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ABSTRACT

Streets and aqueducts relationship in Europe is a detectable pattern. With a shared linear condition, these encounters between infrastructures occur in different ways, from their absolute alignment to their unexpected intersection. Arches, stones, facades, people, details, shadows and other actors together explain useful stories for architectural design.

Through the case study of the Aqeduto das Águas Livres and its relationship with the streets of Lisbon, it is possible to get a wide range of different meeting casuistry. The movement of the aqueduct plays a characteristic and fundamental role in the physiognomy and configuration of the city's streets, as well as of the built environment. From great monumental moments to more modest locations, different displays allow us to approach the urban and architectural richness that occurs in the conjunctions between street and aqueduct. In that sense, thanks to its variety, Lisbon is a place that gives a catalogue, from specific and exceptional situations to urban scenarios comparable to other European cities. Aqueducts, as more than streets for water, materialize in an infrastructural body that conditions the configuration of the streets with which they meet. Because of the effects that they entail along the time and beyond the architectural aspects – from tangible to intangible dimensions – it is important to consider these encounters between infrastructures as a valuable field of design for the city.

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Streets Love Aqueduct: Águas Livres Aqueduct in Lisbon

ENCOUNTERS BETWEEN ÁGUAS LIVRES AQUEDUCT AND LISBON'S STREETS

Streets and aqueducts relationship in Europe is a detectable pattern. Proof of this are cases such as the Aqueduto Água da Prata in Évora, the Aqueduc Saint-Clément in Montpellier, the Aqueduct of Segovia or the aqueducts of Rome. With a shared linear condition, these encounters between infrastructures and the city occur in different ways, from their absolute alignment to their unexpected intersection. Arches, stones, facades, people, details, shadows and other actors together explain useful stories for architectural design.

In the doctoral thesis "Encounters with the infrastructure"¹ there is a classification and an atlas of European cases of encounters between elevated linear infrastructures and architectures of the European sedimentary city. Among all of them, it is worth highlighting here those referring to street infrastructures, urban facades or inhabited arches; cases in which aqueducts appear with a link to the street. Through the case study of the Aqueduto das Águas Livres and its relationship with the streets of Lisbon, it is possible

to get a wide range of different meeting casuistry. Elevated, buried, touching, stepping on, lengthening, peeking out briefly, breaking, narrowing, widening, planning, articulating, limiting, giving meaning, housing memory, enabling news points of view, containing unexpected programs or even becoming streets within streets, the movement of the aqueduct plays a characteristic and fundamental role in the physiognomy and configuration of the city's streets, as well as of the built environment. From great monumental moments such as the Alcântara Valley, precious designs such as Praça das Amoreiras or more modest situations such as Travessa do Chafariz das Terras, the presented collection allows us to approach the urban and architectural richness that occurs in the conjunctions between street and aqueduct. In that sense, thanks to its morphological variety, Lisbon is a place that gives a catalogue, from specific and exceptional situations to urban scenarios.

The methodology applied in the research is based on two fundamental references, the Actor-Network Theory² and the Grounded Theory³. Both sources supported the development of the thesis that was the origin of this



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article. The collection of different types of data was filtered according to the initial condition of the established encounter. Instrumentally, priority was given to photography and to the account of the topological conditions.

The aim of this article is to show different realities connected by a common condition, the aqueduct that meets the street. An encounter of infrastructures with infrastructures produced not from the same moment or integrating project, but from the confluence of works at different moments that dialogue according to the opportunities that arise.

The results of this research try to help to show the possible relations that can be established between a linear infrastructural element and the street. The different cases studied show how these relationships can be the result of coincidences, or consecutive processes in which the elements are aligned in an unexpected or natural way.

Crossing through: Alcântara Valley

In the Alcântara Valley, the aqueduct moves and stretches horizontally in the air while its legs reach the ground. The streets of the neighborhoods, developed at its feet, are configured according to the topography. The encounter between the aqueduct and the configuration of the neighborhoods at both sides of the Valley, is produced from a void relationship with the street.

On the southern slope, the unitary project of the Bairro da Serafina, at higher elevations, is distinguished from the Bairro da Liberdade, at lower elevations. The solid, monolithic presence of the aqueduct, in a development of constant standards, contrasts with the variability of the surrounding environment. Rua dos Arcos becomes two, on either side of the aqueduct that occupies a position on its central axis. Each face of the aqueduct, on either side of its own thickness, is a different facade, concave or convex, dark north or light south. These are accompanied by a variety of facades of different heights, colors, materials, states, styles and lives⁴. **Fig. 1**

In this section of street, the asphalt pavement is scattered like a large continuous stain under the arches. Distinct blacks, patches of cobblestones, undercuts and weeds between cracks materialize the ground that is molded like a thin layer over the previous terrain. From its appearance it seems that it has always been there, like a geological layer of the mountain.

