TRAINING.

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From infrastructure to public spaces

How train stations and their design rationales reflect the evolutions of European societies

from the XIXth century to today

Marine Pierson

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Note

I have been working as an architect and urban planner at Cobe Architect for the last five years.
On of my first assignment was to work on the book they publishes, O*ur Urban Living Room,* and the exhibition that came out with it.
Since a big part of my task was the chapter about Norreport Station, you will find in this thesis the similar text and diagrams I did for the book.

Acknowledgments

Here is the result of my three years of research at Università degli Studi di Genova - Scuola Politecnica. I had the chance to start this program after my first project called TRAINING. TRAINING was resulting from almost a year of research but it was above all a great opportunity which I was given to concretize a work which was close to my heart, through the Métropoles du Sud Scholarship. I would like to warmly thank the people behind this project, Jacques BRION, Marion MOUSTEY and of course, Élodie NOURRIGAT. A special thank you goes to her for following me after these many years and supporting my work.

One aspect of muy research is to involve and integrate people in an architectural and urban approach. This book would not have existed without Charlotte, Audrey, Jean, Laurent, Thomas, Louise, Caroll, Loïc, Marion, Adrien, Renaud, Marianne, Julie, Justine, Mélanie, Flo, Nathalie, Anne-Sophie, Biba, Christelle, Vincent, Marlène, Rémi, Chloé, Johan, Damien, Mylène, Martin, Antoine, Mathieu, Eve, Ha, Coriandre, Stella, Selma, Camille, Pauline, Jimmy, Marine as well as many anonymous who, I hope, will recognize. Thank you for giving me your time, playing the game and sometimes exceeding a certain timidity.

My research started with my master's thesis in Management of Sustainable Urban Projects, thank you to Catherine BERNIÉ BOISSARD and Fabien BLASCO for having been kind enough to bring me their knowledge of the city of Montpellier!
I would like to thank AREP and particularly Joelle BAGDASSARIAN for her help during my research on the Montpellier train station.

Thank you to COBE for the last 5 years during which I was able to work with great people on many projects and get to know Norreport by heart. Thank you to my colleague, Rasmus Hjortshoj for letting me use his beautiful pictures.

A huge thank you to Manuel Gausa for giving me that chance, trusting me and accompany me these last years.

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Abstract

The status of train stations in the city has already been the subject of a large number of investigations; let them be literary, artistic or scientific. Can we name a better sign of urbanity than this architectural object combining mobility and centrality?

Train stations are a constant element of European cities. They are a link between scales, interconnecting far and close, they are places where things meet. They are the heart of cities inter-modality systems but they also connect cities to a national and international scale. Across there more than one century of existence, they have been confronted to great challenges but also many opportunities that shown in their design.
Train stations, as spaces with specific purposes, are not just a sum of devices, nor a sum of wishes from users wanting to take the train. They worked out over time with continuous approximations, learning by doing, and especially by the increasingly fine coordination between behaviours, functions, places and objects that train stations brings together and that make them such special city elements.

Architecture and urban planning have the opportunity to perform by perfecting and setting urban patterns, in order to eventually give users the chance to understand and influence their environment. This is even truer for train stations as catalyzers of city characteristics.
Given the meaning of the stations at various scale, from the building itself to larger urban systems, we are trying here to understand what drove these projects from the XIXth century to today, in order to hopefully identify some design features that would improve their flexibility and the users experiences in the future. To achieve that, we organize this thesis around answering these questions:

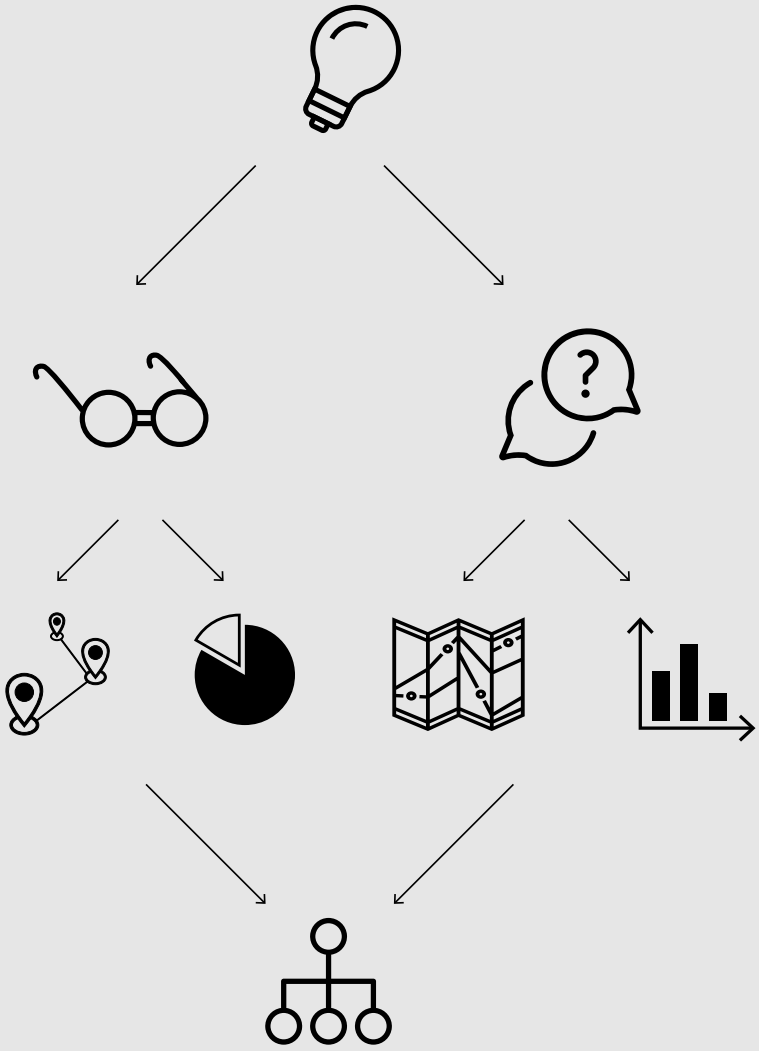
How did train stations translate the evolution of European societies from the XIXth century to today in the way they were designed?

Does the station design have an impact on the users experience, both about the travel but also about the city? If so, how to define design rationales to make that space functional and create opportunities for social interactions?

In order to achieve that goal, we organized this thesis in two parts, following their own methods. These develop from each other to eventually lead to common results in conclusion.

Our entire argumentation is based on three case studies, to which we apply each of our assomptions in order to confirm or refute them. We decided to analyze 3 cases of European train stations that we know well, that were built first in the XIXth century and went or are going through a renovation process. They are Gare Saint-Roch in Montpellier - France, Norreport Station in Copenhagen - Denmark and Gare du Nord in Paris - France.

Method



Subject

European train stations from
the XIXth century being renovated

Question

How did train stations translate the evolution of European societies from the XIXth century to today in the way they were designed?

Does the station design have an impact on the users experience, both about the travel but also about the city?

Case studies

Montpellier Saint-Roch
Norreport Station
Gare du Nord

Architectural analysis
History
Urban scale
Building scale

Data analysis
Count of people
Type of people
Flow of people

Experts examination
Quality eval.
Mapping of features

Users survey
Questionnaire
Mental maps

Interpretation

Gathering and simplification of results

Comparison

Putting the cases into perspective to find common understanding and impacts

Recommendations

Figuring out design tools and rationale from success and failures found out through analysis to eventually implement in future station design

00.

Introduc-tion

Train stations are a constant element of European cities. They are a link between scales, interconnecting far and close, they are places where things meet. They are the heart of cities inter-modality systems but they also connect cities to a national and international scale. Across their more than one century of existence, they have been confronted to great challenges but also many opportunities that show in their design.

The XIXth century invented stations. These "places of modernity" have in fact become markers of urbanity in sixty years, reorganizing in depth the social practices and the uses of the city.

The status of train stations in the city has already been the subject of a large number of investigations; let them be literary, artistic or scientific. Can we name a better sign of urbanity than this architectural object combining mobility and centrality? The historian Georges Duby thus evoked them in the introduction of his book.

> **"Was not the station, at the end of the XIXth century, by its proud proportions and by the set of signs that it exhibited, the equivalent of what had been, seven hundred years earlier, the Gothic cathedral, the major architectural expression of urban pride and, by its metallic frames, by the glorification which it claimed of steam and speed, the dazzling contradiction of the old earth cultures?"**[1]

[1] DUBY Georges, *Histoire de France des origines à nos jours*, Bibliothèque historique Larousse, 2011, p.31.

At the end of the XIXth century, train stations were new city elements that had to be accepted by the population. They were often compared to monuments because of their unique architectural language made of majestic entrances, large halls and complex interiors. They were the visual combination of engineers' prowess and well thought urban insertion. This is the case of Gare du Nord that was implemented in the plan of Haussmann and still represents today an example of social, artistic and technical successes. They improved the ways of building in general because their functionality required innovative systems, pushing the designers to explore the potentials of materials such as steel, iron and glass but also to optimize building methods and investigate constructions handling.

In the middle of the XXth century, with the modification of the transportation market, this primacy was challenged by car flows finding more accessible nodal points, hence the frequent disconnection between transport hubs and urban centres. According to some, this change of focus was supplemented by a change in the station building visual aspect itself:

> **"Recent stations have almost abandoned the outward signs of their civic vocation, the architectural structure of a forum for public life."[2]**

At the same time, others regret the change of purpose of train stations, while introducing the sensitive aspect related to these objects of transportation:

> **"The station once attracted men looking for lost steps, unfinished gestures, unfulfilled looks. Travellers or**

[2] DETHIER Jean, curator of the exhibition *Le temps des gares* held at the Centre Georges Pompidou in 1988.

> **inhabitants of a town went to the neighbouring breweries as if something more was going on there and as if the multitude were tastier there than elsewhere, as if the monumentality of the buildings gave a little greatness in the most humble gestures. Today, the station is no longer the temple of departure. It does not make its hymns hear songs from elsewhere, any more than the sirens roar in our ports. We made sure that men no longer took refuge there, by emptying the hall of its seats, by camouflaging the waiting rooms."[3]**

What the author is sad about is actually the whole point of such buildings: being the witness and the actor of the society changes at the same time. From being iconic, almost monuments, train station will then go through a phase of specification, increasingly embodying the state of the urban evolution.

The end the XXth century witnessed other kinds of elaboration of the railway networks. First of all, the introduction of high-speed trains able to travel internationally implied a major change in how station buildings should be designed. Then, the supplementation of diverse public transport systems such as metro or tramway to train stations surely had an impact on the way they had to be thought. Indeed, in the first place, the station buildings were not meant to accommodate these different types of services. The purpose of the trains leaving and arriving the stations was to travel long distances in an efficient way. They acquire the function of linking these means and insuring the transition from one to another. They become, even more than in the past, a concentration of various scales, distances, time frames and therefore, users.

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[3] SANSOT Pierre, *Du bon usage de la lenteur*, Rivages Poche, 2000, p.160.

This time again, train stations show a shift of focus from cars to public transport, made to avoid congestion in city centers, also in an attempt to prioritize sustainable transport solutions.

Population has been rising and cities became much denser with a constant rural exodus, putting more and more pressure on the existing and upcoming city networks. That phenomena put a new stress on train station that, not only had to act like city gates but also as transitions between trains and other modes, between different identities with a potential impact on the larger scale of the railway network. At that point, they become an actual link between the users and their surroundings. In this context, railway stations are to undergo significant changes at the same time functional, related to the increase of travelers, but also symbolic. As gathering places, these spaces crystallize social and urban expectations in terms of exchange and mobility, urban intensification and services. They start being at the heart of speeches and debates on densification and “compactness”, sustainability, challenging the status of public spaces.

From the 1970s and on was observed the new phenomena in the way of thinking geography and urban planning, with a strong conceptual trend aiming to put people first when thinking about that subject.

In these past decades, the radical transformations of cities resulted in a fragmentation of the internal borders, mainly through zoning, dilution and disappearance of external borders. The identity of cities is losing strength, their figure is less memorable, their limits are random, their end, if there is one, is imperceptible. These changes question the representations that citizens have of the organization of metropolitan areas and undermine the rules by which local, regional and national had historically been constructed. On the other hand, it was noticed from very early on that a good use of transportation in

general is in majority based on the impressions the users have of it, showing that their design potentially had a great influence on travel options. This is a basic demonstration of the numerous links between physical environment and human behavior that are treated by the fields of architects and urban planner. This theme became an inspiration for many of them.

Partly because of anthropologists like C. Levi-Strauss, architects like K. Lynch or urban planners like J. Jacob but also as a consequence of all the observed disadvantages of modern cities from the 1960s, a emphasis on the eye-level experience is appearing with a focus on what happens between buildings, the urban spaces. Because these types of cities imply an increase of distances between functions in the cities -like work, habitation, leisure- transportation hubs become a new public space, a meeting space, a place of destination and of wandering. This marks a whole new way of designing train stations, public spaces being thought as a void and an in-between and not as a built form. Again, train stations change status according to the needs of the cities.

Today, an urge for sustainability marks a new chapter. It is well known that cars have a negative impact on our health and on the environment. Rails embody a more ecological answer, which is very advanced in terms of technical features and is able to fix issues of transportation clogging in European cities. A main change is also probably about to happen when it comes to air travel, where many countries talk about keeping planes only for international travelling. This would put a lot of pressure on the European railway networks, and consequently the stations buildings.

Aim of the research

Train stations, as spaces with specific purposes, are not just a sum of devices, nor a sum of wishes from users wanting to take the train. They worked out over time with continuous approximations, learning by doing, and especially by the increasingly fine coordination between behaviours, functions, places and objects that train stations bring together and that make them such special city elements.

Architecture and urban planning have the opportunity to perform by perfecting and setting urban patterns, in order to eventually give users the chance to understand and influence their environment. This is even truer for train stations as catalyzers of city characteristics.

Train stations appear to be carrying different types of challenges. First, they have to live up to city planning evolutions, as illustrated by many renovation plans in European cities. Secondly, train stations are also revealed as a societal metaphor, reflecting the modifications in urban approaches being visible in, amongst others, public spaces. The train stations eventually reveal themselves as an analytical prism. Being in this object but also observing the urbanities from a distance, they accompany them all the way to the trains.

Given the meaning of the stations at various scale, from the building itself to larger urban systems, we are trying here to understand what drove these project from the XIXth century to today, in order to hopefully identify some design features that would improve their flexibility and the users experiences in the future. To achieve that, we organize this thesis around answering these questions:

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In order to achieve that goal, we organized this thesis in two parts, following their own methods. These develop from each other to eventually lead to common results in conclusion. Our entire argumentation is based on three case studies; to which we apply each of our assumptions in order to confirm or refute them. We decided to analyze 3 cases of European train stations that we know well, that were built first in the XIXth century and went or are going through a renovation process.

The first study case is Gare Saint-Roch in Montpellier. This is the city where I studied for eight years and I got the opportunity to use that station by many means as well as the transportation features around it.

The second one is Nørreport Station in Copenhagen, where I live now. I had the opportunity to study that station in depth in the architecture studio that designed the new project and employs me today.

The third station is Gare du Nord in Paris. It caught my attention when all the concerns about its new project driven by the Olympic games were addressed in the media. These had an even larger meaning because of how beautiful the heritage building still looks today.

The first part of the thesis -referring to many famous historians and architects- is a take on the history of train stations in Europe. It tries to deal with both a general and generic approach of history with a run through the main trends of architecture tendencies on the one hand and the understanding of three case studies on the other hand. This historical part is supposed to address train stations at the scale of the building of course, explaining the different types and building details, but also at the city scale, exposing the different relationships trains stations can have with the network and fabric they are implanted in. The architects' references essentially point out the difficulties of bringing the station and the city together: whether it is the general a question of articulation of scales of analysis or the specific problems of taking care both of passengers and freight. Eventually, the purpose of this chapter is to show how train stations went originally from iconic monuments to places of efficiency, security and innovative technical solutions.

The second part is raising awareness on the emergence of the so-called new geography that is a milestone in the history of urban planning. It shows a shift of focus in the way of thinking this field, which will be visible in many renovation projects of train stations from the XIXth century in Europe. A special accent will be put on the question of public spaces and on the potential effects of such exchange hubs on sociability, to which trains stations are confronted today, both inside and outside. Again we will use our three study cases to feed our demonstration. This time we went to meet experts and users in order to get another take on that subject and to be in line with the emphasis of that part. We used the knowledge from Jan Gehl and Kevin Lynch to elaborate our

survey methods. In that part, we will enhance the new change of status of train stations, the passage from infrastructure hubs to public spaces.

The paradox that one of our case studies will highlight is that this focus on public space is accompanied with a very liberal and commercial take over of train stations at the same time. L. Gille illustrates very well the challenges caused by the commercial management that public spaces seem to be the victim of, mixing poles and places of exchange:

> **"Passing through a public space also means staying there and vice versa, staying in a public space must be part of a passage."**[4]

[4] GILLE Laurent, *Les dilemmes de l'économie numérique*, Editions fyp, Collection Innovation, 2009, p.113.

01.

From city icons...

...to tech-nological symbols

Train stations as architectural elements of the city

Figure 1 Seal of the first railway company

In the following years the railway networks recorded a prodigious development, going from less than two hundred kilometres in the early XIXth century to over two thousand kilometres in 1835, of which about a large proportion was made in America. By 1850 the lines had reached thirty-eight thousand kilometres, of which 60% were built in Europe, while in 1910 they had exceeded one million kilometres[7].

The connection of the network with France and Switzerland, through the great Alpine tunnels, occurred at the end of the century. In 1905 a large part of the railway system was nationalized[8]. After the First World War the great tunnels were completed and the plants were upgraded with electrification, having of course reasons coming from a military character.

Railways and transportation planning at the end of the XXth century

In Western European countries, the great urban and territorial upheavals of the second post-war period, in particular the massive displacements of the population from the countryside to the city, the impressive development of private motorization, the consequent expansion of urban areas, the new employment models of the soil and the highest living standards of citizens, have led to new and different use of rail infrastructure. The passenger traffic, constant or growing in the lines of connection with the most important urban centres, has been reduced on the peripheral routes of connection with the population decreasing centres; freight traffic has fallen sharply due to competition after the increasing in flexibility and speed of the road vehicle, so that the transport of low value goods with tolerance of medium-long delivery

[7] LEE, Charles Edward, *The Evolution of Railways*, Railway Gazette (2 ed.), London, 1943.

[8] PINKNEY David H., *Decisive Years in France, 1840-1847*, Princeton UP, 1986, p. 47.

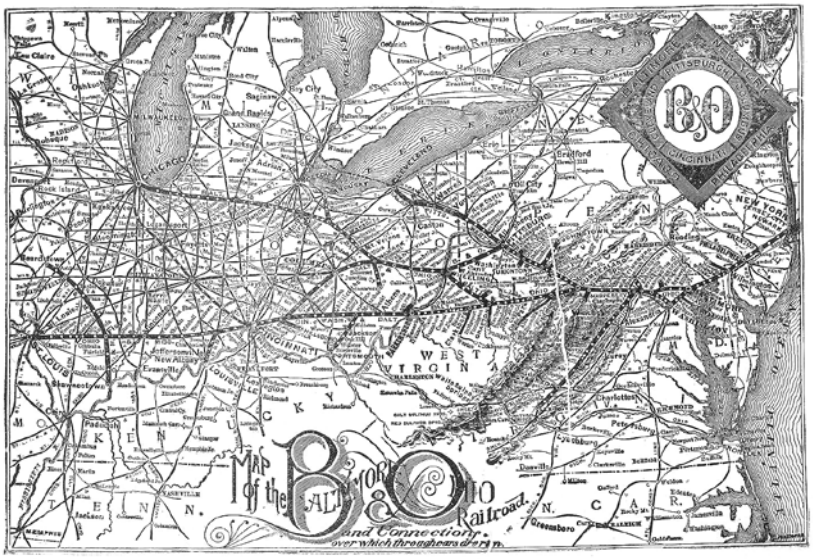

Figure 2 Network of the Baltimore and Ohio Railroad (B&O) in 1891

times, for which the most expensive transport is not convenient, remains on rubber. All this not only highlighted the intrinsic rigidity of the railway system in the face of new needs, but also caused the heavy financial crises of the public and private companies providing the service, resulting in the consequent, increasingly unpopular, economic rescheduling of the governments.

The responses of the railway authorities, coordinated in 1991 by a specific EU directive[9], resulted in a series of re-functionalization measures implemented progressively and in different ways in the different countries according to implementation times that are proportionate to the importance of the investments.

A first series of measures concerned the increase in tariffs and the reduction of non-economic services and surplus staff. The increase in tariffs has been more sensitive in England, due to the policy of liberalism conducted by the conservative governments in power since 1979, which aimed at the privatization of the British Rail[10]. Frequent, if not economically obliged, was the decision to dispose of the sections not sufficiently used, and to reduce staff numbers, and destined to further decrease. In parallel, interventions were implemented to rationalize the use of labour thanks to the increase in automation, the reduction of services to the public and other similar measures.

A second series of interventions concerns the goods sector: staff reduction, closure of small airports and in an unsuitable position; creation of large freight transfer centres from automated road vehicles, computerization of freight wagon sorting stations.

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[9] EU Council Directive 91/440/EEC of 29 July 1991 on the development of the Community's railways.

[10] GLOVER John, *ABC National Railways - A Guide to the Privatised Railway,* Paperback, 1996.

Figure 3 Railways network in Europe in 1870

Figure 4 Railways network in Europe from 1930 to 2000

A third series of interventions is about the upgrading of lines with greater demand for traffic. This is the field of the most conspicuous investments directed to the creation of high-speed trains and high capacity for transporting people.

A fourth series of interventions concerns the economic valorisation of the land owned by the railway companies; therefore, promotion of real estate initiatives in the land made available by the disposal of obsolete railway plants and placement of profitable economic activities within the railway stations.

In this part of our thesis, we will try to answer questions about the evolution of form of train stations over history and the impact of their design on their ways of functioning in their own city context. We will try as well to find out what are the best practices to take the context into account when designing stations.


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01.1.

Short history of train stations in relation to societies history

In the architecture of the station, in addition to the precise answer to the typological and functional requirements, semantic aspects are emphasised and combined for the means of transport, qualification of the city it's in and the characteristics of the traffic carried out. This explains their design process leading today to a very complex balance between railway engineers, structural engineers, landscape architects, information technology specialists and architects closely coordinated. This has not always been the case, indeed the design of train stations has traditionally been, as for the technical and implementation part, the systematic and continuous work of specific departments of the railway administration. There is only a few example in large cities, where it sometimes happened that urban and architectural solutions were considered by a various range of specialists organized in association with local administrations. But even in these cases, frequently, either due to the normalized characteristics of the topic of transportation, or due to reliability requirements, professionals with a solid operating experience in the field of railway works tend to emerge. If the station design therefore represents the architectural response of expert technicians to a problem very conditioned by technical aspects, it can be assumed that the railway station as a complex work of art and engineering presents itself as a special occasion in retracing and studying the various styles that characterize architecture from the nineteenth century to today.

