Seminar on

CP 13 : 1999 Code of Practice for Mechanical Ventilation and Air-conditioning in Buildings

Organised by :
Institution of Engineers Singapore
and
ASHRAE Singapore Chapter

Date : Friday, 30 March 2001

Time : 8.30 a.m. – 5.30 p.m.

Venue : RELC

Co-ordinator : Mr Leong Cheng Wee

Speakers : A/Prof Bong Tet Yin
A/Prof Wong Yew Wah

Fees * :
S$230.00 (IES/ASHRAE Singapore Chapter Members)
S$280.00 (Non-members)

30 MARCH 2001 (FRIDAY)

PROGRAMME FOR THE DAY

TIME	EVENTS
8.30 – 9.00 A.M.	REGISTRATION
9.00 – 10.30 A.M.	LECTURE BY A/PROF BONG TET YIN
10.30 – 11.00 A.M.	BREAK
11.00 A.M. – 12.30 P.M.	LECTURE BY A/PROF WONG YEW WAH
12.30 – 14.00 P.M.	LUNCH
14.00 – 15.30 P.M.	LECTURE BY A/PROF BONG TET YIN
15.30 – 16.00 P.M.	BREAK
16.30 – 17.00 P.M.	LECTURE BY A/PROF WONG YEW WAH
17.00 – 17.30 P.M.	Q & A SESSION

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** 5 % Discount will be given to companies that send 3 or more participants.*

Course Outline

The seminar will provide an insight to the intent of the clauses in the code and its interpretation. A comparison with the changes, new and revisions, introduced in the present version against those in the 1982 version will be made.

1. Introduction to CP13:1999, objectives, background and references.
2. Ventilation rates and air intakes locations.
3. MV systems in car-parks, kitchens, bathrooms, exits, fire-fighting lobbies, generator rooms, and FCCs.
4. Pressurization systems for stairs, internal corridors, and mechanical smoke ventilation in basement occupancies.
5. Engineered smoke control systems.
6. General requirements for air-conditioning design. Need for cooling load calculation and part load operation.
7. Indoor thermal environment, air quality, air purging and filtration.
8. Controls, air handling systems, and mechanical plants.
9. Ductwork design requirements, fire precautions and fire dampers, construction.
10. General requirements for pipework. And electrical installations.
11. Energy auditing facilities.
12. Design for maintainability, personnel safety and accessibility.

CV of Speakers

Assoc Prof Bong Tet Yin

Dr Bong Tet Yin is Associate Professor in the School of Mechanical and Production Engineering, Nanyang Technological University. For many years, he was head of Thermodynamics and Heat Transfer Division in NUS. His areas of research are in ventilation and air-conditioning. He chaired the working group on the review of CP13:1999. He is a fellow of IES and served as a member of the IES council. He is a fellow of ASHRAE and a past president of the ASHRAE Singapore Chapter.

Assoc Prof Wong Yew Wah

Mr Wong Yew Wah is Associate Professor in the School of Mechanical and Production Engineering, Nanyang Technological University. He is a member in the CP13:1999 review working group. His areas of research include ventilation, building energy performance and energy simulation. He is a member of IES and ASHRAE and a past president of ASHRAE Singapore Chapter. He is currently the Vice Chair for Technical Energy and Government Activities in ASHRAE Region 13.

Registration Form

Seminar on CP 13

☐ I would like to purchase _____copy/copies of CP 13 at $52.00 per copy.

Name : _____ Designation : _____

Company : _____

Address : _____

_____ Postal Code : _____

Tel : _____ Fax : _____

Email : _____

IES/ASHRAE Singapore Chapter Membership: YES/NO M'ship No.:_____

Contact Person : _____ Designation : _____

Tel : _____ Fax : _____

Email : _____

Date : _____ Signature : _____

Please made cheque payable to : ***"Institution of Engineers, Singapore "***

For enquiries, please contact Jenny : jenny@iesnet.org.sg/Derek : derek@iesnet.org.sg

*IES Address : **70 Bukit Tinggi Road, Singapore 289758 Tel : 4695000 Fax : 4671108***

IES

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NO:	NAME:	COMPANY:	ADDRESS:		MEMBER:	MEMBERSHIP NO:
1	GAN CHIEW MONG CONSTRUCTION MANAGER		BLK 628 #06-120 HOUGANG AVE 8 SINGAPORE 2898034	TEL: FAX: 2898034	☑	19970453M
2	LOH KOK KWAI M&E ENGINEER		BLK 507D WELLINTON CIRCLE #11-96 SINGAPORE 754507	TEL: 7595561 FAX:	☑	19910563G
3	NG ENG JIN		9 JLN MERANTI TMN MELODIES 80250 JOHOR BAHRU	TEL: 607-3332448 FAX:	☑	19900052G
4	CHOO GIN SIAH	3MECH TECHNOLOGY PTE LTD	23 GREENLEAF AVE SINGAPORE 279604	TEL: 4626019 FAX: 4667361	☐	
5	TAN BOON HOCK MANAGING DIRECTOR	3MECH TECHNOLOGY PTE LTD	23 GREENLEAF AVE SINGAPORE 279604	TEL: 4626019 FAX: 4667361	☑	19810125M
6	LOH ANDREW DIRECTOR	ALPHA CONSULTING ENGINEERS PTE LTD	2 ALEXANDRA ROAD #03-03 DELTA HOUSE SINGAPORE 159919	TEL: 3758912 FAX: 2769929	☑	19800058M
7	TEO CHOR KOK DIRECTOR	AMEGA ASIA PTE LTD	451 JOO CHIAT ROAD SINGAPORE 427664	TEL: 3443390 FAX: 3440336	☑	

