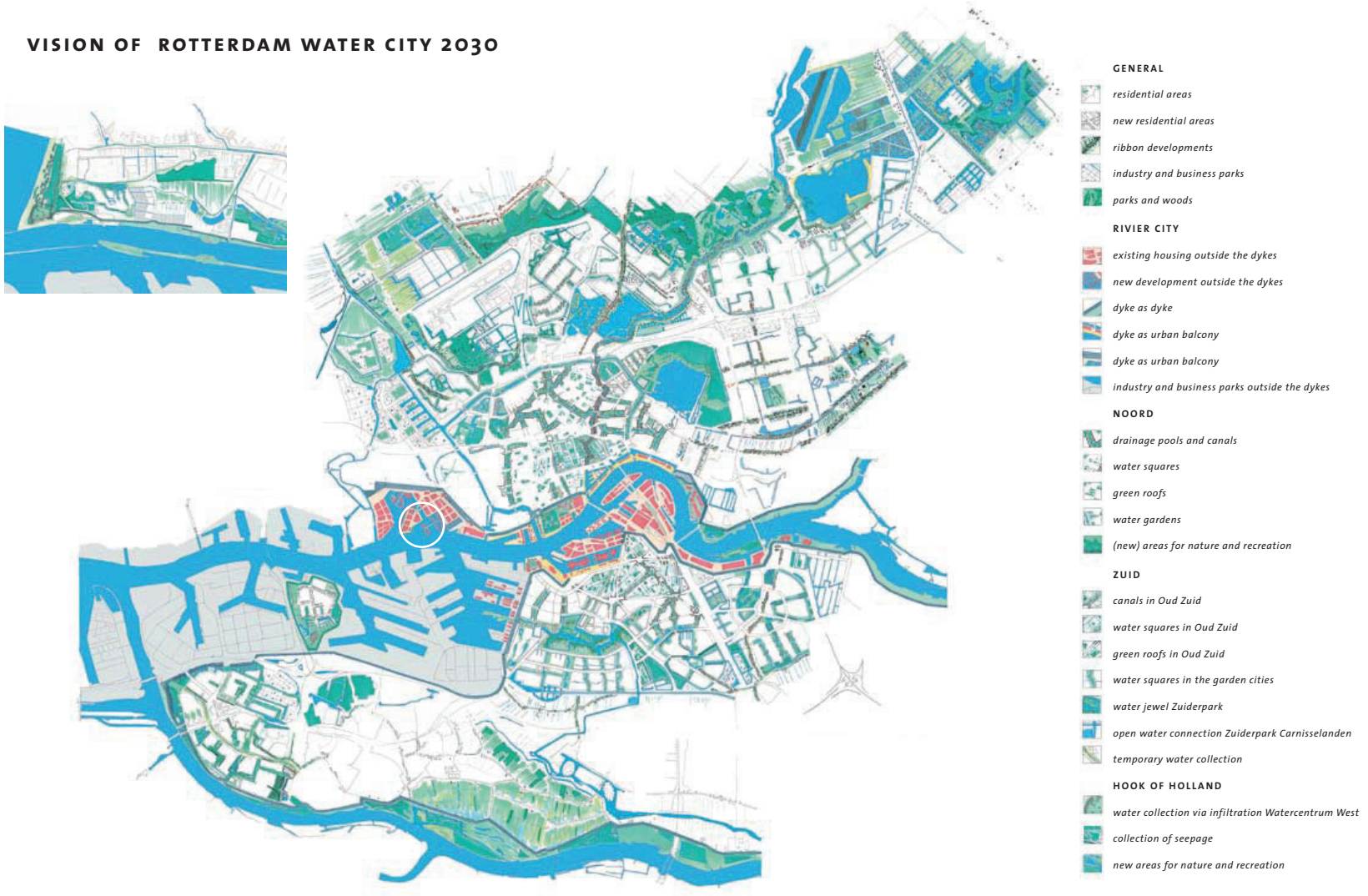
Heat stress

Because of a high percentage of impervious surfaces and pavement, the heat stress in cities like Rotterdam can become an issue with regards to future development, also connected to rise of average temperatures due to climate change. The area around Katoenveem is marked as warmer than usual and on certain spots even significantly warmer. This means that the perceived temperature caused by heat stress is higher than desired. The presence of more shade and greenery could lower heat stress levels, as well as the use of for example green roofs.

