SEM 029

Seminar on the

NEW FIRE CODE

-THE FOURTH MILESTONE-

26 Sep 97
PSB Auditorium

Organised by

FIRE SAFETY BUREAU

SINGAPORE CIVIL DEFENCE FORCE

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MEANS OF ESCAPE

PART I

PREPARED BY : MS LEONG WAI YING
MR LAU KWONG CHUNG

MEANS OF ESCAPE

INTRODUCTION

1. **The major amendments include:**
   a) **Determination of Remoteness of Exits**
   b) **Residential Buildings under Purpose Group I having 4 storeys or levels including Basement or Attic**
   c) **Exits from Residential Units**
   d) **Timber Construction for Attic Floors under 25m2 for buildings of Purpose Groups I and II**
   e) **Internal Corridors which are not naturally ventillated in hotels**
   f) **Requirements in Assembly Occupancy with Fixed Seating**
   g) **Workers Dormitories**
   h) **Revision of travel distances for all purpose groups under Table 2.2A**
   i) **Permitting 4 storey shop, factory and warehouse to have single exit staircase**

2. **Many of the above are either new clauses or are major revisions of the existing ones.**

3. **The cineplex where several mini-cinemas are housed into one building is a new building type which started in the early 1990's and is becoming increasingly popular. Clause 2.8.5 was inserted to address this building type.**

4. **Workers Dormitories which were built exclusively to cater to the needs of the foreign construction workers came into being only recently. Clause 2.9 provides guidelines for the design of Workers Dormitories.**

5. **A new method of determining Remoteness of Exits is introduced and illustrated with diagrams.**

6. **Purpose Group III – Institutional has been amended to include Dormitories (which are similar to Hostels)**

7. **Purpose Group VII – Place of Public Resort has been amended to include Boarding Houses (which are similar to hotels)**

8. **The other amendments are mainly refinements and clarification to current definitions which may be unclear or are imprecise, for example, the habitable height of a building is now given as that measured from the average level of the ground adjoining the outside of the external walls of the building to the finished floor level of the highest habitable floor. Previously, the interpretation of the reference level of the highest habitable floor was always in question.**

NEW CODE (new clause):

CL.1.2.17

A dead-end is a situation within a space, normally a corridor or lift lobby area, where exit is only possible from one end, with no possible escape from the other end. The maximum length of such dead end spaces shall not exceed 13m or 19m (sprinklered) as stipulated in Table 2.2A, column (vi) see diagram 1.2.17

a) **If two exits or exit access doors are required, they shall be placed at a distance from one another equal to or not less than half the length of the maximum overall diagonal dimension of the building to be served, meaured in a straight line between the nearest edges of the exit doors or exit access doors (see diagram 1.2.60(a)(i) to (v)). If the distance between the 2 exits is less than half the length of the maximum overall diagonal dimension of the building or area to be served, it shall be considered as a one-way escape arrangement.**

b) **In buildings protected throughout by an approved automatic sprinkler system which complies with the requirements of chapter 6, the minimum separation distance between two exits or exit access doors measured in accordance with subclause 1.2.60(a) shall be not less than one third of the maximum overall diagonal dimension of the building or area to be served.**

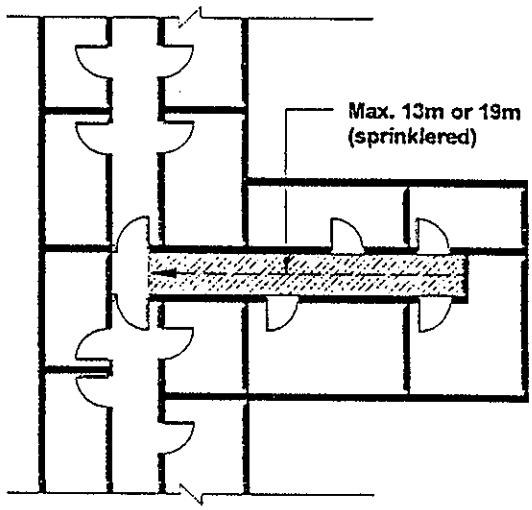
c) **Where exit staircases, exit passageways or exit ramps are interconnected by a corridor, exit separation shall be permitted to be measured along the line of travel within the exit access corridor. The exit access corridor connecting the exit staircases, exit passageways or exit ramps shall be protected by minimum one hour fire rated enclosures. Doors opening into this corridor shall have minimum half hour fire resistance rating (see diafram 1.2.60(c)).**

NEW CODE (new clause):

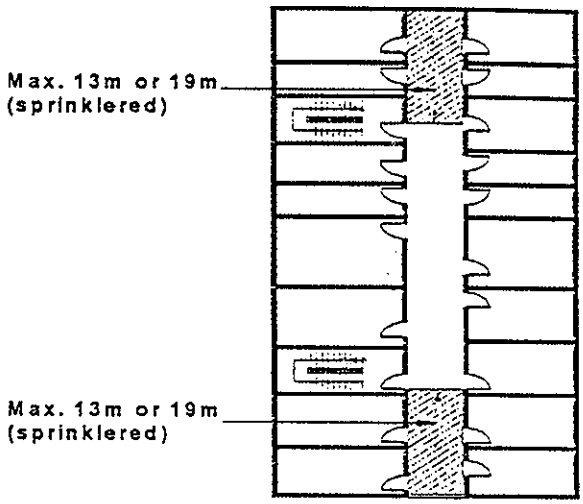
CL.1.2.17

A dead-end is a situation within a space, normally a corridor or lift lobby area, where exit is only possible from one end, with no possible escape from the other end. The maximum length of such dead end spaces shall not exceed 13m or 19m (sprinklered) as stipulated in Table 2.2A, column (vi) see diagram 1.2.17

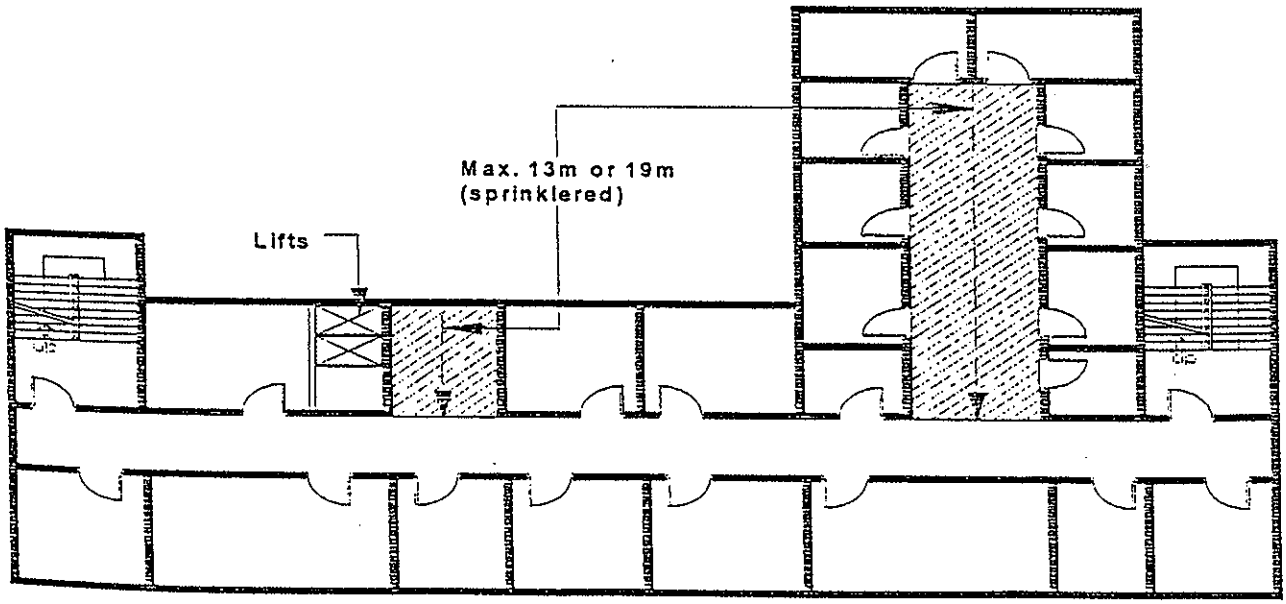
DEAD END CORRIDORS



a. 'T' JUNCTION WITH MAIN CORRIDOR



b. CONTINUATION PAST STAIRWAY



c. Example of two common types of dead-end corridors. Both dead-end pockets serve as traps because travel into them does not lead to an exit; the egress path must be reversed to reach an exit staircase

LEGEND

Dead end corridor max. 13m or 19m (sprinklered)

ONE WAY TRAVEL / DEAD END

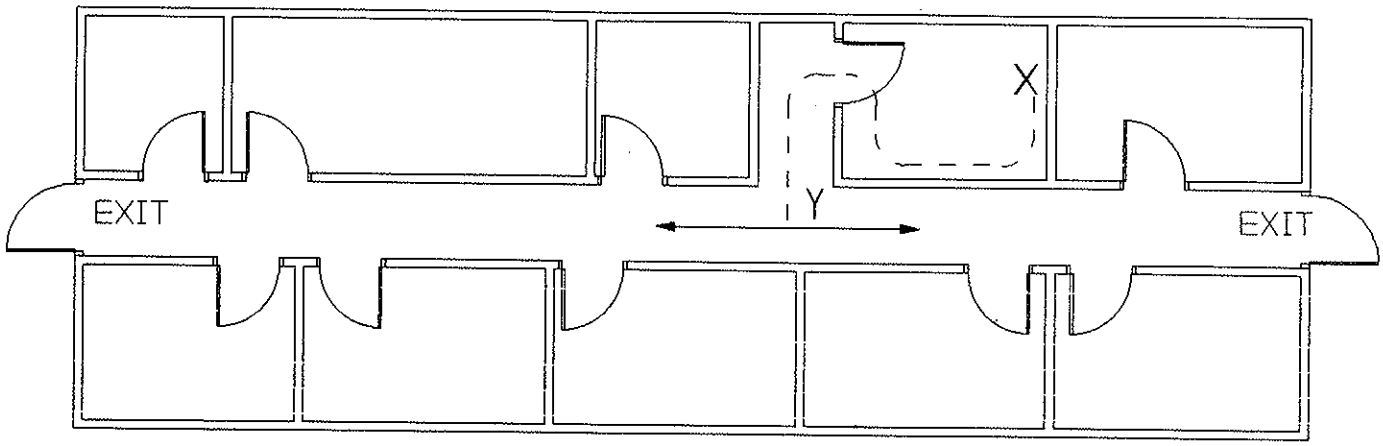


FIG 1(A): XY = ONE-WAY TRAVEL

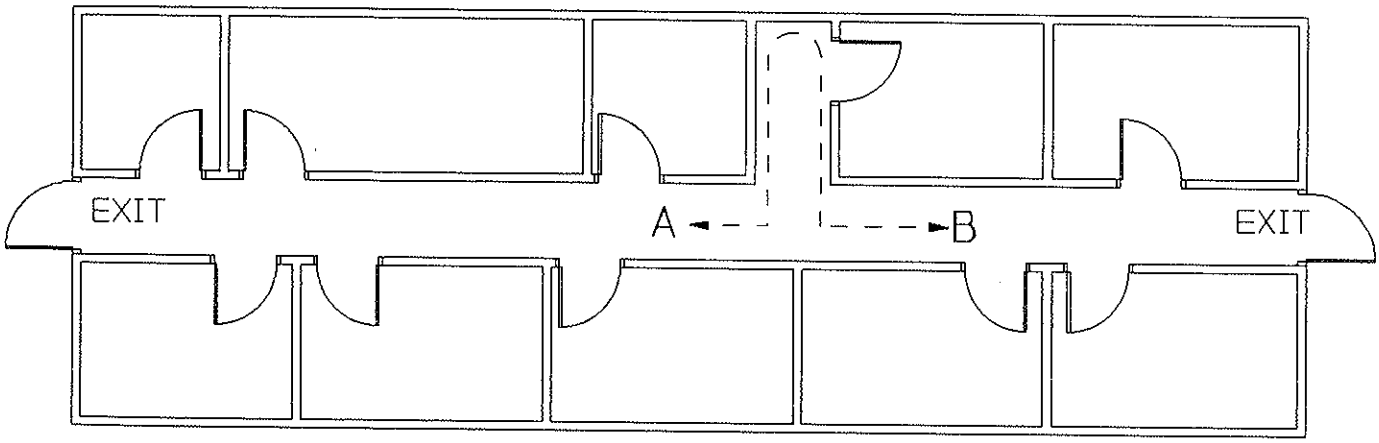


FIG 1(B): AB= DEAD END

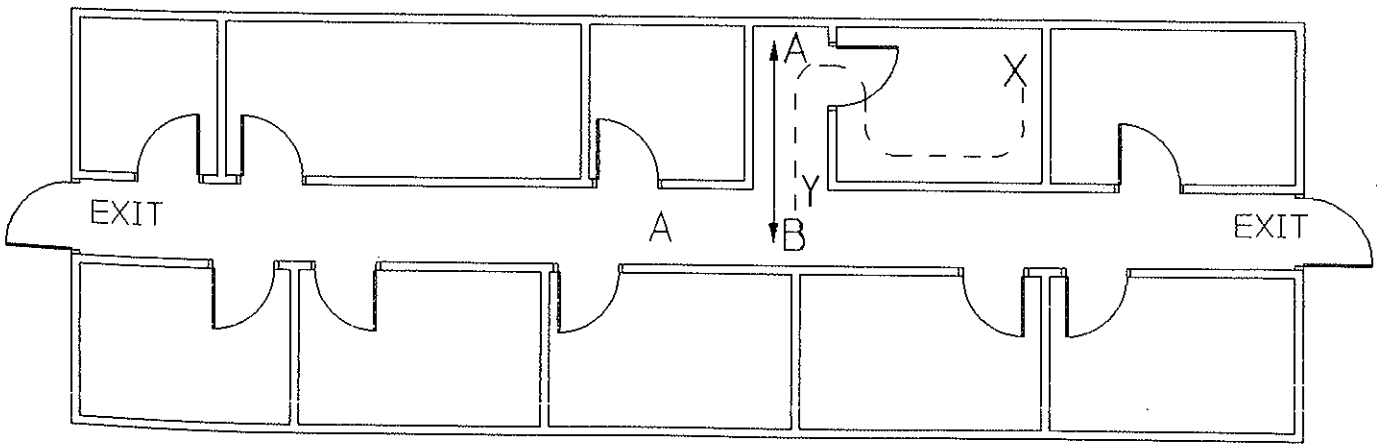


FIG 1(C): AB= DEAD END
XY = ONE-WAY TRAVEL

Comment (Cl.1.2.17)

1) **This definition is introduced as much confusion was caused by the reference to "dead end" being used interchangeably with one-way travel in Table 2.2A.**

2) **Although in practical terms, one-way travel is similar to the dead-end arrangement, the concepts are completely different.**

3) **A dead end occurs when an occupant enters a space or corridor thinking there is an exit at the end, and finding none, must retrace his path to reach an exit. Precious time is lost and additional travel distance is incurred when the occupant doubles back to look for the exit.**

4) **One-way travel or common path of travel exists where a space is arranged so that the occupants within that space are able to travel only in one direction to reach any of the exits or to reach the point at which the occupants have the choice of 2 paths of travel to remote exits.**

NEW CODE:

Cl.1.2.60

Where more than one exit is required from a building or portion thereof, such exits shall be remotely located from each other and shall be arranged and constructed to minimize the possibility that more than one can be blocked by any one fire or other emergency condition.

a) If two exits or exit access doors are required, they shall be placed at a distance from one another equal to or not less than half the length of the maximum overall diagonal dimension of the building to be served, meaured in a straight line between the nearest edges of the exit doors or exit access doors (see diagram 1.2.60(a)(i) to (v)). If the distance between the 2 exits is less than half the length of the maximum overall diagonal dimension of the building or area to be served, it shall be considered as a one-way escape arrangement.

b) In buildings protected throughout by an approved automatic sprinkler system which complies with the requirements of chapter 6, the minimum separation distance between two exits or exit access doors measured in accordance with subclause 1.2.60(a) shall be not less than one third of the maximum overall diagonal dimension of the building or area to be served.

c) Where exit staircases, exit passageways or exit ramps are interconnected by a corridor, exit separation shall be permitted to be measured along the line of travel within the exit access corridor. The exit access corridor connecting the exit staircases, exit passageways or exit ramps shall be protected by minimum one hour fire rated enclosures. Doors opening into this corridor shall have minimum half hour fire resistance rating (see diafram 1.2.60(c)).

EXISTING CODE:

Cl.1.1.55

A situation where there are 2 independent escape routes and the subtended angle between the 2 lines of travel from the relevant point in the room or space to the exits shall not be less than 45 degrees. If the subtended angle is less than 45 degrees, it shall be considered as a one-way escape arrangement, notwithstanding the fact that there are 2 or more exits.

Comment (Cl.1.2.60)

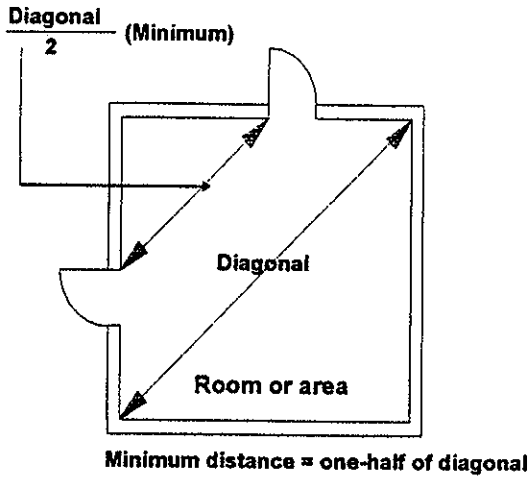
1) This new method of locating the exits replaces the old concept of using 45 degrees to determine the remoteness of exits.

2) The old method, based on the British Standards, was especially restrictive in central core designs where numerous waivers were sought by the architects from FSB when interpreting whether the travel is one or two-way.

3) The new concept is based on the NFPA Guidelines on the Arrangement of Means of Egress. Here, the criteria of 2-way escape is no longer dependent on whether a 45 degree angle is subtended or not. The provision of 2 escape staircases based on their remoteness in location ensures that the building envelope is adequately served by 2 independent escape routes.

