



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

MAINTENANCE FOR AIR CONDITIONING

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(PERAK)**

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It is recommended that the report of this practical training provided

By

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MAINTENANCE FOR AIR CONDITIONING

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 NW Teguh SDN BHD for duration 20 weeks starting from 23 August 2021 and ended on 7 January 2022. It is submitted as one of the prerequisite requirements of BGN 310 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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ABSTRACT

Air conditioning (often referred to as AC, or air con) is a system used to cool down the temperature in an inside space by removing the existing heat and moisture from the room. Thus, it is also important to do the maintenance process for the air conditioning to keeps the air conditioning in the building runs as good as new. It is also to keep the temperature inside the building to always cool and comfortable for the people inside the building. This report will discuss about maintenance service of air conditioning. This report was conducted for University of Reading Malaysia, which is located at Kota Ilmu, Persiaran Graduan, Educity, Nusajaya, Johor Darul Takzim. The objective of the report is to analyze the maintenance process of air conditioning and how it carried out. It will focus on the whole process of maintenance service for central air conditioning, split air conditioner and cassette air conditioner.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Air conditioning can be defined as a system that are used to control a temperature in the room for human comfort. It is also known that the physical properties of air can be control by using cooling, heating, humidification, and dehumidification. These processes are used to maintain a good condition for human comfort. Thus, all together control of temperature, humidity, air motion and cleanliness are known as air conditioning (Saha B, 2018). The acronym HVAC&R stand for heating, ventilation, air conditioning, and refrigeration. All these processes combined are equivalent to the function perform by the air conditioning (Frank Kreith, 2019).

According to research from Yu B (2009) that the purpose of air conditioning is to provided thermal comfort and an acceptable indoor air quality for occupation. This is to make occupations more and more comfortable in healthy indoor environment. People spend 80%-90% indoor and indoor environment and comfort are very important for human health and work efficiency. Especially for those who work in the office daily. Uncomfortable work environment can affect their quality of work thus decreasing the workability of the workers.

The types of air conditioning that are used in University of Reading Malaysia are Central air conditioning, Split air conditioner and Cassette air conditioner. Central air conditioning has a large cooling capacity of 30 TR or more (Saha B, 2018). This makes it a good option for larger building area such as restaurant and mall. The components of central air conditioner according to Saha B (2018) is there are separate room and conditioned air is delivered through a system called

ducting system. There are also other components such as refrigeration system, blower, return air ducting and the plenum where outdoor and indoor air is mixed.

Next, split air conditioner is probably the most popular type of air conditioning for residential building in Malaysia. According to Hleborodova (2018), the split air conditioner is divided into 2 which is the outside condenser and inside evaporator. The evaporator is the thing inside the house which emits the cool temperature inside the house while the condenser emits the air you don't want outside. Besides that, cassette air conditioner is placed in the ceiling and are ideal for large area of building. The cassette air conditioner must be built inside and hung on the ceilings (Bamodu, 2017).

Although there are many types of air conditioning in Malaysia. However, the aim of this report is to discover the maintenance process of central air conditioning, split air conditioner and cassette air conditioner in University of Reading Malaysia.

1.2 Objectives

To identify the method of air conditioning maintenance process and procedure at University of Reading Malaysia that include:

1. Central air conditioning
2. Split air conditioner
3. Cassette air conditioner

1.3 Scope of Study

The scope of study has been carried out at University of Reading Malaysia, which is located at Kota Ilmu, Persiaran Graduan, Educity, Nusajaya, Johor Darul Takzim. The contract of maintenance for air conditioning had started back in 2018. The building is consisted of 2 block which is named south and north block and have 2 upper level and one ground level. The project is currently on going. Therefore, the focus of the study is to determine on how the process of maintenance service of air conditioning for central air conditioning, split air conditioner and cassette air conditioner. Hence, the study will be explained not only on method of air conditioning maintenance process but including the procedure of air conditioning maintenance. Even so, the study will not concentrate on the manpower need on the project, repairing the air conditioning, costs and duration matters. In order to fulfill the data, there were three methods need to be carried out which is observation, interview and document reviews. In conclusion, all further explanation relating to the above method were explained as below.