In some specific points there are sidewalks and some singular elements. At the intersection of Rua dos Arcos with Rua Miguel ngelo de Blasco and Rua Padre Domingos Maurício dos Santos, the space of the street widens, leaving space for the bus stop on an islet. This widening creates a singular open space, a hinge between different



developments of the neighborhood on the topography. Under one of the arches, the asphalt turns into a cobblestone pavement, perfectly aligned under the viaduct. Further down, at the intersection with Rua Inácio Pardelhas Sanchez, a fountain appears at the foot of one of the pillars of the aqueduct. Its position, attached to the infrastructure, with steps and sidewalk absorbing the slope, stands out as a corner element that turns the space of movement between streets into a place to stop.

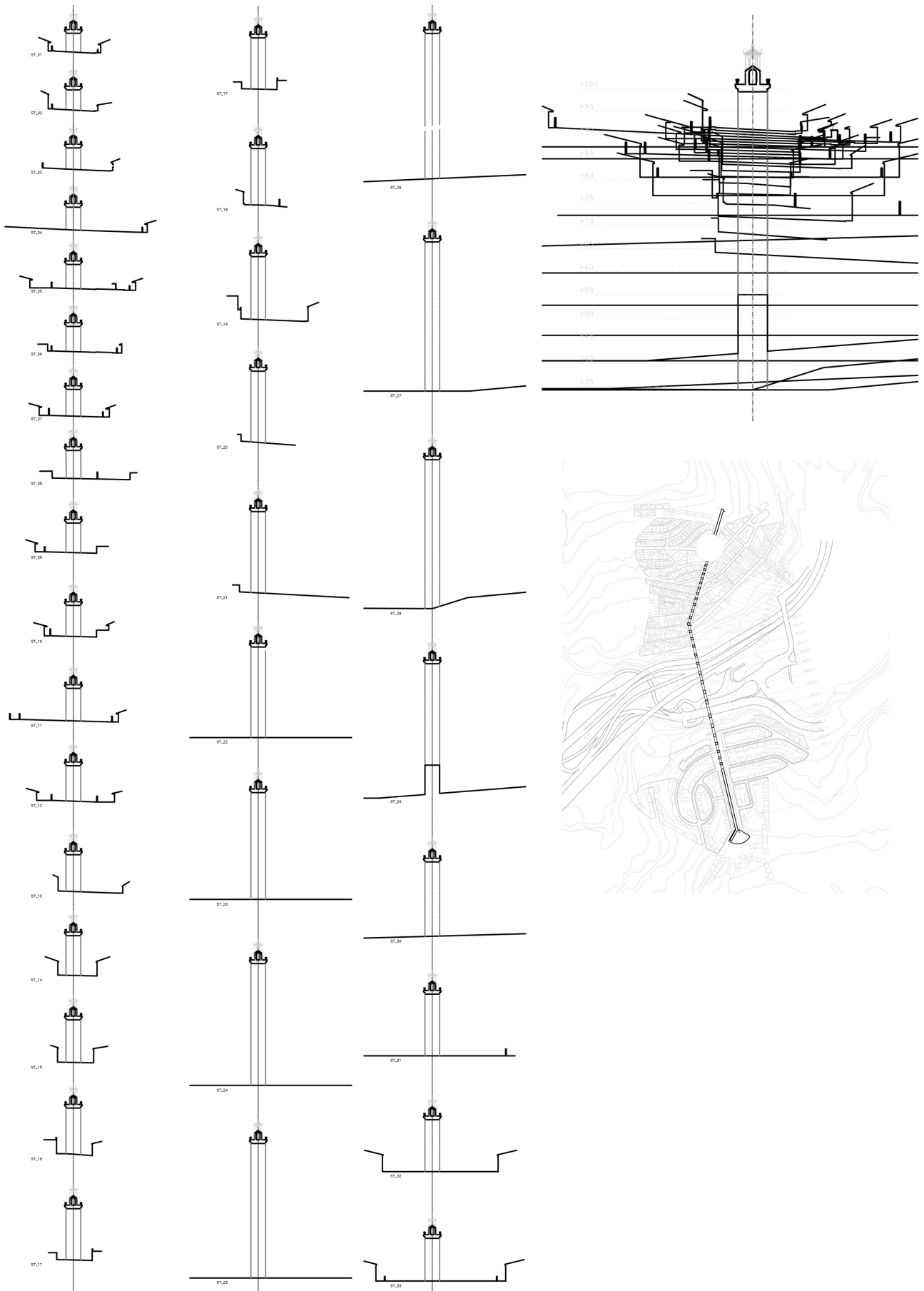
On the northern slope, the Bairro dos Mestres surrounds the aqueduct. Its development as a unitary project also addresses the relationship with the aqueduct, an essential element of the neighborhood⁵, through the designed urbanization of its contact. **Fig. 2**

In this case, the aqueduct is surrounded by a constant parterre. The grass that surrounds it is only interrupted by three streets that cross under its arches and the sidewalks at its edges. This creates a public space that aims to place the aqueduct as an element to be observed, but without fervently advocating direct contact. Only under one of its arches there is a small area for children's games, fenced off like an island, a symptom of the distance taken from the aqueduct.

