THE ADAPTIVE REUSE OF THE ARCO DO CEGO ANCIENT CAR-BARN STRUCTURE IN LISBON

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Introduction

The industrial revolution of the eighteenth and nineteenth centuries changed society in a permanent way. It changed not only the productive structure of the economy, but also the way people communicated, travelled, lived and worked. The built environment, in particular, was affected in many ways, namely by the mass production of new materials, readily available and at a lower cost. Brick masonry walls and steel framed structures were extensively used becoming a trademark of the industrial building, all across Europe. Architects and engineers seized the opportunity that new construction techniques provided to build wider and taller structures, and the common commercial and productive typologies, such as warehouses and factories, developed significantly in order to meet new standards and new production methods, powered by new forms of energy.

From the material point of view, the industrial heritage was disruptive towards the past. Brick, tiles, iron and glass soon replaced timber structures with lime and stone masonry walls. Additionally, most industrial buildings were solid and built to last. It is not surprising that so many examples still survive today in reasonably good condition. However, its future is not so much a question of physical preservation but to ensure a viable use in contemporary society.

Some authors\(^1\) refer to the oil crisis of 1973 as the origin of a new attention to old buildings and its reconversion potential. Industrial buildings in particular were praised for their technical and spatial characteristics which made it especially useful for reconversion: they are usually large buildings with interior open spaces and high ceilings, built with thick solid walls but with independent metal framed structures. If outdated equipment and production methods made them redundant for today’s society needs, their potential for new uses was acknowledged as very promising.

This paper presents the example of the reconversion of an important tram station from the origins of electricity in Portugal that was still in use until the late 1990’s but became redundant since then. Its significant urban presence and

the importance of preserving the memory of the old trams that were still in use some years ago in Lisbon, led to an innovative solution, combining public value and heritage protection.

**Historical background**

The current architectural structure of the Arco do Cego, surviving that which was in its time the Lisbon Tram Station in that area of the city, corresponds to a typical building of the post-industrial revolution period. It is common to many other examples of the so-called *Iron Architecture*, such as the numerous train stations emerging at the third quarter of the nineteenth century.

From a typological perspective, the Arco do Cego Tram Station (located in the North of the City) is identical to another tram station built in Santo Amaro (at the Calvário neighbourhood, South of the city, along the river Tagus) and still in use today. Originally built in 1874 to accommodate horse-driven cars, it was later transformed following the development of the new electric line of transportation, started in 1901. The insufficiency of the Santo Amaro station to cope with the transportation needs of a rapid growing city, led to the creation of a new station on 1882, located in the far northern limits of the city, an area called Arco do Cego. Built to accommodate the so called American cars, including the horse’s mews, it was later the object of significant transformation to house the new electric cars.

The electrification of the Lisbon transport system became therefore the main reason for the construction of a new building, the Car-Barn (a large steel structure) promoted by the Carris Company, following the designs of Mechanical Engineer Lawrence Granville Hawkins, who would later become the responsible for Workshops and Car-Barns of the company in 1925.

Its construction starts in 1905 with three main longitudinal bays (naves), in a steel frame structure composed of metallic trusses supported by double braced columns, delimited by external brick masonry walls with large vertical windows and double-edged roofs with ceramic ‘Marselha’ tiles.

Later, in 1913, two bays were added to the East of the existing structure, and in 1914 a new three storeys building is added to the West (the electric sub-station), in a brick masonry load bearing structure with white painted window frames and a bay-window, much to the English style. In 1936, the general site is the object of partial demolition in the North area, due to the alteration of its limits, partially sold to the government to build the new Treasury Building (Casa da Moeda). It remained in this condition and actively used by Carris, for nearly sixty years.
The Arco do Cego tram station

Current condition

The surviving structure of the old Tram station corresponds to a part of the early twentieth century original building, once in 1997 the electric station was deactivated and it began being used by a private bus operator. It is not clear the degree of transformation it went through over the years it worked as a bus terminal, however, it seems to have been in 2004, with further adaption works for its use as a car park, that some major alterations were introduced, namely, the demolition of the two long West bays.

Today, the building preserves the three original bays built in 1905, eventually with some minor alterations difficult to identify, apart from the only surviving external brick masonry wall (South, facing the Arco do Cego public garden), as all others were demolished.
Legal protection

The existing building and its site are not currently listed, but they come under partial legal protection due to its inclusion within the special protection zone (an automatic area surrounding any listed building according to Portuguese heritage laws) attributed to the nearby Casa da Moeda, listed as Monument of Public Interest in 2012. In addition, being scheduled by the Heritage Inventory of the Lisbon City Council\(^2\), it is subject to a secondary protection system, which demands for specific building consent from the council services.

