

Codes & Regulations Affecting The Lift Installations In Singapore

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ABSTRACT

The revised Code of Practice for Installation, Operation and Maintenance of Electric Passenger and Goods Lift (Singapore Standard CP2:2000) was approved by the Electrical Industry Practice Committee (EIPC) on behalf of the Standards Council of Singapore on 28 September 2000. The major national reference standards used for the latest revision (which is the 3rd revision) are: EN81-1:1998 and ASME A17.1:1996. Besides this CP2:2000 Code of Practice, there are other codes and regulations (such as the Buildings Control Authority's Code of Barrier-Free Accessibility in Building and the Fire Safety Bureau's Code of Practice for Fire Precautions in Buildings affecting the lifts and escalators installations in Singapore. The paper looks at the relevant codes and regulations affecting the lifts installations in Singapore and highlights the key points of changes in the revisions.

1) BACKGROUND

In Singapore, there are three main government bodies which are responsible for the implementation of codes and regulations. They are:

- (a) Building Plan & Management Division (BPM) of the Building & Construction Authority (BCA);
- (b) Fire Safety Bureau (FSB) of the Singapore Civil Defence Force (SCDF); and
- (c) Singapore Productivity & Standards Board (PSB).

Although PSB through its Centre for Standardisation is responsible for the reviews and approval of the various Codes of Practice (CP) and Singapore Standards (SS) on behalf of the Standards Council of Singapore, the other two authorities (i.e. BPM and FSB) are responsible for the enforcement of the codes and regulations affecting the installation, operation and maintenance of the lifts in Singapore.

The professional engineer (PE) for a project is also required to certify that the lift has been designed and installed according to the code requirements.

The relevant lift and escalator codes, standards and regulation under PSB's reviews are:

- (a) Code of Practice of Installation, Operation & Maintenance of Electric Passenger & Goods Lift (CP2:2000)
- (b) Code of Practice of Installation, Operation & Maintenance of Escalators and Passenger Conveyers (CP15:1990)
- (c) Specification for Battery-Operated Emergency Power Supply for Lighting cum Ventilation and Alarm Bell of Lifts (SS209:1996)

Those under BCA's review are:

- (a) Code on Barrier-Free Accessibility in Building (1995) Chapter 5 on Lift (Pages 48 to 50)
- (b) Building Control Act Chapter 29, Part IV Division 7 (2000) on Lifts and Escalators (Page 41)

And, those under SCDF'Ss reviews are:

- (a) Code of Practice for Fire Precautions in Building (1997)
 - Chapter 3.8.8 on Protected Shafts (Pages 108 to 109)*
 - Chapter 6.6 on Lifts (Pages 197 to 198)*
 - Chapter 8.1.3b on Emergency Lighting (Page 224)*
 - Chapter 8.2.1b on Voice Communication (Page 226 to 227)*

2) CP2: 2000 CODE OF PRACTICE OF INSTALLATION, OPERATION & MAINTENANCE OF ELECTRIC PASSENGER & GOODS LIFTS

SSCP2 was first published as Singapore Standard 51 : 1971. It was then revised in 1974 and became renamed Singapore Standard CP 2: 1974. The second revision to CP2 was completed in 1979. Between 1979 and the introduction of this revised edition (CP2: 2000), a total of seven amendments were introduced.

CP2: 2000 edition was approved on 28 September 2000 to keep abreast of technological changes and technical developments of lift systems, and had taken references mainly to latest major codes as EN81-1:1998 and ASME a17.1:1996. Changes were also made to improve clarity and rectify editorial errors.

Although CP2:2000 does not cover the lift-without-machine-room, it recommends EC Lift Directive 95/16/CE as reference for such second generation lift system.

Although CP2:2000 now delete the old clause which specified that "safety gear shall not stop an ascending car," it does not insist on the need for ascending car overspeed protection (see comments in Forward on page 6).

CP2: 2000 (Annex D) also requires the owner of the building to do periodic maintenance and examination of the lift as follows:

- (a) Periodic Maintenance : by registered lift contractor at intervals not exceeding one month.

