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The Lisbon and Seville stations: their place within railway station typology and their impact on the organization of urban space[1]

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Abstract
The introduction of railway transportation to the Iberian Peninsula entailed the construction of a series of structures that were essential to its functioning, from the railway lines themselves to water deposits, workshops, and stations. The latter assumed varying degrees of importance, depending on their location along the lines: those which were in cities, being the starting points of railway lines, were bigger-sized and more important. While some stations were little more than mere halts, very simply built, their urban counterparts in the big cities constituted great public works and are considered, as a group, to be among the most characteristic examples of industrial architecture. In the 19th century, railway stations were the most visible picture of the novel architectonic programs using cutting-edge technology, regarding materials – iron, steel, and glass – and lighting, through the use of electricity. This turned them into privileged spaces for applying and demonstrating materials, styles, techniques, functions, and meanings that crucially altered the 'street aesthetics', leading to a profound renewal of both the morphological organization of cities and the urban landscape.
In this article, we aim to make a comparative study between two stations in Lisbon (Rossio and Santa Apolónia) and another two in Seville (La Plaza de Armas and San Bernardo) to investigate, on the one hand, how they fit into the typology of their respective countries' railway stations, and on the other, whether they had an identical influence on the organization and enlargement of their cities' urban spaces.

Keywords: Railway Station, Industrial Architecture, History of Urbanism.

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Train stations, iron architecture and the urban landscape

> The state of the science of the iron constructions was not advanced enough, the security given by the calculations was not yet assured; today, they know where they are going, they are able to count the force of the wind. The resistance which the iron opposes to it. Mr. Eiffel came at the proper time (Universal Exhibition Paris 1889 – Practical Guide).

Iron buildings saw great expansion after the 1851 Universal Exhibition, organized by Henry Cole (1808-1882) and Prince Albert in London, for which was built, in iron and glass, the Crystal Palace[2]. This palace, along with Les Halles in Paris in 1853 and the Saint-Eugene church in 1854, significantly contributed to demonstrate the potential of iron as a building material. From the 1889 Universal Exhibition onwards, iron was gradually replaced by steel for technical reasons, the latter being both harder and more elastic. In fact, the stages in the architecture of iron followed up closely on the evolution of these materials' technology and economics (Lemoine, 1986).
Serving as the point of arrival and departure of a means of transportation whose dimensions had never been seen before, mobilizing people and goods in great numbers, urban stations were great public works – for some, like Loyer (1983), they were even the most characteristic example of industrial architecture, because "Bien plus que l'usine, la gare est symbole de l'architecture industrielle – pour deux raisons: c'est le lieu d'exhibition des machines auprès du grand public, c'est aussi celui où, tout naturellement les matériaux produits par l'industrie on le plus tôt trouvé la place". In the 19th century, railway stations were the most visible picture of the novel architectonic programmes[3] and of the techniques used at the time (Lemoine, 1986).
According Karen Bowie "C'est le fer qui constitue les nouvelles voies et une place convenable doit lui être réservée dans les édifices qu'elles font élever. Elles semblent appelées à glorifier en quelque sorte cette précieuse matière dont l'industrie vient de doter l'architecture" (Bowie, 1994, p.205).
These buildings were spaces of experimentation for architects and engineers. The clash between these two professions, which characterised a large part of the 19th century, was often present in the making of these buildings. This debate pitched the defence of form over matter, favoured by architects, against the engineers' idea stating the precedence of materials and techniques[4].
The "double function – reception hall "in the front" and passing-through halls "in the back" – resulted in many cases in the kind of typical representative form exhibited by polarized disciplines of construction of that time: "Architects" – mostly from the Beaux-Arts school – built the front sites, ingénieurs centraux constructed the industrial halls above the tracks" (Pafmmatter, 2000).
The development of technique and of the use of iron as a building material was decisive for the construction of railway systems that transformed urban landscapes – not only due to the existence of railroads, but above all thanks to the construction of railway stations, which remain to this day, according to some authors, the most important examples of iron architecture.

[2]When we refer to this kind of architecture, we mean buildings made from iron ore, i.e., iron, steel, or cast iron. Meanwhile, cast iron, since it allows the creation of pieces of different shapes and sizes, was the one which really marked metallic construction in the first industrial period.
[3]Also known as the "requirements program", it lists the social and functional needs of a given type of construction.
[4]As mentioned by Francastel (1956), this debate concluded with the insertion of technique into the life of the arts.

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In the beginning, iron was not unanimously accepted by architects and people in general as having aesthetical value. For that reason, the metal structure was often concealed under other materials. Such was the case with the old Gare d'Orsay, built in Paris from 1898 to 1900, covered in stone so as not to clash with the architecture of this area of the city. It was and still is, however, a major reference in iron architecture.
Railway stations, viaducts, tunnels, and tracks spread throughout the Iberian space from the second half of the 19th century on, leaving their imprint on the landscape wherever construction and engineering work were carried out. As we shall see, in both Lisbon and Seville the main railway stations started out as plain buildings which were later replaced by much larger ones using iron in their construction. Given their great dimensions, the halls of railway stations were often seen as 'Iron Cathedrals', despite the contradiction between the greatness of a cathedral and the vulgar nature of a large hall, entrepot, or hangar (Salem, 2005).
Railway stations had not only enormous boarding quays, in which metallic structures and glass met in a new conception of space, but also immense circulation and waiting areas which should draw inspiration from "the good principles of architectonic art", contributing, "like temples do, to educate the people's taste" (Azola y Munondo, 2000). The utilization of iron and glass was also a statement of the development of engineering and of engineers' command of new materials and construction techniques. Thus, they affirmed the country's technological progress and expressed its modernity, all the more so since railway was at the time a symbol of progress.
The stations serving as points of entry and exit from the cities were often used to reinforce their countries' national identities. The construction of large train stations in the middle of cities caused significant urbanistic changes. Very often it implied the destruction of low-rent housing and other pre-existing buildings. In other instances, it favoured the construction of residential boroughs and the opening up of new avenues (Pinheiro; Matos, 2014).
In the 20th century, railroads often promoted urban deconcentration and the emergence of new suburbs, which toward the end of the century became degraded city areas. In the last decades of the century, the railway stations' economic and urban power of attraction caused them to be included in projects of urban restructuring – including the projects dedicated to the 1992 Universal Exhibition in Seville and the 1998 Universal Exhibition in Lisbon.
Having set this contextual framework, this article aims to help us understand the influence exerted by railway on the cities of Lisbon (Portugal) and Seville (Spain), through a comparative analysis starting with the history of how the railway system was implanted in those two cities, the typologies of train stations in Portugal and Andalucía, the Portuguese railway stations of Santa Apolónia and Rossio (Lisbon) and the Spanish stations of Plaza de Armas and San Bernardo (Seville).