1.4 Methods of Study

1. Observation

The observation made is about how the process of maintenance for air conditioning are done in the large area of the building. The average time taken for this observation are about 1-2 weeks for me to know about all the process needed for the maintenance services. From cleaning the filter, FCU service and cleaning the cooling tower and outdoor unit. In general, the amount of time needed for maintenance services in University of Reading Malaysia are about 1 month and will started at the same routine of maintenance services once the report on the application for maintenance being updated once a month. The application is called GEM and it is used as digital report for the maintenance services. The observation of the maintenance services for air conditioning process had been recorded by smartphone with all photos, videos and data are in the same smartphone.

2. Interview

The interview is a method where one participant asks questions, and the other provides answers. In common parlance, the word "interview" refers to a one-on-one conversation between an interviewer and an interviewee. The interview was conducted with the company manager, Mr. Hisham who is someone responsible for the company background. The interview was also conducted with the workers who are at the University of Reading Malaysia, Mr. Khairul who has been working for 2 years. The unstructured interview did not have any specific duration of time as the questions are asked spontaneously while working. The unstructured interview was recorded through a smartphone. However, for the semi-structured interview about the company background, it was held in the company office and the interview carried out around 15-20 minutes. The semi-structured interview was recorded through short notes.

3. Document Review

The document review was used to collect all the data for the air conditioning maintenance service. The document that has been reviewed is a project tender about what types of air conditioning and how many of them are for maintenance service. This document will be used as a reference for the air conditioning service process. It is also reviewed about standard operating procedure (SOP), progress of the maintenance service, safety and health procedure. Furthermore, the pictures taken from other workers are also the best reference during document review.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

NW TEGUH ABADI SDN. BHD (NWTASB) is a company registered under Malaysia Construction Industry Development Board (CIDB). This company is registered in grade G3 in category B (building construction) for specialization B04, grade G3 in CE (civil engineering construction) for CE01 and CE21, grade G3 in ME (mechanical and electrical) for specialization E03, E06, E10, E11, E16, E17, E21, E32 and M15, and grade G2 in ME for E04. Apart being registered under CIDB, NWTASB also has SSM Business Registration certificate (1250795-D), Minister of Finance Malaysia Company (K66586572502674940) and Bumiputera Company Minister of Finance Malaysia (BP66586572502674940). NWTASB also registered under Johor Corporation Centre Development (JCCD) with registration number JCCD/SKJ/20/02/00048. NWTASB focus the business area mainly in building and process plan services. Even though NWTASB is new in the market now, they are moving forward to secure a lot of projects in the future. With the recognition from the Malaysia Construction Industry Development Board (CIDB) as a bumiputera company, NWTASB managed to expand the scope of work to manage carry out building construction of 1-unit residential house, supply and install traffic light and install solar street lighting.

2.2 Company Profile

NW Teguh Abadi Sdn Bhd formerly as Teguh Abadi was established on 16th June 2014 and upgrading to “Sendirian Berhad” on 11th October 2017 to be one of the Engineering and Facilities Management in Building Maintenance Management (BMM). The company lead in Electrical, Mechanical and Civil design, supply, construction, installation and maintenance. This company based in Johor Bahru and located at Lot A4, Blok A, Kompleks Premis Usahawan SME Bank, No 15, Jalan Tahana, Kawasan Perindustrian Tampoi, 80350 Johor Bahru, Johor Darul Takzim.

