

P5 Report

Train station as integrated urban element in 'Koog-Zaandijk'

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Preface

This is my P5 report as part of my graduation at the Faculty of Architecture at the TU Delft. The studio I participate in is the Hybrid Buildings Graduation studio, focusing on station areas in the Zaanstreek region in Holland. The graduation project is split in five poll moments. This report is related to the fifth and last poll on Monday July 1st 2013.

The first part of this report introduces the graduation studio, the reason why I choose for this studio and the location of the graduation project. The problems that are present in the area are stated and research questions are based on this. The actual research and the conclusions are the basis for the specific design assignment. During the MSc3 semester the research on the area took the major part of the process and the focus gradually moved in the direction of design.

At the end of this part of the report I will reflect on the work of the first semester of the graduation and place and state the relevance of the subject within the architectural debate.

The second part of this report is dedicated to the architectural development of the hybrid building originated from the train station of Koog-Zaandijk. This part of the graduation has been performed during the P3 and P4 periods and took a longer period of time than I had intended in advance.

Based on the urban plan for the station area of station Koog –Zaandijk and the current factory grounds of ADM Cocoa factory, a solid linear volume containing a clear position of the train station is created. The train station is a point of orientation while it is closely surrounded by a diversity of facilities making it a binding element in the functional network of the area.

I would like to wish the reader of this report an enjoyable read.

Mark de Vries

July 2013

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1 Introduction

The Hybrid Buildings Graduation Studio is part of the chair Building Typology at the Faculty of Architecture of the Delft University of Technology.

1.1 Hybrid Building Graduation Studio

The general focus of the graduation studio is 'on how architectural interventions can activate and contribute to the process of urban transformation'. (Building Typology, n.d.) The hybrid building is able to act as a catalyst within these transformations.

1.1.1 The Zaanlijn, an urban artifact in the Zaanstreek¹

The studio focuses on multiple station areas, mostly along the Zaanlijn railway, in the Zaanstreek region. The main subjects of the graduation studio are the density of dwellings within the station areas, the quality of the train station and the presence of industry (partly heritage) closely intertwined into the urban tissue.

Global program in time

In the first quarter of the MSc3 semester the research is focused on the entire area of Zaanstad and performed by groups. Based on conclusions of this research, which also results in several master plans for the area, a specific site where an urban intervention and architectural design has to be made for has to be chosen. Results have to be presented during the P1 presentation.

In the second quarter of the MSc3 semester the research is related to the specific site and performed individually. Next to research the focus shifts to design (study). The urban intervention has to be worked out and attempt at the architectural design has to be made. Results have to be presented during the P2 presentation.

1.1.2 Personal motivation

The choice for this this studio I've made because of the combination of themes of mobility and the hybrid building as catalyst in a process of urban transformation.

My interest for mobility nodes arose during my internship at Movares², where I worked on a wide range of projects related to train stations of different scales. The integration of the train station within its context, which in case of the studio will relate to dwelling, in combination with the functional requirements of a mobility node is challenging.

The focus of the studio on the Zaanstreek has an extra dimension for me because of my origin, Uitgeest, which is close by. I passed the area often when travelling to Amsterdam by train.

1.2 Municipality Zaanstad

All train stations are situated within the municipality Zaanstad, which is situated North West of Amsterdam in the province Noord-Holland. The municipality was created by the merging of several villages in 1974 and has today 150.000 inhabitants. (Gemeente Zaanstad, 2011, p. 35) The area contains 6 train stations on 2 different railway lines.

1.2.1 Railway lines

On state line K between Amsterdam and Den Helder (opened in 1860):

¹ The overall theme of the graduation studio, as stated in Assignment I (Gramsbergen & Rogic, 2012a)

² Movares is since 2006 the name of Holland Railconsult, a private company which is in 1995 formed out of 'Ingenieursbureau NS '(Engineering Dutch Railways)

- Zaandam
- Koog-Bloemwijk
- Koog-Zaandijk
- Wormerveer
- Krommenie-Assendelft

On the line between Zaandam and Enkhuizen (opened in 1884):

- Zaandam Kogerveld

The train station of Zaandam is not part of the scope of the studio because of the recent large-scale transformations (project Inverdan) within the station area.

Additional two hypothetical stations are explored, one situated between Zaandam and Koog-Bloemwijk, another situated nearby the station Krommenie-Assendelft.

All train stations are types of the same scale

1.2.2 Program High-frequent Rail transport

The initiative of the national government to introduce the Program High-frequent Rail-transport (Programma Hoogfrequent Spoorvervoer, PHS) will cause a heavier use of state line K. The line is part of the so called 'travelers corridor Alkmaar - Amsterdam (Ministerie van Verkeer en Waterstaat, 2011) The PHS means that between 6:30 hours and 20:00 hours the line will be used by 6 intercity trains and 6 sprinter trains per hour. At the train stations that are involved in this project, only the sprinter trains will make a stop. The introduction of the PHS can result in more attractive station areas because of the improved accessibility. At the same time, a higher frequency of use can result in more users what will influence the livability of the station area. A higher frequency of passing trains will have a negative influence on the possibility to cross the railway. Railway crossings will be closed for a longer period, which is common to measure in 'closed minutes per hour'.

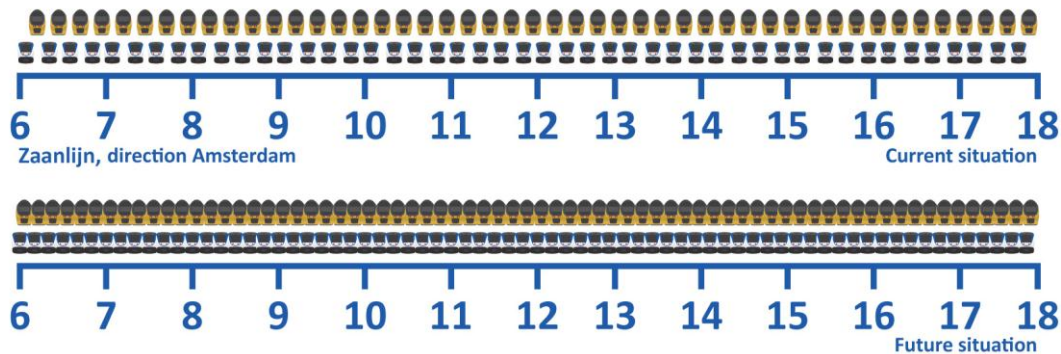


Figure 2: Current and future situation of the frequency of trains.

The Randstad has the densest rail network of Holland, what gives it, in combination with the PHS, the potential to function more as a metro network. The introduction of two more train stations on State line K will result in an equal spread of train stations with an in between distance of less than 1600 meters. This means a continuous coverage of the 800 m radius station areas along the rail line.

1.2.3 Zaanstad - Amsterdam

Compared to the public transport network within the city of Amsterdam, the villages within Zaanstad are very closeby Amsterdam.

Route	Public Transport type	Travel time
Amsterdam CS – Bijlmer Arena	Metro	15 minutes
Amsterdam CS – Museumplein	Tram	14 minutes
Amsterdam CS – Koog-Zaandijk	Train	16 minutes

Figure 1: Comparable travel times from/to Amsterdam Central Station (9292, n.d.)

1.3 Density of dwellings in station areas

The station area is defined by the area within an 800-meter radius measured from the center of the train station. The distance to any destination within this radius is suitable for walking (Goudappel Coffeng, 2011, p. 9) within approximately 7 minutes.

Between 1970 and 2010 a large number of dwellings is build outside these station areas, which affected the coverage percentage of the train station. The position of the train station didn't have influence on the choice of location for new developments. At this moment the average coverage in Zaanstad is 31%. In order to fulfill the dwelling requirements, the coverage has to increase to 40% in the year 2030. (Engel & de Waaijer, 2010, p. 7)

This densification is part of the program 'Kansen voor ruimtelijke ontwikkelingen rondom ov-knooppunten in Noord-Holland (Changes for spatial development around public transport nodes in Noord-Holland). The program is part of the Structuurvisie 2040 (Structural vision 2040) of the Province Noord-Holland. Noord-Holland focuses on the public transport nodes because 'it can give important contribution to protect the valuable open landscapes and strengthen the vitality of villages and cities.' (Goudappel Coffeng, 2011, p. 6)

1.4 Quality of the train stations

The latest large interventions on most of the train stations have been done in the 1970's. The train station of Krommenie-Assendelft is an exception and is in 2008 again transformed. In the mentioned program (Goudappel Coffeng, 2011) the rail corridor is described as 'life-work corridor' where dwelling is dominant. Creating a mix of dwelling and employment, adding more facilities and improving the transfer possibilities between the car and public transport are important themes.

1.5 Industry intertwined in the urban tissue

Industry is an important program in Zaanstad. The region is the oldest industrial area of Europe. (Gemeente Zaanstad, 2011, p. 3) From historical point of view industry has been the most important way of income. Starting in the 16th century with the use of windmills, an important shift during the industrialization in the 19th century and nowadays still intertwined in the urban tissue of Zaanstad. 'Conservation and reuse of the industrial heritage is important because it's an important part of the identity of this area'. (Engel & de Waaijer, 2010, p. 10)

The mixed morphology of the area, dwellings and industry, small and big grain directly next to each other is characteristic for Zaanstad. It is known as Zaans mosaic. (Staller, 2012)

Most industry is located near the Zaan river because of its infrastructural function. Raw materials are delivered and semi-finished products are picked up, both by boats. Part of the industry buildings is heritage. The industry is slowly moving out the older buildings for environmental and spatial reasons. The industry buildings that are suitable for reuse are being transformed and made suitable to house other kinds of program.

2 Problem statement

The problem statement forms the basis of the research (Chapter 3 and 4). The findings of the research will form the basis of the design assignment (Chapter 5).

The problem statement focuses in general on three themes:

- Densifying the station area
- Improving the train station
- Industrial heritage

(Engel & de Waaijer, 2010, p. 10)

In terms of scale the research can be divided in to two parts. A research on Zaanstad and the Zaanlijn as a whole forms the basis for a more specific research focused on a site where an urban transformation and architectural project will be designed. This division will also structure this report.

The site I chose to elaborate on is the ADM cocoa factory site next to station Koog-Zaandijk in combination with the train station.

2.1 Zaanstad

2.1.1 Densifying the station areas

The densities of dwellings in the station areas are at this moment not optimized. In order to increase the support of the use of the train as way of transport for people, it is recommended to let people live within the station area. In the research report '22 Stations locaties in Hollands Noorderkwartier' a density of 40 dwellings per hectare is stated to be feasible for the station areas. The station area has an area of 200 Ha. A density of 40 dwellings per hectare and occupation of 2,13 people per house (Engel & de Waaijer, 2010, p. 6) results in approximately 1700 people within 7 minutes walking from the train station.

2.1.2 Improving the train stations

The train station along the Zaanlijn are positioned in the second half of the 19th century. The rail line was positioned outside the village on the Western side. Since than the villages grew both in Northern and Southern direction, merging together, but more interesting is the expansion in Western direction, on the other side of the railway. The train station now has to deal with two directions, East and West. The station (buildings) also changed during time, but the relation with both sides has not been that strong.

2.1.3 Industrial heritage

The industry in Zaanstad is an important carrier of the identity of the area. Although it's common for the area and accepted that living and working is mixed industry causes also problems. Environmental issues like smell, noise and pollution are related to the processes of the factory. In spatial terms the grain of the industrial sites is much bigger compared to the dwelling areas surrounding the sites.

2.2 Research questions for Zaanstad

A main research question is formed, which is chosen to discover and understand the area of Zaanstad and give arguments to make a choice for a specific project site. Sub-research questions are made to structure the research. The hypothesis will relate to the main research question.

Main research question

- Which station area has the biggest potential to be transformed into a node that contains a mix of program to create a lively area, next to the task to densify dwellings?

Sub-research questions

- What are the main structuring elements in Zaanstad?
- What are the locations suitable for densifying dwellings?

2.3 Hypothesis for Zaanstad

The station area of Koog-Zaandijk is positioned on the crossing of four different neighborhoods and surrounded by areas with different functions. The presence of a large-scale recreational function (Zaanse Schans) causes a mix of users of the train. Industrial buildings, as a carrier of identity, are located close by the railway.

2.4 Koog-Zaandijk station area

The more specific research will focus on the station area of train station Koog-Zaandijk, positioned at the border of the villages Koog aan de Zaan and Zaandijk, along the crossing of the provincial road N203 (North to South, Limmen to Zaandam) and N515 (East to West, Haarlem to Beverwijk).

My field of interest is related to the train station and its role in and relation with the surroundings. In particular the change in typology of a train station in relation to the growth of the city and frequency of the train schedule. Key terms are: *train station, platform, integration, connection, extra value*.

2.4.1 Improving train station Koog-Zaandijk

The role of the train station and the station building in both functional and spatial terms has changed during its existence. The train has become a common way of public transport. 3000 people per day use the train station of Koog-Zaandijk. (Gemeente Zaanstad, 2011, p. 26) The two most important groups of users are commuters, primarily in the direction of Amsterdam; and tourists, primarily for a visit of the 'Zaanse Schans'. According to (Goudappel Coffeng, 2011, p. 51) this is an advantage because the social-recreational users of the train cause more spread in the use of the train station, next to the peak moment in during rush hour.

Functional role of the train station

In the current situation the train station functions as a stopover. The train station is used to transfer between different types of transport. The only additional function on the platform is a kiosk that sells drinks and snacks. The train station lost its romance and the role for the city is mono-functional.

Commercialization of the society influenced the program of mobility nodes; this can be seen clear at nodes of a large scale. The flows of people make these nodes interesting, as they are potential customers. (Chung, Inaba, Koolhaas, & Leong, 2002) In which way a relatively small train station can function as a hybrid node, combining both mobility and a social and commercial role for the context in order to stimulate people to make use of public transport is an interesting subject with the further growth of the urban landscape.

Which functions can make use of the train more attractive? The train station can be more than an ordinary stopover. Combining program that is interesting for commuters when leaving for work and when arriving on their way to their homes, or adding program interesting for tourists can stimulate the use of the train.

Spatial role of the train station

The railway of state line K exists out of 2 tracks. The platform of train station Koog-Zaandijk is positioned in between the tracks: an island platform. The tracks isolate the platform and station building from the urban context. The provincial road, positioned East of the railway increases this isolation.

When the global position of the station was determined, at the end of 19th century, there was only built area on the east side, in between the railway and the river. The station only had to connect with this side. When the area on the west side became also an important area for living during the 20th century, the station had to serve both sides.

The current situation treats both sides equal: there is not clear front entrance. This equality is fair. In order to improve the relation with the urban context on both sides, the position of the platform, the station building and the accessibility have to be restructured. The role of the train station as a connecting element in an urban context, split up by the railway itself, can be strengthened.

