1.0 SERVICE AND MAINTENANCE SCHEDULE

The contractor shall inspect and service all machinery and equipment comprising the complete Air-Conditioning and Ventilation System under this contract directed by UiTM.

On each inspection and service of the complete air conditioning system and ancillary equipment, the contractor shall performed works as detailed below:

STANDARD OF PROCEDURE FOR SERVICING.

Item	DESCRIPTION
1.	**Indoor:** a) To clean air filter. b) To clean indoor body. c) To check electrical control (MCB / MCCB). d) To check and tighten electrical wiring and contactor (D.O.L Starter). e) To check and tighten starter or transformer. f) To check supply air temperature. g) To inspect drain water pump. h) To check wireless remote controller batteries and replace if necessary. i) To record data service/ job sheet. j) To perform well housekeeping within working area.
2.	**Outdoor Normal servicing:** a) To clean condenser using water. b) To clean outdoor body with cloth and soap. c) To take running ampere (amp) d) To check refrigerant pressure (suction & discharge). e) To check and tighten up screw to mounting. f) To check and tighten up copper pipe (flare nut). g) To record data service sheet/ job sheet. h) To top up some refrigerant in order to meet normal working pressure of the air condition unit. i) To perform well housekeeping within working area.

Item	DESCRIPTION
3.	**~~Outdoor~~ Chemical Cleaning (as per required by S.O./S.O.R) :** a) To clean condenser or evaporator using chemical detergent). b) To rinse with enough water after using chemical detergent. c) To clean outdoor or indoor body with cloth and soap. d) To take running ampere (amp). e) To check refrigerant pressure (suction & discharge). f) To check and tighten up screw to mounting. g) To check and tighten up copper pipe (flare nut). h) To record data service/job sheet

The following are some maintenance recommendations for technicians in conducting air conditioning system inspections.

Warning: Disconnect the main electrical power to the unit before attempting any maintenance. Some systems may have more than one breaker such as a split air conditioner. Failure to disconnect the electrical power may result in equipment damage, personal injury, or death.

Air Filter

A clogged air filter in an air conditioner will lead to the evaporator freezing. A frozen evaporator will not allow any air to pass by it. This could cause serious damage to a compressor. As the suction line and evaporator freeze, there is a chance for refrigerant, in the form of a liquid, to enter in to the compressor. This will damage the compressor permanently.

Clean semi-permanent plastic impregnated fibre filters by:

a. Vacuum cleaning; or

b. Washing with detergent and water, air drying thoroughly, and reinstalling.

Outdoor (Condenser) Coil Cleaning

In such cases, if the coil becomes obstructed, it is recommended to use cleaning agent in the cleaning process to ensure the coils is thoroughly clean. There is commercial coil cleaning solvents/chemical in the market. Follow the solvent manufacturer's instructions when using the solvent (normally concentration ratio is 1:10 solvents and water solution).

To clean the condenser coils, remove the top of the unit to clean the outdoor coil, flushing water through the coil from the inside out. Use a cleaning solvent/chemical that with not erode the aluminum fins on the coil. Anything cleaning agent that can break down dirt and cottonwood will work. Spray the

cleaning solution onto the condenser coils using a spray bottle. DO NOT scrub the coil because the fins might bend. Bending the fins has the same effect as a plugged coil; both reduce efficiency of the system. Allow the cleaning solution to sit for a minute to penetrate the dirt and grime and dissolve any organic matter.

Then wash the coils very carefully with a garden hose. DO NOT over pressurize the water from the garden hose as this can cause the fins to bend. Use a cleaning solution even if cannot visibly see dirt on the outside of the coil. The coil is a heating transfer surface and will be more efficient the cleaner it is. Therefore cleaning with a cleaning solution is always recommended. Some coils can be clean without taking the cover off the unit. To access other coils, just remove the outside cover.

Note: *Do not get water on any controls or other electrical devices. If any electrical component gets wet, dry it thoroughly before energizing.*

Keep the outdoor coil clean for complete airflow and proper operation. Do not allow leaves, grass clippings, or other material to obstruct the coil. Do not allow anything to block the coil. Keep fences, shrubs, or other obstructions at least 24 inches from the coil air inlets.

Indoor (Evaporator) Coil Cleaning

Inspect the indoor coil at least once a year for cleanliness, and clean as necessary.

1. The coil can be cleaned when dry. If it is coated with lint or dirt, blow compressed air or nitrogen (*never use refrigerant*) through the supply air side of the coil fins. Place a sheet of metal or cardboard under the return air side of the coil to catch any debris before it gets into the furnace or air handler.
2. If the coil is coated with oil or grease, clean with a mild detergent and water solution. Rinse thoroughly with clear water. Be careful not to get water into the air handler.
3. After cleaning the coil, inspect the drain pan and condensate line. Remove any debris from the pan and flush with clear water.
4. Use high-pressure water to clear any clog in the condensate line.

Important: *Do not use caustic household drain cleaners in the condensate pan or near the indoor coil. These drain cleaners can quickly damage the indoor coil.*

Blower Wheel

Inspection of a blower motor covers two major parts, is the blower wheel clean and the air holes on the motor itself clean so the motor can cool itself. The blower wheel needs to be cleaned so that the condenser can move enough air to boil off the refrigerant back to a gas, if the blower wheel it dirty the air flow will be reduced causing a reduction in air flow causing the evaporator to freeze up

which could damage the compressor by hot boiling off the liquid refrigerant to a gas and physics tells us we cannot compress a liquid. It is very important that the blower wheel itself is clean so it can move as much air as it was designed to.

