

MAINTENANCE MANAGEMENT ACTIVITIES OF COLLECTIVE HOUSING BUILDINGS

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Abstract

The purpose of this paper is to present a case study about the audit of the maintenance process of the collective housing building in the Municipality of Lipjan - Republic of Kosovo. The research methodology included interviews, audit of the residential facility and maintenance process, and database analysis of facility user requests for maintenance. The results showed that the average attendance of accepted requests is low and the biggest requests are related to the maintenance of the common space, electrical installations and the physical condition of the common spaces, including mainly doors and windows. According to the maintenance management, the need for a better structuring of the initial request acceptance system and greater rigor towards the quality of services was verified. The paper expands the knowledge regarding the maintenance process of buildings for collective housing and this characterization of the maintenance management of the said facilities will hopefully serve as a reference point for such facilities.

Keywords: Management, maintenance function, collective housing

1. Introduction

Construction objects from the beginning of their use are subject to degradation processes, for the reason that the systems are different in terms of construction and have limited capacities of use. (Beatriz Silva, et al 2020). Maintenance is an action to preserve the functionality of the building and to guarantee the safety of use and can be characterized as any intervention made on the property and its parts, with the aim of preserving or recovering its functional capacity. However, building maintenance does not only involve structural issues; also include maintenance processes that directly affect legal, social, economic, cultural and environmental issues (Nour, 2003). Maintenance cannot be carried out in an improvised manner because it is essential to face it as a technical service that requires adequate training in the execution of the activities to be undertaken. (Gabriela Alves Tenório de Moraes, 2018). Maintenance without technical criteria results in failure; unnecessary expenses; material, physical and psychological damage to users as well as marked depreciation of buildings (Newman, Alexander, 2000), In addition, the search for meeting customer needs, concepts of quality and performance in accordance with changes in construction techniques, recovery and maintenance and user level, stimulate the construction sector to adapt to this new scenario and to demand greater efficiency and quality for its products. (Beatriz Silva, 2020). In this context, building maintenance management includes the planning, execution, evaluation and control of various activities aimed at keeping buildings at the performance level for which they were designed because it faces a market with a lack of knowledge on how to deal with problems that are usually found in construction facilities in general and collective housing facilities in particular. (Gabriela Alves Tenório de Moraes, 2018).



Figure 1. Location of the object

Therefore, the design and implementation of the maintenance program of buildings for collective housing, besides being important for the safety and quality of life of the users, is essential for maintaining the performance levels throughout the projected life cycle of the facility. The program consists of defining essential maintenance activities, their periodicity, those responsible for execution, reference documents, normative references and necessary resources. So it is clear that research works should be developed to increase knowledge on this topic and to contribute to the improvement of the practices adopted, reducing costs and increasing the satisfaction and reliability of the users of these facilities.

2. Materials and Methodology

It is essential to verify whether the existing theoretical frameworks of Maintenance Management proposed by studies in the climates of advanced nations differ by presenting gaps that do not capture the peculiarities of the cultural context of developing countries. This is done with a direct and deliberate focus on the behavior construct for Maintenance Management. Maintenance culture is included in this current study among other factors that have already been investigated. Thus, it is necessary to understand how effective Maintenance Management can be achieved and the possible obstacles to achieving it in public buildings. Based on these insights, this study adopts a literature review method. (Babatunde Fatai Ogunbayo et al'2022) This was achieved by efficiently reviewing peer-reviewed journal articles related to Maintenance Management of public buildings.

2.1 Studies on maintenance activities: Studies on Maintenance Activities for existing facilities are highly desirable to be known. The reality is that all elements and components that make up a building inevitably deteriorate over time due to inherent design and construction defects and the effects of environmental agents as well as user activities. As the components and elements of a building begin to deteriorate, it becomes necessary to take measures to preserve the desirable characteristics that enable the building to provide comfort and safety. This is the basic maintenance philosophy.

In the Republic of Kosova, maintenance of facilities is carried out by building a manual which includes content, operation and use as well as recommendations to regulate their activities. Maintenance as a set of activities must be performed throughout the life of the building to maintain or recover its functional capacity and its component systems to meet user needs and safety.

2.2 Maintenance management: According to many researchers, facilities maintenance management faces a market of lack of knowledge on how to deal with problems commonly encountered in buildings. The management of the built environment includes actions of planning, execution, evaluation and control of various activities aimed at keeping the facilities

within the level of performance for which they were designed. All maintenance services consume resources, so the evaluation of these services is a challenge for managers, since each organization will have to develop a spending model in accordance with its reality. Researchers say that the management of the maintenance system includes means to preserve the original characteristics of the object and to prevent possible performance losses due to the action of degradation agents. Finally, it is emphasized that the development and application of an adequate building maintenance program is able to minimize the occurrence of pathological manifestations and correct them when they occur.