- (b) Periodic Examination & Inspection (No Load Test) : by registered lift contractor at intervals not exceeding 12 months.
- (c) Full Load Test : by registered lift contractor at intervals not exceeding every 5 years.

The following are some of the significant changes introduced in **CP2 :2000 (reference clauses in bold)** compare with *CP2:1979 (reference clauses in italic.)*

- i) Added - **Clause 1.1 k**
 - indicate that service lifts (dumbwaiters) are not covered
- ii) Added - **Clause 1.1 l**
 - indicate that vehicle lifts, home lifts and stair lifts are not covered
- iii) Added - Definitions and Terminology:
 - Automatic Rescue Device (ARD) - **Clause 2.4**
A battery-operated device which will bring the car to the nearest landing and open the lift landing and car doors in the event of power failure.
 - Lift, Service (Dumbwaiter) - **Clause 2.43**
Permanent lifting appliance serving defined landing levels, comprising a car, the interior of which is inaccessible to persons on account of its dimensions and means of construction, running at least partially between rigid guides which are vertical or whose inclination to the vertical is less than 15°.

To satisfy the condition of inaccessibility, the car dimensions do not exceed:
 - a) floor area = 1 m²
 - b) depth = 1 m
 - c) height = 1.2 m

A height greater than 1.2 m is permissible, however, if the car comprises several permanent compartments, each of which satisfies the above requirements.
 - Lift, Observation - **Clause 2.45**
An observation lift is a passenger lift designed to permit exterior viewing by passengers, while the car is travelling, through large transparent panels. Depending on architectural design, the lift may run in a well that is mainly open or has a shroud incorporating correspondingly large transparent panels. Observation lifts may be installed inside or outside a building.
- iv) Revised - Lift Well
 - Requirement for emergency openings of not more than 11m apart from sill to sill and the omission of requirements for 15m apart skip-stop lifts vs requirement of not more than 11m apart only for single lift and 15m apart for skip-stop lift (**Clause 3.2**) vs (*Clause 5.2*).
- v) Revised - Glass enclosure for observation lift

- It shall comply with SS 341 (**Clause 3.11.3**) vs BS 6206 (*Clause 5 of Supplement 1*).
- vi) Added - Access to Pit:
 - Hands-hold for pit ladder to extend up to 1500mm above bottom terminal floor & pit ladder to be installed for every lift (**Clause 3.12.1**) vs (*Clause 7.1*).
- vii) Added - Dryness of Pits:
 - When sump is provided, sump cover shall be non-slip type & not easily displaced. Sump shall not be connected to close drainage system but may be connected to an open-ended drain below the sump level. Where pump is required, it shall be installed outside the lift well and also has separate access for maintenance of the unit (**Clause 3.12.3**).
- viii) Added to Minimum Pit Depth:
 - Where there is a difference in level between the adjacent lift pits, a non-load bearing wall or wire-mesh screen not less than 1000mm high and measure from the level of the higher pit floor shall be constructed to separate such pits (**Clause 3.12.6**).
- ix) Added - Ventilation:
 - For natural ventilation, an opening of 20% of the floor area is recommended to achieve cross-flow. Where ambient temperature is more than 32°C, the provision of mechanical ventilation is recommended (**Clause 4.7**).
- x) Added - Limitations to the Use of Machine Room:
 - Machine room shall not be used as a means of gaining access to any other part of the building (**Clause 4.8**).
- xi) Revised - Doors to Machine Room:
 - It shall be self closing self locking door of not less than 1000mm wide and 2000mm height (**Clause 4.10**) vs access to machine room through a manhole in the floor (*Clause 6.10*).
- xii) Added - Car Doors
 - For lifts which are located in an unprotected lift well (for example, edge of atrium floor), door panels made of glass shall be fixed in such a way that forces demanded by this, which may be applied, are transferred without damaging the fixing of the glass. The doors shall use laminated glass. In the event of breakage, there shall not be any opening greater than 150mm in diameter (**Clause 6.2.2.4**).
- xiii) Added - Stairways:
 - Stairways shall be provided for access to every machine room between the top floor served by the lift and the machine room floor level (**Clause 4.11**).
- xiv) Added - General requirements to car enclosure
 - The deflections of car-frame and platform members with a safety factor of not less than 5 and based on the static load imposed upon them shall not be more than the following (**Clause 6.1.1**):