1 Provincie Zuid-Holland. (n.d.). Klimaatatlas | Zuid-Holland. Retrieved March 29, 2020, from https://zuid-holland.klimaatatlas.net/

ANNEX 2: WATERPLAN

HOW IS CLIMATE CHANGE ANTICIPATED BY THE CITY?



1 Water plan 2030 - Vision of the municipality of Rotterdam on the measurements and developments needed to reduce consequences of climate change

Waterplan 2030

According to the Water Plan published by the municipality of Rotterdam, the city will have to deal with major consequences of climate change, connected to water:

- higher water levels because of a higher sea water level and consequently the risk of flooding of areas ourside the dikes (like the area around Katoenveem)
- flooding caused by an increase in rainfall, which underlines the importance of sufficient water storage and buffer zones.

The city also plans to actively improve the quality of water, of which a very important aspect is more nature-friendly water banks.

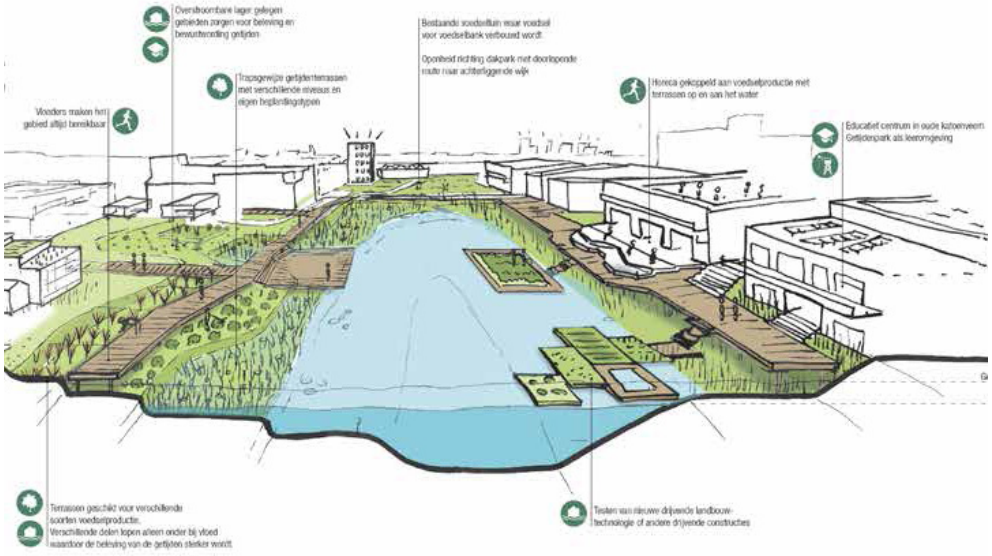
For future developments of the area around Katoenveem the possibility of a higher water level should always be taken into acount. The water plan proposes water-adapted building forms, floating or placed on piles[2] as an answer for rising water levels, as well as green roofs and watersquares to create buffer zones.

1 Gemeente Rotterdam. (n.d.). Waterplan2 | Rotterdam.nl. Retrieved March 29, 2020, from https://www.rotterdam.nl/wonen-leven/waterplan-2/
2 Municipality of Rotterdam (2007) Waterplan Rotterdam: werken aan water voor een aantrekkelijke stad, p. 91

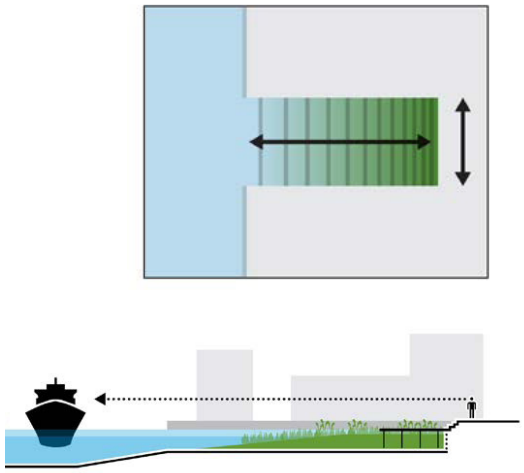
ANNEX 2: THE RIVER AS A TIDAL PARK

HOW IS CLIMATE CHANGE ANTICIPATED BY THE CITY?

