



**DEPARTMENT OF BUILDING
UNIVERSITI TEKNOLOGI MARA
(PERAK)**

BUILDING MAINTENANCE WORK

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Building Maintenance Work

be accepted in partial fulfillment of requirement has for obtaining Diploma in Building.

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STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at Batu Pahat District Education Office for duration of 20 weeks starting from 23 August 2021 and ended on 10 January 2022. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfilment of the requirements for obtaining the Diploma in Building.

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Alhamdulillah, thank God for what I have been able to achieve till the moment I breathe now.

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Last but not least, thank you to my parents who have been supportive to keep me motivated whenever I face my ups and down and being tolerant with me for me to spend more time in completing this report.

ABSTRACT

Maintenance is technical and administrative procedures taken to retain or repair an item in a state that permits it to perform its intended purpose. It is important to keep a building maintained for a long lifespan of use. In this report, the project was held at Tiara Block in SMK Dato Onn Jaafar. The objectives of this report are to inspect and prepare the solution with the accurate cost for the broken infrastructure. Maintenance of the ceiling was done at the classrooms since it was damaged due to the natural weather. The installation method was also discovered in this report. A quotation session was made to appoint the contractor for the project. To keep the building well-functioning, it would be nice if it has a regular maintenance schedule. In conclusion, this report will explain more about the procedures for applying for maintenance for a school building.

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CHAPTER 1.0

INTRODUCTION

1.1 Methods of study

There are many methods to study the topic. The method I use are by observation, unstructured interviews and document reviews. When I do the inspection of the site, I observe the issue then taking the notes of the important points like how the process happen and things need to do and taking pictures of the site for further reference.

I also gathered the information I got from the people I interviewed. Usually, there will be many people involved during the site inspection. Therefore, I will ask them directly at the site. There are teachers, engineer from PPDBP, engineer from Public Work Department of Batu Pahat, engineer of Segamat Education Office, engineer of Kulai Education Office, head engineer of Johor State Education Department and architects, interior design and consultant of the company involved during some project inspection.

After doing the inspection of the site, I need to prepare the Bill of Quantities (BQ) of the project to estimate the cost before the contractors begin the work. In order to prepare the BQ, I used to review the older documents and examples as reference.

1.2 Background of study

Maintenance work is a sum total of all technical and administrative procedures taken to keep or restore an item in a state that allows it to perform its intended purpose. The maintenance needs shall not be less than those required to meet the applicable legislative requirements. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

One of the key goals of maintenance is to keep a structure as close to its original state as possible so that it can efficiently perform its purpose. The basic goals of building maintenance are to preserve the value of an investment, keep the building in good repair so that it can continue to serve its purpose, and offer a pleasing look. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

Improved design, specification, construction, and maintenance data feedback to designers could reduce the amount of essential building maintenance labour. Furthermore, successful maintenance management necessitates a wide range of abilities. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

Technical knowledge and experience are required to detect maintenance needs and describe the appropriate treatments, as well as an awareness of modern management practises, knowledge of property and contract law, and an appreciation of the relevant sociological and economic factors. The procedures for managing and carrying out building maintenance must be improved. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

Maintenance budgets should be concise and well-thought-out, and they should be backed up with comprehensive information on the repercussions of disregarding maintenance. Improving efficiency and productivity should be a top priority. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

Maintenance work is also divided into two categories which are 'predictable' and 'avoidable.' Predictable maintenance refers to the regular periodic work required to maintain a product's performance characteristics, as well as the work required to replace or repair the product after it has reached the end of its usable life cycle. The work necessary to fix problems caused by poor design, wrong installation, or the use of bad materials is known as preventable maintenance. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

A system with planned inspections and maintenance will have higher overhead expenses than one without, but the planning should result in cheaper maintenance costs. A fully organised system is not always the greatest option, and the optimal method for the estate must be carefully devised. (Seeley, I. H. (1987). Building maintenance. Macmillan International Higher Education).

