

SBS5313 Fire Services
<http://ibse.hk/SBS5313/>



Module introduction: building fires, fundamental concepts of fire, fire characteristics and hazards;
types of fire services installations

7 Sept 2018 (Part A)



Teacher :

Ir. Eur Ing. Prof. K P Cheung

Faculty of Science and Technology

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- A. QF Level 5
- B. QF Credit 12
- C. Pre-requisite Nil
- D. Co-requisite Nil
- E. Module Aim(s)

The module aims to provide an understanding of the building related legislation, code of practices and related responsibilities of various fire services, and their relationship to the design of fire services systems in buildings.

F. Module Learning Outcomes

On completion of this Module, students are expected to be able to:

1. articulate the responsibilities and roles of an engineer as defined in the building related legislation & regulations, and code of practices related to the fire services systems
2. select and justify options in the design of water-based fire services systems;
3. design simple fire services systems for active fire protection; and
4. compare various design options and examine passive fire services protection systems.

G. Module Outline

The following topics/areas should be covered:

1. Introduction to building fires and fire services systems

- fundamental concepts of fire, fire triangle, properties of fuel, fire load, fire extinguishing mechanisms, fire fighting agents, fire process, ignition, fire growth, flashover, and heat transfer

2. Fire safety provisions and code requirements

- laws of Hong Kong, building regulations, provisions of fire service installations, code of practices for means of escape, fire resisting construction, means of access for fire fighting and rescue
- Considerations for operation and maintenance of fire services systems

3. Water-based systems

- sprinkler heads, sprinkler systems, fire hydrant and hose reel systems; stand-pipe, wet, dry, pre-action, drencher, and water mist systems, etc.; system components, source of water supply, design hazard classifications, water discharge density, pipe sizing methods, pump duty, system pressure and flow characteristics, high-rise systems, operation and maintenance, case studies and the fundamental design skills

4. Gas protection systems

- halon and halon alternatives, Carbon Dioxide (CO₂) systems, FM200 systems, system components and layouts, operation and maintenance

5. Fire detection and alarm systems

- selection of detectors, components and layouts, cross zoning, beam detection systems, application of codes and design guides, and audibility of fire alarm

6. Passive fire protection systems

- design of passive fire safety measures; fire resistance and fire resisting construction, compartmentation, building evacuation, means of access for fire-fighting, and refuge floor

H Class Contact Hours

- Lecture/Seminar : 28 hours
- Tutorial : 8 hours
- Practice/Laboratory work/Field work : 6 hours

The percentage contributions of the different assessment items to the overall module assessment are:

- In-class test : 15%
- Laboratory work : 10%
- Examination : 60%
- Mini design project : 15%

Reading List : the following list and other materials recommended in other lecture notes

Textbook

1. Chartered Institution of Building Services Engineers (CIBSE) Guide E: Fire Safety Engineering, CIBSE, London, UK, 2010.

References

2. Buildings Department, Hong Kong Special Administrative Region (HKSAR). *Code of Practice for Fire Safety in Buildings*.
3. Fire Services Department, Hong Kong Special Administrative Region (HKSAR). *Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment*.
4. Loss Prevention Council. (2003). *LPC Rules for Automatic Sprinkler Installations - Incorporating British Standard BS EN 12845*. Fire Protection Association.
5. NFPA. (2008). *Fire Protection Handbook*. 20th ed. National Fire Protection Association.
6. Sturges, J.L. (2003). *Fire Safety and Buildings*. Blackwell Science.

Web resources

1. FSD, HKSAR. List of FSD Circular Letters. Retrieved July, 2014. from Fire Services Department on the world wide web:
<http://www.hkfsd.gov.hk/home/eng/circular.html>.

SBS5313 Fire Services <http://ibse.hk/SBS5313/> Teaching Schedule 2018-2019

Semester 1, Friday, 9:30 a m-12:30 p m(lecture 2 hours, tutorial 1 hour, in average), venue: LT5, THEi-TY

Ref.	Date	Topics	Lecturer(s)
A01	07-Sept-2018 (Fri)	Module introduction; Fundamental concepts of building fires, fire characteristics and hazards; types of fire services installations; Fire safety law/regulation/code requirements for buildings; F S Notes in drawings submitted to BD.	Ir Prof K P Cheung
A02	14-Sept (Fri)	https://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf : 5.8 Emergency generator & 5.16 Fireman's lift -Electrical power and control for fire pumps and F S Installations	Ir Dr Y F Kwok yfkwok@vtc.edu.hk
A03	21-Sept	Passive fire protection, firemen access, high rise fire safety, smoke control and fire engineering approach	Ir Prof K P Cheung & guest speaker
A04	28-Sept	Fire hydrant & hose reel systems: design principles and hydraulics. Issuance of Mini design project –group project -15 groups (15% marks): Design of Fire Hydrant System & Sprinkler System	Ir Prof K P Cheung
A05	05-Oct	Tutorial Session on Design of fire hydrant system of Mini Design project– Room 614 : Each group 20 minutes = 9 groups each of 11 students	Ir Prof K P Cheung
A06	12-Oct	Automatic sprinkler systems : design principles and hydraulics ; Further briefing on Mini design project	Ir Prof K P Cheung
A07	19-Oct (Fri)	https://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf : 5.1 Audio/visual advisory system 5.2 Automatic actuating devices (Electrical and electronic parts) 5.9 Emergency lighting & 5.10 Exit sign (& circuitry fundamentals) 5.11 Fire alarm system & 5.12 Fire control centre 5.13 Fire detection system & 5.15 Fire resisting cable for fire service installations	Ir Dr Y F Kwok yfkwok@vtc.edu.hk

A08	26-Oct	Tutorial Session on Design of sprinkler system of Mini Design project– Room 614 : Each group 20 minutes = 9 groups	Ir Prof K P Cheung
A09	02-Nov	Further discussion on Hydraulics for Fire Hydrant and Hose Reel Systems & Automatic Sprinkler system; Briefing of laboratory work	Ir Prof K P Cheung
A10	09-Nov	Hand-in of Mini design project: group project, (15%); BSE Laboratory- Room 614 on 3 experiments: (10%) -Experiment 1: Reynolds Experiment -Experiment 2: Pumps operating in parallel and in series - Group report: 11 persons to write 2 reports of 2 experiments: - 9 groups of 99 students, each group of 10-11 students	Ir Prof K P Cheung
A11	16-Nov	Pre-action sprinkler systems; Drencher systems	Ir Prof K P Cheung
A12	23-Nov	Gas protection systems : CO2, clean fire fighting agents, FM200	Ir Prof K P Cheung
A13	30-Nov	Hand-in of Laboratory Group work report (10% marks) Commissioning and Testing of fire services installations; Some common fire tests used in Hong Kong	Ir Prof K P Cheung
A14	07-Dec 2018	In-class test : 1.5 hour (15% marks); Revision	Ir Prof K P Cheung
Exam	Dec 2018	Written examination: (60% marks) - Date & Time: ?? - Venue: The Grand Hall, THEi Building, Tsing Yi	Ir Prof K P Cheung

Assessment Methods:

Mini design project : 15%

Laboratory work : 10%

In-class test : 15%

Examination : 60%



懷疑洩漏煤氣的單位
The flat on fire



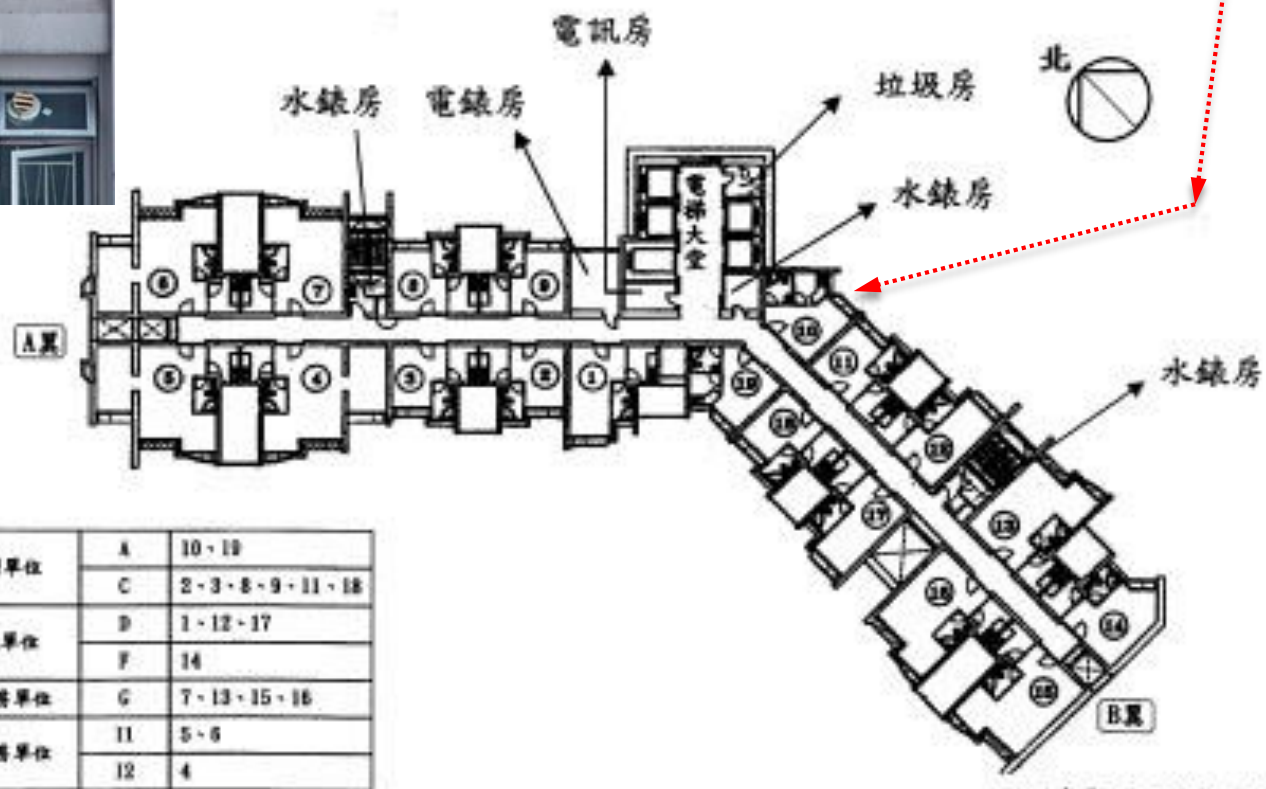
走廊一片狼藉，
堆滿肇事單位的
雜物。

Appledaily news -Town gas explosion and fire, Shek Kip Mei 23 Nov 2014 -A1頭條-石硤尾邨大爆炸 戶主死 6消防命危 2014年11月23日 <http://hk.apple.nextmedia.com/realtime/breaking/20141123/53157106> 石硤尾邨美映樓發生煤氣大爆炸慘劇，一隊消防員在破門進入一個懷疑洩漏煤氣的單位時，單位內突然發生大爆炸，威力強大，波及大廈多個單位，連升降機門亦炸至飛脫。9名消防員首當其衝，分別被炸傷及烈焰灼傷，當中6人危殆。消防員稍後在單位內發現一具男屍，連同受傷的街坊，事件共釀成1死12傷。警方初步調查懷疑有人開煤氣自殺，觸發今次慘劇。



