Campus South

"A village-like experience"

Analysis of the Hembrug area and the Campus South ensemble

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Introduction

A village-like experience

This analytical piece explores the former military production terrain of Hembrug, Zaandam The Netherlands. This work is part of the graduation studio of Heritage & Architecture (H&A). The aim of the project is the redevelopment of the former industrial site, where this work is set to be the foundation. The site used to be the heart of the Dutch military industry during the twentieth century, this place was aimed at making weapons and ammunition for the so-called 'Artillerie Inrichtingen' and always remained isolated from the outside world, surrounded by secrecy. Now the site has lost its original purpose, and can finally redeem itself from this cloak of silence.

Due to its eventful past, the area nowadays possesses numerous cultural and historical values. For the redevelopment of this former military site it is important to analyze these different values. To make the project and research more manageable, the site of Hembrug (illustrated below) was divided into different ensembles. The ensemble chosen for this analysis is marked red.

The first time visiting the site, the former military terrain reminded me of a village-like environment. The main aim of this work is to dissect the (spatial) qualities of the site and its buildings. In order to accomplish this, the following research question has been set up:

"How does the contemporary composition of Campus South contain this village-like experience, and how did this composition come into existence?"

This question shall be explored and dissected in the next three chapters:
1: Hembrug
2: Campus South
3. Buildings & Elements

fig. 0.01 military heart of The Netherlands

Reading guide

Unless indicated otherwise, all figures and photos are made by the author.

The buildings and elements of Campus South shall be indicated according to their corresponding names (in Dutch), see 2.2 Building Overwiew or Chapter 3 Buildings & Elements for the lists. Buildings will be numbered and the elements will be listed with letters.

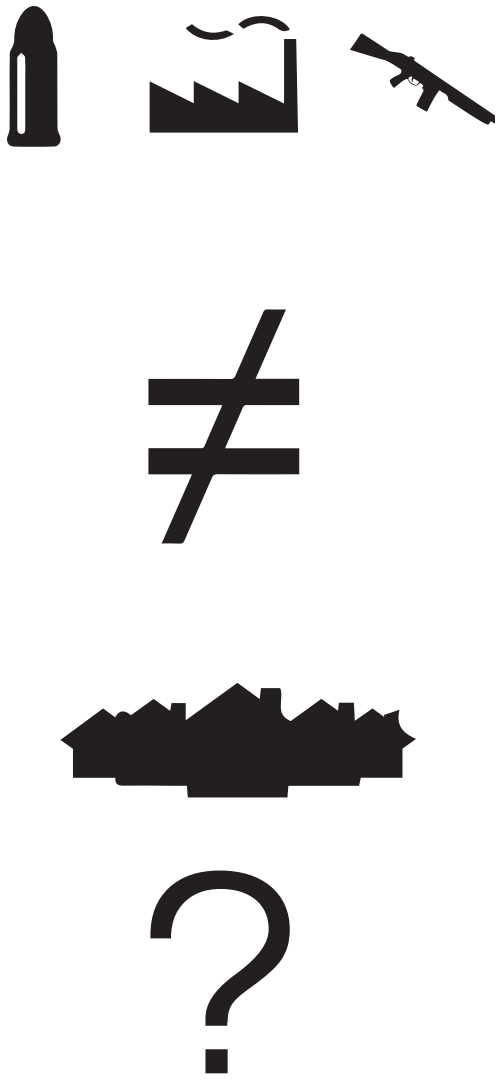


fig. 0.02 can a military production site have the characteristics of a village?

aerial view Hembrug (via SteenhuisMeurs 2010 pp.31)

Chapter 1
Hembrug

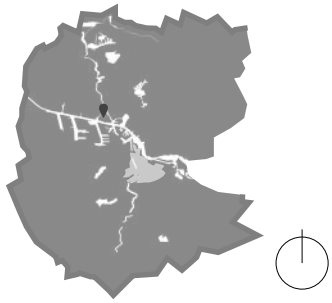
Brief history of its genesis

How did the Hembrug terrain gain its shape and composition, and did the area of Campus South have any influence on the spatial layout?

1.1 Development of Hembrug

The military chose the site to locate its factories due to the strategic location in the middle of the 'Stelling van Amsterdam', which was the defensive line of the Netherlands' most important city.

'Stelling van Amsterdam', Netherlands from above



'Stelling van Amsterdam', Amsterdam region from above

The core of the factory complex from 1895-1909 was formed by the buildings of the arms factory, the cartridge factory, and the ammunition factory. In the arms factory (W.F.) almost all parts of the m95 rifle were manufactured, assembled and stored.

The core of the factory complex was formed by the buildings of the arms factory, the cartridge factory and the ammunition factory. Because of the coherent production processes, the cartridge factory, and the ammunition factory stood side by side. The factories consisted mainly of large production halls and smaller buildings.

fig. 1.1.01 1850

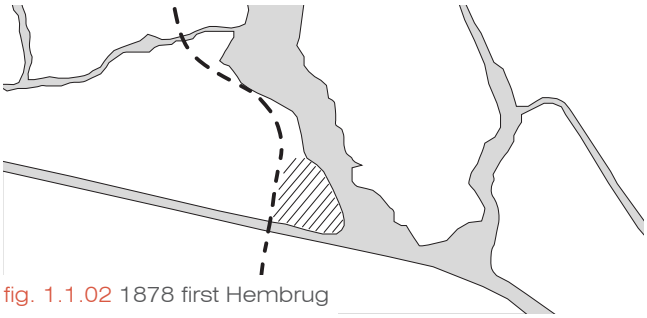


fig. 1.1.02 1878 first Hembrug

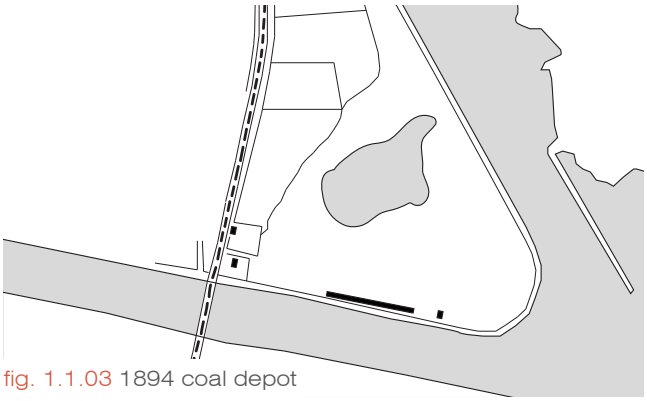


fig. 1.1.03 1894 coal depot

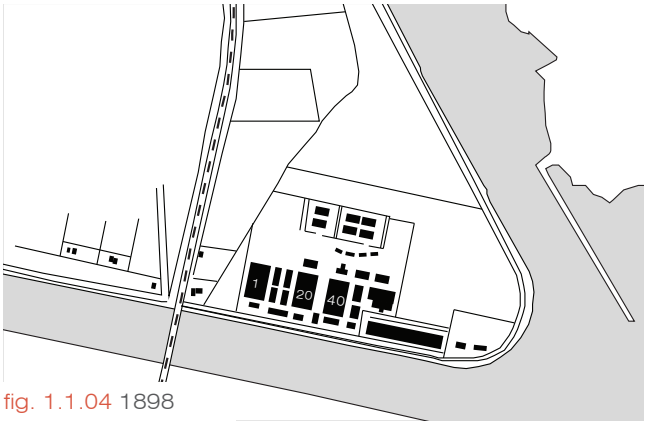


fig. 1.1.04 1898

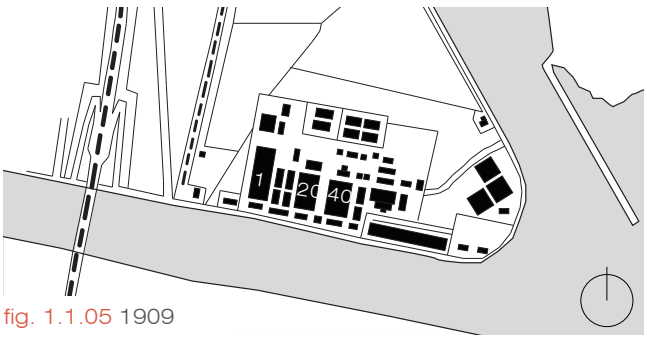


fig. 1.1.05 1909

The compact military building complex from the period 1895-1909 developed in a few decades into a complete factory city. The outbreak of the First World War in 1914 caused enormous growth on the Hembrug terrain. New weapons and ammunition were mostly the reason for the construction of new warehouses and factories. The division into weapons, cartridges and ammunition zones was retained. Weapon- and ammunition factories, on the east and west sides of the complex could expand to the sides. The central pattern factory could not easily expand due to the lack of space, nowadays it is still visible that the buildings were clumped together.

fig. 1.1.06 1924

fig. 1.1.07 1941

fig. 1.1.08 1996

1.2 Structure

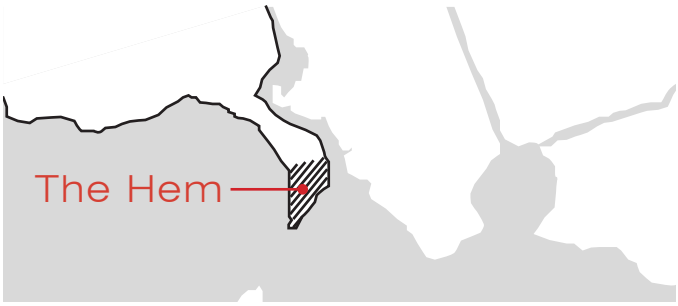


fig. 1.2.01 1850 tongue of land the 'Hem'

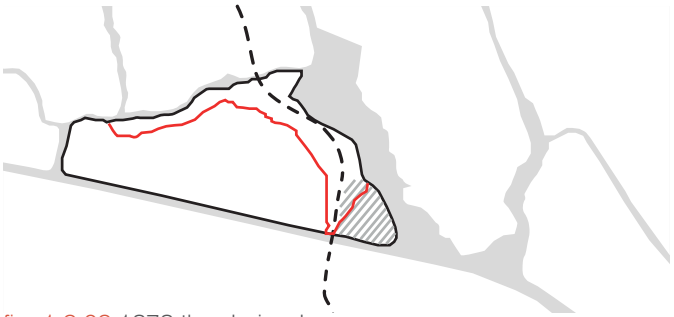


fig. 1.2.02 1878 the drained area

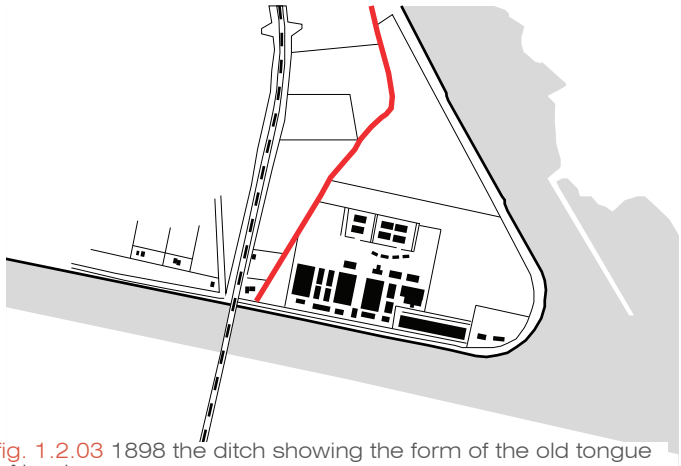


fig. 1.2.03 1898 the ditch showing the form of the old tongue of land

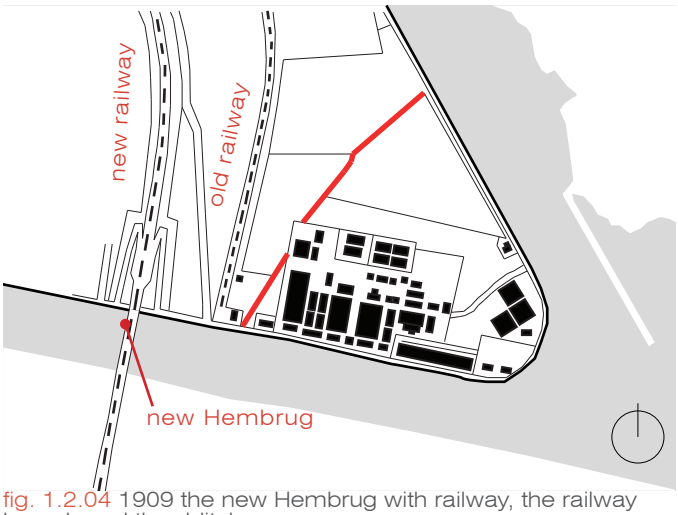


fig. 1.2.04 1909 the new Hembrug with railway, the railway branch and the dditch

The Hem

The Hem was a former landtongue, which later became the Hembrug terrain as we know it today. The remains of the shape of this landtongue were still present for a long time in the form of a ditch (marked in red). Still remains of this ditch are visible today, only not in the Campus South ensemble. The ditch used to find its way through Campus South, but had to make way for new buildings and urban structures.

The Hembrug

The area is named after the bridge that spanned the Northsea Canal. The first bridge was being used from 1878 until 1907. In 1907 a new bridge was taken into use, the new Hembrug was located slightly more to the west. The old railway became a branch of the new main railway which connected Zaandam and Amsterdam. This branch was still being used to deliver cargo like raw materials to the Campus South, which were then further distributed of the Hembrug terrain. Because the Campus South was of importance for delivering cargo, the main road bends around the former shooting range (see fig. 2.2.08).

The shooting range

One of the main roads of the Hembrug terrain is the Middenweg, which crosses the site from the east to the west. Strangely enough, this axis does not cross the entire width of the terrain. This is because of the presence of a shooting range in the past, which ran perpendicular to this axis. Until this day, the axis stops at the former intersection with the shooting range (see fig. 1.2.08).

fig. 1.2.05 shooting range 1898

fig. 1.2.06 shooting range 1909

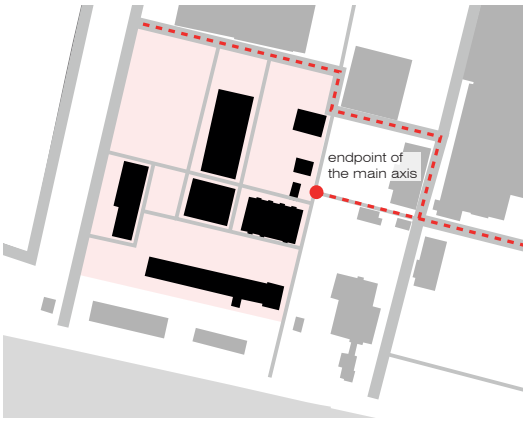


fig. 1.2.08 the main axis stopping at the intersection with the former shooting range, and bending around it

fig. 1.2.07 present-day situation

1.3 Former division of the area

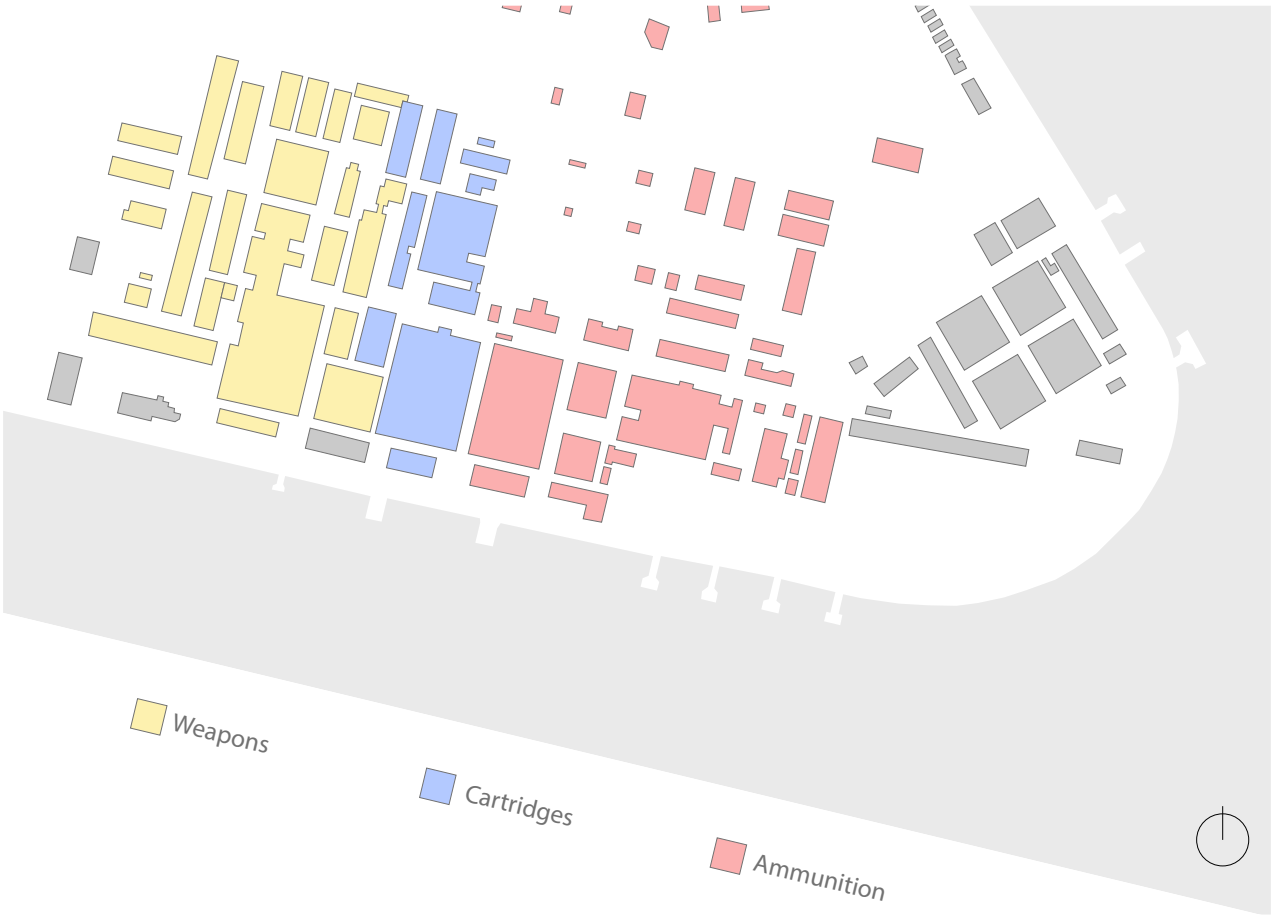


fig. 1.3.01 different functions in Hembrug (author's edit of the original image, via SteenhuisMeurs 2010 pp.26)

1.4 Building phases

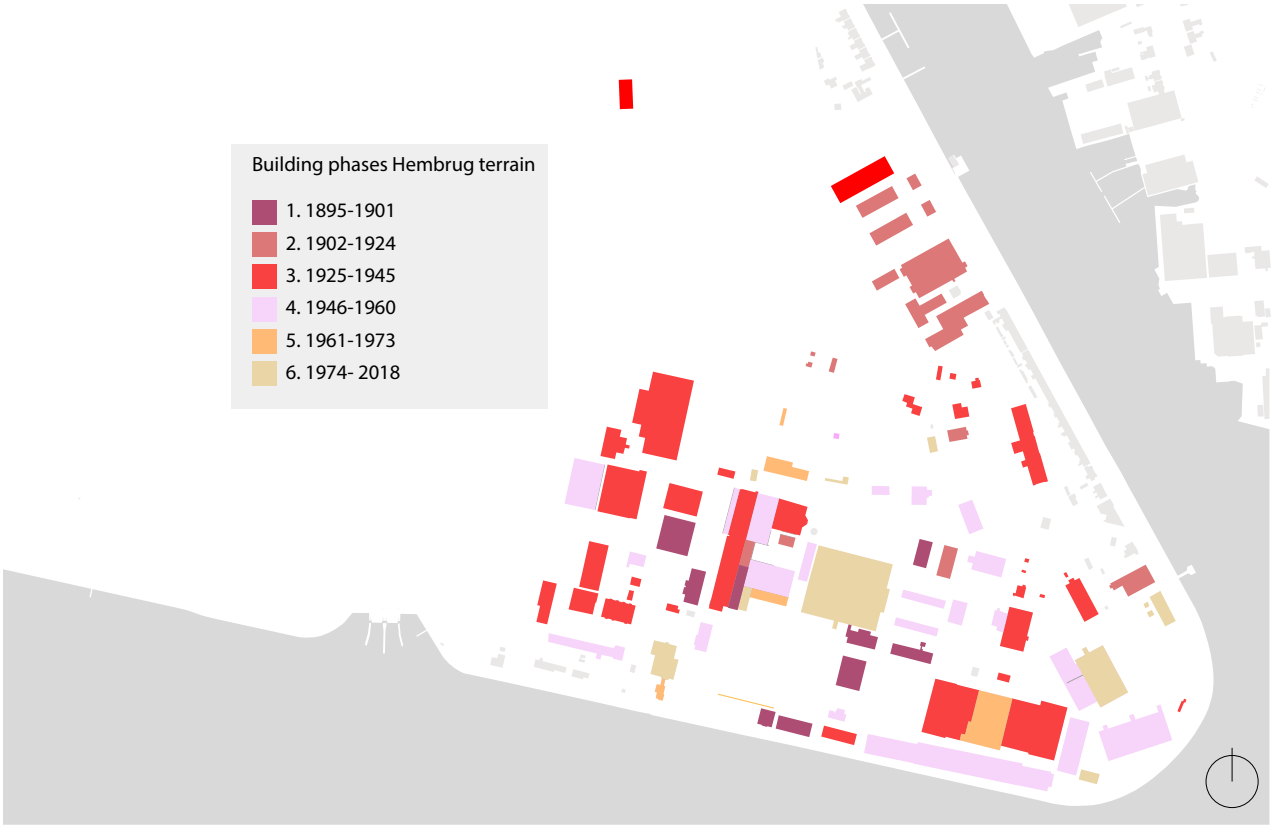


fig. 1.4.01 building periods

Characteristics of the idfferent building phases

Phase 1 (1895-1901)

fig. 1.4.02

Phase 2 (1902-1924)

fig. 1.4.03 via Factsheet

Phase 3 (1925-1945)

fig. 1.4.04

Phase 4 (1946-1960)

fig. 1.4.05

Phase 5 (1961-1973)

fig. 1.4.06 via Factsheet

Phase 6 (1974-2018)

fig. 1.4.07 via Factsheet

Chapter 1
Conclusion

"How did the Hembrug terrain gain its shape and composition, and did the area of Campus South have any influence on the spatial layout?"

The water around the former tongue of land was drained in order to give space to the upcoming industry. At first, the contemporary Hembrug terrain was used as a coal depot. Later on, the Dutch military used the site for production due to its strategic location in the 'Stelling van Amsterdam'.

The area is named after the bridge that spanned the Northsea Canal. In 1907 a new Hembrug was taken into use. The old railway became a branch of the new main railway which connected Zaandam and Amsterdam. This branch was still being used to deliver cargo like raw materials to the Campus South, which were then further distributed of the Hembrug terrain.

One of the main roads of the Hembrug terrain is the Middenweg, which crosses the site from the east to the west. Because of the presence of a shooting range in the past, the road does not cross the entire width of the terrain, it stops at the border of the contemporary Campus South area.

Because Campus South was important for distributing the raw materials that came in by train, the main axis bends around the former shooting range to make a connection with the contemporary Campus South area.

aerial view Hembrug (via SteenhuisMeurs 2010 pp.31)

Chapter 2 Campus South

What are the characteristics of Campus South and how were these shaped over the course of time?

What role did the area of Campus South play throughout the history of the terrain?

What elements give Campus South the village-like atmosphere?

How can the characteristics of Campus South be integrated into plan for future redevelopment?

2.1 The role and development of Campus South

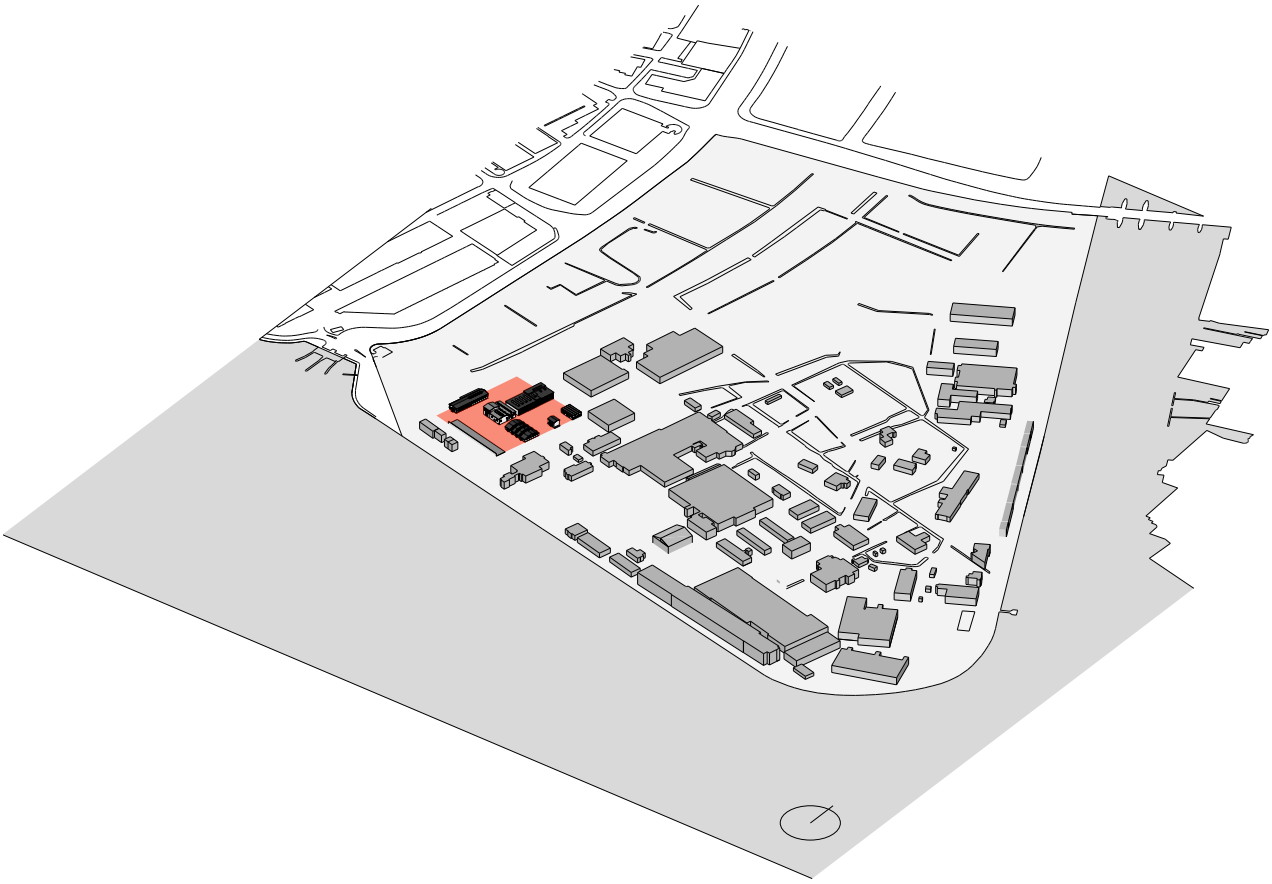


fig. 2.1.01 location of Campus South

1909

The former railway track was already there and is therefore the oldest element of the ensemble. Furthermore, a few small buildings were there, most of the site's surface was still vacant.

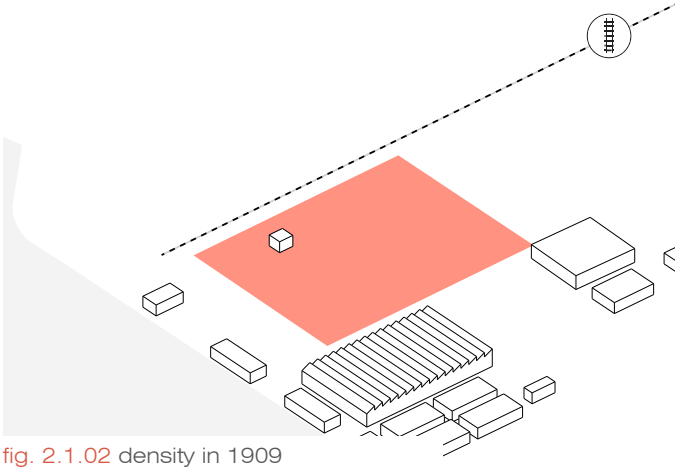


fig. 2.1.02 density in 1909

1924

Due to WOI, the Hembrug terrain experienced enormous growth and expanded from the center to the sides. The area of Campus South became more densely built.

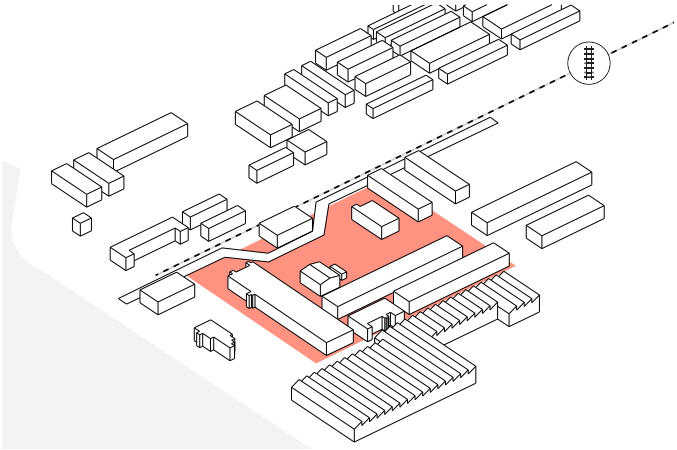


fig. 2.1.03 density in 1924

1941

The density at the area of Campus South reached its peak during this period. The area was located close to the weapon factories and focussed mainly on its role as a distributor (see 2.4 Former use and function).

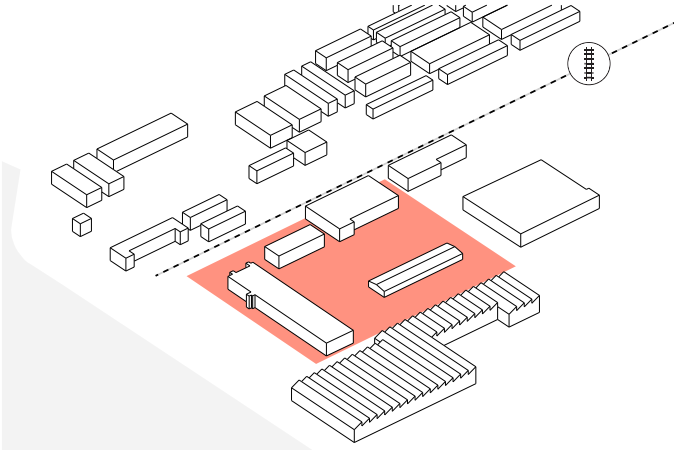


fig. 2.1.04 density in 1941

Present

When Eurometaal arrived in 1973, a lot of buildings were demolished. This resulted in the open spaces that define the ensemble as it is today.

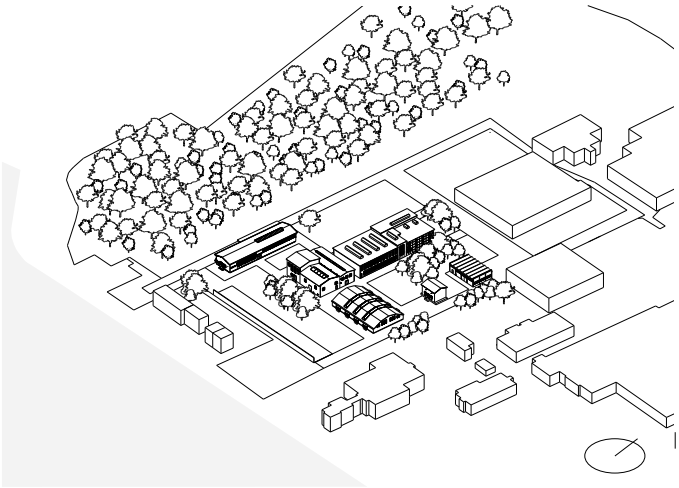


fig. 2.1.05 present-day situation

2.2 Former use and function

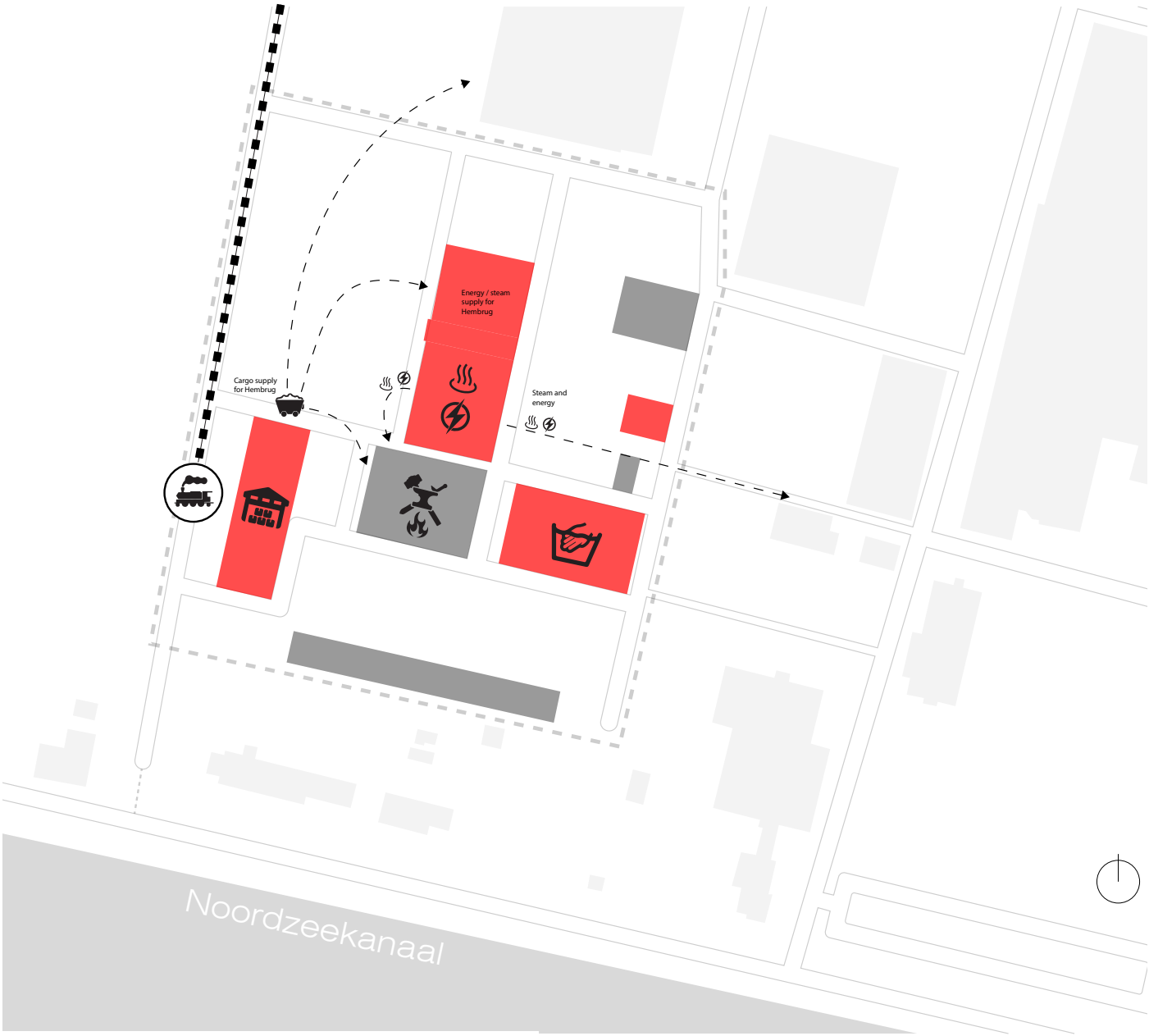


fig. 2.2.01 logistics cargo and raw materials

Logistics cargo & raw materials

It appears that the Campus South area acted as the heart of Hembrug. Building 218, a boiler plant, used to provide energy and steam for a big part of the former military site. Close to the boiler plant, building 341 is located. This building served as a train station and temporary warehouse for raw materials, these materials were then transported to different factories on the terrain. Whereas these elements were essential for the production process throughout the whole area, one can state that the Campus South ensemble functioned as the logistic epicenter of Hembrug, and is therefore a prominent part of its heritage. (via rijksmonumenten.nl)

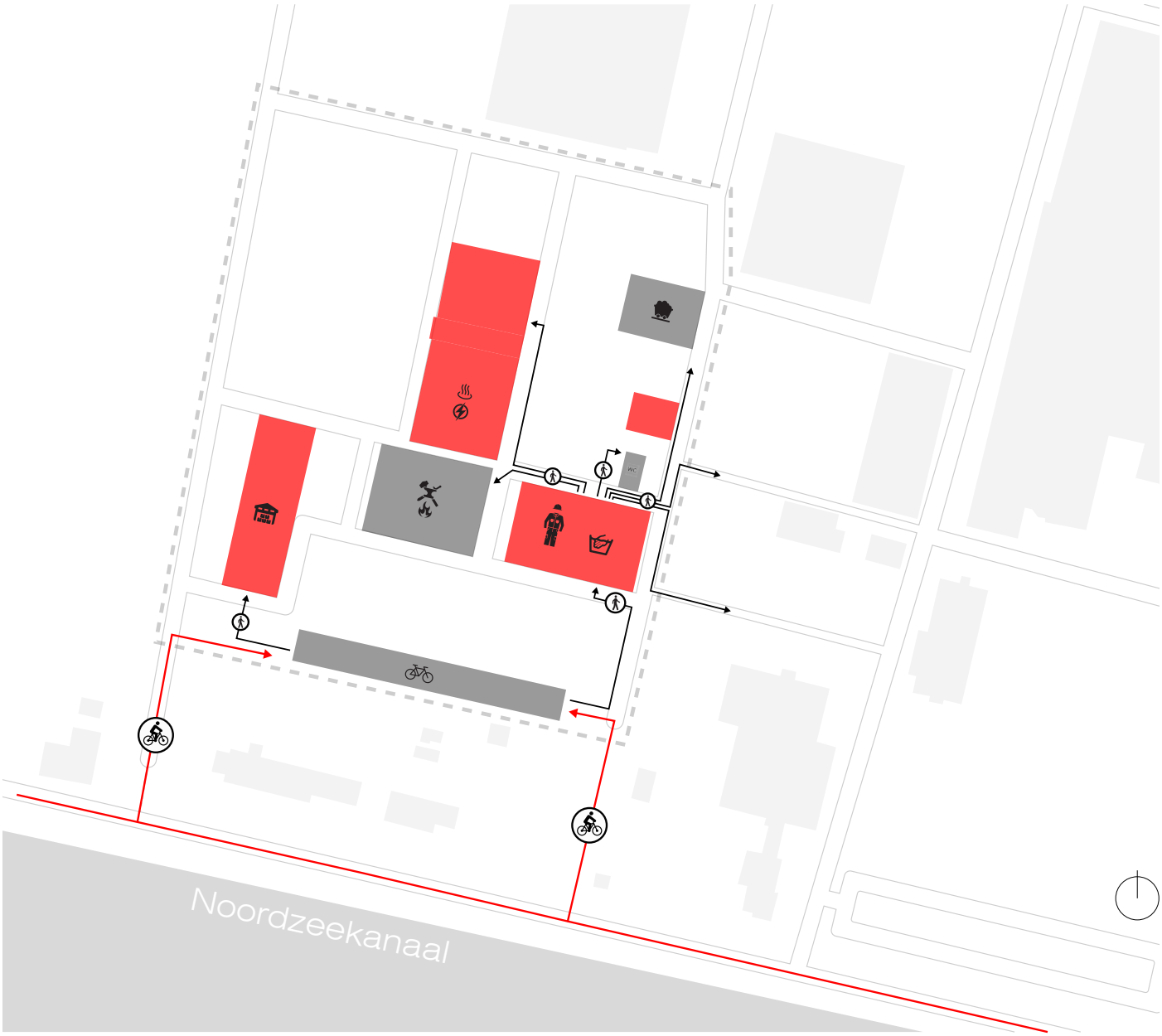


fig. 2.2.02 logistics employees

Logistics employees

The campus south area can thus be seen as the former beating heart of the Hembrug area. But it also appeared to be of importance for the logistics of the workforces.

Since most of the workers back in the day used to make their way to the site by bike, the area needed a bike storage. This storage is located on the south side of the ensemble, close to the wash- and dressing room. The employees would change and continue their way on to their workstations. (via Jos van Rijn)

2.3 Important elements

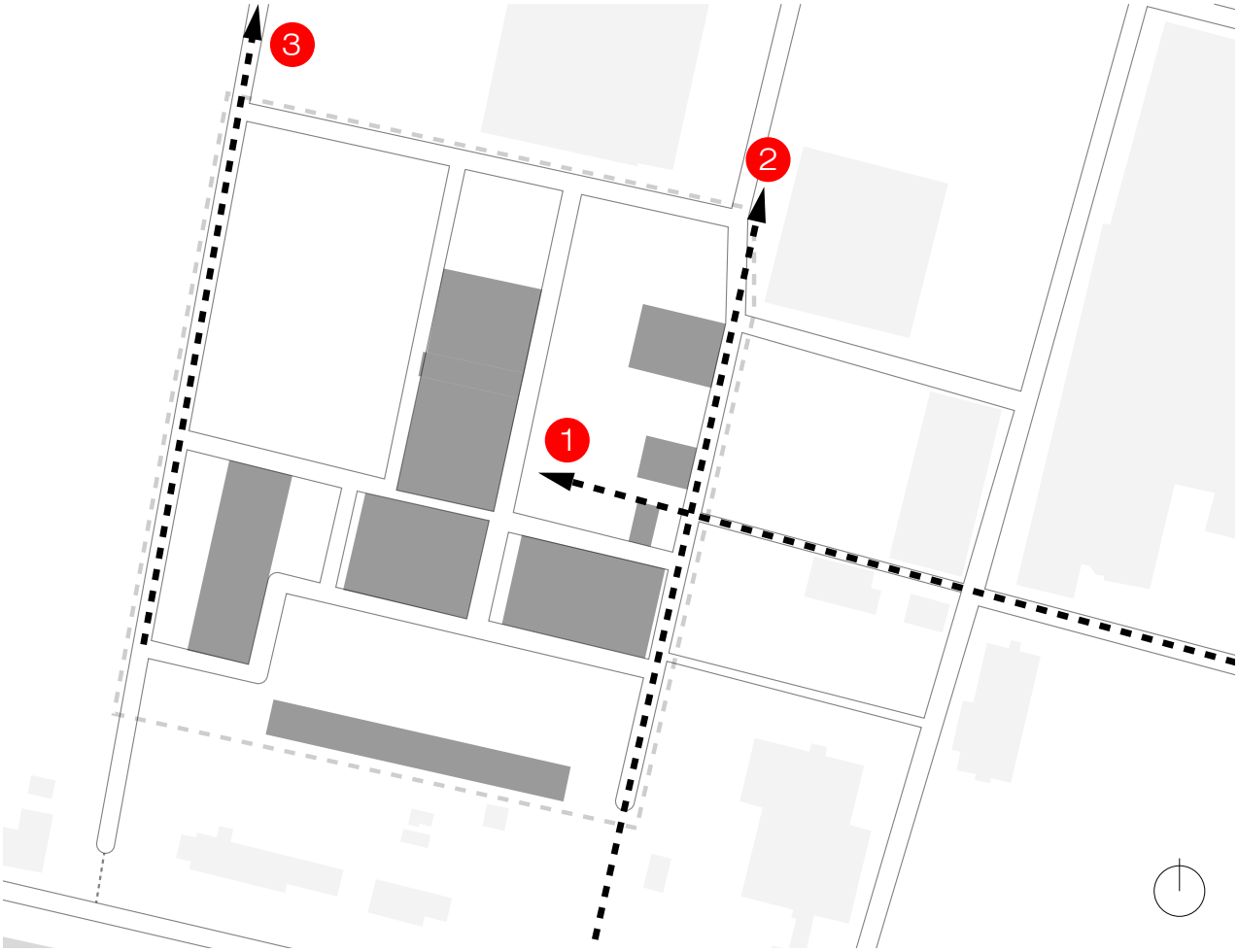


fig. 2.3.01 important axes

1

To be preserved because of the long steam pipe network, which played an important role in the way the area functioned (see 3.22 Elevated steam pipe network). Also, the former military complex as a whole can be overseen on this axis.