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8	TAN YAN KIAT PARTNER	BELMACS CONSULTING ENGINEER	156 CECIL STREET #08-02 FAR EASTERN BANK BUILDING SINGAPORE 069544	TEL: 2256118 FAX: 2253923	☑	19810049M
9	ABHAY N PIMPALKHARA SNR. ENGINEER	BESCON CONSULTING ENGINEERS PTE	26 HORNE ROAD #02-00 BH BLDG SINGAPORE 209062	TEL: 2932611 FAX: 2931126	☐	
10	YAP ROY M&E ENGINEER	BESCON CONSULTING ENGINEERS PTE	26 HORNE ROAD #02-00 BH BLDG SINGAPORE 209062	TEL: 2932611 FAX: 2931126	☐	
11	YEAP YAU YEN LARRY PROJECT MANAGER	BOVIS LEND LEASE PTE LTD	510 THOMSON ROAD SLF BLDG #06-01 SINGAPORE 298135	TEL: 2588777 FAX: 2596677	☑	
12	TAN ROY MD	BRASMO ASIA PTE LTD	66 TANNERY LANE #03-04 SINDO BUILDING SINGAPORE 347805	TEL: 7478233 FAX: 7479233	☑	
13	CHONG BAK PENG PRINCIPAL CONSULTANTS	CALVARY PROJECTS & CONSULTANCY	BLK 118 BUKIT BATOK WEST AVE 6 #03-276 SINGAPORE 650118	TEL: 8972607 FAX: 5632643	☑	19960603M
14	CHUA CHWEE HONG MAY PROPERTY MANAGEMENT EXECUTIVE	CASUARINA PROPERTIES PTE LTD	65 CHULIA STREET #45-01 OCBC CENTRE SINGAPORE 049513	TEL: 2360208 FAX: 5355217	☐	

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15	GOH LAY HUI PROJECT ENGINEER	CHIYODA SINGAPORE (PTE) LIMITED	14 INTERNATIONAL BUSINESS PARK JURONG EAST SINGAPORE 609922	TEL: 5633488 FAX: 5675231	☐	
16	MARIO S. RAGMA JR. MECHNICAL ENGINEER	CHIYODA SINGAPORE (PTE) LIMITED	14 INTERNATIONAL BUSINESS PARK JURONG EAST SINGAPORE 609922	TEL: 5633488 FAX: 5675231	☐	
17	WONG HAI SOON MECHNICAL ENGINEER	CHIYODA SINGAPORE (PTE) LIMITED	14 INTERNATIONAL BUSINESS PARK JURONG EAST SINGAPORE 609922	TEL: 5633488 FAX: 5675231	☐	
18	ABDUL RAZAAK SYED MUBARAK CUSTOMER SERVICE ENGINEER	COMFORT MANAGEMENT PTE LTD	NO. 9 LITTLE ROAD 7TH STOREY OFF UPPER PAYA LEBAR ROAD SINGAPORE 536985	TEL: 4871189 FAX: 3448580	☐	
19	ANTONIO MUCI CUSTOMER SERVICE ENGINEER	COMFORT MANAGEMENT PTE LTD	NO. 9 LITTLE ROAD 7TH STOREY OFF UPPER PAYA LEBAR ROAD SINGAPORE 536985	TEL: 4871189 FAX: 3448580	☐	
20	CHOW CODY CUSTOMER SERVICE ENGINEER	COMFORT MANAGEMENT PTE LTD	NO. 9 LITTLE ROAD 7TH STOREY OFF UPPER PAYA LEBAR ROAD SINGAPORE 536985	TEL: 4871189 FAX: 3448580	☐	
21	CHUA CHERYL SALES EXECUTIVE	CSR SOUTH EAST ASIA PTE LTD	8 TUAS AVENUE 2 SINGAPORE 639448	TEL: 8614722 FAX: 8623533	☐	

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22	SEOW PETER SALES MANAGER	CSR SOUTH EAST ASIA PTE LTD	8 TUAS AVENUE 2 SINGAPORE 639448	TEL: 8614722 FAX: 8623533	☐	
23	SIN CHRISTINA SALES EXECUTIVE	CSR SOUTH EAST ASIA PTE LTD	8 TUAS AVENUE 2 SINGAPORE 639448	TEL: 8614722 FAX: 8623533	☐	
24	NG POH SWEE PROJECT OFFICER	DEFENCE SCIENCE & TECHNOLOGY AGENCY	1 DEPOT ROAD DEFENCE TECHNOLOGY TOWERS #03-01J SINGAPORE 109679	TEL: 3732103 FAX: 3732141	☐	
25	SANJEET S. SANDHU ASSOCIATE	DONNELLEY SIMPSON CLEARY & OEHLERS	80 RAFFLES PLACE #26-20 UOB PLAZA 2 SINGAPORE 048624	TEL: 2160022 FAX: 2160020	☑	19950703M
26	WONG KIN YAN GROUP SNR. MANAGER	GLENEAGLES TECHNOLOGIES SERVICES	30 BIDEFORD ROAD #05-00 THONG SIA BLDG SINGAPORE 229922	TEL: 7960048 FAX: 7960066	☑	19850041M
27	AHMAD HUSAINI B HASHIM TECH OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
28	CHEW NGAN JEE HG TECH. OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	

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29	CHIA CHING SAI HG TECH. OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
30	CHIEW JOHHNY HG TECH. OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
31	GOH PENG WATT PRINCIPAL MECH. ENGINEER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☑	19820168M
32	HO THIAM TECK HG TECH. OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
33	KOH CHOON HORE EXECUTIVE MECH. ENGINEER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
34	LEE SANG TONG EXECUTIVE MECH. ENGINEER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
35	LEOW BENG KIAT MECH. ENGINEER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	