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The flat on fire

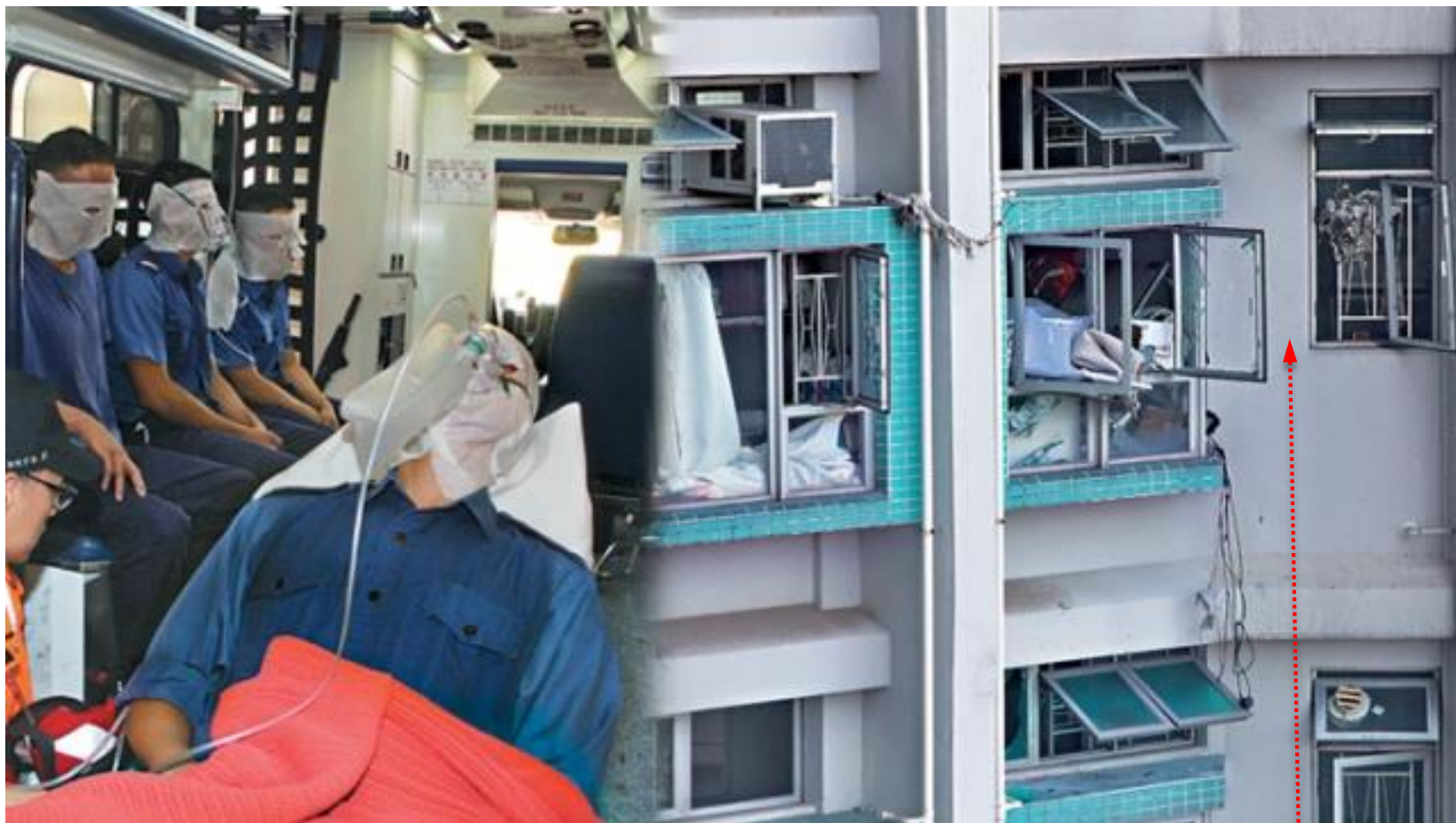
石硤尾邨第一期 美映樓 (2樓至30樓)



小型單位	A	10、19
	C	2、3、8、9、11、18
2人單位	D	1、12、17
	F	14
一睡房單位	G	7、13、15、16
兩睡房單位	H	5、6
	I	4

註：每層各有三部升降機直達。

此圖供參考，所有圖則、用料及設備，以香港房屋委員會最後批准為準。



四名消防員須敷燒傷面膜送往明愛醫院。(左)肇事單位多扇玻璃窗震爛，有電線跌出窗外。(右)

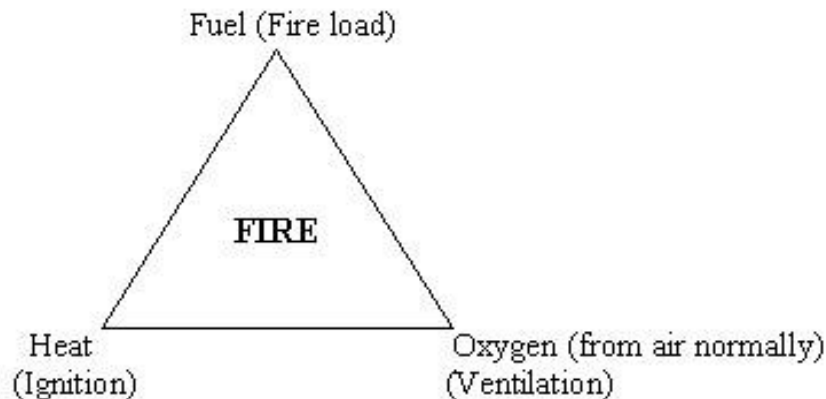
懷疑洩漏煤氣的單位
The flat on fire

Appledaily news -Town gas explosion and fire, Shek Kip Mei 23 Nov 2014 -A1頭條-石硤尾邨大爆炸 戶主死 6消防命危
2014年11月23日 <http://hk.apple.nextmedia.com/realtime/breaking/20141123/53157106> 石硤尾邨美映樓發生煤氣大爆炸慘劇，一隊消防員在破門進入一個懷疑洩漏煤氣的單位時，單位內突然發生大爆炸，威力強大，波及大廈多個單位，連升降機門亦炸至飛脫。9名消防員首當其衝，分別被炸傷及烈焰灼傷，當中6人危殆。消防員稍後在單位內發現一具男屍，連同受傷的街坊，事件共釀成1死12傷。警方初步調查懷疑有人開煤氣自殺，觸發今次慘劇。

A fire is started

- **NFPA Test Burn – VIDEO - -showing flashover** - flashover means all combustibles in the room burn together : when the room fire temperature is around 600 degree C
<http://www.youtube.com/watch?v=5GMhfLamERc>
- **Christmas Tree Fire Safety**
<http://www.youtube.com/watch?v=lwBiZtfjioU&feature=related>

This video is from NIST (National Institute of Standards and Technology). It is a Safety Video of a Dry Scotch Pine Tree that fully engulfs a room in 48 seconds.



The Fire Triangle

→ see **video **The Fire Triangle** :

<http://www.youtube.com/watch?v=mgNOjLnzplo>

Fire safety design principles

***To contain the fire: Fire Resisting Construction

*** people shall get away, after the fire is detected manually [by actuating the breakglass unit, or automatically [by smoke detector or heat detector]
→ go through Means of Escape → go to places of relative safety, then places of ultimate safety

**To suppress the fire: automatic sprinkler system for offices, shops- LPC
Rules for Automatic Sprinkler Installations; LPC=Loss Prevention Council, UK



#In fact a hydrant-supported **sprinkler system** should be installed for residential buildings in HK. That is , to connect small pipes to the hydrant riser of residential buildings to supply one or two sprinklers for each flat.
→ Greatly enhancing fire safety for residential buildings

** First aid fire fighting :



消防喉全圖

用。市民自行裝置的滅火筒為安全計，最好能按規定每年進行定期檢查保養，確保滅火筒在火警發生時能正常操作，發揮滅火效用。

滅火筒的應用

使用消防喉的步驟

1. 打破玻璃，按火警鐘



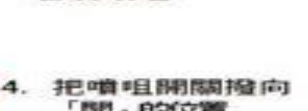
1. Break the glass of the "Breakglass unit" : the alarm bells will sound, and the fire service pump will operate

2. 開啟水掣



2. Open the water valve

3. 打破玻璃，拉出喉管及噴咀



3. Break the glass and pull out the hose and the nozzle

4. 把噴咀開關撥向「開」的位置



4. Open the control valve of the nozzle

5. 將水柱射向火源底部

5. Shoot the nozzle water to the base part of the fire

Automatic Fire Sprinklers

Home Fire Sprinkler Demonstration <http://nfpa.typepad.com/firesprinklerinitiative/>

A side-by-side room display set up at the Plymouth Massachusetts Fire Department. Sprinklers had been installed in only one of the rooms. Both rooms were set on fire. Home fire sprinklers are designed to activate when a certain degree of heat increase is reached, so as the temperature in the display went up, the sprinklers went off. As seen in this demonstration, the fire in the sprinklered room was controlled quickly by overhead sprinklers. In contrast, the fire in the room without sprinklers burned out of control until the fire department put out the fire.



Image courtesy: <http://jpfire.co.uk/Services.php> :

from left : concealed sprinkler [the circular plate is fitted to the false ceiling;

Middle : Activated sprinkler head -water discharged from a pendent sprinkler;

Right: Sprinkler Head and Rosette, with rosette fitted to false ceiling

See the **NIST Recreation of "The Station Nightclub Fire" with Sprinklers**

<http://www.youtube.com/watch?v=gT1EWVR1iP8&feature=related>

Key points of [Code of Practice for Fire Safety in Buildings 2011 \(October 2015 version\)](http://www.bd.gov.hk/english/documents/code/fs2011/fs2011_full.pdf)
http://www.bd.gov.hk/english/documents/code/fs2011/fs2011_full.pdf [230+ pages]

These requirements will affect design of floor layout, building massing and structural systems.