2.4.2 ADM cocoa factory industrial site

The ADM cocoa factory dominates the site on the east side of the station. The factory settled at this location in the beginning of the 20th century and slowly grew, resulting in an occupied site of approximately 160 by 350 meters, an area of 4.4 Ha.

At first sight most of the buildings of the factory are not high quality architecture or distinctive in their appearance. Though the factory is of importance for the identity of the area. The density of industrial buildings is high at certain parts of the site. Building parts are positioned directly next or on top of each other. By decreasing this density by removing the buildings that are low in quality, the buildings of importance get more air to breath.

2.5 Research questions for the Koog-Zaandijk station area

Problems related to all themes of the graduation studio are found in the station area. The functional and spatial role of the train station in relation to its context is weak at this moment.

A main research question is formed, which makes clear the direction of the research and intervention I would like to make. Sub-research questions are made to structure the research. The hypothesis will relate to the main research question.

Main research question

- *What are the present and missing characteristics of the Koog-Zaandijk station area that are able to create extra value to make use of the train and make the train station an integral element that creates coherence in the village?*

Sub research questions

- What is the character of the morphology and typology of the area around station Koog-Zaandijk?
- What is the spatial relation of the train station with the surrounding neighborhoods?
- Which types and amount of (public) transport, parking and bicycle storage are needed?
- How does the main cross connection (Guisweg) relate to the buildings that stand along the road?
- What buildings of the ADM factory are worthwhile to re-use?
- Which tools are suitable to improve the connection between the areas east and west of the barrier that is formed by the rail tracks and road?

2.6 Hypothesis for the Koog-Zaandijk station area

The station area is at this moment not much more than the platform with shelter and the entrance to the platform itself, being not an integral part of its context. The train station is a point in the village where people from both sides (east and west of the rail tracks) come together at the barrier formed by the course of the rail track.

3 Methods and techniques

The research should result in general knowledge. In a more narrow sense the product of research can be seen as 'the description of existing reality' (Máčel, 2005, p. 25). The existing reality in this case is related on a large scale to the Zaanstreek and on a more detailed scale on the station area of Koog-Zaandijk.

Methods and techniques are not isolated ways of working, methods can have overlap and the same techniques can be used within different methods.

The socio-spatial model of the 'Network City' (Dupuy, 2008) is the basis for a network study. A differentiation is made between first nature networks and second nature networks. The content of the different networks are explained in the paper Urban Analysis: City Dynamics (Sanchez, 2011).

First Nature

- Water system
- Green system
- Soil structure

Second nature, first level: Technical networks

- Local public transport
- Motorized traffic
- Pedestrian and cycle traffic

Second nature, second level: Production and Consumption Networks

- Nodes of production: industry, financial and knowledge
- Nodes of consumption: retail and services

Second nature: Leisure network

- Public spaces and green structure
- Cultural and recreational nodes

Second nature: Household networks

- Morphology, density, typology
- Social configuration

Within the network study several methods and techniques to document the process and the results of analysis will be used. As told by (Avermaete, 2012) specific thought frames within architecture, known as episteme, structure the research. It is not necessarily that only one thought frame is used. Using multiple can give different insights on a subject, which in the end can lead to a better argumentation. The episteme of typology will be used during morphological [3.3] and typological research [3.4].

3.1 Map study

The map study is a method that has overlap with the major part of the methods and techniques that are used during the research. The map study exists out of collecting data and recording them in a map whereby the production of the map concerns with usage of color, legend and readability. (Moens, 2005, p. 71)

3.2 Descriptive research

The describing of the characteristics of an area of the accurate description of a building is a method to register. An important aspect of descriptive research is that in one ore another way every description is subjective. (Lans & van der Voordt, 2005, p. 54)

Techniques – Describing with text, can be based on literature [3.3]

3.3 Historical research

The history of a place can give answers on how the current situation has been established. It gives identity to a place and causes inhabitants to have a relation with the location. As written by Cavallo '...the globalization of the market economy generate as counterforce a strong emotional desire to keep links with the past, with the essential characteristics of the historical urban fabrics'. (Cavallo, 2008, p. 9)

Literature

Knowledge is documented in literature. 'The study of literature is almost always the first step in a study of architectural history'. (Máčel, 2005, p. 68) Literature about the area of Zaanstad will tell the history of the region. The urban and architectural developments are the primary subjects. More general historical information will place these developments in a wider context. The genius loci, the spirit of the place, has a strong relation with the history of the place.

Morphological analysis

On the urban scale the morphological analysis is a way to understand the presence of mass and voids. The terms built (mass) and unbuilt (void) are also often used in this type of analysis, but are confusing as a street can also be seen as a built element. ³The literal meaning of morphology is 'knowledge of form'. According to Meyer morphological reduction is important 'to be able to make statements on the position and significance of a building in a given spatial context'. (Meyer, 2005, p. 125)

Techniques - The morphological research will be based on historical maps, representing different periods of time. The products are maps per period of time.

3.4 Typological research

The typological research contains analysis and design study. This division is based on the idea of Moneo that architecture is not only described by types, it is also produced through them. (Moneo, 1978, p. 23)

Typo morphological analysis

A typological research on the neighborhoods surrounding the station area to understand the local used typologies. The morphological analysis is usable. Different typologies can be connected to timeframes. An overlap between historical and typological research is common. The context is determined and the objects are variable which are conditions for a typological research. (de Jong & Engel, 2005, p. 103)

Techniques - During a field trip the buildings can be documented by photography. With web applications like Google Maps areas can be searched via internet.

³ As discussed during the course AR3AUH23 Research & Design Methods

Design study

In a more generic study, research will be done on how different typologies can be used to create a certain density (studio assignment 2). Both the context and the object are variable which result in a design study. (de Jong & Engel, 2005, p. 103)

On a generic plot with the size of 600 x 500 meters different building typologies have to be compared, discussed and tested. (Gramsbergen & Rogic, 2012b) The quantitative aspect plays also an important role. Ratios between the site area, the built area, unbuilt area and floor space indicate this aspect. (Leupen & Grafe, 2005, pp. 80-81)

Techniques – Drawing of maps and sections. Calculations of FSI, GSI and OSR.

3.5 Case study / reference study

Analysis on realized projects with comparable design assignments gives insight in possible solutions, literal translation is not the approach. The goal is to get 'acquainted with specific demands, regulations and considerations' of the particular kind of building. (Breen, 2005, p. 100)

Precedents, train stations and the railway as barrier

Many public transport nodes are transformed at this time, on large scale (Nieuwe Sleutelprojecten), but more interesting are the locations of smaller scale where the barrier function of the railways is tackled. It is important to fence of the topic through a clear choice of case studies. (Cavallo, 2008, p. 9)

Technique – Comparing different solutions. Describing to pros and cons.

Montage on urban scale

The content of the montage can be of a wider subject than only a reference of a particular kind of building. In order to compare known realized projects in scale the use of a montage can give quick and clear insights.

Technique – Mounting equal scale satellite images with Adobe Photoshop.

3.6 Field trip

To understand and get familiar with the region it is important to visit and observe the area. Visiting, exploring, observing and understanding the area is of great importance in order to shape the design assignment. (Box, 2007, p. 72) The area will be visited at least twice, during the first part of the research multiple locations in Zaanstad and in the second part the chosen project site to get more familiar with the specific location.

Technique – Observation of the area, exploring the area.

4 Analysis and argumentation

The problem statements mentioned in chapter 3 are divided into two parts: on the scale of Zaanstad and on the scale of the station area of Koog-Zaandijk. The analysis and argumentation and also the conclusions in chapter 5 are also divided according to this.

4.1.1 Group work on Zaanstad

The first part of the research, on the entire region of Zaanstad, is done by the studio as a whole, divided in 7 groups of 3 students.

Station area

Each group works on a specific station area. The choice for the specific station area is not related to specific reasons. The division of the different station areas is shown in figure 2. Together with Patriek Duisdecker and Steven Tol I participated in group 4, working on the station area of Koog-Zaandijk.

Additional research theme

Per group an additional research is done on a specific subject on the entire Zaanstad area. The division of the different themes is shown in figure 2. Together with Patriek Duisdecker and Steven Tol I participated in group 4, working on the theme 'Structuring Elements'.

Group	Station area	Additional research theme
1	Hypothetical South	Cross section formal character
2	Krommenie-Assendelft	Public spaces of the station
3	Wormerveer	Station entrance/square
4	Koog-Zaandijk	Structuring Elements
5	Koog-Bloemwijk	Railroad crossings
6	Hypothetical North	Cross section functional character
7	Zaandam Kogerveld	Station typology

Figure 3: Division of the station areas and global research themes for Zaanstad. There is no relation between the choice of station area and the choice of additional research theme.

Typological study

As mentioned in chapter 3, research will be done how different typologies can be used to create a certain density. The typological is generic, although a train station and a course of a railway is part of the area. Together with Patriek Duisdecker and Steven Tol I participated in this study.

Master plan Zaanstad

The final stage of group work is the design of a master plan for the Zaanstad, showing how 7000 dwellings can be divided over the area of Zaanstad to determine the building program for each station area. The master plan will be a starting point for further research and design. The group for the master plan contains 7 people. Together with Vincent Paar, Dennis Smit, Matthijs Tabbers, Manuel Torres and Mischa-Mara Wullums I participated in group 3.

4.1.2 Individual work on Koog-Zaandijk

The second part of the research, on the site within station area of Koog-Zaandijk, is done individually.

4.2 Zaanstad

Main research question

- Which station area has the biggest potential to be transformed into a node that contains a mix of program to create a lively area, next to the task to densify dwellings?

Sub-research questions

- What are the main structuring elements in Zaanstad?
- How are surrounding industrial sites related to the train station?
- How do the cross connections relate to the train stations?
- What are the locations suitable for densifying dwellings?
- Which kinds of target groups make use of the train (stations)?

4.2.1 Main structuring elements

What are the main structuring elements in Zaanstad?

The main structuring elements are part of the natural landscape, main infrastructure, buildings of value and carriers of identity. Based on this idea different structuring elements in Zaanstad are mapped. (see figure 4)

Natural elements

Water – The river Zaan is an important backbone, it structured the initial developments of the villages in Zaanstad.

Protected nature – The field South of Wormerveer is protected nature area. Official definition of the protection is 'Natura 2000' area.

Infrastructure

Provincial road - The N203 is an important road connecting all villages in Zaanstad. Before the arrival of the highways, this road was the common connection between Alkmaar and Amsterdam for cars. The road is largely parallel to the river and can be seen as the 'new' backbone in combination with the railroad.

Railroad – The railroad, introduced in the 1860's is an artifact in the Zaanstreek and an important structuring element.

Cross connections – The cross connection with the N203 and railroad are important points because of the possibility to cross the barrier formed by the rail and road.

Industry

Industrial sites - Industry is of major importance in Zaanstad, as the oldest industrial area of Europe it is part of the identity of the area. Within the industrial sites are characteristic buildings of which a part is heritage.

Monuments

National – National monuments are strongly represented in the area. The monuments are mostly positioned along the oldest street of the village. For the villages along the Zaan river this means the dike road (Zaanweg, Lagedijk, Hoogstraat, Raadhuisstraat, Zuideinde). Krommenie is not positioned along the Zaan, monuments can be found along the Zuiderhoofdstraat / Vlietsend.

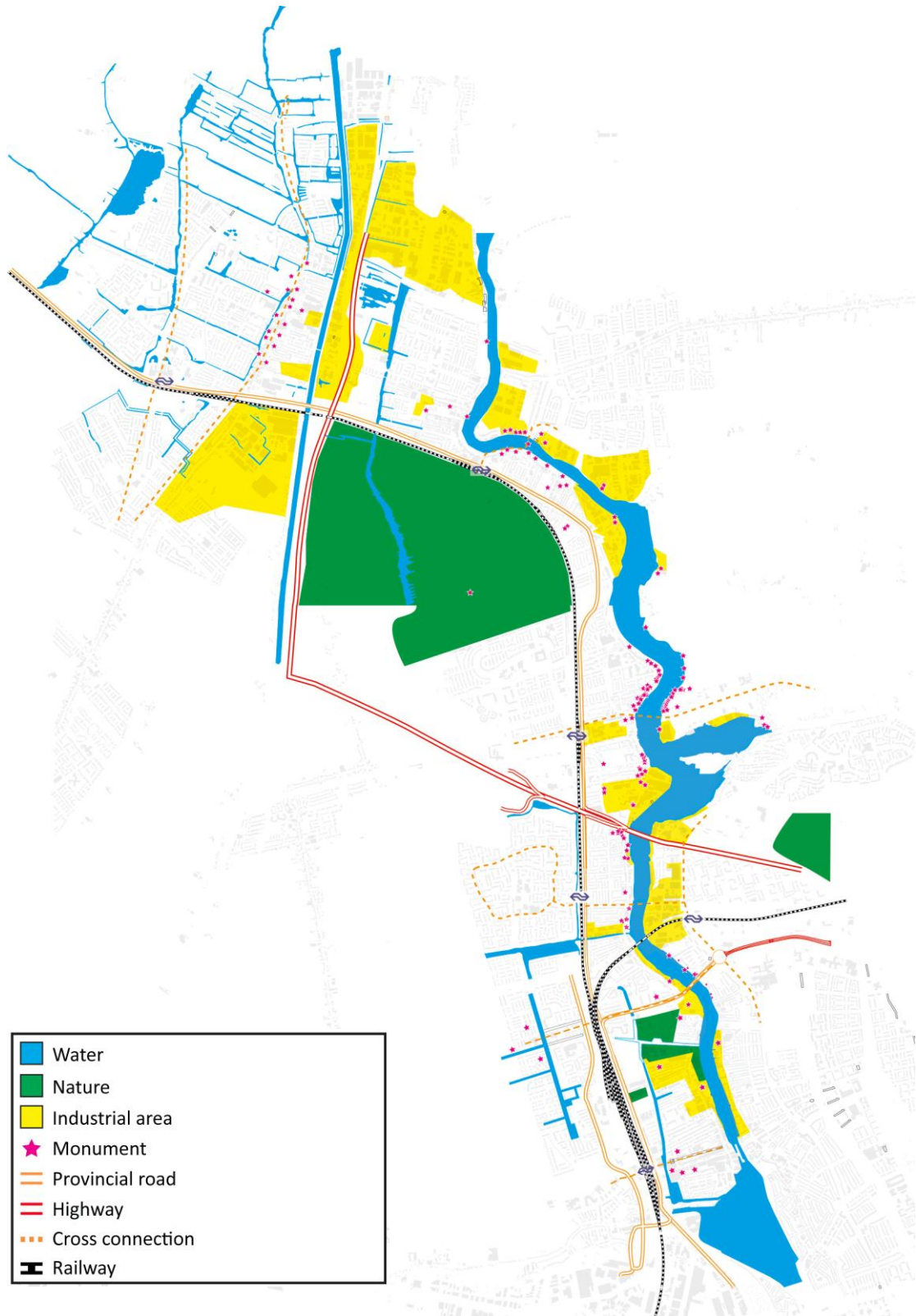


Figure 4: Main structuring elements in Zaanstad

4.2.2 Urban densification

What are the locations suitable for densifying dwellings?