2

A long line of sight, used by all workforces due to the presence of the changing room and the bike storage. This road stands on the place of a former shooting range, which also explains why the main axis of the site (the contemporary Middenweg) does not cross the full width of the terrain, which would have been the most logical.

3

This road replaces the old railway track, over which cargo used to be supplied (see 3.23 Former railway track).

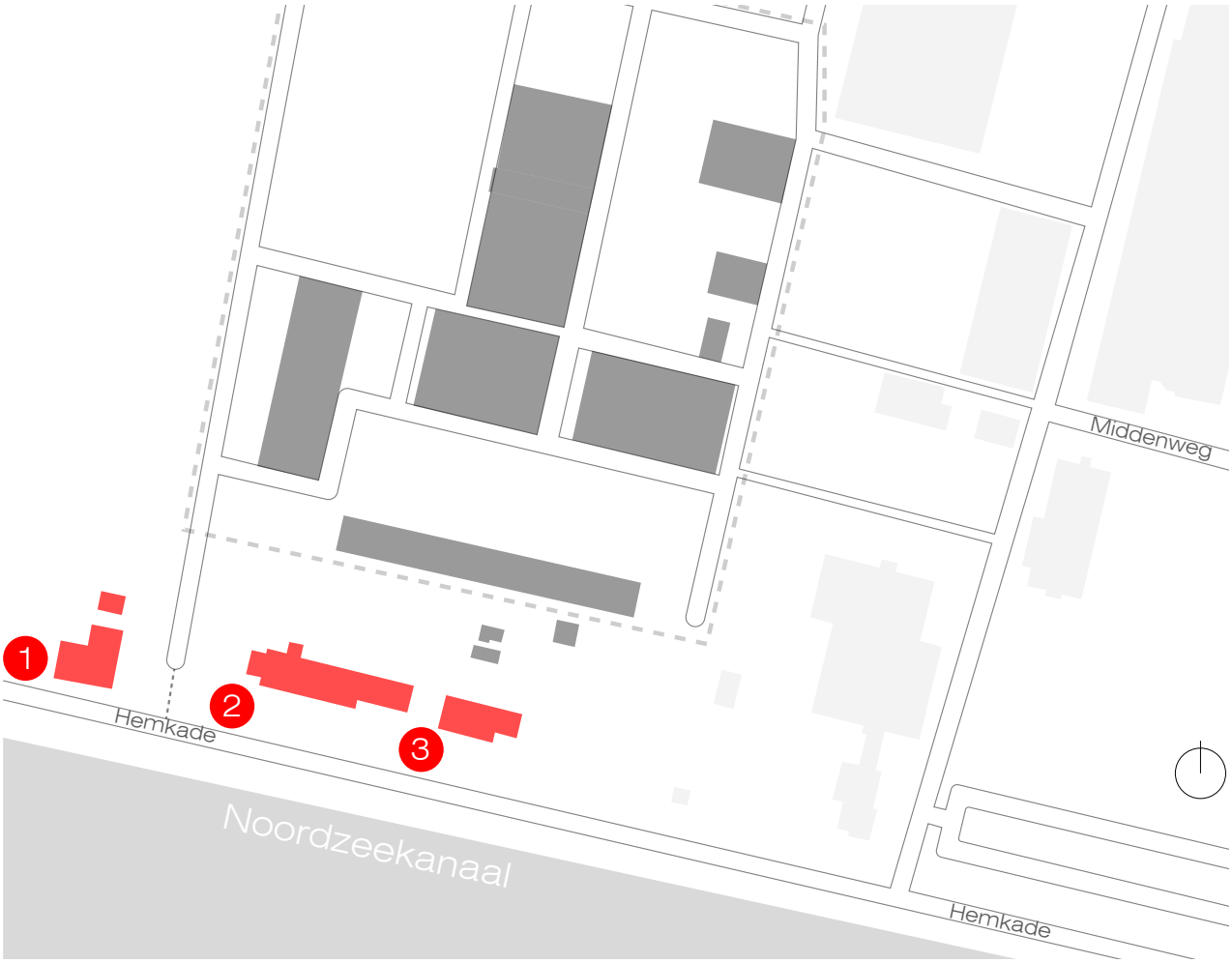


fig. 2.3.02 houses at the Hemkade

1

fig. 2.3.03 the oldest house on this part of the Hemkade, built in 1930. Located next to the entrance, it could have functioned as a guard house (pictures from google street view)

2

fig. 2.3.04 newer houses, Hemkade 22-24 (pictures from google street view)

3

fig. 2.3.05 newer houses, Hemkade 20,21 (pictures from google street view)

2.4 Spacial organization

Open fields

Since the arrival of Eurometaal in 1973, a lot of factory- and warehouse buildings have been demolished. At the site which is in this booklet referred to as Campus South, it meant a dramatic decrease in its built surface, resulting in vast open fields. The word ‘campus’ derives from Latin, meaning ‘field’. The word was first used to describe the large field which separated Princeton (New Jersey) from the small nearby town1. A campus can in this way be seen as a field of separation, where it forms a distance between the buildings instead of binding them together by forming a communal space.

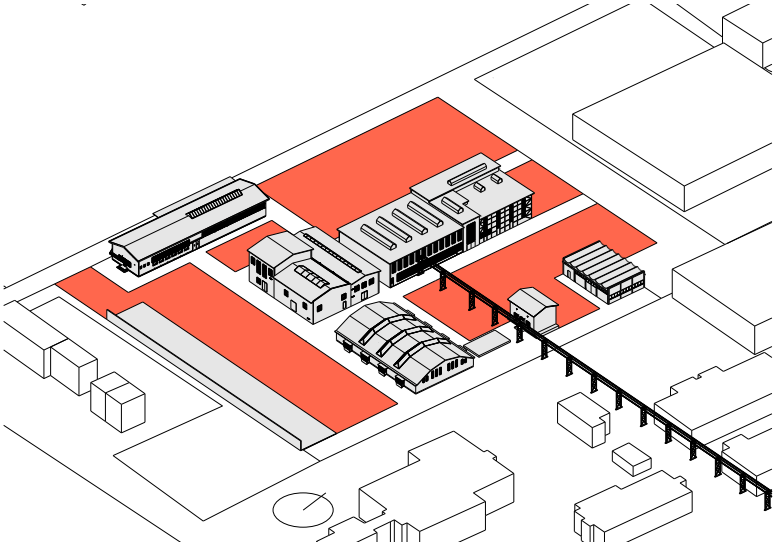


fig. 2.4.01 open fields

In Campus South, this distance is enforced by some of the wildly grown greenery. These trees and bushes split some of the open fields, dividing it into pieces. On the other hand, the open spaces give Campus South its open and communal feel and therefore enhance the character of the site. In the future there should be made use of these open spaces for people to gather, and for the buildings to bind themselves to these open fields.

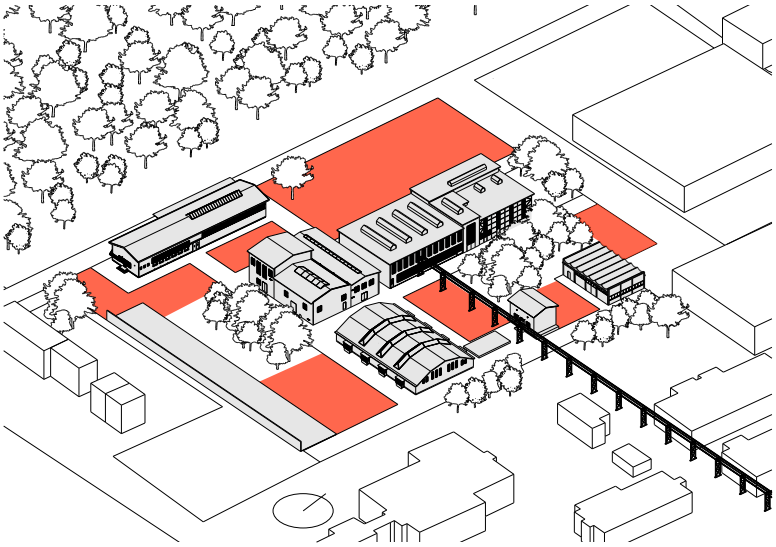


fig. 2.4.02 open fields with the wildly grown trees and bushes

Building mass

BUILDING	M^2
• Overslagloods	458
• Harderij	576
• Ketelcentrale	986
• Waslokaal	633
• Carbidgebouw	130
• Lorriegarage	225
TOTAL	3278

Total surface Campus South: approx. 16000 m^2.

Built surface of the ensemble is approx. 20%

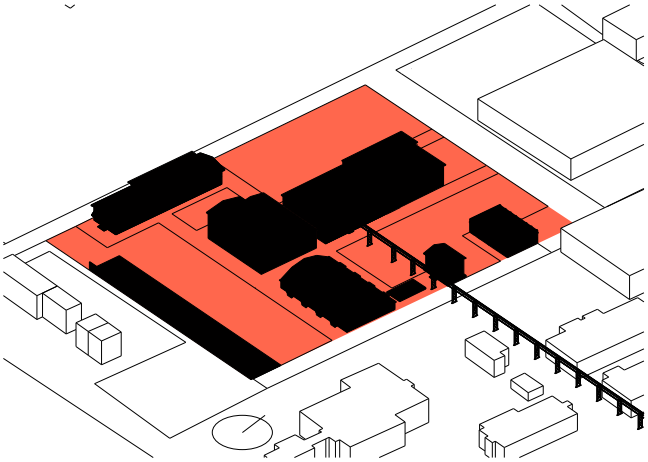


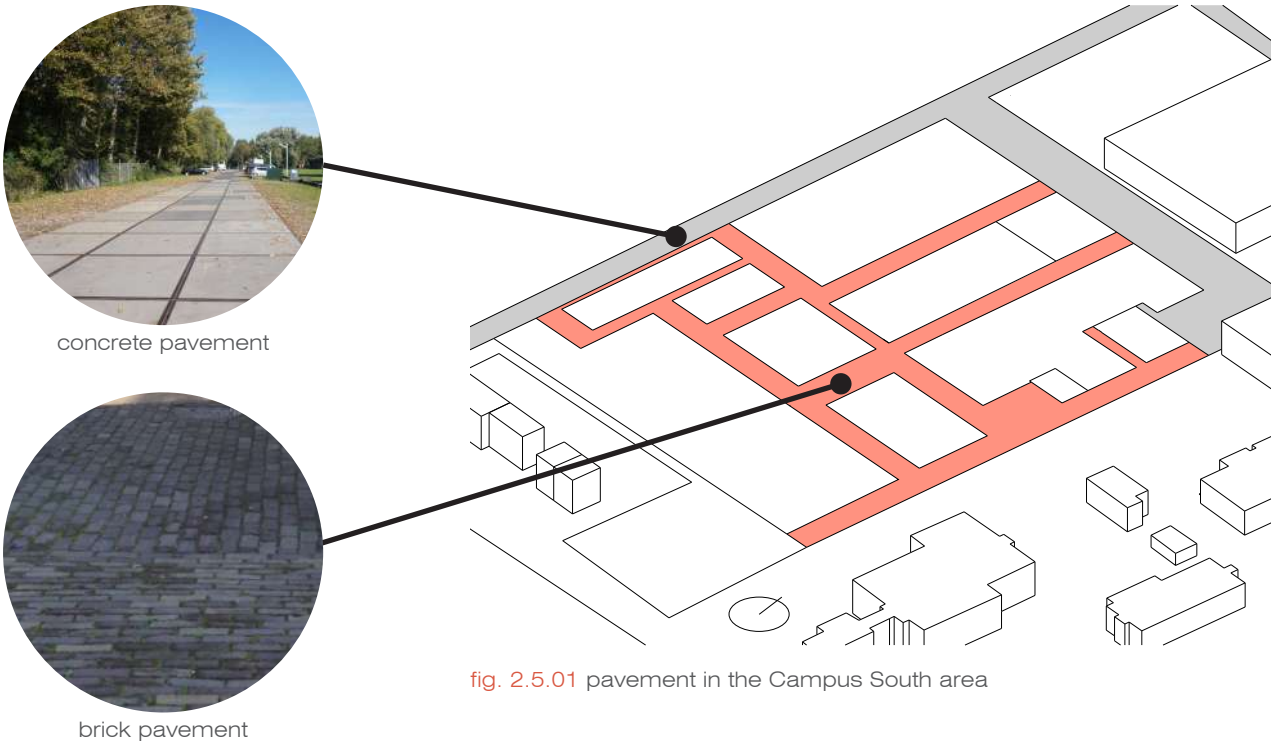
fig. 2.4.03 building mass (author's visualization)

fig. 2.4.04 the wildly grown trees and bushes making parts of the open fields inaccessible

2.5 Characteristics

Pavement

Nowadays the main roads can be recognized by the concrete Stelcon plates. The roads have a width of two or three plates, with brick pavement on both sides. The concrete pavement is mostly not original but probably produced in the site's factories. The size of the plates is adjusted according to the terrain's spatial demands. In the past, the original roads of the military site were executed in brick pavement with and equipped with a narrow-gauge railway (via SteenhuisMeurs 2010 pp. 58).



concrete pavement

brick pavement

fig. 2.5.01 pavement in the Campus South area

Entrances

Almost all the building on the Campus South ensemble can be entered from multiple facades, with the Carbidgebouw as an exception. For the functioning of buildings like the Overslagloods and the Waslokaal having multiple entrances was crucial, see Chapter 3 Buildings & Elements for further explanation.

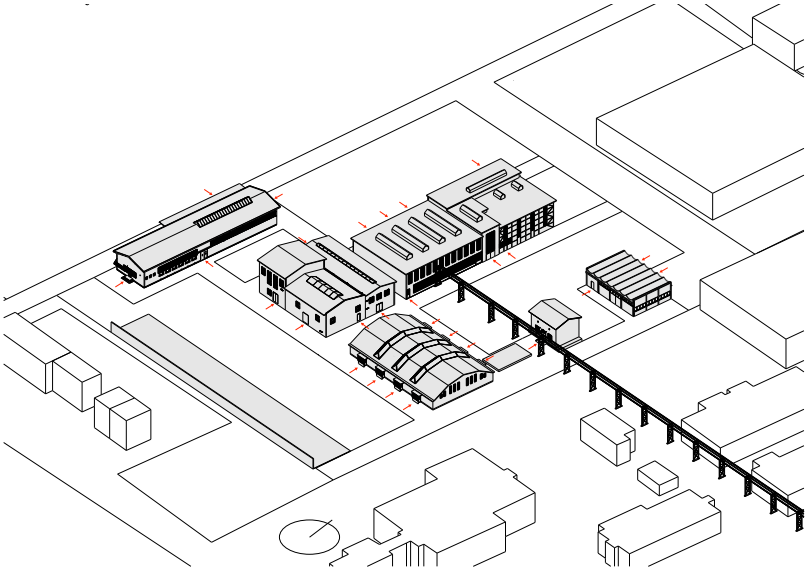


fig. 2.5.02 building entrances

Monuments

Campus South counts a total of 4 monuments out of the 6 buildings still present on the site.

Listed national (rijks) monuments include:
- Overslagloods
- Ketelcentrale
- Waslokaal

Listed municipal Zaandstad monument include:
- Carbidgebouw

See Chapter 3 Buildings & Elements for further explanation about the appreciation and monumental status.

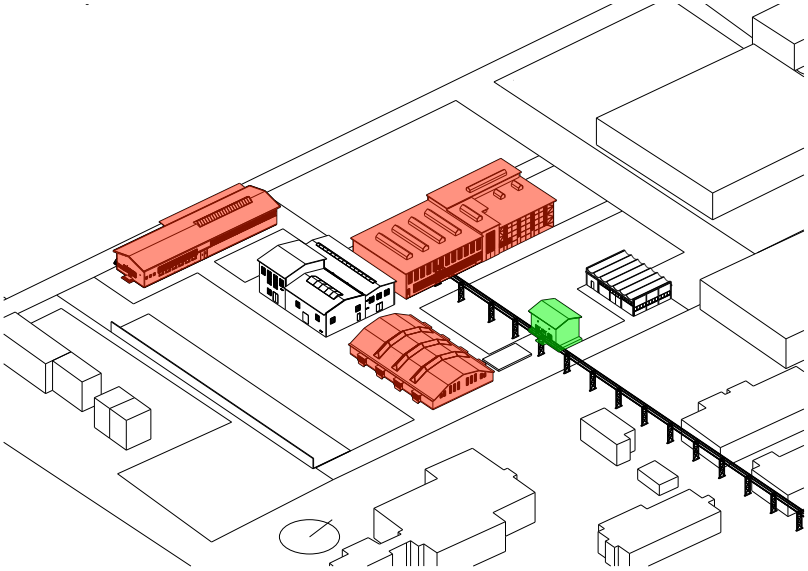


fig. 2.5.03 monuments (national (rijks)monuments are marked in red, municipal monuments are marked in green)

2.6 Accessibility

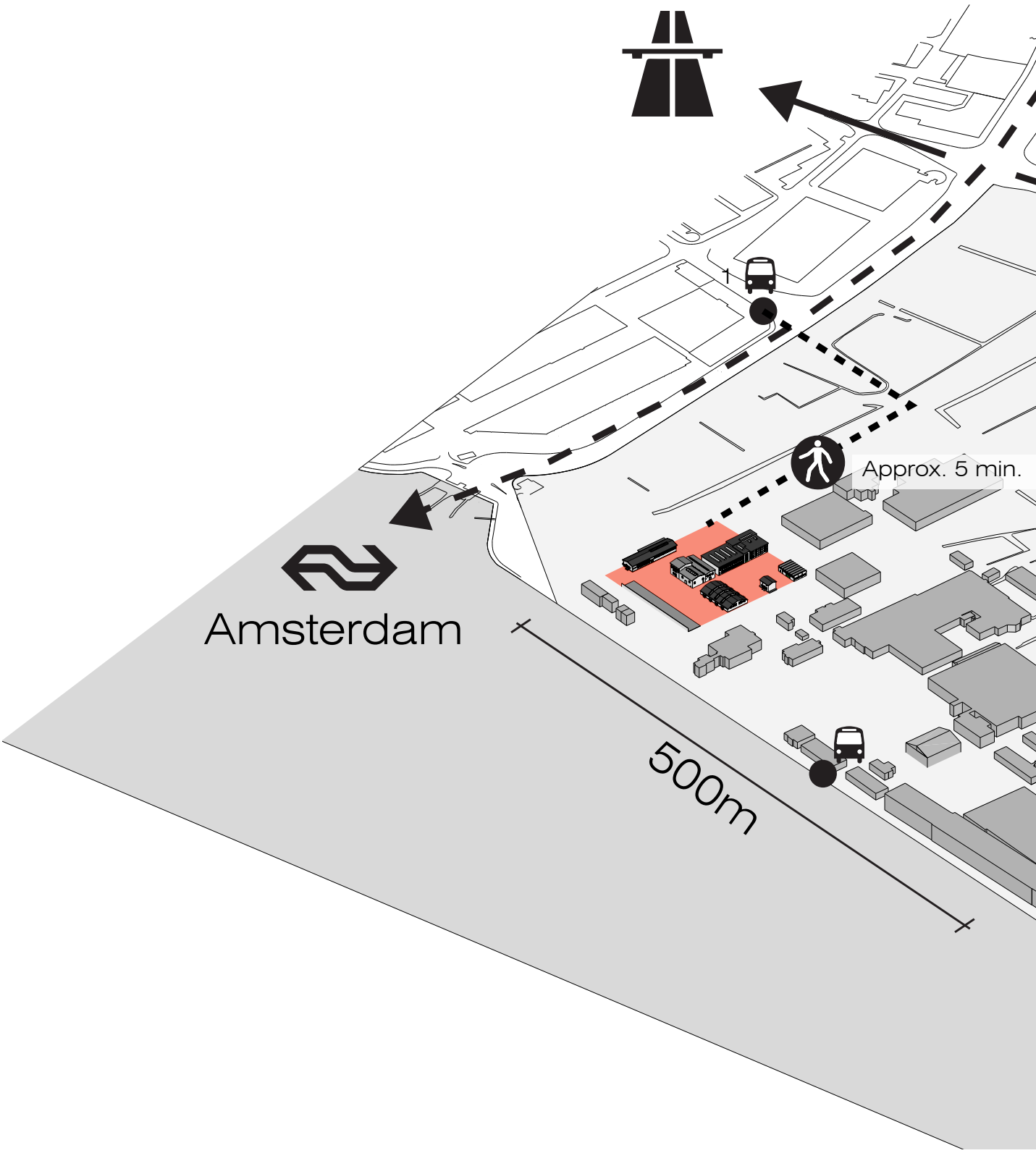
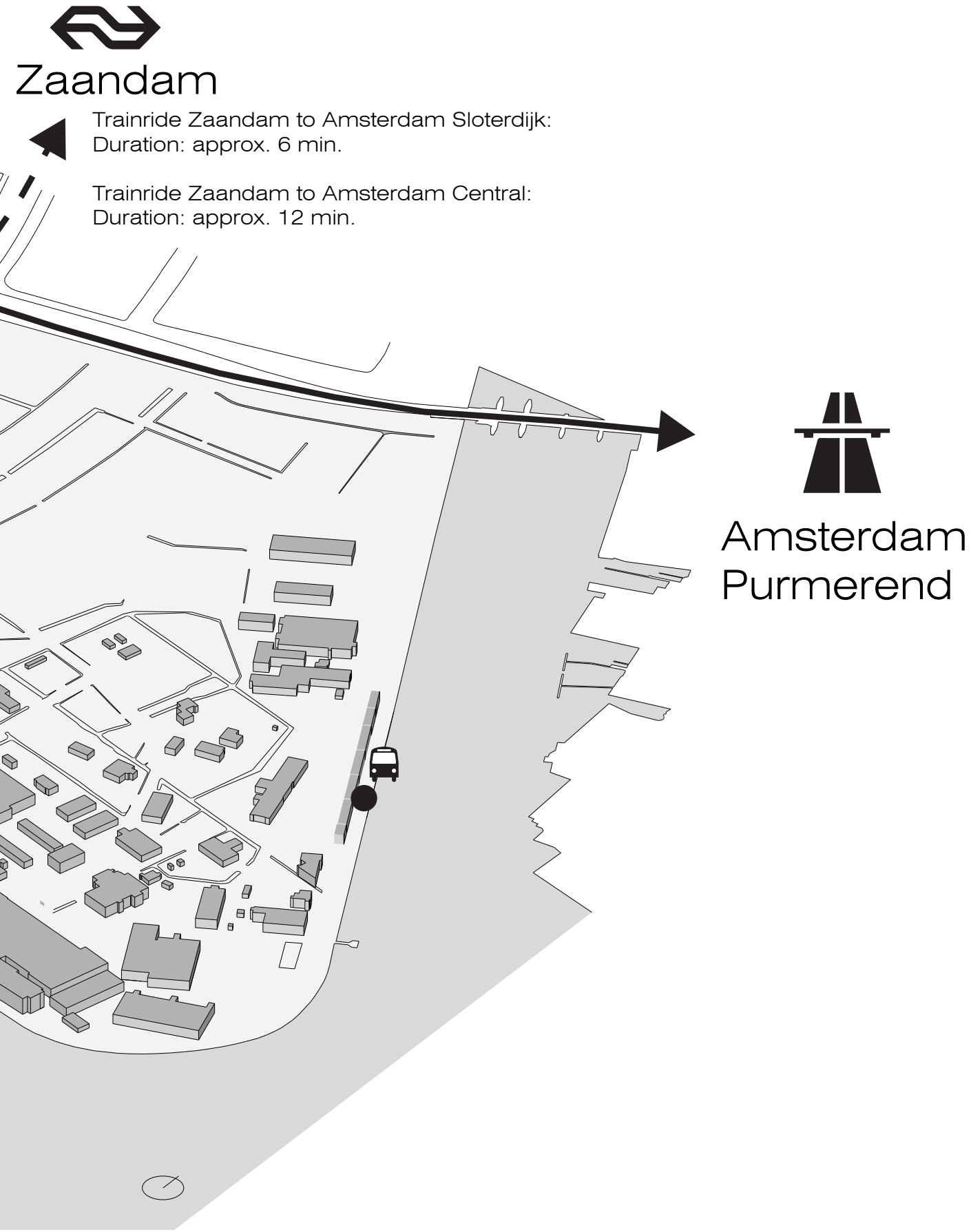


fig. 2.6.01 accessibility of the site by public transport and bike



infrastructure (author's visualization)

2.6 Accessibility

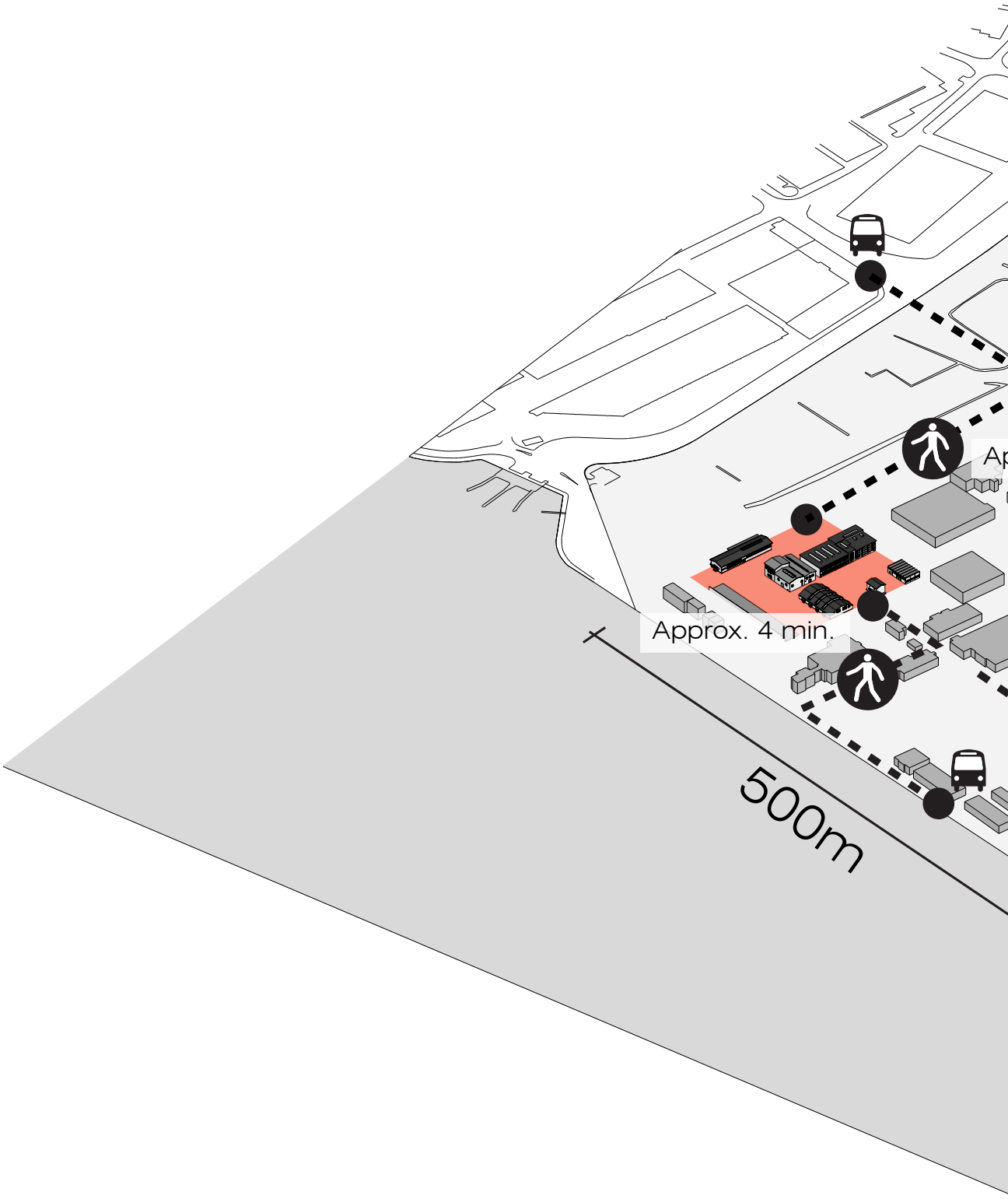
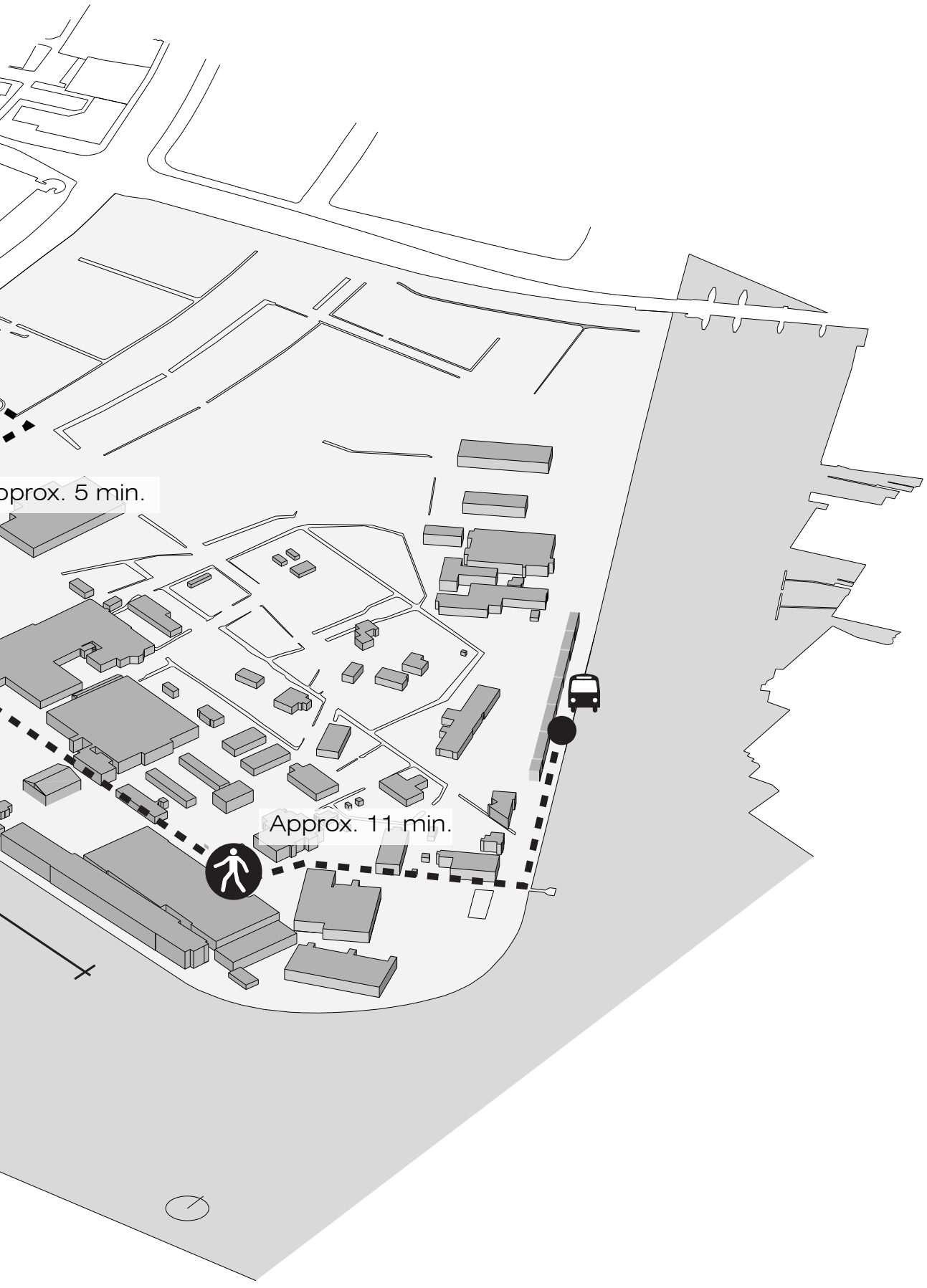


fig. 2.6.02 accessibility of the site by public transport

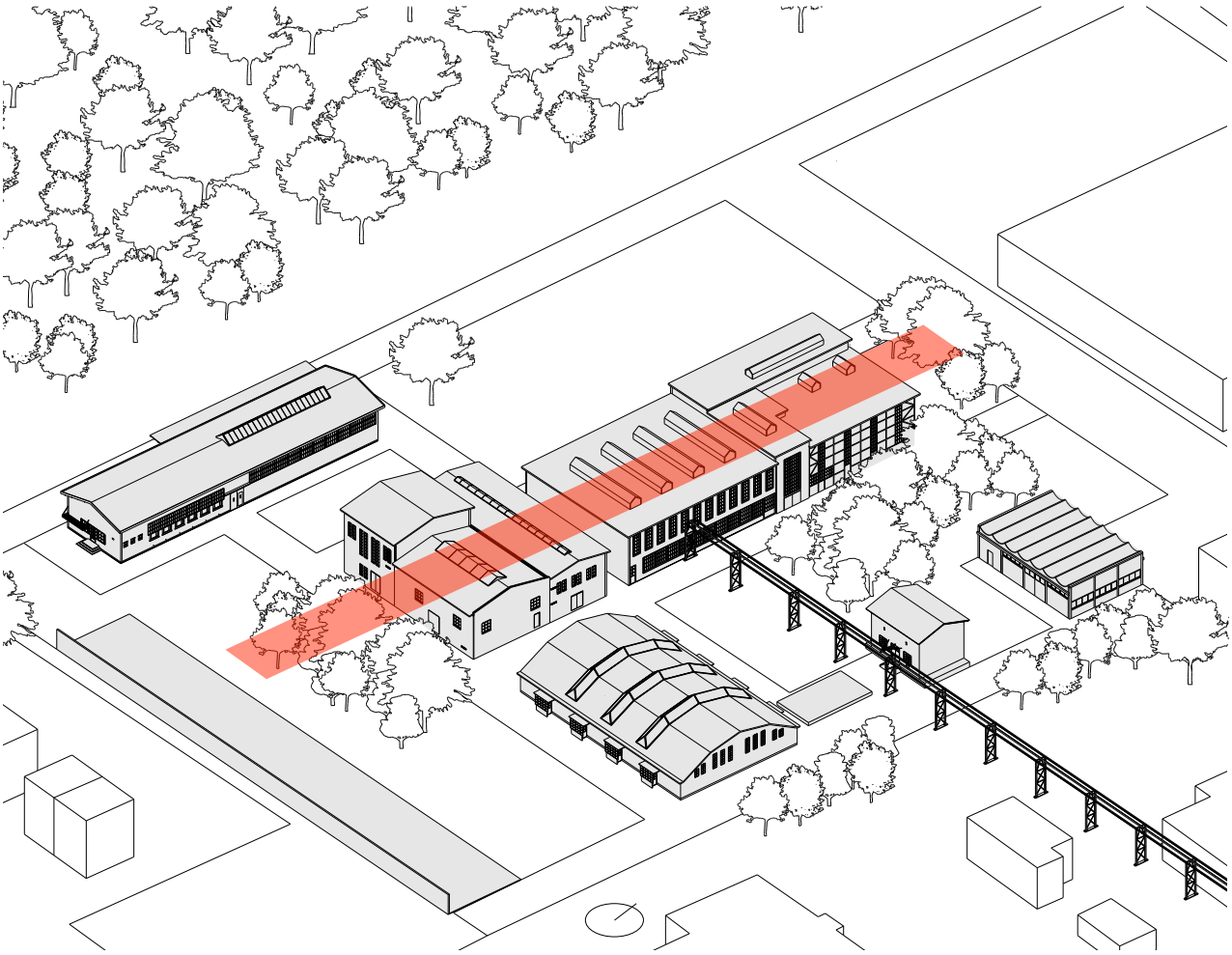

pprox. 5 min.
Approx. 11 min.

2.7 The border

The ensemble's composition can be described as a center of building volumes enhanced by vast amounts of open space. Although it might seem that these open spaces enforce the movement through the area at first, they do not always do so. In some of the open spaces, and especially the one between the Harderij and the former bike storage, trees and bushes have wildly grown due to lack of maintenance during the years.

