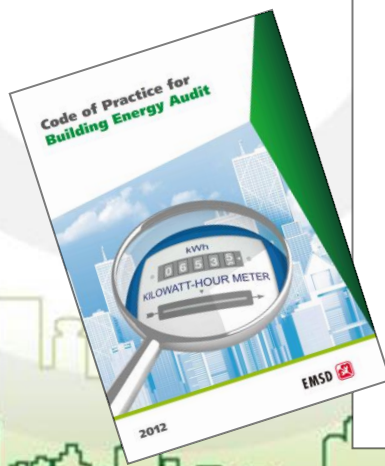


Completing of Executive Summary Form EE-EAes (V.1)



ENERGY AUDIT
REPORT

prepared for

Buildings Energy Efficiency
Ordinance (Cap 610)

Executive Summary of Energy Audit Report for Energy Audit Code (EAC)
Please refer to Section 5, Code of Practice for Building Energy Audit

Form EE-EAes(V.1)

This Executive Summary (technical form EE-EAes) forms part of the report (EA report) of the energy audit carried out under the Buildings Energy Efficiency Ordinance (Cap 610), for the building hereinafter cited, and consists of the following parts:

Part 1 – Administrative Information & Building Characteristics

(A) Administrative Information

(B) Building Characteristics

(i) Building Type, Usage & Operation

(ii) Central Building Services Installation (CBSI)

Part 2 – Historical Energy Consumption Analysis

Part 3 – Energy Management Opportunities (EMO)

The Executive Summary form provides an overview of the audited building's characteristics (type, usage, operation, and performance of key components), its historical energy performance, and the energy management opportunities identified in the audit. The detailed building characteristics and audit findings should be included in the EA report.

The EXCEL version of this form has built-in certain calculation functions for cells in yellow shading.

This form also provides an extended framework for the REA to collect essential information, such that he/she can gain better insight to the building's characteristics, operation and its central building services installation (CBSI) and be more effective in identifying energy management opportunities (EMO).

Please refer to the EAC and its Technical Guidelines on the EAC (TG-EAC) for interpretations and intents of various terminologies and expressions.

Part 1 – Administrative Information & Building Characteristics

(A) Administrative Information

Name of Building ¹⁾ :	[EAC Clause 8.1]		
Address of Building:	[EAC Clause 8.1]		
1) Date of commencement of energy audit:	[dd/mm/yyyy]	and ended on:	[dd/mm/yyyy]
2) Date of completion of energy audit:	[dd/mm/yyyy]	and issued on:	[dd/mm/yyyy]
3) Energy Audit Form validity period - issued on:	[dd/mm/yyyy]	and expired on:	[dd/mm/yyyy]
4) Energy Audit Report reference no. (optional):	[dd/mm/yyyy]	and issued on:	[dd/mm/yyyy]
5) Does the audited building import or export energy from/to other building?	<input type="checkbox"/> No <input type="checkbox"/> Yes		
	Building(s) importing energy or to which energy is exported	import or export	import or export
	(Name(s) of building(s))	Address(es) of building(s))	
If yes, please provide information ²⁾ in order to EAC clause 4.6:			

EMSD EAC

Page 1 of 11

EMSD/EE-EAes(V.1)



Form EE-EAes

- Indication of the REA's appreciation of the audited building
- Pay attention to ^Remarks (3 pages) in the Form
- Compare performance indicators (W per L/s, kW/kW etc.) with similar in other projects
- Benchmarking for good performance
- Download latest version (yellow shaded cells – auto calculation)

***Illustration in following slides
of form completion
based on a commercial “model building”
(hypothetical data with reference to certain actual submissions)***

Commercial “Model Building”

(building with common area)