Clause A1.3

Diagram A1 shows the framework for fire safety in buildings.

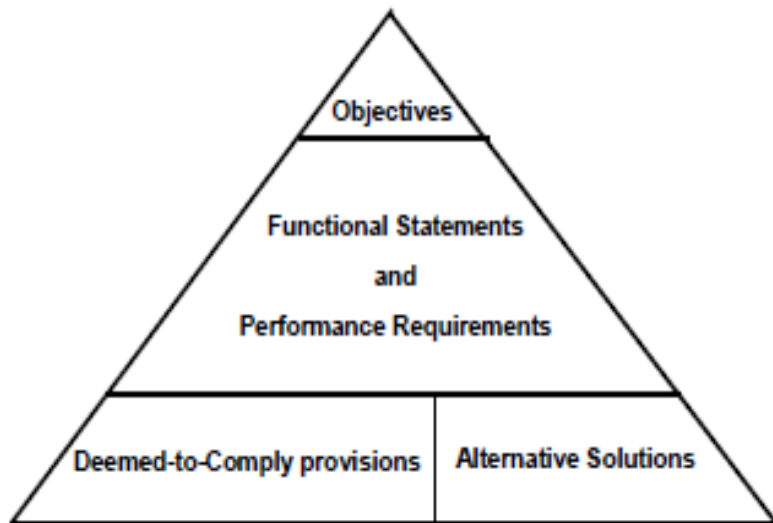
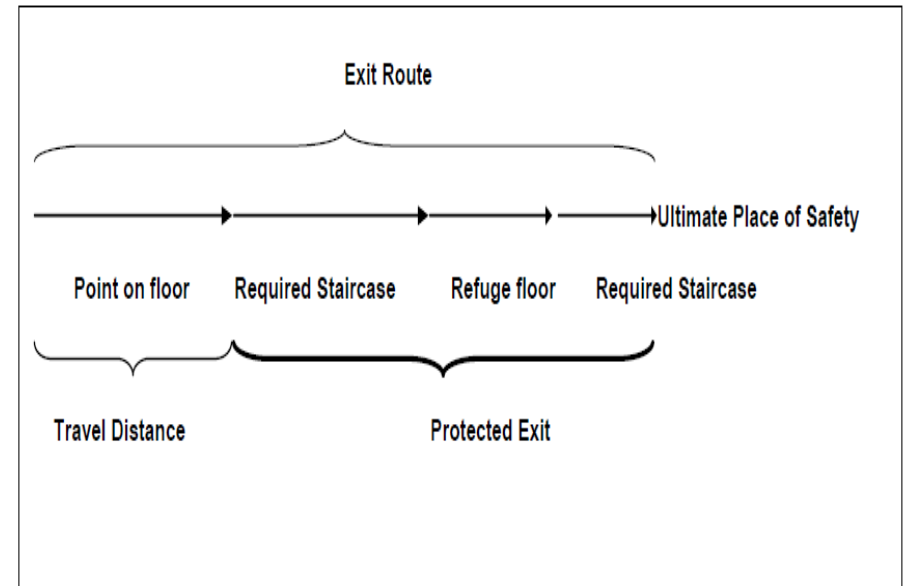


Diagram A1 – Framework for Fire Safety in Buildings

For details see [Page 2 – Ref. 1]



Means of Escape :

For details see [Page 21 – Ref. 1]

Section 2 – Provisions of Means of Escape

Subsection B4 – Assessment of Occupant Capacity

Clause B4.1

As a guide to assessing the requirements on means of escape, the following Table B1 should be used as the basis for calculating the occupant capacity of a building or part of a building.

Table B1: Assessment of Occupant Capacity

Use Classification	Type of Accommodation	Occupancy Factor (usable floor area in m ² per person) or otherwise as specified
1b	Flats:	
	- with corridor or balcony access having five or more flats on each floor served by each staircase	4.5
	- flats not covered by the above	9
1c	Tenement houses	3
2	Boarding houses, hostels, hotels, motels, guesthouses	Number of bedspaces
	Dormitories	3

AND other types of buildings- For full table and details - – see [Page 25-27 - Ref. 1] – How many people are there in the building?

Key points of [Code of Practice for Fire Safety in Buildings 2011 \(October 2015 version\)](#)

Table B2

Table B2: Minimum number and width of exit doors and exit routes from a room, fire compartment or storey

Occupant Capacity of room, fire compartment or storey (No. of persons)	Minimum No. of exit doors or exit routes	Minimum total width (in mm)		Minimum Width (in mm) of each	
		Exit doors	Exit routes	Exit door	Exit route
4- 30	1			750	1050
31-200	2	1750	2100	850	1050
201-300	2	2500	2500	1050	1050
301-500	2	3000	3000	1050	1050
501-750	3	4500	4500	1200	1200
751-1000	4	6000	6000	1200	1200
1001-1250	5	7500	7500	1350	1350
1251-1500	6	9000	9000	1350	1350
1501-1750	7	10500	10500	1500	1500
1751-2000	8	12000	12000	1500	1500
2001-2500	10	15000	15000	1500	1500
2501-3000	12	18000	18000	1500	1500
>3000 persons - the number of exit doors, exit routes and their width to be determined by the Building Authority					

For full table and details - see [Page 34 - Ref. 1]

Table B4

Table B4: Discharge Value of a Required Staircase in a Sprinkler Protected Building

No. of storeys served	Width of required staircase					
	1050mm but under 1200mm	1200mm but under 1350mm	1350mm but under 1500mm	1500mm but under 1600mm	1600mm but under 1700mm	1700mm to 1800mm
1	420	480	540	600	640	680
2	452	518	585	651	697	742
3	484	556	630	702	754	804
4	516	594	675	753	811	866
5	548	632	720	804	868	928
6	580	670	765	855	925	990
7	612	708	810	906	982	1052
8	644	746	855	957	1039	1114
9	676	784	900	1008	1096	1176
10	708	822	945	1059	1153	1238
Each additional storey add	32	38	45	51	57	62

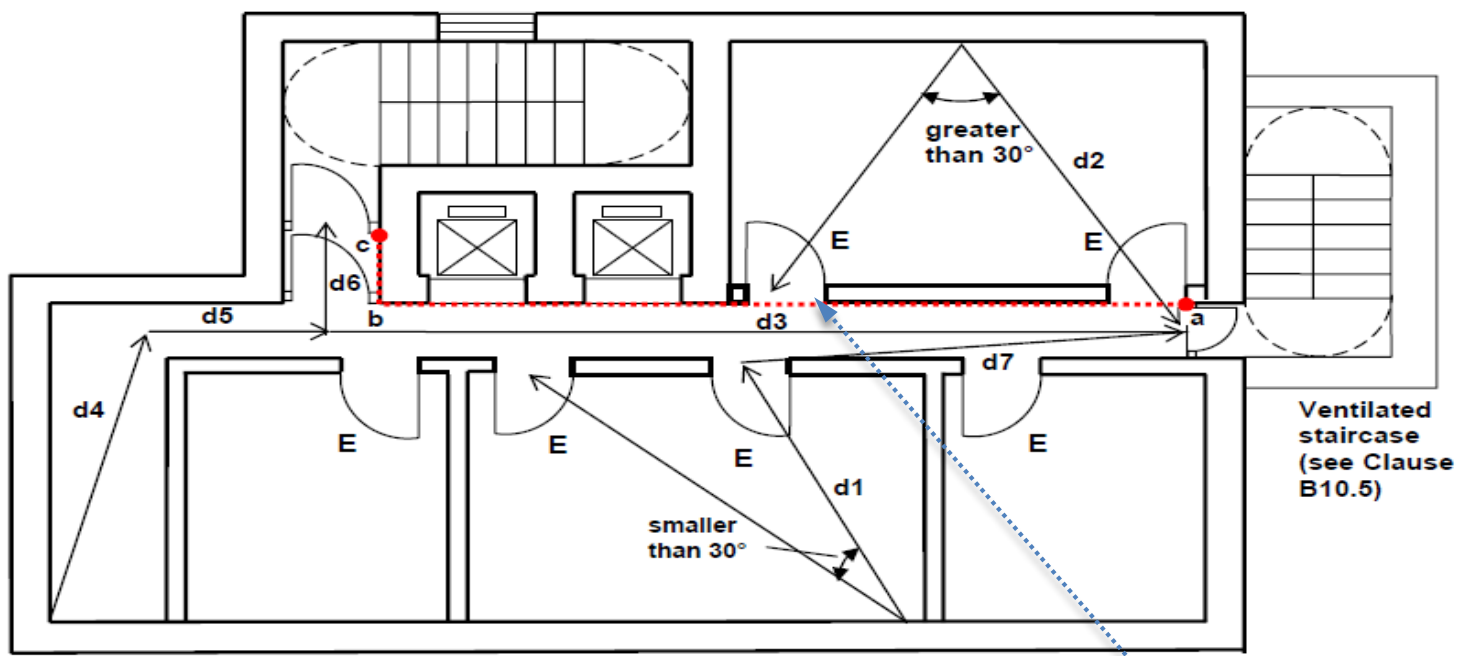
Note:

1. The discharge value of a required staircase having a width more than 1800mm may be obtained by using linear projection from the table.