- | | | | | |
|--|-----|----------------------------|---|--------------------|
| | (a) | For crosshead | : | 1/1000 of the span |
| | (b) | For plank | : | 1/1000 of the span |
| | (c) | For platform-frame members | : | 1/1000 of the span |
- xv) Revised - Top Emergency Exit
- Exit opening size shall measure at least 350mm by 500mm. The top exit and suspended ceiling openings, if any, shall be located as to provide a clear passageway, unobstructed by fixed equipment located in or on top of car. The movable portion (exit panel) of the suspended ceiling which is below the top exit opening shall be restrained from falling. It may be hung upward or downward provided that the exit will permit a clear opening with the top exit opening (**Clause 6.1.1.3**) vs the exit opening shall have an area which permit easy passage of a normal grown up person (*Clause 10.3*).
- xvi) Added - Car Roofs:
- A safety railing shall be provided at the car roof except where it is not practical for example, observation lifts (**Clause 6.1.1.4**).
- xvii) Revised - Ventilation to lift car:
- Cars shall be provided with ventilation apertures in the upper and lower parts of the cars. (**Clause 6.1.2.2.1**).
 - The effective area of ventilation apertures situated in the upper part of the car shall be at least 1% of the available car area, and the same also applies for the apertures in the lower part of the car.
The gaps round the car doors may be taken into account in the calculation of the area of the ventilation holes, up to 50% of the required effective area (**Clause 6.1.2.2.2**).
 - Ventilation apertures shall be built or arranged in such a way that it is not possible to pass a straight rigid rod 10 mm in diameter through the car walls from the inside (**6.1.2.2.3**).
- xviii) Revised - Side emergency exit:
- Silent (**Clause removed**) vs Allowed (*Clause 11.3*).
- xix) Added - Car Doors protective device:
- Protective device shall automatically initiate re-opening of the door in the event of a person being struck (or about to be struck) by the door in crossing the entrance during the closing movement (**Clause 6.2.1.5**).
 - Where power-operated horizontal sliding doors are used, the force necessary to prevent closing of the doors shall not be more than 150 N. This force shall be measured at the middle of its travel (**Clause 6.2.1.6**).
- xx) Added - Passenger Lifts Rated Loading Capacity:
- Recommended that beyond 40 persons or 2720 kg load, add 0.115 m² for each extra person or 0.16 m² for each extra 100 kg (**Clause 6.4.1c**) vs *Table with limit to 40 persons*.

- xxi) Revised - Size of main rope:
- Minimum diameter 8.0mm (**Clause 8.1.1.2**) vs 9.0mm (*Clause 18.4*).
- xxii) Revised - Factor of safety:
- Factor of safety for main rope shall be not less than 12 (**Clause 8.1.1.7**) vs not less than 10 (*Clause 18.9*).
- xxiii) Added - Overspeed Governor Ropes:
- Breakage or slackening of governor rope shall cause the motor to stop by means of an electric safety device. The ratio of the pitch diameter of the governor pulley and nominal rope diameter shall be at least 30 (**Clause 8.1.5**).
- xxiv) Revised - Governor rope:
- Minimum diameter of governor rope shall be 6mm (**Clause 8.1.5**) vs 7.0mm (*Clause 18.4*).
- xxv) Revised - Function of safety gear:
- **Clause 8.2.2** vs *Clause 20.2* Deleted "Safety gear shall not stop an ascending car."
- xxvi) Added - Braking Systems:
- The lift shall be provided with a braking system which operates automatically (**Clause 11.2.1.1**):

 (a) in the event of loss of the mains power supply
 (b) in the event of the loss of the supply to control circuits

- The braking system shall have an electro-mechanical brake (friction type), but may in addition, have other braking means (eg. electric) (**Clause 11.2.1.2**).

- Revised electro-mechanical brake (**Clause 11.2.2**) vs (*Clause 28*).