There is a need for 7000 additional dwellings in Zaanstad. In order to optimize the density of dwellings in station areas, it is advisable to locate all these dwellings within the station areas. An analysis on all possible locations to locate new dwellings resulted in a master plan. The study is performed according to the guidelines of studio assignment III by (Gramsbergen & Rogic, 2012c)

Per station location the potential sites are mapped, divided in 3 different categories:

Free to built area

Sites or pieces of land that are unbuilt.

Industrial sites

Industry within the station area means in most cases industry intertwined in the centers of the village.

Dwelling areas suitable for densification

The present dwelling areas don't all make the asked density of 40 dwellings per hectare. Although it's difficult to measure these values, it is tried to map these areas.

The potential areas were able to locate in total more than the asked 7000 dwellings. Chosen is to start densifying from the South of Zaanstad, focusing on the train stations Hypothetical South, Zaandam Kogerveld, Koog-Bloemwijk and Koog-Zaandijk.

Station	Dwellings on 'free to built'	Dwellings on 'industrial'
Krommenie-Assendelft	720	0
Hypothetical North	0	0
Wormerveer	444	630
Koog-Zaandijk	656	1266
Koog-Bloemwijk	80	174
Zaandam Kogerveld	1304	1662
Hypothetical South	760	0

Figure 5: Master plan 3, division of dwellings per station area and type of site

The total amount of dwellings in the master plan is 7072.



Figure 6: Master plan for Zaanstad with the division of 7072 dwellings

4.3 Koog-Zaandijk

Main research question

- *What are the present and missing characteristics of the Koog-Zaandijk station area that are able to create extra value to make use of the train and make the train station an integral element that creates coherence in the village?*

Sub-research questions

- What is the character of the morphology and typology of the area around station Koog-Zaandijk?
- How does the main cross connection (Guisweg and N203) relate to the buildings that stand along the road?
- What is the spatial relation of the train station with the surrounding neighborhoods?
- Which types and amount of (public) transport, parking and bicycle storage are needed?
- What buildings of the ADM factory are worthwhile to re-use?
- Which tools are suitable to improve the connection between the areas east and west of the barrier that is formed by the rail tracks and road?
- How can unequal level crossings be implemented for efficient use?

4.3.1 Introduction

In order to understand names of the station, the neighborhoods and streets that are mentioned in the upcoming paragraphs, this introduction with maps and a small description introduces the station area of Koog-Zaandijk and the project site: the ADM cocoa factory terrain, the train station and the area East of the train station.

Train station

The name of station Koog-Zaandijk is based on the two villages Koog aan de Zaan and Zaandijk. The station is positioned on the border of these villages. The areas of the villages can be seen in figure 7.

Neighborhoods

The global division of the station area in neighborhoods can be seen in figure 8.

- Oud Zaandijk
- Oud Koog aan de Zaan
- Sport park Koog-Zaandijk
- Rooswijk

Streets

Multiple streets surround and cross the project site and can be seen in figure 9.

- N203
- Guisweg
- Stationsstraat
- Lagedijk
- Wezelstraat
- Bijenkorfstraat (private)
- Wilhelministraat
- Smidslaan

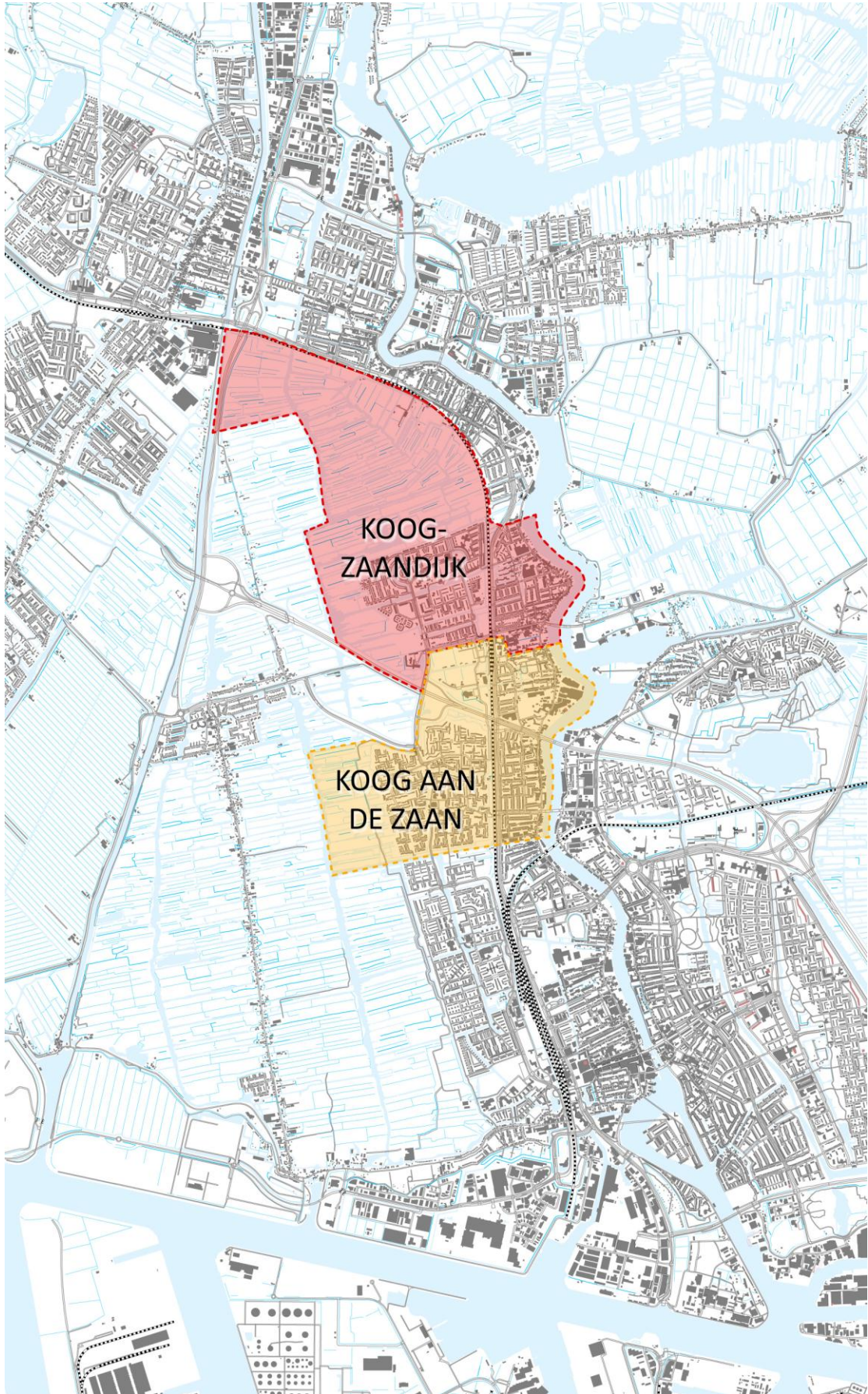


Figure 7: Neighborhoods in the Koog-Zaandijk station area

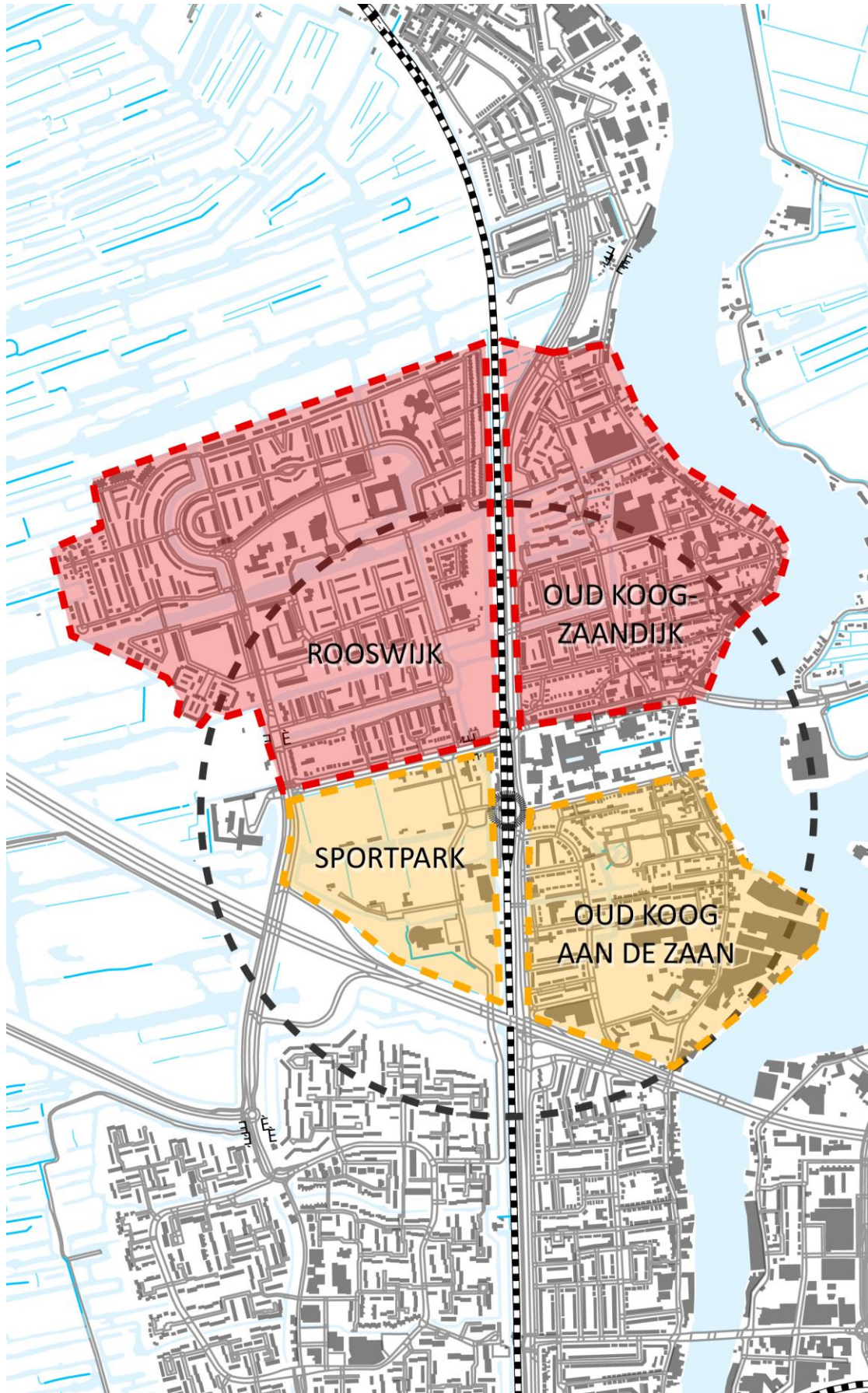


Figure 8: Neighborhoods in the Koog-Zaandijk station area



Figure 9: Streets surrounding and crossing the project site

4.3.2 Morphology of the station area

What is the character of the morphology and typology of the area around station Koog-Zaandijk?

> 1850

The dike (current Lagedijk / Hoogstraat) along the Zaan river formed the first element of the cultivated landscape. The comb-structure of the landscape was introduced to dry mill the wetlands. Windmills were placed on a certain distance from the river inside the land. Paths positioned perpendicular to the dike road and river connected the windmills with the main infrastructure. The structure that emerged is known as the comb-structure.

There is a lot of differentiation in the sizes of the houses and plots. Differences are not extreme but there is continuous variation.

1850 – 1910

In 1868 the new railroad opened and a strong border is created on the Westside of the villages. The expansion of the villages wasn't very large.

At the beginning of the 20th century North of the Guispad (current Guisweg) is an interesting small development of villa's. Large plots with large houses along curved streets are a new type of building pattern in Oud Koog-Zaandijk.

1910 – 1940

The first serious attempt to built on Western of the railroad. The beginning of the neighborhood Rooswijk.

The left over open spaces Eastern of the railroad are built on. Interesting is that the linear comb-structure starts to loose its grip in the new developments and the larger buildings blocks that were common for this period can be seen, for example in Oud Koog-Zaandijk. Industrial companies like Cacao de Zaan (current ADM) and Honig (current Tate & Lyle) start to occupy large sites within the urban tissue.

1940 – 1970

The modernistic expansion in Rooswijk is clear on the map, an high Open Space Ratio without losing FSI. Dwellings are mostly appartments, more information about the typologies can be found in paragraph 4.3.3. The existing water structure in East-West direction is largely kept in its original state, which relates strong to the origin of the location.

The left over open spaces Eastern of the railroad are built on. The urban tissue on the Eastern side is now completely built.

1970 – 2000

The largest extension of Rooswijk is built, named Rooswijk Noord. Extension is located outside the station area.