1.3 Objectives

- to observe the defect of the infrastructure that need to repair
- to identify the way to solve the broken infrastructure problem
- to measure the accurate cost of maintenance work

1.4 Scope of study

Throughout the writing of this report, all the sites involved are schools around Batu Pahat District. All the school's maintenance issues are managed by Batu Pahat Education Office (PPDBP) under the Development and Management Sector. The scope of work that I studied here were everything related to maintenance work including civil engineering, mechanical engineering and electrical engineering.

The maintenance work that I covered are the plumber work, water system, sewage system, electric flow of the building, structure and infrastructure defects like crack at the column, slab, beam or floor and broken of roof, doors, windows, gate and ceiling. In addition, I also learn the process of open, close and winner selection of the tender and requirements needed to compete for the tenderers. In this company, I did not have chance to go at a construction site and learn the construction process. There are no new construction project sites under PPDBP.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of company

The Batu Pahat District Education Office was established in 1913 and began operations at Jalan Mohd Khalid. In 1960, it relocated to No 1 Jalan Pejabat, and on December 1, 1999, it moved to an area of 0.5 hectares in Jalan Zaharah as shown in Figure 1. This approach is, of course, intended to stifle the rapid advancement of education, which need strategic sites and suitable facilities.

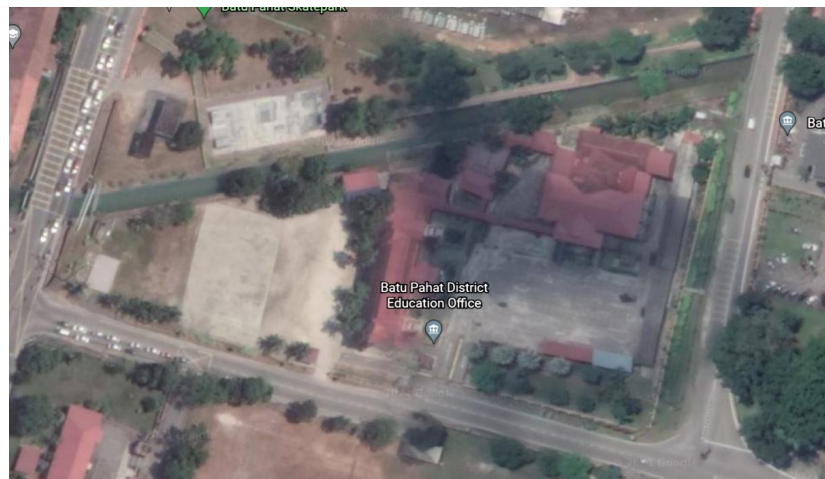


Figure 2.1 The location of PPDBP

From the first District Education Officer, known as the Organizer, Mr. Mohd Doon b Taib, who served from 1913 to 1928, the Batu Pahat PPD has progressed under the leadership of visionary management and with the assistance of education service officers and devoted support employees.

Based on the table below, there are 176 schools under the jurisdiction of PPD Batu Pahat.

Table 2.1 Schools under PPDBP

NO.	SCHOOL	TOTAL
1.	Sekolah Menengah Harian	26
2.	Sekolah Rendah Harian	104
3.	Sekolah Jenis Kebangsaan Cina (SJKC)	36
4.	Sekolah Rendah Jenis Kebangsaan Tamil (SJKT)	3
5.	Kolej Vokasional	2
6.	SMA	4
7.	SRAB	1
TOTAL		176

Compared to other state of education office, PPDBP has the most schools to handle. An area of Batu Pahat District is 1873 km² with 156,236 population recorded in 2021. (Population of Cities in Malaysia (2021), n.d.)

2.2 Company profile

Education office is a department who responsible to manage schools under their district. All of the education office is managed under the education department in each state. For example, Batu Pahat Education Office is under the Johor State Education Department. While education department is under the Ministry of Education.

PPDBP is located in the middle of the Batu Pahat city. Other office building nearby are Batu Pahat Municipal Council Office, Batu Pahat Information Department, Malaysian Anti -Corruption Commission Batu Pahat Branch, Batu Pahat Courthouse and Batu Pahat Public Works Department.