Railroad in Portugal and Spain, and the absence of connections between Lisbon and Andalucía

Due mainly to the unavailability of capital, a lack of skilled labour, and rugged terrain which made it necessary to build numerous bridges and viaducts, the implantation of the railway network in the Iberian Peninsula came later than in other European regions. Although Spain had drawn up plans for railroads in its territory from 1829 to 1832, the first railway line, linking Barcelona and Mataró, was only inaugurated in 1848 (Alegria, 1983). In Portugal, railroads arrived later, in 1856, connecting Lisbon and Carregado. This delay of almost ten years, relative to Spain, can be

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explained by the political and economic instability which the country faced in the first half of the 19th century[5].
The main point in building the railroad, for Spain, was to interconnect several locations across the country, namely linking Madrid[6] to the main ports on both the Northern and Mediterranean coasts. Portugal, on the other hand, sought to promote Lisbon as the principal trade hub between Europe and the Americas, for which reason the connection of its railway line to Spain was essential (Pinheiro, 1986; Salgueiro, 2008). This explains why Spain prioritized the consolidation of connections within its national territory, while apparently leaving in second place the railroad link to Portugal.
The installation of railway lines in both countries was due mainly to the initiative of foreign entrepreneurs, who possessed the capital and human skills needed to execute these great public works.
Regardless of each country's general purposes or modes of management, we can see that both Spain and Portugal ended up planning railway lines which could promote their capitals as the central points of their respective networks. Thus, by graphically studying the layout of the railway lines built in the Iberian Peninsula, we can identify the location of Madrid and Lisbon through the convergence of a great number of railroad branches toward these two points.
The first merger of railroad plans began in 1864, with the report of the 1st Portuguese-Spanish Joint Commission (November 1st). This report laid down the courses of the lines which were to connect Portugal and Spain. Of the four planned links, only two saw the light of day:

- Minho Line: Porto – Valença – Tuy - Vigo (1886)
- Douro Line: Porto – Régua - Salamanca (1887)

One of the unbuilt lines, called "Tagus River Valley", seems to have been replaced by the Cáceres Line, built in 1878 by the Spaniard D. José Salamanca for the transportation of phosphates. Another unbuilt project was the Guadiana Line, designed to link Lisbon to Huelva. The reason here was that it would probably have generated competition between Spanish ports (Cádis, Seville and Huelva) and the port of Lisbon (Alegria, 1983).
The first line to establish a connection between the two countries was the Carregado line (already mentioned) which was extended to Badajoz, having reached the frontier in 1863. Over the years, some railroads in the Iberian grid were deactivated, as was the case in 1889 with the Cáceres branch. The Douro Line lost its extension to Spain when this country managed to connect Salamanca to Galicia, thus undermining the trajectory previously followed within Portugal.
There was never a direct railroad connection between the region of Andalucía, where the city of Seville lies, and Portugal. The earliest railway lines in Andalucía worked as an extension of its port areas for freight transport. Most of the equipment and coal needed for the railroads to function, in fact, came onto land through these ports. Thus, due to the competition likely to arise between the

[5]Portuguese Civil War (1828-1834). Its implantation began only during the *Governo da Regeneração* (1851-1910).
[6]For this reason, Spain's railroad history continued with the construction of the Madrid - Aranjuez (1851) and Madrid - Valencia (1859) lines (Sobrino, 1998, p.833).

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ports of Cádiz, Seville, and Huelva, and the port of Lisbon, a direct connection from Andalucía to Portugal never came to exist[7].
Being as it is a means of transportation of great economic and financial importance, the railway can be considered a structuring element for a country's territory, in several contexts and scales of analysis. So far, we have been able to grasp that the implantation of the Iberian railroad grid saw diverging interests and goals between Portugal and Spain, regarding the systems' implantation strategies, and that the Lisbon railway stations were never connected directly to those of Seville. Next, we will look at how this duality influenced the development of both these cities' architecture and landscape, by studying the *partidos arquitectónicos*[8] followed in these two countries.

The railway station typologies in Portugal and Andalucía
Generally speaking, the architecture of train stations was determined by the scale of their use and their importance within the railroad grid. The buildings that stood out were those that dealt with great quantities of people and goods. At first sight, Portugal and Andalucía seem to utilize similar typological definitions. In Portugal, buildings were classified as stations of Class 1, 2, 3, 4, or Halt (*Apeadeiro*) while in Andalucía the categories Small, Medium, and Large were used. Such classifications turn out to be nearly identical when placed in parallel. The Portuguese Halt, Class 4, 3, and 2 stations correspond to Andalucía's Small and Medium stations, while the Portuguese Class 1 stations match the Large stations of Andalucía.
For better understanding, a more detailed presentation of each typology follows below. It clearly shows that, despite the different goals laid out during the installation of the railway in both countries, the *partido arquitectónico* used to classify railway stations in the urban context appears to be the same.

- **Portugal**

According to Rui Manuel Vaz Alves (2015) the station typologies mentioned above were characterized as follows:

- **Halt:** it was a simple, functional support infrastructure, designed as a stop with two platforms and a small construction to shelter the passengers, which could or not include a ticket booth.
- **Class 4:** a two- or three-storey building, comprising a ground floor with a lobby, station master's office, ticket booth, merchandise and baggage dispatch room, and waiting room. On the upper floor was a house for the station master, with one or more bedrooms.
- The two typologies described above were built in the traditional way, in masonry and adobe.
- **Class 3:** a central body with two storeys (first floor: main entrance, waiting rooms, baggage compartment, ticket booth and station master's office; second floor: station master's home), two symmetrically laid out lateral bodies (bedrooms for the railway´s workers) and a metal-structure porch to shelter the passengers.

