EHV CS

A comprehensive multilevel solution for the bus station of Eindhoven CS
This booklet is part of the graduation project for my Master in Architecture at Eindhoven University of Technology. I have chosen to conclude my Master with the project ‘Urban Nodes’ because the gray area between Architecture and Urban Design the studio features fascinates me; public buildings and transportation hubs, being used by a very diverse public every day. The fascination lies in the versatility of and complexity of design assignments posed in this gray area.

The graduation studio ‘Urban Nodes’ has been very interesting, inspiring, challenging and demanding. The collaboration with fellow students and support from the tutors has been of great help in conducting my research and developing the design for Eindhoven station. This project is shining a new light on the longstanding problems on the ‘Heckenpoel’ bus station in Eindhoven and I hope it will contribute to a future constructive and comprehensive solution for the area.

I am finishing this project with considerable pride and satisfaction and I will carry the experiences I gained during the master program, the graduation project and the excursion to Japan with me during (the start of) my career.

Many thanks to my tutors, my fellow students, the Municipality of Eindhoven, EHV365 and all others who were involved in helping and supporting me throughout my Master program and graduation.

Enjoy reading!

Joris Pierik
Eindhoven, 3 - 2 - 2015
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I. Summary
Summary

The central station of Eindhoven, and especially the bus station ‘Neckerspoel’ and the northern station building ‘Noordzicht’ are in desperate need of refurbishment. The entire area has been, and is being burdened by many different problems. Problems originating from the historical and geographical circumstances in Eindhoven, World War II bombings, previous municipal decisions, deterioration and the ever-growing amount of travellers and passants in the station area.

The problems in the area and the pressing undercapacity of the bus square result in a chaotic spatial organisation. This causes lack of efficiency, comfort and safety, not only for travellers, but also for other pedestrians, cyclists, taxis, cars, and buses.

The solution for the area is in essence quite simple: The existing height differences in the area are a great opportunity for creating a comprehensive multilevel bus station. Raising the buses up to the level of the Fellenoord and lowering the pedestrians to one level beneath. This principle eradicates routing conflicts between buses and pedestrians completely.

The entirely overhauled layout for the area proposed in this design is an intricate multilevel building, containing an underground parking for over 900 vehicles, indoor taxi stands and K+R, a bicycle parking for over 500 bicycles, 30 bus platforms, 236 hotel rooms, 5600 m² of office space and 5,700 m² of shops, cafes and places to stay. All of these facilities are under the same roof: it is therefore safe to say that the new station possesses plenty of facilities for comforting all travellers, passants and visitors.

The effect of the multilevel approach for solving the problems on the central station in Eindhoven is very positive: conflicts in different users’ traffic flows are minimized, creating more efficiency, comfort and safety in the area. Not only the routing has become more efficient, also the spatial layout has drastically improved and multifunctionality has increased.

The unattractive and overcrowded Fellenoord area is transformed into an area where staying is comfortable and where the future increase in the amount of buses, travellers, bicycles and cars is accommodated. It makes Eindhoven’s city entrance more comfortable and future-proof. The iconically tilted triangular building is a new orientation point in the area and redefines the Fellenoord, transforming it from an ill-defined urban plain merged together with the bus square into a properly enclosed street along the Central Business District.
II. Introduction
General introduction in ‘Urban Nodes’

This project is part of the graduation studio ‘Urban Nodes’. The studio (obviously) focussed on urban nodes, more specifically on multi-level urban nodes. The nodes have been researched from two perspectives: Urban Planning and Architecture, which made the studio an inspiring mixture of specialisms. Multi-level urban nodes can be found in all kinds of shapes and sizes: They can be a traffic node of highways, a market place in a city centre, a point of traffic congestion, or a large central station where many modes of transport meet and many traffic flows intersect and/or connect. Any place where abnormally many users cross or meet each other can be considered an urban node.

The start of the studio was collective, the ultimate final projects were however individual projects. The subjects and locations that were researched and designed were as a result of that very diverse.

Before the individual research and design process commenced, a collective research was conducted. The research focused on three topics:
- The history of Eindhoven
- The development of multi-level urban concepts
- The analysis of existing train stations and their contexts.

The collective research gave the individual the opportunity to gain knowledge about the studio’s focus and, more importantly, to discover his or her preference for a graduation subject and location. The freedom of choice in the project gave me the opportunity to choose a location that grabbed my interest: Eindhoven central station. The station, and especially the north side, is a very interesting location, especially due to its intensive and diverse traffic flows on and all around the station, the problems of undercapacity and the variety of users. The problems seem to only grow worse in the future and the station should therefore be made future resistant in order to keep Eindhoven accessible by public transport.

The station has been the subject of many studies, researches and design proposals in the past, so it was interesting to ‘have a go at it’ and see if I could present creative solutions for the issues at hand.

For instance, the clear separation of different traffic streams with huge multi-level traffic solutions,introverted buildings in very crowded areas and underground pedestrian passages to connect different buildings and neighborhoods may seem quite unorthodox in the Dutch culture, but they are in fact quite customary in Japan.

Part of the collective studio was a two-week graduation excursion to Japan. Tokyo was the main destination, but also Kyoto and Yokohama were incredibly fascinating cities to experience. The Japanese culture, customs and architecture have inspired me greatly. The influences of what I have seen in Japan are visible in the final project.
§2 Station Eindhoven in the media

Articles in newspapers and on the internet concerning the Eindhoven station are mainly about the undercapacity, future growth, lacking and desired facilities, and the construction of the new pedestrian passage. (See p.69 IV.11)

Although the construction of a new, wider, passage is good news for the capacity of the station terminal, it does not at all improve conditions around the station, such as serious parking problems for both cars and bicycles, traffic flow conflicts, undercapacity of the bus station and so on.

The necessity for improvements on Eindhoven station is immediately apparent when looking at some of the articles found in the media.

The problems have been around for a long time and so have the plans for relieving the area of those problems. However, the municipality only has a centrain budget at its disposal, in which there has not been room for a new station in the past years.

Minor changes have been made, such as adding some green and trees to the bus station in 2004 and currently the reconstruction of the pedestrian tunnel. These are however not structural changes that will make the entire station future-proof in terms of capacity, functionality, efficiency and comfort.

A comprehensive intervention for the entire station is therefore still to be realised.

Neckerspoel is being refurbished

17 - 02 - 2004

Press release Municipality of Eindhoven - The Municipality of Eindhoven is going to refurbish the Neckerspoel bus station at the north side of the train station. The complete facility is going to be renewed and improved, as is the dynamic traveller information system.

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Bustation ‘Neckerspoel’ is bursting at the seams

4 - 4 - 2009

Eindhoven - The bus station ‘Neckerspoel’ has reached the edges of its capacity. Especially the introduction of more city and regional buses last december has made the bustation burst at the seams. The municipality is working on a solution.

Reconstruction Eindhoven station in full swing

11 - 4 - 2014

Eindhoven - The transformation of the train station in Eindhoven is in full swing. The past weeks mostly digging has taken place to enable the construction for a new pedestrian passage.

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International bus connection

Eindhoven in use from June 23rd

13 - 6 - 2014

The international bus connection between Eindhoven, Antwerp and Düsseldorf will be in use from the 23rd of June onwards, Arriva sais. The bus company is in collaboration with Deutsche Bahn to make the international connection possible.

Eindhoven expands regulation for free public transport

15 - 12 - 2014

Eindhoven - Eindhoven wants to continue offering free public transport for people with a minimum wage. The municipal council has decided, based on the results of 2014, to continue the regulation in 2015 and 2016 and has made the necessary resources available.
§3 Problem statement and location

The current south side train station in Eindhoven has been replaced and changed many times; in its current design it has been in use since 1956. In over 50 years a lot has happened and a lot has changed.

The station, which was originally designed by Koen van der Gaast, was intended to only process trains and travellers as swiftly as possible, with as little distraction as possible. However, it is currently unable to deal with the vast growth in the amount of trains, buses, taxis, cars, bicycles and pedestrians. (See IV.9)

Between 2012 and 2020, the amount of travellers on Eindhoven station is expected to further increase from 74,000 to 151,000 travellers. *

The current station is incapable to process the growth of more than 50% in travellers.

It is not only the looming undercapacity that will become a serious problem. Since 1956 the station culture has also changed: In the '40s and '50s there was a heavy competition between the car and the train. The station had to be as quick and efficient as possible to be able to beat the speed of the car; extra functionality on the station would only slow the journey down.

Since the train established itself as a worthy mode of transport and a good alternative for the car, the culture on stations has changed; more functions have been added to the train stations. More shops, cafes and facilities were added to stations to service customers to their every need. Hoog Catharijne in Utrecht is a clear example of this cultural shift in the 70's: it was a very progressive concept for redeveloping station areas.

This cultural shift has never really set foot in Eindhoven. When the North side ('Noordzicht') was added in the '90s, some multifunctionality was introduced, but it never really accommodated the traffic oriented retail as for instance in Utrecht. In the entire country the station retail turnover kept, and continues to keep, on rising. (See IV.8)

§3 Problem statement and location

* Gemeente Eindhoven (12-05-2009)
Prognosis reizigersstromen 2020

The increase in travellers also has negative side effects on the security of the station. The traffic flows of station users and other traffic participants. (See IV.6)

Travellers exiting the station on the North side immediately have to be careful for routing conflicts between buses, taxis, cars and bicycles crossing their paths.

It is an unsafe and uncomfortable situation, which will only become worse as the amount of travellers (and also buses, taxis and cars) will grow. The routing conflicts are caused by how the bus square is located relative to the station. The area could be used much more efficiently, enabling the predicted future growth as well as improving the safety and comfort.

The bus square is in conflict with the traffic flows of the traveller because its current layout it needs to be quite huge in order to accommodate the amount of buses. The bus square 'Neckerspoel' is a vast urban plan of over 100x120 meters. With this incredible size it lacks the human scale entirely as well as any architectural or urban quality. The entire area is in urgent need for an impulse, to relief the travellers, the locals and the traffic users of these problems and issues.

With a monumental south side station facade, the north side is, because of these issues, seriously falling behind and in need of a proper city entrance of its own: An equal city entrance, for acknowledging the equality of the commercial south side and the residential and corporate north side of Eindhoven.

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† Waiting room in Hoog Catharijne station building

†† Retail facilities in Noordzicht station building

‡ Bus square 'Neckerspoel' (in background Noordzicht)
The project started with formulating a research question. Inspired by many multifunctional terminals and stations the research question was:

"What would Eindhoven CS be like if it was a place to stay?"

This question suggests the transformation into or the addition of a 'place to stay', but implicitly the question contains a broader assignment. Transforming a relatively monofunctional and 'cold' transportation space into a place to stay demands much more than merely placing tables and chairs at the passant's disposal. In order to determine what is necessary, one must first clearly define what a 'place to stay' is. The definition used in this project can be described as:

“A place where somebody can sit, stand, walk around or simply 'be' in a comfortable and relaxed manner, with the spatial quality and facilities present to accommodate this.”