Unlike the Rua dos Arcos on the south side, here two streets with different names are developed in parallel, Ruas 1 and

2. These are not characterized by continuous building facades, facing the aqueduct as in the southern case, but the configuration of plots and isolated buildings of the dos Mestres neighborhood produces streets with a large number of cutout "skies." With a discontinuous rhythm, the fences are the first limit behind which the volume of the house is set back. In the highest section there are facades with accesses to the houses. In the lower section (from Rua 5 onwards) and with a steeper slope, the fences become dividing walls and the accesses are made through the transversal streets. Between these and the aqueduct, the grass extends, interrupted by a strip of stairs. This change from fences to party walls in this last section means that the aqueduct goes from being part of the parallel street to creating an intersection in the fabric of the neighborhood.

Along both slopes of the Alcântara Valley, the aqueduct is increasing in height and size as it descends downhill to maintain the upper gallery at a constant height and section. In the air, the water is carried by the aqueduct through its gallery. In addition, the aqueduct has the space to become a passageway that connects the Campolide hill with Monsanto⁶ for pedestrians (today it can only be visited as a street viewpoint or tourist attraction). This double infrastructural condition in this section, both for water conduction and for people, allows us to understand this





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section together with Rua dos Arcos and Ruas 1 and 2 as a multiple street, those of the air and those of the ground. **Fig. 3**

Intersecting: Arco do Carvalho

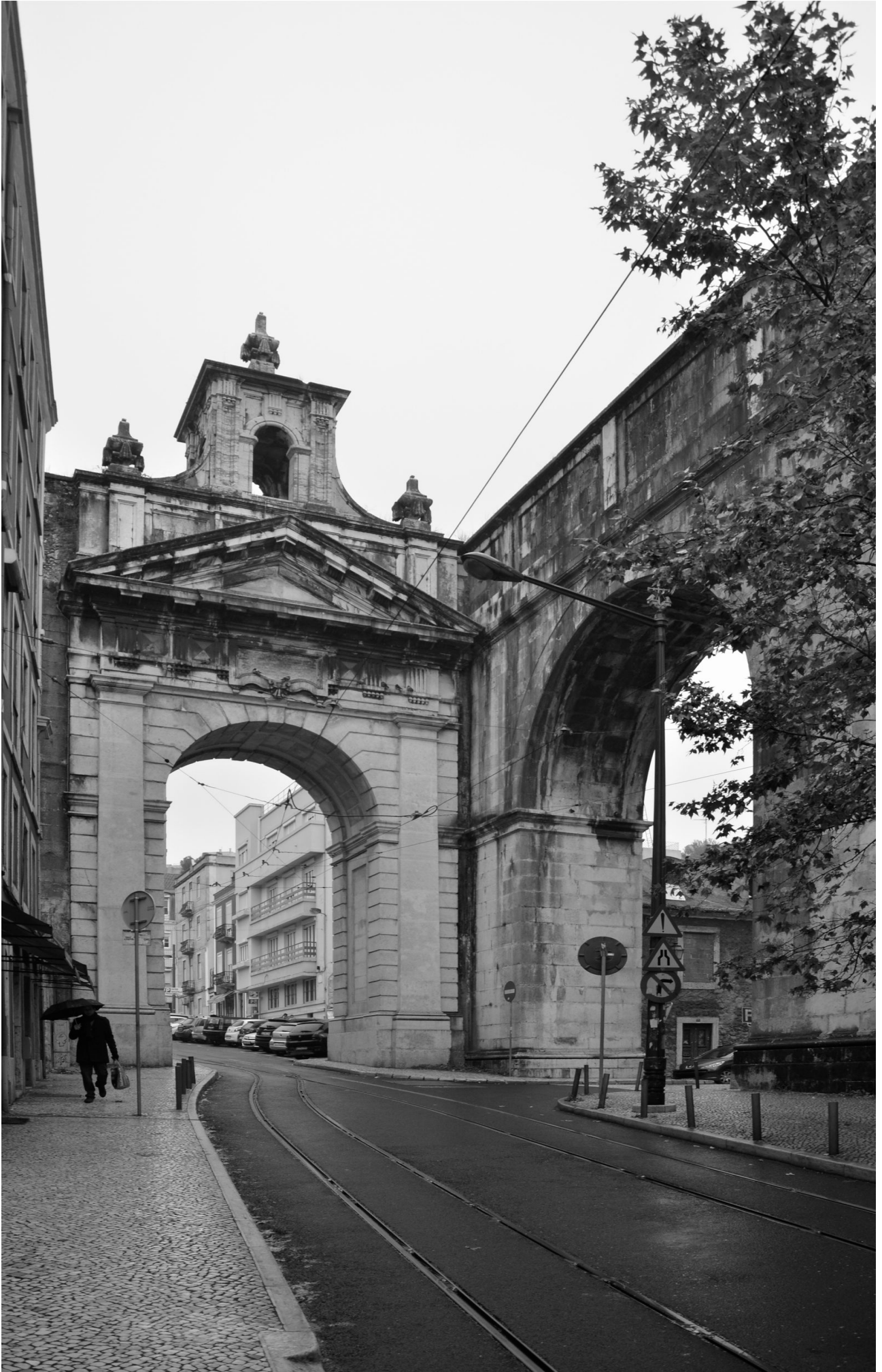
From the enclosure of Meia Laranja, on its arrival at the high elevation of Campolide, the aqueduct continues on its way. From Calçada da Quintinha to Alto de Carvalho, the aqueduct becomes the support of a passage that extends between buildings to a border of a cliff. This currently closed section, in addition to contacting the rear part of some terraced houses, has the potential to become a street-viewpoint towards Campo de Ourique and the Alcântara valley. The aqueduct supports this street and crowns the topographic feature. Towards Avenida Eng. Duarte Pacheco, the aqueduct produces the Arco do Carvalho. Here, its presence links the intersection of two streets like a backdrop: seen from the south side it is common to both, on its north side it is specific to each street. The location of one of its lanterns at the intersection vertex, as well as the fountain at street level, underlines the role of the infrastructure in the recognition of the meeting of streets. **Fig. 4**