- **See Clauses 11.2.2.1 to 11.2.2.7 for detail descriptions.**
- xxvii) Revised - Emergency operation of lift in the event of fire
- Where required by the relevant authority, the lift will be brought to the alternate designated floor in the event there is fire in the designated floor vs only one designated floor (**Clause 13.1.3**) vs (*Clause 26.3*).
- xxviii) Revised - Interferences:
- The electromagnetic compatibility of the electric installations and applications shall comply with the requirements of EN12015 & EN12016 (**Clause 15**) vs Suppression of radio interference as laid down in Radio Communication Regulation Part V: Regulation of Electrical Interference (*Clause 3.7*).
- xxix) Added - Type Test Requirements (**Clause 16**)
The following shall be type-tested:

 (a) landing door locking device;
 (b) safety gear;

- (c) overspeed governor;
- (d) buffer;
- (e) safety circuit containing electronic components.

3) SS209: 1996 - SPECIFICATION FOR BATTERY-OPERATED EMERGENCY POWER SUPPLY FOR LIGHTING, VENTILATION AND ALARM BELL OF LIFTS

- Equipment need to be tested and certified by PSB.

4) DIRECTORY OF PSB CERTIFIED PRODUCTS UNDER PRODUCT LISTING SCHEME SECTION 17 ON FIRE RATED LIFT LANDING DOOR

- PLS (Product Listing Scheme) is a broadbased third party product quality assurance scheme involving type-testing and surveillance inspection of the product.
- The different PLS classification are:
 - (i) Class 1A: Factory audited by PSB or its local representative for quality assurance. PSB label are rerialised for regulated product, and not serialised for non-regulated product.
 - (ii) Class 1B: Product is type tested and inspection/resting carried out per production batch. Label are serialised and issued by PSB.
 - (iii) Class 2: Product will be type tested and testing of samples selected from open market. No PSB labels issued.
- Part 1 Section 17.2 listed the Fire Rated Lift Landing Door under PLS.
- Integrity criterion: BS476: Part 22:1987
- FSB would accept products under Class 1A and 1B only.

5) CP15: 1990 - CODE OF PRACTICE FOR INSTALLATION, OPERATION AND MAINTENANCE OF ESCALATORS AND PASSENGER CONVEYORS

- Revision of previous CP15: 1980
- Largely based on BS5656: 1983 Safety Rules for Construction and Installation of Escalators and Passenger Conveyors

6) CODE OF BARRIER-FREE ACCESSIBILITY IN BUILDING (EDITION 1995) CHAPTER 5 ON LIFT

The following are some of the significant changes of the **Edition 1995 (reference clauses in bold)** vs *Edition 1990 (reference clause in italic)*.

- i) Revised:

Minimum size of lift shall be 1200mm wide by 1400mm deep (**Clause 5.2**) against 1100mm wide by 1400mm deep (*Clause 5.3*).

[**Note: CP2 Table 1 this area will be equivalent of 10 persons/680 kg lift capacity**]

ii) Revised:

Lift control panel shall be placed between a height of between 900mm and 1200mm from the floor level (**Clause 5.5a**) vs 1200mm and 1500mm from the floor level (*Clause 5.4*).

iii) Added:

Where it is impractical to provide a lift or a ramp, a wheelchair stairlift or platform lift should be considered as a reasonable alternative for vertical circulation with the building (**Clause 5.8**).

7) BUILDING CONTROL ACT (EDITION 2000) CHAPTER 29, PART 5, DIVISION 7, ON LIFTS AND ESCALATORS

- Every building comprising 5 or more storeys above the ground level shall be provided with one or more passenger lifts.
- Lift Installation, Operation & Maintenance to comply to SSCP2.
- Escalator Installation, Operation & Maintenance to comply to SSCP15
- Residential building above 4 storeys to all communal areas (see Division 2 – provisions for physically handicapped) will need a Lift for Disabled which comply to Code on Barrier-Free Accessibility in Buildings (Chapter 5).

8) CODE OF PRACTICE FOR FIRE PRECAUTIONS IN BUILDING (EDITION 1997)

The following are some of the significant changes of the **Edition 1997** (reference clauses in **bold**) vs *Edition 1991* (reference clause in *italic*).

i) Added:

Where the depth of the basement is more than 9m below the average ground level, there shall be provided at least one fire lift (**Clause 6.6.3a**).

ii) Added:

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

iii) Added:

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

iv) Added:

Where a lift is either located at the edge of atrium floors or at the external wall and outside the building, the lift shall be considered as not enclosed within a protected shaft (Clause 3.8.8c).

