A.3.3 Assessment on Air Conditioning

HVAC (heating, ventilating, and air conditioning) is the technology of indoor and vehicular environmental comfort. Its goal is to provide thermal comfort and acceptable indoor air quality.

Heating, is a process whose purpose is to generate heat for the building. This can be done via central heating. Such as a system contains a boiler, furnace, or heat pump to heat water, steam, or in a central location such as furnace room in a mechanical room in a large building. The heat can be transferred by convection, conduction, or radiation.

Ventilation, is the process of changing or replacing air in any space to control temperature or remove any combination of moisture, odors, smoke, heat, dust, airborne bacteria, or carbon dioxide. Ventilation includes both the exchange of air with the outside as well as circulation of air within the building. It is one of the most important factors for maintaining acceptable indoor air quality in buildings.

Air conditioning, is the process of providing cooling and humidity control for all or part of building. Air conditioned buildings often have sealed windows, because open windows would work against the system intended to maintain constant indoor air conditions. Outside, fresh air is generally drawn into the system by a vent into the indoor heat exchanger section, creating positive air pressure.

Air conditioning and refrigeration are provided through the removal of heat. Heat can be removed through radiation, convection, or conduction. Refrigeration conduction media such as water, air, ice, and chemicals are referred to as refrigerants. A refrigerant is employed either in a heat pump system in which a compressor is used to drive thermodynamic refrigeration cycle, or in a free cooling system which uses pumps to circulate a cool refrigerant.

In the power plant, air conditioning is used to provide desired working environment for the control rooms, data centre rooms, office, hall space, etc. The air conditioning system can be either centralized or decentralized type using vapour compression or vapour absorption techniques.

During the audit, air conditioning assessment performed on the units as follows:

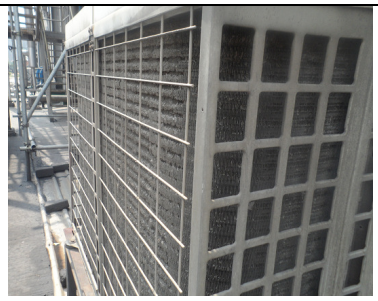
No	Unit	Location
1	AC Daikin RU08KUY1	Switchgear Room 3.3 kV
2	Air Tech 10TU	Switchgear Room 3.3 kV
3	York EWX60	Switchgear Room 380 V
4	York EWX60	Switchgear Room 380 V

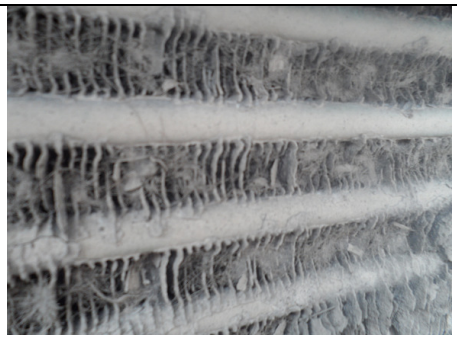
Assessment step during audit as follows:

- Visual inspection and measurement of mechanical and electrical components in the system of refrigeration and air conditioning
- Inspection and measurement performance of unit (chiller, AHU)

The analysis using software ASHRAE Psychrometric Analysis to know the performance of unit based on data measurement.
Data measurement collection can be seen in appendix page. Based on measurement result, obtained refrigeration cycle and P-h diagram.

Summary of the measurement and inspection are as follows :

Unit 1 : Daikin RU08KUY1		
Parameter	Analysis	
COP = 2.09	AC performance is not optimal, which resulted in heavy compressor work, the energy input to compressor in producing cooling effect is higher.	
Visual Inspection	 Condenser coil is dirty, condenser heat disposal is not maximal	 Filter is dirty, inhibit air flow rate

<table>
<tr><td colspan="3">Unit 2 : Air Tech 10TU</td></tr>
<tr><td>Parameter</td><td colspan="2">Analysis</td></tr>
<tr><td>COP = 2.95</td><td colspan="2">AC performance is not optimal, which resulted in heavy compressor work, the energy input to compressor in producing cooling effect is higher.</td></tr>
<tr><td rowspan="2">Visual inspection</td><td> 
Condenser coil corroded, condenser heat disposal is not maximal</td><td> 
Filter is dirty, inhibit air flow rate</td></tr>
<tr><td> 
Freon pressure less</td><td> 
Outdorr cashing corroded</td></tr>
<tr><td colspan="3">Unit 3 : York EWX 60</td></tr>
<tr><td>Parameter</td><td colspan="2">Analysis</td></tr>
<tr><td>COP = 2.95</td><td colspan="2">AC performance still normal, but still less than standard COP ≥ 3.5, this is because the condenser fin already damaged and dirty.</td></tr>
<tr><td>Visual inspection</td><td> 
evaporator coil is damaged, heat</td><td> 
evaporator holder corroded</td></tr>
</table>

	absorption is not optimal	
Unit 4 : York EWX60		
Parameter	Analysis	
COP = 3.01	AC performance still normal, but still less than standard COP ≥ 3.5, this is because the condenser fin already damaged and dirty.	
Visual Inspection	 Filter is dirty, inhibit air flow rate	 Drain tub is dirty and leaking