Floor Space Usages, Norm of Operation [General/24-hour & AC/Non-AC], and Corresponding Area (m ²)						
Floor	Usages	General		24-hour		Overall area (m ²)
		AC	Non-AC	AC	Non-AC	
B/F	Car park	N/A	N/A	N/A	900	1800
	Plant rooms & staircases	450	180	180	90	
G/F	Plant rooms, switch room, cleaner room & staircases	120	100	N/A	40	1800
	Shopping arcade entrance lobbies (also for officer tower) & public circulation areas	370	N/A	N/A	N/A	
	Carpark entrance	N/A	N/A	N/A	90	
	Shopping arcade retail shops	540	N/A	40	N/A	
	Restaurant (not served by CBSI lighting and CBSI AC)	500	N/A	N/A	N/A	
1/F	Property management office	30	N/A	N/A	N/A	1800
	Shopping arcade public circulation areas & visitor toilets	600	N/A	N/A	N/A	
	Shopping arcade retail shops	840	N/A	N/A	N/A	
	Shopping arcade plant room, switch room & staircases	60	270	N/A	N/A	
2-31/F	Office floors common lift lobbies, common corridors & common toilets	N/A	1500	N/A	N/A	30600 (30 x 1020 m ²)
	Office floors general offices (including pantries & private toilets)	24816	N/A	N/A	N/A	
	Office floors plant rooms, switch rooms, cleaner rooms & staircases	3060	1224	N/A	N/A	
32/F	Plant room & switch room	260	50	100	100	510
Total Floor Area of Building						36510
Common area (as interpreted in BEO for a building with common area)						9774

(Coloured rows a(i) a(ii) b(i) b(ii) c e match sub-items numbering in slide 8)

Commercial “Model Building”



Central chilled water plant

➤ Water-cooled chillers

3 nos., each at 2033 kW cooling, total 6100 kW cooling

➤ Air-cooled chillers

1 no. 600 kW and 1 no. 1200 kW cooling, total 1800 kW cooling

➤ Cooling towers

3 nos., total heat rejection 7911.4 kW and fans motor power 75.5 kW

➤ Condenser water pumps

3 duty and 1 standby, 3 duty total 268.9 kW rated motor power at 431.43 L/s

➤ Chilled water pumps

- Primary - 5 duty and 1 standby, 5 duty total 57.8 kW rated motor power at 302.4 L/s flow
- Secondary – 5 duty and 1 standby, 5 duty total 165 kW rated motor power at 290 L/s flow



Form EE-EAes (V.1)

Part 1 – Administrative Information & Building Characteristics			
(A) Administrative Information		(EAC Clause 8.1)	
Name of Building ^{^1}	Model Building		
Address of Building	721 Model Road, Hong Kong		
1) Date of commencement of energy audit :		7/6/2013 (dd/mm/yyyy)	
2) Date of completion of energy audit : (not later than 6 months after the energy bill reference month)		4/9/2013 (dd/mm/yyyy)	
3) Energy Audit Form validity period - issued on :	5/9/2013 (dd/mm/yyyy)	and expired on:	4/9/2023 (dd/mm/yyyy)
4) Energy Audit Report reference no. (optional) :		N/A	
5) Does the audited building import or export energy from/to other building ? If yes, please provide information below ^{^34} . (Refer to TG-EAC clause 4.4)			No
Building(s) importing energy or to which energy is exported			Import or Export
Name(s) of Building(s)	Address(es) of Building(s)		

- Energy import/export to be reported/estimated [item 5)]
 - TG-EAC clauses 4.4, 7.3.3 & 8.4

Part 1 – Administrative Information & Building Characteristics		
(B) Building Characteristics		(EAC Clause 8.1)
(I) Building Type, Usage & Operation		(Please click to select where applicable and insert N/A for non-applicable items.)
1) Type of Building		
(a) Please choose the type of building of the building entity ^{^2} audited:	Commercial building	
(b) Please indicate the portion of the building entity being common area ^{^4} :	26.8%	
(c) Please indicate the no. of blocks ^{^2} of the building entity:	1	no. of blocks
2) Total internal floor area ^{^5} of the building entity (m ²):	36,510	
3) No. of floors ^{^6} of the building entity:	35	
4) Major type of building façade:	Curtain wall	
5) Date(s) of issue of occupation approval (dd/mm/yyyy) ^{^7} :	5/7/2001	
6) Type of central air-conditioning ^{^8} provided:	<input type="checkbox"/> Cool air <input checked="" type="checkbox"/> Chilled water <input type="checkbox"/> Condenser water <input type="checkbox"/> Not applicable	

- BEEO common area [sub-item 1)(b)]
 - buildings with “common area” – with Deed of Mutual Covenant (DMC) and separately owned units (Remark ^4)
 - buildings without “common area” – single ownership, “0” to be inserted, but still can have “commonly used areas” (see later slide)
- Total internal floor area of the building entity [item 2)]
 - To include tenant units area (Remark ^5), irrespective of CBSI served or non-served
- Central air-conditioning (AC) [item 6)]
 - 10% CBSI energy consumption criterion, may tick more than one sub-item (Remark ^8)

7) Summary of operation characteristics of categorized major usages of CBSI-served areas:

(Below is a summary of the categorized usages in item 8). Item 8) should be completed first, based on which the following summary information can be provided.) (EXCEL version of Form EE-EAes has the built-in function to automatically add the corresponding % area figures in item 8) and insert in the relevant yellow shaded cells in item 7.)