[7]For example, in the Conference on the Port of Lisbon (1883), the port of Seville was considered to be a competitor of its Lisbon counterpart. This conference was published in *Revista de Obras Públicas e Minas*, Lisboa, 1883, p.127-128.
[8]This term is used as a synthesis of the conditioning factors in the architectural project, taking into consideration the building's physical, technical, topographical and social characteristics.

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- **Class 2:** similar to Class 3 buildings, only larger, to accommodate more passengers and merchandise, besides being able to support other services such as railroad switch offices, signalling lamps, restaurant/bar and telegraph.

To these two typologies were added *azulejo* tiles depicting traditional customs and historical events of the country's history.

- **Class 1:** a station through which a great volume of passengers and merchandise flowed. Its building was designed in an exemplary way, according to the existing requirements. Sometimes it followed the region's traditions, at other times it favoured national styles, on yet other occasions it took a pre-existing building and adapted it to the new functions, even if this conditioned the new station's architectonic characteristics.

- **Seville**

Although different names from those chosen in Portugal were used, in Andalucía too rationality and functionality prevailed in designing the architectural programmes of railway stations, classifying their typologies in the following manner (Sobrino, 1998):

- **Small and Medium stations:** with a square or rectangular plan, it includes a waiting room, lobby, ticket booth and one main office. Some have two storeys, the upper one being reserved for the station master's residence. They might include a marquee on the boarding dock and a warehouse besides some services such as post office, station master's office, bathrooms and small dwellings for the employees.
- **Large stations:** their projects would vary in accordance with the city's size and importance.

The Lisbon and Seville stations in their urban context

Lisbon (Rossio Station and Santa Apolónia Station)

Despite being located in the same city, the Rossio and Santa Apolónia Stations had different urban and temporal frameworks. The Santa Apolónia station, at the end of the Eastern and Northern line, was the first railway station built in Lisbon, and the choice of its precise location generated heated debate. It was necessary to link the railway to the city port, so as to make the import and export of merchandise more efficient (Pinheiro; Matos, 2016). Its implantation was finally settled by an official document dated March 8th, 1853 (Abragão, 1956): it would be near the old port warehouses, at the *Cais dos Soldados*. For its part the Rossio station, inaugurated in 1890, was planned in a "Haussmanian" urban context, away from the river, being meant to provide a way in and out of the capital towards the Western region.

On September 17th 1853, work was begun on the first international railroad that was to connect Lisbon to Europe. Its area of implantation was very narrow, which implied significant investment in expropriations, land removal and consolidation, street frontlines and demolitions (Pinheiro; Matos, 2014) and made it necessary to bring down many structures – such as the *Forte da Cruz da Pedra*, the palace of the Abreu de Freitas family, and the ample yard of the *Forte de Artilharia*, among others.

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At the same time, land was reclaimed from the Tagus River. The first landfill was known as the "caldeiras"[9] and was located beyond the *Praia dos Algarves* area.
The building known as the "fish oil warehouses" (with a 7,700sqm area) saw works done in order to adapt it to its new functions – namely sanding-up, landfills and the construction of platforms along the river's margins, which began in 1855 (Alves, 2015).
The first ticket booth and halt of this line functioned in the former Santa Apolónia convent, which the *Companhia Real dos Caminhos de Ferro Portugueses* had acquired in 1852[10]. Initially, this halt was near the river, at the *Cais das Carvoeiras*; but later on, as more land was reclaimed from the river, it got farther and farther way from the latter, being moved eventually to the other side of the railroad.
In 1861, demolition began of the old the "fish oil warehouses", giving way to the construction of a railroad roundabout (Abragão, 1956). In October 1862, the French journal *Nouvelles Annales de la Construction*[11] described it by saying that it could contain up to 20 locomotives, being made up of two separate parts: the platform itself, which was the building's main body; and a building on the side, which formed a second external line and took up two-fifths of the main building. The latter housed the warehouses, accounting offices, both the deposit chief's and vice-chief's offices, the repair workshops, and the mechanics on duty.
Not long after this line started functioning, the first station turned out to be insufficient, due to an increase in the movement of people and goods. This made it necessary to erect, from the ground up, the present-day building of the Santa Apolónia station. The new location chosen implied a prolongation of the railroad lines, which initially had only gone so far as the convent[12]. This was accomplished thanks to the landfill mentioned before, on which work had begun in 1855.
The engineer Eugénio Page, in charge of the general undertaking of the Northern and Eastern Line, assigned the project of the Santa Apolónia station to Angel Arribas Ugarte – who then passed it on to the engineer J. Evangelista de Abreu, a man who had completed his training in Paris, at the *École de Ponts et Chaussées*, having had the opportunity to visit many railroad works, some stations among them. Construction was adjudicated to the firm Oppermann & C[a], which sent down to Lisbon the engineer Agnès to direct the works (Pinheiro; Matos, 2014).
In the beginning, the station's proximity to the Tagus River led to the adoption of a model shaped like an 'L' – instead of the more usual 'U' – since, as Charles Alfred Oppermann said, the plot on the riverside could later be expanded, through landfills, thus enabling the platforms to be enlarged at a later time. Thus, "the portion located beside the Tagus is taken up almost entirely, at the ground floor level, by covered passages: in this way it will not interfere in any enlargement on that side"[13].
The building consisted of a ground floor, a mezzanine and a first floor. Its width on the inside was 17.10 m. The mezzanine did not stretch throughout the whole building, so as to allow greater height in the waiting rooms, buffet, etc., located at the top. On the first floor were rooms for the service manager, committees, clerks, litigation, library, dressing rooms, and other uses. The director's

[9]According to Abragão (1956, p.460), these were small docks and river shelters scattered along the river's margins.
[10]Archives of the Lisbon Town Hall–LxConv091.
[11]A. Cassagnes, « Grand rotonde à locomotives annulaire de la Gare centrale de Lisbonne », *Nouvelles Annales de la Construction*, 8[e] Année, Octobre, 1862, p.162.
[12]This convent was brought down in 1950.
[13]*Nouvelles annales de la construction*, 12º Année, 1866, p.18.