- v) Added:
Where shaft vents could not be provided because of the location of the lift shaft, fire rated ventilation duct serving as ventilation of the shaft may be provided instead. If the duct is not to be fire rated, fire dampers shall be provided to the duct at the wall of the lift shaft, provided such relaxation shall not apply to shaft containing fire lift (Clause 3.8.8d).
- vi) Note: In CP2 (Clause 13.2), the fire lift minimum capacity is 1.45m²/545 kg which is equivalent to 8 persons capacity

9) EXEMPTION OF LIFTS FROM THE REQUIREMENTS OF THE FACTORIES ACT CHAPTER 104, SECTION 29 ON HOISTS AND LIFTS)

The Factories Act Chapter 104, Section 29, requires that lifts and hoists installed in factories (including warehouses) be thoroughly examined and tested at least once in every 6 months by an approved person. However, effective 1st December 2000, the Factories (Hoists and Lifts) (Exemption) Order 2000, states that any lift installed in a factory that has been inspected and tested under the Building and Common Property (Maintenance and Management) Rules, administered by the Building and Construction Authority (BCA), shall be exempted from section 29 of the Factories Act. This Order will apply specifically to lifts installed in premises that are deemed to be factories in completed buildings.

10) BIOGRAPHY

Johnson See is the Managing Director of Otis Singapore responsible for the company's business operations in Singapore and Brunei. He also manages the company's export markets in Myanmar, Pakistan and Sri Lanka.

He has considerable experience in the elevator industry having spent seven years as Managing Director of Kone Singapore.

He also has in depth knowledge of the building and construction industry having worked with THORN Security, United Engineers and George Kent. In addition to having expertise in elevators and escalators, he also specializes in building automation systems, fire protection and security alarm systems and other building services. Before entering the private sector, Johnson was senior manpower officer with the Economic Development Board.

He is an Honors graduate from the University of Strathclyde, UK, with a BSc degree in Electrical and Electronic Engineering in 1979.

Appendix A

SINGAPORE CODES/REGULATIONS AFFECTING LIFT & ESCALATOR INSTALLATIONS

- | | | | |
|---|--|---|---|
| 1. | CP2 : 2000 (PSB) | - | Code of Practice of Installation, Operation & Maintenance of Electric Passenger & Goods Lifts |
| 2. | SS209 : 1996 (PSB) | - | Specification for Battery-Operated Emergency Power Supply for Lighting cum Ventilation and Alarm Bell of Lifts |
| 3. | CP15 : 1990 (PSB) | - | Code of Practice of Installation, Operation & Maintenance of Escalators & Passenger Conveyers |
| 4. | Fire Safety Bureau (FSB) | - | Code of Practice for Fire Precautions in Building (1997)
<i>Chapter 3.8.8 on Protected Shafts (Pages 108 to 109)</i>
<i>Chapter 6.6 on Lifts (Pages 197 to 198)</i>
<i>Chapter 8.1.3b on Emergency Lighting (Page 224)</i>
<i>Chapter 8.2.1b on Voice Communication (Pages 226 to 227)</i> |
| 5. | Building & Construction Authority (BCA) | - | Code on Barrier-Free Accessibility in Building (1995) Chapter 5 on Lift (Pages 48 to 50) |
| 6. | Building & Construction Authority (BCA) | - | Building Control Act Chapter 29 Part IV Division 7 (2000) on Lifts and Escalators (Pages 41) |
| <hr style="border-top: 1px dotted black;"/> | | | |
| 7. | CP5 : 1998 (PSB) | - | Code of Practice for Wiring of Electrical Equipment of Building |
| 8. | CP14 : 1996 (PSB) | - | Code of Practice for Scaffolds |
| 9. | CP35 : 1996 (PSB) | - | Code of Practice for The Selection, Care and Maintenance of Steel Wire Ropes for Hoisting |
| 10. | SS297 : 1996 (PSB) | - | Specification for Steel Wire Ropes for Hoisting |
| 11. | SS341 : 1989 (PSB) | - | Specification for safety glazing materials for use in buildings (human impact consideration) glass |
| 12. | SS358 | - | Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V |