Building facade: Rua and Praça das Amoreiras

After crossing Campo de Ourique, the aqueduct appears near the Bloco das Águas Livres to jump in a triumphal arch

over Rua das Amoreiras. Here the infrastructure adopts one of its most spectacular relationships with the street. Its body goes beyond its functional infrastructural form. The crossing over Rua das Amoreiras is made over a triumphal arch, making the characteristic aqueduct gallery practically disappear behind the pediment. It reappears immediately when making the turn to develop next to the street. In a street perspective, the direction of the aqueduct almost creates a vanishing point towards the arch. **Fig. 5**

In this section, the aqueduct maintains a high level over nine large arches that connect the triumphal arch with the Mãe d'Água building, generating a *façade* that divides Rua das Amoreiras from Praça das Amoreiras. This front is a street *façade* on one side and a square *façade* on the other. In addition, the thickness of the infrastructure generates a transition threshold between the spaces of the street and the square. This aqueduct in Jardim das Amoreiras⁷ combines a multi-scale design, from the small-scale details, the spatial decisions regarding the urban space, or its design as infrastructure. Its configuring role for this urban space is fundamental, organizing the topography and the spatial construction of the square, as well as the development of the Bairro das Águas Livres⁸. The Mãe de Água building is a key piece, especially from Rato's point of view, from where the aqueduct and the building are understood together with



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Aqueduto das Águas Livres and Rua dos Arcos in Bairro da Serafina and Liberdade, Lisbon (ph. Pablo Villalonga Munar, 2022).

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Aqueduto das Águas Livres and Rua 2 in Bairro dos Mestres, Lisbon (ph. Pablo Villalonga Munar, 2022).

3

Aqueduto das Águas Livres over Alcântara Valley. Transversal sections sequence and overlaps (drawing by Pablo Villalonga Munar, 2022).

4

Arco do Carvalhão, Lisbon (ph. Pablo Villalonga Munar, 2018).

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Arco das Amoreiras, Lisbon (ph. Pablo Villalonga Munar, 2018).

the streets as an enclave. From this point, the aqueduct divides again into two branches that continue under the streets; the Galeria de Loreto and the Galeria da Esperança.

Peeking out: Beco do Casal and many others

We have seen cases where the aqueduct can be clearly seen, but most of the aqueduct is developed underground. In this other case, it is only intermittently visible to the outside through its lanterns and log houses; small buildings that appear as “periscopes,” supplying light, air and access to the buried galleries. These appear in different ways, between party walls, isolated, attached to walls. Proof of this are the lanterns that appear just after the Reservatório de Campo de Ourique, in the Beco do Casal or “Casas do Registro” like the one in Travessa do São Sebastião da Pedreira. Their decontextualized appearance follows the order of the infrastructure that does not attend to the variabilities of what surrounds it.