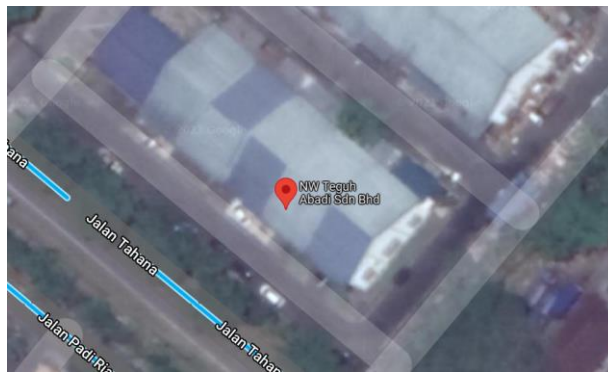
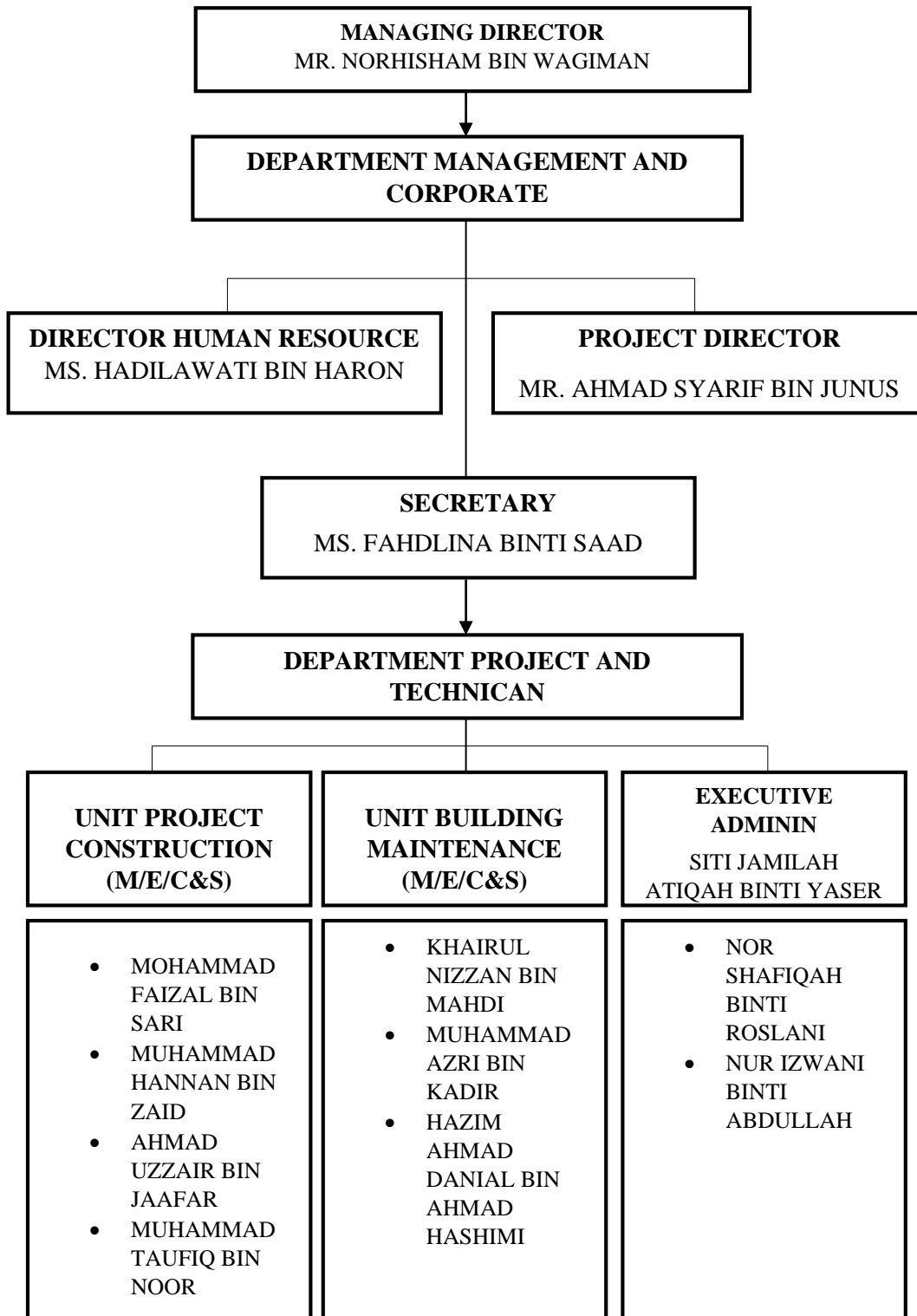