The assignment that flows from this research question is not an exact and scientific research with an unambiguous and clear conclusion; it is a design assignment with many variables to eventually achieve 'comfort', a subjective emotion, perceived differently by each person. The difficulty of answering the research question lies in the fact that the answer can not be checked without actually executing the design; something that will most likely will not happen in the current economic circumstances. The design, which is eventually the proposed answer to the question, can only be checked and judged for its quality by experts in the field of architecture, urban design and other closely affiliated fields of expertise. In order to eventually be able to create a design worthy of being proposed as the answer to all problems at Eindhoven station, an extensive design research had to take place. As the answer to the research question is not a literal conclusion in words but an architectural design, the research itself is not a mere literary research. An executing research is more appropriate: Newly gained knowledge is applied in a sketch or design, which can be criticized and feedbacked upon. Consequentially the feedback is used to establish what more literary and referential research is needed, which can then be applied again in a revised design.

§ 4 Research and the research question

Before designing could be initiated, first a basic frame of reference had to be established. This frame of reference comprises of two elements: the first is information about the site; the history, current situation, the actors at play etc. The second element is about general principles; legislations, turning radiuses, general assumptions for designing stations, bus squares, transportation spaces and malls.

The start of the design-loop is therefore the research. Once that initial research has been conducted, the ongoing process of designing, researching and redesigning can be continued.

In the research there are basically four important sources:
- History
- On-site
- Theory
- References

These four sources have their own areas in which they are very useful. To be able to diagnose the exact problems and needs in the area, historical and on-site research are very useful. To explore possible solutions for the identified problems, theoretical research and references can provide the information needed.

References and inspiration can be acquired anywhere though, not only in literature and theories. Experiences and accidental inspirations can be of as much added value to the design as strictly structured research methods.
Relevance and significance of the issues

The issues around and on the station remain pressing as the amount of trains and busses arriving and departing from the station will only continue to increase, as do the amount of travelers, station passants, cyclists, cars, P+R-users and taxis. As the improvements currently being implemented are only of minor impact, a structural and comprehensive intervention remains necessary.

§5 Relevance and significance of the project

The minor improvements mentioned in the previous paragraph are merely bandages on the metaphorical wound. They do not solve the structural issues that have afflicted the station area for roughly a decade now.

Several large and ambitious plans to really overhaul the station have also been made, by the municipality, urban design firms and students (See IV.11). They are all ambitious, large-scale and focused on a better connection between the bus and the pedestrian. Whenever there will be a budgetary opportunity for the Municipality of Eindhoven to intervene in the area, these plans will most likely be consulted and analyzed to find the ideal blend of elements for the envisioned intervention.

Some of these projects have been designed a few years ago and are therefore somewhat outdated. For instance, all of the plans have been designed without taking into account the new pedestrian passage and will as a result have to be redeveloped before being able to be implemented.

The design in this project has been established with a highly realistic approach, taking into account historical developments, the current situation and the future predictions. Because of the realistic approach, the project might distinguish itself from competing plans by its plug and play readiness and applicability.

For instance, the plan does not contain a complex and unrealistically expensive reconstruction of the main artery roads bordering the project site (Fellenoord and Vastdijk) (fig. [17]), nor does it contain any additional office space, as there are currently many vacant office buildings in the area.

Instead, the project bases its program on recent studies in the area, such as an extensive study into the hotel market in Eindhoven and figures gathered by impartial statistical bureaus (CBS) and the Municipality of Eindhoven. (See IV.8)
III. Design philosophy
§1 Vision and Goals

Connecting

Three circles form the essential focus points of the project. The most important one is ‘Connecting’. Connecting is meant in the broadest sense of the word; firstly, the pedestrian routing on the station is currently very unclear, something that has to be improved.

Secondly, the traffic streams of other traffic users (i.e. buses, trucks, taxis, cars, bicycles) have to be part of a comprehensive solution that reduces conflicts drastically, and by that improving safety and efficiency in the area. These routes should all be calculated for future growth.

Comfort, safety and orientation are factors that will have to be improved by this intervention.

Welcoming

‘Welcoming’ means as much as: Creating a new city entrance. The north side of Eindhoven has grown enormously in the past decades but Noordzicht and Neckerspoel have remained the ‘backside’.

The north side is hugely important for many visitors in Eindhoven, whom are coming to the Business District along the Fellenoord, to the University of Technology, the Rabobank office, the neighborhood Woensel and so on.

The station is the first thing a new visitor sees and experiences: it is the business card of the city. With this many vital functions on the north side of the station, Eindhoven clearly needs a second, equal, city entrance.

Shopping

In order to make the station future-proof, it has to evolve to the modern day cultural standard, where multifunctionality in the form of retail and cafes is essential on a train station.

A station environment is not the place where people will go merely to do their exuberant shopping; the retail facilities would have to be focussed on ‘traffic oriented retail’: Retail that allows for quick shopping, for the grabbing of something a traveller needs right away, like a sandwich, deodorant, flowers or a cup of coffee.

‘Traffic oriented retail’ is a principle becoming more and more common in large transition buildings like train stations and airports.

Staying

In the middle of these circles is ‘Staying’. Its meaning is twofold:

- Firstly: Staying in the sense of spending more time on the station, by having a comfortable place to grab a drink or a bite to eat, to meet, to sit, to wait or to do some shopping.

- Secondly: Staying in the sense of offering a place to stay for a night, a week or longer when people come to Eindhoven for short- or middle-long term business or educational purposes.

The first ‘staying’ is as it was intended in the research question, with the addition that ‘a place to stay’ implies one or a few spots for seating, whilst ‘spending time on the station’ requires an integral design of comfort and facilities.

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Connecting

Welcoming

Shopping

Staying
In order to reach the above vision and goals, the entire station area must be redeveloped, including the ‘Noordzicht’ station building, the ‘Neckerspoel’ bus square, the access and exit roads, pedestrian tunnels and the station tunnel connection.

To prevent the project from getting completely out of hand, some external factors will not be touched, such as the elevation of the Fellenoord and Vestdijk, the location of the pedestrian tunnels underneath these roads and the location of the station’s pedestrian passage.

The main vision for the project is to separate the main traffic streams and still connect them to the existing infrastructure.

To connect this multilevel separated system to the existing infrastructure, the bus will have to be lifted above the pedestrian. This way the bus level can connect to the elevated Fellenoord and the pedestrian level can connect to the existing pedestrian passages underneath.

As a result, the pedestrians will acquire an ‘underground’ world which provides warmth, shelter and seclusion from noise and nuisance from busses, trains and the Fellenoord.

The pedestrian has a central role in the project, as it is the slowest and most vulnerable traffic user, but also commercially the most important, as the pedestrian at slow speed has the opportunity to spend time and money on shops and businesses on and around the station.

Eventually everyone is a pedestrian, whether they arrive by car, bus, bicycle or train. If the pedestrian can move around efficiently and freely, this can have a greatly positive influence on the adjacent and surrounding retail and business facilities. The positive impact is even larger if the very large numbers of travellers on the station (115,000 on a daily basis in 2020) are being taken into consideration.

Making the pedestrian comfortable also means making the transition to and from any other form of transport more comfortable.

To do that, all bicycle parking, car parking, taxi stands and P+R are located indoors, where it is dry, warm and easy and comfortable to find.

§2 Objectives

Pedestrian movement is the absolute most important element of the project. To make sure that they can reach their every destination without having to move or change the existing pedestrian passages, the existing pedestrian routing is used as the base for the future routing.

However, the existing routing is being faced by many obstructions. In the future these will be removed or overcome, enabling more optimized pedestrian routes as shown below.

Surrounding the pedestrian routing with retail and cafes will improve pedestrian comfort and will create a lot of retail exposure, which is positive for shop owners and cafe/restaurant owners.

Making the station a multifunctional environment is therefore an essential piece of the puzzle. The retail and ‘places to stay’ should be visible and easily reachable for all pedestrians. The staying facilities for business and educational purposes (hotel/offices) can be more privately located, secluded from the busy streams of traffic on and around the station.

The hotel containing this function will be lifted above all of the traffic participants, in a building that will form the representative facade of the station from the outside.

[19] Separating the main traffic streams

[20] Future pedestrian routing

[21] Principle section across the Fellenoord

The hotel building’s purpose is not only offering a place to stay. It also has a function on the urban scale.

In the current situation the bus square is directly adjacent to the Fellenoord and Vestdijk, merging into an enormous urban concrete and asphalt plain, inaccessible by pedestrians.

The new hotel building makes the Fellenoord a street again by bordering it with a long facade, and gives the bus square its own, separated, identity.
IV. Urban developments
Eindhoven, one of the clearest examples of the Dutch post industrial city, is less interesting than its current urban complexity.

Eindhoven has experienced many major setbacks in the past: the chokehold of Philips, with its economic void after industrial greatness, financial hardship, the complex annexation of surrounding villages and of course WW II. All of these events have left their traces and scars in the urban tissue. It has shaped the city into what it is now: a city with over 220,000 inhabitants and one of only few Dutch cities to cherish economic growth in times of international financial crises.

In the long history of the city, many municipal councils and urban planners have tried to come up with plans to recover from all of these former and present difficulties, to be able to feast the eyes on the future again. However, many of these plans never even saw the light of day, were changed and thence maimed beyond repair, or were implemented only partly, limiting the intended effects of the plans on the urban environment.

Despite the endless planning and discussions about urban measures to be taken, the city and its inhabitants have proven to be flexible in transferring its main focus in its post-Philips era, from an industrial to a knowledge based economy. Eindhoven University of Technology, the Design Academy and the High Tech Campus are great examples of what Eindhoven is capable of: Educating and innovating in high-quality creative design and technology.

The transformation of the Strijp-S region from the former Philips factories to the “cultural and creative heart of the city” (as stated on the www.strijps.nl) is exemplary for this shift of focus. Eindhoven is a city of evolution, not shy of shedding its skin if necessary, in order to maintain its status as a leading and innovative city.

The identity of Eindhoven is not necessarily captured in one building or one range of buildings; it is the diversity of buildings and the interwoven infrastructure that defines the urban landscape.

Large artery roads such as the Emmasingel, Boschdijk, Nestelt, Feijenoord, Montgomerylaan and the J.F. Kennedylaan all have their origin in history and the local geography.

Socio-economic circumstances have had great influence on the neighborhoods of Eindhoven. It gave them different appearances and purposes: For instance the densely built commercial city centre, the strict and large-scale business district along the Feijenoord and the residential neighborhood of Woensel, all divided by the artery roads of Eindhoven.

The different urban ‘islands’ in between the artery roads is something very characteristic for Eindhoven, presenting its own set of challenges and opportunities in urban development.
Eindhoven, a small city in the province of Noord-Brabant in The Netherlands. Having already acquired its city rights in the year 1232, it has been on the map for almost 800 years.

Eindhoven started out as a small settlement in a very soggy environment of swamps and water. The only solid ground to construct buildings upon were the sand ridges in between the water ways and soggy grass.

The city was naturally bordered by water and as construction was only possible on the sand ridges, the city organically grew according to the geographical circumstances.

What was the entire city in 1835 is now only the city centre. The footprint and the main artery road (Demer) is still very recognisable in the modern day city.

The water and the sand ridges have shaped the city since the beginning. The radial structure of Eindhoven is still present as a result of the geographical morphological origin of the city.

In figure 25 the current ground water levels are visible. The blue is clearly following the trajectory of the water streams (Dommel, Gender), whereas the red represents the dry sand ridges upon which construction was possible. The elongated village of Eindhoven was one of many ‘ribbon developments’ in The Netherlands.

In the centre of Eindhoven these red areas are concentrically shaped. The central road “Demer”, in the 1835 situation the main road, is currently still the main shopping street in the city centre.