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office, and those of several railroad engineers, were on the building's right wing, while on the left were lodgings for the service managers and the main employees.
In the words of Oppermann[14], "the best materials in the country" were used. Baseboards, door- and windowsills, columns, balconies, ornaments and cornices were made from cut-and-polished stone - white limestone with red veins, having the look and hardness of marble. The inner linings were made with lime and marble powder, "typical of this country", and the linings in the main rooms were smoothed out with a hot iron, after marble-like colours had been added, "which results in a very bright stucco, with a beautiful effect".
Parts of this labour had been carried out by Portuguese companies: masonry was assigned to the engineers of Charles Pezerat & Cª, stonework to António Moreira Rato, and woodwork to the mechanical sawing plant called *Aceleração*[15].
The great central hall where the trains were parked was covered with a 24.7m long iron structure. It had no intermediate supports, so the crossbows were reinforced at the points of support of the main rod, using iron plates, to give them enough resistance at the spots of greatest pressure. And in spite of several difficulties, stemming from a shortage of skilled workers, the nature of the materials employed and, above all, the great distances covered by materials and products which had to be transported – iron and cast iron for the structure and the iron beams, coming all the way from France and England, wood, ironware, metalworks, glass panes, lead for gutters, ceramic objects, ornaments which we had to import - the price of building this railway station was around one fifth of that of the new Gare du Nord, in Paris, per square metre of surface.[16]
Indeed, the metal covering of the hall was made in Glasgow by the engineer James Blair (Abragão, 1956), who found it necessary to make some changes to the original project.
Once finished, the station was inaugurated in 1865. From it, the railroad followed along the river up to the *Madre de Deus* building, at which point it turned northwards. In addition to the landfill works was built the Xabregas Bridge, 16.55m long, along with the construction of other viaducts and the tunnel passing under the *Calçada dos Grillos*.
Due to the need to expand the city, the 1870 *Plano de Melhoramento do Porto de Lisboa* [Plan of Improvement of the Port of Lisbon] included additional sanding-up work at *Cais dos Soldados* – beside the station, which up until then lay next to the river. The distance between the station and the river was further increased in 1935/1936, through the implantation of an avenue and a new pier. To enable people and vehicles to pass across the railway lines, a suspension bridge was built close to the station.
As the 20th century drew to a close, the Santa Apolónia station - in addition to its trade-related potential - gained importance in terms of tourism, thanks to its proximity to *Praça do Comércio* (*Terreiro do Paço*). In 1998, in order to unburden the Santa Apolónia area from the heavy traffic of people heading to that year's Universal Exhibition, the underground line was expanded and the area was re-urbanized (new road configuration and pavement, installation of acoustic barriers). Along with these changes came the construction of the Gare do Oriente, which caused the Santa Apolónia station to see a decrease in its number of passengers.

[14] *Nouvelles annales de la construction*, 12º Année, 1866, p.18.
[15] Diário Ilustrado, 31st August 1872, p.1.
[16] *Nouvelles annales de la construction*, 12º Année, 1866, p.19.

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Quite unlike the Santa Apolónia station, built at the city's eastern end – an area of low population density at the time – the Rossio station planted itself at the centre of the city, catering to the growing need of connections among the various railway lines.
In 1886/1887 the government authorised the *Companhia Real dos Caminhos de Ferro Portugueses* to make a railroad link between the Eastern and Western Lines[17]; an urban, double-track extension, linking the Eastern Line to an interface in downtown Lisbon[18]; and two branches in what would later become the *Linha de Cintura*[19]. With the making of these lines, aimed at connecting the capital to the rest of the country, Lisbon became an important railway node. This called for the construction of a large railway station, capable of managing a sizeable traffic of people and goods.