Figure 5 Engraving of Crown Street and its sheds across the rails, 1833

“The station is therefore a suitable type to sum up the chronology of styles imitated, as we have found it more or less fragmentarily.”[11]

When studying the history of train stations architecture, C. Meeks, in her famous book *The Railroad Station, An Architectural History,* proposed a five-stage periodization that we will analyse here.

The first phase lasts approximately 15 years, from 1830 to 1845 and happens mainly in Great Britain and in the United States, with the apparition of the first train stations, rather simple and experimental, since the technological solutions are just emerging like the first train sheds of Britain in 1830, see in Crown Street, the Liverpool station terminal (see figure 5). *The second phase* that she identifies as the 1850s, is described as a phase of "standardization", in the sense that high quality, consistent and multipliable solutions are developed. The train station the Gare de l'Est in Paris is a very good example illustrating this phenomenon that we will study later on. *The third phase* that she described lasting from 1860 to 1890 corresponds to the progress of more and more sophisticated techniques blending composition features and engineering performances. *The fourth period* between 1890 and 1915, which Meeks calls "megalomaniac", is related to the historical period of imperialist colonialism and the unification of national States (Italy and Germany), and is symbolized by an overdone use of engineering and excessive monumental architectural expression. *The fifth phase* that starts at the WW1 and until 1956, marked by the beginning of new transportation modes that challenge the use of railways such as private cars, buses, planes, announces a brand new movement since the apparition of train station, which is the adoption of a modern architectural expression.

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[11] PEVSNER Nikolaus, *A history of building types*, Princeton Bollingen 1970, p. 226.

Figure 6 Old postcard showing the facade of Gare de l'Est from the metro entrance

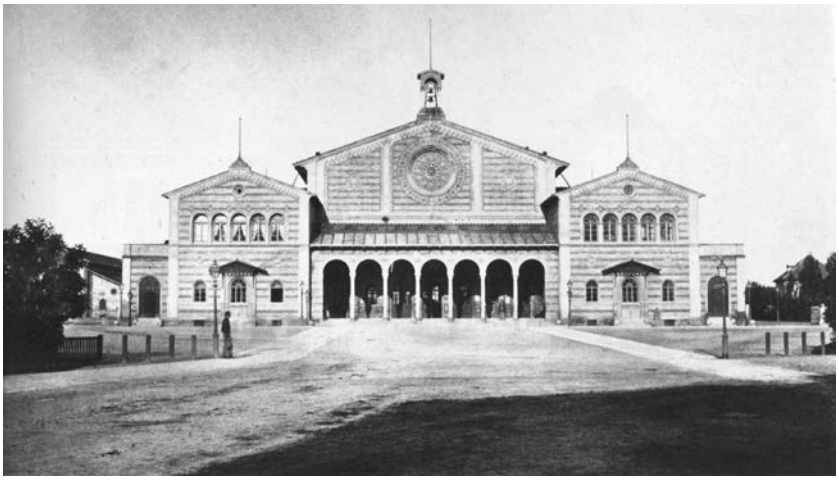

Figure 7 Picture of the facade of München Hauptbahnhof, approx. 1854

01.1.1

The stations of the nineteenth century

The oldest of the stations, according to Pevsner and explained by C. Meeks, is the one located on Crown Street in Liverpool, England, that he describes as "a rather modest building"[12] (see figure 6). In the beginning, when the first rails were built in the middle of the nineteenth century, the only buildings that were given importance to were the head buildings of the lines terminus often located in the major cities. Then, the ones in secondary locations were often simpler buildings, sometimes with regional accents, and the least “influential” stations could even be made of light structure, looking like semi-temporary buildings. Soon their architecture, which implied new urban developments around them, started to include the symbol of new city gates and conveyed the idea of technological progress[13]. By the 1850s, the subject of railway stations is more than starting, it gains in prominence and architects want to have a say in their design.

The Gare de l'Est in Paris (François Duquesney, 1847-1852) is a great example of this new wave, characterized by a very rationally composed typology, which will be considered as paradigmatic. Some of the elements that define this model are seen in the facade organized according to a strong hierarchy principle, generally in three sections and symmetrical, with an important central part and two lateral wings (see figure 7). This organization is visible both in front stations, for example the station of Munich Hauptbahnhof in

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[12] MEEKS Carrol L.V., *The Railroad Station, An Architectural History*, Dover Publications Inc., New York, 1956.

[13] LLOPES Marie-Claire, *Le temps des gares*, Paris Centre Georges Pompidou, 1978.

Figure 8 Picture of the facade of Gare Montparnasse - Victor Lenoir, 1850-1852

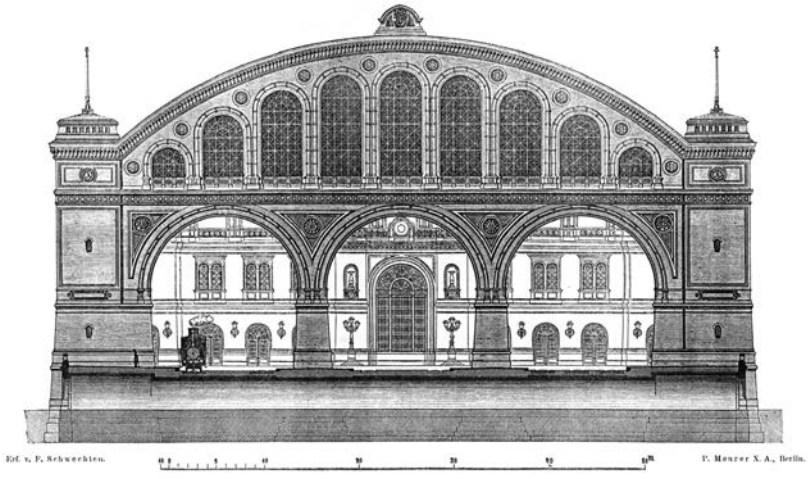

Figure 9 Drawing of the facade of the Anhalter Bahnhof - Franz Schwetchen, 1872-1880

Germany, and in the smaller transit ones, as evidenced by Meeks by showing the station of Saint-Germain-en-Laye in France.

According to the principles of Gare de l'Est, the large metal vaults covering the tracks are visible or projected in elevation, by means of a glass window, of semi-circular or tympanum shape, in large dimensions. This solution was immediately adopted in the first Gare Montparnasse[14] (see figure 8) for example and later in numerous head stations like in the Anhalter Bahnhof in Berlin (see figure 9). According to Pevsner, this kind of simple composition is "relatively rare". Adopted in some of the first train stations, for example the station of London (London Bridge, 1844-1845), this type is soon replaced with a more appropriate and cheaper solution, the introduction of campaniles and large porches or arcades, which, according to how they were articulated and composed, became some recognizable elements. Pevsner writes about, as one of the first compositions with arcades between two elements, the Thüringer Bahnhof of Leipzig (see figure 10). The access function of stations, that should be protected from the weather is carried out in contemporary stations by bold as well as impressive cantilever canopies, which can even be superimposed for functional reasons to the original station building if it lacked one. This scheme with a long continuous covered space, in between two monumental volumes is very visible in the case of Gare du Nord in Paris. Most frequently, the exterior is dominated by a tall element, tower-like, sometimes functional for the surveillance of the rails, more often a "signal" of the building, clearly visible and where is most likely positioned the clock. This solution is adopted vigorously in various American stations as well in the second half of the nineteenth century, where we often can see a mix between historicist and modern aspirations. The tower typology is found in many European stations as

[14] http://www.paris.org/Gares/Montparnasse/

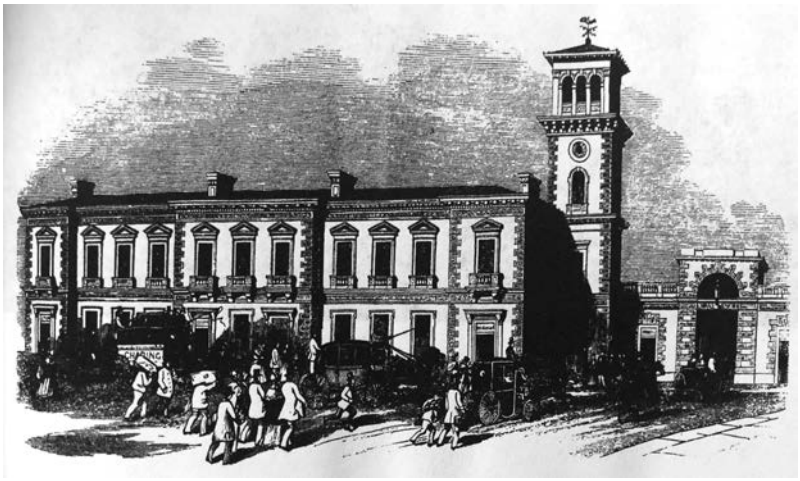

Figure 11 London bridge Station - Thomas Turner and Henry Roberts, 1844

Figure 10 Der Thüringer Bahnhof in Leipzig - Eduard Potsch, 1840-1844

well, and of course the best example is London Bridge Station (see figure 11). The tower also plays an important role in a sense that it introduces the subject of mixed program in relation to train stations, for example when they are combined to hotel buildings. This is the case of the St. Pancras Station integrating the Midland Grand Hotel and of the Gare de Lyon in Paris, latter characterized by a monumental clock. The tower motif is declined in various combinations and modes: twin, placed at the extremity of the central building as in Berlin in the Stettiner Station (see figure 13) or with exuberant decoration as in Prague Central (see figure 14).

The period between the end of the XIXth century and the beginning of the XXth century is characterized by multiple interventions to expand the railway network and to upgrade the existing stations. In the major stations of the end of the century, the entrance hall, the buffer and distribution element between the city and the tracks, are elements of particular prominence having the role of the main façade. The great stations of the second half of the XIXth or early XXth century are defined by a pursuit for grandiose and the monumentality.

> **"The day will undoubtedly come when railway stations will be among the most important buildings, where architecture will be called upon to deploy all its resources, where their construction will have to be monumental. The stations could then be placed on the same line as the vast and splendid monuments devoted to public baths at the home of the Romans."[15]**

[15] DALY César, *Revue Générale de l'Architecture Et Des Travaux Publics*, Vol. 7: Journal Des Architectes, Des Ingénieurs, Des Archéologues, Des Industriels Et Des Propriétaires, 1847.

Figure 12 Helsinki Central station Helsingin päärautatieasema - Eliel Saarinen, 1914

Figure 13 Berliner Stettiner Bahnhof - Theodor August Stein, 1842

Figure 14 Prague Central Praha hlavní nádraží - Josef Fanta, 1871

Figure 15 Alexanderplatz Bahnhof - Johann Eduard Jacobsthal, 1882

Figure 16 Saint Pancras Arcade - George Gilbert Scott , 1863-1876

In these buildings, that are real temples of the mechanism of this period of industrial revolution, clear compositional and typological references to ancient architecture are captured, especially in the entrance gallery, which tends to take on gigantic proportions. This is the case of the Berlin Alexanderplatz Bahnhof with its enormous glass shed that represents the station itself (see figure 15), or again, of the London Saint Pancras station where Sir George Gilbert Scott designed in 1876 in collaboration with the engineers (W. H. Barlow and R. M. Ordish) an impressive hall with a shed that covers all the tracks (see figure 16).

Figure 17 New Bedford station - 1886

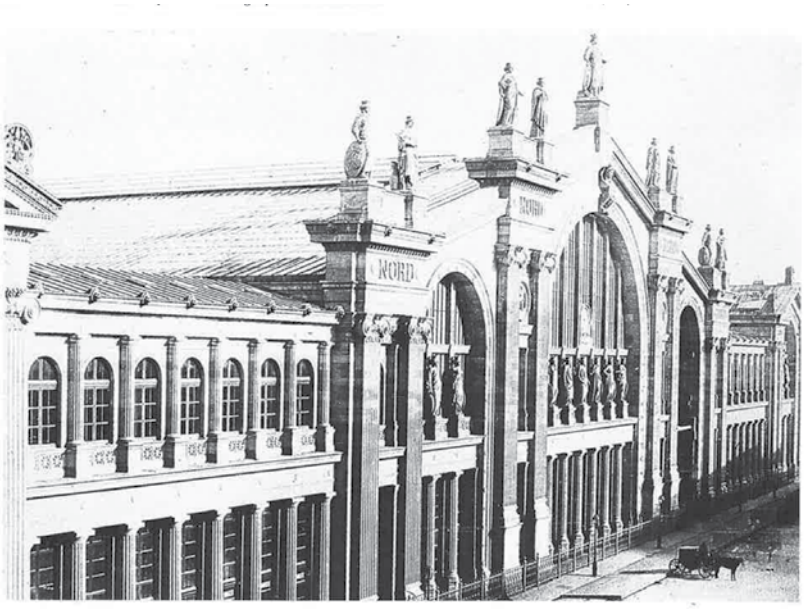

Figure 18 Facade of Gare du Nord - Jacques Ignace Hittorff , 1846

01.1.2

Stylistic features and new functions between the nineteenth and twentieth centuries

Because of the wide range of functions and environments they take place in, the architecture of train stations constitutes a lively catalogue of various architectural languages that can be seen as in dissonance with the strictness of the engineering around railway installations translated into the structures covering the tracks. Meeks has highlighted how the various phases of mutation from eclecticism to modern architecture are punctually traceable in railway architecture. In the early years of the century, when the influence of neoclassicism and "architecture of the revolution" was still strong, we observe some inspiration from Greek classicism in the station of New Bedford in Massachusetts (see figure 17). Shortly thereafter romantic neo-medieval re-enactments are attempted. We can also note how, in the St Pancras station in London, historicism is present in the way that two architectural styles are literally touching each other, showing that travel and engineering features meet under the canopy covering the tracks.

At the end of the century it seems to prevail in the major stations a classical architectural language, according to neo-baroque or neo-rococo variants, solidly and continuously adopted in French stations and which has proved to easily give an impression of grandeur and rhetoric. Karen Bowie describes for example the impressive number of statues initially present in Gare du Nord (see figure 18):

> **“What particularly strikes at Gare du Nord is less the iconography of the sculptural program, than the number of statues ordered and the scope of the artists recruited. The latter presented one by one, with some of their works, give**

Figure 19 Stazione di Bolzano - Angiolo Mazzoni, 1927-1929

an idea of the artistic effort - a veritable campaign of patronage - undertaken by the Compagnie du Nord."[16]

According to Pevsner[17], the first stations where a "modern" language is adopted were built before the First World War, like the Helsinki Central Station, for example (Helsingin päärautatieasema – Eliel Saarinen, 1914). At the end of the 1920s, many other European stations still adopted the academic decorative features. But then some restructuring of other stations like the Statione di Bolzano were a good occasion for anticipating new linguistic expressions, in which the restyling of the main façade with stubby and simplified semi-columns, juxtaposed to the pre-existing Habsburg facade, which support a heavy and bare entablature, aims to celebrate, the incorporation of the last territories liberated after the War[18] (see figure 19).

In the 1930s, in Italy, public buildings, and railway stations in particular, were the ground of experimentation of modern functionalist architecture, which assortment was well suited to express the so-called Fascist Revolution. The era is characterized by the work of the engineer-architect Angiolo Mazzoni who designed several train stations. However, it is the new station of Florence Santa Maria Novella, built after a public competition, that symbolizes a major change in the way of thinking train stations. The passenger building, considered one of the masterpieces of modern Italian architecture, is characterized by the simple, linear volumes, the rationality of the plan, as well

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[16] BOWIE Karen, *Les Grandes Gares Parisiennes Du XIX*^{ème} *Siècle*, Délégation de l'Action Artistique de la Ville de Paris, 1987.

[17] PEVSNER Nikolaus, *A history of building types*, Princeton Bollingen 1970.

[18] http://www.bolzano.net/it/stazione-ferroviaria.html

Figure 20 Florence Santa Maria Novella - Giovanni Michelucci, 1932-1935

as the traditional materials that blend well with the medieval apse of the church next door (see figure 20).

The war period sees many railway stations targeted by bombing for obvious strategic reasons. The enormous damage made to the buildings, becomes often an opportunity for a reconstruction that makes a clean sweep of the existing building in favour of modernity. Most of them, that were mainly demolished after the war to become a new building of approximately the same size and the same typological layout.

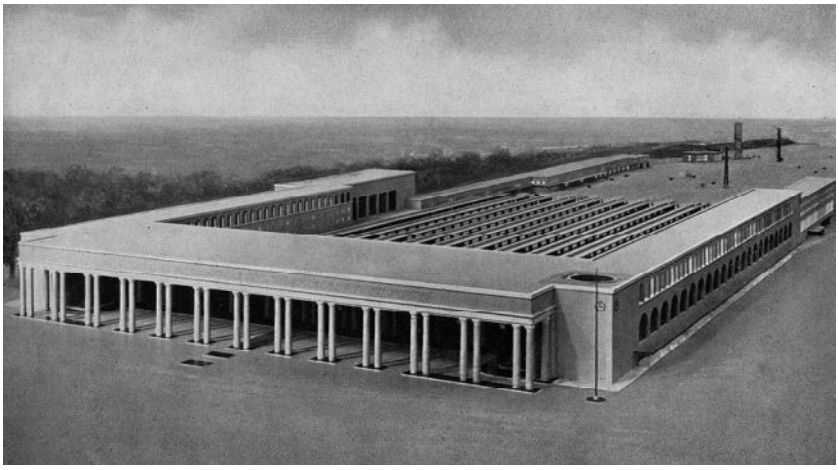

Figure 21 Project of A. Mazzoni for Rome Termini, 1943

Figure 22 Halls of the Rome Termini extension, 1950

01.1.3

The post-war period and current events

Not only the needs of evolution in functionality and urban development around them, but also the strong desire to turn the page and to contradict with the past characterize the architecture of the European railway stations of the 1950s. One of the main witnesses is the Central Station of Rome Termini. The building is based on a strict design of Angiolo Mazzoni that became strongly disapproved after the War (see figure 21). Then a competition was launched when Eugenio Montuori and Annibale Vitellozzi got to design an addition, along this long first stretch (see figure 22). The monumental original building was supplemented by a big hall covered with a curved concrete roof. This marks the beginning of a new era, like Terry Kirk analyses:

> **"Organic architecture is both a social, technical and artistic activity aimed to set the stage for a new democratic society."**[19]

In general, projects, even those not completed, are characterized by an attitude of radical restructuring of existing buildings, without taking into account their architectural value. In the more recent period, the demand for rail transport has been reduced, while the planning of new stations is relatively rare (if we don't consider TGV stations that is a specific case), while on the other hand, operations of renovation and regeneration of the existing ones are increasing. In this process, the railway authorities put the priority on strengthening existing values aiming for an economic enhancement of the most profitable sections. This situation is very present in the countries affected by the World War, notably France, Japan, Germany, England. In these cases,

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[19] KIRK Terry, *The Architecture of Modern Italy: Visions of Utopia, 1900-Present - Volume 2*, Princeton Architectural Press, 2005.

Figure 23 Entrance hall of Kyoto station

the architectural image appears to depend strictly on utilitarian motivations, taking the exhibition of technology and machinery as the main tool for design. It gives the impression that, while in the XIXth century the passenger building was somehow thought and built independently from the "trains" section, in the next century the technical equipment, not only the rails themselves, but also the structures, the air conditioning, the communication devices, advertising, are now visible for all the travellers and part of the design task, becoming themselves the main decorative and symbolic elements. This seems to be an approach, that is also very focused on efficiency seeking for considerable indoor rationality and innovative functioning, underlying the recent works of Jean-Marie Duthilleul for many French railways, including the renovation of Montpellier Saint-Roch which is one of our cases studies. At a larger scale, this goal is claimed through some research for stronger integration in their urban network, as well as a creation of relations to the new TGV network nodes, often implemented outside cities. The example of the Kyoto that we got the chance to visit appears similarly characterized by technological emphasis and its structural boldness arouses special wonder, while its dimensions and decorative richness, that seem to focus largely on developing the retail aspect plugged to the station, received some very enthusiastic welcoming (see figure 23). In general, there is a shift in priorities in the design process, where the new train station altogether renounces to express its autonomous architectural image, either by being better integrated in its immediate context or included among other program and functions very attractive at that time, mostly related to retail activities. In some more isolated places, often trivial, we can still find some emblematic figures being heavily enhanced, in order to mark the main entrance, the ticket desks or lead to the trains through the platforms (see figure 24). In other places, the effort of ornamentation and garnish interventions through historicist features derived from the existing structures, are actually part of another wave, aiming to criticize on the opposite a loss of consistency and a lack of focus on transition and gradation

Figure 24 Kyoto station, access to the tracks

Figure 25 Kyoto station, poetic shape of the technological roof

solutions between past and present, endowed with refinement and good taste (see figure 25).

Other voices were heard, indeed, the ones in favour of the renovation of train stations, claiming some clearly positive aspects in the modern way of thinking of transit buildings. There are two main design aspects, both of a mainly technological nature, being highlighted and particularly appreciated by this wave. The first orientation has to do with the specific attention given to solving the various functional challenges regarding the flows of people: tickets handling, waiting areas, retail, connections and inter-modality in general. The goal is to make the journey run smoothly (the keyword used is "seamless journey") in which the station is considered a "link of a chain of events"[20]. The second orientation is basically related to that wish of accentuation of the engineering and technological aspects.

[20] THORNE Martha, *Modern Trains and Splendid Stations: Architecture, Design, and Rail Travel for the Twenty-First Century*, Merrell Publishers Ltd, 2001.

01.2.

Insertion of train stations in an urban context

We have seen that -historically talking- train stations were often implemented in existing historical cities and plugged to their network. Their typology was made iconic with shapes, proportions and style that differed from the rest of the city forms.

We will see now that the next wave in the way of building or re-building stations takes another path, focusing on fitting in and integrating to the present context. Since the stations design changed after the phase that C. L.V. Meeks calls "megalomania"[21] after 1914, this approach is the task of architects and urban planners to analyse history, proportions, flows, and all the other contextual characteristics of the stations surroundings in order to aim for a design that would be attractive, efficient and that blends in. Indeed nowadays, one of the criteria for a well-thought project is its integration to its network both in terms of functionality but also when it comes to composition solutions and architectural style. The effort of incorporating the stations buildings should provide the users a feeling of movement and travel by passing through various environments with proper characteristics.

