

## **Preventive Maintenance in Vocational Schools in Malang City, Batu and Malang Regency**

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**Abstract:** Preventive maintenance is an act of preserving the condition and readiness of school facilities and infrastructures. Educational facilities and infrastructures, including school buildings and utilities need to undergo scheduled and planned maintenances as they are included in one of instrumental input factors. The aim of this research is to enlist preventive maintenance measures, school facilities and infrastructures functionality, and school utilities' conditions. The data is collected through direct observations and in-depth interviews. From the research data in all observed schools (51 vocational schools), the schools generally do not keep preventive maintenance record. Scheduled maintenance for damaged building is not recorded and the rate of building damage is not monitored. Minor damages are commonly documented in the area of Malang City (604 buildings) and medium damages in the area of Malang Regency (316 buildings). The damages of the school buildings (minor, medium and severe) disrupt the functions of the building as it is considered dangerous for the students. Chipped floors in the damaged buildings can puncture and wound students during their activities.

**Keywords:** preventive maintenances, school buildings

Naturally, school facilities and infrastructures will gradually be damaged. The damages will begin to emerge due to weather influences, temperature changes, utilizing errors or lack of maintenance. These factors slowly alleviate the functions of school facilities and infrastructures that cause them to be depraved (Syafrudie, 2003). Routine and planned school maintenances are a way to prevent damages. The age of the facility and infrastructure, which are routinely treated, will be longer.

Preventive maintenance is a form of step that is conducted consciously to oversee the school facilities and infrastructures so they are in a ready to use condition. Preventive maintenances can also be defined as a minor reparation action for it only watches over the utilities until they can be optimally utilized. Therefore, the preventive maintenance activities are demanded to be planned and programmed in particular times.

The school infrastructure preventive maintenance activities consist of periodical checking, cleaning, and building and furniture painting. Other activities, including adjusting, cleaning, replacing, and calibrating the laboratory utilities, are also a part of efforts in preventive maintenances. In another form of preventive maintenance, there is a minor maintenance that is conducted in a building in a school unit. If necessary, replacing the components can be conducted in order to improve the facilities and infrastructures' performance so the facilities and infrastructures' operating expenses will be effective. In several vocational schools, the facilities and infrastructures' maintenances are often overlooked. It is repeatedly found that the school buildings' maintenances are often disregarded. Even though the maintenances are conducted, money allocation for maintaining the schools' facilities and infrastructures is very little. Preventive maintenance activities aim to watch over the facilities and infrastructures (physical buildings and other school utilities) so the age of the school facilities and infrastructures match with the former planning. By doing preventive maintenances, early school buildings' damages can be avoided. Education Minister's decree

number 031/0/2002 article 68 explicitly states that government organizes the preparation of materials, formulates the policy of schools' facilities and infrastructures standardization. It matches with Education Minister's decree number 129a/U/2004 dated on October 4<sup>th</sup>, 2004 about Minimum Service Standards in the field of education. In order to improve the education quality, government takes up any means possible to improve the education facilities and infrastructures' quality, including the buildings' and school utilities' standard.

Education infrastructure is one of the education resources that needs to get enough attention in the teaching and learning processes. The actual school infrastructure condition mapping is necessary as a reference in planning and building the vocational school buildings. That infrastructure condition mapping will give discretion to the schools and regions to conduct maintenance and procurement that suit the region financial capability.

Conducting direct preventive maintenances in the school buildings will improve the performance of supporting utensils, facilities and infrastructures. Preventive maintenances will minimize the repairing expenses in a large scale and be able to optimize the age of use of the buildings and supporting utensils. The implementation of the facilities and infrastructures' preventive maintenance program impels schools to deliver precise information in the maintenance of school buildings, laboratories and other supporting buildings. By conducting these activities, accurate data and analyses can be obtained regarding the conditions of the vocational school buildings in Malang City, Malang Regency and Batu City.

### **Preventive Maintenances**

Preventive maintenances, based on Minister of Public Work's regulation number 24/Prt/M/2008 about building up keep and maintenance instructions, is included in post construction activities. In this school building maintenance phase, preventive maintenances are implemented periodically, routinely when the construction works have been completed. The works include 1) wall painting maintenance; 2) door and window frame painting maintenance; 3) anti termite maintenance on floors and round the building; 4) roof, ceramic floor and wall replacement maintenance.

