(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2018 Edition)

Part 1 – Air-conditioning Installation Summary

(* Please delete, if not applicable) Page ___ of ___

Name of Building / Unit / Common Area * _____

_____

Address of Building / Unit / Common Area * _____

_____

Date of Declaration by Registered Energy Assessor in Form EE2 / EE3 / EE4 * _____

Documents submitted (Please tick where applicable)	No. of sheets
☐ Form EE-AC Part 1 - Air-conditioning Installation Summary	
☐ Form EE-AC Part 2 - Air Side Distribution Worksheet	
☐ Form EE-AC Part 3 - Water Side Distribution Worksheet	
☐ Form EE-AC Part 4 - System Control Worksheet	
☐ Form EE-AC Part 5 - Thermal Insulation Worksheet	
☐ Form EE-AC Part 6 - Air-conditioning Equipment Efficiency Worksheet	
☐ Form EE-AC Part 7 - Energy Metering and Load Calculation Worksheet	
☐ Form EE-AC Part 8 - Direct Digital Control (DDC) Worksheet	
☐ Form EE-AC Part 9 - Energy Performance of Air-conditioning Installation Worksheet	
☐ Form EE-AC Part 10 - Declaration	
☐ Schematic drawings showing the air-conditioning installation governed by BEC	
☐ A drawing list indicating the title and reference number of each drawing	
☐ Manufacturer-issued technical documents to indicate the capacity rating and COP (at the standard rating conditions specified in BEC) of each equipment indicated in Part 6 of this Form (should the manufactured-issued document be showing the capacity rating & COP at conditions other than the BEC specified condition, a calculation is to be provided on separate sheet to indicate the conversion of the capacity rating & COP (shown in the technical document) to the BEC condition)	
☐ Technical document list to summarise the system fan power of the corresponding air distribution system indicated in Part 2(C) of this form in W per litre per second (L/s) of supply system air flow	
☐ Technical document list to summarise the minimum fan speed of the air distribution system indicated in Part 2(C) of this form	
☐ Technical document list to summarise all the titles of the technical documents and the corresponding model numbers / descriptions of equipment indicated in Part 6 of this Form	
☐ Schematic drawings showing the metering provision and DDC provision for the air-conditioning installation as specified in Part 7 and Part 8 in this form	
☐ Others (Please give details) _____	

Part 1 – Air-conditioning Installation Summary

(* Please delete, if not applicable) Page ___ of ___

Remarks (applicable to Parts 1 to 9) :-

1) Ref. Nos. of all equipment, systems, zones/spaces etc. in this Form should be consistent with the Ref. Nos. shown in drawings.
2) Schematic drawings should :
   - show all relevant equipment including AHUs, fans, variable refrigerant flow (VRF) systems, unitary air-conditioners, chillers, heat pumps, chilled water pumps, heated water pumps, condenser water pumps, cooling towers, radiators, pipework and ductwork distribution system etc.;
   - indicate all newly installed / retrofitted air-conditioning installation governed by BEC, including ductwork, pipework, AHU / Fan, water pump, chiller, heat pump, VRF system and unitary air-conditioner etc;
   - identify each system, zone/space and relevant equipment by its corresponding Ref. No./description, which should be same as shown in this Form; and
   - indicate the air-conditioning installation not governed by the BEC, if shown on the drawing, with an appropriate symbol, marking or colouring different from the ones governed.
   - Indicate isolation devices in compliance with Clause 6.10.5.
3) All documents including this Form are for demonstration of compliance with the BEC for the air-conditioning installation, and should cover all the relevant items governed by the BEC in respect of the air-conditioning installation.
4) Should space provided in this Form be inadequate, please provide details with clear cross-referencing on separate sheets and attach to this Form.
5) Descriptions and numbering of each installation, system, equipment, building block, floor, room, space etc. in each of Forms EE-LG, EE-AC, EE-EL, EE-LE & EE-PB, should such appear in more than one type of Form, should be **identical**.
6) Full justifications should be submitted if the REA find unable to present any of the required energy performance evaluation as prescribed in Part 9.
7) **Any incomplete or erroneous information in this Form may render this Form being regarded invalid.**

Part 2 – Air Side Distribution Worksheet

(Please tick where applicable) Page ___ of ___

Any installation of ductwork involved ?

☐ Yes (if yes, please provide information in (A) to (C) below)

☐ No installation of ductwork involved (if no, please proceed direct to Part 3)

(A) Separate Air Distribution System for Process Zone (BEC Clause 6.5)

Any installation of air distribution system serving process zone involved ?

☐ Yes (if yes, please choose the applicable condition(s) below)

- ☐ the air distribution system serving process zone is separated from other system serving comfort only zone as specified in BEC Clause 6.5.1, or
- ☐ the air distribution system serving process zone is shared with common air distribution system serving comfort only zone but fulfils the condition(s) as specified in BEC Clause 6.5.2

☐ No installation of air distribution system serving process zone involved

(B) Air Distribution Ductwork Leakage Limit (BEC Clause 6.6) (Please tick where applicable)

Any installation of ductwork designed to operate at static pressure greater than 750 Pa involved ?