Scratching: Arco de São Mamede

Following Galeria da Esperança, the aqueduct appears again in Rua do Arco de São Mamede. There, it crosses in an arch over the street and the fountain of São Mamede (which is located with a small space on one side). In this case it is worth noting the deformation produced by the

aqueduct on the buildings at numbers 25 and 10A. The facade adjacent to the aqueduct and tangential to the buildings, is separated to leave a courtyard and open with windows above the infrastructure. From the lower part of Arco de São Mamede, it seems that there is a corner, a turn or a crossing to the street, marked by the fountain at the foot of the facade. However, it is a dead-end space. The aqueduct continues to serve as a plinth, at the change of level with Travessa do Noronha, before getting lost in the interiors of some blocks ahead. **Fig. 6**

Disappearing and reappearing: São Bento and Av. Infante Santo

Further down, where Rua de São Bento meets Palácio das Cortes, there is the scar of the old arch over the street. Remnants of the crossing remain on both sides. At the same site, some arches are embedded in the building of the former Por Timor Library. The cross arch, of the triumphal type, was dismantled in the 1940's. Piece by piece it was moved to the Praça de Espanha and placed in the middle of a traffic roundabout. Its size is dwarfed, surrounded by a space totally opposed to that of its origin. The effect of contrast with the street disappears. Without the street the arch is totally decontextualized. **Fig. 7**

In São Bento, the ruins of the operation remain, marks such



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Arco de São Mamede, Lisbon (ph. Pablo Villalonga Munar, 2022).

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Ruins in Rua São Bento and Arco São Bento in Praça Espanha, Lisbon (ph. Pablo Villalonga Munar, 2018).

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Aqueduto das Águas Livres and Rua do Pau de Bandeira and Tv. do Chafariz das Terras, Lisbon (ph. Pablo Villalonga Munar, 2022).

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Aqueduto das Águas Livres Lisbon's intersection: 01, Bairro da Serafina e Liberdade; 02, Bairro dos Mestres; 03, Arco do Carvalhão; 04, Rua São Sebastião da Pedreira; 05, Jardim das Amoreiras; 06 Arco de São Mamede; 07, Arco de São Bento; 08, Rua do Pau de Bandeira (drawing by Pablo Villalonga Munar, 2022).

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Aqueduto das Águas Livres sections: A, Alcântara Valley; B, Bairro da Liberdade; C, Bairro dos Mestres; D, Jardim das Amoreiras; E, Arco de Carvalhão; F, Arco de São Mamede; G, Rua do Pau de Bandeira (drawing by Pablo Villalonga Munar, 2022).



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as those can be found on the sides of Avenida Infante Santo. However, there, the operation was not of transposition, but of demolition for the construction of this avenue in the 1950's. From these traces of infrastructure, it is interesting to reconstruct the arch over the avenue in our mind.

The line of the infrastructure interrupted by the Avenida Infante Santo continues at higher levels on both sides. While on one side it is interrupted by Calçada das Necessidades, on the other it continues towards Rua do Pau de Bandeira and Tv. do Chafariz das Terras. In this case, the aqueduct develops linearly in the center of the street, with low height and little permeability. Only a door near the Terras fountain connects directly under the aqueduct. The rest of its route is a parapet, a wall, a screen. This causes that from one street it is not barely possible to see what happens on the ground floor of the other. Because of the slope of both streets, the aqueduct-wall is reducing its height to the apex of the junction between streets. There, a bench tops the end. **Fig. 8**

Celebrating: São Sebastião da Pedreira and Praça do Príncipe Real

Spots like Chafariz das Terras, are samples of how other elements are attached or linked to the aqueduct, being a support to equip the street. Thus, the infrastructure does

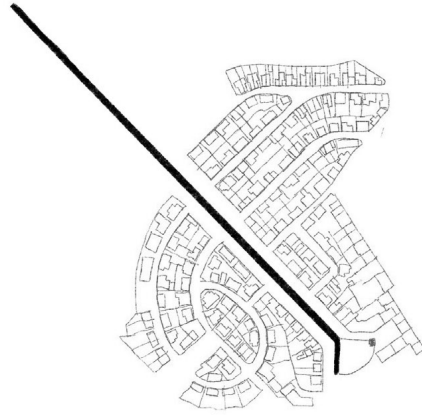
not only appear in the street in the form of an elongated body or a conduit in a gallery, but also like points. In that sense (although it is not the main subject of this article) the fountains are another example of the presence of the aqueduct in the city. They celebrate the arrival of water and make it more than just a fundamental resource. The way in which they are located, the sculptures they house or the dynamics of use they establish, are just some of the ways in which they materialize aspects of the city and its culture. For example, the case of the São Sebastião da Pedreira fountain stands out for its recessed position from the street. This causes the appearance of a public space, redesigned in conjunction with the Filipe Folque viaduct project (interesting multiple crossing of infrastructures and projects) The designed set, square, fountain, buildings and viaduct, create a meander in the Rua de São Sebastião da Pedreira.