Anchored in Minister of Public Work's regulation number 24 in terms of maintenance work categorizations, preventive maintenances consist of continuous (regular, routine) periodic maintenance, emergency reparation, total reparation and improvement. Continuous maintenances include cleaning drainage from garbage and dirt; cleaning up all rooms and schoolyard from garbage and dirt; cleaning up glasses, windows, chairs, cupboards; clearing grasses and bushes; cleaning up and watering toilets to maintain health.

Periodic maintenance activities contain maintaining and painting door and window frames, doors, walls and other building components that appear to be grimy; cleaning and repainting furniture (cupboards, chairs, tables, and the like); checking playing facility and field of ceremony security; repairing damaged roofs; coating cracked wall plastering; cleaning and drying puddle on floors or lobbies.

Emergency repairing includes repairing unexpected damages that will be dangerous if they are not repaired as soon as possible; temporary improvements are sought to be completed quickly so the damages will not worsen and teaching and learning processes are undisturbed. Bad preventive maintenance activities result in degrading building condition. Bad maintenances disrupt building functions and school activities, endanger students' security, and make the rehabilitation costs more expensive. If the maintenances are not conducted properly, toilet facilities will not be healthy and spread diseases. Grounded on Minister of Public Work's regulation number 24/2008, building maintenance activities are conducted on roofs; frames and

doors; walls; glasses; floors; toilets; electricity and clean water; furniture; sewer or dirty water drainages.

## RESEARCH METHODS

This research focuses on high school facilities and infrastructures and everything that appears during the use of which. It also concentrates on building condition information and school building problem mapping.

Data and analysis of building conditions are the main information of this research that is related to the school facility and infrastructure preventive maintenances. This research is a descriptive research that describes the condition of vocational high school buildings in Malang City, Malang Regency and Batu City.

Table 1 Research Variable Description

NO	VARIABEL	INDIKATOR
1	Roofs	Roofs, <i>lisp lank</i> , ceilings
2	School building walls	cracks, plasters, wall paints, moss and crusts
3	Doors and windows	paints, hinges and hangers, locks
4	Floors	wholeness, slippage, colors, popping
5	Toilets	sewer, walls, toilets, water tub, walls and doors, accessories
6	Gutters	Conditions and functions

The population of this research is all school buildings in Malang City (21 schools), Malang Regency (24 schools) and Batu City (6 schools) that had been built from 1960 to 2013. The sample that is used to observe roof; all; door and window; floor; toilet; and gutter conditions at schools.

The data collection is conducted by observing every school, recording building conditions, and obtaining observance data based on the research variables. The data from the observation results is matched with vocational schools' data from Education Boards in Malang City, Batu City and Malang Regency.

The instrument trials are conducted in 5 vocational high schools in Blitar City. These trials are conducted to obtain feedbacks regarding instrument legibility items, and validation efforts about how instruments measure what should be measured. Instrument trials are utilized to test instrument level of reliability when they are used to do the measuring. The results of these trials are employed to improve and topple invalid instruments, and better the instruments that need to be preserved because their indicators cannot be represented by other instruments.

The data from the structured observation and interview results is processed to attain school condition data and observe vocational high school buildings' frequent symptoms of damage. In this research, the technique that is used is descriptive analysis technique; and data tabulation from the results of observations is done through school buildings' checklists. The data that is acquired from the research instruments is administered. The data that is collected in this research is in the form of notes on observation lists, and responses on the instruments. The data that is attained is analyzed descriptively to describe trends in every indicator. To find out about how the school preventive maintenance conditions are, the data analysis is conducted by examine the observation results in the field by utilizing Excel worksheet in Microsoft Office programs.

## RESULTS

From 51 schools that are observed in Malang City, Malang Regency and Batu City, the observed data is tabulated as follows

Table 3 The Conditions of School Infrastructure Damage

REGION	SCHOOL TOTAL	MINOR	MEDIUM	SEVERE
Public/private vocational high schools in Malang city	21	604	7	1
Public/private vocational high schools in Malang regency	24	316	23	8
Public/private vocational high schools in Batu city	6	80	0	3

Based on Table 3, from 21 public and private vocational high schools in Malang City that are observed, there are 604 buildings with minor damages, 7 rooms with medium damages and 1 rooms in one certain school with severe damages. Whereas, from 24 public and private vocational high schools in Malang Regency, there are 316 buildings with minor damages, 23 buildings with medium damages and 8 buildings with severe damages. At the same time, from 6 observed schools in Batu City, there are 80 buildings with minor damages and 3 buildings with severe damages.