☐ Yes, and for each system at least 25% in area of these ductwork is leakage-tested in accordance with DW143 and meet the corresponding maximum allowable air leakage limit given in BEC Table 6.6

☐ No installation of ductwork designed to operate at static pressure > 750 Pa involved

(C) Air Distribution System Fan Power (BEC Clause 6.7)

1) a) Any installation of constant air volume (CAV) air distribution system involved ?

(Please choose applicable condition(s) below)

- ☐ No installation of CAV air distribution system involved (If no, please proceed direct to 2) below)
- ☐ Yes, and system fan motor power for CAV air distribution system for the conditioned space does not exceed 1.6 W per L/s of supply system air flow (BEC Clause 6.7.1 and 6.7.3)
- ☐ Yes, and system not fulfilling the 1.6 W per L/s requirement -
  - ☐ has system fan motor power less than 2.5 kW (BEC Clause 6.7.5 (a)),
  - ☐ has AHUs only with individual fan motor power less than 1.0 kW (BEC Clause 6.7.5 (b)), or
  - ☐ is an installation specified in Schedule 2 of the Ordinance (BEC Clause 6.7.5 (c))

b) The above CAV air distribution system(s):-

- ☐ are provided with low-speed operation at ≤ 66% of the full speed and the fan motor(s), at the low-speed operation, draw ≤ 40% of the full speed power (BEC Clause 6.7.4.1);
- ☐ are provided with low-speed operation at > 66% of the full speed in order to meet the fresh air requirement of the conditioned space (BEC Clause 6.7.4.3). Settings & the corresponding fan power consumption % shown on separate sheet attached.
- ☐ are with supply or return air fan motor power each of < 1.0 kW (BEC Clause 6.7.4)

Part 2 – Air Side Distribution Worksheet

(Please tick where applicable) Page ___ of ___

2) a) Any installation of variable air volume (VAV) air distribution system involved ?
(Please choose applicable condition(s) below)

- ☐ No installation of VAV air distribution system involved (If no, please proceed direct to 3) below)
- ☐ Yes, and system fan motor power of VAV air distribution system for the conditioned space does not exceed 2.1 W per L/s of supply system air flow (BEC Clause 6.7.2 and 6.7.3)
- ☐ Yes, and system not fulfilling the 2.1 W per L/s requirement -
  - ☐ has system fan motor power less than 2.5 kW (BEC Clause 6.7.5 (a)),
  - ☐ has AHUs only with individual fan motor power less than 1 kW (BEC Clause 6.7.5 (b)), or
  - ☐ is an installation specified in Schedule 2 of the Ordinance (BEC Clause 6.7.5 (c))

b) The above VAV air distribution system(s):-

- ☐ are provided with minimum speed ≤ 50% of the full speed and the fan motor(s), at the minimum speed, draw ≤ 30% of the full speed power (BEC Clause 6.7.4.2);
- ☐ are provided with minimum speed > 50% of the full speed in order to meet the fresh air requirement of the conditioned space (BEC Clause 6.7.4.3). Setting & the corresponding fan power consumption % shown in separate sheet attached.
- ☐ are with supply or return air fan motor power each of < 1.0kW (BEC Clause 6.7.4).

3) Any installation of mechanical ventilation system involved?
(Please choose applicable condition(s) below)

- ☐ No installation of mechanical ventilation system involved (If no, please proceed direct to Part 3)
- ☐ Yes, and system fan motor power of the mechanical ventilation system does not exceed 1.1 W per L/s of exhaust air flow or fresh air flow rate whichever the larger (BEC Clause 6.7.6)
- ☐ Yes, and system not fulfilling the 1.1 W per L/s requirement -
  - ☐ has system fan motor power less than 2.5 kW (BEC Clause 6.7.6); or
  - ☐ is an installation specified in Schedule 2 of the Ordinance

Part 3 – Water Side Distribution Worksheet

(Please tick where applicable) Page ___ of ___

Any installation of pipework involved ?

☐ Yes (if yes, please provide information in (A) & (B) below)

☐ No installation of pipework involved (if no, please proceed direct to Part 4)

(A) Pumping System Variable Flow (BEC Clause 6.8)

1) Any installation of pumping system with control valve designed to modulate or step open & close as a function of load involved ?