A study (Sunday Julius Odediran et al, 2012), also shows the procedure for the proper practice of maintenance of facilities where before starting the maintenance services, the performers must provide tools to perform the services, and for the protection of the users from possible damages that come during the realization of the activities informing and warning the users about the possible damages. Also the structure of the documentation and the recording information should be designed to provide evidence of the management of the maintenance program, the cost/benefit ratio in the performance of maintenance services, the reduction of uncertainty in the planning, design and execution of maintenance services, as well as the program and planning of future service. The documentation of the maintenance program should include a manual for the use, operation and maintenance of buildings, a maintenance program, inspection reports, a record of performed maintenance services, technical service responsibility documents that evaluate the efficiency of performed services, etc.

2.3 Maintenance of property for collective housing: Property maintenance is the totality of activities performed to maintain a property, keep it safe and maintain its good condition for the occupants. This is defined as, "the process of maintaining a residential building and its immediate surroundings through a series of specific maintenance activities" (Ksenija Tijanac Štok, et al, (2023). When the residents of a well-maintained property are safe and they feel that their needs are met in relation to what a property is intended for, effective property maintenance equates to a more satisfied resident.

There are different types of property maintenance aimed at keeping a property functional and maintaining its best condition:

Preventive maintenance - is defined as the steps taken to track or detect failures, defects or breakdowns before they can become bigger problems in the future. This type of maintenance usually involves routine checks or inspections of equipment that can be damaged over time.

Below is a common list of what is included in preventive maintenance of a property:

- Insect control
- Inspections for damage or water leaks
- Shower cap and grout inspection
- Roof and gutter inspections
- Checking for cracks in the ceiling or drywall
- Replacement of air conditioner and furnace
- Water heater flushing
- Inspection of smoke and carbon monoxide detectors

Scheduled maintenance – is defined as the same as preventive maintenance, except that it is scheduled.

Condition-based maintenance – refers to quick action when a piece of equipment or property feature shows early signs of failure before it breaks down completely.

Reactive maintenance - refers to fixing a broken part that needs quick repairs such as damage to the roof from strong winds, damage to the electricity network, water supply network, or damage from possible floods.

In order to carry out this research, it was necessary to monitor the condition before the renovation and the work during the renovation.

- Audit of existing condition (before renovation)
- Accompanying the object during the renovation until its completion
- Maintenance management process

Audit of the existing condition (before renovation)

According to the literature (MFK "Fondacion i Mijevjecarit te Kosoves") - defects can have different meanings for different people, they are defined as undesirable or inadequate construction conditions that affect usability, performance, structural conditions or aesthetics. The appearance of defects is a sign that the building is no longer in its original state, which indicates the need for maintenance.



Figure 2. View of the object for collective housing

Defects within the developed model refer to primary, known elements of the building that can be damaged, broken, defective, etc. The appearance of these defects is mostly visible and easily recognizable.

The facility that was part of this research is located in the city of Lipjan in the Republic of Kosovo (MFK "Kosovo Centennial Foundation"). During the audit, the following situation was found:

- **The walls of the building** are made of full brick material with a thickness of 46 cm, while the inside and outside of the walls are plastered. There is no thermal layer there and the standard is not met. It is recommended to install the thermal insulation layer on the external walls.
- **Doors and windows** are not in good condition. They are damaged and mostly cracked due to moisture. It is recommended to change them. The adopted value for PVC windows is $U = 1.8$ (W/m²K) based on the "Technical regulation for energy saving in buildings".
- **The roof** also has no insulating layer and is covered with tiles. It is recommended to renovate the roof and install a thermal insulation layer.

Conveyance of the object during the renovation

The walls of the building

Thermal insulation of buildings is done with materials with high thermal insulation properties (with coefficient of thermal conductivity $\lambda=0.029-0.044$ W/moK). Some of the most used materials in the thermal insulation of buildings are polystyrene, panels with mineral wool or glass.

The cost of thermal insulation of a new building is 1.5% ÷ 2% of the total cost of its construction.



