



# Post-occupancy Evaluation in Public Buildings

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## Abstract

The increase in research devoted to performance evaluation of buildings in Brazil, coincides with the process of formalization of relations involving the history of the building, design, construction and maintenance of buildings. This process is the result of efforts to provide improvements in the supply chain of construction, with the incorporation of technological innovations, environmental comfort and devices for quality control. In Brazil, the contracting of services and public works is based on the law 8.666/93 between various aspects that highlights the importance of durability and the rationalization of public money. The durability of the built environment, compared to wear their equipment, facilities and maintenance needs, is a matter of great importance, especially in public buildings that are constructed to have long life. The present study aimed to identify key problems and pathologies of a public building in order to contribute to improved maintenance of the building, through the results and recommendations of this work. We conducted a case study of the building of the Rectory of Universidade Federal Fluminense - UFF, historical monument of great value to the city of Niterói, State of Rio de Janeiro. For this study, a survey was conducted of the various uses of the building throughout history, in conjunction with the Project developed a Post-Occupancy Evaluation which used instruments such as questionnaires and interviews with users of the building, quality assessments and Walk-through. These instruments have involved the technical, functional and environmental comfort with a focus on behavioral factors of the building and the degree of user satisfaction. As a contribution, this paper presents an array of recommendations to provide subsidies for the execution of maintenance works in the building, thus preserving the historical value of the public building.

**Keywords: Post-Occupation Evaluation, maintenance of historical buildings, Walk-through assessment.**

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## 1. Presentation Theme

The city of Niterói has detaque in the State of Rio de Janeiro due to development indices that make reference in key sectors such as education, health, quality of life and culture, the city grows apace gaining ground on the national scene.

In 1939 was built the Hotel Spa Casino Icarahy (figure 1) in the city of Niterói, state of Rio de Janeiro. In that same decade prevailed in the neighborhood Icaraí mansions, the palaces and buildings up to three floors.

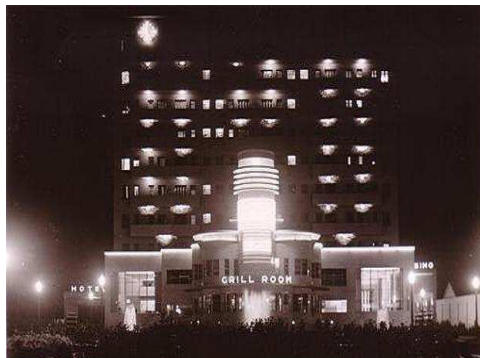
According to the Municipal Bureau of Culture (2000), Casino Icarahy was the first skyscraper in the neighborhood and the attraction of the city during the 30s and 40s.

With the closing of gambling houses in Brazil in 1946, the building was sold and now operates as a hotel and restaurant. After the reform of 1952, came the Casino Theatre. Since 1967, the building was built by the Federal Government going to host the Rector of the Universidade Federal Fluminense (UFF), which occurs until the present day (figure 2).

Due to the great historical and cultural value to the city in October 1994, all the old Casino (main building, your garden and kills its slope) was listed, ie, the preservation of property ordered by the Board of Preservation Hall Niterói, based on Law No. 1.330/94. Thus, the visibility of the architectural ensemble was guaranteed.

The building stands out because it is located in the center of the terrain, with sharp separation front. Its facade is characterized by Art Deco style, with the use of geometrical shapes.

Currently the building is occupied with seven Pro Rectories performing activities of administration and advice to the Rector of the University, being distributed in the floors of the building.



**Figures 1: Hotel Balneário Cassino Icarahy, 1939. (Prefeitura de Niterói, 1988)**



**Figure 2: Facade of the building currently. (Prefeitura de Niterói, 2010)**

## **2. Objectives**

Because it is a historical building, the building has undergone interventions with regard to their adaptation to new uses and also in regard to compensation.

The objective of this study is to evaluate the technical, functional, aesthetic and behavioral environment in use, in order both to users' opinion. Thus, diagnose strengths and weaknesses, defining the latter case, recommendations that may assist the university in future maintenance and performance of the built environment.

## **3. Methodology**

The study emphasizes the identification and descriptive of significant flaws and positive aspects of the building of the Rectory, from the diagnosis of the same condition: technical, global, questionnaires and interviews with officials, particularly those of the Dean of Undergraduate (PROGRAD). The choice of PROGRAD happened because this is the Pro-rector who manages the academic life of the students of the UFF, since joining the expedition to the diploma. Moreover, the sector operates coordinating and supervising the activities developed in undergraduate teaching as well as various academic programs die.