(Please choose applicable condition(s) below)

☐ No pumping system with control valve(s) designed to modulate or step open & close as a function of load involved

☐ Yes, pumping system is/are designed for variable flow and capable of reducing system flow to 50% design flow or less (BEC Clause 6.8.1)

☐ Yes, but the pumping system is/are not capable of reducing system flow to 50% design flow, given the following justification(s) (may check more than one items)

- ☐ minimum flow > 50% of design flow is required for the proper operation of equipment the pumping system serves (BEC Clause 6.8.1(a))
- ☐ pumping system has no more than three control valves (BEC Clause 6.8.1(b))
- ☐ pumping system incorporates supply water temperature reset control (BEC Clause 6.8.1(c))
- ☐ pumping system serves a chiller plant of design capacity ≤ 350kW (BEC Clause 6.8.1(d))

2) For the above variable flow system, variable speed pumps are provided ? (BEC Clause 6.8.2)

(Please choose applicable condition(s) below)

☐ Yes. Each of the pump motor is exceeding 3.7 kW. Therefore, control and devices are incorporated such that the pump motor demands no more than 30% of design input power at 50% of design water volume flow

☐ No. Each of the pump motor is rated at or below 3.7 kW

☐ No. Variable speed pumps are not provided because the variable flow system is:

- ☐ of having the minimum flow > 50% of design flow as required for the proper operation of equipment (BEC Clause 6.8.1(a)), or
- ☐ of having no more than three control valves (BEC Clause 6.8.1(b)), or
- ☐ incorporated with supply water temperature reset control (BEC Clause 6.8.1(c)), or
- ☐ serving a chiller plant of design capacity ≤ 350kW (BEC Clause 6.8.1(d)).

3) Each of the chiller of a multiple chiller plant is provided with automatic isolation devices stopping chilled water from flowing through when the chiller is shut down?

☐ Yes, devices stopping chilled water flow are provided. (BEC Clause 6.8.3)

Part 3 – Water Side Distribution Worksheet

(Please tick where applicable) Page ___ of ___

4) Each of the chillers of a multiple chiller plant is provided with automatic isolation devices stopping condenser water from flowing through when the chiller is shut down?

☐ Yes, devices stopping condenser water flow are provided. (BEC Clause 6.8.3)

☐ No. The chillers are air-cooled.

(B) Frictional Loss of Water Piping System (BEC Clause 6.9)

1) Any installation of water piping with diameter larger than 50mm involved (BEC Clause 6.9.2)?

(Please tick where applicable)

☐ Yes, and piping sized for frictional loss and flow velocity not exceeding 400 Pa/m and 2.5 m/s respectively for system that operate under non-variable flow

☐ Yes, and piping sized for frictional loss and flow velocity not exceeding 400 Pa/m and 3.0 m/s respectively for system that operate under variable flow

☐ No installation of water piping with diameter larger than 50mm

2) Any installation of water piping with diameter at or below 50mm involved (BEC Clause 6.9.1)?

(Please tick where applicable)

☐ Yes, and piping sized for flow velocity not exceeding 1.2 m/s.

☐ No installation of water piping with diameter at or below 50mm involved

Part 4 - System Control Worksheet

(Please tick where applicable) Page ___ of ___

Any installation of air-conditioning system control involved?

☐ Yes (if yes, please provide information in (A) to (G) below)

☐ No installation of air-conditioning system control involved (if no, please proceed direct to Part 5)

(A) Temperature Control (BEC Clause 6.10.1)

When considered not applicable, please state the reason on the space provided below –

_____

then proceed to (B)

1) Each air-conditioning system for cooling or heating provided with at least one automatic temperature control device for regulation of space temperature (BEC Clause 6.10.1.1)?

   ☐ Yes

2) Each temperature control device (for comfort cooling control) capable of adjusting the set point temperature up to 29˚C or higher (BEC Clause 6.10.1.2)?

   ☐ Yes
   ☐ No. The control device is as prescribed in BEC Clause 6.10.1.4(a) or (b).

3) Each temperature control device (for comfort heating control) capable of adjusting the set point temperature down to 16˚C or lower (BEC Clause 6.10.1.3)?

   ☐ Yes
   ☐ No, space heating not provided
   ☐ No. The control device is as prescribed in BEC Clause 6.10.1.4(a) or (b).

4) Each temperature control device (for comfort cooling & heating control) capable of providing a dead band of at least 2˚C within which the supply of heating and cooling energy to the space is shut off or reduced to a minimum, except for a temperature control device that requires manual changeover between heating and cooling modes (BEC Clause 6.10.1.5) ?

   ☐ Yes

(B) Humidity Control (BEC Clause 6.10.2)

Any installation of humidity control (for serving space) involved?

☐ Yes (if yes, please provide information in (B) 1) to 3) below)

☐ No installation of humidity control involved (if no, please proceed direct to (C))

1) Each air-conditioning system for removing or adding moisture to maintain specific humidity levels provided with at least one automatic humidity control device for regulation of space humidity (BEC Clause 6.10.2.1)?

   ☐ Yes

2) Humidity control device (for comfort humidification) provided for each space and each device capable of adjusting the set point relative humidity up to 60% (BEC Clause 6.10.2.2)?

   ☐ Yes ☐ No, space humidification not provided

3) Humidity control device (for comfort dehumidification) provided for each space and each device capable of adjusting the set point relative humidity down to 30% (BEC Clause 6.10.2.3)?

