

School Building Maintenance Strategy: a new management approach

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Abstract¹ – Maintenance is a continuous operation to keep the school buildings, furniture's, and equipments in the best form for normal use. The maintenance of the school building is a daily activity of the institution and its personnel. It is an important factor in the delivery of teaching and learning education system as a whole. Maintenance activity covers the whole building envelope which includes the building structures, roofing, building exterior and interior, wall, columns and fixed furniture. Need analysis in maintenance research shows that many school buildings have small cracks in concrete columns, beams, structural walls, and floors but there is no major damage involved. This is due to the fact that many school buildings are more than 25 years old. Studies on heritage buildings in Malaysia have highlighted several building defects that are commonly found such as fungus stain, erosion of mortar joints, peeling paint, defective plastered renderings, cracking of walls, defective rainwater, roof defects and unstable foundations. Research shows that there are several suggestions to solve the problems in two suggestions which were in technical and building system. Scientific studies and laboratory test are suggested for technical maintenance where as for building system the used of computer

Simulation is suggested to solve related maintenance management problems. Lists of literature review related to maintenance problem in Malaysian school building were analyzed. This literature will be used as an important basis for developing maintenance management computer simulation system.

Keyword : School building maintenance, technical problems, computer simulation system

I. INTRODUCTION

Maintenance of a building is a process of reservation and restoration activity of the structure and components of a building. It covers the whole building which includes toilets, rooms, walls, roofs, drains, doors, windows, floors and also the fix furniture [1]. The issue of building maintenance is a universal issue and is highly considered in the early process of the construction (design) to assure the quality of the building [2].

School buildings are one of the important facilities for getting basic knowledge in everyday life. Maintenance school building also required to serve staff and students well-being besides paying for the brick and mortar of the building. Effective school maintenance protects capital investment, ensures the health and safety of the children, and supports educational performance [3].

In the late of year 2007, there are many cases which involved component failures of Malaysian school building. One of the cases reported was the collapsed roof at Wakaf Tapai Secondary School in Kuala Terengganu on 14 April 2008. While as in November 2008, the same case was reported in SRJK (C) Han Ming, Batu 14, Puchong, Selangor due to the roof truss which was attacked by termites.

The same situation was faced by American schools. As America's school buildings are aging, thus facing a growing challenge of maintaining the nation's education facilities at a

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level that enables their teachers to meet the needs of 21st century learners. Facilities issues arise at all educational levels, from kindergarten through postsecondary, and at all sites, from classrooms to administrative offices. Challenges arise in new and old facilities alike, although the types of concerns may differ [3].

II. LITERATURE REVIEW

There have been a lot of opinions saying that the maintenance process is complicated and requires a hefty cost [1]. But, if it is done according to the required time table, it can lengthen the life of the building and save the cost [2]. There are two types of maintenance process which are preventive maintenance and corrective maintenance [3]. Preventive maintenance is the routine, regularly scheduled maintenance of a piece of equipment to ensure its continued use and maximize its life expectancy. While, corrective maintenance is a emergency work orders which the maintenance activity done after damage occur [4].

However, preventive maintenance is recommended to minimize equipment failure due the time schedule. The cost associated with routine servicing of equipment is small compared to the cost of coping with unexpected and catastrophic breakdown which require not only major repairs but even the replacement of affected components and systems [3]. Figure 1.0 will show the different between preventive and corrective maintenance.

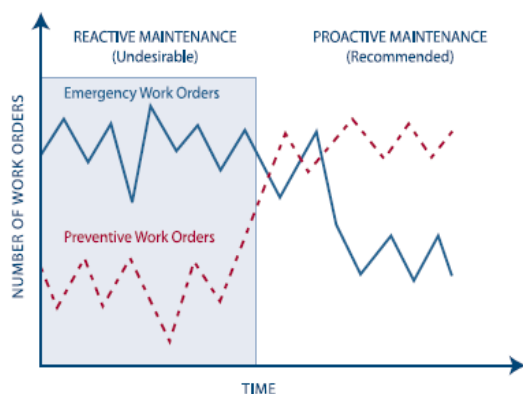


Figure 1.0: The different between preventive and corrective maintenance [U.S Department of Education, 2003]

III. SCHOOL BUILDING DEFECTS

In general, there have several building defects which usually happen to building parts such as roofs, walls, floors, ceilings, toilets, doors and windows [5]. Roofs are the most vulnerable part of a building. There are usually have two types of roofs, flat roof and pitched roof.



Figure 2.0: Second floor-board falling down due to termite problem in Ipoh. (NST, 2005)

As a generalization, it can be said that pitched roof have given few problems and flat roofs have given many [6]. The roof's equipment is to protect the school building from rain, sun, and wind and also the roof is used to keep water from getting into the school building [7], but there are roof problems arise such as roof leakage and ridge leakage [5].



Figure 3.0 Roof structure collapsed in Kuantan (NST 2005)



Figure 4.0: Rotting wall

Where as wall is the widest part of building besides roof but wall failures are essentially of two types such as failure to provide adequate protection against moisture penetration and cracking of the walling materials [6].