In operational terms, the work was divided into three steps:

- Step 1: Survey - identify critical points, describe problems encountered, determining working methods and prepare research instruments [questionnaires, checklists and spreadsheets].
- 2nd Step: Diagnosis - characterize factors acting on the problem through technical evaluation, lift distribution and occupancy through low plants and field survey for deck building, analyzing the results of applying the tools of research, interviews and questionnaires.
- 3rd Step: Recommendations - perform critical analysis of results and recommendations for maintenance and future interventions.

The following are detailed procedures adopted in the implementation and results of each survey instrument.

## **4. Diagnosis of Conditions of Building**

### **4.1 Evaluation Walk-Through**

According to Castro (2004), analysis or Walkthrough Preliminary Analysis of the environment is the recognition and identification of problems and descriptive positive aspects thereof.

Ornstein; Romero (1992) said POE relies primarily on three types of evaluation: a functional - with emphasis on using the technique - with a focus on materials, building systems and building facilities, and behavioral - from observation and consideration of users.

In the case of the Rectory building assessment was performed by the technical team and representative of users (staff of the organization) who toured the building for the recognition of their physical and functional characteristics of the users and their activities. Surveys of operating conditions and condition of the building were recorded through photographs,

graphics existing bases and field notebook for notes on what was found.

### **Infiltrations**

Infiltration is the main cause of mold and mildew stains from walls and the unhealthiness of the internal and external environments. In addition, lead to fungal growth, the decalcification of the concrete, cracking and peeling of the paint.

### **Floors**

The floors of the balconies have insufficient trim, which causes the water from the rains and the air conditioners get accumulated, contributing further to the deterioration of the facade and the walls of the building board.

In the movement of fire stairs, floors vary floors. No standardization occurred in the coatings of the internal areas of the building, where they were observed: hydraulic tiles, wood laminates, parquet, slate, ceramic and rubbery.

### **Ceilings**

The ceilings of the offices have recess in plaster, with matte white paint in good condition. On the roof of the fire escapes were applied in the slab itself paintings that need maintenance.

The lobby of the building features double height ceilings and recess, with indirect lighting in some areas that currently are intended for temporary exhibitions.

### **Corners and edges**

Were observed edges and corners damaged areas of office due to mechanical shocks of furniture and equipment in general.

### **Window sills and balconies**

The narrow width of the sills and running no inclination promote deterioration in the facades and allow water ingress by spans of some windows.

Regarding the balconies, it was found that the guardrails can not expel the water incident, well surpassing the transverse plane and causing sharp swearing. To prevent water from entering the rooms that have access to balconies, as an interim measure adopted by employees, fillets were placed on top of marble sills and toward the door, causing a gap in the passage leading to possible accidents and limit the disabled employees with special needs to balconies.

### **Frames**

Some frames were repainted externally to the latest redesign of the front, but were not painted internally.

Some doors have screens that foster communication and integration of employees, and all, according to NBR 9050, are appropriate regarding the sizing.

### **Paving**

There were no problems on the sidewalks outside the building and paving in the garden.

Only in the parking area there are problems of irregularities in paving the sidewalks due to the fact some cars in the same vouchers.

## **Garden**

The garden outside the building is maintained by the gardening team, with good condition, despite it not present the original French style.

## **4.2 Evaluation of Quality and Environmental Comfort**

Salgado (2004) says the quality assessment involves different aspects ranging from post-occupation This evaluation - focusing on the views of users about the performance of the building - even a purely technical assessment of the functioning of devices that allow the operation of a system building.

In this study, we evaluated issues relating to functionality, safety, suitability and comfort of environments.

## **Ventilation**

The ventilation of the building happens artificially through wall air conditioning unit. In some sectors the distribution of the air conditioner is broken due to divisions that make up the environments. It was verified the lack of drains in the devices installed on the windows, which has caused stains on the facades. There is also air conditioning units installed in the internal partitions of the rooms, facing the circulation, causing the water swearing in the hallway that leads users to the stairs of the building, causing accidents (figure 3). The staircases feature windows that contribute to cross-ventilation (figure 4).



**Figure 3 and 4: air conditioning installed and window on the stairs (Authors, 2010)**

## **Effects of pollution**

Pollution is one of the causes of spots in painting the facade of the building which is easily identified by the fact that the painting of the building be white in color.