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36	LIM BOON LEONG TECH OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
37	ONG PUNG TINN HG TECH. OFFICER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
38	SIM BOON LENG EXECUTIVE MECH. ENGINEER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
39	WONG TAK MING DENIS SR. MECH. ENGINEER	HOUSING & DEVELOPMENT BOARD	HDB CENTRE ELECT & MECH ENGRG DEPT TOWER B 13TH STOREY 3451 JALAN BUKIT MERAH	TEL: 2797899 FAX: 2797914	☐	
40	SIEW YEE CHEONG PRINCIPAL CONSULTANT	INTEGRATED BUILDING CONSULTANTS	BLK 261 WATERLOO STREET #04-09 WATERLOO CENTRE SINGAPORE 180261	TEL: 3334211 FAX: 3334611	☑	19820117M
41	TAY LENG KEE ENGINEER	INTEGRATED BUILDING CONSULTANTS	BLK 261 WATERLOO STREET #04-09 WATERLOO CENTRE SINGAPORE 180261	TEL: 3334211 FAX: 3334611	☑	20000029G
42	HO HIN CHEONG THOMAS TECH. ENGINEERS	JINTECH TECHNOLOGY (S) P/L	48 TEBAN GARDEN ROAD SINGAPORE 600048	TEL: 8964324 FAX: 8964324	☑	

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43	CHUA LUI FONG DANIEL	JOHNSON CONTRLS (S) PTE LTD	NO.1 GENTING LANE #03-00 SINGAPORE 349544	TEL: 7480202 FAX: 7434420	☐	
44	ONG CHIANG HOON JACKY	JOHNSON CONTRLS (S) PTE LTD	NO.1 GENTING LANE #03-00 SINGAPORE 349544	TEL: 7480202 FAX: 7434420	☐	
45	SEE CHENG MING	JOHNSON CONTRLS (S) PTE LTD	NO.1 GENTING LANE #03-00 SINGAPORE 349544	TEL: 7480202 FAX: 7434420	☐	
46	WANG AIK LEAN ADRIAN	JOHNSON CONTRLS (S) PTE LTD	NO.1 GENTING LANE #03-00 SINGAPORE 349544	TEL: 7480202 FAX: 7434420	☑	19960082G
47	KHONG WENG FOOK MECHNICAL ENGINEER	JTC INTERNATIONAL (SINGAPORE) PTE LTD	8 JURONG TOWN HALL ROAD #08-00 THE JTC SUMMIT SINGAPORE 609434	TEL: 6652564 FAX: 5690963	☑	19950634M
48	TAN SIEW LUAN JASMINE EXECUTIVE DESIGNER	JTC INTERNATIONAL (SINGAPORE) PTE LTD	8 JURONG TOWN HALL ROAD #08-00 THE JTC SUMMIT SINGAPORE 609434	TEL: 6652564 FAX: 5690963	☐	
49	LI JUN ENGINEER	JUANTARA CONSULTANT	1 SOPHIA ROAD #07-30 PEACE CENTRE SINGAPORE 228149	TEL: 3331822 FAX: 3331200	☐	

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50	ONG CHUAN HOCK SENIOR PRINCIPAL ENGINEER	JURONG TOWN CORPORATION	8 JURONG TOWN HALL ROAD SINGAPORE 609434	TEL: 8833712 FAX: 8855909	☑	19970281M
51	ROSMAN B JERLANIE ATE	JURONG TOWN CORPORATION	8 JURONG TOWN HALL ROAD SINGAPORE 609434	TEL: 8833353 FAX: 8855896	☐	
52	TOH GEE BING TE	JURONG TOWN CORPORATION	8 JURONG TOWN HALL ROAD SINGAPORE 609434	TEL: 8833353 FAX: 8855896	☐	
53	YEO ENG KWEE VINCENT TECHNICAL EXECUTIVE	JURONG TOWN CORPORATION	8 JURONG TOWN HALL ROAD SINGAPORE 609434	TEL: 8833351 FAX: 8855896	☐	
54	TAN YONG KENG MANAGING DIRECTOR	KENYON ENGINEERING PTE LTD	1 LOYANG WAY 6 SINGAPORE 507076	TEL: 5428667 FAX: 5428669	☑	19700130M
55	WANG XIN ENGINEER	KENYON ENGINEERING PTE LTD	1 LOYANG WAY 6 SINGAPORE 507076	TEL: 5428667 FAX: 5428669	☐	
56	TEO KAY GIN PRINCIPAL	KSEVEN ENGINEERING AND TECHNICAL SERVICES	7500A BEACH ROAD #04-311 THE PLAZA SINGAPORE 199591	TEL: 2943648 FAX: 2996335	☑	19750069M

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57	AHMAD EFFENDI TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
58	ANG LAY KENG TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
59	CHENG CHIT SIONG SENIOR ENGINEER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
60	CHNG PECK NANG HIGHER TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
61	HERWAN MOHAMAD SALLEH TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
62	LING LEONG SING TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
63	MOHAMED FAIRUZ B A MUTALID TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	

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64	MOHAMED NAZARUDIN TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
65	MOHD SHAHRIL MOHD ATAN PROJECT ENGINEER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
66	MUHAMMED FARDIN TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
67	NEO PHIL PROJECT ENGINEER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
68	NG KELVIN TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
69	ONG POH AIK TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
71	SIM VINCENT TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	

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72	TEO ENG KWANG SENIOR TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
73	THO GEOK KIOW TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
74	VIJAYAN GOPALAN SENIOR TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
75	WONG SIEW HENG SYSTEMS ENGINEER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
76	WONG YAN KIT HIGHER TECHNICAL OFFICER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
77	YEW ENG TONG PROJECT ENGINEER	LAND TRANSPORT AUTHORITY	460 ALEXANDRA ROAD #28-00 PSA BUILDING SINGAPORE 119963	TEL: 3757246 FAX: 3777000	☐	
78	TAN CHOON HIN SENIOR ENGINEER	MINISTRY OF THE ENVIRONMENT	ENVIRONMENT BLDG 40 SCOTTS ROAD #14-00 SINGAPORE 228231	TEL: 7319598 FAX: 7350523	☑	19820142G

IES

EVENT TITLE: **SEMINAR ON CP13:1999 CODE OF PRACTICE FOR MECHANICAL VENTILATION AND AIR-CONDITIONING IN BUILDINGS**

CODE: 01CP13

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FEES FOR NON-MEMBERS: $280.00

VENUE: RELC

DATE: 30 MARCH 2001 (FRIDAY)