   ☐ Yes ☐ No, space dehumidification not provided

Part 4 - System Control Worksheet

(Please tick where applicable) Page ___ of ___

(C) Zone Control (BEC Clause 6.10.3)

Any installation of zone control involved?

☐ Yes (if yes, please provide information in (C) 1) to 3) below)

☐ No installation of zone control involved (if no, please proceed direct to (D))

1) Each zone controlled by a separate temperature control device for controlling the temperature within the zone (BEC Clause 6.10.3.1)?

☐ Yes

2) Any zone having spaces on different floors (BEC Clause 6.10.3.2)?

☐ Yes, and corresponding air-conditioning system serving spaces on different floors being independent perimeter system designed to offset only envelope heat gain or loss or both and fulfilling the requirements in BEC Clause 6.10.3.2 (a) & (b)

☐ No zone having spaces on different floors

3) Any zone for human comfort application with both heating & cooling provided (BEC Clause 6.10.3.3)?

☐ Yes (If yes, please provide information below)

Whether controls permit the heating of previously cooled air, the cooling of previously heated air, or both heating and cooling operating at the same time?

☐ Yes (If yes, please choose applicable condition(s) below, BEC Clause 6.10.3.3)

☐ (a) for a VAV system which, during periods of occupancy, is designed to reduce the supply air to each zone to a minimum before reheating, recooling, or mixing of previously cooled/heated air, and the minimum volume being no greater than 30% of the peak supply volume

☐ (b) for the reheating or recooling of outdoor air which has been previously pre-cooled or pre-heated by an air handling unit

☐ (c) at least 75% of the energy for reheating or for providing heated air in mixing is provided from a site-recovered or renewable energy source

☐ (d) the zone having a peak supply air flow rate of 140 L/s or less

☐ (e) where specific humidity levels are required to satisfy process requirements

☐ (f) for installation specified in Schedule 2 of the Ordinance

☐ No controls permit the heating of previously cooled air, the cooling of previously heated air, or both heating and cooling operating at the same time

☐ No human comfort application with both heating & cooling involved

Part 4 - System Control Worksheet

(Please tick where applicable) Page ___ of ___

(D) Off-hours Control (BEC Clause 6.10.4)

When considered not applicable, please state the reason on the space provided below –

_____

then proceed to (E).

1) Any air-conditioning system with cooling or heating capacity greater than 10 kW?

☐ Yes, and each system equipped with automatic controls capable of accomplishing a reduction of energy use during periods of non-use (BEC Clause 6.10.4.1)

☐ Deploying control setback (BEC Clause 6.10.4.1(a))

	Occupied set point (°C)	Setback set point (°C)
Cooling Mode		
Heating Mode		

Remarks: The setback set point to be maintained at least 5°C above the occupied set point during cooling mode and at least 6°C below the occupied set point during heating mode

☐ Deploying equipment shutdown (BEC Clause 6.10.4.1(b))

with at least one of the following:

☐ Automatic time scheduling system including accessible manual override control;

☐ Occupant sensor installed and shut off the AC system in _____ mins when no occupant is sensed

☐ No air-conditioning system with cooling or heating capacity > 10 kW

2) Any air-conditioning system with cooling or heating capacity of 10 kW or below?

☐ Yes, and system controlled by readily accessible manual off-hour control to achieve a reduction of energy use (BEC Clause 6.10.4.2)?

☐ No air-conditioning system with cooling or heating capacity ≤ 10 kW

3) Any air-conditioning system serving guest room in hotel, guest house or hostel (BEC Clause 6.10.4.3)?

☐ Yes, and each guest room or suite provided with a single master control device to reduce energy use during un-occupied periods (BEC Clause 6.10.4.3 (a), (b) or (c))

☐ No system serving guest room in hotel, guest house or hostel

4) Fresh air intake and exhaust air discharge serving each of a conditioned space provided with automatic shut off damper (BEC Clause 6.10.4.4)?

☐ Yes.

☐ No. Reason(s):_____

5) The automatic dampers are kept on shutoff position during preoccupancy cool-down and off-hour setback (BEC Clause 6.10.4.4)?

☐ Yes.

☐ No. The system is not designed with preoccupancy cool-down and/or off-hour setback modes.

Part 4 - System Control Worksheet

(Please tick where applicable) Page ___ of ___

(E) Isolation of Zones (BEC Clause 6.10.5)

Any air-conditioning system serving zones of non-simultaneous operation involved?

☐ Yes. The zones are divided into isolation areas where:- (please provide information in (E) 1) to 5) below)

1) each of the isolation area, consisting of zones of similar characteristic, is of ≤ 2300m^2; and

☐ Yes

2) each of the isolation area covers a single floor only; and

☐ Yes

3) controls and isolation devices are provided to automatically shutoff:-
(may check more than one item)

☐ the conditioned supply air to the area; and/or
☐ the fresh air to the area; and /or
☐ the exhaust air from the area.