Diagram 1.2.60(a)(i) to (a)(iv)

Remoteness of exit staircase
Arrangement of exits



Minimum distance = one-half of diagonal

Diagram 1.2.60(a)(i)

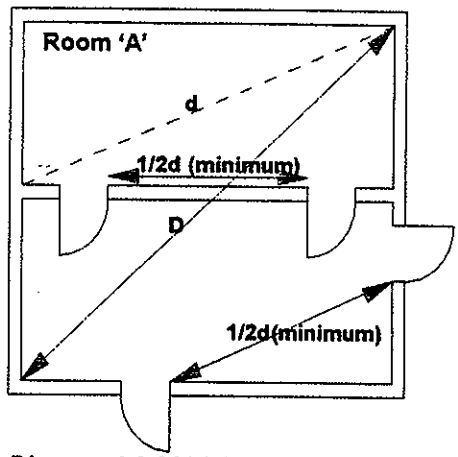


Diagram 1.2.60(a)(ii)

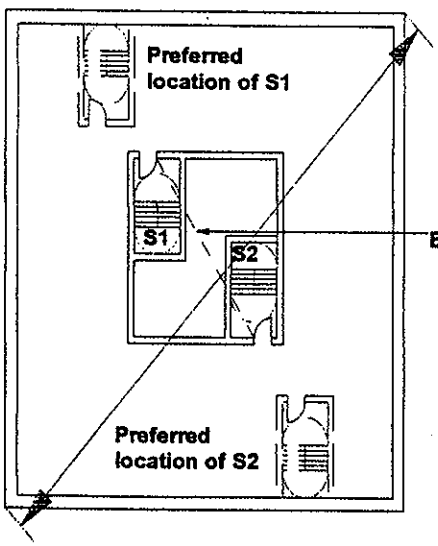


Diagram 1.2.60(a)(iii)

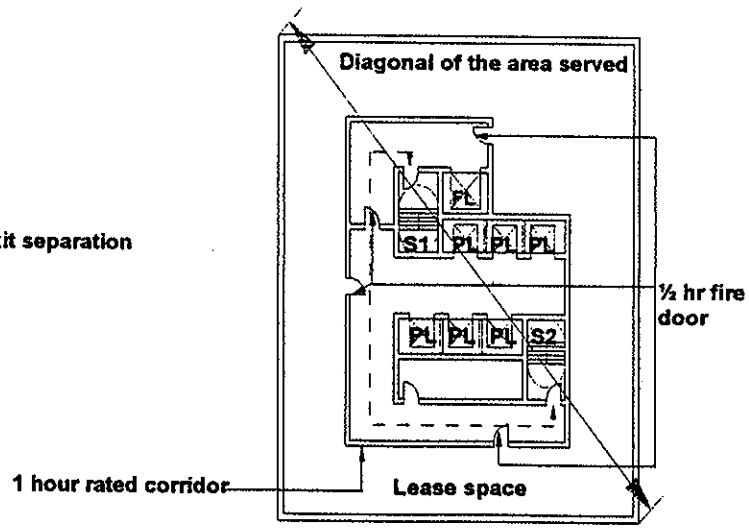


Diagram 1.2.60(a)(iii)

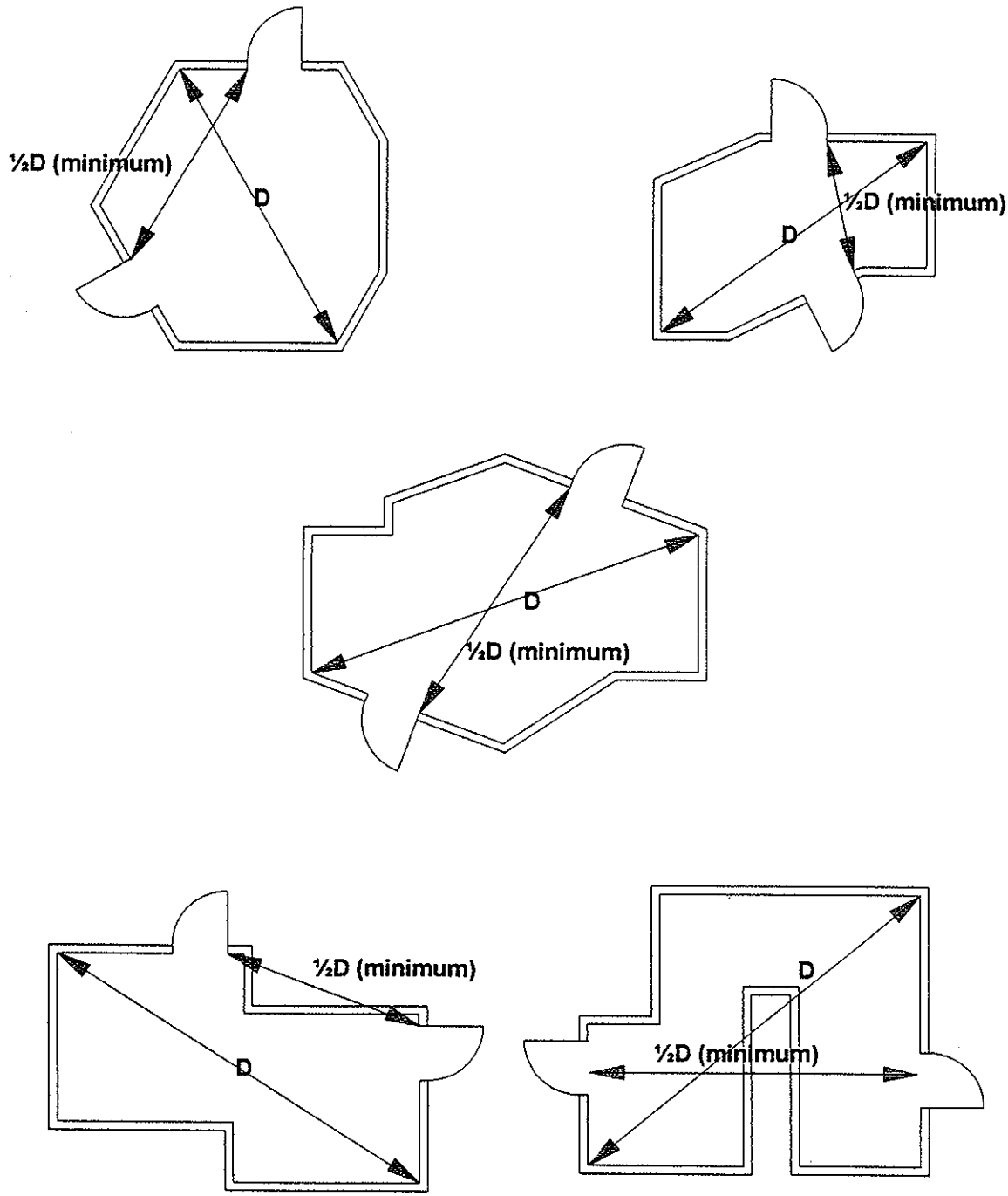
One-way escape arrangement
The distance between the exit of staircases S1 & S2 is less than half the length of the max. overall diagonal dimension of the building or floor space

Two-way escape arrangement
Exit separation between the exit of staircases S1 & S2 may be based on the travel distance in the exit access corridor enclosed with 1 hour fire rated walls and ½ hour fire rated door

Drawn by RT/FSB

Diagram 1.2.60(a)(v)

Remoteness of exit staircase
Arrangement of exits



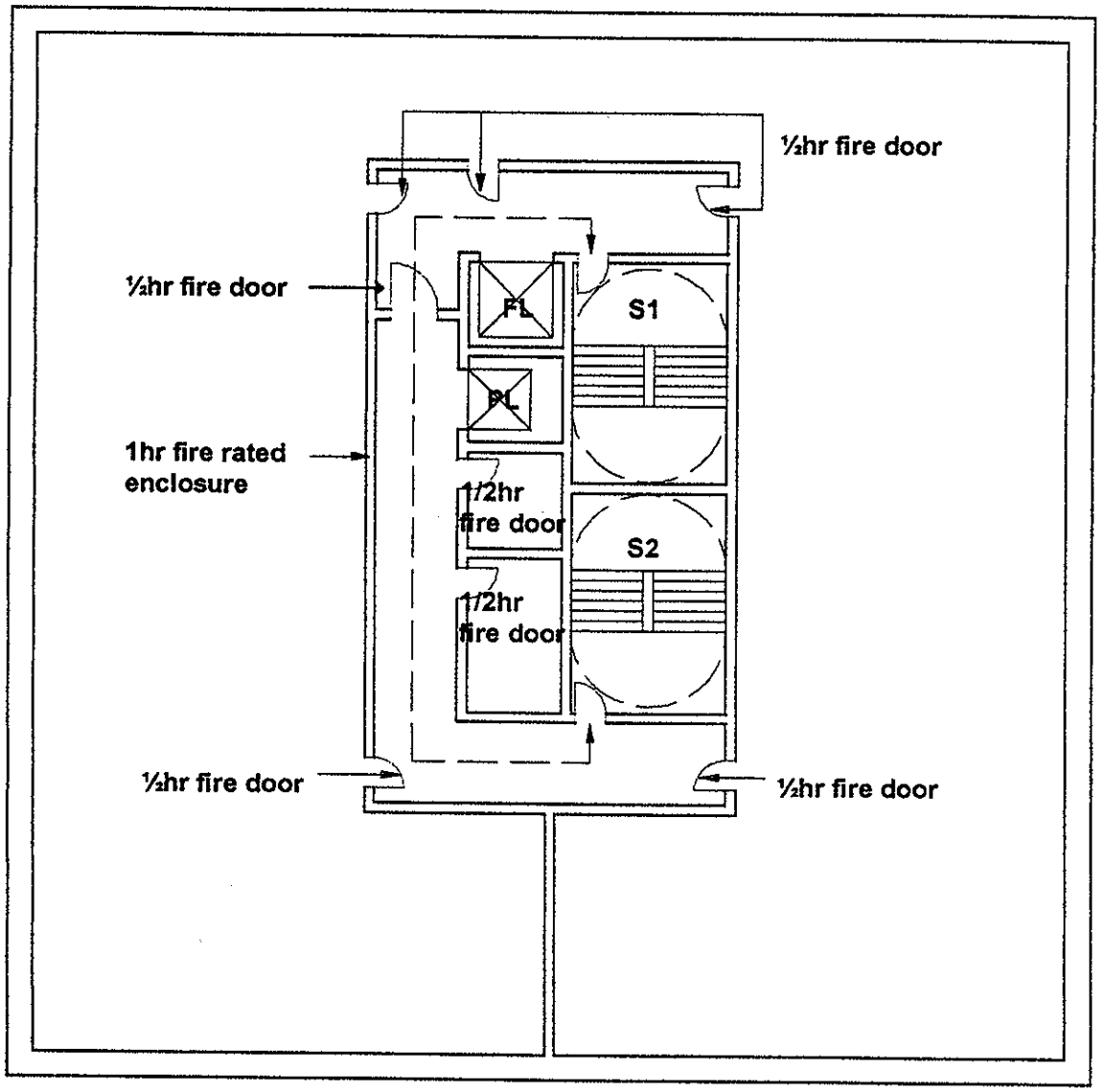
(Not to scale)

Drawn by RT/FSB

Diagram 1.2.60(c)

Remoteness of exit staircases

Arrangement of exit staircases



(Not to scale)

Remoteness of exits is measured along 1-hour rated corridor with ½ hour fire doors. In place of measuring physical distance between exit stair enclosures, distance for purposes of determining remoteness is permitted to be measured along a protected corridor.

Drawn by RT/FSB

REMOTENESS OF EXITS

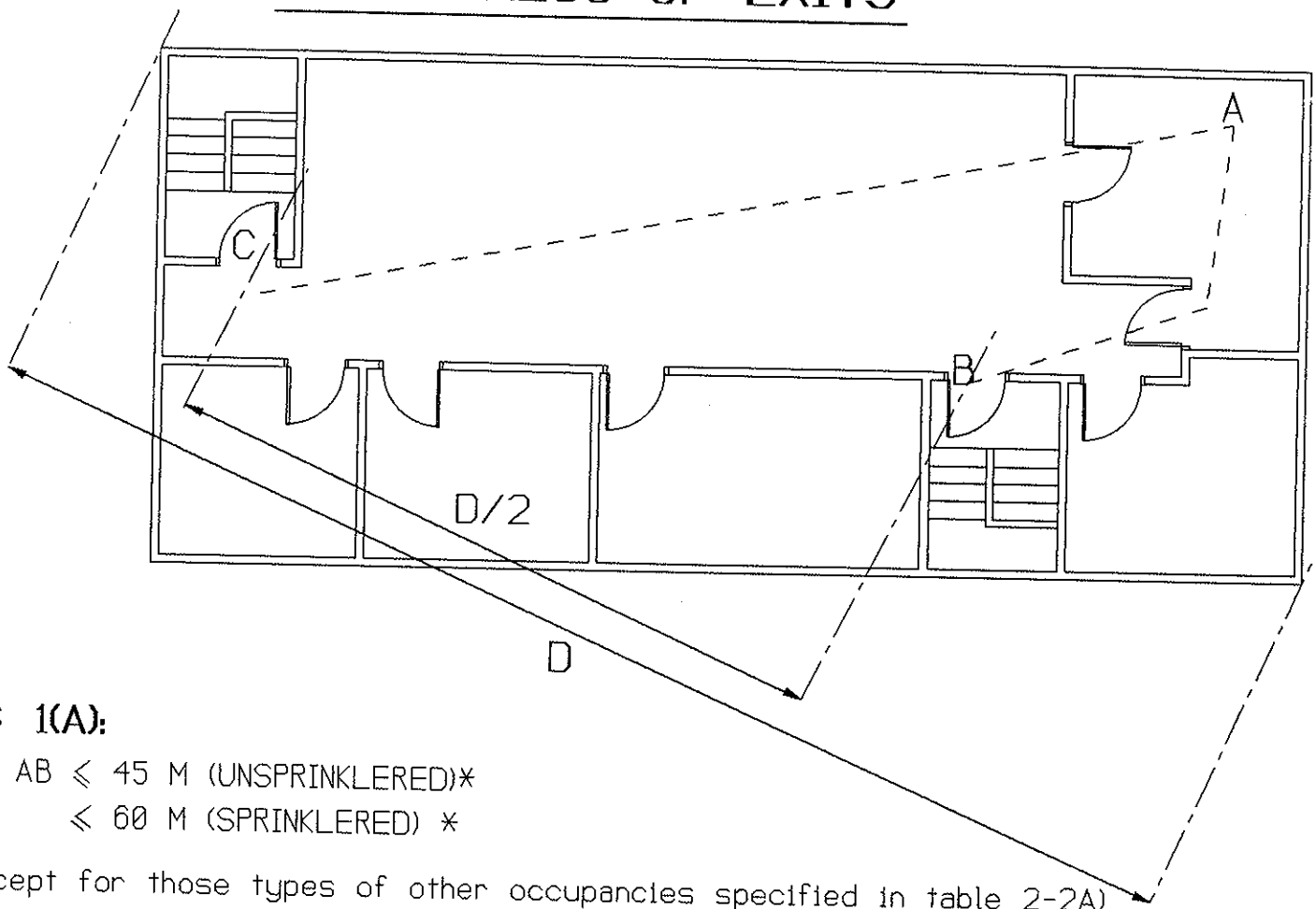


FIG 1(A):

AC , AB ⩽ 45 M (UNSPRINKLERED)*
⩽ 60 M (SPRINKLERED) *

* (Except for those types of other occupancies specified in table 2-2A)
In large room, AB , AC ⩽ 2/3 X 45m or ⩽ 2/3 x 60m
(direct distance measurement)

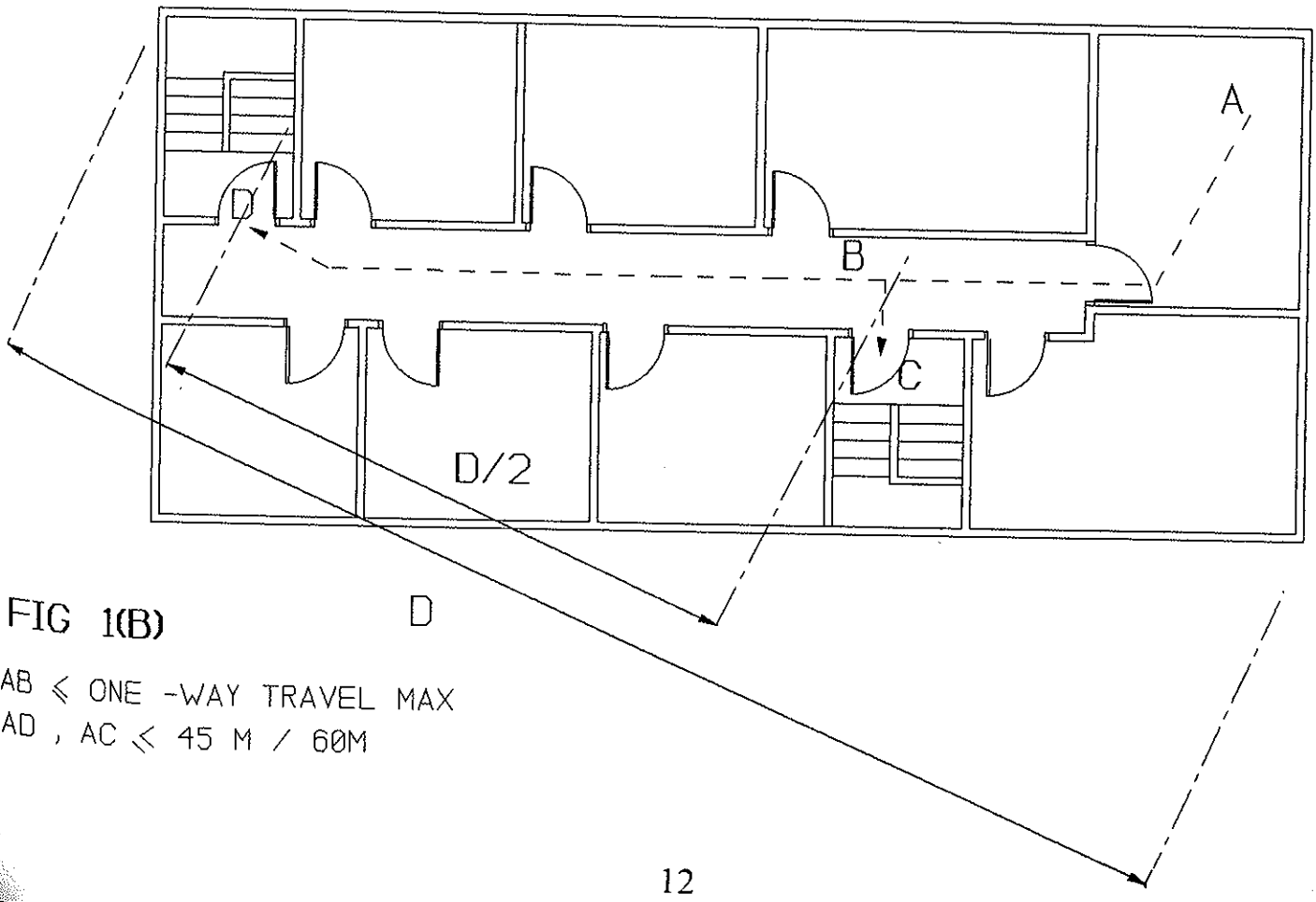


FIG 1(B)

AB ⩽ ONE -WAY TRAVEL MAX
AD , AC ⩽ 45 M / 60M

REMOTENESS OF EXITS

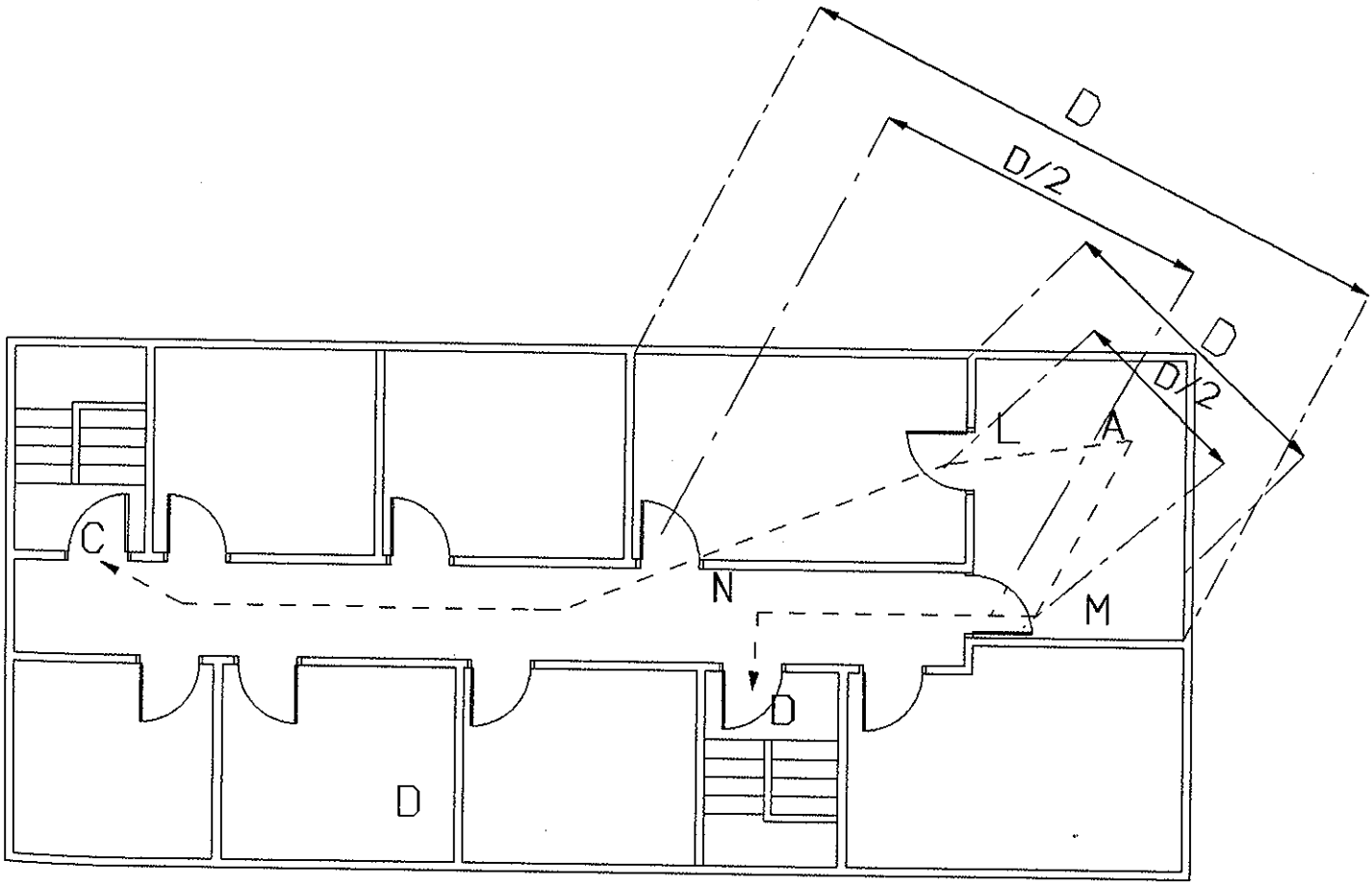


FIG 1(C)

AC , AD ≤ 45 M (UNSPRINKLERED)
60 M (SPRINKLERED)

* Location of doors :- L & M is ≥ D/2 and N & M is ≥ D/2 to qualify for 2 way travel

Extract notes from previous Seminar on Self Declaration Scheme for FSB Plan Approval on 4/4/96

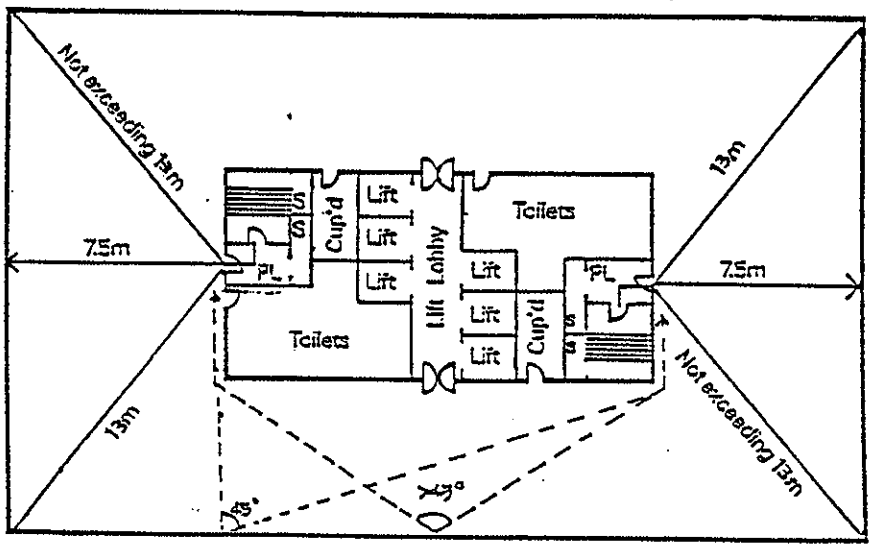
MEANS OF EGRESS

TWO-WAY ESCAPE

It is applicable in a situation where there are two independent escape routes and the subtended angle between the two lines of travel from the relevant point in the room or space to the exits shall not be less than 45 degrees. If the subtended angle is less than 45 degrees, it shall be considered as a one-way escape arrangement, notwithstanding the fact that there are two or more exits.