In other cases, such as the fountain at Praça do Príncipe Real, the fountain becomes not only the surface celebration of the aqueduct, but also a monumental space hidden beneath its surface, the Reservatório da Patriarcal, dedicated to cultural events. The relationship between underground and water appearing on the surface is an inherent condition for the materialization of the aqueduct as an infrastructure. This occurs constantly in the city in

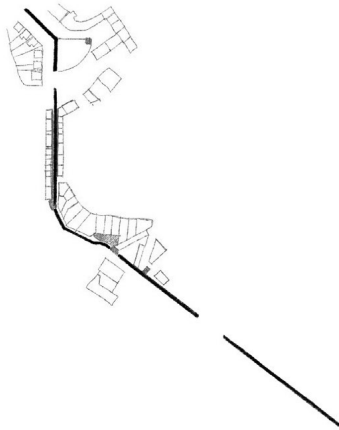
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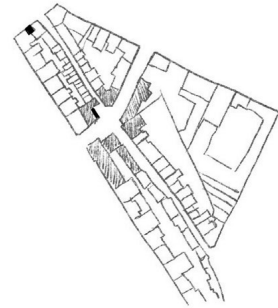
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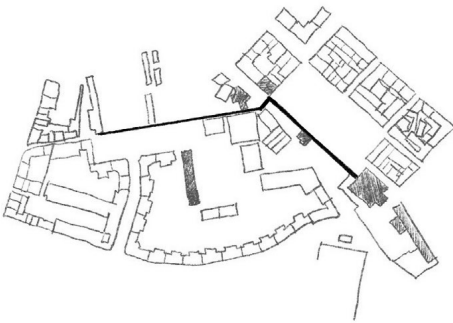
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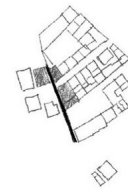
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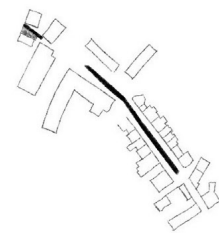
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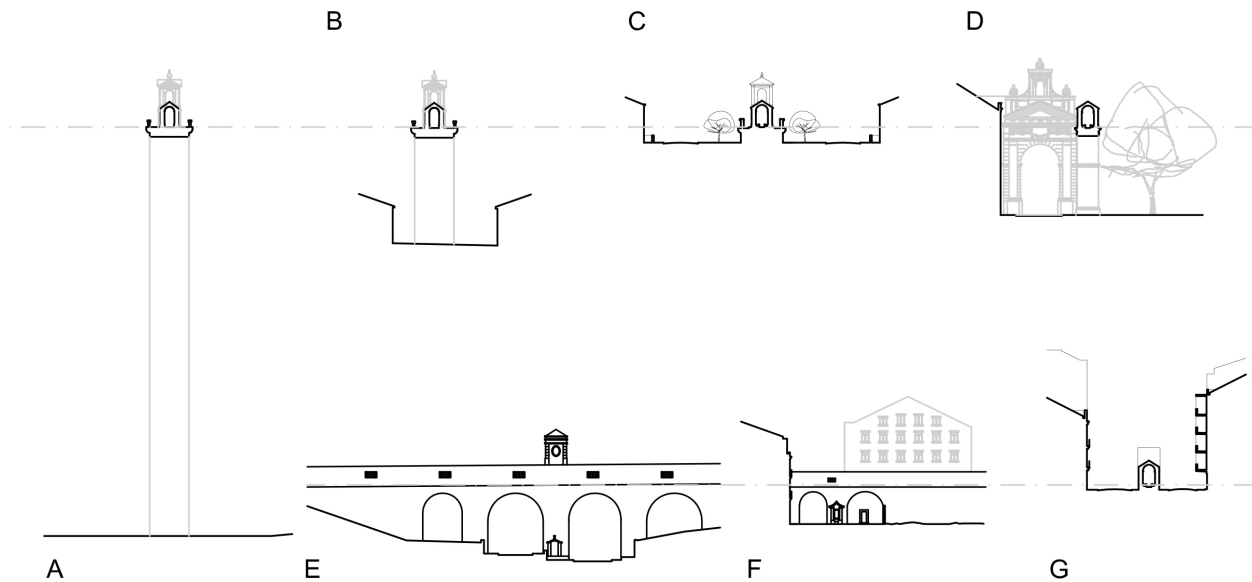
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multiple ways, from the private space of the home, its route through the streets, to its arrival at the most representative of public spaces.