Historic, social and urban value

From the city’s perspective, the Arco do Cego Tram Station is representative of the urban expansion of Lisbon towards the North, at the end of the nineteenth century, namely the so called New Avenues (Avenidas Novas), which saw in the development of the public transport system (namely the electric car), an important ally and facilitator. In fact, the site was reconfigured in 1903 (to the South) and in 1904 (to the North) due to the opening of two important avenues (Avenidas Duque d’Ávila e João Crisóstomo).

Therefore, the existing building is not only an important example of industrial architecture (typical metallic structure used in wide span naves) but also an iconic element of the demographic and urban expansion of the early twentieth century and a symbol of technological progress, namely the development of the initial electric infrastructures of the city (public lighting and transport system).

\(^2\) The building is listed in the Municipal Map of the Built and Natural Heritage, under the designation of (Ancient) Carris Central Station – CMP 23.69.
Additionally, it is worth mentioning that the Arco do Cego Tram Station (built in 1882 and altered in 1905) was originally located in the urban limit of the city, which was then an industrial area where the important Lusitânia Ceramic Factory was located. Built in 1890, next to the Bull-fight Arena of Campo Pequeno (another interesting industrial building of Neo-Moorish style, built in 1892 in a metallic frame structure and brick masonry walls), this factory produced construction materials such as roof tiles, bricks and wall tiles, precisely the materials that can be seen today in the surviving structure of Arco do Cego, presumably produced at the Lusitânia factory.

The existing building presents a remarkable material authenticity, despite several interventions made in recent decades, following the end of its use as a tram station in the early 1990’s and subsequent use as bus station and car park (its current use).
Its original metallic structure survives still today with little or no alteration to its spatial and geometric configuration, apart from small partial demolition to the West and the natural signs of material decay following negligence over time. The same can be said regarding the original brick masonry, built in the English bond technique.

**Adaptive reuse**

Given its heritage value and the proximity of the traditional Engineering University Campus of Lisboa, the Instituto Superior Técnico (IST, founded in 1911), its future use began to be evaluated in early 2010, in order to bring it back to public use, in a way that would reflect its historic importance, its architectural value and the memory (not so long ago) of the ancient electric tram station. In 2011, the Lisbon City Council agreed to give the building and its site for university use, namely to be transformed into a student’s facility, as a study, leisure, recreational and cultural space of the IST, open 24 ha day. This new university building, located just one block away from the traditional IST compound, was called IST Learning Center and extends the notion of campus outside its walls and into the city’s urban fabric.

It is worth mentioning that the site is located between the IST campus and one of the most important subway lines of the Lisbon underground, along a pedestrian and cycling path that became an important area of urban life in recent years, with
restaurants and cafés and a public garden just next to the Arco do Cego building. The reconversion of this large under-valued structure into a new and modern building, open to public use and available to students of any Lisbon University colleges is a major contribution to the requalification of this part of the city, in terms of cultural life, qualified public spaces and a renewed sense of place.

Fig. 7. Different spatial solutions for a multi-functional building
Source: Tecnico Learning Center project team (IST).

Fig. 8. External view of the Arco do Cego new IST Learning Center (computer image)
Source: Tecnico Learning Center project team (IST).
The architectural solution, however, was quite a challenge in order to meet the conditions defined by the Lisbon City Council, particularly the construction of a subterraneous car-park (underneath the structure) and the inclusion of a permanent Fire Brigade headquarter within the general building space. The university’s plan was to create a multifunctional cultural and educational infrastructure that would accommodate different uses simultaneously. These uses include a leisure/study area open to students 24 h a day, a small administrative office, a cafeteria, a printing area, a commercial space, toilets, storage areas, catering facilities and a large open space available for all types of academic, social or cultural events (exhibitions, fairs, concerts, conferences, etc.). The potential conflict between some of these uses and the co-existence with a Fire Brigade, called for elaborate solutions in terms of space management, technical infrastructures, privacy, security and accesses, while maintain the building’s architectural and heritage features.