Photo 2.2.1 Location of the company based on google map
(Source: Google Maps)

With the company’s mission to be a preferred service provider of Integrated Building Maintenance Management (IBMM), Mechanical & Electrical Engineering and Civil & Structure. This company also ready to achieve the company’s vision of to instill commitment quality and excellent in our service through product, innovation, talent development and employee dedication. NWTASB can be contacted via company email at admin@teguhabadi.com.my

2.3 Company Organization Chart



2.4 List of Project

Table 2.4.1 Completed Project

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Supply and Install traffic light power ducting and cable at Southern Puteri Harbour, Iskandar Puteri, Johor	One hundred eighteen thousand eight hundred eighty-six Malaysian Ringgit (RM118,886.00)	August 2015	October 2015	2 months	Inneonusa Sdn. Bhd
2.	Kerja-kerja pembinaan (construction works) untuk 2 Unit Rumah Penyelia dan 1 Unit Rumah Pengurus di kawasan Flecra Pagoh, Segamat, Johor	Six hundred sixty- eight thousand five hundred Malaysian Ringgit (RM668,500)	August 2016	May 2017	9 months	MAMH Gemilang Selatan

3.	Supply, install and documentation ICT Network equipment for Institute Pengurusan Temenggong Ibrahim	Three hundred eighty- four thousand seven hundred fifty- four Malaysian Ringgit (RM384,754)	October 2017	December 2017	2 months	Dafinah Technology Sdn Bhd
4.	Supply and install cabling panel motor control for conveyor 4kW motor at MCC8-4 panel	Fourty one thousand one hundred nineteen Malaysian Ringgit (RM41,119)	September 2019	October 2019	1 month	MSM Sugar Refinery Sdn Bhd
5.	Menaiktaraf laluan pejalan kaki di Pekan Serkat, Majlis Daerah Pontian	Four hundred and one thousand eight hundred thirty-five Malaysian Ringgit (RM401,835)	January 2020	May 2020	4 months	Majlis Daerah Pontian

Table 2.4.2 Project in Progress

No.	Project Title	Project Value	Start Date	Completion Date	Project Duration	Client
1.	Supply, Installation, and commissioning of FTTX Network infrastructure at Apartment Villa Rose, Kulai, Johor	Seventy thousand Malaysian Ringgit (RM70,000)	October 2021	November 2021	1 month	Jaringan Setia Sdn Bhd
2.	Service for 312 units of fan coil (FCU) monthly service and maintenance for ACMV system at University of Reading Malaysia, Nusajaya	One hundred and forty-one thousand six hundred Malaysian Ringgit (RM141,600)	January 2021	December 2021	11 months	Global Facilities Management Sdn Bhd
3.	Kerja-kerja penyelenggaraan pendawai elektrik di SK Kota Dalam, Batu Pahat, Johor	Fifty thousand Malaysian Ringgit (RM50,000)	October 2021	December 2021	2 months	Perniagaan Mega Inspirasi

CHAPTER 3.0

CASE STUDY

3.1 Introduction to case study

The case study is about air conditioning maintenance service for central air conditioning, split air conditioner and cassette air conditioner. The project has started the service since 2018. The cost of the maintenance service approximately one hundred and forty- one thousand and six hundred Malaysian Ringgit (RM 141,600). Currently the project still on going until December 2021 and will be continue until next year if the agreement of the contract between NW Teguh Abadi Sdn. Bhd and GFM Sdn Bhd are made. Thus, the study will be explained about method of maintenance process for all three types of air conditioning in University of Reading Malaysia. Nevertheless, the study will not concentrate on the manpower need on the project, repairing the air conditioning, costs and duration matters. The project took place in Kota Ilmu, Persiaran Graduan, Educity, Nusajaya, Johor Darul Takzim.