Together with the Harderij and the Ketelcentrale, this creates a border (see 2.7.03 section II) that consists of the mentioned building volumes and wildly grown greenery. This border splits the area in two, these two parts are now only connected with a number of pathways instead of an open field.

fig. 2.7.01 the border that splits Campus South



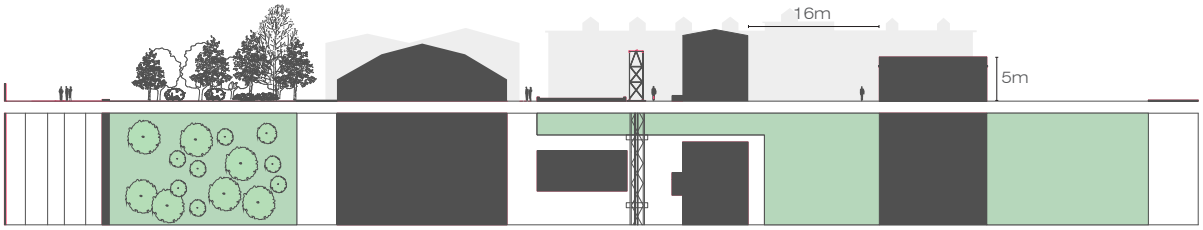


fig. 2.7.02 section I
showing some of the open spaces between the buildings, the field on the left side is densely coffered in wildly grown trees and bushes. (not true to scale)

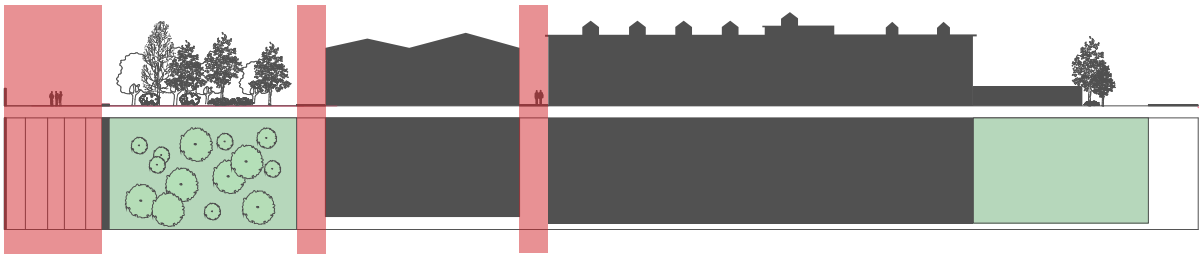
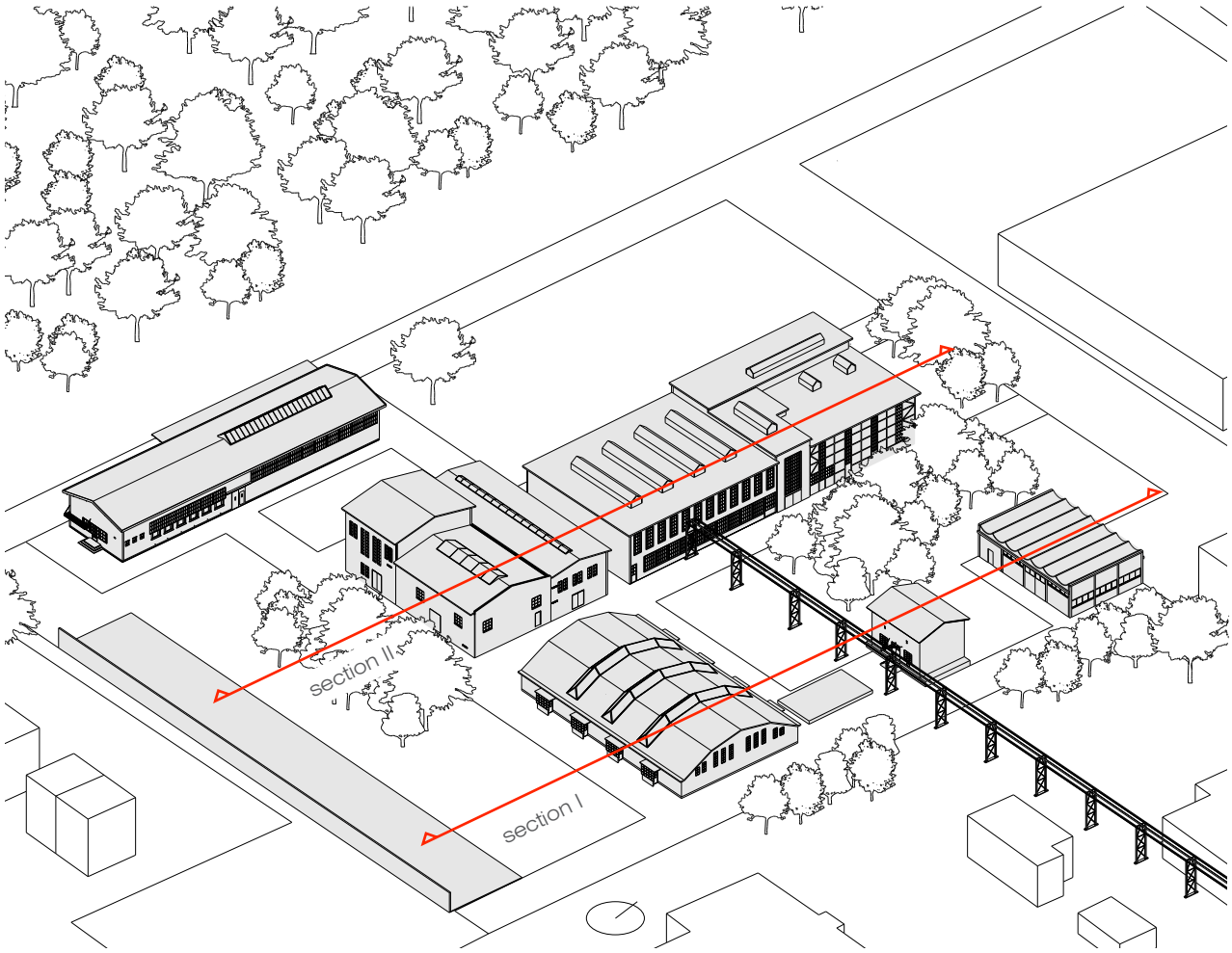


fig. 2.7.03 section II
showing the border that splits the area in half, only a few pathways (marked in red) connect the both sides of Campus South nowadays. (not true to scale)

fig. 2.7.04 the border that splits Campus South



2.8 Building overview

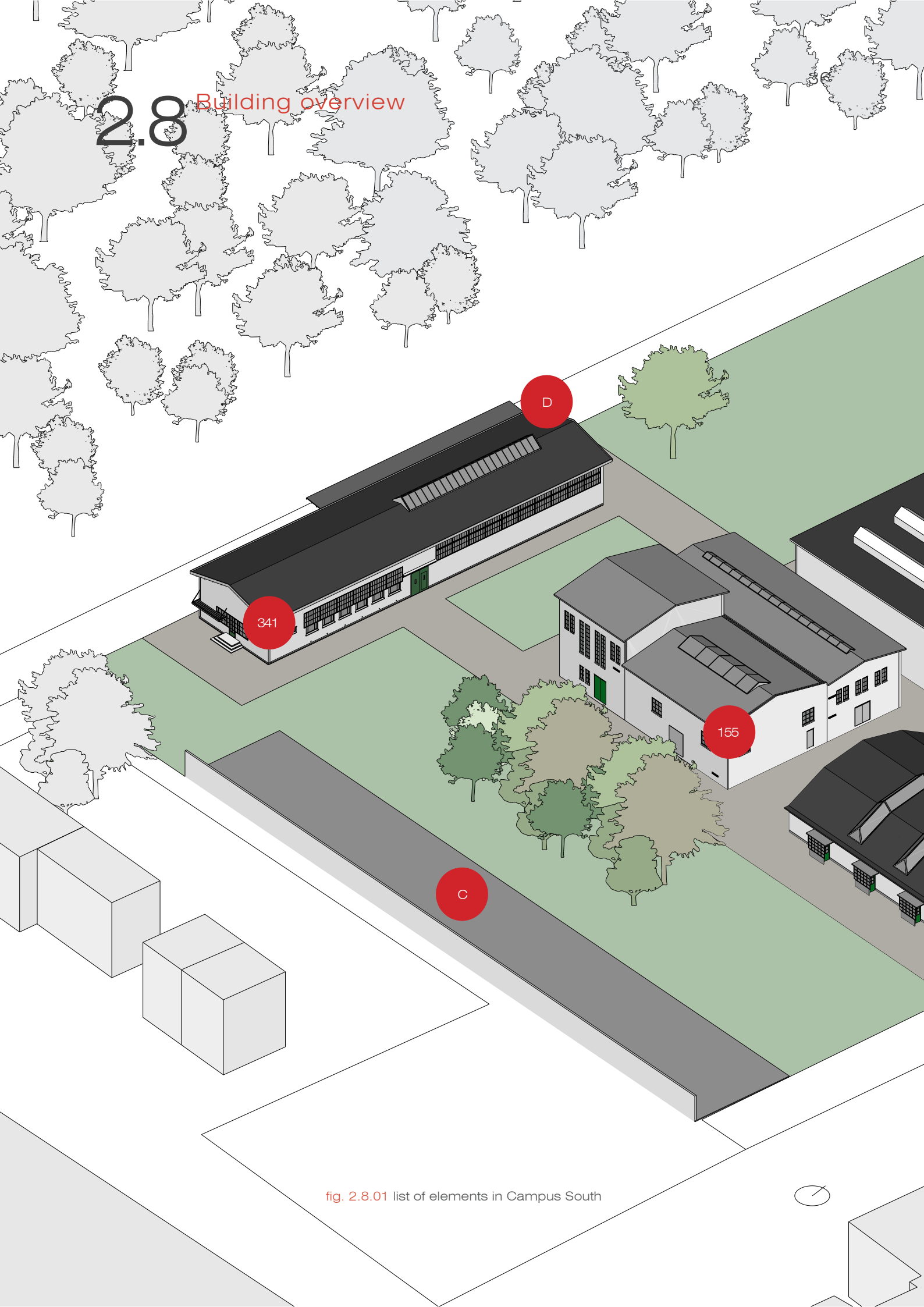
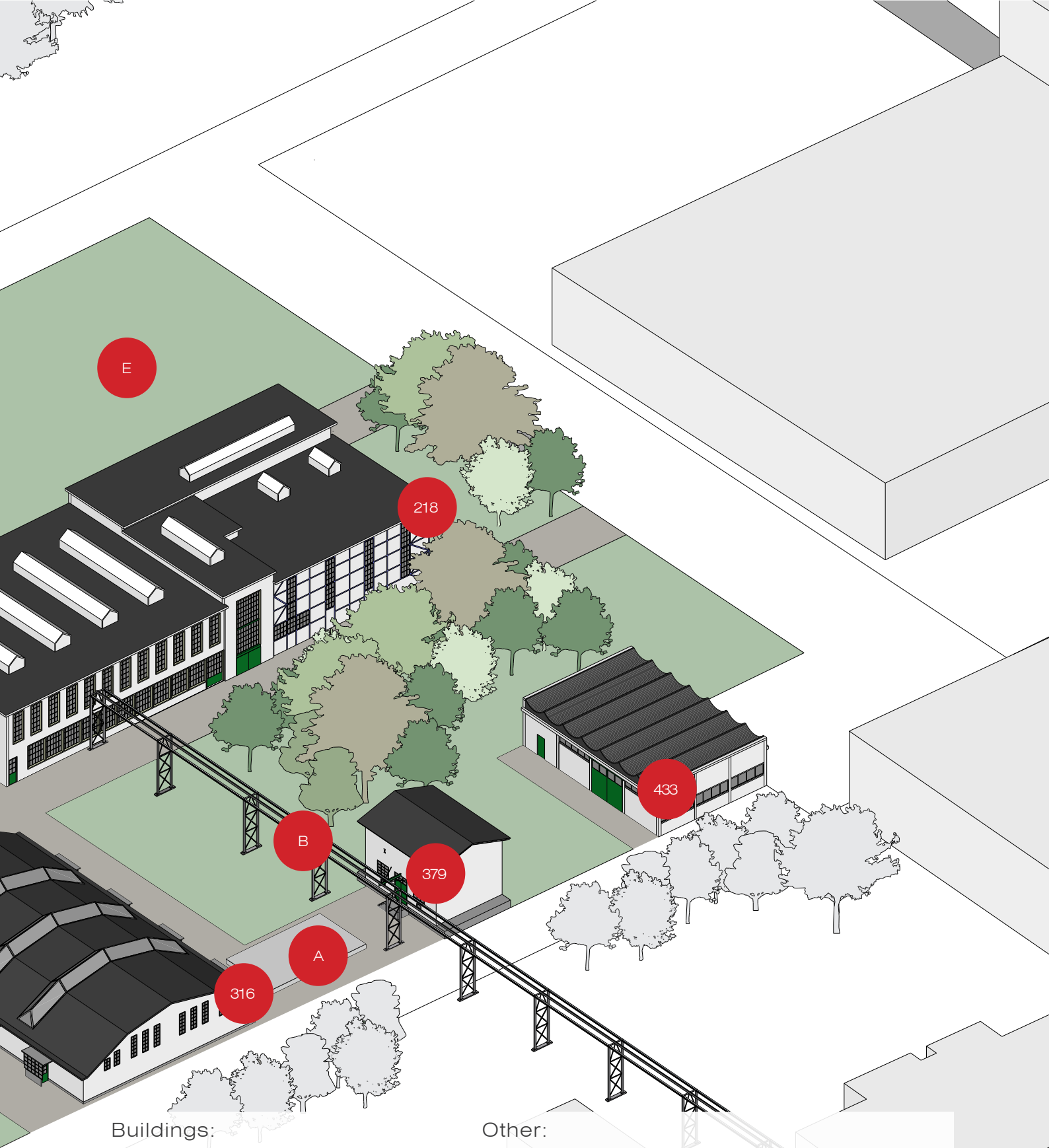


fig. 2.8.01 list of elements in Campus South



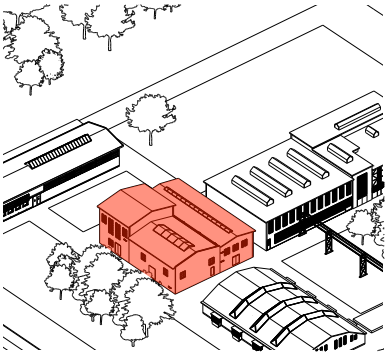
Buildings:

155	Harderij
218	Ketelcentrale
316	Waslokaal
341	Overslagloods
379	Carbidgebouw
433	Lorriegarage

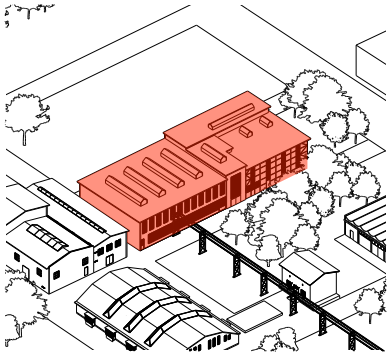
Other:

A	Foundation
B	Steam network with steel frame
C	Bike storage
D	Railway carriage
E	Platform

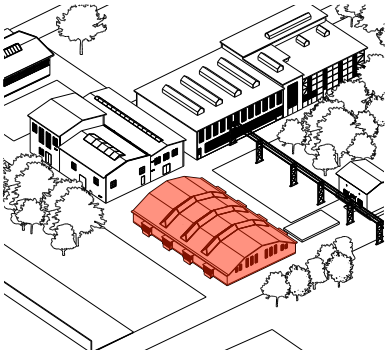
2.9 Building typologies & functions



Harderij
no.: 155



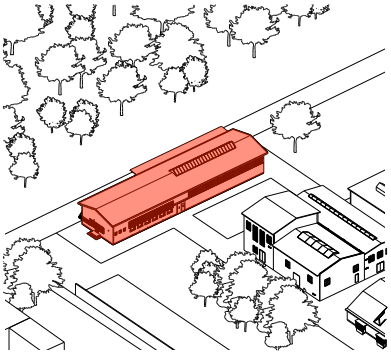
Ketelcentrale
no.: 218



Waslokaal
no.: 316

Third phase

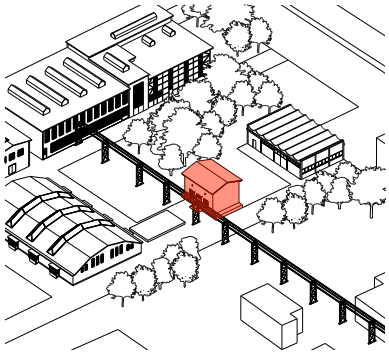
1930	1930	1936
		
		
hardening metals	production of steam	washing and changing facility



Overslagloods
no.: 341

1935

warehouse and station



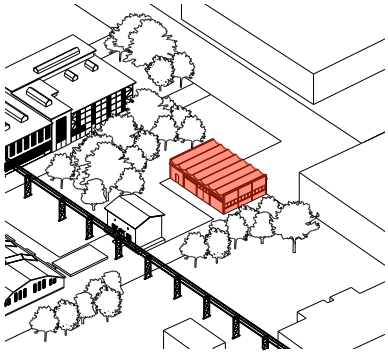
Carbidgebouw
no.: 379

Second phase

1961

CaC_2

production of calcium carbide



Lorriegarage
no.: 433

Fourth phase

1921

repair facility for the ‘lorriewagons’

2.10 The village and future plans

Village like elements

When I first experienced the area, it reminded me of a village. A few elements were of importance for the cause of this village-like experience.

1 Central element

A lot of villages are built around a central element, abuilding of importance with a vertical accent. For me, although in a smaller scale, the Harderij was this central element, with its higher volume giving the vertical accent. Due to its central location, and the way the other buildings seemingly evolved around it, it forms the center quite literally and figuratively.

2 Brick pavement

The brick pavement creates a cozy and village-like atmosphere, which is in contrast to the heavy and sober concrete plates.

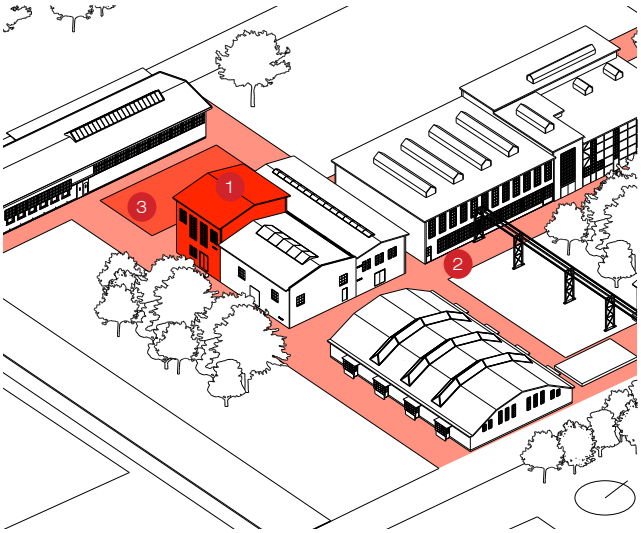


fig. 2.10.01 village-like elements

3 Square(s)

The open fields aid in the creating of a quiet and peaceful atmosphere, which reminds one more of a village-like environment than a former industrial military site. Especially the open space between the Overslagloods and the Harderij reminds of a central square, a place where markets would be organized.

4 Mix of typologies

The different building typologies give Campus South a dynamic village-like feel, wherein a village there would be different functions and typologies as well. Buildings like the Waslokaal and the Overslagloods are designed in order to host a specific function, these buildings therefore are like a ‘tailor-made suit’. Buildings like the Ketelcentrale however consist of vast amounts of open space and are based on a more ‘loose fit’ approach. (see Chapter 3 Buildings & Elements)

fig. 2.10.02 building forms in Campus South

Surroundings - elements

Campus South is located in the most southwestern corner of the Hembrug terrain but still finds itself enclosed by elements. On the west side, the row of trees serves as a border between the provincial road s152 and the Campus South area. In the south, a row of houses blocks the direct view to the water. And also on the northern and eastern sides buildings embrace the ensemble to a large extent.

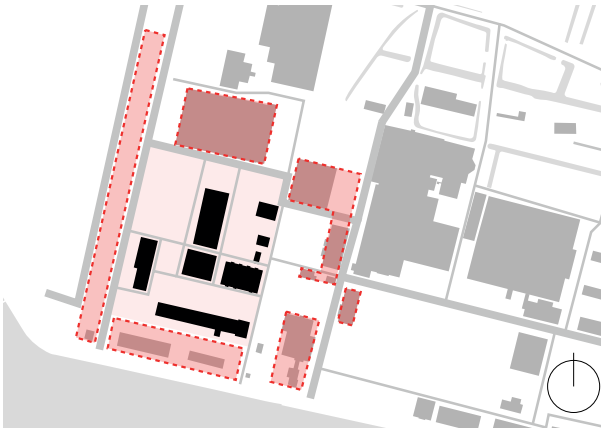


fig. 2.10.03 the surrounding elements embrace Campus South

Surroundings - open spaces

Besides this border of buildings, the vast amounts of open spaces and greenery are located near to Campus South. These spaces provide a transition of the denser eastern part of the Hembrug terrain to the more open composition of Campus South.

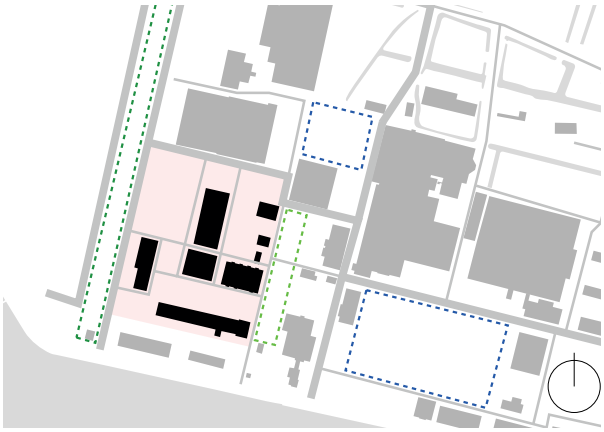


fig. 2.10.04 the open spaces provide a transition of density

Palmbout

Palmbout has made plans for the future redevelopment of the area. For Campus South they tried to enhance and enforce the current open fields in the area, creating communal squares. (via Palmbout)

One of the aims for the redevelopment of the area was the preservation of its character, which in the case of Campus South means the preservation of the open fields. But also its mix of typologies and building forms/sizes make the area a dynamic one.

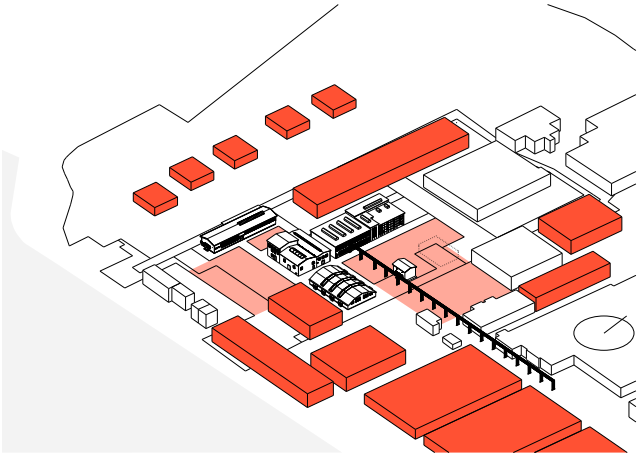


fig. 2.10.05 Palmbout's urban plan defining open areas

Chapter 2 Conclusion

"What are the characteristics of Campus South and how were these shaped over the course of time?"

One of the most important characteristics of the Hembrug area is the long sightlines and axis, and also in the campus south ensemble there are a few to be distinguished:
- The elevated steam network;
- The former railway track;
- The former entrance of the workers.

Other characteristics are:
- The different building typologies;
- The composition of open spaces;
- The brick pavement.

"What role did the area of Campus South play throughout the history of the terrain?"

The role that the area played was mostly that of a distributor. This was at the point when Hembrug experienced an immense growth of density (from 1914). The steam pipe network was used to provide energy and heat to most of Hembrug's factories, and finds its origin in Campus South, and runs parallel to the terrain's major axis (the contemporary Middenweg). The railway track is the oldest axis on the ensemble and was used to bring in raw materials for the entire terrain.

"What elements give Campus South the village-like atmosphere?"

Central element, the Harderij acts as the central element that the village was built around.
Brick pavement gives the ensemble a cozy and more village-like character than the concrete Stelcon plates.
Square(s), the open field act between the Harderij and the Overslagloods reminds of a main village square.
The mix of building typologies gives a dynamic village-like feel

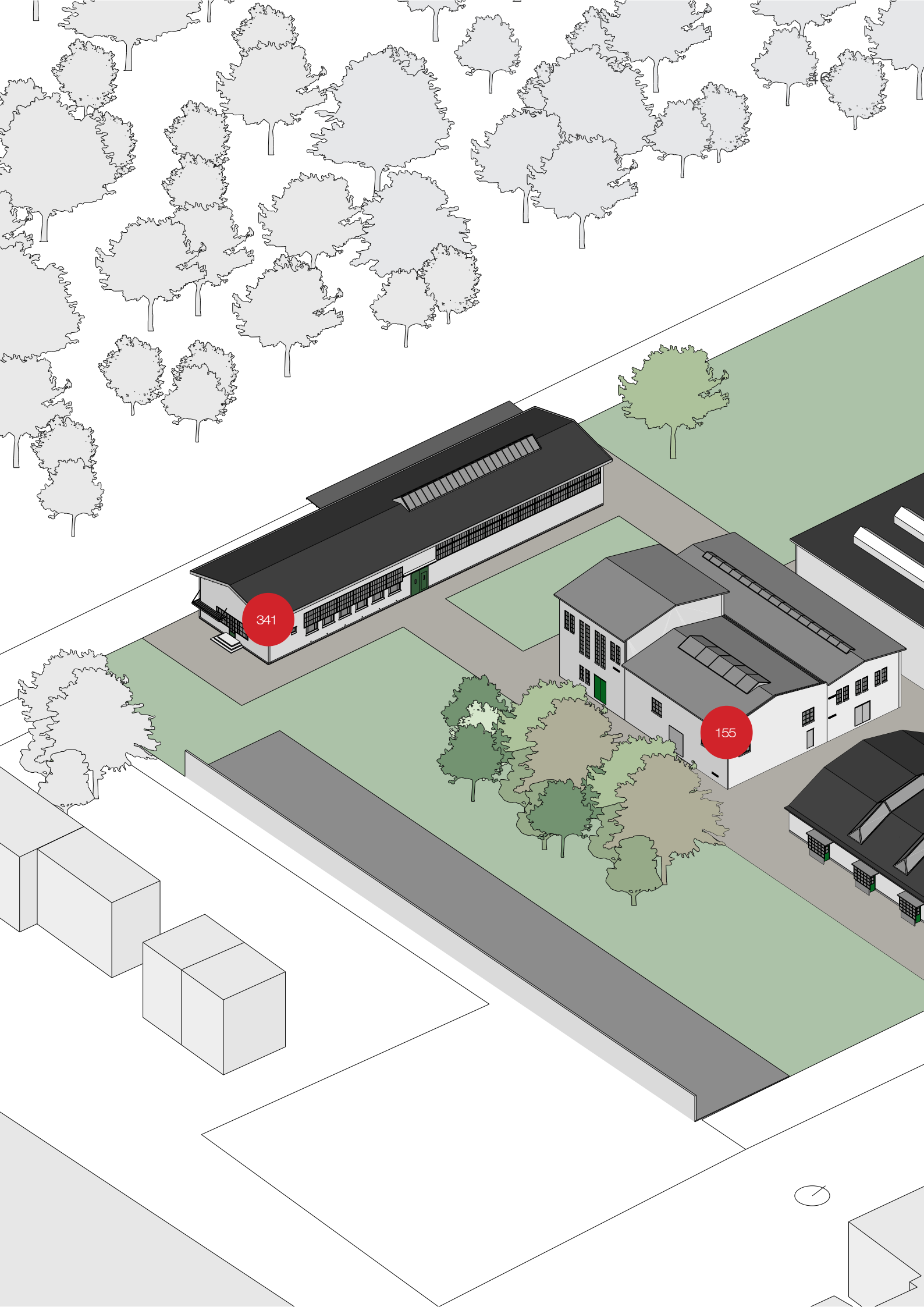
"How can the characteristics of Campus South be integrated into a plan for future redevelopment?"

There are a few more aspects that define the area as it is today, among other things the amount of open space and the rectangular building plots. The vast amount of open space on the Campus South ensemble is a result of the demolition of the majority of buildings that existed on the site, these spaces now serve a communal purpose, and provide a place for people to gather, relax and/or recreate. Firstly, the required amount of new floor space and functions, and where these should be located on the Hembrug site. Second, since the ensemble was way more densely built, one could desire to densify the area again.

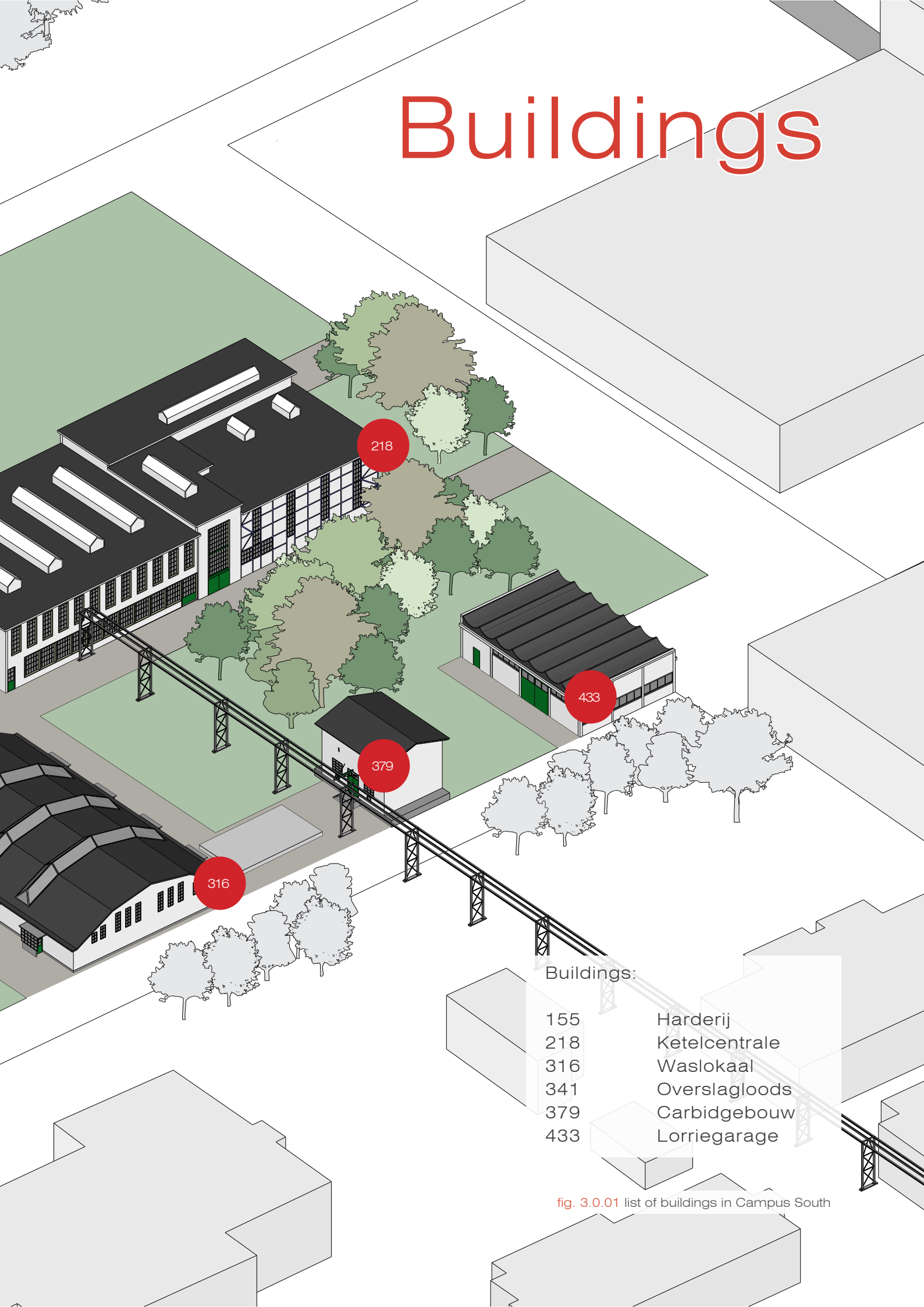
Chapter 3 Buildings & Elements

What are the unifying and deviating characteristics of the different buildings in Campus South?

Are there still traces of history and/or historical use to be found in the buildings or elements at Campus South?


341
155

Buildings

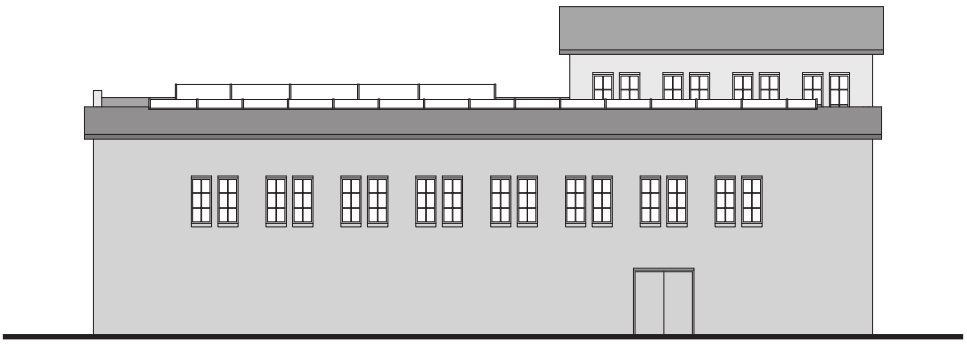


Buildings:

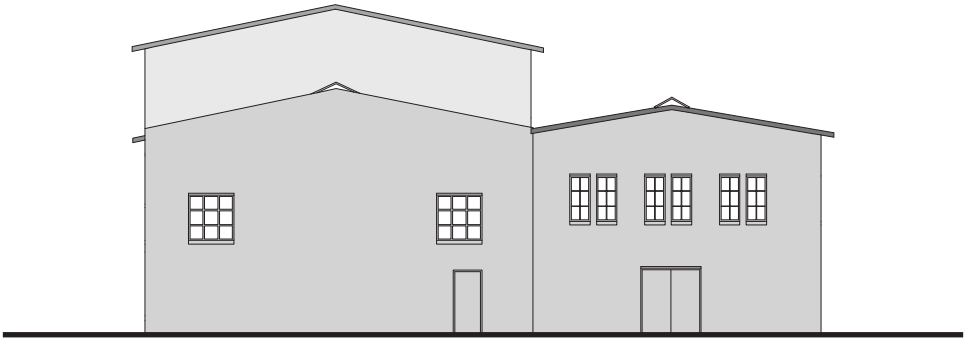
155	Harderij
218	Ketelcentrale
316	Waslokaal
341	Overslagloods
379	Carbidgebouw
433	Lorriegarage

fig. 3.0.01 list of buildings in Campus South

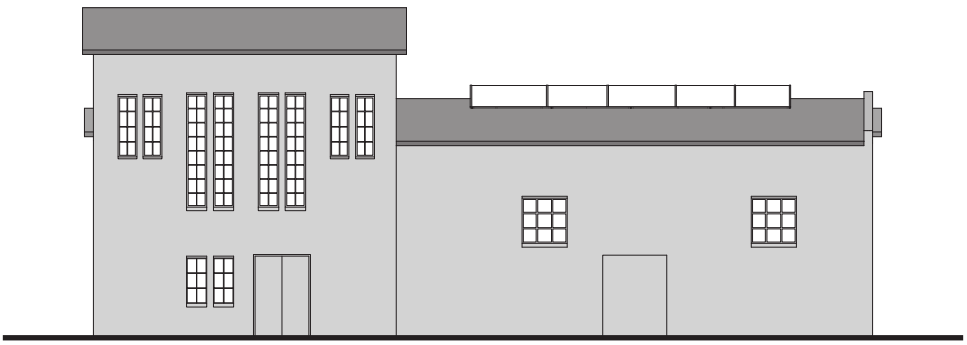
3.1 Harderij (155)



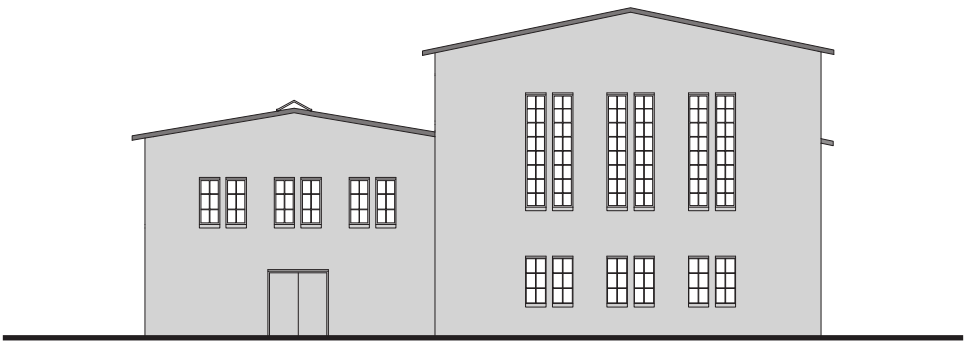
northern facade



eastern facade



southern facade



western facade

fig. 3.1.01 facades of the Harderij (1:250)

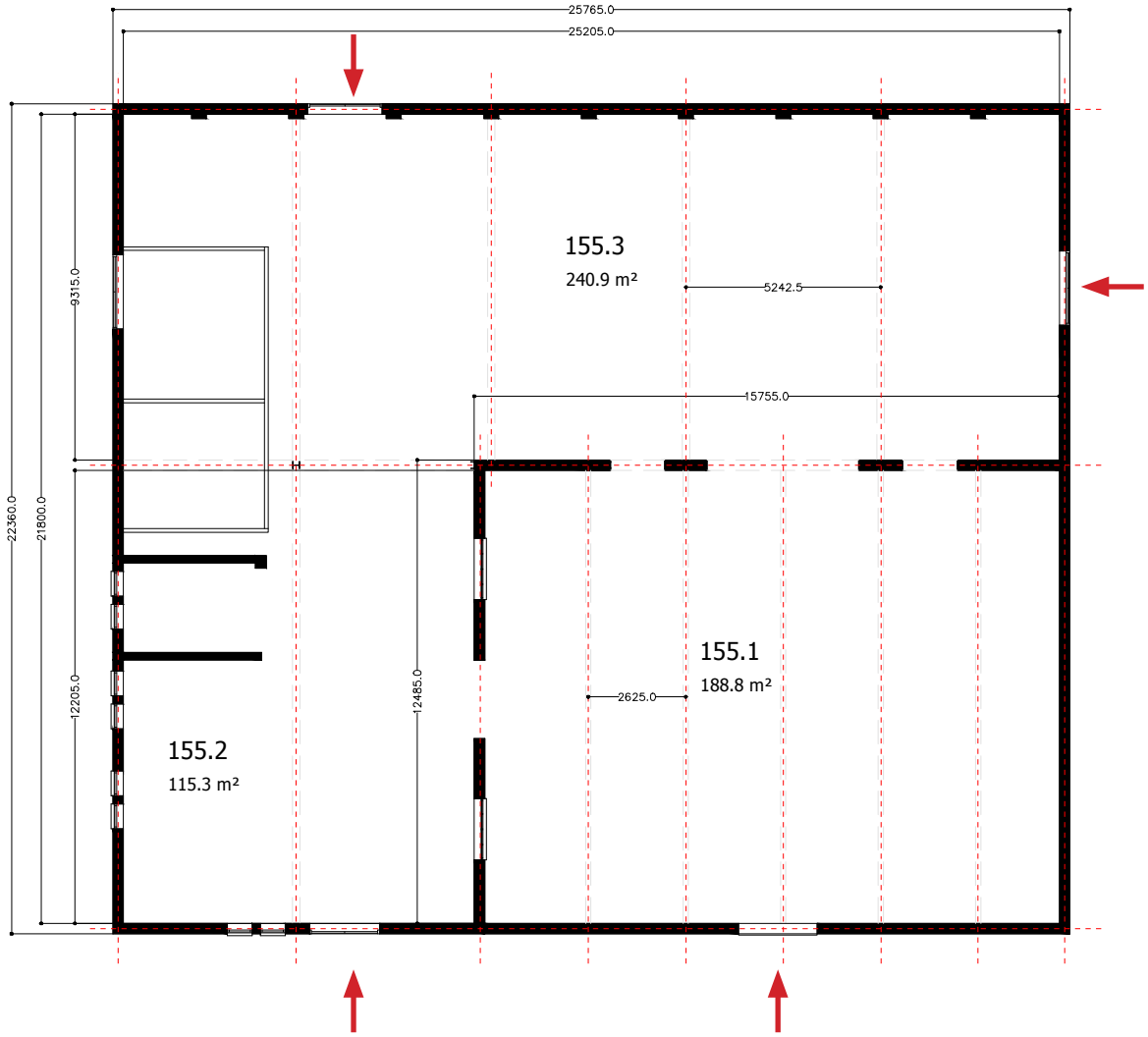


fig. 3.1.02 floorplan of the Harderij (1:200)

Info

Building number:	155
Adress:	Ketelhuis 10
Monument:	No
Monument number:	-
Former function:	Hardening metals
Building period:	1930 / third phase
Total m²	approx. 545

Characteristics

The former metal hardening facility is located right in the center of the Campus South area. The total floorplan of the building measures roughly 23 by 26 meters. The total building volume can be divided into three smaller ones with varying roof heights, with the southeastern part of the building as the oldest. The Harderij is recognizable due to its masonry facade, rectangular window layout, varying roof, and distinguishable building volumes.

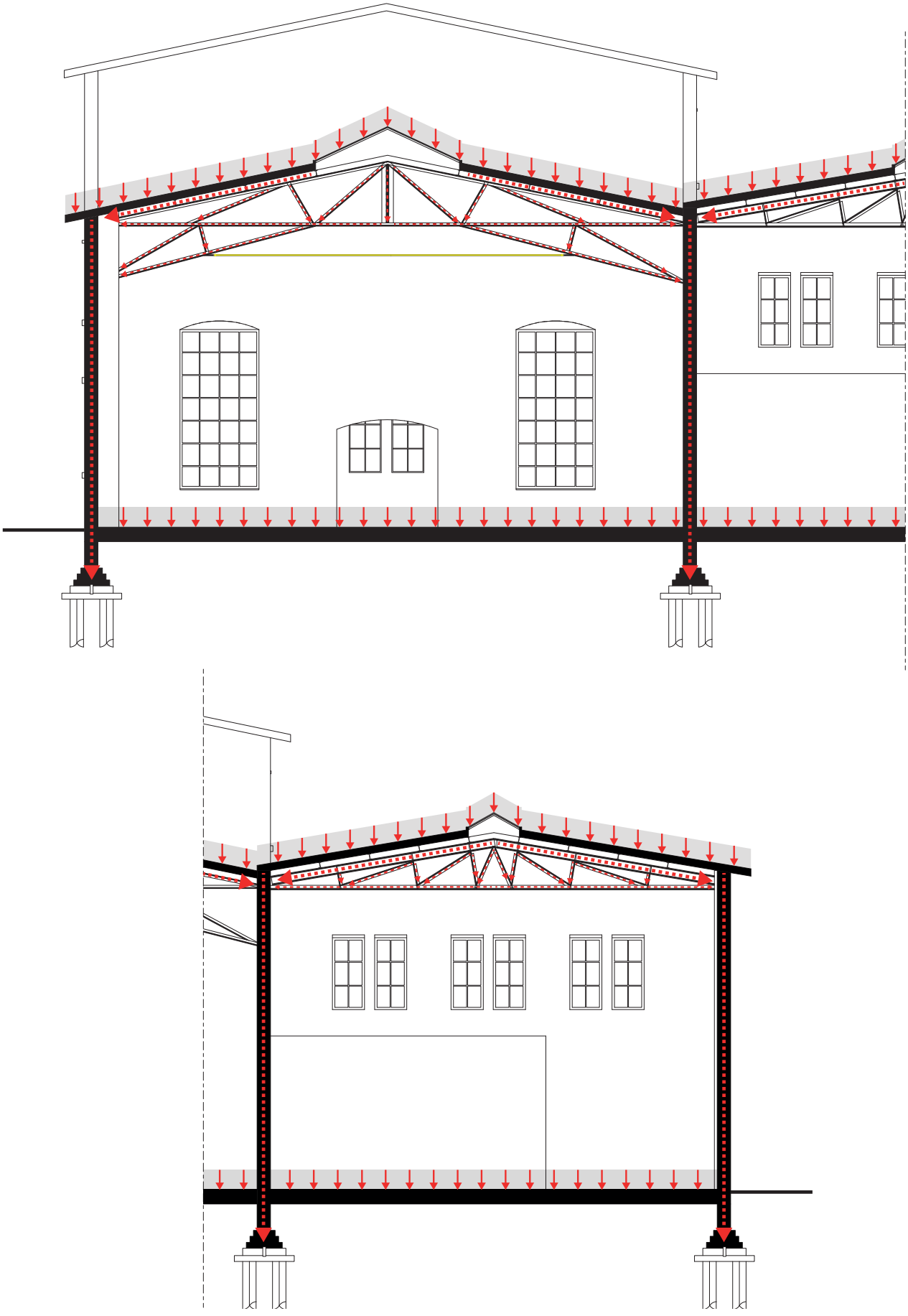


fig. 3.2.01 section A: distribution of forces (not true to scale)

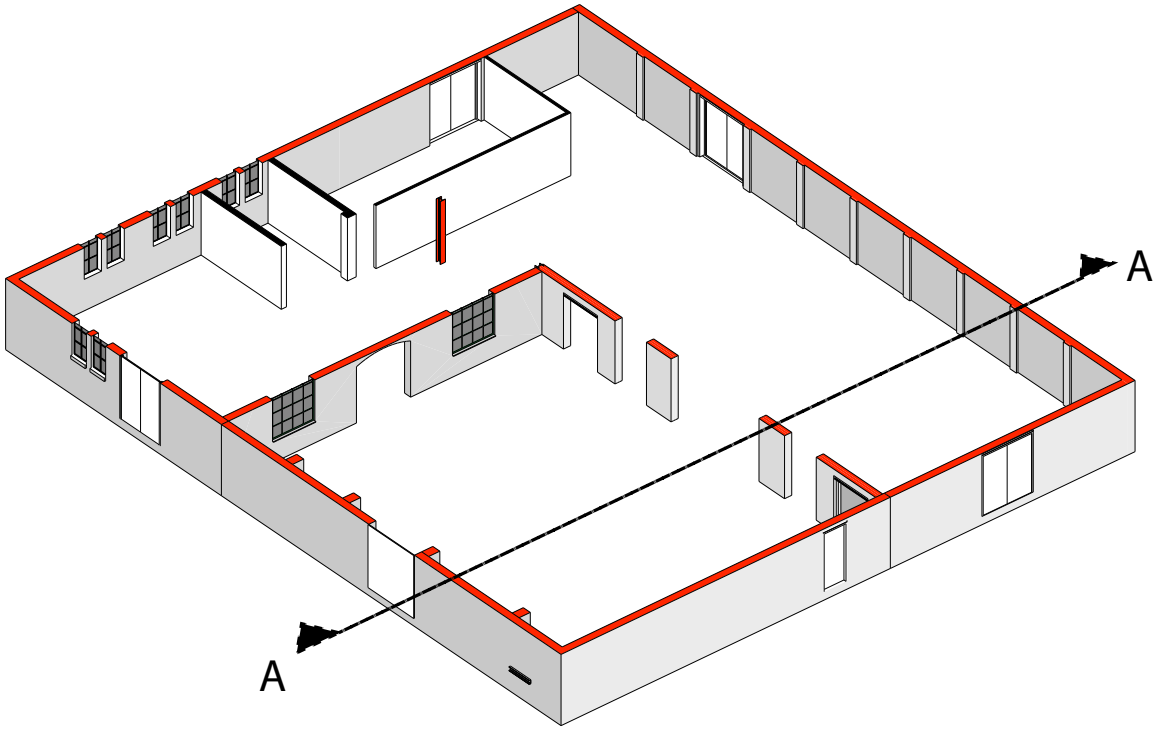
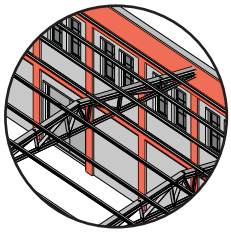


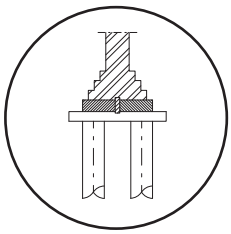
fig. 3.2.02 loadbearing elements in horizontal section



extruded brick grid in facade

Stability

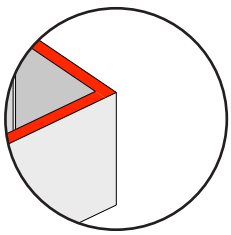
The building consists of three volumes, all with a loadbearing masonry facade with a total width of 280mm. The roof is supported by a grid of steel frames.



