# SINGAPORE CIVIL DEFENCE FORCE FIRE SAFETY & SHELTER BUREAU



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18<sup>th</sup> May 2001

Registrar, Board of Architects (BOA) Registrar, Professional Engineers Board (PEB) President, Singapore Institute of Architects (SIA) President, Institution of Engineers, Singapore (IES) President, Association of Consulting Engineers, Singapore (ACES)

Dear Sirs

# FIRE CODE REVIEW COMMITTEE-2<sup>nd</sup> RELEASE OF CHANGES/AMENDMENTS TO FIRE CODE 1997

The Fire Code Review Committee, which comprises representatives from \*SIA, IES, ACES, REDAS, SISV, HDB, JTC, NTU, NUS, BCA, LTA, IFE, PSA, PSB and SCDF, met monthly as from 7<sup>th</sup> Dec 1999 to review the Fire Code 1997.

2 FSB is pleased to forward to you the 2<sup>nd</sup> release of changes/amendments to the Fire Code, which have been deliberated and agreed upon by the Fire Code Review Committee. A reprint of the relevant pages of the Fire Code incorporating the changes/amendments, which are highlighted by a black vertical line, are given in Annex A. The changes/amendments to the Fire Code shall take effect as from 1<sup>st</sup> June 2001.

3 Please convey the contents of this circular and Annex A to members of your Institution/Association/Board/Organisation. You may reprint or photocopy the relevant pages incorporating the changes/amendments to the Fire Code at Annex A for dissemination to your members. The circular is also available in our website: http://www.scdf.gov.sg

Teo Lim Teck Secretary, FSB Standing Committee for Commissioner Singapore Civil Defence Force cc CEO, BCA All members of FSB Standing Committee All members of Fire Code Review Committee President, REDAS President, IFE President, SISV CEO, HDB Group President, PSA CEO, JTC CE, LTA (Attn: Mr Mohinder Singh) CE, PSB (Attn: Mr Lau Keong Ong/Ms Tan Chiew Wan)

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# 2<sup>nd</sup> RELEASE OF CHANGES/AMENDMENTS TO FIRE CODE 1997

# Chapter 3 -

3.4.3(a)	Timber floors	97
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1.2.43	Non-load bearing wall means a wall which supports no load other than its own weight.	Non-load bearing wall
1.2.44	Boundary presumed to exist for the purpose of this document between buildings on the same site.	Notional boundary
1.2.45	The "occupant load" of a building or part thereof means the total number of persons that may occupy such building or part thereof at any one time.	Occupant load
	The "occupant load" shall be established either:	
	(a) by applying to the floor areas available for occupation based on the appropriate areas per person as laid down in Table 1.2 A, or	
	(b) by the actual number of occupants for whom each occupied space of the building is designed as shown on the plans,	
	whichever is greater unless otherwise permitted by the Relevant Authority.	
1.2.46	The maximum aggregate area of unprotected areas in any side or external wall of a building or compartment as referred to in Cl. 3.5.3.	Permitted limit of unprotected area
1.2.46(A	) Private lifts are passenger lifts which are meant for the exclusive	Private lifts
	use of occupants in the building, and are located to open its door directly into private enclosed spaces.	New subclause added under Supplement 3/2001 dated 18 May 2001
		Effective date 1 Jun 2001
1.2.47	An exit staircase, exit passageway, lift, chute, duct or other shaft which enables persons or things or air to pass from one compartment to another.	Protected shaft

