

# Rehabilitation strategies for residential buildings

6 case studies awarded by PNRU and PNTP

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## INTRODUCTION

This dissertation aims at understanding and evaluating strategies for the rehabilitation of residential buildings, based on the analysis of winning interventions of two Portuguese prizes of rehabilitation: Prémio Nuno Teotónio Pereira (PNTP) and Prémio Nacional de Reabilitação Urbana (PNRU). The study also aims to understand what is currently valued by the entities that promote the awards that have greater visibility in the rehabilitation area in Portugal.

This topic was chosen due to the significant interest in rehabilitation and to the conviction that it is through rehabilitation that the already consolidated cities will become better prepared for their future challenges.

After the survey of all interventions in residential buildings awarded by Prémio Nuno Teotónio Pereira and Prémio Nacional de Reabilitação Urbana, the criteria for the final selection of the case studies were defined as follows: (i) collective residential buildings; (ii) located in Oporto or Lisbon; (iii) having gone through total interventions; and (iv) that had been awarded in the last four years. The selected case studies were analyzed through the files sent by the architects, the documents in the municipality's archives and through field visits to the buildings. Six case studies were analyzed by their morpho-typological and constructive characteristics (primary elements, secondary elements, coatings, and finishes). Later, they were compared through a analysis grid that allowed to understand the level of preservation of existing values and to identify some strategies for rehabilitation of currently awarded residential buildings.

The bibliography that supported this dissertation corresponded to the main international charters and conventions related to heritage and rehabilitation, to the main regulations that were dictating the rules of this type of interventions in Portugal, as well as books, publications, thesis, and documents related to this theme. The consulted bibliography allowed the reflection on the issues raised by these authors in the theme of rehabilitation and were fundamental for the subsequent analysis of the rehabilitated residential buildings, awarded by the National Urban Rehabilitation Award and the Nuno Teotónio Pereira Prize.

## REHABILITATION

This chapter aimed to carry out a brief theoretical reflection on the topic of rehabilitation by analyzing, in a first part, the main international charters and conventions related to the rehabilitation of current buildings and, in a second part, the main regulations that were dictating the rules in this type of interventions.

The concept of rehabilitation in current buildings arose in the context of “integrated conservation”, in the European Charter of Architectural Heritage, which mentioned, for the first time, the importance of the existing values in this heritage and the importance of its integration in daily life. Later, the Document of Nara for the Authenticity and the Burra Charter reinforced this idea, stating that the preservation of this heritage must be based on its values, developing interventions based on the true knowledge of the object to be intervened. Finally, the Recommendations for the Analysis, Conservation and Structural Restoration of Architectural Heritage (2003) came to defend the importance of preserving the structures and stated, with great anticipation, that “[f]requently, the application of the security levels adopted in the design of new buildings requires excessive measures, if not impossible” (ICOMOS 2003).

Regarding the Portuguese legislation, the principal regulations related to rehabilitation interventions were analyzed. In 1930, RGCU, the principal regulation regarding construction projects in Lisbon, was published. It organized and established strictly in a single document the building standards, becoming essentially a prescriptive regulation. Even though this regulation was specific to buildings located in Lisbon, some of its articles were posteriorly used in the construction of RGEU.

RGEU, created in 1951 and still in force, places the interventions in existing buildings alongside with new constructions allowing exceptions in cases of “minor importance” or those in which compliance is not justified for economic reasons.

In 1999, RJUE intended to concentrate the existing legislation. Here, there was a concern to distinguish the different types of interventions and it was included the principle of protection of the existing, meeting the principles established by the charters and documents that were being published internationally. Later, in 2009, RJRU was published, focusing mainly on urban rehabilitation. This regulation took a step back because, despite including the principle for the protection of the existing, this valuation was seen essentially from a functional perspective and not cultural.

In 2014, the RERU was created. It intended to exempt from normative compliance for a period of 7 years (2014-2021) the buildings or fractions of residential use over 30 years old or located in urban rehabilitation areas. This regime has highlighted the existing regulatory misfit, however, its fundamentally economic motivation did not prevent the destruction of existing patrimonial values nor the desirable increase in the performance levels of buildings, two of the fundamental objectives of the rehabilitation, as established in the Amsterdam Charter.

This conflict between the legal framework and interventions in current buildings with heritage values was mainly caused by a political will to promote this type of interventions, living, at the same time, in a context where rehabilitation was a marginal part of construction-related operations.

