

MOBILITY HUB

Facilitating Urban Connections
using the Idea of Street

Bin Wei - 5089050
Complex Studio - Research Plan



How can the mobility hub facilitate the east-west connection in Feijenoord area on neighborhood level by using the idea of street?

Abstract

Keywords:

Migration of street, over congestion, urban connection

Street, as the fundamental infrastructure for circulation, access and connectivity, is the crucial public space that supports economic, social and cultural activities. Moreover, the identity and development of city would be influenced by the street. Since the street was taken as a unit of planning in the 16th century, it has been researched in different aspects to support a more efficient and colorful urban life.

Located in the south of Europe Cultural Capital - Rotterdam, the Feijenoord district suffers from congested streets, lack of social events and urban disconnection. The streets are mainly for vehicles rather than pedestrian and social

activities. As the city municipal pays more attention to the future development of Rotterdam South, the street becomes one of the most useful spatial tools to facilitate urban life and offer better urban connections.

Based on the problems above, this article addresses the relationships among social activities, street space and atmosphere. Further, several spatial modes of the street are given as options for the design project. Through the site research of Feijenoord, the Mobility Hub Project is proposed as the convergent zone to integrate the district in terms of street.

1. Introduction

Street as the public space for urban life

In this chapter, the migration of street is selected as the topic to explore the ideal urban life on street which becomes one of the project ambitions. From definition and history, a brief overview of literature gives different perspectives of street space and functions.

1.1 Definition of Street

Mumford (1961, p.116) states that "Perhaps the best definition of the city in its higher aspects is to say that it is a place designed to offer the widest facilities for significant conversation." The street is mainly the place where such conversations take place in different aspects. Social, economic, political and cultural activities endow the street with urban characters different from simple space in between buildings.

There are four aspects of street definition:

1. Physical Aspect

The more or less narrow, linear space lined by buildings found in settlements and used for circulation and sometimes, other activities. --- Rapoport (1987, p.81)

2. Functional Aspect

The unrestricted movement of people and goods within a city is essential to its commerce and vitality, and streets provide the physical space for this activity.

3. Social Aspect

A central metropolitan thoroughfare, an arena where strangers encounter one another, come face to face with the size and heterogeneity of urban life. --- Jukes (1990, p.xiv)

4. Political Aspect

The fundamental reality of streets, as with all public space, is political. If the

street was an invention, it set out to designate a public domain that would take precedence over individual rights. --- Kostof (1992, p.194)

These definitions give different perspectives on street space. However, they all imply that street space is the container of social activities and urban life. In this aspect, the richness of activities becomes one of the standards to judge street space.

1.2 History of Social Street

In the history of the street, urban life and social activities are the everlasting topics during every period.

In the middle ages, the medieval street was "the place of work, the place of buying and selling, the place of meeting and negotiating, and the scene of the important religious and civic ceremonies and processions" by Jackson (1987,

p.289). Mumford (1961) suggests that "to adapt to the changing tempo of social and economic life, the boulevard and the avenue became the unit of planning" in the renaissance age. With the process of the Industrial Revolution, the factory led to the dark, airless and deteriorating streets. To fight against it, the nature element was embedded in street life in Garden City. Subsequently, different future urban life on the street was introduced in different city theories, such as the Contemporary City by Le Corbusier. Nowadays, with the expansion of the infrastructure landscape, the resurgence of people street becomes the main topic in urban design (Figure 1-1).

To conclude, proper space for social activities, efficiency and convenience, the comfortable human scale and the natural elements are the crucial features for a street to facilitate social activities. Namely, **rich social activities, efficient and convenient circulation, the comfortable natural environment** is the ideal urban life on the street (Figure 1-2).

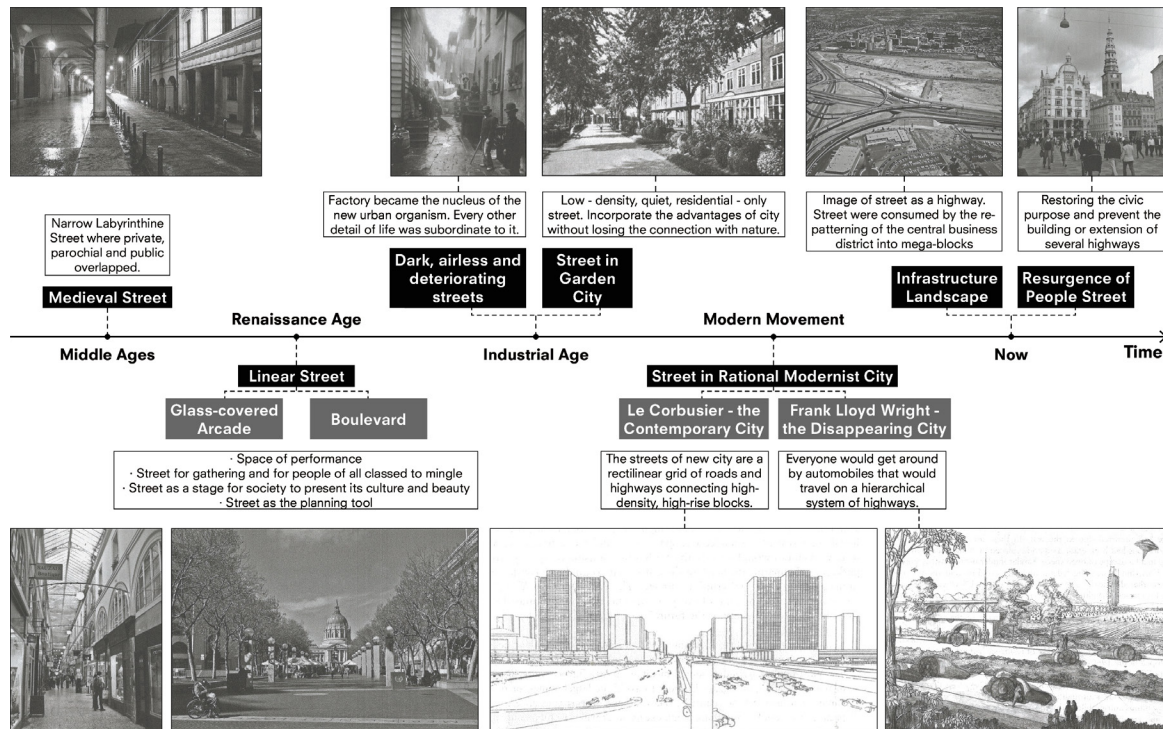


Figure 1-1 History of Social Street



Figure 1-2 Colourful Urban Life on Street.

2. Problem Statement

Tedious and incoherent urban life

This chapter will mention two specific problems within the site by analyzing two essential functions that streets have. Further, the research question will be stated.

2.1 Over Congestion – Street as the Carrier of Social Activities

On the human scale, the street gives people the first impression when they first step into a city. Jane Jacobs (1961, p29) describes that “Think of a city and what comes to mind? It ‘s streets. If a city’s streets look interesting, the city looks interesting; if they look dull, the city looks dull.” To make the streets interesting, only delicate space is not enough. Social activities are a crucial element to enrich the experience. In this sense, one of the functions of the street is the carrier of social activities.

To better understand the current situation in the Feijenoord area, the research defines four different levels of the street according to the measurement and use: city level, district level, neighborhood level and community level (Figure 2-1).

The sections of each type of street show the situation of use (Figure 2-2).

According to the sections, here are the situations:

- Most of the streets are not designed for people, but for trains and cars.
- In the streets where there are sidewalks, the space for people is inadequate for social activity in terms of size and quality.
- The boundary of public buildings is closed to the street space. The clear territory eliminates the possibility of interaction.

To conclude, the first problem is:
In the current situation, the over-congested street in Feijenoord cannot facilitate social activities.



Figure 2-1
Types of Street in the Feijenoord area.

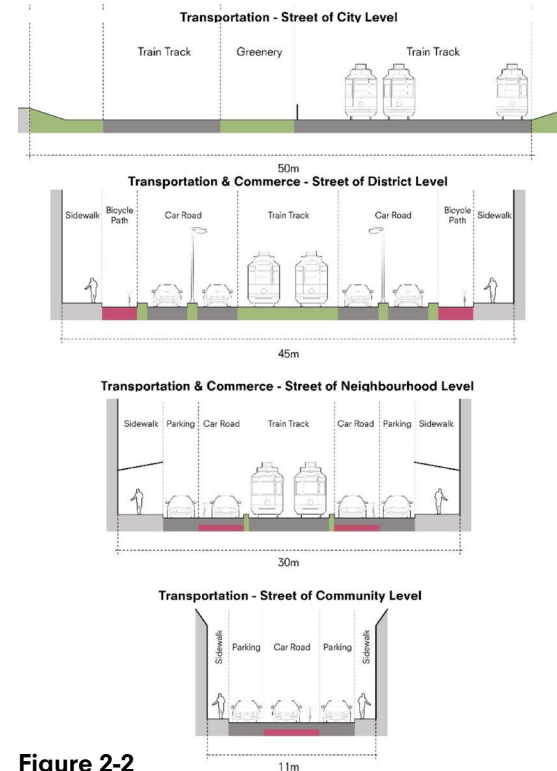


Figure 2-2
Type of Street in the Feijenoord area.

2.2 Poor Connection – Street as the Connection of Urban Areas

In the city scale, the street is the connection axis in between the urban areas. Not only the physical connection, but also the series of programs give the possibilities to the urban interactions. Another function of the street is the connection between urban areas.

According to the first problem above, there are few gathering spaces on the congested street. However, other public space like squares and playgrounds, which can relieve the stress of the high density of people, has a poor connection with the main public street (Figure 2-3). In the diagram, existing squares are more private and used by communities instead of urban public social activities.



Figure 2-3
Poor Connection between Street and Squares.

When it zooms out to the whole site, the railway splits the site into two parts: the residential part in the west and the riverside part in the east (Figure 2-4). In the program aspect, there is not a

continuous sequence of public programs from east to west. Moreover, the disparity of the program between east and west exacerbates the disconnection problem. In the west, it is mainly retail programs for residents. While in the east, the municipal plans to relocate the stadium and create the sport-leisure axis to match the huge sports events on the country and Europe level (Figure 2-5).