1.2.48 Wall, floor or other part of the building which encloses a Protecting protected shaft, but not:

OCCUPANCY LOAD-PURPOSE GROUP-II BUILDING TYPES -

#### SCHEDULE 2 OTHER RESIDENTIAL APARTMENTS, MAISONETTES

FUNCTIONAL SPACES	REMARKS		OCCUPAN (m <sup>2</sup> /person)	CY LOAD
Gross Floor Area	calculated on habitable	areas	15.0	
OCCUPANCY LOAD- PURPOSE GROUP III- BUILDING TYPES-	SCHEDULE 3.1 INSTITUTIONAL HEALTH-CARE OCC (HOSPITAL, CLINIC		LINIC)	
FUNCTIONAL SPACES	REMARKS	OCCU (m <sup>2</sup> /per	PANCY LOA rson)	D
Reception Area Lobby/Corridors Waiting Area/ Visitors Lounge	non-simultaneous	$\frac{3.0}{3.0}$		
Out-patient Waiting Area		1.5		
Admin Offices Doctor's Offices Nursing Station Staff Lounge		10.0 10.0 10.0 3.0		
Consultant/Treatment/ Examinati Therapy Centre Operation Theatre Surgical Viewing Gallery Patient Accommodation	Intensive Care Room (max 2 beds)	5.0 10.0 7.5 3.0 20.0 10.0		Amended under
Laboratories Pharmacy	Ward	<b>10.0</b> 20.0 20.0		Supplement 3/2001 dated 18 May 2001
Kitchen/Housekeeping Laundry*(1) Toilet/Locker/ Changing Room	non-simultaneous	10.0 10.0 		Effective date 1 June 2001
Storage Canteen Restaurant Shop		30.0 1.5 1.5 5.0		

\*To refer to (1) (2) or (3) of notes at the end of Schedule 8

# OCCUPANCY LOAD- SCHEDULE 6

PURPOSE GROUP VI- FACTORY

# BUILDING TYPES FACTORIES, FLATTED FACTORIES, INDUSTRIAL PLANTS

FUNCTIONAL SPACES	REMARKS	OCCUPA (m <sup>2</sup> /perso	NCY LOAD n)	
Reception Area Lobby/Corridors Waiting Area/Visitors Lounge	non-simultaneous	$\frac{3.0}{3.0}$		
Admin Office Meeting/Seminar Room Library Workshop Laboratories Exhibition	Stack Area Reading Area	10.0 1.5 10.0 5.0 <b>10.0</b> 5.0 1.5	Amended Supplement 3/2001 18 May 2001	under dated
Production Area*(2)		10.0	Effective date 1 June	e 2001
Packing/Distribution Area Material/Product/ General Storage	non-simultaneous	10.0 30.0		

\*To refer to (1) (2) or (3) of notes at the end of Schedule 8

FUNCTIONAL SPACES	REMARKS	OCCUPANCY LOAD (m <sup>2</sup> /person)
BUILDING TYPES-	HOTELS, HOLIDAY RESORTS, BOARDING HOUSES, CONVENTION CENTRES, PRIVATE CLUBS	
PURPOSE GROUP VII-	PLACES OF PUBLIC RESORT	
OCCUPANCY LOAD-	SCHEDULE 7.1	

Reception Area Lobby/Corridors Waiting Area/Visitors Lounge Atrium Floor/Concourse Hotel Bedroom	non-simultaneous 4 to a room	$\frac{3.0}{3.0}$ 3.0 3.0
Bar/Pub Discotheque Night Club	Gross area Gross area Gross area	1.0*1.0(including dine & dance area)1.5(including dine & dance area)
Restaurant		1.5
Exhibition/Multi-purpose Area		1.5
Function/Ball Room Pre-function Room Business Centre Admin Office Conference Room Meeting/Seminar Room Library	non-simultaneous Stack Area Reading Area	1.5 
Shop Health Club/Centre*(3) Swimming Pool Deck Swimming Pool Squash Court	2 per court	5.0 5.0 10.0
Staff Rest Room Staff Canteen Toilets/Changing/Locker Room Kitchen/Service Area Laundry*(1) Mechanical Plant Room	non-simultaneous non-simultaneous	

\*To refer to (1) (2) or (3) of notes at the end of Schedule 8

Amended under Supplement 3/2001dated 18 May 2001

Effective date 1 June 2001

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#### OCCUPANCY LOAD-

#### SCHEDULE 7.8

#### PURPOSE GROUP VII- PLACES OF PUBLIC RESORT

BUILDING TYPES-RECREATIONAL BUILDINGS, AMUSEMENT CENTRES

FUNCTIONAL SPACES REMARKS

OCCUPANCY LOAD (m<sup>2</sup>/person)