To clean the blower wheel out is very simple by pulling the blower tray out and clean with a light brush. Next is the blower motor when the motor is running heat is created in the windings and the motor has holes on the ends of it to draw air in to cool itself while it is running. If these holes are blocked the motor will overheat constantly, and the result will be premature failure. To clean these air passages simply wipe with light brush.

Electrical Checks

Inspect the system's electrical wiring and check for loose connections. Inspect the contactor for pitting and replace if pitting is observed. Inspect the conditions of wiring and connections for evidence of overheating. A discoloured connection equates to a bad connection. Inspection and/or testing of capacitors should also be done. Any capacitor showing evidence of leakage must be replaced.

Motor And Fan

Check the motor bearings. If the motor bearings are showing wear, the motor should be replaced before failure occurs. Inspect the fan blade. If visible cracks or missing balancing weights are detected, replace the fan blade.

Refrigerant Charge

Check the system's refrigerant charge. If the system is undercharged, add refrigerant; if overcharged, remove refrigerant.

Check system refrigerant charge. Before checking the charge:

1. The indoor conditions must be within 2 degrees F of the desired comfort conditions.
2. Ensure adequate indoor airflow before checking charge.
3. Run the system until the operating conditions stabilize (about 5 minutes).

If the system is undercharged, add refrigerant. If overcharged, remove refrigerant.

Running Amp

A condenser/capacitor is designed to pull certain amperage when it is running and something is wrong if it is pulling higher amperage than expected. The solution could be as simple as cleaning the condenser, to reduce the stress on the compressor. To check the amperage, remove the cover then turn the unit on. Clamp the meter on one of the power lines. Compare amperage reading to the amperage rating found on the manufacture's name plate.

Drain Line

An inspection of the drain line could prevent a huge mess. Since an air conditioner removes humidity from the air, there is always water that is going to be coming out of the unit. This water needs a clean line to a working drain. You can test the drain line by either blowing it out or pouring a glass of water down it.

Refrigerant Pressure

With a refrigerant gauge, pressure can be checked to see if there is a proper charge in the unit. The high side gauge can vary depending on the outside temperature. For system using R-22, the range at high side gauge will usually be between 240 and 270 psig and the low side gauge will usually be between 60 and 80 psig. (For other refrigerant, please refer to the its working pressure)

Really good indications that the unit is running well are, the suction line is sweating and the temperature of the suction line is around 50 to 55 degrees Fahrenheit. Also the air blowing out of the condenser is warmer than the outside air temperature.

Pipe Insulation

Insulation on the suction line is very important for two reasons. One being that this line will sweat if it is not insulated. The drops of water that are formed from this sweat will create water damage. Secondly, the pipe should be insulated so that is doesn't pick up any extra heat that the condenser will then have to remove. All the heat that the air conditioner absorbs should occur in the evaporator. For efficiency reasons, the only air that should be circulated through the ductwork should be treated air.

If you have a cartridge pump there are no couplers or oil ports.

Room Temperature

Most temperature drops across an evaporator will be 15~20 degrees Fahrenheit. To check this measure the inlet temperature and then, the outlet temperature and subtract them to get the temperature drop.

Other Considerations

The technician should also flush the condensate drain and observe any changes to the user's lifestyle that may impact system performance (these might include a room that is no longer used where the homeowner has closed the diffuser).

2.0 Defects Report

It shall be the responsible of the air conditioning Contractor to report and replace or renewed and advise in writing to the S.O. any defects in the air conditioning equipment and ancillary equipment during the preventive maintenance.

The report shall state observed defects and it cause, the parts to be replaced or renewed and shall also include and estimate of the cost of repairs required.

3.0 Repairs

The air conditioning Contractor shall repair all defects in the air conditioning system including all ancillary equipment on the instructions of the S.O.

The cost of such repairs shall be separate and shall not be included in the cost of monthly service and maintenance. However, the Contractor shall rectify all defects in repairs at his own cost during the maintenance and guarantee period, which follows from the date of practical completion.

All repairs on the complete air conditioning system and ancillary equipment shall be guaranteed by the air conditioning contractor against defects in workmanship and materials for a period of three (3) months to take effect from the date of completion of the repairs.

4.0 Consumable Materials

The air conditioning Contractor shall supply the following consumable materials as and when required:

a) All oils and grease required for lubrication of compressors, fan bearing, motor bearing, pivots and other moving parts.

b) All refrigerants required replacing refrigerant losses in the refrigerant system.

c) All carbon brushes required replacing worn brushes in electric motors.

d) All consumable filter elements.

e) Al electric contact points required replacing worn electric contact points in switchgears; motor starter gears electric control gears and electric relays.

f) Al electric fuses required replacing blown fuses.

g) All cotton waste, soap detergent and other cleaning materials required for cleaning purposes.

The cost of these consumable materials shall not be charged for separately by the air conditioning Contractor, but shall be include in the fixed monthly rates quoted by the air conditioning Contractor for service and maintenance of the air conditioning unit and ancillary equipment.

5.0 SERVICE AND MAINTENANCE RECORDS

Finally, a record should be kept of all maintenance and repairs made to the system. It is always helpful to have a history of the system, especially when a customer has a question.

The air conditioning Contractor shall provide a service and maintenance record book for the complete of the air conditioning plant service and maintenance by him. Record book briefed details of all service, maintenance and repairs carried out shall be entered into this book for checking purposes.

The air conditioning Contractor shall also keep and accurate detailed records and duplicate of all service, maintenance and repair works carried out by him. This record shall be in the form of a Kad Harta Modal, soft copy of the form will be provided by UiTM to contractor fulfill.

The air conditioning Contractor shall produce a report if any equipment needed to be changed before the system breakdown (plan maintenance).