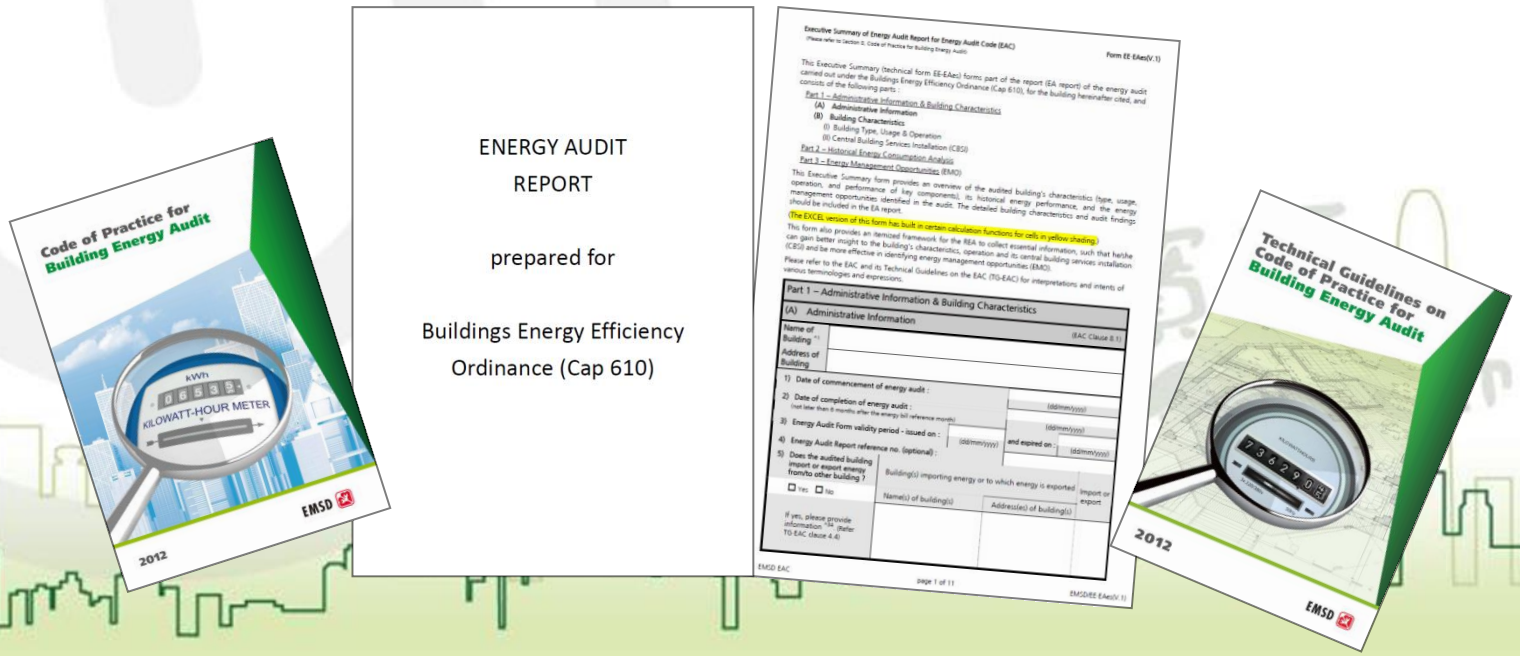
Completing of Executive Summary Form EE-EAes (V.1)



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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 BEEO 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:	☐ Cool air ☑ Chilled water ☐ Condenser water ☐ 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).)

Operation characteristics / Major usage	% 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) :

CBSI served Categorized major usages / Operation characteristics		Norm ^17 of operation: General or 24-hour	Norm ^17 of operation: AC or non-AC	%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]: 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%			
			Non-AC	4.1%	55	6	61
		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%	60	7	67
		24-hour	AC	0.8%	120	48	168
			Non-AC	0.6%	120	48	168
(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%			
			Non-AC	2.7%	120	48	168
(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 m^2 restaurant not to be included in sub-item (d)

(Sub-items numbering match coloured rows a(i) a(ii) b(i) b(ii) c e in slide 3)

EMSD

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% for office floors		25% for shopping & leisure floors			50% 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)	☑ Chilled water AHU (VAV/CAV) ☑ Chilled water FCU ☐ Unitary air-conditioner ☐ 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/m^2) [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	

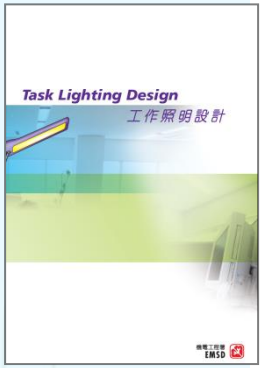
- Can work out kW motor power per unit internal floor area