Reception Area Lobby/Corridors Waiting Area/Visitors Lounge Admin Office Meeting/Seminar Room	non-simultaneous	$\frac{3.0}{3.0}$ 10.0 1.5
Bowling Alley	exclude bowling lanes	1.0
Amusement Park	exclude machine areas	1.0
Billiards Room		5.0
Skating Rink	Rink Area Spectator Area	3.0 1.5
Discotheque Pub/Bar Karaoke Lounge Night Club	Gross area Gross area Gross Area Gross Area	1.0 (including dine & dance area)*1.01.5 (including dine & dance area)1.5 (including dine & dance area)
Health Club/Centre*(3)		5.0
Restaurant Cafetaria/Snack Bar		1.5
		1.5
Fast Food Outlet Kitchen/Service Area		<b>1.0</b> 10.0
Toilet/Changing Room General Storage Mechanical Plant Room	non-simultaneous	30.0 30.0

\*To refer to (1) (2) or (3) of notes at the end of Schedule 8

\* Amended under Supplement 3/2001 dated 18 May 2001

Effective date 1 June 2001

### OCCUPANCY LOAD- SCHEDULE 7.9

PURPOSE GROUP VII- PLACES OF PUBLIC RESORT

BUILDING TYPES-

EATING HOUSES, RESTAURANTS, COFFEE SHOPS, HAWKER CENTRES, FAST FOOD OUTLETS

FUNCTIONAL SPACES	REMARKS	OCCUPANCY LOAD (m <sup>2</sup> /person)
Reception Area Lobby/Corridors Waiting Area Admin Office Meeting/Seminar Room	non-simultaneous	$ \frac{3.0}{3.0} \\ 10.0 \\ 1.5 $
Dining Area Bar/Pub Lounge Kitchen/Service Area	Hawker Centres Fast Food Outlets Others Gross area	1.5       1.0       Amended under Supplement         1.5       3/2001       dated 18 May 2001         1.0       2.5       Effective date 1 June 2001
Storage Area Toilet/Changing Room	non-simultaneous	30.0
Staff Rest Room	non-simultaneous	—
Mechanical Plant Room		30.0

OCCUPANCY LOAD-
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SCHEDULE 7.10

PURPOSE GROUP VII- PLACES OF PUBLIC RESORT

BUILDING TYPES- BUS TERMINAL, TRAIN STATION, AIRPORT, FERRY TERMINAL

FUNCTIONAL SPACES	REMARKS	OCCUPANCY LOAD (m <sup>2</sup> /person)
Reception Area Lobby/Corridors Waiting Area/Visitors Lounge Concourse Admin Office Meeting/Seminar Room Ticketing Office Business Centre	non-simultaneous	3.0 3.0 3.0 10.0 1.5 10.0 10.0
Passenger Arrival/ Departure Areas/Foyers	Bus Terminal Others	1.5 3.0
Restaurant Cafeteria Fast Food Outlet Kitchen/Service Area Shop		1.5         1.5         1.0         10.0         3/2001         dated 18 May         5.0
Staff Rest Room Storage Area Toilets/Changing Room Mechanical Plant Room	non-simultaneous non-simultaneous	<b>Effective date 1 June 2001</b> 30.0 30.0

OCCUPANCY LOAD-	SCHEDULE 8
PURPOSE GROUP VIII-	WAREHOUSE, GODOWNS, PUBLIC CAR PARK
BUILDING TYPES-	WAREHOUSE, GODOWNS, CAR PARKS

FUNCTIONAL SPACES	REMARKS	OCCUPANCY LOAD (m <sup>2</sup> /person)
Reception Area Lobby/Corridors Waiting Area/Visitors Lounge Admin Office Meeting/Seminar Room	non-simultaneous	$\frac{3.0}{3.0}$ 10.0 1.5
Packaging Area Goods Storage General Storage Loading/Unloading Area Staff Rest Room	4 per Bay non-simultaneous	10.0 30.0 30.0
Toilets/Changing Room Staff Canteen Kitchen/Service Area Mechanical Plant Room	non-simultaneous	1.5 10.0 30.0

Note:

a)	Car Parking Areas - occupancy calculated on the basis of 30 m <sup>2</sup> per	r person.

b)	For building types not included in the above tables, occupancy load calculation shall be
	based on the figures established for buildings within the same purpose group, or as
	otherwise determined by the <u>Relevant Authority</u> .