ORGANISED BY: IES AND ASHRAE SINGAPORE CHAPTER

CEC

NO:	NAME:	COMPANY:	ADDRESS:		MEMBER:	MEMBERSHIP NO:
79	WAH YUEN LONG DEPUTY CHIEF ENGINEER	MINISTRY OF THE ENVIRONMENT	ENVIRONMENT BLDG 40 SCOTTS ROAD #14-00 SINGAPORE 228231	TEL: 7319598 FAX: 7350523	☐	
80	YAHYA ABDUL GHANI DEPUTY CHIEF ENGINEER	MINISTRY OF THE ENVIRONMENT	ENVIRONMENT BLDG 40 SCOTTS ROAD #14-00 SINGAPORE 228231	TEL: 7319598 FAX: 7350523	☐	
81	PHUA KIA JUAN SNR. ESTATE OFFICER	NANYANG TECHNOLOGICAL UNIVERSITY	PERSONNEL OFFICE ADMINISTRATION BLDG, LEVEL 4 50 NANYANG AVE SINGAPORE 639798	TEL: 7904676 FAX: 7919340	☐	
82	QUEK TING KOK SENIOR ESTATE OFFICER	NANYANG TECHNOLOGICAL UNIVERSITY	PERSONNEL OFFICE ADMINISTRATION BLDG, LEVEL 4 50 NANYANG AVE SINGAPORE 639798	TEL: 7904676 FAX: 7919340	☐	
83	MOHD AZMAN BIN SAIM ESTATE OFFICE/HIGHER TECHNICIAN	NANYANG TECHNOLOGY UNVERSITY	ADMINISTRATION BUILDING LEVEL 4 50 NANYANG AVENUE SINGAPORE 639798	TEL: 7911744 FAX: 7919340	☐	
84	PEI SWEE HENG TECHNICAL SUPPORT OFFICER	NATIONAL UNIVERSITY OF SINGAPORE	OFF. OF ESTATE & DEVELOPMENT 2 ESTATE OFFICE DRIVE #02-04 SINGAPORE 117587	TEL: 8743027 FAX: 7786031	☐	
85	TAN KOK YONG TECHNICAL SUPPORT OFFICER	NATIONAL UNIVERSITY OF SINGAPORE	OFF. OF ESTATE & DEVELOPMENT 2 ESTATE OFFICE DRIVE #02-04 SINGAPORE 117587	TEL: 8743027 FAX: 7786031	☐	

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86	TAN MING CHENG TECHNICAL SUPPORT OFFICER	NATIONAL UNIVERSITY OF SINGAPORE	OFF. OF ESTATE & DEVELOPMENT 2 ESTATE OFFICE DRIVE #02-04 SINGAPORE 117587	TEL: 8743027 FAX: 7786031	☐	
87	TAN YAT SENG TECHNICAL SUPPORT OFFICER	NATIONAL UNIVERSITY OF SINGAPORE	OFF. OF ESTATE & DEVELOPMENT 2 ESTATE OFFICE DRIVE #02-04 SINGAPORE 117587	TEL: 8743027 FAX: 7786031	☐	
88	WOON SAN HAW TECHNICAL SUPPORT OFFICER	NATIONAL UNIVERSITY OF SINGAPORE	OFF. OF ESTATE & DEVELOPMENT 2 ESTATE OFFICE DRIVE #02-04 SINGAPORE 117587	TEL: 8743027 FAX: 7786031	☐	
89	FOO CHUAN SEN PROJECT ENGINEER	NYLECT ENGINEERING PTE LTD	NYLECT IND. BLDG. NO. 1 WOODLANDS SECTOR 1 SINGAPORE 738309	TEL: 7514187 FAX: 7599562	☐	
70	TOON CHIN CHUAN PROJECT MANAGER	PM-B PTE LTD	159 SIN MING ROAD #04-05 AMTECH BUILDING SINGAPORE 575625	TEL: 5503828 FAX: 5531107	☑	
90	SOON ANG KOH DIRECTOR	PROVAC INTERNATIONAL PTE LTD	BLK 155 KALLANG WAY #07-25/26 KOLAM AYER INDUSTRIAL PARK SINGAPORE 349244	TEL: 2988888 FAX: 2920898	☑	
91	GOH CHONG KEONG WILLIAM VP(M&E)	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☑	

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92	LIM CHIN HUAT PRINCIPAL ENGINEER	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574010 FAX: 3574188	☐	
93	NAH CHAI ME ELAINE TECHNICAL ASSOCIATE	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☐	
94	ONG LIN MIN MECHANICAL ENGINEER	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☐	
95	ROGAYAH BINTE HUSSIAN TECHNICAL ASSOCIATE	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☐	
96	SIOW KIAT LAN ENGINEERING ASSISTANT	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☐	
97	TAN KAY HUAT TECHNICAL ASSOCIATE	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574010 FAX: 3574188	☐	
98	TAN PEI LIAN CELIA MECHANICAL ENGINEER	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☐	

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99	TAN SHAN ENGINEER	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574010 FAX: 3574188	☐	
100	TOH CHOON HEOK TECHNICAL ASSOCIATE (MECHANICAL)	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574033 FAX: 3574188	☐	
101	ZHANG YONG WEI MECHANICAL ENGINEER	PWD CONSULTANTS PTE LTD	238B THOMSON ROAD #17-00 NOVENA SQUARE TOWER B SINGAPORE 307685	TEL: 3574010 FAX: 3574188	☐	
102	FOONG KENG YUEN PATRICK EXECUTIVE DIRECTOR	PWD EMS PTE LTD	5 MAXWELL ROAD #12-00 TOWER BLK MND COMPLEX SINGAPORE 069110	TEL: 3258767 FAX: 3258881	☐	
103	KOH KWONG QUEE HUB MANAGER	PWD EMS PTE LTD	5 MAXWELL ROAD #12-00 TOWER BLK MND COMPLEX SINGAPORE 069110	TEL: 3258767 FAX: 3258881	☐	
104	NEO N. K. LIONEL SENIOR MANAGER	PWD EMS PTE LTD	5 MAXWELL ROAD #12-00 TOWER BLK MND COMPLEX SINGAPORE 069110	TEL: 3258767 FAX: 3258881	☐	
105	TAN KIAT LEONG GENERAL MANAGER	PWD EMS PTE LTD	5 MAXWELL ROAD #12-00 TOWER BLK MND COMPLEX SINGAPORE 069110	TEL: 3258767 FAX: 3258881	☐	