Major usage	Operation characteristics	% area of total of building entity ^{^9^27E}	% AC area of total of building entity ^{^10^27E}	Average weekly operating hours (hrs/week) ^{^11^12}	Daily average no. of occupants ^{^12}
(a) Office		72.2%	68.1%	61	2,485
(b) Shopping & leisure		6.5%	6.5%	126	270
(c) Back of house area		17.2%	11.6%	67	6
(d) Restaurant					
(e) Car park		2.7%		168	4
(f) Others ^{^13}					
Total ^{^14^27E}		98.6%	86.2%	N/A	2,764
Daily average occupant density (m ² per person) ^{^15 ^27E}					13

➤ CBSI-served areas [item 7)]

- CBSI – Central Building Services Installation, energy consumption on account of the owner of the building (landlord) (^16)
- five [sub-items (a) to (e)] common major usages [& Others, sub-item (f)]
- % area - Total Internal Floor Area of the building entity as the denominator (^16)
- CBSI non-served areas need not be included (^16)
- “Total” needs not add up to 100%, as not all areas are CBSI-served (cannot exceed 100%) (^16)
- % area figures (yellow cells) automatically transferred from item 8) (next slide)

Part 1 – Administrative Information & Building Characteristics

8) Details of operation characteristics of CBSI-served areas grouped under categorized major usages ^16

(with energy consumption on account of the building owner) :

Operation characteristics CBSI served Categorized major usages		Norm ^17 of operation		%tage area of total of building entity	Weekly operating hours ^12 (hrs/week) [sum up "weekday" hours and "weekend" hours to obtain hours of "week total" ^27E]		
		General or 24-hour	AC or non-AC		weekday	weekend	week total
(a)	(i) Commonly used areas ^18 of office floors (office tower entrance lobby, lift lobbies, common corridors, common toilets etc.)	General	AC	0%	55	6	61
			Non-AC	4.1%			
		24-hour	AC	0%			
	Non-AC		0%				
	(ii) Areas specific for office works (general office, private office, meeting rooms, data centres, server rooms, clinics, laboratories, tutorial schools, private toilets etc.)	General	AC	68.1%	55	6	61
			Non-AC	0%			
24-hour		AC	0%				
		Non-AC	0%				
(b)	(i) Commonly used areas ^18 of shopping & leisure floors (shopping mall entrance lobby, public circulation areas, atrium, visitor toilets, etc.)	General	AC	2.7%	90	36	126
			Non-AC	0%			
		24-hour	AC	0%			
	Non-AC		0%				
	(ii) Areas specific for shopping & leisure (retail shops, department stores, cinemas, health clubs, private toilets etc.)	General	AC	3.8%	80	32	112
			Non-AC	0%			
24-hour		AC	0.1%				
		Non-AC	0%				
(c)	Back of house areas (plant rooms, cleaner rooms, staircases (outside public circulation areas))	General	AC	10.8%	60	7	67
			Non-AC	5.0%			
		24-hour	AC	0.8%	120	48	168
			Non-AC	0.6%			
(d)	Restaurants	General	AC	0%			
			Non-AC	0%			
		24-hour	AC	0%			
			Non-AC	0%			
(e)	Car parks	General	AC	0%			
			Non-AC	0%			
		24-hour	AC	0%	120	48	168
			Non-AC	2.7%			
(f)	Others ^13 (if applicable, please specify)	General	AC	0%			
			Non-AC	0%			
		24-hour	AC	0%			
			Non-AC	0%			

- Commonly used areas [sub-items (a)(i) & (b)(i)] - broader sense meaning, not confined to BEEO interpreted "common area" (^18)
- CBSI non-served 500 m² restaurant not to be included in sub-item (d)