**Innovative methodology**

In recent years, other examples of the heritage conversion for different uses have been quite successful, turning what used to be old and abandoned historic buildings into modern urban icons of the city. The recent Time Out Lisbon Market is a good example (2014). Originally built in the same period, although in the French style (*Beaux-Arts*) and better architectural quality, the old and decayed market known as Praça da Ribeira, went through significant adaptation by one of the country’s leading architectural practices (Manuel Mateus arquitectos) to became Lisbon’s most fashionable place to have lunch or dinner at one of its many restaurants and bars. However, it was designed to serve for commercial use only and some of the technical solutions (the acoustics, for example) were not very efficient.

Such cases showed the public’s attraction for large interventions in important landmarks destined to public use and its positive urban effects in the surrounding neighbourhoods (new real estate development, improved public parks and spaces, better social environment, local pride, increased security). But it also made clear that such reconversions are as much about heritage renewal as they are about the proper spatial analysis and solutions (adequate programme) and the sensible introduction of new technical infrastructures, such as heating, ventilation, solar energy or sound insulation. These aspects became the main focus of the architectural solution for the Arco do Cego intervention: total respect for the original historic structure, matured spatial definition of different functions and the careful introduction of new technical systems and materials.

The architectural design was developed in-house, an innovative solution consisting of a team of the Department of Architecture of the IST itself³. Such practice was very much influenced by the Brazilian example of the University of São Paulo, where projects were developed specifically to provide for students and professors to work together in a real-world simulation of a professional architectural practice, while tending to the internal needs of the university.

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³ The Arco do Cego architecture team was led by Prof. António Barreiros Ferreira and included Ana Rita Gonçalves, Daniel Rego, Katherine Both and Maria João Tato. The authors of the present article were also part of the design team.
Prior to the start of the architectural design stage, the Arco do Cego building was the object of academic exercises within the Master degree in Architecture. Architecture students were asked to work on the functional analysis of the building and its programme, and some final dissertations addressed themes like the nature of the new library spaces or the social impact of the nearby garden, in view of its foreseeable adaptation. Considering its future use by the student population, it is very meaningful that it were the students themselves who contributed to the programme’s definition, reflecting the habits, wishes and expectations of a new generation.

Architectural solution

In order to meet with the complex programme, the design solution created independent volumes inside the wide open-space (with two levels, in a mezzanine format), respecting the original framed structure. This allowed for different areas with specific functions. The west side facing the public garden is occupied by the student’s area, including the commercial and social spaces, benefiting from a direct access from the street. The east side is partially occupied by the fire brigade, with specific emergency exits to the public road. In the middle of the complex, there are toilets, the main entrance to the south and the large area destined to events to the north. The interior metallic structure will be painted white, just as the interior walls, providing for a modern and contemporary image and creating a light atmosphere for leisure activities.

Fig. 9. Internal view of the Arco do Cego new IST Learning Center (computer image)

Source: Tecnico Learning Center project team (IST).
The facades will be preserved but the roof surface will be carved in an elaborate solution, with different angles along the naves to provide for both sun light, a cooling effect and solar panels according to the insulation of the place.

Through careful restoration of the original fabric and the introduction of contemporary design (in particular, the spatial dynamic solutions and the necessary introduction of technical infrastructures) it will became an iconic part of the new extended university campus, with a modern look.

**Conclusion**

In 2015 Europe is commemorating the Industrial and Technical Heritage Year. But persevering industrial heritage is both a problem and an opportunity. Large redundant buildings demanding significant investments and with limited possibility for change (given its heritage status) are a challenge for public authorities and private real-estate promoters. In many countries, there are examples – those buildings regarded as the most representatives of such heritage universe – that are still waiting for a viable use today (i.e. Battersea Power Station in London). In other cases, interesting solutions were found in the form of contemporary interventions that lend new life to old structures (i.e. Tate Modern in London). But to those less representative buildings, a new future depends on a new use, therefore reconversion is essential. The Arco do Cego old tram station is a good example of a very significant building for its represents the early days of the Lisbon transport system, when the electric car benefited from the introduction of electricity and promoted the expansion of the city. Nevertheless its original function is no longer viable.

The proximity of the Instituto Superior Técnico (University of Lisbon) was the starting point of a maturing process to devise a new and appropriate use to the building. The university itself decided to take the matter in its own hands and provided for an alternative approach, with in-house knowledge, combining students and professors in the technical team that designed the new building. The transformation of a large warehouse typology into a learning centre, open 24 hours a day, next to a fire brigade headquarter is quite unique and very demanding from an architectural point of view. The solution considered questions such as space management, security, planned accesses and the autonomy of different functions. But the final result will provide for the renewal of the surrounding neighbourhood, the improvement of university facilities and a better urban environment.