

THE ROLE OF PREVENTIVE MAINTENANCE IN ENHANCING THE PERFORMANCE OF THE VSS 'FEHMI LLADROVCI' BUILDING IN DRENAS

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Abstract

This research addresses the importance and impact of preventive maintenance in the infrastructure management of the SHMP 'Fehmi Lladrovci' building in Drenas, analyzing its role in increasing safety, reducing emergency repair costs, and optimizing the technical and functional performance of the building. Preventive maintenance is a planned program of regular inspections, adjustments, and replacement of worn or failing parts, with the aim of maintaining the function and efficiency of each asset in the building. A well-designed and well-implemented preventive maintenance program will extend the life of equipment by reducing replacement costs, preventing most breakdowns that affect the users of the school facility, maintaining the energy efficiency of the equipment, improving the effectiveness of maintenance, and improving the overall condition of the facility and the experience of its users. This program includes; the components of an effective program, the scientific and engineering principles behind many of the most common and important maintenance tasks, and the application of works including theories of operation, maintenance requirements, and existing regulations.

Keywords: preventive maintenance, school building, maintenance program

Introduction

Public buildings, in particular school buildings at all levels of education in Kosovo, represent assets of particular importance to society. These buildings, together with the accompanying infrastructure that serves the wider communities, have been built with considerable investments and over different periods of time. However, their management has not always been at the appropriate level, both technically and institutionally.

Unfortunately, in the period before 1990 and especially during the transition years and after that year, the maintenance of school buildings has been minimal, in many cases almost non-existent. This has resulted in their gradual degradation, significantly reducing the functionality and lifespan of these educational assets.

Natural depreciation, combined with the lack of maintenance interventions and rehabilitation investments, has led to many of these buildings no longer being able to fulfill the functions for which they were built. This situation not only reduces the quality of educational services, but also jeopardizes the safety, health and well-being of students and educational staff.

The management and maintenance of school facilities constitute an essential component in providing a safe, functional and suitable environment for the development of the learning process. School facilities are not only physical spaces for learning, but also factors that directly affect the quality of education and the well-being of students and educational staff.[1][2]

In many cases, school buildings in Kosovo face various challenges related to the lack of regular investments, poor maintenance and the need for renovations. This situation requires continuous commitment from the relevant institutions to ensure optimal conditions for educational development. One of the facilities that is of particular importance in this context is the "Fehmi Lladrovci" primary school in the Municipality of Drenas. This school, with a two-story building and easy access for pedestrians and vehicles, represents an example of the need for

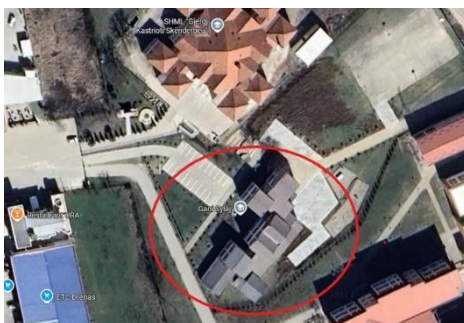
efficient management and regular maintenance. Although the facility is functional and in daily use for the learning process, continuous care is needed to preserve the infrastructure, improve the physical conditions and create a stimulating environment for students.

Methods and Materials

Description of the condition of the SHMP 'Fehmi LLadrovci' school building

Below is a detailed description of the existing condition of the building, including the construction, electrical and mechanical systems and the general condition. The "Fehmi Lladrovci" school is located in the center of the Drenas municipality, in an area easily accessible to residents of the city and surrounding villages. Its position is strategic, with paved roads and good access for pedestrians and vehicles.[7]

Around the school there are green spaces and public facilities, which contribute to the creation of a quiet and suitable environment for students. It is located near other municipal facilities and is well connected to the local transport network. This location makes the school easy to reach by students and staff, ensuring good access for visitors and the wider community.[8]



During the audit, it was noted that some of the structural elements (such as load-bearing beams, walls and internal partitions) have suffered physical damage and structural cracks, which pose a risk to the safety of the facility in the event of external loads (such as earthquakes or severe weather conditions). The lack of maintenance in previous periods had resulted in erosion of some parts of the concrete and exposure of the reinforcement in some areas.

