

(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2012 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 |
|--|---------------|
| <input type="checkbox"/> Form EE-AC Part 1 - Air-conditioning Installation Summary | |
| <input type="checkbox"/> Form EE-AC Part 2 - Air Side Distribution Worksheet | |
| <input type="checkbox"/> Form EE-AC Part 3 - Water Side Distribution Worksheet | |
| <input type="checkbox"/> Form EE-AC Part 4 - System Control Worksheet | |
| <input type="checkbox"/> Form EE-AC Part 5 - Thermal Insulation Worksheet | |
| <input type="checkbox"/> Form EE-AC Part 6 - Air-conditioning Equipment Efficiency Worksheet | |
| <input type="checkbox"/> Form EE-AC Part 7 - Energy Metering and Load Calculation Worksheet | |
| <input type="checkbox"/> Schematic drawings showing the air-conditioning installation governed by BEC | |
| <input type="checkbox"/> A drawing list indicating the title and reference number of each drawing | |
| <input type="checkbox"/> 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) | |
| <input type="checkbox"/> 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 | |
| <input type="checkbox"/> Others (Please give details) _____ | |

Remarks (applicable to Parts 1 to 7) :-

- 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, unitary air-conditioners, chillers, 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 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.
- 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) 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) 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 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))

2) 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 Part 3)
- 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 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))

For the above VAV air distribution system(s), is there any supply or return air VAV fan with motor output power of 5 kW or greater ? (Please tick where applicable)

- Yes, and controls and devices are incorporated such that the fan motor demands no more than 55% of design input power at 50% of design air volume flow (BEC Clause 6.7.4)
- No supply or return air VAV fan with motor output power of 5kW or greater

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)

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 designed to modulate or step open & close as a function of load involved
- Yes, pumping system is/are designed for variable flow, with control valve(s) capable of reducing system flow to 50% design flow or less (BEC Clause 6.8.1)
- Yes, but control valve(s) is/are not capable of reducing system flow to 50% design flow, given the following justification(s)
 - minimum flow greater than 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 one control valve (BEC Clause 6.8.1(b))
 - pumping system incorporates supply water temperature reset control (BEC Clause 6.8.1(c))

For the above variable flow system(s), is there any variable speed pump with motor output power of 5 kW or greater ? (BEC Clause 6.8.2) (Please tick where applicable)

- Yes, and controls and devices are incorporated such that the pump motor demands no more than 55% of design input power at 50% of design water volume flow
- No variable speed pump with motor output power of 5 kW or greater

(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) ?

(Please tick where applicable)

- Yes, and piping sized for frictional loss and flow velocity not exceeding 400 Pa/m and 3 m/s respectively
- 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) ?

(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 ? <input type="checkbox"/> Yes (if yes, please provide information in (A) to (D) below) <input type="checkbox"/> No installation of air-conditioning system control involved (if no, please proceed direct to Part 5) | | |
| (A) Temperature Control (BEC Clause 6.10.1) | | |
| Any installation of temperature control (for serving space) involved ? <input type="checkbox"/> Yes (if yes, please provide information in (A) 1) to 4) below) <input type="checkbox"/> No installation of temperature control involved (if no, please proceed direct 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) ? <input type="checkbox"/> 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) ? <input type="checkbox"/> Yes | | |
| 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) ? <input type="checkbox"/> Yes <input type="checkbox"/> No, space heating not provided | | |
| 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 6.10.1.4) ? <input type="checkbox"/> Yes | | |
| (B) Humidity Control (BEC Clause 6.10.2) | | |
| Any installation of humidity control (for serving space) involved ? <input type="checkbox"/> Yes (if yes, please provide information in (B) 1) to 3) below) <input type="checkbox"/> 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) ? <input type="checkbox"/> Yes | | |
| 2) Humidity control device (for comfort humidification) provided for each space and each device capable of adjusting the set point relative humidity down to 30% (BEC Clause 6.10.2.2) ? <input type="checkbox"/> Yes <input type="checkbox"/> 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 up to 60% (BEC Clause 6.10.2.3) ? <input type="checkbox"/> Yes <input type="checkbox"/> No, space dehumidification not provided | | |
| (C) Zone Control (BEC Clause 6.10.3) | | |
| Any installation of zone control involved ? <input type="checkbox"/> Yes (if yes, please provide information in (C) 1) to 3) below) <input type="checkbox"/> 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) ? <input type="checkbox"/> Yes | | |
| 2) Any zone having spaces on different floors (BEC Clause 6.10.3.2) ? <input type="checkbox"/> 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) <input type="checkbox"/> No zone having spaces on different floors | | |

Part 4 - System Control Worksheet (cont'd)

(Please tick where applicable)

Page ___ of ___

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

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

Any installation of off-hours control involved ?

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

No installation of off-hours control involved (if no, please proceed direct to Part 5)

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 through control setback or equipment shutdown during periods of non-use (BEC Clause 6.10.4.1)
- No air-conditioning system with cooling or heating capacity greater than 10 kW

2) Any air-conditioning system with cooling or heating capacity not more than 10 kW ?

- Yes, and system equipped with automatic controls capable of accomplishing a reduction of energy use through control setback or equipment shutdown during periods of non-use (BEC Clause 6.10.4.1)
- 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 not more than 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

(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2012 Edition)

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

(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2012 Edition)

Part 6 – Air-conditioning Equipment Efficiency Worksheet

Page ___ of ___

(Please tick where applicable)

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 / Centrifugal *2 | Capacity & COP at cooling mode at full load | | |
|---|------------------------------|--|---|---|-----------|------------------------------------|
| | | | | Rated capacity (kW) | COP *3 | |
| | | | | | Rated COP | Min allowed COP in BEC Table 6.12b |
| (Please insert additional row if necessary) | | | | | | |
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2) Any unitary air-conditioner / heat pump installation involved (BEC Clause 6.12) ?

- Yes (If yes, please provide information in table below)
- No unitary air-conditioner / heat pump installation involved

| Equipment Ref. No. | Technical catalogue Ref. No. | Air-cooled / Water-cooled *1 | Capacity & COP *3 at cooling mode at full load | | | Capacity & COP *3 at heating mode at full load | | |
|---|------------------------------|------------------------------|--|--------------|--|--|--------------|--|
| | | | Rated capacity (kW) | Rated COP *3 | Min allowed COP in BEC Table 6.12a / clause 6.12.2 | Rated capacity (kW) | Rated COP *3 | Min allowed COP in BEC Table 6.12a / clause 6.12.2 |
| (Please insert additional row if necessary) | | | | | | | | |
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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 or Centrifugal.
- *3 COP means Coefficient of Performance.

(Please refer to Section 6, Code of Practice for Energy Efficiency of Building Services Installation 2012 Edition)

Part 7 – Energy Metering and Load Calculation Worksheet

Page ___ of ___

(Please tick where applicable)

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

Any installation of chiller / unitary air-conditioner / heat pump with cooling or heating capacity \geq 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)
- No installation of chiller / unitary air-conditioner / heat pump with cooling or heating capacity \geq 350 kW involved

(B) Metering for Chilled / Heated Water Plant

Any installation of chilled / heated water plant with cooling or heating capacity \geq 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)
- No installation of chilled / heated water plant with cooling or heating capacity \geq 350 kW involved

(C) 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