Therefore, each building should be thought on its own, in relation to its specific situation and we will evaluate here which ways have been employed in the history to achieve that goal.

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21 MEEKS Carrol L.V., *The Railroad Station, An Architectural History*, Dover Publications Inc., New York, 1956.

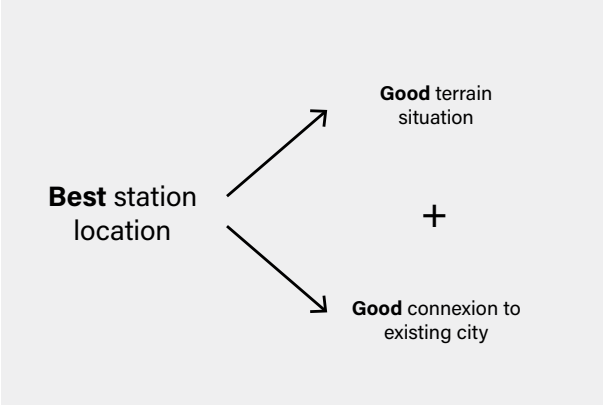

Figure 26 The location of train stations, the best of two parameters

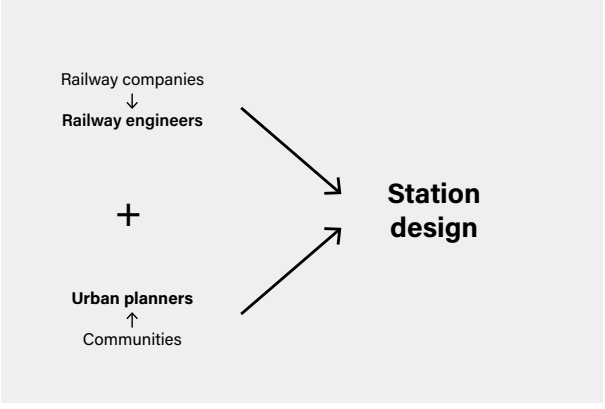

Figure 27 The location of train stations, the balance between the actors

01.2.1.

The location of the station in the city

The location of the station in the city depends fundamentally on the balance of two different ranges of perimeters. First and foremost, the characteristics of the rails layout are the main thing that will have an impact on the implantation of the station, and this will depend a lot on the topography of the terrain, the physiognomies of the place, physically talking landscape, weather, etc.). Secondly, the needs for a good connection to the city core plays a decisive role, in the way that it seems necessary that the station is located next to pre-existing road connections to the centre, therefore in the vicinity of the gates of the existing historical wall fortifications. This goes in relation to the operating needs (for example the station will be a “head type” for the big terminus cities and we will find another type for the intermediate stations). (see figure 26)

We find the two sets of needs in the different design rationales of the railway engineers (from the railway company) on the one hand and of the urban planners (on behalf of the local community) on the other hand. From the railway engineer’s perspective, there are motivated placements strictly functional to the service aiming for flexible solutions, with large reserve spaces for further extensions and developments, in opposition to the head stations type that have a very constrained implantation and are therefore known for higher operating costs. From the urban planner's side there are different approaches, alternating between the removal of the station from the city due to the difficult compatibility of the railway or, in order to serve the maximum population, the location of the stations near the urban centres, the same way as the head types, or underground, squeezing the railway beams and the structures overall to minimize their environmental impact. (see figure 27)

In general, we can assume that the balance of power between the railway companies and urban communities has determined the prevailing time of the

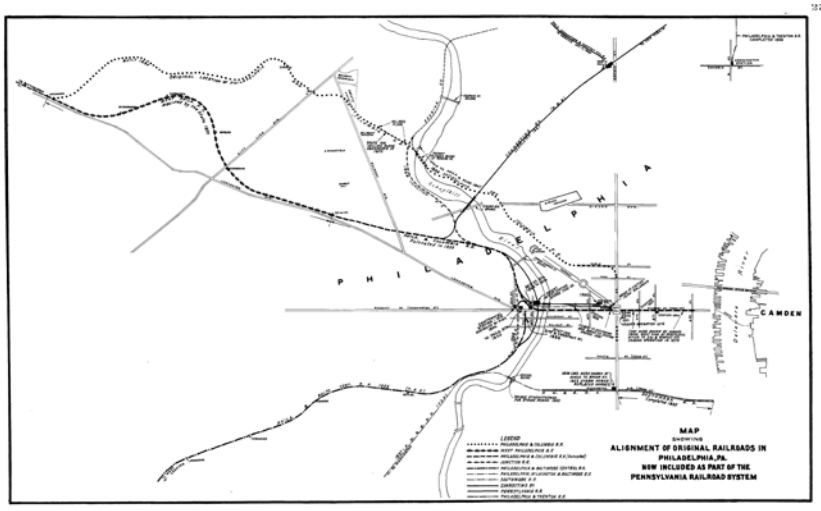

Figure 28 Map of the Juntion Road connecting Philadelphia, Pennsylvania - 1948

technical and economic instances. Indeed, at the time of construction of the network the bargaining power over the railway was very high. The negative consequences in terms of coal pollution in the air were not at all considered[22]. There was a big competition between small cities to get a chance to build their own train station in order to put them on the map and eventually strengthen their commercial and industrial potential. To achieve this, they were willing to make unthinkable sacrifices. In general, the railway lines entered European cities, penetrating the historic walls in the case of head stations or approaching the city in the case of transit stations. In any case, the railway brought about significant changes in the structure of historical cities, as describes the American historian:

> **"Except for certain parts of Europe where old regulations fortunately segregated the railway stations on the edge of the historic city, the railway was authorized to dive into the very heart of the city and to create in its central areas an expanse of freight yards and sorting stations, economically justifiable only in the open countryside. All this broke the natural arteries of the city, creating an insurmountable barrier between large urban neighbourhoods, which in certain cases, for example that of Philadelphia, can be called an authentic Chinese wall."[23]**

(see figure 28)

With the advent of this network, many cities lost their relative insularity. Large and medium-sized cities saw the station penetrate the edges of the dense

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[22] KOOPMANS Jochem Jan Gerardus, *The Fire Burns Much Better ...: 200 Years of Steam Locomotive Exhaust Research, 1804-2004*, Camden Miniature Steam Services, 2014.

[23] MUMFORD Lewis, *The City in History: Its Origins, Its Transformations, and Its Prospects*, Mariner Books, 1968

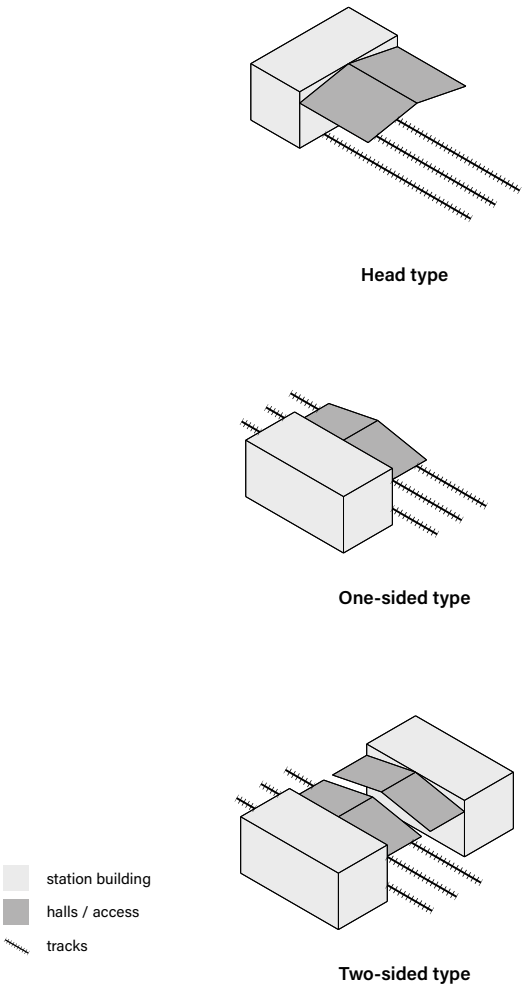

Figure 29 Diagram of the 3 main types of station implantation in the XIXth century

urban fabric, determining the need for new connection roads: this is when now classical typologies appeared like the "station's avenue", the "station's boulevard", or the "station's plaza" etc. and special accommodations to enhance the station building: usually large symmetrical squares and gardens. In these urban planning arrangements since the XIXth century the functional needs have been a priority to solve. This appears to be treated with increasing consideration in the contemporary examples of road and traffic aspects, in order to organize the different flows for the various types of vehicles, and in different types of areas and densities.

After a thorough observation of the location of stations in European cities, it is possible to identify some patterns depending on their size and rank regarding the rest of the urban system. This is also relying on the analysis of Caroll Meeks regarding the phase of standardization of stations, technical improvements providing common ways of building and lay-outing, making them stricter and more efficient. She therefore distinguishes three main typologies:

> **"Three principal types of station were to be found during the last years of the pioneering period: one-sided, two-sided and head."**[24]

(see figure 29)

It is difficult to find information about the one-sided stations since they are not that frequently found in the transportation network. They are mostly present in small cities and on the edge of urban developments. The reason for that is that they are obviously lacking accessibility and flexibility but can be necessary in

[24] MEEKS Carrol L.V., *The Railroad Station, An Architectural History*, Dover Publications Inc., New York, 1956, p.58.

Figure 30 Station of Montpellier Saint Roch - Insertion in urban fabric

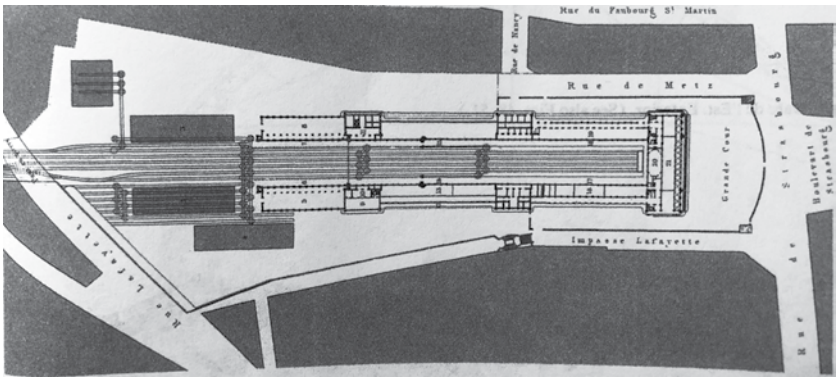

Figure 31 Station of Gare de l'Est - Plan of the tracks level

some conditions related to the topography or the connexion to the network for example.

In medium-sized cities we often see two-sided stations since they don't really have the role of terminus destinations. Indeed, this is mostly the case of stations being incorporated afterwards into the railway routes at a bigger scale. These stations can be mirrored along the rails (twin type) but they are often asymmetrical with one main building having the necessary functions such as waiting rooms, lockers, tickets sales etc. This building is often a long stripe, disposed along the rails and parallel to the edge of the old centre. Therefore, this type of stations often gives a frontier effect to the neighbourhood it's placed into. As we will develop it a little further, this is the case for the city of Montpellier, where the Gare Saint-Roch is located on the south edge of the "Ecusson" (see figure 30). This also presents two other disadvantages. First of all, it questions the ease of access of the different sides of there are more than two lines running. Secondly it limits strongly the expansions of the railway network since it blocks it on both sides and prevents the implementation of new lines. Partly for these reasons, bigger metropolises prioritised the third type which is the head-station type.

In the big cities - this is the case of the great European capitals such as Paris, London, Berlin - a plurality of head stations, corresponding to the different companies that once operated, are arranged around the inner fortifications of the city, marking the terminus of a certain number of lines. Carroll L.V. Meeks evokes that the first station of the type is the Gare de l'Est in Paris (see figure 31), built in 1852 by the architect F. Duquesney which was inspired by the first layout of the Gare du Nord I that we will describe a little bit later. This was thought as a head-building perpendicular to the rails giving the access to the different lines. Originally built as a "U", the side wings evolved to enlarge the main building instead, enabling more railways to be built without affecting the circulation in the station.

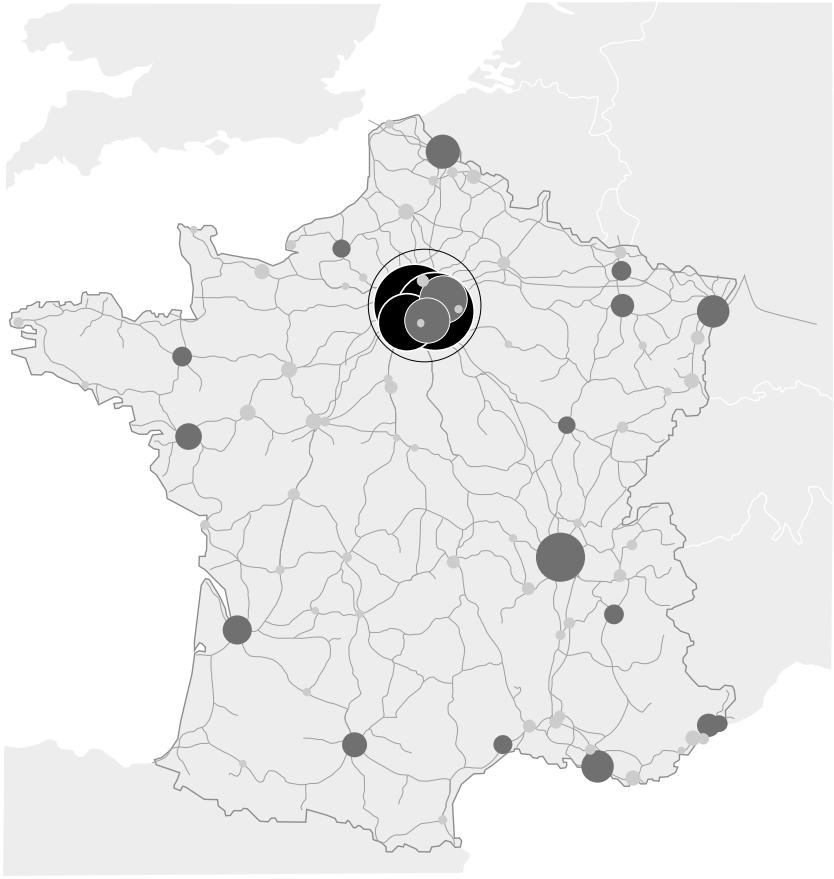

Figure 32 Mapping of the busiest stations in France

01.2.2.

The impact of the position of the railways and the flows they induce

The essential functional interactions between the railway station and the urban fabric are translated into a complex concentration of flows of people, goods, public transportation and private vehicles, which operation from time to time requires adjustments in terms of regulation, restraint and rationalization.

The flows of people at stake are very high: Grand Central Terminal of New York counts almost 200 thousand travellers a day, while the large Japanese Shinjuku station in Tokyo, sees passing 1.260 thousand travellers a day and 800 thousand for Paris Gare du Nord. (see figure 32).

These flows induced by the stations represent a major challenge for cities, that have been studied by some urban planners like Luca Bertolini and Tejo Spit. They made an analytical study in *Railway Development, Impacts on Urban Dynamics* where they acknowledge the barrier that the railways imply in the cities. They call it "Station areas as nodes and places in urban networks: An analytical tool and alternative development strategies". Bertolini categorized:

> **"two types of station neighbourhood…: that on the 'right' and that on the 'wrong' side of the tracks"[25]**

The wrong side is identified as the part "behind the stations, meaning not on the side if the main halls and entrances where, he describes, are very often found less activities, cheaper apartments and are not that attractive in general. He continues by addressing the integration of rails and stations in the city:

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[25] BERTOLINI Luca and SPIT Tejo, *Railway Development, Impacts on Urban Dynamics*, Physica-Verlag Heidelberg 2008, p.332

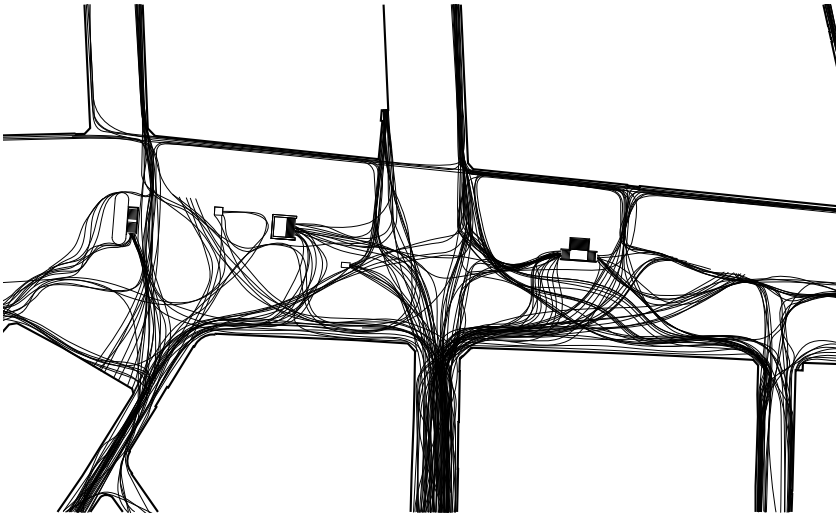

Figure 33 Flows at Norreport Station

> **"The growing flows of people passing through stations are a direct result of the increasingly open nature of the urban system: of people living in one place, working in a second and spending their free-time in yet a third, but also of business relationships requiring exchanges of persons based in distant locations, or of equally extensive spatial patterns of movement generated by different types of consumption."**[26]

The flows, linked to the rails activities, if on the one hand are related to congestion challenges that need to be addressed; on the other hand, have beneficial consequences in terms of vitality that have an impact on both real estate and economic activities. In that sense, the Transportation Research Board of Washington DC published a Digest that they justify as such:

> **"Transit operators, transportation and land-use planners, real estate developers, public officials, and concerned citizens should benefit from the information included in this Digest as they face many critical decisions in the future."**[27]

Here the consultants underline how in the recent economic valorisation operations of the stations the search for profit prevails rather than a systematic study of the complexity of the flows in the perspective of their rational optimization.

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[26] BERTOLINI Luca and SPIT Tejo, *Railway Development, Impacts on Urban Dynamics*, Physica-Verlag Heidelberg 2008, p.336

[27] Transit Cooperative Research Program, Sponsored by the Federal Transit Administration, RESEARCH RESULTS DIGEST, June 1995--Number 7

Figure 34 Station of Montpellier Saint-Roch in its context

The impact of these flows on the urban network both in an immediate context but also on a larger scale, are various and sometimes even opposite. Let's start with the challenges. First of all, the increase in the level of accessibility translates into an increase in urban traffic (pedestrian, private and public transportation) throughout the day, with peaks at the commuters' arrival and departure times that are concentrated in the main traffic routes leading to the accesses to the station. Consequently, these whole areas have different potentials for offices, commercial and residential uses with associated increases in the value of the buildings. Secondly, the systems of railway beams, depending on where they are placed give a psychological or physical barrier effect on urban life, as well as they have an impact on future developments in the city (see figure 34). It is not rare to observe pockets of degradation being created where are the occluded areas, with the development of marginal homeless camps or illegal markets. Finally, the same dimensional characteristics of railway works (large works, warehouses, etc.) and the emission of pollutants (in particular noise, since the smoke of steam engines doesn't exist anymore in many countries) certainly has a negative impact on these areas and therefore explains as well the difficulty to dedicate these areas to residential use.

On the other hand, are some potentials. The railways extend the influence of the city deep into the metropolitan territory because it reduces distances and gives a relative dimension to the elements in regards to the train stations. Note in particular Jean Bastié[28], who writes regarding the metropolitan expansion of Paris at the time of the establishment of the railway network, phenomena that can today be confirmed by the establishment of the Grand Paris Express:

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[28] BASTIE Jean, *L'urbanisation Française*, *La région parisienne croissance et organisation*, Centre de Recherche d'Urbanisme, Paris, 1964, p. 106.

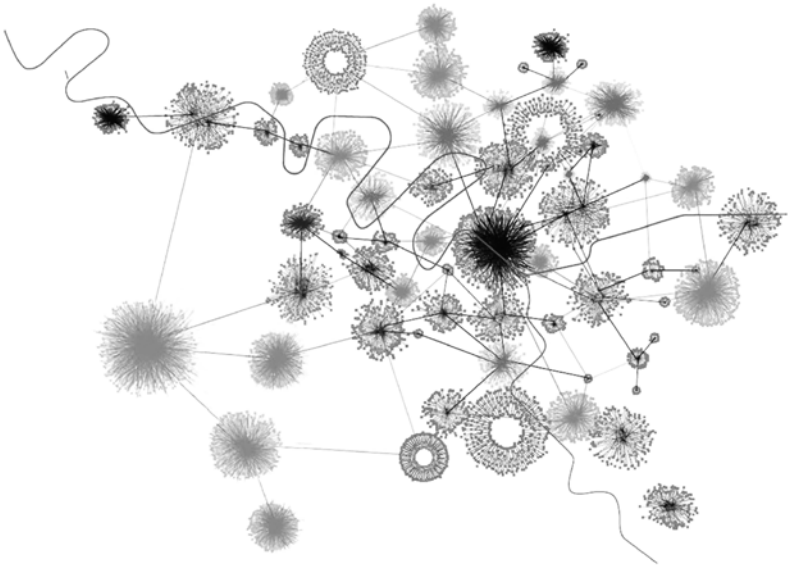

Figure 35 Diagram from LIN showing the networks in Paris according to micro-centralities

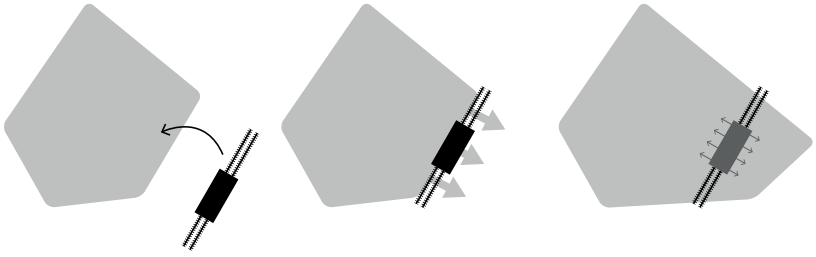

Figure 36 Simplification of the three phases of relationship between the station and the city in Europe

- The replacement of the kilometric distance with the time distance: the expansion is no longer linear along the roads, but by nodes around the railway stations, where accessibility improves noticeably, not only due to the decrease in travel times, but also to the economic convenience to use the public transport dependent on special price conditions that usually favour commuter workers.

- The appearance of a new density located at intersections or railway branches;

- The overcoming of a significant growth within the metropolis in terms of the markets, retail, offices and activities in general.