For full table and details - see [Page 31 - Ref. 1]

Key points of Code of Practice for Fire Safety in Buildings 2011 (October 2015 version)

Diagram B2 : Internal Corridor Access



For details - See Page 63-67 of Ref. 1

Notes:

E	Exit door	
d4 + d5	Deadend travel distance	See Clause B11.2
d1	Deadend travel distance	See Clause B11.2
a – b – c	Minimum separation between 2 required staircases	See Clause B10.2(b)
d3 + d6	Maximum separation between 2 required staircases	See Clause B11.3(b)
d2	Travel distance	See Clause B11.3(a)
d1 + d7	Travel distance	See Clause B11.3(a)

Red-dotted distance:
Maximum 48 m :
Details, see:
Clause B11.3 (b) of Ref. 1

Key points of Code of Practice for Fire Safety in Buildings 2011 (October 2015 version)

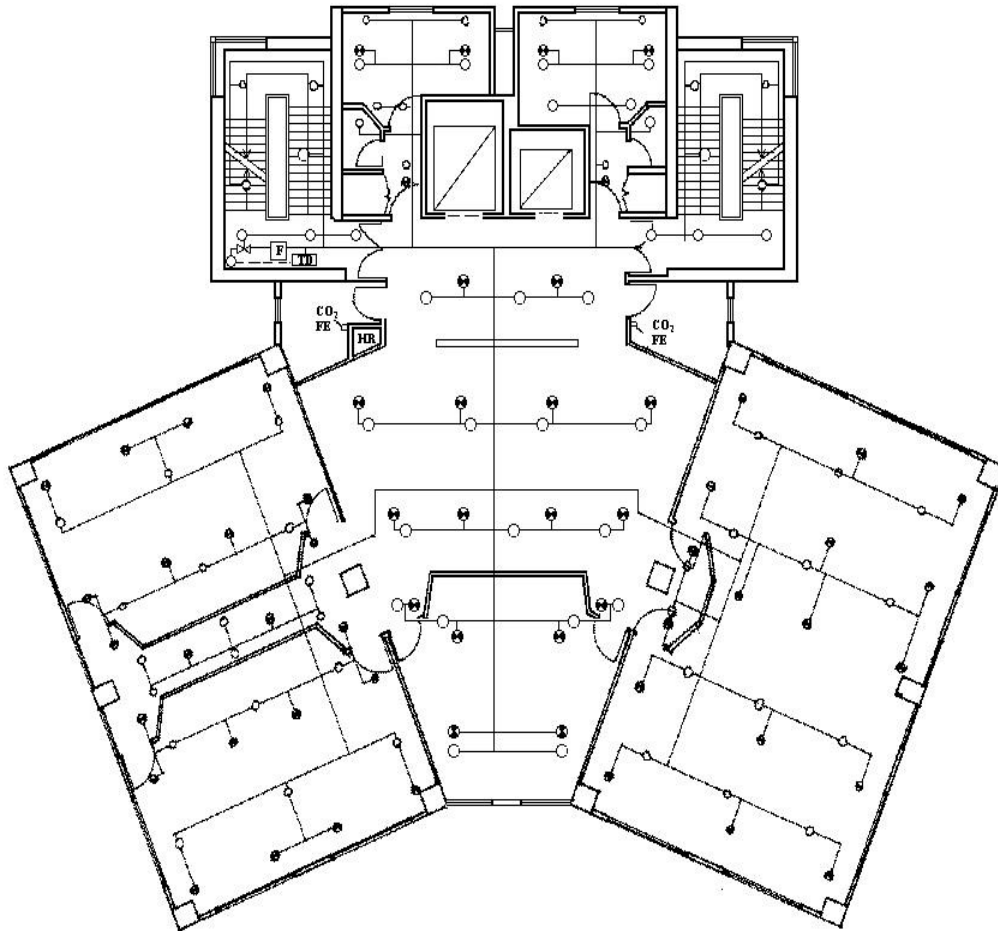
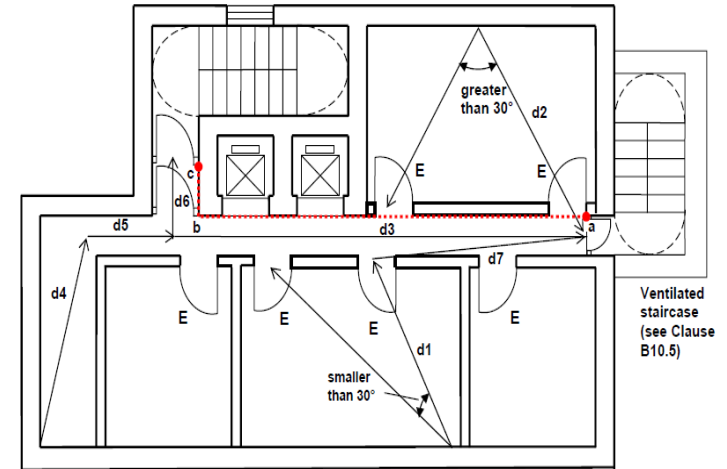


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d2	Travel distance	See Clause B11.3(a)
d1 + d7	Travel distance	See Clause B11.3(a)

5/F Tsui Tsin Tong Building, HKU – Sprinkler Layout –

Also compare the staircase and lift layout with the COP diagram in the previous slides

<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ; http://www.safety.hku.hk/homepage/manual_Floorplan.html

People evacuation principles and software illustration

Reference :

COP for Fire Safety in Buildings 2011 http://www.bd.gov.hk/english/documents/code/fs_code2011.pdf ;
<http://www.bd.gov.hk/english/documents/> ;

Codes of Practice for Minimum *Fire Service Installations* and Equipment and Inspection, Testing and Maintenance of ... 2012
<http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf> ; <http://www.hkfsd.gov.hk/eng/code.html>



buildingEXODUS V4.0 simulation of highrise building evacuation

<https://www.youtube.com/watch?v=6E0VO6dTUBA> [2:12 minute]



Crowd Simulation - Evacuation Drill

<https://www.youtube.com/watch?v=kHfHewzp5ls> [1:19 minute]



Christmas Tree Fire Safety <https://www.youtube.com/watch?v=ZLHhG65fLeY> [1:58 minute]

$$\frac{T_p + T_a + T_{rs}}{T_f} \leq 1, \text{ for safe escape from certain point in space in a building}$$

SEE : An examination on the people evacuation parameters addressed by some computational software in modeling people evacuation in huge uncompartmented building volumes in case of fire

Key points of [Code of Practice for Fire Safety in Buildings 2011 \(October 2015 version\)](#)

Table C1 – Fire Resistance Rating and Fire Compartment Limitations

Use Classification	Compartment Area/ Volume	Fire Resistance Rating (minutes)
1. Residential	Not limited	60
2. Hotel and similar Transient Accommodation	Not limited	60
3. Institutional	Not exceeding 2,500m ²	60
4. Commercial:		
4a. Business Facilities	Not exceeding 10,500m ²	60
4b. Mercantile Facilities	Not exceeding 2,500m ²	60
	Exceeding 2,500m ² but not exceeding 10,500m ²	120

For details see [Page 71 – Ref. 1]

Fire resistance - The ability of an element of building construction to withstand the effects of fire for a specified period of time without loss of its fire-separating or load bearing function (see BS476: Part 20 to 24). The 3 elements for fire resistance period (FRP) are:- Stability / Integrity / Insulation - For a wall, e.g. 140/130/120 (in minutes); for a metal panel, e.g. 150/110/- (in minutes).

Key points of [Code of Practice for Fire Safety in Buildings 2011 \(October 2015 version\)](#)

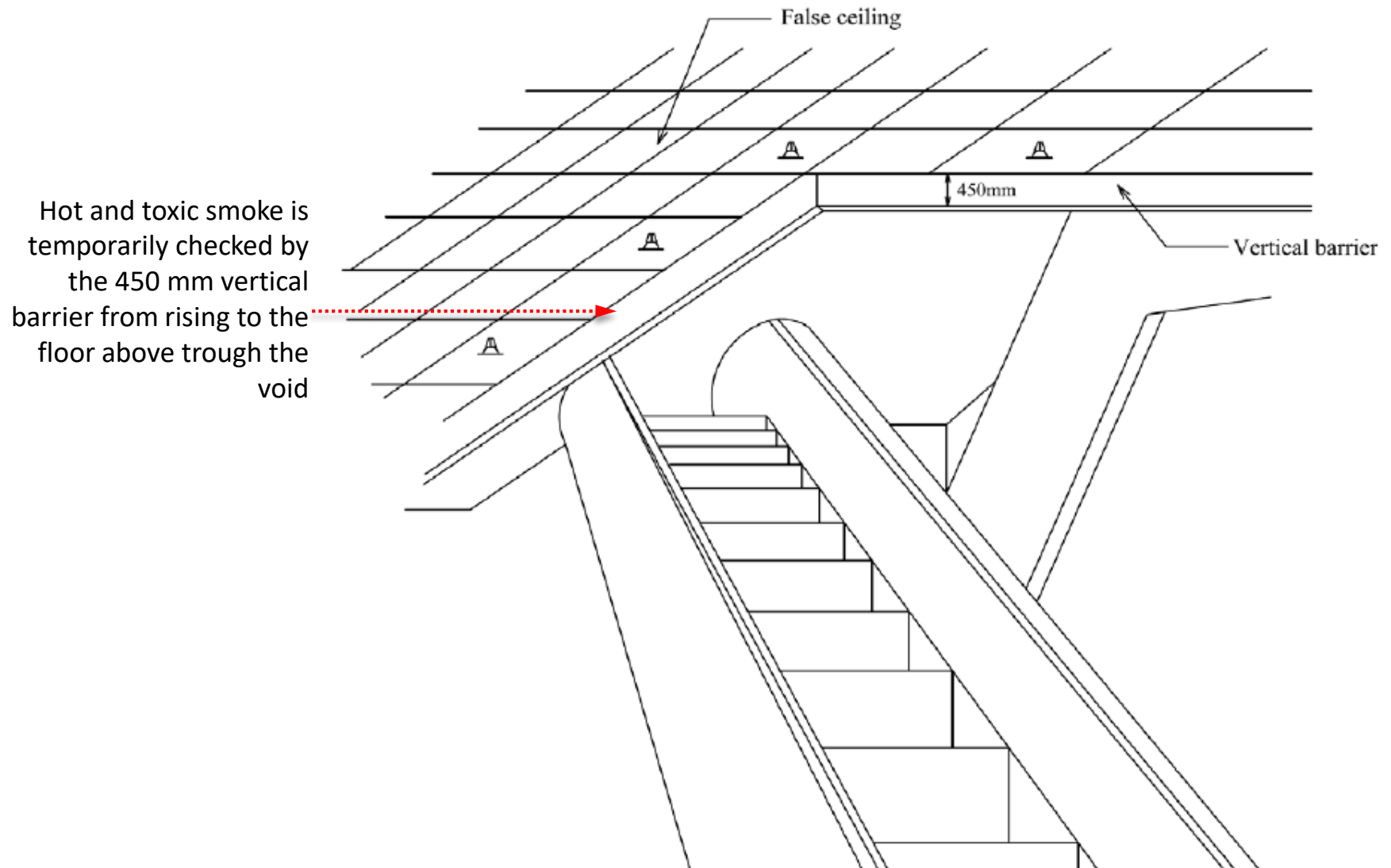
Table C2: Fire Resistance Rating Criteria for Elements of Construction, Fire Barriers and Other Components