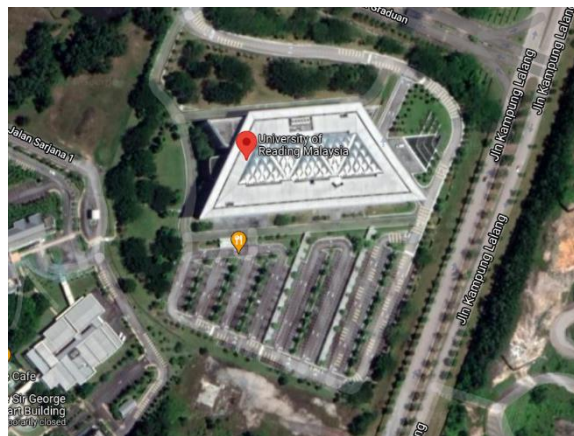


Photo 3.1.1: Location of University of Reading Malaysia based on the satellite map (Source: Google Maps)

University of Reading Malaysia are one of the campuses that are located in EduCity Iskandar. EduCity Iskandar is Asia's first multi-campus education city with 305-acres of universities, higher education institutions, research & development centres, EduCity Village, EduCity Hub, EduCity Sport Complex as well as recreational facilities. The campus covers an area of 27,000 square meters with two block and 3 level of building. There is also residential area near the multi-campus education city namely, Taman Eco Botanic.

The activities that have been carry out is maintenance service for air conditioning. The maintenance service of air conditioning includes cleaning or changing filter for Air Handling Unit (AHU) and cleaning cooling tower of central air conditioning, checking voltage for all three types of air conditioning, and cleaning filter for both cassette and split air conditioner. The work schedule of the maintenance service is on "GEM" application. The application is equipped with report of work for each unit of air conditioning which makes it easier to do the maintenance service report.

This work need supervise from air conditioning technician, thus technician from other company like GFM Sdn Bhd supervise our work weekly. The machineries and tools that involved in the project are ladder, clamp meter, blower, water jet and vacuum. For precaution measures, workers need to wear safety boot and put the caution sign when cleaning the cassette air conditioner especially at an area where people walked by. For internship student, they only work 5 days a week from Monday to Friday at 8.30 am to 5.30 pm. There is also over time work on Saturday for cooling tower cleaning service.