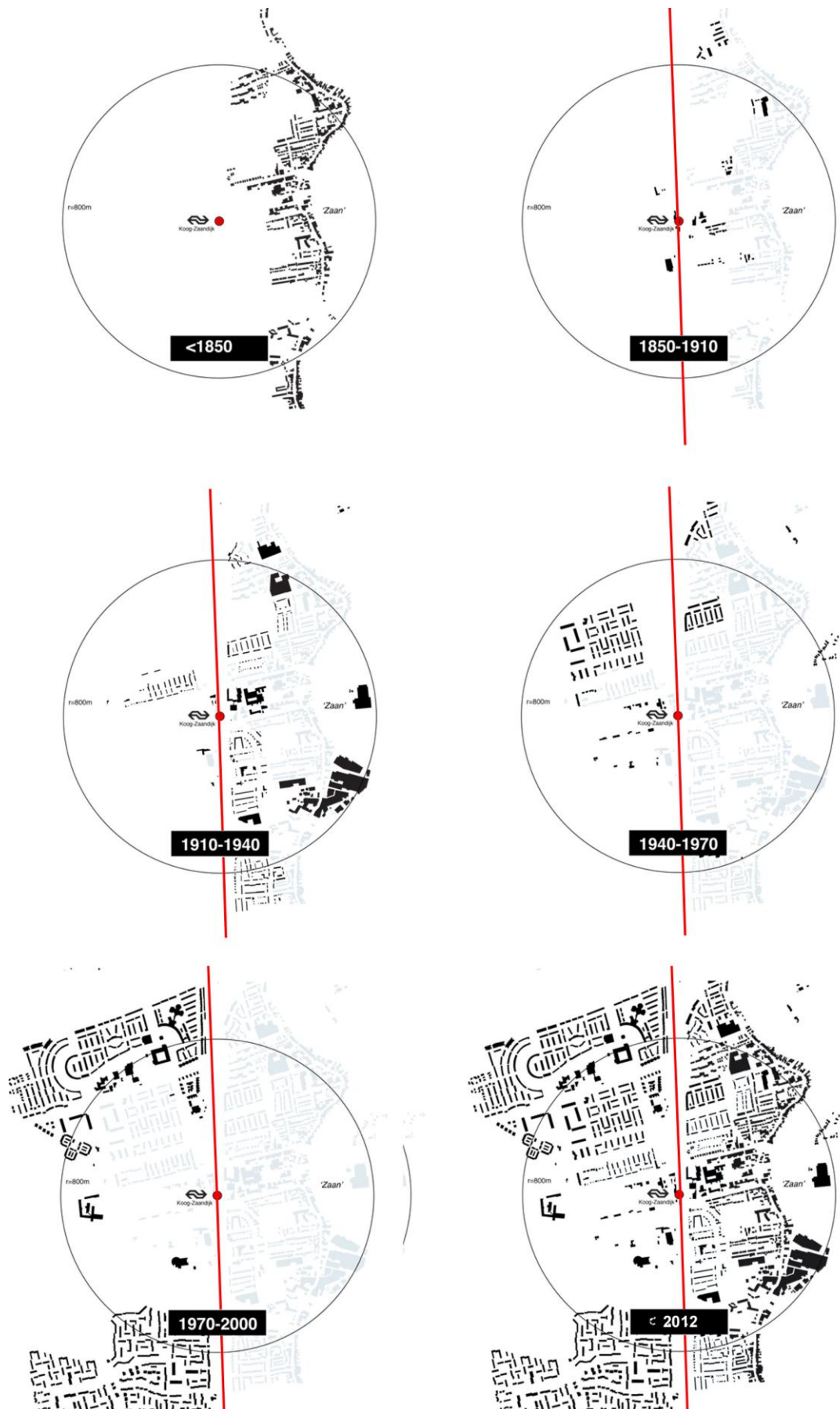


Figure 10: Morphology in 6 different time periods. Black elements are the new built elements in the period.

4.3.3 Building typology in the station area

The building typologies in the different neighborhoods are mostly connected to the time of building. The analysis is going into the sequence of time in buildings per district and which typologies are present in this district. The analysis goal is to capture the 'genius loci' of the place by unraveling the build area into typology.

District Oud-Zaandijk



Figure 11: Building types per time frame in district Oud-Zaandijk (Source: author)

In the district 'Oud Zaandijk' a lot of periods are present. This district contains the most variety in typology, some old typical 'Zaanse huisjes' what is so characteristic for the region are positioned along the river the Zaan. Besides the Zaanse Schans (open air museum of some typical Zaanse architecture), which attracts a lot of tourist, this district is as well very popular among tourists.

Next to the typical 'Zaanse huisjes' the big industries and the typology of the stroke buildings are also present over here. This district exists out of many architectural languages with very diverse atmospheres. The municipality labels this phenomenon as 'Zaans mosaic'.

District Oud Koog aan de Zaan

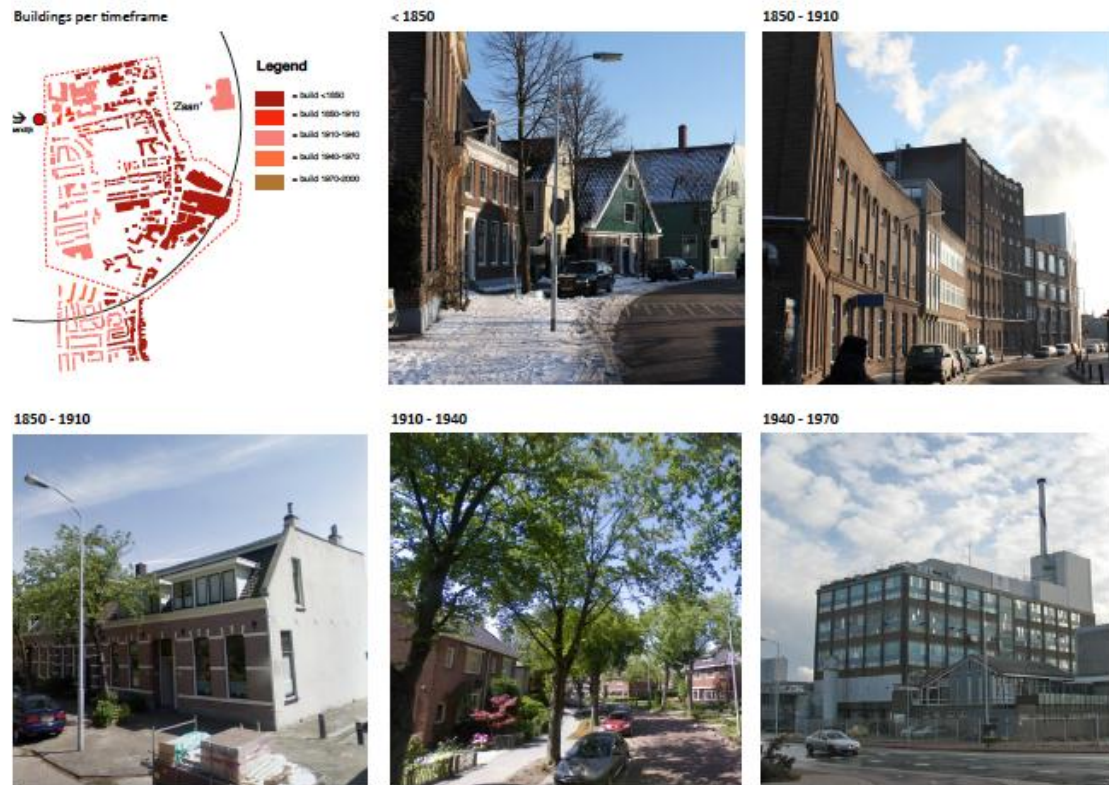


Figure 12: Building types per time frame in district Oud Koog aan de Zaan (Source: author)

Like the district Oud Zaandijk, this district contains many typical 'Zaanse huisjes' along the Zaan. But what also become immediately visible in this map are the two big industrial areas that more or less disturb the pattern of the district.

In the north this is the cocoa factory of ADM and along the east bank of the Zaan this is the Tate and Lyle factory. These big industries really determine the genius loci of this district and are very dominant. Again the Lagedijk and the 'comb-structure' become visible in the urban pattern. Along the parallel road on the west side of the district, worker houses determine the area.

District Rooswijk

Buildings per timeframe



Figure 13: Building types per time frame in district Rooswijk (Source: author)

Initially the buildings started along the Guisweg that runs perpendicular to the river the Zaan. The district Rooswijk is where it all started, and can be considered as a neighborhood with many stroke buildings, typical worker houses. Big post war building blocks are also represented over here.

Rooswijk Noord is the newest neighborhood in this district. The quality of the protected natural reserve is implemented deep into the neighborhood. Water and green were two important main elements of the design for this neighborhood. The atmosphere of the district Rooswijk differ a lot compared to Oud Koog aan de Zaan and Oud Zaandijk.

Typological study: comb structure

The typological study is part of studio assignment 3.

Based on the characteristic comb-structure a typological study has been done, creating a comb-like urban pattern, with a density of 40 dwellings per hectare. Different street profiles are applied in order to test different types.

Characteristics:

- Density of 40 dwellings per hectare
- Straight streets (paths)
- Straight water structures along the streets or direct in between the plots

The design steps for this urban study are shown in figure 15. This method is described in (Meyer & Westrik, 2008)

Design steps

- Defining the main infrastructure
- Defining the islands
- Defining the building blocks
- Defining the plots
- Defining the buildings

The study makes clear which size of profiles and plots are feasible to apply in order to reach the density that is desirable for the station areas.

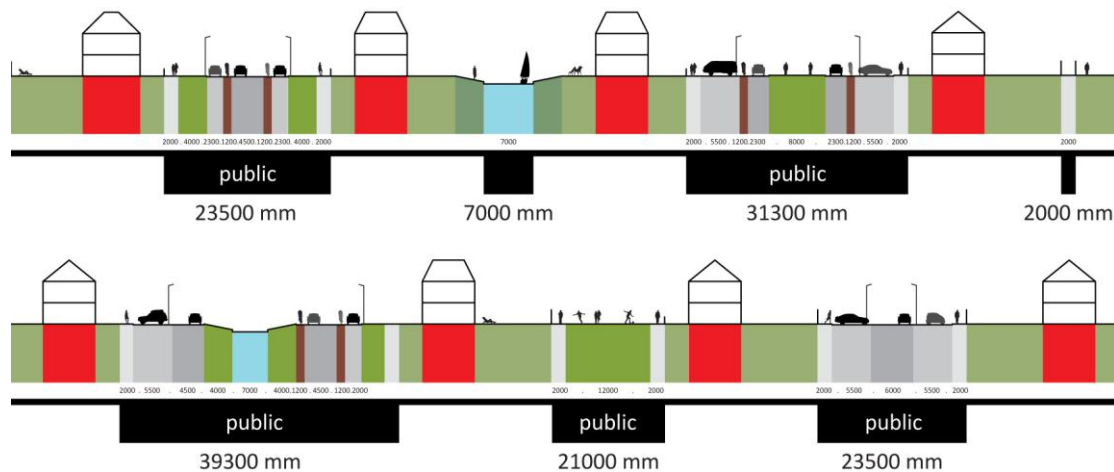


Figure 14: Different street profiles within an area with a homogenous density of 40 dwellings per hectare.

Typological study: density variations

In order to reach a density of 40 dwellings per hectare it is of course not necessarily needed to create a homogenous density in the whole area. In the design in figure 16 the average density is 40 dwellings per hectare (FSI 0,4 with dwellings of 100 m²), the densities differ within the area between FSI 0,15 and FSI 0,8



Figure 15: The process of designing the urban system. An area with an average FSI of 0,4 (dwelling of 100 m²)



Figure 16: An area with a mix of densities, but with an average FSI of 0,4 (dwelling of 100 m²)

4.3.4 Train station and its context

What is the spatial relation of the train station with the surrounding neighborhoods?

Different types of stations

During its current 145 years of existence the train station have had 3 different station buildings. The type of platform is related to these buildings.



Figure 17: The 3 station buildings of station Koog-Zaandijk

1) 1869 – 1931

The first station building was built as a 'standard' design, SS Hoogezand. The building had a stately character. As written by Engel 'The station buildings were monuments of a new territory order.' (Engel, 2007, p. 34) Station buildings represented the character of the new qualities of the train as a way of transport. The position of the station building was in front of the Bonsempad, which name was changed to Spoorstraat and is now known as Stationsstraat. (Historische Vereniging Koog-Zaandijk, n.d.-a)

2) 1931 – 1976

Because of the construction of the provincial road, the station building had to be replaced. (Historische Vereniging Koog-Zaandijk, n.d.-b) The new buildings character is already less stately, although a touch of symmetry and the use of a central avant-corps like in the first station building is still part of the design. The renewed road (current N203) caused a weaker relation between the train station and the Stationsstraat.

3) 1976 – current

After almost 50 years the train station got its largest transformation. The station building has been demolished and replaced by smaller pavilions on an island platform. The character and quality of the new station buildings have been influenced by the financial situation of the NS⁴ at that time. With the stations buildings on an island platform, the orientation of the station became equal to both the East and West side, at the same time the island platform isolated the train station more from its surroundings. The platform is accessible by a pedestrian tunnel (Kogertunnel), which also functions as a connection between East and West.

⁴ NS is the abbreviation of 'Nederlandse Spoorwegen', which stands for 'Dutch Railways'. NS is the main passenger railway operator in Holland.



Figure 18: The different positions of the 3 station buildings

The problem with the position of the train station and rail tracks within the context has to do with the growth of the city. 'The rail lines are in the past constructed at the border of the city, because of that they are poorly embedded in the local surroundings.' (Goudappel Coffeng, 2011, p. 50) This becomes clear when looking at the morphology study [see paragraph 4.2.2].

According to Bertolini & Spit as cited in (Wilde, 2006, p. 47) a train station is a geographical entity with two identities. 'The railway is a public transport node and at the same time it is a place in the city with a concentration of infrastructure and a group of buildings and open spaces.'

Island vs. side platform

At this moment the train station is not well connected with its urban context and functions as an island, spatial and functional.

The position of the train station has always been related to the Guisweg, in order to also serve the people living in the village Westzaan. Because of the railway crossing the platform is positioned south of the Guisweg, positioning the station building in front of the Stationsstraat. The relation with the Stationsstraat has been stronger than with the Guisweg. In order to improve the relation with the Guisweg the station can be repositioned. This will be possible because of the probable sinking of the tracks (master plan 3), in order to create a free passage of the Guisweg.

4.3.5 Public transport facilities

Which types and amount of (public) transport, parking and bicycle storage are needed?

The train station forms a public transport hub. Within a small area it is possible to change between walking, bike, car, taxi, bus and train.

Parking for both bicycle and car is at both sides of the station, with emphasis at the western side. The reason for this is the availability of space at the western side.

There are 168 parking lots and 5 bicycle storages have a capacity of 382 bicycles. According to the report of (Goudappel Coffeng, 2011, p. 36) the capacity of bicycle storage is not sufficient, numbers are not suggested.

When the station area will be densified and more services are incorporated, the need for parking will increase.

The orientation of the station is changed during time and if a front has to be pointed, the West side is now the most dominant, instead of the East side in the past, where the first station buildings and the station square could be found.