Figure 5.0: Rotting door due to moisture penetration effect door frames and panels

Floors have not been a high risk area in recent years but failures have occurred, particularly in concrete screeds, by chemical attack, usually by sulphates, on the concrete base slab and through insufficient support to the slab by inadequately compacted hardcore [8]. The types of floor defect are concrete floor cracking, floor moisturizing and floor finishes defect [5].



Figure 6.0: Ceiling moisturizing

The function of ceilings is to cover the electrical, water pipe and fire resistance system which located between ceiling and roof structure. The types of ceilings defect are ceilings moisturizing, asbestos ceiling damage and peeling of ceiling paint [5]. The functions of windows and doors are to protect the building from rain and wind and to provide good ventilation for school building. Such defects are wet rot in the frames, attack by termites and peeling of doors and windows frame [6]. While, for the toilets, the common types of defect was leaking in pipe and clogging pipe [5].

IV. SCHOOL BUILDING MAINTENACE PROBLEMS

Based on research done by Noor Hidayah (2008), there have several problems faced by Malaysian school, stating that in Malaysia, about 80% schools age are 15 years and above. They need more attention in doing maintenance activity. However, they faced many problems in maintenance policy and procedures which produces by Malaysian Department of Education. One of the problems is the process in getting maintenance funding, where it is too difficult to understand and it take a long time to

approve it. As an alternative, 70% of Malaysian school community does the maintenance activity by themselves without using the maintenance funding.

Other than that, the school community said that the education department takes a long time to solve the maintenance problems. Research shows that only about 25% respondent said that Education Department takes less than 1 month to solve the maintenance problems [9]. Where as most of the school community states their readiness to maintain the building before the process of restoration are done, but they didn't have technical knowledge needed in the process to fill the maintenance form. The school community also fail to follow the procedure and standard of Malaysian School Building (*Surat Pekeliling Am Bil.2 Tahun 1995*) [1].

There are several problems in Malaysian Department of Education side related to building maintenance such as not enough technical staff related to maintenance activity. Other than that, 71% respondents from Education Department research shows that there has no systematic work system. [9].

V. SUGGESTIONS

Research shows that there are several suggestions to solve the problems, such suggestions which were related to technical and building system. Scientific studies and laboratory test are suggested for technical maintenance where as for building programme the used of computer simulation and are suggested to solve related maintenance management problems.

Such scientific studies and laboratory tests are important as they provide additional information that can lead to solving related building problems or defects. Common scientific studies required during the conservation works include microbiological studies to identify plant species, dispersion agents, control ranking and chemical fungicides; archaeological studies to trace hidden remnants; and the study of relative humidity to gauge the local temperatures and air moisture levels. Some examples of the laboratory tests required are the brick test to analyze the compressive strength and level of porosity; the timber test to identify timber species, grading and group strength; lime plaster to determine the component elements through X-ray Fluorescence (XRF) analysis; the salt test to detect the salt levels and the percentage of total ions; and the

paint test to classify paint types as well as colour scheme analysis [10].

Other than that, a building system using a computer simulation is suggested to use by school community especially in rural school. The system will provide a systematic model according to the form template produce by Malaysian Department of Education. The management of school building will use a suitable software application in the process to build the system. The system will contain part of building diagram such as roof, wall and floor. Then, the users just need to click the related button which located at building part that need to do maintenance. Lastly, the output of the system will come in template form sheet which equipped with cost estimation. The system will facilitate the user of the management of school for building maintenance activity.

A school maintenance programme is an organizational activity carried out by the school community in order to prolong the life expectancy of school buildings, its furniture and equipment. In order to start a school maintenance programme the school building should meet a minimum standard of condition. Maintenance is a continuous operation to keep the school building, furniture, and equipment in the best form for normal use. The school maintenance programme should be systematic and pro-active to prevent the need for repairs. It should have a sufficient staff and budget for proper maintenance. The maintenance programme should be comprised of three basic components: organization, inspection, and maintenance plan [7].

VI. CONCLUSION

As Malaysian school buildings are aging, we face the growing challenge of maintaining the nation's education facilities. This due to the fact that routine and unexpected maintenance demands are bound to arise, every education organization must proactively develop and implement a plan for dealing with these inevitabilities. A sound facilities maintenance system plan helps to ensure that school facilities are, and will be, cared for appropriately. Negligent facilities maintenance planning can result in real problems. Large capital investments can be squandered when buildings and equipment deteriorate or warranties are invalidated. Failure to maintain school facilities adequately also discourages future investment in the public education system.

There have several problems faced by Malaysian school maintenance team. For the maintenance team they faced problems from two sides which are from school maintenance community and Malaysian Department of Education. They have their own problems and need to solve it together to get the impressive solution. Studies on school buildings in Malaysia have highlighted several building defects that are commonly found such as fungus stain, erosion of mortar joints, peeling paint, defective plastered renderings, cracking of walls, defective rainwater, roof defects and unstable foundations. This research, suggested several suggestion for solving future maintenance problem related to school building.

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