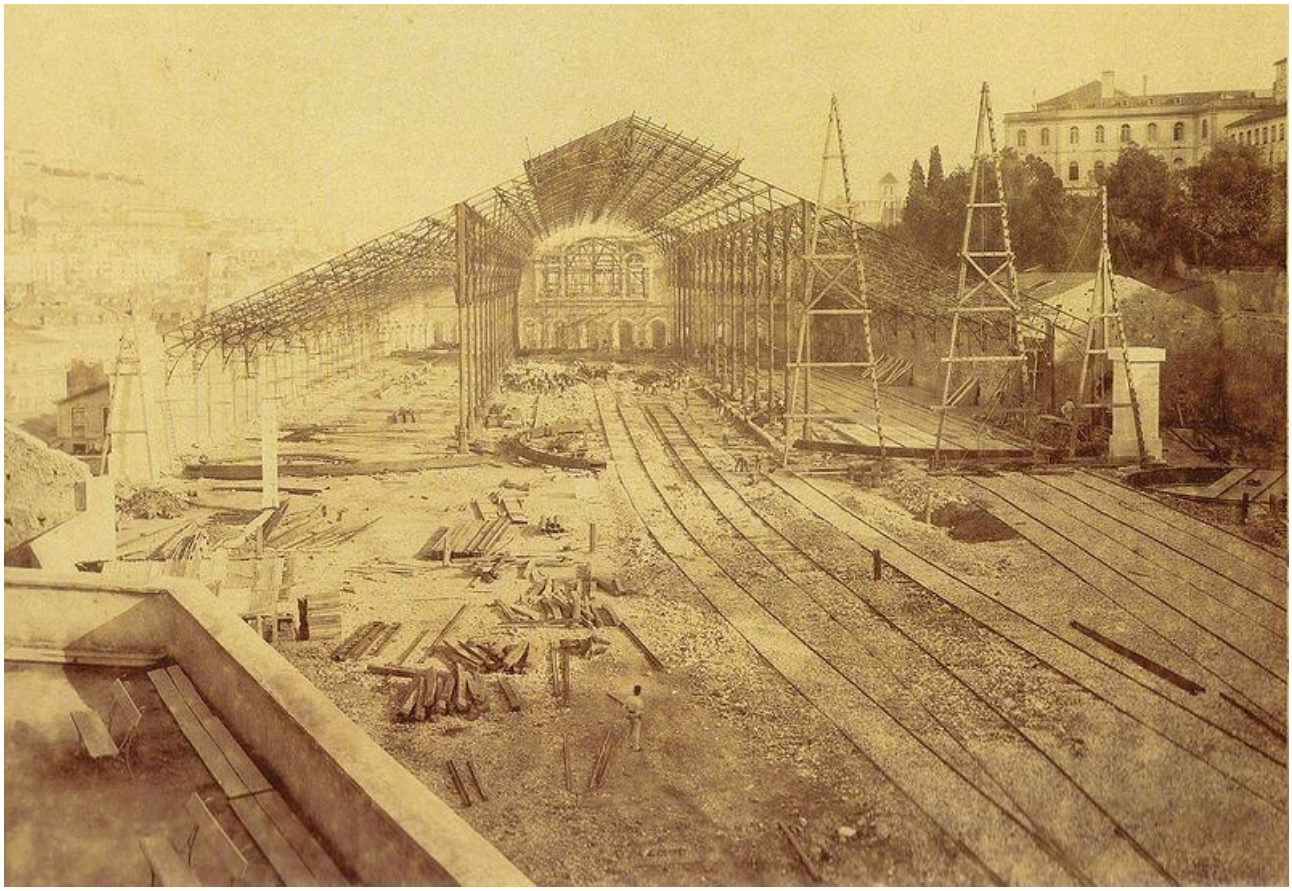

Fig. 1. The construction of the Rossio Railway Station (Lisbon, 1890-1891). Source: Comboios de Portugal (CP): Os caminhos-de-ferro portugueses 1856-2006, ISBN 989-619-078-X

On April 16th, 1889 a text by L. Mendonça e Costa, published in the journal *Gazeta dos Caminhos de Ferro*, announced the inauguration of the Rossio station in these terms: "This great work of art is now inaugurated. This new proof of daring by our engineers is, at the same time, a thing of beauty

[17]License issued on July 7th, 1886.
[18]License issued on April 9th, 1887.
[19]License issued on July 23rd, 1887.

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and a convenience for our capital". This news article made clear the development of engineering in Portugal and its ability to work with new materials and construction techniques, laying down a series of technical challenges that had to be met by the competence not only of Portuguese engineers but also that of foreign companies (Cardoso de Matos, 2017).
At that time, the engineer Emile Pitsch (1890) published an article on the Rossio station referring that it was composed of a pair of 2-storey buildings "which made an 85º angle between them, due to the prior existence of old, fortified walls which one wanted to make the most of". On the first and second floors of the main building, facing *Praça Camões*, were the offices and meeting rooms, while the ground floor housed the ticket booths. There were two Edoux lifts for travellers, and two cargo elevators.
Since the Rossio station was located in the middle of Lisbon, its construction demanded the demolition of several buildings and the opening of a tunnel under the city. As the aforementioned article said, it was "a great underground passage which lets the city centre communicate with every national and foreign railway line". Among the Portuguese engineers involved in this work stood out Cândido Xavier Cordeiro[20] who, on behalf of the *Companhia Real dos Caminhos de Ferro*, oversaw the construction, aided by the engineer Vasconcellos Porto and the head of section B. Chabrion.
The need to open a long tunnel underneath the city made it necessary to resort to foreign firms, and so its construction was contracted to Duparchy & Bartissol (from the *Calçada da Glória* to the *Escola Politécnica*), while the second leg was built by Papot & Blanchard. The third and last part was assigned to E. Beraud. Among the engineers working for the foreign companies involved, the principal ones were E. Tabary and E. Pitsch, and the head of section Charles Bartissol[21]. For the works on the tunnel of the Rossio station, Bartissol additionally hired the engineer Jules Robert, who had studied at the *École Centrale de Paris* (Matos, 2017).
The tunnel was 2.612m long and was drilled from six wells scattered throughout the urban space. The large scope of the work engaged large numbers of both engineers and workers; the latter reached a maximum of nearly 1,000. The width of the tunnel was 8m and its height, measured at the exit point of the Rossio station, was 6m. The dome was made of brick masonry.[22]
Given the modest dimensions of Portugal's metallurgic and metalworking industries, insufficient for the production of large scale metallic structures like those needed for this station, the iron structure for the cover was commissioned to the Belgian firm Baume & Marpent, a big player in the making of metal structures and trains which played a very relevant role in several countries, within and outside Europe (Vijver, 2006).
The construction of the Rossio station was one of those moments in which Portugal went against engineers' and architects' conceptions of the architecture of this kind of building. The façade, designed by the architect Luís Monteiro in the *Manuelino* style, was criticized in various articles published at the time. In 1888, one of these said: we see no reason why, in a construction of this kind, one should adopt the cumbersome style which gave glory to our architecture.

[20]A graduate of Coimbra University, he completed his training at the *École des ponts et chaussées*. On his return to Portugal he became intensively involved in Portuguese railroads, namely those linking Porto and Braga. He worked for the *Companhia Real de Caminhos de Ferro* between 1885 and 1902 (Cardoso de Matos, 2010, p.231-240).
[21] Charles Bartissol was the cousin of Edmonde Bartissol and later on established a construction and cement plant in Biarritz.
[22]"O grande tunnel da estação do caminho de ferro do Rocio", *A ilustração portuguesa: semanário: revista literária e artística*, Year 5, N.º 52, 6th October 1890, p.7.

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It is very fitting for a museum or a church, but we find it inadequate for a railway station in which, in our view, the idea of progress and all the advances of modern science stand out in the most evident way.
An article published in the magazine *O Occidente*, in 1888, stated that a traveller looking at the station "will feel, like we do, suffocated when he sees, at such short distance, a building so heavy, and he will write down in his *portfeuille*, just like we do here – very pretty, but very inadequate"[23].
As time went by, the Rossio station underwent alterations looking to adapt it to the newest requirements - not only of railroad service, but also of the architectonic trends which marked different periods. The 1940's saw the renovation of the atrium, ticket booths and access to the platform, based on a project by the architect Cottinelli Telmo[24]. In 1958, the eastern side of the terminal received 13 panels with figurative *azulejo* tiles by Lucien Donnat e Amaral, depicting the Portuguese industry and export products[25] and, in 1996, the opposite side received another 13 *azulejo* panels, by the painter Lima de Freitas, alluding to mythical and legendary figures from the city of Lisbon. In 1971, this station was listed by the *Instituto Português do Património Arquitectónico* – IPPAR as a "Building of Public Interest".
At the start of the 21st century, the wear of the Rossio tunnel made it necessary to close it down for consolidation works. This was done in 2004 and, in 2008, it was reopened to the circulation of trains. Simultaneously, the Rossio station underwent renovation works[26] and, in 2011, in the context of the Brunel Prizes, it received a special mention in the Passenger Building category.