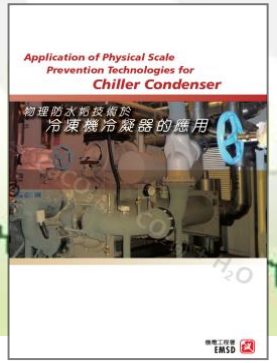
Part 2 – Historical Energy Consumption Analysis[^29]				(EAC Clause 8.1(g))
1) Annual electricity consumptiuon of last 36-month (kWh/annum) (EAC Clause 8.1(g)ii))		5,476,500 (kWh/annum) Past 1st 12-month	5,640,795 (kWh/annum) Past 2nd 12-month	5,750,325 (kWh/annum) Past 3rd 12-month
2) Annual consumption of energy[^30] other than electricity, of last 36-month (MJ/annum) (EAC Clause 8.1(g)ii))		0 (MJ/annum) Past 1st 12-month	0 (MJ/annum) Past 2nd 12-month	0 (MJ/annum) Past 3rd 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 (MJ/annum) Past 1st 12-month	20,306,862 (MJ/annum) Past 2nd 12-month	20,701,170 (MJ/annum) Past 3rd 12-month
4) Annual Energy Utilisation Index (EUI) of last 36-month (MJ/m^2/annum)[^27E] (EAC Clause 8.1(g)ii)) (kWh/m^2/annum can be obtained by dividing the MJ/m^2/annum figure by 3.6)		540 (MJ/m^2/annum) Past 1st 12-month	556.2 (MJ/m^2/annum) Past 2nd 12-month	567 (MJ/m^2/annum) Past 3rd 12-month
5) Monthly EUI of past 1st 12-month period (MJ/m^2/month) (EAC Clause 8.1(g)iii))	48.6 (1st month)	51.3 (2nd month)	54.0 (3rd month)	58.1 (4th month)
	54.0 (5th month)	50.0 (6th month)	45.9 (7th month)	35.1 (8th month)
	36.5 (9th month)	33.8 (10th month)	33.8 (11th month)	39.2 (12th month[^31])
6) Annual energy consumption breakdown, of past 1st 12-month period (MJ/annum) (EAC Clause 8.1(g)iv))	12,223,548.0 Air-conditioning[^32]	2,385,563.4 Lighting	1,441,787.2 Lift & Escalator	3,664,501.4 Others[^33]
7) Energy supply from CBSI to building's units, as a percentage of the total energy consumption of past 1st 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 12th month of item 5) ending on				16/4/2013 (dd/mm/yyyy)

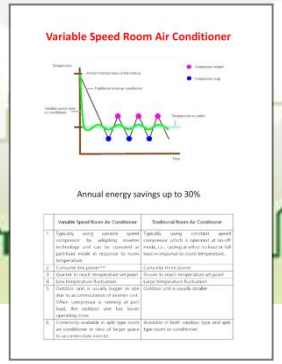
- 12-month profile [item 5)] – summer high & winter low, 12th month being the energy bill reference month [item 8)]
- Energy consumption breakdown [item 6)] (TG-EAC)
- Energy supply to units [item 7)] (TG-EAC) – e.g. in form of chilled water

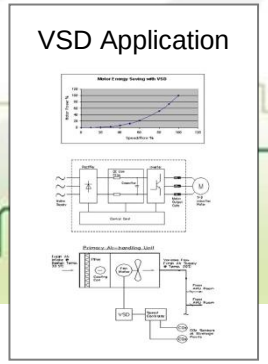
Energy Management Opportunities (EMO)

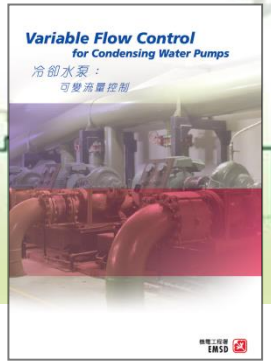
- Contribution of Cat I EMOs
  - Over cooling, over illumination, unnecessary operational hours
- Retro-commissioning backed by findings
- Air-conditioning part load energy savings
- Assess EMO with due regard to sustainable development
- EMSD publications on energy saving measures
  - http://www.emsd.gov.hk/emsd/eng/pee/aest_pub.shtml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