Elements of construction or other components		Criteria to be satisfied			Method of Exposure
		Stability	Integrity	Insulation	
1	Structural frame, beam or column	Y	N	N	Exposed faces only
2	Floor including fire compartment floor	Y	Y	Y	Each side separately
3	Roof forming part of an exit route or performing the function of the floor	Y	Y	Y	From underside
4	Loadbearing wall not being a fire barrier	Y	N	N	Each side separately
5	External wall	Y*	Y	Y	Each side separately
6	Loadbearing wall being a fire barrier	Y	Y	Y	Each side separately
7	Non-loadbearing wall being a fire barrier	N	Y	Y	Each side separately
8	Protected shaft, lobby and corridor	Y*	Y	Y	Each side separately
9	Fire shutter, fire stop, fire dampers, sealing system	N	Y	N (unless specified)	Each side separately

For full table and details , see **Page 73 of Ref. 1**

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Diagram C4: Vertical Barrier at Escalator (see Clause C10.1)



For details see [Page 99 – Ref. 1]

Table D1 : Number of Access Staircases, Fireman's Lift and Firefighting and Rescue Stairways Required

Type of Building		No. of Access Staircases required	No. of Fireman's Lifts required	No. of Firefighting and Rescue Stairways required
(1) All buildings and all basements	Not exceeding 1 storey	-	-	-
(2) Domestic buildings for single family	Not exceeding 3 main storeys	-	-	-
(3) Domestic buildings or offices with G/F shop or carport	(a) exceeding 1 storey but not exceeding 6 storeys and uppermost floor not exceeding 13m above ground and usable floor area not exceeding 250m ² per floor	One	-	-
	(b) exceeding 1 storey but not exceeding 6 storeys and uppermost floor	One	-	-

For full table and details, see **Page 107 of Ref. 1**

Key points of [Code of Practice for Fire Safety in Buildings 2011 \(October 2015 version\)](#)

These requirements will affect design of floor layout, building massing and structural systems.

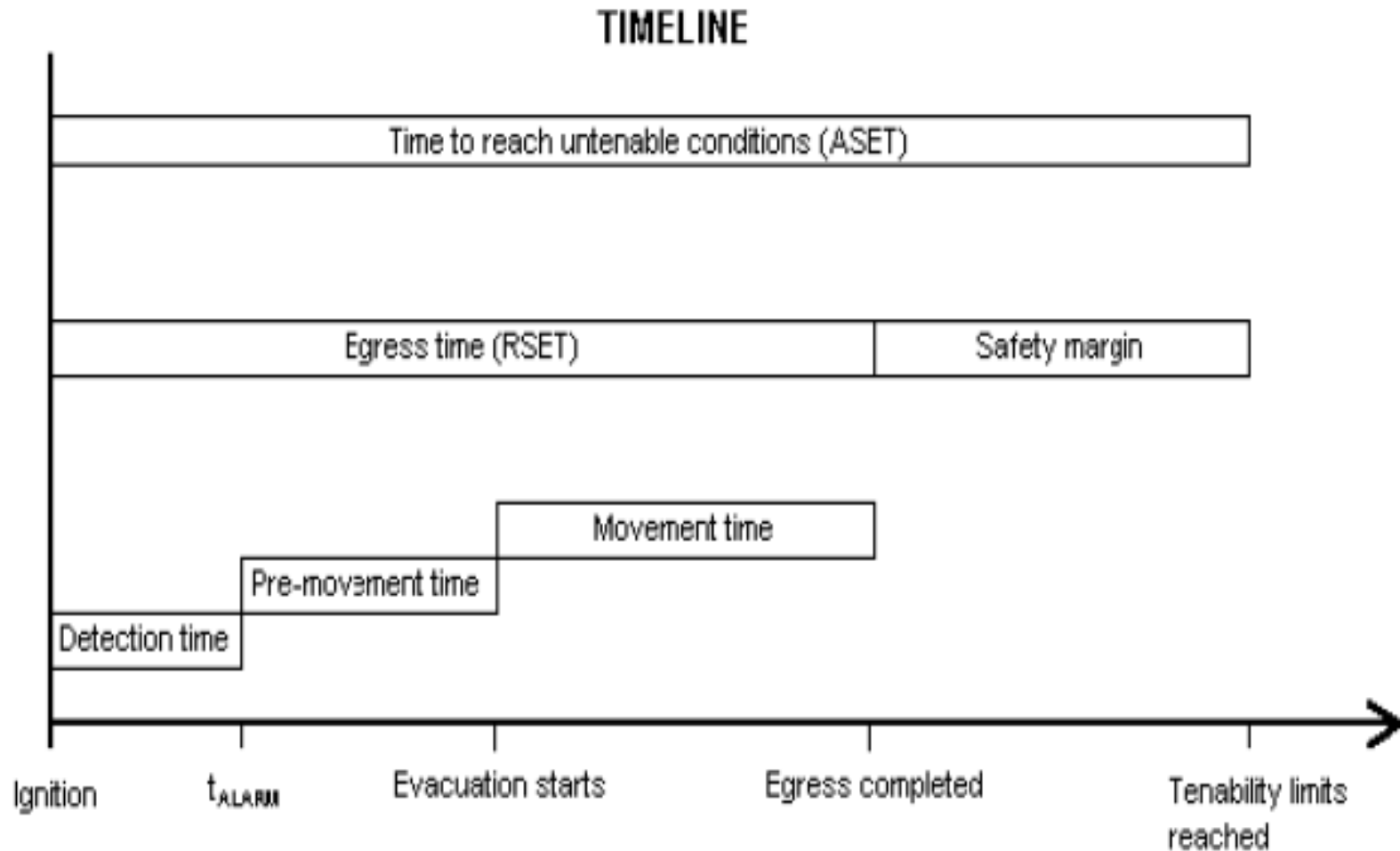
Part E - Fire Properties of Building Elements and Components

This Part contains six Sections:

- **Section 1 – General**
- **Section 2 – Loadbearing Elements**
- **Section 3 – Non-loadbearing Elements**
- **Section 4 – Protection of Openings in Fire Barriers**
- **Section 5 – Non-combustibility**
- **Section 6 – Fire Testing Authorities**
- **Reference – List of Tables**

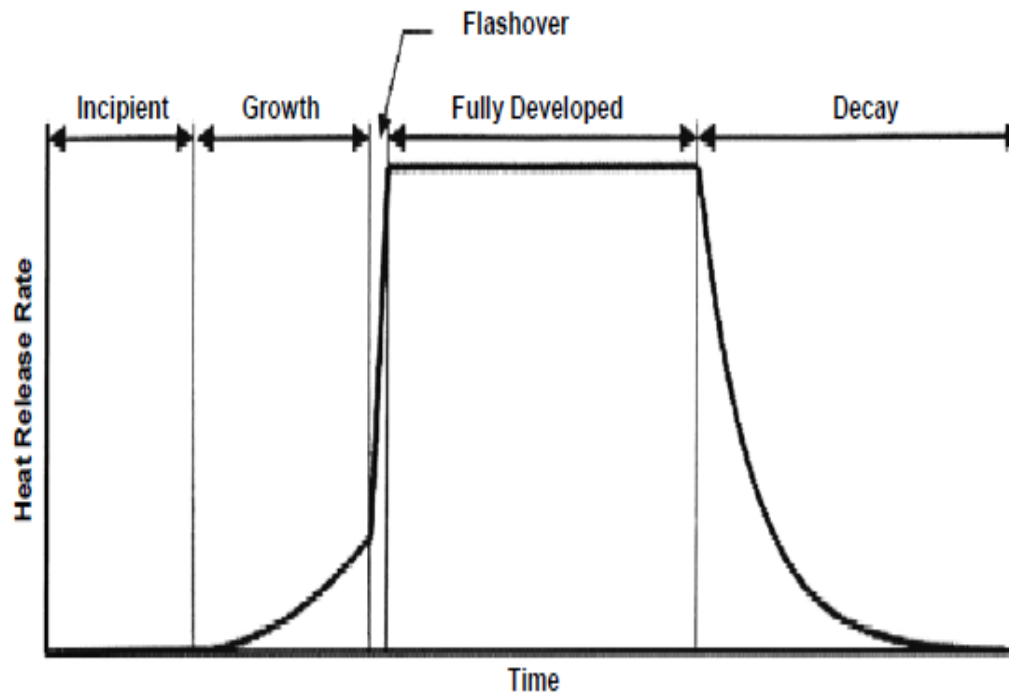
For full details, see **Page 150-238 of Ref. 1**

Diagram G1: Graphical Representation of a Timeline Assessment



For details see [Page 212 – Ref. 1] : “Tenable” means air/smoke conditions still allow people to stay inside that part of the building, in case of fire

Key points of Code of Practice for Fire Safety in Buildings 2011 (October 2015 version)



For details see [Page 203 – Ref. 1]

Diagram G2: Typical Phases of a Fire Curve

Stages in an Enclosure Fire:

1. “fire growth” video <http://www.youtube.com/watch?v=9JU59Nsv2vg> by NFPA <http://www.nfpa.org/> ;
2. some notes in http://www.see.ed.ac.uk/~s0458490/thesis%20web/fire_types.html

Key points of Code of Practice for Fire Safety in Buildings 2011 (October 2015 version)

For details see [Page 203 – Ref. 1]