In 1835 Eindhoven is still a small settlement, but it would take only 54 years before the beginning of the great breakthrough.
In 19th century Eindhoven, already many businesses, mostly textile manufacturers, had emerged. They were mostly located near the Dommel, for the water supply (for washing the textile and dumping waste). When the steam engine was invented, these businesses grew to become textile factories on a larger scale.

However, Eindhoven’s industrial power only started in 1891, with the foundation of a small company called ‘Philips’, manufacturing the revolutionary new light bulb.

By 1920, the province of Noord-Brabant and the municipality of Eindhoven had decided upon annexating five villages surrounding Eindhoven: Woensel, Tongelre, Stratum, Gestel, Strijp and Eindhoven were to merge together into the municipality of Eindhoven. As Eindhoven was in the middle of these five annexated villages, the municipality of Eindhoven would get a strongly concentric urban fabric.

Philips would expand to become the most powerful and influential company in Eindhoven; it was the largest employer and had a very active ground policy, resulting in the purchase of many plots, eventually merged together to become the Strijp R, Strijp S and Strijp T regions.

As the largest employer in the city, Philips evoked an enormous growth in the amount of workers. Many of them settled in the village of Woensel.

Whilst on paper all villages then were part of Eindhoven, in the hearts and minds of the people this was far from the case. All municipal decisions were taken (or not) with much difficulty and as a result hardly any structural plans for improving the city were approved; the villages’ individual interests were still on top of the list, even for many of the municipal councillors.

Consequently, the narrow and overcrowded same-level railroad crossing between Woensel and Eindhoven remained untouched for years.
Between 1921 and 1949 Eindhoven went through enormous growth, both in actual size and economy. The canals surrounding the city were put underground to enable further barrier-free growth of the city.

Further growth was an absolute necessity, a result of the tremendous housing shortage due to the ever increasing amount of labourers from Philips.

The housing shortage was a very pressing issue in Eindhoven. Philips had in the meantime acquired so much land that it had become a serious threat for the financial and spatial movavurability of the municipality.

The relationship between Philips and the municipality was to be called tense at best; both parties were absolutely unwilling to compromise on any of the land owning issues.

However, by the time World War II had begun, the problems between Philips and the municipality suddenly became insignificant. The Nazis had forced Philips to build weaponry for them, which paralyzed Eindhoven's economy, but more importantly, made Strijp an important target for an attack of the allied forces.

Strijp S was bombed on the 5th of December 1942 by the British Royal Airforce (RAF) during the 'Sinterklaasbombardement'. The consequences were dramatic. 138 people were killed, and the damage to the city was enormous. "De Admirant" and "Witte Dame" were set on fire, factory buildings were destroyed, and so were the train tracks and a large area with houses and streets between Woensel and Eindhoven. The narrow connection between the two neighborhoods was wiped off the map.

Even while the war was still going on, the municipality and Philips started with making reconstruction plans for the destroyed area.

Ir. J. van der Laan was the urban planner who made the reconstruction plans, including the elevated train tracks ('hoogspoor'). The architecture firm Verhagen, Kuiper en Gouwetor was asked to make the additional extension plan, which would form the base for the reconstruction of Eindhoven.

Already in 1953 the elevated train tracks were completed and in 1956 the new station followed, which was designed by architect K. van der Gaast. Years later the rest of the surrounding infrastructure would be redeveloped drastically.
The construction of the ‘hoogspoor’ was combined with the displacement of the train track trajectory to a more northern location. Additional houses were destructed for the realization of this plan. It was a collaboration between the industry (i.e. Philips) and the municipality.

In 1955 the general extension plan was presented, followed by the plans of German traffic engineer Prof. Feuchtinger, who was also hired by the municipality to solve the longstanding traffic issues.

Prof. Feuchtinger’s urban traffic plan abandoned the idea of the radial city. As a traffic engineer Prof. Feuchtinger chose for efficiency and large artery roads. His main east-west tangent (Fellenoord) would re-divide Woensel and Eindhoven. Being able to penetrate and pass through the city by car, bus and truck was the main purpose of the plan. Eindhoven was finally relieved of the traffic problems that had always been around due to the narrow railroad crossing between Woensel and Eindhoven.

Along the Fellenoord the new Rabobank office was built in 1967; the region would later develop into the new Central Business District of Eindhoven.

Around the same time a station entrance on the north side of the tracks was constructed (1970). It was a wooden temporary building that mainly served as an entrance for all whom arrived by bus on the new northern bus square.

The ‘temporary’ northern station building would eventually be replaced in 1991 after a lengthy 21 years of service.

Prof. Feuchtinger’s intervention was eventually not entirely executed as planned. The ring road lacked an eastern tangent, and the intended tangent/park way to Nijmegen would not turn out as planned.

The plan was flawed at the point where it did not contain a dense street network for slow traffic users like pedestrians and cyclists.

Tunnels were realised for slow traffic users to cross the Fellenoord, but the paths connecting to these tunnels seemed improvised, resembling ‘elephant paths’ on the serengeti.

It is this problem that is still problematic on the Neckerspoel bus square today. (See IV.3)
During the ‘70s the Fellenoord developed further into the Central Business District (CBD) of Eindhoven. The Rabobank was accompanied by other offices and the University of Technology, then still called THE (Technische Hogeschool Eindhoven).

The construction of Feuchtinger’s tangents was completed, apart from the missing east tangent, and the neighborhood Woensel kept on growing. All in all, the Fellenoord region was being developed heavily; the bombings during WWII showed their positive side effect; they had released Eindhoven of some of the burdens that had always limited the growth of the area.

During the ‘80s the developments on the Fellenoord continued, more office buildings, the Beurshotel and the Holiday Inn Hotel were built.

The wooden northern station building was replaced in 1991 with a new four-storey building called ‘Noordzicht’, designed by J. Bak. The ground level of the building contains shops and facilities, the start of some multifunctionality on the station. Above the ground level are three levels of offices, for the national railways’ (NS) and the national police’s (KLPD) offices.

The commercial plinth contains small shops, fast food, snack bars and a small supermarket. The multifunctionality of a station environment is something totally contradictory to the beliefs of K. van der Gaast, the architect of the south side of the station in 1956, whom believed that any extra functions on the station would be mere obstructions.

Along with the Noordzicht building, the new bus square was also realized. It had a much larger capacity than the former bus square and was an improvement in spatial organisation.
In recent years the CBD has been under continuous development. In 2004 the Kennedy Business District has been built next to the station. Currently construction is taking place for the new pedestrian passage on the station and across the Fellenoord also the Rabobank office has been torn down and is being rebuilt with a new design from UNStudio.

In 1997 it became clear that Eindhoven was about to leave Eindhoven. Of the over 40000 employees Philips had after the war, only less than 20000 were left. The exit of Philips from its original city was a sensitive blow to the municipality and the city. It came as a total surprise, and despite that Philips’s power over the city had decreased since the end of the war, Eindhoven still enjoyed financial and reputational advantages from Philips. Eindhoven was Philips and Philips was Eindhoven, it always had been, yet now that would come to an end.

Philips had (mostly) transformed Eindhoven from a small village into a prosperous industrial city, the economically most powerful city in the country outside of the Randstad.

For Eindhoven now the post-Philips-era had emerged. The old Philips buildings had to be either destroyed, saved to become a monument or be repurposed, but most importantly: Eindhoven had to reinvent itself as a city without Philips.

The city is still in the middle of finding its new identity, but it is clear that the municipality of Eindhoven has found a new path. According to the marketing agency responsible for Eindhoven’s image (EHV365), the ambition is to gain a top 10 ranking of global innovative cities.

Eindhoven has now shifted its focus to technology, design and knowledge. Something that comes to expression in the investments in for instance the University of Technology (TU/e), High Tech Campus, Strijp S and the Design Academy.
In present Eindhoven, the consequences of the ‘hoogspoor’ and Feuchtinger’s plan are still very dominantly apparent.

The area in between Mathildelaan-Stationsweg and Fellenoord-Dr. Dorgelolaan (in fig. 38 in purple) is an isolated area where no residential functions are located. The area has an impenetrable appearance, which is why in the ‘90s the municipality decided to close the connection between Mathildelaan and Stationsweg to create the 18-September square (after the liberation by the USA on 18-09-1944).

The isolated area is being crossed by the train tracks. The trifold barrier between the south side of Eindhoven and the north, causes them to be two different worlds.

The north side of the Central Business District is quite an incoherent collection of buildings. The large scale and enormous width of the Fellenoord and the tangents has caused the areas in between to be very disconnected up to a level where they hardly show any relation with one another at all.

Feuchtinger’s tangents have created the islands in Eindhoven in order to optimize the motorized traffic flow into and through the city. The three northern tangents are park ways that connect to the Fellenoord; wide 2x2-lane artery roads enclosed by trees. These roads form considerable barriers to be overcome by the crossing ‘slow traffic’. By ‘slow traffic’ is meant pedestrians, cyclists and destination traffic.

Also in between the arteries, on the urban islands, the slow traffic is much less carefully taken care of than the traffic on the artery roads. Often the routing on the islands seems incidental and bound to result in conflicts of routing. These ‘elephant paths’ especially come to expression on Neckerspoel and adjacent plots.

It is this principle (large artery roads disconnecting urban areas) that has made Eindhoven a city of metaphorical islands; isolated stand-alone building blocks with hardly any relation with the other islands.

§2 Arteries, islands and elephant paths
§3 Problems of Neckerspoel and Noordzicht

Fellenoord/Vestdijk barrier

The Fellenoord (and the Vestdijk) form a considerable barrier for the station and Neckerspoel. Movement is limited for the buses and taxis on the square. The accesses and exits for the area are not ideal as a result of that. Not only does it limit the movement on the area, it is also a visual barrier across the street. As the Fellenoord is elevated above the level of the bus station, the view across the Fellenoord is very minimal.

The busses and the high trees on the Fellenoord also limit the view considerably. As a result, orientation in the area is very difficult, a first-time visitor simply has no idea which direction to go to get to his or her destination.

Tunnels

When the Vestdijk and Fellenoord were constructed, also the pedestrian tunnels were realized to allow slow traffic to move underneath the artery roads, preventing having to cross them on a same-level crossing.

Although the principle of a split level solution is understandable and even desired, the execution was poor. The tunnels have low ceilings, are made of bare concrete and are poorly lit. Consequently the tunnels feel unsafe and are therefore deserted at night, except for youth hanging around.

The tunnels are also positioned in such a way that orientation is difficult for any pedestrian or cyclist; one must know the area to know where it goes.
**Bus station cabin**

At the north side of the bus station is a small building that used to serve as the distribution center for bus travel information and coordination.

As a result of technological developments, this information no longer needs to be done via this cabin; it is all being done digitally, via digital screens on the platforms, websites and apps.

When the building became obsolete, it was transformed into the lunch shed for the bus drivers. The ‘watch tower’ has not been in use ever since.

The building dates back to 1991 and is outdated and deteriorated. In aesthetics it is also not quite up to speed with surrounding buildings anymore.

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**Bus bridge**

The bus square has two entrances/exits for the busses. The most intensively used is the bus bridge connecting to the Vestdijk.

As the bus square and the Fellenoord are oppositely slanted, they are at the same level near Kennedy Business Center, but are vertically four meters apart at the Vestdijk.