Figure 2-4
Physical Poor Connection between Street and Squares.

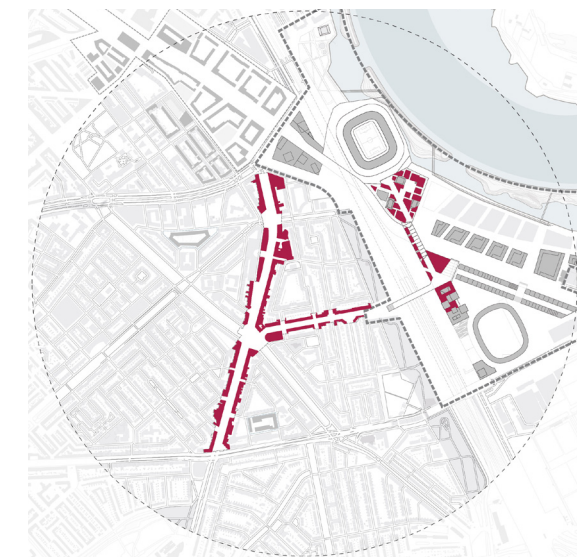


Figure 2-5
Program Poor Connection between East and West.

On a larger scale, it is the railway that tries to connect our site with Rotterdam central splits our sit. And the only station is closed now (Figure 2-6).

To conclude, the second problem is: **The physical and urban-program poor connections in three scales, Street - Squares & West - East & Feijenoord - Rotterdam, get in the way of future development.**

2.3 Conclusion

Based on the two specific situations above, the urgent problem of the Feijenpoort Area is the **tedious and incoherent urban life**. The congested environment makes the experience monotonous and the poor connection enlarges and strengthens the experience (Figure 2-7).

2.4 Research Question

Based on the problems above, the research question can be stated: **How can the project facilitate the east-west connection in Feijenoord area on neighbourhood level by using the idea of street?**

The following research will be conducted in two parts:

- The relationship between street space and the atmosphere for social activities.
- Based on Feijenpoort Area, the current situation and future plans will be researched, then the project ambitions can be proposed.

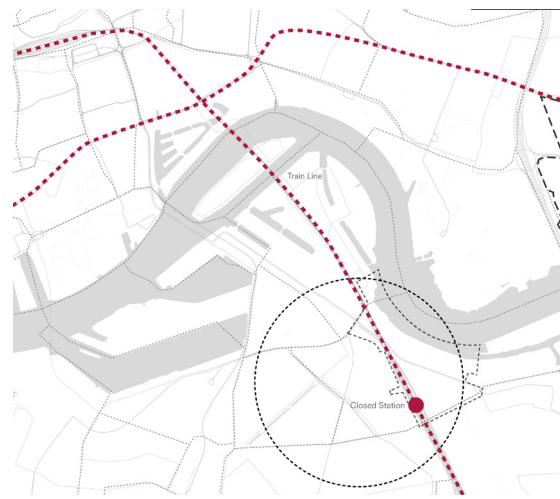


Figure 2-6 Poor Connection between Feijenoord and Rotterdam.



Figure 2-7 Tedious Urban Life and Activities.

3. Solution 1

Define spatial modes of the street

In this chapter, six parameters that affect the street space and atmosphere will be studied. Based on the analysis of street space and social activities, a typology of space-activity combination is used as the approach to define several spatial modes for future projects.

3.1 Typology of Street Use

Based on the definition of the street above, the street would migrate for different uses and atmosphere under the global background (Figure 3-1).

- First, the basic function of the street is the circulation for all users - vehicle, bicycle, pedestrian. Besides, it also serves for staying like parking.

- Second, because the street is one of the most important public spaces in urban life. A lot of public events and social activities would happen here, such as the celebration and protest.

- Then, today's consumption street epitomizes the indoor shopping mall, while the retail boulevard also plays an important role in the city.

- Next, street could also be with some specific theme, such as combining tradition, culture and commerce, or commemoration, or symbol of the financial services industry,

- In the community, promenading and children's playgrounds are placed on the street.

- Finally, there are also some specific uses of the street, for example, street for greenery, or the homeless.

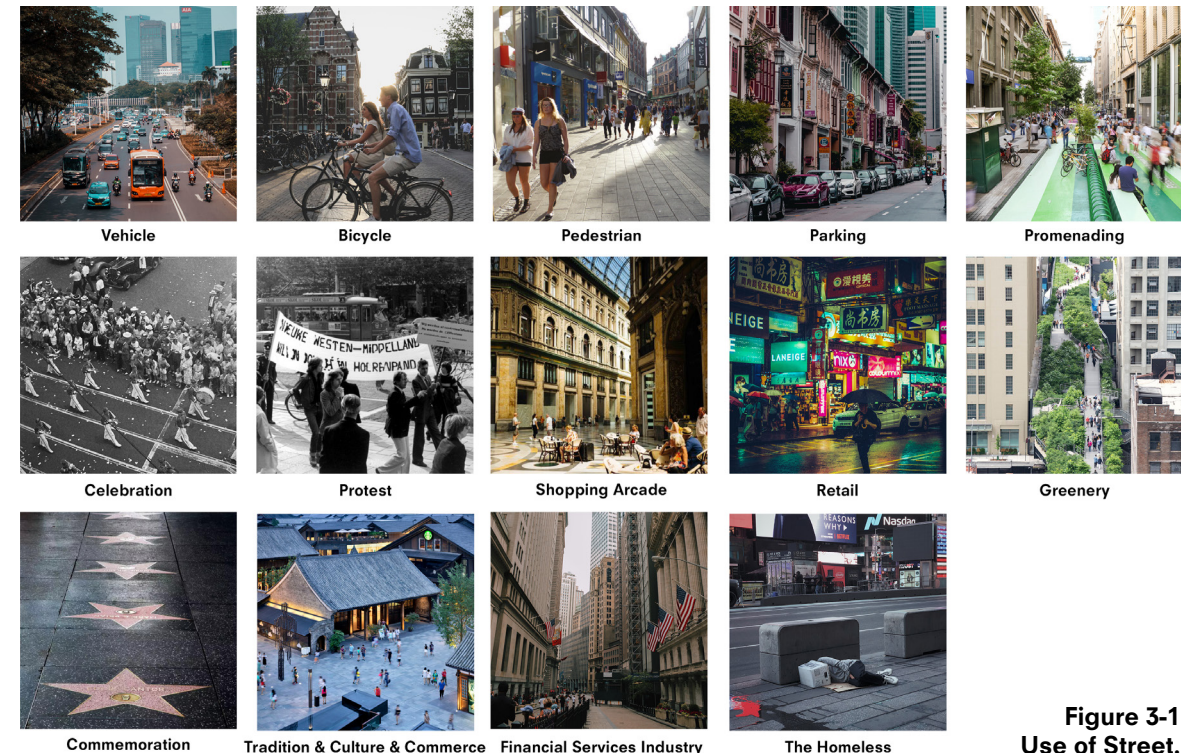


Figure 3-1 Use of Street.

3.2 Personal Distance

After the analysis of street use, the users' habits and behavior are also important.

Vikas (2013, p.60) mentions that "social behavior requires passive or active engagement with another, the interpersonal distances encountered by people on the street shape their experience". In E.T. Hall's work, *The Hidden Dimension*, he defines four scales of the distance of people: Intimate (0 - 0.5m), personal (0.5 - 1.2m), social (1.2 - 3.6m) and public (3.6 - 7.6m). Each scale indicates one certain physical distance, several kinds of social activities and relationships between people (Figure 3-2).

3.3 Social Activities

One street without any social activities is the desert in the city. Different social activities need different suitable personal distance. Vikas (2013, p.97) develops a typology of social behaviors according to his observation and research. In this typology, there are three types of behaviors: Passive, Fleeting and Enduring Sociability.

- For passive sociability, it "occurs on the street in the form of several non-verbal activities and behaviors" (Vikas,

2013, p.100). And people usually eating or drinking, reading or even work on the street along together with strangers. In the aspect of space, they need simply a bench or table, and the ideal distance is the social distance which is 1.2 - 3.6m.

- For fleeting sociability, it is "short-term, low-intensity contacts among residents, workers and even visitors" instead of "considerable stationary activities" (Vikas, 2013, p.106). In this situation, those activities could be "waving to a known neighbor", "verbal exchanges among adults promoted by children or pets", or simply chats among audiences of street performance. This type of activity could happen anywhere on the street. But one situation could kill it, and that is the congested space with a high flow of people.

- For Enduring Sociability, it "includes intimate relationships and affiliations – both meaningful associations among people" (Vikas, 2013, p.110). It happens among close friends, partners or acquaintances. The place for it usually is street furniture. And the distance between people is intimate distance – 0 - 0.5m.

Besides regular activities on street like walking, other social activities, such as performance, are also vital to the

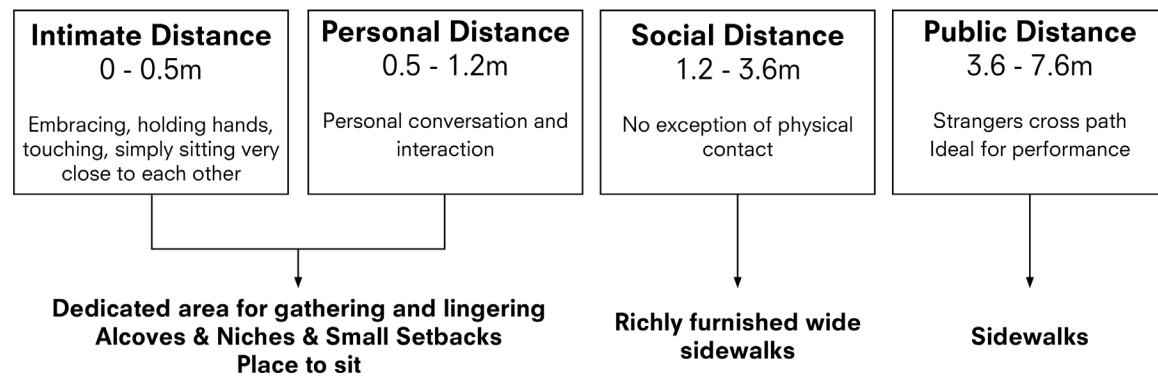


Figure 3-2 Four Types of Personal Distance.

atmosphere and space quality. And street furniture, buffer zone for staying and trees are the crucial incubator for social activities.

