

# The Portuguese National Laboratory of Civil Engineering and the assemble of an architectural research agenda for the promotion of 1960's-70's Lisbon new residential neighbourhoods

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## **Abstract**

World War II imposed massive territorial transformations throughout a number of affected cities, including the provision of housing and new urban infrastructures. To support such societal requests, some governmental research centres, promoted the development of scientific studies to sustain welfare policies. In Portugal, the National Laboratory for Civil Engineering (Laboratório Nacional de Engenharia Civil, LNEC), which responded directly to the Ministry of Public Works, promoted the development of architecture and urban scientific research for such requests. Thus, during the second half of the 20th century, LNEC played a strategic role in guiding the Portuguese urban transformations, including in its capital city, Lisbon. The investigation conducted by LNEC's architects-researchers, promoted the development of new theoretical research work and the elaboration of architectural and urban plans for specific residential areas. Research and practice were, therefore, articulated and promoted by LNEC. A number of new neighbourhoods planned for Lisbon between 1960's and 1980's, benefited from the contribution of LNEC researchers, including Olivais Sul (1959-1968), Chelas (1961-1966) and Restelo (1970-1984). This paper examines, for the above-identified Lisbon's neighbourhoods, the research contributions, which have guided their architectural and/or urban proposals.

## **Keywords**

urban planning theory and practice, urban history, Lisbon, scientific research, Portuguese National Laboratory for Civil Engineering (LNEC).

## **How to cite**

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## INTRODUCTION

The Portuguese National Laboratory for Civil Engineering (*Laboratório Nacional de Engenharia Civil*, LNEC), as the name suggests, was created to support the intensification of civil engineering works in its various modalities, by the Decree Law N° 35.957 of 19 November 1946. The 'Public Works' policy carried out by "Estado Novo", the authoritarian regime which occurred in Portugal from 1933 to 1974 under the government of António de Oliveira Salazar (1889-1970), significantly increased the number of urban and territorial interventions across the country. Since the volume of works seemed to exceed the Portuguese technical capacity of realization, to avoid devaluing the country's image, the Government invested in the study of materials, processes and construction techniques, namely at LNEC. Two years after the creation of LNEC, the "15 Years of Public Works Exhibition" (Lisbon, 1948) highlighted the importance of this governmental research centre, particularly due to the support that its various departments gave to the construction of roads, bridges, dams, public equipments and social housing neighbourhoods.

However, only in the early 1960s did LNEC include the scientific study of architecture and urbanism at the Buildings and Bridges Department (*Departamento de Edifícios e Pontes*), led by engineer Júlio Ferry Borges (1922-1993). To support the transformations of the cities, a few numbers of young architects started to focus on studies related to construction materials, construction processes and housing at the Construction and Housing Division (CHD, *Divisão de Construção e Habitação*)<sup>1</sup>. The architect Nuno Portas (born 1934) was invited to constitute the research team and, in articulation with the Ministry of Public Works, to define some of the research works domains. The contacts established by Portas with other international research centres contributed to identify the most relevant issues to investigate and helped the Portuguese architect-researchers to initiate the application of new methodologies of research, never experienced before. The presence of Portas at the 8th Congress of the International Union of Architects (Paris, 1965) allowed validating the relevance of the established research program for CHD. In Paris, Portas confirmed that some of the research methodologies followed by the *Centre d'Études des Groupes Sociaux* (CEGS, France), *Centre Scientifique et Technique du Bâtiment* (CSTB, France), *Building Research Station* (BRS, England) and *Research Institute of Construction and Architecture* (VUVA, Czechoslovakia) were similar to the ones conducted at LNEC<sup>2</sup>. Just like these European research centres, in Portugal it was important to follow the path of scientific research in architecture and urbanism while confronting it with the questioning of human needs, namely, those related to families and housing<sup>3</sup>.

The architectural and urban scientific research work conducted at LNEC, directly applied by some LNEC's architect-researchers in a number of urban or architectural interventions were not yet subject of a detailed examination. Thus, through the results of an ongoing postdoctoral research, based on the analysis of LNEC's archives and architect-researchers' memories, this paper aims to analyse the relation between scientific research and the design options to intervene architecturally and urbanistically at *Olivais Sul*, *Restelo* and *Chelas Lisbon's* neighbourhoods. After this introduction, the next three sections will analyse those three neighbourhoods in terms of their research background, in what concerns LNEC's eventual research contributions. Finally, in the conclusion we emphasise the importance of LNEC's scientific research works in architecture and urbanism for the territorial development of the city of Lisbon.