3.2 Maintenance process for Central Air Conditioning

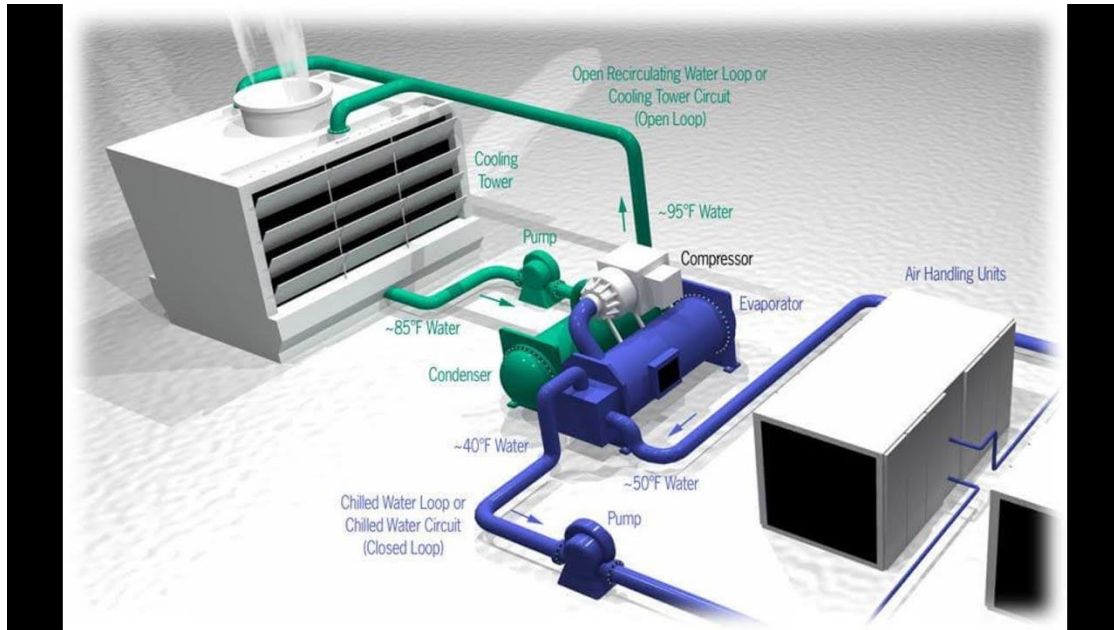


Photo 3.2.1: Central Air Conditioning
(Source: MEP Engineering Tutorials, Jun 2020)

The maintenance process for Central Air Conditioning is divided into two separate process which is services for Air Handling Unit (AHU) and maintenance service for cooling tower.

For the AHU services, the dirty air filters are either wash with water or replace the air filter with the new one. The precaution step taken in the maintenance process is to carefully open the AHU door since there is high wind pressure inside the AHU to avoid any injuries during the maintenance process. For AHU, there are a total of 5 step of maintenance process which is taking the dirty air filters from the AHU, washing the air filters, drying the air filters, reinstall and close back the AHU door.

For cooling tower maintenance process, there are a total of 3 areas needed to be clean to complete the process. The areas are the top of the cooling tower, inside and the outside. Algae, moss, and dust needed to be cleaned every month from the

cooling tower to make sure the air that flows through the building everyday are clean and fresh. The precaution step taken in the maintenance process is to be careful when using water jet and cleaning the cooling tower as it is slippery especially when cleaning the top of the cooling tower. For cooling tower, there are a total of 3 step of maintenance process which is cleaning the top of the cooling tower, inside and outside of the cooling tower with water jet and scrapper.

Process 1: Maintenance for Air Handling Unit (AHU) Air Conditioning Service



Photo 3.2.2 Air Handling Unit (AHU)



Photo 3.2.3: Take out the air filters

- Firstly, go inside the Air Handling Unit (AHU) and take out the air filters. Be careful when opening the door because of its high wind pressure inside the AHU makes it harder to open the door.



Photo 3.2.4: Clean the AHU air filters

- Then, clean the air filters with water until all the dirt and dust clean.



Photo 3.2.5: Dry the air filters

- After that, dry the air filters with a blower. While conducting the work, beware of the slippery floor because of the wet floor from cleaning the filter before.



Photo 3.2.6: Reinstall air filters

- After drying the filters, reinstall back the air filters into AHU unit.



Photo 3.2.7: Close back the AHU door

- Last step is to close the AHU door carefully to avoid any injuries such as fingers stuck on the door

Process 2: Maintenance for Cooling Tower

HOW COOLING TOWERS WORK

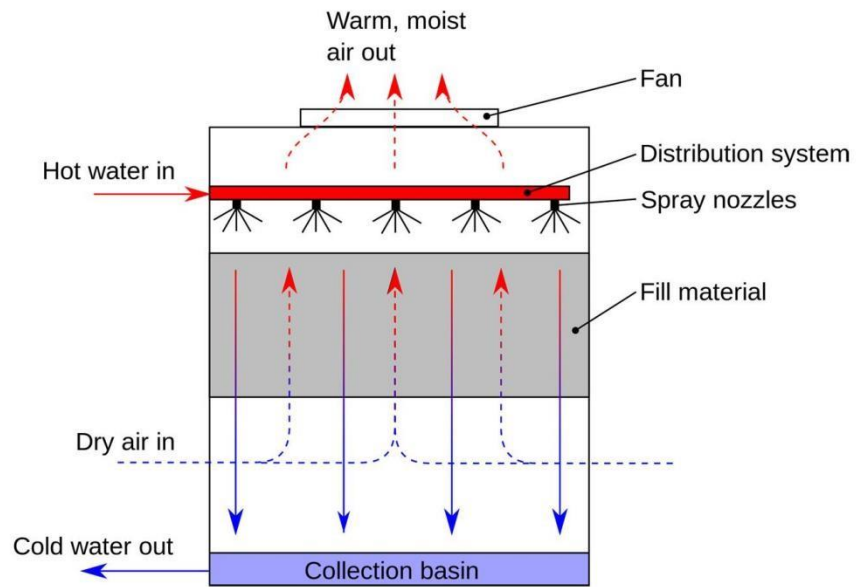


Photo 3.2.8: How cooling tower work
(Source: Thermal Care, USA)