According to Souza (2000), the air dust is transported and deposited on surfaces by wind, and the fine particles adhere better than coarse dust. The deposition of dust will be greater at the bottom of the constructions, due to the fact that the wind velocity increases with height, and yet, being intensified by the dust raised by traffic.

The air flow can be laminar or turbulent, depending on the wind speed and the obstacles,

has great influence on deposition of dust. The direction of raindrops falling on the facade depends on air flow at different levels. The rain showers are not usually sufficient to wash the dust and clean the walls, especially the lower parts. The drip of the rain is the main reason for pollution because it drags the dust, depositing it in a non-uniform.

The accumulation of dust is one of the causes of the frequent need to paint the facades, especially the front facing the public area.

### **Layout**

We observed the following problems: lack of standardization of the mobile office rooms and circulation close, depending on the arrangement of the furniture, causing difficulty in the flow of employees (figure 5), especially those who have limited mobility. In some sectors were installed files sliders that favor the handling of documents.



**Figure 5: circulation narrow (Authors, 2010)**

### **Installations**

We observed inadequate position taken (electric and telephone) in office rooms, causing the proliferation of wires and switches located behind the doors.

There are extensions made in the walls of the balconies, getting exposed to rainwater. It is also noticeable large amount of network wires and equipment (computers, stabilizers, printers, photocopier) and apparent loose in the halls. There were no problems regarding the functioning of the internet and plumbing.

The building has fire extinguishers in the hallways and in the lobby elevators. There are also fire hoses to access the escadas. There aren't antechamber and fire door on the stairs.

### **Lighting**

No issues were identified regarding the distribution and luminance ratios of internal and external areas of the building. In offices were used fluorescent tubes, while in circulation areas, inlaid with CFLs. Some lamps in the office rooms are flickering or flashing light that is a physiological phenomenon that causes discomfort for visual users of the site.

The emergency luminaires in fire escapes remain in good condition.

In the lobby of the building lighting is indirect in some areas with plaster recess, favoring temporary exhibitions that occur in this area.

### **Security**

The presence of security guards outside and inside the building as well as the receiving system and identification compulsory for visitors, function as efficient barrier to intrusion attempts.

### Acoustics

Despite the building was located on a street with heavy traffic of cars and buses, the situation of the building is privileged over the ground by their remoteness front, which contributes to the comfort noise environments.

### Signaling

The floors of the building have few signposts, which causes the discomfort of visitors. We observed no signal in certain rooms and environments with plates that do not match your current usage. There were no signs in case of accidents and risk maps.

### Accessibility

There is only one ramp and handrail with no inclination to inadequate NBR 9050, which allows the passage of the garden to the corridor that leads to the elevator hall, cinema and theater. There were no ramps from the parking lot to the level of the garden paving. The existing elevators to meet the needs as vertical movement.

## 4.3 Level of Satisfaction of Users (Questionnaires)

Preiser (1988), Ornstein, (1992), say the questionnaire POE enables the identification: functional aspects of the workplace, overall assessment of the building, the main qualities of the building and the level of user satisfaction.

Forty questionnaires were distributed, of which 100% returned answered. Table 1 shows the number of completed questionnaires divided by function categories and their respective percentages:

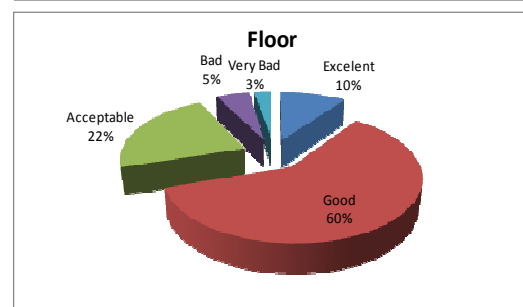
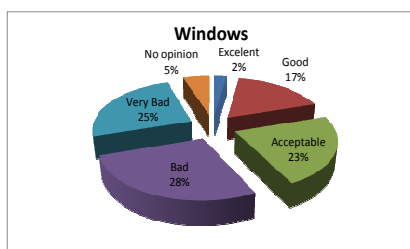
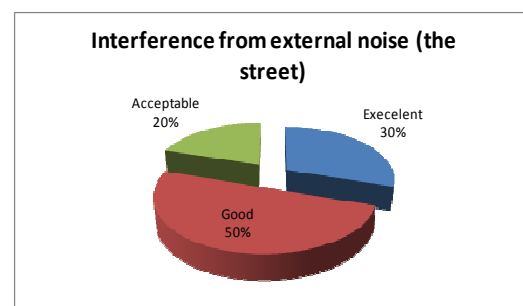
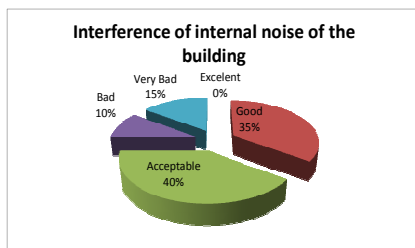
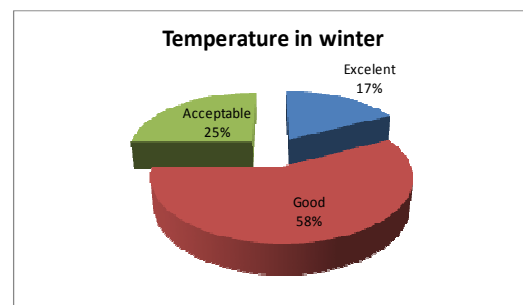
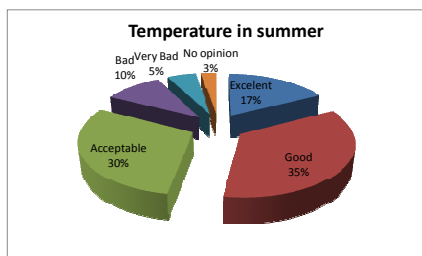
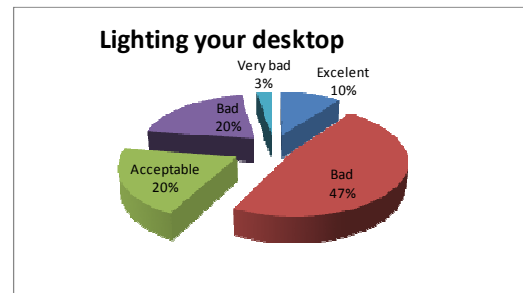
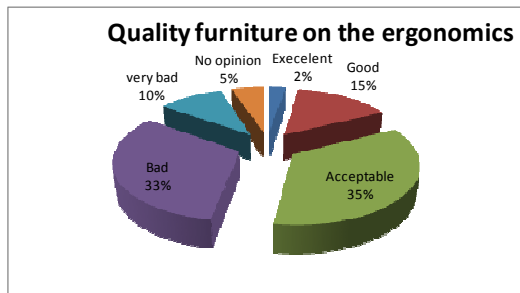
*Table 1: Number of questionnaires, according role categories*

Variables	Frequency	Percentage
Employee	31	77,5
Trainee	02	5,0
Service Provider	07	17,5
<b>Results</b>	<b>40</b>	<b>100,0</b>

Most respondents were female (82.5%) while men accounted for 17.5%. Their ages ranged from 10.0% to less than 25 years, 17.5% for 25 to 40 years, 62.5% for 41-55 years and 10.0% for over 55 years. Most industry officials have long service with more than 10 years (55.5%) between 6 and 10 years (10.0%), between 1 and 5 years (25.0%) and less than 1 % 7.5 years.