These effects were described by the architects LIN in their work about the Grand Paris when they expose the concept of "ville légère" (see figure 35):

> **"The sustainable metropolis of tomorrow must work with all of its substances. Beyond the macro-centers which are important for its regional and global positioning, the micro-centralities of the metropolis guarantee the supply, access to mobility, services for all of these inhabitants on a local scale. In addition, they define, in the diffuse fabrics of the metropolis, the feeling of belonging to the urban public sphere."**[29]

[29] LIN Finn Geipel + Giulia Andi, Architecture Urbanisme, LIA Technische Universität Berlin, Wilhelm Klauser, InD, Kaye Geipel, Joseph Hanimann, *Ville légère - La part souple des métropoles* Habiter le Grand Paris, Berlin, 2013.

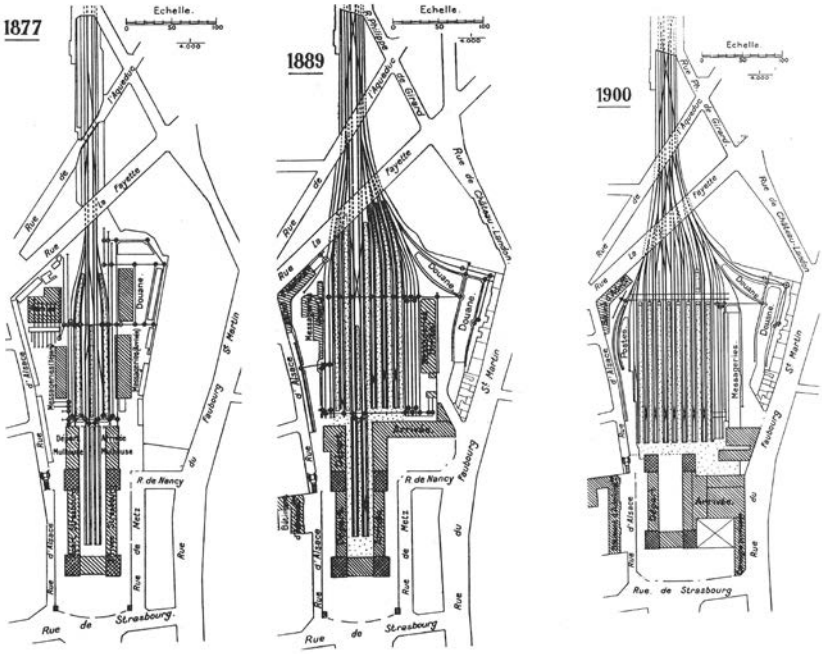

Figure 37 Plans of the railways of Gare de l'Est over time

01.2.3.

A global shift in the cities due to the development of the railway network

The functional and physical relationships between city and station change over time, sometimes very quickly, according to an evolution that can be summed up in three phases (see figure 36). The first phase corresponds to the installation and penetration of the railway infrastructure in the heart of the city:

> **"The station appears (...) as a large piece of equipment, located in the first periphery," which "acts as a warhead and commands (...) a road axis towards the city centre and related urban renewal processes "[30]**

This quote applies to the so-called "head stations" that often take place in the city centre and are at the departure of railway routes. Behind the main head-building, railway stations agglomerate warehouses and industries. In the years following the creation of these first railways and the subsequent very rapid development, the stations were enlarged by merging the adjacent spaces. Consider, for example, Gare de l'Est in Paris that underwent a very rapid growth translated by the railways becoming wider and wider in only 23 years (see figure 37). This phenomenon of growth lasts throughout the nineteenth century until at least the First World War.

A second phase qualifies for the manifestation of conflicts between urban growth and limit determined by railway belts. After various studies and proposals for reorganization of the railway road network carried out in the

[30] VENTURA Nico, *Stazioni Ferroviarie per la Città di Oggi* in "Casabella" n.606, 1993.

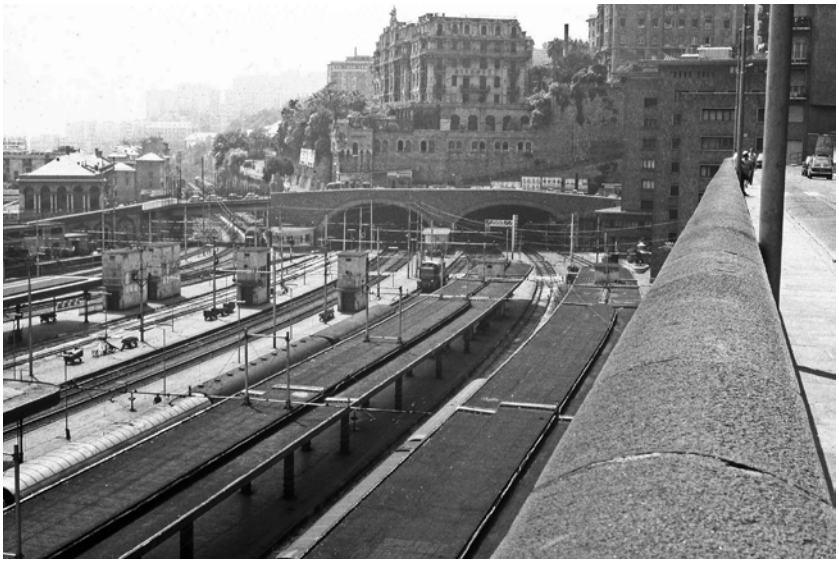

Figure 38 Station of Genoa Principe and its landscape - Alexander Mazzucchetti, 1853-1860

major cities since the beginning of the century, restructuring interventions were achieved, which can be placed around the period between the two world wars until the fifties. It is a phase that:

> **"in some way connected to the passage from steam to electric traction, relates to the new functional role of the railway station (from a place of great distances to a transformer of traffic) and figurative (symbol of the conquests of the bourgeoisie with functional structure)."[31]**

A third phase, of further restructuring and reconversion, corresponding to the last forty years of the XXth century, sees on the one hand the railway stations lose the freight role following the industrial decentralization, while on the other hand, in some cases of central passenger stations, it is characterized by an extraordinary enhancement of the place, as a location for tertiary and management activities. Head stations, once at the edge of the agglomeration, appear to be incorporated by the later urban development. This is the case of the station of Genoa Principe, which is placed in the angle of Piazza Acquaverde, on the edge of a strong topographic landscape (see figure 38). Its western arch and remoteness from the directional areas had been repeatedly complained by commentators and became the support of a highly active directional system after the war and its connexions to Genoa Brignole and Genoa Sampierdarena.

Recent research on the consequences on the city of TGV (Train Grande Vitesse) in France have shown how the greater ease of transport to and from the city centre tends to increase the degree of attraction and how to reduce

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[31] VENTURA Nico, *Stazioni Ferroviarie per la Città di Oggi* in "Casabella" n.606, 1993.

Figure 39 Visualisation of the new neighbourhood planned around the new station in Montpellier

travel times on some railway routes has modified the geography of the displacements. In the areas closely adjacent to the railway stations there have been, as previously underlined, considerable real estate revaluations both for residential use and for commercial use, in proportion to the level of intermodal integration of the transport structure. In the case of families, in the long run, greater flexibility appears in the choices concerning the place of residence. A minor correlation seems to manifest itself in the localization of firms, more linked to the economic contingency than to the demand for means of transport. Taking into account these effects, together with the commissioning of the new high-speed networks, considerable resources were used to improve the access systems to the railway areas, to adapt the old stations and to enhance the value of the neighbouring areas at the stations. This was the case after the station of Montpellier was decided to be renovated, when a mixed masterplan was planned around it (quartier Nouveau St-Roch), that we will describe in the next part (see figure 39). Again, Luca Bertolini analyses it:

"Many of these projects, typically showing a dense mix of office, retail, leisure, and housing, are located around highly accessible places such as main railway stations. High-speed railway station areas in European cities in particular have been the theatres of many such initiatives in recent years."[32]

In other circumstances the railway line, no longer competitive, has been progressively abandoned. Frequently, railway workshops and freight terminals, which have become obsolete, have been reached by the city, becoming attractive areas for new additional buildings. Large railway stations have been abandoned due to interventions to modify or rationalize the network. It is the sensational case of the Paris Gare d'Orsay (see figure 40, 41), abandoned,

[32] BERTOLINI Luca and SPIT Tejo, *Railway Development, Impacts on Urban Dynamics*, Physica-Verlag Heidelberg 2008.

Figure 40 Gare d'Orsay used as a station - Victor Laloux , 1900

Figure 41 Gare d'Orsay used as a museum - ACT Architecture, 1979

destined for demolition in the seventies, subsequently declared a national monument and converted into a museum. Karen Bowie writes:

> **"At first glance, the idea of transforming a station into betting seems astonishing. What building could have offered a more striking contrast with the atmosphere of collecting and meditation generally associated with a museum? It is very doubtful for this reason that Laloux station has undergone such fundamental changes (...) What is astonishing, after all, that to find, in a station of the XIXth century, a lighting system perfectly adapted to the development of an art object?"**[33]

We are today even witnessing a whole new phase which corresponds to a time of "putting people first". This new wave lead by urbanists like Jan Gehl will be exposed in details a little later but it is characterized by a change of hierarchy and putting now the accent on public spaces instead of the buildings themselves. Some architects now focused on the empty spaces first, trying to minimise the built form for sustainability but also society and functionality purposes. This is the case for the transformation of the station of Nørreport in Denmark that we will expose in the next chapter.

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[33] BOWIE Karen*, Les Grandes Gares Parisiennes Du XIX^{ème} Siècle*, Délégation de l'Action Artistique de la Ville de Paris, 1987.

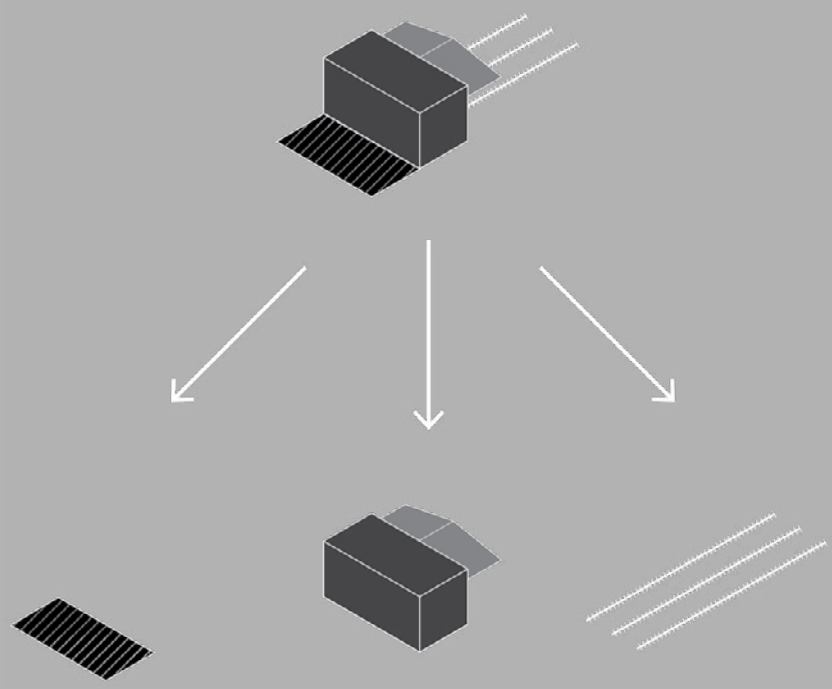


Figure 42 The three components of train stations in Europe

01.3.

Architectural analysis of train stations

There are various definitions for railway stations, such as a point where " a place with one or more buildings and platforms where trains stop for people to get on or off"[34] or as: “not considered merely as nodes, where people change from one form of transport to another, but also as places where spatial concentrations of high value activity are recognised as having a positive impact on cities”[35].

This shows all the different ways they can be interpreted and we will focus here on their physical aspect in order to try to understand the different types and, eventually, relate these type to their impact on the users.

[34] Cambridge Dictionnary, 2020

[35] BRUINSMA Frank, *The impact of railway development on urban dynamics in Railway Development: Impacts on Urban Dynamics*, Editors: Bruinsma, F., Pels, E., Priemus, H., Rietveld, P., van Wee, B. (Eds.), 2008, p.11.

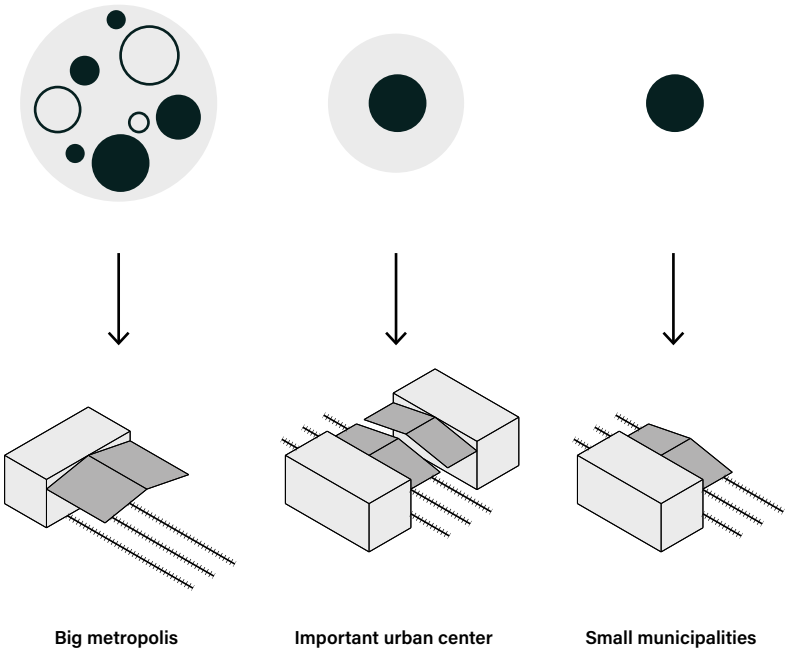


Figure 43 Type of train stations according to the amount of traffic

01.3.1.

Technical classification of railway stations

Train stations in Europe appear to have some common points, mainly coming from the components. It is easy to say that whatever their, size, style, geography, they are defined by three features that, themselves can vary a lot (see figure 42). These are:

- The rails and the platforms to access them
- The building itself and its functions (often with a hall attached to it)
- The plazas to access it and landscape surroundings in general

The differences will mainly be in the style, dimensions, disposition and relationship between each other. Therefore, the stations appear classified according to different criteria even though we can notice some main parameters, common to each station and that are interdependent:

- the type and quantity of traffic,
- the position of the station and of the passenger building in relation to the railways,
- the features of the services.

Main types of train stations

It can seem quite reductive to classify trains stations, knowing there are so diverse in many ways. But this is still a necessary exercise that can actually be done pretty easily, since there were built according to specific periods of time and answering the criteria we just named before.

According to the amount of traffic, (see figure 43) although it is difficult to establish unequivocal quantitative and qualitative thresholds, the railway

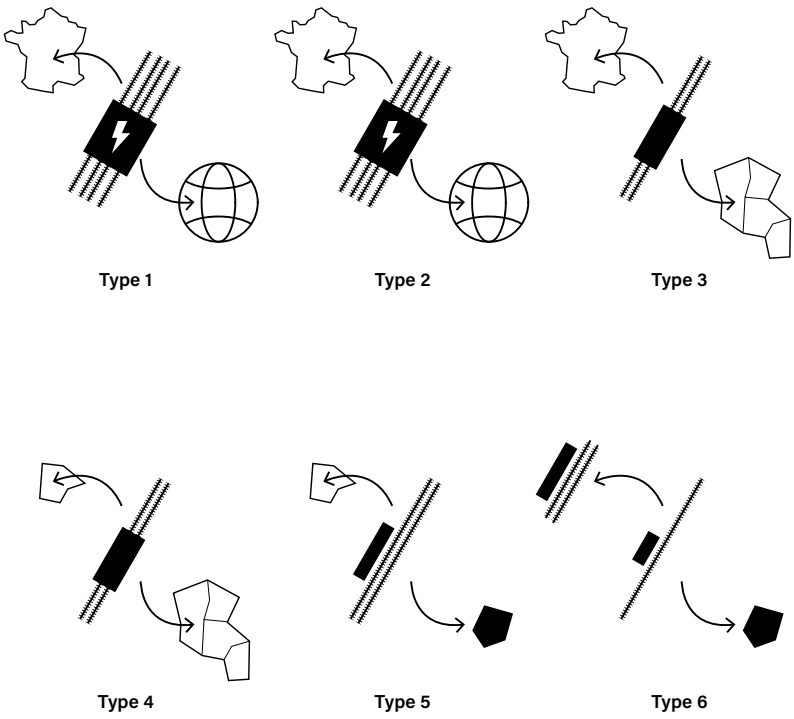


Figure 44 Type of train stations according to the functinnality

technique traditionally distinguishes three types of passenger stations in correlation with the rank of the urban settlement in which they are located.

The first includes the large stations of metropolitan or city areas, compartments and other node stations, very often represented by head type buildings. This category is usually characterized by a location within a dense urban fabric and by a strong polarizing role.

The second typological category includes the main stations of important urban centres, that have more than two tracks in each direction. Such stations, for the case of branch stations, are characterized by being located within the dense urban fabric and have a significant polarization role. To this typology important secondary stations of large metropolitan areas can be assimilated.

The third category (see figure 44) contains the smaller stations, including medium-sized stations and commuting exchangers in large metropolitan areas, as well as stations or stops for small municipalities.

According to functional specialization we distinguish:

1. high-speed passenger stations, specialized for high-speed train traffic, which are of international and national interest

2. major passenger stations, which may be of international, national and interregional interest

3. passenger stations lines of regional or metropolitan interest;

4. railway stations of lines of local interest

5. freight stations and yards, located near the nodes, where wagons arriving to a limited number of destinations are selected

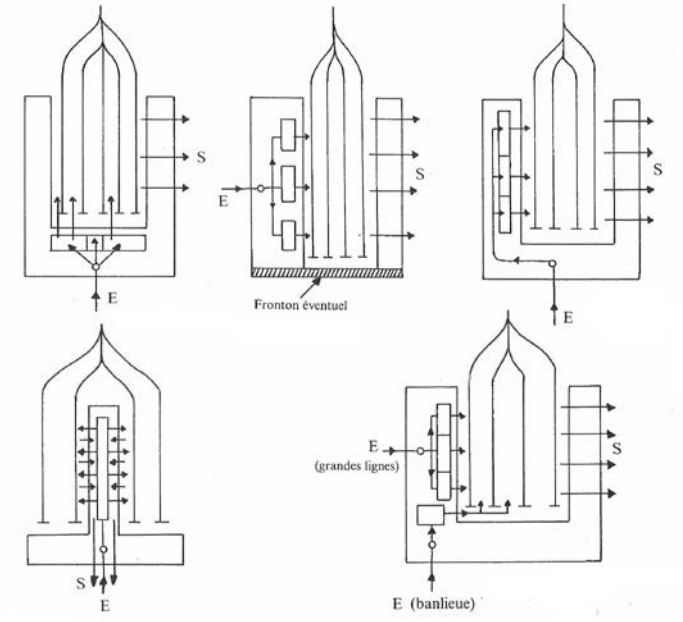


Figure 45 Head type stations - options for position between tracks and building

6. mixed stations, usually in association with small and medium-sized stations

The amount of traffic conditions as well the type of stations, that becomes actually a little more complex than this dichotomy between head and side stations. We therefore count the following main types:

- head station: typical of the large terminus cities and of the extreme stations, distinguished by a large bundle of tracks that narrows as it connects with the arrival and departure lines, it is characterized by considerable complexity and cost of operation; note that this type can be used for extreme or intermediate stations;
- transit or passage station: when the passenger building is located on the tracks;
- wedge-shaped station: when the passenger building is located at bifurcations;
- island station: when the passenger building is surrounded by lines.

This leads us to the next criterion, directly linked to the previous one.

The second criterion is the location of the passenger building compared to the tracks, (see figure 45) the manuals analysing the nineteenth century are limited to the identification of two types. Indeed, the placement of waiting rooms and ticket offices in relation to the tracks can be made in two different ways: either one putting the accent on front-end access to the wharves, or one which in favour of side-access buildings. The first includes the terminus stations, so-called “head-stations” with buildings on the end of the tracks. The second includes transit stations with a passenger building that encloses the line on one or both sides, including the simplest transit stations.

Of course nowadays the stations types are more and more complex, because of different reasons like the adaptation to the context of the multiplication of

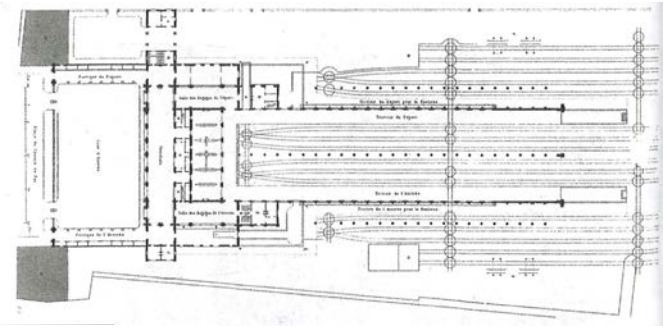
technical solutions for example. If we extend the research to more contemporary manuals, we distinguish other type that will be described in the next part.

Within the group of head stations, we distinguish also some variations. Gare du Nord I which is one of our case studies is organized like this first diagram, with a front access. For such stations that have a heavy flow, this system is not very efficient since it concentrates it. This is one of the reasons why Gare du Nord I was transformed into Gare du Nord II rather quickly, making it a hybrid model (see figure 46).

Montpellier Saint-Roch, another of our cases which became a head station after its renovation is like the second scheme, in lateral. This type enables a more efficient boarding of many travellers and their luggage at the same time since it splits the flows through all the wagons. On the other hand, the building is more expensive to build and had more maintenance cost because it requires two facades instead of one short.

There are also some cases that are outside these two main waves, just like Gare de l'Est, evoked earlier, which is thought as a "U" shape. The advantage of these stations is that they get the efficiency asset without needing to take care of the two facades. The travellers have a longer route to access the train, though.

Finally, in some smaller stations like Nørreport in Copenhagen, we distinguish an alternative type with a central access. This fits very well in cases where there is no need for too many lines or if the traffic is relatively slow. The surfaces are reduced to their minimum and the accessibility is very clear for the users.