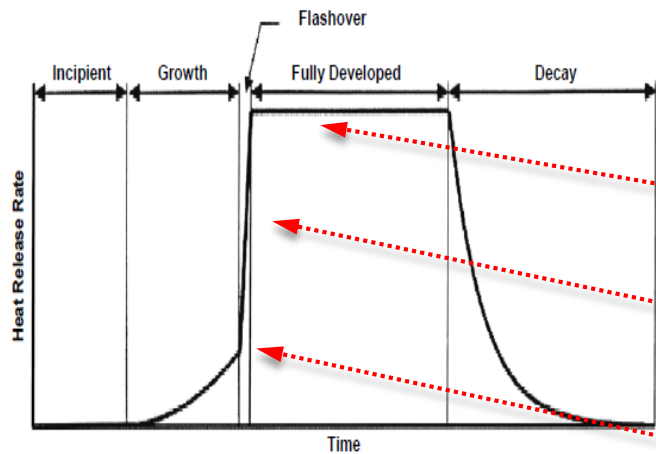
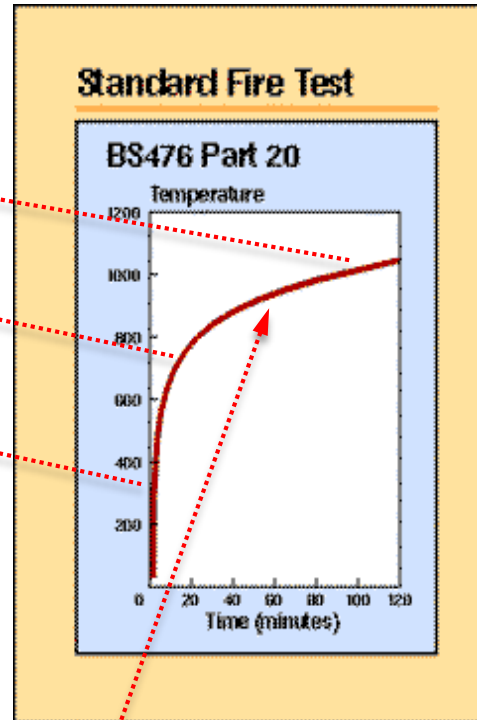


Diagram G2: Typical Phases of a Fire Curve



the furnace is at the back



BS 476: Parts 20, 22, : Standard time-temperature curve

[image courtesy : http://www.911review.com/articles/jm/cache/fr006_files/firea27.gif]

of the furnace with equation :

$T_{\text{furnace}} = T_{\text{ambient}} + 345 \log (8 t + 1)$, where

T_{furnace} = temperature of furnace , deg. C

T_{ambient} = temperature of ambient, deg. C, and

t is time from starting of the furnace in minutes

Fire Resistance Test Projects - Timber Door Set

<http://www.red.com.hk/Projects-2.htm> of

RESEARCH ENGINEERING DEVELOPMENT FAÇADE CONSULTANTS LIMITED (RED) –Testing laboratory of curtain wall and fire properties of building components in Hong Kong

<http://www.red.com.hk/>

CODES OF PRACTICE FOR MINIMUM FIRE SERVICE INSTALLATIONS AND EQUIPMENT AND INSPECTION, TESTING AND MAINTENANCE OF INSTALLATIONS AND EQUIPMENT [COP -Minimum FSI]

<http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf> – for building design – what are the types of fire services installations to be provided inside the building; e.g. page 38 of [COP-Minimum FSI] :

Items (iv) to (xi), (xiv), (XV) apply to **Tsui Tsin Tong Building, HKU**

4.32 Institutional buildings—high rise

REQUIREMENTS—SYSTEMS/INSTALLATIONS/EQUIPMENT FOR:

- (i) Audio/visual advisory system
- (ii) Automatic actuating devices
- (iii) Automatic fixed installation other than wat
- (iv) Emergency generator
- (v) Emergency lighting
- (vi) Exit sign
- (vii) Fire alarm system
- (viii) Fire control centre
- (ix) Fire detection system
- (x) Fire hydrant/hose reel system
- (xi) Fireman's lift
- (xii) Portable hand-operated approved appliance
- (xiii) Pressurization of staircase
- (xiv) Sprinkler system
- (xv) Ventilation/air conditioning control system

apply

For plant rooms.

火警疏散圖
徐展堂樓

地下

集合地點：馮平山博物館入口

Fire Evacuation Plan
Tsui Tsin Tong Building

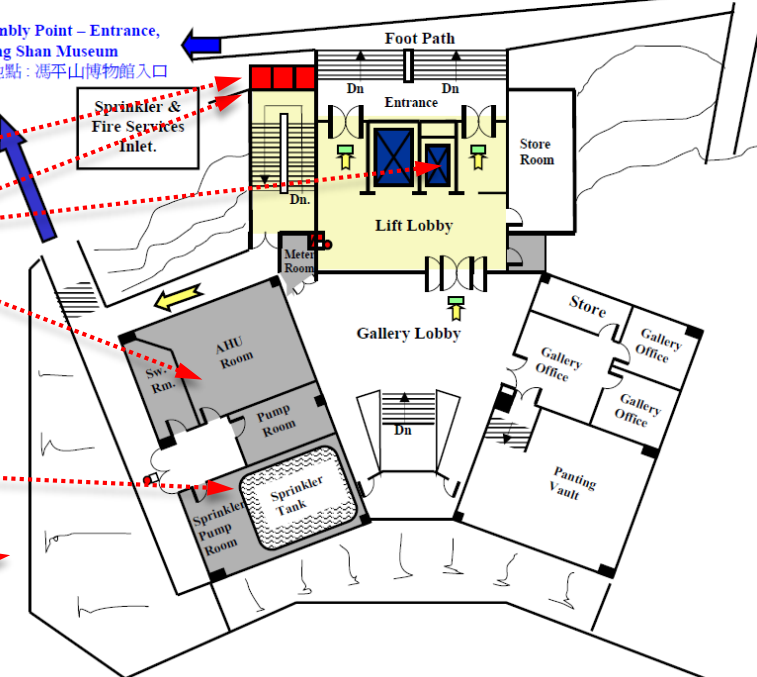
Ground Floor

Assembly Point : Entrance, Fung Ping Shan Museum

LEGEND :

- | | |
|--|---------------------------|
| | FIRE PANEL
消防控制板 |
| | HOSEREEL
消防喉轆 |
| | MANUAL CALL POINT
火警鐘掣 |
| | FIRE ALARM BELL
火警鐘 |
| | EXIT SIGN
出口牌 |
| | ESCAPE ROUTES
逃生路線 |
| | PROTECTED AREA
保護區域 |
| | PLANT ROOM
機房 |
| | STAIRCASE
樓梯 |
| | CORRIDOR
走廊 |
| | LIFT
升降電梯 |

To Assembly Point – Entrance,
Fung Ping Shan Museum
往集合地點：馮平山博物館入口



Tsui Tsin Tong Building, HKU

<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;

Drawn by Safety Office on 4/1998 By DP
Revised on 10/2009

Code of Practice for Minimum Fire Service Installations and Equipment [COP -Minimum FSI]

<http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf> – for building design – what are the types of fire services installations to be provided inside the building; e.g. page 38 of [COP- Minimum FSI] : Items (iv) to (xi), (xiv), (XV) apply to **Tsui Tsin Tong Building, HKU**

4.32 Institutional buildings—high rise

REQUIREMENTS—SYSTEMS/INSTALLATIONS/EQUIPMENT FOR:

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- (ii) Automatic actuating devices
- (iii) Automatic fixed installation other
- (iv) Emergency generator
- (v) Emergency lighting
- (vi) Exit sign
- (vii) Fire alarm system
- (viii) Fire control centre
- (ix) Fire detection system
- (x) Fire hydrant/hose reel system
- (xi) Fireman's lift
- (xii) Portable hand-operated approved
- (xiii) Pressurization of staircase
- (xiv) Sprinkler system
- (xv) Ventilation/air conditioning contr

apply

火警疏散圖
徐展堂樓

一樓

集合地點：馮平山博物館入口

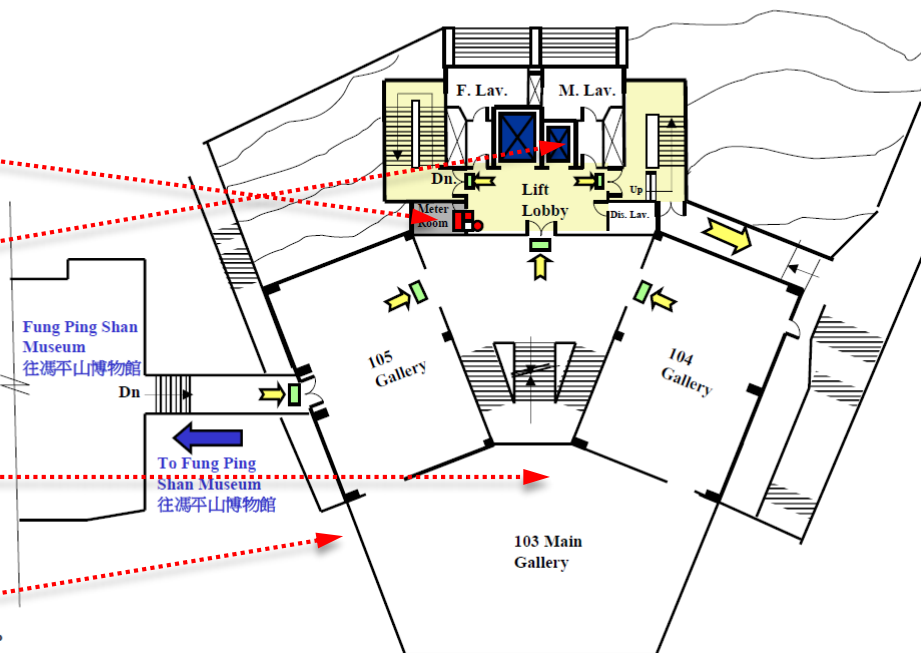
Fire Evacuation Plan
Tsui Tsin Tong Building

First Floor

Assembly Point : Entrance, Fung Ping Shan Museum

LEGEND :

圖標	FIRE PANEL
消防控制版	HOSEREEL
消防喉轆	MANUAL CALL POINT
火警鐘掣	FIRE ALARM BELL
火警鐘	EXIT SIGN
出路牌	ESCAPE ROUTES
逃生路線	PROTECTED AREA
保護區域	PLANT ROOM
機房	STAIRCASE
樓梯	CORRIDOR
走廊	LIFT
升降電梯	



Tsui Tsin Tong Building, HKU

<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;

Drawn by Safety Office on 4/1998 By DP
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4.32 Institutional buildings—high rise

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- (ii) Automatic actuating devices
- (iii) Automatic fixed installation other than
- (iv) Emergency generator
- (v) Emergency lighting
- (vi) Exit sign
- (vii) Fire alarm system
- (viii) Fire control centre
- (ix) Fire detection system
- (x) Fire hydrant/hose reel system
- (xi) Fireman's lift
- (xii) Portable hand-operated approved appliance
- (xiii) Pressurization of staircase
- (xiv) Sprinkler system
- (xv) Ventilation/air conditioning control