Aims of school facility maintenance

Facility maintenance includes all activities that enable the maintenance of the function of the school facility in harmony with its purpose and destination, and in particular with the regular use and normal functioning of this educational facility.[7]

In addition to the home and family, children have a central position in a community, therefore the school is the most important place in which they spend a significant part of their time. The school facility, classrooms and other spaces in schools must be accessible and suitable for the stay of students for the development of learning and other activities related to learning.[8]

Renovated and maintained schools in order to maintain the physical structure and function for a longer period, must be adequately managed with preventive maintenance.

Preventive (proactive) maintenance includes maintenance in order to prevent damage to the facility or any equipment defects. It is carried out at regular intervals during the school year and not in response to damage. As the name suggests, preventive maintenance means that a

plan of activities is prepared for the maintenance of the school, which must be implemented in an organized, coordinated and controlled manner. About 30% of maintenance in schools is preventive maintenance. Schools are expected to adopt a predetermined plan, instead of a reactive approach to maintenance. Developing a maintenance mindset and a conscious approach to carrying out maintenance and minor repairs are essential to ensuring that school facilities are used rationally.[9]

Interventions in the building structure

The damaged structural elements have been reinforced with modern materials, ensuring the static safety of the building. The damaged walls have been restored and the external facade has been repaired with new thermal insulation. The roof has been leveled and restored, replacing the existing covering with insulating and weatherproof materials.

Electrical and Lighting System

The existing electrical system was outdated and outside safety standards, with old cable networks, damaged switches and insufficient lighting in many areas. Potential electrical hazards were identified, especially in corridors, classrooms and technical areas, which posed a risk to both staff and students.[6]



A new electrical network has been installed according to EN/IEC safety standards. The lighting fixtures have been completely replaced with energy-efficient LED bulbs. New electrical panels have been installed with modern fuses and clear divisions for different areas of the facility.

Thermal insulation and ventilation

The audit found a lack of efficient thermal insulation, both on the external walls and on the roof. This caused significant energy loss during the winter season and inadequate thermal conditions during the summer. The windows were old, with simple glass and damaged wooden frames, which did not provide hermetic closure and made it difficult to maintain the internal temperature. The natural ventilation system was inefficient, as many classrooms had only one window, which negatively affected the circulation of fresh air, making the environment unsuitable for long stays.

10 cm thick thermal insulation was applied to the external walls and roof, to reduce energy loss. The old windows were replaced with PVC windows with double thermal glazing, which help maintain the internal temperature and improve natural lighting.[3]

The natural ventilation system was improved by rearranging the windows and building additional air outlets. Ceiling fans have been installed in closed classrooms for better air circulation.

Sanitation and supporting infrastructure

The toilets were in poor functional and hygienic condition, lacking basic hygiene standards and accessibility for students with special needs. Other parts of the infrastructure such as the water supply system, sewage system, as well as supporting facilities (remedial teaching rooms, libraries or teaching cabinets) were inadequate and often out of order.[6]



The toilets have been completely renovated: new ceramics, privacy partitions, new water supply and a modern drainage system have been installed. Access for students with special needs has been ensured through the construction of dedicated toilets and auxiliary equipment. The hot water supply has been improved through the installation of new boilers in the sanitary areas. The library, teaching cabinets and spaces for supplementary learning have been renovated. Special facilities for extracurricular activities (music, art, sports) have been created, increasing the educational offer of the school. A landscaped courtyard with outdoor lighting, recreational areas and seating for students has been built.[13]

Preventive Maintenance Management Process

According to research for our region, school facilities that are public facilities should be subject to management models that guarantee sustainable maintenance and timely completion according to the specifications of these facilities.