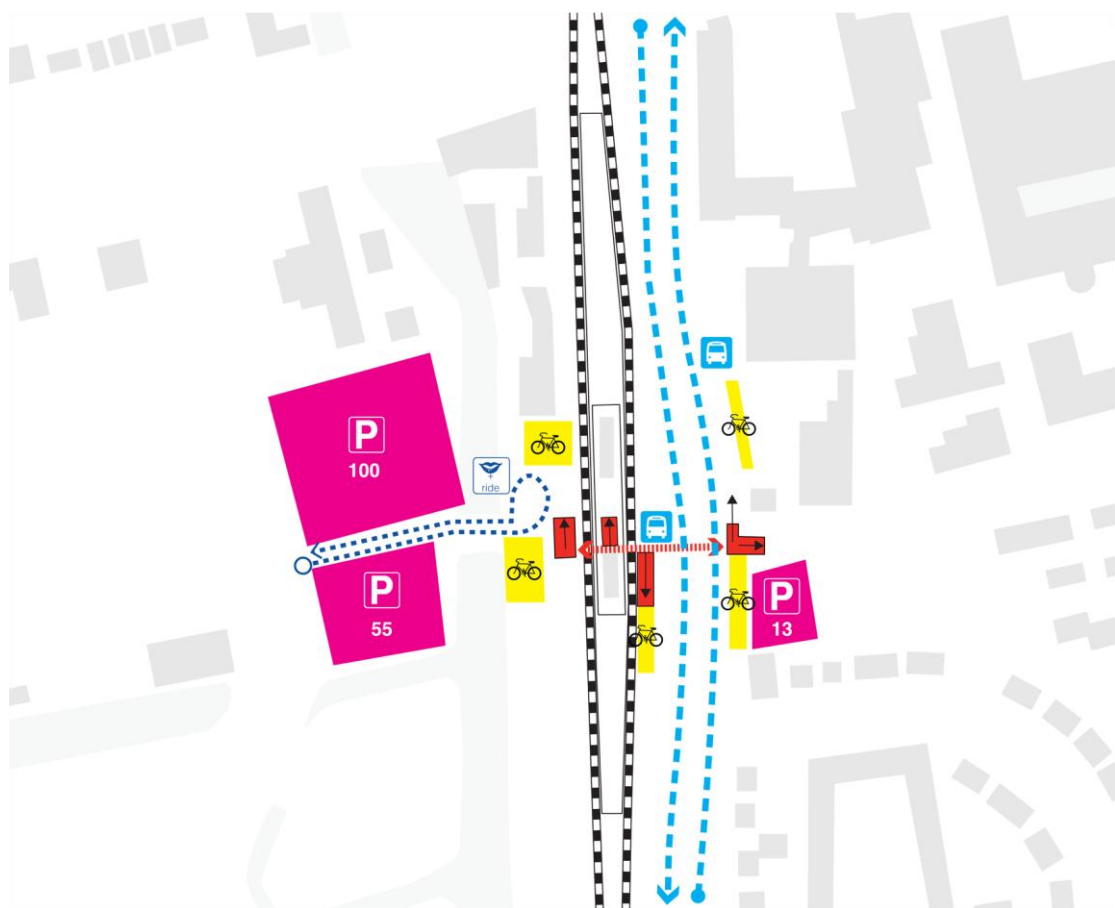


Figure 19: (Public) transport facilities around station Koog-Zaandijk (source: author)

4.3.6 Main cross connection

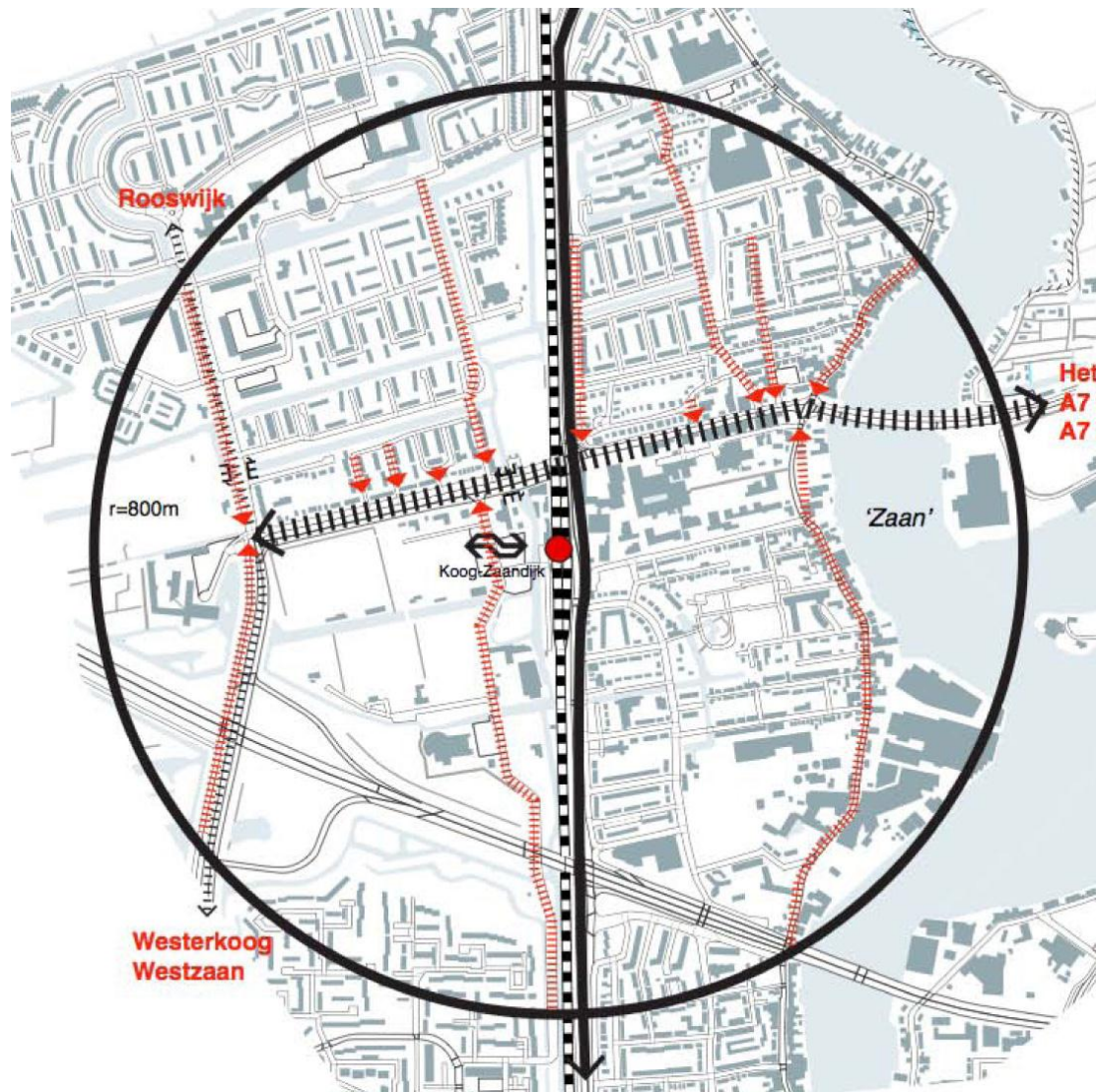


Figure 20: The main cross connection (Guisweg & N203) and roads connecting to the Guisweg. (source: author)

N203

The provincial road N203 (Limmen to Zaandam) is the main traffic route through the region. The profile of the road contains two lanes in each direction at the major part. Through the whole Zaanstad, with exception of a part of Wormerveer, the road is positioned parallel next to the railway. Together they form a strong barrier within the built area. The road is mainly used for regional traffic within Zaanstad; on a larger scale the A8 highway plays an important role.

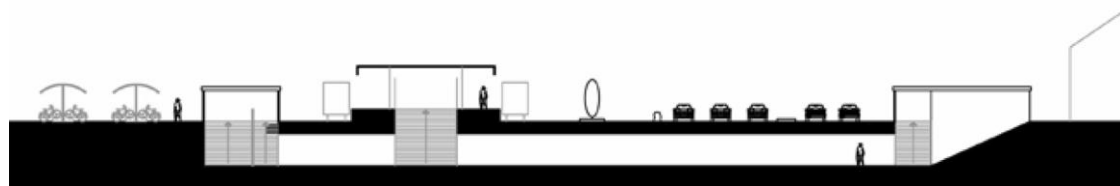


Figure 21: Section N203 at the position of the pedestrian tunnel. The rail tracks, train station and road create a very wide profile. (Source: author)

Guisweg

The Guisweg forms the northern border of the site. The Guisweg plays an important role in area of Koog-Zaandijk. It is the main connection between East and West, contains the only railway crossing and the possibility to cross the Zaan river at the Julianabrug (Juliana bridge).

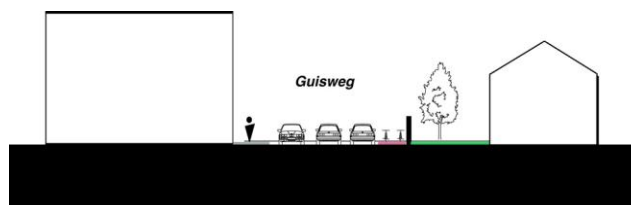


Figure 22: Section of the Guisweg, left the ADM factory, right the backyard of the dwellings at the Parklaan.
(source: author)

Because of the scale of the site of ADM cocoa all traffic from the area South of the site must pass the Lagedijk and continue on the Guisweg to leave the village.

The profile of the Guisweg, next to the ADM cocoa site is disturbed by the industry on one side. At the North side of the street, back gardens fenced with a brick wall face the street. More in Eastern direction, the Guisweg can be characterized as the 'shopping street' of the area. Though the quality of the buildings is not really well.

The Guisweg is part of the main route to reach or leave the different neighborhoods in the area. Many side streets connect to the Guisweg as can be seen in figure 20.

Railroad crossing

Parallel to the N203 is the railroad. The Guisweg crosses the railroad on equal level. With the current schedule of the train the railroad is closed for approximately 25 minutes per hour. The increased frequency of trains with the PHS will increase the time the rail crossing is closed, which makes it desirable to create an unequal level rail crossing.

4.3.7 Streets defining the project site

A clear overview of the different streets can be seen in figure 9.

The N203 cuts through the project site West of the ADM factory, the current Guisweg limits the project site in the North. The Stationsstraat limits the site in the South; The Lagedijk limits the site in the East, but cuts also partly through the project site at the part where the site reaches till the Zaan river.

Stationsstraat

The Stationsstraat forms the South border of the site.

The position of the Koog-Zaandijk train station had originally a strong relation with the 'Stationsstraat'. This street, which is positioned perpendicular to the rail tracks, connected the train station to the 'Lagedijk' and the river 'Zaan', but is also a 'dead end' on the riverside because it's not possible to cross the water at that point.

The 'Stationsstraat' is positioned parallel to the 'Guisweg', with a in between distance of 180 meters. The relation between the station and the 'Stationsstraat' has become weaker since its construction because of the change from side platform to island platform.

Houses at the Stationsstraat have been there at the South side of the road. The North side has been used for dwellings but the growing factory took over the land. The street profile is

now dominated by small-scale housing on the one side, and industry and related office buildings on the other side.

By removing the factory from its location, the profile and program of the Stationsstraat can be improved and reflect better to the small-scale housing.

Lagedijk / Hoogstraat

The Lagedijk partly forms the East border of the site. The Lagedijk is the oldest road in the area, the original dike road.

4.3.8 ADM cocoa factory

What buildings of the ADM factory are worthwhile to re-use?



Figure 23: The Stationsstraat (Koog aan de Zaan) with houses on the South side. The current ADM site in front is still unbuilt. Photo taken at the end of the 19th century. (Historische Vereniging Koog-Zaandijk, n.d.-a)

The site which is currently occupied by ADM was the last part untilled land in between the villages Zaandijk and Koog aan de Zaan. (see figure 23). In between the Guisweg and Stationsstraat arose the ADM cocoa factory, opening its first part in 1911.

The ADM cocoa factory disturbs the street profiles of both streets and after more than 100 years of growing industry, the ADM site causes several spatial problems in the urban tissue of Koog-Zaandijk.

Criteria to keep current factory buildings:

- The building has a rich industrial character
- The building has historical value
- The building is characteristic for the company
- The position of the building is/can be structuring in the urban plan
- The building is suitable for re-use.

The most iconic buildings of the ADM factory are the 'powder factory', the 'technical office' and the bricklaid chimney. The former post office and school building along the Stationsstraat are recently bought by the factory and interesting for reuse.



Figure 24: Current buildings on the project site in black, preserved buildings in red. (Source: author)

Powder factory

The building is characteristic for the factory. Visible from a large distance the building is an orientation point in the area. The distinctive façade, with a clear repetition of the window frames, make the building recognizable.

The column and beam structure make the floors of the building flexible, which is an advantage when new functions will

be introduced. The floor height of approximately 4,5 meters is quite high, it can give special quality to the spaces inside. Though the floor height is difficult to split in to two levels.



Figure 25: Powder factory

Technical office

The technical office building is positioned South of the Powder factory. The building has a stately character and a clear appearance of an office building. Although the building looks like an exact symmetric design in first sight, the building has come to its current look in different periods of building. In between the building and the powder factory is



Figure 16: Technical office

water, originated from the former comb-structure. This canal is kept in place within the ADM site.

Chimney

The oldest preserved chimney of the factory, made a bricks, is positioned West of the former headquarters. It is one of the six left over bricklaid chimneys in Zaanstad. In the beginning of the 20th century there were more than 100 bricklaid chimneys in Zaanstad.



Figure 26: Bricklaid chimney

Post office building

Located at the 'corner' of the N203 and Stationsstraat. The building is a municipal monument. According to (Gemeente Zaanstad, n.d.) the building is from architectural-historic point of view a good example of a post office in Functionalist style.



Figure 27: Former Post office

School building (1914)

Located at the Stationsstraat, the building of the former Christian school was one of the few functions located in front of the station, close to the former station buildings. The location of the school building is important because the windmill 'Zwarte Bonsem' stood at this place. The existence of the Stationsstraat (former Bonsempad) is related to this windmill.

The school building can together with the post office become an interesting building ensemble with help of additional buildings.



Figure 28: Former Christian school

4.3.9 Connect East and West

Which tools are suitable to improve the connection between the areas east and west of the barrier that is formed by the rail tracks and road?

Connection between east and west

To reduce the barrier that is created by the rail line and provincial road connections between the areas east and west of the tracks have to be improved. These connections can be made with the help of a variety of tools.

Buildings (mass)

Existing buildings can bind. As a result of analysis on the current morphology and the industrial buildings two buildings are marked as capable to create a connection. On the east side the current power station is positioned stands right in front of the 'powder factory' building of the ADM cocoa factory. See figure 29/30.



left: Figure 29: The power station, East of the train station (Bing, n.d.)

right: Figure 30: The characteristic powder building of ADM (Gemeente Zaanstad, n.d.)

The distance between the building fronts is 215 meters. The course of the railway and provincial road is positioned exactly in between.

Open/public space (voids) creating visual connections

The direction in which the connection has to be improved is equal to the historical pattern of the comb structure. Open spaces like paths, streets, canals and yet uncultivated meadows were orientated between east and west.

Infrastructure (network) creating physical connections

The current connections near the project site are the railway crossing of the Guisweg and the slow traffic tunnel (Kogertunnel) beneath the train station. In order to improve the connection between the both sides, in relation to the new situation of the levels of the road and rail, slow traffic connections to the platforms and to both sides of the rail have to be designed.