DIAGRAM A

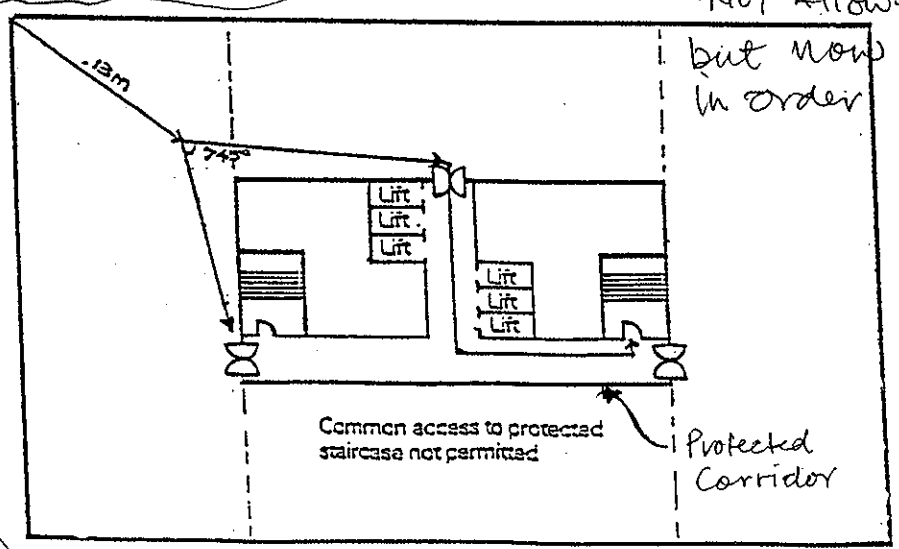
S – Ventilation shaft PL – Protected lobby to protected staircase.



CORRECT

DIAGRAM B

Old Code 1991 - NOT Allowed but now in order



INCORRECT

Cl.2.2.6

NEW CODE:

The maximum travel distance for the respective types of occupancies shall not be greater than as laid down in Table 2.2A read in conjunction with the following:

a) In the case of a floor area designed with minimum two exits, the maximum travel distance as given in Table 2.2A shall be applicable. The maximum travel distance starting from the most remote point in any occupied space to the nearest exit shall not exceed the limits specified in Table 2.2A, and...

EXISTING CODE:

a) In the case of a floor area designed with 2-way escape provisions, the maximum travel distance as given in Table 2.2A shall be applicable to both escape routes measured from the most remote equidistant points (in relation to the two exits) in the room or space to the door opening into an exit staircase, exit passageway or exterior open space, and...

TABLE 2.2A DETERMINATION OF EXIT REQUIREMENT

(i) Type of Occupancy	(ii) Max Travel Distance (m) (One-way Escape)		(iii) Max Travel Distance (m) (Two-way Escape)		(iv) Capacity No of persons per unit of width (x)				(v) Min Widths (m)		(vi) Max Dead End (m)
					Door openings (c),(e)		(f)	(d)			
	Unsprin-klered	Sprin-klered	Unsprin-klered	Sprin-klered	To outdoors at ground level	Other exit & corridor doors	Stair-cases	Ramps Corridors Exits Passageways	Stairs	Corri-dors	Corridors
High hazard	10	20	20	35	50	40	30	50	1	1	13
Industrial buildings (factories, workshops, godowns/warehouse)	15	25	30	60	100	80	60	100	1	1	13
Dormitories, hostels	15	25	30	60	50	40	30	50	1	1	13
Shops	15	25	45	60	100	80	60	100	1	1	13
Offices	15	30	45	75	100	80	60	100	1	1	13
Places of public resort & carparks	15	25	45	60	100	80	60	100	1(h)	1(h)	13
Schools & educational buildings	15	25	45	60	100	80	60	100	1	1½(a)	13
Hospitals	15	25	30	45	30	30	15	30	1	2(b)	13
Hotels, boarding houses (k)	15	20	30	45	50	40	30	50	1	1	13
Blocks of flats/maisonettes (k)	(15(g) (20(j)	30(g) 40(j)	30 45(j)	60	50	40	30	50	1	1(i)	13
Detached, semi-detached & terrace houses, including townhouses	NR	NR	NR	NR	NR	NR	NR	NR	0.9	1	NR

NR = No requirements Maximum direct distance = 2/3 x maximum travel distance ... see cl.1.2.18.

(x) Unit of width = 0.5 metres.

(a) Applies to corridors serving classrooms. Other corridors shall have a minimum width of 1 metre.

(b) Applies to corridors serving patients. Other corridors shall have a minimum of 1 metre.

(c) See cl.2.3.9.

(d) See cl.2.3.8.

(e) Where a door opening is divided by mullions into two or more door openings, each such opening shall be measured separately in computing the number of units of exit width.

(f) See cl.2.2.15(e) regarding reduction of exit provision.

(g) For travel distance in single staircase flats .. see cl.2.4.

(h) Refer to cl.2.8.2.

(i) Staircase within maisonette serving as an internal access to be at least 0.9m width.

(j) Applies to external corridor .. see cl.2.4.9.

(k) Measurement of travel distance is from the guestroom door or residential unit door to exit staircase .. see cl.2.7.4 & 2.4.7 respectively.

CL.2.4.1

NEW CODE:

Mean of escape for a building or a separate part of a building of single occupancy of Purpose group I not exceeding 4 storeys, may be provided via access staircase, and exit staircase under the provision of cl.2.3 is not required. Where the building has 4 storeys or levels, inclusive of attic and basement, subclause 3.2.4(d) on the provision of automatic fire alarm system or an unenclosed external staircase shall be complied.

EXISTING CODE:

Means of escape for a building or separated part of a building of single occupancy of purpose group I not exceeding 3 storeys may be provided via access staircases, and exit staircases under the provisions of Cl.2.3 shall not be required.

Comment (Cl.2.4.1)

1) **This clause was introduced in June 1996 to take consideration of the proliferation of 4-level purpose group I buildings due to the sudden surge in the public demand for 2-storey conventional houses with an attic and basement which URA allows in a 2-storey zone.**

2) **FSB was concerned with the dangers of smoke hazard in the volume of the 4-storey space and the additional time required by occupants to escape from the topmost level in times of emergency.**

3) **Developers and architects disagreed with FSB. They contended that such house was meant for single family occupation. The issue was discussed at length at the FSB Standing Committee meeting and later resolved with FSB issuing a circular on 13 Jun 96 permitting 4-storey (inclusive of attic floor and basement level) houses provided that either an automatic fire alarm system is installed to cover the whole building or an unenclosed extended staircase is provided to serve the topmost floor.**

4) **Internal protected staircases are not allowed as an alternative to the provision of an automatic fire alarm system or an unenclosed external staircase.**

5) **The fire alarm system is a standalone system which need not be connected to the monitoring company. It should, however, be provided in complete compliance with CP10 and should be RI-inspected when completed.**

CLAUSE:- 2.4.1

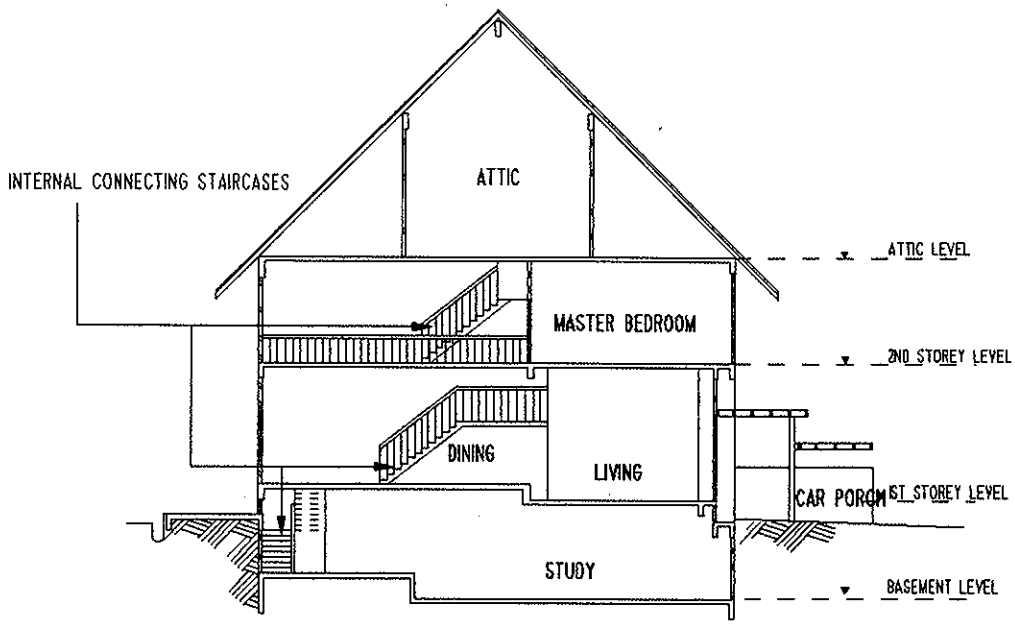


FIG.1 (A) :

Building under Purpose Group I with 2 storeys + basement + attic levels

- Automatic Alarm Fire Systerm required

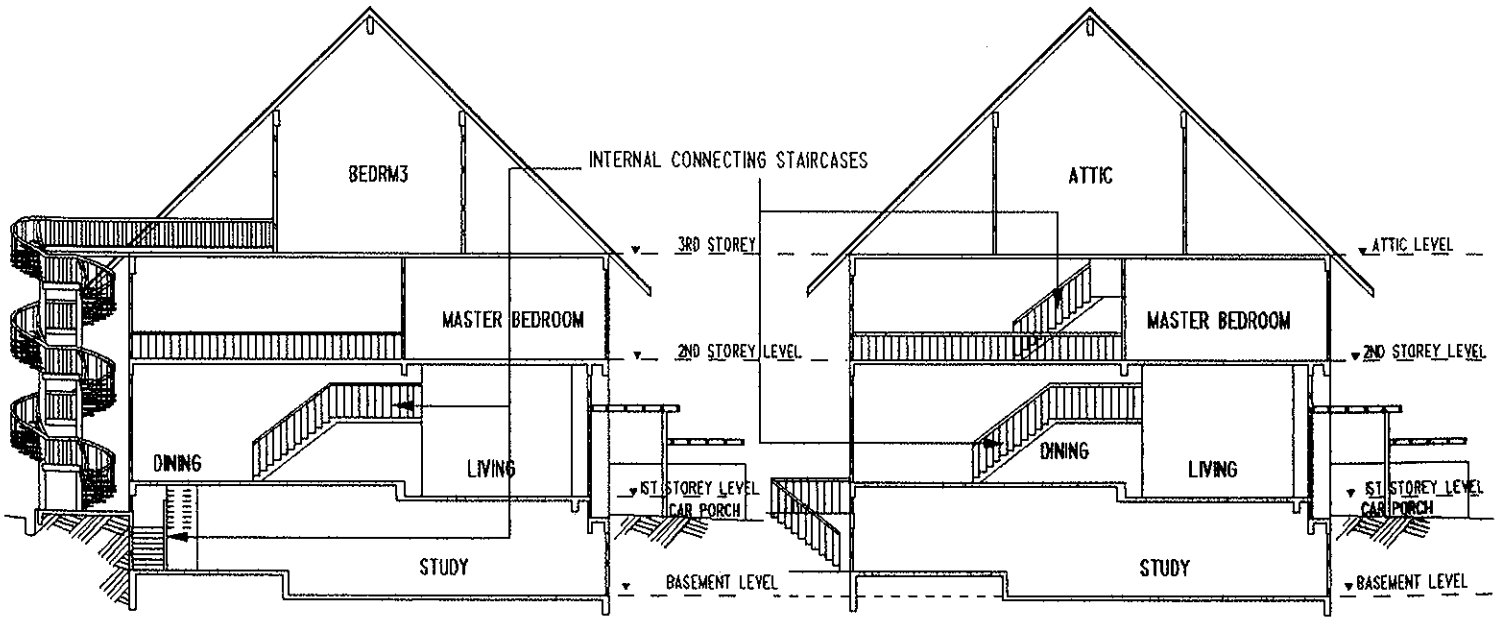


FIG.1 (B) :

Building under Purpose Group I with 3 storeys + basement BUT with complete 3rd storey separation and independant access from external staircase

- Automatic Fire Alarm Systerm not required

FIG.1 (C) :

Building under Purpose Group I with attic + basement BUT with complete separation of basement level and independent external staircase from basement to rear garden

- Automatic Alarm Fire Systerm not required as the connecting levels are only the top 3 floors

WORKER'S DORMITORIES

1.0 Definition :- Dormitories include buildings or spaces in buildings where group sleeping accommodations are provided for workers under joint occupancy and single management, with or without meals, but without individual cooking facilities.

The phase 'without individual cooking facilities' refers to the absence of cooking equipment in any room or unit of dormitory.

2.0 REQUIREMENTS OF A WORKER'S DORMITARY

2.1 COMPARTMENTATION

- Each dormitory bedroom shall not exceed 120 m².

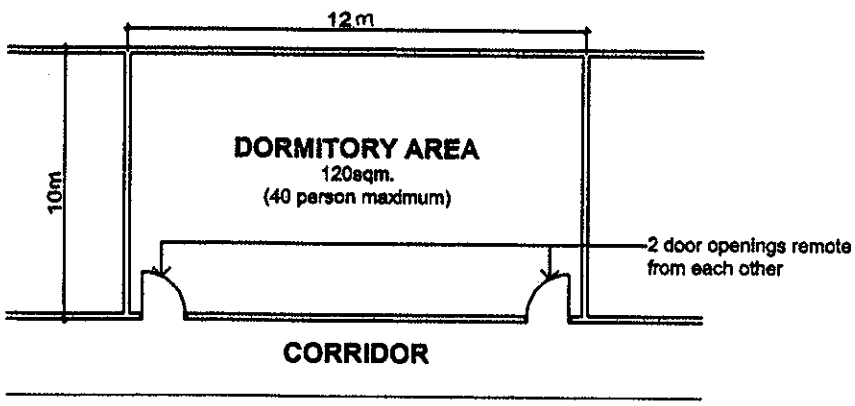


Diagram (I) - Compartmentation size of a Workers' Dormitory

- Occupant load shall be 3 m² per person subject to a maximum of 40 persons in each dormitory bedroom.

- Two exit door openings shall be provided remote from each other if the occupancy load exceed 20 persons.

2.2 MEANS OF ESCAPE

- Within a dormitory bedroom, there shall be two door openings remote from each other if the occupancy load exceed 20 persons.

- There shall be at least two independent exit staircases or exists from every storey of a building.

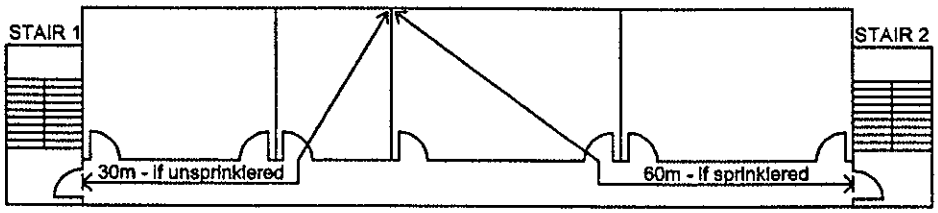


Diagram (II) - Mean of 2-Way Escape

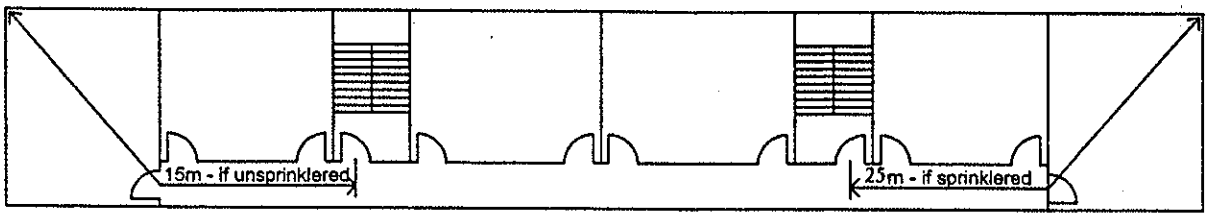


Diagram (III) - 1-Way Escape from Dormitory Bedroom

Protection	2-Way Escape	1-Way Escape
Sprinkler Bldg.	60 m	25 m
Unsprinkler Bldg.	30 m	15 m

MEANS OF ESCAPE

PART II

PREPARED BY : MR TEO LIM TECK
MR RANDY TAN

Means of Escape (PT. II)

(1) The impact that application of the fire code may have on saving lives is difficult to measure; however , it is reasonable to assume that its influence is extremely significant. For this reason, exit design should be based upon careful evaluation of the active and passive fire protection systems in the building, the routes that occupants need to traverse to a safe exit, and an analysis of the population characteristics and hazards of the occupancy.

(2) Thus, the exit design should provide a reasonable level of safety to life from fire by permitting everyone to leave the fire area in the shortest possible time to an area of safety.

(3) Let us continue to examine the new changes and amendments to the means of escape provision in the fire code.

(4) ***(See Table 2.2A in Annex A)***

Cl.2.2.6 The maximum travel distance for the respective types of occupancies shall not be greater than as laid down in table 2.2A. This table is to be read in conjunction with the following:

(a) In case of a floor area designed with minimum two exits, the maximum travel distance as given in table 2.2 A shall be applicable. The maximum travel distance starting from the most remote point in any occupied space to the nearest exit, shall not exceed the limits specified in Table 2.2A

(a) The one-way and two-way travel distances in Table 2.2A have been revised. The increase in the length of travel distances is based on the following considerations:

(i) ***Human factor***

People tend to avoid bodily contact with others. If a choice is given, people would try to establish "territories" to avoid bodily contact with others.
Crowding people into spaces of public resort such as restaurant, nite club, seminar room, exhibition hall having a high occupant load factor of 1.5 sq m per person may create a hazardous condition. Needless to say, under psychological stresses imposed during a fire emergency, such crowding and human contact could contribute to crowd pressures resulting in injuries.
When a queue occurs because of overcrowding or blocked exit, crowd control becomes difficult and well-being of occupants could be threatened.