The idea of thinking and level of work of officers and staff show sincerity to raise the level of professionalism of the teaching service to continue the struggle to build a nation -state with a national identity, unity and integrity. Therefore, PPD Batu Pahat displays determination and integrity, leading the growth of human capital in education management one step ahead.

At PPD Batu Pahat, they carry the hopes of the community, realize the dreams of the new generation of the country, apply the aspirations of National education, towards world -class education by 2020. All policies and activities implemented adhere to the vision of 'Excellent Generation Generator School'.

The noble vision is manifested through the mission of developing individual potential through quality education led by the Batu Pahat District Education Officer and assisted by a coalition of education staff and support staff structured into 8 main units with their respective roles and job specifications.

2.3 Company organisation chart

The figure below is the organization chart of Batu Pahat District Education Office.

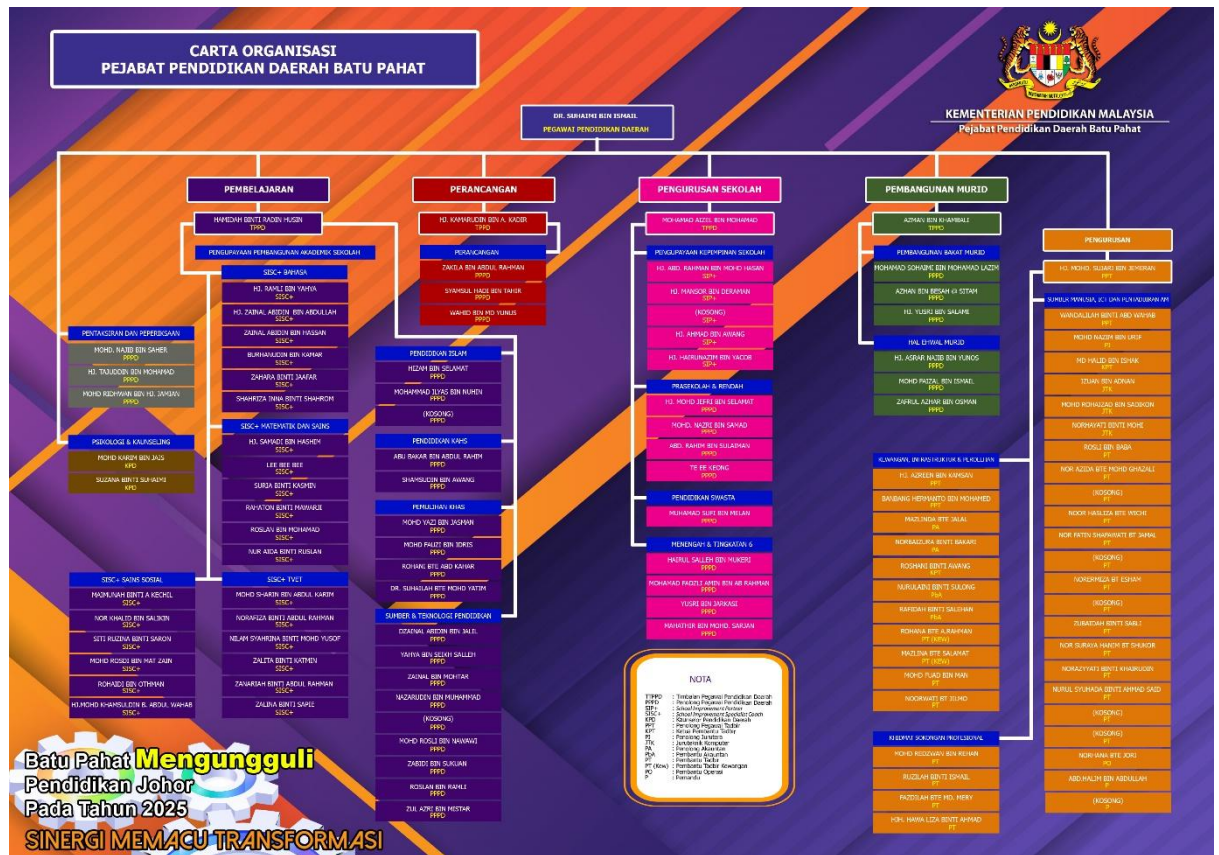


Figure 1.3 PPDBP Organization Chart

The Head Officer of Batu Pahat Education Office (PPDBP) was Dr. Suhaimi bin Ismail. He was transferred to PPDBP from Mersing Education Office on 15th February 2021. There are 4 important sectors and 20 units in PPDBP. Those sectors are Learning Sector, Planning Sector, School Management Sector and Student Development Sector. For Learning Sector, the head officer is Madam Hamidah binti Radin Husin. While in Planning Sector, they have Mr. Kamarudin bin A. Kadir as their leader. While the rest, Mr. Mohamad Aizel bin Mohamad for the School Management Sector and Mr. Azman bin Khambali for Student Development Sector.

2.4 List of projects

There are many completed and in progress maintenance project under PPDBP.

2.4.1 Completed project

The table below shows some completed project list under PPDBP.

Table 2.4.1 Completed project

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Maintenance work of internal sanitary water supply system, electrical wiring and roof maintenance works involving structures.	98,000.00	25/07/2021	12/09/2021	1 month(s) and 18 day(s)	SMK Tun Ismail
2.	Water tank and ceiling maintenance works and roof maintenance works involving structures.	99,056.40	01/04/2021	20/05/2021	1 month(s) and 19 day(s)	SMK Permata Jaya