Seville (Plaza de Armas Station and San Bernardo Station)

The final integration of Andalucía (Cuéllar Villar; Sánchez Picón, 2008) into the wave of progress epitomized by the modern railroad transportation system began in 1853, when the state commissioned a railway line funded by the financial conglomerate *Crédito Mobiliario Francés*, which in 1857 set up the *Compañia de Ferrocarril de Córdoba e Sevilla* (Wais, 1974) - which in turn merged, in 1875, with the *Compañia de Compañía del Ferrocarril Madrid, Zagaroza y Alicante*, known by the initials M.Z.A (López García, 1986). This line, linking Seville to Córdova, started to function on June 2nd 1859.
March 1st 1860 saw the inauguration of the line from Seville to Jerez de la Frontera, run by the *Compañía de los Ferrocarriles de Sevilla a Jerez* y de Puerto Real a Cádiz, which in 1861 become the *Compañía de Ferrocarril de Seville a Jerez y Cádiz*.
In the same year of 1861, in order to bring about the convergence of the two lines, the State imposed the construction of the *Empalme de San Jerónimo* station (1861), located north of the city, as the point toward which they should converge.

[23] *O Occidente*, vol II, nº 343, 1st July 1888, p.149/150.
[24] Having graduated from the *Escola de Belas Artes de Lisboa* in 1920, he became known for his architectural works, among them the Honour Pavilion of the Rio de Janeiro Exhibition (1922), the Standard Eléctrica plant in Junqueira, Lisbon, the Coimbra University campus, and several pavilions for the 1944 *Exposição do Mundo Português*. In 1923 he joined, as an architect, the *Companhia dos Caminhos de Ferro Portugueses*, for which he carried out several projects.
[25] These panels had been offered by the *Fundo de Fomento de Exportação*, as a way of trying to contribute to the diffusion of Portuguese products.
[26] The renovation project was done by the atelier Broadway Malyan.

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In addition to connecting the cities of Madrid, Córdoba, Cádiz and Huelva, the strategic results sought through the construction of the two Seville stations, which explain their placement within the city's urban grid, can be summarized under the following objectives (González Dorado, 1975):

- Avoid the interruption of the city's main access ways, by overcoming the problems that these new structures would cause to internal communications;
- Facilitate the link between the railroad and the fluvial port of Seville;
- Place the stations near the urban centre, to facilitate the arrival and departure of people and goods;
- Provide an architectonic image that would respect the historic character of the city's architecture, given its proximity to the old historic centre.

These goals, however, were not entirely attained, concerning especially the city's urbanism, since the railway lines cut across the internal communications needed for the urban growth of Seville in the first third of the 20th century. The place chosen for the line connecting Seville and Cádiz became a barrier to development toward the east. The same thing happened in the north area: the link to the *Empalme de San Jerónimo* and the *Plaza de Armas* line went along the margin of the Guadalquivir River, which made the city's westward expansion more difficult.
From April 25th 1859 onwards (Sobrino, 2017), when circulation started on the Seville-Córdoba line, the temporary building erected to accommodate passengers and luggage proved to be insufficient. It was thus necessary to make a new building, which became known as the Plaza de Armas Station and constituted a major example of architectural historicism in iron in Andalucía's 19th century, a building which can be classified as *Neomudéjar* architecture[27].
The final project for the Plaza de Armas Station dates from 1889, but the work was only concluded in 1901. The first study was carried out by Nathan Süss, an engineer with the *Compañia de Ferrocarril de Córdoba y Sevilla*, and was later modified by the engineers Nicolás Suárez y Albizu, and José Santos Silva, working under the service and works master of the company M.Z.A., the engineer Letona. Plaza de Armas was the principal station in Seville, until the modern Seville-Santa Justa Station was built (1989-1992).
Construction of the station began in 1893, having required the prior demolition of all technical services buildings of the old station[28]. As a terminal station[29], the building had a façade comprising two 2-storey side pavilions, dedicated to the offices, and a central gallery on the ground floor, serving as the passengers' entrance. Over this gallery was built a metallic covering, featuring a clock looking outwards from the façade. In 1906, the central portion of this dome was sealed by a glass and iron structure, to prevent the rain coming in on windy days.
The design of the protecting cover was similar to that of the Engine Room in the 1889 Paris Exhibition: it comprised a double covering made from an external, undulating metallic structure and an internal wooden structure, thus creating an intermediary air chamber that provided better

[27]The denomination "mudéjar" was utilized by the archaeologist Manuel de Assas in 1857, in an article published in *Seminario Pintoresco Español*, and by José Amador de los Ríos in 1859, in his initial address to the *Real Academia de San Fernando* (Torres Balbás, 1949). The neomudéjar style gets its ornamental references from Spain's Islamic architecture. Its application to railway stations started in England, with the construction of the *Moorish Arch* in 1830, and in France, with the station of Meaux (1848).
[28]Thus causing the loss of priceless railway architectonic heritage.
[29]This project was influenced by that of the Atocha station in Madrid (1880-1892).

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ventilation and the expansion of materials. The whole structure lay on very tall porticoes made of metal. The platform hall was 105m long by 30m wide by 20m high, occupying a total surface area of 6500sqm.

Fig. 2. Aerial view (1984) of the Plaza de Armas Railway Station (Seville, 1898-1902). The travellers' building, in the centre, is in neo-Mudejar style, on the left the workshops, the river Guadalquivir and the Cartuja-Fábrica Pickman, on the right, the historic city. Source: Diario ABC, Col. A. Esquivias, Sevilla, 2013.

The main nave at the centre had three longitudinal platforms, with four tracks arranged in pairs - following the conventional layout of major stations - and a fourth platform at the head. The covering of this nave was composed of three articulations, each one divided into ten parts, of which eight had glass-covered skylights equipped with a technical catwalk along the cover. In order to light and ventilate the nave, the side walls received windows set in a way that matched the alignment of the station's service doors. These windows had fixed blinds, being closed with coloured glass panes that produced an agreeable visual effect, in addition to greatly helping the space's ventilation[30].