Appendix B

MAJOR NATIONAL STANDARDS REFERRED TO BY CP2 : 2000

1. BS 476
 - Fire tests on building materials and structures
 - Part 4 : 1970 Non-combustibility test for materials
 - Part 7 : 1997 Method of test to determine the classification of the surface spread of flame of products
2. BS 952
 - Glass for glazing
 - Part 1 : 1995 Classification
3. EN 12015 : 1998
 - Electromagnetic compatibility - Product family standard for lifts, escalators and passenger conveyors – Emission
4. EN 12016 : 1998
 - Electromagnetic compatibility - Product family standard for lifts, escalators and passenger conveyors – Immunity
5. IEC 60085 : 1984
 - Thermal evaluation and classification of electrical insulation
6. IEC 60331
 - Tests for electric cables under fire conditions - Circuit integrity
 - Part 11 : 1999 Apparatus - Fire alone at a flame temperature of at least 750°C
 - Part 21 : 1999 Procedures and requirements - Cables of rated voltage up to and including 0.6/1.0 kV
7. IEC/TR2 60332
 - Tests on electric cables under fire conditions
 - Part 3 : 1992 Test on bunched wires or cables

REGULATORY AUTHORITY
CP 2 : 2000
Code of Practice

**CODE OF PRACTICE FOR
Installation, operation and
maintenance of electric
passenger and goods lifts**

PSB

DEPARTMENT OF TRADE AND
SS 209 : 1998
ESTABLISHED IN 1965

WIRE CIRCULATION EQUIPMENT
Battery-operated emergency
power supply for lighting,
ventilation and alarm bell of
lifts



PSIA

CODE OF PRACTICE FOR
Installation, Operation and
Maintenance of Escalators and
Passenger Conveyors

CP 15 1990

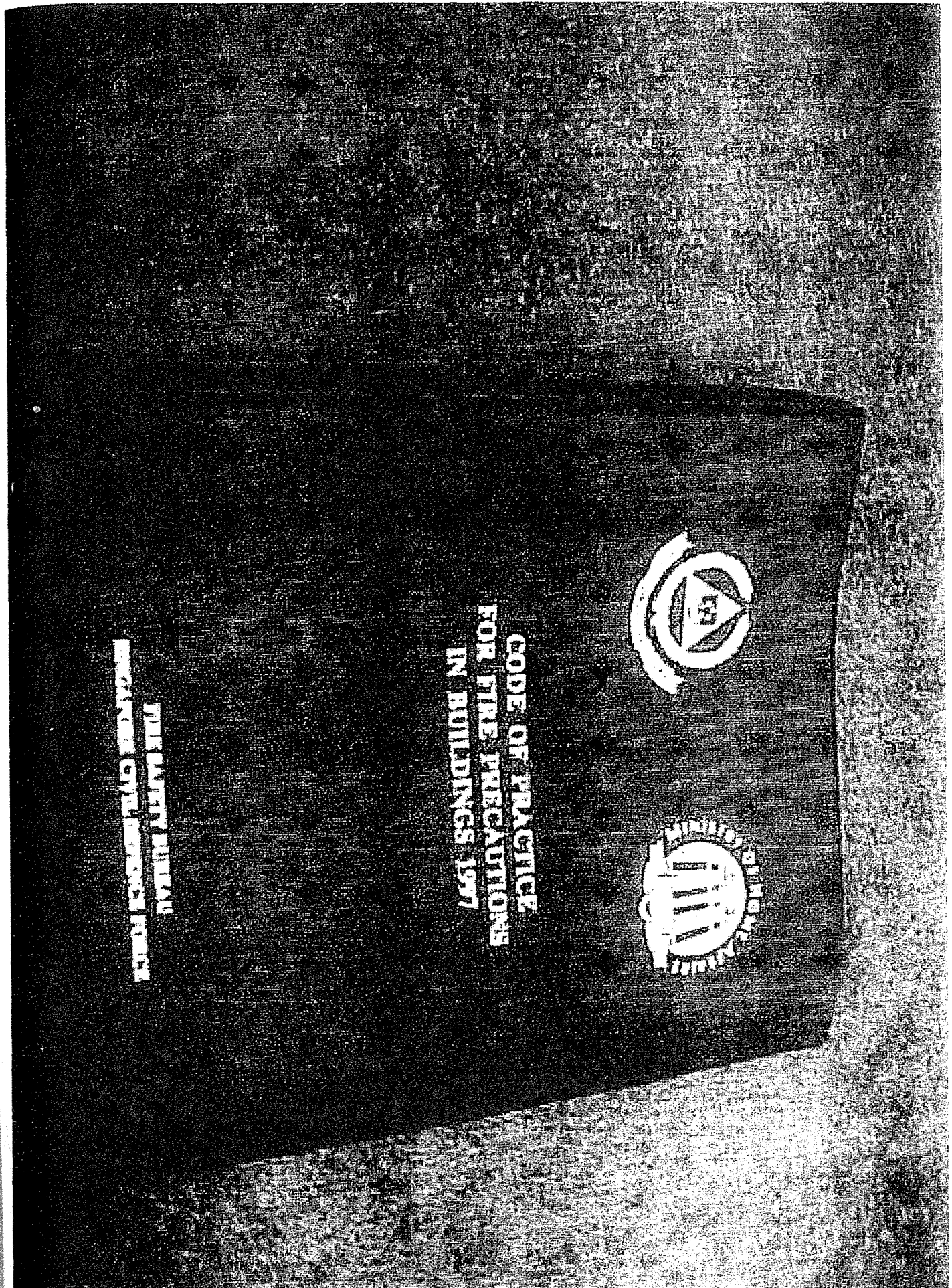
Published by the Singapore Council for Technical Education