However, the current Decree-Law 95/2019 has contributed to the necessary and urgent regulatory adjustment and shows that a qualified rehabilitation intervention gives an holistic response by solving, in an integrated way, a set of issues and taking a step forward in the articulation between regulatory requirements and the identified values. It also defines the principles and rules that should guide interventions in existing

buildings: the principle of protection and valorization of the existing, the principle of environmental sustainability and the principle of proportional and progressive improvement.

This adjustment was made based on a triangle (difficult to conciliate) whose vertices correspond to the patrimonial value, performance and environment. Thus, one cannot look at the issues from one point of view. A comprehensive strategy is needed, defined by assessing the specific needs of each building and its true performance (Graf and Marino 2011).

Briefly, as established in 1975 by the Council of Europe, the rehabilitation of buildings aims at improving its performance, creating conditions that meet the demands of contemporary life, maintaining its interior structures and its structural logic, and, at the same time, carefully preserving its cultural significance and the values of each building.

## STUDY AWARDS

By analyzing the objectives of both awards, it is possible to verify that PNRU is mainly concerned with urban rehabilitation and its related economic and social sectors, not mentioning the architectural aspects. PNTP, also because it is more extensive in defining its objectives and although mentioning the technical, economic, and social perspective, states that it intends to promote the work developed by architects, builders and promoters and the dissemination of good practices. It also mentions the importance of preserving and revitalizing the housing heritage.

In general, both awards pay attention to topics such as urban regeneration, sustainability, the importance of the values of the area where it is included and of the pre-existing structures. However, the emphasis they place on each of them is different mainly because they are attributed by entities with different objectives.

At the urban level, the PNTP has a more functional and social-inclusion logic, while the PNRU, being concerned about the relationships between the building and the characteristics of the place, has a logic of alteration of the physical fabric, monetization, and gentrification processes.

From the architectural point of view, the reference to the preservation of the existing values is reduced but a special emphasis is placed, in both awards, on the values inherent in the structure itself and on the relationships between the building and the area where it is included.

The economic impact criterion is mainly valued by PNRU, which highlights the increase in the real estate value of the area, the capture of new economic activities, the creation of jobs both in the building itself and in its surroundings, and the increase of the area's tourist attraction.

Finally, the sustainability perspective is also present in the two awards. In PNRU, greater emphasis is given to the improvement and fulfillment of energy requirements, while in PNTP the focus is on the use of environmentally sustainable materials, of techniques and solutions that reduce energy consumption and the

ecological footprint associated with the construction sector. PNRU also values the quality of the construction, increasing its durability and reducing the costs during the buildings' lifetime.

Regarding the jury of the two awards, although both present members of great quality, the most relevant differences between the two are: (i) the promoting entity (PNTP is awarded by the State (IHRU) and PNRU by real estate agents (Vida Imobiliária and Promevi)), leading to the first prize focusing more on disciplinary and social issues and the second in economic ones, having a more commercial logic, of customer attraction; (ii) the continuity that exists in the PNTP jury, becoming a jury with tradition and experience in the area, with a vision, also, of greater continuity; and (iii) the visit to the building by the PNTP jury, a very important aspect in architecture and, in particular, in rehabilitation.

It was also possible to conclude that, although both awards are linked to urban rehabilitation and revitalization of cities, PNRU tries to approach the economic activity by assuming that it is an award more related to real estate, with a more urban and economic dimension ("regeneration and revitalization of the urban fabric", "impact on economic activity", "adoption of good practices of urban rehabilitation", "solutions of business models" (PNRU Regulation)), also visible through its own name. PNTP, although also caring about the urban fabric, focuses mainly on the relationships and interconnections [of the urban fabric] with the intervention itself ("accessibility", "integration of local characterization values", "compatibilization with the existing uses in the area", "interconnection with existing spaces and values", "appropriation by users", "dissemination of social improvements in access to housing" (PNTP Regulation)), and not so much in increasing the real estate, economic and tourist attraction of the urban area.

## CASE STUDIES

**Palácio do Contador Mor** has different construction dates, being the first from late fifteenth century and presenting characteristics of the pombaline construction method on the upper floors. According to the inspection lead in 2006, it was in poor condition, particularly in terms of the conservation of the wood structures (floors, the pombaline cage and roof).

The project mainly established as values to preserve the exterior and aesthetic characteristics of the building: the coatings of the facades, the tiles wainscot, the existing patios, the Portuguese floor of the entrance hall, the ceilings with heritage value and the archaeological finds. The principle followed of respect and maintenance of the composition of the elements of the facades, its height and the volumetry, had, as an exception, the change of the basement spans for garage gates.