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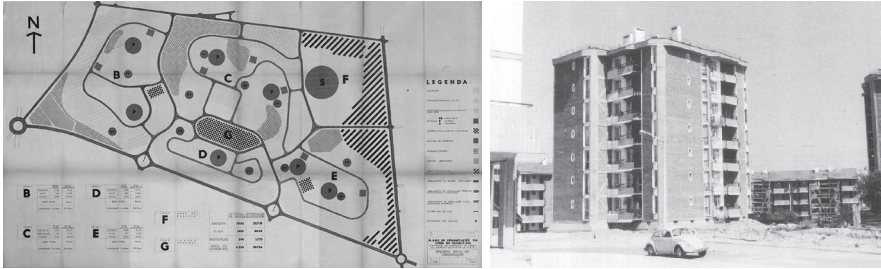


Fig. 1. Olivais Sul cell division, 1959 (left) and the construction of one of Nuno Portas and Batolomeu Costa Cabral tower at Olivais (right).

## OLIVAIS SUL NEIGHBOURHOOD

Until the 1930's, the territory where the neighbourhood of Olivais was developed was mostly rural, composed by farms, olive groves and vineyards, which had a huge responsibility to feed a vast part of the inhabitants of the city of Lisbon<sup>4</sup>. The expropriation which occurred in Lisbon, between 1938 and 1948, for the implementation of the Master Plan for the City of Lisbon (1948) elaborated by the architect-urbanist Étienne de Gröer (1882-1952), include a large part of this territory for the construction of a residential area. Given the need of housing, the municipality gathered a group of diversified technicians – composed by architects, urban planners, engineers, sociologists, landscape architects and economists – from the Technical Housing Office (GTH). This team planned Olivais, according to two areas: north (1955-1958) and south (1960-1967) neighbourhoods. Olivais Sul (south) was developed by the architects Rafael Botelho (born 1923), Carlos Duarte (1926-2019), Mário Bruxelles (born 1930), Celestino de Castro (1920-2007) and António Pinto de Freitas (1925-2014). It covered an area of 186.6 ha and planned for 34000 inhabitants, organized in units or cells, within circa 4000-5900 ha. Each cell, as those of the British 'New Towns', should contemplate diversified models of residential buildings, to promote not only social interaction, but also equipments and facilities to encourage a certain day life autonomy. Bartolomeu Costa Cabral (born 1929) and Nuno Portas were responsible for the urban plan and architectural project of the cell C (1959-1968), developed in articulation with GTH.

Before Costa Cabral integrated LNEC's team (1967), he did an internship-work experience at CSTB (1962), where he collaborated with architect George Candilis (1913-1995); and at the Greater London Council (England, 1965), where he studied social housing. At LNEC he started to develop the study "Rationalization of dwellings organization solutions"<sup>5</sup>, which focused on the problems of the dwelling adaption in face of the changing family needs. With this work, the Portuguese public laboratory aimed to be closer to the urban field problematic. As Costa Cabral defended, it was already worldwide recognized as fundamental the expansion of research focusing the future conditions of the 'habitat', in view of the unprecedented intensity in the urbanization phenomenon<sup>6</sup>. At Olivais, Portas and Costa Cabral defined an urban plan nearer to the 'cluster' defended by the Team X, than the modern 'habitation unit', which

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was planned before at Olivais Norte (north). Thus, the urban solution for Cell C of Olivais Sul resulted in the proposal of streets and green empty spaces planned around the residential areas, in a closer manner. The idea was to recover the traditional urban spaces, with streets, squares and “cortiles” (courtyards), where the inhabitants could get together. To search for the most appropriate housing grouping form for that specific cell, as identified at LNEC'S report, Costa Cabral took into consideration a publication from VUVA, which focused on “les solutions optimales des volumes d'immeubles d'habitation”<sup>7</sup> (optimal solutions for residential building volumes). Consequently, the residential buildings were constituted by three housing rows (category I), punctuated by a set of small towers (category II), designed to a population of low financial income, in accordance with three housing categories as defined by Law N° 42.454 (14/10/1957). The idea was to replace the common high towers by lower buildings, which resulted in eight floors high buildings, close to the residential rows complex of four floors height.