3.4 Territoriality

Vikas (2013, p.60) states that: "Territorial behavior is an important behavior mechanism in the public realm, especially in the context of social behavior in public space such as streets" The territory behavior on street forms the boundary of the street that restricts the street space and influence the social activities.

Different from the private territory where people would use physical barriers, the public territory in street is formed by personalizing a certain environment by symbolic barriers. Becker and Coniglio (1975) suggest that "Personalization serves as a non-verbal communication mechanism that provides environmental messages of territoriality". Basically, there are three ways of personalization in street. One is **embellishing the façade of the street**, which creates a solid boundary. One is **modifying the physical environment**, which creates a soft boundary. Another is **replacing the surface with a buffer zone**, which blurs the boundary instead of creating it (Figure 3-3).

3.5 D/H

In the last part, the street surface is studied and classified as the space quality influential factor. Moreover, another important parameter is D/H, which is the ratio of street width to building height.

In the introduction chapter, it can be found that in different stages of street

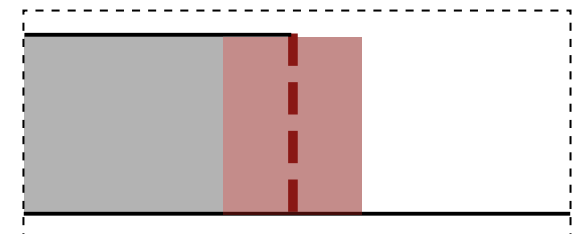
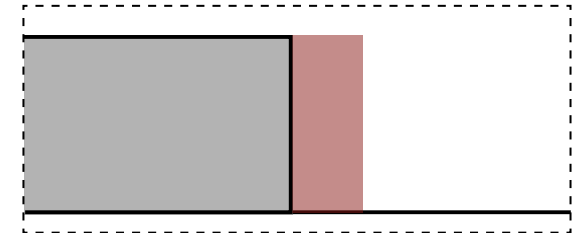
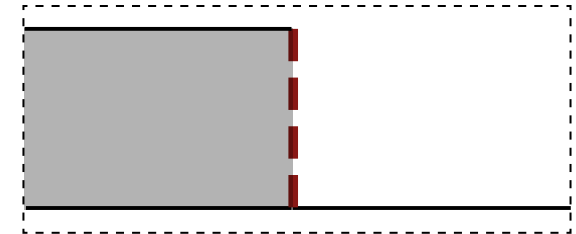


Figure 3-3 Three Types of territoriality in street.

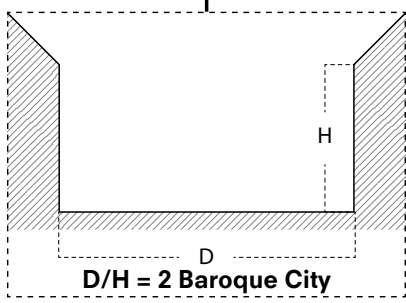
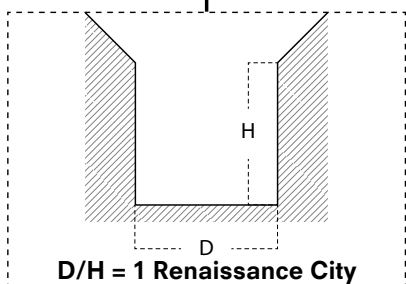
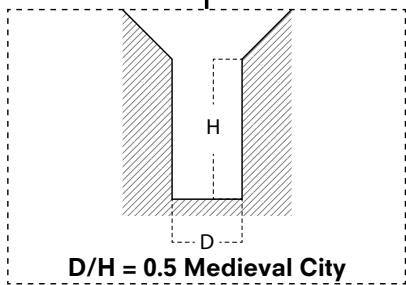


Figure 3-4 Three Types of D/H of the street.

history, the D/H of the street is different to achieve social purposes (Figure 3-4).

Yoshinobu (1979, p.46) suggests that “D/H =1 may be taken as a kind of median from which spatial qualities vary depending on whether D/H is greater or less than 1.” The greater the D/H is, the street is more open up, and even expensive and vast. The less the D/H is, the street is more intimate, and even cramped.

3.6 Material and Media

Size and boundary are not the only factors that influence the street space. The media and the material of the street surface are dominant parameters in the street atmosphere. For instance, within the same size and proportion space, wooden material and some signboards can create a welcome and relaxing atmosphere (Figure 3-5).

According to the spatial effect, there are four types of street surface (Figure 3-6):



Figure 3-5 Power of Material and Signboard.

- Solid Material Surface, for example, the granite, brick or concrete façade, asphalt road and stone sidewalk. This type of surface is suitable for transportation and movement.

- Soft Material Surface, such as cedar or cypress façade and grassland. The natural material, especially wood, can generate a warm and relaxing atmosphere for people to stay.

- Transparent Material Surface, like the combination of steel and glass. The transparent surface gives more possibilities to street space and can also be a hint to other programs.

- Media Surface, for example, the graffiti, façade screen and signboards. Yoshinobu (1979, p.46) calls the “perpendicular signboards and other fixtures that project over the building facades” the “Secondary Profile” of the street. Those media attachments “blur the outline of the primary profile”, “far from helping to define the street as figure”.

3.7 Spatial Modes for Street

According to the study of the six parameters above, they can be divided into two groups: activity group (street use, personal distance, social activity) and space group (territoriality, D/H, material and Media). Further, the program-oriented system can be used to find the relationship among them (Figure 3-7).

According to the program in different scales, there can be three representative street use: the retail street on community-scale, regional event street on district-scale, and celebration street on city-scale.

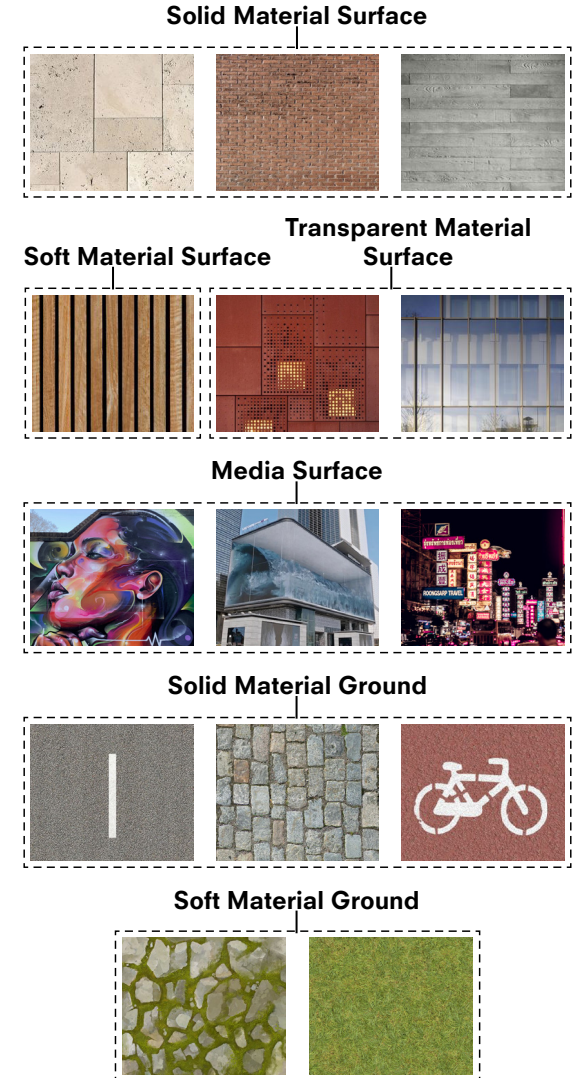


Figure 3-6 Different Types of Street Surface.

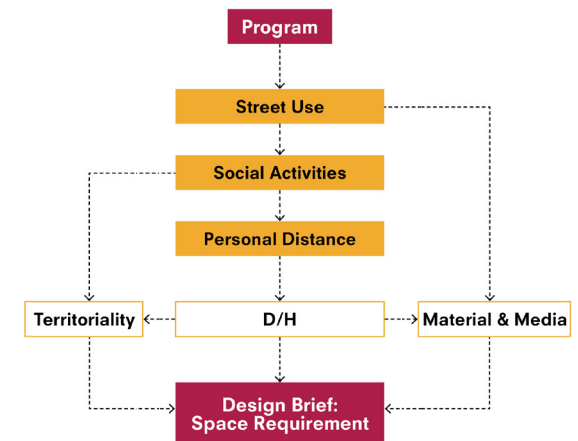


Figure 3-7 Relationships among Parameters.

Space Mode 1. For retail or commercial streets, people often go to some specific commercial destinations along or with close friends and family groups. Open-up street and soft-material façade can create a relaxing atmosphere. The solid material for the ground is good for movement on street. In the group, the enduring social activities will happen with intimate distance. Therefore, the group needs a specific space to stay, like outdoor tables for coffee. While among the groups, people need enough social distance (Figure 3-8).

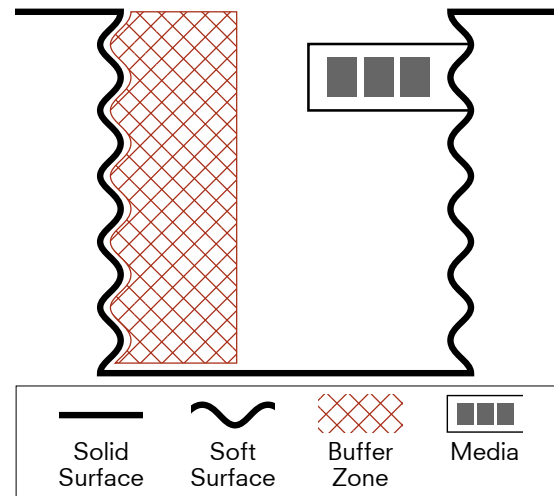


Figure 3-8 Space Mode 1.