The interior was demolished and only the original structural masonry stone walls (currently with only a divisional function of the housing fractions) and the floors structure over the ceilings that had patrimonial value were maintained. A new concrete structure was made, being responsible for the structural behavior of the entire building. The roof structure was also replaced, and small windows were added to enable the use of the top floor, maintaining the original building height. The project also removed two of the three stair cores and replaced the original typology of the building with a quadruplex typology.



Figure 1 - (1) Interior main room, before the intervention. (2) Main entrance atrium, before the intervention. (3) Main Façade, after the intervention. (4) Rua das Damas, after rehabilitation. (5) Outdoor patio, after intervention.

The intervention in the building in **Travessa do Abarracamento de Peniche** was able to integrate different moments. The 19th century building, which was changed in 1950 by the architect Raul Chorão Ramalho, was in a reasonable state of conservation. The use has been changed from single-family housing to collective housing but, by maintaining the vertical accesses and most of the interior compartments, it is possible to still read it as a whole.

The existing construction system has been maintained, repaired, and strengthened and the new walls were added considering the duality of existing construction solutions (pombaline cage structure (original) and reinforced concrete structure (intervention 1950)). The window frames have been replaced by new wooden ones with a simplified design and the exterior doors and interior shutters were maintained and repaired. The connection between the two existing volumes was made through an underground tunnel, allowing the preservation of the existing backyard and the relationship of heights between the two levels of the garden.



Figure 2 - (1) Main façade, before intervention. (2) Main stair core, before intervention. (3) Main façade, after intervention. (4) Main room, after intervention. (5) Section, after intervention.

The buildings that constitute the set **Restauração 430** corresponded to Porto bourgeois buildings, of the second half of the 19th century. The interiors of the two buildings were highly degraded and practically unrecoverable, and the interior structure was replaced by an armed concrete structure. The partition was changed, and the stair cores demolished. The new ones are in the same locations as the originals, but they do not have continuity in height. Thus, despite the intention to preserve the memory associated with the arrangement of the stair cores and with the existing skylights, the last ones lost their greatest function and importance of relation with the stair and of complementary lighting to the facades of the interior compartments. The handrail of no. 432 has been removed and reassembled according to the new configuration of the stairs.

The composition of the facades was fully maintained, and a new volume was added accommodating the vertical accesses (stairs and elevator). In this volume the material used in the cladding was clay slate in the

form of soletos, which corresponded to the pre-existing coating of the gable wall of the contiguous building (now covered by this new volume), relating with the memory of the pre-existing materiality.



Figure 3 - (1) Main facades, before the intervention. (2) Stair core, before the intervention. (3). Skylight, before the intervention. (4) Main facades, after intervention. (5) Stairs no. 432, after the intervention. (6) Interior Room, after intervention.

**Sottomayor Residence** corresponds to a residential complex of the early twentieth century. This project proposed three different types of intervention, depending on the different states of conservation. The three existing buildings kept the staircase cores that still existed. In no. 90 and 94 the interior compartmentation was altered, because the interiors were already demolished, and in no. 86 (in better conditions) the existing interior compartments were mainly preserved. The decorative elements of the entrance vestibules, stairs and elevator were maintained or remade with a similar design to the original.

In the original buildings, the ground floor window spans were transformed into door or storefront spans. Roof windows were also added to the roof (coated with zinc plate) and the ceramic material coated in greenish tones of the last floor was changed to a slate coating. The frames are new in PVC and have a similar design to the original.

The new volume accommodates new fractions and the approach followed was analogy. The alignments, materials, colors, and textures of the set of Avenida Duque de Loulé were maintained, and were used formal elements close to the originals, but assuming a contemporary language and avoiding copying.



Figure 4 - (1) Main façade, before the intervention. (2) Ceiling collapse, before intervention. (3) Rua Luciano Cordeiro Facade, after intervention. (4) Main stair core, after intervention. (5) Interior Room, after intervention.

**República 37** was an income building from the beginning of the 20th century. Generally, the building was in good condition and the original use was maintained. The interior organization was changed, and the main stairs was demolished to be in a central area, common to the two buildings (inside the central lobby) and, possibly, to increase the useful area of the fractions. This is a profound change because, in addition to its structuring function in the interior distribution of the building, this element also had a great patrimonial value related with the excellence of its design and with the richness of its materials.

The composition of the facades, their coatings and finishes were maintained. In this building, no roof windows were added but, instead, flat openings were made in the roof. The marquees located on the west façade were recovered but interrupted to allow the connection between the two volumes of the intervention. The floors and structural walls were mostly maintained, and the roof structure was replaced by another metallic one, to ensure the watertightness of the building.