3.	Open road/square maintenance works.	98,005.40	01/04/2021	20/05/2021	1 month(s) and 19 day(s)	SK Seri Banang
4.	Building	49,976.18	28/04/2021	06/06/2021	1 month(s)	SK Parit

	structural maintenance works, ceilings, floors, doors and other related works.				and 9 day(s)	Bilal
5.	Drainage and doors maintenance works	29,974.60	28/04/2021	13/06/2021	1 month(s) and 16 day(s)	SMK Tanjung Semberong
6.	Internal water supply and sanitary system maintenance works, ceiling maintenance works and roof maintenance works-not involving structures	50,000.00	28/04/2021	13/06/2021	1 month(s) and 16 day(s)	SK Kampung Jawa
7.	Sewerage and sewage cleaning system maintenance works, fire prevention maintenance works and floor maintenance works.	96,093.90	1/04/2021	20/05/2021	1 month(s) and 19 day(s)	SMK Datin Onn Jaafar
8.	Water pump/boost	98,700.00	1/04/2021	20/05/2021	1 month(s) and 19	SMK Taman

	pump and toilet maintenance works and floor/door maintenance works.				day(s)	Seri Kota
9.	Boost pump maintenance works and other related works.	20,000.00	15/08/2021	12/09/2021	28 day(s)	SK Seri Molek
10	Electrical wiring maintenance works, ceiling maintenance works and drainage maintenance works.	49,985.28	28/04/2021	13/06/2021	1 month(s) and 16 day(s)	SK Seri Utama

2.4.2 In progress project

The table below shows some in progress project under PPDBP.

Table 2.4.2 In Progress Project

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Open Hall construction	449,256.30	20/12/2021	In Progress	16 weeks	SK Bukit Kuari
2.	Open Hall construction	445,790.50	22/12/2021	In Progress	16 weeks	SMK Dato' Bentara Luar
3.	Open Hall construction	442,232.00	20/12/2021	In Progress	16 weeks	SK Seri Bertam
4.	Open Hall construction	446,280.80	20/12/2021	In Progress	16 weeks	SK Bukit Rahmat
5.	Piping work	19,990.00	6/1/2022	In Progress	1 week	SMK Dato Syed Esa
6.	Roofing work	19,990.00	2/1/2022	In Progress	1 week	SK Parit Raja
7.	Piping and cutting tree work	19,990.00	6/1/2022	In Progress	1 week	SMK Dato Bentara Luar
8.	Electrical wiring maintenance work	19,980.00	7/1/2022	In Progress	1 week	SK Tenaga Setia
9.	Electrical wiring maintenance work	19,980.00	5/1/2022	In Progress	1 week	SK Tanjung Semberong
10	Sewage	19,990.00	6/1/2022	In Progress	1 week	SK Seri

	cleaning system maintenance work, door and painting works.						Binjai
11	Roofing maintenance works and cleaning water tank works.	19,990.00	5/1/2022	In Progress	1 week		SK Banang Jaya
12	Ceiling and roof maintenance works.	19,980.00	5/1/2022	In Progress	1 week		SK Tenaga Setia