Space Mode 2. For regional event street, the urban activities, like performance and exhibition, need some certain buffer space where the soft material can help people to stay and participate. In this situation, a relatively narrow street with a transparent façade can make people pay more attention to the event itself (Figure 3-9).

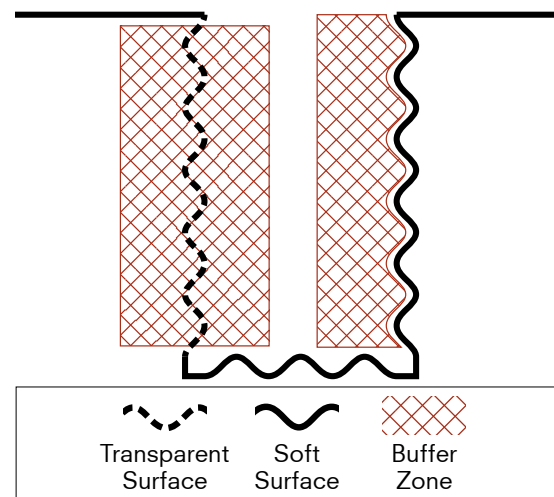


Figure 3-9 Space Mode 2.

Space Mode 3. For celebration street, there should be enough and open space for a large number of people. People would gather and stay on the street where the transparent street façade may not be needed. Moreover, hard material for the surface is suitable for people's movement. The decoration or the media screen can help with building the atmosphere (Figure 3-10).

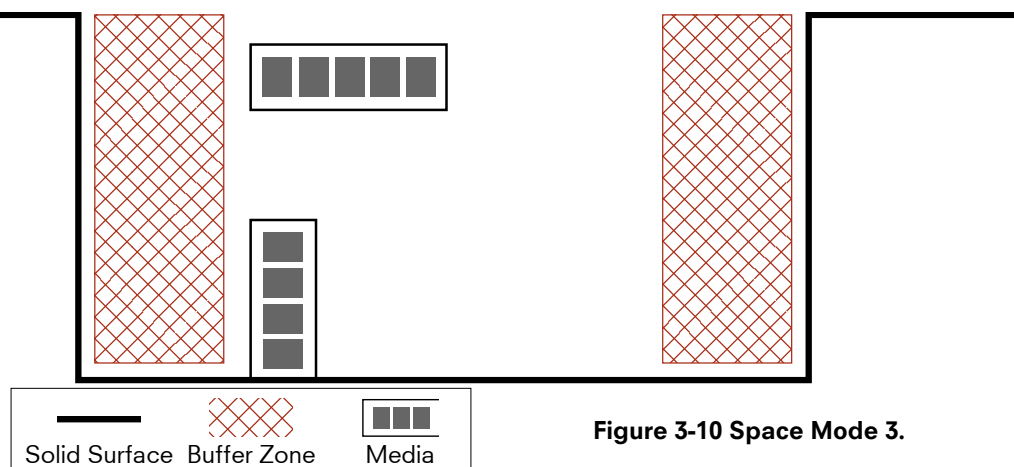


Figure 3-10 Space Mode 3.

4. Solution 2 Convergent zone to offer the connection

This chapter would focus on the site. The municipal future plans and site resources will be studied to reveal the importance of the convergent zone, which can integrate the resources and separated urban areas.

4.1 Future Plan

In the Feijenoord area, there are mainly three municipal future plans. One is the **commercial street plan**. It aims at making the Beijerlandselaan the heart of the neighborhood area. One is the **Feijenoord City Master Plan** which tries to create a new sports axis from the old stadium to the new one. Another one is the **Project of Parkstad**, which aims to create modern housing (Figure 4-1).

Each of the future plans suggests its own axis and future vision. However, when they work together under the same urban background, there are still some disadvantages.

The project of Parkstad tries to become the "gate" to Rotterdam south but it is ignoring the city space behind the "gate". The Feijenoord City Master Plan's ambition is to shape the riverside area into an international sports area, which exacerbates the unbalance of Feijenoord. While the commercial street plan only focuses on the neighborhood scale and detailed problems.

From the mapping, those three future plans meet at one area where the high-rise housing will be built and block the space. In a word, the new project needs to reorganize the three future projects in the same context and scale.

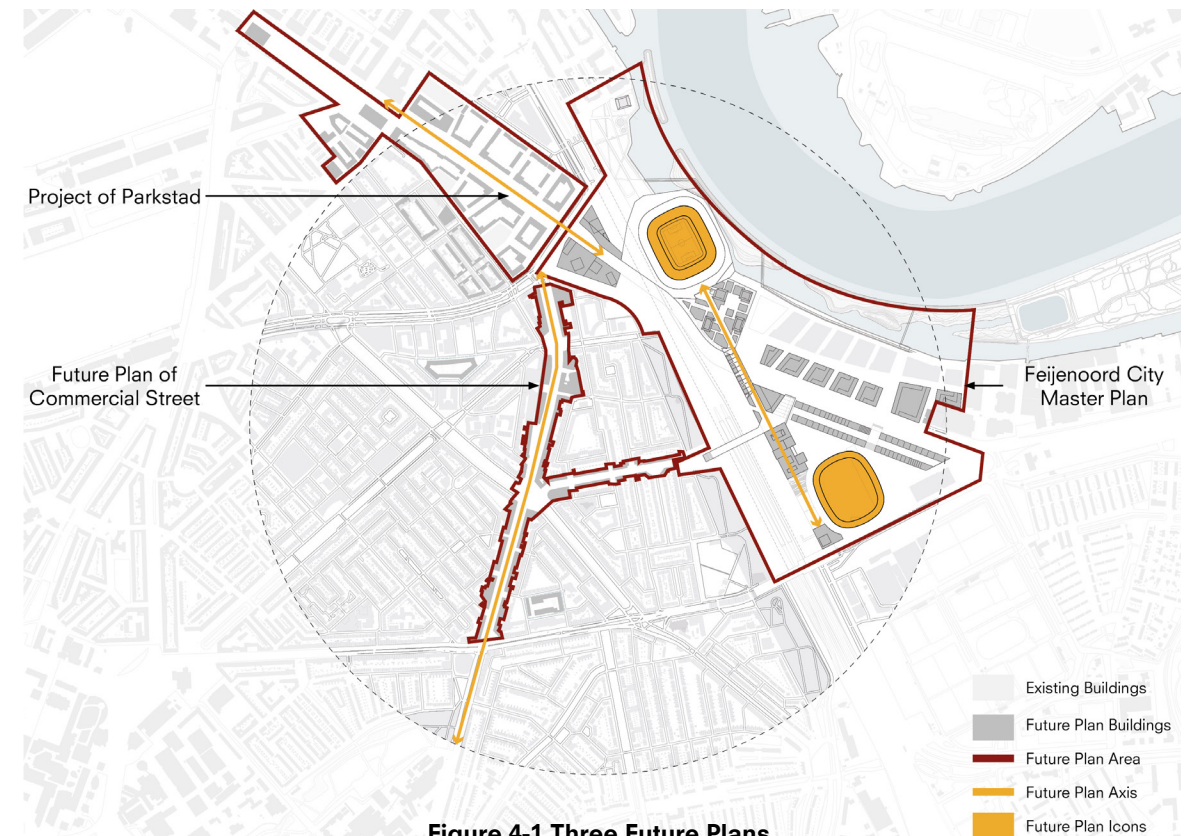


Figure 4-1 Three Future Plans.

4.2 Site Resources

Although the Feijenpoort Area has some problems, its potential is huge because of the rich resources.

- For the natural resources, there are two city-scale parks: Varkenoordse Park and Mallegat Park. However, they are separated by the railway line (Figure 4-2).
- For the transportation resources, the municipal suggests two new train stations and an extra metro line go across the Feijenoord in the next 20 years. And it can help with improving the mobility of the area (Figure 4-3).
- For the population resources, there will be around 4000 houses added by the municipal future plans. Combined with the existing 53,000 population, such large numbers of people have an urgent need for urban life (Figure 4-4).

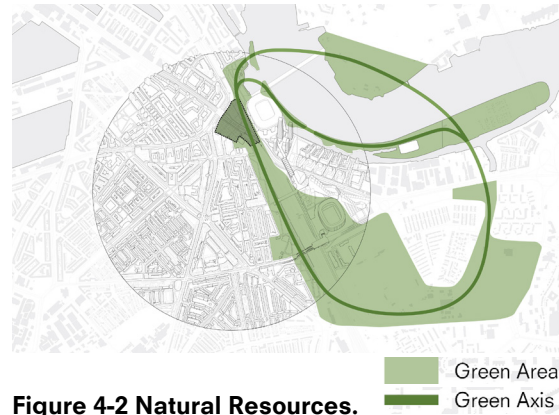


Figure 4-2 Natural Resources.

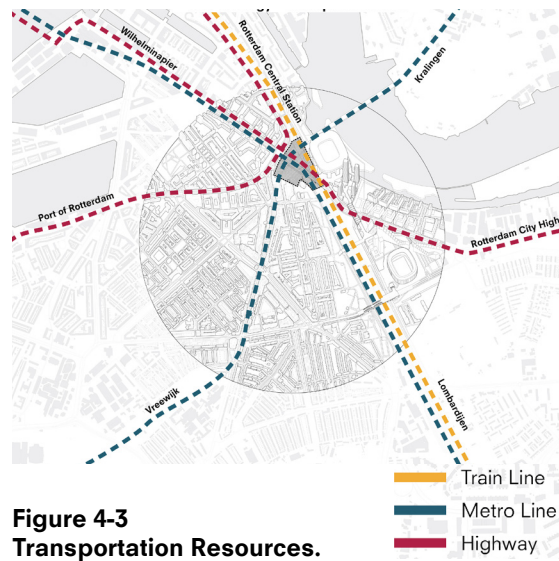


Figure 4-3 Transportation Resources.

