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# Design studies on the coexistence of city and rail

## Attempts on integrating railways in the urban context

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*ABSTRACT. Railways provide connection but, at the same time, rupture. They are entangled with the city, posing inevitably the question of their spatial cohesion with the urban context. The aim of this paper is to understand how design research can contribute to the improvement of railroads in their urban environments, with particular attention to the way new forms of interactions with the existing cities can be accomplished. Starting with some excellent historical examples, like the Great Victorian Way of Joseph Paxton and the Vienna's Stadtbahn of Otto Wagner, the paper will illustrate the project for the metropolitan railways in the Dutch City making a jump to the present time. At the end of the paper, the work of the Master Graduation Studio Hybrid Buildings at the Faculty of Architecture – TU Delft will be shortly shown; the case study is the 'Zuidas' area in Amsterdam.*

*KEYWORDS: Design Research, Railways, Mobility, City, Urban Voids.*

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## **1. Introduction**

Like any other infrastructure in the urban context, railways provide connection but, at the same time, rupture. The main problem is that for various reasons throughout history, it has been very difficult to combine other types of urban circulation and functions to the railway yards. Railways are 'by nature' too often physically disconnected to their (urban) environment, forming an autonomous transport system that follows the logic of efficiency in performance and technique. In tune with this practice, many railways have been built in the past without considering their integration into the surrounding (urban) environment. The result is that today the railways are often entangled with the city, posing inevitably the question of their spatial cohesion with the urban context. Particularly nowadays, in the XXIth century, the discussion about the development and transformation of mobility dynamics creates interesting perspectives for designers. The project of infrastructures is often an occasion to propose interventions for the transformation of the city wherein technical as well as political, economical and geographical factors are involved. Regarding railroads, this debate has constantly being alive all around Europe. During the XIXth century, with the question of how integrate railways with the existing cityscape, as well as nowadays, considering the number of competitions and projects for the accommodation of metropolitan and high-speed railway lines.

In this framework the realization of new railways and stations along with the transformations, re-conversion or re-use of existing ones, are currently important issues in the research field of urban landscape and design as well as in practice. These projects are embracing every time greater urban areas. Some of these areas are inadequate for mobility, marginal to urban fabric and unattractive, (in)directly showing social, economical and environmental burdens at several scales. Because of their size and importance this type of projects requires constantly new approaches. It is clear that such projects cannot be approached only as solutions for large-scale objects isolated from the surroundings. At the contrary, taking into account the complexity of every specific urban setting, they must be seen as opportunities to rethink the urban environment as a whole. In order to function, be adequate and fit, railroads should blend with urban landscapes, engaging not only with engineering but also with physical, social and cultural dimensions. The design task is therefore not only about embellish the technical solutions but mainly about providing answers as well as inspiration for all different parties involved in the process.

## **2. Railways in the modern city: the first design studies**

In the XIXth century the European city in general, still based on its medieval structure, transforms drastically by the effects of the industrial revolution. The city expands, not only due to morphological extensions but also because new means of transportation change the perception of its visible boundaries<sup>1</sup>. From 1800 to approximately 1865 the population of London and Paris had almost quadrupled; by 1880 also Berlin and Vienna had considerably grown, reaching both almost one million inhabitants. Consequently, the need of better transportation inside the city becomes an important matter, particularly in order to improve the mobility of citizens. Main roads had to be enlarged and newly paved to meet the demands of

the increased vehicle traffic. Yet, despite various efforts of public authorities, chaos and congestion in major cities did not seem to stop.