Part 1 – Administrative Information & Building Characteristics

(II) Central Building Services Installation^{^19}

1) Air-conditioning Installation

(a)(i) Chillers, Heat Pumps, Boilers, Other Heating^{^20^34}

Type of equipment (C/HP/B/O) ^{^21} (C: Chiller, HP: Heat Pump, B: Boiler, O: Other heating)	Cooling (for heat rejection) (A/FW/SW/FE) ^{^22}	Compressor (Ce/Se/So/Re) ^{^23}	Refrigerant (R134a/ R123/R407c/R410a/ R22/R12/R11 etc.) ^{^24}	Rated Capacity (kW)	Rated input power (kW)	Quantity	COP (kW / kW) ^{^25}
C	FW	Se	R134a	6,100	1196.1	3	5.1
C	A	So	R134a	1,800	620.7	2	2.9
Total for cooling ^{^26} , of all chillers / heat pumps:				7,900	1816.8	5	4.3
Total for heating ^{^26} , of all boilers / heat pumps / other heating:				N/A			

(a)(ii) Unitary air-conditioners^{^20^34}

Type of equipment (R/S/P) ^{^21} (R: Room type, S: Split type, P: Packaged type)	Cooling (for heat rejection) (A/FW/SW/FE) ^{^22}	Compressor (Se/So/Re) ^{^23}	VRF? ^{^24}	Refrigerant (R134a/ R123/R407c/R410a/R 22/R12/R11 etc.) ^{^24}	Rated Capacity (kW)	Rated input power (kW)	Quantity	COP (kW / kW) ^{^25}
S	A	So	V	R407c	75	25.9	5	2.9
S	A	So	N/A	UA	25	10.0	5	2.5
Total for cooling ^{^26} , of all unitary air-conditioners:					100	35.9	10	2.8
Total for heating ^{^26} , of all unitary air-conditioners:					N/A			
Percentage (based on total cooling capacity) of all unitary air-conditioners (add up to 100%) :		25%		25%		50%		
		for office floors		for shopping & leisure floors		for other floors		

- Chillers [sub-item (a)(i)] and Unitary air-conditioners [sub-item (a)(ii)]
 - each row to cater for equipment of the same configuration (^20)
 - COP in row for “Total” is the weighted performance of all chillers / unitary ACs (^26)
- Ratings to be based on technical brochure, catalogue, nameplate (^19)
- Not to include standby equipment (^19)

(II) Central Building Services Installation^{^19}

1) Air-conditioning Installation

(b) Air-conditioning pumps		Pump rated motor power (kW)	Pump rated flow (L/s)	Quantity	Performance (W per L/s)
(i) Chilled water pumps	Primary circuit, sub-total of all pumps ^{^27}	57.8	290.0	5	199.1
	Secondary circuit, sub-total of all pumps ^{^27}	165.0	302.4	5	545.6
	Total, of all chilled water pumps^{^27A}	222.8	302.4	5	736.6
(ii) Condenser water pumps	Fresh water, sub-total of all pumps ^{^27}	268.9	431.4	3	623.3
	Sea water, sub-total of all pumps ^{^27}	N/A			
	Total, of all condenser water pumps^{^27B}	268.9	431.43	3	623.3
(iii) Heater water pumps - total of all heated water pumps ^{^27}		N/A			
(c) Heat rejection		Fan rated motor power (kW) ^{^27C}	Rated heat rejection capacity (kW) ^{^27C}	Quantity	Performance (kW / kW) ^{^27C}
Sub-total, of all cooling towers ^{^27C}		75.5	7,911.4	3	104.8
Sub-total, of all radiators ^{^27C}		N/A			
Total, of all heat rejection equipment^{^27C}		75.52	7,911.4	3	104.8

➤ Air-conditioning pumps [sub-item (b)] & Heat rejection [sub-item (c)]

- add up rating of each equipment in a sub-group to arrive at the sub-total of the sub-group (^27)
- sub-item (b) (i) - performance of “Total, of all chilled water pumps” - based on flow of secondary circuit (^27A)
- sub-item (c) - performance of “cooling towers” in kW heat rejection per kW fan motor power (^27C)



(d) Air-conditioning fans		Fan rated motor power (kW)	Fan rated flow (L/s)	Quantity	Performance (W per L/s)
Sub-total, of all AHUs & FCUs (excluding primary air AHU) ^{^27}		264.51	146,948	100	1.8
Sub-total, of all primary air AHUs, fresh air and return air fans (for conditioned areas) ^{^27}		66.13	41,329	13	1.6
Total, of all air-conditioning fans ^{^27D}		330.63	146,948	113	2.25
Percentage (based on total fan rated motor power) of all air-conditioning fans (add up to 100%) :	89%	8%		3%	
	for office floors	for shopping & leisure floors		for other floors	
(e) Chilled / Heated water plant sequencing control					
Please indicate if automatic sequencing control is provided:					Yes
(f) Overall representative indoor room temperature set point in summer (°C):					25.0
(g) Major type of air-side system (CBSI): (may tick more than one item, if it serves 20% or more of AC area of building entity)		<input checked="" type="checkbox"/> Chilled water AHU (VAV/CAV) <input checked="" type="checkbox"/> Chilled water FCU <input type="checkbox"/> Unitary air-conditioner <input type="checkbox"/> Not applicable			
(h) Is power supply to air-side system AHU/FCU fans mainly on account of the building owner or tenants?			On account of tenants		