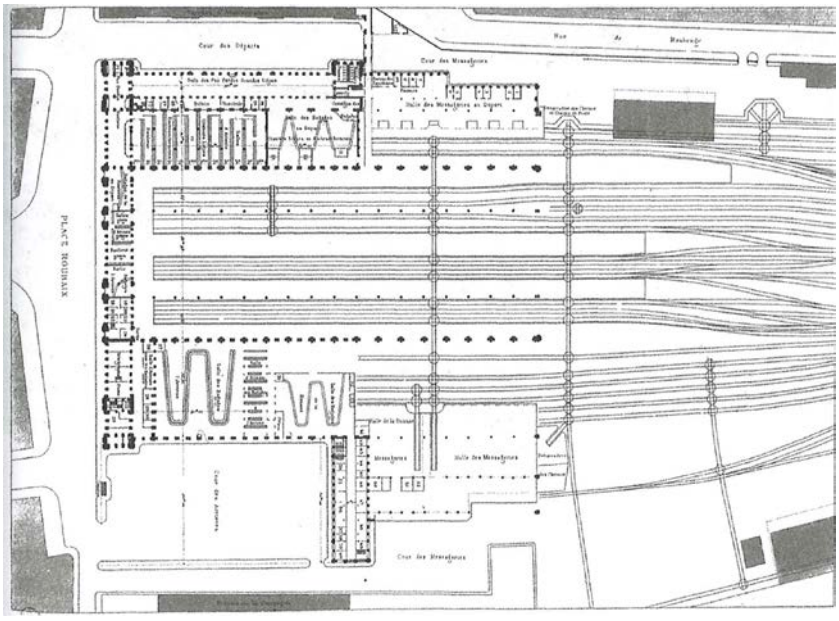


Figure 46 Evolution of layout between Gare du Nord I and II

Eventually, when it comes to the type of service related to the activities of the trains, three categories of terminus are mainly distinguished:

- station at the origin and control of the line,
- station being only a branch, or in correspondence with a bifurcation of the line,
- station that is only an in-between, insures the communication between heterogeneous sections, such as, for example, from simple to double track or with different scale.

In this classification, systems must also be included, which cannot properly be considered "stations", such as: passing stations, junctions and sorting stations. These primary functions were indeed introduced as services directly linked to the trains. Today this notion of services is way wider and includes a very wide range of possibilities, many of them being related to retail activities but also functions like selling tickets etc.

Figure 47 Auguste Perdonnet, manager of the Compagnie de l'Est from 1830

01.3.2.

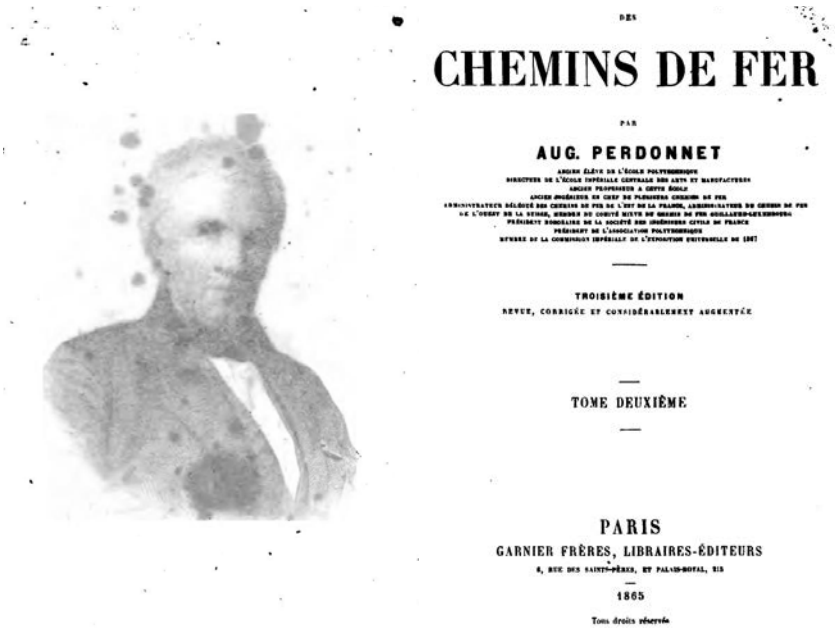
Originally, a balance between engineering and architecture

Originally and behind the station buildings that we see today were most of the time national transportation company having their own engineers in-house. Their role as experts was rather transversal based on their difficult task being the layout, challenging on many levels: the organisation of the large passenger train station should take as fact the thoughtful articulation between physical and economic, the multiple stages of the journey of travellers, from the arrival yard to the boarding platform, and similarly for arrival. The complexity came from the two asymmetrical traffic systems: on the departure side, it was necessary to create a real waiting room; on the contrary, on the arrival side, ensure the rapid release of an intermittent flow. As an adjunct to the problems of passenger traffic, it was also necessary to adjust the space-waiting time for boarding or preparing for the journey: next to multiple waiting rooms that naturally separated the three classes of passengers, were nice to have a post office, urinals, maybe a restaurant and bookstores.

A. Perdonnet, railway engineer, who became manager of the Compagnie de l'Est, in his book[36] that is a true encyclopaedia of railway technologies, dedicates a long chapter of his essay to the question of "the arrangement of stations". The author explains the many possible variants, with their respective advantages and disadvantages.

Just like he did, we won't evoke the case of freight stations or very small stations since they are often separated, in France, from the "passengers"

[36] PERDONNET, Auguste, *Traité élémentaire des Chemins de fer*, Langlois et Leclercq, Paris, 1855.



DES

CHEMINS DE FER

PAR

AUG. PERDONNET

TROISIÈME ÉDITION

REVUE, CORRIGÉE ET CONSIDÉRABLEMENT AUGMENTÉE

TOME DEUXIÈME

PARIS

GARNIER FRÈRES, LIBRAIRES-ÉDITEURS

1865

Tous droits réservés

Figure 48 Traité élémentaire des Chemins de fer, Auguste Perdonnet, Langlois et Leclercq, Paris 1855

stations. Then, if we focus on large passenger stations, the author stipulates that the engineers had to make sure they would include:

- the main tracks for travelling where trains pass and stop with in parallel some service roads for locomotive manoeuvring and for storage. The amount of tracks varies to the traffic and the kind of transit of each station
- buildings to host ticket offices, waiting rooms, locker rooms for the luggage on departure and arrival, and other accessories
- other distinct buildings for the storage of locomotives and cars
- water tanks and hydraulic cranes for the supply of locomotive machinery
- on the biggest lines, buildings for services, often associated with the offices of the administration of the rail company, and sometimes repairing ateliers, with shops attached to them
- specially for the head-station types, we can find other outbuildings suitable for special services, usually placed on special ground quite distinct from the passengers and services for the public.

But the body of buildings assigned to travellers itself must combine multiple spaces and specialized areas. Thus:

> **"these buildings generally contain, in the part specially dedicated to the departure: a vestibule more or less vast; offices for the distribution of tickets to travellers; a luggage registration desk and a departure baggage room; an office for the registration of goods, called messenger (goods carried with passengers by high-speed trains) and a room for depositing them; a correspondence office; a room for the telegraph; a room for the postal service, one**

1845. VOL. 4. SAMEDI 13 DECEMBRE 1845 N. 50

JOURNAL DES CHEMINS DE FER

Navigation à vapeur. PARAISSANT TOUS LES SAMEDIS. Arts mécaniques.

ON S'ABONNE

PRIX :

INSERTIONS.

SOMMAIRE.

Réimpression du *Journal des Chemins de fer*.

Les années 1842, 1843 et 1844 de la collection du *Journal des Chemins de fer* se vendent aux Bureaux, au prix de 40 fr. les trois volumes.

Carte des Chemins de fer français.

La Carte des chemins de fer français en construction, en étude ou en projet, publiée seulement par l'administration du *Journal des Chemins de fer*, est à la disposition des abonnés qui n'ont pas encore réclamé. Tout nouvel abonné, jusqu'au 31 décembre prochain, aura droit à la Carte.

Les personnes non abonnées pourront se procurer la Carte au prix de 1 fr. 50 c. en noir et 2 fr. coloriée avec soin, seulement aux Bureaux du journal.

Nos abonnés d'Angleterre sont invités à retirer leur carte chez M. Smith, 19, Strand, où les non abonnés pourront l'acheter.

Nos abonnés de Lyon sont prévenus qu'ils peuvent retirer leur Carte chez madame Philippe, née Baudier, dépositaire de journaux à Lyon.

Nos abonnés de Marseille, chez M. Michelet Peyron, libraire dans cette ville.

Nos abonnés de Bordeaux, chez M. Delpech, libraire.

Les personnes non abonnées peuvent se procurer chez les mêmes dépositaires, au prix de 2 fr.

Ordonnances du Roi.

LOUIS PHILIPPE, Roi des Français, à tous présents et à venir, salut.

Figure 49 Journal des chemins de fer, Volume 4, 13th December 1845

or more waiting rooms of varying size with outbuildings; rooms or offices for the stationmaster, for the sub-chiefs, and for the guards, servants, etc.; cabinets for the supervisory commissioner and the police commissioner (in France at least); a lamp; a room to prepare the heaters; a cabinet to deposit; while awaiting the opening of the offices and the departure of the train, the effects that the travellers usually carry with them in the wagons, such as bags, umbrellas, coats; urinals and latrines. On the arrival side there is usually a luggage room with waiting room attached for travellers waiting for their luggage; an office for the employees of the grant; one or more rooms for the visit of the employees of the grant or customs; an exit vestibule for those who leave without luggage; a room for the delivery of goods couriers on arrival and an office for distribution. We place indifferently on the side of the departure or on the side of the arrival: an office for the doctor; sometimes a buffet; sometimes also a guard-house; a lost property claim office and a drop-off room; the offices of the administration including those of the chief engineer; the housing of the chief operating officer and those of certain senior employees, such as the head of the movement, the head of the station, etc.; housing for the head of the customs employees"[37]

In addition, and because of these many requirements, the first conceptions of the stations generally shared a number of common characteristics like the separation of the departure and arrival sidewalks, the coverage of the

[37] PERDONNET, Auguste, Traité élémentaire des Chemins de fer, Langlois et Leclercq, Paris, 1855, p. 265-266.

Ce n'est pas d'aujourd'hui que nous connaissons la rivalité qui existe parfois entre les ingénieurs et les architectes ; ce n'est pas d'aujourd'hui que nous voyons ces derniers entreprendre des travaux qui sont du ressort des ingénieurs ; à quoi bon les imiter dans leurs prétentions, et s'exposer à un résultat infailliblement malheureux !

La façade de l'embarcadère, vue de près, et abstraction faite de sa position, est assez belle, et la critique ne pourrait guère se porter que sur quelques ornements microscopiques qui nous ont semblé fort inutiles, placés qu'ils sont sur les parties les plus élevées du bâtiment. Le péristyle est vaste et tous les bureaux de recette, de bagages, de marchandises y ont accès.

Figure 50 Quote from the *Traité élémentaire des Chemins de fer*

sidewalks and the paths in-between, not only for the comfort of the travellers, but also, for the protection of equipment that is required to be parked on the tracks.

These represent so many pieces constituting the puzzle of the main station buildings, where performance and functioning are key, leaving no space for architects and a conceptual approach.

This shows that originally, the role of architects was not meant to be. Indeed, in his large book, Auguste Perdonnet only dedicates 10 pages to the architecture part (that he basically qualifies as decoration) in opposition to the 260 regarding layout and functionality. This is when he decides to mention the *monumental clock* that should appear on the main façade of train stations. This shows that the role of architects at that time lies in the outer appearance of the buildings. We notice now that the role of architect has changed with time. It was very important in the early beginning of train stations, when these new scary elements took place in the city and needed to be accepted by the population. A special effort was then put in their ornamentation and general appearance to the citizens. The two tasks were really separated but anyways, there were many critics about the engineers taking over the architects' role. In the XIXth century, *the Journal des Chemins de fer et des progrès industriels* gives a critique about the progress in the building of the Gare du Nord:

> **"It is not today that we got to know the rivalry that sometimes exists between engineers and architects; It is not today that we see the latter undertaking work which is the responsibility of engineers; what good is it to imitate them in their pretensions, and to expose themselves to an infallibly unhappy result!"**[38]

[38] *Journal des chemins de fer*, Volume 4, 25 Octobre 1845, p. 796.

Est-il possible à un homme d'embrasser à la fois plusieurs spécialités?

Pour construire une gare, il faut avoir vu de près l'exploitation d'un chemin de fer, en avoir étudié avec soin les besoins et les exigences, prévoir même les éventualités; un oubli, une erreur, quelque minime qu'elle soit, devient, par la suite, une faute capitale, irréparable. Il faut avoir assisté aux mouvements de voyageurs et de marchandises dans une grande gare, non sur le papier, mais sur les lieux, et cela pendant des années, pour pouvoir émettre des idées justes sur un point aussi délicat.

Figure 51 Quote from the *Traité élémentaire des Chemins de fer*

Already at that time, when urban planners didn't exist yet, the awareness around the role of architects seemed to raise in favour of a more global field of expertise as it is written a little further in the Journal:

> **"Is it possible for a man to embrace several specialties at the same time? To build a station, you have to have a close look at the operation of a railway, to have carefully studied its needs and requirements, even to foresee the eventualities (...). You must have witnessed the movement of passengers and goods in a large station, not on paper, but on the spot, and this for years, in order to be able to express correct ideas on such a delicate point."**[39]

This shows a mind openness starting to be present in the second half of the XIXth Century, that will be developed and we will be explained in the second part of this thesis.

[39] *Journal des chemins de fer*, Volume 4, 25 Octobre 1845, p. 916.

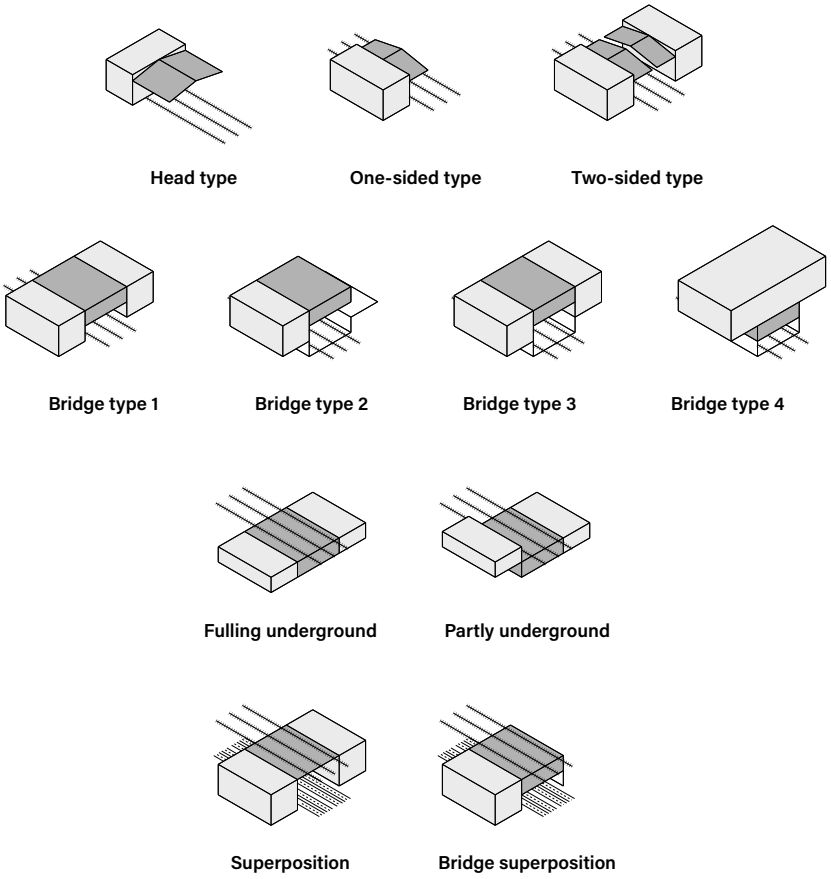


Figure 52 A new typpology, the bridge-stations

01.3.3.

Architecture of train stations, today's new challenges

While the stations built in the XIXth century were following two main typologies (head-type or two-sided types, even sometimes one-sided type), the challenges appearing with time forced to evolve and we see appearing new types, that are by-products of these first families. Despite its great iconic impact on the city's images the head-station is a problematic since it ends the course of the railways and requires many exercises to manage the trains to get them in and out. It lacks flexibility and occupies large surfaces of the city. Double sided stations, on the other hand are more efficient since they serve both sides of the tracks and allow trains to pass by easily and rapidly. They also have a smaller impact on the city network in terms of space but are challenging in the sense that they often create situations of barrier and front-side versus back-side experiments. In addition to that, the passage from one side to another was usually made through tunnels or corridors that were not pleasant for the travellers and felt in the end like a long way.

These and major technological and engineering improvements are enough reasons for a new typology to appear in the design of train stations, which can be summed up as "bridge-stations" (see figure 52). These basically link all the platform from above and allow an easy and fast access to all destinations from a central point. Instead of being thought in two dimensions, the stations are now thought vertically as well which gave many three dimensional qualities such as:

- accessibility from a wide range of options

- efficiency in the changeover of transportation mode in the case hubs multimodal hubs

- low impact on the urban fabric

Figure 53 The hall of Berlin Hauptbahnhof - Meinhard von Gerkan, 1995-2006

- preserves an iconic feeling and architectural clear identity.

This type is very obvious in the Central Station of Berlin Hauptbahnhof that we had the chance to visit. This station built in eleven years and finished in 2006 by Meinhard von Gerkan is a contemporary, multimodal hub. The architecture itself gives that feeling of mobility, of three dimensional practice and from a user point of view, having a clear overview of the building inside improves very much the travelling experience. Despite its large size, it enables good orientation inside, lets a lot of light in which improve a feeling of safety and feels like a city space because of a well thought inside-outside transition. Eventually, its positioning in the heart of Berlin is very innovative in the story of the stations of the XXIst century (see figure 53).

Geography is substituted for history

Train stations have evolved with techniques, but also with lifestyle and style trends. Little by little the traditional symbolic is transformed. For the needs of function and promotion, the themes are renewed. When going through a renewal process, many designers are trying to enhance the context they were built and evolved in, honouring the old stations and the way they were built first while answering new requests that we will study later on. There comes from for instance the increasing of number of travellers, the evolution of technology, the development of public transportation etc.

In the XIXth century, during the creation of most of the city centres train stations that we know today, the focus went from making this building acceptable but the population, to structural challenges leading to the construction of big halls, while ensuring an efficient and well-functioning place. In the following parts of this thesis, we will see that the focus will keep on evolving, partly towards the user's experience and the insertion of the building at eye-level into its context.

Figure 54 The layers to analyse urban fabric

01.4.

Case studies

We've seen that designing train station was a really challenging and prestigious task because it addresses many fields of expertise and requires a good balance between them, at different scales. This is a building type particularly complex that will eventually have a vast impact on public realm.

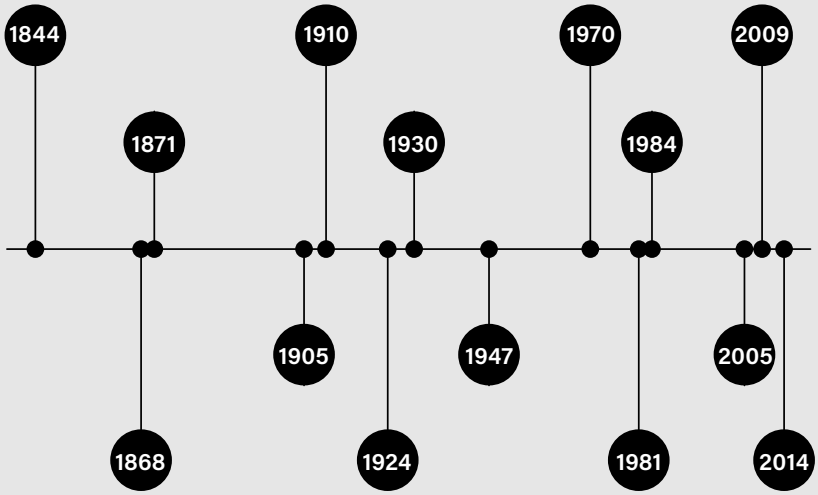
In order to put into perspective the typologies that we have just enhanced, we decided to analyze three cases of European train stations that we know well, that were built first in the XIXth century and went or are going through a renovation process.

We will tackle them with a common method, understanding them from the bigger scale to the smaller and eventually trying to grasp the challenges of their new design. We will try to relate them to the patterns that were described in the first part and see how these influence their functionality and integration.

The first study case is Montpellier Saint-Roch. This is the city where I studied for eight years and I got the opportunity to use that station by many means as well as the transportation features around it.

The second one is Nørreport Station in Copenhagen, where I live now. I had the opportunity to study that station in depth in the architecture studio that designed the new station and employs me today.

The third station is Gare du Nord. It caught my attention when all the concerns about its new project driven by the Olympic games were addressed in the media. These had an even larger meaning because of how beautiful the heritage building still looks today.



Timeline

1844	Construction of the neoclassic station by C. Didion
1868	First extension and installation of the clock
1871	Second extension
1905	Third extension and renovation
1910	Construction of the Square Planchon in front of the station
1924	Construction of the underpasses to access the tracks easily
1930	Adjustment of the Sète and Latets bridges
1947	Electrification of the tracks
1970	Extension and creation of a large bus station
1981	Reconstruction of a new station to welcome the TGV
1984	Registration of the station as heritage building
2005	Renaming of the station as Gare Saint-Roch
2009	Vote for a major renovation project to answer come challenges
2014	Opening of the new station

Data

Client	SNCF Gares & Connexions
Architects	SNCF Gares & Connexions – AREP / F. Bonnefille, J.M. Duthilleul, E. Tricaud
Engineers	AREP, MAP3 (structure), SNCF PRI/CIMED (ingénierie ferroviaire)
Bureau de contrôle et coordinateur SPS	Veritas
Budget	56 million euros
Travelers	8.125.316 / year in 2017
Lines	6 railways, 4 platforms
Connections	4 tramway lines + 6 bus stops
Dimensions	14.5*200 m, 4 600 m^2 with 1 500 m^2 of retail

01.4.1.

Gare Saint-Roch, Montpellier, France

Montpellier

Montpellier is a French city in the Hérault department, Occitanie region. It stands on the edge of the Mediterranean Sea, without being a harbor city. It counts today 285.000 inhabitants and hasn't stopped growing since 1945. It got the status of metropolis gathering almost 610.000 inhabitants in total.

It is a medieval city, named for the first time in year 985. It historical center is called the Ecusson and is very specific because of the density of its buildings; it has almost not changed since the XIIIth century. It is only pedestrian and has a great public transportation network. It is circled by a series of boulevards along its old fortifications and city gates, some of them remaining today. It is close to 60ha, placing it as one of the biggest pedestrian areas in Europe.