(ii) ***Factors affecting movement of people***

In a space which has high occupant load factor such as shopping floors or areas of public resort, movement of people would be slower when compared to office floors. Where movement of people reached a stage of "shuffling" a significant panic exposure exists and the conditions would be compounded under fire emergency. The walking speed of people in an occupied space would be much reduced when the population density is high and the route leading to the exit is excessively long.
In buildings such as school or theatre housing highly mobile occupants, the speed of movement of people would be much faster than occupants in hospital or homes for the aged.

(iii) Active fire protection

Automatic sprinkler system is considered sufficiently reliable and has a major influence on life safety. In addition to providing an automatic alarm of fire to alert occupants so that early evacuation could take place, it quickly discharge water on the fire to provide cooling effects, contain or extinguish the fire before smoke has spread dangerously.

(iv) Types of occupancy

Hazard of contents is meant to convey the relative danger of the start and spread of fire in a building, the probable smoke or gases generated by the fire, and the possibility of an explosion or other occurrence endangering the lives and safety of the occupants. Different occupancy groups differ in fire hazard. Separate and different exit requirements should be made for each occupancy group. Shop and office occupancies are grouped together in the fire code 1991. There is an increased hazard to life in shopping floors, resulting from the display of combustible goods, the greater density of population, and the transient character of most occupants. These factors are not found in office, educational and residential buildings which have a relatively low content of combustible materials along the escape route, lower population density, and occupants who are familiar with escape routes pattern. Under the new fire code 1997, office is detached from the shop occupancy and assigned longer travel distances, both one-way and two-way in sprinkler protected building.

(5) ***Exits from apartment units (see diagram in Annex B)***

Cl.2.4.6 Exits from residential unit

(a) In each residential apartment or masionette unit, the exit or exits shall be provided such that the travel distances measured from any point within the unit to the exit door or doors shall not exceed 20m (see diagram 2.4.6(a)) and

(b) In addition, in the case of a masionette unit comprising not more than two storeys, where a single door is provided,

(i) The door shall not be located on the upper storey of the unit; and

(ii) The floor area of the upper storeys shall not exceed 60m² unless a separate exit is provided on this upper storey.

(c) All exits from residential or masionette units shall have direct access to exit staircase, exit passageway or exterior open space.

(a) Fire code 1991 requires apartment units with gross floor area exceeding 120sqm to be provided with 2 exits which shall be spaced remote from each other.

Numerous waiver applications were processed to address 3 issues:

- gross floor area marginally exceeding 120sq m;
- "remoteness" of the 2 exits, which was considered acceptable by qualified persons was not acceptable to FSB plan processing officers.
- cross ventilated or smoke dispersal situation within the apartment unit.

(b) The above issues were discussed by members at length in the FSB Standing Committee, resulting in FSB issuing a circular on 3 Apr 97 to raise the gross floor area to 140sq m for one exit provision. For units having gross floor area exceeding 140sq m, the remoteness of the 2 exits to be provided shall be measured by the shortest travel distance from one exit to the other within the unit, which shall not be less than one half the diagonal of the floor space of the unit. In lieu of 2 exits, it is acceptable to provide an automatic fire alarm system with the fire indicator board to be located in the fire command centre or guard house or in the absence of both, in the main lobby of the building at ground level. All units irrespective of the size are required to comply with travel distance requirements measured from the furthermost bedroom door and the most remote point in the unit to the exit door shall not exceed 13m and 19m respectively.

(c) However, when the Fire code Review Technical Committee was reconvened in May 1997, the above requirements on "remoteness" of exits for units greater than 140sq m and provision of automatic fire alarm system were reviewed respectively.

(d) The Committee after a lengthy discussion, agreed that since life safety hinges on travel distances, the units, irrespective of the floor area shall only need to comply with the travel distance requirements ie. every bedroom door and any point within the unit to the exit door or doors shall not exceed 13m and 19m respectively.

(e) FSB later reviewed the above requirement further and decided that only the one-way travel from the most remote point to the exit door or doors should apply and that it could be increased to 20m. The occupant load per unit is very low and that the occupants, being residents, should be familiar with the escape route of their home.

(f) The latest change as mentioned in (vi) is now incorporated into the new Fire Code 1997

(6) ***OFFICE/SHOP/FACTORY/WAREHOUSE OCCUPANCY***

(See diagram in Annex C)

Cl.2.6.1 In an office, shop, factory and warehouse building, at least two independent exit staircases or other exits shall be provided in compliance with the requirements of Cl.2.2.11, except that one exit staircase may be permitted if the building is of non-combustible construction and not exceeding four storeys, subject to:

(c) With the exception of office building, the gross floor area of shop, factory and warehouse building shall not exceed 185m² on any storey, including service ducts, lift shafts, toilets, staircases etc.

(d) The habitable height of the shop, factory or warehouse building shall not exceed 15m measured from the outside average ground level to the finished floor level of the highest floor or 4 storey, whichever is lower; and

(e) Access to the building for fire fighting appliances being provided for in compliance with the requirements in Chapter 4.

(a) Fire Code 1991 permits only office up to 4-storey and residential building up to a habitable height of 60m to have single exit staircase, subject to meeting other technical requirements.
New fire code 1997 under Cl.2.6 will permit shop, factory and warehouse buildings up to 4-storey to have single exit staircase, provided the gross floor area of each storey does not exceed 185sq m.
The above relaxation is welcomed by the developers and professional as it is in keeping with the trend to build low-rise, small factory/warehouse units in land scarce Singapore.

(7) ***Cl.2.7.5(a) Internal corridors which are not naturally ventilated shall be subdivided by smoke barriers into the following lengths:***

Building protected by sprinkler system - 45m
Building not protected by sprinkler system - 30m

(See diagram in Annex D)

(a) The above requirement applies to internal corridors in hotel residential floors, which are not naturally ventilated. The provision of smoke check door to hotel guestroom corridors had been a requirement but it is not mentioned in the Fire Code.

(b) The main function of smoke check door is to prevent the whole internal corridor being filled with smoke very quickly, should there be any migration of smoke from any of the guestroom served by the corridor. Smoke check door is not required to have fire resistance rating.

(c) Since the smoke check door would only act as a physical barrier, dividing the corridor into separate zones against smoke migration, there is no requirement to provide separate set of pressurisation system to each zone of the internal corridors which is mv/pressurised.

(8) ***Cl.2.8.3 Assembly occupancy with fixed seating:***
(Theatres, Cinemas, Auditorium, Concert Hall etc)

Aisles or gangway shall be provided with intersecting rows of seating, and the number of seats in a row, shall be in accordance with the provisions tabulated as follows:

Table 2.8.3(a)(ii) Number of seats in a row

Seatway width	Maximum no of seats in a row	
mm	Gangway on one side	Gangway on two sides
300 to 324	7	14
325 to 349	8	16
350 to 374	9	18
375 to 399	10	20
400 to 424	11	22
425 to 449	12	24
450 to 474	12	26
475 to 499	12	28
500 or more	12	Limited by the travel distance

(See diagram in Annex E and F)

(a) The seatway shall be the minimum clear width between rows, which shall not be less than 300mm, measured as the clear horizontal distance from the back of the row ahead (including seats that tip up automatically) and the nearest projection of the row behind when the seats are in upright position. The seatway widths shall be constant throughout the length of the row.

(b) Traditionally, the number of seats in a row has been limited to max. of 14 seats per row.

(c) Where gangways are provided at each end of the rows of seating, the number of seats in a row can be increased as shown in the above table, provided travel distances are complied with and the seatway widths are increased in relation to the number of seats. The seatways provide the initial parts of escape routes and hence need to be of sufficient width to enable easy movement towards the gangway(s).

Conclusion

All the changes and amendments to the provisions of the means of escape under Chap 2 of the Fire code are made to address the difficulties and problems that were encountered by code users. Due recognition is given to the need for higher flexibility in designing residential units, and the difficulty faced in trying to comply with 2-exit per unit. Greater trust is also given to sprinkler protection, and thus longer travel distances are permitted. These changes are certainly welcomed by most of you QPs and developers. So, we should be expecting less wavier attempts.

TABLE 2.2A DETERMINATION OF EXIT REQUIREMENT

(i) Type of Occupancy	(ii) Max Travel Distance (m) (One-way Escape)		(iii) Max Travel Distance (m) (Two-way Escape)		(iv) Capacity No of persons per unit of width (x)				(v) Min Widths (m)		(vi) Max Dead End (m)
					Door openings (c),(e)		(f)	(d)			
	Unsprin-klered	Sprin-klered	Unsprin-klered	Sprin-klered	To outdoors at ground level	Other exit & corridor doors	Stair-cases	Ramps Corridors Exits Passageways	Stairs	Corri-dors	Corridors
High hazard	10	20	20	35	50	40	30	50	1	1	13
Industrial buildings (factories, workshops, godowns/warehouse)	15	25	30	60	100	80	60	100	1	1	13
Dormitories, hostels	15	25	30	60	50	40	30	50	1	1	13
Shops	15	25	45	60	100	80	60	100	1	1	13
Offices	15	30	45	75	100	80	60	100	1	1	13
Places of public resort & carparks	15	25	45	60	100	80	60	100	1(h)	1(h)	13
Schools & educational buildings	15	25	45	60	100	80	60	100	1	1½(a)	13
Hospitals	15	25	30	45	30	30	15	30	1	2(b)	13
Hotels, boarding houses (k)	15	20	30	45	50	40	30	50	1	1	13
Blocks of flats/maisonettes (k)	(15(g) (20(j)	30(g) 40(j)	30 45(j)	60	50	40	30	50	1	1(i)	13
Detached, semi-detached & terrace houses, including townhouses	NR	NR	NR	NR	NR	NR	NR	NR	0.9	1	NR

NR = No requirements Maximum direct distance = 2/3 x maximum travel distance ... see cl.1.2.18.

(x) Unit of width = 0.5 metres.

(a) Applies to corridors serving classrooms. Other corridors shall have a minimum width of 1 metre.

(b) Applies to corridors serving patients. Other corridors shall have a minimum of 1 metre.

(c) See cl.2.3.9.

(d) See cl.2.3.8.

(e) Where a door opening is divided by mullions into two or more door openings, each such opening shall be measured separately in computing the number of units of exit width.

(f) See cl.2.2.15(c) regarding reduction of exit provision.

(g) For travel distance in single staircase flats .. see cl.2.4.

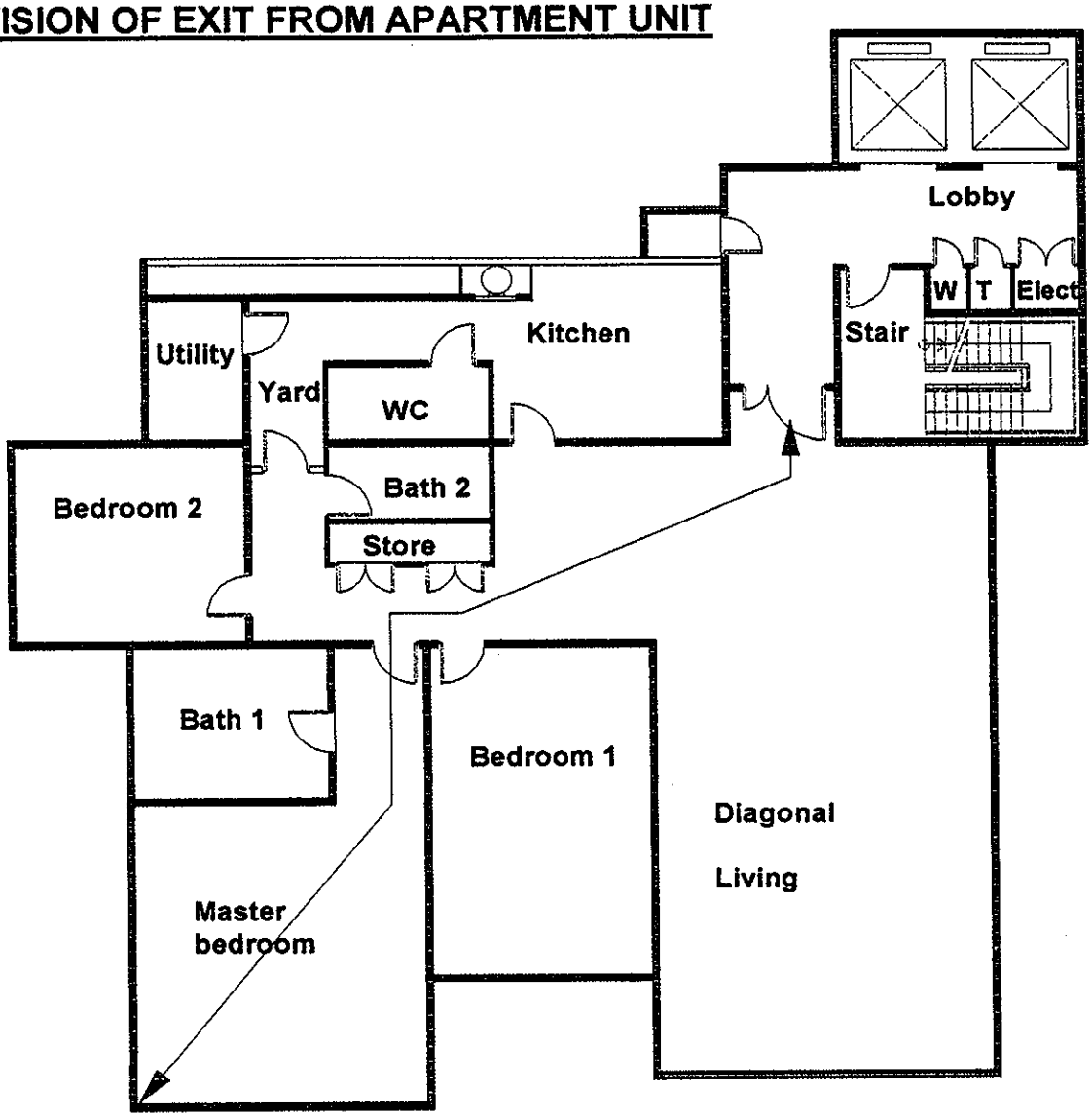
(h) Refer to cl.2.8.2.

(i) Staircase within maisonette serving as an internal access to be at least 0.9m width.

(j) Applies to external corridor .. see cl.2.4.9.

(k) Measurement of travel distance is from the guestroom door or residential unit door to exit staircase .. see cl.2.7.4 & 2.4.7 respectively.

PROVISION OF EXIT FROM APARTMENT UNIT



Not to scale

LEGEND

Travel distance from any point within the unit to the exit door (max. 20m)

Drawn by RT/FSB

Diagram *A*

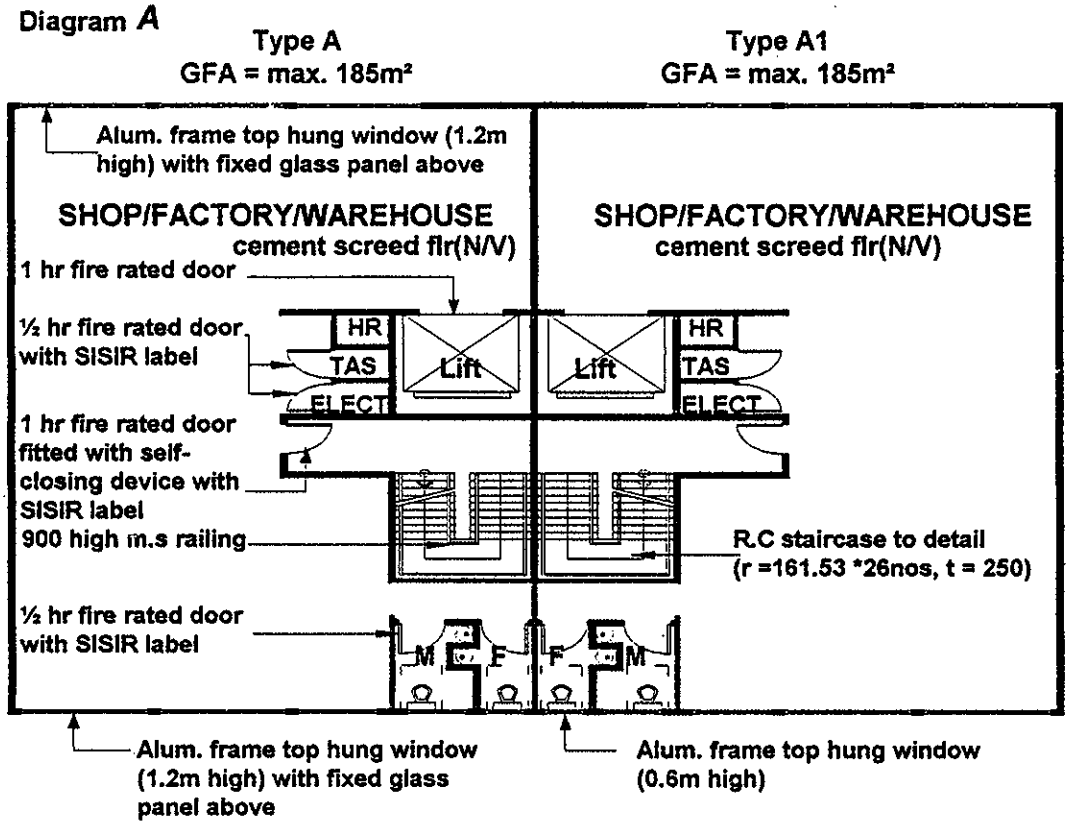
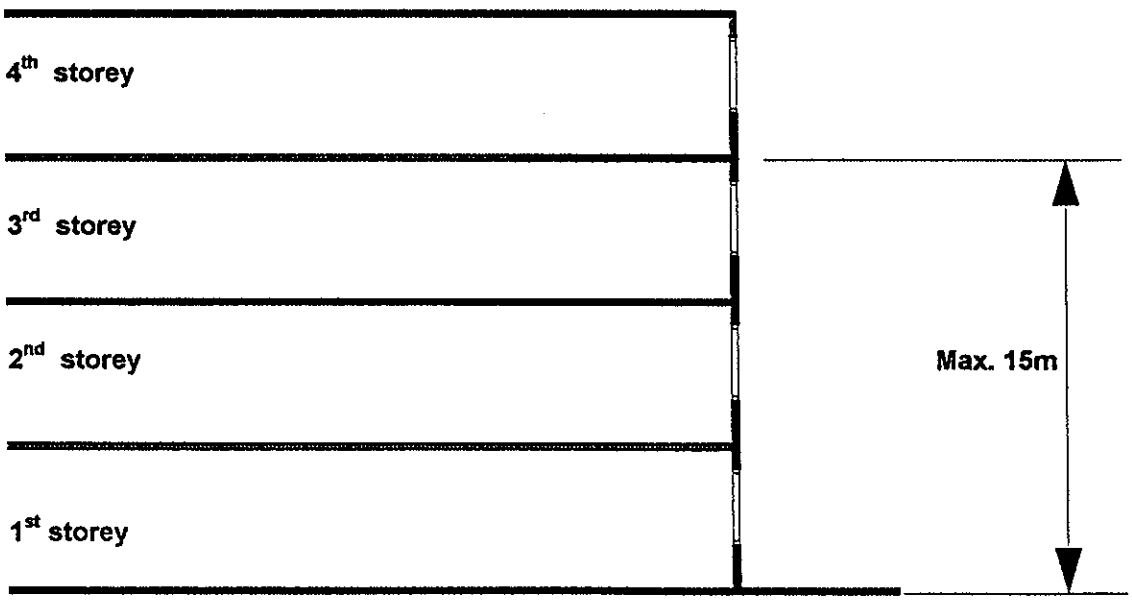
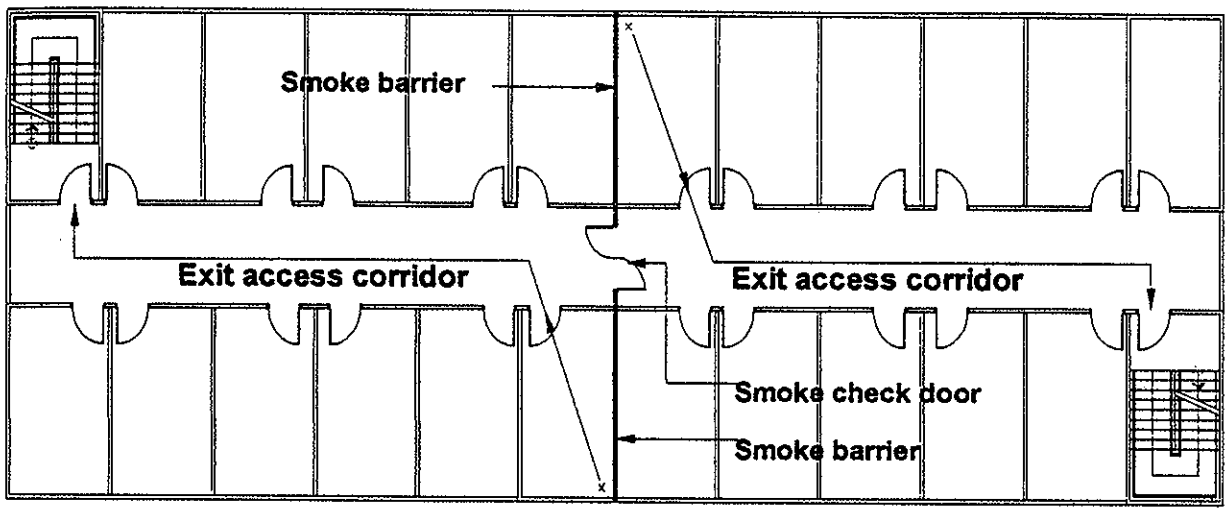