火警疏散圖 徐展堂樓

三樓

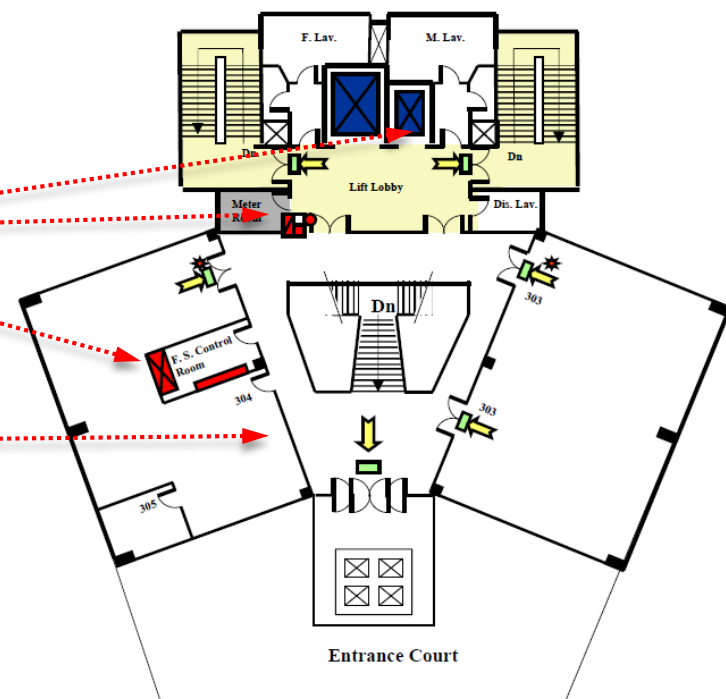
集合地點：梁球瑯大樓, LG2

Fire Evacuation Plan Tsui Tsin Tong Building

Third Floor

Assembly Point : K. K. Leung Building, LG2

apply



Tsui Tsin Tong Building, HKU

<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;

Code of Practice for Minimum Fire Service Installations and Equipment [COP -Minimum FSI]

<http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf> – for building design – what are the types of fire services installations to be provided inside the building; e.g. page 38 of [COP- Minimum FSI] : Items (iv) to (xi), (xiv), (XV) apply to **Tsui Tsin Tong Building, HKU**

4.32 Institutional buildings—high rise

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- (iii) Automatic fixed installation other
- (iv) Emergency generator
- (v) Emergency lighting
- (vi) Exit sign
- (vii) Fire alarm system
- (viii) Fire control centre
- (ix) Fire detection system
- (x) Fire hydrant/hose reel system
- (xi) Fireman's lift (Lift machine room)
- (xii) Portable hand-operated approved
- (xiii) Pressurization of staircase
- (xiv) Sprinkler system
- (xv) Ventilation/air conditioning contr

apply

火警疏散圖

徐展堂樓

天台

集合地點：梁球璠大樓, LG2

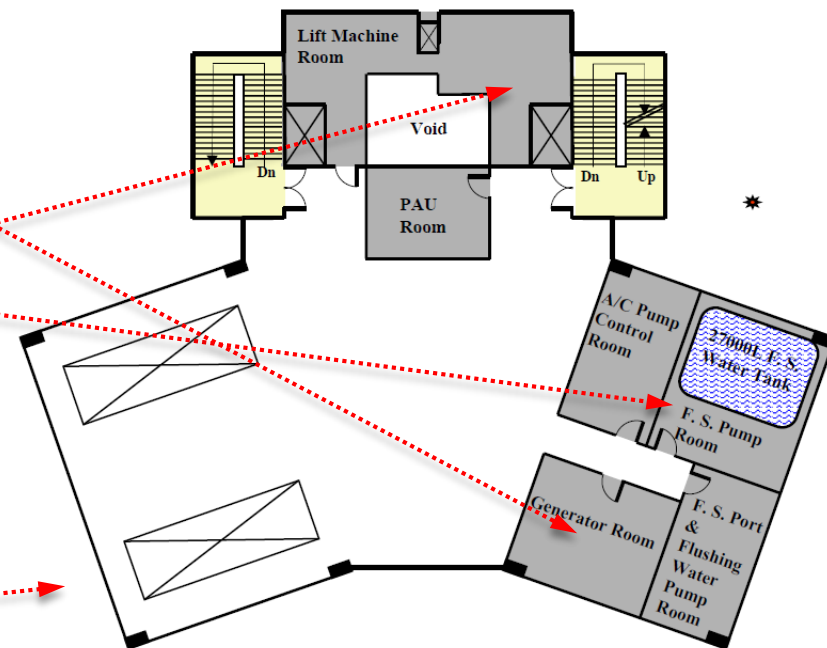
Fire Evacuation Plan Tsui Tsin Tong Building

Roof Floor

Assembly Point : K. K. Leung Building, LG2

LEGEND :

- | | |
|--|-------------------|
| | FIRE PANEL |
| | HOSEREEL |
| | MANUAL CALL POINT |
| | FIRE ALARM BELL |
| | EXIT SIGN |
| | ESCAPE ROUTES |
| | PROTECTED AREA |
| | PLANT ROOM |
| | STAIRCASE |
| | CORRIDOR |
| | LIFT |
| | VISUAL FIRE ALARM |

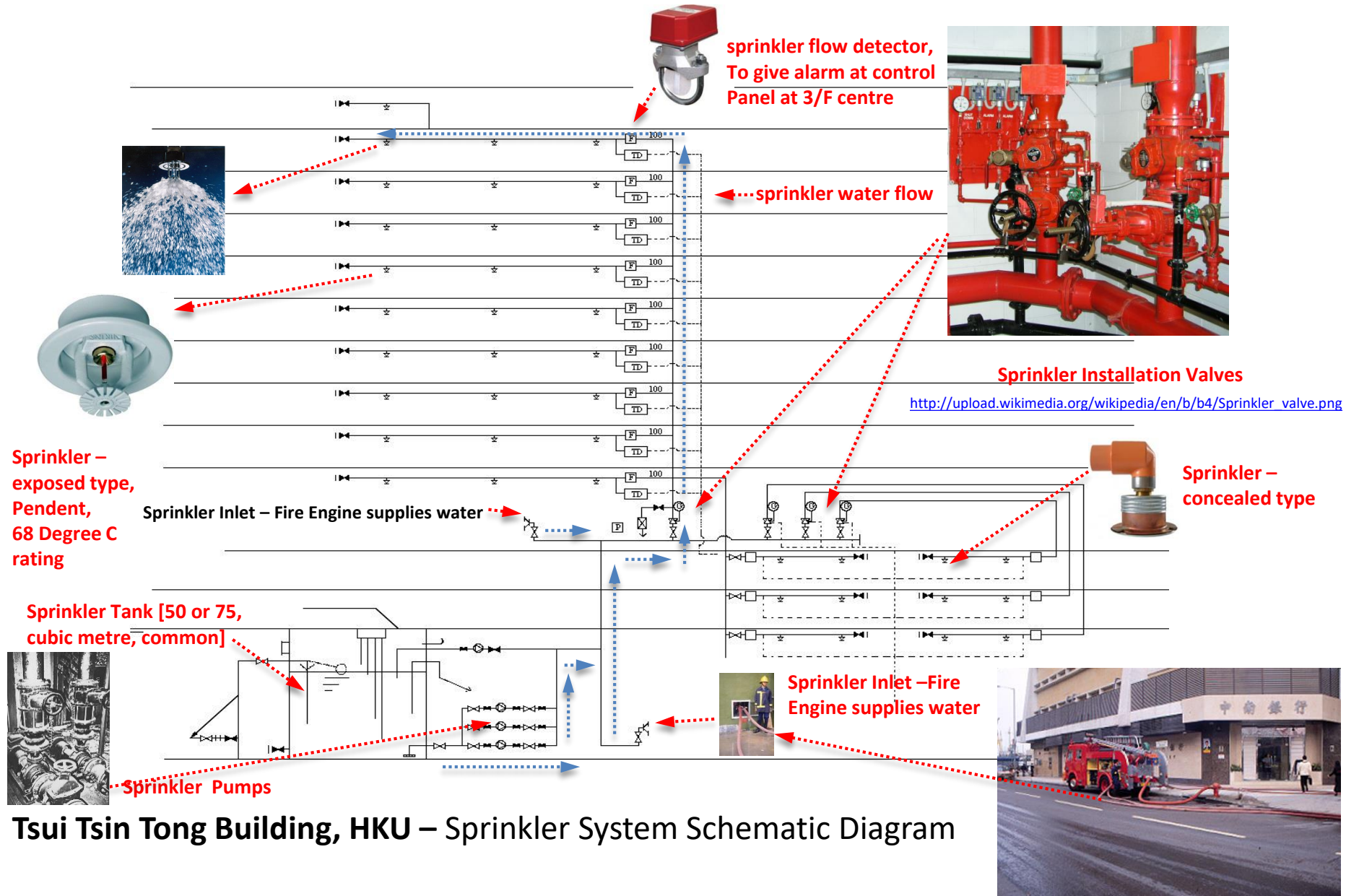


Tsui Tsin Tong Building, HKU

<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;

Drawn by Safety Office on 4/1998 By DP
Revised on 8/2009

Code of Practice for Inspection, Testing and Maintenance of Installations and Equipment -2nd part
of <http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf> – How are the types of fire services installations inside the building to be tested to satisfaction for issuance of occupation permit for the building



Code of Practice for Inspection, Testing and Maintenance of Installations and Equipment -2nd part
of <http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf> – How are the types of fire services installations inside the building to be tested to satisfaction for issuance of occupation permit for the building

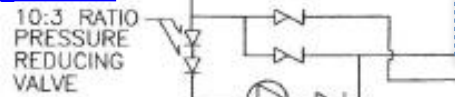
Fire Service Tank [36 cubic metre, common]