\*(1) Laundry Areas equipped with machine operation, occupancy may be calculated at 15.0 sq m per person.

	sauna/steam bath and whirlpools.	Effective date 1 Jun	e 2001
*(3)	Health/Fitness Centres include areas for weight training, aerobics, massage,	18 May 2001	
*(2)	Production Area whether automated or not, shall be calculated on the basis of <b>10.0m<sup>2</sup> per person</b>	Supplement 3/2001	under dated

2.2.13 (c) Exception:

2.2.14

(i)	cl.2.2 store the d at lea	omission of smoke stop lobby required under 2.13(b) to exit staircase of any building exceeding 4 ys is allowed under the following situations, provided oor opening into the exit staircases shall be fire door of ast1-hour fire resistance and fitted with automatic self- ng device to comply with the requirements of cl.3.9.2:	Omission of smoke stop lobby is allowed Amended under Supplement 3/2001 dated 18 May 2001	
	(a)	where the internal exit staircase is provided with pressurization up to a habitable height of 24m in compliance with the requirements of Chapter 7;		
	(b)	where an external exit staircase is constructed to comply with cl.1.2.29;	Effective date 1 June 2001	
	(c)	where an external exit staircase of a building is located along its perimeter wall and provided with uninterrupted external ventilation openings having not less than 50% of the planal area of the staircase at each storey level;		
	(d)	in an open-sided car park floor where cross- ventilation is provided. Under this situation, the fire door to the exit staircase can be $\frac{1}{2}$ -hour fire rated.		
(ii)		omission of smoke stop lobby to exit staircases shall not lowed under the following situations : -	Omission of smoke stop	
	(a)	where the building exceeds 4 storeys and belongs to Purpose Group III and VII;	lobby is not allowed	
	(b)	where the internal exit staircase, which is provided with pressurization, exceeds the habitable height of 24m;		
	(c)	where the exit staircase is designated as fire fighting staircase adjacent to a fire lift as required in Chapter 6.		
Smoke Free	e Appro	bach to Exit Staircase in Basement Occupancy:	Smoke free approach in basement	

(v) exit doors opening into an external exit passageway shall have fire resistance for at least half an hour and fitted with automatic self-closing device.

## (d) Ventilation

- (i) all internal exit passageways shall be naturally ventilated by Ventilation fixed ventilation openings in an external wall, such ventilation openings being not less than 15 per cent of the floor area of the exit passageway, and
- (ii) internal exit passageways that cannot be naturally ventilated shall be mechanically ventilated to comply with the requirements in Chapter 7.

## 2.3.3 Exit Staircase:

(a)	Inte	Internal exit	
			staircase
	(i)	an internal exit staircase which serves as the required exit of the building shall be enclosed with construction complying with the provisions of Cl. 3.8, and	Note :
			Subclause
			2.3.3(a)(ii)
			has been
			deleted
			Amended under
			Supplement
			3/2001 dated
			18 May 2001
			Effective date
			1 June 2001

	<ul> <li>(ii) there shall be no unprotected openings of occupancy area within 1.5m horizontally or within 3m vertically below any part of the ventilation openings located in the external wall of the internal exit staircase.</li> </ul>		Unprotected openings Note : Subclause 2.3.3(a)(ii) has been deleted
			Amended under Supplement 3/2001 dated 18 May 2001
			Effective date 1 June 2001
(b)	Exter	rnal Exit Staircase	External exit staircase
	(i)	external exit staircase may be used as required exit in lieu of internal exit staircase provided it complies with the requirements of exit staircase, except for enclosure of an internal staircase, and	
	(ii)	there shall be no unprotected openings within 3 m horizontally or within 3 m vertically below, or adjacent or facing (unless there is adequate separation complying with cl.3.5) any part of the external exit staircase; and	Amended under Supplement 3/2001 dated 18 May 2001
	(iii)	the external exit staircase shall be located so as to lead directly to a street or open space with direct access to street.	Effective date 1 June 2001
(c)	exter maxi disch	xit staircases shall discharge at ground level directly into a safe ior open space. However, in sprinkler protected building, mum 50% of the total building exits may be allowed to arge directly to the ground level circulation space subject to the wing:	Discharge
	(i)	The discharge point of the exit staircase shall be at a location in the circulation space at ground level within sight of and with direct access to a safe exterior open space; and	
	(ii)	The maximum distance between the discharge point of an exit staircase and the exterior open space shall not exceed 10m.	