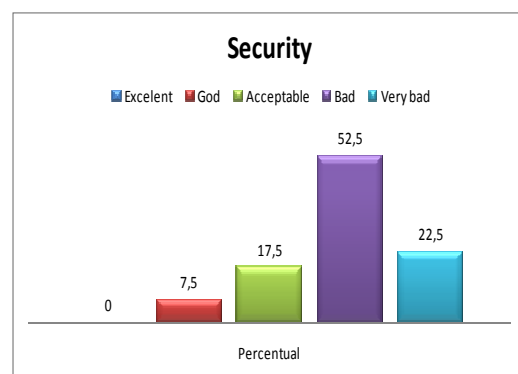
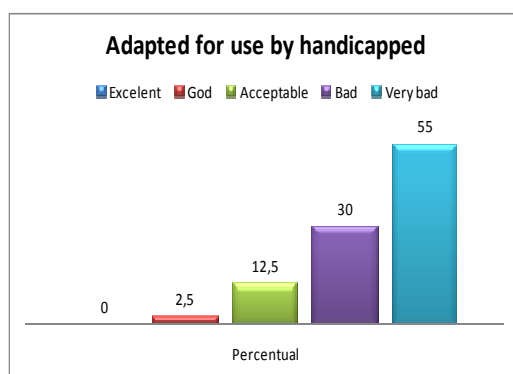
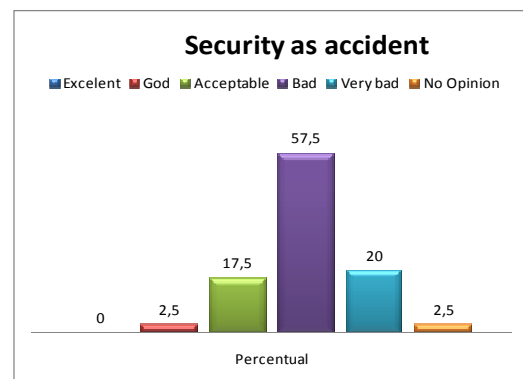
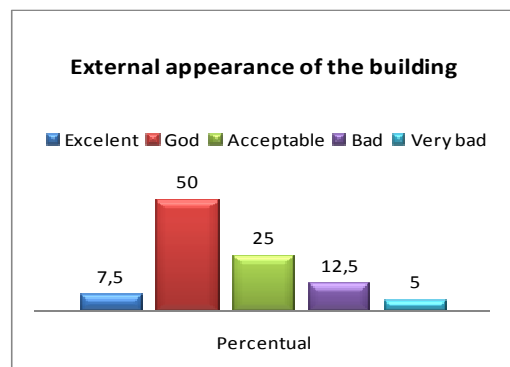
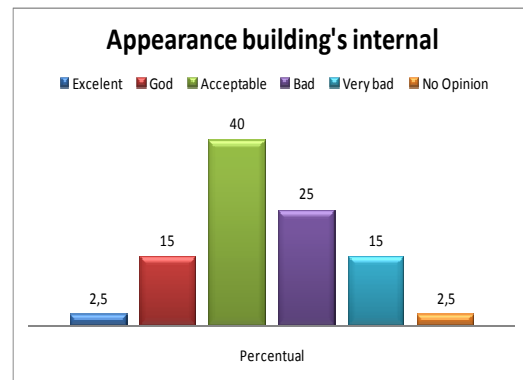
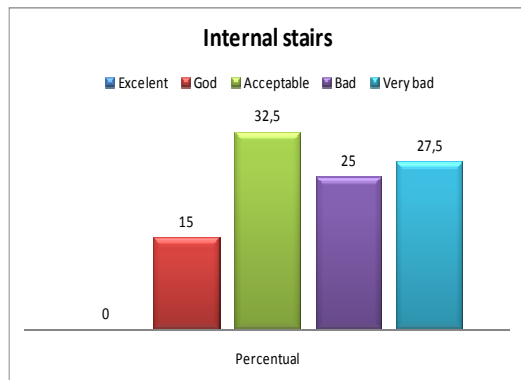
## Feedback from users on the desktop



The graphs above show the level of user satisfaction in the workplace. Due to the lack of standardization of mobile and inappropriate choice as ergonomics, there is a dissatisfaction approximately 83% of respondents. Officials expressed satisfaction about the lighting, especially those who work in environments with a balcony, which allows the use of natural lighting and ventilation. In other environments fluorescent lamps meet the users and provide lower energy consumption. The temperature in summer causes dissatisfaction among users due to the difficulty of distributing the air conditioning system. In winter there is a significant use of natural ventilation as the building has large will enable cross ventilation. The external noises interfere less in the building because of the remoteness of the terrain front, but there is a lack of the use of materials that reduce the noise caused by internal users. Some

windows require maintenance and greater opening to allow air circulation. The floors are in good condition and in some cases needing replacement parts. The dissatisfaction of the users when the restrooms is related to the reuse of the building, since the existing toilets were constructed for hotel use and are not distributed according to actual need.

### Opinions on building users



From the graphs it is possible to perceive the dissatisfaction of the users of the building as the signaling and safety as accidents, since the building does not present risk map and a few fire extinguishers. Due to the large influx of people into the building, there is a need to build new ramps and renovate existing ones to meet the special needs and handicapped. The stairs need emergency luminaires and more intense artificial lighting to prevent accidents. Most users satisfaction shows the external appearance of the building which has recently undergone renovations and dissatisfaction with the outward appearance for reasons explained above in evaluations Walk-Through, Quality and Environmental Comfort.