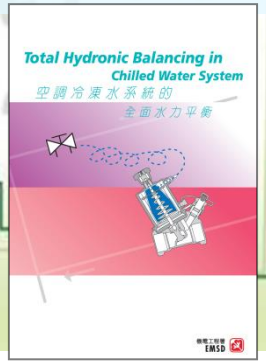












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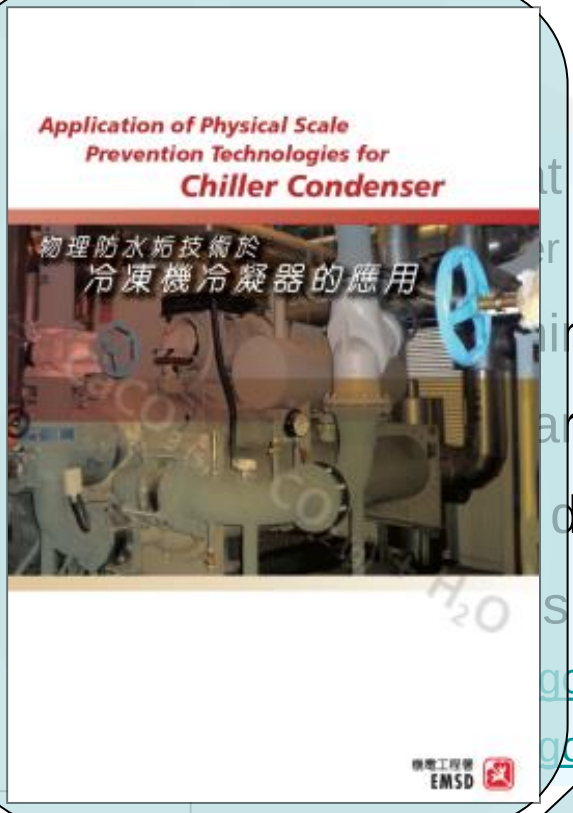
Energy Management Opportunities (EMO



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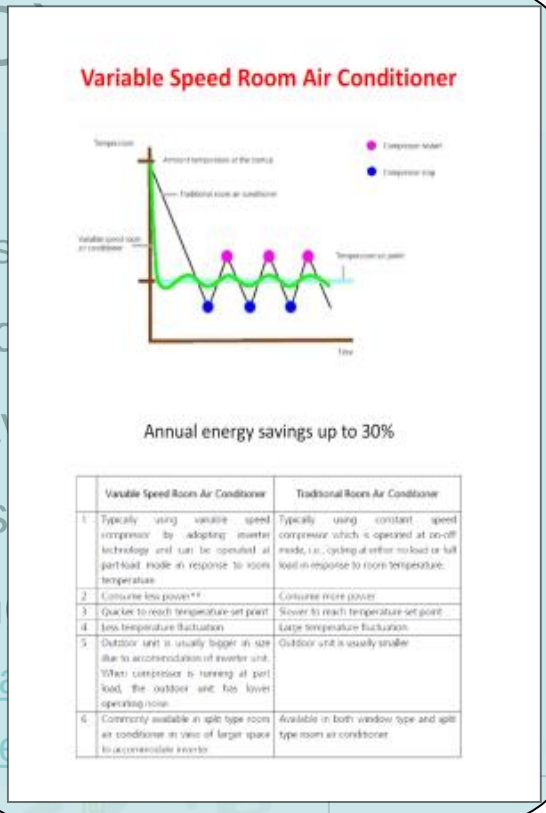
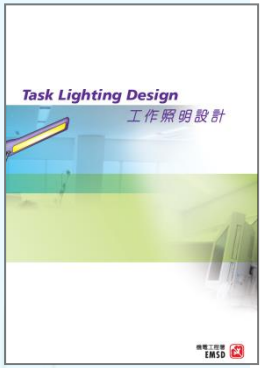
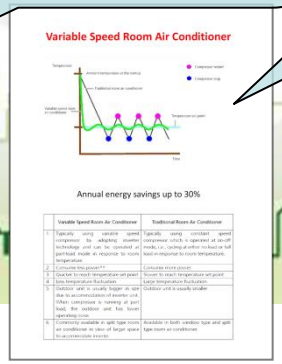
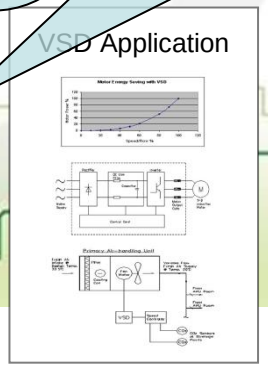
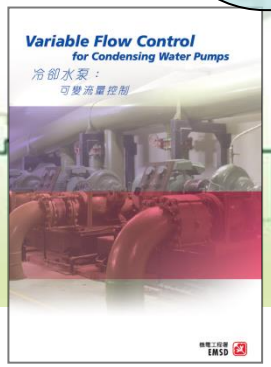