CHAPTER 3.0

CASE STUDY

3.1 Introduction to case study

This case study is about building maintenance work. Among all the maintenance projects that I have discovered, I decided to choose one of the projects which is repair and maintenance of the internal piping system, water tank and fence and other related works at SMK Datin Onn Jaafar, Batu Pahat. Most of the residents in Batu Pahat called this school as *DOJ* or *Pesta*. As shown in the figure below, this school is located on a land area of 10 acres (4 hectares).



Figure 2.1 Site location

The total cost of the project was RM96,093.90. It started in May 2021 and finished in December 2021. The work done there was repairing the roof of the administrative block, repairing the ceiling in the block of classrooms, building a fence around the sewage tank, plumbing work and changing the water tank. All of the ceiling needs to be repaired because it already reached its life expectancy. The built fence was reinforcing fabric of steel (BRC) type. The school also had plumbing problems so

had to build a new plumbing system. But, in this section, I will only focus on repairing ceiling work.

3.2 Observation of the defect of the infrastructure that need to repair

There are procedures in the process for the school to apply for maintenance for a building. The school needs to submit an official letter regarding the building maintenance application and send it to the assistant education officer of the planning sector. As soon as he receives the information, he will hand it over to the engineer and the engineer will come over to the school and do an inspection according to what the school has complained about.

After doing the inspection, observation and taking the measurement of what the school has complained about, the engineer will prepare the Bill of Quantities (BQ). BQ is an official paperwork which states the cost for the works, items, labors and machineries. It also outlines the construction or repair contract's terms and conditions, as well as itemizing all work so that a contractor may price the work for which he or she is bidding.

For the ceiling work at SMK Datin Onn Jaafar, the teacher complained that their ceiling was sagging (as shown in Figure 3.2.1 and 3.2.2). When we observed, we found that the hanger wire which holds the ceiling also needed to change. This ceiling work was at Tiara Block and the ceiling used in the classroom.



Figure 3.2.1 Damaged ceiling

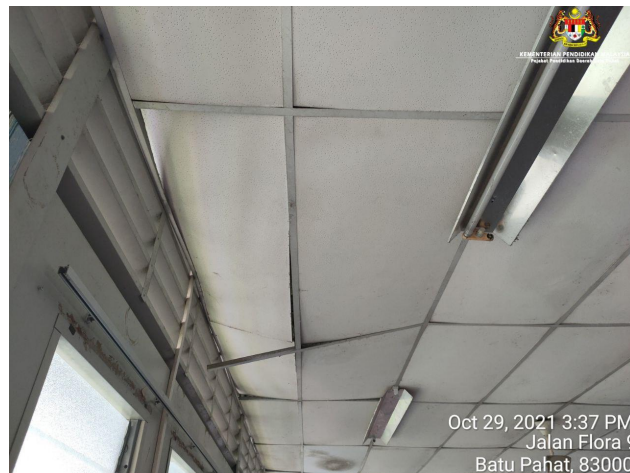


Figure 3.2.2 Sagging Ceiling

Thus, this problem needs to be solved quickly since it might be dangerous for the students in the classrooms. The ceiling might have fallen on the students' head out of the blue. Since the classroom is having a good wind flow throughout the class, the ceiling cannot stand when it comes to heavy wind that makes it easily become sagging. Suspended ceiling is actually not suitable for outdoor use.

3.3 Identification solution of the broken infrastructure problem

Luckily, not all the ceilings are broken. As a solution, the ceiling and the hanger wire will be replaced with the new one. After the observation, we take the measurement of the classroom area using the distance laser meter. There are three classes in the Tiara Block and most of the ceilings from the three classes are facing the sagging problems. The ceiling pieces were measured by numbers while the hanger wire was measured by square meter. The size of the ceiling is 2 feet \times 4 feet.