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#### 2.3.4 Scissor Exit Staircase

- (a) Where two separate internal exit staircases are contained within Scissor exit the same enclosure, each exit staircase shall be separated from the staircase other by non-combustible construction having fire resistance for a minimum period equal to that required for the enclosure, and
- (b) Such scissor exit staircases shall comply with all applicable provisions for exit staircase, and
- (c) Door opening into scissor exit staircases shall be at least 7m travel **Amended under**

under Supplement 3/2001 dated 18 May 2001

Effective date 1 June 2001

#### 2.3.5 Basement Exit Staircase

- (a) Any exit staircase which serves a basement storey of a building Basement shall comply with all the applicable provisions for exit staircase, exit staircase and
- (b) Such exit staircase shall not be made continuous with any other exit staircase which serves a non-basement storey of the building, and
- (c) Basement exit staircases which are vertically aligned with the exit Separate staircases of non-basement storeys shall be separated from such protected other exit staircases by construction having fire resistance for a shaft minimum period equal to that required for the enclosure.
- (d) Where upper storey staircase is allowed by the Relevant Authority Upper storey to be continuous with that serving the basement which is naturally ventilated, the following shall be complied with:
   Upper storey staircase continues into basement

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2.3.9	(i)	assembly/mass occupation, such as auditorium, concert hall, theatre, assembly hall, exhibition hall, cinema, etc which has to be kept shut and fastened while the building or part of the building is occupied shall be fitted with 'panic bolt' and appropriately marked 'Push Bar To Open' in letters not less than 1000mm high to enable the door to be quickly opened when a pressure on the bar is applied in the direction of		New subclause added under supplement 3/2001 dated 18 May 2001 Effective date 1 June 2001
	(j)	One w exit sta situatio	ng of staircase and smoke stop/fire lift lobby doors ay locking device is allowed to be provided to doors of aircase, smoke stop/fire lift lobby in the following ons, provided only one-way locking device is used, eg bolt or thumb turn locking device :	New subclause added under supplement 3/2001 dated 18 May 2001
		(i)	exit door between staircase shaft and occupancy area; and	Effective date 1 June 2001
		(ii)	exit access door between smoke/fire fighting lobby and occupancy area; and	
		(iii)	exit door between staircase shaft and smoke stop lobby; and	
		(iv)	exit door between staircase shaft and circulation area; and	
		(v)	exit access door between smoke stop/fire fighting lobby and circulation area.	
		fire fig shall n	lected floors under subclause 2.3.9(i), the doors of the ghting/exit staircase and smoke stop/fire fighting lobby ot fitted with any locking device to allow for re-entry he staircase to the interior of the building.	
	(k)	card lo	e access-control is provided to exit door using smart ocking device, magnetic bar and electro-mechanical g device : -	New subclause added under
		(i)	The activation of the building fire alarm or sprinkler system shall automatically unlock the door. It shall remain unlocked until the building fire alarm system system has been manually reset; and	supplement 3/ 2001 dated 18 May 2001 Effective date 1 June 2001