Hosereel Riser, with hosereels connected at EACH FLOOR

http://www.hkfsd.gov.hk/eng/faq1_fs.html#5

Fire Hydrant & Hose reel Pumps



FIXED PUMP/ INTERMEDIATE BOOSTER PUMP (ONE DUTY, ONE STANDBY) AT LANDING VALVE C3

Fire Service Inlet –Fire Engine supplies water



FIRE BRICK INLET

Fire Hydrant Riser

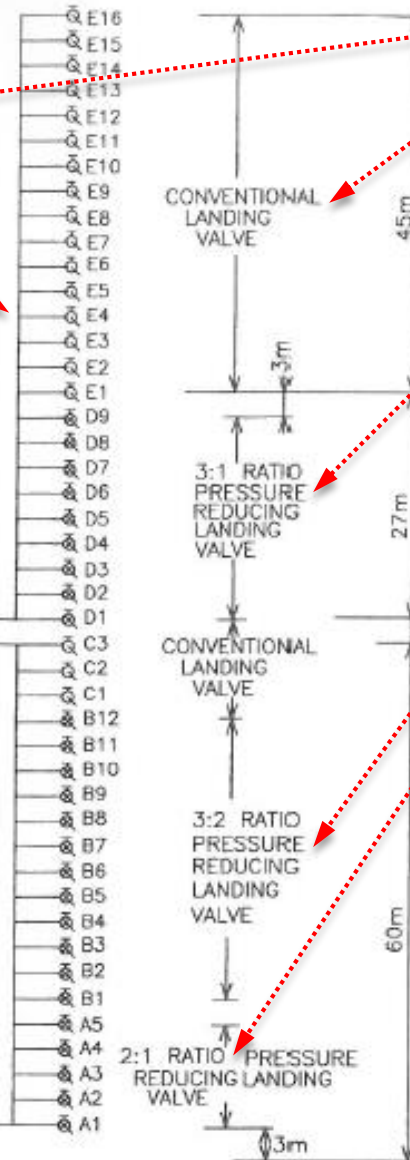


Firemen nozzle

Flexible Hose

USE conventional Fire Hydrants

Do not use integrated Pressure-reducing Fire Hydrants



A Fire Hydrant and Hose reel System in Hong Kong
(in which **integrated Pressure-reducing Fire Hydrants** were wrongly used)

Figure 1 Schematic diagram of fire hydrant system for 40-storey residential tower

Fire Hydrant Test for an Industrial Building in Hong Kong held in 1990
6 water jets each delivering 450 litre per minute : see COP-FSI -section 5.14 Fire hydrant/hose reel system
(e) INTERMEDIATE BOOSTER PUMP , page 30-32 of COP-FSI <http://www.hkfsd.gov.hk/eng/code.html>



Fire Hydrant Test for an Industrial Building in Hong Kong held in 1990

6 water jets each delivering 450 litre per minute : see COP-FSI -section 5.14 Fire hydrant/hose reel system

(e) INTERMEDIATE BOOSTER PUMP , page 30-32 of COP-FSI <http://www.hkfsd.gov.hk/eng/code.html>



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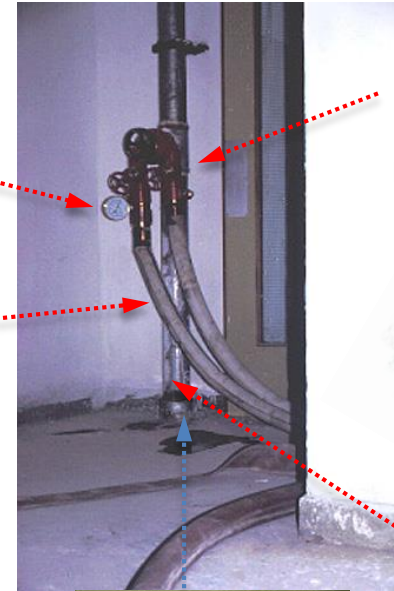
(e) INTERMEDIATE BOOSTER PUMP , page 30-32 of COP-FSI <http://www.hkfsd.gov.hk/eng/code.html>



Flexible hose connected to a single-outlet hydrant in a non-industrial building during testing

Pressure gauge

Flexible hose



Twin-outlet fire hydrant

fire hydrant riser

fire hydrant riser



Street hydrant (pedestal hydrant)



****NO pressure-reducing fire hydrants shall be used in normal buildings**



Hydraulic platforms [i.e. snorkel] : Cage



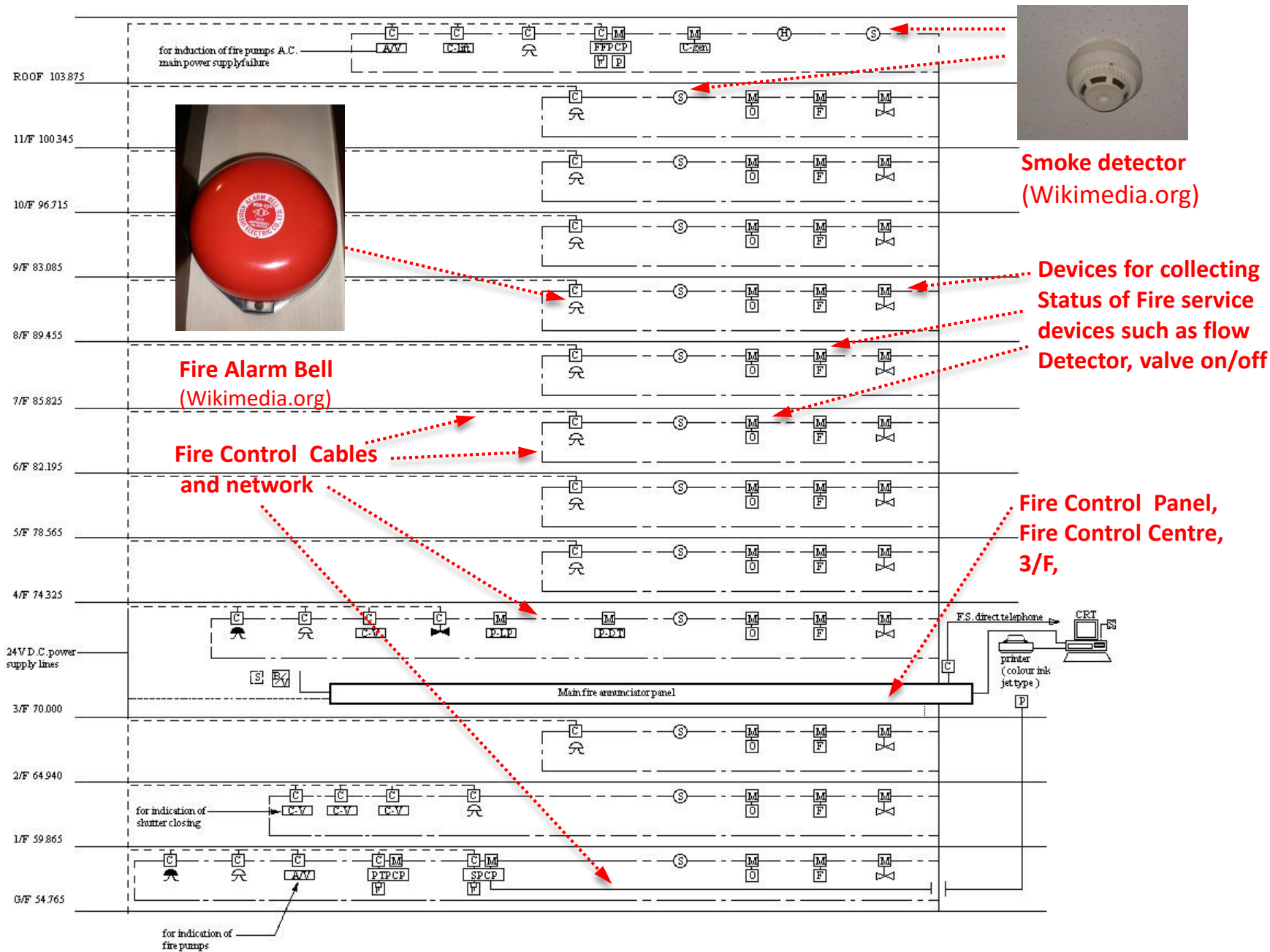
Fire engine Pumps
Inside

Outlet connectors
Supplied with high
pressure water
discharged from fire
engine pumps

Connectors drawing
water from street
hydrant to supply
fire engine pumps



Photos of 1987, Hong Kong



Tsui Tsin Tong Building, HKU – Fire Detection and Alarm Diagram

Integrated Sustainable Approach

DESIGN MANUAL - BARRIER FREE ACCESS 2008 & amendments →
http://www.bd.gov.hk/english/documents/index_crlst.html

- Unwanted fire is minimized ,and suppressed quickly : minimum loss of property and objects burnt, minimum injury, best no injury and no life loss. [note :Wanted fire: cooking]
- Means of Escape affect floor layout, and staircase location, and structural systems
- Water tanks and pump rooms for fire fighting systems, and plumbing and drainage systems to be provided inside buildings
- Electrical Transformer Room & Main switch room are commonly provided at G/F, cable duct and sub-switch rooms are provided at each floor
- Water efficient and energy efficient pumps and equipment are to be used
- Optimized overall planning with air-conditioning and other building services, and FUNCTIONS of the buildings to be carried out to attain **Integrated Sustainability**

Case study on overall *Building Services Integration*

- **Tsui Tsin Tong Building, HKU:** Building No.13 in [HKU main campus map](#)
- Floor Layout and evacuation plans for **Tsui Tsin Tong Building, HKU :**
<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf>

Basic Reading :

1. [Code of Practice for Fire Safety in Buildings 2011 \(October 2015 version\)](http://www.bd.gov.hk/english/documents/code/fs2011/fs2011_full.pdf)
http://www.bd.gov.hk/english/documents/code/fs2011/fs2011_full.pdf
2. CODES OF PRACTICE FOR MINIMUM FIRE SERVICE INSTALLATIONS AND EQUIPMENT AND INSPECTION, TESTING AND MAINTENANCE OF INSTALLATIONS AND EQUIPMENT <http://www.hkfsd.gov.hk/eng/source/safety/File2012.pdf>
3. DESIGN MANUAL - BARRIER FREE ACCESS 2008 & amendments http://www.bd.gov.hk/english/documents/index_crlist.html
4. Tsui Tsin Tong Building, HKU - Evacuation plans with building services plant rooms
<http://www.safety.hku.hk/homepage/pdf/FPTTT.pdf> ;
5. Smith, David Lee, *“Environmental Issues for Architecture”*, Chapter 12 & 13. Hoboken, N.J. : Wiley, c2011.
6. Reid, Esmond, *“Understanding Buildings”*, London : Construction Press, 1984.

Further reference :

1. All buildings of HKU - Evacuation plans with building services plant rooms [showing layout of plant rooms for building services, and compliance of MOE design] http://www.safety.hku.hk/homepage/manual_Floorplan.html
2. Buildings Department , HKSAR :Codes of Practice, Design Manuals
<http://www.bd.gov.hk/english/documents/index.html>

*** Thank you very much ***