➤ Air-conditioning fans [sub-item (d)]

- add up rating of each equipment in a sub-group to arrive at the sub-total of the sub-group (^27)
- sub-item (d) - performance of “Total, of all air-conditioning fans” - based on flow of “Sub-total, of all AHUs & FCUs” (^27D)

➤ Sub-items (g) & (h) –

to take into account too the FCUs/AHUs provided with CBSI chilled water for air-conditioning of leased/separately owned units (in addition to AHUs/FCUs serving the commonly used areas or of the building owner)

2) Central Mechanical Ventilation				
	Fan rated motor power (kW)	Fan rated flow (L/s)	Quantity	Performance (W per L/s)
Sub-total, of all exhaust and intake fans for car park ^{^27}	9.9	9,900	4	1
Sub-total, of all exhaust and intake fans for toilets, pantries, un-conditioned areas etc. ^{^27}	49.2	98,380	80	0.5
Total, of all central mechanical ventilation fans^{^27B}	59.1	108,280	84	0.55
Total internal floor area of areas served by central mechanical ventilation (m ²) :		3,419		
Percentage (based on total rated motor power) of all central mechanical ventilation fans (add up to 100%) :	39%	15%	46%	
	for office floors	for shopping & leisure floors	for other floors	

3) Lighting Installation (Lighting power below to be based on rated luminaire wattage, and to include decoration lighting of the building owner but not external lighting)				
(a) Sub-total lighting power, of all luminaires with T5 fluorescent lamps (kW)				90.6
(b) Sub-total lighting power, of all luminaires with fluorescent lamps other than T5 (kW)				4
(c) Sub-total lighting power, of all luminaires with compact fluorescent lamps (kW)				5
(d) Sub-total lighting power, of all luminaires with incandescent lamps (tungsten filament, tungsten halogen etc.) (kW)				11
(e) Sub-total lighting power, of all luminaires with discharge lamps (metal halide, high pressure sodium vapour etc.) (kW)				3
(f) Sub-total lighting power, of all luminaires with LED (light emitting diode) lamps (kW)				1
(g) Sub-total lighting power, of all luminaires with other types of lamps, if any (kW)				
Total lighting power, of all luminaires (kW) [obtained by summing up all figures in (a) to (g)^{^27E} :				114.6
Total internal floor area of areas having CBSI lighting installation (m ²) :				9,774
Total lighting power density (W/m²) [obtained by dividing total lighting power by total internal floor area (having CBSI lighting) above^{^27E} :				11.7
Percentage (based on total lighting power) of all luminaires (add up to 100%):	59.2%	17.2%	23.6%	
	for office floors	for shopping & leisure floors	for other floors	



4) Lift and Escalator Installation			
	Rated Motor Power (kW)		Quantity
Sub-total, of all traction lifts with DC Ward Leonard drive			
Sub-total, of all traction lifts with DC thyristor Leonard drive			
Sub-total, of all traction lifts with AC variable voltage (VV) drive			
Sub-total, of all traction lifts with AC variable frequency (VF) drive			
Sub-total, of all traction lifts with AC VVVF drive	438		11
Sub-total, of all traction lifts with other types of drive			
Sub-total, of all hydraulic lifts			
Sub-total, of all escalators and passenger conveyors	20		4
Total, of all lifts, escalators and passenger conveyors ^{^27E}	458		15
Percentage (based on total rated motor power) of all lifts, escalators & passenger conveyors (add up to 100%) :	95%	5%	0%
	for office floors	for shopping & leisure floors	for other floors

5) Other Installations ^{^28^34}	
Total quantity of personal computers and photocopiers, with electricity consumption on account of the building owner :	5.00
Total rated motor power, of all plumbing & drainage pumps (kW)	146
Other installations, if applicable (please specify, and insert N/A if not applicable) ^{^28^34}	
N/A	