In order to overcome the difference in height, the bus has to use a bridge, over the bus drivers’ lunch shed, over the bus lane, sidewalk and bicycle path.

The buses therefore constantly have to ascend and descend; highly inefficient as these busses use much petrol and emit CO$_2$ and particulates.
Noordzicht station building

Built in 1991 in combination with Neckerspoel, the building was unconventional in the sense that it lacked a classical ‘station axis’. Usually, when exiting a train station, there is a direct line of sight perpendicular on the station towards the primary destination or direction of movement, about which more in §5 The lack of sight lines.

Currently, the building is somewhat outdated and out of place on the ‘island’ it shares with Kennedy Business Center. A new city entrance deserves a contemporary icon or monument as the visitors’ first experience in Eindhoven, as is the case in the monumental south side of Eindhoven station.

Bus square

Measuring over 145x100 meters, the bus square is an enormous concrete urban plain. It lacks every kind of comfort (shelter, warmth, protection, routes, facilities, etc.). It is the domain of the bus, but in order to reach the pedestrian platforms, the travelers have to cross the bus lane.

The bus square is also slanting down 2 meters and in the opposite direction the Fellenoord rises 2 meters. As a result there is a height difference of 4 meters in the north-west corner, inefficient for the use of space and a visual barrier.

The three gravest flaws of the bus square are:

§4 Bottleneck of traffic streams
§5 The lack of sight lines
§6 Height differences
On and around the current station square, many routing conflicts occur. The conflicts can mostly be explained by the urban developments around the Fellenoord and Vestdijk during the post-WW II reconstruction period.

As previously mentioned, slow traffic was not fully taken into account in the making and execution of Feuchtinger’s plans (IV.1). The tangents and artery roads, in this case Fellenoord and Vestdijk, are most dominant in the area.

The Neckerspoel bus square is problematic for the pedestrian routing, in the sense that it limits the movement of pedestrians exiting and entering the station. As the buses need much space, the pedestrians are forced to stay on a narrow strip between the station and the buses.

The tunnels under the Fellenoord and Vestdijk pose an opportunity to cross the streets without conflict, but there are still many problems in the area; conflicts, that occur between ‘slow traffic’ and ‘fast traffic’.

The most alarming conflicts are those around the entrance/exit of the Noordzicht station building. Upon exiting the station, travellers have mere meters to walk before walking onto the bus lane. When going left (west) or right (east) they encounter either bicycle paths or car lanes (taxi/P+R).

The continuous threat of being run over by any other traffic participant does, obviously, not contribute to pedestrian comfort, nor to the general safety in the area.

Barrier free movement directly outside of the station is essential for a traveller to be comfortable and to be able to get a clear view of where to go without having to stop and hold up the pressing crowd.

In fact, as visual orientation in the area is already quite difficult, the lack of barrier free movement is an extra pressing issue.

### §4 Bottleneck of traffic streams

- Crowd waiting and crossing bus lane
- Cars stopping on zebra for K+R and pedestrians crossing unsafely
Northern European train stations have a long tradition of ‘station axes’. When steam trains were introduced during the Industrial Revolution, they were highly modern and advanced, something cities wanted to show off with; they were proud to have a train station in their city.

A road or avenue perpendicular to the station added monumentality to the station; it became a destination.

Of course a large street directly towards the station also had a logistic purpose. As more and more people wanted (or became able to) travel by train, these people had to be enabled to reach the train station.

In for example Amsterdam the Damrak is a clear example of such a station axis, from a large distance the station is visible, and equally important: People exiting the station know what the main direction to move to is.

As becomes clear in fig. 54, Noordzicht completely lacks such a station axis. The only clear sight line is towards the university, straight through Kennedy Business Center.

Although this axis is not nearly as monumentally impressive as the Damrak, it does provide some orientation for travellers, something the rest of the station area is lacking completely.

The pedestrian tunnels offer connections to many different destinations, such as Beursgebouw, Woensel and Rabobank, but those destinations are not visible before having passed through the tunnel.

The lack of a station axis causes difficulty for travellers to find their way around northern Eindhoven, making ‘Noordzicht’ ('view over the north') at best an ironic name for the station.

§5 The lack of sight lines

The lack of sight lines

Although this axis is not nearly as monumentally impressive as the Damrak, it does provide some orientation for travellers, something the rest of the station area is lacking completely.

The pedestrian tunnels offer connections to many different destinations, such as Beursgebouw, Woensel and Rabobank, but those destinations are not visible before having passed through the tunnel.

The lack of a station axis causes difficulty for travellers to find their way around northern Eindhoven, making ‘Noordzicht’ ('view over the north') at best an ironic name for the station.
The Neckerspoel bus square is slanted from the highest point (south-east) to the lowest (north-west).

The bus square drops two meters from east to west, at the same time the Fellenoord rises 1.5 meters. This results in a height difference of 3.5 meters, to be overcome by the busses with a bridge towards the Vestdijk.

Not only the busses have to overcome the height difference, also the bicycle path alongside the square drops and climbs several meters moving from the Vestdijk tunnel to the university.

This 3.5 meter drop could be used much more efficiently, for instance for creating two different levels: One on Fellenoord-level and one on pedestrian tunnel-level.

It is this principle that forms the basis for the project: A split level solution for the entire bus station, decreasing climbs and drops drastically, as well as conflicts in traffic flows. (See V.1)
On any train station many different stakeholders are active. In Eindhoven this is of course no different, and all stakeholders have their own interests.

For instance, the Cultural Heritage Agency’s main interest is to keep the monumental stations’ pedestrian tunnel and south station building preserved as much as possible, whereas it is in NS’ best interest to increase the tunnel’s width and upgrade it to modern standards.

However, there are some things most stakeholders in Eindhoven could agree on:

- Future growth should be accommodated on the station and bus square;
- Facilities should stay up-to-date to ensure maximum efficiency and comfort in the future;
- The Neckerspoel bus square is in desperate need of a capacity and facility upgrade.

As visible on the right page, three important stakeholders have already agreed upon the need for places to stay on Eindhoven station. Although verbalized in different manners, the core of the statements are similar: Pedestrians need to be able to spend more time on the station in a comfortable way, with the facilities and spatial quality to do so.

Additionally there are also unrepresented users of the station, such as pedestrians passing through the station, cyclists, people passing by in their cars and trucks, loading/unloading trucks, volunteers. Designing a station which passes for the approval of every stakeholder (let alone the construction team) is therefore a complicated task.

### The stakeholders

- **Noordelijk building**
  - DTZ Zadelhoff (owner Noordelijk)
  - AAFM (managing Noordelijk)
- **Locals in neighborhood**
  - Residents
  - Shops
  - Offices
  - Hotels
- **Government**
  - Ministry of Infrastructure and Environment
  - Cultural Heritage Agency
  - Province of Noord-Brabant
  - Municipality of Eindhoven
  - BvdM (City branding)
- **Public transport**
  - NS Stations
  - ProRail
  - Connexxion
  - HOV exploiters
  - Taxi industry
- **Travellers’ organizations**
  - Rover
  - LDC-CV
- **Office space**
  - NS
  - KPD
- **Station facilities**
  - Station bicycle parking exploiters
  - Miscellaneous station facility exploiters
  - Station shop exploiters
    - VVV, Kiosk, Albert Heijn, Starbucks, Burger King, De Broodzaak, Bruna, etc.

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“The vision of NS is to transform station regions to areas where living, working and recreating come together and where staying is pleasant.”

- NS Publication Hoog Catharijne, Utrecht

“Travellers want more cafes on train platforms”

- Travellers inquiry by Rover (may 2014) (V.4)
For at least the past decade, Eindhoven has been growing quite extensively. As stated in the article below, Eindhoven’s growth can be partly explained by emigration out of the rural areas and into the city. It is a national trend and does not seem to be reaching its peak anytime soon.

Eindhoven’s growth is however not only due to the emigration out of the countryside, it also has to do with the newly developed ambition of Eindhoven: Technology, Design and Knowledge.

For instance the High Tech Campus, the Design Academy, the University of Technology, Strijp S and various business incubator initiatives contribute to attracting new businesses and personnel into the city. Also events focussed on the technology-design-knowledge pillars help, such as the ‘lichtjesroute’, Glow and Dutch Design Week.

The prognosis for the inhabitants is about 225,000 in 2020, after which it will continue to grow. It is a modest but continuous growth.

As the amount of inhabitants will continue to grow, also the amount of people living in Woensel will grow. Currently about half (49%) of Eindhoven is living in Woensel, which is about 110,000 people.

This increasing amount of people is making extensive use of the pedestrian tunnels and the station area, which is, partly, why the station needs the impulse in both the bus square as the northern city entrance.

As also the amount of students attending TU/e is continuously growing, the undercapacity of the station and Neckerspoel will only grow worse.

Eindhoven - We all want to move to Eindhoven and nobody wants to live in the rural areas anymore. Eindhoven is bursting at the seams and surrounding villages will be abandoned. That might try a bit exaggerated, but the numbers show that people will be moving into the cities in the following years. ...
Office market

As for the office market, growth is not to be expected. In the past years, Eindhoven was one of only a few Dutch cities to cherish economic growth in times of global financial crises. This has however not resulted in substantial growth of the office market. As the Central Business District around the station in combination with the city centre contains over 35% of the total amount of office space in the city (411,345 m²), economic trends have immediate influence on the area.

According to an inventory study by EIB, vacancies in Eindhoven offices will decrease from about 10% to about 6%, a positive development. This is however only induced by the absence of newly constructed offices. The research also states: “The expansion of the office space supply has surpassed the demand. It has partly caused the current vacancy of estimated 533,000 m² in the province of Noord-Brabant. [...] The vacancy percentages differ greatly per area. In the area Eindhoven the vacancies have risen as of mid 2011 to 12%. These vacancies are mainly concentrated on the more formal monofunctional office locations.”

The Fellenoord region is an exemplary formal monofunctional office location, which makes it even more clear that in the area no new offices are needed. In 2010 the demand of office space in Eindhoven was 1.8 million m². In 2020 this is expected to be 2.0 and in 2040 1.9. This moderate growth can be compensated by the vacant office spaces; it would not induce the construction of new offices.

However, office space lost in the construction of the new station should be reconstructed on the station site, as they contain functions bound to the direct environment of the station, such as NS offices, NS training facilities and personnel lounges.

Although the office market is shrinking, the business hotel market is not. These markets are deeply intertwined, so realizing hotel space near the Fellenoord might give an impulse to the area.

Hotel market

The hotel market is a lot more promising in Eindhoven, as described in a study from Horwath HTL, commissioned by the Municipality of Eindhoven*. To quote the research: “The hotel demand of Eindhoven is expected to grow with a yearly average of 2.8% between 2012 and 2020, taking into account conjunctural fluctuations, where which the major growth will emanate from the individual corporate segment and smallest growth from touristic segments.”

“In the period 2014-2020 there is space for circa 370 rooms in Eindhoven, inc. 145 rooms for the Holiday Inn at Night Forum.” - Horwath HTL

The net space for hotel rooms is in Eindhoven therefore 225, of which some could be filled by uncertain hotel plans in the city, in various states of readiness and feasibility. Most new initiatives are planned near Eindhoven Airport.

The majority (71%) of the current hotels in Eindhoven is owned by large hotel chains. In order to be able to compete in price, quality and service, any new hotel will most likely have to be part of a hotel chain as well.