The project adds a new volume with residential use and the contrast was the strategy followed. The new volume features a trapezoidal plant and uses contemporary materials in its design. Despite its contemporary approach it does not cease to create a relationship of materiality and color between the aluminum net that coats it and the iron marquees of the existing building. This relation is also present in the tension and proximity of the two volumes.

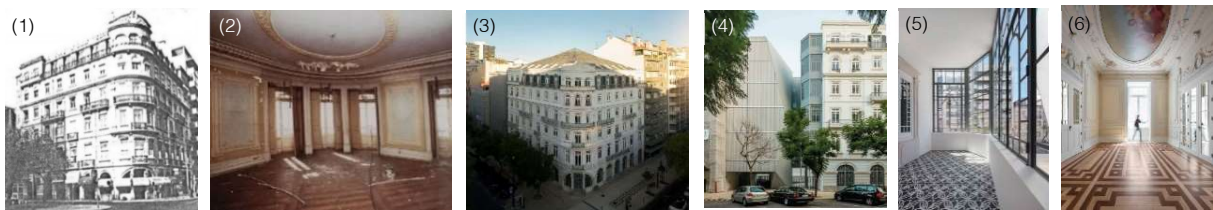


Figure 5 - (1) View of Avenida da República, before the intervention. (2) Principal room, before the intervention. (3) Bird view, after the intervention. (4) Connection between the two volumes, after the intervention. (5) Interior Marqueises, after the intervention. (6) Main room, after the intervention.

Finally, the **8 Building**, dated from the mid-twentieth century, already presented elements in reinforced concrete. The original building was intended for services and its use now corresponds to collective housing. Despite being in a good state of conservation, the original plan has changed over the years leading to the fact that, when it was acquired, the building was subdivided and without coherence between the bodies that constitute it, not presenting a great interior quality. Despite this, the project maintained the three original stair cores and extended the existing central corridor, allowing the creation of a ring corridor that distributes to the spaces facing the main facades or the interior courtyard. In this building were added narrow, high, and coated with zinc plate traps.



Figure 6 - (1) Corner building, before the intervention. (2) Concrete stairs, under construction. (3) Wooden roof structure, under construction. (4) Exterior facades, after intervention. (5) Clock Tower stair core, after the intervention.

## Common Strategies

After the analysis and comparison of the case studies it is possible to identify some **common strategies** followed: maintenance of the composition of the facades, subdivision of fires, replacement of the roof structure and addition of roof windows replacement of window frames, improvement of acoustic and thermal performances and, among others, the addition of a new volume.



The facades' composition, exterior cladding, stonework frames, exterior doors, and iron railings were almost always maintained, mainly because changes in facades have a big impact on urban space. It was possible to identify that most of the changes in these elements occurred on the ground floor, in the buildings where there was a change of that floor functionality. In general, there was a concern to maintain the original alignments, not introducing discontinuities in the composition and coherence of the facades, nor important structural changes of the exterior walls.

In all buildings, there has been an increase in the number of apartments, with sometimes profound changes in the original typologies of the buildings and in the functional/spatial organization of the interior of partitions. Original typologies of left/right or one apartment per floor have been replaced with four apartments per floor or were introduced new typologies in duplex/quadruplex in urban areas where the dominant typology is one fraction per floor or single-family dwelling.

The roofs' structure was replaced in most case studies, increasing the building's watertightness, and allowing a more optimized use. In the buildings in which they were replaced, they were in poor condition, rotted or demolished, except for one of the case studies.

Roof windows were also introduced in four case studies. This is an increasing trend followed in rehabilitation interventions to allow the use of the last floor in attic and, once again, increasing the profitability of the operation. The roof windows were always added according to the alignment of the spans of the lower floors and in most case studies, its design is compatible with the design of the roof and with the building's characteristics.

The structural walls have always been maintained. These were generally in good condition, had a great structural quality and served as support for coatings and finishes to be preserved. The floors were replaced in three of the case studies. In the buildings analyzed, the floors' structure corresponded, in general, to the most degraded elements, making it almost impossible not to intervene here, replacing them or just repairing and reinforcing. Although it is not possible to identify accurately, in the case studies analyzed, the new floors were placed approximately at the same level as the original ones, maintaining the existing height and the relationship with the existing spans.

In all case studies, the existing window frame solutions have been replaced by certified market solutions to ensure and improve the performance of buildings. Although its preservation and recovery should be given priority, these are elements with a huge influence on the comfort of its inhabitants, which is why its replacement is a common practice.