➤ Can work out kW motor power per unit internal floor area

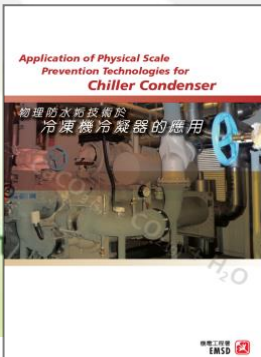
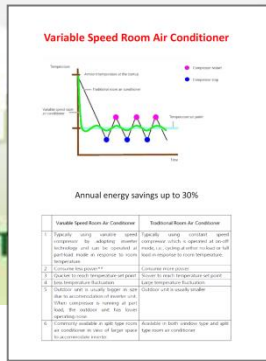
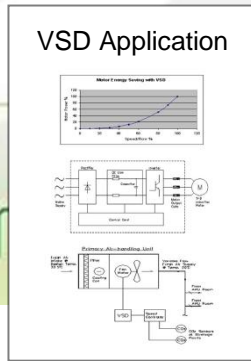
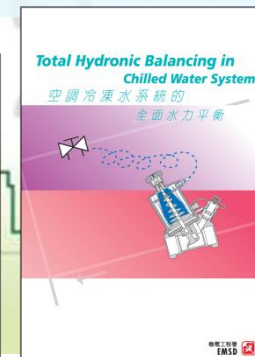
Part 2 – Historical Energy Consumption Analysis ^{^29}		(EAC Clause 8.1(g))		
1) Annual electricity consumption of last 36-month (kWh/annum) (EAC Clause 8.1(g)ii)		5,476,500	5,640,795	5,750,325
	(kWh/annum)		(kWh/annum)	(kWh/annum)
	Past 1 st 12-month	Past 2 nd 12-month	Past 3 rd 12-month	
2) Annual consumption of energy ^{^30} other than electricity, of last 36-month (MJ/annum) (EAC Clause 8.1(g)ii)		0	0	0
	(MJ/annum)		(MJ/annum)	(MJ/annum)
	Past 1 st 12-month	Past 2 nd 12-month	Past 3 rd 12-month	
3) Annual total energy consumption, of last 36-month (MJ/annum) (sum of figures in 1) & 2)) ^{^27E} (EAC Clause 8.1(g)ii)		19,715,400	20,306,862	20,701,170
	(MJ/annum)		(MJ/annum)	(MJ/annum)
	Past 1 st 12-month	Past 2 nd 12-month	Past 3 rd 12-month	
4) Annual Energy Utilisation Index (EUI) of last 36-month (MJ/m ² /annum) ^{^27E} (EAC Clause 8.1(g)ii) (Value in kWh/m ² /annum can be obtained by dividing the MJ/m ² /annum figure by 3.6)		540	556.2	567
	(MJ/m ² /annum)		(MJ/m ² /annum)	(MJ/m ² /annum)
	Past 1 st 12-month	Past 2 nd 12-month	Past 3 rd 12-month	
5) Monthly EUI of past 1 st 12-month period (MJ/m ² /month) (EAC Clause 8.1(g)iii)		48.6	51.3	54.0
	1 st month	2 nd month	3 rd month	4 th month
	5 th month	6 th month	7 th month	8 th month
	9 th month	10 th month	11 th month	12 th month ^{^31}
		36.5	33.8	33.8
		54.0	50.0	45.9
6) Annual energy consumption breakdown, of past 1 st 12-month period (MJ/annum) (EAC Clause 8.1(g)iv)		12,223,548.0	2,385,563.4	1,441,787.2
	Air-conditioning ^{^32}	Lighting	Lift & Escalator	Others ^{^33}
7) Energy supply from CCSI to building's units, as a percentage of the total energy consumption of past 1 st 12-month period (EAC Clause 8.1(h))				62%
				(%)
8) Energy bill reference month (month for which the most recent energy bill has been issued by the energy supply utility prior to commencement of energy audit, i.e. the 12 th month of item 5) ending on				16/4/2013
				(dd/mm/yyyy)

- 12-month profile [item 5)] – summer high & winter low, 12th month being the energy bill reference month [item 8)]
- Energy consumption breakdown [item 6)] (TG-EAC)
- Energy supply to units [item 7)] (TG-EAC) – e.g. in form of chilled water

Energy Management Opportunities (EMO)