CONCLUSIONS

Throughout this Lisbon's journey, the aqueduct is hidden or shown, crossing different realities that give rise to a wide variety of casuistry. The look that has been made here from the point of view of the street could be transferred to other cases of aqueducts, but also of other linear infrastructures such as viaducts or old defensive walls.

The methodology used for this article is based on the direct experience of the visit and its registration. The author is aware of the added value that a more detailed and systematic comparison through drawing could give to this work. He is also aware of the lack of many other places of interest that could enrich the categories mentioned and open up many others. The approach presented here is the beginning of this possible classification, based on the topological condition, understanding the aqueduct as a body that generates an action of relationship with its environment. Understanding its position as a result of movements between the city and the infrastructure. Therefore, its presence is treated as photographs of gestures developed in the time and slowness of the order of

the construction of the city. The specific relations of Lisbon presented here may show topological situations similar to other places in Europe. Their comparison and specific study, as well as the coincidence in time between streets and aqueducts development, is under development for another wider article or research work.

The encounters between the aqueducts and streets are builders of complex urban landscapes, explicit evidence of the overlapping infrastructural layers that make up the city. Streets of water and streets for people are capable of establishing relationships of mutual advantage, both at the level of connectivity given their infrastructural condition, as well as from their roles with respect to urban morphology.

A fundamental reference for this article has been the thesis of Sérgio Proença⁹. In it, the role of the aqueduct, an infrastructural element, as a generator of asymmetries, lateral limits or street fronts is raised. Both as a result of a residual process of the construction of the street space, and as a result of a preconceived composition: "[...] in the composition of the cross-section of the street in Lisbon, the aqueduct is a limit but also an element of spatial articulation and sometimes a structuring element of the composition."¹⁰

Although with nuances and combinations, this article detects three main types of relationship between aqueduct

and street, typical of the encounters of the infrastructure with the city: by contact, by tangency or by emptiness.

In Lisbon, as it has happened throughout history in other cities¹¹, the relationship with water supply infrastructures has left its mark on the urban and cultural landscape of the city. The street meets the aqueduct in different forms and hierarchies; from long galleries to punctual fountains, from situations of mutual construction and coexistence, to destruction and conflict. **Fig. 9**

In the Alcântara Valley, the aqueduct reinforces the layout of the streets through which it runs. However, while in the Bairro da Liberdade it was developed without a unitary project that recognized it, in the Bairro dos Mestres, the aqueduct is recognized as an essential and considered element of its design. In these cases, the sequence of arches is characteristic in providing visual permeability in its presence in the urban landscape. This situation contrasts with cases such as Rua do Pau de Bandeira and Travessa do Chafariz das Terras in Lisbon or Casal do Pelão in Belas, where the aqueduct is also located in the center of the layout, but whose presence acts as a screen or opaque wall.

In Rua das Amoreiras or in streets such as Travessa do Barbosa, the aqueduct is located on one side, accompanying the street and generating a characteristic facade of the street. In this boundary position, the role of the aqueduct in the definition of Praça das Amoreiras stands out in its combination with the buildings of Bairro das Águas Livres. In other cases, the aqueduct acts as a lateral boundary as in the case of Largo de São Carlos, also as a retaining wall, as in the cases of Rua Eng. Pedro Appleton in Caneças. In these cases, the aqueduct becomes a configurative facade of the street space or public space.

In Avenida Infante Santo, the conflict of interests between infrastructures caused the demolition of the aqueduct, whose ruins remained as scars on both sides. A similar situation to that of the Arco de São Bento, whose transposition to Praça de Espanha left the rest of its ruins on Rua de São Bento. In this case, although the arch over the street was not completely destroyed, it was orphaned of its relationship with the street in a new environment that decontextualizes its meaning.

In the Arco de São Mamede and Arco do Carvalhão, the aqueduct crosses transversally to the streets, respecting the passage under its arches. In these cases, the arches take on special relevance and meaning, being able to be part of the collection of "Arcos e arcadas de Lisboa,"¹² specific Lisbon's feature of the relationship between the city and the topography. This monumental presence of the aqueduct in the street, whose maximum exponents are the cases of the Alcântara Valley and Praça das Amoreiras, have their counterpoint with those subtle or intermittent presences, in the form of lanterns or galleries that protrude, result of the hidden passage of the aqueduct under the streets.

In all these cases, the power of the designed detail, of the way in which time sequences the construction relationship between aqueduct and city, generates particular urban phenomena, fruit of the different encounters between

infrastructural lines; street and aqueduct.