It was possible to verify that the options taken to improve the performance of the building were essentially the replacement of the roof structures, the replacement of window frames and use of double glazing, the introduction of thermal plastering on the outside, the introduction of plasterboard ceilings and walls and the introduction of insulations (XPS or rockwool) in between walls or floors.

It is often necessary to build a new volume as an extension of the original building. It was possible to verify that, regardless the different types of approaches followed in relation to the image (analogy or contrast), in



all the projects analyzed the pre-existing building's height was extended to the new volume, a requirement of regulations and urban plans, to ensure the homogeneity of the built set.

## CONCLUSIONS

This dissertation aimed to understand and evaluate common strategies for rehabilitation of residential buildings, based on the analysis of interventions that won two national rehabilitation awards: Prémio Nuno Teotónio Pereira and Prémio Nacional de Reabilitação Urbana.

After analyzing the case studies and reading the analysis grids, it was possible to verify that the interventions focused on three main aspects: the exterior image of the building; the typological questions/interior spatial structure; and the issues of environmental and functional performance.

The exterior image of the buildings, being an important value for the urban integration and continuity, becomes one of the mostly preserved aspects, mainly due to the requirements of the national and municipality plans. The awards' criteria also pay attention to this aspect, recognizing interventions that respect and value the characteristics of the area and that promote an urban and landscape integration (PNRU) and those that consider the preservation of local characterization values and urban areas (PNTP).

It was also possible to verify that, in all buildings, there were changes in the typology and interior spatial structure because of the increase in the number of fires. While PNRU considers these issues mainly from a perspective of profitability and gentrification processes, PNTP pays particular attention to this aspect in a logic of social inclusion. Despite being a valid and often necessary option (often, old buildings have compartments with high gross areas making their economic viability difficult and causing the "exodus of the most disadvantaged inhabitants", a contrary attitude to what was proposed in the Amsterdam Charter in 1975), after the change in the interior organization, it is essential that the original character of the building is perceived.

Finally, in relation to the adaptation to the new requirements, after these interventions, all buildings allow a use according to contemporary requirement levels, which is an indispensable condition for the extension of the life of buildings because only their integration into daily life allows them not to fall into disuse. PNRU states in its criteria that there should be an energy rehabilitation of the building and PNTP refers this aspect essentially from an environmental perspective, valuing the "application of environmentally friendly solutions, technologies and materials that reduce energy consumption" (PNTP Regulation).

As explained in the theoretical analysis to international charters and conventions and to Portuguese legislation, the concept of rehabilitation in architecture arose to respond to the adequacy of current residential buildings. The great difficulty in this type of interventions is to establish a balance between the need to adapt the building to the contemporary life needs and the preservation of existing values, contributing to the maintenance of the cultural meaning and authenticity of the object to be rehabilitated.

This balance must be achieved through a hierarchization of values, implying choices between the elements that will be preserved and those that will be removed.

In most case studies, the opportunities of intervention for the adaptation of these buildings to the current requirements were in the elements of lower quality or more degraded. These are usually the roofs and floors structures, the coverings of the ceilings or floors (to allow the reinforcement of the floor's structure) and the window frames (which, despite being elements of enormous value, must be often replaced by regulations requirements). The adaptation and adequacy of the spatiality and interior organization was also necessary, in most cases, for the reasons already mentioned.

The construction environment (facades and roofs), the common circulation systems (atriums, stairs, corridors), the construction systems and materialities (structures, but also secondary elements, coatings, and finishes) are central aspects to the characterization of buildings and therefore should be preserved whenever possible. When these elements are greatly modified or when they are removed without criteria, the authenticity of the building may be compromised, or even fail to understand it as a whole object (between what existed and what was added to it).

The concern to ensure the "best possible articulation between the performance of buildings, in view of the current expectations of comfort and safety, and the protection and enhancement of the existing" (Decreto-Lei n.º 95/2019) has been, over the years, often forgotten in Portuguese regulations, mainly for economic or functional reasons. However, it is currently reinforced by the principles laid down by the new decree-law (RAREFA).

It is possible to conclude that a rehabilitation intervention should provide users with a comfortable contemporary life, enabling the use of the buildings according to current standards of safety, habitability, use, economy, and aesthetics, without distorting it as an object of architecture. Thus, a rehabilitation intervention should always be adaptive, having the ability to adjust depending on the diversity of situations and the need for intervention.

A rehabilitation intervention, as an architectural project, should always reflect its time, and it is also important that, where it becomes necessary to intervene, this is accomplished by adding new values and new layers to buildings with very long lives. When done in continuity, these interventions of reinvention can contribute positively to the valorization of the existing.

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RAREFA

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