For the installation, the damaged ceiling tiles were removed first. Then, the rails that run along the walls were checked to make sure they are not bent or loose. To confirm the rails were still straight and aligned, a level meter was used (refer Figure 3.3.1).



Figure 3.3.1 Level meter

Next, after identifying the failed wire hangers, the new wire was hung through an available hole on the rail and at the end of the wire was twisted up to keep it suspended. As shown in Figure 3.3.2 was an example of the situation.



Figure 3.3.2 Twisted wire

After that, directly above where the hanger wire is, a wooden screw was screwed into the wooden joist. It is not necessary to screw it all the way into the joist. Next, the wire was pulled up and the hanger was wrapped around the screw where the rail begins to lift. The excess wire was cut away.

Lastly, the ceilings were placed as shown in Figure 3.3.3 and the rails were checked once again using the level meter. Any necessary adjustments were made to make the ceiling be level.



Figure 4.3.3 Placing the ceiling tiles

3.4 Measuring the accurate cost of the maintenance work

The final step before giving the project to the contractor is preparing the Bill of Quantities (BQ). As mentioned before, BQ is a paperwork stating the price for the works, labors and machineries. The BQ will state the items or works needed to do with the accurate or lump sum cost referring to the work rate schedule issued from the Public Works Department. The BQ will be prepared by the engineer from PPDBP.

The Figure 6 shows the BQ for the ceiling work at the Tiara Block. The work will be shortly described and the price shown was based on the stated number code of work rate price. The work rate price was multiplied to the quantity of the work to get the total price. For example, the standard rate price for ceiling tiles by pieces was RM37.70. Then RM37.70 was multiplied to 19 pieces of the ceiling needed to change, making it equal to RM716.30 for the changing ceiling work.

	A	B	C	D	E	F	G
52		BLOK TIARA					
53		KERJA-KERJA SILING					
54							
	A	Kerja - kerja menyelenggara kerangka siling melendut (aluminium beranod) termasuk mengganti baru dawai penyangkut kerangka siling dan memastikan kedudukan selari dan selamat termasuk serta kerja - kerja yang berkaitan.	G223 +AR	M2	257.40	25.30	6,512.22
55							
56	B	Kerja - kerja menanggal dan membuang siling lama yang telah rosak dan kerja - kerja membekal dan memasang siling baru bersaiz 2'x4' termasuk kerja - kerja yang berkaitan dan dilakukan sehingga sempurna seperti yang diarahkan oleh Pegawai Penguasa.	G75 + M31+AR	NO	19	37.70	716.30
57							
58							
59						JUMLAH HARGA (RM)	18,971.63

Figure 3.4 Bill of Quantities

After the BQ was completed, the quotation session was made to appoint the contractor for this project because this project was over RM20,000.00. Procurement by quotation worth RM20,000.00 to RM500,000.00 must be invited among 5 district contractors grade G1. For the quotation process, a bid barrel was placed at a point where all the tenderer feels easy to place in their application.

The validity period of the quotation is not more than 90 days from the closing date of the quotation depending on the complexity of the quotation executed. If the offer validity period has expired, the quote must be re -invited. Also, the bid box shall be opened as soon as possible by the Quotation Opening Committee after the quotation is closed. The Quotation Opening Committee must consist of at least 2 officers appointed by the Head of Department in writing.

After the contractor of the project has been appointed, the engineer of PPDBP will brief the work that is going to be done and the contractor can begin the job as soon as possible.

CHAPTER 4.0

CONCLUSION

The conclusion from this case study showed how important maintenance works for a building. A maintenance work should not be done only when it is already damaged but it is supposed to make a routine to keep the building updated and well used. This report explained how to apply for maintenance of a school building from the procedures it took until the contractor ran the project. The drop ceiling in the classrooms of the Tiara Block was replaced and the installation method was described.

The hanger wire needs to change to new and the same goes to the damaged ceiling tiles. If it stays in that way it might be dangerous to the students. By doing regular maintenance work of the building, it is actually more cost saver compared to doing maintenance when it is already damaged.

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