A station at the edge of the Ecusson

The train station of Montpellier was built in 1844 by the engineer Charles Didion who was in charge of the connection between Nîmes and Montpellier. The station was placed at the edge of the historical center, the Ecusson. It really stood in-between two atmospheres, with on one side the dense medieval city and on the other side a large residential area surrounded with fields.

The station has undergone a massive renovation project in 1868 (when had been put up the distinctive clock), 1871 and 1905. The stone neoclassical facade has an impressive construction, having among other features imposing columns. Right in front of it is placed the Planchon garden, that still exists today after being built nearly simultaneously with the station building, in 1910,

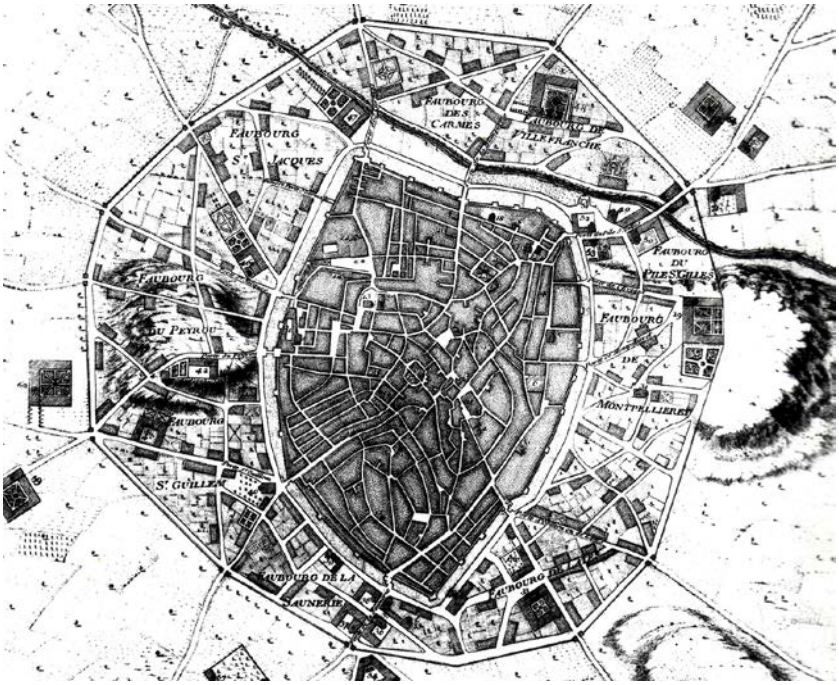


Figure 55 Map of Montpellier, 1737

along with the Sète and Lattes bridges (which afterwards were adjusted, in 1930).

Implementing the train station has implied bigger urban projects in the city, including the creation of the République Street in 1846, then the Maguelone Street in 1857 to connect it to the existing network. The station starts functioning the same way as it does today in 1924, thanks to the construction of underpasses, that were dug to facilitate the crossing of the tracks. This effort corresponds to the overall development of the rail network in France. The tracks were electrified in 1947, when the Jules Ferry Street was created including a bus station and a kiss and ride facility for cars. In the 1970s, the station is expanding to the South West to increase the capacity of the bus station which is supposed to absorb all the city buses but also the departmental and international lines. The arrival of the high-speed train in Montpellier in the 1980s is preceded by a complete dislocation and reconstruction of the station, in 1981. Only the recognizable facade was kept as it is. Before its last renovation in the 2010s, the station had a hall of 430 m^2 on the ground floor, with an overhanging floor of 900 m^2. It was registered as a heritage monument since the end of 1984, especially thanks its clock and remarkable stone facade.

The station today and yesterday

The station of Montpellier as we've known it (until its last renovation in 2014) was inaugurated in 1981 by George Frêche, mayor of the city of Montpellier. Then, he decided to rename it "Saint-Roch" in 2005 in reference to the character from the region, name that will be taken over for the urban planning project that came right next to it. This period corresponds to a moment when its role has also changed because -amongst other things- of the large development of public transportation in Montpellier (two tram lines from the

Figure 56 Montpellier today

2000s, buses, bicycles available). It has a role of multimodal exchange hub. Today, the station irrigates four tram lines and six bus lines, together with city bikes, kiss and ride, taxi station and a large parking house for cars.

Before the renovations in the 2010s, the station was organized in three levels:

- an underground level reserved to pedestrians to allow access to the tracks taking the form of a dark tunnel corridor

- a ground floor level dedicated to the "passenger hall" overlooking the garden with direct access to platform A, with an information desk and a typical small shop for newspapers, cigarettes and candies

- a level on the first floor where were located the ticket sales, waiting areas, more shops and main access to all the platforms of the train tracks. This level was accessible through some escalators to the North and to the South but also by the Sète bridge to the South-West.

This is a case of typical pass-through station, with buildings on both sides of the tracks but with a main access towards the old city and a secondary one to the other side.

Montpellier Saint-Roch, a new mobility hub

The process In 2009, the City Council of Montpellier voted in favor of a modernization of the train station to make it a new Multimodal Exchange Center. This came alongside the debate regarding the new connection between Montpellier and Perpignan on the bypass of Nimes and Montpellier:

> **"Beyond the improvement of the services to the travelers, and the implementation of a quality architectural project, a better integration of the station in its environment by**

Figure 57 The historical facade of Montpellier Saint Roch - Charles Didion, 1844

Figure 58 The Square Planchon, 1916

privileging the accessibility of the complementarity of the modes of displacement "[40]

SNCF which is the national train company in France is the client of the project. The competition was won by the Parisian architectural firm of JM. DUTHILLEUL, the project was estimated to 56 million euros divided between the restructuring of the station (50.5 million), landscape (3 million) and the upgrading of railways and platforms (2.5 million). The financial partners of the project are mainly the Region of Languedoc Roussillon (the region is now regrouping more departments and is called Occitanie) and the SNCF with about 17 million euros each, then in decreasing order the Department of Hérault, Montpellier Agglomeration, the City of Montpellier, the State, RFF and others in decreasing order[41].

A bridge station for a new organization of the flows

After the renovation, the organization of the new station remained overall similar. It has a ground floor lobby (with direct access to the Auguste Gibert plaza) on the site of the preserved historical façade. It allows access to the lower level to lead directly to the different platforms and also orientates the travelers to the upper level where they can always find, in a more modern and clearer version, the reception desk, ticket sales, the terminals, waiting and display areas, access to docks and more shops and cafes than before. This space is organized around a large central corridor-type circulation oriented along the tracks between the Lattes bridge and Sète bridge. On either side of

[40] Abstract of the report of the City Council, July 26th 2010 - *Project for the extension and modernization of Saint Roch Station* - Opinion of the City on the public consultation procedures proposed by the project owner.

[41]https://objectif-languedoc-roussillon.latribune.fr/economie/infrastructures/2014-12-02/la-nouvelle-gare-saint-roch-inauguree-a-montpellier.html

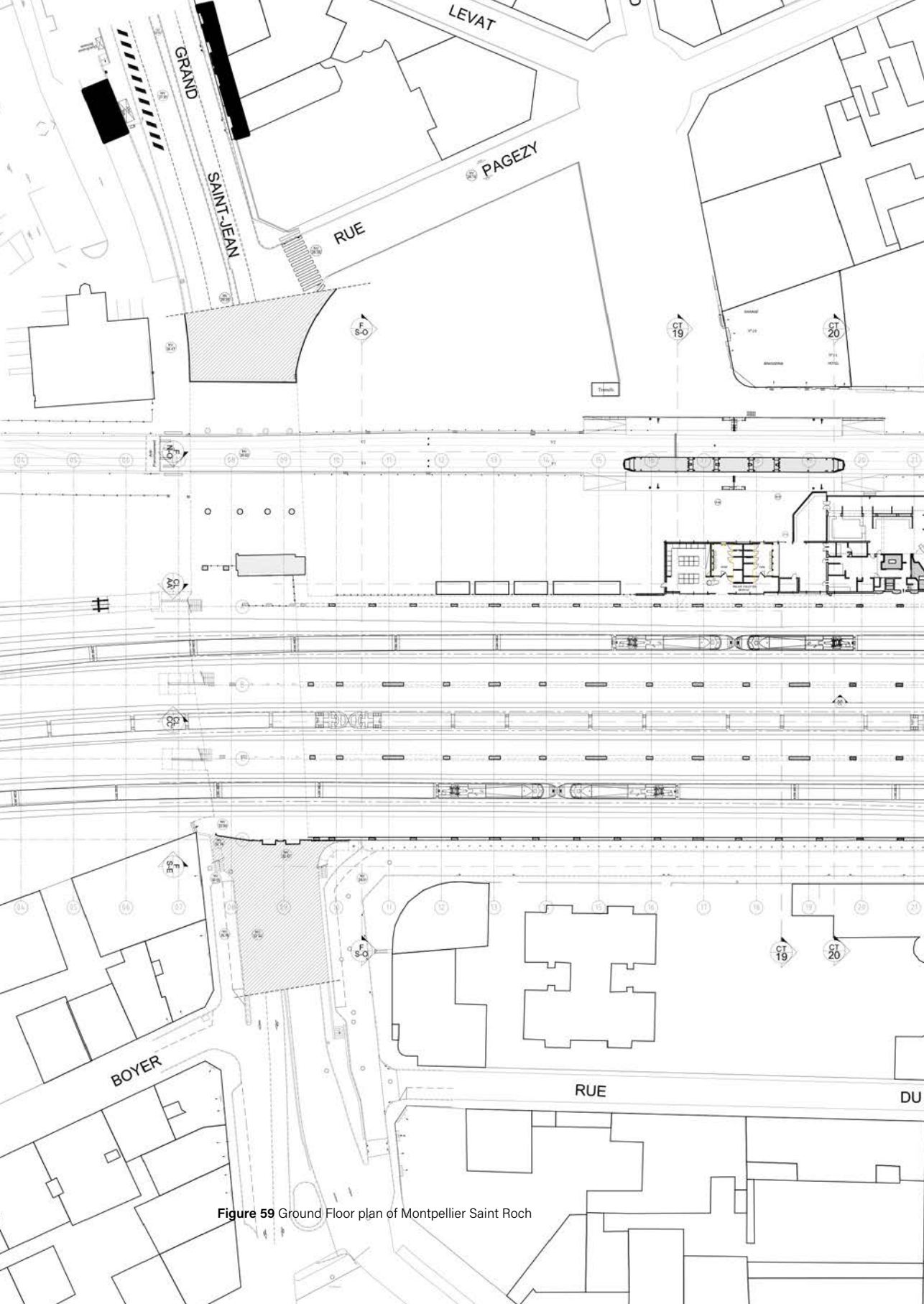


Figure 59 Ground Floor plan of Montpellier Saint Roch

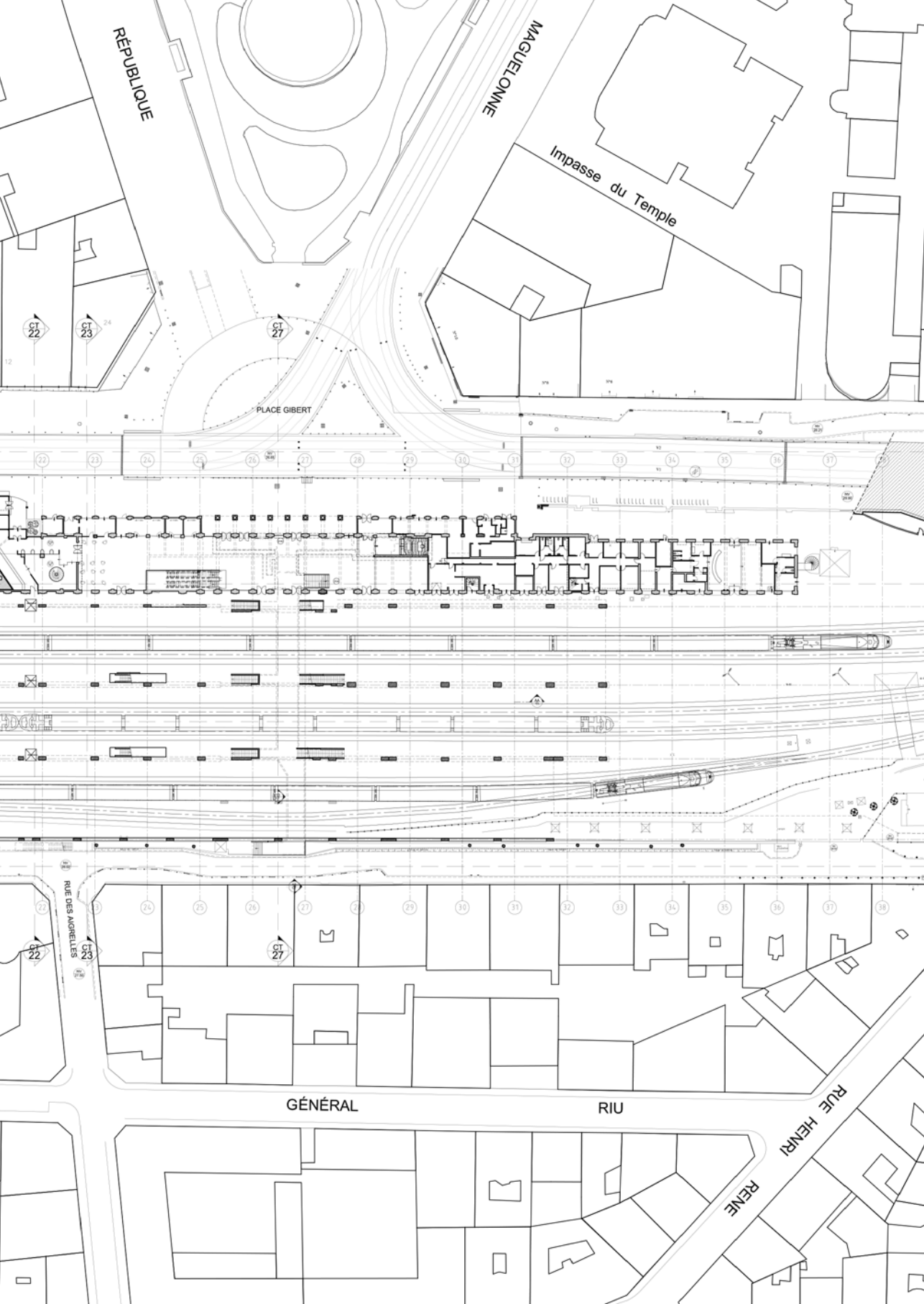

RÉPUBLIQUE
MAGUELONNE
Impasse du Temple
CT 22
CT 23
CT 27
PLACE GIBERT
RUE DES AIGRELLES
GÉNÉRAL
RIU
RENE
RUE HENRI

Figure 60 The historical facade of Montpellier Saint Roch - Charles Didion, 1844

it, we find programmatic entities that are located in "boxes" with access to the docks in between.

The expression of the renovation As we have described earlier, the train station of the Montpellier Saint-Roch station went through a complete redevelopment in the 2010s that led to its re-opening in 2014. After undergoing several works of expansion, enlargement and transformations due to various reasons including the arrival of high speed trains, and the development of the demography, the station ended up lacking in efficiency, got dissolved and was not functioning properly.

The underlining goal of this architectural competition regarding one of Montpellier's biggest public spaces was to enhance the functions it's been assuming for some years without having them thought as a whole:

- being a major transportation hub, now including many new public transportation features
- providing public utilities to the city
- get rid of the image of barrier the station has between the Ecusson and the southern part of the city

The point was not to re-do the station's structure entirely but to work with the existing configuration. Therefore, the existing slab of the first floor was kept but pierced with hoppers in order to multiply the number of connections to the platforms but also to bring more light and fresh air to that level, improving the comfort of travelers waiting for their trains. There was originally a wish for optimization of the platforms level in terms of general movement but nothing was noticeable in the final project.

Figure 61 The historical facade of Montpellier Saint Roch - Charles Didion, 1844

Figure 62 The Square Planchon, 1916

The extension building that is the main part of the renovation is on the first floor. It has the shape of a nave that is extruded along this corridor building. Indeed the project can be summed up as a large ventilated and cooled roof. On each sides are different shops and functions, the rest being the ground floors' roofs as flat sedum surfaces.

The nave's dimension are 13.65 meters wide and 195 meters long and is divided into several modules. The materiality is deliberately in contrast with the heavy stones of the heritage façade. It is very light and translucent, letting the ray of sun pass and reflecting the shadows. This is supposed to be very luminous, not like the previous station and to appear as an icon of the city, a recognizable signal during the nighttime. The modules function like pads creating a buffer from the sunrays and to insulate against energy waste the other half of the year. Some canisses are hanging from these modules as an addition defense against the outside conditions as well as they serve for phonic purposes.

The new station is to be seen as a roof. There are as well extra elements making the transition between inside and outside. These are covered spaces marking the secondary accesses and defining smoking areas. The point of the architects when they designed the station was to give a new experience to the travelers by stimulating their senses. A special attention has been given to indoor climate, especially given the fact that Montpellier had a Mediterranean climate. Then the goal was to have a pleasant visual encounter with a clear and well-lit area focus the acoustics on landscape features to cover the noises due to the train activities. We can notice here an opposition with the past in where the efforts were put regarding the design objectives of the station. The office of JM DUTHILLEUL has a vast experience in the design of train stations in France and is identified by his aspiration to juxtapose old and new structures in favor of modernity, performance and multimodality.

Figure 63 Aerial view of Montpellier Saint Roch


Quick

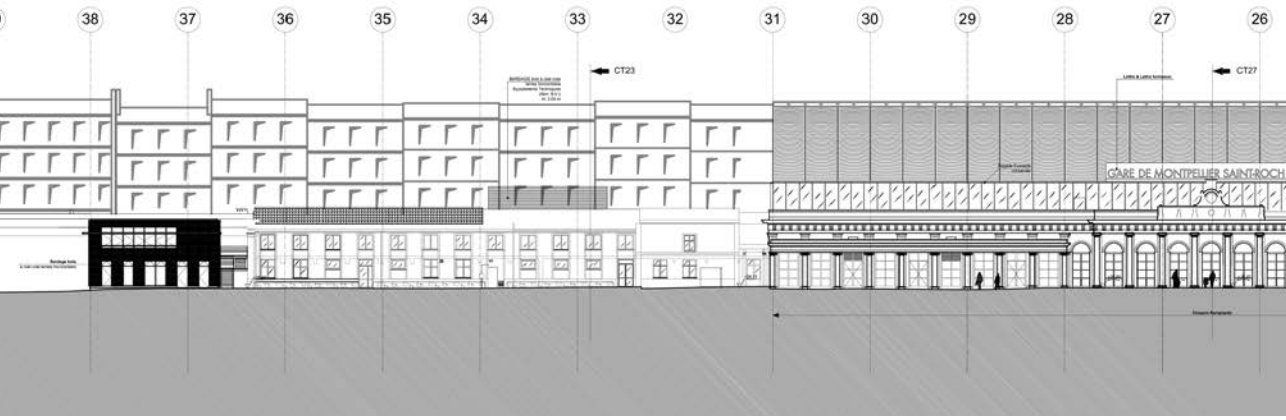


Figure 64 Longitudinal elevation of the new facade of Montpellier Saint-Roch, on top of the old facade

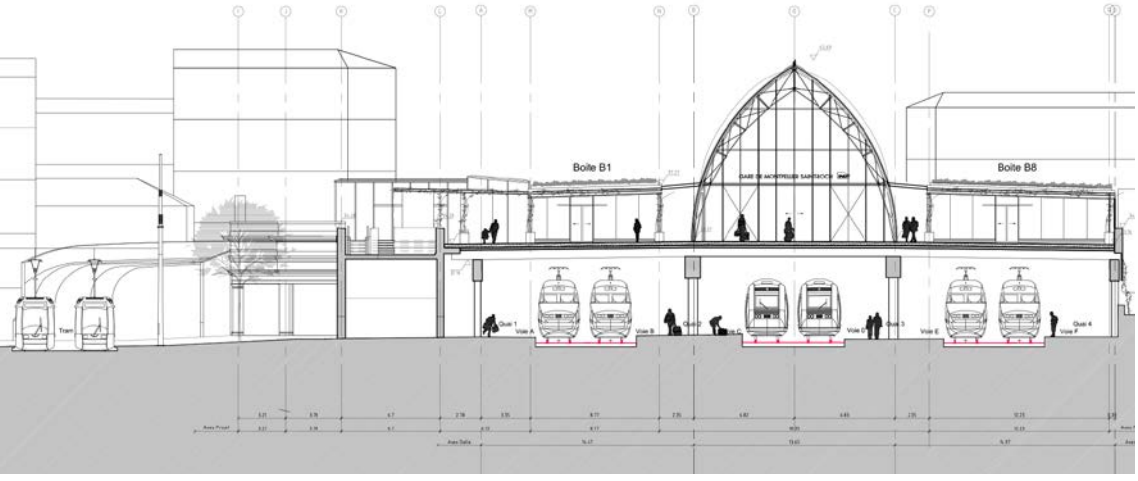
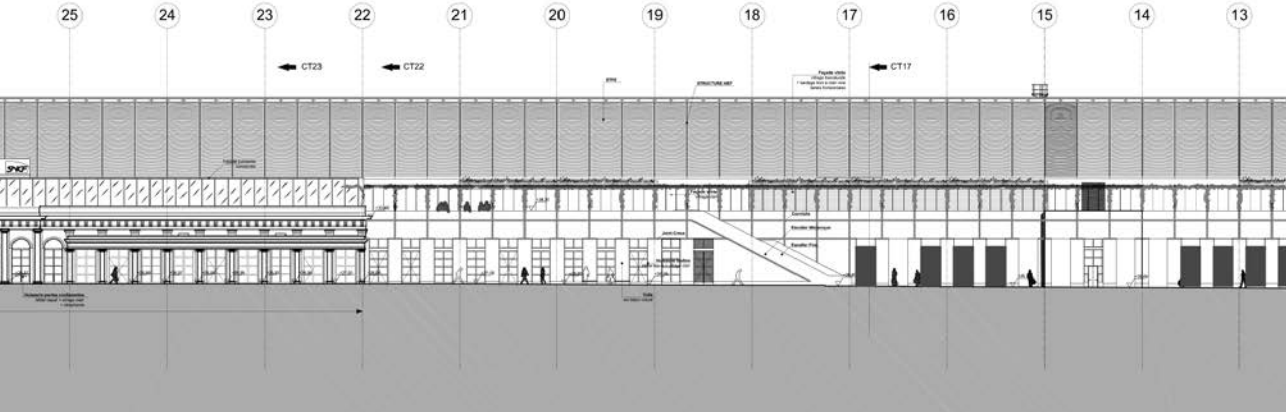


Figure 65 Transversal elevation of the new facade of Montpellier Saint-Roch, on top of the tracks