The potential 225 rooms are, according to HTL, most feasible in three specific hotel concepts:
- Modern low budget
- Traditional low budget
- Day Use

The low budget hotels have the most potential because Eindhoven is already richly endowed with four-star hotels. “The development of hotels with an ambition below four stars are more viable.” - eib

This means that both three-star hotel chains and budget hotel chains, with under 225 rooms, focussed on the business segment would have the most visibility in Eindhoven.

As a location the station in Eindhoven would be ideal: Near Central Business District, on an infrastructural hub, easily reachable from outside and within the city and with enough space to accommodate a large hotel chain.
Undercapacity of the station

In the coming years, Eindhoven station will have to cope with an incredible increase in the amount of users. Not only the amount of travelling and trains will grow, but also the amount of cyclists, desired parking places for bicycles and cars. The amount of bus travellers is expected to grow by 80% and more distant and international connections are being planned.

The station is already undercapacitated in several areas, such as the bus capacity, bicycle parking and car parking.

In the future the undercapacity will grow worse, as shown in figure 63. Interpreting these numbers will lead to the processing of around 130,000 daily users in the travellers terminal in 2020.

As the municipality acknowledged this pressing issue, a plan was developed to increase the capacity of the pedestrian passage (IV.11). This will solve the immediate issues in the passage. However, the problems around the passage are not solved.

As (between 2014 and 2020) NS HiSpeed will most likely start accommodating international train connections via Eindhoven and also international bus connections have been initiated, a different target audience will come to the station.

People who travel abroad will most likely stay there for a longer period of time, which is why they will want to park their cars safely for a longer period of time. In anticipation of this, the parking demand is increasing tremendously in the coming years.

Eindhoven is currently already suffering from a severe parking shortage. The station does not have a proper P&R-parking in or near the station. The parking facility assigned as the P&R is 300 meters away from the station, outside, unguarded and vastly undercapacitated.

The bicycle parking is also not up to standard at the station. There are too little places and they are wildly scattered over the station area. In 2020 the total amount of bicycle parking spots demanded on the station is expected to be 12,200, of which 5,100 on to be realised on the north side of the station.

In ‘Ontwikkelingsvisie Plus NS Station Noordzijde’ the Municipality of Eindhoven predicts an increase for the busses of 50%, a huge extra load on the already barely sufficiently facilitated bus square ‘Neckerspoel’.

As an addition to all of these numbers, also the retail on stations in The Netherlands have been growing in both sheer size and turnover.
In order to improve the city and the station, the Municipality of Eindhoven has made many plans and studies. Two of the most important ones are:

- ‘Verbinden en Verblijven’ (09-2005)
- ‘Eindhoven op Weg’ (11-2013)

‘Verbinden en Verblijven’ is an ambitious (pre-crisis) vision for the redevelopment of the entire Fellenoord area. The plan poses to completely redesign most office buildings, Beursgebouwen, post office, station square north (Neckerspoel), station square south and most importantly the Fellenoord road and all adjoining roads. Instead of the elevated road it is now, it would become submerged, leaving the space above free for bicycle and pedestrian bridges.

The plan was considered quite ambitious and during the crisis it proved to be overly ambitious. Some elements of the plan were kept, such as the redevelopment of the post office area (‘Lichthoven’), other plans were shoved in the drawer to never see the light of day again.

‘Eindhoven op Weg’ has a more realistic approach for tackling the problems the city is facing. The ambition is mainly to enable the inner city to grow again, decrease the environmental footprint of the city, reduce cars in the inner city and invest in public transport, cyclists and pedestrians.

§10 Former studies and plans for improvement

The station area and Fellenoord play an important role in ‘Eindhoven op Weg’. In figure 66 it is visible that all main arteries around the station are envisioned to be relieved of most ongoing traffic. The reduced capacity creates the opportunity to access Neckerspoel directly from the Fellenoord, as shown in the sketch below, illustrating a possible future solution for the area.

Also designs specifically for Neckerspoel and the station have been made by the Municipality, TU/e-students and other planners. Most of these plans are multilevel, separating motor traffic and pedestrians: ‘D’r op’ (’Over’) and ‘D’r onder’ (’Under’). Buses on level 1 and 0, Pedestrians on 0.

In figure 67 it is therefore also visible that the municipality has adopted this idea in its more recent urban plan ‘Eindhoven op Weg’.
As previously mentioned, the new pedestrian passage is one of very few plans for Eindhoven station to actually be executed.

The new passage is actually a major overhaul and expansion of the existing tunnel. The existing tunnel will be expanded to the east-side substantially. The tunnel is also excavated to create more light and height in the tunnel, for pedestrian comfort.

The new passage is subdivided in three sections. In the middle the actual passage for the pedestrian traffic stream, to the east stores and shops for the pedestrian’s convenience and to the west a lounge and sitting areas. The actual passage is increased from 8 meters to 13 meters.

Also the accessibility for the disabled is being improved in the new passage, as it is quite poorly facilitated in the current situation.

The new pedestrian passage is an absolutely necessary addition to the station, as it improves traffic flow, multifunctionality and accessibility. However, it leaves most of the problems the station is having untouched. The undercapacity of the bus square, the lack of orientation in the area, the conflicts of routing, the parking problems, and so on.
V. Design approach
In the current situation on Neckerspoel bus square, pedestrians, cyclists, cars and busses all move around on the same level. The resulting conflicts cause a decrease of comfort and safety in the area.

By separating all of these traffic streams, conflicts are reduced considerably. By choosing to put the bus platforms over the pedestrian level, many advantages are reached:

- Firstly, the pedestrians can directly connect to the existing tunnels underneath the Fellenoord.
- Secondly, the busses can easily connect to the existing level of the Fellenoord, neutralizing any height differences to be overcome by the busses, improving efficiency.
- Thirdly, it does not require any elevating/excavating of the Fellenoord road, which would be immensely expensive and also give huge problems for traffic.
- Fourthly, pedestrians are constantly protected and sheltered from the elements and surroundings. The busses, train tracks, the Fellenoord traffic and the Vestdijk traffic leave the station area exposed to noise, nuisance, fumes and potential safety risks, which is why it is in the travelers’ best interest to protect them from these hostile environmental factors.

Additionally, the Dutch climate is not one of eternal sunshine and warmth, which is why shelter is also of importance for comfort, especially in autumn showers and winter frost.
§ 2 Consolidating the elephant paths

The routing of the pedestrians and cyclists are in the current situation forced around the bus square (IV.4, p.58). It withholds the slow traffic from moving directly in the desired direction. Especially the pedestrians are being obstructed from moving freely and comfortably.

The routes of slow traffic have had to find their ways around the limiting factors on the area, such as the bus square, the Vestdijk, Fellenoord and KBC. The space that remained in between, the negative space, was available to be used by the slow traffic. The routes that were developed have much in common with elephant paths, or ‘desire paths’: paths that have not been formed by planning but paths made by the users, as a shortcut from existing routes, following the line of a desired trajectory (‘desire line’).

To improve the efficiency and comfort, the elephant paths can be improved and optimized by further implementing these desire lines, as in figure 20. The pedestrian passages, tunnels and the paths through Kennedy Business Center are the anchor points of the paths, in between are the paths as they will be implemented in the new design of the station.
During the graduation excursion to Japan in May 2014, we came across many fascinating, interesting and inspiring architecture. One of the most well-known Japanese architectural post-WWII styles is Japanese Metabolism. It was introduced during the early 60s in Japan:

“Metabolist architects and designers believed that cities and buildings are not static entities, but are ever-changing—organic, with a ‘metabolism.’ Post-war structures of the future are thought to have a limited lifespan and should be designed and built to be replaced.” – Jackie Craven (26-12-2014, architecture.about.com)

The most well-known metabolistic structures are buildings, constructed around a concrete core with replaceable elements attached to it, such as the Nakagin Capsule Tower in Tokyo (Kisho Kurokawa, 1972). However, Japanese Metabolism also came to expression in infrastructural structures, such as the Shinjuku underground pedestrian passages system.

Shinjuku Station is the busiest station in the world with 3.64 million daily users. The station is connected to the city via an intricate network of underground passages. The station does not have just a front and rear entrance; it has over 200 entrances scattered around Shinjuku to the station, a Metabolistic approach to the urge for connectivity and efficiency in travel.

The sheer size of the passage system around and underneath Shinjuku Station is as impressive as it is hard to grasp at first, but it is of major importance for guiding all of the nearly 4 million daily travellers to their destinations. The passage not only connect the skyscrapers in the business district to the station, but also to the smaller scale urban fabric: on the other (east) side of the station, this area has both residential and office functionality. Projected on Eindhoven, it would reach from the PSV stadium to the city centre, the Villa-wijk, the south of Woensel and the university campus.
Although on a vastly different scale, the situation in Shinjuku was a major inspiration for the new design of the station in Eindhoven.

The same principle applies: the pedestrian is granted a world of its own, where he or she can safely and efficiently move from A to B, from the station to the business district or to the residential neighborhood.

It is also an open network, accessible at any time and also able to be used for passing through, even without the station being the destination.

In Japan, the infrastructural levels are kept mainly free of multifunctionality; these functions are transferred to the pedestrian domain: the pedestrian passages and the dense inner city network of streets and alleys.

In Eindhoven, the infrastructural level, the Fellenoord, Vestdijk, bus square, etc. are already free of any facilities of multifunctionality. The newly designed pedestrian passage level could therefore easily be equipped with facilities like shops, food courts, cafes, and information desks.

Adding functions to the pedestrian level of a station is not unique in The Netherlands; most stations contain some multifunctionality, some even in a multilevel principle, containing an extensive collection of stores and food courts, such as Hoog Catharijne in Utrecht.

In a multifunctional station area, many facilities are required, such as the aforementioned shops, food courts etc. There are however many more: car parking, office space, bus platforms/information and in Eindhoven’s case hotel facilities (as described on p.69 VI.8).

Stacking these functions neatly upon each other is an efficient way of dealing with vertical transportation. Stairs, elevators and escalators can go directly from the bottom level to the top level (and vice versa), without any obstructions for the user.

Creating a multilevel station area is also an efficient way to create space for all functions desired and needed to meet the 2020 capacity requirements.

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There are three levels that are most notable for the project, each with its own qualities and focus points.

1. **Hotel/office levels**
   These levels, in purple, collected in the hollow square building above the station are the most visible for the outside world. The building is therefore the business card of the new station, the icon, the orientation point, it is what makes the station notable as the station entrance from within the city.
   As for the users, the view is most important. Looking over the city from multiple levels above the station, will give the new station more right to call itself ‘Noordzicht’ than the existing station building.

2. **Bus platforms level**
   The redevelopment of the bus square is the essence of this project. The future undercapacity of the station has mostly to do with the conflicting routing around the busses and the undercapacity of the bus platforms. The bus square in the new design will be free of all conflict with pedestrians, as they will reach the bus platforms via large stairs and passages underneath the bus roads. The bus platforms will no longer be 13 different narrow sidewalks with all only 1 or 2 bus lines stopping at each particular platform. The bus square will comprise three pedestrian islands, being reached by stairs by the travellers. The buses can drive around them and stop to load and unload travellers. The three islands have their own destinations: Daily Short-distance Travel (within city centre), Daily Long-distance Travel (within Eindhoven), Long-distance Travel (HOV and international connections).