1 A tidal park in Keilehaven as part of area transformation



2 Low tide in the tidal park in the Keilehaven



3 Principle of tidal parks in harbour basins

The river as a tidal park

To improve the quality of the water(side) in Rotterdam, the idea of "the river as a tidal park" has been developed. The main goals of this plan are:

- to reconnect the city with nature to increase the biodiversity
- to create a learning environment
- increase water safety
- produce food (and experience the growth of it)
- to create a basis for urban development
- to close regional loops and reuse of residual flows

For the Keilehaven a plan is made to create a tidal park in the harbour bassin. The idea is to let the pavement gradually lower towards the water, and thus experience the tide. This plan is meant to improve the qualities of the urban environment and thereby create opportunities for a succesfull redevelopment of the area.[4]

1-3 images on Keilehaven as tidal park, source: De Urbanisten. (2016). *De Rivier als getijdenpark - Groeidocument 2*. Retrieved from https://www.commissiemer.nl/projectdocumenten/00003152.pdf, p. 75-77

4 De Urbanisten. (2016). *De Rivier als getijdenpark - Groeidocument 2*. Retrieved from https://www.commissiemer.nl/projectdocumenten/00003152.pdf, p. 75-77

ANNEX 3: SKIN

WHAT DOES THE NORTH FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?

1

2

1. It is not visible what is behind the plate, this makes it difficult to estimate the appearance of the original facade. As we can see from pictures, the is a deviation in the grit, instead of a triple window, there is a double window. This part of the facade differs from the grid. An assumption of this deviation is there was perhaps a different function behind this part of the facade. The building is known for is function lead design choices.

2. Photo's of the past show the windows are not original. This makes sense because the window frames are more modern and interrupt the rhythm of the original window frames.

1 Kuiper, A. (2020). Katoenveem. [Photo]
2 Boon, C. (2017). Katoenveem. [Photo]

ANNEX 3: SKIN

WHAT DOES THE NORTH FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?

1

3. These stairs is very likely not original. It connects to one of the newly installed windows and was probably placed when Atelier van Lieshout took over the building. It probably served as an emergency staircase.

1 Kuiper, A. (2020). Katoenveem. [Photo]

ANNEX 3: SKIN

WHAT DOES THE EAST FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?

1

2

1. Office. Photographs from the past show that there used to be an office building against the east facade. The contours of this building are still clearly visible on the facade. In my own interpretation, the office building should have looked something like the one on the next page.

3

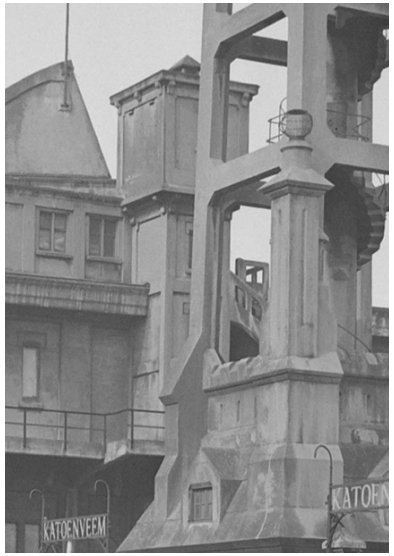
4

2. Openings that interrupt the rythm. These openings are not original, this can be concluded from photos of the past. For the façade fragments that cannot be found in photos can be argued that they are not original by the fact they deviate from the grid that Kanters designed.

1 Unknown. (1952). Katoenveem with watertower. [Photo]. Retrieved from: Stadsarchief Rotterdam
2,3,4 Boon, C. (2017). Katoenveem. [Photo]

ANNEX 3: SKIN

WHAT DOES THE EAST FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?



1

2

3

4

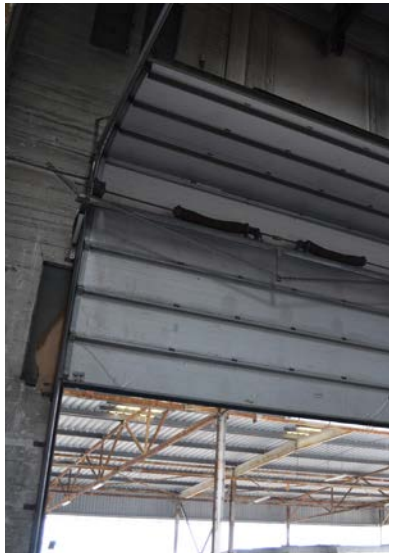
3. Elevator shaft with spiral staircase. The elevator shaft and stairs are now covered with metal sheet for protection. Historical photographs show us what the elevator shaft and stairs looked like. For example, there are some windows with the same ornaments on top of each other on the lift shaft and the spiral staircase will look a lot like the other stairs Kanters designed.