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106	TAY CHEW SEH PETER AREA MANAGER	PWD EMS PTE LTD	5 MAXWELL ROAD #12-00 TOWER BLK MND COMPLEX SINGAPORE 069110	TEL: 3258767 FAX: 3258881	☐	
107	LIM CHENG HONG SALES/MKTG MANAGER	R. GLAZEN SINGAPORE PTE LTD	NO. 5 HARRISON ROAD SINGAPORE 369645	TEL: 2819335 FAX: 2811189	☑	
108	TAN PECK KHOON DIRECTOR	RANKINE & HILL (S) PTE LTD	38 KIM TIAN ROAD #01-02 KIM TIAN PLAZA SINGAPORE 169262	TEL: 2789588 FAX: 2735290	☑	19810011M
109	KONG CHEE WAI ASSISTANT ENGINEER - MECHANICAL	ROTARY ENGINEERING LIMITED	17 TUAS AVENUE 20 SINGAPORE 638828	TEL: 8611155 FAX: 8619404	☐	
110	PHANG LOON HENG SENIOR MECHANICAL ENGINEER	ROTARY ENGINEERING LIMITED	17 TUAS AVENUE 20 SINGAPORE 638828	TEL: 8611155 FAX: 8619404	☐	
111	CHEN ZHE MAINTENANCE ENGINEER	ROTARY IMC PTE LTD	17 TUAS AVE 20 SINGAPORE 638828	TEL: 8611155 FAX: 8619404	☐	
112	CHEN ZHE MAINTENANCE ENGINEER	ROTARY IMC PTE LTD	17 TUAS AVE 20 SINGAPORE 638828	TEL: 8645109 FAX: 8619404	☐	

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NO:	NAME:	COMPANY:	ADDRESS:		MEMBER:	MEMBERSHIP NO:
113	CHAN WAI MUN M&E ENGINEER	SANTARLI CONSTRUCTION PTE LTD	531 YISHUN INDUSTRIAL PARK A SINGAPORE 768739	TEL: 8583388 FAX: 8520055	☐	
114	TEO KONG POON FACILITIES DIRECTOR	SEAGATE TECHNOLOGY INTERNATIONAL	16 WOODLANDS LOOP SINGAPORE 738340	TEL: 7515611 FAX: 7515988	☑	19790008F
115	NG CHOON YONG MANAGER	SEMBCORP PARKS MANAGEMENT PTE LTD	3 LIM TECK KIM ROAD #09-01 S'PORE TECHNOLOGIES BLDG SINGAPORE 088934	TEL: 3295822 FAX: 2219096	☑	1990032M
116	TAN YOK KHOON MANAGER	SEMBCORP PARKS MANAGEMENT PTE LTD	3 LIM TECK KIM ROAD #09-01 S'PORE TECHNOLOGIES BLDG SINGAPORE 088934	TEL: 3295822 FAX: 2219096	☐	
117	ONG SEOW PENG ASSISTANT ENGINEER	SINGAPORE MRT LTD	300 BISHAN ROAD BISHAN DEPOT SINGAPORE 579828	TEL: 5548062 FAX: 5528974	☑	IA
118	TAN JOCK TOON SIMON WORKS MANAGER	SINGAPORE MRT LTD	300 BISHAN ROAD SINGAPORE 579828	TEL: 5548062 FAX: 5528974	☑	IA
119	CHAN SUI KUEN TECHNICAL SUPPORT OFFICER	SINGAPORE POLYTECHNIC	C/O DEPT. OF HUMAN RESOURCE 500 DOVER ROAD SINGAPORE 139651	TEL: 7721686 FAX: 7721979	☐	

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120	CHUA WEI LEE ESTATES OFFICER	SINGAPORE POLYTECHNIC	C/O DEPT. OF HUMAN RESOURCE 500 DOVER ROAD SINGAPORE 139651	**TEL:** 7721686 **FAX:** 7721979	☐	
121	LIM SENG HONG PROJECT OFFICER	SINGAPORE POLYTECHNIC	C/O DEPT. OF HUMAN RESOURCE 500 DOVER ROAD SINGAPORE 139651	**TEL:** 7721686 **FAX:** 7721979	☐	
122	NGAN CHIANG THYE TECHNICAL SUPPORT OFFICER	SINGAPORE POLYTECHNIC	C/O DEPT. OF HUMAN RESOURCE 500 DOVER ROAD SINGAPORE 139651	**TEL:** 7721686 **FAX:** 7721979	☐	
123	RAEWYN YOGA RAJA TECHNICAL SUPPORT OFFICER	SINGAPORE POLYTECHNIC	C/O DEPT. OF HUMAN RESOURCE 500 DOVER ROAD SINGAPORE 139651	**TEL:** 7721686 **FAX:** 7721979	☐	
124	TEOH CHEE KIONG TECHNICAL EXECUTIVE	SINGAPORE PRODUCTIVITY AND STANDARDS BOARD	2 BUKIT MERAH CENTRAL PSB BUILDING SINGAPORE 159835	**TEL:** 2793340 **FAX:** 2745413	☐	
125	LAU JIN CHIANG ASSISTANT MANAGER	SINGAPORE TECHNOLOGIES ELECTRONICS LTD	NO.24 ANG MO KIO ST 65 SINGAPORE 569061	**TEL:** 4807704 **FAX:** 4821079	☐	
126	ONG HAI TIEN ENGINEER	SQUIRE MECH PTE LTD	51 BRAS SASAH ROAD #03-01/06 PLAZA BY THE PARK SINGAPORE 189554	**TEL:** 3346233 **FAX:** 3345948	☐	