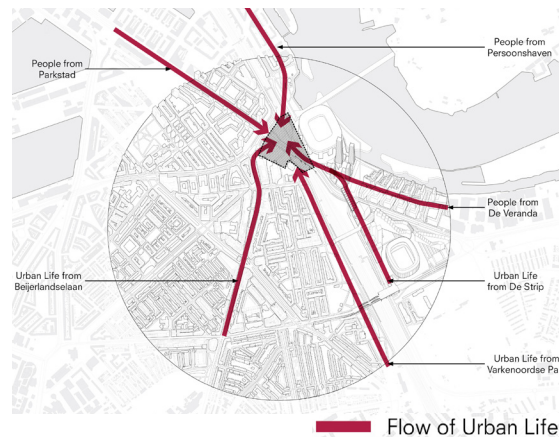


Figure 4-4 Population Resources.

4.3 Convergent zone

To integrate future plans and balance the different areas, the convergent zone is proposed as the location of the project (Figure 4-5).

On the one hand, the convergent zone is located in the space where three future plans meet together. By modifying the municipal proposed axis, it can integrate and balance the housing, commercial program and sports-culture program.

On the other hand, the railway and highway go across the zone where the train and metro station can be placed into. In this way, the convergent zone can organize transportation flows easily to offer better urban connections.

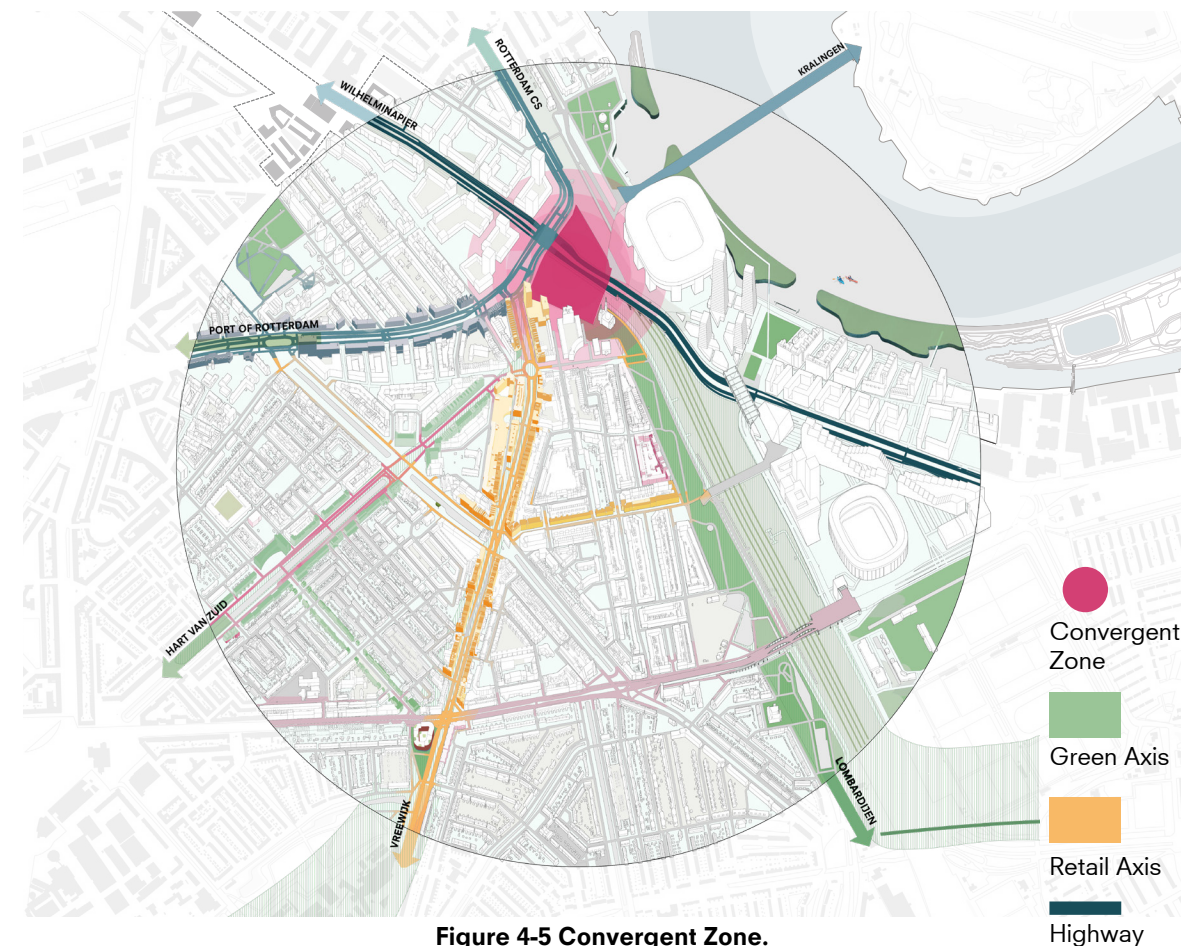


Figure 4-5 Convergent Zone.

5. Conclusion

Mobility hub project with the idea of street

To answer the research question:

Mobility hub, which facilitates social activities by means of street, creates the convergent zone to connect the urban areas.

As the shelter for urban life, the mobility hub project is not the machine that pushes people to the destination, but rather a place to stay or enjoy the urban life in movement.

On a bigger scale, the project is a component to complete the Rotterdam south urban life loop. And the loop can also enrich the character of Rotterdam, which is not the high-rise and modern busy life, but the colorful local life within the greenery and nature.

To explain the mobility hub in detail, there are three programs in it:

- **Train & Metro Station**, as the connection between Feijenpoort and Rotterdam central & international. It serves for local people and visitors for Feyenoord Events. The huge number of passengers enriches activities and urban life.

- **City Event Street**, as the urban space to facilitate social activities and connect separated areas. In the meantime, the event street can play the role of buffer space for stations and help with organizing flows.

- **Landscape Park**, as the green link to complete the ecological circle and slow traffic axis in the city scale. Further, the park gives the natural elements to the convergent zone and improve the street

atmosphere.

In the aspect of space, the street is used as the tool to facilitate different types of social activities by changing the features of itself – territoriality, size & proportion and material. By analysis of the social activities, there are three basic spatial modes for different programs of street – mode of retail or commercial streets, mode of regional event street, mode of celebration street.

Bibliography

1. Mumford, L. (1961). *The City in History: Its Origin, Its Transformations and Its Prospects*. New York: Harcourt Brace Jovanovich
2. Rapoport, A. (1977). *Human Aspects of Urban Form*. Oxford: Pergamon Press.
3. Jukes, P. (1990). *A shout in the Street*. New York: Farrar Straus Giroux.
4. Kostof, S. (1992). *The City Assembled: The Elements of Urban Form through History*. Boston: Little, Brown & Co.
5. Jackson, J.B. (1987). The American Public Space. In N. Glazer and M. Lilla (eds), *The public Face of Architecture: Civic Culture and Public Spaces*. New York: The Free Press
6. Vikas, M. (2013). *The Street - A Quintessential Social Public Space*. Routledge.
7. Becker, F. and Coniglio, C. (1975). *Environmental messages: personalization and territory*. *Humanities*, 11, 55-74.
8. Hall, E.T. (1966). *The Hidden Dimension* (1969 ed.). Garden City, NY: Doubleday
9. Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York: Vintage Books.
10. Yoshinobu, A. (1979). *The Aesthetic Townscape* (1983 ed.). The MIT Press
11. Baird, G. (2011). *Public space : cultural, political theory : street photography : an interpretation*. SUN.
12. Moughtin, C. (1992). *Urban design : street and square*. Butterworth Architecture.
13. Westerveld, E., & Rotterdam Marketing. (2000). *Rotterdam*. Scriptum.
14. Shannon, K., & Smets, M. (2010). *The landscape of contemporary infrastructure*. NAI.
15. Thorne, M., & Art Institute of Chicago. (2001). *Modern trains and splendid stations : architecture, design, and rail travel for the twenty-first century*. Merrell.
16. Brambilla, R., & Longo, G. (1977). *For*

pedestrians only : planning, design, and management of traffic-free zones. Whitney Library of Design.

17. Asensio Cerver, F., & Webb, M. (1997). *The architecture of stations and terminals*. Hearst Books International

18. Neufert, E., Neufert, P., & Kister, J. (2012). *Architects' data (4th ed.)*. Wiley-Blackwell.

Appendix – Design Brief

1.1 Project Ambition

From the conclusion chapter, the overall project ambition is that the mobility hub in the convergent zone could support urban life and make better connections. In order to achieve it, the project defines the street atmosphere and reorganize the site resources (Figure A-1).



Figure A-1 Project Ambition

1.2 Users

For the users of the mobility hub, there are three groups. The first group, which is the main users, is **residents** and **visitors**. The second group, which works in the mobility hub, is **merchant** and **performing & art Organization**. The third group, which maintains the order of the project, is **train & metro staff** and **community officer**.

The maximum number of main users, which are residents and visitors, determines the size of the project. For the resident, in the municipal document, the passengers, who either live or work in the site, will increase to 33,00 persons per day in 2040. While for visitors, they are mainly attracted by Feyenoord Stadium Events. For each event, the passengers, who use public train and metro, will be around 39,275 persons. To conclude, the **project capacity is around 72,275 persons per day**.

1.3 Client

Due to the feature of the mobility hub project, the whole project development is a complex process. The design and

construction are just the start of the project. The adaptation, modernization, maintenance and repair are also crucial during the whole life of the project. Therefore, the clients vary a lot.

There are basically five clients throughout the project development process: **Feijenoord Municipal Civic Authority, Rotterdam Municipal Civic Authority, Third-Party with Commercial Interest in the Project, Infrastructure Company and Railway Company**.