Diagram *B*



Means of Escape

Provision of smoke barrier/smoke check door to internal corridor of hotel residential floors

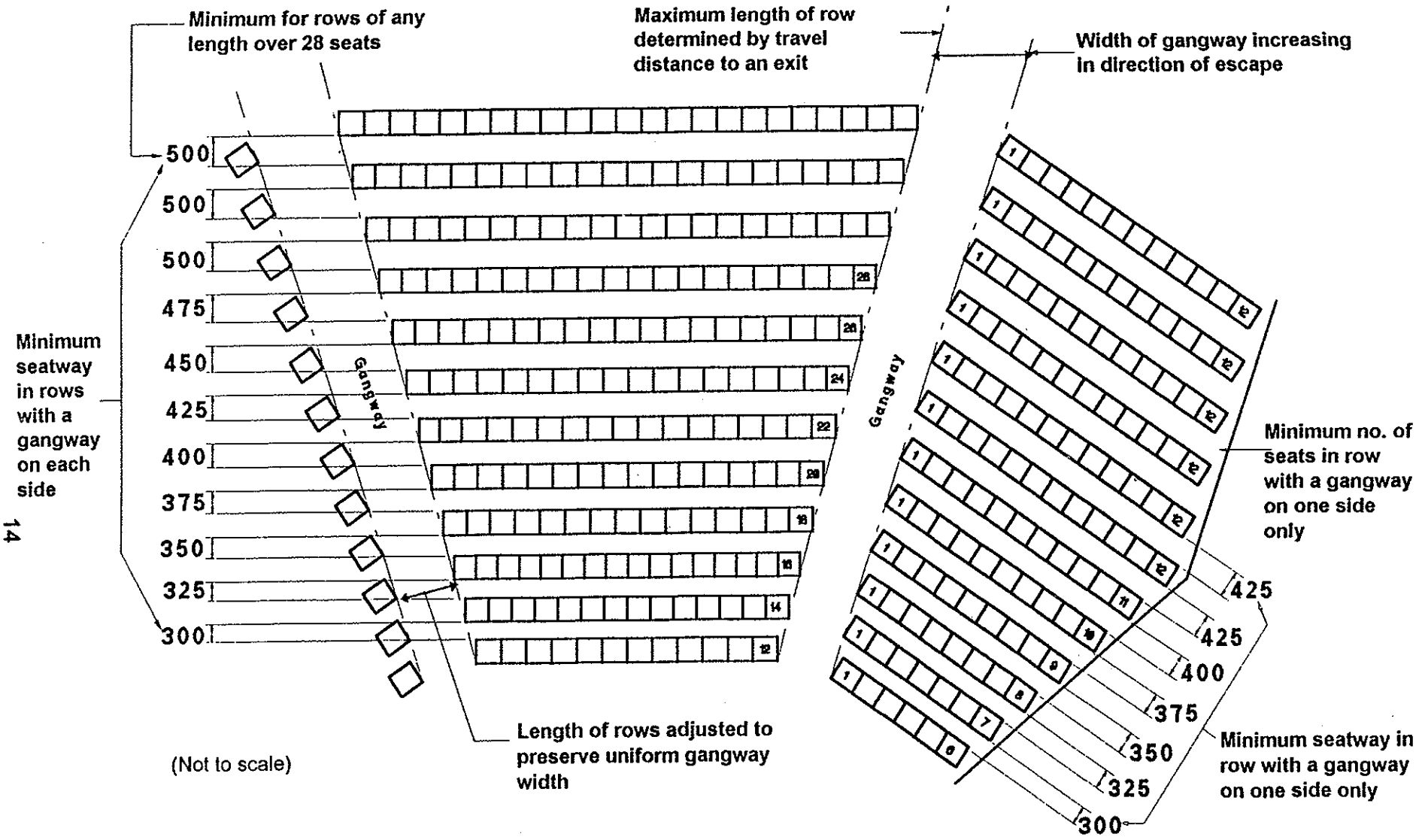


The smoke barriers shall consist of non-combustible partitions containing smoke check doors. The smoke barriers, including the enclosing walls to the corridor, shall be constructed of full height, carried right up to form a close joint with the soffit of the floor slab above, or an imperforate non-combustible ceiling or the roof coverings.
The smoke barriers shall be sited at suitable locations across the corridor to create multiple sections, with each having free and direct access to an exit or exit staircase, exit passageways or exit ramps.

Smoke check doors excluding glass doors, shall be provided with clear glass panels having at least 25% of the surface area of each door leaf.

Smoke check doors shall be self-closing, swinging type and may be double swinging but shall close the opening completely with only such clearance as is reasonably necessary for proper operation. The doors shall be closely fitted around their edge and the bottom clearance gap between such doors and the floor shall not exceed 4mm.

Smoke check doors shall normally be in the closed position. However, they may be left open if they are arranged to close automatically by an approved electro-magnetic or electro-mechanical device which can be activated by the presence of smoke and/or the building fire alarm system.

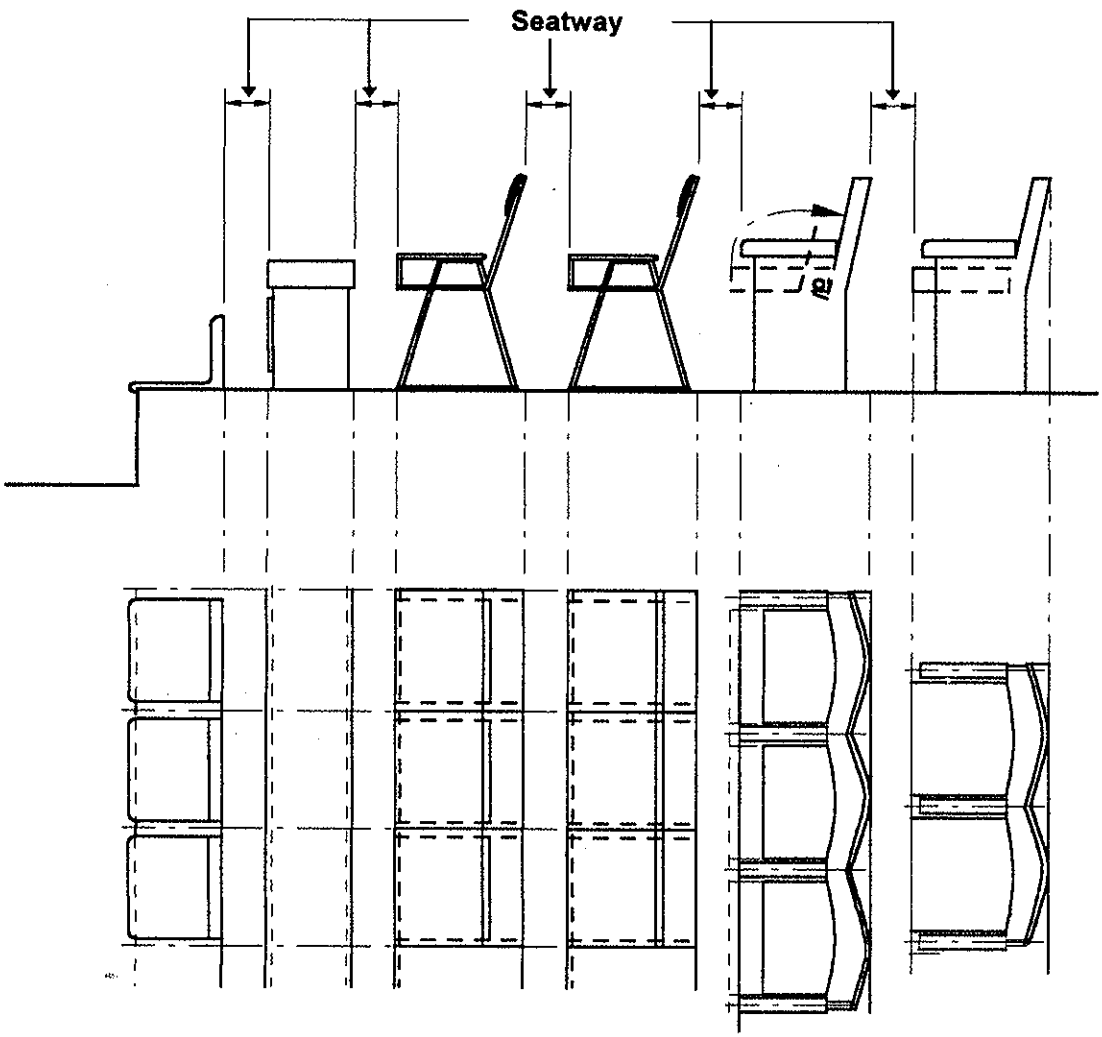


Seatway width and number of seats in a row

Diagram 2. 8.3(a)(ii)-A

Drawn by RT/FSB

Determination of seatway width



Seatway widths should be not less than 300mm and should be constant throughout the length of the row.

Drawn by RT/FSB

STRUCTURAL FIRE PRECAUTIONS

INTRODUCTION

1 This paper will highlight the main changes made to chapter 3 of the Code of Practice for Fire Precautions in buildings.

2 Chapter 3 of the Fire Code aims to minimize the risk of the fire spread between adjoining buildings or specified parts of the buildings by effective compartmentation and proper use of materials and constructing methods. This paper will also attempt to explain the rationale behind the more important amendments.

THE NEW CHANGES

Clause 3.2.4 Compartmentation height

3 Previously, up to a habitable height of 24m, no compartment was permitted to comprise more than 3 sty. The latest amendment allows for some flexibility for buildings under purpose group I. This adjustment is made to correspond with the URA planning guideline for conventional houses which are allowed to be built beyond 3-level high.

4 Under the new clause 3.2.4(d), group I buildings such as detached and terraced houses can be constructed of 4 storeys, inclusive of attic and basement. However, one of the following shall be complied with:

a. An automatic fire alarm system is installed to meet SS CP 10. The system need not be connected to a fire monitoring company; or

b. An unenclosed external staircase serving the top most storey is provided. The staircase shall directly discharge to a safe open area at ground level.

5 Provision of automatic fire alarm is aimed at alerting residents for early escape during incipient fire. Introduction of external staircase will provide an alternative escape route.

6 In a situation when the basement is not linked to the aboveground storey, the basement is not considered as part of the aboveground compartment. However, compartmentation between the basement and the upper storeys shall be deemed to have been broken when the compartmentation is penetrated by openings or services, even if:

a. Such openings are provided with fire doors; &

b. The services are in protected shafts.

Clause 3.2.5 Compartmentation of Basement Storey

7 Following the change in clause 3.2.4 (a) & (d) above, clause 3.2.5 (c)(i) is adjusted accordingly with minor changes:

8 Compartmentation is required for any floor immediately over a basement storey if such storey

a. forms part of a building of purpose group I which has five (not four) or more storeys (including the basement storey) or a building or compartment of purpose group II to VIII; and

b. has an area exceeding 100sq m except that in the case of a building or compartment of purpose group IV,V and VII, the Relevant Authority may consent to exempt from the above requirements provided the building is fitted throughout with an automatic sprinkler system in compliance with the requirements in Chapter 6 and the floor at first basement storey level is constructed as a compartment floor if the building comprises more than one basement floor.

Clause 3.2.5 (j)Workers' dormitories

9 Under the new clause, there are four sub-clauses to be complied with:

a. Each dormitory bedroom shall not exceed 120sq m and an occupant load of 40 persons;

b. Separation wall of 1 hr fire rating (minimum) shall be provided between dormitory bedrooms;

c. Each dormitory bedroom shall be compartmented with minimum 1 hr fire rated compartment wall

d. Kitchen shall be enclosed with minimum 1 hr fire rated compartment wall, including 1/2 hr fire rated door. Kitchen shall not be located within the dormitory bedroom.

10 This clause was put in to address the new trend of development of multi-storey worker's squater. The nature of it, albeit is similar to residential use, has to be assessed differently due to the higher occupancy rate within units and the fire hazard arising from the people living within.

Clause 3.2.7 Buildings of High Hazard Occupancy

11 This clause has been revamped to better serve its purpose. With recognition of the sprinkler system's effectiveness, FSB has allowed storage use in buildings above the height of 24m for goods that are not highly combustible or of low toxicity in nature. The new clause states:

a. The compartment of buildings of high hazard occupancy shall not exceed one half of the sizes stated in table 3.2A and each compartment shall comprise one storey only; and

b. No storey of a building whose habitable height exceeds 24m shall be used for the bulk storage of goods or substances of high combustible nature unless it is provided with a sprinkler system; and

c. The type of storage shall not include the following:

(1) Materials which will flame up by itself without the presence of any fire source below the ignition temperature of 200 degree celsius; and

(2) Combustible/highly flammable materials which include those highlighted in sub-clauses (a),(b),(c) and (d) of clause 1.2.39.

Clause 3.4 Test of Fire Resistance

12 Both clauses 3.4.1 and 3.4.2 relating to tests for fire resistance have been updated. The standard for such tests were previously BS 476:part 8:1972. The new standard is BS 476:part 20-23.

Clause 3.4.3 Timber Floors

13 A new clause 3.4.3 pertaining to timber floors has been inserted into the Code. It is to emphasize the need of non-combustible construction particularly for key elements of structure. Extensive use of timber will lead to sub-standard or inferior buildings that can be easily gutted by fire, and more severe losses of life when fire strikes. However, this requirement is relaxed for two specific situations.

14 The new clause states that the use of timber floors is not permitted, except:

a. For an attic having not more than 25sq m in floor area in buildings under purpose group I and II; and

b. In buildings designated for conservation where the timber floors are required to be retained, but subject to compliance with the technical guidelines for 'Fire safety requirements affecting shop-houses under conservation.'

15 In the case of groups I and II buildings, a minimal use of timber for attic floor is tolerable, with the view that such buildings for dwelling purpose would normally be of low occupancy and are properly compartmentalized by themselves. For conservation buildings, FSB reckons the fact that URA would want the buildings of historical values to be preserved. A separate guideline was drawn and enforced for such buildings in which timber floors with proper protection would be allowed.

Clause 3.5.2 (b) Exception for Single Storey Building of Group VI and III.

16 A new paragraph has been added to relax the fire resistance of external wall for group VI and VIII buildings.

17 For single storey buildings under purpose group VI and VIII, the fire resistance of external wall as required under cl 3.5.1 (a) (ii) shall not apply, provided such wall has minimum fire resistance complying to BS 476: part 20 to 23.

Clause 3.5.3

18 Cl 3.5.3 relates to requirements on unprotected areas in facades of buildings. A new paragraph has been inserted to serve as a relaxation to car park building. For such buildings, under Cl 3.5.3 (d), the setback requirement may be based on the floor that has the largest extent of unprotected openings. Also, in calculation of area of unprotected openings against the setback distance, Table 1 of Appendix B can be used, instead of Table 2.

Clause 3.5.7 External protection of fire spread between high and low parts of buildings.

19 A new clause has been added to check the possibility of spread of fire externally between a high part and low part of a building, which abuts each other. For a building of this nature, where one part of building is higher than the abutting part of the building, either one of the following requirements need to be complied with:

a. The roof over the lower part of the building shall be fire rated in accordance with the element of structure for minimum 1 hr for a distance of 5m measured horizontally from the external of the higher part of the building; or

b. The external wall of the higher part of the building overlooking the roof below shall have the necessary fire resistance rating, in accordance with the element of structures for minimum 1 hr, for a vertical height of not less than 9m, measured from the roof of the lower part of the building.

20 The intention of this clause is to prevent the vertical spread of fire from one part of the building to another abutting part. However, this clause does not apply to buildings of single occupancy and where the separate parts of the building form one single compartment.

Clause 3.7.6 Requirement of Non-combustibility of Compartment Wall or Compartment Floor

21 This clause has been amended to address the material used for construction of compartment wall or compartment floor. It states that:

> Every compartment wall or compartment floor shall be constructed of non-combustible materials, unless permitted by the Relevant Authority.

22 The intention of this clause is to secure the intact and integrity of such elements of structure so that escape of people is not jeopardized in the event of a fire.

Clause 3.8.5 (b) Ventilation of protected shaft for Gas pipe.

23 This clause is adjusted for the purpose of allowing other methods of ventilation for protected shaft containing a gas pipe, provided these methods conform with the SS CP 51.

24 A protected shaft containing a pipe conveying gas shall be adequately ventilated directly to the outside air or the modes of ventilation allowed under SS CP 51.

Clause 3.8.7 (b) Services within protected enclosed staircase

25 To address the issue of services, particularly pipes for rain water within protected shaft in staircase, FSB has now spelt out clearly the types of services and the material of each pipe that can be allowed:

26 A protected shaft that contains an exit staircase shall comply with the following:

a. It shall not contain any pipe conveying gas or combustible liquid

b. It shall not contain any services that are not solely serving the same exit staircase except for:

(1) cut-off sprinkler and pipe for that staircase; and

(2) UPVC or cast iron rain water down pipe serving the roof directly above the exit staircase, but not routed through anywhere outside the staircase.

c. The protecting structure shall be constructed of masonry.

3.8.8 (b) Lift shaft for bubble lift.

27 This sub-clause has been extended to read as follows:

The protecting structure shall be constructed of masonry. In the case of the lift which is located at the edge of atrium floors or at the external wall outside the building, the requirement for a protecting structure shall not apply.

28 In both situations, compartmentation of shaft is deemed not applicable. Hence, amendment to this clause will serve better in understanding the requirement and intent of such clause.

Clause3.8.8 (c) Ventilation To Protected Shaft For Lift

29 To allow for greater flexibility in the planning of means of ventilation to lift shaft, FSB has widened this sub-clause read as follows:

"The protected shaft shall be vented in accordance with SSCP2 Code of Practice for Installation, Operation and Maintenance of Electric Passenger and Goods Lifts. The vents shall be so arranged as to induce exhaust ventilation of the shaft. Where vents could not be provided because of the location of the lift shafts, fire rated ventilation duct serving as ventilation of the shaft could be provided instead. If the duct is not to be fire rated, fire damper shall be provided at the wall of the lift shaft, provided such relaxation shall not apply to lift shaft containing fire lift."

Clause.3.8.8 (d) Exception of Protected Shafts In Exit Staircase

30 An exception is applied to group II buildings having habitable height not exceeding 4 storeys. Since such buildings require no smoke stop lobby, it is reasonable to allow protected shafts containing services to be located within protected staircase.

" All protected shafts containing services shall not be located within an exit staircase except for the case of residential apartment/maisonette development under purpose group II not exceeding 4-storey where smoke stop lobby is not required."

Clause3.9.3 Pipes That Penetrate Separation Wall, Compartment Wall or Floor

31 This sub-clause has been modified by the inclusion of a control to prevent groups of pipes passing through separation wall, compartment wall or floor. The revised clause would prohibit clustering of pipes, thus reducing the weakening effect that is likely to arise from such penetration.

"Pipes which pass through a separation wall, compartment wall or compartment floor shall be kept as small as possible and fire-stopped around the pipes. The nominal diameter of the pipe shall be not more than the relevant dimension given in Table 3.9A.Spacing between pipes shall be minimum 50mm or 1/2-diameter of the largest pipe, whichever is the larger."