'Amsterdamse paalfundering'

Foundation

The foundation is expected to be an 'Amsterdamse paalfundering', which was commonly used in that time and area. This assumption is based on references of factory buildings throughout the area of Hembrug and Zaanstad, for the required drawings of the Harderij's foundation are not yet acquired.



loadbearing facade

Primary construction

Brick loadbearing facade, built up in the following way:
- 100mm brick (Waalformaat)
- 80mm cavity
- 100mm brick (Waalformaat)

3.2 Harderij Construction

Roof section 1 building 155

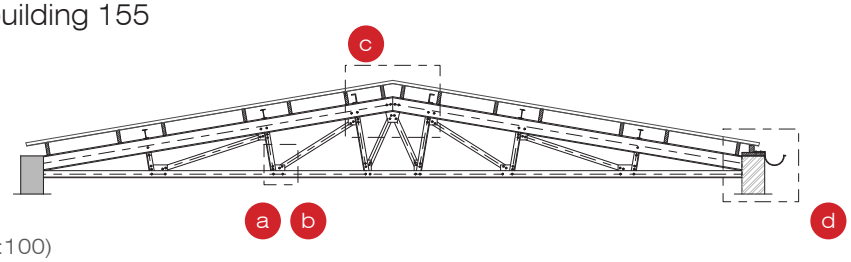


fig. 3.2.03 roof section (1:100)

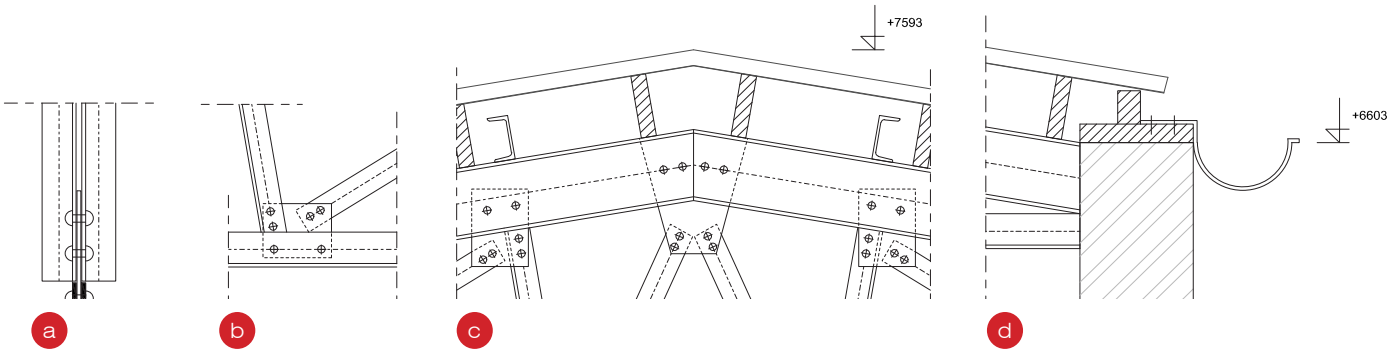
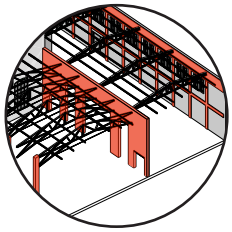


fig. 3.2.04 details of the roof construction (1:20)



steel roof construction

fig. 3.2.05 steel roof construction and the brick supports that stick out of the surface of the wall

Roof

The type of truss in building 155 can be identified as a “fink truss” (v-spant in Dutch). The first thing that catches the eye is the use of two mirrored L-shaped profiles instead of one T-, IPE-, or other profile. These two L-shaped profiles are joined together with a “button head” rivet, these rivets were used all around the steel frame in order to connect the different profiles and elements together.

Where nowadays the entire construction of the building would be executed in steel, the roof construction of these former factories is supported by a brick wall. The roof is a pitched type.

Other elements

Finally, there are still traces of a crane-system to be recognized, supporting elements that stick out of the concrete wall remained and give a little more insight in how the space was used back in the days.
Finalizing, elements like rivets, the steel profiles used for the roof, the brick bonding and even the concrete walls are all traces of former use and activity in and around this building. These elements need to be treated with care, in order to keep the character of the building alive. (see Chapter 7 Appendix for an example of the crane system in a technical drawing)

fig. 3.2.06 crane system in place

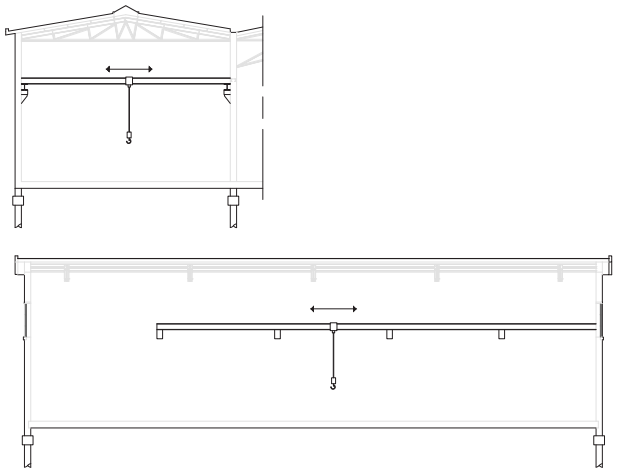


fig. 3.2.07 the crane system working in both directions (not true to scale)

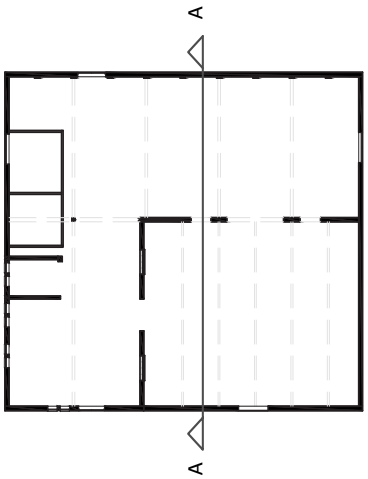


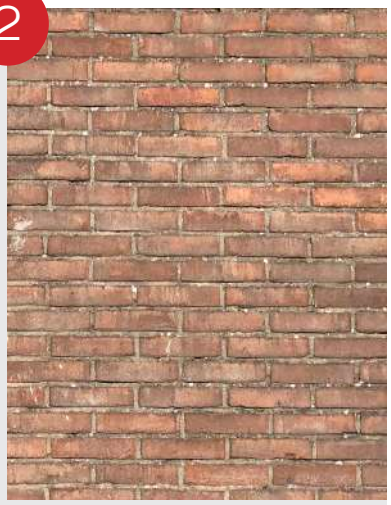
fig. 3.2.08 floorplan with section A (1:500)

3.3 Harderij Materials

1

brick

2



brick

3

window(frames)

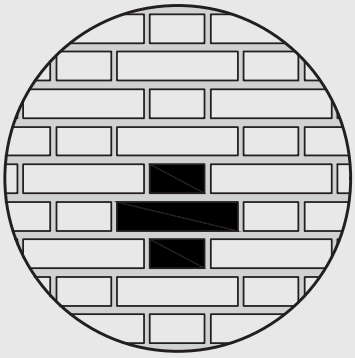


fig. 3.3.01

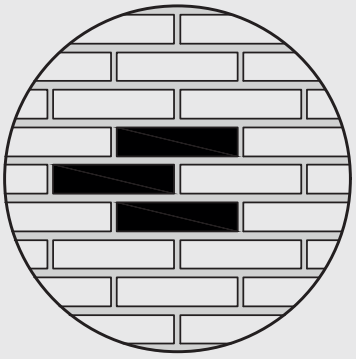


fig. 3.3.02

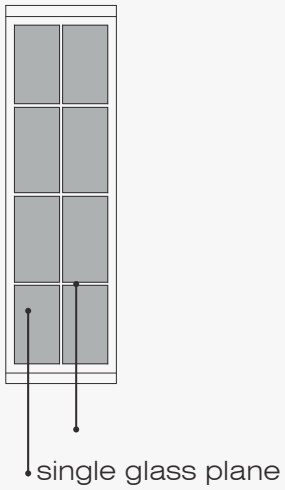


fig. 3.3.03

Brick information:
- ‘Waalmaat’ sized brick (210.100.50mm)
- 1. Flemish bonding
  2. Stretcher bonding
- ‘Stootvoeg’ (10mm)*
- ‘Lintvoeg’ (15mm)*

* The average width, deviations in the width of the jointing can occur.
The ‘lagenmaat’ and ‘koppenmaat’ are still unknown, but will be measured in the future.

fig. 3.3.04 holes in the facade filled up with other color to accentuate were the wall was penetrated by elements

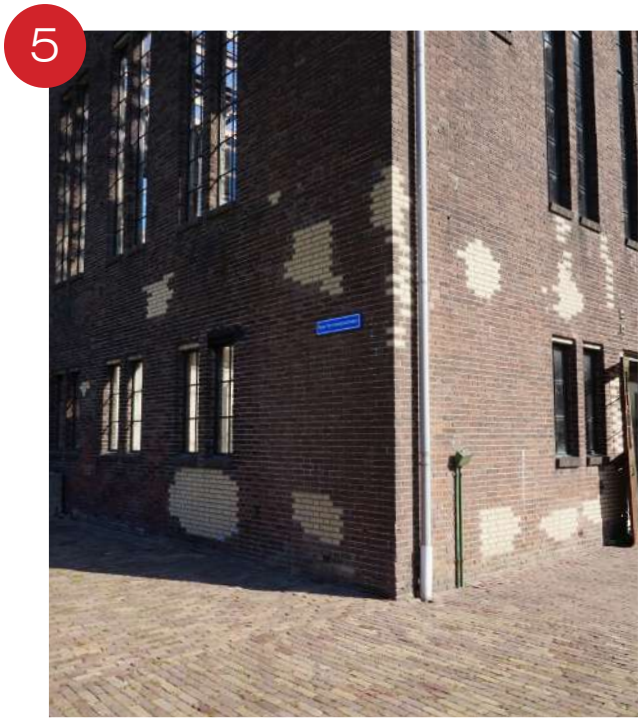


fig. 3.3.05 holes in the facade filled up with other color

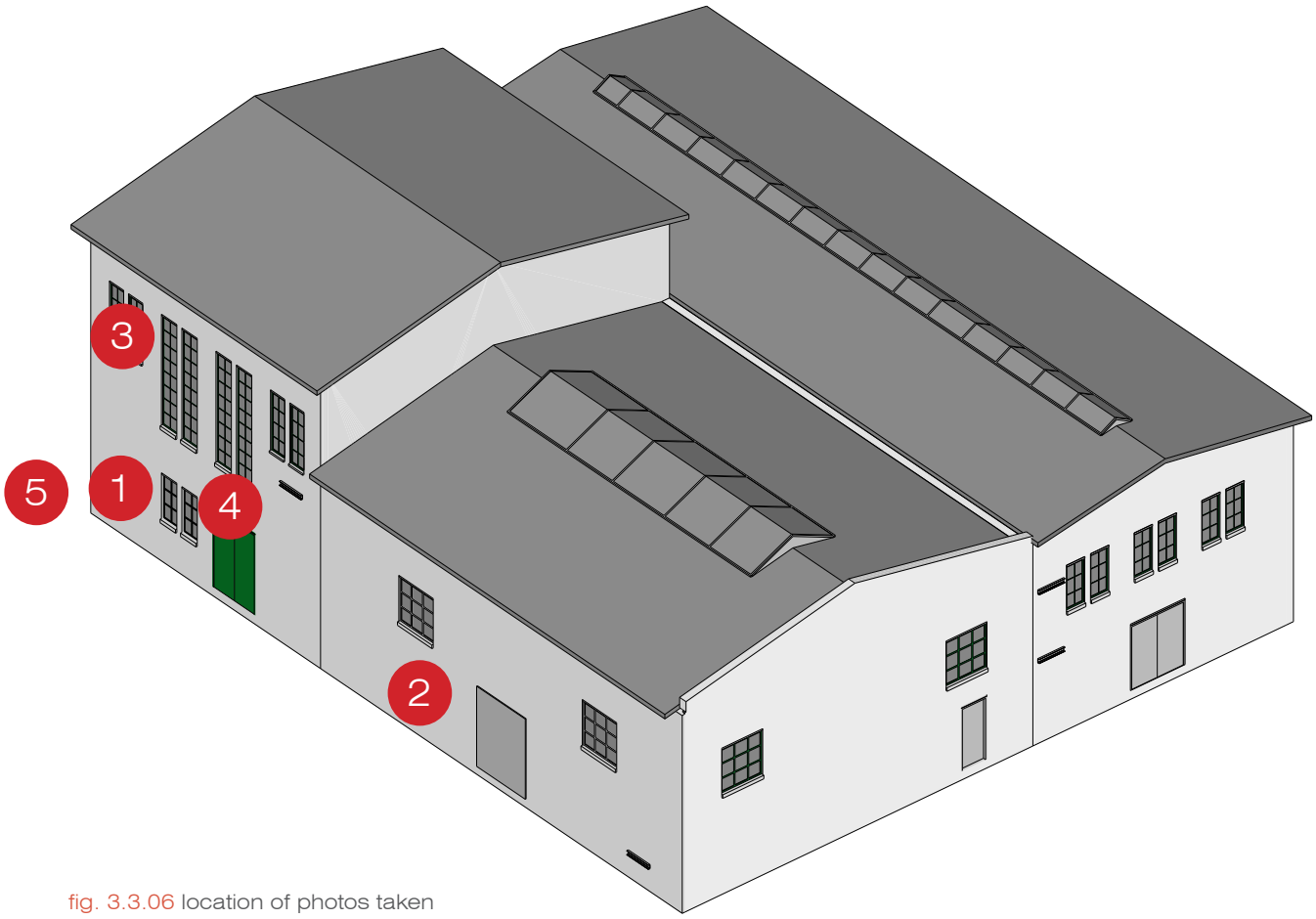


fig. 3.3.06 location of photos taken

3.4 Harderij Composition

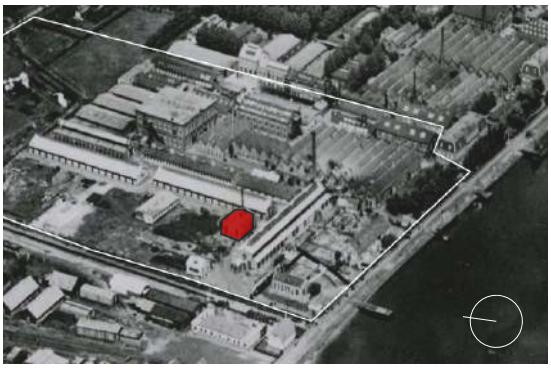


fig. 3.4.01 first building mass of the Harderij (via Beeldbank gemeente archief Zaanstad)

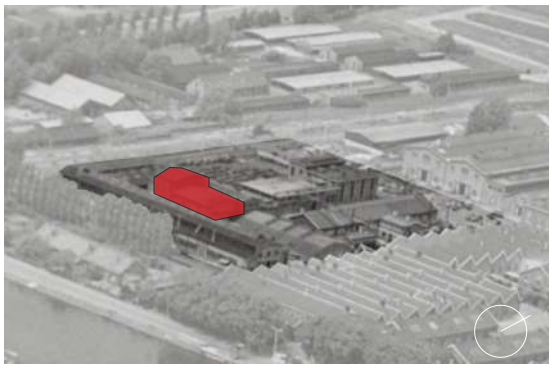


fig. 3.4.02 second building mass of the Harderij (via Beeldbank gemeente archief Zaanstad)

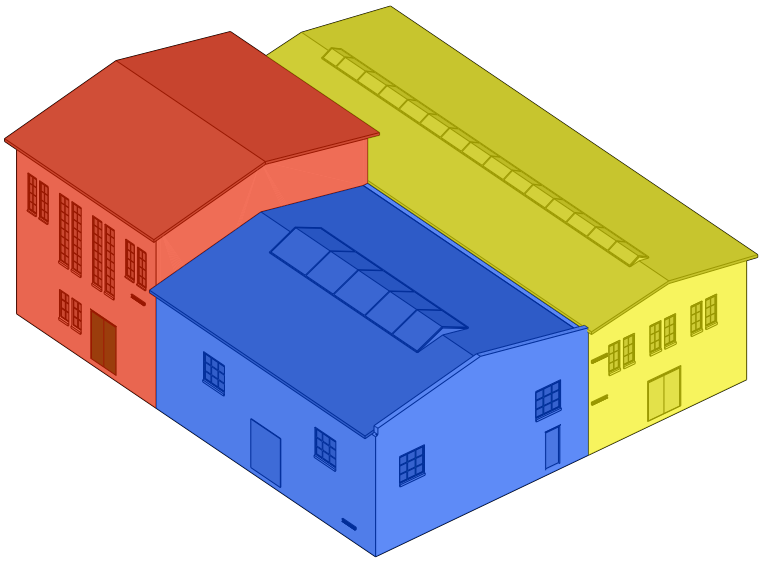


fig. 3.4.03 different building volumes of the Harderij

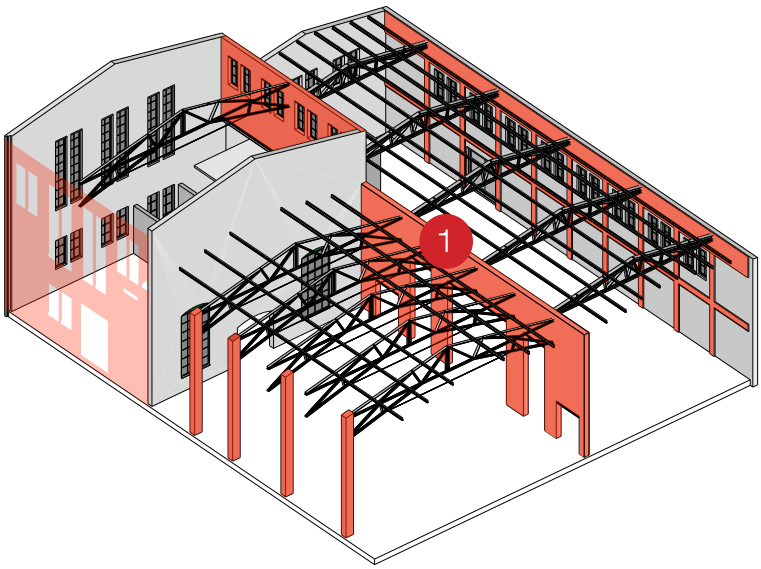


fig. 3.4.04 loadbearing and connecting components of the Harderij

The Harderij has been expanded twice, the order of these expansions is still recognizable today. The main facade of the firstly-built volume is still present inside the building (see fig 3.4.06 & 3.4.07). Strangely enough, the facade of this building volume is executed with a newer masonry bonding (the stretcher bond), which is probably evidence of replacement. This is because in the former main facade a Flemish bonding is still visible.

All three roofs of the different building volumes are supported by steel trusses. These trusses are then supported by the loadbearing facades and the loadbearing wall in the center of the building (marked with 1). This wall connects the roof constructions of the separate volumes.

fig. 3.4.05 different bonding, Flemish (left) and Stretcher (right)

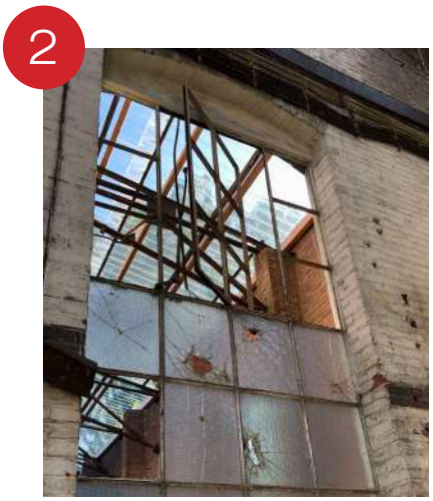


fig. 3.4.06 operable window frames inside the harderij, the old main facade

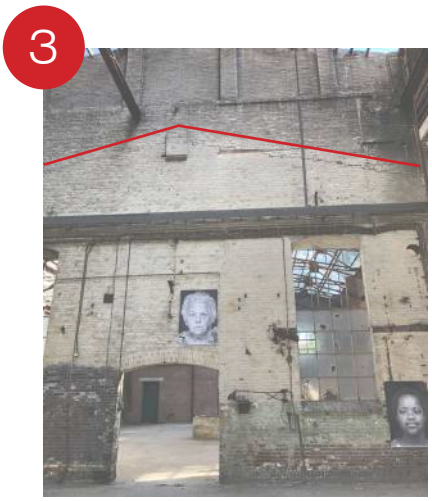


fig. 3.4.07 former main facade, the white paint from the old facade is still visible and reveals the old gamble roof shape (marked in red). It is therefore an evidence the higher volume was added later

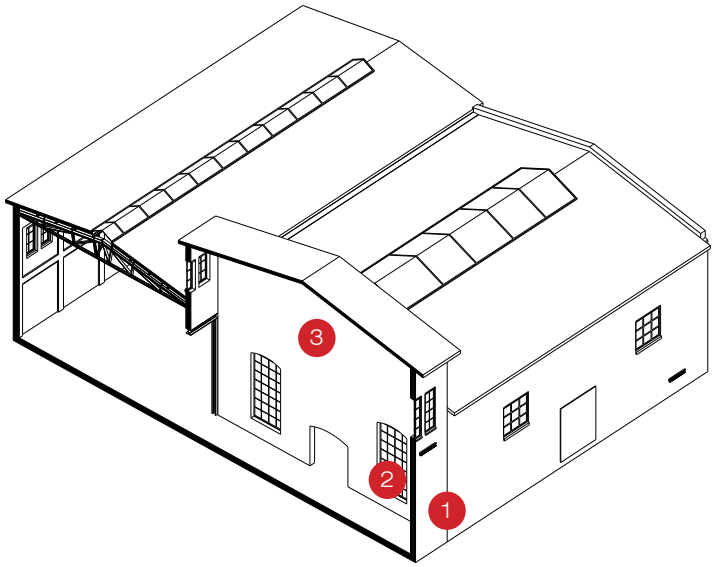


fig. 3.4.08 different building volumes of the Harderij

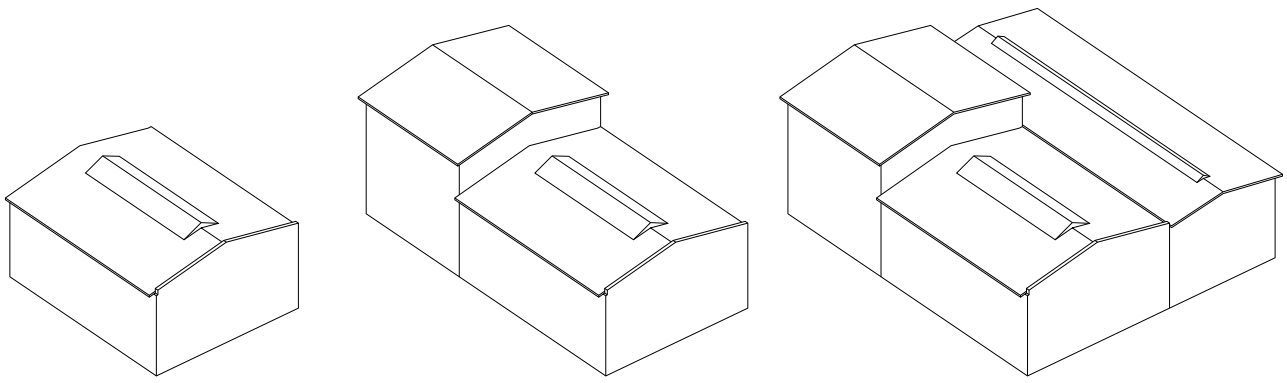
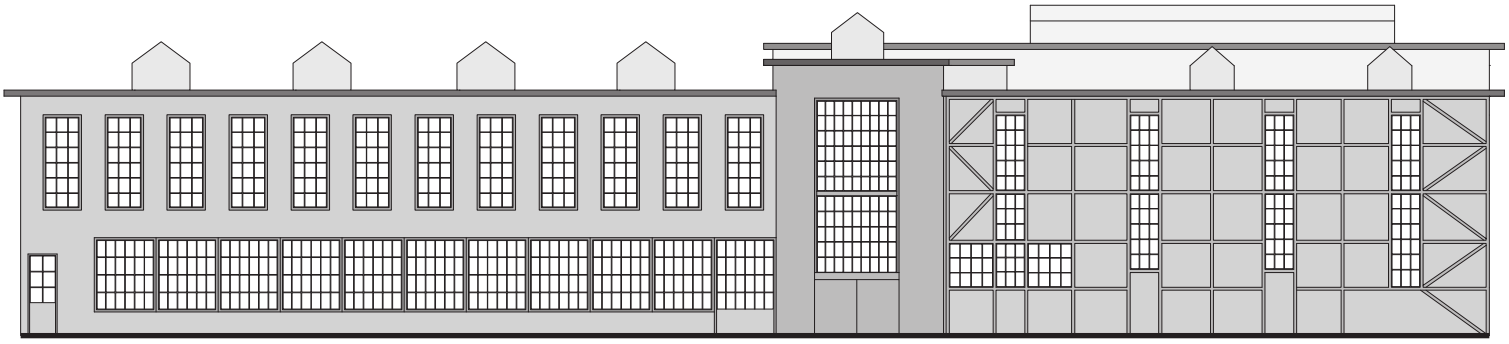


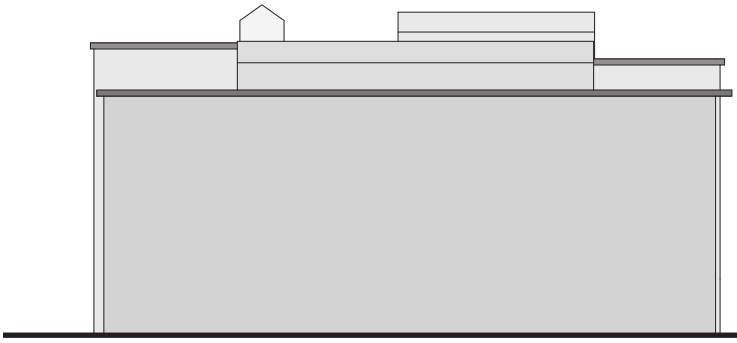
fig. 3.4.09 cronological order of building volumes

3.5 Ketelcentrale (218)

northern facade



eastern facade



southern facade

western facade

fig. 3.5.01 facades of the Ketelcentrale (1:250)

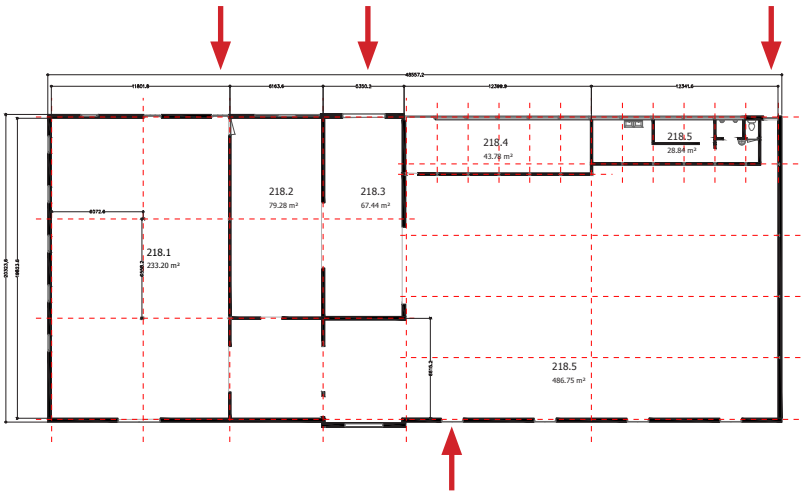


fig. 3.5.02 floorplan of the Ketelcentrale (1:500)

Info

Building number:	218
Adress:	Hemkade 24A
Monument:	Nationally listed
Monument number:	530306
Former function:	Steam plant
Building period:	1930 / third phase
Total m²	approx. 986

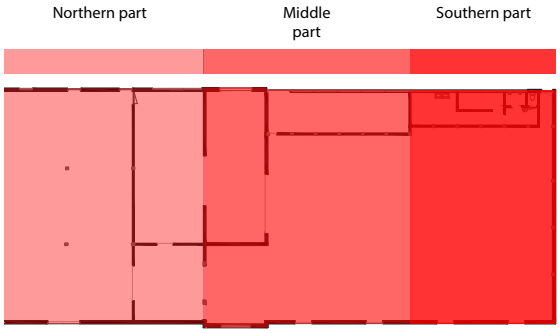


fig. 3.5.03 different parts of the Ketelcentrale

Building characteristics

The former steam production plant could in the past be seen as the beating heart of the Hembrug area. It is one of the bigger buildings on the Campus south ensemble with a rectangular floorplan measuring 45 x 20 meters. The total building volume can be divided into three smaller ones with varying roof heights, with the most northern part of the building as the oldest. The Ketelcentrale is recognizable due to the blue trusses and the masonry facades. In the northern and eastern facade, one can find big areas of glass, which were required to lighten up the vast interior space.

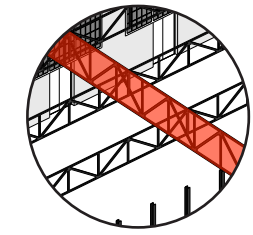
The middle part of the building volume was added on in a later stadium (yet to be identified in which period), yet it has the same type of steel construction and window frames as the south side. The most southern part was added on around 1950-1956 as an extension. All of the volumes are executed with a steel frame construction, thus the brickwork in the facade is not load-bearing.

Appreciation

The argumentation for its listed status includes that the building serves as an example of an energy plant on a military-industrial site, and also that it is a historical-functional epicenter of the Hembrug area. (via rijksmonumenten.nl)

3.6 Ketelcentrale Construction

fig. 3.6.01 section A: distribution of forces (1:200)



perpendicular steel truss

Stability

The building consists of three volumes, all with a load-bearing steel frame, the facade is not load-bearing. The roof is also supported by a grid of steel trusses, the roof construction above the entresol also stabilized by bracings.

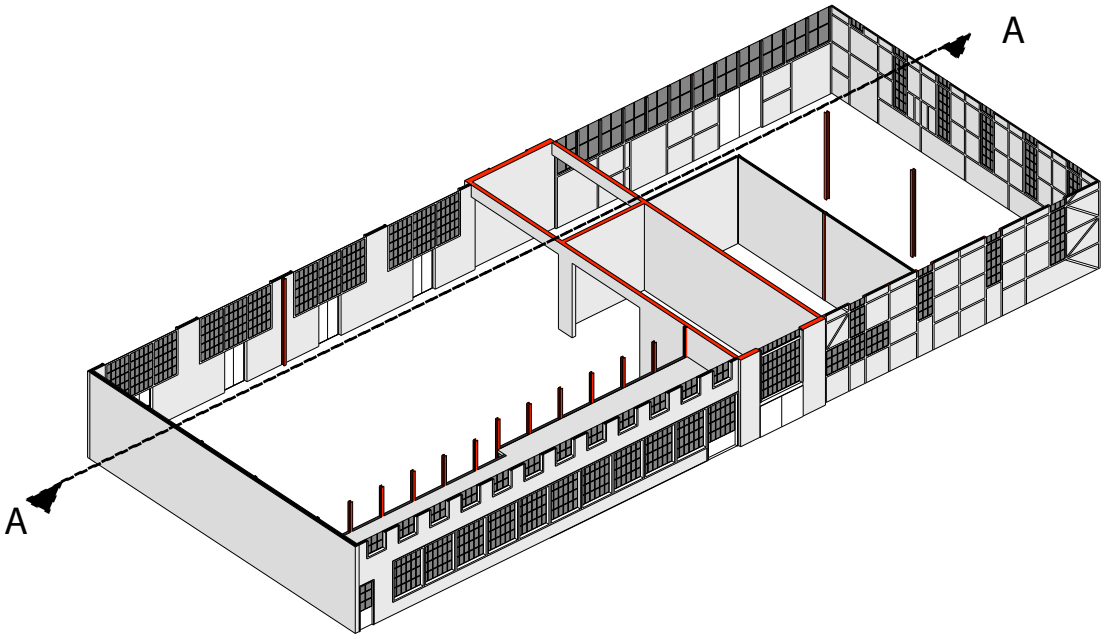
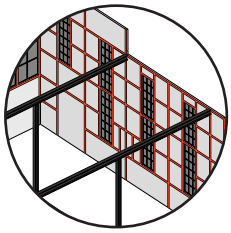


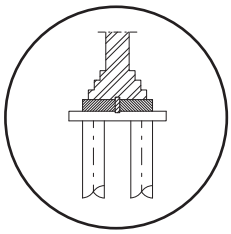
fig. 3.6.02 loadbearing elements in horizontal section



steel framework in facade

Primary construction

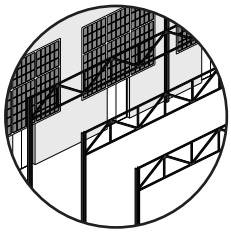
The stability is provided by the big steel trusses on the southern part. For the northern does also have a steel frame construction. The higher middle volume is most likely to be executed with load-bearing brick walls, connecting to both the most southern and northern halls.



'Amsterdamse paalfundering'

Foundation

The foundation is expected to be an 'Amsterdamse paalfundering', which was commonly used in that time and area.



steel trusses

Roof

The type of truss in the southern part of the building (see section A) can be defined as a "Flat Warren truss" (v-liggers in Dutch). The steel roof construction which is supported by a steel frame creates a vast amount of space, which was required for the factories' machines and materials.

3.6 Ketelcentrale Construction

Details

The following details give an indication of how the high middle volume connects to both the northern and southern volumes of the Ketelcentrale. Although it looks like the two walls are executed with a load-bearing brick construction, also this part of the building is supported by a steel frame. The brick is just a mere infill of this construction.

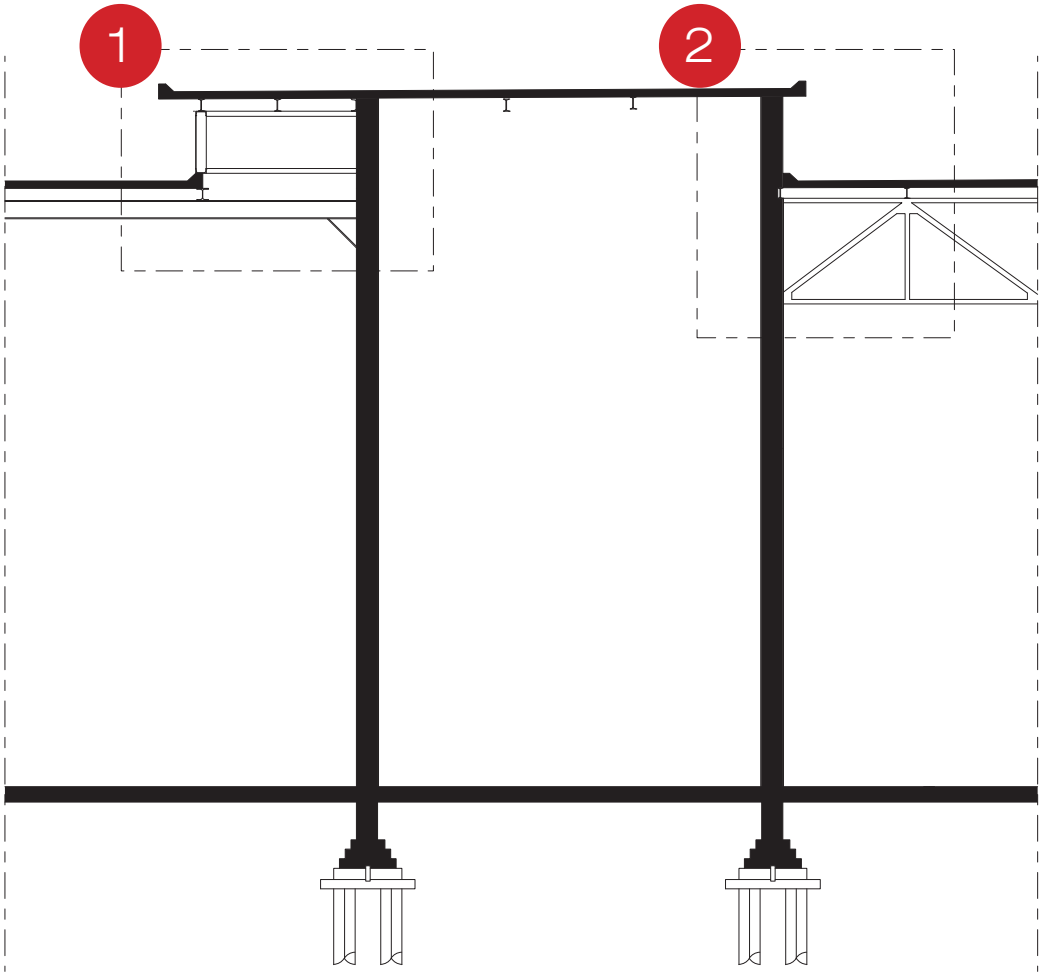
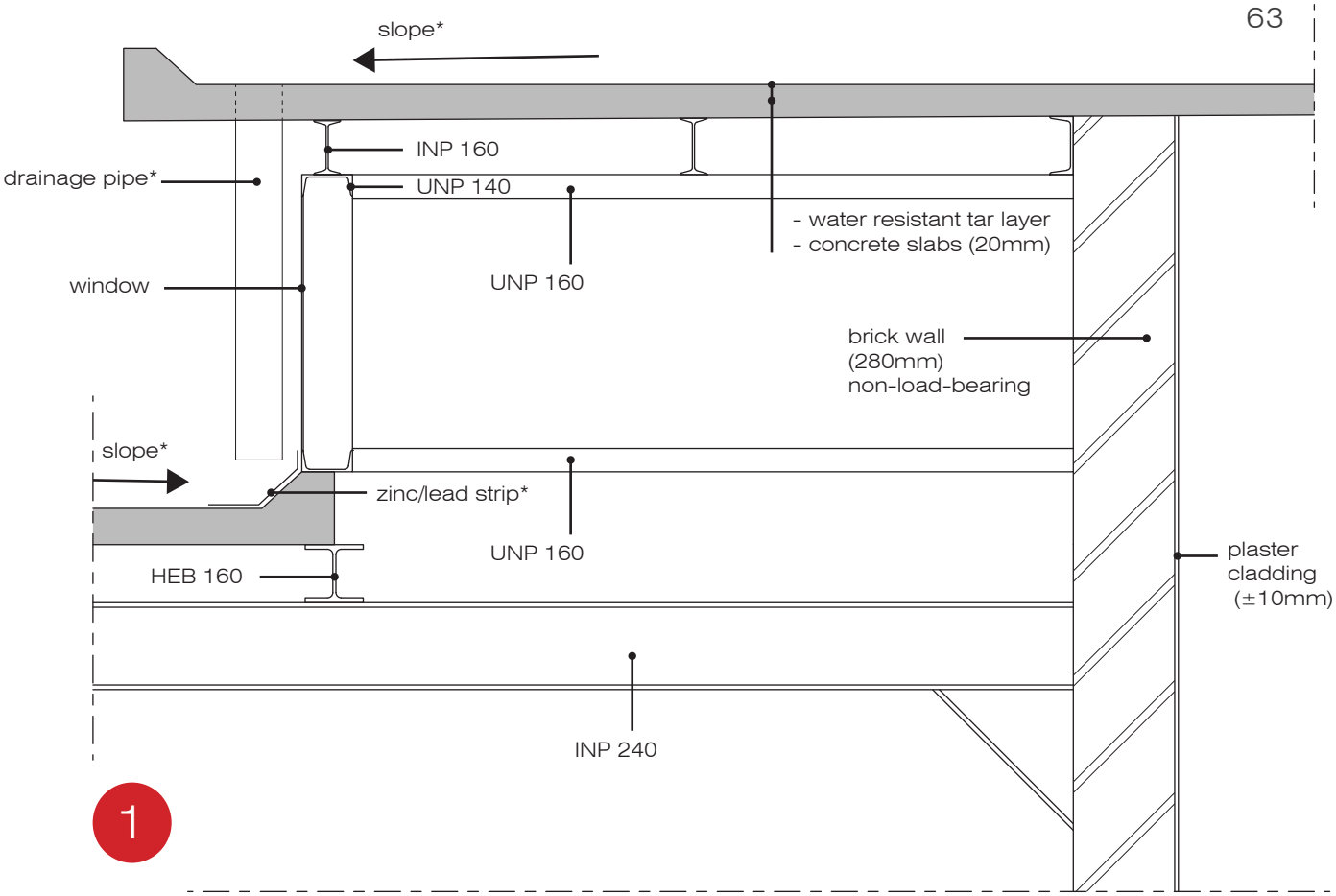
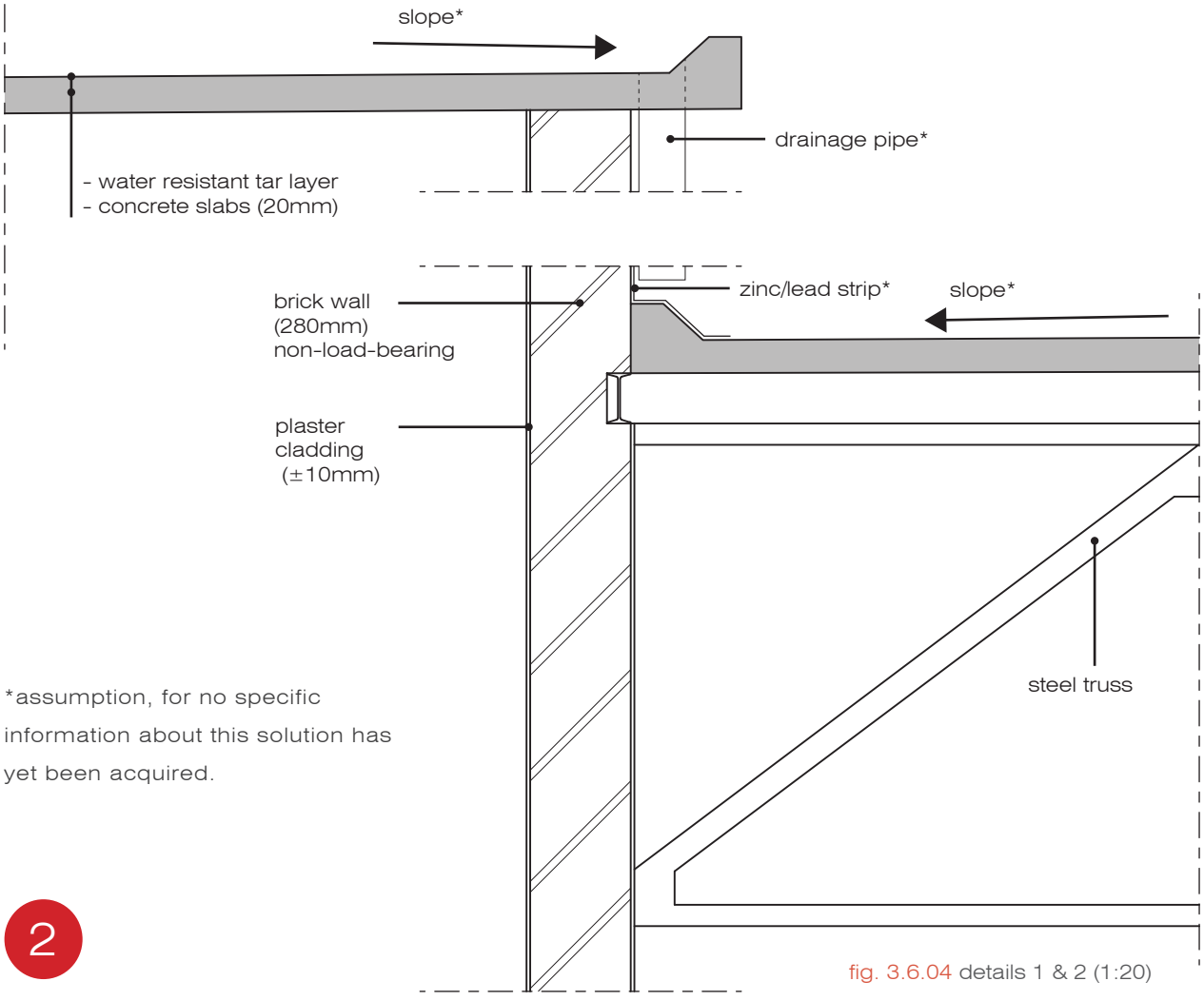


fig. 3.6.03 position of details 1 & 2 (1:100)