4) controls and devices are provided for: (may check more than one item)

☐ the systems as prescribed in (E) 3) above; and/or
☐ the chilled water plant,
to allow stable operation when serving only the smallest isolation area (BEC Clause 6.10.5.2)

5) no isolation devices and controls provided (BEC Clause 6.10.5.3. (b) and (c)):
(may check more than one item)

☐ at the exhaust airflow from a single isolation area of <10% of the design airflow of the exhaust system to which the isolation area connects; and /or
☐ at those zones intended to operate continuously; and/ or
☐ at those zones intended be inoperative only when all other zones are inoperative.

☐ Yes, but isolation device and control not provided because the isolation areas are connected to an exhaust air fan system of ≤ 2400 L/s (BEC Clause 6.10.5.3 (a));

☐ Yes, but isolation device and control not provided because the isolation areas are connected to a fresh air fan system of ≤ 2400 L/s (BEC Clause 6.10.5.3 (a));

☐ No. The systems serve zones of simultaneous operation or of the same occupancy schedule. (please proceed direct to (F))

Part 4 - System Control Worksheet

(Please tick where applicable) Page ___ of ___

(F) Control of VAV Distribution System (BEC Clause 6.10.6)

Any installation of VAV distribution involved?

☐ Yes (if yes, please provide information in (F) 1) to 3) below)
☐ No installation of VAV distribution system involved (please proceed direct to (G))

1) Static pressure sensor so located that the set point is of ≤ 300 Pa (BEC Clause 6.10.6.1)?

☐ Yes

2) Static pressure sensors installed at downstream of major duct split (BEC Clause 6.10.6.1)?

☐ Yes, and sensors are installed in each major branch.
☐ No

3) Static pressure sensor set point can be reset based on the actual demand load of the conditioned space (BEC Clause 6.10.6.2)?

☐ Yes

(G) Demand Control Ventilation (BEC Clause 6.10.7)

1) Any installation of carpark ventilation involved?
(may check more than one item)

☐ Yes, the exhaust air fan(s) and fresh air fan(s) can be operated, by staging or modulation, down to ≤ 50% of the design capacity based on the detected contaminant level (BEC Clause 6.10.7.1 and 6.10.7.2 (a));
☐ Yes, the exhaust air fan(s) and fresh air fan(s) serving basement carpark are also provided with staging or modulation control in response to temperature (BEC Clause 6.10.7.1);
☐ Yes, but the total fan motors' nameplate power (including the exhaust air fans, fresh air fans and jet fans) is < 11 kW (BEC Clause 6.10.7.2 (b)).
☑ No installation of carpark ventilation involved.

2) Any conditioned space with design fresh airflow rate ≥ 1400 L/s involved? (BEC Clause 6.10.7.3)

☐ Yes, the fresh air damper connecting to air handling unit and /or fresh air fan can be modulated based on the conditioned space's CO_2 level (BEC Clause 6.10.7.4);
☐ Yes, but not provided with modulation of the fresh air damper connecting to air handling unit or the fresh air fan because of having exhaust air energy recovery provision (BEC Clause 6.10.7.3);
☐ No. Each of the conditioned space is of design fresh airflow rate below 1400 L/s.

Part 5 – Thermal Insulation Worksheet

(Please tick where applicable) Page ___ of ___

Any installation of chilled water pipework, refrigerant pipework, or ductwork or AHU carrying/handling cooled air involved (BEC Clause 6.11)?

☐ Yes (if yes, please provide information in (A) to (D) below)

☐ No installation of chilled water pipework, refrigerant pipework, or ductwork or AHU carrying/handling cooled air involved (if no, please proceed direct to Part 6)

(A) Chilled Water Pipework (BEC Clause 6.11.1)

Any application of thermal insulation to chilled water pipework involved?

☐ Yes, and thickness of thermal insulation is determined in accordance with BEC Table 6.11a

☐ No insulation to chilled water pipework involved

(B) Refrigerant Pipework (BEC Clause 6.11.1)

Any application of thermal insulation to refrigerant pipework involved?

☐ Yes, and thickness of thermal insulation is determined in accordance with BEC Table 6.11b

☐ No insulation to refrigerant pipework involved

(C) Ductwork & AHU Casing (BEC Clause 6.11.1)

Any application of thermal insulation to ductwork carrying cool air or casing of AHU handling cool air involved?

☐ Yes, and thickness of thermal insulation is determined in accordance with BEC Table 6.11c

☐ No insulation to ductwork carrying cool air or casing of AHU handling cool air involved

(D) Insulation for outdoor or unconditioned space (BEC Clause 6.11.2)

Any insulation for outdoor or unconditioned space involved?

☐ Yes, and insulation is water vapour retardant (BEC Clause 6.11.2)

☐ No insulation for outdoor or unconditioned space involved

Part 6 – Air-conditioning Equipment Efficiency Worksheet

(Please tick where applicable)

Page ___ of ___

1) Any installation of chiller involved (BEC Clause 6.12)?