The architectural projects suggest inspiration from the Italian social housing neighbourhoods, particularly the those developed by the INA-Casa program (*Istituto Nazionale delle Assicurazioni*), which were visited by Portas in 1958 and, a few years later, analyzed at LNEC by the trainee architect Alexandre Alves Costa<sup>8</sup> (born 1939), who verified mathematically the compatibility between functions and possible forms of grouping. It was also considered fundamental the information acquired from the “Pilot survey on family needs in housing”<sup>9</sup>, where LNEC's researchers followed Chombart Lauwe's social methodology and inquired families from particular neighbourhoods from Lisbon, namely inhabitants from Olivais Norte. The results from this inquiry were very important to support the subsequent studies, namely by Portas, who focused on the “study of the functions and requirements of housing areas”<sup>10</sup>, verifying the dimensions of the house and of each division, proposing minimum areas programs (considering quantitative and quality aspects). Supported by these three LNEC's reports, Portas and Costa Cabral defined the interior division of the apartments for Cell C of Olivais. As testified by Costa Cabral in a personal interview to the authors<sup>11</sup>, the kitchen was considered the social space area of these social houses, particularly because it is the house division where the family get together. Thus, Costa Cabral and Portas proposed a kitchen with many compartments, ready to cook, but also to receive family and friends. On the exterior, the facades announced the truth of the construction materials, particularly concrete and brick, not covered, as used in Italian architecture of the 1960s.

## RESTELO NEIGHBOURHOOD

After a long and complex process of Ajuda's hillside urbanization<sup>12</sup>, in 1970, the architects Nuno Portas, Nuno Teotónio Pereira (1922-2016) and João Paciência (born 1943) were invited to develop a new urban plan for the north of Restelo neighbourhood. The previously urban plan, developed in 1964 by the architect Francisco Zinho Antunes (1921-2002) and the engineer Eurico Ferreira Gonçalves (1916-2005), was interrupted by the Lisbon's mayor, because it previewed the construction of a set of towers behind Jerónimos Monastery, one of the most important monuments from the XVIth century built in the area.

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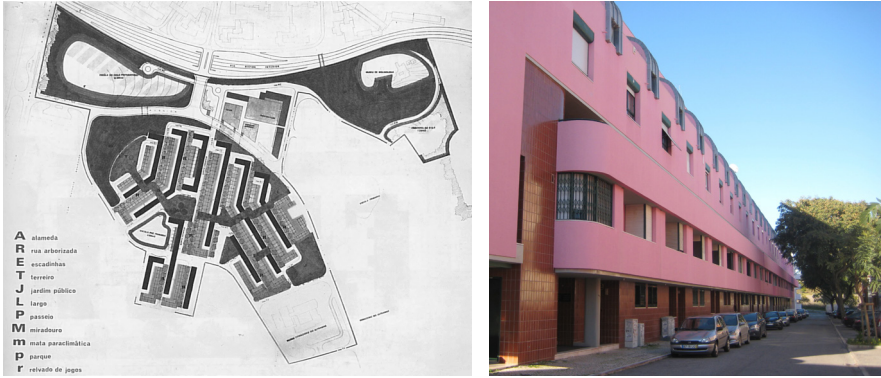


Fig. 2. Restelo Detail Plan (left) and housing complex (right).

Therefore, as the new team of architects had to maintain the population density provided in the previously urban plan (18.300 inhabitants<sup>13</sup>), informed by the research work developed by Costa Cabral at LNEC's CHD and by Leslie Martin (1908-1999) and Lionel March (1934-2018) at the *Centre for Land Use and Built Form Studies*<sup>14</sup> (LUBFS, Cambridge), the chosen urban layout was in defence of the “grid as a generator of the city”<sup>15</sup>. Consequently, the image of the old city of Lisbon was recovered and the streets were designed facing the Tagus River. As defended by Portas, the team opted for “high density/low height”<sup>16</sup>, achieved by the fact that in the same block, single-family houses were beside collective housing blocks. The height of the buildings was defined by the street's width, and those calculated on the percentage of the expected number of inhabitant's occupation.

However, with the changes occurred at the municipal land use management, transferring in 1972 the lands domain to the *EPUL-Empresa Pública de Urbanização de Lisboa* (Lisbon Public Urbanization Company), longitudinal housing blocks with five floors and a line of townhouses were planed to the pilot city block. Here the facades had a hierarchical design: the front facade of the housing blocks highlighted the duplex organization and the gallery access, in the back facade, a garage; the townhouses putted in evidence the patios (on the back). The patios and the high galleries placed in evidence the Smithson architecture influence, which separated the pedestrian from the automobile way. The Portuguese architects also searched for the relation between public and private space, to promote interaction between inhabitants. To recover the notion of “public space”, the topographic differences were resolved by staircases, terraces and gardens. In the end, the predicted commercial areas were not built, and this neighbourhood became dependent from the neighbouring neighbourhoods.