A consistent solution to the growing demand for reliable and faster transport came with the railway, already tested as transportation system between cities; its characteristics made the train a valuable transport alternative inside the city itself. In 1855 Joseph Paxton made in London the first proposal for a new urban communication network including a railway. Paxton presented a 10 miles long boulevard, in the form of a girdle, envisioning in the heart of London a quite sophisticated system: a street, a railway and an arcade with both express and stopping trains running through the upper levels (Fig.1). The route would cross bridges and parks not touching any important building. The arcade would be accessible from all existing streets and would house also hotels, shops and cafés; Paxton's plans included even the proposal for the neighbouring housing. The Great Victorian Way would serve also as connection between all stations, facilitating effective intermodal transfers between the railway termini in the city. Following the experience of the Crystal Palace, the Great Victorian Way was thought completely of iron and glass and included solutions for the ventilation and sewerage system. This project expressed a quite radical image of future town planning and Joseph Paxton was absolutely aware of that; he believed in its relevance and viability and, with firm determination, he presented the proposal to Lord Granville and Prince Albert, who showed Paxton's ideas to the Queen. Nevertheless, despite his revolutionary achievement of the largest iron and glass buildings in the world, Paxton's visionary plan for the Great Victorian Way was just too big in scale and, due to the conflicting interests inside the Metropolitan Board of Works, did not come into realization<sup>2</sup>.

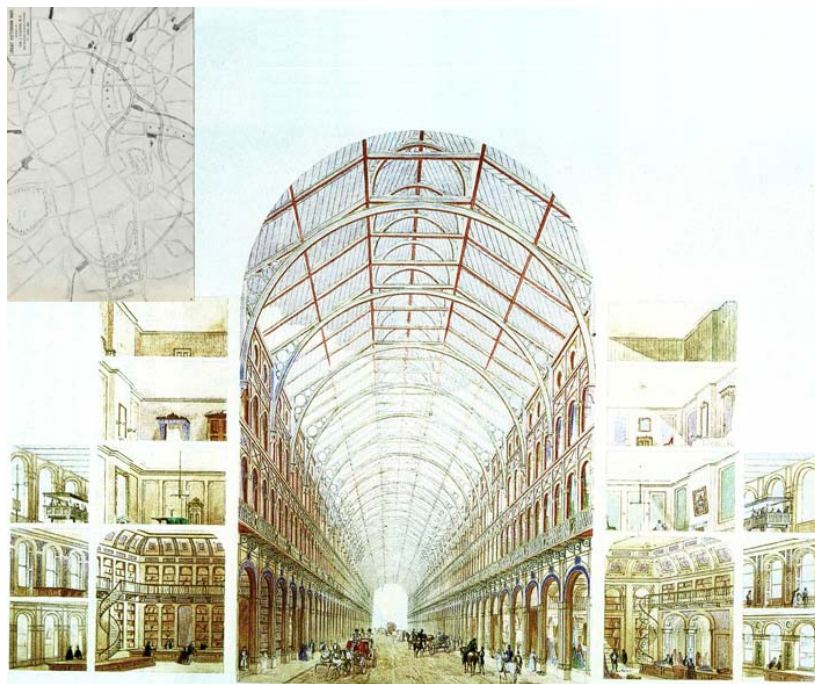


Fig. 1

Few years later, in 1863, the first steam powered metropolitan railway line opened in London between Paddington and Farringdon<sup>3</sup> and, despite the enormous pollution caused by the steam train in the underground section<sup>4</sup>, became a great success. Additional advantage was the possibility to combine its construction with the realization of sewerage systems and water ducts. Soon after the example of London, the discussion about the construction of metropolitan railway systems started in other European cities. Especially from the viewpoint of urban planning, the emergence of the railway as transportation system plays an important role in the way the expansion of the modern city was conceived. Representative examples are the projects for the *Circle Line*<sup>5</sup> in London, the *Petite Ceinture*<sup>6</sup> in Paris or the *Ringbahn*<sup>7</sup> in Berlin. No major city could be imagined without a modern railway system; but this new element also brought new questions. What kind of impact would the metropolitan railway lines have on the existing city? What would be the most sensible architectural approach to design and construct its buildings? And what would be a proper way of showing this type of projects to the citizens? It becomes clear that the design of stations, viaducts, tunnels and bridges cannot be left only to engineers but requires the expertise of architects with the ability of envisioning new interrelations between infrastructure and existing urban environment.

### **3. Railways in the urban context: the example of the Vienna's *Stadtbahn***

The debate about the expanding modern cities finds in Otto Wagner one of its most remarkable exponents. About the modern city he stresses in the book 'Moderne Architektur'<sup>8</sup>: "their unprecedented size has given rise to a number of new problems that await an architectural solution". The new problems awaiting an architectural solution become visible when the new railway system must be integrated in the existing cityscape. The railway with its iron bridges and viaducts, symbols of the modern technology but traditionally belonging to the world of engineers, is a threat for the existing city and its monuments. In this respect the mission of the architect is to harmonize the realistic and practical approach of the engineer with the more idealistic attitude of the artist.