Program creating functional connections

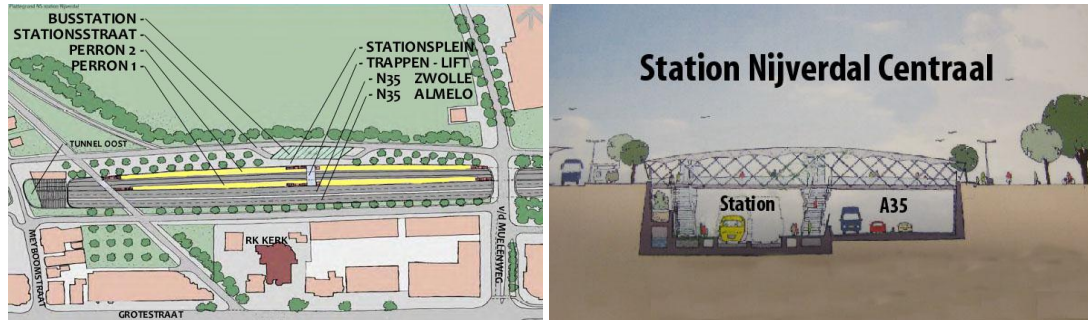
Creating a sequence of public functions, perpendicular to the barrier and with the possibility to easily cross the barrier can hold the area together because the functional sequence makes it a whole. The program is not limited to one level, especially not when unequal crossings are introduced.

4.3.10 Precedents of barrier solutions

Station Nijverdal

A bundle of the railroad (2 tracks) and a freeway (4 lanes), both sunken with respect to the ground level. The construction at the position of the station platform is known as an open tunnel. At both sides of the platform the tunnel continues closed.

Relevance - The openness of the tunnel at the position of the platform is an important decision. It has major influence on the way a passenger will experience his/her arrival. An open tunnel has a stronger relation with its surroundings.



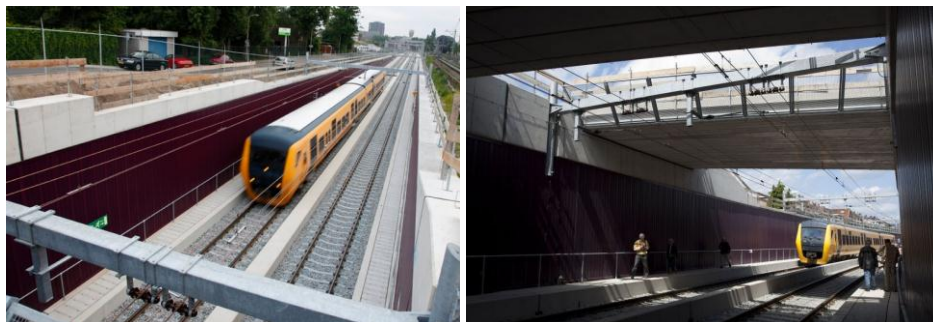
left: Figure 31: The project area of Station Nijverdal (Tunneplan Nijverdal, n.d.)

right: Figure 32: A section of Station Nijverdal (Wegenforum, n.d.)

Almelo Verdiept

The tunnel at Almelo doesn't contain a train station. Between the train stations of Almelo and Almelo the train goes through an open tunnel. At two points a viaduct is made to connect existing roads. Before the tunnel is put into use there were rail crossings that caused a lot of trouble.

Relevance - The viaduct can be compared to a solution for the rail crossing of the Guisweg.



left: Figure 33: The open tunnel of Almelo Verdiept (Van Hattum en Blankevoort, n.d.)

right: Figure 34: The open tunnel with viaduct of Almelo Verdiept (TC Tubantia, n.d.)

Kap van Barendrecht

At the train station of Barendrecht, the tracks are still on ground level. Interesting is the whole construction built over the tracks and platforms. Over the whole length a 'box' is placed. The length of the box is 1500 meters and is much bigger than only the station. The connecting element in this project is the rooftop park. On top of the train station a park is made, which can be accessed from both sides of the tracks and in this way creates a possibility to cross the barrier.

Relevance - In this situation there is no direct rail crossing for motorized traffic, which makes the precedent less relevant.



Figure 35: The train station of Barendrecht (Kap van Barendrecht, n.d.)

Spoorzone Delft

The intervention in Delft the train station is completely hidden underground. A closed tunnel over a distance of 2300 meters causes a strong influence of the experience of the train passenger. The train will

Relevance – A completely closed tunnel at the position of the train station decreases the feeling of accessibility of the platform. The scale of the solution is too large compared to the project site at 'Koog-Zaandijk'.



left: Figure 36: The project area of Spoorzone Delft (Spoorzone Delft, n.d.)



right: Figure 37: A section of Spoorzone Delft (Spoorzone Delft, n.d.)

5 Conclusions

The problem statement [chapter 2] and the findings of the research [chapter 4] have led to the design assignment for the Koog-Zaandijk station area.

5.1 Conclusions for Zaanstad

The research question, *'Which station area has the biggest potential to be transformed into a node that contains a mix of program to create a lively area, next to the task to densify dwellings?'* can be answered. The answer will be the project site where the further research and design will be related to.

In my hypotheses I stated that the train station of Koog-Zaandijk would have the station area with the biggest potential. After the research on the different station locations in Zaanstad, which do other groups largely perform as this is the structure of the graduation studio, I can conclude that Koog-Zaandijk has the biggest potential. Within Koog-Zaandijk the ADM cocoa factory site is of interest for me to elaborate further on.

Pros for the Koog-Zaandijk area

- Large area suitable for densification of dwellings, both on the East side (current sports fields) and the West side (ADM cocoa factory)
- Complex cross connection of the N203 and Guisweg in combination with a railroad crossing.
- Historical comb-structure involved in the ADM site, visible in roads and water and a clue for the urban design.
- Characteristic industrial buildings in a close range of the train station, ADM factory buildings on the East side and the power station on the West side.
- Mix of train users, commuters and tourists, causing a spread of the users of the station.
- Presence of a large social-recreational function, the 'Zaanse Schans'

Cons for other station areas

- **Zaandam Kogerveld** – The location is not along the Zaanlijn and because of that not influenced by the PHS, which means not a new meaning for the stopping service train.
- **Koog-Bloemwijk** – The area has less possibility to densify with dwellings and the space to improve the train station is limited.
- **Wormerveer** – No direct need for an improved connection between the two sides divided by the railroad.
- **Krommenie-Assendelft** – Recently transformed station and surrounded by actual large scale dwelling developments (Saendelft vinex suburb)

5.2 Conclusions for Koog-Zaandijk

The research question, *'What are the present and missing characteristics of the Koog-Zaandijk station area that are able to create extra value to make use of the train and make the train station an integral element that creates coherence in the village?'* can be answered and give several motives for the design assignment.

To understand the present and missing characteristics of the station area it has been important to understand the role of the train station during its existence. The position of the train station in relation to the built area of the villages that it is serving changed in the past 145 years. The growth of the urban area had consequences for the infrastructure and the functions located within the urban tissue. The spatial and functional role seems to be inferior to all developments in the immediate vicinity.

- The train station is an island, because of tracks & provincial road
- No additional program of daily use is present at the train station
- Connections in spatial, functional and infrastructural terms can improve the connection between the east and west side.
- Typological comb-structure can be seen in developments of all time periods and on both the west and east side. The structure can direct the urban plan.
- Several characteristic (industrial) buildings can be reused, to preserve the identity and structure the urban plan.
- Less dwellings, because of industry & sports fields are currently present nearby the station.

5.2.1 Design assignment

The design assignment is twofold, the site of the ADM cocoa factory has to be developed in a dwelling area that relates to the local building patterns. The comb-structure, perpendicular to the Zaan river and the railway in combination with the preserved (industrial) buildings can structure the urban design. The streets at the North (Guisweg) and South (Stationsstraat) border of the site are an important issue as they connect the site to the existing urban tissue.

The layout of parts of the profile of the Guisweg has to be reconsidered when connecting the new infrastructure and buildings. The road is the major entrance to the neighborhoods Oud Zaandijk and Oud Koog aan de Zaan. The main route from the train station to the Zaanse Schans is also along the Guisweg. More distinction between the fast and slow traffic on the Guisweg can create a more pleasant route for pedestrians and bicyclists.

The station and the relation of the station with the surroundings have to be re-evaluated. At the moment the train station functions as an island in between the tracks and the provincial road. The role of the train station will change because of the introduction of the PHS, the stop service will act more like a metro. The level of the tracks in relation to the provincial road has to defer in order to create an unequal rail crossing.

To create a relation between the sides east and west of the train station different tools are explored [paragraph 4.3.9] to create this connection. The connection made by the position of the ADM powder factory building and the power station frame the direct station area. This area will be elaborated on in more detail. The buildings will be reused and where necessary made suitable for 'human' program. The program for this area is more diverse: Next to dwelling, which is still the major part of the program, additional services are introduced to create extra value to make use of the train. Passengers can do their daily shopping and sports within a few steps when they're at the station. The building I'll design will improve the connection between east and west and contains the hybrid program of the train station, additional daily services like a grocery store and fitness, and dwellings.

"The train station as integrated urban element in 'Koog-Zaandijk'."

5.2.2 Goal

The railway (Amsterdam – Den Helder) and provincial road (N203) form a barrier between the east and west part of the urban area of Zaanstad. Train station Koog-Zaandijk has to function as a stitch between east and west in spatial, visual and functional terms. At the same time the Koog-Zaandijk station area got to have a strong relation with the urban context, in contrast with its current isolated position.

The train station will not be a building, but will be part of the context, the train station as an integrated urban element. The public space has to play an important role in the design assignment.

By programming a variety of functions for daily use, extra value for using the train (station) will be created. At the same time the (commercial) program can benefit from the significant flow of people that pass the area every day.

The amount of dwelling on the project site is at the current moment close to 0 dwellings per hectare. Increasing the density of dwellings to approximately 60 dwellings per hectare in the zone direct around the train station (master plan 3) will be the major part of the added program.

Characteristic industrial buildings that surround the train station have to play a steering role in the design. On an urban level structuring the morphology of the site's structure. On an architectural level applicable characteristics in material, rhythm and form, of the industrial heritage can, without losing the scale, refer to the industrial character of the area.

6 Discussion

6.1 Reflection

The research that is done during the first semester of the graduation project forms the basis for design. Accurate documentation of the process and its findings explains the road that is traveled from the first introduction to the project till this moment in the graduation project.

P2 report within the graduation process

The thesis, at this moment in the form of the P2 report, is the documentation of the research and the process of the graduation. It is as clearly as possible structured document with a continuous story line, largely written at the end of MSc 3. Although that the structure in the research is clear now, the process will improve when the link between writing the report and conducting the research is stronger. When you carefully write an introduction to a subject and state the problems with the consequent research questions on paper you are forced to find the essential meaning of what you need and want.

Choice of location, comparative analysis

The choice of location after the general research on all station locations, performed by the different groups within the studio, could be argued stronger. After 6 weeks of researching in particular the station area of Koog-Zaandijk the process of choice is not objective. A part within the research process could have been a explicit comparative analysis of the results of the analysis on the specific locations. An important condition in that case would be the similarity of the analysis products. Better communication between groups and working with a pre-set format can

Summary of the points to improve:

- Clarifying the research questions in an earlier stage of the process in order to specify the analysis. Write consequent in order to come to the essence.
- The documentation of the research process, in order to better clarify design decisions. 'Unconscious' research is done, which is in most cases can be explained afterwards, connecting the way of working to methods.
- Communication between groups in order to bring all research on the same level to be able to do an explicit comparative analysis between locations.

6.2 Recommendations for further research

At this point in the process recommendations for further research can be done based on the findings of the research. Research ends with conclusions, but other important results are the questions that arise. A selection of recommendations for further research, some more general, some really specific and location based, is given.

6.2.1 The character of the road N203

Most of the time parallel to the course of the train, the road N203 is of importance for the connection in North-South direction. At the same time, as concluded in the analysis, it forms a barrier through the villages. The road is still a Provincial Road, but the question is if it has still meaning on that scale.

More detailed research on the amount of traffic and the destinations of the traffic can be done in order to conclude out of scientific research if the size of the road is still relevant. This can be done in relation to the infrastructure network on a larger scale incorporating the highways. A suitable research method can be modeling based on the use of the road

through time and the relation with other traffic veins. As written by (Klaasen, 2005) modeling is able to reflect on the future scenarios in a justifiable way.

6.2.2 Additional train stations on the Zaanlijn

As part of the research on Zaanstad the outcome of the new possibilities of adding new train stations is an interesting starting point for further research on this subject. Additional train stations in combination with possible repositioning of existing train stations will improve the coverage of station areas in such a way that they slightly overlap.

More detailed research in relation to the growth plans of the municipality and the character of the rail line in the future can give more answers on the needs of additional stations.

6.3 Position within the current architectural debate

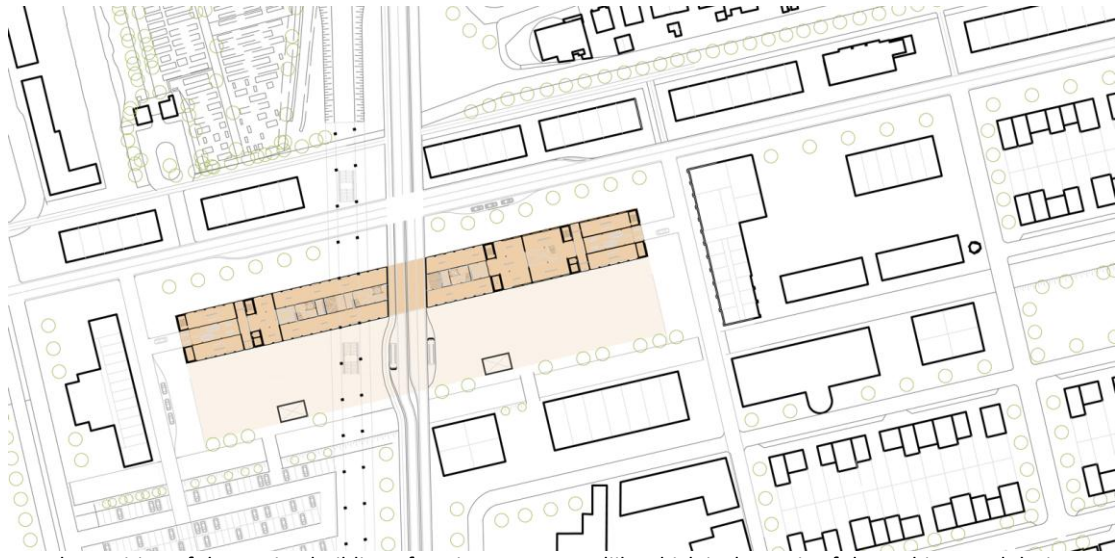
The role of the train station and the station building in both functional and spatial terms has changed during its existence. The train has become a common way of public transport. At the scale of the train station in this project the train stations are a stopover, in Koog-Zaandijk also an island in spatial terms.

The railroad is an artifact in the urban landscape and an element that is not flexible. While the course of the rail keeps the same for long periods, the train station itself has a changing identity and can react on the development of the city.