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127	SIM MABEL ENGINEERING ASSISTANT	SQUIRE MECH PTE LTD	51 BRAS SASAH ROAD #03-01/06 PLAZA BY THE PARK SINGAPORE 189554	TEL: 3346233 FAX: 3345948	☐	
128	WONG DANIEL ENGINEER	SQUIRE MECH PTE LTD	51 BRAS SASAH ROAD #03-01/06 PLAZA BY THE PARK SINGAPORE 189554	TEL: 3346233 FAX: 3345948	☐	
129	LIM SAMUEL SNR. ENGINEER	ST ARCHITECTS & ENGINEERS PTE LTD	60 ADMIRALTY ROAD WEST #03-01 SINGAPORE 759947	TEL: 8497511 FAX: 7568036	☑	19920002M
130	LOY CHEE HIANG VP	ST ELECTRONICS PTE LTD	24 ANG MO KIO ST.65 SINGAPORE 563061	TEL: 4807750 FAX: 4848840	☑	19720045M
131	LOY TECK TONG MECHANICAL ENGINEER	TECHNOCON ENGINEERS (PTE)	200 JALAN SULTAN #09-05/08 TEXTILE CENTRE SINGAPORE 199018	TEL: 2929606 FAX: 2980415	☑	19960676M
132	ONG HUN KOK ANTHONY SENIOR MECHNICAL ENGINEER	TECHNOCON ENGINEERS (PTE)	200 JALAN SULTAN #09-05/08 TEXTILE CENTRE SINGAPORE 199018	TEL: 2929606 FAX: 2980415	☑	19920394G
133	THNG PHENG SOON PROJECT MANAGER	TUAN SING HOLDINGS	30 ROBINSON ROAD #12-00 ROBINSON TOWERS SINGAPORE 2279139	TEL: 3220175 FAX: 2279139	☑	19820040M

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134	LEE SING TUCK	URBAN REDEVELOPMENT AUTHORITY	45 MAXWELL ROAD THE URA CENTRE SINGAPORE 069118	**TEL:** 3293245 **FAX:** 2201595	☐	
135	TAN KOON CHWEE ADRIAN MAINTENANCE ENGINEER	VICOM LTD	385 SIN MING DRIVE SINGAPORE 575718	**TEL:** 4584555 **FAX:** 4581040	☐	
136	HO MUN WENG PROJECT ENGINEER	YORK INTERNATONAL PTE LTD	10 UPPER ALJUNIED LINK #08-00 YORK INTERNATIONAL INDUSTRIAL BUILDING SINGAPORE 367904	**TEL:** 4886703 **FAX:** 2843473	☑	
137	NG AI YEN PROJECT ENGINEER	YORK INTERNATONAL PTE LTD	10 UPPER ALJUNIED LINK #08-00 YORK INTERNATIONAL INDUSTRIAL BUILDING SINGAPORE 367904	**TEL:** 4886703 **FAX:** 2843473	☐	

SS CP13:1999

Seminar on

Code of Practice for Mechanical Ventilation and Air-conditioning in Buildings

Assoc Prof Bong Tet Yin
Assoc Prof Wong Yew Wah
School of MPE, NTU

Seminar objectives

- An insight to the intent of the clauses in code and its interpretation
- Comparison with the changes, new and revisions, from the 1989 version

Contents of Seminar (Part 1)

- Introduction, objectives, background & references
- Ventilation rates & air intake locations
- MV systems in car-parks, kitchens, etc
- General requirements for air-conditioning design
- Load calculations and part load operation
- Indoor thermal environment
- Air quality, purging, filtration
- Controls, AHUs and plants

Contents of Seminar (Part 2)

- MV issues related to fire safety considerations
- Engineered smoke control systems
- Design requirements for ducts and other air passages, fire precautions, fire dampers, and construction
- General requirements for pipe work, electrical installation, and equipment installation
- Energy auditing facilities
- Design for maintainability, personnel safety, and accessibility

Background

- CP13 was first published in 1980 with an amendment in 1982, and erratum issued in 1982 and 1983.
- It provides general guidance in the design, construction, installation, testing and commissioning, maintenance and operation of mechanical ventilation and air-conditioning systems.
- Review process began in August 1995.

Objectives of Review

- To update the CP, consolidating the different regulations, guidelines and other CPs relating to mechanical ventilation and air-conditioning.

Objectives of Review

- To provide general guidance in the design, construction, installation, testing and commissioning, maintenance and operation of mechanical ventilation and air-conditioning systems to meet the minimum requirement for indoor air quality, energy conservation, fire safety and maintainability.

Ventilation Rates for Comfort Air-conditioning

- An occupancy load as allowed in Fire Code is assumed.

(Table 1)	CP13:1980* m^3/h per m^2	CP13:1999 m^3/h per m^2
Restaurant	10	10
Dance halls	10	19
Offices	1.2	2.3
Classrooms	6.0	9.2

* from Building Regulations

Table 1

Type of building/occupancy	Min. outdoor air supply $L/s/m^2$ floor area	$m^3/h/m^2$ floor area
Restaurants	2.8	10
Dance Halls	5.3	19
Offices	0.65	2.3
Shops, supermarkets and department stores	1.00	3.6
Lobbies, concourses and corridors	0.25	0.9
Classrooms	2.6	9.2
Theatres and cinemas	2.0	7.3
Factories and workshops		
Light	1.2	4.3
Medium	0.7	2.6
High	0.35	1.3
Hotel guest rooms	15 L/s per room	54 m^3/h per room

→ from ASHRAE 62 (Hotel guese Room Ventilation)

Ventilation Rates for Comfort Air-conditioning

- The ventilation rate can be reduced down to 20% of the values in Table 5.1 when the indoor CO_2 level is 1000 ppm or less, but not less than 1.2 m^3/h per m^2 in office premises, classrooms, theaters and factories

Ventilation Rates for Mechanical Ventilation

(Table 2)	CP13:1980 ACH	CP13:1999 ACH
Restaurant	6	10
Car Parks	6	6*
CD shelters		16

* for high ceiling, the ACH can be calculated based on 2.5 m ceiling height.