The participation at the competition for the *Stadtbahn* in Vienna in 1890 is for Otto Wagner a unique occasion to deal with this issue in practice. In the various projects for the railway system presented since 1871, the main concerns of both municipality and public opinion were on how viaducts and railway tracks on surface could appropriately be combined with the existing city. Wagner wins the competition proposing six lines in total, four of which would be realized. Wagner's proposal is extraordinary thanks to the powerful range of drawings envisioning the integration between infrastructure and city. The production between 1894 and 1900 of almost 2.000 drawings about the *Stadtbahn* confirms Wagner's determination of controlling every single detail of the project.

In the final realization we can identify various stylistic tendencies, particularly in the stations of the different lines. Wagner's studies about the relationship between city and infrastructure become completely explicit, in my opinion, in the 'Gürtellinie'. This part of the *Stadtbahn*, characterised by the alternation of bridges, viaducts and walkovers, crosses almost all city radials connecting the heart of Vienna with the outskirts. In the main traffic points, Wagner treats the side elevation of the railway viaducts like the facade of a building (Fig.2). In addition, Wagner studies carefully the overlaying points between railway and city, controlling

as much as possible the impact of the infrastructure on the existing urban context. In several illustrations Wagner shows how the new railway line could be superimpose on the existing urban texture; this is clearly visible in the drawings by means of broken lines projected on the urban plan

