Chaby building – Inspection, Rehabilitation, and Maintenance

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***Abstract*—** A study was carried out on the Chaby building, involving inspection, rehabilitation, and maintenance of the most critical areas of the house and common parts of the building, taking into account the criteria implemented in the "Method for the Evaluation of the Conservation State of Buildings" (MAEC), developed by LNEC (National Laboratory of Civil Engineering). The objective of this work is to identify the deteriorations of the Chaby building by conducting a visual survey, describing the anomalies and their possible causes. After that, a rehabilitation and maintenance plan is developed to address the problems found in the residential and common areas of the building. The rehabilitation plan consists of a set of efficient solutions for the respective anomalies. As for the maintenance plan, its main objective is to preserve the building after its rehabilitation.

***Keywords*—** Inspection, anomalies, rehabilitation, maintenance.

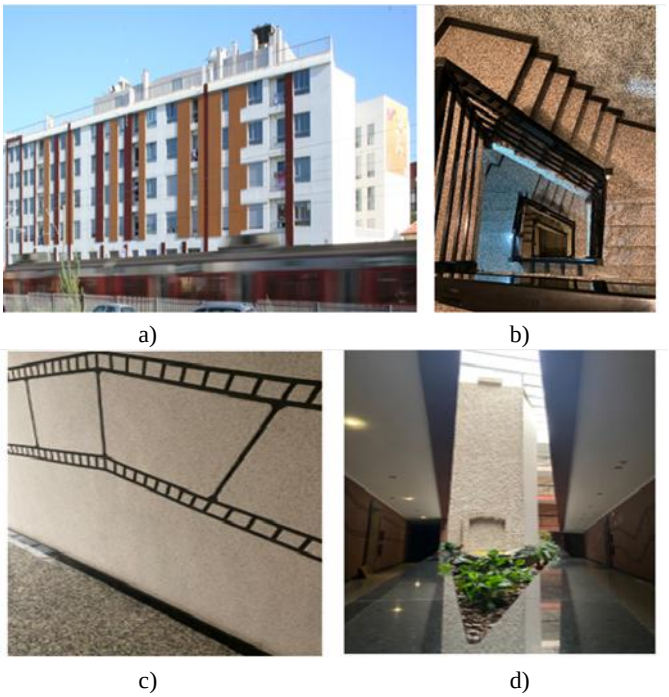
I. Introduction

Initially, the collected data from the Chaby building is approached, providing a geographical context, a brief history, and a description of the materials used in its construction.

It is situated in the residential area of the Sintra Railway Line, Portugal, specifically in the Algueirão Mem-Martins area, just a few minutes away from the train station of the same name.

II. Characterization of the Building

The building was constructed in the early 21st century and features a typical construction style of that time, making ample use of reinforced concrete (Fig. 1.a)). In a brief description of what is visible when visiting the building, it appears to be built with high-quality materials. For example, the common staircases in the building are mostly made of decorative sand paints, showcasing attention to detail (Fig. 1. b and 1.d)). The interior wall coverings also exhibit delicate and high-quality craftsmanship, as in shown in Fig.1c)



a) b) c) d)

Fig. 1 Building Characteristics. a) exterior façade; b) the stairs; c) craftmanship; d) interior/exterior garden.

III. Development of the Work

Next, the work will translate the adopted evaluation method for inspecting the building, reflecting on the method's essence, its application, and the chosen criteria and weightings for its implementation. This part of the work is largely based on the Method (MAEC).

To carry out the assessment, classification, and qualification of the conservation status of a building in Portugal, it is necessary to rely on information from previously conducted technical building inspections, as well as the methodology developed by LNEC (National Laboratory for Civil Engineering) called MAEC (Methodology for Assessing the Conservation Status). MAEC consists of an assessment form and application instructions.

According to MAEC, this methodology is applied to evaluate the conservation status of a functionally distinct space, which can be either residential or non-residential, encompassing the entire building or a part of it. A visual inspection of the property and its common areas is conducted

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by a technician to gather the necessary information for filling out the assessment form, following the criteria specified in the application instructions.

A chapter is dedicated to describing the visual inspection carried out on the building, considering all the factors imposed by LNEC for assessing anomalies in the functional elements of the structure (Fig. 2)

Efflorescence and detachments

Dark stains

Green Stains and efflorescence

Plaster Detachment

Dark stains

Physical harm

Fissuring

Humidity

Fig. 2 Anomalies of the building

To determine which functional elements should be considered during the inspection and included in the assessment form, it is necessary to refer back to MAEC. According to MAEC, only functional elements or their parts that meet the following conditions should be taken into account:

I. - Directly benefit the assessed space (e.g., the level of anomaly in elevators should not be evaluated if the assessed space is on the ground floor).