#### 4.1 Considerations for the reuse of the building

In the case of the historic building that was the subject of adaptive reuses or retrofit (defined here as the modernization of the building without significant changes in its form and in its use), should be noted some peculiarities in the application of the approach. In the evaluation of reuses, special attention should be given to the relationship between the morphological structure pre-existing and the new intended use. Veloso (2007) said the area of conservation of heritage buildings, should be observed the suitability of the new program, since a single use (housing, for example) may suggest programs more or less suited to the pre-existing structure.

With regard to the building of the rectory was observed that the current use of an administrative building of the University, the program has very divergent from the original program intended for a hotel. With so many changes were needed inside the building and a large financial investment.

Another aspect to be considered, both in cases of reuse and retrofit, are the formal and stylistic characteristics that confer identity to the historic building, as a representative of an era. The essential features of such disfigurement is not located within modifying actions (often necessary) for the preservation and conservation of heritage, but as a renovation project any. On the other hand, it is permissible and even advisable, incorporating new construction technologies and new systems for building facilities in new interventions, in order to distinguish them from pre-existing and empower the old building to the performance of its new function, serving the needs of the present. The building of the rectory, despite various modifications and adjustments made internally but stayed with the features essential to the preservation of historic building.

### 5. Recommendations for building maintenance

After the analyzes in the building, so an array of recommendations to contribute to the maintenance project for the building.

RECOMMENDATIONS FOR BUILDING OF REGENTS OF THE UFF ITEMS RECOMMENDATIONS	
ITEMS	RECOMMENDATIONS
<b>Infiltrations</b>	Cleaning and replacing the drainage systems of the balconies.
	Deploy trim for stormwater runoff that are inductees in the balconies. Waterproofing of balconies.
	Replacing the existing blanket on the roof.
<b>Floors</b>	Standardization of the floors of the floors of the common areas of the building.
	Replacement of broken pottery on the stairs and passageways.
<b>Ceilings</b>	Painting the roofs of some stairs and circulation areas.
<b>Corners and edges</b>	Placement of metal or PVC profile at the corners for greater flow of furniture and equipment.
<b>Sills and thresholds</b>	Advancement into the masonry sill avoiding the appearance of damp stains and dirt on the facade.
	To avoid the deposition of dust and stains due to moisture, it is recommended that the sill highlight of cloth facade of at least 25mm, has a trim of about 8% to 10% and that its underside is provided with drip tray.
	Remove the fillets on the sills to prevent accidents.
<b>Frames</b>	Painting and exchange of hardware enabling opening of gaps and natural ventilation.

<b>Paving</b>	Leveling the paving of the parking lot and road signs prohibiting parking vehicles on sidewalks.
<b>Ventilation</b>	Placement of drains and replacement of existing filters of air conditioners.
	Installing central air system to better distribution in the room because the height of the partitions
<b>Facades</b>	Applying sealer and paint the facades general.
<b>Layout</b>	Review the layout as the design of internal circulations of rooms offices.
	Standardization of securities, installation of cabinets and sliding files.
<b>Facilities</b>	Installing taken near the equipment, changes in positioning of switches.
	Installation of pull boxes and raceways for conducting wireless network and equipment in general.
	Withdrawal of sockets and extensions exposed to the action of rain on the balconies.
<b>Lighting</b>	Replacing bulbs in offices that are flickering to prevent visual discomfort.
	Installation and exchange of signs that indicate the sectors and rooms according to the current usage.
	Instalação de placas de instrução em caso de acidentes e incêndio.
<b>Accessibility</b>	Adequacy of existing ramp with handrails and tilt according to NBR 9050.
	Construction of new ramp giving access to the garden from the parking lot.

There are currently experiencing some maintenance work, revision and adaptation of buildings and some of the recommendations are being met.

## 6. Conclusion

The After analyzing the problems identified in the building was the rectory, it was found that the cost to repair damage are much greater than the costs of preventive measures. Therefore, you must provide a consistent Maintenance Plan, which defines the frequency of inspections and preventive interventions, such as cleaning, unblocking drains, review of grouting, refinishing and other activities as needed. This plan should also take into account the natural aging of materials, maintenance standards required, the scale of priorities, financial availability and feedback from users.

The surveys should be conducted periodically and should be based on standardized lists (checklist), drawn from a screenplay logical inspection, considering the parts of greater importance. The surveys may be interleaved with visual inspections prepared, those that take place in some assays for measuring the condition of materials and structure.

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