*assumption, for no specific information about this solution has yet been acquired.

fig. 3.6.04 details 1 & 2 (1:20)

3.7 Ketelcentrale Materials

1

brick

2

brick

3

window(frames)

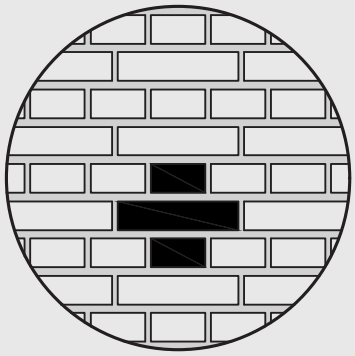


fig. 3.7.01

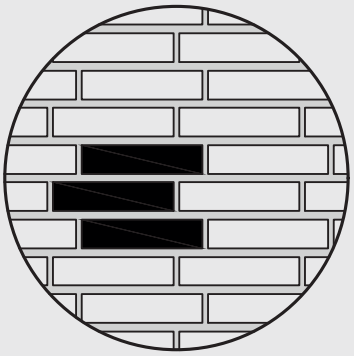


fig. 3.7.02

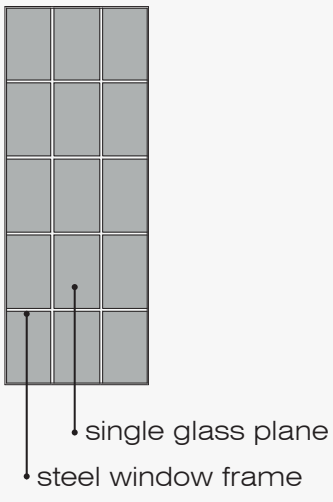


fig. 3.7.03

Brick information:
- ‘Waalmaat’ sized brick (210.100.50mm)
- 1. Dutch bonding
  2. 1/4 running stretcher bonding
- ‘Stootvoeg’ (10mm)*
- ‘Lintvoeg’ (15mm)*

* The average width, deviations in the width of the jointing can occur.
The ‘lagenmaat’ and ‘koppenmaat’ are still unknown, but will be measured in the future.

window(frames)

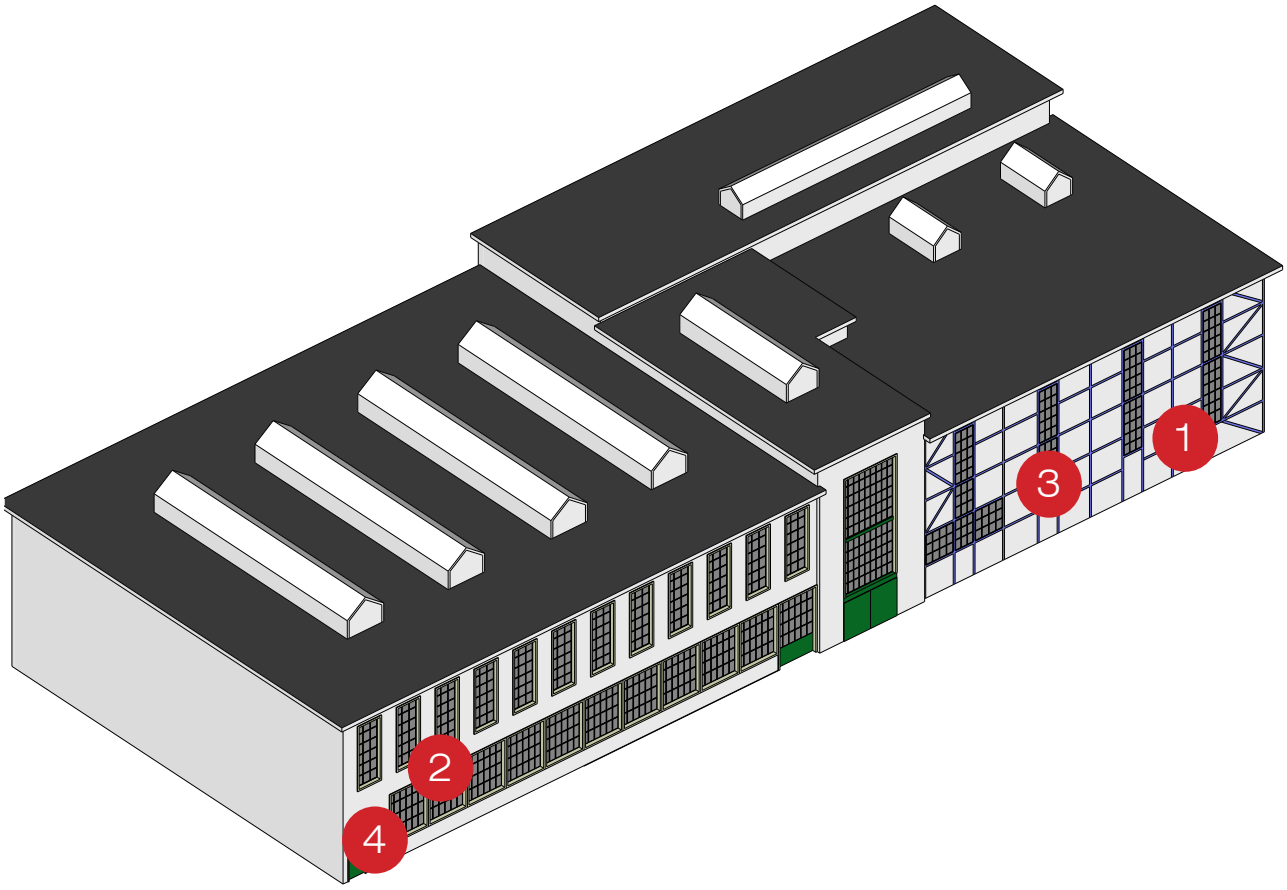


fig. 3.7.04 location of photos taken

3.8 Ketelcentrale Composition

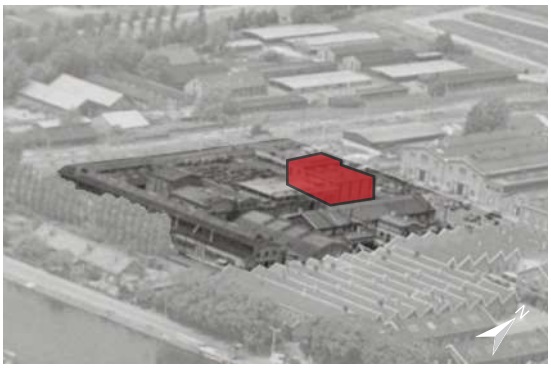


fig. 3.8.01 first building mass of the Ketelcentrale (via Beeldbank gemeente archief Zaanstad)

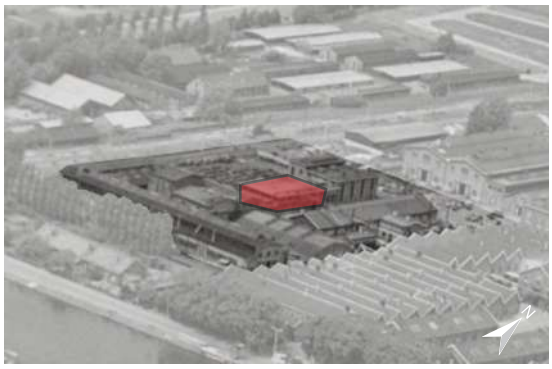


fig. 3.8.02 second part of the Ketelcentrale appearing to be under construction (via Beeldbank gemeente archief Zaanstad)

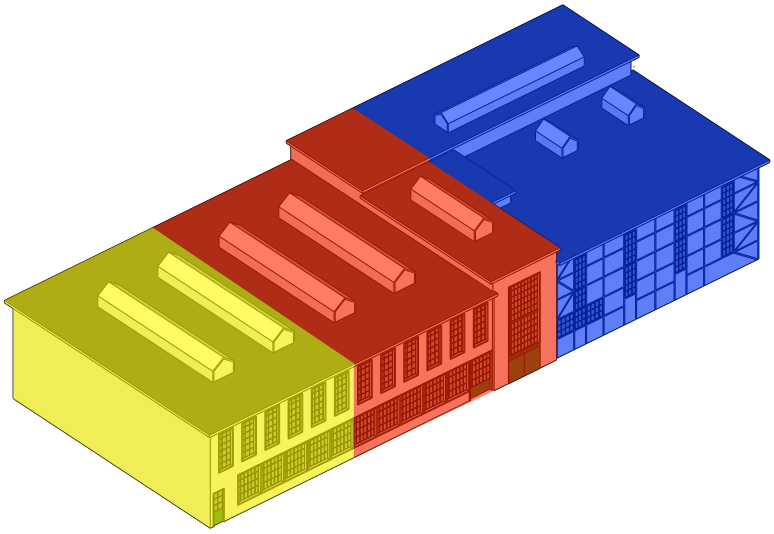


fig. 3.8.03 different building volumes of the Ketelcentrale

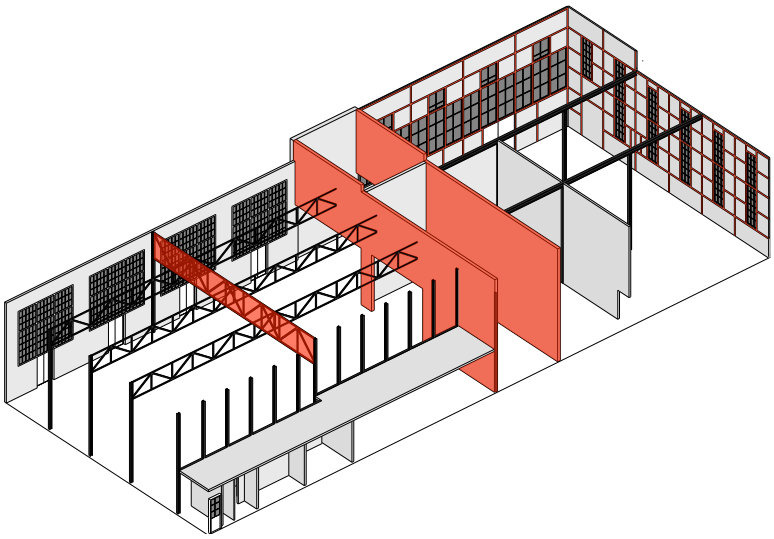


fig. 3.8.04 different building volumes of the Ketelcentrale

The different building volumes are all constructed out of a load-bearing steel frame. This also goes up for the walls marked in red (in fig 3.8.04), where the brickwork is used to fill up the spaces between the steel construction. These two walls in the middle part of the building form a link between the most northern and southern volumes, not only for the facades, but for the roof construction as well.

The second building volume (in chronological order of time, which is marked in red in fig 3.8.03), has been added around 1950-1956 (via rijksmonumenten.nl). The most southern part (marked in yellow, has been added around 1962 and is executed in the same style as the first expansion. The only exception that is visible nowadays is the color of the brickwork (see fig 3.8.08).

fig. 3.8.05 the newer southern part of the building

fig. 3.8.06 operable window frames inside the harderij, the old main facade (author's image)

fig. 3.8.07 former main facade (author's image)

fig. 3.8.08 difference in brick color

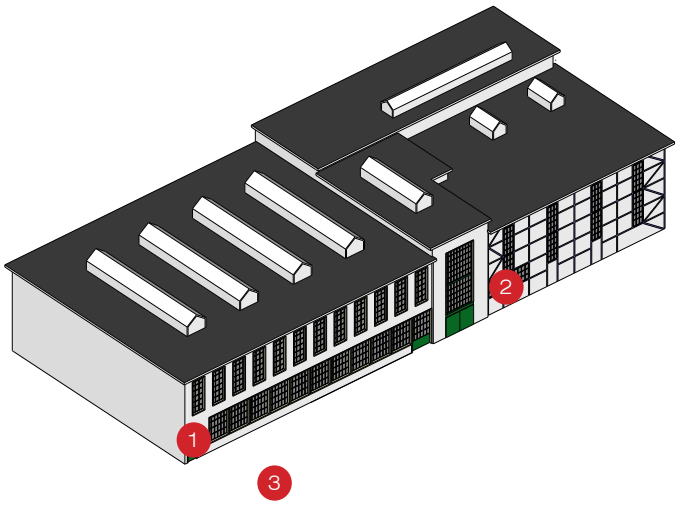


fig. 3.8.09 location of photos taken

Like already mentioned, the northern part of the Ketelcentrale was firstly built, after the southern section followed. The north side of the building can be identified by its Dutch masonry bonding, blue steel trusses- and window frames. The most southern part is identifiable by its ¼ running stretcher bonding, concrete outer window frame, and green steel inner window frame.

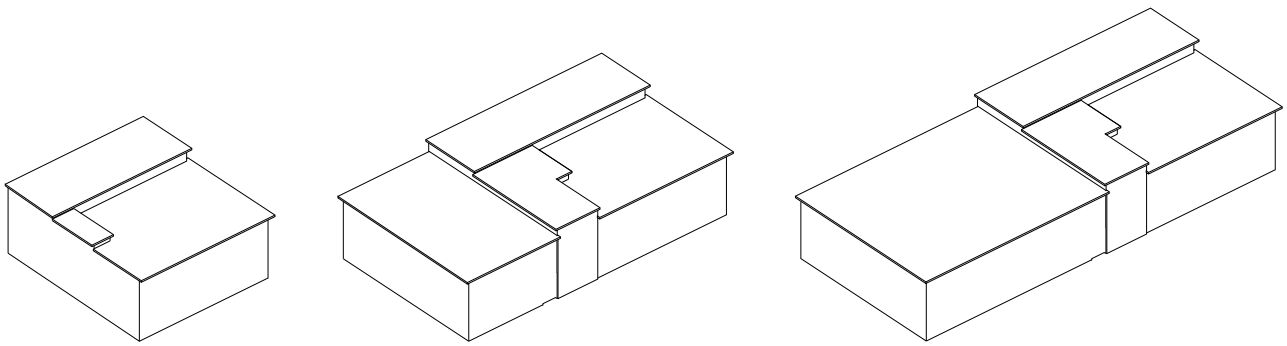
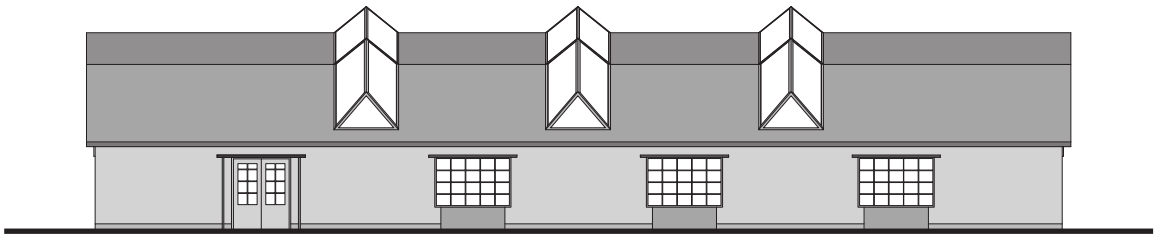
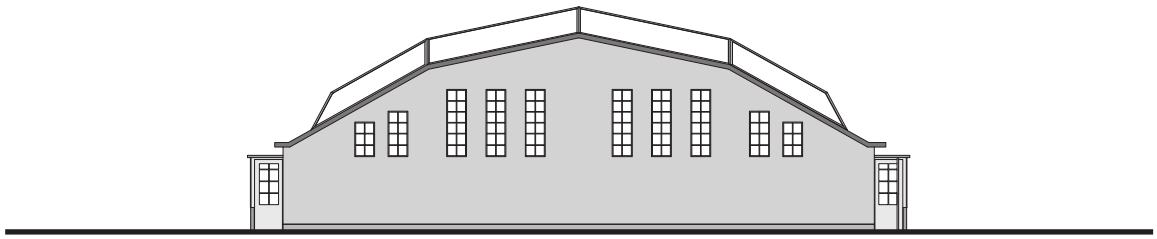


fig. 3.8.10 cronological order of building volumes

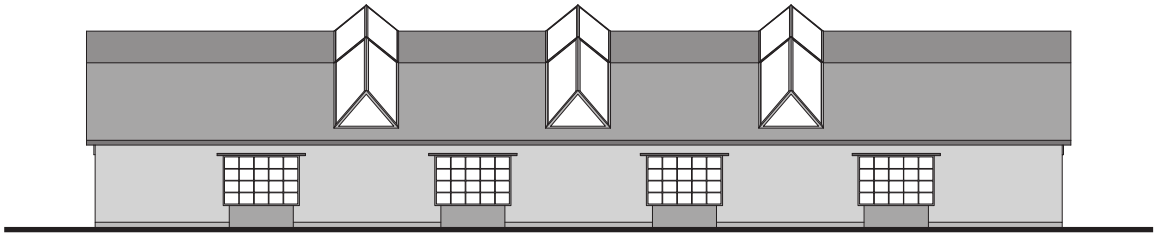
3.9 Waslokaal (316)



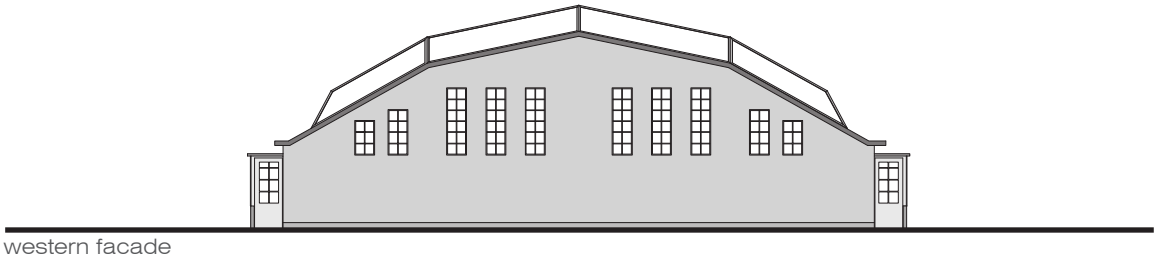
northern facade



eastern facade



southern facade



western facade

fig. 3.9.01 facades of the Waslokaal (1:250)

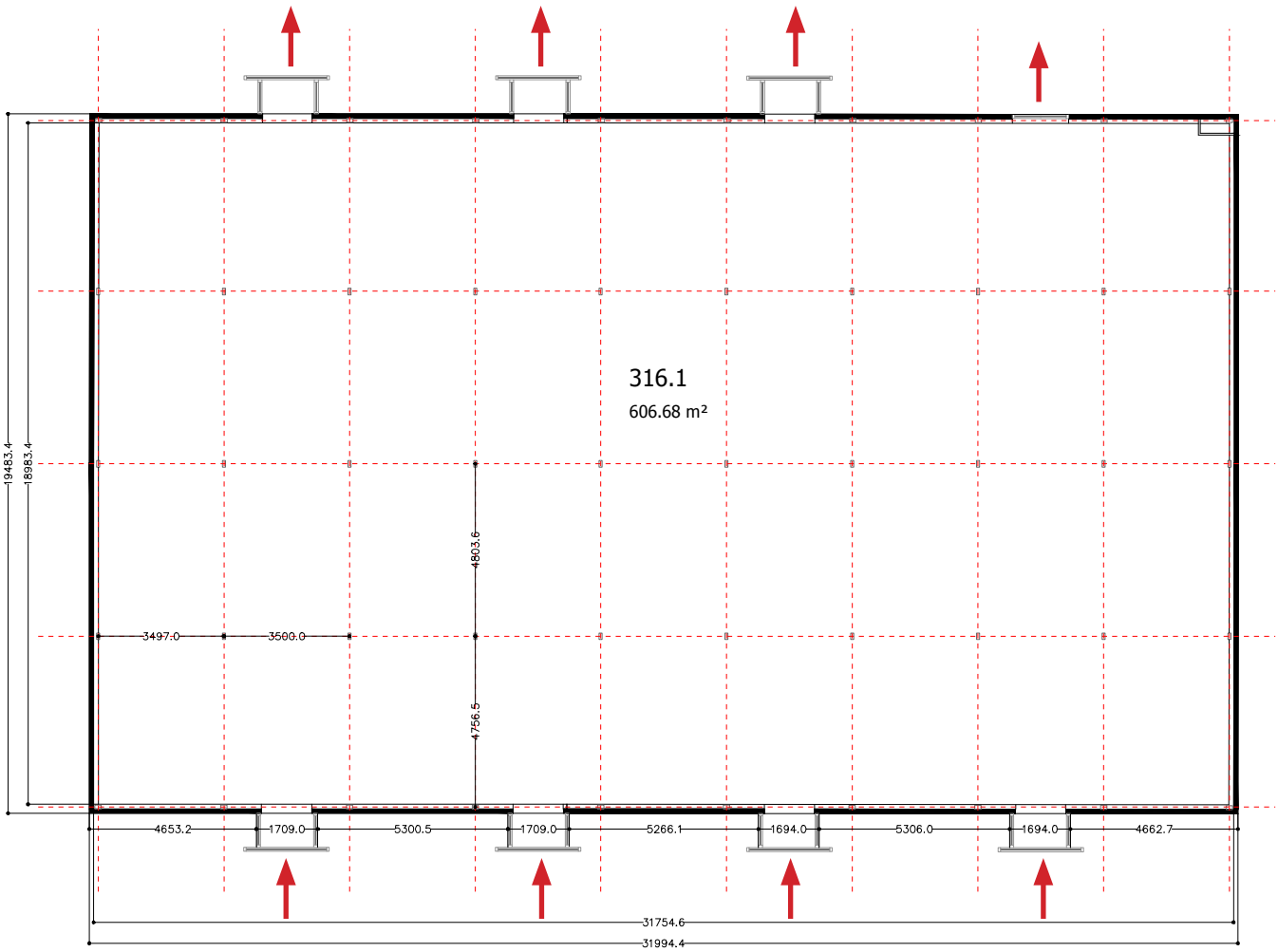


fig. 3.9.02 floorplan of the Waslokaal, entrances and exits marked with a red arrow (1:200)

Info

Building number:	316
Adress:	Harderij 5
Monument:	Nationally listed
Monument number:	518040
Former function:	washing and changing facility
Building period:	1936-1941 third phase
Total m²	approx. 633

Building characteristics

The building has a rectangular floor plan and consists of a single story under a bent slated roof with the ridge facing west-east. The Waslokaal has a concrete foundation and its facades are built in gray brick masonry in half-brickwork. The end facades have high-positioned narrow concrete windows with rod distribution. The side facades both contain four extended concrete entrance portals with iron windows (in the second, fourth, sixth and eighth travee). The wooden gutters along the facades have a large overhang.

Appreciation

As an example of a washing building belonging to a factory complex from the second quarter of the 20th century. Also because of its values construction wise, for it is one of the only buildings with a wooden construction (and also one of the best preserved).

3.10 Waslokaal Construction

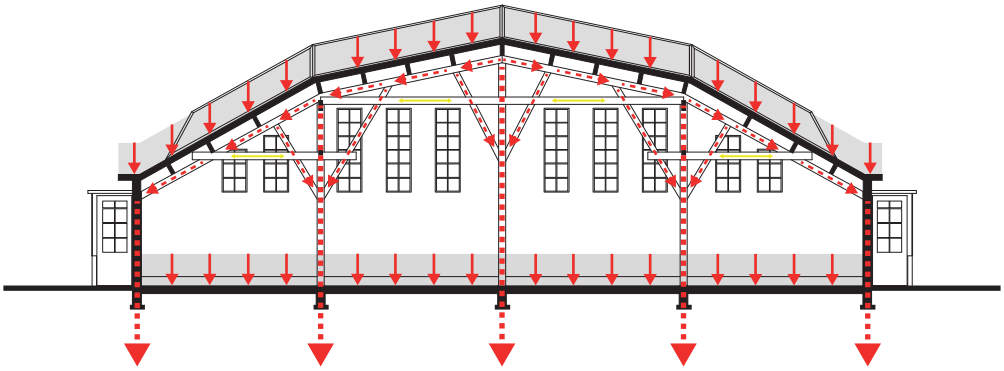
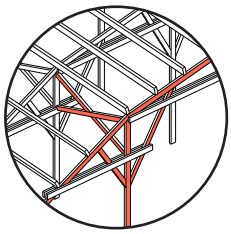


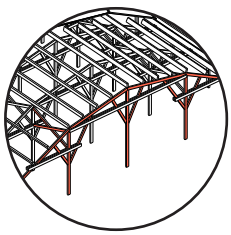
fig. 3.10.01 section A: distribution of forces (1:200)



wooden construction including braces

Stability

The building consists of a loadbearing wooden frame divided over nine bays, covered with a gambrel-shaped roof which is supported by purlins and rafters. Together with the wooden columns, the roof is supported with struts, which are on their turn interlocked by two horizontal beams. The rafters and struts support the purlins. Also, between the rafters a wind brace has been attached to the side aisles.



wooden portals

Primary construction

The primary construction consists of 10 wooden portals every 3,5m. These portals contain 5 columns connected by trusses and horizontal beams. The purlins connect the individual portals.

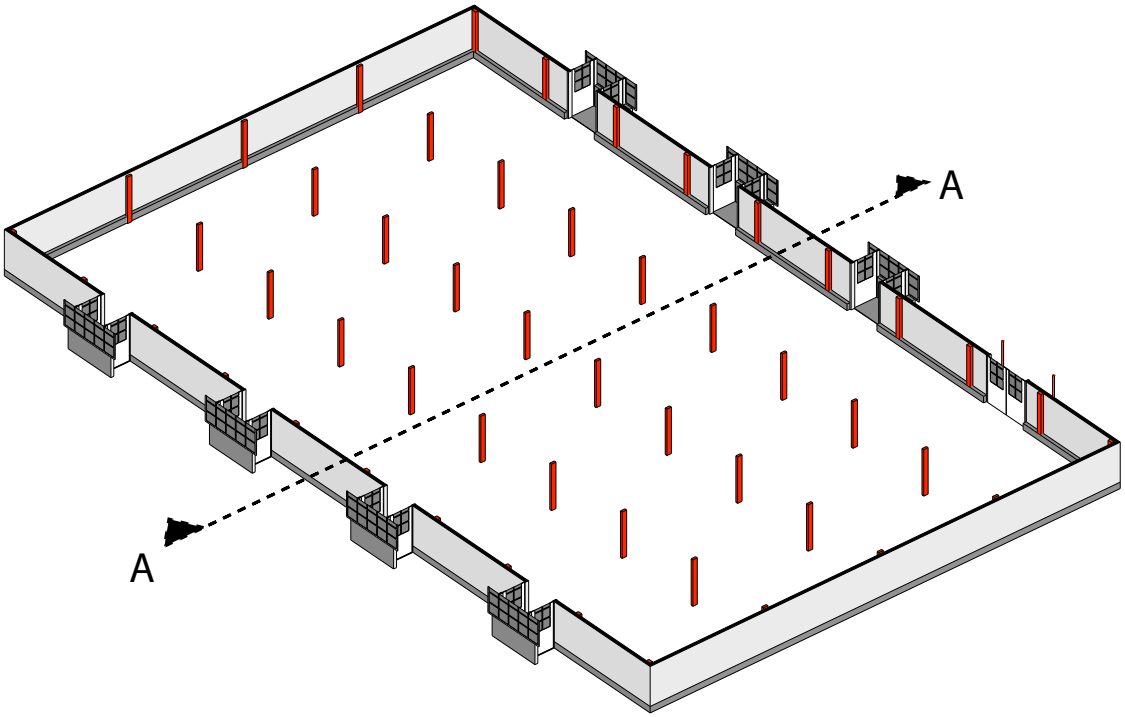
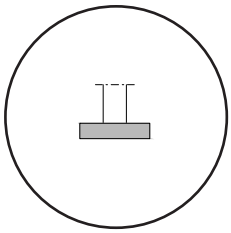


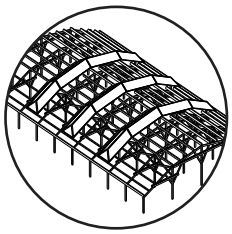
fig. 3.10.02 loadbearing elements in horizontal section



concrete footing foundation

Foundation

The foundation is known to be a concrete ‘fundering op staal’ without piles, because of its lightweight wooden construction. The floor, however, is not supported by any foundation and has consequently sagged.



wooden construction with skylights

Roof

Together with the wooden columns, the gambrel roof is supported with struts, which are on their turn interlocked by two horizontal beams. The rafters and struts support the purlins. Also, between the rafters a wind brace has been attached to the side aisles.

3.11 Waslokaal Materials

1

brick

2

window(frames)

3

portal(frames)

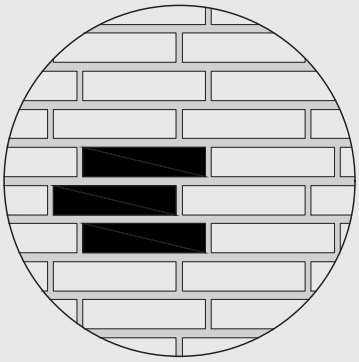


fig. 3.11.01

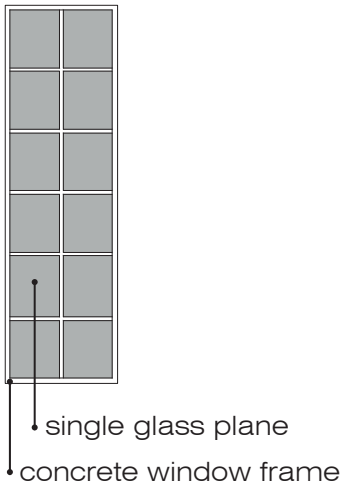


fig. 3.11.02

Brick information:
- ‘Waalmaat’ sized brick (210.100.50mm)
- 1. 1/4 running stretcher bonding
- ‘Stootvoeg’ (10mm)*
- ‘Lintvoeg’ (15mm)*

* The average width, deviations in the width of the jointing can occur.
The ‘lagenmaat’ and ‘koppenmaat’ are still unknown, but will be measured in the future.

These portals made sure that the building was accesable over the entire length, and guarenteed a good logistic flow for all the workers entering and leaving the building

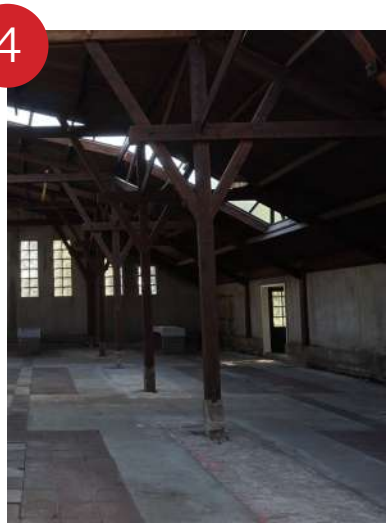


fig. 3.11.03 the monumental wooden construction and roof cladding

fig. 3.11.04 the monumental metal-framed rooflights

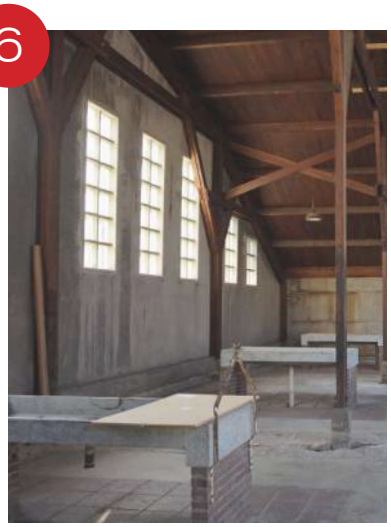


fig. 3.11.05 some of the washing sinks are still present

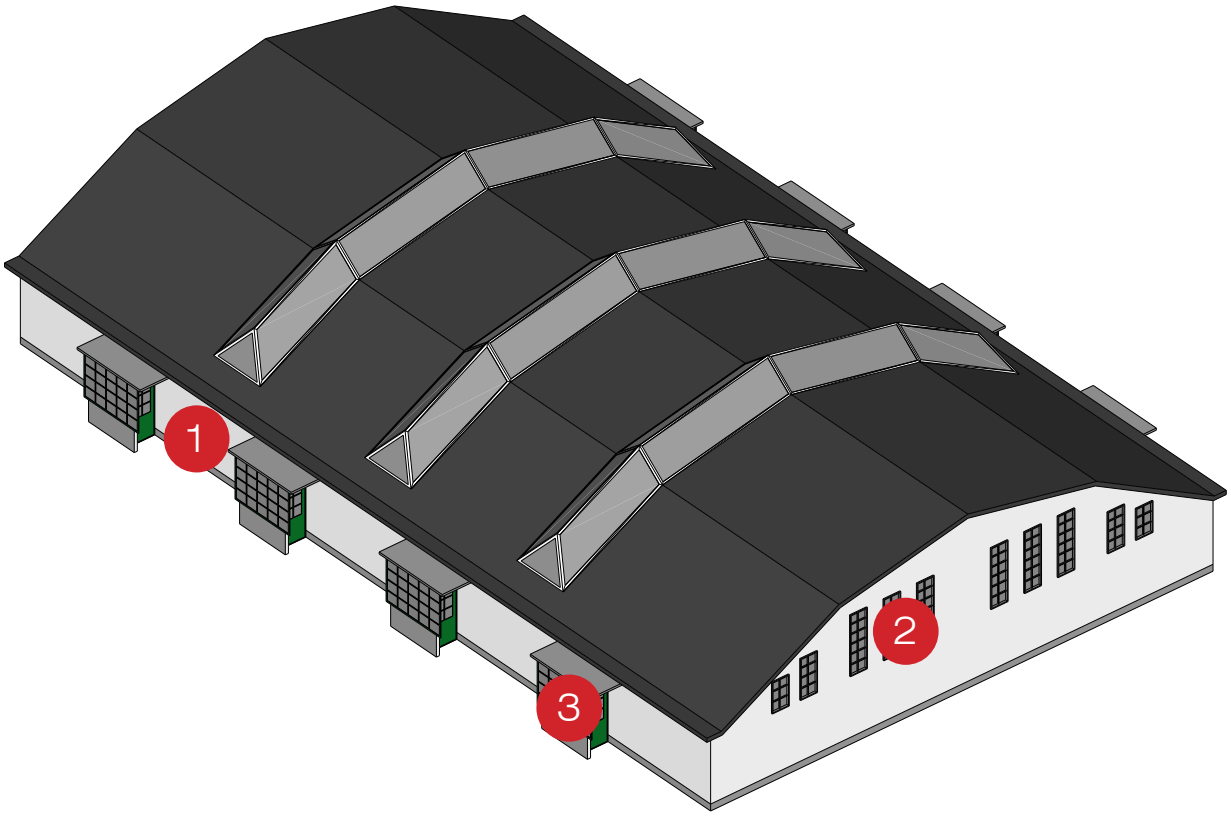
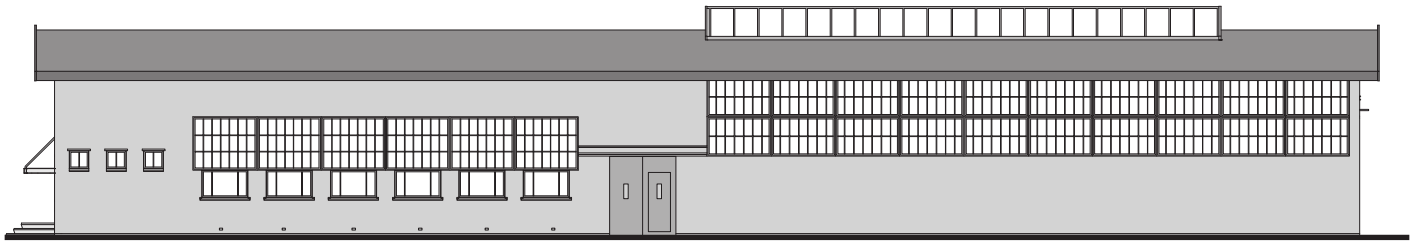


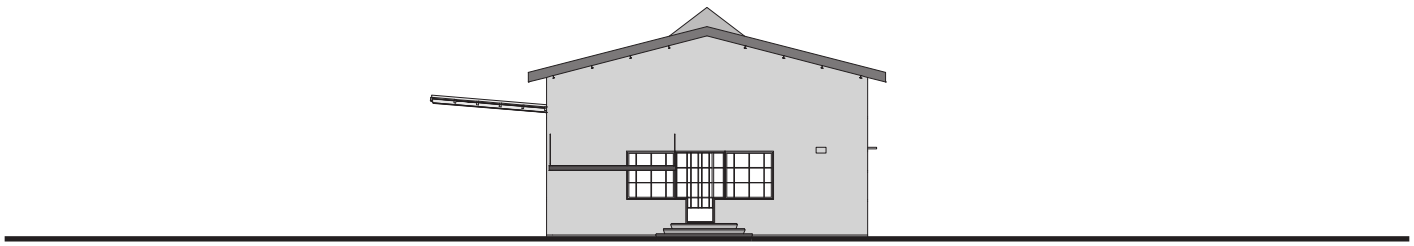
fig. 3.11.06 location of photos taken

3.12 Overslagloods (341)

northern facade



eastern facade



southern facade

western facade

fig. 3.12.01 facades of the Overslagloods (1:250)

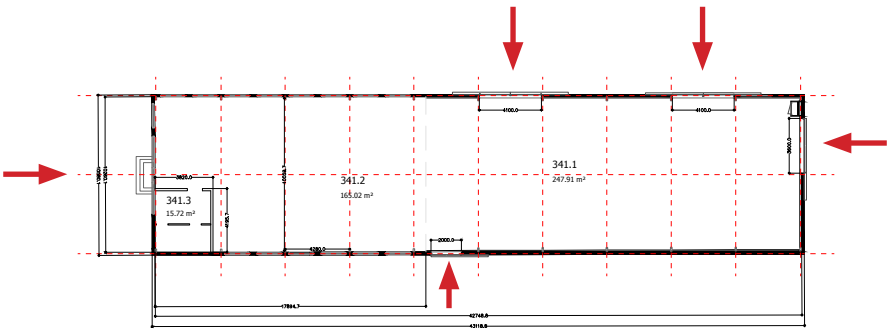


fig. 3.12.02 floorplan of the Overslagloods (1:500)

Info

Building number:	341
Adress:	Hemkade 24A
Monument:	Nationally listed
Monument number:	530308
Former function:	Warehouse “Building 341”,
Building period:	1935 / third phase
Total m^2	approx. 458

Characteristics

The building served as a temporary storage facility for raw materials that were brought in by train, the remains of the former railway can be found next to the west-facing facade. This facade contains a canopy covering two big sliding doors. At this spot, the cargo would be unloaded and transferred inside.

Besides the sliding doors, the building contains a few other characteristic elements: the rectangular steel window frames (which are also recognizable in the other buildings on the site from the third phase), the pitched roof and the long roof light.
The brick façade -which is executed in Flemish bonding- wraps itself around the steel frame construction, making it a part of the interior. Due to its Flemish bonding, the building can be recognized as one of the older buildings in the Campus South ensemble.

Appreciation

Its steel structure and the big roof lights are typical elements in industrial buildings and therefore enhance the terrain’s character as an old industrial site. These elements should therefore be preserved or treated with care. It is also listed as a monument for being of cultural-historical importance as one of the former buildings to play a critical role in the Hembrug complex. (via rijksmonumenten.nl)

3.13 Overslagloods Construction

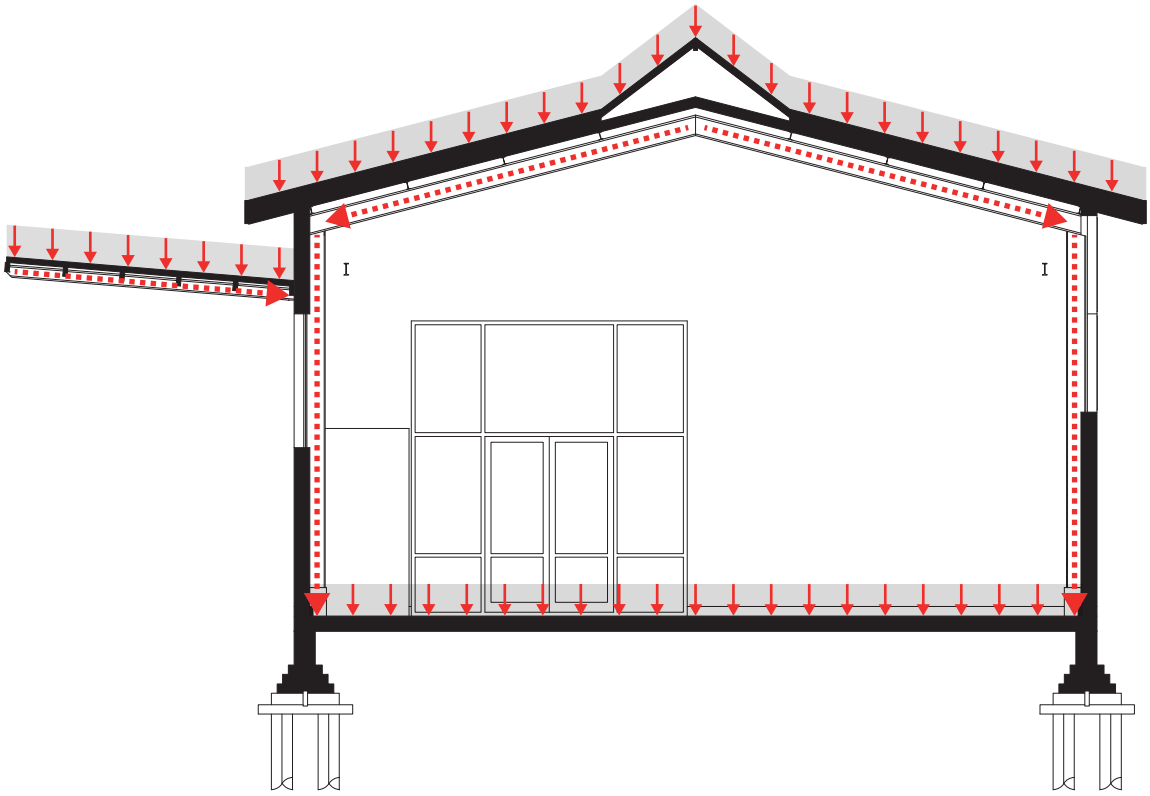
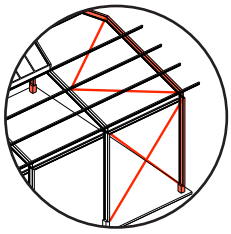


fig. 3.13.01 section A: distribution of forces (1:100)



steel portals

Stability

The Overslagloods consists of a load-bearing steel frame consisting of 11 portals which are connected by steel purlins that run over the length of the building. The steel portal at the most northern end has braces for extra stability in both directions.