☐ Yes (If yes, please provide information in table below)

☐ No chiller installation involved

Equipment Ref. No.	Technical catalogue Ref. No.	Air-cooled Chiller / Water-cooled Chiller *1	Reciprocating / Scroll / Screw / VSD Screw / Centrifugal / VSD Centrifugal*2	Capacity & COP at cooling mode				
				Rated capacity (kW)	COP *4 at:			
					FL	75% FL	Min. allowed COP in BEC Table 6.12b	
							FL	75% FL
(Please insert additional row if necessary)								

2) Any installation of high temperature chiller or chiller at elevated temperature involved (BEC Clause 6.12)?

☐ Yes, design chilled water supply and return temperature are set at _____ ºC and _____ ºC respectively. (If yes, please provide information in table below)

☐ No installation of high temperature chiller or chiller at elevated temperature involved

Equipment Ref. No.	Technical catalogue Ref. No.	Air-cooled Chiller / Water-cooled Chiller *1	Reciprocating / Scroll / Screw / VSD Screw / Centrifugal / VSD Centrifugal*2	Design capacity (kW)	At cooling mode * 5:				
					Projected capacity (kW)	COP *4 at:			
						FL	75% FL	Min. allowed COP in BEC Table 6.12b	
								FL	75% FL
(Please insert additional row if necessary)									

Part 6 – Air-conditioning Equipment Efficiency Worksheet

(Please tick where applicable)

Page ___ of ___

3) Any unitary air-conditioner installation involved (BEC Clause 6.12)?

☐ Yes (If yes, please provide information in table below)

☐ No unitary air-conditioner installation involved

Equipment Ref. No.	Technical catalogue Ref. No.	Air-cooled / Water-cooled *1	Capacity & COP *4 at cooling mode at full load			Capacity & COP *4 at heating mode at full load		
			Rated capacity (kW)	Rated COP *4	Min. allowed COP in BEC Table 6.12a (Part 1) / Clause 6.12.2	Rated capacity (kW)	Rated COP *4	Min. allowed COP in BEC Table 6.12a (Part 1) / Clause 6.12.2
(Please insert additional row if necessary)								

4) Any variable refrigerant flow (VRF) system involved (BEC Clause 6.12)?

☐ Yes (If yes, please provide information in table below)

☐ No VRF system involved

Equipment Ref. No.	Technical catalogue Ref. No.	Air-cooled / Water-cooled *1	Capacity & COP *4 at cooling mode at full load			Capacity & COP *4 at heating mode at full load		
			Rated capacity (kW)	Rated COP *4	Min. allowed COP in BEC Table 6.12a (Part 2)	Rated capacity (kW)	Rated COP *4	Min. allowed COP in BEC Table 6.12a (Part 2)
(Please insert additional row if necessary)								

Part 6 – Air-conditioning Equipment Efficiency Worksheet

(Please tick where applicable)

Page ___ of ___

5) Any heat pump system involved (BEC Clause 6.12)?

☐ Yes (If yes, please provide information in table below)

☐ No heat pump system involved

Equipment Ref. No.	Technical catalogue Ref. No.	Air-to-Water / Water-to-Water *3	Capacity & COP *4 at full load		
			Rated capacity (kW)	Rated COP *4	Min allowed COP in BEC Table 6.12c
(Please insert additional row if necessary)					

6) a) Any open-circuit cooling tower involved (BEC Clause 6.12.4)?

☐ Yes, condenser water flow ≥ 1.7 L/s per kW of centrifugal fan motor nameplate power.

☐ Yes, condenser water flow ≥ 3.4 L/s per kW of propeller/axial fan motor nameplate power

☐ No open-circuit cooling tower involved.

b) Is/Are the fan(s) of an open-circuit tower served by an individual motor or an array of motors with the rated motor power totalling 3.7 kW or above (BEC Clause 6.12.5)?

☐ Yes, and the fan(s) incorporate control and devices that result in the fan motor demand no more than 30% of design input power at 50% of design air flow and automatically control the fan speed to control the leaving condenser water temperature of the cooling tower.

☐ No, the fan(s) are not served by motor(s) with rated power totalling 3.7 kW or above.

Remarks (applicable to Part 6) :-

*1 Please specify the type of cooling, air-cooled or water-cooled.

*2 Please specify the type of chiller, Reciprocating, Scroll, Screw, VSD Screw, Centrifugal, or VSD Centrifugal.

*3 Please specify the type of heat extraction.

*4 COP means Coefficient of Performance.

*5 For chiller designed to be operated at high temperature, the projected chiller COP figure should be provided based on the standard rating condition per BEC Table 6.12b.