3. **Pedestrian level**
   The final and most important is the pedestrian level. It is the level travellers will see first when entering the city, the level where the connections to all facilities are made.
   As this is the level at which the elephant paths are consolidated, the routing will be organic, intuitive and fluent. The different destinations of the tunnels and paths will be made clear with intuitive routing and clear signing and information. Places to stay and retail facilities will be present and easily-accessible, but will not stand in the way of pedestrian movements and efficiency.
As stated numerous times, many different traffic flows meet on the station area, much expansion and growth will occur and many additional facilities will be needed in the future.

In the future situation all of these traffic flows will gain much more space for moving freely, as they will be separated over different levels. The different users will cross each other without noticing and without conflict.

The conflicts between the slow traffic, between cyclists and pedestrians, will also no longer occur, assuming these users will stick to the paths laid out for them. The lack of conflicts is a huge gain for safety and comfort, people no longer need to be extra alert for any possible collision waiting to take place.

The added comfort for all station users is not only due to the lack of conflict; shelter is also key for carefree movement around the station.

Because of this, all bicycle parking facilities, car parking facilities, taxi stands and K+R stands will be incorporated in the indoor design. This way, all transitions to other modes of transport can be done within the comfort of indoor circumstances.

In figure 83 the future traffic streams are visible. There are many more crossings of routes than in the existing, but far less conflicts.

Bus
Car, Taxi, P+R
Pedestrian
Bicycle
Conflict

[83] Future traffic flows

[86] Traffic streams of cyclists, pedestrians and cars

[87] Design sketch of hotel entrance on parking level
The upper building’s purpose is not only offering a place to stay, it also has a function on the urban scale. In the current situation the bus square is directly adjacent to the Fellenoord and Vestdijk, merging into an enormous urban concrete and asphalt plain, inaccessible by pedestrians. This is not only uncomfortable for the pedestrians on the bus square, it also lacks orientation and guidance for the traffic users on the Fellenoord.

The new hotel building makes the Fellenoord a street again by bordering it with a long facade, and gives the bus square its own, separated identity. The donut-shaped building has two exteriors, one facing the Fellenoord, and one facing the bus square.

The ‘exterior’ appearance, facing the Fellenoord, is what defines the street and what will be the most recognisable facade for the station. The ‘interior’ bus square facade, is what will be perceived as the city entrance by bus travelers. These two facades will represent the two different worlds; the outside strict corporate/infrastructural world; and the enclosed travellers’ islands world.

§7 Defining the Fellenoord

The upper building will contain both a hotel and office space. The office layer will contain offices for NS and for KLPD, i.e. the same companies as on the existing station with roughly the same amount of square meters at their disposal.

The hotel function is much more interesting for the Central Business District, as it will become a budget long stay hotel; according to the Horwath HTL hotel market analysis (p.69 IV.8), the most viable hotel concept in Eindhoven. Something that is of added value to the area is the long-stay concept, meaning that guests can stay longer than just a few nights. Several weeks or months are possible, which will make it more inviting for businesses from outside outside of Eindhoven to visit and/or collaborate with businesses at the CBD, or to start their own business in any of the vacant office buildings in the CBD.

A long-stay budget hotel is much easier and accessible to stay for a few weeks/months than having to rent an apartment or dorms for that limited time. It will therefore be an appealing concept for for example entrepreneurs and expat-students.

§8 Functional impulse in the CBD
§9 Different users’ needs

Slow traffic
To decrease conflicts, slow traffic and motorised traffic will be separated thoroughly. Both have their own specific needs and capacity demands, to be able to accommodate the future growth.

Pedestrians
The pedestrian is the most important user of the train station as everyone is a pedestrian sooner or later. The amount of daily passants on the station will increase from 96,897 in 2008 to 151,000 in 2020, of which 72% (+2%) will pass through the new underground pedestrian level *. Their first experience of Eindhoven.

City entrance
For about 100,000 people, the pedestrian level will be part of their commute to and/or from Eindhoven, it will therefore have to be a comfortable place to stay and move through, with adequate facilities at hand.

Places to stay
Places to stay are essential for improving comfort while waiting or staying at the station. Staying has to take place outside of the busy traffic streams.

Retail
Staying does not only mean sitting. Spending time on the station also requires activity, such as eating, drinking and making use of traffic-oriented retail. The existing retail functions on the station have to be incorporated in the new station, supplemented with new shops and cafes to improve staying and shopping on the station.

Cyclists
The amount of cyclists will increase by 61% between 2008 and 2020. This increase demands a vast expansion of bicycle parking facilities: 12,200 parking places in 2020, of which 5,100 on the north side **. These will be designed indoors and will be directly accessible from the pedestrian passage level, reducing vandalism and increasing travellers’ comfort.

Motorized traffic
Busses
Bus traffic will also intensify substantially. Not only will the existing lines become busier, also new lines will be introduced, such as HOV and international connections. The amount of bus travellers is expected to grow from 40,357 to 72,500 in 2020, an increase of almost 80% *.* This increase demands for more platforms for the buses and waiting space for the pedestrians.

Cars
Cars make use of the station in three different roles: for taxi fares, for dropping people off (K+R) and for parking.

Taxi & K+R
Currently taxi stands and K+R are both on top of a zebra path for pedestrians, resulting in uncomfortable movement for all [p.59 IV.4]. These stands will be moved to the indoor underground levels, where entering and exiting the cars will be comfortable and safe. Taxi’s will require a capacity of seven stands (3 + 4 buffer), K+R will require 12 stands **. Parking
With an increase in travellers and an increasing part of those travellers travelling for further distances, demands for parking places will increase tremendously. Currently the station is already coping with a vast parking shortage. In 2020 the amount of parking places required will be roughly 900. With the addition of a hotel and removing the existing spots on/around the bus square, the total parking reserve to be incorporated in the design is between 1028 and 1109. However, Kennedy Business Center has an overcapacity of 200 places, which can be subtracted from the total amount of parking places.

The total amount on the station will therefore have to be between 828 and 909 parking places.

*R. van 't Plate. 2003
** Prognose Reizigersstromen Eindhoven 2020 (05-12-2009) Gemeente Eindhoven

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VI. Design of the station
The situation on and around the bus square of Eindhoven bus station demands for a radical redevelopment. The new bus station is a comprehensive redesign of the entire Neckerspoel plot into a multilevel environment in which pedestrian traffic streams can move freely and unobstructedly in any direction.

With an underground parking for over 900 vehicles, indoor taxi stands and 8+4 bicycle parking for over 5000 bicycles, 30 bus platforms, 236 hotel rooms, 5600 m\(^2\) of office space and 5,700 m\(^2\) of shops, cafes and places to stay all under one roof, it is safe to say that the new station possesses plenty facilities for comforting all travellers, passants and visitors.

The new bus station is much more than merely a collection of bus platforms; it is an extension of the urban tissue. By transforming the bus station plot from a single slanted plot into a multilevel environment, many advantages are achieved. The two main levels, the bus square and the underground pedestrian layer, both connect barrier-free to their entrances/exits (resp. the Fellenoord road and the pedestrian passages underneath the Fellenoord and Vestdijk).

The underground pedestrian layer connects various places and destinations to the station without obstructions, via a protected and comfortable environment, with sufficient retail, food and cafe program to ensure that any passants’ needs can be fulfilled.

Barrier-free movement on and around the station is the main focus of the design, but not the only one. The above-ground building is of major importance for the Fellenoord and the Central Business District, both in function and aesthetics.

Its contribution to the area is twofold. Firstly, it contributes to redefining the Fellenoord into a properly enclosed street. The current bus square is an uncomfortable and vast urban plain, lacking any quality for staying. The new building, with its dominant facade on the Fellenoord, optically and spatially separates the bus square from the Fellenoord.

Secondly, the program of the building is an impulse for the area. The building contains a large business oriented hotel with 212 regular rooms and 16 long-stay rooms. By offering hotel rooms and long stay rooms directly in the Central Business District, collaborations and start-ups from out of town might become easier and more attractive to set up.

The building is of course not the only part of the design contributing to the CBD, the entire project makes the area more easily accessible by any mode of transport and upgrades its spatial quality, therefore making the area more attractive altogether.
The many functions in the buildings are distributed over nine levels. The layers demanding the least daylight and therefore the bottom levels are the underground parking. It contains over 900 parking places, spread over two levels. The entrance and exit connect directly to the Fellenoord road, so it is easily reachable from any direction: the highway, the neighborhood of Woensel or the city centre.

The pedestrian layer lies directly above the underground parking. Containing the connections to all different layers and functions of the station, this pedestrian layer is the most important and prominent layer of the project. It also contains the pedestrian tunnel connections to the rest of the area, bordered by multifunctional facilities.

Directly above the pedestrian layer is the bus square. With three large platform islands the bus square is a vast improvement on the existing situation: Conflicts of routing no longer occur and at the same time the capacity is increased to cope with future passenger flow growth.

On top of these layers is the office/hotel building. The building has its own independent construction and is also in aesthetics more autonomous.

The lower levels are mostly integrated with the environment: the above-ground building is doing quite the opposite. It is a statement, an orientation point and an icon in the megastructural Fellenoord environment.

The iconic appearance, consisting out of a heavy concrete and glass facade in a dramatic triangular overhang creates an open view over the north of Eindhoven. Especially the hotel restaurant on the top floor is given an excellent view.

The hollow shape of the building allows daylight and fresh air on the bus square and on the interior facades. The hotel guests get a good view of the activity on both the busy bus square below and the Fellenoord area on the north side of the station.
## 2 Morphological development

### 0 - Existing situation

The bus square in the existing situation is in desperate need of thorough renewal, or better: complete replacement. Because the bus square is malfunctioning in so many areas, it is impossible to create a comprehensive solution for all of the problems whilst maintaining the blueprint of the plot.

In order to create an efficient, comfortable and iconic station on the north side of Eindhoven CS, the design process has to start from absolute zero; only the surrounding infrastructure is left untouched as much as possible.

Completely redeveloping the surrounding infrastructure would be a very costly, avoidable (and unnecessary) matter.

### 1 - New multilevel plot

In order to reduce conflicts between slow traffic and motorized traffic, without creating obstructions for any of these traffic users, requires a multilevel approach for the bus square. Two levels are the main focus: an underground pedestrian level, and a ground level bus station. The underground level is aligned with the pedestrian tunnels, the top level is aligned with the Fellenoord road.

This way cars and other Fellenoord-users are also not distracted or obstructed by slow traffic whilst at the same time the slow traffic is not discomforted by cars, buses and taxis. The pedestrian comfort, safety and efficiency is the first and most important priority throughout the project.
2 - Pedestrian connections

The main underground level, the pedestrian level, connects the existing pedestrian passages and tunnels underneath the Fellenoord, Vestdijk and train tracks. The routes are shaped organically, resembling the fluent conflict-free traffic flows of the pedestrians. Along these routes will be traffic oriented retail shops and stores designed for quick purchases, as the modern-day commuter demands on modern-day transport terminals and stations.


3 - Places to stay

Along the pedestrian routes are coves and voids, allowing pedestrians to step outside of the busy stream of commuters and escape the rush. In these areas pedestrians can relax, sit, wait, eat and drink; they are the ‘places to stay’ in the station. The areas are essential for creating comfort and complacency in the passages. The places to stay also function as food courts; they are surrounded by coffee bars, fast food joints, healthy food shops, sandwich bars, cafes and a station restaurant. Combined with the traffic oriented retail it forms a multifunctional station terminal, serving every need of the modern-day commuter.
4 - Connection to the bus square

In 2020, 49% of the users of Eindhoven station will arrive and/or depart by bus. That is almost half of the 151,000 travellers.