Table 2

Type of building/occupancy	Min. outdoor air supply, ACH
Offices	6
Restaurants, canteens	10
Shops, supermarkets and department stores	6
Workshops, factories	6
Classrooms	8
Theatres and Cinemas	8
Lobbies, concourses, corridors, staircases, and exits	4
Toilets, bathrooms	10
Kitchens (commercial, institutional and industrial)	20
Car parks	6
Fire Command Centres	6
Civil Defence Shelters	16

Outdoor Air Intakes (additional requirements)

- Insect screen
- Protected from rain water
- Protected from water droplets from cooling tower
- At least 5 m away from any air discharge
- At least 2.1 m above floor level of busy thorough fare

Car parks

- Low Level Extraction:
  - 650 mm above finished floor, measured from the top of the grille (CP:13:1999)
  - 600 mm above finished floor(CP13:1980)
- When mechanical ventilation is provided with supply and exhaust, the exhaust rate should exceed the supply rate.

Car parks

- During period of low occupancy, the extraction rate can be reduce if the CO concentration < 25 ppm.
- The extraction fan can be switched off if the CO concentration < 9 ppm or at ambient level.

(a) ppm is per volume.

(b) location of sensor is not defined, to be determined by engineer

Car parks

- Table 3 : Mode of ventilation for aboveground car park
- (Please add at the bottom of the table: For fume extract, the extraction rate is 1.2 ACH.)

Size of ventilation opening (% of floor area)	Ventilation Mode (NV, MV or Fume extract)	
	Zone 'A'	Zone 'B'
20% A + 20% B	NV	Fume extract
20% A + 2% B	NV	MV without supply
20% A	NV	MV
2% A + 2% B	MV without supply	MV without supply
2% A	MV without supply	MV

Car parks

- Table 4 : Mode of ventilation for basement car park

Size of ventilation opening (% of floor area)	Ventilation Mode (MV or Fume extract)	
	Zone 'A'	Zone 'B'
20% A + 20% B	Fume extract	Fume extract
20% A + 2% B	Fume extract	MV without supply
20% A	Fume extract	MV
2% A + 2% B	MV without supply	MV without supply
2% A	MV without supply	MV

For 1st basement only.

Kitchens

- To be provided with 20 ACH (total) for ventilation
- Kitchen hood required for appliance heating capacity of 8 kW and above
- Exhaust flow rate:
  - Q = 1.4 x 2(L+W)H (CP13:1980) X√
  - Q = 1.4 x 2(L+W)H x F (CP13:1999) X√
  - F = 1.0 for heavy duty cooking
  - F = 0.7 for light duty cooking

(1.4 is the safety factor)

Air Conditioning Design

- The cooling load (sensible and latent) and ventilation load should be calculated.
- The system should be able to meet the indoor temperature and humidity requirements at full load, and at part load.

Air Conditioning Design

- Indoor relative humidity should not exceed 70% when the sensible cooling load is at half its design value.
- Design conditions:
  - Indoor: 23 - 25 °C, 55% - 65% rh
  - Outdoor: 32 °C db and 26 °C wb
- Design documentation should be kept.

2% of time it will exceed this outdoor condition.

Air Conditioning Design

- Actual indoor environment:
  - 22.5 C - 25.5 C
  - relative humidity not exceeding 70%
  - air movement not exceeding 0.25 m/s, measured at 1500 mm from the floor

RH 70% is average.

Purging of Indoor Air

- An air purging system should be provided in each air-conditioned floor.
- Capacity of exhaust fan higher than flow rate of incoming outdoor air.
- Air purging rate at 2 ACH minimum, to be discharged at least 5 m away from adjacent air intake.
- Existing fan for air-conditioning can be used for purging.

Air Filtration

- Outdoor air for ventilation should be filtered on entering a building. Filter efficiency: 60% arrestance or better.
- Re-circulated air (or mixed air) should be filtered. Filter efficiency: 80% arrestance or better.

To be filter first before mixing.

Air Filtration

- It should be possible to assess the filter condition and the pressure drop across it.
- For places with continuous occupancy, a secondary filter of 80% dust spot efficiency or better is recommended.

Air Filtration

- When the outdoor PSI exceeds 100 based on PM10 over 24 hours and no secondary filter is used:
  - further cleaning of the re-circulated air or mixed air of fine particles is recommended;
  - filtering the ventilation air with a filter having 80% dust spot efficiency can be assumed to meet the further cleaning requirement.

PM(10) → 10 micro or less particles.

Control

- The operation of an air-conditioning system should be controlled such that the use of energy is efficient.
- There should be a sufficient number of zones and each zone should have a thermostat.

Control

- There should at least be one thermostat in each air handler.
- It should be possible to reduce or shut off the cooling to each zone.

Air Handling Units

- AHUs should be equipped with control devices.
- Each cooling coil can only be 8-row deep maximum.
- When more than one coil are used, a space in between should be available for cleaning.

Air Handling Units

- Drainpipe should be provided with a U-bend, and there should be an air break between the drainpipe and the floor trap.
- When the fan is off, the condensate should drain out, and the flow of chilled water to the coil should stop.

To prevent water backflow from FT.

So that drain pan will be dry.

Air Handling Units

- The internal surface should be abrasion resistant.
- An air handler room should not be used as a storage space.

Plants

- Equipment and motor used should comply with CP24.
- Chillers should be able to operate properly over the full range of the cooling demand.
- Frequent surging or starting and stopping of the chillers should be avoided.

Plants

- Only non-CFC refrigerant is to be used.
- For safety requirements refer to ASHRAE Standard 15.

Plants (adopted from CP24:1983 Part2)

- Limit on total fan power:
  - for CAV system, not more than 0.47 W per m^3/h,
  - for VAV system, not more than 0.74 W per m^3/h.
- Limit on piping friction pressure loss:
  - not more than 4.0 m of water per 100 m of pipe.