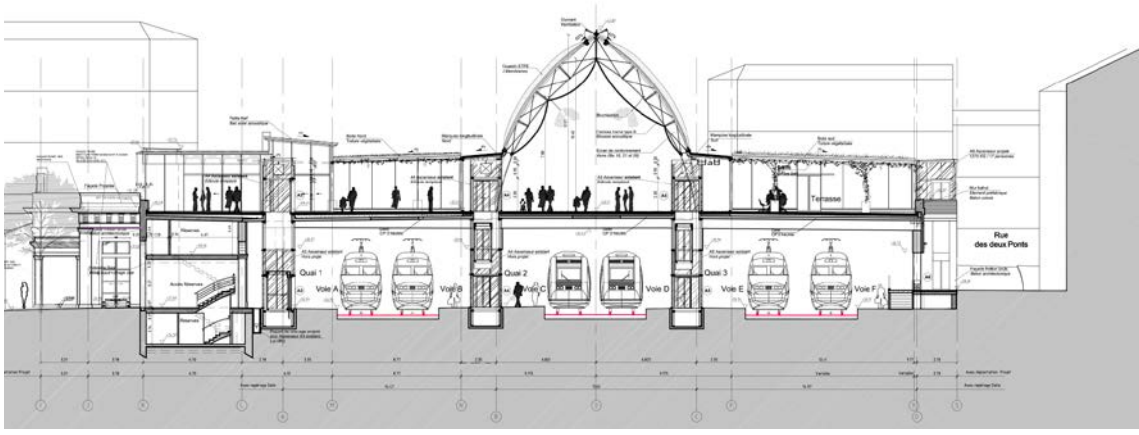


Figure 66 Transversal section of the nave

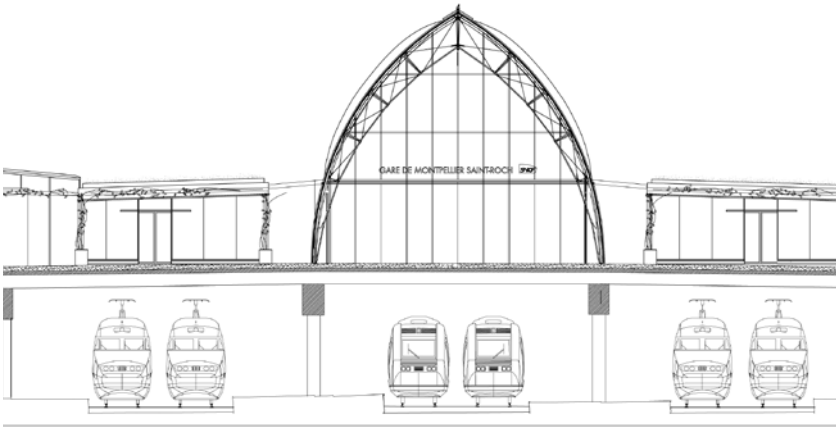


Figure 67 Transversal elavation

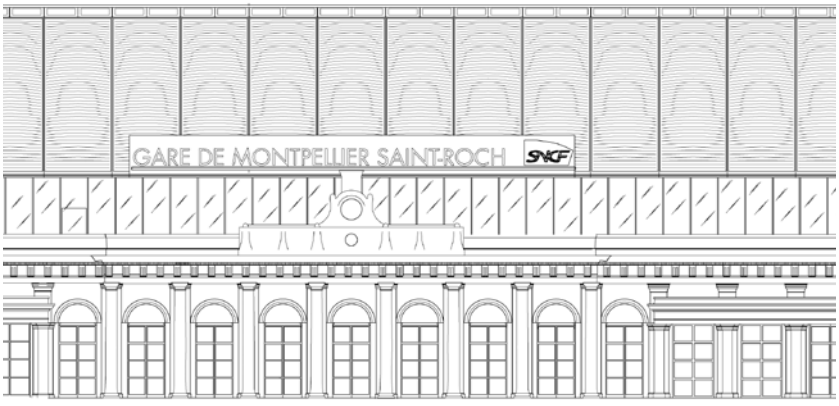


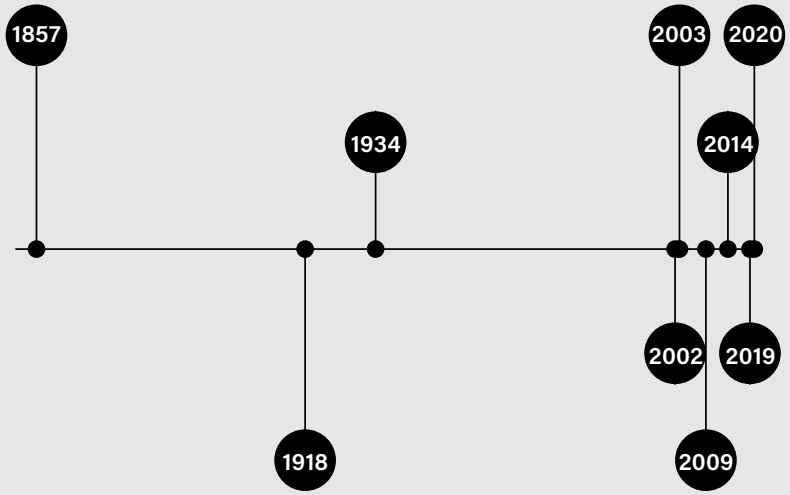
Figure 68 Longitudinal elevation

Lastly, the fact that the station will now be able to handle so much more people and destinations works for a revitalization of the whole station area, motivation the implantation of a mixed neighborhood that will be called the “Nouveau Saint-Roch”.

The nave for a new city icon

The nave has the shape of a simple half-ogive in section that is put on top of the corridor that creates the main meeting place on the first floor. This element is almost 12m high from the slab’s level. In terms of dimensions, the ogive is made of two symmetrical arches. He material that was used is some kind of plastic that is more resistant than glass and often used is dome shapes. It integrates some skylights in some place for fire reasons. This material is made of three layers that work like a cushion and insulates the indoor areas.

The nave is extruded in one direction and creates a kind of tube on top of the tracks. It is a series of arches that are placed every 3.25 meters and that are holding together from the inside with a layer of lattices. As we decribes before, we find pergolas on both sides of the nave, creating a buffer between inside and outside. There are 2.5m wide and again, have a rather “modern” metallic materiality. Their structure also protects the escalators from the rain and the direct sunrays. The different functions along the corridors (ticket sale, shops, etc) are also inside steel boxes following the rhythm of the arches. These boxes have sedum roofs that are visible from the higher buildings in the surroundings.



Timeline

1857	Naming of the station after the city gate Nørreport
1918	Opening of the first train station
1934	Building of new railways for S-trains
2002	Opening of the first metro line M1
2003	Opening of the second metro line M2
2009	Announcment of the winning design team for the New Nørreport
2014	Opening of the New Nørreport Station
2019	Opening of the third metro line M3

Data

Client: City of Copenhagen, Banedanmark and DSB
Architects: COBE Architects Gottlieb Paludan Architects,
Engineers: Sweco, Bartenbach LichtLabor, Aarsleff Rail
Bureau de contrôle et coordinateur SPS : Veritas
Budget: 21 million euros
Travelers: 30600 using the trains
77200 Using the regional trains
39200 Using the metro in 2014
Lines: 6 railways, 3 platforms
Connections: 2 metro lines + 10 bus stops + 6 regional trains
Dimensions: 10,500 m2 with 2,500 parking lots for bicycles

01.4.2.

Nørreport Station, Copenhagen, Denmark

Nørreport Station is the busiest train station in Denmark, with more than 250.000 people bustling through it daily. Since the 1960s the station developed into a vast and chaotic intersection – an urban wasteland in the middle of the city. The idea behind the new station was to give Nørreport back to the people by reorganising the flow and the infrastructural hierarchy of the space. The architects from Gottlieb Paludan and COBE Architects tried to imagine how people would naturally move if released from the restrictions of cars, bicycle stands and traffic lights. This study became the basis for the new station, providing an open and efficient public space designed directly for the needs of the people using it. The new station is not only a station, but an urban landscape for people. It transforms Copenhagen's busiest and most heavily trafficked space into one unified flow space and becomes an integrated part of the pulsating city around it.

Copenhagen, a small Scandinavian capital

Copenhagen is a small city with no significant landmark attractions when it comes to monuments. But architectural and artistic monuments are not what draw people to Copenhagen. Instead, a series of successful urban developments has created a new kind of urban attraction. The city has become known for the way it is used and designed, and for its high quality of life.

This phenomenon is not the result of just one thing, but a mix of successful developments in different fields through the last several decades. The Danish welfare model, the healthy food revolution, the bicycle culture and the revitalization of urban space has created a cocktail of liveability and happiness that is now world-famous.

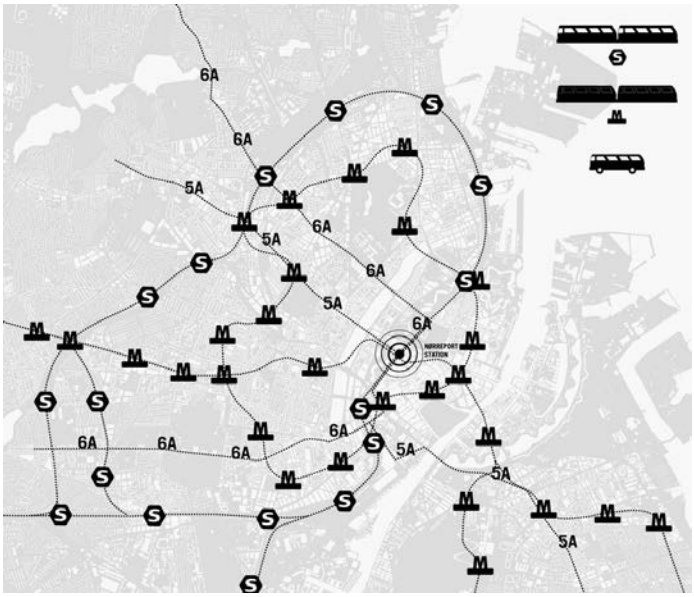


Figure 69 Public Transportation: Train, Metro, and bus routes

Copenhagen's bicycle culture in particular has caught on as a symbol of modern living. It is the icon of an attractive urban lifestyle that combines efficient green mobility, and leisure. The tourist attraction is not a museum or a piece of architecture but an overall urban experience.

Historically, Copenhagen was not designed for cars. The dense medieval center of narrow street networks was created for horses and carriages. In those days, transportation by horse was only available to the rich. Most people crossed the city on foot, and the streets were designed for pedestrian traffic. When the bike was introduced in the 1890s, it radically changed the way people used the city. The development of new, outer housing neighborhoods like Vesterbro and Nørrebro – today the most vibrant and attractive urban areas of the city – was a direct result of the invention and the eventual popularity of bikes. It became possible for working class people to move out of the old city and beyond the fortification walls, because they could bike to work in the crowded city center. The horse lanes were gradually transformed into bike lanes, transforming Copenhagen into a bicycle city. In the post-war 1950s and 60s, a global financial upturn made it possible for the working class to own a car, and the fabric of Copenhagen once again changed. People no longer wanted to live in the worn down city center, which at the time was very dense and in poor condition after the war. In the 60s, Copenhagen had become a city with a car-dominated infrastructure. In those years, the growing density of cars slowly turned public spaces into vast landscapes of car parking, and the urban life suffered. The former horse – and bike – lanes were turned into roadside parking spaces, stifling the street life of the city.

Today, the city has transformed once again. Now, many people choose to stay and live in the city center. The worn down city that was escaped in the 50s and

Figure 70 Cyclist density

60s has transformed into one of the most liveable cities in the world. This second wave of densification has had a unique impact on the way we use and design the city today. We have yet again become a city for people.

The transformation of the Copenhagen streets and the return of a new bicycle and pedestrian era raises a new set of challenges. How to accommodate the 650,000 bikes that exist in Copenhagen, without filling public spaces with cramped parking depots? How to create an inclusive public space for the 1,000 new inhabitants that arrive in Copenhagen each month? And how to interlay all modes of traffic to enhance mobility while at the same time having quality urban spaces?

The challenges Copenhagen currently faces might be specific to the local geography, but they can still be utilized for solving the global challenges of mobility and urban space faced by cities worldwide. Already the Copenhagen-style bicycle lane has become a global model exported almost 1:1 in many other cities.

With the influence of famous urban planner like Jan Gehl, it is pretty noticeable that, in Copenhagen, streets are also urban spaces – places not only for flow, but also for social interaction. This doesn't mean that they are losing in functionality, they anyways remain as easy to walk, bike or use collective transportation as to drive.

Nørreport in Copenhagen seemed like a good example to study, since it is actually and urban space that is not only trying to promote the most convenient and safe bicycle routes possible, but at the same time provide beautiful public environments where infrastructure and public spaces are completely intertwined as one urban organism.

Figure 71 Nørreport Station, under the snow, before the renovation

Nørreport station, from city gate to city heart

The station is named after the city gate Nørreport demolished in 1857, which is commemorated with a milestone by the station. The station was built in connection with the railways and opened in mid 1918. However, the two western railroad tracks, which were initially intended for short-distance traffic and which have been included in the subway since 1934, were first put into service on October 1st, 1921.

On the surface, the station was formely made of two circular buildings - popularly called the "soup terraces" - which contained ticket sales, ventilation systems and a small waiting room for tram passengers.[42] The architect of the newly baroque pavilions was Danske Statsbaner's chief architect Heinrich Wenck. These buildings were demolished in 1932 because of a redevelopment of the station prior to the opening of the regional lane, but the stairs were re-used. Until the demolition of this one from 2011 to 2013, decorative elements from the original station could be seen by the two stairs to the regional train platform - a balustrade with attic band loop at the southernmost staircase and a couple of pillars carrying bullets at the northernmost staircase.

At the same time, in 1932, the short-distance tracks had to be lowered to make space for the overhead lines. The same happened in 1985 for the long-distance tracings in connection with the electrification of the coastal railway. The new station from 1934 was designed by Wenck's successor K.T. Seest. As something new, the station's name was bent in neon tubes on the roof of the functionalist building. These letters are still visible today and represent an iconic feature of the station.

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[42] POULSEN John, *Nordbanen: med tog til Nordsjælland gennem 125 år*, Historisk-topografisk Selskab, 1991.

Figure 72 Nørreport Station 1918

Figure 73 Nørreport Station 1950

Metro Station In the 1990s, it was decided to build a metro in Copenhagen, which should include a station at Nørreport and with an underground transfer tunnel to the railway station. The metro station opened on October 19th, 2002, and Nørreport served as the terminal station for Amager metro trains for seven months until the next stage was finished and ready to function in May 2003. Only for the metro parts, the station was used in average by 37.500 travelers per day in 2012.[43]

Air pollution and renovation The regional and long distance platform at Nørreport Station is one of the most air polluted places in Denmark, and DSB has for years dispensed with violating the air pollution limit values. In addition, the platform is very narrow, less than half the width of the recommended platforms. It is the diesel-powered trains used on the long-distance journey that are mainly responsible for the pollution, which is considered particularly dangerous, because consists of ultrafine particles. A survey for the Engineer in 2008 showed that the air on the platforms contains about 300 million. ultrafine particles per liters of air.[44]

Due to, among other things, poor air quality and poor lighting DSB started thinking about a New Nørreport project in the early 2000s. The new design was intended to ensure improved air quality and lighting. Because of the major increase of the number of travelers due to the wider range of transportation possibilities at Nørreport, there was also a desire for improvement of the flows in general in the area, that were to be conducted in a more functional way, so the station could be separated from the car traffic. Before the renovation, the station was between two lanes. The work was estimated to last approximately

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[43] Count form the Danish metro company, *m.dk*

[44] KOCK SØRENSEN Bjørn, *Chok-måling. Ni millioner gift-partikler i hver indånding*, Ingeniøren, 2008.

Figure 74 Nørreport Station 1990

five years and cost between 0.5 and 1.0 billion Danish kroners. This project would also involve an elongated glass dome over the entire regional train area. As an alternative, the Mayor at that time, Ritt Bjerregaard and the minister of Technology and Environment Klaus Bondam proposed to replace the current station buildings with a new thinking. The new Nørreport would, besides of course, contain a railway station, also contain a high-rise building and perhaps even an underground shopping center. This should be included in the considerations regarding the use of the station area in connection with a conversion of this[45]. In October 2009, a large majority of the parliamentary parties agreed to initiate a modernization, which main goal was to ensure the air quality of the long distance trains platform. The project was completed between 2011 and 2014 and meant that theses platforms remained unsuable for eight months.[46]

At that occasion, an architectural competition for the New Nørreport was launched, and by the end of 2009 the mayor presented the winning team. New Nørreport was carried out by:

- Banedanemark was in charge of the concrete renovation and of the Danish Transport Authority's project proposal for the renovation of the long-distance railways and platforms.
- DSB was in charge of the construction of the new station buildings.
- The City of Copenhagen was responsible for the layout of the space at the street level, while Gottlieb Paludan Architects, COBE and Bartenbach LichtLabor teamed as the architects and lighting specialists.

[45] From the newspaper Politiken , edition 17.01.2008

[46] https://www.trm.dk/

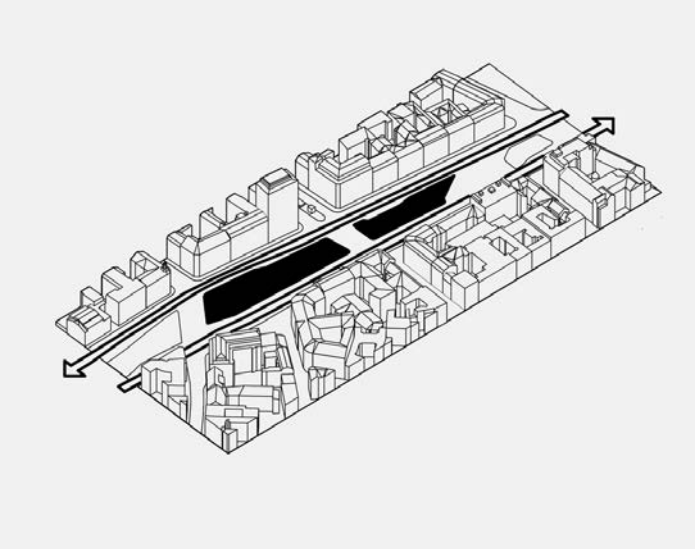


Figure 75 Nørreport before

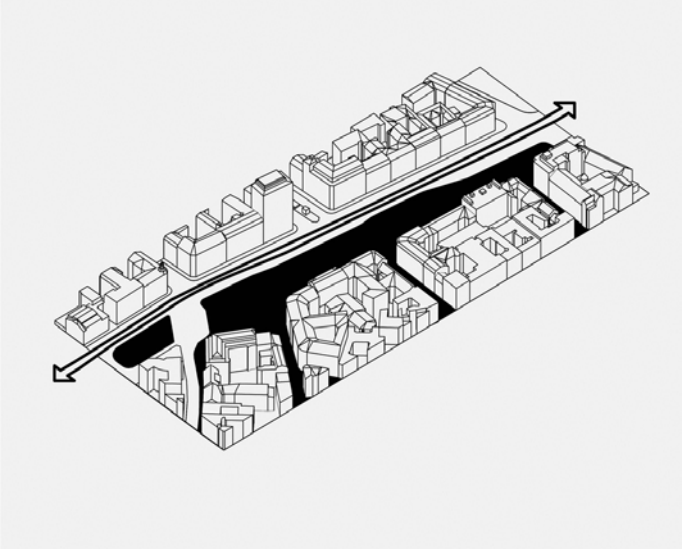


Figure 76 Nørreport after

- Grontmij acted as the consultant on the activities both underground and above ground.
- Ramboll was the consultant on traffic and signage and safety.

On September 16, 2011, it was announced that the work would be On the street level, a new station front yard, new station buildings and 2,100 bicycle parking places were established. The underground work was finished in the spring of 2014, and was completed with the reopening of the long-distance platform in April, 2014, while work above ground was completed in early 2015.

The New Nørreport, functionality as a proiority

Nørreport Station is a historical hub of public transportation in Denmark, with roughly 250.000 people and 20.000 bicycles passing through and using the station's facilities every day. Before the car invasion in the 1960s Nørreport was a lively space for people. The station has since shifted into a chaotic distribution line of trams, cars and buses, neglecting pedestrians and cyclists. Nørreport is a historical part of Copenhagen and is meaningful to many people. The proposal to renew the station sparked a public debate about the structure and the modernisation of the city in general.

Two busy roads used to close off Nørreport from the rest of the city as a lonely island in a chaotic traffic space. Reorganising the traffic of cars towards the north provided the station with an extended public space and a new connection to the medieval city to the south.

Figure 77 The new Nørreport station with its old sign

The compact city blocks on both sides of the station clearly define Nørreport as a public space. It is a much-needed open expanse in one of the densest parts of the city. The views along the tree rows, the underground infrastructure, and the interlacing urban spaces invite people to flow through the station and out into the city. The programmatic elements on the surface are strategically arranged and designed so to provide unobstructed movement throughout the urban space and down to the platforms.

Nørreport was once a difficult place to manoeuvre through – a traffic junction where one had to wait patiently for all the cars and buses to pass. Now it functions as an important public space where pedestrians have reclaimed priority, and the cars must drive around.

Thousands of bikes used to fill up the spaces around Nørreport. Without an efficient organisation, they were randomly scattered around, creating a messy and dysfunctional public space.