1.4 Urban Ambitions

Besides connecting and integrating urban areas, the mobility hub also aims to enrich the character of Rotterdam by offering another type of urban life. In the meantime, as one of the centers in Rotterdam South, the project makes the south area more attractive and give more opportunity to the local development.

1.5 Program Ambitions

For three different programs, the ambitions vary. For **landscape park**,



Landscape Park



City Event Street



Train & Metro Station

Figure A-2 Program Ambition

it connects the natural resources to complete the green circle in the city scale. Besides, it also aims to improve the quality of people’s urban life. For the **train & metro station**, it connects the Feijenoord with Rotterdam Central and international. It also helps improve the mobility of Rotterdam South. For **City Event Street**, the ambition is to offer a gathering space and atmosphere for people’s urban life. In the meantime, the event street allows holding big events, such as festival celebrity, in Rotterdam South (Figure A-2).

1.6 Building Ambitions

A large part of the building is going to hide underground. On the one hand, it gives the city space back to the residents. On the other hand, the “invisible” urban center avoids blocking the view and introduce nature to the city.

2.1 Site Location

Based on the research above, the site is located in the convergent zone - Rosestraat, 3077 ME Rotterdam & Varkenordseviaduct in Rotterdam South Site Area is 60,000m² (Figure A-3).



Figure A-3 Project Site

2.2 Site Mapping

1 Building function analysis

Beside the site location, there are two important building functions. One is the sports facilities, the new stadium that would hold big events. Another is commercial buildings, which offer the normal urban life for residents (Figure A-4).

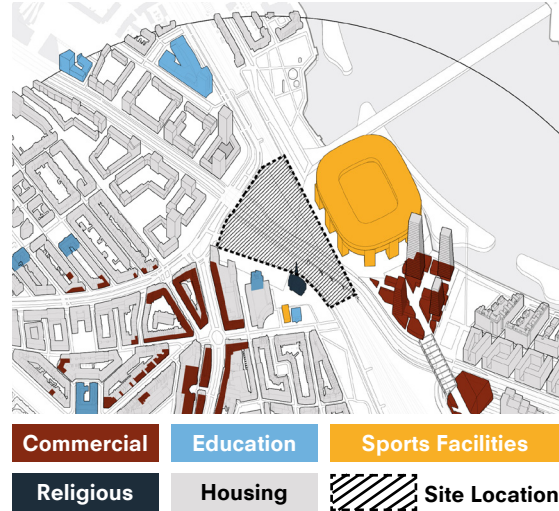


Figure A-4 Building function analysis.

2 Nature element analysis

There are abundant nature resources around the site. Three parks: Mallegat Park, Tides Park and Varkenoordse Park. While the river Maas is also closed to the project (Figure A-5).



Figure A-5 Nature Element Analysis.

2.3 Site Approach

Basically, there are five ways to approach the site (Figure A-6).

- Train: Original line to Rotterdam South
- Metro: Line D/E&Newly proposed line F
- Bus & Tram
- Highway: S106 & S123 & S120
- Bicycle & On Foot

In the mobility hub, train, metro and pedestrian are the most important flows. Because of the new added metro & train station and street, the current train track could be lowered down underground. However, for the other general flows, like the highway and bus & tram flows, the current situation can be kept in the project design.

2.4 Urban Rules

In the municipal zoning plan, the convergent zone area has two functions: residential housing and railway. Therefore



Figure A-6 Site Approach - Public Transportation



Figure A-6 Site Approach - Car



Figure A-6 Site Approach - Bicycle & On Foot



Figure A-7 Urban Rules - Max Height

the only useful urban rules is the max height. In the following design process, the urban rules will be redefined (Figure A-7).

3.1 Program Statement

From the conclusion chapter, there are three programs in the Mobility Hub Project:

• **Train & Metro Station**, as the connection between Feijenpoort and Rotterdam central & international. It serves for local people and visitors for Feyenoord Events. The huge number of passengers enriches activities and urban life.

• **City Event Street**, as the urban space to facilitate social activities and connect separated areas. In the meantime, the event street can play the role of buffer space for stations and help with organizing flows.

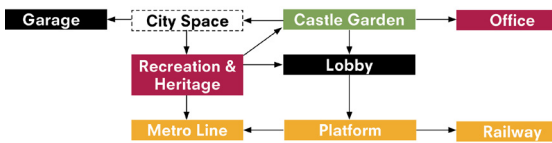
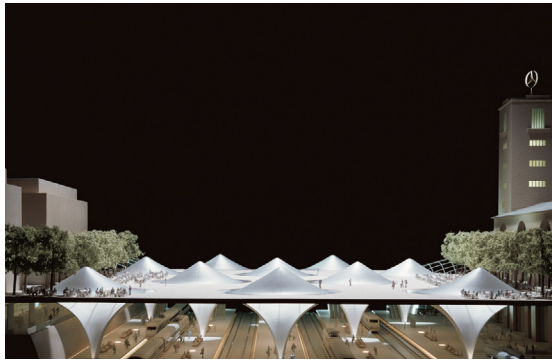
• **Landscape Park**, as the green link to complete the ecological circle and slow traffic axis in the city scale. Further, the park gives the natural elements to the convergent zone and improve the street atmosphere.

3.2 Reference Research

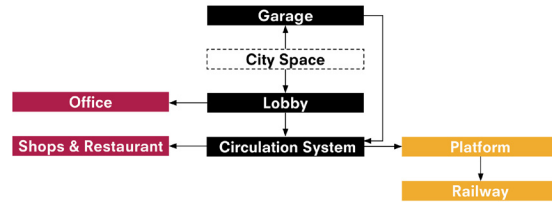
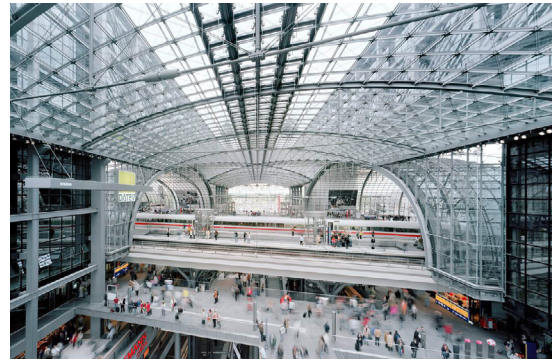
According to the capacity of the Mobility Hub, there are five references of transportation hubs are studied. The diagrams below are the program percentage and relation from each reference (Figure A-8).

The form shows the comparison of the capacity and the size of reference with the Mobility Hub Project (Figure A-9).

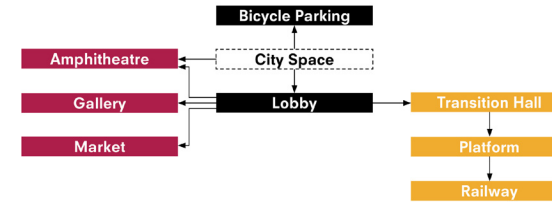
Stuttgart Central Station



Berlin Central Station



The Flinders Street Station



Rotterdam Central Station

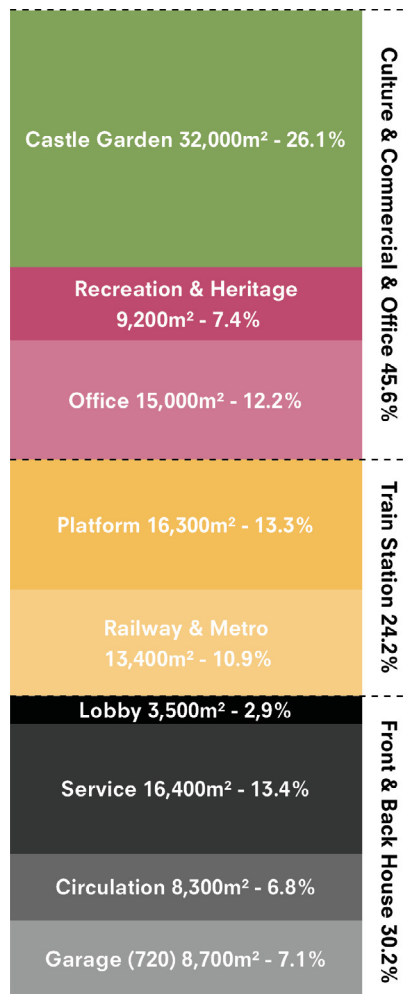
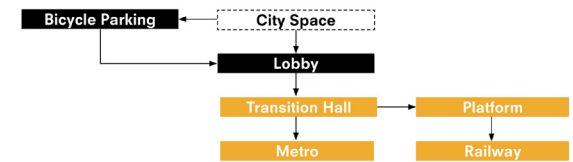