Photo 3.2.9: Cooling Tower



Photo 3.2.10: Cleaning the top of the cooling tower

- Firstly, clean all the algae and moss with scrapper. Put together all the algae and moss in a plastic bag to throw it away later. Then, clean the leftover of the dirt with water jet. Beware of the water jet when using it as it has high pressure of water and can cause injuries.

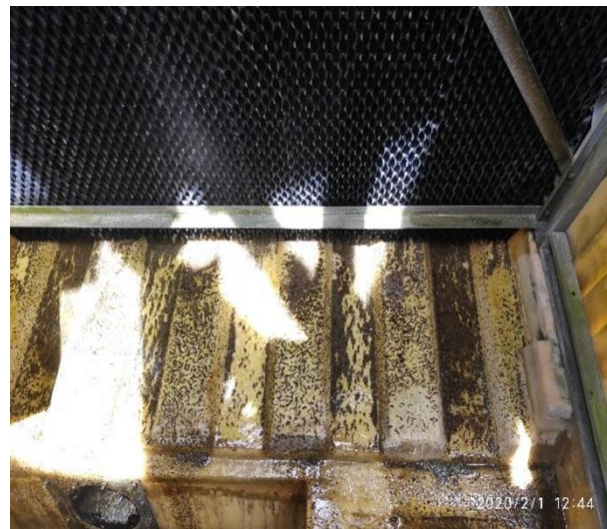


Photo 3.2.11: The inside of the cooling tower is cleaned and washed

- Secondly, clean the inside of the cooling tower with water jet. There is 6 cooling towers need to be clean for Central Air Conditioning.



Photo 3.2.12: The outside of the cooling tower is cleaned and washed

- Lastly, clean the outside of the cooling tower with water jet and metal brush. Precaution steps need to be taken seriously in this matter when climbing the metal valve to clean the cooling tower as it can harm the body if we fall off from it.

3.3 Maintenance process for Split Air Conditioner



Photo 3.3.1: Split Air Conditioner
(Source: Acontech, Malaysia)

The maintenance process for split air conditioner is divided into two different steps which is for outdoor unit and indoor unit.

For indoor unit maintenance process, the air filter inside the indoor unit need to clean and wash from dirt and dust. It is because the air filters play major part in protecting the rest of the unit from dust accumulation and greatly contribute to air quality. Other than cleaning the air filters, it is also important to check the voltage of the unit and suck the stagnant water from the valve and drainage to avoid any leakage. For indoor unit maintenance process, there are 6 step which is open the front panel, pull out air filters from the unit, suck stagnant water, wash air filters and dry it, reinstall the air filters and check the voltage used for the unit.

Next, the outdoor unit of split air conditioner need to be clean both surrounding of the unit and fins of the unit. The surrounding area need to be clean because it plays a significant role for air quality of the unit. Cleaning the body and fins of the outdoor unit also have the same reason for it to be clean from dust and dirt. There are 4 step of maintenance process for this which is cleaning the fins, cleaning the surrounding area, check the gas capacity left in the unit and check the voltage of the unit.

Process 1: Maintenance service for Indoor Unit



Photo 3.3.2: Open front panel of the indoor unit

- Firmly grasp both side of the front panel and pull upward to about 60-degree angle.



Photo 3.3.3: Remove air filter

- Remove the air filter as indicated on above picture to clean it from dirt



Photo 3.3.4: Suck stagnant water

- Suck stagnant water in the indoor unit component and drainage to avoid any leakage from happening in the future with a vacuum.