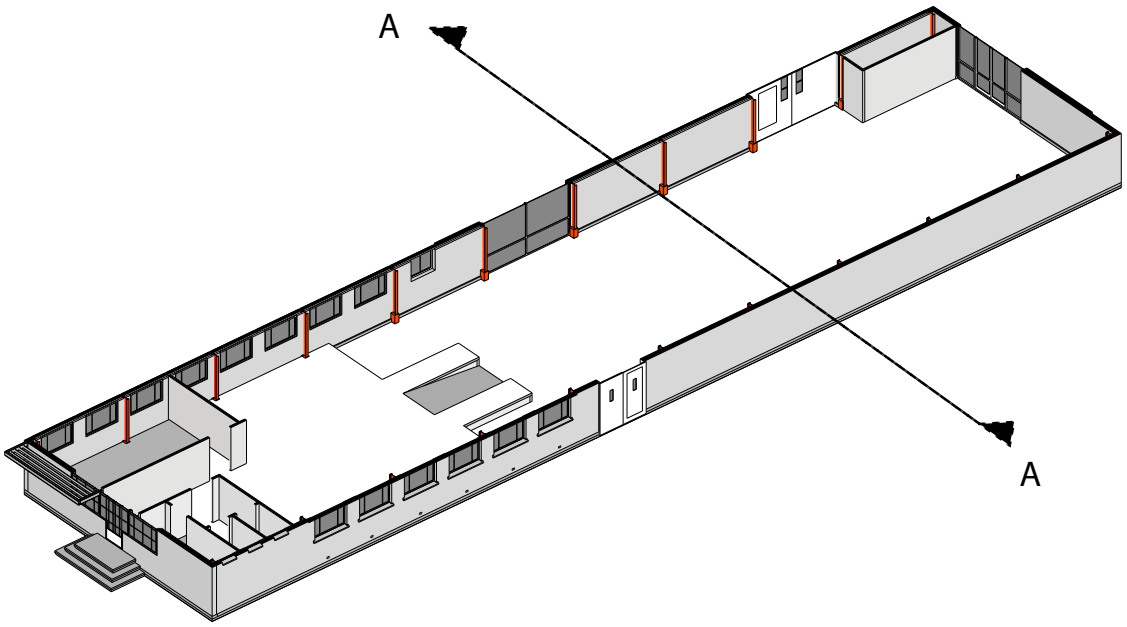
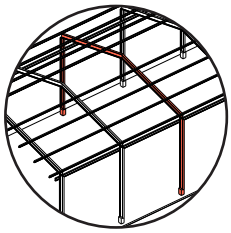


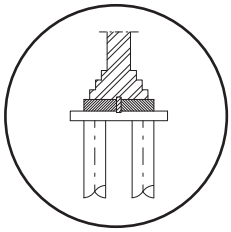
fig. 3.13.02 loadbearing elements in horizontal section



steel frame

Primary construction

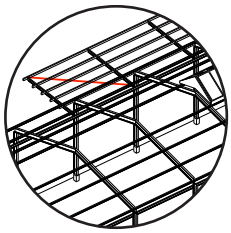
The construction of the former warehouse consists of a steel frame (this includes the canopy), executed out of the following profiles: purlins (IPE 100), rafters and columns (IPE 240).



'Amsterdamse paalfundering'

Foundation

The foundation is expected to be an 'Amsterdamse paalfundering', which was commonly used in that time and area. However, the foundation could also be a 'fundering op staal', because of the building's position on the soil of the former land tongue.



canopy supported by braces

Roof & canopy

The canopy is probably secured with additional braces on both ends, this will be further examined in the future.

3.14 Overslagloods Materials

1

brick

2

brick

3

window(frames)

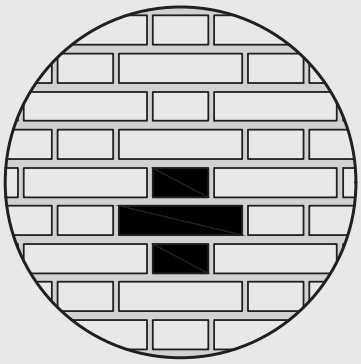


fig. 3.14.01

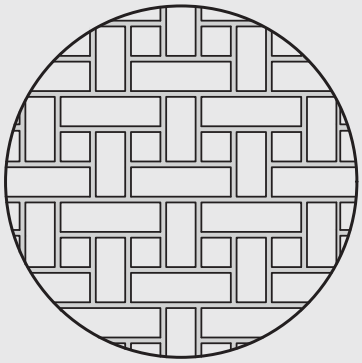


fig. 3.14.02

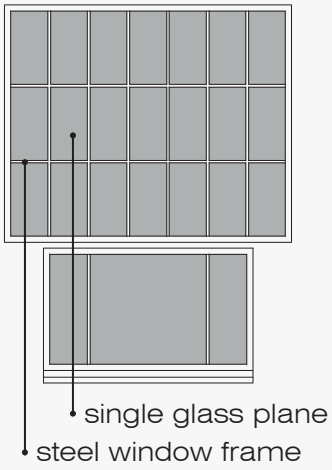


fig. 3.14.03

Brick information:
- ‘Waalmaat’ sized brick (210.100.50mm)
- 1. Flemish bonding
  2. Bonding yet to be identified
- ‘Stootvoeg’ (10mm)*
- ‘Lintvoeg’ (15mm)*

* The average width, deviations in the width of the jointing can occur.
The ‘lagenmaat’ and ‘koppenmaat’ are still unknown, but will be measured in the future.

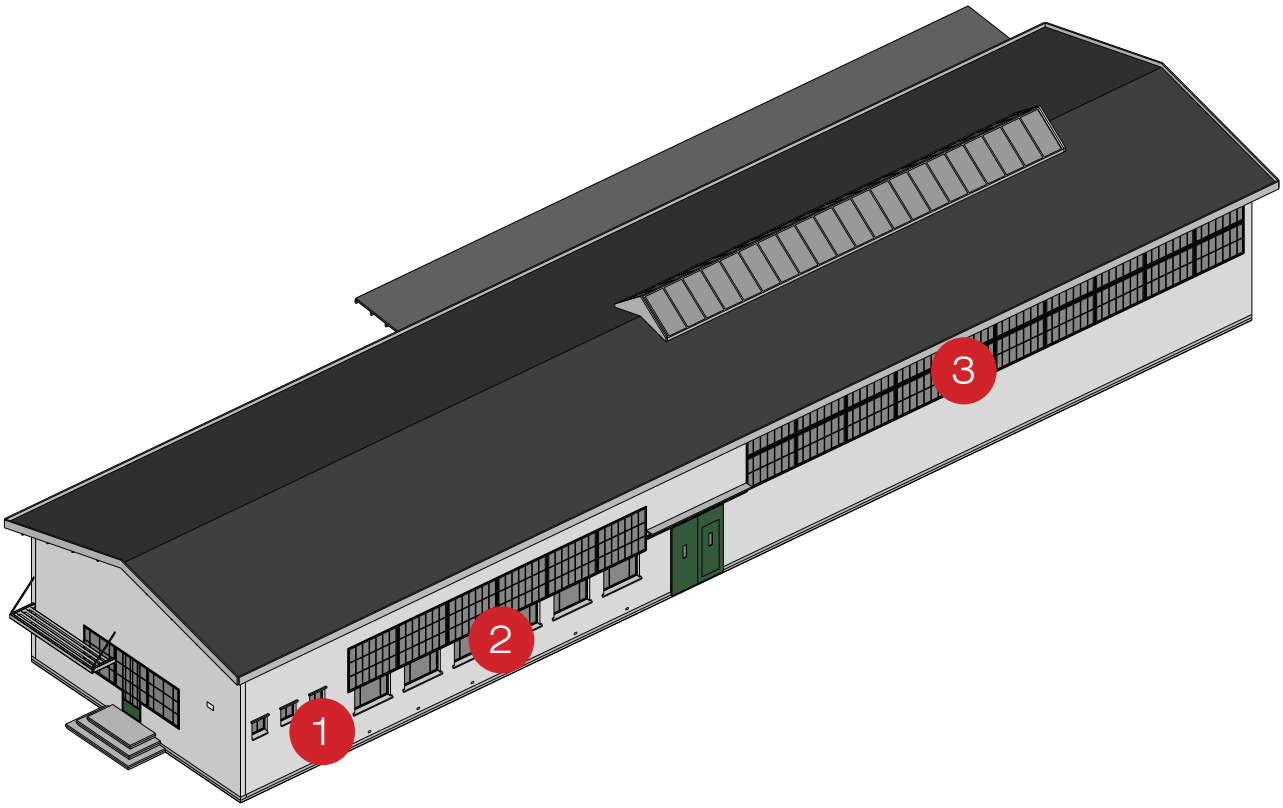
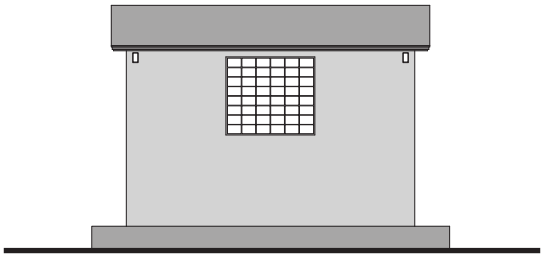
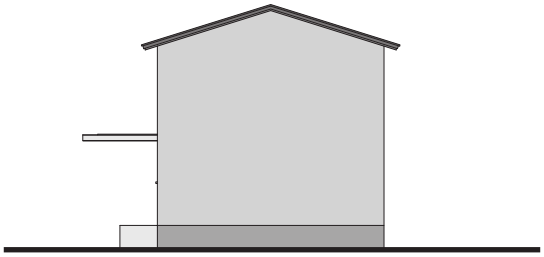


fig. 3.14.04 location of photos taken

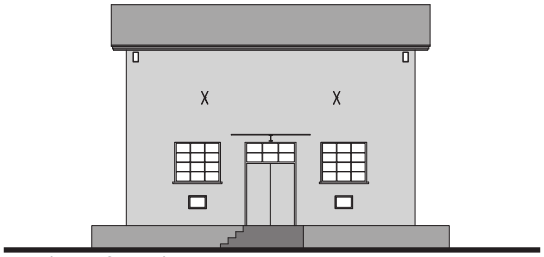
3.15 Carbidgebouw (379)



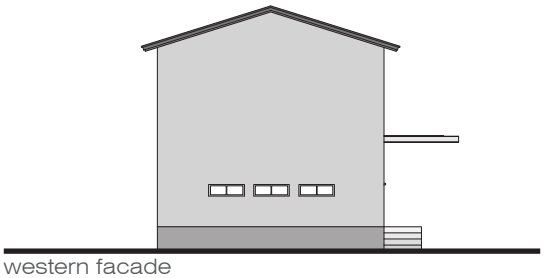
northern facade



eastern facade



southern facade



western facade

fig. 3.15.01 facades of the Carbidgebouw (1:250)

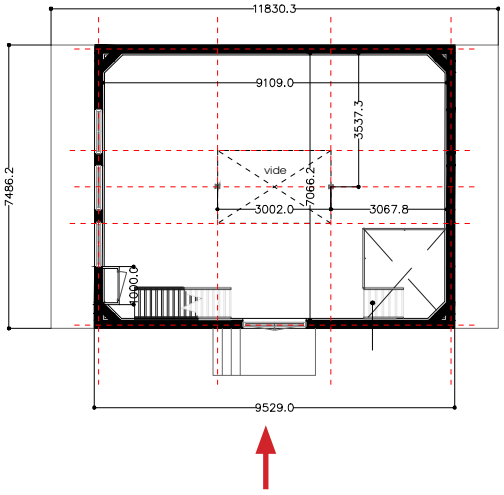


fig. 3.15.02 floorplan of the Carbidgebouw (1:200)

Info

Building number:	379
Adress:	Kardoes 12 1505RG
Monument:	Municipal monument
Monument number:	0479/WN131
Former function:	Production of carbide
Building period:	1921 / second phase
Total m^2	approx. 130

Characteristics

The Carbid building, or Building 379 was probably used to produce calcium carbide. Between 1900 and 1945, calcium carbide was often used in carbide lamps, which were among other things placed on bikes and cars. And since the Hembrug terrain still produced cars during the German occupation in the WOII, this building still had an important function.

Built in the second phase, and the oldest remaining building of the ensemble as it is today the Carbidgebouw shares some of the same traits with other buildings on the ensemble. These traits include the steel window frames and a typical (in this case Flemish) brick bonding. It is also one of the few buildings on the ensemble with a basement and/or a first floor (next to the Ketelcentrale).

Appreciation

An explanation of why the Carbidgebouw is listed as a municipal monument is yet to be found.

3.16 Carbidgebouw Construction

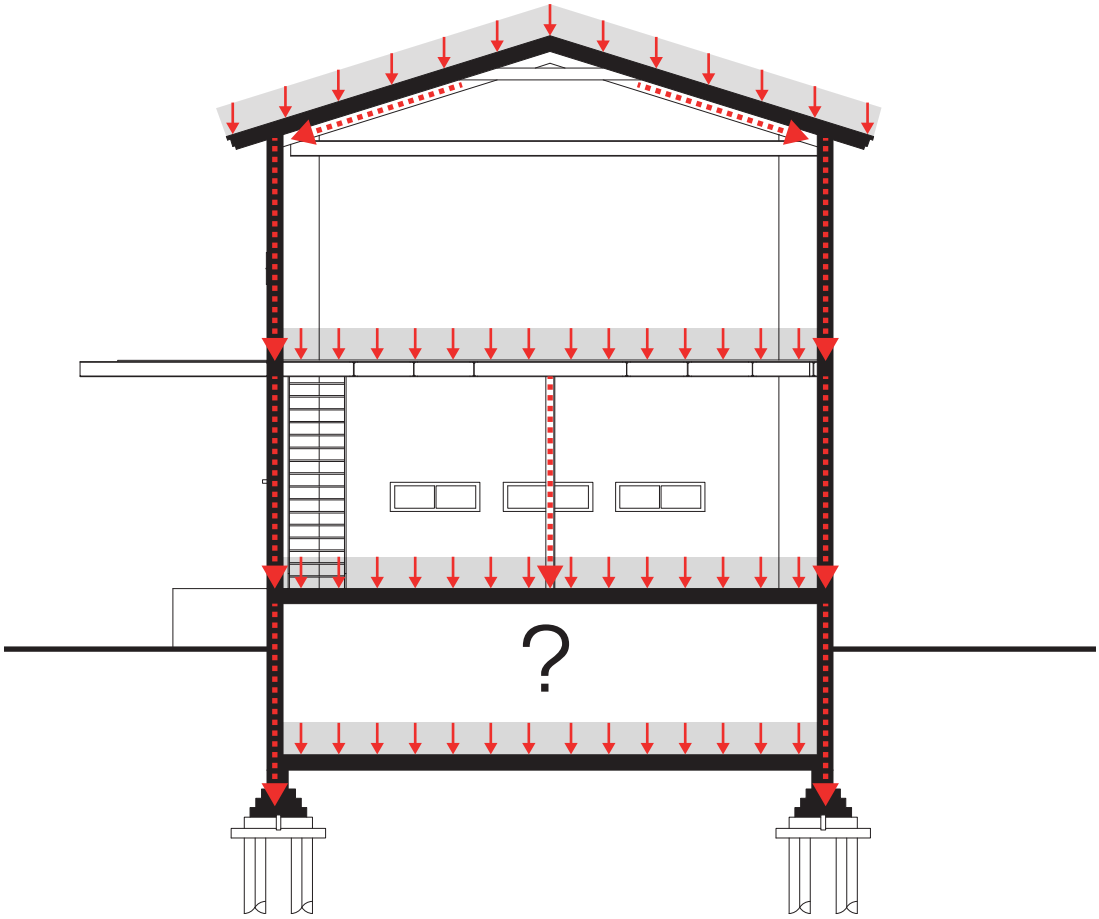
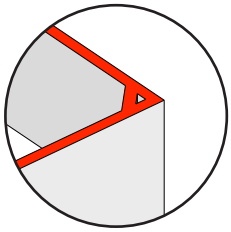


fig. 3.16.01 section A: distribution of forces (1:100)



roof construction and brick walls

Stability

The building consists of a loadbearing brick facade which ensures the stability.

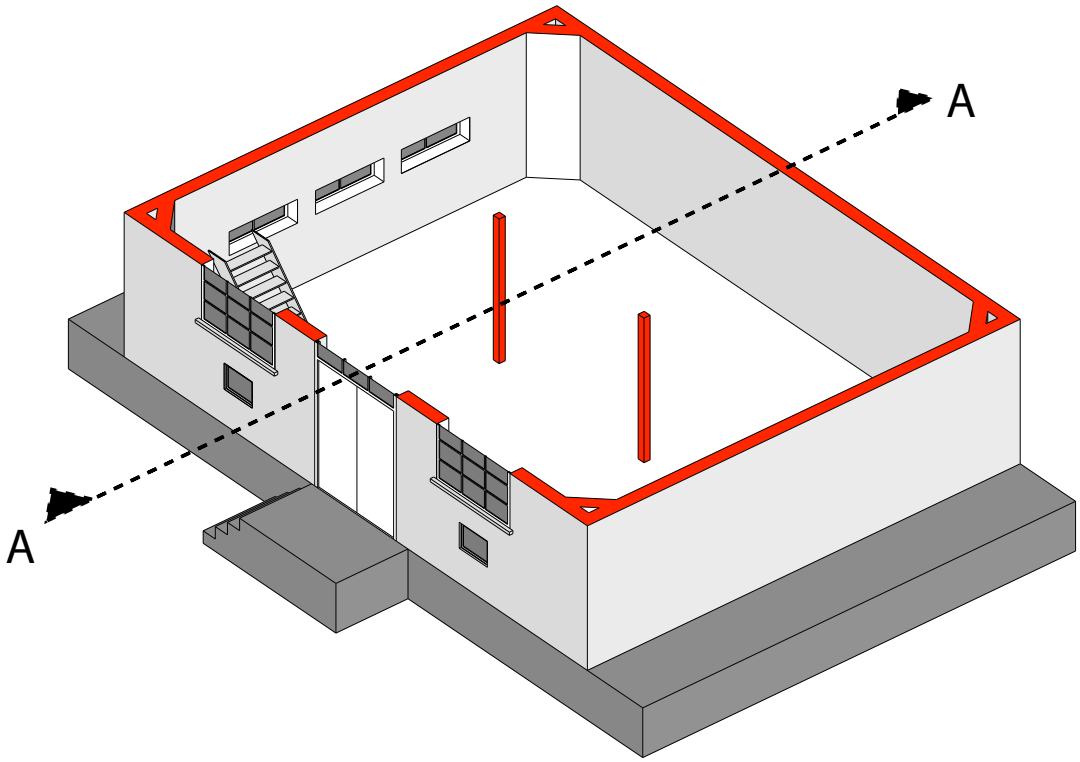
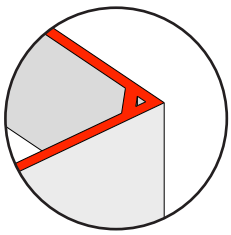


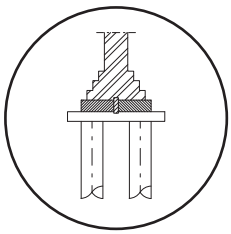
fig. 3.16.02 loadbearing elements in horizontal section



loadbearing brick facade

Primary construction

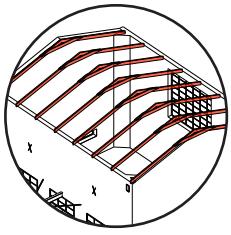
The construction of the Carbidgebouw consists of a loadbearing brick facade with a width of 210mm.



'Amsterdamse paalfundering'

Foundation

The foundation is expected to be an 'Amsterdamse paalfundering', because of its heavy brick structure of multiple levels.



wooden roof construction

Roof

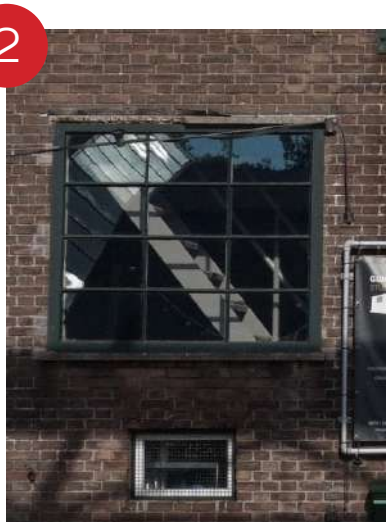
The Carbidgebouw's roof is supported by 8 wooden trusses, which are on their turn supported by the load-bearing brick walls.

3.17 Carbidgebouw Materials

1

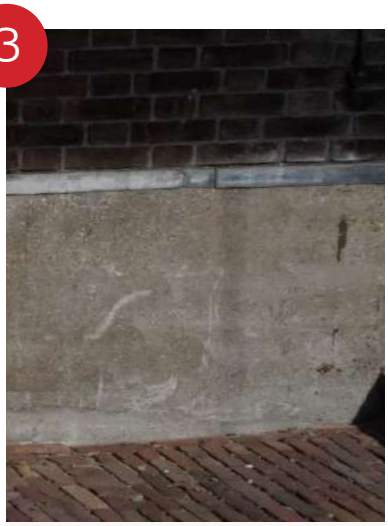
brick

2



window(frames)

3



concrete plinth

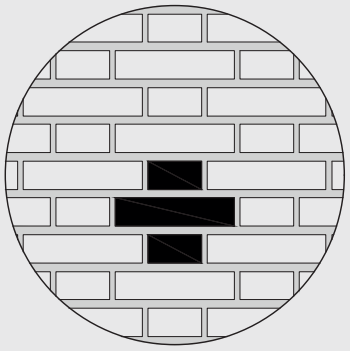


fig. 3.17.01

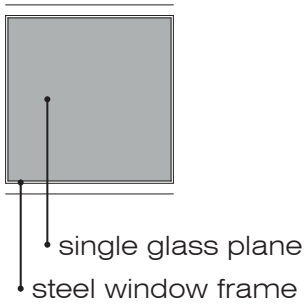


fig. 3.17.02

Brick information:
- ‘Waalmaat’ sized brick (210.100.50mm)
- 1. Flemish bonding
- ‘Stootvoeg’ (10mm)*
- ‘Lintvoeg’ (15mm)*

* The average width, deviations in the width of the jointing can occur.
The ‘lagenmaat’ and ‘koppenmaat’ are still unknown, but will be measured in the future.

The plinth sticks out on both the eastern- and western side of the building and indicates the size and position of the underlying basement.

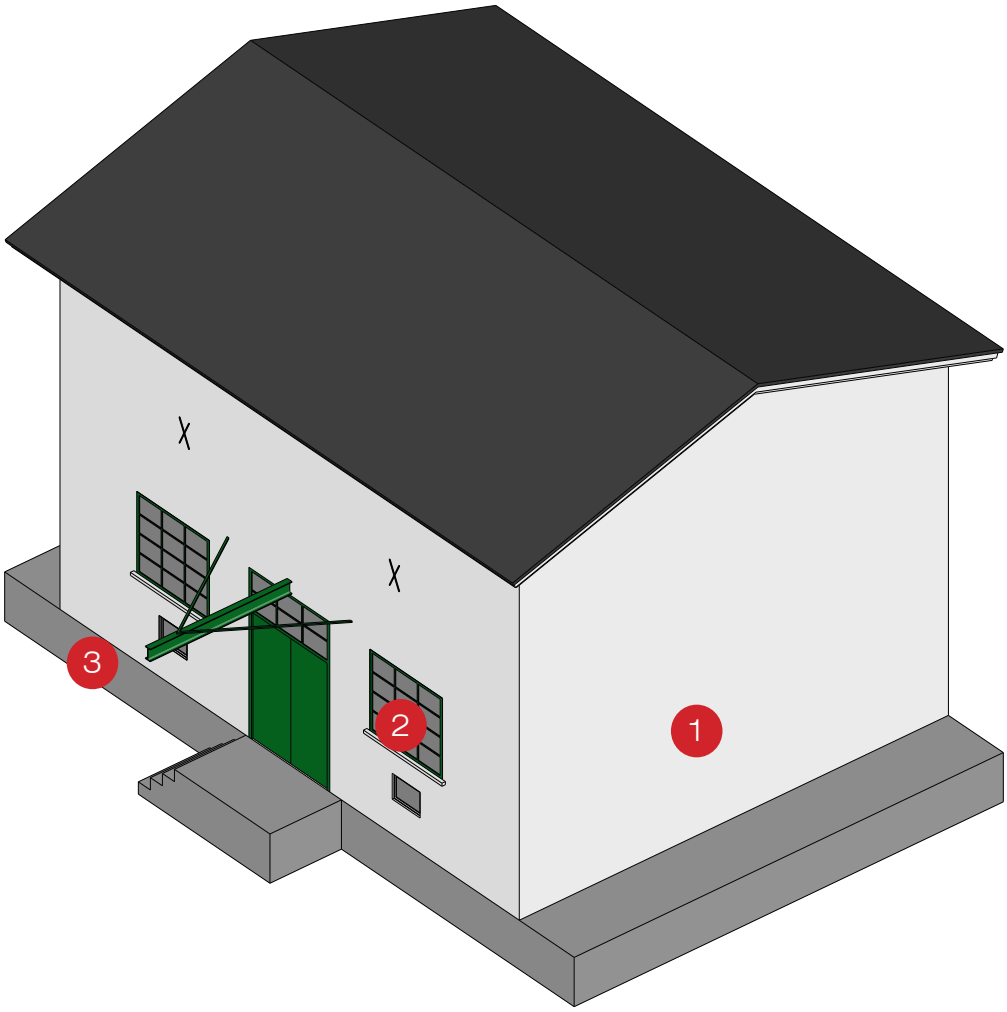
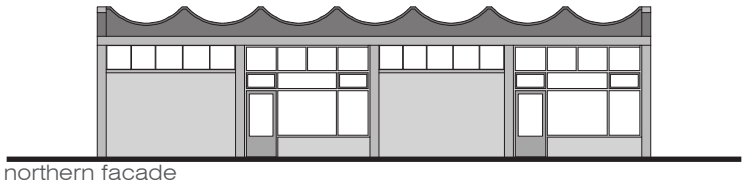
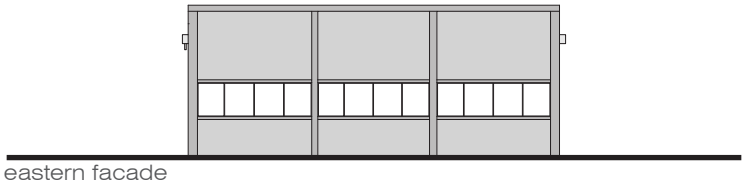


fig. 3.17.03 location of photos taken

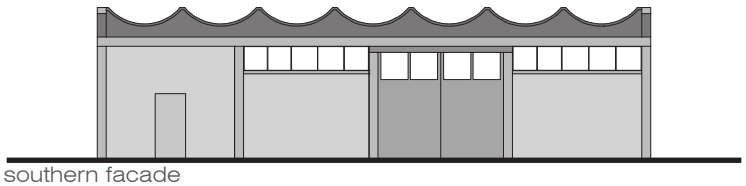
3.18 Lorriegarage (433)



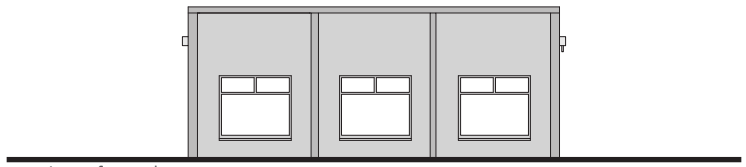
northern facade



eastern facade



southern facade



western facade

fig. 3.18.01 facades of the Lorriegarage (1:250)

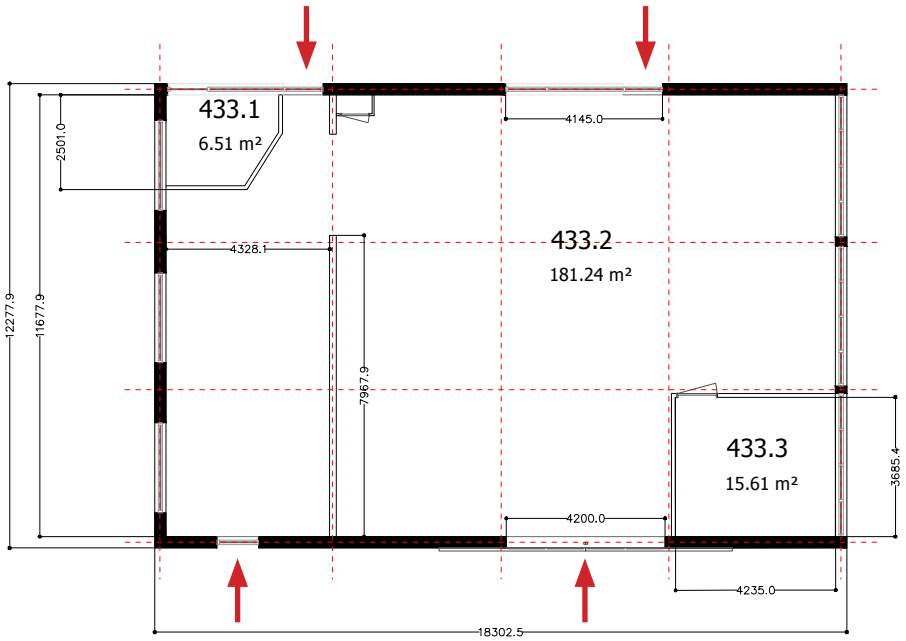


fig. 3.18.02 floorplan of the Lorriegarage (1:200)

Info

Building number:	433
Adress:	Hemkade 24A 1506 PR Zaandam
Monument:	No
Monument number:	-
Former function:	Repair facility for the Lorrie wagons
Building period:	1961 / fourth phase
Total m²	approx. 225

Characteristics

Since the early days, the infrastructure Hembrug site was equipped with narrow-gauge railways, of which none are visible today. Building 433 served as a place to repair the wagons that were used to transport materials over the railway system. (via SteenhuisMeurs 2010 p.25)

Being the newest building of the site, it has a different typology than most of the other buildings on the ensemble. The shell roofs can be seen in ensembles parts of the Hembrug terrain like the 'Plofbos' and 'Cape South'. Also, the brick bonding is one that is become one of the present-day standards: the stretcher bond. Also, the foundation and the construction are executed out of concrete elements. Here the brickwork in the facade does not have a loadbearing function, unlike some of the other buildings of the ensemble.

3.19 Lorriegarage Construction

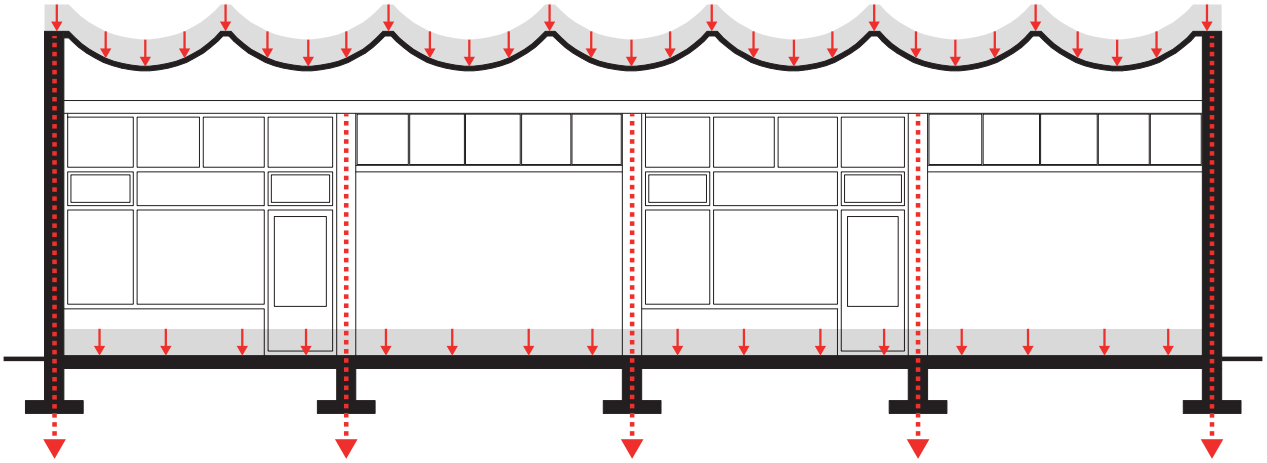
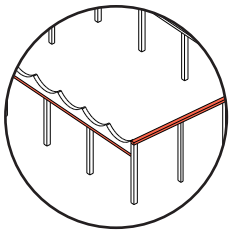


fig. 3.19.01 section A: distribution of forces (1:100)



concrete columns and beams

Stability

The building consists of a concrete frame construction (the only one on the Campus South ensemble) which provides the stability.

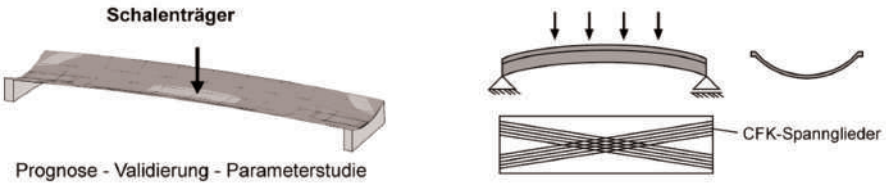


fig. 3.19.02 explanatory drawing of the the roof construction (via IMB)

see appendix p. 143 for a technical drawing of a similar kind of roof construction

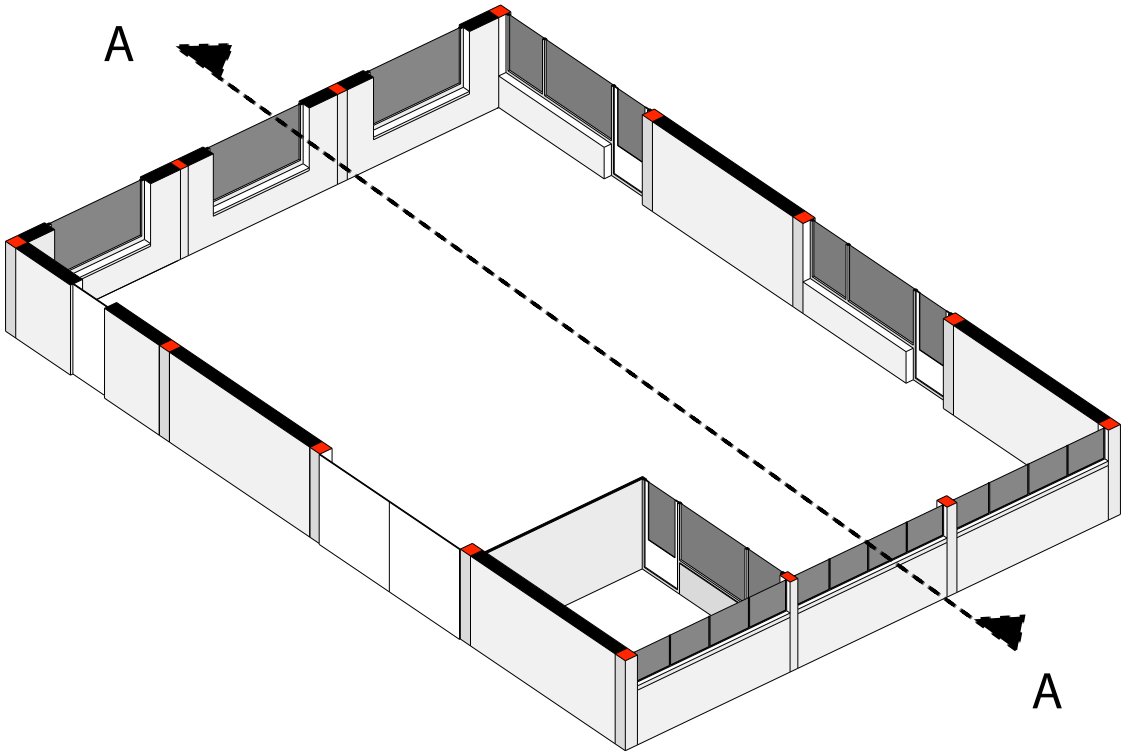
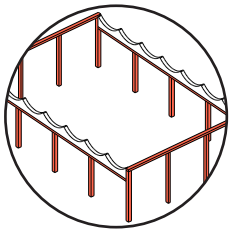


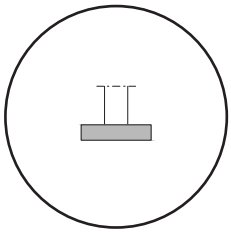
fig. 3.19.03 loadbearing elements in horizontal section



'fundering op staal'

Primary construction

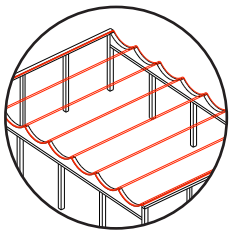
The construction of the former repair facility consists of concrete beams of 300mm (width) by 200mm (height) resting on concrete columns of 300mm by 300mm.



concrete footing foundation

Foundation

The foundation is expected to be a concrete footing foundation, because of its lightweight concrete construction frame and the rather late building period.



concrete shells

Roof

The roof consists of concrete shell elements, which are supported by a concrete construction of columns and beams.

3.20 Lorriegarage Materials

1

brick

2

window(frames)

3

roofconstruction

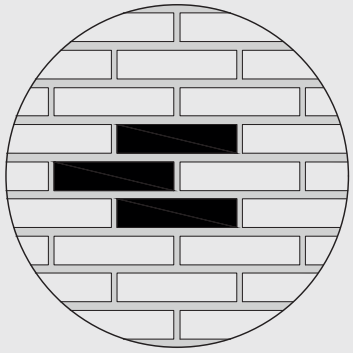


fig. 3.20.01

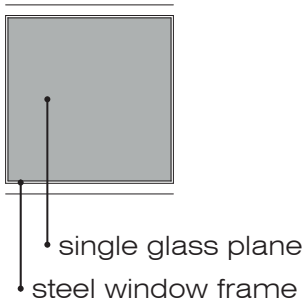


fig. 3.20.02

Brick information:
- ‘Waalmaat’ sized brick (210.100.50mm)
- 1. Stretcher bonding
- ‘Stootvoeg’ (10mm)*
- ‘Lintvoeg’ (15mm)*

* The average width, deviations in the width of the jointing can occur.
The ‘lagenmaat’ and ‘koppenmaat’ are still unknown, but will be measured in the future.