Description of the flows

Nørreport Station is a hub with train, metro, bus, bicycles and cars. Two pairs of double tracks with center platforms for respectively dedicated to regional and long-distance trains lying along Nørre Voldgade, as the two platforms are slightly offset relative to each other. The two tracks of the metro go perpendicular to the other four tracks with the station under Frederiksborggade northwest of this. A subway tunnel connects the subway platform with the other two platforms and Frederiksborggade's southeastern part. The total length of the station system for regional and long-distance

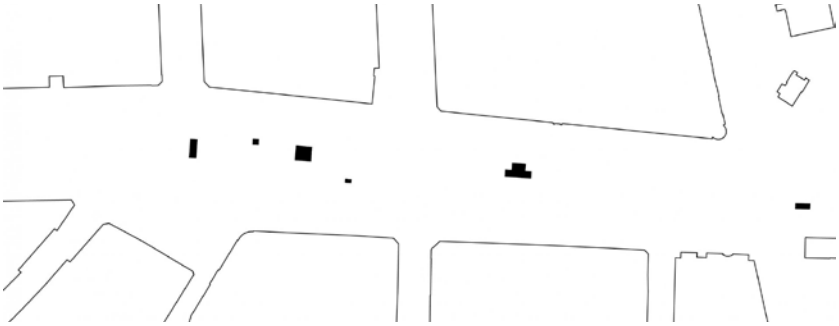


Figure 78 The fixed elements of the Nørreport station - stairs and elevators

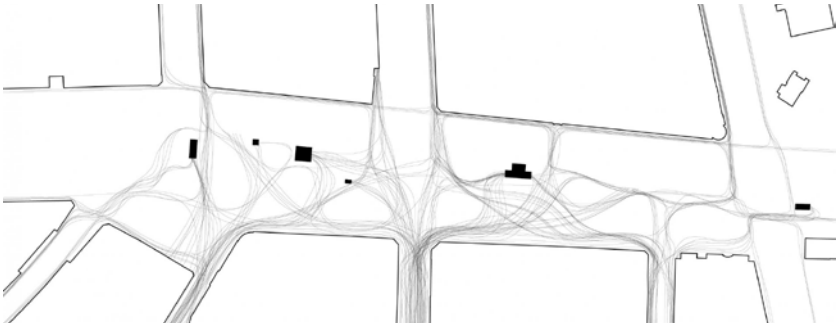


Figure 79 The flows expected around these elements

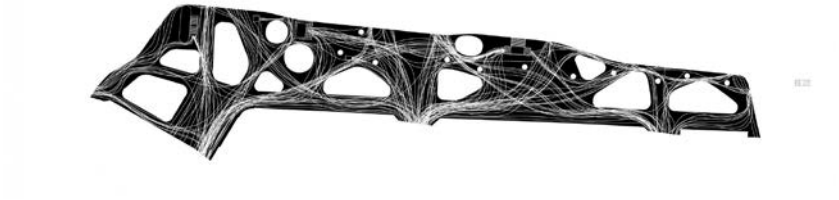


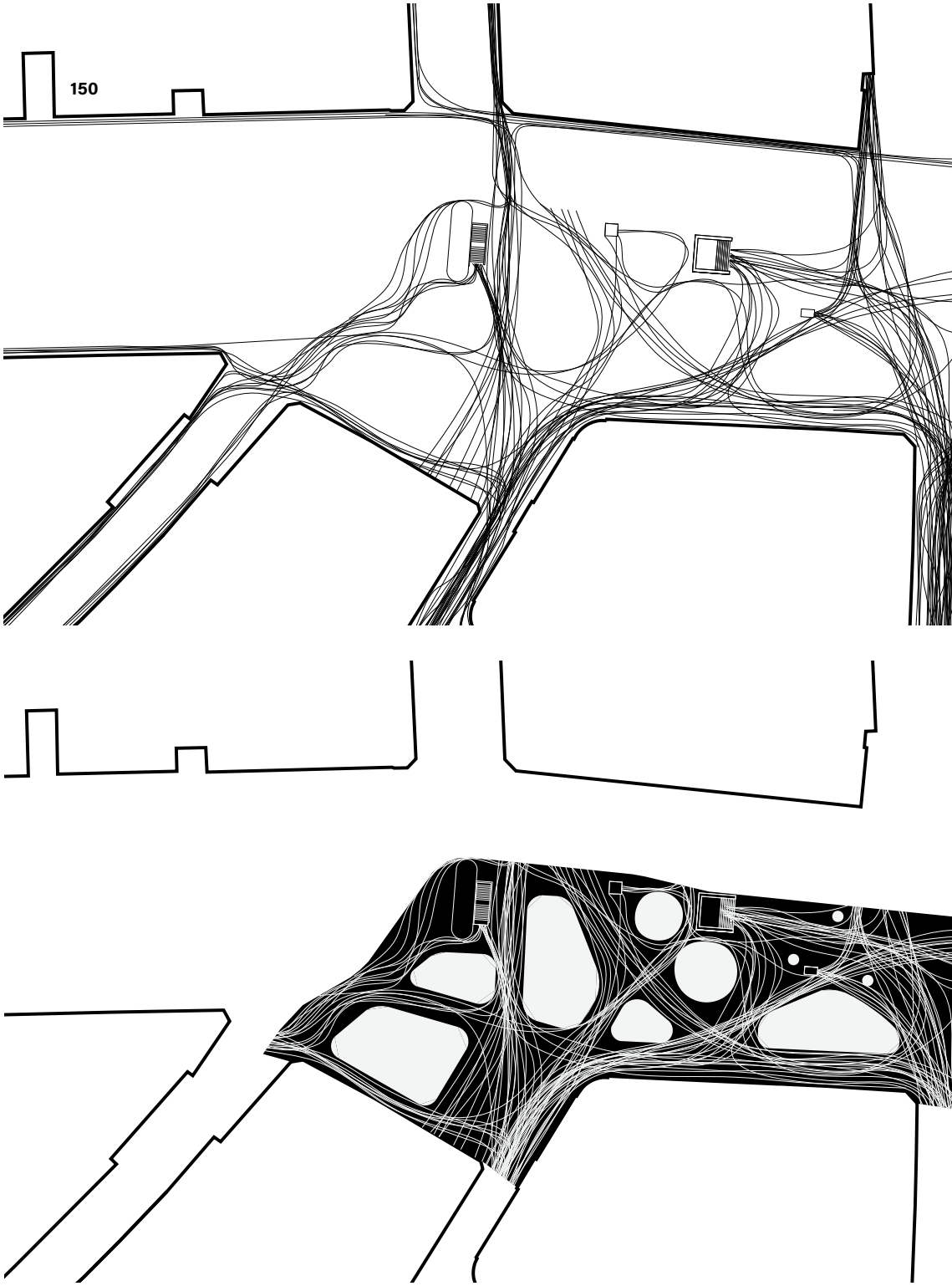
Figure 80 The project thought outside-in

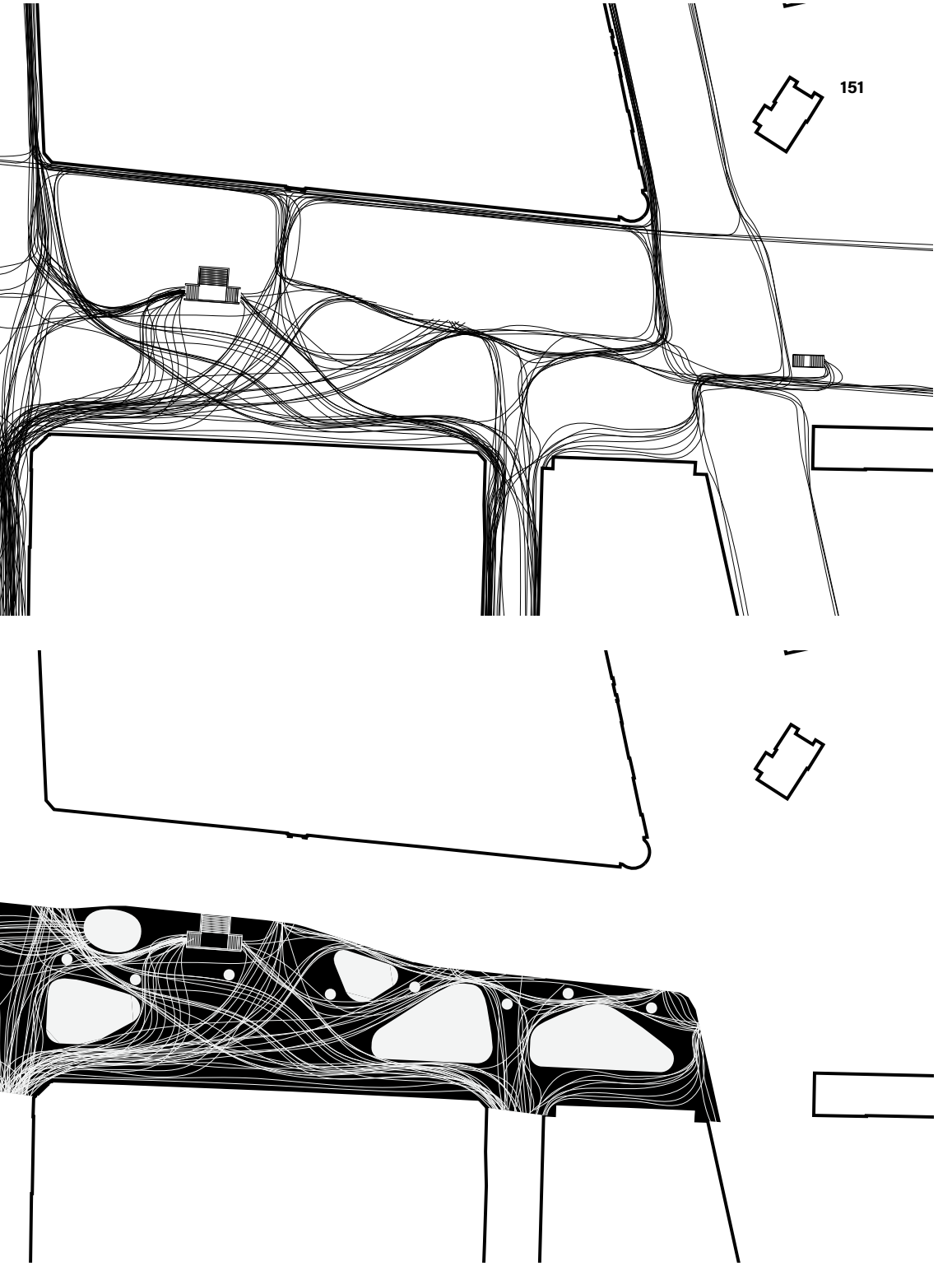
trains is approximately 400 meters and the width varies between 22 and 32 meters.[47]

On the street level various roofs, kiosks, bicycle parking, bus stops and stairs to the platforms have been established. Starting from the northeast, in Øster Voldgade, there is a staircase to the long-distance platform and bicycle parking. After the junction, the station's facilities are distributed in a square along the southeast side of Nørre Voldgade until the junction with Nørregade. This space has a number of slightly recessed areas for bicycle parking. In addition, there are a number of vent pipes adjacent to the long-distance platform. In the middle of the square, there is a covered booth and stairs to the regional trains platform. After the intersection, there is a larger covered stall for information, stairs and lifts for different trains and toilets. Just before the intersection with Nørregade, we can find a covered staircase to the regional train platform. After the South West intersection, there is a bicycle parking and a bus lane with its driver building for the bus lines that have the terminus at Nørreport Station.

The metro station is located below Frederiksborggade. In front of the food halls of Torvehallerne, there is a staircase in the middle of the road leading down to a porch, from which there is an escalator leading to the metro platforms. In addition, there are lifts in that same place but also at Israel Square.

[47] http://www.bane.dk/visArtikel.asp?artikelid=8512

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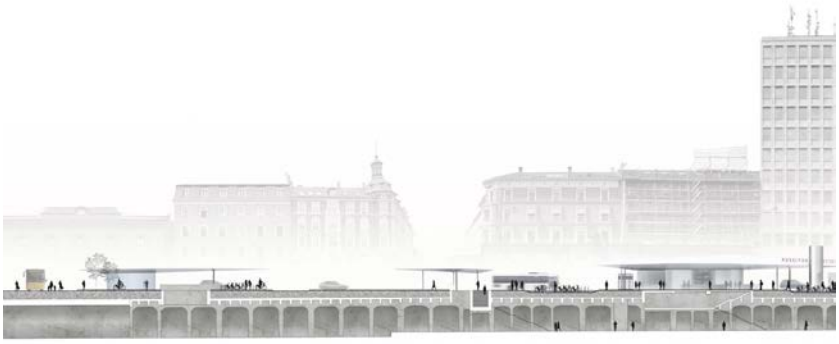


Figure 81 West section of Nørreport station along the train tracks

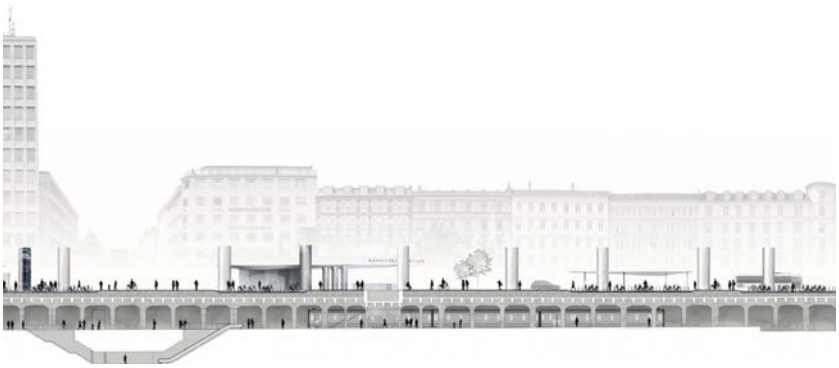


Figure 82 East section of Nørreport station along the train tracks

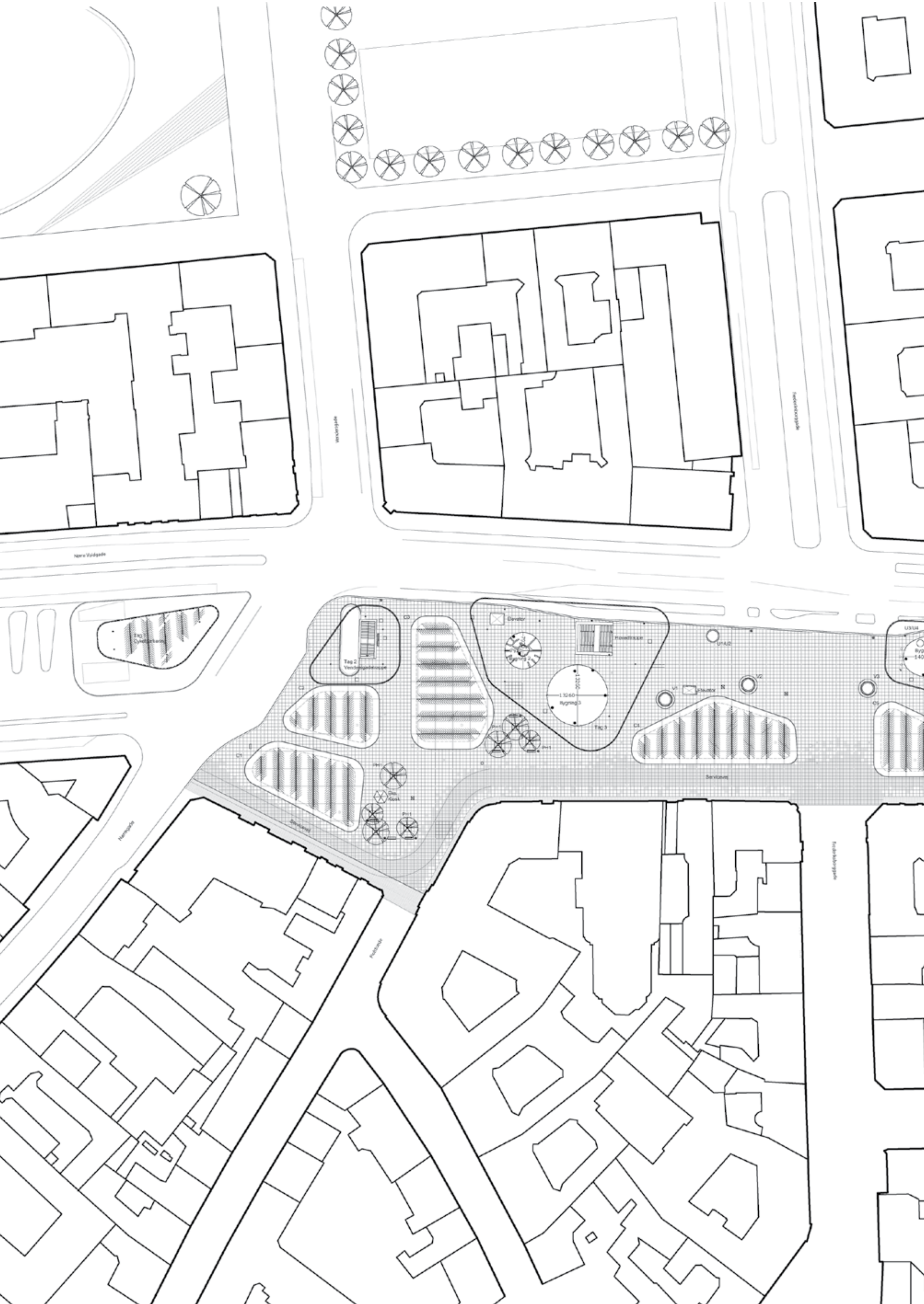
On Nørre Voldgade, car, bus and bicycle traffic are gathered on the northwest side along the square. There are two bus stops in each direction for different lines as well as a stopover for the lines having the terminus at Nørreport Station. In addition, there is a stop in Frederiksborggade immediately before the intersection with Nørre Voldgade. On the other hand, there are no parking spaces directly adjacent to the station, but there is an underground parking facility nearby under Israel Square.

Concept and architectural expression

A station becomes an urban space Nørreport Station is an anchor point for infrastructure in Copenhagen, but it doesn't have a spectacular tower, a clear centre or a main entrance. It is a different kind of station – a completely open space consisting of variations of organic suspended roofs, and pathways that fluently integrate with the city around it. It is a space of constant flow that one gradually becomes part of as one moves with the stream of people to the many underground platforms.

The architects explain that, in wintertime, the station showed that it has a voice and life of its own by revealing the organic pathways drawn on its snowy surface. The pathways, created by people's movement in and around the station, clearly showed them where there was a need for passages, shelter and bicycle storage.

Therefore, the pedestrian flow was the main design parameter of the new Nørreport Station. The entrances to the underground platforms became the starting point of the new station design, as they were fixed and could not be moved. A study was made on how people moved to and from these entrances. When mapped out, the movements formed organic curves of flow across the urban space.



Nørre Voldgade
Tag 2
Elevator
Hovedtrappe
13260
Bygning 3
Tag 3


Nørrevoldgade
Botanisk Have
Tag 5
Cykelparkering
Rosenborg Kaserne

Figure 83 Sky view from the bike parkings and functional roofs

The station elements were arranged in between the main flow lines to make the best use of the heavy traffic areas. This provides optimal access to bike storages, kiosks, washrooms, and ticket stands without disrupting the natural flow of movement.

The transparency and overview of the station is created by lowering the bikes into the surface of the ground, and by emphasizing the ventilation towers as free-standing light sculptures and information columns. All functions and stairs to the platforms below are united under large, hovering roof structures.

The roofs hover like a cluster of clouds atop the different station elements. In some places, they provide cover for round glass buildings containing kiosks and public toilets. In others, they shelter the staircases leading down to the station's underground platforms or cover some of the many bikes that are located at the far end of the station. The organic shapes of the new station are designed to create a generous public space where people can move through fluidly. A fantastic side effect to the curvy design is that now Nørreport has no corners and backsides, which means a safer environment for the users.

From bicycle parking to "bicycle beds" One of the big task for the architects in this project was not only planning the stations itself but also answer the question how to organize thousands of bikes in a very dense urban setting, without creating clutter and visual eyesore? The solution was to place them in well-defined areas slightly lowered into the ground, as sunken 'bicycle beds'. This way the bicycles have their designated space and are less visually obstructive. The stands keep the bikes contained and work against expanding the outer edges of the parking spaces. Multiple options were tested on how to efficiently arrange bikes and still create high quality urban spaces around

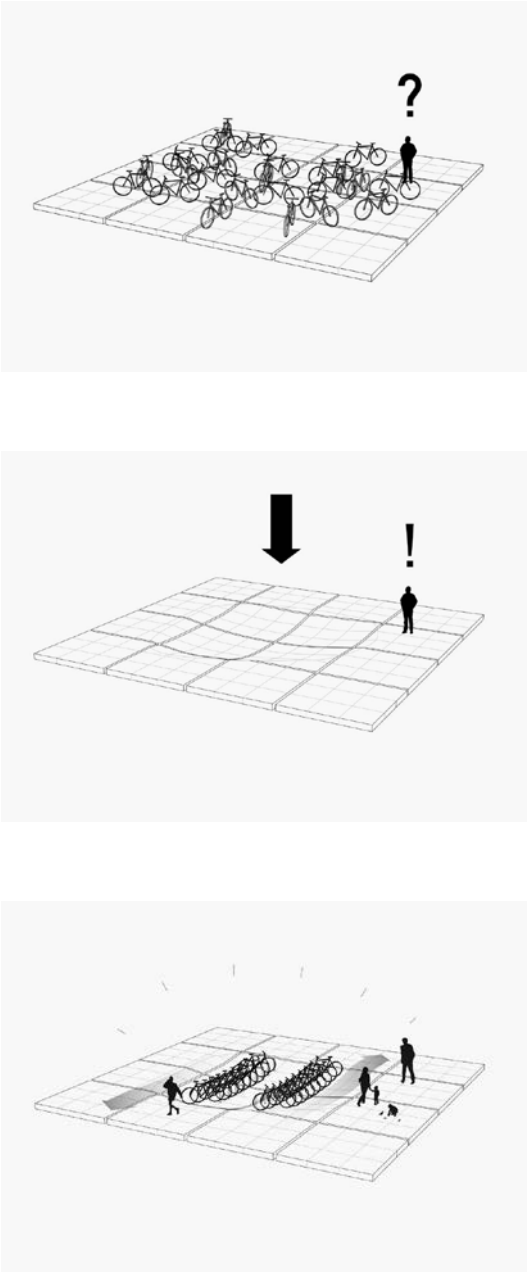


Figure 84 Innovative solution for bike parking to free views at eye-level

them. The bike beds are arranged around the flow of people that pass through Nørreport every day.

The cyclist is highly prioritized at Nørreport Station. In the stream of people passing through the station area, efficient and orderly bicycle parking is situated in small clear islands. These areas are strategically placed according to the flow of bikes from the surrounding streets. Bicycle parking is not stored away, but instead is a beautiful and integrated part the streetscape.

The bicycle parking at Nørreport stands out as dense gardens of small light columns. These provide natural pauses in the movement over the dynamic landscape. Like flowerbeds in the park, the bicycle parking is lowered 30-50 centimetres into the surface of the ground. They appear as smaller pockets on the square, where one can easily and comfortably park a bike before moving on.

When the bicycles are parked in the lowered bicycle islands, there is a clear indication of where to park and where to walk. At the same time, the lowered bicycle section provides visual calmness; the bikes become less dominant and one can see across the entire plaza.

The bike stands are singular, free-standing columns that are placed into the pavement of the overall grid. The circular columns mirror the rounded expressions found in the rest of the station design. The bike stands are arranged at different distances to create space for the diverse selection of bikes used in the city, from slender racing bikes to larger Christiania carrier cycles.