The growth of the urban landscape, where in our case Zaanstad is part of the greater metropolitan area of Amsterdam, makes it possible to let the train act as a metro (PHS). On the other hand commercialization of the society influenced the program of mobility nodes, this can be seen more at those with a large scale. In which way a relatively small train station can function as a hybrid node, combining both mobility and a social role for the context in order to stimulate people to make use of public transport is an interesting subject with the further growth of the urban landscape. In combination with the industrial character of the site on the east side of the station, a multiple architectural fields will be touched.

7 Architecture

Conditions given by the urban plan for the train station area of Koog-Zaandijk form the basis of the design process of the architectural object. Several architectural problems (probleemstellingen) are present at the start of the process.



The position of the station building of station Koog-Zaandijk, which is the topic of the architectural design created during the MSc4 semester, is marked on the map.

Architectural problems

Train station as a stop

With the introduction of the 'Programma Hoogfrequent Spoorvervoer (PHS)' the train station will function more as a stopover. This is a step that fits in the image of austerity of station buildings, especially at the scale of small train stations. From a stately building at the end of the 19th century to a planar that forms the platform at the beginning of the 21st century. Reduction of the buildings at the smaller stations can be seen throughout whole the country.

Less time for waiting will be spent at the stopover because of the increased frequency on which trains are stopping (6 trains per hour, maximum waiting time will be less than 10 minutes). Additional functions can make people stay longer around the train station, which will improve the liveliness of the area.

Train station as a binding element

The train station attracts people. Where traffic flows come together arises an attractive location for trade (historical fact) and services (modern era). The station functions as binding element within the urban system. The central position of the train station within the urban context is an advantage for this role of the station. The separation between the eastern part and the western part of the railway can be reduced with architectural tools. The building mass, the position in the urban tissue and the program can bind east and west.

Train station as part of a larger building

An attractive location for trade and services must accommodate a varied program. The use of the train can be stimulated because an attractive program surrounds the train station. The surrounded program can profit from the flows of travelers that visit the area every day.

In all scenarios it is very important that it keeps clear that the train station plays a leading role within the building object.

Train station as transport hub

At multiple levels traffic passes or crosses the building. The building is part of the transport hub where train, bus, car, bicycle en pedestrian routes from North to South and East to West come together.

Direction North-South:

- Railway Alkmaar – Amsterdam
- Provincial road N203 Limmen – Zaandam
- Bus line XX
- Bicycle route Alkmaar - Zaandam

Direction East-West:

- Provincial road N515 Westzaan – Purmerend (Guisweg / Guislaan)
- Bicycle route Het Kalf – Westzaan (Guisweg / Guispad)

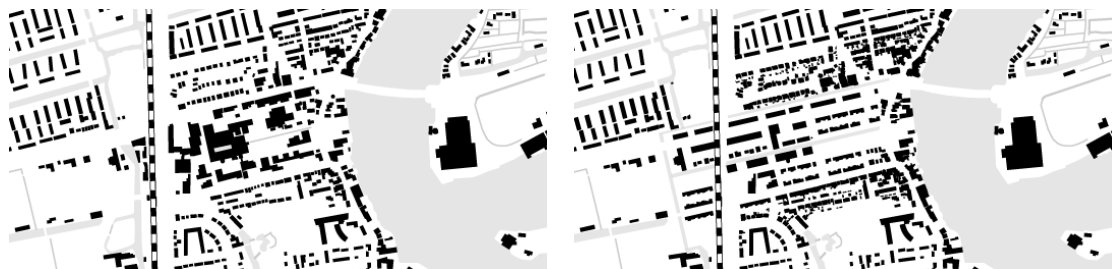
7.1 Situation

The station of Koog-Zaandijk is located in the Zaanstreek area and is crossed by the railway Alkmaar – Amsterdam. With the urban plan 'The Combs', developed during the MSc 3 semester, the dwelling density within the station area is increased to 40 dwellings per hectare. The train station plays a crucial role within the urban plan and has to improve the liveliness and quality of the urban area to make it ready for the new role of the Zaanstreek area as an urban vein of the capital Amsterdam.

7.1.1 Comb structure

The pattern of the urban plan is based on the historical comb structure of the local landscape. Ditches perpendicular to the river were created to dewater the meadows. When buildings needed to be built farther inland because the dike along the river was fully built, the street pattern followed the pattern of the ditches. This can still be clearly recognized in the current pattern of streets and water network.

The structure of the street network of the new urban plan and the water network is strongly influenced by this idea of the historical comb structure. The building volumes related to this are elongated masses, perpendicular to the river, provincial road and railway.

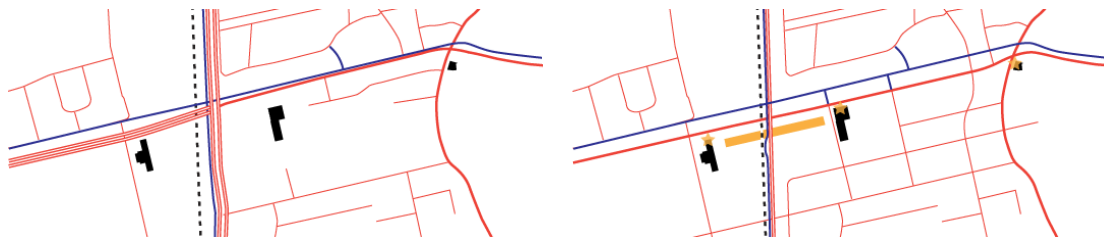


Left: The existing morphology, the factory doesn't fit in the urban tissue / Right: The repaired urban structure based on the historical comb structure.

7.1.2 Cross connection

Two major roads form a cross connection within the urban plan. The Provincial road runs parallel to both the railway and river. The Guisweg runs perpendicular to these infrastructural elements. Originally the Guisweg was a path and did run along a ditch as described in paragraph 7.1.1.

Within the urban plan the position and character of the Guisweg are reconsidered. This has resulted in a split of the Guisweg: a bicycle path named 'Guispad' and a lane for fast traffic with more allures named 'Guislaan'. In this way the lane runs directly along multiple important historic industrial buildings and the new station building. The path, with parallel to it the excavated ditch with characteristic trees, creates a more pleasant scale for the slow traffic.

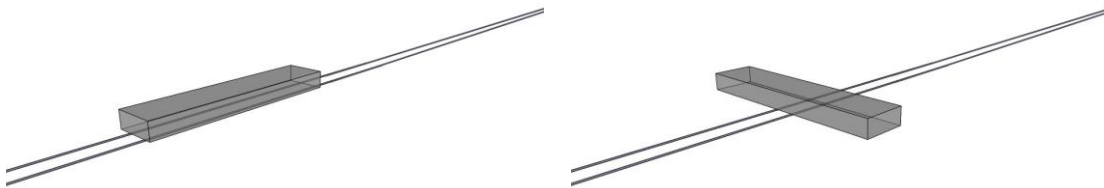


Left: The existing infrastructure / Right: The new infrastructure with the separated Guisweg along the station.

7.1.3 90 degrees rotated station building

Based on the urban plan the elongated building volumes are positioned perpendicular to the railway and provincial road. The volume of the station building continuous where, in the current situation, all buildings are strictly secluded from the infrastructure. This results in a volume that is crossed by two major infrastructural elements. Because of this new position of the station building, the building mass and program become tools to connect the east and west.

The most important access road that connects the two parts of the city east and west of the railway with the train station is the Guisweg. People who want to go in North/South direction by car use the provincial road, which competes with the railway. By rotating the building, it is positioned along the Guisweg.



90 degrees rotation of the direction of the station building

7.1.4 Point of orientation

A train station is a point of orientation within an urban network. A recognizable volume with a solid character has to reflect the industrial origin of the area. The perception of the building from different positions within the area has to generate a sense of public liability and centrality.

7.2 Building mass

A linear volume along the Guisweg within a building envelope with a length of 172 meters, a width of 17 meters and a height of approximately 20 meters (at least not higher than the ADM power factory building) is originated from the urban plan.

The volume is crossed by the railway tracks and platform at the level of the first floor (+6000mm). In plan this forms a cross with a deviation of 14 degrees. At the same time, the Provincial road N203 crosses the building at the level of the ground floor, parallel to the railway. Both of these infrastructural elements strongly influence the building mass. They need voids in the mass to pass through.



The building mass of the station building (red) in its urban context. White volumes are new volumes, brown volumes are existing (industrial) buildings

7.3 Spatial basis

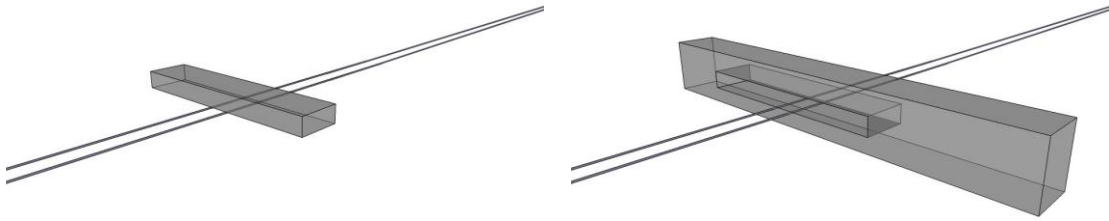
7.3.1 Subtracted mass in longitudinal section

The presence of the train station as part of the building has to be clear to strengthen the idea that the train station is a point of orientation. Positioning the program of the train station is the primary design step in the spatial organization of the building

I want to make really clear that I never had the intention to create a bridge; I want to make a hole, a void that is subtracted from the 'original' building mass and that indicates the position of the train station in a volume that contains a wide variety of program.



Diagram of the spatial basis in longitudinal section and elevation



In order to extend the buildings floor space to extend the functional program, the volume of the station building is inverted whereby a subtracted mass is created, based on the building mass stated in the urban plan.

7.3.2 Central interaction zone in cross section

The secondary spatial structure is created in the cross section. A central zone that is divergent in width from bottom to top contains all possibilities to interact between different spaces on a floor or between different floors. Vides, stairs and public elevators are located within this zone.

A continuous line of sight is created throughout the length of the building, all program dividing are transparent in the central zone. Visual connections between different floors are created by vides.

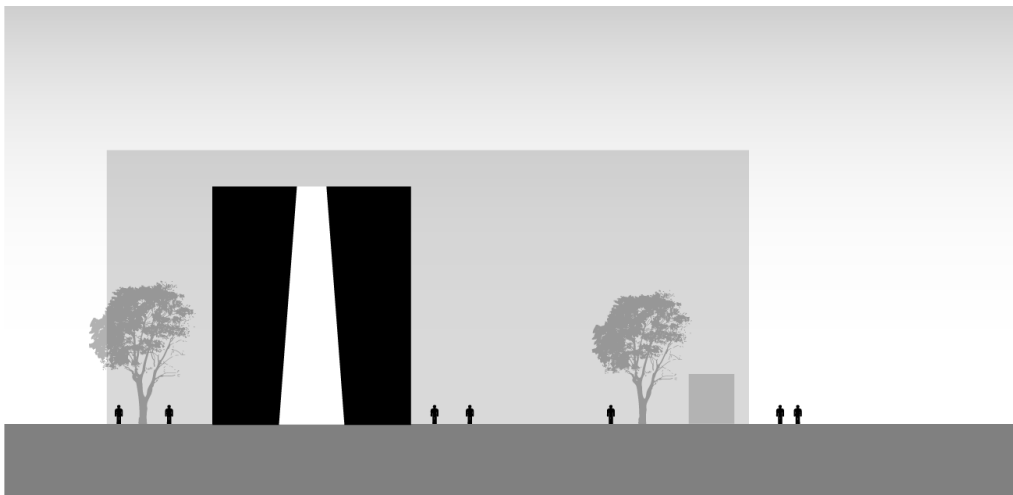


Diagram of the spatial basis in cross section and elevation

7.3.3 Programmatic layers

The program of the building is in section organized in 3 different layers.

1. Direct public program accessible via ground level.
 - Train station with facilities, shops, café/restaurant and parking garage entrance
2. Indirect public program accessible via first floor.
 - Platform, tourist information, cultural facilities
3. Private program at the third and fourth level, which can be accessed via lobbies on ground level and basement.
 - Dwellings

The basement of the building is accessible for pedestrians, bicycles and cars. Specific entrees for cars are situated at the east and west side of the building. Entrees specific for bicycles are created north (connected to the new Guispad bicycle path Westzaan – 't Kalf) and south (connected to the bicycle path Uitgeest – Zaandam) of the building.

7.4 Material basis

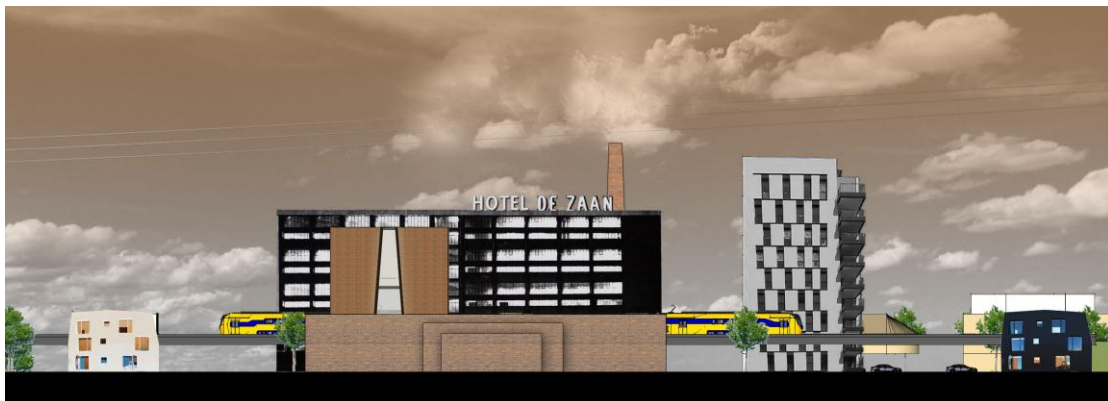
Inspiration for the industrial architecture and the characteristic materials belonging to this kind of buildings mainly came from industrial buildings in Holland and Germany, originally built in the beginning of the 20th century. Examples are the NDSM warehouses (Amsterdam, NL), the coalmine industrial complex of Zollverein (Essen, DE) and the photography of Bernd and Hilla Becher, which includes a wide variety of industrial building typologies.



From left to right: Sequence of industrial end facades by Bernd and Hilla Becher / coalmine industrial complex of Zollverein / Roof lights at a NDSM warehouse.

Steel structures, brick facades and façade openings made of glass within steel window frames are the common materials.

Exceptions are made because of the construction of the 3rd and 4th floor. An attempt was made to make the structure as light as possible. Though this is not directly visible in the appearance of the building.



Artist impression of the sequence of the existing power station, the new station building, the existing ADM powder factory and the existing ADM brick chimney.

7.5 Building Technology

Constructive problem

The constructive challenge in the project is clearly the span of the building above the hole. In order to maximize the experience of the subtracted mass the span (84 meters) had to be carried in once, no supporting elements that disrupt the experience of the hole are desired. The shape of the central zone gives an extra dimension to this challenge.