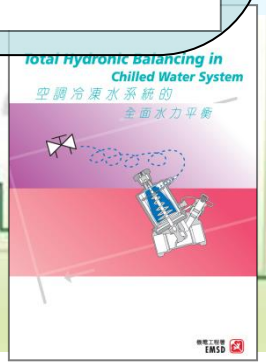




VSD Application







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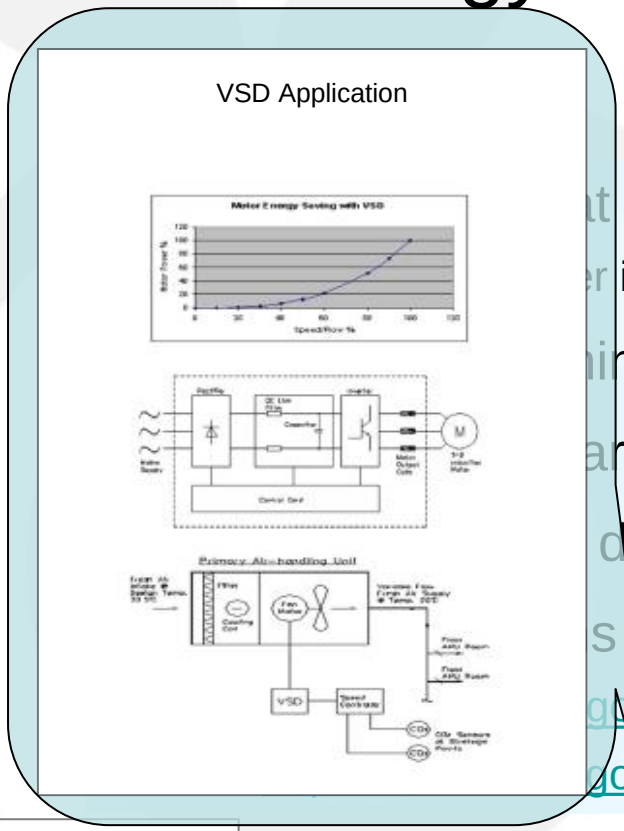
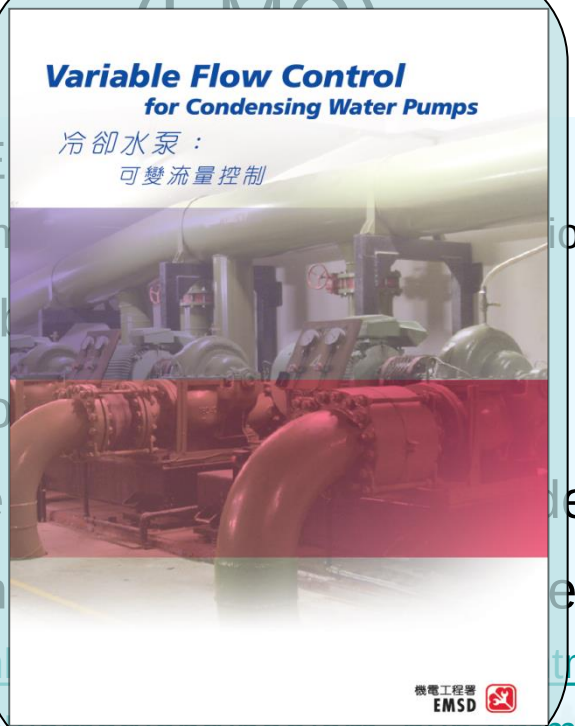
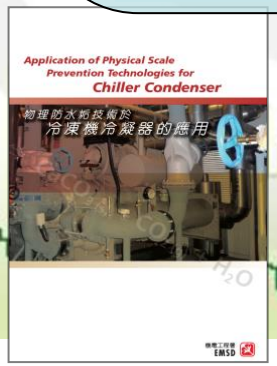
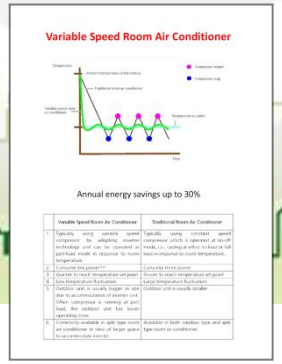
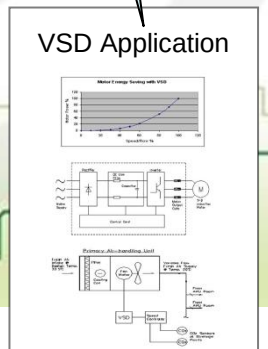
Energy Management Opportunities