Figure A-8 Reference Research

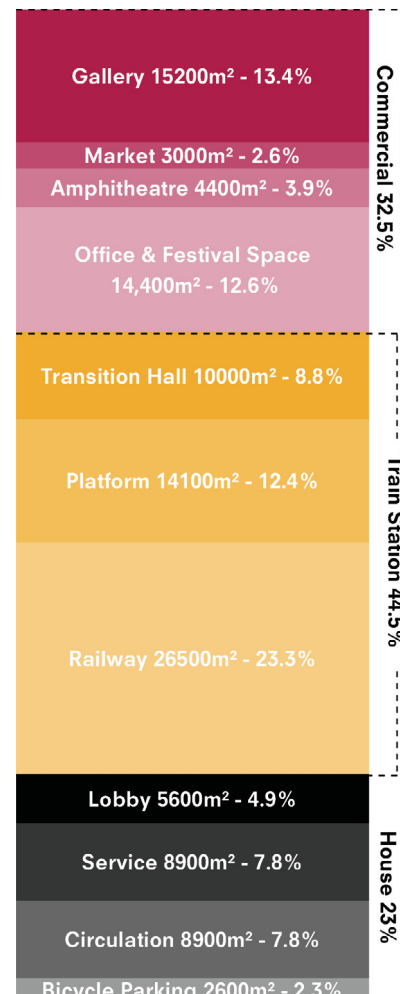
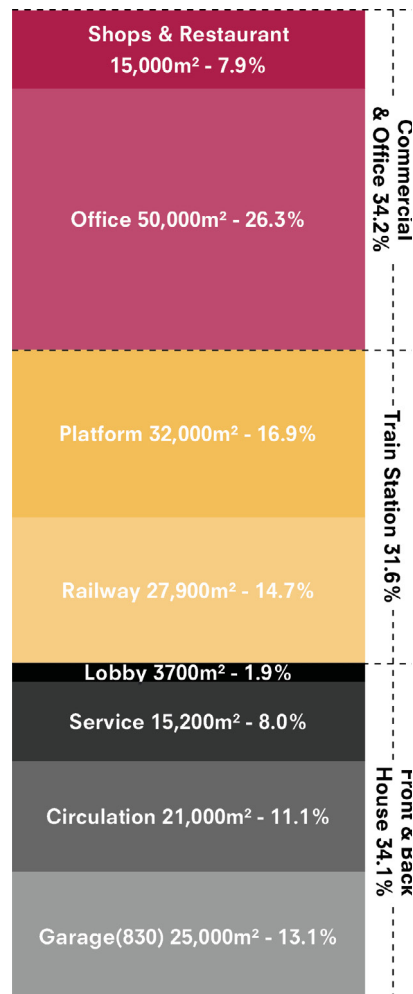
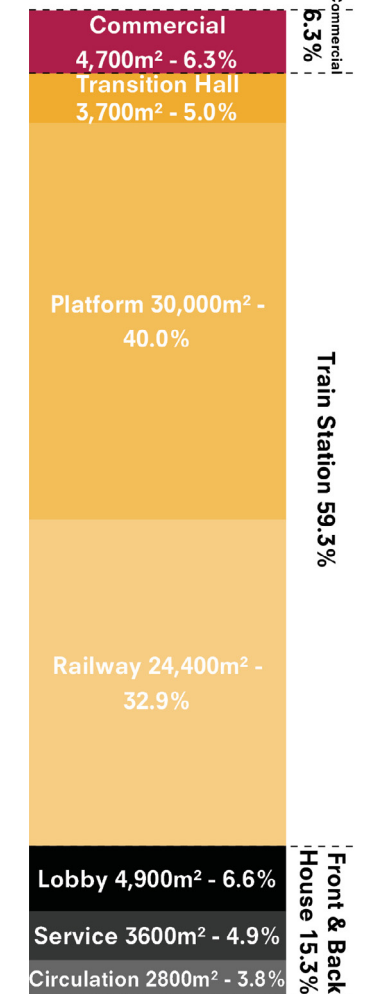


Figure A-8 Reference Research



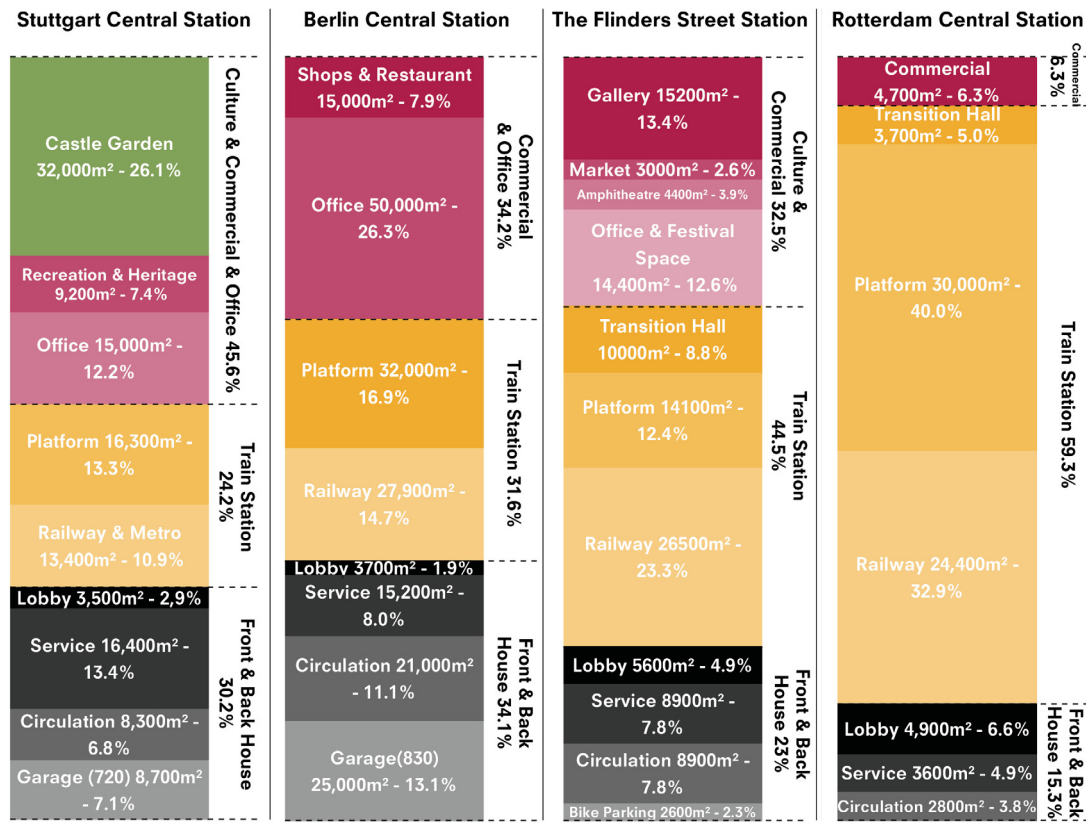


Figure A-8 Reference Research

	Stuttgart Central Station	Berlin Central Station	The Flinders Street Station	Kyoto Station	Rotterdam Central Station	Rotterdam Blaak station	Feijenoord Zuid Station	Feijenoord city station
Scale	400*80 m	550*80 m	550*80 m	470*90 m	250*150 m	180 m	300 m	
Site Area	34,400 m²	33,300 m²	40,000 m²	42,700 m²	46,000 m²	180m	300m	
Building Area	185,000 m²	175,000 m²	140,000 m²	238,000 m²	67,000 m²	180m	300m	
Passenger Capacity	140,000/D	300,000/D	92,000/D	123,360/D	110,000/D	24,500/D	3,000/D	72,275/D
Program Proportion	0.63 0.81 1	1.1 1	0.74 1		0.08 1			
Size & Shape								

Figure A-9 Comparison of Reference and Mobility Hub Project

3.3 Benchmarking of the Program

According to the reference study, the benchmarking of the program can be determined (Figure A-10).

Train & Metro Station (62,000m²)

- Railway*8 – 18,000 m²
- Platform*5 – 19,000 m²
- Transition Hall – 12,350 m²
- Lobby – 3,850 m²
- Service – 8,800 m²

City Event Street (48,000m²)

- Event Street – 9,600 m²
- Shops & Restaurant Street – 12,000 m²
- Market Street – 6,000 m²

- Parking (1500*Bikes + 150* Cars) – 3,850 m²
- Circulation – 12,100 m²

Landscape Park (40,000m²)

- Landscape – 30,000 m²
- Sports Area – 5,000 m²
- Amphitheatre – 5,000 m²

3.4 Program Relations

According to reference study, the program relations is showed in the diagram (Figure A-11).

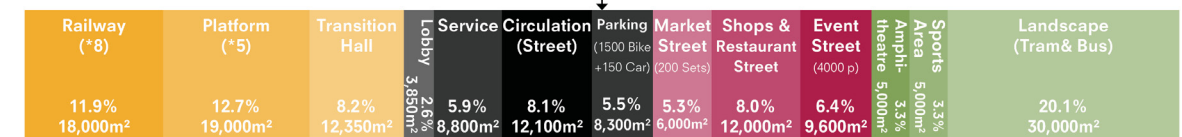
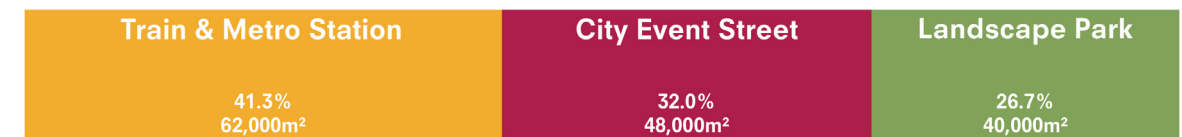


Figure A-10 Benchmarking of the Program

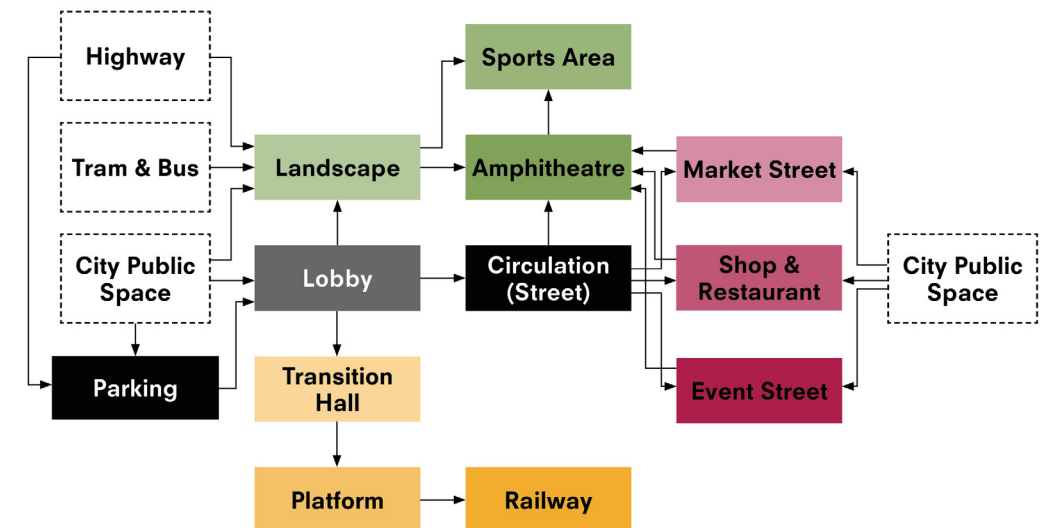
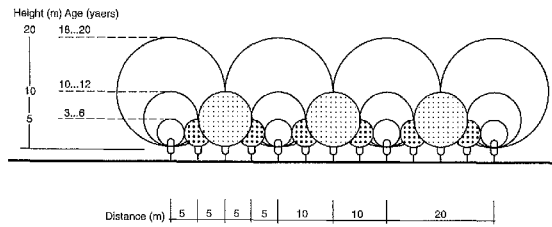