Figure3. Insulation of external walls

Doors and windows

Windows are a very important element of the exterior envelope of the building that enables lighting of the interior space and visual contact with the environment. As for the entire envelope of the building and for the important windows is the overall coefficient of heat transmission k expressed in W/m^2K . Existing windows have coefficient k of about $3.5-5.7 W/m^2K$; while the new double-glazed windows have this coefficient of $1.40-1.80W/m^2K$.

Therefore, the use of aluminum profiles for the processing of doors and windows for residential buildings is very pragmatic because they have solid characteristics in terms of energy efficiency, they react well during temperature changes, they have a lifespan of over (50 years), while during high temperatures (long fires) are not deformed and destroyed.

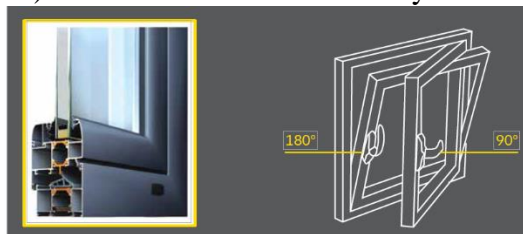


Figure 4. Aluminum profile and opening methods

- **The roof-** Based on the existing condition, the complete renovation was done according to the standards.



Figure 5. The existing state and after the renovation of the roof

2.4 Facility maintenance cycle:

Activity	Naming	Control cycle
Painting of exterior walls and insulation	Decorative and efficient	4-5 years
External perimeter walls	Regular inspections	yearly
	Inspection and checking of details	5-6 years
Partition walls	staining	3 years
	Structural adjustments	As needed
Exterior windows, fences and metalwork	Condition check and repair	yearly
	Painting (steel and iron)	2-3 years

Roof and gutters	Checking and cleaning vertical and horizontal gutters	Before and after rain showers
Channels for surface water drainage (atmospheric)	Checking and cleaning for bugs and vegetation	yearly
Underground water drainage channels	Control and cleaning of wells	2 month
	Checking and cleaning pipes	2 years
Fire services	Control and adjustment by management staff	weekly
	Repair and reporting to the fire department	yearly
	Fire resistant doors	month
Green surface	Checking by management staff	1-5 day
		yearly
The others		

3. Conclusions

Findings in the field of management of maintenance and renovation of collective housing facilities have important multidimensional implications in this field. Therefore, our contribution in this field comes through the use of advanced methods and data analysis to address the challenges and problems of managing collective housing facilities.

The facility analyzed in this paper is located in the Republic of Kosovo in the city of Lipjan. In this object, a detailed analysis has been made about the existing condition of the building and the measures that should be taken in relation to maintenance and renovation. Deficiencies have been identified and measures have been recommended. The main part of the model is a list of defects that can appear within the mentioned elements of the object. The evaluation of the heat transmission coefficient (U-value) for external walls, doors, windows, floor and roof before and after taking the recommended efficient measures was done.

The main objective was the existing condition and renovation to ensure the standard of living of the residents and increase the value of the object. Maintenance has been described as an essential variable in infrastructural sustainability with housing as an essential human need that cannot be overemphasized; therefore, this study assessed maintenance practice among residential building users in Kosovo.

In summary, the main incentive for undertaking maintenance is to prevent deterioration and abandonment of the facility by residents. The focus in managing the maintenance process and operation is the difficulty experienced in addressing stakeholder behaviors towards the maintenance process. However, considering the role of well-maintained public buildings, understanding their needs and the ability to manage any new changes towards improving their behavior would lead to an effective maintenance management system.

References

- [1]. (Beatriz Silva, et al 2020). Bullying's Negative Effect on Academic Achievement
- [2]. (Nour, 2003). National Responsibility
- [3]. (Gabriela Alves Tenório de Moraes, 2018). Building maintenance management activities in a public institution
- [4]. (Newman, Alexander(2000), Structural Renovation of Buildings: Methods, Details, & Design Examples, 1st Edition.
- [5]. (Babatunde Fatai Ogunbayo et al, 2022) Review of Culture in Maintenance Management of Public Buildings in Developing Countries
- [6]. (Sunday Julius Odediran et al, 2012), Maintenance of Residential Buildings: Users' Practices in Nigeria,

- [7]. (Ksenija Tijanic Štok, et all, 2023) Priorities in Croatian School Building Maintenance: A Comparison of the Main Stakeholders' Views
- [8]. (MFK "Fondacion i Mijevjecarit te Kosoves")-Memorandum i Mirekuptimit mes MFK dhe Komunes se Lipjanit per Riparimet per Eficience te Energjise ne Ndertetat Banesore,2021