4. Some openings of the original design have been closed off. Possibly because of anti-burglary and because they were no longer needed when Veem lost its function as cotton storage.

1 Unknown. (1952). Katoenveem with watertower. [Photo]. Retrieved from: Stadsarchief Rotterdam
2 Van Straalen, L. (2020). Katoenveem. [Photo]
3 Van Dijk, F.H. (1937). Katoenveem. [Photo]. Retrieved from: Stadsarchief Rotterdam
4 Boon, C. (2017). Katoenveem. [Photo]

ANNEX 3: SKIN

WHAT DOES THE EAST FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?



1

2

5. The garage door is not original, it passes right through the window frames. It is likely Atelier van Lieshout made this opening to get large artworks in and out of the building. During the time that this art studio was located in Katoenveem, many adjustments were made to the building.

3

4

6. The original staircase is badly damaged.

1, 2, 3, 4 Boon, C. (2017). Katoenveem. [Photo]

ANNEX 3: SKIN

WHAT DOES THE SOUTH FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?

1

2

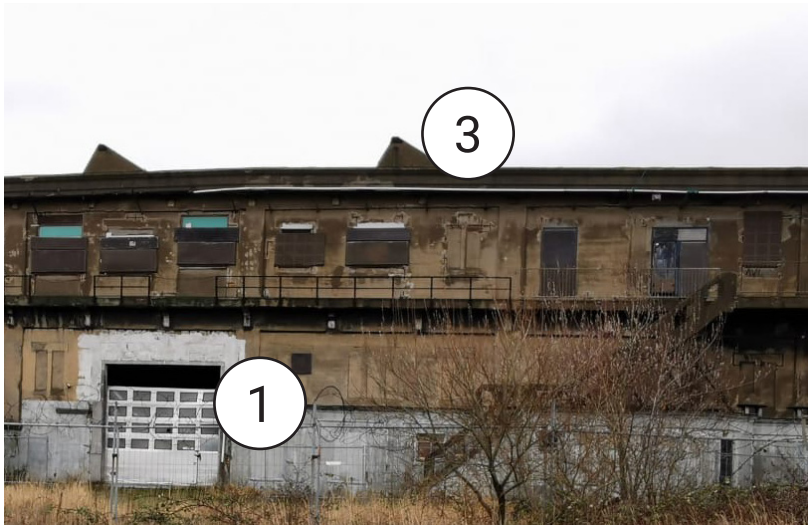
There are some interventions found in the south facade. The new openings are changed for a new office in the corner of the facade. Changes 1 and 2 are made in existing openings. Change 3 is more radical in its outline. Most of the existing window openings are closed in a practical way because of damage to the existing glass.

1&2 Boon , C de (2016) Katoenveem

ANNEX 3: SKIN

WHAT DOES THE WEST FACADE COMMUNICATES ABOUT THE ORIGINAL DESIGN?

1



2

A large new garage dor is made into the facade.(1) On the upper floor a new office space is created behind the facade. Here new openings (2) are made with different contours than the existing windows. The rest of the openings are closed. (3)

3

1. Unknown, (stadsarchief Rotterdam) 2020
2. Spook Z. (2020). Katoenveem
3. Drawing Bouwhistorisch Rapport (2016)

ANNEX 4: FLOOR PLAN

WHAT DOES THE FLOOR PLAN COMMUNICATE ABOUT THE ORIGINAL DESIGN?

On the east and west facade large garage doors have been implemented. The exterior picture is of the west side, the interior picture is of the east side.

In the first compartment a brick wall and steel staircase have been added.

The second compartment has added steel columns and beams between the concrete beams. Also a wooden stair has been added. Furthermore wooden beams have been placed on the walking paths, as visible in the lower picture.

Illustration: 'Collage of added or changed elements', by Stoffels, E. (2020), based on:
1 Boon, C. (n.d.). Interior Katoenveem. [Pictures].