Photo 3.3.5: Wash and dry the air filter

- Wash and clean air filters with water to clean it from dirt and dust
- Then, dry the air filters with a blower before reinstalling it to the indoor unit



Photo 3.3.6: Reinstall the air filters

- Reinstall the air filters then close the front panel cover tightly



Photo 3.3.7: Check the voltage

- The final step is to check the voltage used for the unit. Make sure the voltage is not higher than 260 volts and lower than 230 volts using clamp meter.

Process 2: Maintenance service for Outdoor Unit



Photo 3.3.8: Cleaning the surrounding area

- Firstly, clean the surrounding area with water jet to get rid of algae, dust and dirt of the surrounding outdoor unit. Be careful of the slippery floor when conducting the work.



Photo 3.3.9: Clean the fin and body of the outdoor unit

- Then, clean the fin and the body using water jet. Beware not to scratch or damage the fin as it can reduce the efficiency of air flow.



Photo 3.3.10: Check the quantity of the gasses

- If the quantity of the gasses inside of outdoor unit is low, then we will call a technician from GFM Sdn Bhd as they are specialist in this area.



Photo 3.3.11 Check the voltage

- Finally, check the voltage used for outdoor unit. Make sure the voltage is not more than 430 volts and lower than 420 volts.

3.4 Maintenance process for Cassette Air Conditioner



Photo 3.4.1: Cassette Air Conditioner
(Source: Eco Climate Solution, New Delhi)

Cassette air conditioner shall be maintained frequently especially if it is use daily. Maintaining the cassette air conditioner is a must for people to breath clean and dirt-less air.

For cassette air conditioner, there a total of 7 step needs to be done for the maintenance service process. Those steps are open the front frame, uninstall air filters, clean air filters, dry air filters, clean the body with tissues, reinstall air filters and lastly check the voltage.

A total of 32 units of cassette air conditioner needs to be maintained and serviced in University of Reading Malaysia according to the schedule provided by the company.

Maintenance Process for Cassette Air Conditioner Unit



Photo 3.4.2: Open the front frame

- Firstly, open the front frame of the unit to uninstall the filter from the frame. One of the precaution steps taken before conducting the work is one person need to hold the ladder to maintain the stabilization of the ladder. It is to avoid from falling off the ladder while conducting the work.



Photo 3.4.3: Uninstall the air filters

- Next, uninstall the air filters from the unit to clean all the dirt and dust with water.



Photo 3.4.4: Wash the air filter with water

- It is essential to wash the filters with water especially if it is not being serviced for more than 2 months and the unit active daily.



Photo 3.4.5: Dry the air filters

- After washing the filters, dry it with a blower before putting it back on the unit. Make sure the air filters are clean from dust.



Photo 3.4.6: Clean the unit body

- Then, clean the outside body of the cassette with tissues to take out all the dust off the unit. Also, make sure to clean the shielding plate on the dust collector of the unit.



Photo 3.4.7: reinstall the filters and frame

- Reinstall the clean air filters with its frame and close the front frame tightly.



Photo 3.4.8: Check the voltage

- Lastly, check the voltage used for the cassette air conditioner. Make sure the reading is not more than 25.0 volts and less than 23.0 volts

CHAPTER 4.0

CONCLUSION

The air conditioning is important in the building because it makes the building comfortable to occupy. Air conditioning also improve air quality inside the building as it has a filter to filter any dust and make it safer for us to breath fresh air. The maintenance process for central air conditioning divided into 2 different process which is AHU and cooling tower service. Each of them has 5 and 3 steps respectively. For split air conditioner, it is also divided into 2 process which is indoor service and outdoor. Each one of them has 6 and 4 steps of maintenance process. Then, cassette air conditioner has 7 steps of maintenance service.

The process of completing all the air conditioning maintenance service in University of Reading Malaysia takes 1 month for all of it to complete. The process will be repeat again every month as it is a monthly service. The schedule of the maintenance will be given from the company through an application called “GEM”.

The method of the maintenance process for each different type of air conditioning might be different from other company as we only do the basic services and the other serious problem with the air conditioning will be fix by other technician. However, the other step of maintenance process is the common method of maintenance service, and it is a similar method to any other company services around the world.

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