These vast numbers describe the necessity for a solid connection between the pedestrian level and the bus platforms with the capacity to withstand such intense use every day of the year.

Three staircases and elevators connect to the bus platforms. The two major stairs have a width of about six meters. The third staircase is smaller, as it will be enduring less travelers than the other two. On the west side of the plot the void for the bicycle path connection is made.

5 - Voids and roof lights

The stairwells to the bus platforms are vastly oversized to allow much daylight to enter the pedestrian level. Also an additional void and roof lights are designed for the same purpose.

Being deprived of daylight is uncomfortable for people, as it takes away the sense of time of day and the weather. People lose touch with the direct environment.

The balance between these comforts and discomforts is searched in the amount of voids and roof lights.
6 - Bus platforms

The bus islands are situated around the stair wells and thus the bus platforms. This means that commuters do not have to cross the bus lane in order to reach their bus, something that is the case on the existing bus station.

The newly designed situation is much more efficient for both the pedestrian and the busses. Conflicts no longer occur on the bus square.

The busses will connect directly to the Fellenoord from a single entrance/exit to the bus station, increasing the clarity and predictability of the bus routing for other traffic users.

The bus level also contains more bus stops and more bus buffer (waiting/storing) places than the existing Neckerspoel. It is an upgrade for the area in all aspects.

7 - Office/Hotel building

Despite being merely the tip of the iceberg of the project the upper building is of major importance. The building contains one level of office space, to replace the offices in the “NoordZicht” station building, and a business/long stay-hotel. The hotel is placed centrally in the CBD and excellently accessible on foot, by car, bicycle and public transport. It is therefore the ideal location for such a hotel.

The building is in the urban context very important, as it redefines the Fellenoord and it functions as the orientation point and icon of the station. Its remarkable exterior is what will grab the attention of people passing by: The new city entrance that the north side of Eindhoven deserves.
A. The triangle is the most stable geometrical shape and is therefore used extensively in architecture, engineering, and constructions. The triangular shape therefore forms the base for the design of the station building.

B. The balance of a triangular centre is used to hang two inversed triangles. The inversed triangles are counterbalanced by the central triangular shape. The shape is then still inherently balanced.

C. Translating this into a building, the central triangle is shaped into a void; the two remaining volumes then counterbalance each other. The shape is started from the top, creating an iconic corner tip overlooking the north.

D. In order to ensure maximum openness in the building, the entire facade is made into a truss. The triangle is once again constructively essential, to enable movement under the entire structure, the truss is partly submerged underground.

E. The angular facades are held together by constructive pretensed floors. The outward forces in the facades are conveyed through the floors to the oppositely positioned inner facades, counterbalancing each other.

F. Concrete staircases are placed where the triangular truss axes meet underground. The angular load forces are then directed into vertical loads to be absorbed by the foundation.

G. The load-bearing facades create an aesthetically simplistic and iconic appearance. The large faces of glass are essential for the functions in the building, the offices and the hotel.

H. The large building structure fits well into the urban context of the Fellenoord mega-structural ensemble.
8 - Facades

Placed in the urban context, the dominant architecture of the building comes to expression. The building very large, even in its megalithic environment.

The truss-like facade is one of transparency and simplicity; it does not try to hide or conceal its enormous scale. The building claims its (righteous) place of being the most apparent building along the Falenrood. As described in the Design Philosophy (p.28 Chapter III), the project is supposed to be a new, equal, city entrance for Eindhoven Noord. A large iconic and dominant building such as the design below will be able to accomplish this. The general urban scale of the entire region is also large enough to not be imbalanced by such a strong statement.

9 - Render impression

Placing the building in its context is not necessarily showing the same image as the building actually being built in the future.

The direct environment of the station is under continuous redevelopment: The Rabobank building in the north has been demolished to be replaced by a newly designed replacement, Beursgebouw is under discussion constantly, as it has been around very long for a “temporary” building, and the entire Falenrood crossing is also not an optimal situation, according to the Municipality of Eindhoven, as can be derived from former municipal plans (see p.72 IV.10). The new station can form the base for a new, modern Falenrood District.
Many other buildings and designs served as an inspiration for designing the new bus station. The iconic slanted triangular shape is a strong architectural statement and has thus been used before.

For instance in the design of the Tokyo International Exhibition Center [109]. In this design the triangular shape also forms the base for the building’s construction, transferring the horizontal and vertical loads to the load bearing staircases in the corners. This construction allows the entire ground floor to remain column-free and open for free movement of, in this case, the pedestrians.

For the bus station the same constructive principle applies, but instead of standing on 4 main corner columns it stands on 9. The ground floor then remains open for the busses to pass under the building.

The north-west corner of the new bus station has a large overhang, leaning towards (and slightly over) the Fellenoord/Vestdijk crossing. Inspiration to use such a triangular overhang for the building came from many other buildings, amongst which are the new Rotterdam Central Station [110], the Stedelijk Museum in Amsterdam [111] and the Denver Art Museum in Colorado [112].
The Mercedes-Benz Museum in Stuttgart opened its doors in 2006, after the design competition of 2001 was won by UN Studio.

It is a magnificent building both in touch with the delicate art pieces inside and the harsh cold environment outside the building. The museum is located directly along the highway, surrounded by a large factory building, an open field and a soccer stadium.

"The wooded hills around Stuttgart form a rich setting above which only a few landmarks stand out. By opting for a structure with a vertical emphasis, it was possible to make the museum a further element in a network of emblematic buildings, securing for it a distinct, recognizable place in the silhouette of the city."

- UN Studio, DETAIL Magazine 6/2009

The environment of the building is comparable to the situation in Eindhoven: Both environments are the domain of the car, the surroundings lack any kind of human scale and consequently an opportunity presents itself for an architectural statement in the ill-defined and anonymous urban space.

The way the museum responds to its environment is very inspirational: It is not aggressively dominant but it does stand out and is very recognizable in all of its simplicity. The museum has inspired to use a similar material for the facade cladding of the new bus station in Eindhoven.

The station will be wrapped in aluminium panels, giving it a remarkable and gallant appearance in its anonymous environment.

The angular geometrics and extensive use of glass in the design for the new station combines well with the color and texture of the aluminium panels.

In the artist impression (on the following page) the new station is visible with the aluminium facade. The new bus station is a remarkable new emblematic building on the Fellenoord.
To create a comfortable environment in the underground pedestrian layer, a lot of light is needed. Through the large voids and staircases, a substantial amount of daylight enters the building, but to supplement that and to illuminate the station in the evenings and at night, artificial lighting is needed for the entire passage system.

The entire ceiling of the pedestrian layer will be covered with diffuse lighting fixtures, creating a recognizable uniformity in the building and also preventing any dark spots in the passages. Especially at night these passages ought to be lit consequently and brightly, as these passages will not close at night and are part of the urban routing system for pedestrians and cyclists.

The Chinese firm O-Office Architects has implemented a illuminated ceiling system in a renovational project in Guangzhou, China. The effect this ceiling has is very desirable for the bus station in Eindhoven. It illuminates every corner and creates almost no shadows at all, making the pedestrian experience the space as if everything is visible; there are no hidden spots, creating a safe and secure experience of the space for all passants and visitors at any time of the day.
The entire facade of the hotel building exists out of glass and aluminium facade panels. The constructive load-bearing truss in the facade is made of pretensed concrete. In between the load-bearing trusses, spanning from the ‘outer’ facade to the ‘inner’ facade, practically holding them together, are sheet THQ-beams upon which the concrete hollow-core slab floor are positioned.

The floors are ‘hidden’ behind the glass curtain walls, with only a single aluminium profile dividing the glass panels in the facade. It created a uniform grid over the entire facade in the spirit of the pompous and dominant facade overhanging the Fellenoord, Vestdijk and the bus square. The entire facade is detailed as cleanly as possible, making the facade a clear and contemporary.
Floor construction
- Top slab
- Insulation barrier
- Hollow core concrete floor slabs supported by THQ-beams
- Insulation
- Suspended ceiling

Aluminium curtain wall

Panel covering floor end

Support construction for aluminium curtain wall

Triple glazing

Facade construction
- Stucco finish
- Pretensed concrete construction (3 x 1 m)
- Insulation
- Water resistant foil
- Air cavity for circulation
- U-profiles + Omega profiles
- Aluminium facade panels

Roof construction
- Aluminium roof panels
- U-profiles + Omega profiles
- Air cavity for circulation
- Water resistant foil
- Insulation
- Hollow core concrete floor slabs supported by THQ-beams
- Suspended ceiling
The bottom level of the station contains the parking facilities for visitors of the above station, the shops, the offices and the hotel.

In the existing situation the amount of parking places for station visitors is far below par, which is why the new design contains many new parking places. (p.93 V.9)

According to calculations (with the municipality’s prognosis) incorporated, the total amount of parking places in 2020 would have to be between 828 and 909.

The bottom level of the project contains 565 parking places, which are connected to pedestrian level with 8 elevators and 5 staircases.

The five staircases with elevators connect the parking layer to all above layers, including the bus stands, offices and the hotel. Locating the parking garage underneath the station is very convenient for any visitor.

First of all it reduces the distance the visitor has to travel by foot from their car to their destination and back. Secondly it prevents the visitor from being exposed to the elements. As the parking garage is indoors, the pedestrian layer is covered and the train platforms are covered, the transition can be made completely dry and comfortably.

The dimensioning of the parking places and the car lanes are up to modern standards: A two-middle road of at least 6 meters wide and parking places at 90 degrees of 2.5 meters wide and 5 meters long.

The grid in which the parking garage is placed is 12x12 meters with square columns of 750x750mm.
On level -2 there are 565 parking places. On -1 an additional amount of 370 parking places will be realised, which brings the grand total to 935.

The most ambitious prognosis of the municipality for 2020 is 909 parking places (whilst using the overcapacity of Kennedy Business Centre). The 935 places exceeds the prognosis, which makes it additionally future proof.

The -1 parking deck does however not only contain parking facilities; also K+R and taxi stands are located on this level.

For traveller comfort this is excellent. The transition from whatever previous mode of transport to the car is comfortable, dry and warm. It also contributes to the clearness of pedestrian routing: For the any kind of motor transport, the traveller goes to level -1. In the current situation the situation is much less clear.

Taxi’s and K+R both stop in the middle of a pedestrian zebra crossing near KBC, whilst the assigned station’s parking facility is an undercapacitated fenced outdoor concrete field nearly 300 meters of walking away from the station.

For new visitors it is not even clear that the parking facility exists, something that will drastically change in the new situation where pedestrians are able to immediately reach the parking facility from the station terminal on level 0.

The routing leads from the entrance of the east side of the plot, past the K+R and taxi, to the secure parking garage.
Level 0 is the most important level in the project. It is the level where visitors enter the station when arriving on foot, by bicycle or train. The parking decks also connect directly to the pedestrian layer.

The vertical connections connect all functions of the station: the horizontal connect on the pedestrian level connect the station to its surroundings. These pedestrian walkways are all surrounded by retail program, such as shops, food courts, cafes and information desks. The places to stay are surrounded by the cafes and food shops and are openly connected to the pedestrian walkways.