Part 7 – Energy Metering and Load Calculation Worksheet

(Please tick where applicable)

Page ___ of ___

(A) Metering for Chiller / Unitary Air-conditioner / Heat Pump

Any installation of chiller / unitary air-conditioner / heat pump with cooling or heating capacity ≥ 350 kW involved?
(Please tick where applicable)

☐ Yes, and equipped with continuous monitoring facilities to measure the power input, energy input, cooling power output, heating power* output, cooling energy output, heating energy* output and coefficient of performance (BEC Clause 6.13.1), and the measurement parameters are trended every 15 minutes and include hourly, daily, monthly and annual data, capable of maintaining all data collected for a minimum of 36 months (BEC Clause 6.13.5)

- ☐ Schematic wiring diagram / drawing no. _____ attached
- ☐ Photo ref. no. _____ attached
- ☐ Document ref. no. _____ showing the details of the device attached

☐ No installation of chiller / unitary air-conditioner / heat pump with cooling or heating capacity ≥ 350 kW involved

(B) Metering for Chilled / Heated Water Plant

Any installation of chilled / heated water plant with cooling or heating capacity ≥ 350 kW involved?
(Please tick where applicable)

☐ Yes, and equipped with continuous monitoring facilities to measure the power input, energy input, cooling power output, heating power* output, cooling energy output, heating energy* output and coefficient of performance (BEC Clause 6.13.2), and the measurement parameters are trended every 15 minutes and include hourly, daily, monthly and annual data, capable of maintaining all data collected for a minimum of 36 months (BEC Clause 6.13.5)

- ☐ Schematic wiring diagram / drawing no. _____ attached
- ☐ Photo ref. no. _____ attached
- ☐ Document ref. no. _____ showing the details of the device attached

☐ No installation of chilled / heated water plant with cooling or heating capacity ≥ 350 kW involved

Part 7 – Energy Metering and Load Calculation Worksheet

(Please tick where applicable)

Page ___ of ___

(C) Metering for Air-Handling Unit

Any installation of air-handling unit with motor or an array of motors ≥ 5.0 kW involved?
(Please tick where applicable)

- ☐ Yes, and equipped with metering devices or provision of measurement for measuring power consumption of the air-handling unit (BEC Clause 6.13.6);
- ☐ Yes, but metering devices or provision of measurement not provided because of the air-handling unit not being accommodated in a plant room.
- ☐ No installation of air-handling unit with motor ≥ 5.0 kW involved.

(D) System Load Calculation

Any air-conditioning cooling and/or heating load calculation involved?
(Please tick where applicable)

- ☐ Yes (if yes, please provide information below)

  Please indicate the established internationally recognized procedure & method adopted in the load calculation (BEC Clause 6.4.1)

  ☐ ASHRAE ☐ CIBSE ☐ Others _____(Please specify)

  Design conditions for system load calculation complying with BEC Table 6.4.2?

  ☐ Yes

- ☐ No load calculation involved

Remark (applicable to Part 7) :-

* Only applicable to equipment / plant with heating

Part 8 – Direct Digital Control (DDC) Worksheet

(Please tick where applicable)

Page ___ of ___

(A) DDC for Chilled / Heated Water Plant (BEC Clause 6.14.1 (a))

Any installation of chilled / heated water plant with cooling or heating capacity ≥ 350 kW involved?
(Please tick where applicable)

- ☐ Yes, and equipped with DDC having the capacity as prescribed under BEC Clause 6.14.2;
- ☐ Yes, but not equipped with DDC because the plant serves three zones or less;
- ☐ No.

(B) DDC for Air-distribution System (BEC Clause 6.14.1 (b))

Any air-distribution system, serving a conditioned space, with system fan motor power ≥ 7.45 kW involved?
(Please tick where applicable)

- ☐ Yes, and equipped with DDC having the capacity as prescribed under BEC Clause 6.14.2
- ☐ No. The system fan motor power of each air-distribution system is less than 7.45 kW.

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission)

Page ___ of ___

(A) Chilled / Heated Water Plant Energy Performance

(1) Pumping System Configuration

(a) Chilled water pumping system	☐ Differential Bypass system with Constant Speed Pump ☐ Primary-Secondary System with Constant Speed Primary Pump and Variable Speed Secondary Pump ☐ Primary Variable Flow System ☐ Others (Please give details) _____
(b) Heated water pumping system	☐ Differential Bypass system with Constant Speed Pump ☐ Primary Variable Flow System ☐ Others (Please give details) _____

(2) The Chillers and Heat Pumps

	Rated input power (kW) *1 (include air-cooled condenser fans' power)	Total Rated cooling/ heating capacity (kW) *2	Performance (kW/kW)	Performance (kW/RT)
(a) Total of all chillers, exclude standby and night load units (Performance taking **total rated cooling capacity** as the base)				
(b) Total of all heat pumps*3, exclude standby and night load units (Performance taking **total rated heating capacity** as the base)				N/A

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission)

Page ___ of ___

(3) Water Pumps

		Pump motor nameplate power (kW)	Pump flow (L/s)*4	Performance (kW per L/s)	Performance (kW/kW)	Performance (kW/RT)
(a) Chilled water pumps (Performance taking **rated chilled water plant capacity** as the base)	Primary circuit, sub-total of all duty pumps					
	Secondary circuit, sub-total of all duty pumps					
	Total of all duty chilled water pumps*5					
(b) Sub-total of duty condenser water pumps (performance based on **rated chilled water plant capacity**)						
(c) Sub-total of duty seawater pumps (performance based on **rated chilled water plant capacity**)						
(d) Sub-total of duty heated water pumps (performance based on **rated heated water plant capacity**)						N/A