Clause 3.10 Exit Staircases

32 This clause has been revamped, in view of changes made to cl.2.3.6 and cl.3.2.4 (d),to explicitly specify the requirements for exit staircases. The rigidity construction of exit staircase and its endurance against fire are the two fundamental factors that make the escape of people possible within a multi-storey building in an event of fire .Hence, it is important to specify non-combustible construction of staircase and masonry construction for enclosing walls, except for group I and II buildings, in which the access staircase is allowed to be of timber construction.

33 **Cl.3.10.1** Every exit staircase, including the treads/risers and landing shall be constructed of non-combustible materials. The exception is for buildings under purpose group I, where only the stringer or structures supporting the treads/risers and landing shall be of non-combustible materials.

34 **Cl.3.10.2** The exit staircase shall be separated from other parts of the building by a masonry structure which having fire resistance not less than the period required by cl.3.3 for Elements of Structures.

35 **Cl.3.10.3** Doors opening into the exit staircase shall have fire resistance of at least half an hour and fitted with automatic self-closing device.

36 **Cl.3.10.4** Finishes to the ceilings/walls and floors of the staircase shall be of non-combustible material.

Clause 3.11.11 Suspended Ceiling Over Protected Areas

37 This is another new clause inserted to address the wrong use of combustible materials within protected areas, such as exit passageway, smoke-stop lobby, exit staircase, etc. Integrity of such areas must be maintained at all times. Prohibiting the use of
combustible material for elements within these areas would enhance safe evacuation of people.

38 **Clause 3.11.11** The concealed spaces of suspended ceiling over an exit passageway, smoke-stop lobby, exit staircase or other designated means of escape facilities shall comply with the following:

a. the ceiling-supporting elements and the ceiling shall be constructed of non-combustible material; and

b. the exposed surfaces within the concealed space shall be of class 0 surface flame spread.

Clause 3.12.2 and Clause 3.12.3 Fire Stopping Materials

39 There are many fire stopping materials that are able to provide fire resistance with elasticity catered for the need of absorbing movement in walls or floors. However, most of these are combustible in nature. Taking into consideration the fire performance they could achieve and the suitability for thermal movement in walls or floors, FSB has made changes to this clause to relax the requirement of non-combustibility.

40 **Cl.3.12.2** Fire-stopping shall be of material having the necessary fire resistance when tested to BS 476: Part 20 or other acceptable standards.

41 **Cl.3.12.3** Suitable fire-stopping materials include:

a. Proprietary fire stopping and sealing systems (including those designed for service penetrations) which have been shown by tests to maintain the fire resistance of the wall or other elements, subject to approval by the Relevant Authority.

b. Other fire-stopping materials include:

(1) cement motar;

(2) gypsum based plaster;

(3) cement or gypsum based vermiculite/ perlite mixes;

(4) glass fibre, crushed rock, blast furnace slag or ceramic based products(with or without resin binders),and

(5) intumescent mastics.

Note: These materials may be used in situations appropriate to the particular material only. Not all of them will be suitable in every situation.

Clause3.13.4 and Clause.3.13.5(a)(i) Class of Flame Spread To Be Not Lower Than Specified

42 Only a minor adjustment has been made to this clause, which is to spell out circulation spaces within which no combustible materials/finishes is allowed. These areas are smoke-stop lobby, exit staircase and exit passageway. The Table3.13 A was correspondingly revised to suit the adjustment made for clearer and better application.

Clause.3.15 Materials for Construction

43 A new clause has been introduced to provide a list of requirements pertaining to the restriction on the use of material for various elements of construction. This new provision will serve as a guide for consultants to understand more about the types and restriction in use of unconventional materials for building construction, in terms of fire safety.

CONCLUSION

44 By and large, all changes including new provisions as discussed, are aimed to enhance the standard of the Fire Code and to keep it abreast with the new technology of the building designs and construction methods. I believe that consultants will be able to find answers in this Code to most of the queries or doubts that they may have had in the past. We shall strive to improve further with useful inputs from all of you.

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SITE PLANNING AND EXTERNAL FIRE FIGHTING PROVISION

INTRODUCTION

1. Singapore has achieved very good records of low fire incidents and low casualty rate arising from fire. This should partly be attributed to the level of fire safety control and the various fire safety programmes that had been introduced over the years. Though we have attained certain level of success in fire prevention, we should not be relax as outbreaks of fire in buildings still could not be totally eliminated.

2. Fire safety considerations are incorporated into the latest building designs and building occupants are now more educated than before about fire prevention. However when these measures fail to prevent the spread of fire, the safety of the building occupants would depends on the external fire fighting provisions. These provisions do not assure immediate control of the situation when a fire breaks out, but they do offer better opportunities for the occupants to escape and prevent the spread of fire via the external avenues.

3. But for external fire fighting operation to be effective, accessibility to the building is necessary. This is why in any building design, proper and adequate access roads, hardstandings and access openings must be provided adequately.

4. Knowing the importance of external fire fighting provision, the Code Review Committee has made some changes to the present Fire Code so that the fire fighting provision could be further enhanced after incorporating and considering the latest fire fighting technologies available in Singapore.

5. This paper will highlight the changes that will be made in the new Fire Code under Chapter 4 : Site Planning and External Fire Fighting Provision". The main purpose of Chapter 4 is to make provision for space around buildings so that rescue and external fire fighting operations can be effectively conducted by fire fighters, with the use of fire appliances equipped with aerial devices.

AERIAL APPLIANCES AVAILABLE

6. There are two main types of fire fighting appliances used by the Singapore Civil Defence Force. The pumpers, which form the main bulk of our fire appliances, provide the first line of fire fighting operations. The other types of appliances are the aerial ladder and aerial platform. These aerial vehicles in general could reach up to a height of 30m except for the case of SS600 which could reach up to 60m. Due to the different designs of the appliances, the reach at the various floors from the hardstanding varies.

CHANGES IN THE NEW FIRE CODE

7. After having a glimpse of the types of aerial appliances available in the Singapore Civil Defence Force, I shall now highlight the changes in the new Fire Code.

Access Opening

8. Clause 4.2.2 (b) which dictates the specification of the Fire Access Opening has been amended to include the detailed design of the panel. Henceforth, all access openings shall be posted with either a red or orange triangle of minimum size of 150mm on each side on the external side of the wall. Size of at least 50mm for the wordings "Fire Fighting Access – Do Not Obstruct" shall be provided on the internal side of the panel. Such posting of signs is not applicable to residential buildings under Purpose Group I & II.

9. With this provision, the Qualified Person could have a clearer idea of the colours, sizes and locations of wordings to be provided for the Fire Access Panel (FAP) and thus reduces the possibility of different QPs providing different designs for the FAP. Furthermore, the wordings "Fire Fighting Access – Do Not Obstruct" reminds the occupant not to block up that area and thus provides free access for firemen during a rescue operation.

10. Clause 4.2.2 (d) (ii) which specifies the numbers and positions of access openings for building other than residential has also been amended. Under this amendment, in a building where there are compartments or spaces of less than 620 m^2 of floor area which are not accessible from one another, there shall be one access opening for every of such spaces.

11. Clause 4.2.2 (d) has also increased the provision of FAP up to the habitable height of 60m instead of 24m to cater for the new generation aerial appliances.

Hardstanding and Accessway

12. Clause 4.2.3 (a) has been amended for residential building. Under the amendment only if a residential building with habitable height not exceeding 10m, no hardstanding will be required but there must be working space of 4m wide around the building for the purpose of pitching portable ladders.

13. Note that this provision is only applicable to residential building. For non-residential, FAP shall be provided for building that is more than one storey, unless otherwise stated in the Fire Code.

14. Clause 4.2.3 (b) lists down the requirements for hardstanding. The following changes have been made. The minimum width of hardstanding shall be 6m wide and the minimum length shall be 15m long. With this provision, only one dimension of hardstanding is required regardless of the height of the building (clause 4.2.3 (b) (i)).

15. However when the habitable height of building exceeds 24m, the hardstanding shall be constructed to sustain the load of stationary 44 tones fire engine with footplates (jacks) and stabilizer loads as compared to the requirement of 20 tonnes hardstanding for buildings that are 24m or lower (cl.4.2.3 (b) (iii)). The hardstanding shall be laid on level platform or if on an incline, the gradient shall not exceed 1:15 (cl.4.2.3 (b) (iv)). Some of the above changes have already taken effect and had been circulated to the professional organisations.

16. One major change to the provision of hardstanding is highlighted in cl.4.2.3 (c). This clause requires non-residential development consisting of factory and warehouse to provide accessway with hardstanding spaces adjacent to the building. Such accessway shall have a minimum width of 6m and be positioned at least 2m from the building and shall be located on at least two sides of the building. The provision of accessway shall be calculated based on the cubical extent of the building. This change arising from the fact that factories and warehouses are large in size and fire could spread from one area to the other easily. By providing hardstanding along the factory will provide more access space for our fire fighters.

17. The Fire Code also specifies the requirement of marking fire engine accessway and hardstanding under cl.4.2.3 (d). It is now required that:

a) All four corners of fire engine hardstanding are marked and the marking be in contrasting colour to the ground surfaces or finishes;

b) Fire engine accessway and hardstanding area provided on turfed area must be marked with contrasting object (preferably reflective) so that fire engine accessway and hardstanding area are also visible at night. Such markings on accessways are to be at intervals not more than 3 metres apart and shall be provided on both sides of fire engine accessway.

c) Proper signage showing wordings "Fire Engine Access – Keep Clear" shall be provided. Size of wordings shall not be less than 50mm in height.

18. By having clearer indication of hardstanding and accessway on site will ensure that the area will not be converted into another usage unintentionally, or cause it to be obstructed during emergency. It also provides a clear indication of the location and so spare our firemen's time to search for the position of hardstanding.

19. Finally, the last change in this chapter is with regard to the water supply for private hydrant. Clause 4.4.2 (c) has been amended to list down specifically the water supply requirement for the various developments at locations which are located above reduced level of 125m. This revision will ensure that adequate water supply and pressure are provided to the private hydrant for a duration of 45 min.

CONCLUSION

20. Fire Safety Bureau, being the fire regulating body in Singapore will strive to improve the fire prevention standard in the building. We also consciously look out for possible areas of relaxation so as not to incur wastage of resources. The revision on "Site Planning and External Fire Fighting Provisions" steer towards achieving this purpose.

FIRE FIGHTING SYSTEMS

Introduction

1 Fire Fighting Systems ranging from the portable fire extinguisher to wet riser system and operation feature of fire lift are specified in Chapter 6 of the revised 1997 fire code. In revising this chapter, new clauses were added and existing ones reviewed to the bring the code up to date. In addition, this chapter was reviewed based on the feedback gained in the course of implementing the previous code.

Objective

2 The aim of this paper is to identify and explain those clauses which were introduced or revised under Chapter 6 of the 1997 fire code.

Addition or Revision Clauses

3 In this Chapter the following key topics were introduced or revised:

a) Rising main and Hosereel System

i) provision of rising main for residential building
ii) standby fire hose for rising main
iii) installation of rising main for building under construction
iv) provision of hosereel to residential building exceeding 24m in habitable height (Purpose Group II)
v) Hosereel water supply pipe

b) Electrical Alarm System

i) electrical Fire Alarm of Purpose Group II Mixed Occupancy and Group II with Lower car park floor
ii) types of fire alarm system for dormitories (below and above 4 storey)
iii) alarm system for cinema hall
iv) updating of Table 6.3A (provision of fire alarm according to purpose group, height and size of the building)

c) Sprinkler Installation

i) provision of sprinkler system at basement
ii) updating of Table 6.4A (compartmentation requirements for special purpose room in building).

d) Lift

i) operation features of fire lift

a) Rising Main and Hosereel System

The following clauses have been added or revised as follows:

i) Provision of Rising Main for Residential Building

New Clauses

Clause 6.2.1 (d) Notwithstanding the requirements in sub-clause (a), for a building under Purpose Group II, having a habitable height exceeding 10 m but not exceeding 60 m, dry rising main shall be provided.

Clause 6.2.3 (c) Each rising main either dry or wet, for buildings under Purpose Group II, shall be fitted with a breeching inlet directly at the foot of the same riser stack.

Revised Clause

Clause 6.2.3 (a) All buildings fitted with rising mains shall have access ways for pumping appliances within 18 m of the breeching inlets. The breeching inlets shall be visible from the access ways.

In the existing code, hardstanding is required to be provided to the engine to reach every residential unit. With the provision of dry rising main for residential building having a habitable height exceeding 10 m but not exceeding 60 m, the fire engine can access to the dry rising breeching inlet immediately to carry out internal fire fighting operation. As such, the provision of hardstanding is no more required in the new code.

ii) Standby Fire Hose For Rising Main

An additional clause stating the requirements of standby fire hose for rising main was incorporated in the new code.

New Clause

Clause C1.6.2.5 Standby Fire Hose For Rising Main

Where standby fire hose for rising main is required by the Relevant Authority, the following requirements shall be complied with:

(a) The standby fire hose shall be of 64mm nominal internal diameter in order to ensure that the hose coupling will fit existing coupling tail pieces. The hose shall be rugged and capable of carrying water under substantive pressure in accordance with BS 6391. The required length of the hose shall be 30m.

(b) The fire hose couplings shall be manufactured to BS specification or equivalent and of light alloy or gunmetal. The size of coupling shall be 64mm male and female instantataneous type with standard (double pull) release mechanism. The couplings shall be tied in by binding with galvanised mild steel wire and applied over a hose guard of synthetic fibre. It shall be able to withstand a minimum working pressure of 15 bars.

(c) The hose shall be kept stowed (not to be connected) in a flaked position and housed in a locked glass fronted cabinet adjacent to each landing value at the riser location. The cabinet shall be located at a height of 900mm above floor level and conspicuously labelled.

The introduction of this new clause will impose standby fire hose in cases where there is a need to re-address inadequate provision of fire engine access.

The provision of the standby fire hoses will facilitate the fire fighter to enable them to carry out fire fighting operation more effectively.

Moreover, standby fire hose is not uncommon in most other countries like the US. Australia and the European countries.

The coupling of the hose shall not be connected to the outlet of the landing valve. This is to prevent the coupling from getting stuck to the landing valve over prolonged period if left unchecked and thus hampering effective fire fighting operation.

iii) Installation of Rising Main for Building Under Construction

Another new clause is added as follows:

> **C1.6.2.6 When a building in pursuance of Cl.6.2.1, is required to be equipped with rising mains, such raising mains shall be installed progressively as the building attains height during the course of construction. All outlets, landing valves and inlets, water tanks and pumps, and hydrants as may be required for the system, shall be properly installed as directed by the Relevant Authority so as to be readily operational in case of fire.**

As the occurrence of a fire cannot be ruled out during construction, it is necessary to ensure that rising mains are properly installed in buildings that are under construction. The rising mains must be progressively installed as the building gains height. Guidelines have been drawn up for the installation details.

iv) Provision of Hosereel to Residential Building Exceeding 24m in Habitable Height (Purpose Group II)

The existing Clause 6.2.8 (a) (i) has been expanded as follows:

Revised Clause

> **Clause 6.2.8 (a) At least one hydraulic hosereel conforming to the requirements in SSCP29 Code of Practice for Fire Hydrant Systems and Hosereels shall be provided in every storey of building except the following:**
>
> **(i) Purpose Group I and II which does not exceed 24m in habitable height.**

The non-provision of the hosereel in residential building was revisited and was found to be essential for high rise apartment blocks. This requirement is thus re-instated in the Fire Code 1997. Residents of high rise residential flats can make use of the hosereel to fight incipient fire inside an apartment or a maisonette unit as a first line of defence.

v) Hosereel Water Supply Pipe

The existing Clause" The use of Copper Tubing with compression joints is permissible for the connection of the hosereel to PUB mains" has been expanded to include stainless steel piping. The revised version is:

Revised Clause

> **Cl.6.2.8 (c) The use of copper or stainless steel pipings are permissible for the connection of the hose reel to the PUB mains.**

The revised clause allows the flexibility of using alternative material for the water supply pipe of the hosereel system.

b) Electrical Alarm System

i) Electrical Fire Alarm of Group II Mixed Occupancy and Group II with Lower car park floor

Clause 6.3.1. (b) has been amended as follows:

> **Clause 6.3.1 (b) (i) For a building of mixed commercial cum residential use, the upper storeys of the building shall be provided with manual alarm system. If the habitable height of the building does not exceed 24m. only the alarm bell of the fire alarm system needs be extended to the common area of each residential floor.**
>
> **Clause 6.3.1.(b) (ii) For residential developments which are located over car parks [irrespective of whether the car parks are in the basement] where fire alarm system is required under Table 6.3A the alarm bells of the fire alarm system shall be extended to the common areas of each residential floor, irrespective of the height of the building**

These amendments are merely to clarify and rectify what are already in practice. They specify the type of fire alarm system to be provided for the mixed commercial-cum-residential usage and relevant development over the car parking floor. The residents ought to be alerted should there be a fire in the lower floor with commercial usage or car park facilities which would pose a higher fire risk.

ii) Types of Fire Alarm System for Dormitories

Other new clauses regarding the types of fire alarm system that are to be provided for the dormitories are added as Clause 6.3.1. (d) (i) and Clause 6.2.1. (d) (ii) which read as:

> **Clause 6.3.1 (d) For dormitories, including workers' dormitories, electrical fire alarm system shall be provided as follows:**
>
> **(i) dormitories not exceeding 4-storey, manual fire alarm system is to provided to comply with SS CP 10;**
>
> **(ii) dormitories exceeding 4-stoery, automatic fire alarm system shall be provided to comply with SS CP10**

A sub-committee was formed to look into the fire safety aspect of workers' dormitories. Unlike residential premises the occupancy rate in these dormitories are exceedingly high. There is a tendency for workers to cook within the living area and this poses a great fire hazard especially when the workers are sleeping and the cooking left unattended. The committee recommended the provision of fire alarm system for the dormitories to ensure early evacuation of the occupants should there be a fire outbreak.

iii) Alarm System for Cinema Hall

The existing Clause "The existing clause 6.3.6 has been modified and expanded as follows:

Revised clause

> **Clause 6.3.6 A theatre, cinema shall be provided with an electrical fire alarm system of the manual type complying with the following:**
>
> **(a) The manual alarm system shall be installed in the lobbies and other areas adjoining the auditorium and shall be connected to a fire station through an approved alarm monitoring station , and**
>
> **(b) Visual and audible alarm indicators shall be installed in the projection room and in another**

room where a responsible person is readily available to alert the audience in case of fire.

(c) The provision of the fire protection system in cinema which forms part of the building shall similar to that of the building.

Nowadays the design concepts of the cinema have been changed. From the current trend, we can see that mini-cinemas (cineplexes) are built within commercial complexes. They will attract more movie goers as they can view different film shows inside the same complex.

This revision is basically to standardise the requirements for application to both stand alone cinemas and cineplexes in commercial complexes.

iv) updating of Table 6.3A (provision of fire alarm according to purpose group, height and size of the building)

The existing table 6.3 A has been updated. It includes an insertion for dormitories under purpose Group III (Institutional) and the sub-dividing of purpose Group VII (Places of Public Resort) into with stay-in facilities and without stay-in facilities:

Revised Table

Table 6.3A

PROVISION OF FIRE ALARMS ACCORDING TO PURPOSE GROUP, HEIGHT & SIZE OF THE BUILDING

A **Purpose group of No of storeys of Building**	B **Total floor area (per storey in sq m) in excess of which alarm must be provided**	C **Type of Alarm**
III (Institutional)		
(iv) Dormitories		
a. - Single storey building	NR	(m)
b - Building of 2 to 4 storeys	NR	(m)
c. - Building of more than 4 storeys	NR	(a)
VII (Place of Public Resort)		
(i) With stay-in facilities,		
a - Single storey building	NR	(m)
b - Building of 2 to 4 storeys	NR	(a)
c - Building of more than 4 storeys	NR	(a)
(ii)Without stay-in facilities		
a - Single storey building	400*	(m)
b - Building of 2 to 4 storey	200**	(m)
c - Building of more than 4 storeys	NR	(a)

* Single storey building with area less than indicated is not required to be provided with alarm system unless otherwise specified by the Revelent Authority.