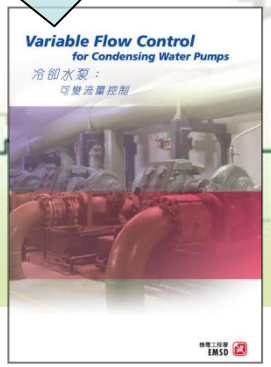


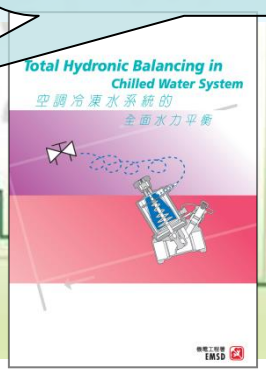












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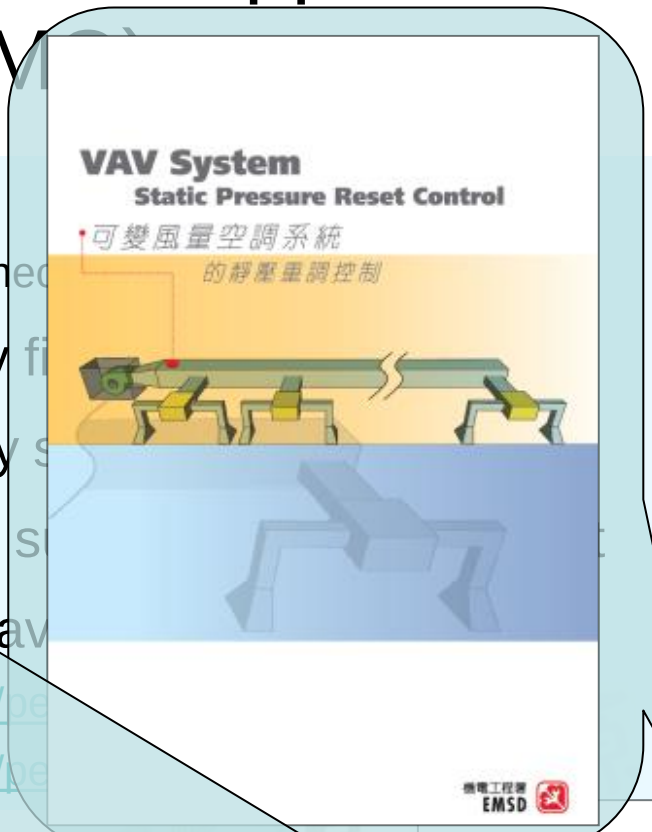

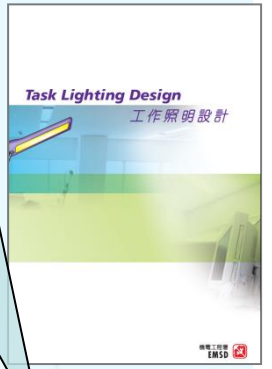

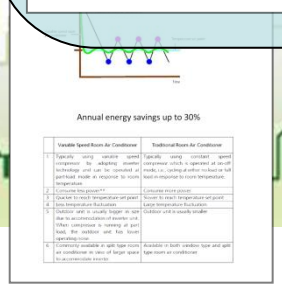

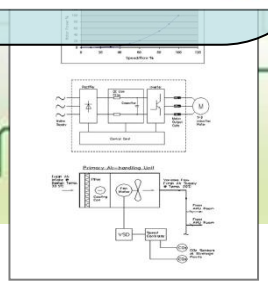

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Energy Management Opportunities (EMO)

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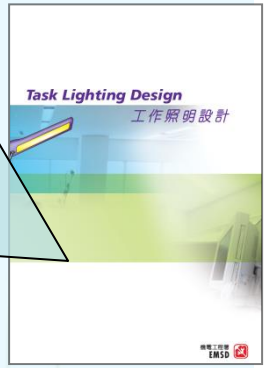

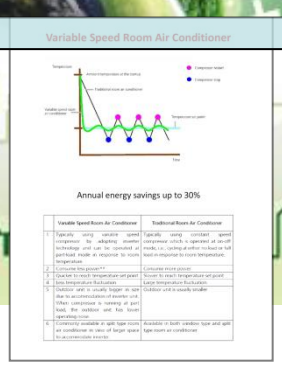

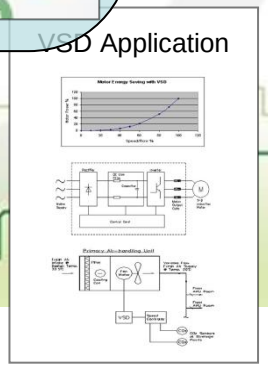

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Thank You

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