Concrete shell components

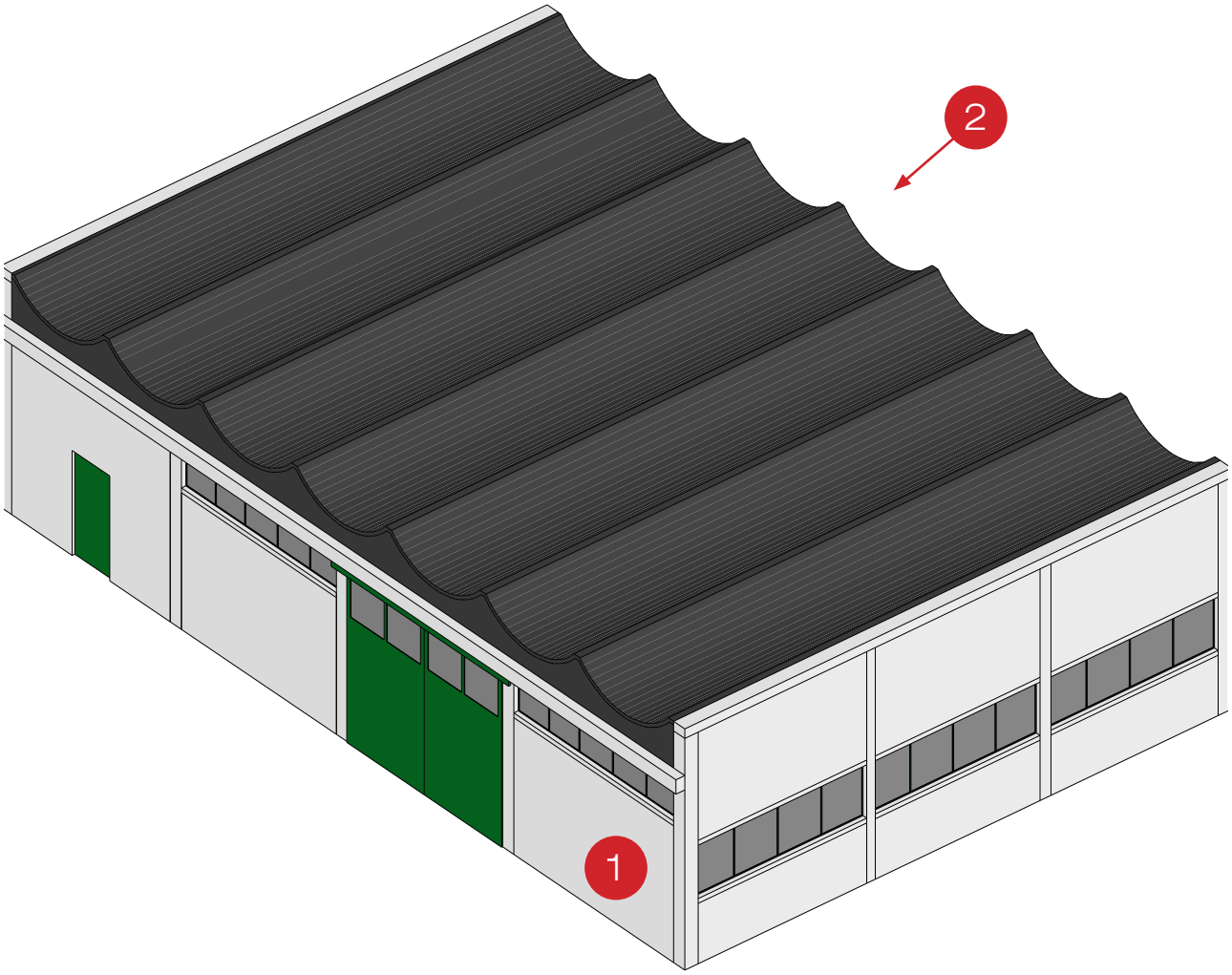
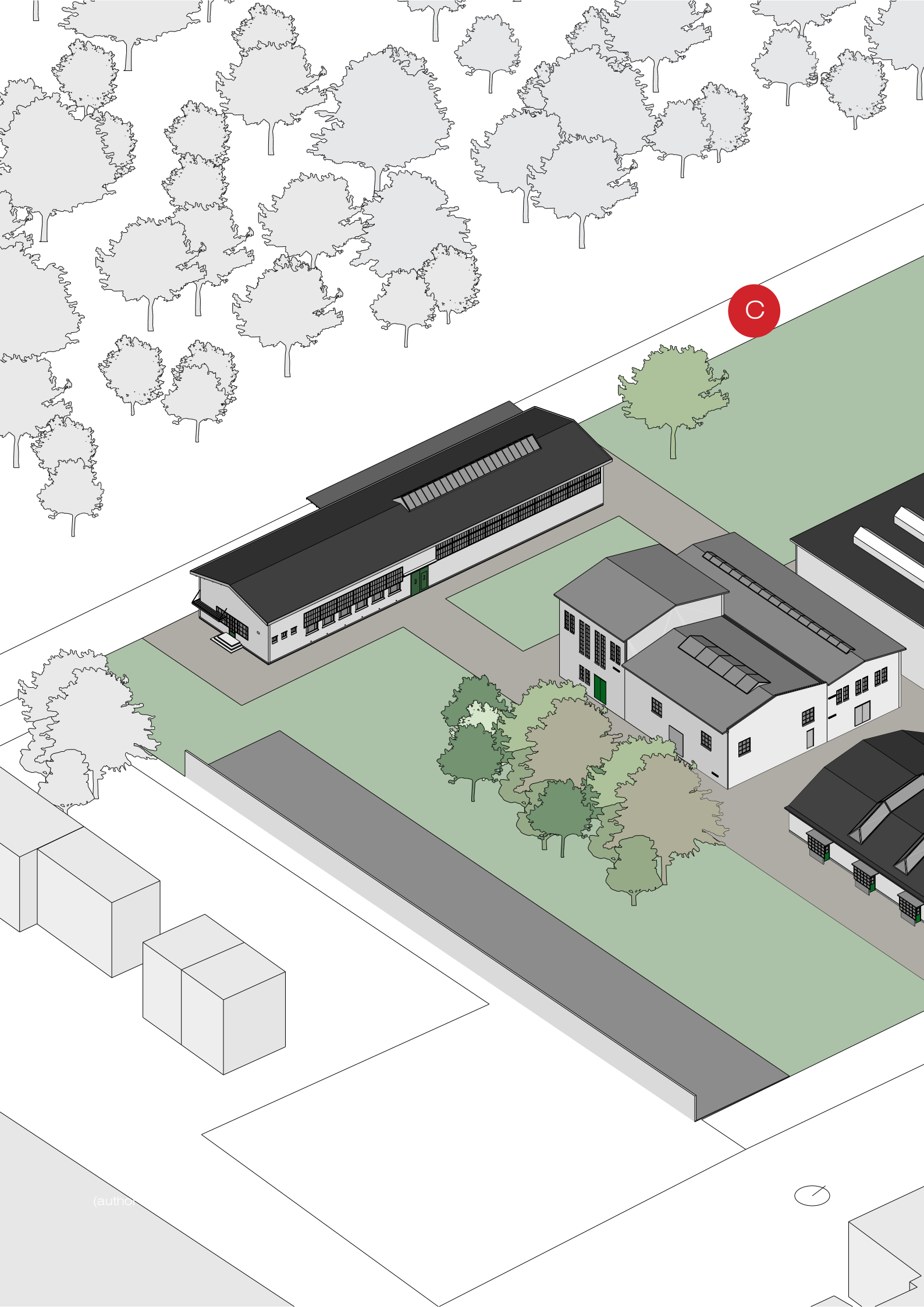
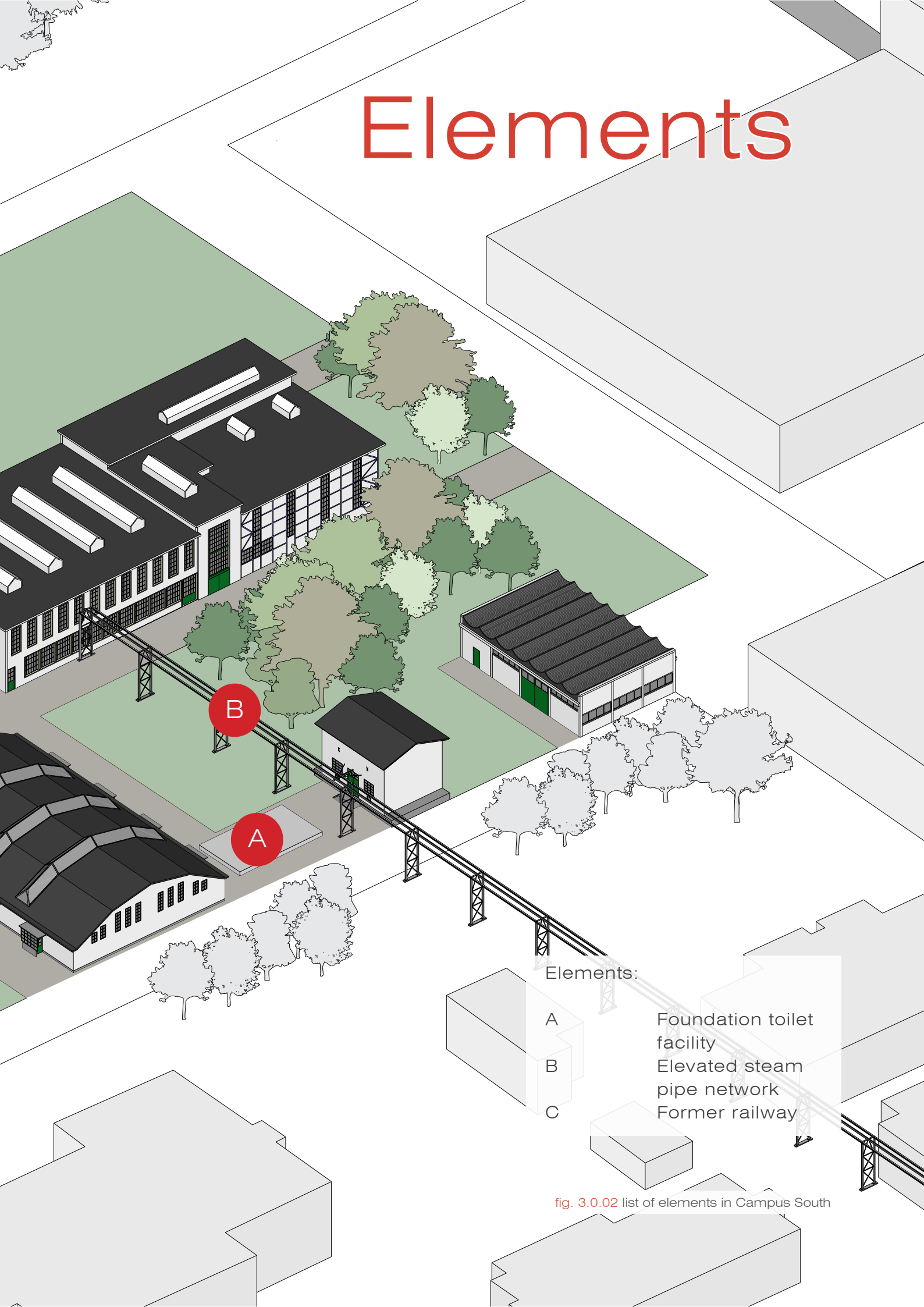


fig. 3.20.03 location of photos taken


C

Elements



Elements:

A	Foundation toilet facility
B	Elevated steam pipe network
C	Former railway

fig. 3.0.02 list of elements in Campus South

3.21 Foundation toilets

Element:	A
Adress:	-
Monument:	-
Monument number:	-
Former function:	Toilet facility
Building period:	?

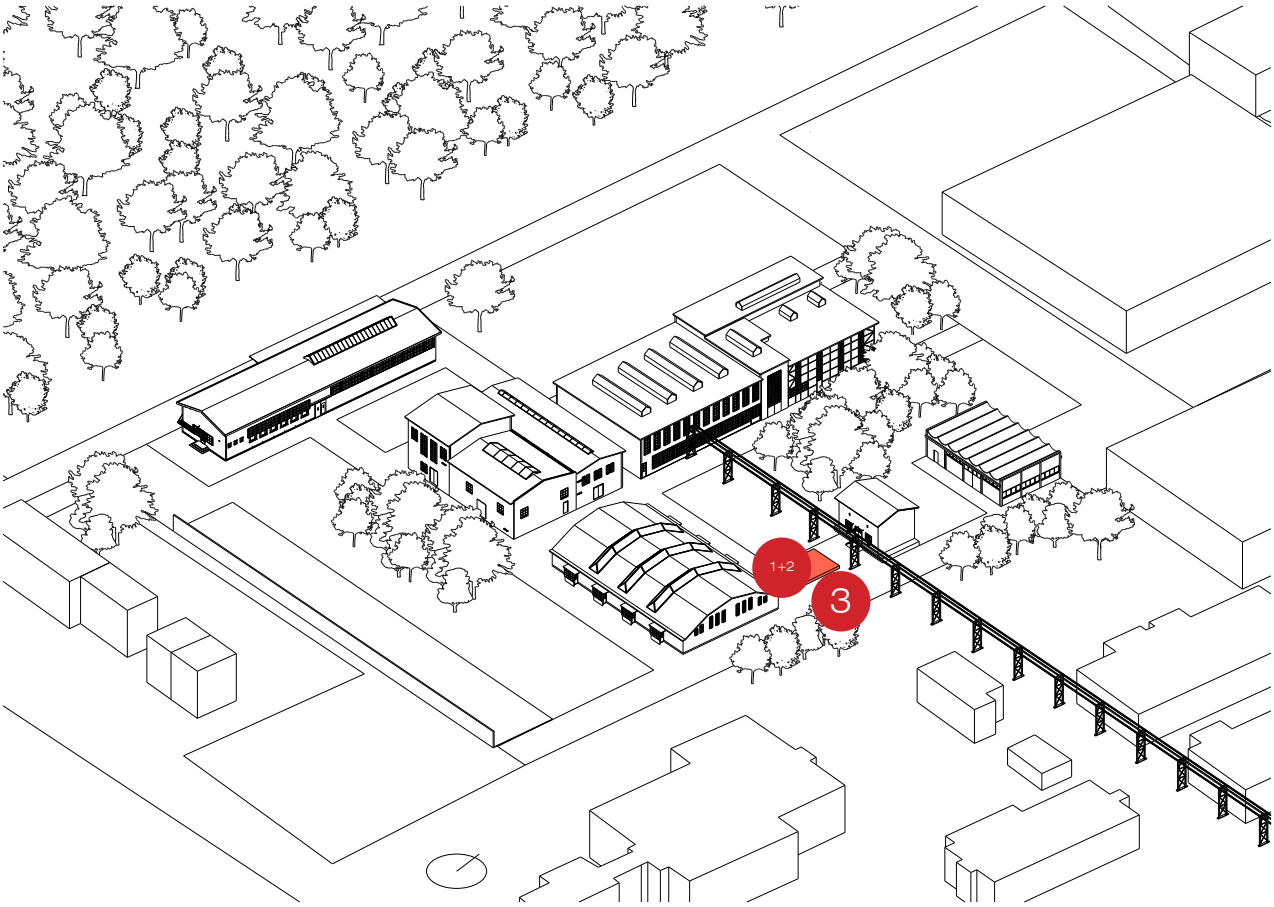


fig. 3.21.01 location of the former toilet facility in Campus South

According to ex-employee Goos Vonk, the toilet facilities at the Hembrug terrain were not included in the terrain's buildings. The toilets were housed in individual buildings spread over the site. Compared to the others these buildings were small. Around 12 toilet units were only closed off with small wooden doors to prevent people from smoking secretly. In the area of Campus South a foundation of one of the toilet buildings has still remained. It is still visible where the drain pipes of the toilets were situated. (Via G. Vonk)

1

fig. 3.21.02 the granite floor finish of the former toilet facility is still visible

2

fig. 3.21.03 foundation of the former toilet facility

3

fig. 3.21.04 the former toilet facility next to the Waslokaal

3.22 Steam pipe network

Element:	B
Adress:	-
Monument:	-
Monument number:	-
Former function:	Steam and compressed air distribution network
Building period:	1940 / third phase

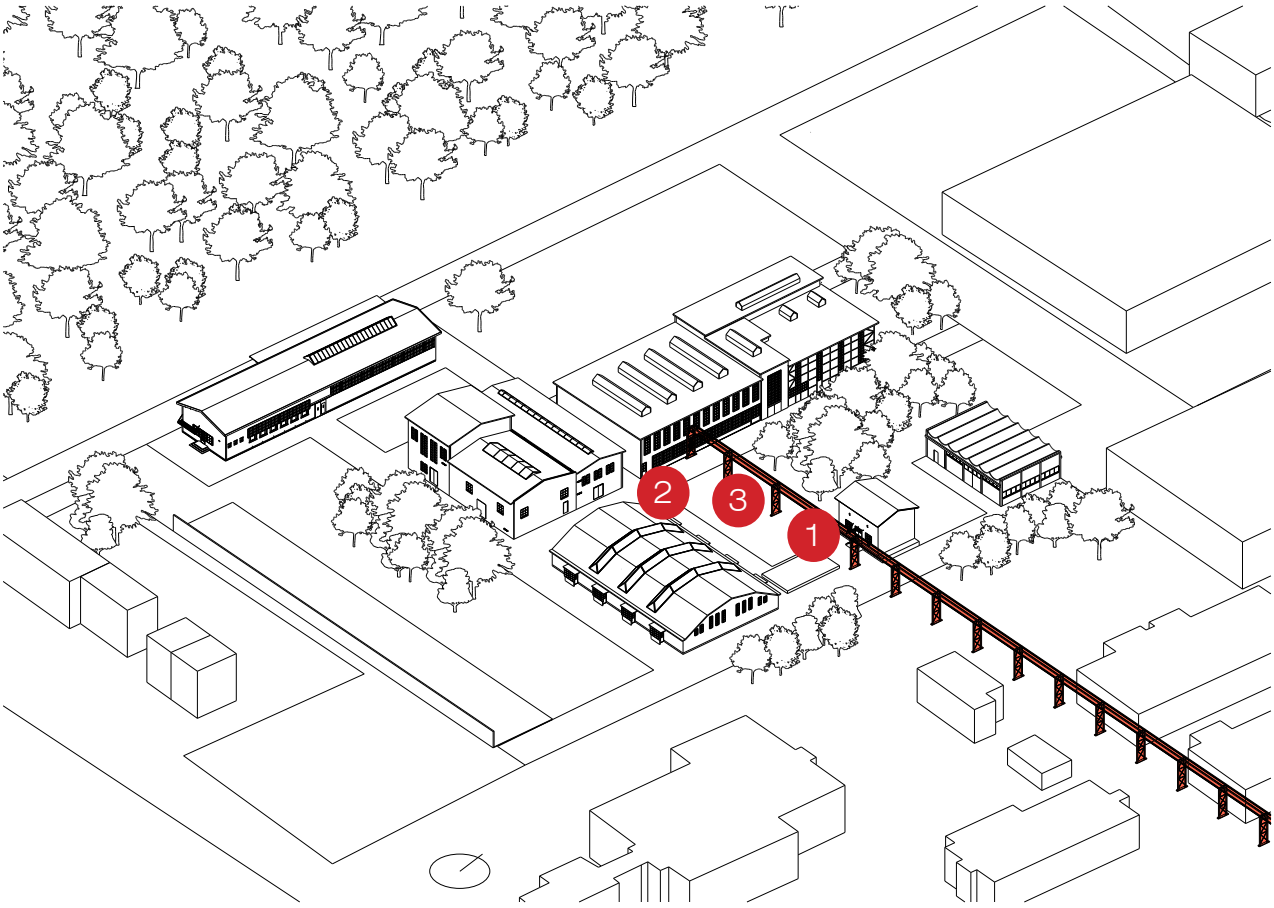


fig. 3.22.01 location of the elevated steam pipe network in Campus South

fig. 3.22.01 elevated steam pipe network

This elevated structure was the former steam heating network of the Hembrug area. It is one of the monumental elements the area possesses. As a result of expanding the factory, the structure was made to ensure safety. Inside some of the buildings, the use of fire was too dangerous. Herefore this aboveground heating system on girder columns was constructed. This element immediately reminds the observer of the former industrial function of the site. In addition, this structure can be seen in more places in the area which shows the cohesion of the terrain. (via SteenhuisMeurs 2010 p.20)

1

fig. 3.22.03 elevated steam pipe network steel construction

2

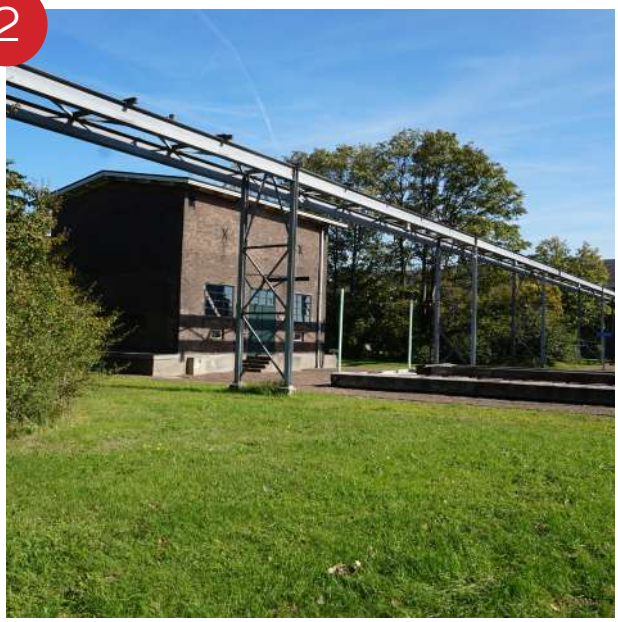


fig. 3.22.04 the steam pipe network is an important axis throughout the Hembrug terrain

3

fig. 3.22.05 elevated pipe network meets the facade of 218

3.23 Former railway

Element:	C
Adress:	-
Monument:	-
Monument number:	-
Former function:	Railway track for the supply of raw materials/goods
Building period:	?

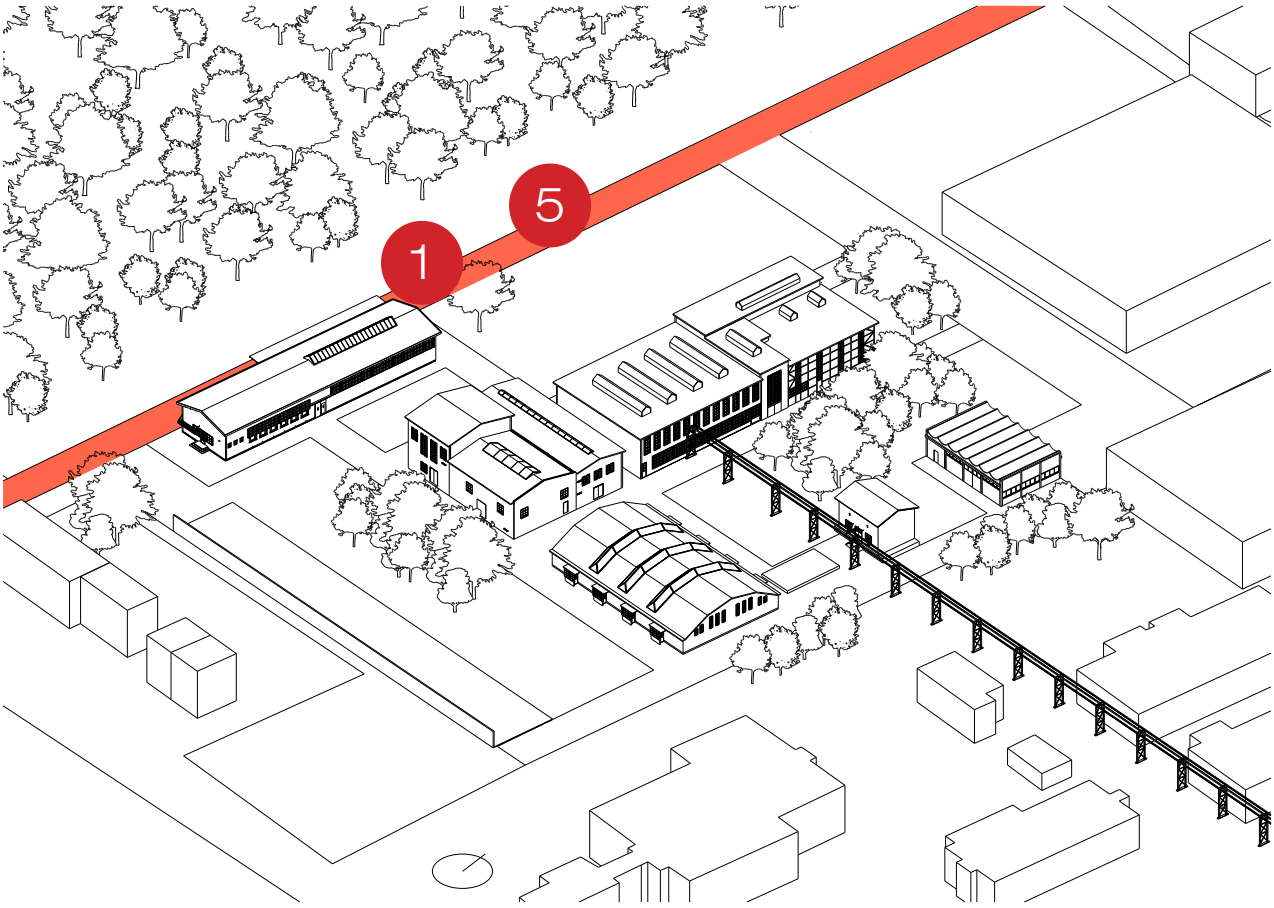


fig. 3.23.01 location of the former rail track in Campus South

fig. 3.23.02, fig. 3.23.03 old train wagon is a remembrance of the former railway track and former function of the Overlsagloods.

fig. 3.23.04

fig. 3.23.05

fig. 3.23.06 former railway track (het verloren spoor)

Chapter 3 Conclusion

"What are the unifying and deviating characteristics of the different buildings in Campus South?"

Although the buildings on Campus South have different typologies, there are some striking similarities. Firstly, all of the facades are erected in brick, often characterized by the cross bonding. This bonding can be seen in most of the (older) buildings on the site, like the Harderij, Ketelcentrale, Waslokaal, Overslagloods, and Carbidgebouw.
Although the Harderij and Ketelcentrale have been expanded over the years, one is able to identify the oldest parts by recognizing the cross bonding.
Another unifying aspect is the vast amounts of interior space, often realized by a steel (roof) construction. An exception is the Waslokaal, which also has a large interior space but is one of the only (preserved) buildings on the Hembrug site with a wooden construction.
Another noticeable similarity is the roof lights, which were applied to lighten up the vast amounts of interior space. The only exception of this rule is the Carbidgebouw.

Furthermore, and perhaps one of the most recognizable elements, the rectangular window frames. These frames are mostly made of steel, With again the Waslokaal (partially) serves as an exception, where the frames are made out of casted concrete. However, the frames of portals in the Waslokaal are executed in steel.
Lastly, the roofings of the former factory buildings in the Cape South ensemble are mostly pitched roofs, with the Ketelcentrale (flat roofing) and the Lorriegarage (shell roofing) as the exceptions.

"Are there still traces of history and/or historical use to be found in the buildings or elements at Campus South?"

Harderij
• pieces of evidence of the expansion can be seen in the different brick bondings, the inner front facade with its operable windows and white paint marking the former roofline.
• remnants of the former crane system.

Ketelcentrale
• pieces of evidence of the expansion can be seen in the different brick bondings.

Waslokaal
• the portals remind of the former function, the building had to host as many workers at the time as possible while maintaining a good logistic flow.
• the sinks that are still present inside the building remind one of the function and the Waslokaal's interior composition.

Overslagloods
• the canopy and sliding doors remind one of the building's former function as station and warehouse for raw materials that were brought in by train.

The toilet facility
• the granite floor still shows the former function as a sanitary building.

The train wagon
• reminds of the former railway and function of the Overslagloods.

Chapter 4
Cultural value

4.1 CV Matrix

	age value	historical value	intentional commemorative value	non intentional commemorative value
surroundings / settings		Former militairy production area		Memories important factor in the defence of the Netherlands Commual relationship between ensembles
site	Most of the buildings were in the third phase of the area's development	The ensemble's role as a distributor	Train represents former use of the former station (project building) The road on the place of the former railway track is now called 'het verloren spoor'	Ensemble represents most essential part of the area
skin (exterior)	Buildings from different phases identifiable by the brick bonding	Brick facades with steel doors and window frames. Windows have a small glass division	The holes in the facade of the Harderij are filled in with a different brick color	Different brick bondings in the Harderij and Ketelcentrale indicate the expansions
structure		Steel structures to create vast interior spaces	The buildings with a steel or wooden construction are older than the concrete one	Waslokaal is one of the only buildings with a wooden construction left on the Hembrug terrain
space plan	the former railway track is the oldest axis on Campus South	Portals in the Waslokaal were important for logistic flow of the employees		
surface (interior)		Former main facade to be recognized inside De Harderij		
services		Elevated steam pipe network finds it origin in Campus South	The Overslagloods serving as a former station / warehouse building	Remaining elements remind of the former function (i.e. washing basins in the Waslokaal)
stuff			The granite floor of the former toilet facility indicates that it was a sanitary building	
spirit of place		Abandoned atmosphere		

use value	new uses value	(relative) art value	rarity art value
The strategic location was of importance for the Dutch militairy to chose the site	Opportunities for companies to settle and for dwellings to be realized	Hembrug has a unique character, that of an old industrial site which still has a cozy village-like atmosphere	Peacefull former industrial area Unique militairy production zone in the Netherlands
Routing of the former employees through the area	The open fields of Campus South can become communal places for people to gather and recreate	The compostion of open fields and buildings squattered over the ensemble	Different typologies of the buildings in Campus South
Skylights to light up the vast interior spaces		Decorative brick bonding in the Overslagloods	
Wooden construction waslokaal	Waslokaal and its structure are renovated		
Large generic spaces without structural elements in the Harderij and Ketelcentrale	The open interior spaces give freedom for implementing future functions	Transparent roof in the Harderij to emphasize the spatiality	
Remains of an old crane system in the Harderij	Preservation of the character is possible, even when implementing a new function	Ceramic tiles and paint finishes are still visible inside the Harderij	
Presence of the a toilet facility Presence of a washing building	Position at a possible new entrance at the Hemkade, and also close to the present-day main entrance	Cohesion in facade material and color	
Ceramic tiles in the Harderij were probably used to make cleaning easier			
Vacant plots create public gathering places			

For the (color) legend, see page 104.


































4.2 Cultural Value explanation

The value of a significant building, space, component or any other element on the Campus South ensemble has been put in the Cultural Value Matrix. These elements are assessed by means of the following color codes:

Low value

Average value

High value

The value is decided upon with the following factors in mind:

- Being of (great) importance for recognizing the former function and/or activities that took place within this building or area;
- Importance for preserving the local character of Campus South;
- Importance for preserving the character of the Hembrug terrain;
- Being suited for a new future function and use.

Levels of significance

The artifacts on the Campus South ensemble can have value for various reasons. Therefore, it is important to group the artifacts of value according to their identified features. The qualities chosen derive from M.Kuipers' book Designing from Heritage, which has been a guideline in valuing the artifacts on the Campus South ensemble. The qualities in which these artifacts are subdivided are the following:

- Historical
- Spatial
- Social
- Architectural

On the next page each quality with the corresponding artifact(s) can be found, including a short elaboration and its related Heritage Value rating (Low, Average or High).

Scale level: ensemble & fabric

Historical

Important axes of use (intangible features)

High value
- Railway track: Marks the position of the former railway, and also gives an indication of the location of the first Hembrug / train wagon

High value
- Steam pipe network: Finds its way along the main axis of the site and was important for the production process. Also shows how most of the former factories where positioned adjacent to this main axis.

Avarage value
- Entrance of the ensemble via the Hemkade for bikers: Shows the logistic flow of workers back in the days. The routing from the bike storage to the Waslokaal is also a part of the routing.

Other traces of use (tangible features)

High value
- Steam pipe network: A trace of the former distributing function that Campus South had, also contributes to the industrial character.

Avarage value
- Train wagon: A trace of the former distributing function that Campus South had, also gives a hint for the location of the former railway track.

High value
- Portals Waslokaal: Shows that the building had to host a lot of workers at once, the four entrances on both sides ensured maximum efficiency for the workers to be on time.

Low value
- Sinks Waslokaal: Remembrance of the former function, also the pavement in the Waslokaal indicates the former interior composition. The three sinks that are still present today help to form a better understanding of what the interior looked like and how it functioned back in the day.

Avarage value
- Presence of the bike storage: Important for understanding the routing of the workforces via the Hemkade, and also gives a clear understanding of the location of the former entrance.

Low value
- Foundation toilet facility: Gives a bit more understanding of how the logistics worked back in the day, the Waslokaal itself did not have any toilets, the workforces needed to go to this separate facility just next to the Waslokaal. Also, the material that covers the floor of the toilet facility appears to be the same as that of the sinks in the Waslokaal, which indicates that this finishing was probably used for most sanitary facilities.

Avarage value
- Pavement: The concrete “Stelcon” pavement reminds of the former industrial function, and also marks the primary infrastructure. The brick pavement however, has more of a cozy/warm character. This difference also contributes to the village-like atmosphere in Campus South.

Spatial

High value
- Open fields: In between and around the buildings make them look scattered around the ensemble. This composition contributes to the character of Campus South, where the lack of density and the presence of green form a counterweight against the rough industrial character of the buildings and other elements. Also, a trace of past demolishment, open plots used to be building plots.

Social

High value
- Open fields: Form communal gathering spaces / spaces suitable for events like markets etc.

Architectural

High value
- Brick facades: All building facades are executed out of brick which has a unifying quality.

High value
- Steel window frames: Almost all the buildings' window frames are executed out of steel which has a unifying quality.

High value
- Skylights: Lighten up the interior space and make for a specific incidence of light (intangible feature). They also contribute to the industrial character, for most industrial-type buildings of that time had skylights.

Avarage value
- Big interior volumes: Is a characteristic of industrial buildings, these big and open interior spaces should therefore be treated with care.

High value
- Steel (roof) construction: Is a characteristic of industrial buildings, should be left in sight as much as possible.

High value
- Different typologies of the buildings: Makes it quite unique on the Hembrug terrain.

Avarage value
- Shape: All buildings have rectangular floor plans, which is an occurring trend on the Hembrug terrain.

Avarage value
- Color: The dominant color on the outside of the buildings is that of the brown bricks, with dark green accents given by the steel (window) frames. The roofs are mostly covered in a dark gray layer of tar on the outside.

Views

Low value
- The small alley between the Harderij and Ketelcentrale is the only real cut through the middle of the ensemble and offers a line of sight from the lost railway track into the Hembrug area and the other way around.

Indifferent features

Indifferent
- "The border" (as described in chapter …) splits the ensemble in two. Consequentially it makes clear that there's a unifying element missing for all the different buildings in the ensemble to work and coexist together in the future.

Indifferent
- The trees that are present on the ensemble have no significance because they are a result of a lack of maintenance. The latter is not including one oak tree close to the Harderij and Waslokaal because of its monumental status.

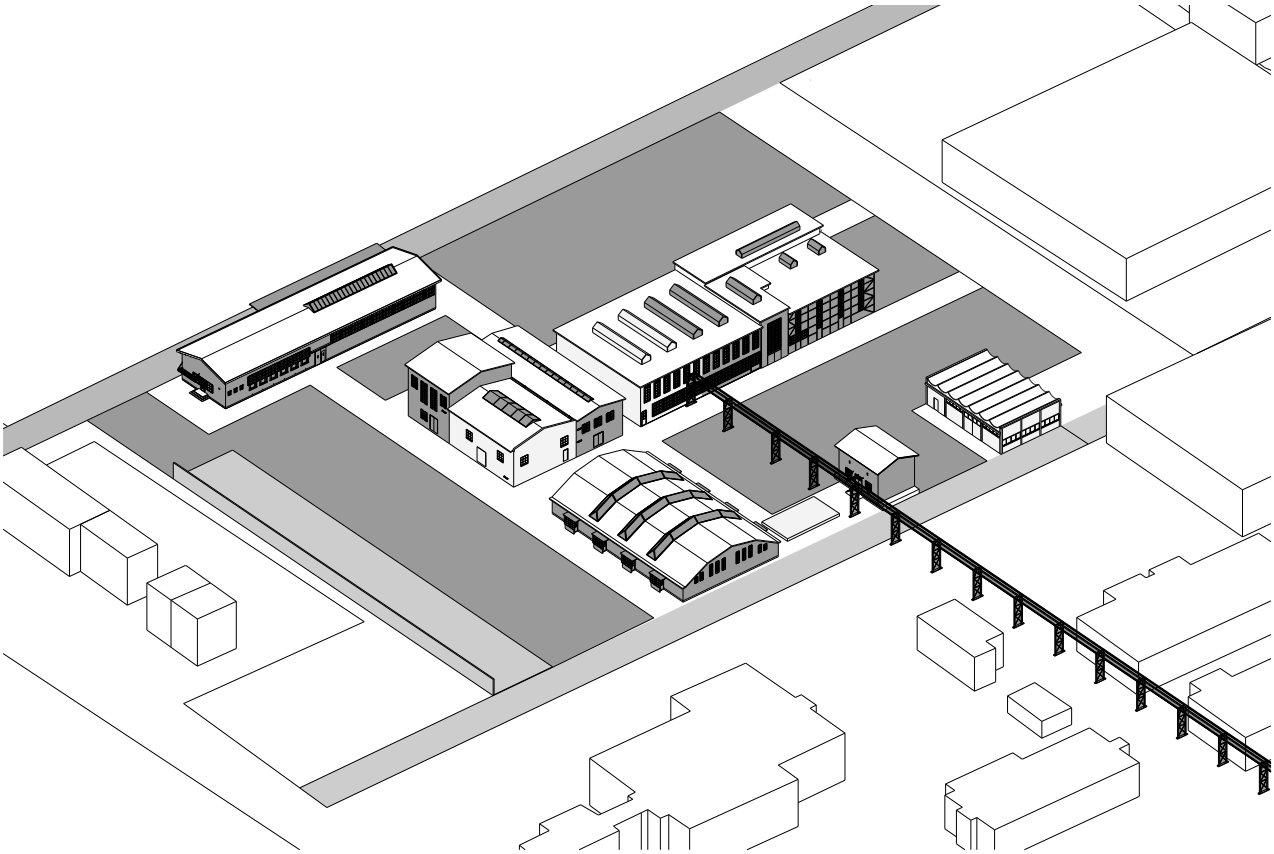


fig. 4.2.01 Cultural Value color indication

Scale level: buildings & elements

The previous table covers the pieces of heritage from the overall scale of the ensemble, in the tables and figures below the (parts of the) individual buildings and elements will be rated and elaborated.

Harderij

High value	• 3 different volumes: proof of expansion and growth of the Hembrug terrain.
Avarage value	• Interior facade: proof of expansion and growth of the Hembrug terrain.
Avarage value	• (Visibility of) roof construction.
Low value	• Gamble roof, made out of transparent corrugated sheet.
High value	• Skylights, for they enhance the industrial character.
Avarage value	• Openness of the interior volume, except for the highest building volume, because this one had an entresol. (see fig 4.2.01)
High value	• Steel window frames.
High value	• Brickwork. Except the brickwork on the outer facades of the oldest volume, for this brick is added in a later stage and has a different bonding and color. (see fig 4.2.02)

fig. 4.2.02 old floor construction of the entresol

fig. 4.2.03 new brick wall (left) against the original plastered brick wall of the first building volume of the harderij

Ketelcentrale

High value
- 3 Different volumes, proof of expansion and growth of the Hembrug terrain. The newest building volume has low value because of the fact that it is a later addition in the same style. (see fig 4.2.03)

High value
- Steel trusses in the roof construction, as it enhances the industrial character.

High value
- Skylights, for they enhance the industrial character.

High value
- (Visibility of the) steel frame construction, as it enhances the industrial character.

Avarage value
- Openness of the interior volume.

Low value
- Flat roof: composed out of concrete panels like most of the buildings on the Hembrug terrain.

High value
- Steel window frames, because it has a unifying quality.

High value
- Brickwork. Also the difference between brick color and bonding in the different building volumes as a trace of expansion. Except the brickwork on the outer facades of the oldest volume, for this brick is added in a later stage and is a mere copy of the other volume (it also has a different color). (see fig 4.2.04)

fig. 4.2.04 newest building volume only differs in the color of the brick

fig. 4.2.05 newest building volume only differs in the color of the brick

Waslokaal

Avarage value • Grid of columns.
Avarage value • Placing of old sinks and drainage visible in tiles.
High value • Wooden construction.
High value • Skylights: running along the width of the building and following its roofshape, making them unique on the Hembrug terrain.
Low value • Tiles on the floor as a remembrance of the former interior composition, like the placement of the sinks a sewage.
Avarage value • Openness of the interior volume.
High value • Portals: as a remembrance of the former use and logistical flow of the workforces.
High value • Brickwork, because it has a unifying quality.
Avarage value • Concrete frame windows, exception in the ensemble.
High value • The gambrel roof shape is the only one on the Hembrug terrain.

Overslagloods

High value • Visibility of the steel portals: as it enhances the industrial character.
High value • Skylight, for it enhances the industrial character.
Avarage value • The openness of the interior volume.
High value • Canopy, as a remembrance of the former function.
Avarage value • Sliding doors as a remembrance of the fact that goods/product were loaded on and off the train.
High value • Steel window frames, because it has a unifying quality.
High value • Brickwork, because it has a unifying quality.
Avarage value • Train wagon in front of the building, as a remembrance of the furmer function as a station/warehouse building.

Carbidgebouw

Low value • Steel construction to support the 1st floor.
Low value • Relatively small interior volume.
High value • Steel window frames, because it has a unifying quality.
High value • Brickwork, because it has a unifying quality.

Lorriegarage

Low value • Grid of concrete columns.
Avarage value • Shell-like roof shape, is the only one on the Campus South ensemble and therefore increases the diversity of building structures.
Avarage value • Concrete frame construction, is the only one on the Campus South ensemble and therefore increases the diversity of building structures.
Low value • Relatively small interior volume.
Low value • Wooden window frames, does not enhance the industrial character nor it has a unifying quality.
Low value • Brickwork, because of the newness of the bricks it does not contribute

Envisioned role of the other ensembles

The map below shows the envisioned role of the other ensembles.
For further explanation see: Chapter 4 Position statement.

1 cathedral

commercial & education

2 plots in the wood

low density resedential

3 waterfront

HOTEL

hotel & tourism

4 ladder

commercial & tourism

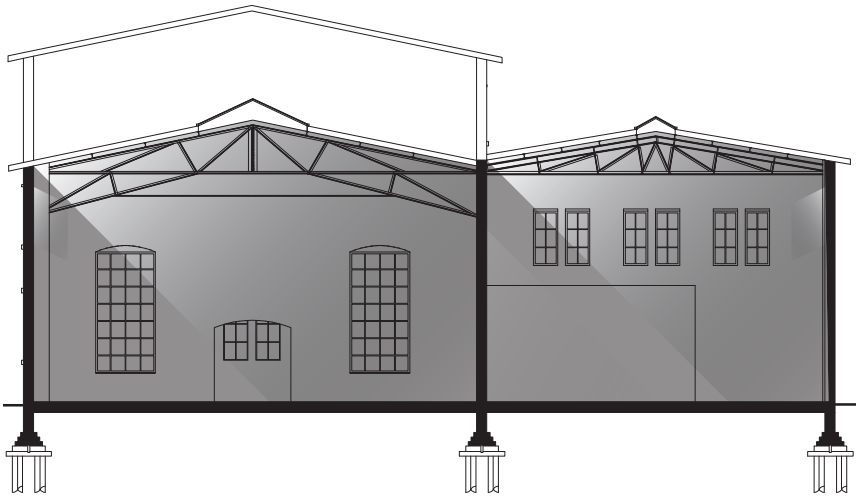
5 cape north

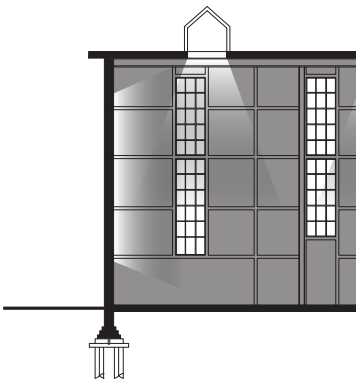
restaurant & tourism

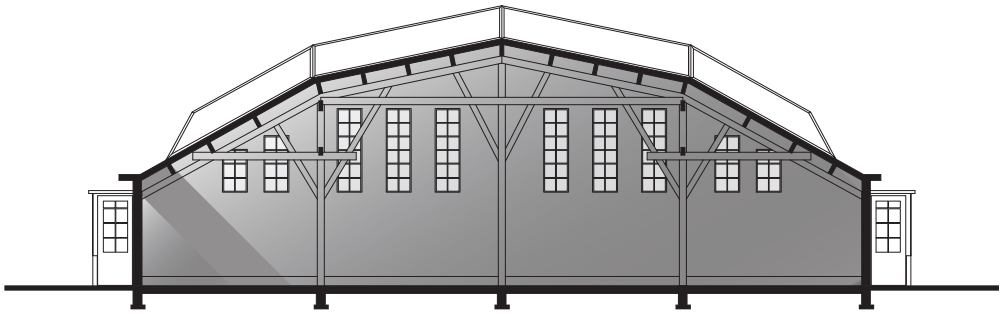
6 cape south

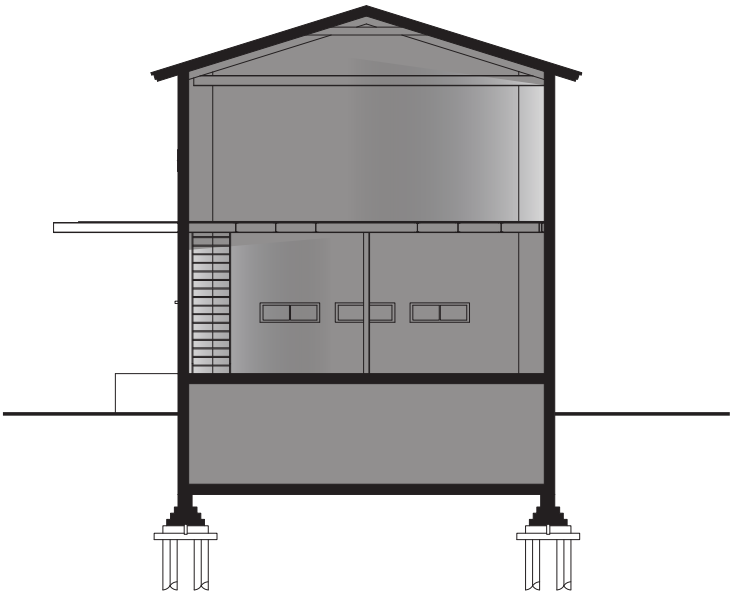
gardens & artists

fig. 4.2.06 envisioned role for the other ensembles









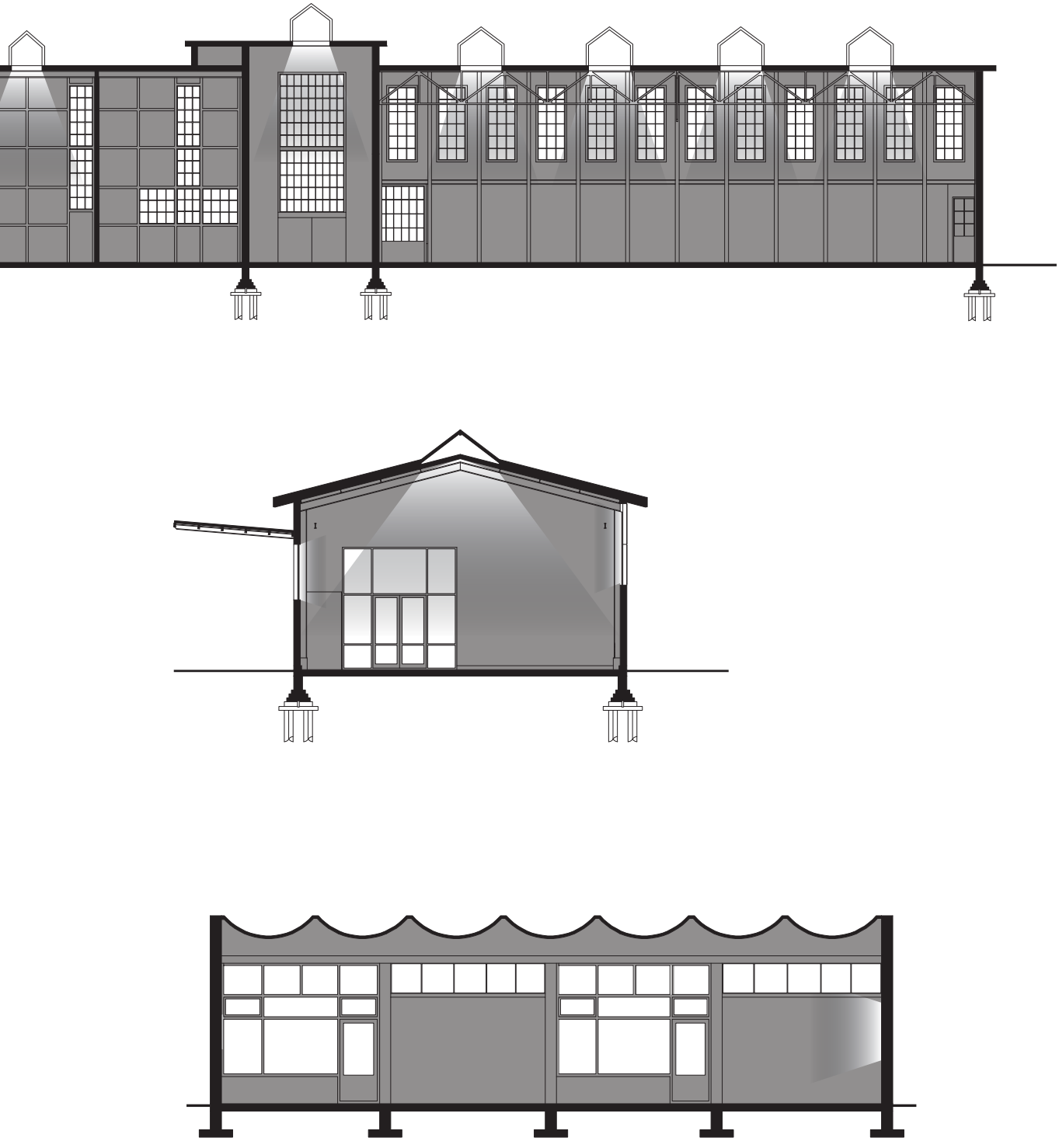


fig. 4.2.07 incidence of light in the Campus South buildings

Chapter 4 Position statement

Traces of former use and the role within the Hembrug terrain are still visible in Campus South today. These traces can be large; for example, in the form of the foundation of the former bike storage. But these artifacts can also be of a subtler nature, like the portals of the Waslokaal. These traces of the former role as a distributor are important and can be a guideline for the future redevelopment of the ensemble, although choices need to be made. For example, the present-day open fields on the ensemble contribute to its character and composition. They are also a remembrance of the period of demolishment within Hembrug. The open fields represent the former building plots and give therefore a good insight into the ensemble's former density. However, buildable land in the Amsterdam region is obviously very valuable from a financial perspective. Since this area will find itself engulfed by the vastly growing metropolitan area of Amsterdam, such large plots will not come in cheap. Therefore, it is important to find a balance between preserving some of the open areas and making way for new structures. The open plots have a social quality as they can serve as communal gathering- and recreational areas, which also make them valuable from a social perspective. Since the built surface on Campus South is only about 20%, it is quite obvious that there is room for new structures on some of these plots, as long as there remains an open communal area for the future users of this ensemble.
Also, important axes and viewing lines like the former railway track, the entrance at the Hemkade and the one of the elevated steam pipe network need to be preserved, as they are pieces of remembrance of the former function and traces of past logistical flow.