A public tender was called for making the cover's framework. Among the competing firms were the *Sociedad de Altos Hornos de Vizcaya*, *Compañia de Asturias, Maquinista Terrestre y Marítima*

[30] *Revista de Obras Públicas*, Tome 1,1901, pp.182-188.

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from Barcelona, a Belgian company based in Villebroek, the firm Carde y Escoriaza from Madrid, and finally *Baume et Marpent. Usines et Fonderie. Société Anonyme*, a Belgian firm which made the best offer and so got the assignment.
The construction of this cover employed prefabricated structures sent over from Belgium (Sobrino, 2017), which enabled the assembly work to proceed very quickly: having started in August 1900, by December 8th of that same year it was finished. During the same period were also made the wooden linings and the cover plates, water pipes were installed and painting jobs were carried out. The engineers from Baume & Marpent developed an important project to calculate the resistance of the central framework's elements, taking into account the weight of the roof and its maximum flexibility, as well as the pressure that the wind might exert.
Building this station caused the destruction of part of the Plaza de Armas, the Humeros neighbourhood, the walkway to *Barqueta, the Patín de las Damas, Husillo Real, Puerta de San Juan, Puerta de la Barqueta*, and a section of the fortified wall from the *Puerta Real* to the *Puerta da Barqueta*. At the same time, the existence of the station, a place of comings and goings for people and merchandise, led to an appreciation of the land in the surrounding area and all along the tracks, stimulating the urbanization of the area between the *Plaza de Toros* and the *Puerta Real*, and also between the ramparts and the Guadalquivir River (Garmedia, 1987, p.184-185).
Given the new needs in transportation, in 1982 the Plaza de Armas station was remodelled by the architect A. Barrionuevo[31]. In 1990, the *Dirección General de Bienes Culturales de la Junta de Andalucía* declared the building to be an 'asset of cultural Interest', in the 'Monuments' category (Royal Decree 1380/1990).
However, its use as a railway station continued only up to 1992 when, due to the Universal Exhibition, railroad connections were moved out to the station of Sevilla-Santa Justa, whose construction entailed the demolition of many service buildings in the Plaza de Armas station and the removal of its railroad tracks.
The Seville-Cádiz line, too, began as a temporary station. Its first proposed location was the *Campo de la Feria (Prado de San Sebastián),* but the inhabitants did not approve of this on account of the *Feria de Abril* (Garmedia, 1987). After several protests and attempts at reconciling the interests of the people and the company, in 1859 it was decided that the station would go up on the Huerta de la Bobolla, to the southeast of the city.
To install the railway line, the company had to purchase 60.557sqm of land near the *Prado de San Sebastián* and another 25.253sqm for the passage of the line through the *Prado de Santa Justa*, taking up the obligation of levelling the following plots:

- The reef from *Puerta de la Carne* to San Bernardo;
- The Madrid road;
- The area between the tracks and the *Huerta del Pedroso*;
- The course from the station to Enramadilla. (Garmedia, 1987)

Despite controversy over whether or not this railway line should be connected to the port of Seville, in the end this did come to be the case, resulting in a new urban barrier to the south of the city. This construction left Seville completely surrounded by railway lines. As a consequence, in 1861 there

[31] *Revista Arquitectura*, #243, 1983, p.66-71.

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were several protests by inhabitants of the station's surroundings against its location, since they lacked good connections to the city centre. The problem was solved by building a bridge which connected the *Huerta del Pedroso* to the station yard. This bridge was brought down in 1886, when work began on the definitive San Bernardo station.
This station was built on a project by Anatole Margheman, who had been director-general of *Compañia de los Ferrocarriles Andaluces* since its foundation. He had the collaboration of Lucien Villars, an advisor to the company, and of its Director of Deposits and Planning, Antonio Sanz. The definitive project was signed in 1901 and included six tracks, three platforms, and a 29-metre wide, 100.7-metre long metallic structure. A square and a 12-metre wide avenue were opened in front of the station. The building for the passengers was symmetrical and ornamented with Renaissance motives, being topped by the 100.7m long metallic cover. Located behind the main volume, it was built on a project by Agustín S. de Jubera. The station was inaugurated in 1907 (Palomares, 2017).

A comparative look at the Lisbon and Seville railway stations

To develop a comparison between the Lisbon and Seville train stations, two stations in each city were selected. This being a work of empirical research, we will analyse these buildings' architectonic characteristics "through the delimitation of the analytical divisions that direct our gaze" (Spósito, 2016), starting out from the information displayed on Table 01.

Table 1.
Reference Data

Station	Santa Apolónia	Rossio	Plaza de Armas	San Bernardo
Year of Inauguration	1865	1890	1901	1907
Architectural Typology	1st class (Terminus)	1st class (Terminus)	1st class (Terminus)	1st class (Passage)
Metallic Structure	Platform Covers	Building and Cover	Building and Cover	Platform Covers
Provider of the Metallic Cover	---	Belgian company *Baume et Marpent. Usines Fonderie, Société Anonyme*	Belgian company *Baume et Marpent. Usines Fonderie, Société Anonyme*	---
Architectural Style	Neoclassical	*Manuelino*	*Neomudejár*	Neoclassical
Area of Implantation	Tagus riverbank	Centre of Lisbon	Guadalquivir riverbank, outside urban limits	Urban limits of Seville
Present-day Urban Context	Tagus riverbank	Centre of Lisbon	Guadalquivir riverbank, within urban limits	Within the urban area
Present-day Use	Railway and Underground station	Railway and Underground station, shopping mall	Market and leisure space	Butcher's and sports complex

The period of time in which the stations were built was one of the criteria when selecting them for this study: all four of them were made in the 'iron age', in the transition from the 19th to the 20th centuries. Although actual construction years differed, the projects were developed and executed in the same period, a time characterized by the use of new materials (in the present case cast iron, steel