** The total floor area per storey shall not exceed that as stated in clause 6.3.1 (c).

NL = no limit NR = not relevant
(m) = manual type (a) = automatic + manual type

c) Sprinkler Installation

i) <u>Provision of Sprinkler System at Basement</u>

The existing Clauses 6.4.1. (d) (i) and 6.4.1. (d) (ii) have been modified as follows:

Revised Clause

Clause 6.4.1 (d)

(i) All basement storeys, except for those used as purpose groups I or II, shall be provided with an automatic sprinkler system irrespective of compartment size. Where the upper storeys of the building is fully compartmented from the basement storey, the requirement for provision of automatic sprinkler system for floors above the basement shall be considered separately and in accordance with sub.cl. (iii) (a) , (b) and (c).

(ii) Where the basement storey is cross-ventilated such as to avoid smoke logging conditions, the basement storey may be exempted from the requirements of provision of an automatic sprinkler system, at the discretion of the relevant authority.

A new clause is expanded to address the trend of apartment/maisonette building having basement car park without sprinkler and smoke purging system.

New Clause

Clause 6.4.1.(d)(iii) In the case of residential development located over basement car park, relaxation of the provision of these sprinkler system and smoke purging systems to the basement car park may be granted by the Relevant Authority if the following conditions are satisfactorily fulfilled:

(a) basement car parking shall consist of one level only

(b) external openings shall be provided to achieve effective cross-ventilation by means of evenly distributed vertical openings along the perimeter walls and evenly distributed voids over the basement in such manner that :

(i) no point within the basement is more than 12 m from any vertical opening or

void for spaces that are in between two openings or voids;

(ii) no point shall be more than 6m from any opening or void for spaces that are ventilated by such opening of void on only one side; and

(iii) such vertical opening shall be at least 600mm in height ;

(c) total aggregate area of these voids and vertical openings shall be not less than 20% of the total basement floor area;

(d) automatic fire alarm system shall be provided to the basement car parks with extension of alarm bells to the common/lobby areas of the upper storeys in accordance with cl. 6.3.1 (a) and (b) (ii).

As basement car parks for residential developments pose a relatively lower fire risk as compared with other purpose groups, a standard set of requirements to waive provision of sprinkler system for a single basement car park for building under Purpose Group II shall be imposed.

The other reasons of introducing these new clause 6.4.1.d. (iii) is due to recurring waiver applications for the provision of sprinkler system and smoke purging system to residential development located over basement car park.

ii) Updating of Table 6.4 A(compartmetation requirements for special purpose room in building).

The provision of sprinkler system for the transformer room (Oil type) is exempted. The reason is that sprinker protection could do little to suppress the oil content of a fire of this nature.

Revised Table

Table 6.4A Compartmentation requirements for special purpose rooms in buildings

Usage	Non-sprinkler protected building (2)		Sprinkler protected building (3)		
	Compartmentation	Door Rating	Compartmentation	Door Rating	Sprinkler
(1)	(2a)	(2b)	(3a)	(3b)	(3c)
Transformer (Oil types)	4 hours	4 hours	4 hours	4 hours	Ex

S = Sprinkler system has to be extended into such rooms
Ex = Sprinkler system is exempted from the corresponding area provided the area is fitted with an automatic fire alarm system installed according to SS CP 10

d) Lift

i) Operation feature of Fire Lift

The existing clause 6.6.3 (a) has been revised as follows:

New Clause

> **Clause 6.6.3 (a) In any building or part thereof, in which the habitable height exceeds 24m, or the depth of the basement is more than 9m below the average ground level, there shall be provided at least one fire lift, which shall be contained within a separate protected shaft or a common protected shaft containing other lifts subject to such other lifts being served at each storey by the fire fighting lobby, which is required by the provisions of Cl.2.2.13 (b) of this Code.**

The amendment of this clause is to require fire lift to be brought down into basement floors that exceed the depth of 9m so as to meet the needs of fire fighters.

Three new sub-clauses on the operational features of fire lift are added as follows:

New Clauses

Clause 6.6.3 (b) A fire lift shall have access to every habitable floor above or below the designated floor and shall be adjacent and accessible to an exit staircase and be approached by a fire fighting lobby at each storey.

The addition of this clause is to be in line with the changes in developments, once predominantly used for car parking are now commonly changed for commercial usage .

Clause 6.6.3 (c) Fire lift shall be provided with an operational feature that would enable firemen to cancel first or earlier call which had been inadvertently made to the fire lift during an emergency.

This is to increase the effective use of the fire lift in case of emergency .

Clause 6.6.3 (d) A lift mainly intended for the transport of goods shall not be designated as a fireman's lift.

As good lifts are used for transporting goods and goods are commonly found stacking unscrupulously at the lift lobby. This may affect the fire fighters while carrying out fire fighting operations during emergencies.

Conclusion

4 The primary objective of this paper is to ensure that the requirements of amendment made to the code, in respect to the fire fighting provision, are fully understood by the code users.

5 Overdesigned system are expensive while underdesigned system can result in tragic losses of life and property. Thus, it is hoped that with the provision of the guidelines of various fire protection systems in this Chapter, the code users, especially the qualified persons, who are in charge of the fire safety designs of their projects, will be able to design effective fire preventive measures for the buildings.

MECHANICAL VENTILATION AND SMOKE CONTROL SYSTEMS

INTRODUCTION

1 The purpose of this paper is to highlight the salient revisions and additions to Chapter 7 of the Singapore Code of Practice for Fire Precautions in Buildings. It is hoped that the intent underlying the clauses in the revisions could be discussed and to allow them to be appreciated in the proper context. The views expressed here however are those of the authors alone.

OVERVIEW OF ISSUES

2 Standards and codes are attempts to lay down guidelines and to set the minimum level of acceptability to practices in an industry. As technology advances the frontiers of an industry, ideas evolve and practices change to adapt to the situation. Hence standards and codes must too be expanded and revised accordingly.

3 An overview of the changes in the chapter on Mechanical Ventilation and Smoke Control Systems is first presented.

Revisions and Additions

4 The major changes and additions to the chapter are in the clauses on **smoke control: basement smoke control, atrium smoke control, engineered systems** and **auditorium smoke control.** Additions and changes to these clauses shall be discussed in detail later in the paper.

5 Apart from the addition of **Sub-clause (j)** on **Fire Rated Duct** in **General Clause 7.1.1,** the changes in the rest of the chapter appear to be minor. In this sub-clause, ducts made of proprietary fire rated materials and tested to **BS476 Pt 24** or equivalent standard is permitted subject to the approval of the authority. Non-rated ducts or other services are generally not permitted to run above fire-rated ones except when this is unavoidable, then stringent conditions to the integrity of installations above the fire-rated ductwork apply.

6 Other minor revisions include:

a. **Clause 7.1.1 (f) (ii)** on the **supports for the ceiling membrane enclosing a ceiling plenum** being of non-combustible material. The requirement of the melting point of such support members is now removed.

b. **Clause 7.1.1 (h) (i)** on the provision of **fire dampers.** The adjective **automatic** has been deleted as these as it is understood that the fire dampers are self actuating.

c. **Clause 7.1.2 AHU room.** The limitation on the **35kW cooling capacity package units** in such room have been deleted.

d. **Clause 7.1.3 (a)** on the prohibition of the use of the protected shafts of exits, smoke-stop lobbies as supply, exhaust or return air plenum of AHUs have been **rephrased** for clarity.

e. **Clause 7.1.4** on mechanical ventilation in smoke-stop lobbies and fire-fighting lobbies. The reference to **internal exit passageway** have been **deleted** but inserted in **clause 7.1.3** on mechanical ventilation for exits. .

Amplifications and Clarifications

7 The reason that there is little change to the parts of the chapter other than sections on smoke control systems is because many of the issues in Chapter 7 have already been addressed in existing codes such as Singapore Standard CP13 Code of Practice for Mechanical Ventilation and Air-conditioning in Buildings and Singapore Standard CP 10 Code of Practice for the Installation and Servicing of Electrical Fire Alarm Systems. However there were still some instances where the requirements of the Fire Code and the two CPs were at variance. In such situations, the requirements of the Fire Codes takes precedence. These instances are discussed below and the relevant bodies have been notified to make the necessary amendments in the review process for these CPs.

a. **Clause 7.1.2 (c)** on the provision of **smoke detectors for AHU shutdown** upon detection of smoke in the return air system. The Fire Code do not require the AHU shutdown smoke detection system to form a separate zone to the building fire alarm system and recommendation will be made for the corresponding Clause in CP 10 to be revised to harmonize with this requirement.

b. **Clause 7.2.2 (a)** specifies a **minimum pressure differential of 50 Pa** between the exit staircase and the accommodation area when all doors connecting to the staircase enclosure is closed. The requirement in CP 13 will be revised accordingly.

c. **Clause 7.1.4 (d)** on the provision of a **manual start/ stop switch** with visual indication for smoke-stop lobby and fire-fighting lobby mechanical ventilation system operation in the fire command centre. The switch can also be on the main fire indication board location when there is no fire command centre. The intent of

this requirement is to allow fire fighting personnel to shut down the system temporarily in the event that smoke is drawn into the space through the outdoor air intake as well as manually activate the system should the fire alarm system fail to automatically activate it. Some confusion have arisen in practice when the fan operating switch is latched in the close position and the system could only be shut-down at fan location thus contradicting the intent expressed in the clause.

d. A similar situation is encountered in **clause 7.1.9 (a)** and **clause 7.2.6 (c)** for the activation of **pressurization systems in exit staircases.**

Prescriptive versus Performance Based Code

8 The trend towards a performance based code is clearly reflected in the revisions to the Fire Code. An early example of performance based specifications is that for the Staircase Pressurization Systems which appeared in the Fire Code in the early 1980s. However as research on building smoke control has shown, many parameters enter the considerations in the design of such systems and a prescriptive based code cannot properly address all the situations except in very simplified cases. Hence the introduction of engineered smoke control systems into the present code and expansion of performance based requirements into many systems.

Basement smoke control system

9 The existing **clause 7.4.1** has been restructured and expanded. While the basic requirement to provision of smoke control system in basement remains unchanged, new sub-clauses are added to deal with ancillary spaces in basement.

10 No changes are made to existing **clause 7.4.2** for provision of smoke vents.

11 The requirement of engineered smoke control has been relocated with references made to **clause 7.6,** a new clause which covers the provisions of engineered smoke control system.

12 Some significance of this revised section are described below:

a. The area requirements (i.e. total aggegrate floor area of 1900sq m) for engineered smoke control system for basement remain unchanged. There are also no changes on the smoke vents requirement.

b. The section does not apply to basement or a portion of basement that is used as carparking and compartmented from the rest of the basement In which case, only smoke purging system under **clause 7.1.9** would govern.

c. Portions of the basement which are used as Plant/ equipment or services area would require smoke vents or smoke purging system. However, small plant/ equipment room with floor area not exceeding 250sq m is exempted, provided the subject room is compartmented from rest of the basement and designed with 2 doors for better reach in fire fighting operation. With the adoption of a common set of requirement for engineered smoke control system **(given in clause 7.6),** the minimum height for smoke layer measuring from the floor level has become 2.5m instead of 2.1m. The 2.5m height is needed to ensure that the design smoke layer base is situated at a level well above the heads of people try to escape beneath it. The technical committee deliberated on the issue and found no justification to retain the clear height below smoke layer at 2.1m especially for basement occupancy and decided to adopt a common height of 2.5m for both basement and upper floors.

Atrium smoke control system

13 In the absence any established smoke control design references then, the existing **clause 7.5.1** merely requires the atrium smoke control system to be designed to the satisfaction of the Relevant Authority without stating the overseas standards or publications to follow. However, over the past years, two technical reports i.e. BR 186 and BR 258 published by the Fire Research Station (FRS) of the British Research Establishment, UK have been widely used as design guides for engineering smoke control systems. The technical committee had considered the relevancy and significance of 186 and BR 258 and decided to adopt them as our base guide for smoke control design. The details are given in the new clause 7.6 which will be discussed later. The existing clause 7.5.2 is removed as the Technical Committee felt that the prescriptive height of 18m for mechanical smoke extraction system would no longer be relevant if the smoke control system is to be engineer designed to BR 186 and BR 258.

Engineered smoke control system

14 The entire new section 7.6 is devoted to requirement of engineered smoke control system. Although BR 186 – "Design principles for smoke ventilation is enclosed shopping centre" and BR 258 – "Design approaches for smoke control in atrium buildings" are specified in the new **clause 7.6.1** for the design of smoke ventilation system by natural or mechanical extraction form, other design standards may be use subject to acceptance of FSB. The subsequent **clauses i.e. 7.6.2** to **7.6.31** deal with the important design criteria pertaining to the engineered smoke control system. Many of which are recommendations given BR 186 and BR 258.

15 They are discussed as following:

a. Building to be provided with smoke ventilation system is to be sprinkler protected so that the fire sizes are controllable.

b. Maximum fire size for a sprinkler control fire for various occupancy as per FRS's recommendations are prescribed.

c. The engineered smoke control system may be designed basing on smoke zones. However, the smoke ventilation system shall be capable to handle the layout demand of smoke exhaust under the worst case scenario.

d. Height to base of smoke layer is fixed at a minimum of 2.5m.

e. Smoke reservoir sizes are specified for different methods of smoke extract design. For extraction from room of origin, the maximum smoke reservoir sizes are 2000 sq m and 2600 sq m for natural smoke ventilation and mechanical smoke ventilation respectively. For cases where smoke is allowed to spill into the circulation space or atrium space before extraction taken place, the smoke reservoir sizes are halved. In any case, the maximum length of smoke reservoir is limited to 60m. Smoke reservoirs may be formed by fixed building configurations, or architectural downstands constructed of non-combustible materials capable of withstanding the highest design smoke temperature, or retractable smoke curtains supplied and installed in accordance with BS 7346 or equivalent. Smoke curtains are subjected to the PSB batch inspection labeling scheme.

f. Sizes of rooms discharging smoke into circulation space or atrium are not to exceed 1000sqm and 1300sq m for natural and mechanical smoke ventilation respectively.

g. Where the design uses the false ceiling space as the smoke reservoir, the ceilings are to have at least 25% perforation to enable smoke collection within the false ceiling space.

h. Limits are set for mass flow rate not exceeding 175 kg/s and minimum smoke layer temperature of 18°c above ambient to ensure proper operation of a smoke ventilation system.

i. While smoke is being extracted, either by natural vent or mechanical extraction, replacement air is to be provided by natural means drawing air directing from the external at a velocity not exceeding 5m/s and discharging at low level to avoid distribuance of smoke layer. Replacement air supplied by fan is not permitted.

j. The smoke ventilation system shall operate automatically upon detection of smoke by smoke detector placed strategically at the smoke caution zone. There is no longer requirement to connect signal from the sprinkler flow switch as back-up as the technical committee reckoned that activation of sprinkler flow switch is less accurate in pinpointing the exact fire location.

k. Notwithstanding the automatic operation, a remote manual activation with status monitoring of the operation status of the smoke ventilation system are to be provided at FCC or FIB.

l. Upon activation, the time taken for the smoke ventilation system within a smoke zone to be fully operational is not to exceed 60 secs.

m. AHUs serving the smoke zone are to be shut down automatically upon activation of the smoke ventilation system.

Auditorium (Cinemas, Theatres etc) smoke control system

16 This is new section in the fire code. The section applies to auditorium including multiplex cinemas in shopping centre. The major requirements are as following:

a. For any non sprinkler protected auditorium and sprinkler protected auditorium having floor areas exceeding 500 sq m, smoke vents having 2½ of the floor area of the auditorium is to be provided.

b. Operation of smoke vents is to be controlled by automatic device via activation of smoke detection.

c. Engineered smoke control system may be provided in lieu of smoke vents.

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PROVISION OF RISING MAINS FOR BUILDINGS UNDER CONSTRUCTION

INTRODUCTION

1 Under the current requirements on Code of Practice (CP) 29, all rising mains (either dry or wet riser) shall be designed and installed for buildings while under construction. However, there had been a couple of recent building fires where investigation revealed that such fire-fighting measures will not satisfactory provided, thereby posing problems to our fire-fighting operations.

2 The rationale for the provision of rising mains is to ensure that they are able to tackle and put out a fire expeditiously before it spreads, especially where large quantities of combustible materials are usually present at construction worksites. Currently, there are two types of rising mains required in our buildings, ie. dry riser for buildings between 24 to 60 metres in habitable height and wet riser for buildings above 60 metres.

3 In general, building owners comply with the requirements of providing rising mains in buildings under construction. However, a few of them faced some problems in compliance with the technical requirements laid down in the CP 29. To address this problem, SCDF has drawn up a set of guidelines to facilitate the compliance by building owners and Qualified Persons (QP).

OBJECTIVE

4 The aim of this paper is to set out the technical guidelines on the provision of rising mains in buildings under construction. This would facilitate the main contractor and the QP to comply with them .

SCOPE OF WORKS FOR THE PROVISION OF RISING MAINS

5 The following are an elaboration of the main provision after having discussed at a meeting with IES, SIA, REDAS, Singapore Contractor Association Ltd (SCAL) and ourselves :-

a provision of dry & wet riser ;

b provision of 2-way/ 4-way breeching inlets ;

c lift/ passenger hoist

d generator set/ permanent power supply

e fire engine accessway

f testing of the rising mains, etc

6 The responsibility of the main contractor of the project is to actively work closely with the PE to ensure that all requirements for the provision of rising mains in the building are complied with and allowed for in the construction stage.

7 An inspection checklist has been designed for the provision of rising mains in buildings under construction (see Annex A). The major items in the checklist are discussed and elaborated as follows :

a Provision of dry & wet risers

All rising mains (dry & wet) shall be made operational for all floors (except the uppermost 3 floors) as soon as the uppermost completed floor reaches 24 m. This is because the uppermost 3 floors are likely to be strutted with props and scaffoldings for the purpose of gaining structural strength. Moreover, some of the staircases may not have been provided yet with no access available to the upper floors.

Dry & wet rising mains shall be installed progressively as the building gains height, in order to provide fire-fighting capabilities at all stages of construction. All outlets, landing valves, inlets, water tanks and pumps, where required shall be provided and made readily operational.

b Provision of normal lift/ passenger hoist

A normal lift is preferred for the purpose of fire-fighting. However, we are fully aware that this is not possible at the construction stage. As a ready-made alternative, the passenger hoist (usually installed on site) can then be made available for use by firemen.

c Provision of electrical supply

A generator set may be used for fire-fighting if the permanent power supply is not available prior to the completion of the building. In a fire situation, an experienced worker should be made available to operate the generator set immediately.

d Provision of fire engine accessway

It is difficult to provide fire engine accessway & hardstanding during construction stage as the entire site is invariably cluttered all kinds of activities and items such as electrical services, water pipes, excavation works and all kinds of equipment. Space for fire-fighting accessway may not even be available or, otherwise very limited.

However, in spite of the site constraints, adequate fire engine & hardstanding shall be provided where practicable, for the purpose of effective fire-fighting operations.

Where there are no fire engine accessway & hardstanding provided at site, the main contractor should install more portable fire extinguishers at every floor, which would facilitate first-aid fire fighting by construction worker. This would at least help to control any fire that may occur before the arrival of the fire engine. Nevertheless, it is important that good housekeeping is observed.

e Provision of adequate pressure & flow

It is important to note that for the rising mains to be effective, it must be hydraulically tested and a pressure-release valve installed at the highest point of the riser stack. In the case of wet riser system, a break tank of only 11.5 m^3 is required to provide for close-range fire-fighting for at least 5 minutes and the continuous flow of water supply can subsequently be drawn from the public fire hydrant. The main contractor should also bear in mind that the break tank must be installed before the building reaches 60 metres mark.

For the testing of flow rate for wet riser system (residential & non-residential buildings), the topmost landing valve should be tested (under pump/gravity feed) with a flow rate of at least 27 L/s. This minimum flow rate required for residential buildings will also applicable to non-residential buildings (commercial buildings), as the fire hazard in both types of buildings are similar while under construction.

IMPLEMENTATION

8 The implementation of the inspection checklist for rising mains in buildings under construction has already been effected. FSB officers will be carrying out spot checks to ensure compliance. For your information, we have informed the various professional bodies accordingly.

CONCLUSION

9 The main contractor and the QP should understand the need and rationale on the provision of rising mains in buildings under construction. They must take upon themselves the responsibility of ensuring that such rising mains fully comply with the requirements.

10 The guidelines set out in the inspection checklist will be incorporated as part of the CP 29 in its subsequent revision.