Figure 2 Medium Damages

Rooted in the levels of damage, school buildings in Malang Regency have the highest numbers of damage. There are 8 severely damaged buildings spread in 24 schools, 3 buildings spread in 6 schools in Batu City and only 1 severely damaged building in Malang City spread in 21 vocational schools. In the area of Malang regency, there are 23 buildings with medium damages spread in 24 schools, while in Malang City, there are 7 buildings with medium damages spread in 21 schools. Moreover, in Batu City, there is no building with medium damage spread in 6 schools.



Figure 3. Severe Damages

Anchored in Table 3, there are more buildings with minor damages in school buildings in vocational schools in Malang City compared with school buildings' conditions in Malang Regency and Batu City. There are 604 buildings with minor details in Malang City spread in 21 schools. If rated based on the level of minor damage, Malang Regency comes first with 316 buildings spread in schools, then Batu City with 80 damaged buildings spread in 6 schools.



Figure 1. Minor Damages

Table 4 School Infrastructure Conditions

Vocational High Schools Per Area	Rainwater Ducts	Water Disposal	Waste Disposal	Fire Prevention	Room Transition	Lightning Rod
Public/Private Vocational High Schools In Malang City	21	21	14	12	17	11
Public/Private Vocational High Schools In Malang Regency	20	20	17	6	11	11
Public/Private Vocational High Schools In Batu City	6	6	4	4	4	5

From 21 vocational schools in Malang City, all of them have rainwater ducts and water disposals. There are 14 out of 21 schools in Malang City that possess waste disposal facilities, and there are 12 schools in Malang City that own fire prevention facilities. Only 17 out of 21 schools that have room transition facilities and there are only 11 schools that retain sufficient lightning rods.

From 24 schools in Malang Regency, 20 schools have rainwater ducts and water disposals. There are 17 schools that possess waste disposals. Reviewed from the availability of the fire prevention facilities, there are 6 out of 24 schools that provide fire prevention facilities.

There are 11 schools that provide room transition facilities and only 11 vocational high schools that provide lightning rods in their school buildings.

During the observations of rainwater duct and water disposal facilities, all schools in Batu City (6 schools) have retained these facilities. There are 4 schools that own waste disposals, fire prevention facilities, and room transmissions. There are also 5 out of 6 schools in Batu City that have lightning rod facilities.

Generally, vocational high schools in Batu City possess better facilities than schools in Malang City and Malang Regency. There are more or less 70 - 90% schools in Batu City that are complemented with rainwater disposals, water disposals, waste disposals, fire prevention facilities, room transmissions and lightning rod facilities. The condition and completeness of facilities and infrastructures in Batu City are good for the facilities and infrastructures are in a good condition and functioning.

These facilities guarantee that the preventive maintenances are conducted. The availability of water ducts and water disposals elude classes and buildings at schools from being wet, muddy and humid; make the walls dry and moss free. The availability of rainwater ducts and water disposals assure the easiness in preserving the walls and their paints so they will be durable. Due to the availability of waste disposal, schoolyards, libraries, workshops, laboratories and sport facilities are going to be free from domestic wastes as a result of school activities.

Waste processing reassures that all school infrastructures are hygienic and look after all school residences so that they are always healthy and able to do their activities optimally. Fire prevention facility is one of preventive maintenance facilities that secure all buildings and supporting rooms at schools from breakages and failure to function due to fire. It also prevails on lightning rods. Lightning rods make sure all buildings at schools are protected from the possibilities of thunderstruck. Lightning rods also minimize the possibilities of breakage because of thunder, guarantee and take care of the durability of school buildings.

## **CONCLUSIONS**

- 1) Generally, all observed schools do not possess any preventive maintenance documents so the rate of building damage and the data of damaged school buildings' improvement are not recorded. Damage volumes and frequencies in all observed schools are not recorded while preventive maintenance plans in all observed schools are not scheduled.
- 2) Malang City has the highest number of minor damaged building in public and private vocational high schools. There are 604 buildings with minor damages spread in 21 schools in Malang City. From the results of in-depth interview, schools usually do not have maintenance schedules for those rooms with minor damages. Even though the damages are not disruptive, those minor damages are going to extend to medium and severe damages.
- 3) Malang Regency has the highest number of medium damaged building in public and private vocational high schools from all observed areas. There are 23 buildings with medium damages in this regency. The results of in-depth interviews state that schools generally know that their infrastructures are damaged, such as popping on the floors and many cracked floors; not intact wall plasters; falling ceiling and many supported ceiling. There is no fixed preventive plan to repair all these damages in schools in the area of Malang Regency. These conditions begin to disturb the utilization of the room and injure the students for the cracked floors puncture and wound them during their activities.
- 4) There are 8 buildings with severe damages in Malang Regency, 3 buildings with severe damages in Batu City and 1 building with severe damages in Malang City. The damages happen in the form of uneven roof shapes. The arrangements of the roof, when seen from