**DIRECTORY OF
PSB CERTIFIED
PRODUCTS**

UNDER PRODUCT LISTING SCHEME

1999/2000

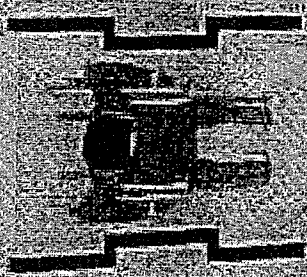
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**BARRIER-FREE ACCESSIBILITY
IN BUILDINGS**

CODE ON

1995



PUBLIC WORKS DEPARTMENT
BUILDING DEPARTMENT

BUILDING CONTROL ACT (CHAPTER 29)

SUBSIDIARY LEGISLATION

REVISED EDITION 2000
(31.1.2000)

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Rg 4	Building Control (Inspection of Buildings) Regulations	S 152/89
Rg 5	Building Control (Temporary Buildings) Regulations	S 153/89
Rg 6	Building Control (Advertisement) Regulations	S 353/89
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O 1	Building Control (Exempt Building Works) Order	S 151/89
<i>Notifications</i>		
N 1	Appointment of Commissioner of Building Control	S 130/99
N 2	Building Control (Exemption from Independence of Accredited Checker) (Consolidation) Notification	S 295/96 (1998 Ed.)

No. S 523

FACTORIES ACT
(CHAPTER 104)

FACTORIES (HOISTS AND LIFTS)
(EXEMPTION) ORDER 2000

ARRANGEMENT OF PARAGRAPHS

Paragraph

1. Citation and commencement
2. Exemption of lifts from section 29 of Act

In exercise of the powers conferred by section 29 (11) of the Factories Act, the Minister for Manpower hereby makes the following Order:

Citation and commencement

1. This Order may be cited as the Factories (Hoists and Lifts) (Exemption) Order 2000 and shall come into operation on 1st December 2000.

Exemption of lifts from section 29 of Act

2. Section 29 of the Act shall not apply to any lift which has been inspected and tested under the Buildings and Common Property (Maintenance and Management) Rules (Cap. 30, R 1) and for which a certificate of maintenance has been issued by the Commissioner of Buildings.

Made this 9th day of November 2000.

TAN CHIN NAM
*Permanent Secretary,
Ministry of Manpower,
Singapore.*