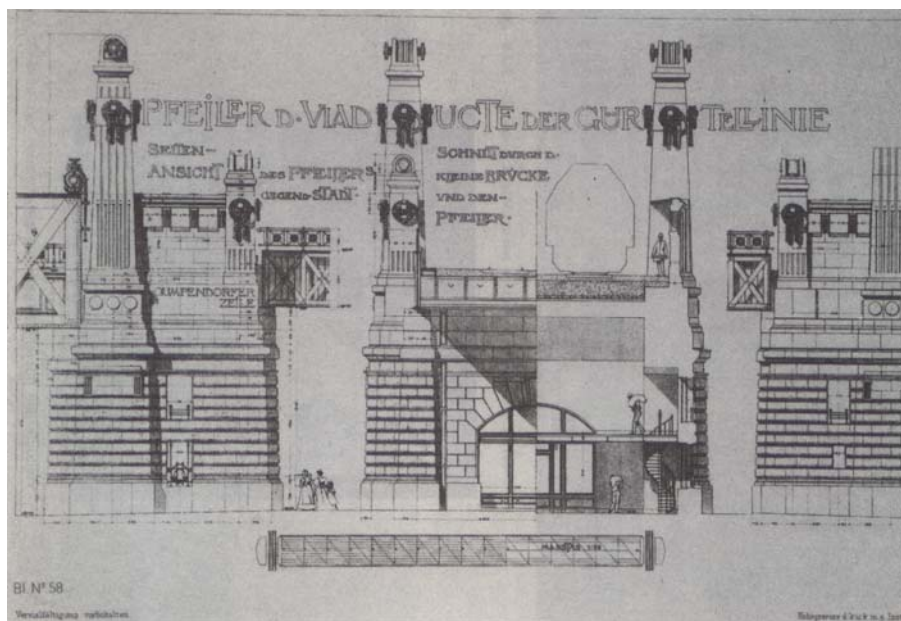


Fig.2

The famous perspective drawings for the 'Hochbahn-Viaduct' (Fig.3) and the pavilion on the 'Elisabethplatz' are clear examples of Wagner's interest for the architectural problems of the modern city. Wagner's studies on the integration of architectonic prototypes in the urban scenery, without any precedent reference, are quite unique for that time. The viaducts are fulfilling a double role. At the one hand statically supporting the tracks on the higher level but, at the other hand, functioning as building with a facade on the street or facing the square. Following this interpretation we could consider these elements as hybrid buildings produced by the development of the modern city. On the same level of the street or square we find not only the access to the station or the accommodation for the railway machinery but also other commercial activities, often housed on two levels under the viaducts. Yet, Wagner's choice for the perspective's viewpoints represents the real experimental character that he entrusts to his drawings. He controls from man height viewpoints the perception of the entire urban space as well as the proportion of viaducts. It is for this reason that, as Günter Kolb notes in his publication on the project<sup>9</sup>, the viewpoint in Wagner's perspectives is very decentralized in relation to the drawing frame. By making the drawings in this way he can appropriately show the right proportions of the different elements composing the street. Pylons and walls, the main structural elements of the viaduct, are placed parallel to the direction of the street, underlining the urban continuity on the ground level also in the presence of an underpass.

These hybrid buildings are treated almost as monuments envisioned as architectural symbols of the modern city. As already mentioned before, the means

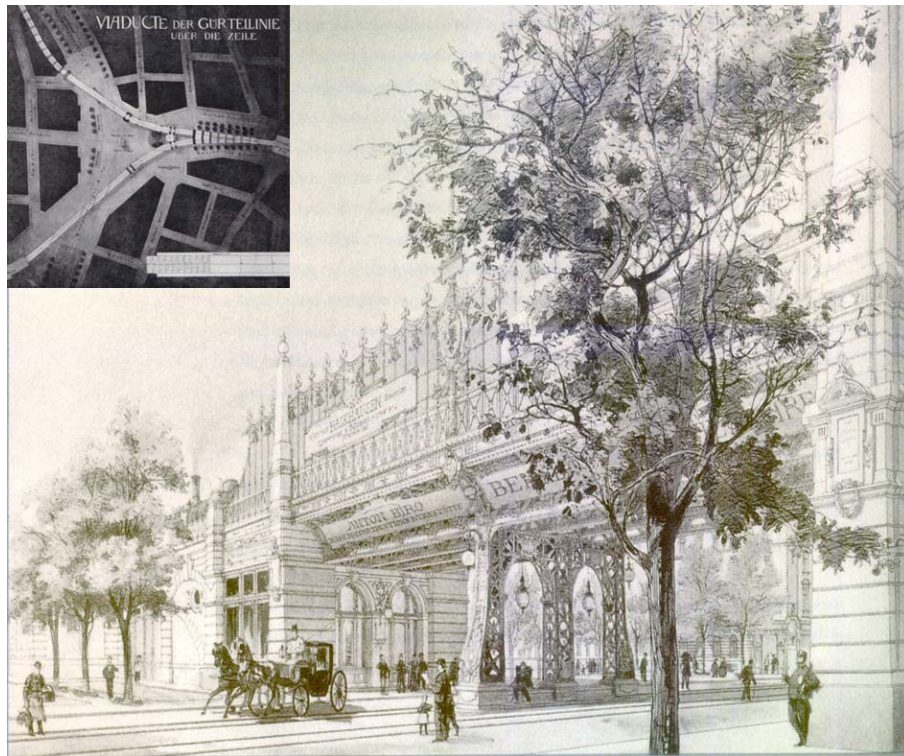


Fig.3

of transportation becomes a building with facades; it is not a barrier anymore but it integrates itself in the cityscape. This is one of the most innovative aspects of Wagner's work; he is fascinated by the possibility created for the traveller of understanding the city through another perception and speed, thanks to the new means of transportation. In some of his writings he describes the coexistence between railway and city in a romantic way, proper of his period, but at the same time with the firm conviction of a modernist.

#### 4. Awaiting metropolitan railways: the Dutch project

While main European cities were concerned with the realization of metropolitan railways, in the last quarter of the XIXth century the discussion in The Netherlands, and particularly in Amsterdam, was still on whether the mainline tracks would reach the city centre at all. Due to its size and relatively small population, the compact Dutch city did not immediately need metropolitan railways. Amsterdam was still served by two terminus stations situated at the edge of the historical city. In addition, the city needed better rail connections with its harbour area. Representative of the debate about the location of railway and station in Amsterdam are the proposals of Huët (1867) and Berlage (1915). The first one envisions a central station on Dam Square, in the heart of the city. Berlage, instead, proposes in his extension 'Plan Zuid' an additional railway station on the



southern edge of the city. Together with the central station of Cuypers, by that time already built, Berlage's station south anticipated the possibility of a bipolar transportation system in the city; the realization of such proposal would have required a connection between the two stations, probably a metropolitan railway like other European capitals.