Aqueducts, as more than streets for water, materialize in an infrastructural body that conditions the configuration of the streets with which they meet. Because of the effects that they entail over time and beyond the architectural aspects – from tangible to intangible dimensions, whether social, historical, cultural or economic – it is important to consider these encounters between infrastructures as a valuable field of design for the city. **Fig. 10**

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¹ Pablo Villalonga Munar, "Encuentros Con La Infraestructura: Intersecciones Entre Infraestructuras Lineales Elevadas y Arquitecturas de La Ciudad Sedimentada Europea" (PhD dissertation, Universitat Politècnica de Catalunya, 2020).

² Blanca Callén, Miquel Domènech, Daniel López, Israel Rodríguez, Tomás Sánchez-Criado, Francisco Tirado, "Diásporas y Transiciones En La Teoría Del Actor-Red," *Athenea Digital: Revista de Pensamiento e Investigación Social* 11, No. 1 (2011): 3–13.

³ Melanie Birks and Jane Mills, *Grounded Theory: A Practical Guide. 2nd Ed.* (London: SAGE Publications, 2015).

⁴ It should be noted that at other times in history the lower arches of the aqueduct were occupied by buildings. On the sides of some of the pillars you can still see the marks of the roofs that were attached to the infrastructure. With this we can imagine the change that this would mean for the street.

⁵ Sérgio Barreiros Proença, "A Diversidade da Rua na Cidade de Lisboa: Morfologia e Morfogénese" (PhD dissertation, Faculdade de Arquitectura, Universidade de Lisboa, 2014), 439.

⁶ At other times in history, the aqueduct was known as Ponte dos Arcos, being one of the controlled entry points to Lisbon.

⁷ Pablo Villalonga Munar and Anna Sala Giral, "Presencias Infraestructurales. El 'Aqueduto Das Águas Livres' En Lisboa / Infrastructural Presence. « Aqueduto Das Águas Livres » in Lisbon," in *Visiones Urbanas*, ed. Miguel Angel Chaves Martin (Madrid: Arte y Ciudad, 2020), 989–97.

⁸ Walter Rossa, *Além Da Baixa. Indícios de Planeamento Urbano na Lisboa Setecentista* (Lisbon: Ministério da Cultura. Instituto Português do Património Arquitectónico, 1998).

⁹ Proença, "A Diversidade da Rua na Cidade de Lisboa."

¹⁰ "[...] na composição da secção transversal da rua em Lisboa, o aqueduto é limite mas também elemento de articulação espacial e por vezes elemento estruturante da composição." Proença, "A Diversidade da Rua na Cidade de Lisboa," 499.

¹¹ Katherine Wentworth Rinne, *The Waters of Rome: Aqueducts, Fountains, and the Birth of the Baroque City* (New Haven: Yale University Press, 2010).

¹² Baltazar Caeiro, *Arcos e Arcadas de Lisboa* (Lisbon: Distri, 1991).

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Le strade amano l'acquedotto: l'acquedotto delle Águas Livres a Lisbona

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acquedotti; Aqueduto Águas Livres; ambiente costruito; monumentalizzazione; infrastruttura

ABSTRACT

Il rapporto tra strade e acquedotti in Europa è un modello rilevabile. Con una condizione lineare condivisa, questi incontri tra infrastrutture avvengono in modi diversi, dall'allineamento assoluto all'intersezione inaspettata. Archi, pietre, facciate, persone, dettagli, ombre e altri attori insieme spiegano storie utili per la progettazione architettonica.

Attraverso il caso studio dell'Aqueduto das Águas Livres e del suo rapporto con le strade di Lisbona, è possibile ottenere un'ampia casistica di incontri diversi. Il movimento dell'acquedotto gioca un ruolo caratteristico e fondamentale nella fisionomia e nella configurazione delle strade della città, oltre che dell'ambiente costruito. Da grandi momenti monumentali a luoghi più modesti, le diverse manifestazioni ci permettono di avvicinarci alla ricchezza urbana e architettonica che si verifica nelle congiunzioni tra strada e acquedotto. In questo senso, grazie alla sua varietà, Lisbona è un luogo che offre un catalogo, da situazioni specifiche ed eccezionali a scenari urbani paragonabili ad altre città europee.

Gli acquedotti, più che strade per l'acqua, si materializzano in un corpo infrastrutturale che condiziona la configurazione delle strade con cui si incontrano. Per gli effetti che comportano nel tempo e al di là degli aspetti architettonici – dalla dimensione tangibile a quella intangibile – è importante considerare questi incontri tra infrastrutture come un prezioso campo di progettazione per la città.

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