Preventive Maintenance is laid out in three parts. The first part builds the components of an effective preventive maintenance program. The second part explains the scientific and engineering principles behind many of the most common and important preventive maintenance tasks. The third part refers to the different types of equipment commonly found in facilities, including the operation of various equipment within the facility.[14][15]

Facility maintenance is carried out depending on the quality of the materials used, depending on the performance of certain works and if they are not carried out according to the manufacturers' descriptions, the request for maintenance and additional costs will appear all the time. Maintenance processes should be carried out according to the established deadlines because it is vital to ensure the proper functioning and longevity, as well as the well-being of the users of the facility. The main objective is to ensure that the building is safe and suitable for the intended purpose, therefore it is suggested that Management and Maintenance be carried out according to a carefully designed cycle according to the specifications of the facility.[16][17]

Facility maintenance cycle

Activity	Name	Control cycle	Activity	Name	Control cycle
Painting exterior walls	Decorative	4-5 years	Exterior windows, fences and metalwork	Condition check and repair	yearly
External perimeter walls	Regular inspections	yearly	Roof and gutters	Checking and cleaning vertical and horizontal gutters	Before and after the rain showers
	Inspection and checking of details	5-6 years			
Partition walls	staining	3 years	Surface water drainage channels (atmospheric)	Checking and cleaning for defects and vegetation	yearly
	Structural adjustments	As needed			
Clean water supply	Quality control and valves	monthly	Firefighting services	Control and regulation by management staff	Weekly
	Cleaning water tanks and valves	3 months		Repair and reporting to the fire department	yearly
				Fire-resistant doors	monthly
Hot water supply	Boiler inspection	monthly	Equipment for sports facilities	Control by management staff	1-2 days
	Checking water heating boilers	6 months		Inspection by a mechanical specialist	yearly
Heating, cooling and air purification in the facility	Checking air filters, recuperators, laboratories, heating systems, collectors and boilers	3 months-1 year	Underground water drainage channels	Checking and cleaning manholes	2 months
				Checking and cleaning pipes	2 years
Others	Checking alarm systems, zeroing systems, cameras, lighting and TV monitors	6 months - 1 year	-	-	-

Summary and Recommendations

Based on the results achieved from the audits conducted before and after the renovation, as well as the monitoring of the one-year period, some important reflections can be made regarding the maintenance management of the “Fehmi Lladrovci” school building. First, it has been evidenced that the lack of a proper maintenance management and organization system

has directly affected the quality of maintenance services and the general condition of the building. The small number of technical personnel and the lack of long-term planning make the interventions mainly reactive, creating the conditions for rapid degradation of the building and increasing the costs of emergency repairs. Second, the quality of the materials and methods used during the renovation have had a positive effect on improving the condition of the school, but their effectiveness is closely linked to the maintenance method during the period of use. This emphasizes the importance of continuity of activities and preventive maintenance.

At the end of this study on the maintenance management of the "Fehmi Lladrovci" school, we can draw some conclusions that reflect the current situation and the needs for improvement of this process:

1. The current state of maintenance is underdeveloped and not well organized, the lack of qualified personnel and long-term planning proves that interventions are mainly emergency and not preventive.
2. The materials and works during the renovation have improved the condition of the facility, but their maximum effect is achieved only with regular maintenance during the period of use of the school.
3. Improving maintenance management requires increasing human, financial and institutional capacities, including specialized training for personnel, preparation of maintenance plans and an effective monitoring system.
4. A proactive and coordinated approach between the school, local authorities and responsible institutions can ensure the long-term preservation of the facility and the improvement of learning conditions.

In this way, by addressing maintenance needs in a timely and systematic manner, the "Fehmi Lladrovci" school will be able to provide a safe, functional and sustainable environment for its students and staff.

Recommendations

1. Strengthening maintenance staff - to ensure effective and continuous maintenance
2. Training and professional development of personnel
3. Drafting a clear maintenance plan
4. Use of quality materials and technologies.
5. Involvement of the school community, cooperation between technical staff, teachers and students
6. Continuous monitoring and auditing.

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