Nevertheless, things went differently and the metropolitan railway did not become an issue until the 1960s. The link between centre and new peripheries became in Amsterdam -considerably expanded in size- a sensitive social issue. Rotterdam was different. The Second World War bombings destroyed almost the entire city. Therefore the project of metropolitan railways was part of the reconstruction plans. In fact it's Rotterdam the first city opening a metropolitan line (the 'Erasmuslijn' in 1968). In the meanwhile the Amsterdam city council decided to replace part of the existing network of trams, already stuck in the surface traffic, by a mainly underground metropolitan network connecting the outer urban areas. The project proposed the realization of four lines. More the result of a social compromise than a straightforward technocratic solution inspired by earlier European metropolitan experiences, the ring-like metropolitan system of Amsterdam had to connect different peripheral districts with each other and the central station, avoiding as much as possible the historical urban core. The first two metropolitan lines opened only in 1977 and three years later both lines reached the central station. In 1990 the transportation system of Amsterdam was expanded via surface light rail towards the south and in 1997 the ring line opened, connecting the western districts to the ones in the southeast. Part of both lines is running in the middle of the southern motorway ring road, passing through the *Zuidas* corridor.

## **5. Railways entangled with the city: projects for the *Zuidas* in Amsterdam**

Like other European capitals, Amsterdam is updating its transportation system and, along with it, its insertion in a greater territorial context. After the gradual expansion of the transportation network to the outer borders of the agglomeration, another crucial moment in the development of Amsterdam is arrived: the new North-South metropolitan line (Noord-Zuidlijn)<sup>10</sup>. The central railway station and the subway are nowadays both part of a comprehensive transportation system having as main switch the airport of Schiphol, a major hub on the high-speed railway network and international air transport. In addition, the new North-South metropolitan line is not only the link between mainline stations but also a new chapter in the urban project of Amsterdam. For the first time the relatively underdeveloped northern part of the city, beyond the IJ-water, will be connected by a metropolitan railway line to central station and city centre.

It is expected that 200.000 passengers will daily use the North-South line. The stations are supposed to last hundred years but their architectural presence will not be evident on the surface. Back in 2001, Jan Benthem, responsible for the project as chief architect of Benthem Crouwel Architects, criticized the political choice of a subway invisible on the surface. The historic core of Amsterdam was not supposed to be contaminated by the high-tech machine below. The museum city will be easily accessible thanks to the North-South line, but the architectural evidence of this great improvement should be hidden and stations should finally offer solutions for the pragmatic needs (Fig.4). The North-South line will also be the link between the central station and the *Zuidas* station -also known as Zuid-WTC station. Only few yards away from the location pointed out by