7.5.1 Order and measures

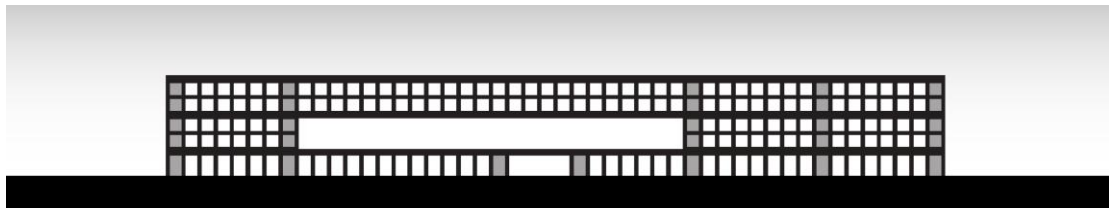
The building order is based on blocks of 4 x 7200 mm in longitudinal direction. 6 of these blocks create a length of 172 meters. The exact width of the building is influenced by the order in the façade, a repeating pattern every 3600 mm, and the off angle of 14 degrees of the perpendicular of the building formed by the railway. The width of the hole is 3 sections, with a total length of 86400 mm.

Longitudinal facades

Order in the longitudinal façade can be reduced to a repeating pattern every 3600 mm. within this grid the façade openings have a width of 2700 mm, being 4/5 of the pattern width. The window openings are mainly square shaped, except at ground level, where an increased floor height asks for higher façade openings.

To save weight prefab brick panels are used at the façade of the floating building part and at the ceiling of the hole.

Where façade openings are not desired, the pattern created with the façade openings continuous. A differentiation in the pattern within the brick shell known as 'Claustra' indicates the position of the 'closed' façade opening. Claustra means that within a certain part of the façade on regular intervals bricks are omitted. This creates a darker part of the façade because of shading in between the bricks.



The repeating pattern in the longitudinal façade.

End facades

The end facades have a characteristic division of the closed and open parts, reflecting directly the shape of the central interaction zone that continues through the whole length of the building. The divergent shape of the façade opening refers to the shape of the industrial chimneys that once where dominating the Zaan area. - Around the year 1913 about 100 industrial chimneys could be found in the area; nowadays only 6 are left over.

The contrast with history because the glass and not the bricks form the shape, which is the common material for the chimneys, reflects the use of this metaphor in the present time.

The functional program of the central zone influences the origin of the shape, which is different per floor. At lower level (basement, ground floor) a wider zone is necessary because of the entrances of the parking garage and the public stairs and elevators of the train station. At the top floors (dwellings) the central zone is the corridor that connects the dwellings. The zone can be much smaller, which results in more available floor space per dwelling.

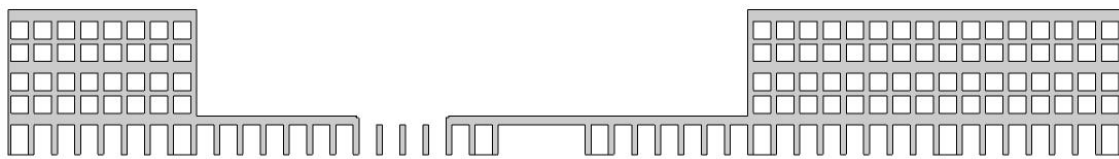
7.5.2 Loadbearing construction

The loadbearing construction is positioned within the longitudinal façade and along the central zone of the building. In order to speed up the building process, which is desirable on

a location with a heavy use of the infrastructure, the use of prefab elements is preferred. A general building order is given in paragraph 7.7.

Concrete structure

The loadbearing part of the façade is constructed with prefab concrete façade elements. The repetitive character of the façade is suitable for prefab elements. The construction of the railway viaduct is dilated from the construction of the building to prevent vibrations from influencing the building. The façade of the floating building part is not created with concrete elements in order to save weight.



The loadbearing concrete façade elements

Steel structure

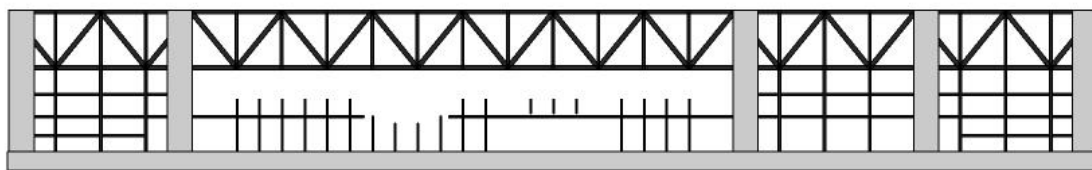
The loadbearing part of the central zone is constructed with steel profiles.

To prevent that the inner steel structure forms thermal bridges, the construction is always positioned inside. This is possible at almost the whole building, except at the basement and parking garage entrances. The construction is wrapped at these points.

In order to keep the construction visible in the end facades, the presence of the underlying loadbearing structure is suggested by 'extending' the width of the window frames to match the width of the steel structure.

The truss beam is extended with steel ribs, which at the same time is part of the house-separating walls.

All steel elements are protected against high temperatures by applying a thin film intumescent coating. This doesn't influence the image of the structure.



The loadbearing steel structures, casted concrete cores and concrete basement walls

Floors

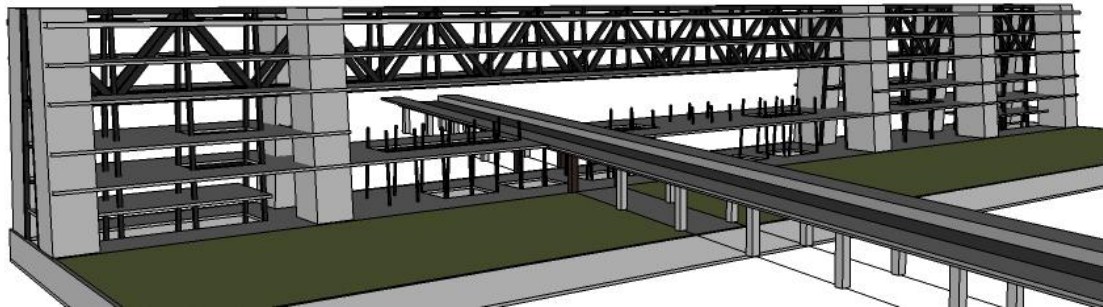
The common elements for flooring everywhere in the building except the central zone are prefab concrete hollow slab floors. The span direction differs through the building. In the floating part of the building the floors span between the house-separating walls. All other floors span in between the longitudinal façade and the steel construction of the central zone. Within the central zone, the materials for the floors are related to the steel and glass elements. Stairs are materialized the same as the finishing of the central zone floors to create coherency in the zone.

The floor of the 'hole' is in general not insulated. The space underneath, the station hall, is an unheated space, which makes insulating not necessary. At the west part of the station

hall a commercial space is located at ground level, underneath the outdoor space. The insulation is positioned underneath the floor, creating a 'cold roof'.

Roof

The roof of the building is constructed with profiled steel sheets to save weight. The insulation is positioned at top of the sheets, which creates a 'warm roof'. The part of the roof above and along the truss beam is mainly made of glass in order to maximize the entrance of the amount of daylight in the corridor and dwellings.



The steel loadbearing structure, casted concrete cores, floors and railway viaduct

Stability

The 5 pairs of casted concrete cores create stability. All cores cantilever to the center axis of the building, which creates a triangular shape of every pair of cores. At the same time the cores at the north side of the building function as (emergency) staircases, the cores at the south side of the building contain the elevators, technical shafts and technical rooms.

7.5.3 Climate and installations

Because of the presence of both railways and roads, mechanical ventilation is applied. Although it's still possible to work with natural air supply by operable windows, the choice is given to the residents.

Dwellings

All pipes and shafts of the dwellings come together in a service layer in between the 2nd and 3rd floor. This service layer has a limited height (800 mm). Underneath the floating building part, this layer also includes the (soundproof) insulation.

The corridor in between the dwelling is unheated. This makes it a temperature transition zone with an average temperature of approximately 15 degrees Celsius. The insulation line of the dwellings is positioned in the façade directly next to the truss beam.

Public facilities

The public facilities at the 1st and 2nd floor and the shops on ground level are mechanically ventilated. In order to limit the length of air canals, the ventilation installations for the public facilities on the 1st and 2nd floor are located in technical rooms on the 1st floor, the installations for the shops on ground level are located technical rooms on the ground floor.

Platform

The platform is completely outdoors. To protect visitors and travelers from wind the construction of the central zone is extended up to 2400mm above the level of the platform. As integral element of the central zone this creates space to shelter on the 1st floor.

Station hall

The station hall at ground level is partly open to the outdoors because of the vides/stairs that connect with the platform at the 1st floor and entrance doors that open continuously. Because of this the station hall is naturally ventilated.

Basement

The basement is open to the outdoors via the parking garage entrances and vides that connect with the station hall. This creates the possibility for natural ventilation. Next to this the basement is also mechanically ventilated because of its size and presence of exhaust.

Technical rooms

On most floors technical rooms are positioned next to the elevator shafts and are located directly next to the façade. At these points the brickwork has a Claustra pattern which makes it possible to ventilate via the façade.

7.6 Building order

Because of the presence of multiple infrastructural elements, the building process has to be structured and planned correctly. Although the building schedule will be adapted by the schedule of the traffic; sometimes the passage of trains, car and other traffic must be stopped to guarantee the safety during the building process.

The sequence of the main steps of the building process is as follows:

Railway, Provincial road, foundation and basement

1. Existing buildings, within the building site, that are not part of the urban plan have to be removed.
2. Temporary railways have to be constructed direct east of the current position of the railway tracks.
3. The construction for the new raised tracks can now be placed; the new position moved a few meters westwards relative to the current position.
4. The temporary railways can be removed when the new tracks are connected to the railroad network.
5. The position of the provincial road has to be moved to the east temporarily.
6. The west part of the foundation and basement can be constructed; the new position of the provincial road is above this part of the basement.
7. After the west part of the basement is covered and the new provincial road is ready, the temporary road can be removed and the east part of the foundation and basement can be constructed.

Loadbearing structure

8. The 10 casted concrete cores have to be constructed in order to create stability from the beginning of the start of the building.
9. The giant truss beam cannot be assembled into one piece at ground level because of the railway and Provincial road that cross the building site. The parts of the truss beam that are not part of the span are constructed first at ground level and placed

into position, 14 meters above ground level. The parts already cantilever for 14400 mm above the 'hole'.

10. Temporary structures are placed on both sides of the provincial road; these support structures keep truss beam in position during construction.
11. The missing parts of the truss beam are constructed on ground level and placed into position, supported by the temporary support structures. After the truss is assembled completely, the support structures can be removed.
12. The ribs of the floating structure are placed in position in a repeating order with an in between distance of 7200 mm. The main steel structure is ready now.
13. The construction of the steel structure for the basement, ground floor and first floor for the building part underneath the hole can start at the same time (12).
14. After these steel structures are also ready, the construction of the longitudinal facades can start. Prefab concrete elements (façade elements, hollow slab floors) are placed in position.
15. The hollow core slab floors of the dwellings can be placed and the roof can be constructed (profiled steel sheets / insulation). After the floors and the roof are ready, the facades that divide the dwellings can be constructed, the steel ribs are wrapped.

Facades, cladding

16. Underneath the floating building part, pipes and shafts come together and (soundproof) insulation has to be placed. The construction that covers the installation elements and supports the brick panel ceiling of the hole has to be placed.
17. The floors within the central zone are constructed where necessary and in the proposed material. The floors aren't made of prefab concrete at several positions in the building and multiple voids are part of the design.
18. Stairs and elevators within the central zone are placed, both in the station zone as in the public facilities at the 1st and 2nd floor.
19. The end facades, which are not loadbearing, can be constructed. Both the structural part of the closed facade as well as the open (glass) part can be placed.
20. The window frames within the longitudinal façade can be placed; probably the window frames are already connected to the prefab concrete façade elements (14).
21. All facades can be insulated and the brick panels can be placed on the facades.
22. The ceiling of the 'hole' can be cladded with brick panels.

Finishing

23. Further steps in the finishing of the building are not described, as they are not as relevant for the understanding of the building process and order of the building.



Impression of the building as seen from the south west side.

8 MSc4 reflection

During the MSc4 semester, the architectural part of the graduation project has been leading.

Planning & process

The original schedule for my MSc4 semester was set between September 2012 and January 2013. During the MSc3 semester I sometimes struggled with combining the study load with my working life, but at the end I did pass the P2 presentation with a plan that I fully supported, but with the feeling that the concept of the building within the urban plan could be more elaborated at that time.

In the beginning of the MSc4 semester the summer break and not being at the faculty during those months caused already a fall behind schedule in the first weeks of the semester.

During the 'in between presentation' in October I was still searching for the right approach to design the station building, a weak design called a lot of questions, I was not on the right direction.

While approaching the P3 presentation, 2 weeks before I finally realized that I needed one strong design approach. For me this was 'design by diagram'. A way of thinking and designing I really appreciate because of the analytical and abstract base. I explain more about this in the next paragraph.

The first ideas of the station building were presented during the P3 presentation, comments made really clear that the building concept was solid, but that I was far behind schedule. I think that I should have been at this stage around the P2 presentation.

The period between the P3 presentation and the ever-changing P4 date was very messy. I skipped both the P4 presentation in December and March because the level of products wasn't up to standard. A growing company (not architecture related), which I run next to my study, took much time per week and sometimes studying was reduced to a few hours a week, although in total I worked and studied in total for 60 to 70 hours per week. All this slowed down the design process and made it necessary to continuously come back to the right way of thinking, which again is not desirable in the process.

Despite attempts to reduce the workload and focus more on study, I never studied as much as I wanted, but did find a way to better combine both worlds. What the outcome of the project would have been if I could have studied full time and performed my graduation in the given timeframe, will stay an unanswered question. Though I'm satisfied with the outcome of my graduation project.

Design approach

Finding the right design approach can be the key to a successful design. A certain design approach can be a personal preference. During the design process of the hybrid station building I discovered and confirmed my preference to 'design by diagram'. A diagram is an abstracted clear representation of the reality. The abstract way of thinking that is necessary to reduce more complex situations to its origin is something that I learned during my studies. During the phase of analysis, the existing is studied: On an urban level mainly at the design location and on building level at precedent buildings. Diagrams played an important role in representing the essence of specific topics by classifying, categorizing and breaking down objects within framed topics. These are analytical diagrams.

During the design phase diagrams played an important role in the process of creating and structuring the building. In plan, section and elevation the program, spatial qualities, construction and materialization are frequently based on diagrams created in studies on the subject. These are generative diagrams.

The synthesis between the analytical diagrams and generative diagrams played a major role in de design process of both the urban plan and the building.

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