Such kind of decision making doesn't only apply to the larger scale, also on the scales of the buildings and other artifacts such choices need to be made. One of the qualities of the Campus South ensemble is the mix of typologies, which can be recognized in the buildings' heights, roof shape and mere volume among other things. It is important for retaining this quality to maintain this diversity, but only if the building contributes to this monumental industrial character. For instance, the Lorriegarage, which contributes to the diversity within the ensemble, lacks the unifying industrial quality. It is built in a later stage and the newness of the materials make it indifferent in this perspective.
When removing the Lorriegarage the Campus South ensemble will lose a typology, which gives the opportunity for the new structures to add new typologies on the site. The latter also forms a dilemma: adding new typologies for the sake of diversity can have a dramatic

impact on the authentic industrial quality of the site. Thus, the new structures should serve to enhance the present-day industrial character while also going along with the trend of diversity on the ensemble. This also implies limitations and rules for these new structures, such as limitations in building height, and of course retaining a certain percentage of the open fields.
Also, adding new structures does not mean that the existing ones cannot be touched. There is the warning to not make an intervention for the sake of making an intervention, it should always contribute to the qualities of the Campus South ensemble and help the area to fit in its future suit. For instance, the newest building volume of the Ketelcentrale is a mere repetition of its predecessor and is therefore of low value. Removing or lifting this volume will also create a continuation of the main axis and will seize the problem of the split ensemble. With making such a passage through the center of the terrain, thus prolonging the main axis of Hembrug (the Middenweg), there will be a new connection from the lost railway track into the Hembrug terrain. Because of the increase in activity in the future, an increasing amount of people will visit the site via public transport. Whether it be the ferry, bus or the future metro line. For visitors entering the site via these spots, and due to its location close to the Hemkade and the current main entrance, the Campus South ensemble can also function as a new passageway to the rest of the Hembrug terrain.
Returning to the topic of interventions of the existing fabric, it is of importance to decide in what way to react upon the existing structures in a consistent manner. The latter entails a consistent choice of material, shape, and/or height. Whether or not the new building volumes are seeking to create contrast or chose to create a harmonious entity needs to be discussed. Because of the existing time layers (such as the different building volumes in the Harderij and Ketelcentrale), the new structures can be seen as a new time layer. This time layer will herald a new period of Hembrug, one where it will act as an area that facilitates living, working and cultural activities. For this new layer to be distinguishable, there should be a contrast in color or materiality. On the other hand, it is also of importance to seek harmony with the existing in the form of typology, volume, and shape. In other words, not neglecting and erasing the industrial character. For this distinguishable new time layer to work, the current materiality of the existing structures should be maintained as much as possible, for example, the brick and the steel window frames among other things.

Campus South can be a place where the future inhabitants and users of the Hembrug terrain can identify themselves with, a place that where the spirit, character, and remembrance of the past are present with a new twist. The ensemble should aim to be a place for future inhabitants, for the envisioned roles for the other ensembles is more aimed towards tourism, among other things (see fig 4.2.06).
The former distributing function can be reintroduced and converted into future needs, like important public functions. Given the scales of the larger buildings on the ensemble (the Harderij and Ketelcentrale foremost), such a public function would fit as well. Also, the diversity of scales and typologies present can make Campus South a dynamic and vivid working and living environment for the future inhabitants of Hembrug, let's call them 'Hembrugains'.

Chapter 5
Masterplan

5.1 Program

Present-day program

Blue: companies

Yellow: rentable/space for presentations and expositions

Orange: catering

fig. 5.1.01 present-day program of Campus South

Envisioned program

Blue: companies

Yellow: Cultural

Orange: catering

Red: Residential

Purple: Commercial

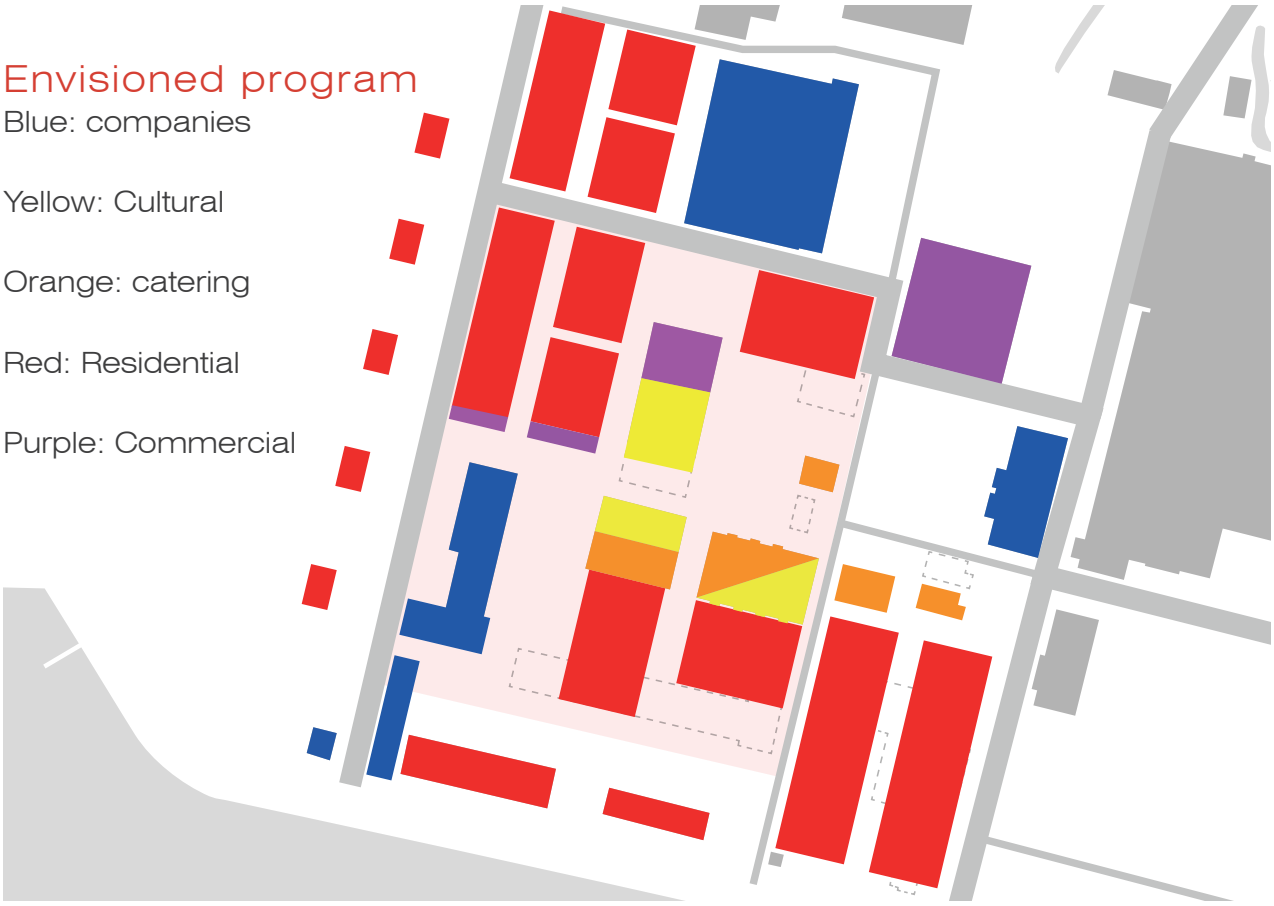


fig. 5.1.02 envisioned program of Campus South

5.2 Connection for Hembrug

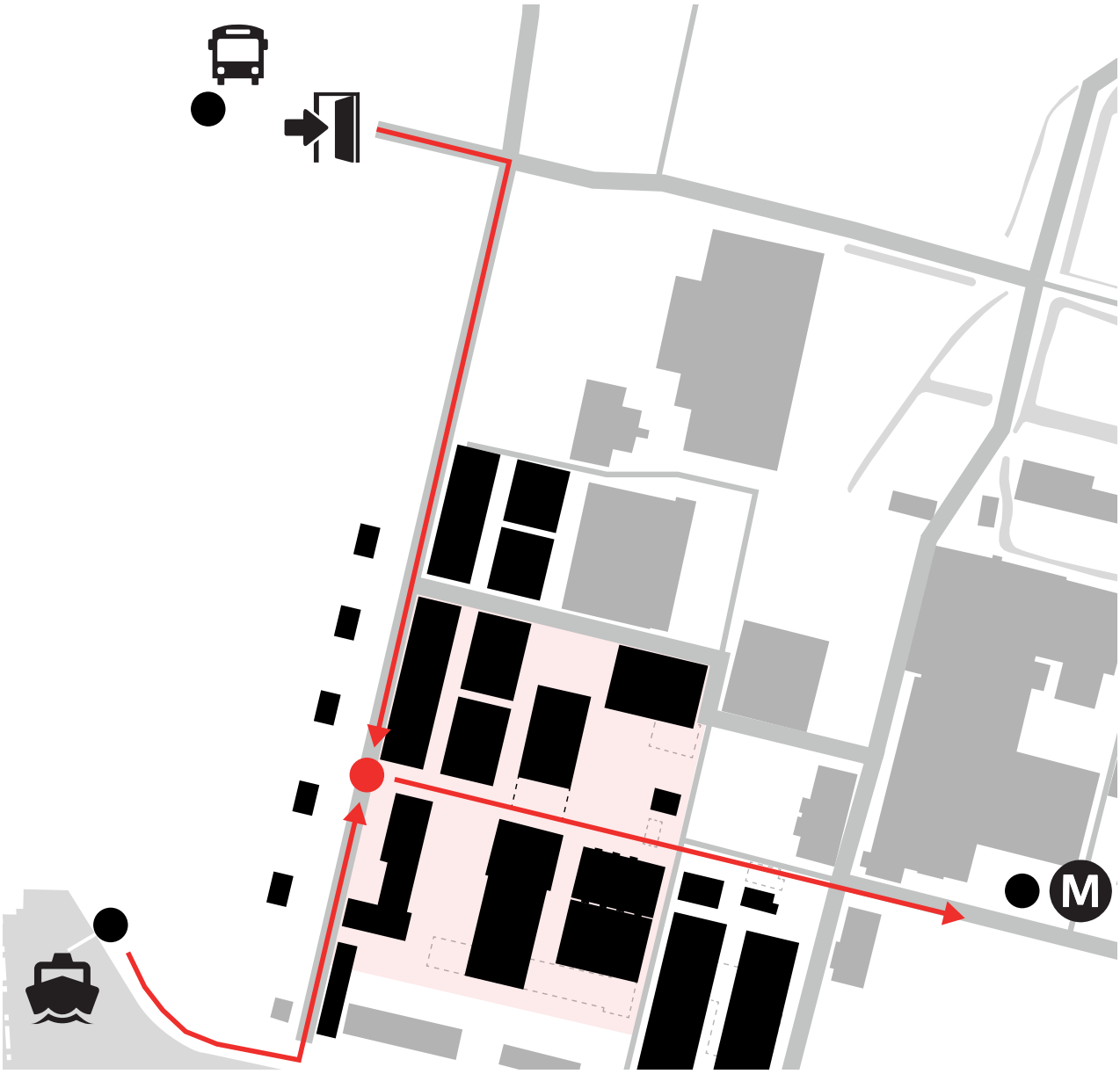


fig. 5.2.01 connector for Hembrug

5.3 Flow through Campus South

fig. 5.3.01 envisioned logistical flow Campus South

5.4 Open fields

Present-day

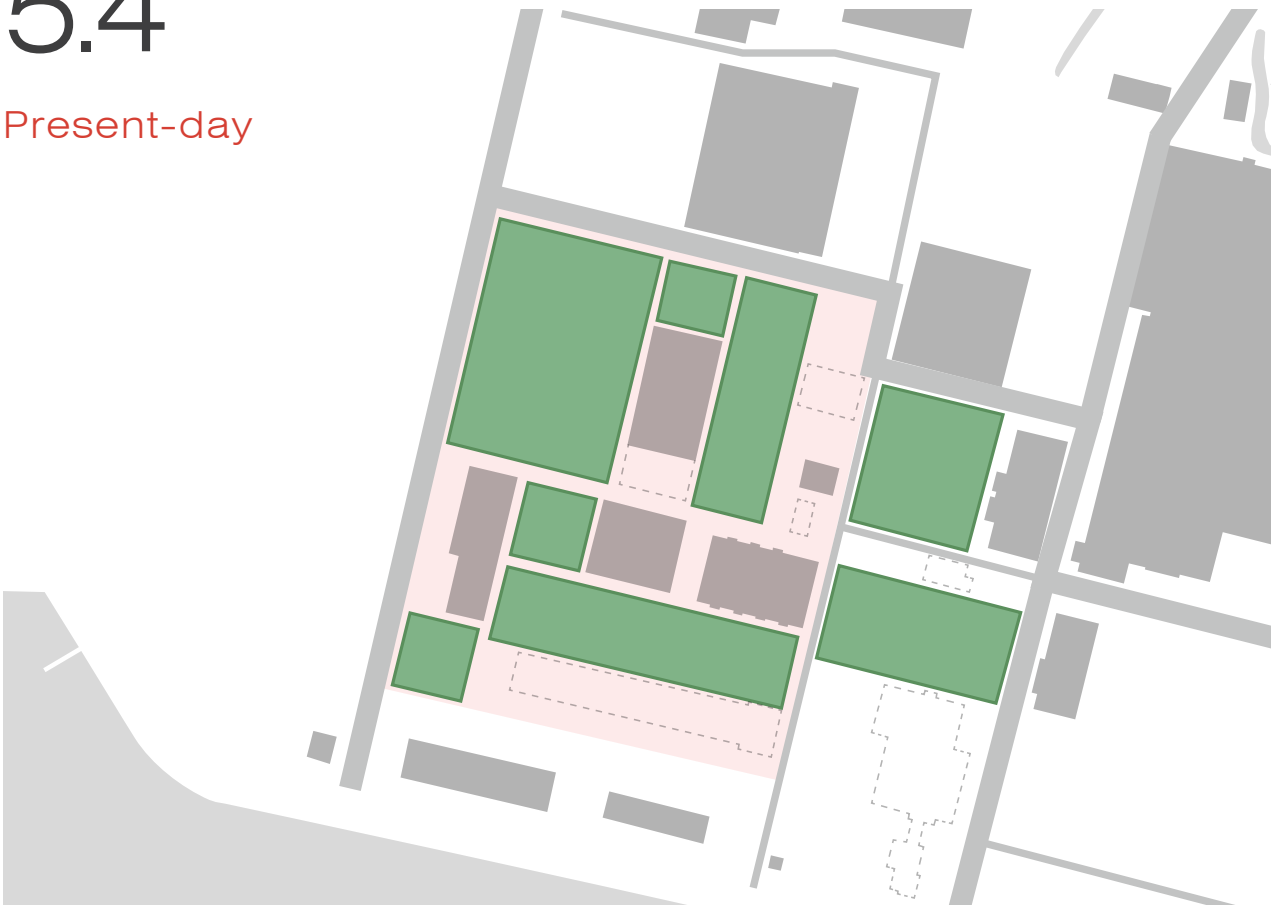


fig. 5.4.01 present-day open fields

Envisioned

fig. 5.4.02 envisioned open fields

Chapter 6
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Chapter 7
Appendix

1672
The Netherlands were under attfack

1679
Dutch guns and ammunition factories in Delft were established

1865
Start digging Northsea Canal

1872
Opening Northsea Canal

1875
Start of the first bridge crossing the Northsea Canal

1879
200th aniversary is celebrated in Delft

1880-1914
Start establishment 'Stelling van Amsterdam'

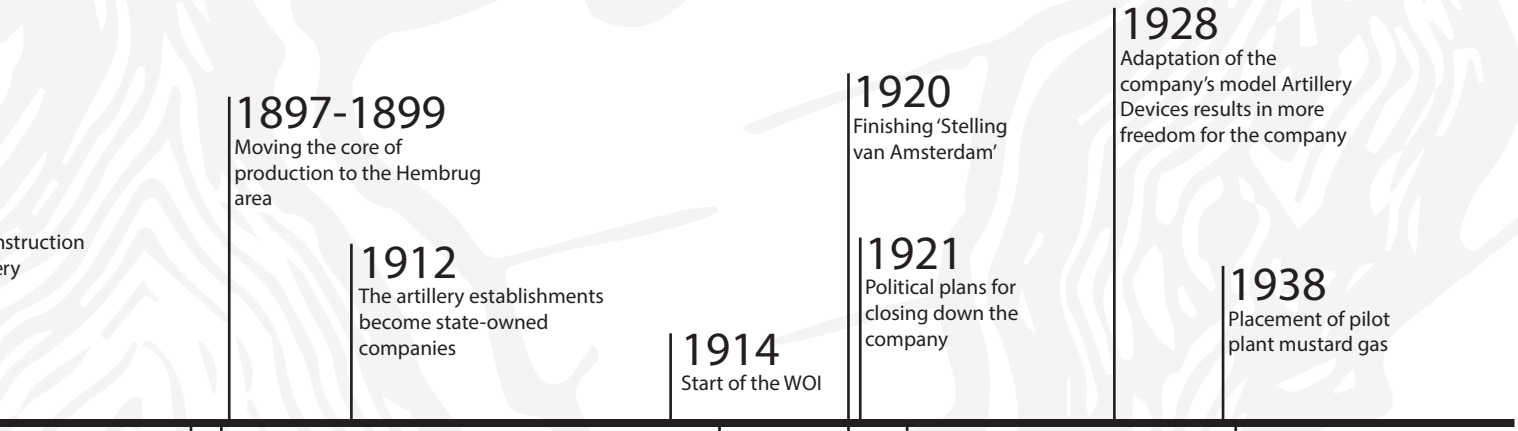
1887
Reorganization: 'cor
sites' become 'artille
establishments'

1889
Introduction o
weapon (M95,
the 'Hembrug
armies of The
the Dutch-Indi

1890
The 'Hem area
storage facilit
and sand. At t
area was alrea
occupied with
warehouse fo

1895*
For the internal design of the area continuity and safety were essential. Modern services were taken care of by constructing a networks for electricity, a gaspipes and waterpipes.

fig. 7.01 timeline events Hembrug



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a' was used as a
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his time, the
ady partly
n an coal
r the navy

f a new type of
also known as
gun') for the the
Netherlands and
ies

1907
Construction of the new bridge

1914
Start of WOI

1913
Move of Delft's factory management

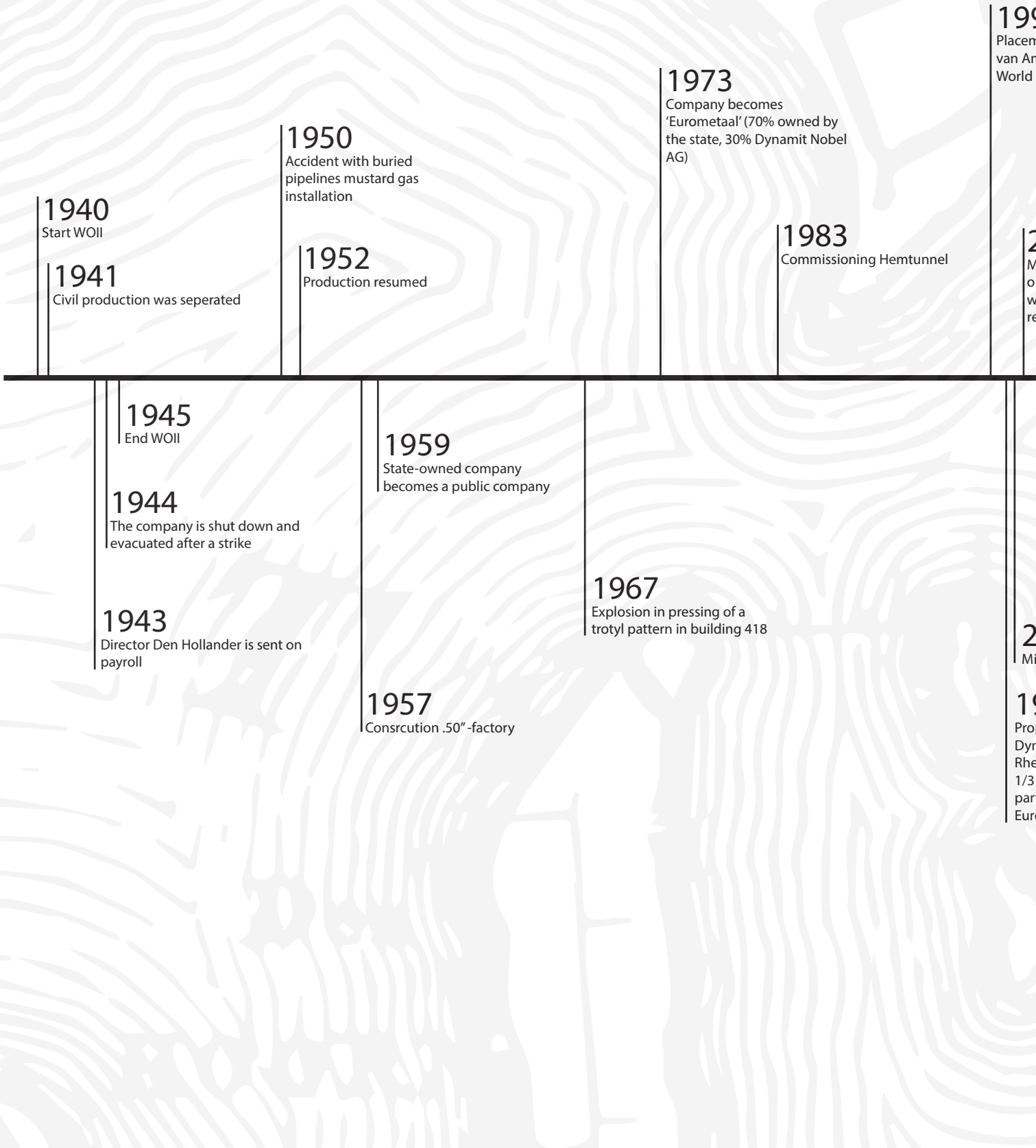
1895*
Due to lack of space in Delft, theconstruction of artillery establishments on the Hembrug area was started. The Hembrug area was chosen because strategic position

1918
End of WOI

1920
The rise of anti-militarism has a big influence on the decline of the company

1924
Completion of relocation from Delft

1939
Accident with mustard gas


1940
Start WOII
1941
Civil production was seperated
1945
End WOII
1944
The company is shut down and evacuated after a strike
1943
Director Den Hollander is sent on payroll
1950
Accident with buried pipelines mustard gas installation
1952
Production resumed
1957
Consrcution .50″-factory
1959
State-owned company becomes a public company
1967
Explosion in pressing of a trotyl pattern in building 418
1973
Company becomes 'Eurometaal' (70% owned by the state, 30% Dynamit Nobel AG)
1983
Commissioning Hemtunnel
199
Placem
van An
World
2
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par
Eur

96
nent of the 'Stelling
msterdam' on the
Heritage List

2001
Municipality
rganizes first
orkshops for the
euse of the area

2003
Eurometaal closes

In the Chief Government Architect's studio, studies are made for the redevelopment of the site with a prison

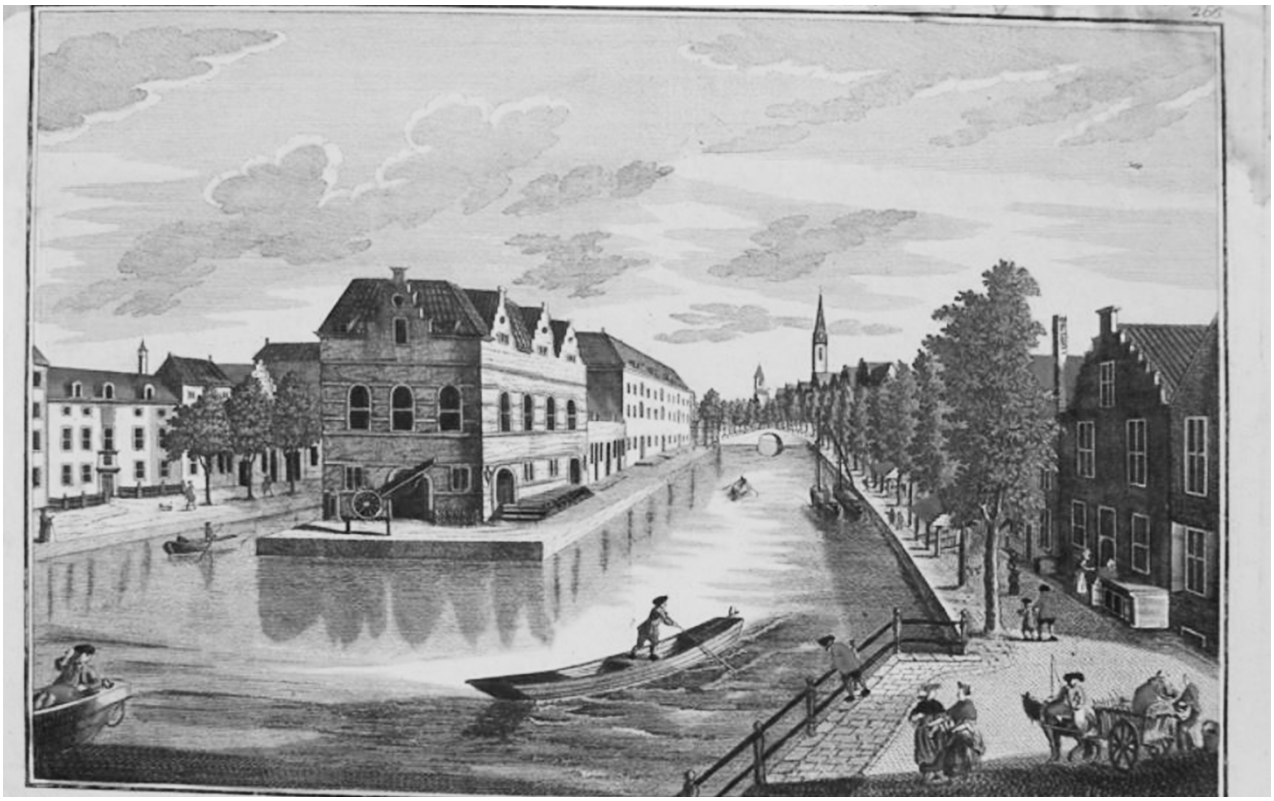
2006
Establishment of the Nieuw Hembrugterrein foundation

Drafting development vision by the Steering Committee of the three governments (municipality, province and empire)

2018 onwards
Future events

2000
litairy leaves the area

999
perty of the state,
namit Nobel AG and
einmetall Euro B.V. (all have
part). Dynamit Nobel's
t passes to Rheinmetall
o B.V.



The year 1672 is known in Dutch history as ‘het Rampjaar’ which means the year of disaster. For 17 months the Netherlands was attacked by various countries, among which Britain and France. It appeared that the Dutch army had been seriously neglected. In reaction to this neglection the Dutch guns and ammunition factories in Delft were established 1679, called the ‘Staatse affuitmakerij’. This development happened under the direction of the military itself. In 1887 the name was changed in ‘Staatsbedrijf der Artillerie Inrichtingen’. In the nineteenth century, the warehouse for the production of the undercarriage of cannons, cannons itself, and sidearms had become a fully-fledged ammunition and weapon factory.

Because Delft did not offer any possibilities for the serial production of modern firearms due to lack of space, the work was centralized and the production was accommodated at a new location on the north side of the North Sea Canal (near the Hembrug in the municipality of Zaandam).

This chapter describes and illustrates how the historical area, by the name ‘the Hem’, changed into the Hembrug site of today. For the beginning of the Hembrug area itself, we have to go back to the development of The IJ. The IJ is a river, formerly a sea arm, in North Holland. The widest parts were around 6km in width. ‘The Hem’ was an outer-dike piece of land in the IJ and was located near the Voorzaan. Between 1865 and 1872 the North Sea Canal was dug, and by plunging the other parts the IJpolders were made on both sides of the canal. The maps below illustrate the transformation. In 1878 the first Hembrug was taken into use. This was a railway bridge over the North Sea Canal and lay in the Zaan Line, between Amsterdam and Zaandam. and was named after the neighborhood of Den Hem.

Initially, Nieuwe Hollandse Waterlinie (NHW) functioned as the country’s main defense line. This line protected the western part of the Netherlands with its large cities, ports and industrial centers against enemy attacks from the east and south.

Between 1880 and 1914, in addition to the NHW, the Netherlands provided itself with a new line of defense called ‘Stelling van Amsterdam’. The defensive line had a length of 135 km, included 42 forts and had a width of 3 to 5 km. It was a wide circle around the capital, Amsterdam, including the industrial area of Zaandam.

In 1882 a sludge depot from Rijkswaterstaat was placed on the polder De Hem for the storage of clay, peat, and sand from the North Sea Canal. Later the Navy built a coal shed along the water.

The factory was built for the production of one rifle, the m95, with the matching 6.5 mm edge patterns. The m95 was introduced in 1895 as the new standard weapon of the army and would remain in all kinds of variants until the Second World War. The order of the production process of this weapon can be read from the original layout of the Hembrug site. Mass production as efficient and safe as possible was the starting point for the precise placement of each building, the road structure, the steam pipes, the narrow-gauge tracks, and the planting.

The artillery establishments did not function as one big company but as three separate factories. From west to east these were the arms factory, the cartridge factory, and the ammunition factory. in the arms factory (w.F.) almost all parts of the m95 were manufactured, assembled and stored. In 1901 the arms factory consisted of fourteen buildings, ranging from workshops and armaments to a firing range and a test building for testing

fig. 7.03 (via Beeldbank archief gemeente Zaandam)

Info via SteenhuisMeurs 2010

1895-1901

The core of the factory complex was formed by the buildings of the arms factory, the cartridge factory, and the ammunition factory. Because of the coherent production processes, the cartridge factory and the ammunition factory stood side by side. The factories consisted mainly of large production halls and smaller buildings for administration, post-processing, and storage. Along the North Sea Canal were the representative management and office buildings, as well as the low-rise buildings of the three factories.

The building line of the new building on the North Sea Canal had to be set back in relation to the existing coal shed. Behind the representative buildings were the three large production halls. Because of the heavy machinery, low-rise could satisfy here. Some distance behind the production halls were the buildings for experimentation and storage, the ammunition warehouses of the ammunition factory were surrounded by earthen walls and some buildings were surrounded by limited planting.

The spatial layout was the same for every factory. Along the North Sea Canal were the main entrance and representative buildings (porter's house, canteen, and an office building). Directly behind these buildings, a strip with large wooden production halls (number. 1, 20 and 40) were located. While in the north storage facilities for coal could be found. The trichotomy resulted in a strong north-south orientation of a large number of roads and buildings, which is still recognizable today. The connecting structure of the site was a central east-west axis, with a narrow-gauge railway for the transport of materials between the factories and from the warehouses to the ships and vice versa. Along with this central axis, there were above-ground pipes that provided each building along this route with steam heating.
In the north of the munitions and patterns factories, a forest was planted around 1920, which became known as 'plof bos'. In this area, ammunition was tested and explosives were also stored.

1901-1924

Developments in the guns industry were fast. Due to the construction of warehouses and the extension of existing buildings, the artillery establishment stayed up to date. Until 1914, the modernization and expansion of the factory could take place within the boundaries of the existing terrain.

The outbreak of the First World War in 1914 caused enormous growth on the Hembrug terrain. The Dutch army ordered enormous amounts of weapons and ammunition and needed new techniques.

The workforce grew rapidly: in 1912 there were 1200 workers, in 1914 almost 1500, in 1915 this doubled to 3,000 employees and the absolute top was reached in 1917 when 8500 people worked in shifts on the site.

The introduction of new weapons or ammunition was mostly the reason for the construction of new warehouses or factories. The division into weapons, cartridges and ammunition zones was retained. Around, in between and next to the existing buildings new constructions were realized. This was easy for the weapons and ammunition factories: there was plenty of room on the east and west sides of the complex. For the centrally located pattern factory, it was more difficult to expand, due to the lack of space. Nowadays it is still visible that the buildings from different periods were clumped together.

1924-1941

The general aversion to armaments meant difficult years for the arms industry. The funds for defense were so low that not enough resources were available to maintain the ammunition for the army. Neither for modernizing the army. At the artillery facilities, current orders were canceled, plans to expand the factories were left unresolved and the number of staff was increasingly reduced. At the end of 1920, only 1900 workers were able to continue their job.

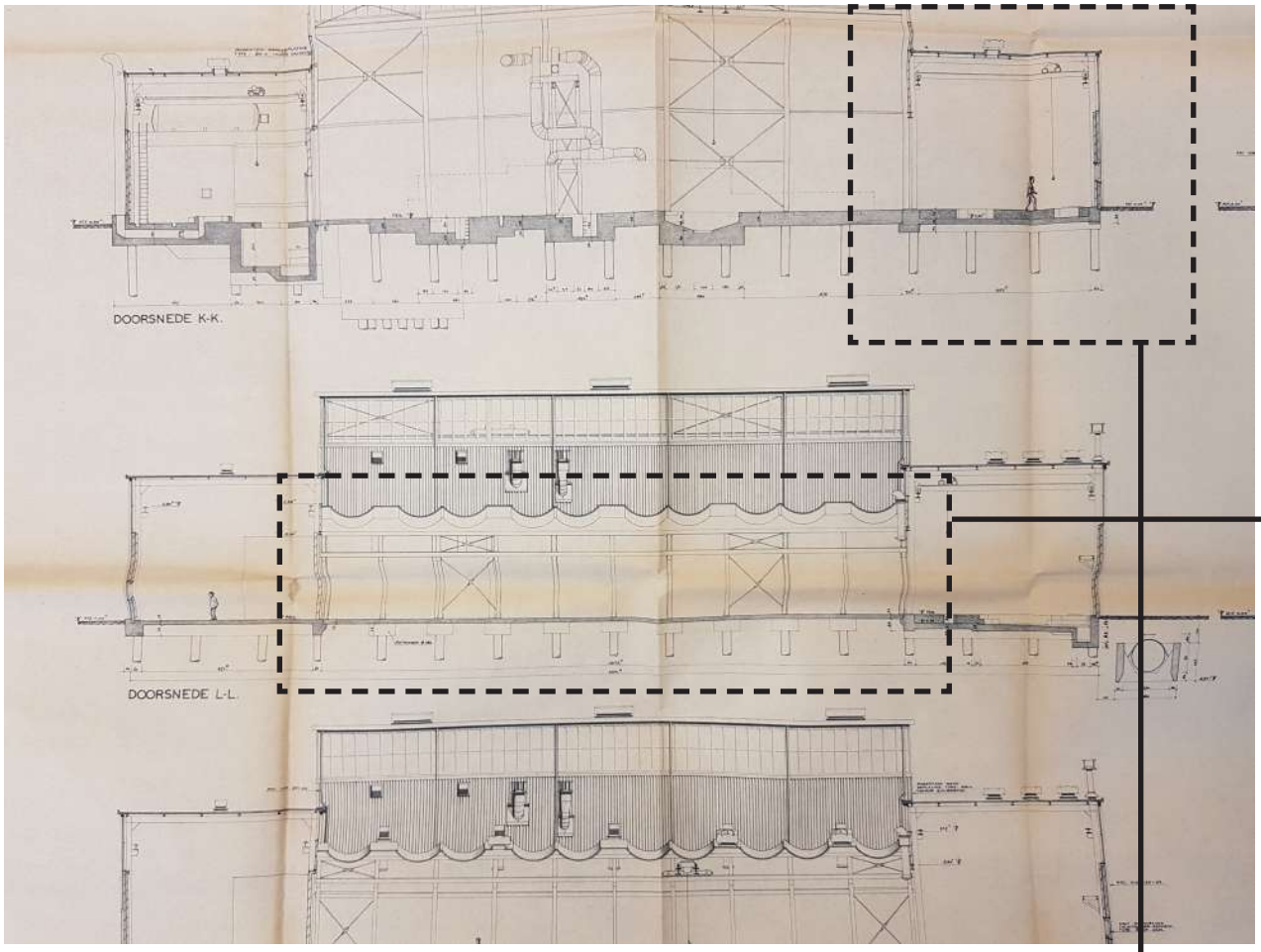
During the crisis years (around 1930) the Dutch army was reduced to a minimum. The artillery establishments concentrated on casting, forging, milling and turning work for private individuals and destined a large part of the site (the old weapon factory) for civil production. Here agricultural and machine tools were produced, and later numerous other products such as bicycles, iron, and optical instruments.

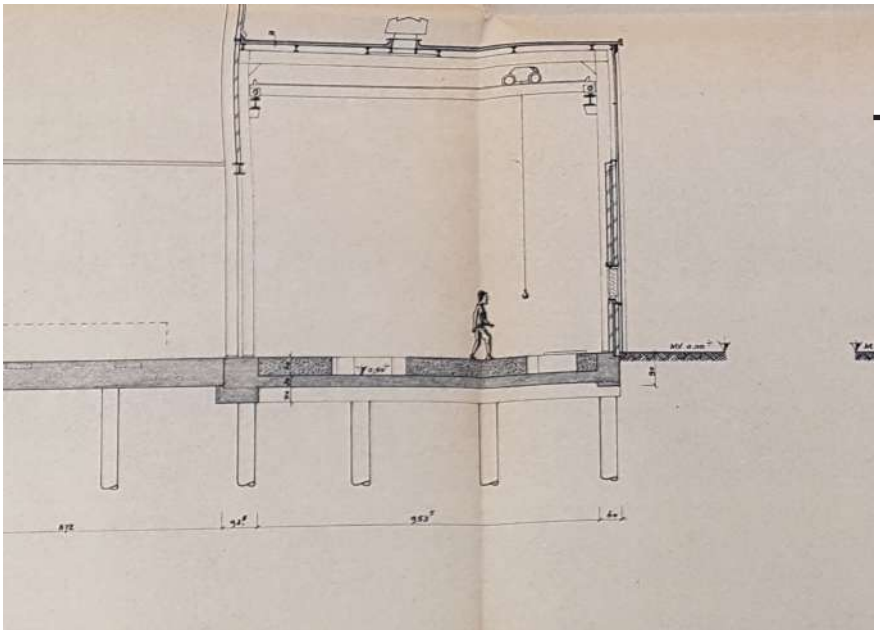
1941-1996

On the western part of the site, where the nV machine tools industry 'Hembrug' was established, the old building 1 was demolished. A management building and buildings 441 and 504 were constructed. With these interventions, the people no longer valued the logic of the terrain and its grown structure.

Germany. With the establishment of the defense fund in 1935, military production in the Netherlands increased. Just before the start of the Second World War, artillery installations produced nearly a hundred different products: weapons, military vehicles, guns (mortars, machine guns), gas masks and ammunition for all kinds of guns. The diversity in products had results on the terrain. Older buildings were demolished and replaced by larger new buildings with a different function because for each product a separate production and processing building was needed. Increase in scale was particularly visible in the western factory part, where assembly hall 320 became one of the largest factory buildings. The design of artillery establishments with three recognizable factory complexes (weapons, cartridges, ammunition) was maintained.

Example of the crane system in a technical drawing of a warehouse building on the Hembrug terrain





Example of the prestressed concrete hyperbolic paraboloid shell. Technical drawings of the ladder.