- (ii) The door shall be arranged to unlock from a manual release device located within the occupancy space, 1200mm above the floor and within 1.5m of the exit door jamb. The manual override device shall be readily accessible and clearly identified by a sign that reads "Emergency Door Release". The mechanism to unlock the door shall be fail-safe type.
- (iii) Where doors opening into passenger lift lobby are to be provided with access-control and would be locked after normal operation hours, the lobby shall be designed to have direct access to at least one exit staircase to prevent any occupant from being trapped in the lobby when the lifts are recalled at 1<sup>st</sup> storey or other designated floor during fire emergency or building's power failure. Alternatively, a two-way communication system shall be available inside the lift lobby for use by trapped occupants to call for help. The two-way communication system shall be linked to the fire command centre and/or building control room which shall be manned 24 hours.
- (l) Staircase re-entry
  - Every exit staircase enclosure serving more than 7 storeys of non-residential building, excluding buildings of detention and correctional occupancies, shall allow re-entry from the staircase enclosure to the interior of the building. There shall be at least 1 level where it is possible to re-entry the interior of the building from the staircase enclosure.
  - (ii) There shall be not more than 6 intervening floors between floors where it is possible to leave the staircase enclosure, either re-entry into the building or exit to the exterior space at grade level or to another building. This would ensure that an occupant need not travel more than 3 floors up or down the staircase to reentry into or exit from the building.
  - (iii) Where re-entry is provided from the staircase enclosure, it shall enter into a common corridor that is connected directly to at least one other exit staircase.

New subclause added under supplement 3/2001 dated 18 May 2001

Effective date 1 June 2001  (iv) Staircase doors permitting re-entry into the building, shall be identified with a signage "Re-entry door" of min. 50mm lettering height on the staircase side of the staircase door.

# 2.4 **RESIDENTIAL OCCUPANCY**

2.4.1 Means of escape for a building or a separate part of a building of single occupancy of purpose group I may be provided via access staircases, and exit staircase under the provision of cl.2.3 is not required.

Residential buildings of purpose group I Amended under Supplement 5/99 dated 17 Dec 99

# 3.4 **TESTS OF FIRE RESISTANCE**

3.4.1 Performance for the fire resistance of elements of structure, doors Fire resistance and other forms of construction shall be determined by reference to the methods specified in BS 476:Part 20 to 23, which specify tests for stability, integrity and insulation.

Specific requirements for each element in terms of the three performance criteria of stability, integrity and insulation are given in Table 3.4A.

3.4.2 An element of structure, door or other part of a building shall be "Deem to deemed to have the requisite fire resistance if - satisfy"

satisfy" provisions

- (a) It is constructed to the same specification as that of a specimen exposed to test by fire in accordance with the method and procedure under BS 476: Part 20 to 23, and satisfied the requirements of that test for the three performance criteria of stability, integrity and insulation for not less than the specified period, or
- (b) In the case of a wall, beam, column, stanchion or floor to which Appendix A to Cl. 3.4 relates, it is constructed in accordance with one of the specification set out in that Appendix and the notional period of fire resistance given in that Appendix as being appropriate to that type of construction and other relevant factors is not less than the specified period.

3.4.3	The	Timber	
			floors
	(a)	for an attic in buildings under purpose groups I and II; and	Amended
			under
			Supplement
			3/2001 dated
			18 May 2001
			Effective date
			1 June 2001

3.8.8	(b)	(iii)	Drywall shall meet the criteria, in terms of impact and
			deflection performance, when subject to the tests of BS
			5588 Pt 5 Appendix A and BS 5234 Pt 2; and

- (iv) Drywall shall meet the criteria, in terms of water absorption and bending strength performance, when subject to the test of BS 1230 Pt 1 (for gypsum plaster board) or ISO 1896 (for calcium silicate or cement board); and
- (v) Drywall shall meet the criteria of Cyclic Loading and Dynamic test as specified under Cl. 3.3 of Building Code of Australia Specification C 1.8.

(c)	Priv occ buil	Private Lift Amended under Supplement 3/2001 dated	
	(i)	Smoke detectors shall be provided at the lift landing area. The activation of any of the smoke detectors at the lift landing area shall cause the lift to home to the designated floor; and	18 May 2001 Effective date 1 June 2001
	(ii)	Emergency power supply from a generating plant shall be provided to home the lift to the designated floor when there is a power failure in the building; and	
	(iii)	The lift shall not be permitted to double-up as a fire lift; and	

(iv) Private lifts shall comply with SS CP 2.