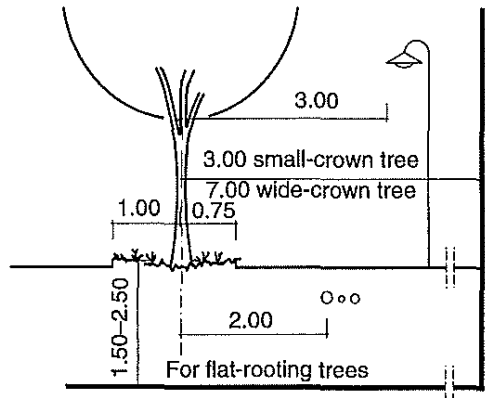
Figure A-11 Program Relations

4 Specific Spatial Requirements

4.1 Spatial Requirements of Greenery element on street (Neufert, Neufert, Kister, 2012, P.376)

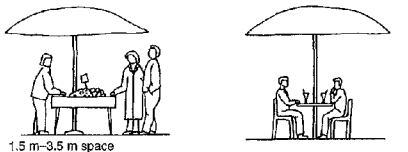
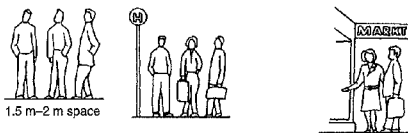
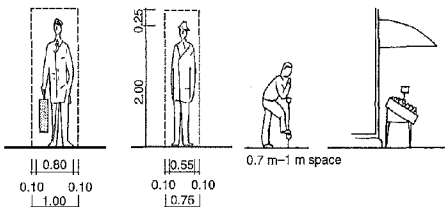


1 When choosing the positioning of trees for planting, the space that will be required by the fully grown trees should be considered (FGSV → refs)



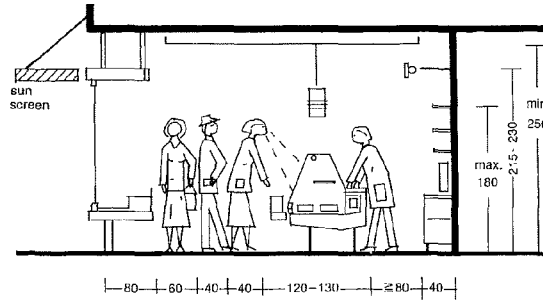
4 Distances of trees from other street elements

4.2 Spatial Requirements of Street Users (Neufert, Neufert, Kister, 2012, P.377)

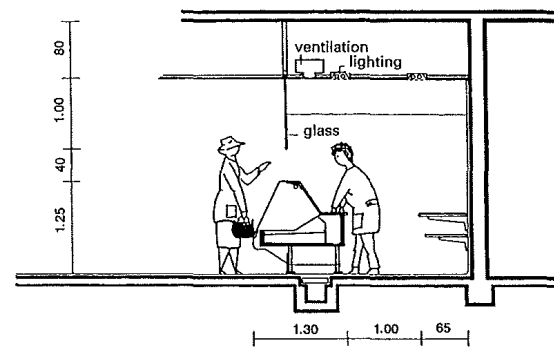


4 Basic dimensions for various uses of pedestrian areas (FGSV: EAH 05 → refs)

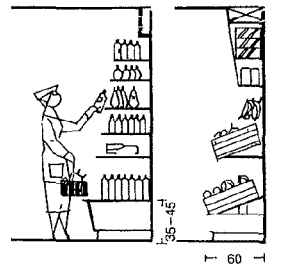
4.3 Spatial Requirements of Retail (Neufert, Neufert, Kister, 2012, P.260)



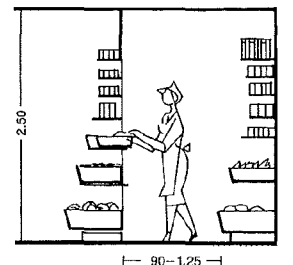
2 Minimum width of a shop ≥ 4.0 m, better 5.0 m



3 Service counter in self-service shop, section

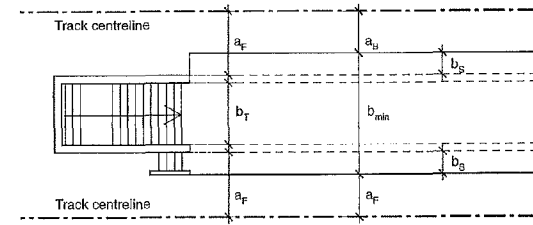


7 Wall shelves for bottles Wall shelves for fruit and vegetables (goods to restock)



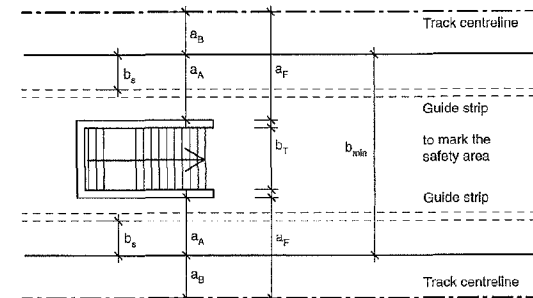
8 Wall with drawers, passage for restocking (sliding baskets are exchanged)

4.4 Spatial Requirements of Train Platform (Neufert, Neufert, Kister, 2012, P.416)



Platform width $b_{min} = b_T + 2w + 2(a_F - a_T)$

- a_F Minimum distance of fixed objects (e.g. columns) from the track centreline on the platform = 3.00 m at the end of the platform = 2.50 m
- a_A Distance between platform structures and platform edge taking into consideration barrier-free access width and the danger area b_s next to short structures (e.g. columns) min. $a_A = b_s + 0.90$ m next to longer structures with min. 1 entrance min. $a_A = b_s + 1.20$ m
- a_B Distance of the platform edge from the track edge
- b_{min} Minimum width of the platform
- b_s Width of the danger area $V \leq 160$ km/h $b_s = 2.50$ m - 1.65 m (for straight tracks) $160 > V \leq 200$ km/h $b_s = 3.00$ m - 1.65 m (for straight tracks)
- b_T Clear width of stairs or ramps between the strings
- w Width of the stair string (including cladding)

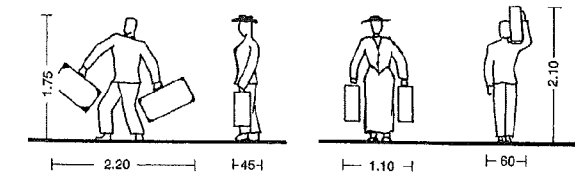


1 Platform widths and danger zones

Platform classification	A	A1	A2	A3	B	B1	B2	C	D
Platform standard length	405 m	370 m	320 m	280 m	210 m	170 m	140 m	120 m	60 m

2 Platform lengths (A express, B local, C and D less significant halts). A full Inter-City Express (ICE) high-speed train needs 405 m and a half ICE train 210 m

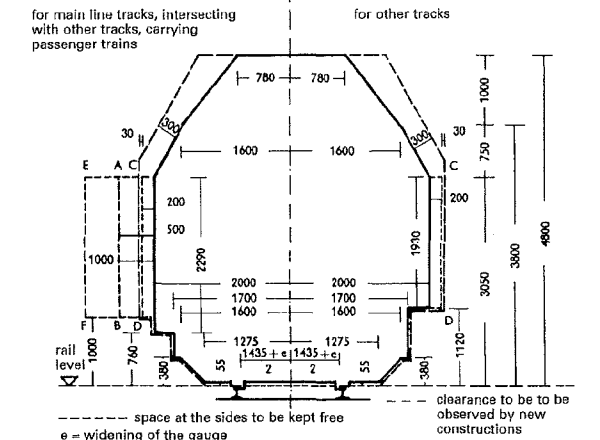
4.5 Spatial Requirements of Passenger (Neufert, Neufert, Kister, 2012, P.417)



1 Space required by passengers

4.5 Spatial Requirements of Standard Gauge Railway (Neufert, Neufert, Kister, 2012, P.410)

Standard gauge railways



A-B for main lines on open stretches for all objects with the exception of fabricated structures
C-D for station sidings and for open stretches of main lines with special structures and signals between the tracks
E-F for fixed objects on passenger platforms

1 Standard clearance profiles (straight track plus curves with radii ≥ 250 m)

Plan of Approach

Concept	Research	Design	Result
Week 3.1	Site Analysis	Massing Design	Massing Options
Week 3.2	Program Analysis	Program Design	Program Options
Week 3.3	Reference	Concept	Concept Diagram
Week 3.4	Planning Analysis	Site Planning	Site Plan
Design	P 2.5		
Week 3.6	Functional Research	Developing Plan	Site Plan
Week 3.7	Space Research	Developing Plan	1:500 Plan
Week 3.8	Structure Research	Developing Section	1:500 Section
Week 3.9	Reference Research	Structure Axon	Axon Drawing
Week 3.10	P 3.0		

Material & Structure	Research	Design	Result
Week 4.1	Material Research	Interior Design	3D Model & Perspectives
Week 4.2	Structure Research	Structure System	Structure Diagram
Week 4.3	Detail Research	Detail Design	1:100 Sections & Plans
Week 4.4	Detail Research	Detail Design	1:20 Detail Drawing
Final	P 4.0		
Week 4.6	Finalizing Research	Finalizing Design	1:5 Detail Drawing
Week 4.7	Finalizing Research	Finalizing Design	Rendering
Week 4.8	Finalizing Research	Finalizing Design	Physical Model
Week 4.9	Finalizing Research	Finalizing Design	Physical Model
Week 4.10	P 5.0		