- Contribution of Cat I EMOs
 - Over cooling, over illumination, unnecessary operational hours
- Retro-commissioning backed by findings
- Air-conditioning part load energy savings
- Assess EMO with due regard to sustainable development
- EMSD publications on energy saving measures
 - http://www.emsd.gov.hk/emsd/eng/pee/aest_pub.shtml
 - http://www.emsd.gov.hk/emsd/eng/pee/em_pub.shtml



Energy Management Opportunities (EMOs)

Application of Physical Scale Prevention Technologies for Chiller Condenser

物理防水垢技術於
冷凍機冷凝器的應用

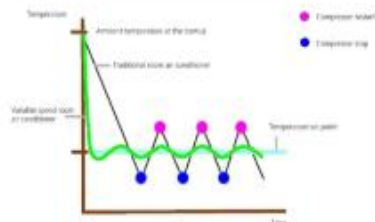


機電工程署
EMSD

Lighting EMOs

er illumination, unnecessary lighting backed by finding part load energy saving due regard to sustainability on energy saving

Variable Speed Room Air Conditioner



Annual energy savings up to 30%

Variable Speed Room Air Conditioner	Traditional Room Air Conditioner
1. Typically using variable speed compressor by adopting inverter technology and can be operated at part-load mode in response to room temperature.	Typically using constant speed compressor which is operated at on-off mode, i.e., cycling at either no-load or full load in response to room temperature.
2. Consume less power**	Consume more power
3. Quicker to reach temperature set point	Slower to reach temperature set point
4. Low temperature fluctuation	Large temperature fluctuation
5. Outdoor unit is usually bigger in size due to accommodation of inverter unit. When compressor is running at part load, the outdoor unit has lower operating noise.	Outdoor unit is usually smaller
6. Commonly available in split type room air conditioner in view of larger space to accommodate inverter.	Available in both window type and split type room air conditioner.



Task Lighting Design 工作照明設計



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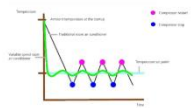
Application of Physical Scale Prevention Technologies for Chiller Condenser

物理防水垢技術於
冷凍機冷凝器的應用



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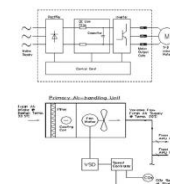
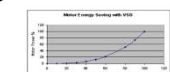
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VSD Application



Variable Flow Control for Condensing Water Pumps

冷卻水泵
可變流量控制



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Practical System Curve Control for Secondary Chilled Water Pumps



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Total Hydraulic Balancing in Chilled Water System

空調冷凍水系統的
全面水力平衡



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EMSD

VAV System Static Pressure Reset Control

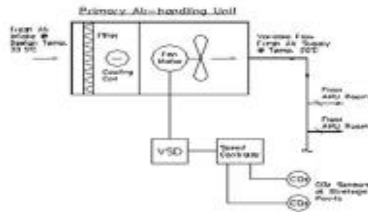
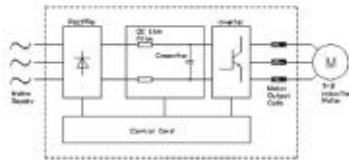
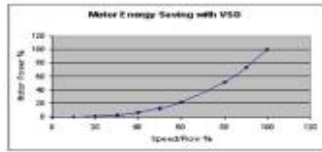
可變風量空調系統的
靜壓重調控制



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Energy Management Opportunities

VSD Application



Variable Flow Control for Condensing Water Pumps

冷卻水泵：
可變流量控制



機電工程署
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Predictive System Curve Control for Secondary Chilled Water Pumps

次級冷凍水泵：
預測系統曲線控制



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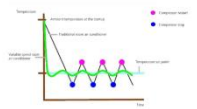
Application of Physical Scale Prevention Technologies for Chiller Condenser



物理阻水技術用於
冷凍機冷凝器的應用

機電工程署
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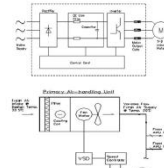
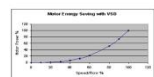
Variable Speed Room Air Conditioner



Annual energy savings up to 30%

Variable Speed Room Air Conditioner	Technical Reasons for Cost-savings
1. Variable speed compressor speed control technology can be applied to reduce the power consumption of the compressor.	Variable speed compressor which is operated at optimal speed can reduce the power consumption of the compressor.
2. Compressor speed control technology can be applied to reduce the power consumption of the compressor.	Compressor speed control technology can be applied to reduce the power consumption of the compressor.
3. Variable speed fan speed control technology can be applied to reduce the power consumption of the fan.	Variable speed fan speed control technology can be applied to reduce the power consumption of the fan.
4. Variable speed fan speed control technology can be applied to reduce the power consumption of the fan.	Variable speed fan speed control technology can be applied to reduce the power consumption of the fan.
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VSD Application