Plants (adopted from CP24:1983:Part2)

- Limit on water transport factor:
  - Not less than 30 kW per kW pumping power.
- Recovery of energy for reuse is recommended.

> 30kW Cooling per kW of pumping power

Cooling Tower should be 40kW heat rejection per kW of pumping power

Contents of Seminar (Part 2)

- MV issues related to fire safety considerations
- Engineered smoke control systems
- Design requirements for ducts and other air passages, fire precautions, fire dampers, and construction
- General requirements for pipe work, electrical installation, and equipment Installation
- Energy auditing facilities
- Design for maintainability, personnel safety, and accessibility

Fire-related issues of MV - Car parks

- (Cross-referenced from 1997 Fire Code)
- Smoke Purging: 9 ACH are to be provided in basement car parks with floor area exceeding 1900 m^2.
- The duct should be of heavy gauge steel and can withstand 250 °C for 2 hours.

Fire-related issues of MV

- (Sections adopted from 1997 Fire Code)
  - Exits
  - Smoke-stop and fire fighting lobbies
  - Engine driven fire pump room and generator room
  - Fire command centre
  - Rooms involving use of flammable and explosive substances

Fire-related issues of MV

- (Sections adopted from 1997 Fire Code)
  - Pressurisation system for exit staircases
  - Pressurisation of internal corridors in hotels

overall 50 Pa higher than occupied space.

Basement occupancies (other than car-parks)

- (Sections adopted from 1997 Fire Code)
  - Smoke purging systems for plant and service areas
  - Engineered smoke control systems

Engineered smoke control systems

- (Sections adopted from 1997 Fire Code)
  - Natural or mechanical extraction
  - Reference:
    - BRE 186 - Design principles for smoke ventilation in enclosed shopping centres
    - BRE 258 - Design approaches for smoke control in atrium buildings

Air Handling Units

- (Cross-referenced from 1997 Fire Code)
  - A manual stop switch in the fan room is required for each air handler exceeding 8500 CMH in capacity, if it is not centrally controlled.
  - Fire dampers are needed in the air ducts, when serving more than one compartment.

Air Handling Units

- (Cross-referenced from 1997 Fire Code)
  - A smoke detector is needed in the return air stream, if the air handler serves more than one floor or compartment or if it supplies 15,000 CMH or more.
  - The smoke detector is to shut down the air handler.

Ductwork and other air passages

- (Sections adopted from 1997 Fire Code)
  - Design
  - Construction
  - Fire dampers

Pipework

- (Sections adopted from 1997 Fire Code)
  - Design

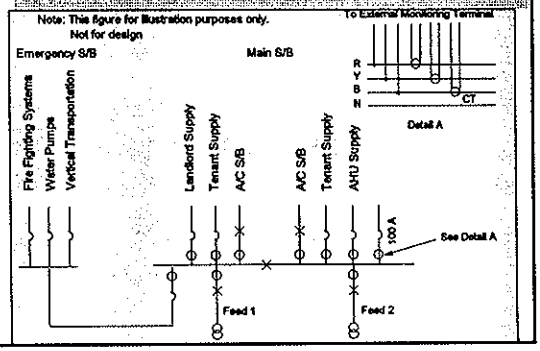
Electrical Work

- (Section adopted from 1997 Fire Code)
- Secondary source of power supply
- Power supply to essential services
- Motor and motor control
- Start-stop control

Electrical Work

- (Adopted from Building Control Regulations 1989)
- Offices, hotels and shops should have data logging facilities for energy auditing.
- There should be facilities to monitor all the incoming power supplies and sub-circuits serving the central air-conditioning system and major ventilation systems.

Electrical Work



Electrical Work

- (Adopted from Building Control Regulations 1989)
- There should be current and voltage taps at the panel meters on the switchboard for indicating incoming supply voltage and current, as well as outgoing supplies to systems.
- The monitoring system should be capable of making trend logs of electrical consumption of the systems.

Equipment Installation

- Heat rejection from air-cooled condensers in an air well should not cause the air intake temperature of an adjacent air-cooled condenser to rise by more than 3 °C.
- Each machine room shall have a refrigerant leak detector that can activate an alarm and exhaust fan.

Equipment Installation

- The exhaust fan should have a minimum capacity of :
  - $Q = 70 \times G^{0.5}$
  - Q = air flow rate, L/s
  - G = refrigerant mass in largest system, kg
- For naturally ventilated machine room, the minimum free opening
  - $F = 0.138 \times G^{0.5}$
  - F = free opening area, m^2

Space for Service Access

- All gauges should be easily readable and replaceable.
- All sensors should be easily accessible for re-calibration.
- Access panels should be provided for equipment and accessories concealed in ceiling space.

Space for Service Access

- There should be adequate space in air-conditioning plant room or equipment space for servicing shell-and-tubes heat exchangers.
- There should be adequate clear space around an air handler; at least 600 mm.
- Platform-supported air-handling units in ceiling void should not be provided.

→ do not encourage AHU to be suspended.

Space for Service Access

- Pipes in riser shaft should be adequately spaced.
- Catwalks should be provided in high ceiling void areas for regular maintenance.

Testing and Commissioning

- Newly installed plants and systems should be re-commissioned after one year of operation and then repeated every two years.

Maintenance

- There should be competent staff in charge of maintenance.
- Shop drawings, plant operation manual, equipment operation and maintenance manuals should be available.
- Electrical single line diagram of the switchboard should be available.

Maintenance

- There should be adequate access for inspection, cleaning and repair.
- There should be facilities for emptying the piping services.
- Air handling unit room should not be used as maintenance workshop.

Maintenance

- At each inspection, service and maintenance of the complete installation, consideration should be given to check and balance the system components that the indoor conditions are satisfied.
- Records should be kept of all maintenance works.

Maintenance of Indoor Environment and Air Quality

- DCC equipment has to be set and calibrated at least every six months, including the thermostat.
- Coils should be cleaned at least every six months and the condensate pipe every month.
- Cooling tower has to be cleaned and treated every month.

Discussion

- Q & A