## CHELAS NEIGHBOURHOOD

Chelas Urbanization Plan, integrated in the city expansion strategy, was developed between 1961 and 1966, by a team of GTH's architects. This team, coordinated by José Rafael Botelho (born 1923), in-

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cluded the architect Francisco Silva Dias (born 1930), which worked later as a researcher from LNEC. Situated in an agricultural area of Lisbon, this urban plan aimed to correct some of the urban decisions applied in Olivais, which had however been so far neglected. Defined by a main central road axis, the Chelas neighbourhood was divided in two areas, limited by green spaces. Chelas predicted 53.300 inhabitants, distributed through 11.500 dwellings. Nevertheless, political changes which occurred in Portugal in the early 1970s, led to changes in the original design and program of this neighbourhood<sup>17</sup>.

The N2 zone, at the northern edge of the neighbourhood, was attributed by the Housing Development Fund ("Fundo de Fomento da Habitação", 1969-1982) to the architect Nuno Teotónio Pereira (1922-2016), however, given the fact that he was a political prisoner in that period, the architects Gonçalo Byrne (born 1941) and António Reis Cabrita (born 1942) were tasked to develop the plan and the main social housing complex, later none as "Pink Panther" (1972-1979), because pink was the colour chosen for the facades. These two architects worked at Teotónio Pereria office (Cabrita from 1966 and Byrne from 1968<sup>18</sup>) with Nuno Portas and, just a few years later, they worked also as LNEC's researchers. At LNEC, Byrne and Cabrita were responsible for the research works entitled "Rationalization of the Project Process - Modular Dimensional Coordination"<sup>19</sup> and "Organization of building projects: Method and model of the project communication to construction"<sup>20</sup>, respectively. These two research works were directly applied in Chelas, as testified by Byrne in a personal interview to the authors<sup>21</sup>. In the first one, in consonance with Christopher Alexander (born 1936) research work<sup>22</sup>, Byrne intended to mathematically look for ways to respond to social housing projects, in order to obtain a schematic and flexible rationalized range of housing types to better respond to the program needs. Regarding to Reis Cabrita research work, he searched to define the rules for projects presentation during the civil construction phase.

By this time, Byrne and Reis Cabrita visited Spain, France, Holland, Belgium, Germany and England to study other social housing models<sup>23</sup>. Chelas social housing complex was inspired by Gallarate neighbourhood (concluded in 1972) designed by Aldo Rossi (1931-1997). The two Portuguese architects planned for Chelas 382 dwellings (category II), distributed by five floors blocks with commercial areas on the ground floor, which helped to resolve the topography. Following the morphological social housing architecture defended at that time in other European countries, in Chelas were proposed long blocks, parallel and perpendicular, with high pedestrian streets, a square and interior block<sup>24</sup>, surrounded by green areas and distinguishing the network to the pedestrian and vehicles. As applied in London social housing, the access to the apartments was through galleries. In the interior of the dwellings, the applied areas were very close to the minimum defined by the legislation. Although, every time that it was possible to consider more space, the area was distributed through the divisions, considering Nuno Portas pilot survey (1963) and the study on housing areas (1964)<sup>25</sup>.

At present, Chelas integrates the largest urban agricultural municipal park of Lisbon, but also other illegal vegetable garden, nearby some of the above-analysed residential units. This indicates that present resident's needs are not being totally fulfilled and therefore emergent activities, organized by local residents, are taking place within the neighbourhood. These are occurring specifically in open spaces, planned by the original urban plan, and constitute an opportunity to rethink today the role of public urban spaces.



Fig. 3. Scheme of Chelas urban plan (left) and the “Pink Panther” social housing complex (right).

## CONCLUSIONS

This presentation has exposed three neighbourhoods, planned between 1960's and 1980's, which have benefited from scientific knowledge founded at LNEC and inspired by foreigner research centres and contemporary architecture and urban design. This is important as it underlines the strategic importance of LNEC research centre to the development of architecture and urbanism practice in Portugal. Furthermore, this presentation reveals how the possibility of linking research with practice was materialized in specific built housing complexes.

During 1960's the Sustainability Agenda was gaining dimension. It was precisely at that time that the main urban discussion ideas were being promoted worldwide, including at the United Nations, with whom also Nuno Portas had collaboration. Today, with the society request for Climate Change it is urgent that new architectural and urban solutions can emerge and inform urban planners on how to transform in a sustainable manner our places of living. The analysis of the above three case studies can be extended to the analysis of other neighbourhoods, in Lisbon but also outside, and inform other dimensions of sustainability, including those related to the food system.

## ENDNOTES

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