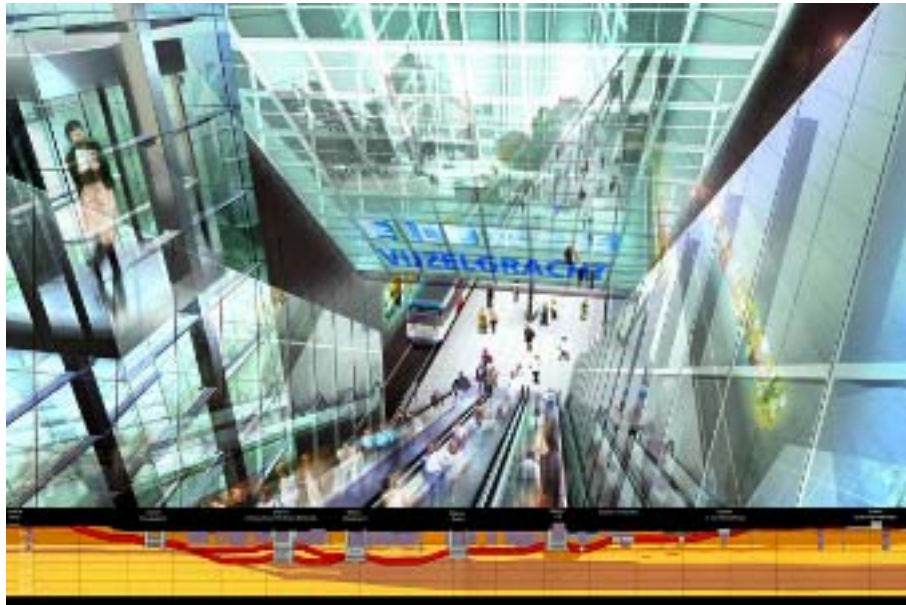


Fig.4

Berlage for his southern station, railways as well as metropolitan railway lines and future high-speed trains, will be all organized in a futuristic high-tech transport hub. Well connected to Schiphol airport, this area is probably the business top location of the entire country with the offer of offices, housing, shopping, in a dense, urban, mixed-use environment.

But what will be the role of architecture in defining the characteristics of new the *Zuidas* station area? Following the assumptions of the North-South line project, a serious of boxes able to house different transportation systems. With architecture almost disappearing, the attention goes to the master plan that only gives an impression of how the city will take shape during the coming two decades. Without disturbing the flows of traffic, the architecture will gradually fill up the location and distract from the infrastructural surgery. This assumption is confirmed by the recent *ZuidasDok* plan<sup>11</sup>, a proposal wherein a section of the ring road A10 is accommodated into a tunnel, creating space for other developments on the surface.

Having the above-mentioned issues in mind, together with students we focused on Amsterdam *Zuidas* as case study<sup>12</sup>. Our attempt is to understand how design research can contribute to the improvement of such urban environment as whole. Next to the solution for the transportation node, proposals are tackling with other problems of the area: firstly the almost complete disconnection between the northern and the southern part of the city. Railroads and motorway are cutting the city literally in two, increasing the barrier effect caused by the infrastructures. The second issue is the evident fragmentation of the urban fabric, accentuated by the heterogeneous characteristics of the existing buildings. Among several designs, putting forward quite different viewpoints, it's interesting to illustrate one of the projects focusing on the *Zuidas* urban environment by stressing the importance of connecting the two sides of the city.