Variable Flow Control for Condensing Water Pumps

冷卻水泵：
可變流量控制



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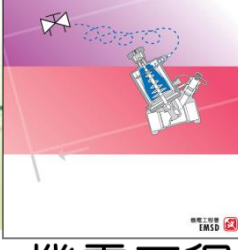


Predictive System Curve Control for
Secondary Chilled Water Pumps
次級冷凍水泵：
預測系統曲線控制

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Total Hydraulic Balancing in Chilled Water System

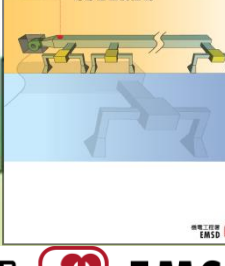
空調冷凍水系統的
全面水力平衡



機電工程署
EMSD

VAV System Static Pressure Reset Control

可變風量空調系統的
靜壓重調控制



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EMSD

Energy Management Opportunities

(EMO)

- Control
-
- Retrofit
- Air-conditioning
- Assessment
- EMS
-
-

Total Hydronic Balancing in Chilled Water System

空調冷凍水系統的全面水力平衡

機電工程署 EMSD

VAV System Static Pressure Reset Control

可變風量空調系統的靜壓重調控制

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減少 備用狀態 耗能

Reducing Standby Power Consumption

機電工程署 EMSD

Task Lighting Design

工作照明設計

機電工程署 EMSD

VAV System Static Pressure Reset Control

可變風量空調系統的靜壓重調控制

機電工程署 EMSD

Application of Physical Scale Prevention Technologies for Chiller Condenser

物理阻水板技術於冷凍機冷凝器的應用

機電工程署 EMSD

Annual energy savings up to 30%

Variable Speed Fan Air Conditioner	Statistical Issues for Condenser
1. Fan speed control (variable speed compressor) for reducing energy consumption and air flow resistance and pressure drop in condenser coil.	1. Fan speed control (variable speed compressor) which is operated at lower temperature.
2. Condenser fan speed control.	2. Condenser fan speed control.
3. Fan speed control (variable speed compressor) for reducing energy consumption and air flow resistance and pressure drop in condenser coil.	3. Fan speed control (variable speed compressor) which is operated at lower temperature.
4. Condenser fan speed control (variable speed compressor) for reducing energy consumption and air flow resistance and pressure drop in condenser coil.	4. Condenser fan speed control (variable speed compressor) which is operated at lower temperature.

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Variable Flow Control for Condensing Water Pumps

卸水泵：可變流量控制

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Variable Flow Control for Condensing Water Pumps

卸水泵：可變流量控制

機電工程署 EMSD

Practical System Curve Control for Secondary Chilled Water Pumps

次級冷凍水泵：實際系統曲線控制

機電工程署 EMSD

Total Hydronic Balancing in Chilled Water System

空調冷凍水系統的全面水力平衡

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Energy Management Opportunities (EMO)



EMOs
illumination, unnecessary operational hours

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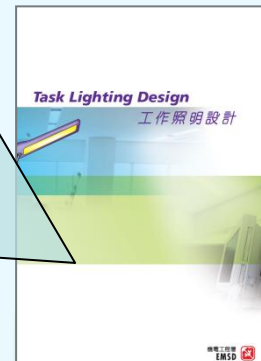
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Variable Speed Room Air Conditioner

Annual energy savings up to 30%

Variable Speed Room Air Conditioner	Standard Room Air Conditioner
1. Variable speed compressor control technology can adjust compressor speed according to load and temperature.	Standard compressor control technology is operated at constant speed, which is causing energy waste and high temperature.
2. Compressor speed control technology can adjust compressor speed according to load and temperature.	Standard compressor control technology is operated at constant speed, which is causing energy waste and high temperature.
3. Variable speed fan control technology can adjust fan speed according to load and temperature.	Standard fan control technology is operated at constant speed, which is causing energy waste and high temperature.
4. Variable speed fan control technology can adjust fan speed according to load and temperature.	Standard fan control technology is operated at constant speed, which is causing energy waste and high temperature.

VSD Application

Motor Energy Savings with VSD

Variable Flow for Condensers

Financing in Water System

VAV System Static Pressure Reset Control

Thank You

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