II. - Can affect the assessed space (e.g., only the level of anomaly in the roof of the section where the assessed space is located should be evaluated if the building has multiple sections).

III. - Are not decorative elements or additions made by the tenant (e.g., wall coverings or floorings installed by the tenant should not be evaluated).

IV. - Are not household appliances or equipment installed by the tenant (e.g., appliances like washing machines or heaters installed by the tenant should not be evaluated).

V. - Are included in the lease agreement (e.g., a residential unit may be leased excluding a storage room or a terrace, as specified in the lease agreement).

VI. - Have not been deactivated by the condominium's resolution (e.g., if a multifamily building has chosen to deactivate a waste disposal system through conduits, the response "not applicable" should be indicated for that functional element).

To distinguish the level of anomalies found in the inspected functional elements, criteria defined in Article 3 of Decree No. 1192-B/2006 are used. These criteria include the consequence of the anomaly on meeting functional requirements, the type and extent of work required to correct the anomaly, the relevance of the affected areas, and the existence of alternatives for the affected space or equipment.

With the support of MAEC, a visual inspection was

conducted, anomalies were classified, and the assessment form for the conservation status of the building under study was eventually completed, with the organization and presentation of the anomalies in the following chapter inspired by the structure of the assessment form developed by LNEC.

Following the study of the evaluation method used, a chapter is dedicated to describing the visual inspection carried out on the building, taking into account all the considerations imposed by LNEC for assessing anomalies in the functional elements of the structure. The inspection consists of a visual examination of the site and the study of photographs taken of the functional elements that are accessible or require inspection due to the presence of anomalies.

A form was then constructed and filled out, which includes the calculation for the qualification of the building's conservation status, taking into account the levels of anomalies and their weighting. The form is developed with the support of the calculation formula created by LNEC, as presented in MAEC.

An anomaly index of 4.1875 was obtained, indicating a good conservation status of the building, as per the first rule mentioned in the previous chapter on assessment, classification, and qualification of the building.

The elements such as the "roof," "ceiling," and "interior walls" of the dwelling exhibit severe and very severe anomalies, which are important functional parts of the dwelling. According to the rules outlined in MAEC, these findings lead to a decrease in the overall assessment result. Consequently, the building's conservation level is forced to lower, falling into a medium.

A framework was then developed for the calculation formula of the building's conservation state rating, as shown in Fig. 3.

Qualification Form	**Anomalies**					**Weighing**	**Score**
	Very slight	Slight	Moderate	Serious	Very serious		
	5pt.	4pt.	3pt.	2pt.	1pt.	(x)	
Building							
Structure		X				6	24
roof				X		5	10
Protruding elements			X			3	9
Common Spaces							
Walls				X		3	6
Floor coverings		X				2	8
Ceilings		X				2	8
Stairs		X				3	12
Joinery and doors		X				2	8
Electrical and lighting installation			X			1	3
Telecommunication and intrusion prevention installations		X				1	4
Elevator installation		X				3	12
Fire safety installation		X				1	4
Housing							
Exterior walls			X			5	15
Interior walls					X	3	3
Ceilings				X		4	8
Total score					(a)		134
Total considerations assigned to applicable functional elements					(b)	32	
Anomaly index					(a/b)		4,1875

Fig. 3 Framework developed for the calculation formula of the building's conservation state rating

After conducting the building inspection, a rehabilitation plan is then formulated, primarily supported by documents provided by the professors of the postgraduate program's courses.

A maintenance plan is developed to ensure that the conservation state of the building is not compromised again.

IV. Conclusion

The easy accessibility to the documents describing the building, the presence of someone in one of the dwellings, and the accumulation of knowledge acquired over a year proved to be major motivations for undertaking this work.

During the initial inspection of the building, it was

concluded that it lacked maintenance and care. The facades showed significant signs of moisture, and the common areas, although fairly well-maintained by the residents, still lacked proper upkeep. There were also some concerning anomalies found within the dwelling.

Most of the anomalies present in the building were not particularly worrisome as they were mainly a result of neglect, primarily affecting the aesthetic appearance.

Explaining the methodology for evaluating the conservation status of buildings (MAEC) was necessary as it provided support in classifying the identified anomalies, considering the assigned weights, and completing the assessment form.

The evaluation form for assessing the building's conservation status was somewhat incomplete due to the lack of inspected functional elements, particularly in the common areas and predominantly within the residential units. Having more parameters for evaluation and calculation would have made the assessment form more comprehensive.

Based on the evaluation form, it was concluded that the building is in a medium state of conservation. After addressing the identified anomalies through rehabilitation measures, the conservation and functionality of the building will be improved.

The proposed rehabilitation solutions aim to enhance the functionality and lifespan of the elements with anomalies, while the maintenance proposal focuses on preserving the rehabilitated elements.

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