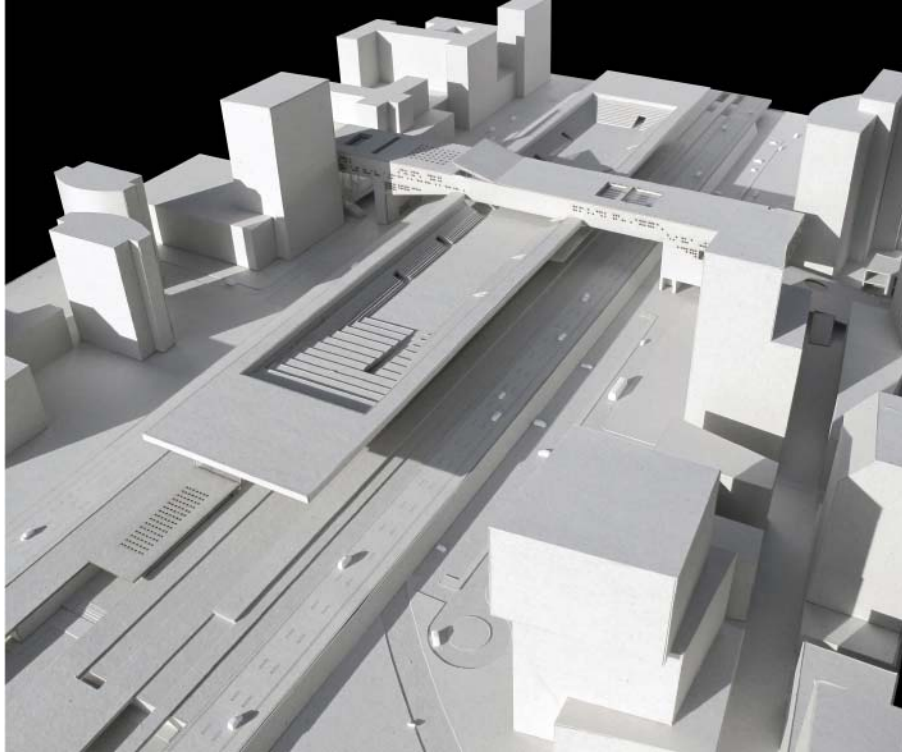


Fig.5

Emphasizing the link between the southern and the northern part, the main goal of Jang Hwan Lee's proposal is designing a contemporary station complex using the available interstitial spaces between the existing infrastructures above the ground. The project foresees two complementary parts joining above the main station hall. The first part is the north/south-oriented building giving access to the station and bridging with one gesture the gap between the two sides of the city. The second part is the so-called 'Elevated Plaza', a huge superimposed urban element, housing additional functions like a shopping centre, offices and leisure (Fig.5). Both elements lay on load bearing components touching the ground only at the interstitial spaces between the existing infrastructural lines of both railroad and motorway. The theme of how to use the forgotten in-between areas can be considered the leitmotif of this proposal. Next to his intrinsic value as a representative design of the graduation studio's approach, Jang Hwan Lee project shows a valuable position on how architecture can contribute to envision the future transformations of such complex urban environments.

## 6. Conclusions

Today the transformations of railway networks are such that it is legitimate to question the future of cities in relation to the train not only as means of transportation but also as catalysts of developments. In the case of The

Netherlands, this is an important field of study, particularly considering the current governmental targets.

Therefore it is not a coincidence that we are currently concentrating on projects and research regarding the transformations of railway infrastructures. Next to sharp planning strategies in the practice, design research in the academic setting is needed in order to help defining the right parameters of intervention and experiment beyond the reach of what the official authorities or project developers think to be feasible, anticipating and envisioning future transformations of the (Dutch) city.

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## 9. Notes

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<sup>1</sup> More about these aspects can be found in the book of W. Schivelbusch, *The Railway Journey, the industrialization of time and space in the 19th century*.

<sup>2</sup> For life and work of Joseph Paxton look at the book K. Colquhoun, *A thing in disguise, the visionary life of Joseph Paxton*.

<sup>3</sup> For more information about the London metropolitan railways look at T. C. Barker, M. Robbins, *A history of London Transport, vol. 1, The nineteenth century*.

<sup>4</sup> The electrification of metropolitan railways in London started only around the end of the nineteenth century.

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<sup>5</sup> Although the municipality of London authorized the route as early as 1853, due to financial problems, the Circle Line was completed only in 1884. The Paddington and Farringdon route is part of this railway line.

<sup>6</sup> The Petite Ceinture of Paris is a circular railway line realized between 1852 and 1869 and connecting all railway lines going into the city centre. Although initially meant for freight transportation, this railway line was fully operational also for passengers and for this reason is somehow considered as the precursor of metropolitan railways. The Petite Ceinture is nowadays in disuse.

<sup>7</sup> The Ringbahn (circle line) of Berlin was build between 1867 and 1877.

<sup>8</sup> Otto Wagner, *Moderne Architektur, Seinen Schülern ein Führer auf diesem kunstgebiete.*

<sup>9</sup> Günter Kolb, *Otto Wagner und die Wiener Stadtbahn.*

<sup>10</sup> See also S.U. Barbieri, R. Cavallo, F. Geerts 'Amsterdam, Noord/Zuidlijn. A new chapter in the city's project' article in *Rassegna 84.*

<sup>11</sup> Information about this proposal are available at the website: [www.zuidasdok.nl](http://www.zuidasdok.nl)

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## 8. Legends

(Fig.1) J.Paxton, The Great Victorian Way. Section and plan (above left)

(Fig.2) O.Wagner, Vienna Stadtbahn. Drawing viaduct Gürtellinie.

(Fig.3) O.Wagner, Vienna Stadtbahn. Plan (above left) and perspective of the viaduct Über die Zeile, Gürtellinie.

(Fig.4) Noordzuidlijn Amsterdam. Rendering station Vijzelgracht and general scheme.

(Fig.5) J.H. Lee, project for the Zuidas Station Complex in Amsterdam. Photograph of the model.

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