(4) Heat Rejection Equipment

	Fan motor nameplate power (kW)	Heat rejection capacity (kW) *6	Performance (kW/kW)	Performance (kW/RT)
(a) Cooling towers, total of all duty units				
(i) Performance in fan motor nameplate power per unit of **heat rejection capacity**				N/A
(ii) Performance in fan motor nameplate power per unit of **rated chilled water plant capacity**				

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission)

Page ___ of ___

(5) Plant's Overall Performance

	Performance (kW/kW)	Performance (kW/RT)
(a) **Chilled water plant overall performance** (BEC Clause 6.13.4). (Performance taking the **rated chilled water plant capacity** as the base)		
(b) **Heated water plant overall performance** (BEC Clause 6.13.4) (Performance taking the **rated heated water plant capacity** as the base)		N/A

(B) Air-Conditioning System Energy Performance

(1) CAV/ VAV air distribution systems

	Fan motor nameplate power (kW)	Rated Cooling Capacity (kW)	Performance (kW/kW)	Performance (kW/RT)
(a) Sub-total of all supply air fans of AHUs (Performance taking **AHUs rated cooling capacity** as the base)				
(b) Sub-total of all supply air fans of the associated primary air handling units (PAUs) (Performance taking **PAUs rated cooling capacity** as the base)				
(c) Sub-total of all return air fans and relief air fans		N/A	N/A	N/A
(d) **Total, of all air-conditioning fans.**				
(i) Performance in fan motor nameplate power per unit **AHU's and PAU's rated cooling capacity**				
(ii) Performance in fan motor nameplate power per unit **rated chilled water plant capacity**				
(e) Total internal floor area served by the systems				m^2
(f) Performance in fan power per unit served internal floor area				W/m^2

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission)

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(2) Fan coil units (FCU) with primary air handling units

	Fan motor nameplate power (kW)	Space cooling load (kW)	Rated Cooling Capacity (kW)	Performance (kW/kW)	Performance (kW/RT)
(a) Sub-total of all fan coil units (FCUs) supply air fans*8 (Performance taking **space cooling load** as the base)			N/A		
(b) Sub-total of all supply air fans of the associated primary air-handling units (PAUs) (Performance taking **PAUs rated cooling capacity** as the base)		N/A			
(c) **Total, of all air-conditioning fans.**		N/A	N/A	N/A	N/A
(i) Performance in fan motor nameplate power per unit **space cooling load and PAU's rated cooling capacity**					
(ii) Performance in fan motor nameplate power per unit **rated chilled water plant capacity**					
(d) Total internal floor area served by the system				m^2	
(e) Performance in fan power per unit served internal floor area				W/m^2	

(C) Mechanical Ventilation System Energy Performance*7

	Fan motor nameplate power (kW)	Internal floor area served (m^2)	Performance (W/m^2)
(a) Car park: Sub-total of all exhaust and intake fans, and jet fans, if any			
(b) Toilets, pantry and un-conditioned areas: Sub-total of all exhaust and intake fans*7			

Part 9 – Energy Performance of Air-conditioning Installation Worksheet

(Only applicable to Stage 2 Declaration Submission)

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(c) Kitchen: Sub-total of all exhaust and make up air fans			
(d) **Total, of all mechanical ventilation fans**			
(e) Performance in fan power per unit served internal floor area			

Remarks (applicable to Part 9) :-

1 *1 The power consumption refer to the consumption at design condition.

2 *2 The cooling/heating capacity in kW refer to the cooling/heating capacity at design condition. Hereafter refers as the "rated chilled water plant capacity" or "the rated heated plant capacity".

3 *3 Identify the standard rating conditions on separate sheet with proper cross-referencing

4 *4 The air/water flow refer to the air/water flow at design condition

5 *5 Pump flow excludes primary circuit for primary-secondary system

6 *6 The heat rejection capacity refer to the heat rejection at design condition

7 *7 Ventilation fans each of rated fan power of below 1.0kW should be excluded. Small ventilation system such as window fan, ducted in-line fan, etc. serving an unit should be excluded.

8 *8 Sub-total of power consumption of FCUs each set at Hi/Mid/Lo speed at design condition.

9 Submit calculation schedules, drawings, schematics and the documents as necessary to demonstrate the sub-total values and equipment capacity shown in this Part of the Form.

Part 10 – Declaration

I, Registered Energy Assessor, hereby declare that all the information contained in this form and in the substantiation materials attached have been thoroughly examined and well prepared to demonstrate the compliance with the Building Energy Code.

I understand that any missing information, inconsistency and incorrectness on the submitted materials / information may result in jeopardizing the approval process and having the entire submission been rejected.

Name of the REA:		Registration No.:	
Signature of the REA		Date:	DD / MM / YYYY