BY : Cpt Jee Su Giam
Fire Safety Bureau

ANNEX A

INSPECTION CHECKLIST FOR RISING MAINS IN BUILDING UNDER CONSTRUCTION

S/No	Description	Yes	If No, remedy action/ comments
PART A			
1	All rising mains (dry & wet) shall be made operational for all floors except the uppermost 3 floors as soon as any completed floor of the building reaches 24 m in height.		
2	Wet rising mains shall be installed progressively when the building attains a height of 60 m during the course of construction. All outlets, landing valves and inlets as well as water tanks and pumps shall be provided and made readily operational.		
3	Provision of * 2-way/4-way breeching inlet as per approved plan.		
4	Lift/passenger hoist ready for firemen's use.		
5	Generator set or adequate PUB power supply for fire-fighting purposes.		
6	Provision of adequate fire engine accessway and hardstanding (where practicable) for fire-fighting purposes.		
7	Adequate portable fire extinguishers to be provided on each floor.		

Date inspected : _____ by _____ Signature _____

* Delete as appropriate

S/No	Description	Yes	If No, remedy action / comments
PART B : CHECKLIST FOR THE TESTING OF RISING MAINS			
BREECHING INLET		In - Order	Not In - Order / Remarks
1	Inlet housed in protective enclosure		
2	Rigidly supported		
3	Labeled " Dry/wet Riser Inlet " and numbered accordingly		
4	Clear of obstruction		
RISER			
5	Air relief valve provided		
6	Labeled & numbered accordingly		
7	Earthing provided		
LANDING VALVE			
8	Blank cap provided		
9	Strapped and padlock in closed position		
10	Clear of obstruction		
TESTING OF PRESSURE/FLOW			
11	Dry rising mains a Pressure constant at 300 psi (20.7 bar) for 30 minutes. b Regularly tested		
12	Wet rising mains a Static pressure shall be less than 8 bar b Topmost landing valve fully opened (under pump/ gravity feed) with flow rate at 27 L/S c Provide break tank with minimum water capacity of 11.5m^3		

Date inspected : _____ **by** _____ **Signature** _____

FIRE SAFETY REQUIREMENTS FOR TEMPORARY STRUCTURES IN CONSTRUCTION SITES

INTRODUCTION

1 Temporary structures that are habitable are very much prevalent, and cannot do without, in practically all work sites pertaining especially to new building developments. Some examples are, site offices, workers quarters or dormitories, canteens, etc.

2 Along with such temporary erections, is the ever presence of a possibly rampant fire threat. It can be observed from the present conditions of most work sites that there is no due concern given for the safety of the workers who occupy the temporary structures, which are often cramped and potently combustible. One can imagine the consequences, if the present practices prevail without control on its construction and the material used. A development of temporary structures, together with its occupants could be devastated, should a fire breakout.

FIRE SAFETY (EXEMPTION) ORDER AND REGULATIONS

3 The Fire Safety Act Chapter 109A, 'The Fire Safety (Exemption) (Temporary Buildings In Construction Sites) Order' and its ensuing regulations, amendments for which came into operation from 1st July 1997, exempts the need for submissions of plans of these temporary structures to FSB for fire safety compliance checks and approval.

4 The exemption here does not preclude the need for compliance of the fire safety regulations. New Regulation 42 of the Fire Safety (Building Fire Safety) Regulations requires the building industry to self-regulate the fire safety works for the temporary buildings in construction sites. Hence, to facilitate self-regulation, technical guidelines for such developments, which are intended to serve as pre-emptive measures to minimise the possible fire threat and risk to human lives and property, have been issued by the Fire Safety Bureau for adherence and compliance by the owners.

NEW REGULATION 42

5 The New Regulation 42 (see Annex 1) requires the building owner/developer, and the qualified person (QP) appointed by the owner/developer to carry out such works, to comply with the conditions for the exemption. The said exemption here applies to fire safety works not covered by Sections 23, 24 and 29 of the Fire Safety Act and Regulation 16 of the Fire Safety (Building Fire Safety) Regulations (Rg 1). This being any building that is :-

a) a worker's quarters , site office, store, builder's shed or other shed;

b) required in connection with any building works relating to permanent buildings; and

c) situated within the boundaries of the site of the building works.

CONDITIONS OF EXEMPTION

6 The conditions of exemption requires that, "The person for whom the fire safety works are to be carried out shall appoint a qualified person in respect of those works." This means that the building owner or developer has to engage a QP to undertake all the fire safety works pertaining to the building project on the owner's behalf.

7 That appointed qualified person (QP) shall then:-

a) design and prepare plans for the fire safety works;

b) take all reasonable steps and exercise due diligence in supervision and inspecting the fire safety works;

c) upon completion of the fire safety works, certify in such forms as the Commissioner may require that the fire safety works have been inspected and completed in accordance with the Act and any regulations made thereunder.

8 The person for whom the fire safety works have been carried out shall:-

a) ensure that all the plans and certificates are at all times kept available for inspection at the site office where the temporary building is situated;

b) submit those plans and certificates for inspection by the Commissioner if the Commissioner so directs;

c) ensure that the fire safety works and the temporary buildings are maintained in accordance with the relevant guidelines;

d) demolish the temporary building before or upon completion of the building works relating to the permanent building at the site where the temporary building is situated.

TECHNICAL GUIDELINES FOR FIRE SAFETY IN TEMPORARY BUILDINGS IN CONSTRUCTION SITES DATED 1st JULY 1997

9 The technical guidelines, issued by FSB on 28 Jun 97, and effective from 1st July 97, was furnished to facilitate the QP to plan and self-regulate the fire safety works for temporary buildings on behalf of the owner or developer (person for whom the fire safety works are being carried out), who appointed him as his QP. The technical guidelines provided draw basic parameters and requirements for temporary structures in construction sites. These will help the QP to design and prepare his plans for the fire safety provisions.

10 Details of the above technical guidelines are given in Annex 2.

CONCLUSION

11 While we enjoy the success of the rapidly growing building infrastructure in Singapore, we should not forget that we owe a lot of its development to a foreign work force, which normally forms the bulk at the construction work sites. We cannot afford a calamity in our work sites. We definitely don't want unwarranted publicity to mar our image. Hence the need to do justice for the safety of the workers, - mostly foreigners, is imperative, and hence the ensuing regulations and guidelines.

12 It is also time that the building contractors and the building industry take on responsibility to get rid of the currently poor living and working conditions, and start caring for the life and properties of these poor workers. We envisage that with the Building owners and contractors taking measures to self regulate, following closely to the guidelines furnished by FSB, and the other technical authorities, will most certainly bring about better image of our construction sites.

BY : Lta John Abraham
Fire Safety Bureau

No S000 -

THE FIRE SAFETY ACT
(CHAPTER 109A)

THE FIRE SAFETY (BUILDING FIRE SAFETY) (AMENDMENT) REGULATIONS 1997

In exercise of the powers conferred by section 61 of the Fire Safety Act, the Minister for Home Affairs hereby makes the following Regulations:

1. These Regulations may be cited as the Fire Safety (Building Fire Safety)(Amendment) Regulations 1997 and shall come into operation on _____ 1977.

2. The Fire Safety (Building Fire Safety) Regulations (Rg 1) are amended by inserting, immediately after regulation 41, the following regulation:

"42.(1) The provisions of the Act and these Regulations shall, with the necessary modifications, apply to fire safety works exempted under the Fire Safety (Exemption)(Temporary Buildings in Construction Sites) Order 1997.

(2) Every person for whom such fire safety works are carried out and every qualified person appointed in respect of such fire safety works shall comply with the conditions of the exemption under the Fire Safety (Exemption)(Temporary Buildings in Construction Sites) Order 1997.".

Made this ___ day of _____ 1997.

PETER CHAN JER HING
Permanent Secretary
Ministry of Home Affairs
Singapore

ANNEX 2

SINGAPORE CIVIL DEFENCE FORCE
FIRE SAFETY BUREAU
25A PATERSON ROAD, SINGAPORE 238511. FAX: 8386427

FSB 37/86
FSB 220/93

DID: 8386452
FAX: 8386422

28 Jun 97

Registrar, BOA
Registrar, PEB
President, SIA
President, IES
President, ACES

Dear Sirs

TECHNICAL GUIDELINES FOR FIRE SAFETY IN TEMPORARY BUILDINGS IN CONSTRUCTION SITES
DATE: 1 JULY 1997

Pursuant to the new Regulation 42 of the Fire Safety (Building Fire Safety) Regulations which allows the building industry to self-regulate the fire safety works in temporary buildings in construction sites, we provide herewith the Technical Guidelines for Fire Safety in Temporary Buildings in Construction Worksites dated 1 July 1997. The amendment to the Fire Safety (Building Fire Safety) Regulations had been passed on 22 May 1997 and shall come into operation on 1 July 1997.

2 This means that all development projects for which building plans are submitted to Fire Safety Bureau from 1 July 1997 onwards shall be subjected to strict compliance to the Technical Guidelines. The Qualified Person (QP) shall be required to endorse on the plans for such temporary buildings and ensure strict compliance to the Technical Guidelines. Although submission to Fire Safety Bureau is not required, a set of the QP endorsed plans shall be available on site for inspection by the Relevant Authority at all times.

Yours faithfully

Ng Ah Hiap
Head
Building Plan & Material Branch
Fire Safety Bureau
for Commissioner
Singapore Civil Defence Force

SINGAPORE CIVIL DEFENCE FORCE
FIRE SAFETY BUREAU
25A PATERSON ROAD, SINGAPORE 238511. FAX: 8386427

cc

DGPW
Director, BCD (PWD)
All members of FSB Standing C'ttee & Fire Code Review Tech C'ttee
President, IFE
President, SISV
President, SCAL
President, REDAS
CE, LTA
DG, CAAS
CEO, HDB
CEO, PSA
CEO, JTC

TECHNICAL GUIDELINES FOR FIRE SAFETY IN TEMPORARY BUILDINGS IN CONSTRUCTION SITES

DATE : 1 JULY 1997

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1 SITE PLANNING

1.1 All temporary buildings shall be sited close to the boundary line adjacent to any public road or any internal driveway that is accessible by the fire appliances. If the temporary buildings are sited more than 100m away from the public road, a private hydrant shall be provided to service these temporary buildings.

1.2 If a building must be sited adjacent to a common boundary, it shall have a minimum setback of 4m from the common boundary. However, if the facade facing the common boundary is protected by a minimum one-hour fire resistance board, the 4m setback will not be required.

1.3 The separation distance between two adjacent buildings shall be at least 4m. However, if the facades facing each other are protected by a minimum one-hour fire resistance board, the 4m separation distance will not be required.

2 MATERIALS OF CONSTRUCTION

2.1 Non-combustible material is preferred for the construction of the temporary building, though timber is also acceptable.

2.2 For a timber constructed temporary building, if the longer dimension of the building (excluding the staircase) exceeds 20m, undisrupted non-combustible walls shall be provided for compartmentation. The maximum length of the longer dimension of the compartmentation shall not exceed 20m. For internal corridors as in Section 3.4, for continuity to the non-combustible walls, minimum half-an-hour fire resistance fire-doors are required so as to prevent spread of fire along the corridors.

3 LAYOUT AND MEANS OF ESCAPE

3.1 Each building shall not exceed 3 storeys, except in the case as provided for in Section 3.4.

3.2 Staircases and corridors shall have a minimum clear width of 1.0m.

3.3 If the layout of rooms on an upper floor is such that the escape of persons is via an external corridor (ie a corridor with its longer side fully open to the

external air), the following requirements shall be applicable:

3.3.1 at least one staircase is required if the one-way travel distance from the most remote point of the floor to the foot of the staircase on ground level does not exceed 19m for steel constructed building, and 13m for timber constructed building;

3.3.2 if the requirement in Clause 3.3.1 cannot be fulfilled, at least two staircases shall be provided, at least one at each end of the building, and the two-way travel distance from the most remote point of the floor to the foot of either of the staircases shall not exceed 30m for steel constructed building, and 20m for timber constructed building.

3.4 If the layout of rooms on an upper floor is such that the escape of persons is via an internal corridor, the following requirements shall be applicable:

3.4.1 the building shall not exceed 2 storeys high;

3.4.2 at least one staircase is required if the one-way travel distance from the most remote point of the floor to the foot of the staircase on ground level does not exceed 13m for steel constructed building, and 9m for timber constructed building;

3.4.3 if the requirement in Clause 3.4..2 cannot be fulfilled, at least two staircases shall be provided, at least one at each end of the building, and the two-way travel distance from the most remote point of the floor to the foot of either of the staircases shall not exceed 25m for steel constructed building, and 15m for timber constructed building;

3.4.4 the internal corridor shall have a width of minimum 1.5m.

	Travel Distance (m)	
	Steel Construction	Timber Construction
Open-sided Corridor		
Single Staircase	19	13
Minimum 2 Staircases	30	20
Internal Corridor		
Single Staircase	13	9
Minimum 2 Staircases	25	15

3.5 All staircases shall be unenclosed and have treads not less than 225mm and risers not exceeding 175mm. All open sides of the staircase and external corridor shall be provided with railings of minimum height 900mm.

4 HAZARDOUS AREAS

4.1 Cooking facilities shall either be located at least 5m away from or be compartmented from any accommodation spaces by walls and floors of non-combustible construction having a minimum half-an-hour fire resistance.

4.2 All stores of highly flammable substances shall not be allowed in the same building used for accommodation purpose, and shall be located at least 5m away from such building.

5 FIRE FIGHTING EQUIPMENT

5.1 At least 2 numbers of portable fire extinguishers of 13A rating each, shall be provided next to every staircase on every floor of any accommodation spaces.

5.2 At least 2 numbers of portable fire extinguishers of 70B rating each, shall be provided at every cooking area.

5.3 A manual fire alarm shall be provided within the premises, such that it is within 30m from any part of the building. A hand-held gong or any form of electric bell shall be deemed an acceptable sounding device; and such sounding devices shall be located such that they are audible from every part of the building.

ISSUED BY FIRE SAFETY BUREAU
SINGAPORE CIVIL DEFENCE FORCE

NEW SUBMISSION PROCEDURES IN FIRE SAFETY BUREAU

INTRODUCTION

1 Under the Fire Safety Act 1993 and Fire Safety (Building Fire Safety) Regulations 1994, plan submissions to Fire Safety Bureau(FSB) are required. Upon completion of the fire safety works, Temporary Fire Permit / Fire Safety Certificate is to be obtained from FSB before the building can be occupied.

2 The objective of this paper is to inform that FSB is considering the introduction of new submission procedures with effect from 1 Nov 97. The motivation for the changes is driven by the notion of giving more trust to building professionals, more efficient use of manpower in FSB and better service to the general public.

CENTRALISATION OF BPM, M&E AND FHM COMSULTATION

3 FSB officers spent a lot of their time clarifying to Qualified Persons (QP) and others on fire precaution matters or the fire code. These clarifications are called 'Consultations'. Consultations could be in the form of a letter or a walk-in consultation. FSB has designated Tuesdays and Fridays for walk-in consultation. The walk-in consultation counter and three consultation rooms at the 2nd storey of FSB premises had been recently renovated to cater for the one-stop consultation for all FSB matters, be it Building Plans, Materials, M&E or Hazardous Installations.

4 The fee structure for the entire process of consultation and plan processing will be reviewed. Better justification will be rendered to the levy such that it will commensurate with the man-effort expended in each process. The idea is to encourage building professionals to be less dependant on FSB and to be more conversant with fire precautions in buildings. Those submissions whose QPs are more conversant would end up saving on the overall fees. On the other hand, those who required a lot of consultation may end up paying more overall fees. This will be a more equitable method of fee collection.

5 The merger of BPM branch, M&E branch and part of FHM branch to form PAC branch and the merger of I&E branch and part of FHM branch to form L&E branch has been implemented to facilitate more focussed empowerment when FSB officers meet the QPs to discuss their projects.

6 Consultation prior to Plans submissions are encouraged so that when the Plans are eventually submitted, there will be no need for Written Direction (WD). QPs may either submit BP submission first followed by M&E submission or both BP and M&E submissions together.

INTERMEDIATE SELF-REGULATION BY QP

7 Currently self-declaration to FSB are made by QPs. FSB would first look out for waiver applications for non-compliances accompanying the submission. Then FSB would conduct selective checks on vital requirements for each submission. Todate this approach of conducting only selective checks has a major set-back of not being able to seive out some non-compliant cases. These non-compliant cases later resurfaced themselves as A&A cases which would inevitably cause greater difficulties for compliance.

8 From the time self-declaration was introduced in July 1996 until today, 42 % of Plan submissions required two or more WDs. Most of the 53 % outright approval are minor cases. For self-regulation to be effective, the quality of submissions must be enhanced, i.e. the 53 % must be brought up closer to nearly 100 %.

9 FSB would not want to revert back to the old practice of detail check for all cases. The underlying philosophy is very simple – it is unfair for 90 % of good submissions to have to wait much longer for their turn for FSB's response, just because FSB is preoccupied with the tedious responses to the 10% of poor submissions. The responses to poor submissions are tedious, as time is required to understand these submissions and then to issue long WDs.

10 In the future self-regulation scheme, all submissions are to be approved if the QP has declared full compliance. QPs are to be fully trusted in their self-declaration upfront. Checks and balances are required as in any system where power and trust is bestowed on individuals. FSB must have a system to ensure that the self-regulation scheme is working effectively. In this new system, **after approval**, FSB officers would select some cases to conduct check thoroughly. QPs found to have cheated in their self-declaration would be taken to task.

11 In order to phase in to the future self-regulation scheme, the industry must gradually be less dependent on FSB's WDs to point out the non-compliances. As a step towards achieving this, in the intermediate process, FSB would practise outright rejection without any WD should the submission be found to be non-compliant upon the selective checking by FSB.

12 Waiver applications are encouraged to be at the consultation stage, so that at Plan submission stage, there could be more outright approval. However, if waiver applications are received at the Plan submission stage, WD would be issued to inform the QP of the Waiver committee's decision. In the event that all the waiver applications are approved, the notice of approval will be issued. Waiver applications may be levied a fee as much effort have been incurred in processing and evaluating such applications.

REVIEW OF CHANGE OF USE (COU) PROCEDURE

13 FSB found that 95 % of the COU applications involved two stages of submission – the later stage being the normal BP submission. Therefore, to avoid the need for the member of public to go through the 2 stages of approval, FSB plans to amalgamate the two stages into one by requiring all submissions involving COU to be made by a QP.

REVIEW OF MINOR INTERNAL PARTITION WORK (MIPW) PROCEDURE

14 90 % of the MIPW applications required the engagement of QPs to endorse on the plans. Therefore, to expedite the process of such cases, FSB may exempt the requirement to obtain approval from FSB. MIPW works may be regulated by QPs in the building industry.

15 The proposed new requirement is for the QP endorsed plans to be lodged with FSB, upon the certified completion. FSB would follow up by conducting random checks on the completed works. If such new procedure is implemented, FSB will issue guidelines for the new MIPW procedure and requirements.

BUILDING MATERIAL APPROVAL

16 FSB had earlier informed that starting from 1 Apr 97, there will be a 3-stage phasing out of the requirement to obtain approval from FSB for building materials. Instead, the Productivity and Standards Board (PSB)'s Product Listing Scheme (PLS) Directory will be in place for the building materials to replace FSB's approval. By the 3rd stage, which is 1 Apr 1998, all building materials shall be in the PSB's PLS directory.

17 FSB and PSB has a joint committee which meets regularly to deal with peculiar cases received by PSB and to resolve any technical issues that may be encountered.

FSB'S IT PLAN

18 Since 1993, FSB's database HOLMS system has already been in place. Over the years, the data compiled had assisted to improve efficiency and to serve the public better. Amongst the advantages of the computer system are the issuing of WD, Notice of Approval and other documents. The data captured facilitate the monitoring of all cases and the generation of statistics and reports. All cases are immediately captured when they are received at the front counter; and thereafter, every transaction is recorded and monitored.

19 The public could enquire on the status of their cases at the counter or through the telephone hotline.

20 For the future, FSB is working with the other government agencies and its IT Consultants to develop more advanced computer systems to better serve the public. Future computerisation plans include an automated plans checking and integrated plan submission system, common to the other government agencies.

CONCLUSION

21 While trying to improve fire safety and keep up with the latest advancement in science and technology affecting fire safety standard in buildings, FSB is exploring better working systems to improve its services to the public. Most importantly, the fire safety standard is better assured with the closer involvement of building professionals.

22 The proposed new submission procedures when implemented will enable FSB to make more efficient use of its limited human resources and at the same time serving the public better. In some cases, queuing or waiting for FSB approval will no longer be required. As the building profession matures, greater trust in the professionals should be shown by the regulating bodies to enable the industry to exercise self-discipline. Thus the impending changes are necessary steps towards meeting this goal.

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