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and glass) and construction techniques, which turned railway stations into symbols of modernity and progress.
Another factor shared by all four stations is their architectonic typology (Table 01). We can easily see they all fall into the same typology. As mentioned before, the railroad halt and the 4th, 3rd, 2nd and 1st classes are the Portuguese equivalent of the small, medium and large size stations built in Andalucía. Thus, the typological agreement between the stations chosen was no coincidence.
When we consider the urban locations of the four examples studied, we realize that both the Santa Apolónia and the Plaza de Armas stations are located near rivers, even though the former was closer to its riverbank than the latter, especially before more land area was reclaimed from the Tagus. The other two stations are not close to rivers, but instead close to the city centres, although centrality is higher in the case of the Rossio station, located in a prime city area, than in the case of the San Bernardo station, on the periphery of Seville. Presiding over the construction of all four train stations was the notion, in varying degrees of visibility and awareness, that they would constitute "gates of entry" into the cities, as well as 'railroad hubs' or "intermodal stations". This explains why architectural project was a big concern in all four cases.
On the other hand, these four new stations brought great changes to the urban space where they were implanted. The plots surrounding the buildings were radically transformed, and sharply appreciated. It is important to highlight here the railway infrastructure as having great potential to connect diverse territorial spaces, while in many cases it had the effect of segregating urban space.
This is more evident in the case of the Seville stations, since here the railway line constricted the urban layout in every direction, shaping up a new rampart after bringing down a part of the fortified wall built in medieval Seville. With the Lisbon stations this was not the case – at least not so acutely. The Santa Apolónia station, which encouraged the conquest of territory from the Tagus River, over time developed connections between this new area and the inner part of the city. The Rossio station, in turn, became integrated from the start within the central fabric of the capital, due to the projects of urban improvement that accompanied its construction.
The styles adopted for the station buildings differ within each city (Table 01): both Santa Apolónia, in Lisbon, and San Bernardo, in Seville, went for Neoclassical, while Plaza de Armas chose *Neomudejár* and Rossio opted for *Manuelino*, i.e., in the latter two cases traditional Spanish and Portuguese styles were used.
The Plaza de Armas station utilized iron architecture, resorting to traditional style in forms and ornamentation, while the Rossio station disguised its use of iron, by hiding its metallic structure. The interesting thing about these two cases is that their structures in iron were both produced by the same manufacturer, the Belgian firm *Baume et Marpent. Usines et Fonderie. Société Anonyme* (Table 01).
The present-day status of these stations varies, depending on the city considered. In Lisbon, both stations are still functioning. Even while they made more difficult the connection between the city and the river[32], there were attempts at re-urbanization along the tracks of Santa Apolónia[33] to create arteries meant to ameliorate this impact. As already mentioned, the Rossio station is not perceived as an urban barrier thanks to the construction of the tunnel, a work of engineering that left its mark

[32]This distance was an issue present in discussions on building a railroad extension to connect Santa Apolónia Station to Cais do Sodré; however, its impact on the urban landscape prevented its construction.
[33] We must mention that, due to the advances in technology, part of the building of Santa Apolónia Station became obsolete, resulting in many empty rooms and spaces. At present, a partial adaptation of the building, to function as a hotel, is expected.

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on 19th-century Portugal. Both Portuguese train stations were able to receive expansion works which allowed them to become parts of Lisbon's intermodal urban transportation system. The construction of Gare do Oriente was simply a way of improving the distribution of growing numbers of passengers, but it did not imply the closing of the old stations. In Seville, on the other hand, the urban situation was different and more complex, which contributed to the stations becoming obsolete. Both Plaza de Armas and San Bernardo stations were engulfed by the city, which prevented their expansion as well as good communication among Seville's internal routes. The barrier function of its infrastructures condemned both stations to eventual deactivation. At present, Plaza de Armas hosts a market and a leisure space, while San Bernardo is home to a butchers' and a sports complex.

Conclusion

The importance of railroads as a structuring element of the territory is often mentioned in works that analyse this infrastructure in different historical periods. Likewise, railway stations were a structuring element in the emergence of new urban centres and, whenever they were built in already existing cities, they were determinant in causing profound urban transformations. The latter case occurred in Lisbon and Seville, home to the stations of Santa Apolónia, Rossio, Plaza de Armas and San Bernardo, which our study has focused on.

Although the stations' locations varied in each city, in both cases their construction entailed the demolition of pre-existing buildings and the reorganization of the adjacent space. In Lisbon, building the Santa Apolónia station made it necessary to expropriate, demolish, and above all, reclaim new land from the Tagus River, while the construction of the centrally located Rossio station required the demolition of several buildings and the opening of a tunnel under the city. In Seville, the construction of the Plaza de Armas station brought about the destruction of part of the Plaza de Armas itself, the Humeros district, several streets, and a section of the old wall. In turn the San Bernardo station, located on the city's periphery, did not have such a great impact on the area chosen for its implantation.

These railway stations enabled connections to other locations in the country and even abroad, becoming a factor of development for the surrounding urban space. Thus, the Santa Apolónia station, built in the eastern part of Lisbon, favoured the development of industrial activities, while the Plaza de Armas station helped the urbanization of the area between the *Plaza de Toros* and the *Puerta Real*, as well as that between the wall and the Guadalquivir River.

These four stations constituted major public works, highlighting the competences of Portuguese and Spanish engineers, while still requiring the help of foreign companies and technology. Thus, alongside engineers such as the Portuguese João Evangelista de Abreu and Cândido Xavier Cordeiro and the Spaniard Nicolás Suárez y Albizu, we find foreign names such as E. Tabary, E. Pitsch and Charles Bartissol. Similarly, Portuguese and Spanish companies share credits with the Belgian firm Baume & Marpent, which played an important role in erecting both the Rossio station in Lisbon and the Plaza de Armas station in Seville. Other intervening companies were Duparchy & Bartissol and Papot & Blanchard.

Owing to their architectonic importance and their significance in urban terms, both the Rossio and the Plaza de Armas stations were classified as heritage buildings. The former was classified, by IPPAR - *Instituto Português do Património Arquitectónico* – as a "Building of Public Interest", in

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1971; the latter was declared by the Junta de Andaluzia's *Dirección General de Bienes Culturales* to be an Asset of Cultural Interest, in the 'Monuments' category, in 1990 (Royal Decree 1380/1990).
Nowadays, the Santa Apolónia and Rossio stations, in Lisbon, continue to operate. In Seville, the Plaza de Armas station was deactivated in 1992 when, due to the Universal Exhibition held that year, railway connections were transferred to the Sevilla-Santa Justa station. As for the old San Bernardo station, it was replaced by another bearing the same name.

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