The main stair cases connect the pedestrian layer to the lower parking level, the above office layer and the hotel. The large open stair connect to the bus layer, one stair case per platform. Each stair case also has an elevator to ensure optimal accessibility for the disabled.

The shops along the pedestrian routes have a secondary service entries on the rear. The entries connect to loading/unloading service elevator in north east corner of the plan, via passages hidden for the public.

The service elevator connects to the parking strip on the Fellenoord currently used by the "t Schimmelt" offices and Beursgebouw. This parking strip will be repurposed to accommodate trucks loading and unloading for the station’s retail facilities. The parking spots that have to make room for this will be compensated for in the underground parking of the station.

On the east side, the entrance and exit of the parking decks connect to the Fellenoord via a closed passage in the pedestrian layer.

In the northwest corner also the coffee rooms for bus and train personnel is located. These spaces are directly accessible from the bus buffer and from the pedestrian tunnels.

The bicycle parking facility on the east side, offering space to over 5000 bicycles, also exceeding the prognosis for 2020. The bicycle parking is accessible directly from the bicycle path and from the pedestrian walkways.
The actual bus station on level 1 contains three pedestrian islands and a large buffer for 12 busses on the side. Having the bus buffer on the bus station will save time driving the busses to the depot and back in order to be stored there. It also reduces the pressure on the bus platforms. When a bus arrives early at the station, the driver can choose to wait in the buffer space instead of at the bus stop.

The bus islands contain 10 bus stops each, creating a total of 30 bus stops. The capacity of the bus station is larger than the existing station and also exceeds the prognosis for 2020.

Each bus island has its own focus: the first (most southern) one, will be the busiest as it focuses on nearby daily commuting destinations within the city. The second bus island focuses on the more distant bus connections within the municipality of Eindhoven and surrounding villages. The third, narrower bus island is for the HOV (Hoogwaardig Openbaar Vervoer) connections, where for instance the iconic Phileas busses will stop and depart.

The first bus island, with the most rush hour sensitive and busy connections is located closest to the exit of the train station’s pedestrian passage, in order to keep walking distance as short as possible and thus improving efficiency and reducing crowdedness in other parts of the bus station.

On the north-side, on the Fellenoord, is the entrance/exit of the bus station. The entrance and exit for the underground parking is also located at the Fellenoord, in the green median of the road.

As a result of these entrances and exits the traffic intensity on the Fellenoord will increase. This increase will be compensated by the municipality’s plans to reduce ongoing traffic on the Fellenoord by rerouting them around the periphery of Eindhoven *.*

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1. Bus platforms

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2. Offices

The office layer on layer two, which is the bottom floor of the separate office/hotel building, contains the offices of the National Railways (NS) and National Police (KLPD). Both already have comparably sized offices in the existing station building. No additional office will be realized as the amount of vacant office spaces in the area is already about 10% (p.68 IV.8).

As unfortunately no additional information was allowed to be provided about the current occupation of the office space in the current station it was not possible to create an accurate estimation of the desired layout for the future offices. The total amount of surface area resembles the current situation and no indication has been given by either the owner (DTZ Zadelhoff) nor the facility manager (AAKnet) that expansion or reduction of the office space will be necessary in the future.

In order to show a possible future layout the assumption has been made for a modern open flexible office space for all the offices. The open office space would be ideal for the new design as it makes optimal use of the tremendous amount of daylight entering the building. The staircases for the offices are also used by the hotel. To prevent hotel guests from wandering around in the offices, the staircases are locked on the office level, only to be accessed with permission.
The third, fourth, fifth and sixth floor contain the hotel. The hotel is business oriented and accommodates space for both regular rooms and long stay rooms. According to the Horwath HTL study into the hotel market of Eindhoven (2012), there is still a market for new hotels in Eindhoven.

A business-oriented budget hotel would have most potential according to the study. It also states that there is still potential for about 225 rooms, and potentially more if the hotel is part of a large hotel chain (due to the increased competitive position in the market).

The newly designed hotel contains 212 regular rooms and an additional 16 rooms intended for ‘long stay’, adding up to a total of 228 rooms. This is slightly over the 225 rooms which are believed to be plausible according to the HTL study.

However, the remarkable accessibility, the diverse supply of rooms, both short and long stay, and the exploitation of the hotel by a large chain is assumed to enable the hotel to contain slightly over 235 rooms.

The corner rooms are long stay rooms with a slightly larger surface. All long stay rooms contain, unlike the regular rooms, a kitchenette to allow long stayers to prepare their own meals.

The central lobby is on the south side of the building. However, all stair cases can be used to reach the hotel by using the hotel key.

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<table>
<thead>
<tr>
<th>Rooms</th>
<th>Level 3</th>
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<tbody>
<tr>
<td>2 person</td>
<td>A</td>
</tr>
<tr>
<td>4/5 person</td>
<td>A+</td>
</tr>
<tr>
<td>Long stay</td>
<td>L1 / L2</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
</tr>
</tbody>
</table>
The second hotel level has roughly the same layout as the first hotel layer. However, due to the slanted facade, each level is larger than the previous one. Due to the increased surface area of each higher level, more hotel rooms can be realized here. This level contains six rooms more than the first hotel level: 117 rooms.

The inner corner of the hotel levels contain a different function every time. The north-east and south-west corners are small relaxing areas, the south-east corner is a storage room/linnen closet and the remaining corner contains an open staircase towards the above level.

<table>
<thead>
<tr>
<th>Rooms</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 person:</td>
<td>B</td>
</tr>
<tr>
<td>4/5 person:</td>
<td>B+</td>
</tr>
<tr>
<td>Long stay:</td>
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</tr>
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</tr>
</tbody>
</table>

The inner corner of the hotel levels contain a different function every time. The north-east and south-west corners are small relaxing areas, the south-east corner is a storage room/linnen closet and the remaining corner contains an open staircase towards the above level.
The fifth level is quite different than the two below hotel levels. On this level all rooms are long stay rooms; larger rooms with a kitchenette and facilities to enable stays lasting days, weeks or even months. Long stay rooms can be an ideal solution for expat students, entrepreneurs or travelling business (wo)men with an assignment in Eindhoven.

Besides the long stay room there are also three conference/presentation rooms and the hotel gym. These spaces have views to both the bus square and the Fellenoord. With their high slanted ceilings they are impressive, spacious and comfortable rooms. On this high level people are offered quite a nice view outside as well.
6. Hotel restaurant

The top level contains the hotel restaurant and bar. The bar in the north-west corner has a beautiful panoramic view over the north of Eindhoven. The windows stretch from floor to ceiling, in the space of up to 12 meters high. Combined with the enormous roof light, allowing sunlight from the south into the building, the spatial experience in the restaurant is the most special of the entire building.

The slanted facades have the effect that the building is leaning outside nearly over the Fellenoord-Vestdijk crossing. Looking down through the storey high windows is then all the more impressive.

The gym one level below has a ceiling of double height, allowing people in the restaurant to have a peek in the gym. This way there are interesting sights all around the restaurant.
VII. Conclusion
In the past many studies have been executed to find a solution for the many problems burdening the central station in Eindhoven. The design for the Central Station of Eindhoven as presented in this booklet will become part of the stack of many previous designs for the area, made by fellow students, the municipality and other parties. However, my strong belief is that this plan, EHV CS, should be on top.

The posed solution could be very feasible for the area as it has many advantages over other designs. The quality of the project does not lay in one single part of the design, it is the collective of many ideas responding to various circumstances, demands, and problems.

The complicated and intricate station area knows many problems such as the urban barriers of the Fellenoord, Vestdijk and train tracks, the isolated location of the station, the undercapacitated bus square, the many conflicting routes of pedestrians, busses, cars and cyclists, and so on.

EHV CS not only solves these problems, but is also able to accommodate the vast future increase of travellers in the future. The plan is a comprehensive solution for the entire area: It transforms the bus station from a mere transition space for bus and train travellers into much more than that: It becomes an integrated part of the urban environment.

The overall design thus has very much potential; not only on the pedestrian layer but on all levels.

The new station contains a sizable underground parking garage, indoor bus stands and K+R, a large indoor bicycle parking, an expanded bus station, office space and a very large hotel with gym, conference rooms and a restaurant with panoramic view.

Ultimately every plan has room for improvement and so does EHV CS. These possible small improvements however will not affect the basic principle of the design: Separating busses and pedestrians, connecting them to their existing routes in the urban tissue, and adding multifunctionality and efficiency to the entire area.
The graduation project in the studio ‘Urban Nodes’ has proven to be very challenging. In the early part of the project it was hard to find a clear research question that covered the load of what I was intending to develop for the station area and the question I eventually started the project with was in retrospect not suitable enough for the project.

The research question “What would Eindhoven CS be like if it was a place to stay?” focussed only on staying on the station, it did not embrace all that was wrong in the area. The final design is much more versatile and extensive than I could ever have foreseen at the beginning of the project, just last year.

During the MO3 (collective research) I have learnt a lot about Eindhoven’s general history, Eindhoven’s station environment, multilevel urban environments and many other loosely affiliated subjects. It was also in this phase of the project that we went on the graduation excursion to Japan. Seeing and experiencing how the Japanese solve their spatial problems in the world’s biggest urban nodes was very impressive and inspiring.

Although doubting the relevance for the project upon departure, it has proven to be a major positive influence on the entire composition of the design and process. As basically the entire design was approved by the graduation committee after the presentation, I could then fully focus on the architectural design of the above building.

The building has roughly retained the hollow square footprint and the functional infill. Other than that, pretty much all has changed. The construction, the constructive materials, facade materials, the layout of the floor plans, locations of the vertical connections and so on.

Conclusively, for the design of the station of Eindhoven is something I can look back on with considerable pride and joy.

My design and the entire project are things that I will carry with me during the start of my young career. The improved design skills I acquired are highly relevant for a good career start and infinitely useful for setting up new designs. I am excited to graduate and am very grateful for the lots of help I have gotten throughout the project.

§2 Reflection on process

I have experimented with innumerable different alternatives for the layout and architecture of the area. It was an iterative process pur using in which I had to find out a great deal about designing on such a vast scale. As future architect I was used to design on a building scale: designing a building that interacted with the urban environment but not necessarily being a part of the urban environment.

EHV CS is intrinsically part of the urban tissue, both on the pedestrian level and on the bus level. As a result of this (thus far) relatively unique experience I have learnt a great deal about designing on an architectural scale bordering urbanism.

Up until the Green Light presentations (about six weeks before graduation) I mostly focussed on the lower levels of the design: the parking levels, the pedestrian layer and the bus layer. The building on top of the entire structure was at that moment a result of the considerations made on the lower levels (such as the construction, the grid and the material use. As a result, the architectural quality of the building was not up to par with the rest, something that has drastically changed after the Green Light.

As basically the entire design was approved by the graduation committee after the presentation, I could then fully focus on the architectural design of the above building.

The profound intervention was at quite short notice for the graduation, which is why despite six weeks of extremely hard working, there are still some minor imperfections in the design. However, imperfections are inevitable, and ultimately the building’s architectural quality, and the quality of the plan offerer, has benefited greatly from these changes.

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My design and the entire project are things that I will carry with me during the start of my young career. The improved design skills I acquired are highly relevant for a good career start and infinitely useful for setting up new designs. I am excited to graduate and am very grateful for the lots of help I have gotten throughout the project.
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