afar, are bent. It shows that the supporting structures of the room are getting fragile and are, soon, going to fall apart. It frequently is caused by the supporting woods in the roof construction (gantries) are getting fragile. Inside the classes, many hanger ceilings are supported. These severe damages are really dangerous for the students and teachers when they are inside the classes or other buildings such as workshops, laboratories or libraries. These rooms need departing. These buildings cannot be used anymore.

- 5) From 51 schools in Malang City, Batu City and Malang Regency, most of them have owned some required facilities (rainwater ducts, water disposals, waste disposals, fire prevention facilities, room transmission facilities and lightning rods). There are several schools that are not complemented with some of those facilities. There are schools that do not have water disposals, fire prevention facilities and lightning rods. The availability of these facilities guarantees the implementations of preventive maintenance. The availability of water duct and water disposal evades classes and buildings from being wet, muddy and humid. It also secures the walls so that they are always dry and moss free. The availability of rainwater disposal and water disposal guarantee the easiness of wall and wall paint maintenances so the walls are going to be durable. The availability of waste disposal makes schoolyard, libraries, workshops, laboratories and sport facilities free from domestic wastes. Fire prevention facilities make sure that all buildings and supporting rooms at schools free from the breakage and failure to function because of fire. The availability of lightning rod secures the buildings from thunderstruck and minimizes the possibility of breakage from thunder, guarantees and takes care of the durability of school buildings.

### Suggestions

- 1) School buildings' preventive maintenance is one of important factors in the success of teaching and learning processes. Preventive maintenance is one of essential factors in the viability of a school system. If the buildings are not well maintained, they will be damaged. Minor damages are going to lead to further damages. If these damages occur, schools will have to spend expensive expenses to repair the damaged buildings' functions. Schools are demanded to make and conduct preventive maintenance systems for the school buildings that are scheduled and planned. Types of maintenance, forms of maintenance, expenses, authorities and times of maintenance have to be comprehensively documented. It is suggested that schools have maintenance plans and provide supporting preparations.
- 2) Malang City has 604 buildings in public and private vocational high schools with minor damages spread in 21 schools. These damages consist of fallen *lips plank*, doors and windows with broken mirrors or stuck hinges, broken gutters or cracked floors. These damages have to be quickly repaired in order to prevent them from spreading out. By conducting preventive maintenances when the damages are still minor, repairing expenses (workers' wages, building materials and repairing time) will be able to be minimized so they will not strain schools' financial.
- 3) Malang Regency has the highest numbers of building with medium damages. There are 23 rooms from 24 schools with medium damages. In-depth interviews result in the fact that generally schools know about the damaged buildings' conditions. The medium damages in these schools include popping floors many cracked floors, cracked wall plasters, fallen ceilings and many supported hanger ceilings. These medium damages have the tendency to endanger students during the teaching and learning processes. In this phase, improvements cannot be put off anymore. They cannot be procrastinated. They have to be conducted now. It is due to the fact that procrastination in repairing the damages will put the students and teachers using the rooms in danger.

- 4) Vocational high schools that have buildings with severe damaged buildings, for example fractured gables, fragile girding caused by moths, bent rooftops, should not be used anymore. Severely damaged buildings just have to wait for time to be fallen apart. It can happen anytime. It may happen the day after tomorrow or next month. Severely damaged buildings need to have fences so no one will enter the buildings in the future.
- 5) This is the time schools need to possess and save building documents, for instance plans of construction's pictures, so when there are problems with installation or building utilities, it will be easy to find the problems and anticipate the maintenances. Planning is needed in terms of preventive maintenance in order to anticipate building component problems. These efforts can be done by owning preventive maintenance documents, conducting minor improvements in school buildings and inserting maintenance components in school work plan and budget documents in order to be able to optimize the use of the school buildings.

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