

GENERAL SPECIFICATION

FOR

LIFT, ESCALATOR AND PASSENGER CONVEYOR

INSTALLATION

IN

GOVERNMENT BUILDINGS

OF

THE HONG KONG SPECIAL ADMINISTRATIVE REGION

2002 EDITION

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BUILDING SERVICES BRANCH
ARCHITECTURAL SERVICES DEPARTMENT

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2. This General Specification is solely compiled for use on lift, escalator and passenger conveyor installation in Government buildings of the Hong Kong Special Administrative Region.

3. It is hereby declared that the specification contained herein may not be pertinent or fully cover the extent of installation carried out by others. Prior consent by the Director of Architectural Services must be obtained for adoption of this General Specification on installations of other nature or locations.

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PART A – SCOPE AND GENERAL REQUIREMENTS

SECTION A1 **SCOPE OF SPECIFICATION**

A1.1 INSTALLATION TO COMPLY WITH THIS GENERAL SPECIFICATION

This General Specification details the intrinsic properties (including materials and workmanship) required of a Lift (passenger, bed/passenger, service and goods), and Escalator/Passenger Conveyor Installations carried out for or on behalf of the Architectural Services Department, Government of the Hong Kong Special Administrative Region.

A1.2 INSTALLATION TO COMPLY WITH THE PARTICULAR SPECIFICATION AND DRAWINGS

The Lift (passenger, bed/passenger service and goods), and Escalator/Passenger Conveyor Installations shall comply in every respect with this General Specification unless otherwise specified in the currently in force Legislation and other Subsidiary Legislation, the Particular Specification, Drawings and/or any other relevant contract documents of the Contract, or modified by the written instructions of the Supervising Officer in charge of the project.

A1.3 SCOPE OF THE WORK

This General Specification, the Particular Specification, the Equipment Schedules and Drawings detail the performance requirements of the work. The work to be carried out in accordance with this General Specification shall include the whole of the design, labour and all materials necessary to form a complete installation including any necessary tests, adjustments, commissioning and maintenance as prescribed and all other incidental sundry components necessary, together with necessary labour for installing such components, for the complete execution of the works and for the proper operation of the installation. It shall also include all necessary co-operation with other contractors involved on the Site in respect of co-ordination, programming, scheduling and sequence of installation of the works.

A1.4 DEFINITIONS, INTERPRETATIONS & ABBREVIATIONS

In this General Specification, the following words shall have meanings herein assigned: -

- | | |
|--------------------------------|--|
| (1) "Building Contractor" | The person(s), firm or company whose Tender has been accepted by the Employer for the building construction, including his or their personal representatives, successors and permitted assigns. |
| (2) "Contractor" | The person(s), firm or company whose Tender for the Lift (passenger, bed/passenger, service and goods), and Escalator/Passenger Conveyor Installations has been accepted by the Employer, and includes the Contractor's personal representatives, successors and permitted assigns. |
| (3) "Electrical Contractor" | The person(s), firm or company whose Tender for the Electrical Works has been accepted by the Employer, and includes the Electrical Contractor's personal representatives, successors, and permitted assigns. |
| (4) "Maintenance Period" | The maintenance period named in the Appendix to the Form of Tender commencing on the day following the date of Completion of the Works or any Section or part thereof certified by the Supervising Officer in accordance with the Contract. |
| (5) "Particular Specification" | The specifications referred to in the Contract for a particular project. |
| (6) "Supervising Officer" | The person, company or firm named in the Articles of Agreement as "the Supervising Officer" or "the Architect" or "the Maintenance Surveyor" or "the Surveyor" as defined in the General or Special Conditions of Contract, or such other person, as may be authorized from time to time by the Employer and notified in writing to the Contractor to act as Supervising Officer for the purpose of the Contract and the person so named or authorized may be described either by name or as the holder for the time being of a public office. |

"Construction Plant", "Contract", "Contract Sum", "Drawings", "Employer", "Hong Kong", "Portion", "Section", "Site", "Specification", "Temporary Works", "Tender" and "Works" shall have the meanings respectively assigned to them in the General or Special Conditions of Contract.

A1.5 SINGULAR AND PLURAL

Word importing the singular only also include the plural and vice versa where the context requires.

SECTION A2
STATUTORY OBLIGATIONS, REGULATIONS, STANDARDS
AND SPECIFICATIONS

A2.1 INSTALLATION TO COMPLY WITH OBLIGATIONS, REGULATIONS, STANDARDS AND SPECIFICATIONS

Lift (passenger, bed/passenger, service and goods) and Escalator/ Passenger Conveyor Installations shall comply with this General Specification and the following statutory obligations, regulations, standards and specifications together with any additions or amendments thereto currently in force: -

- (1) Lifts and Escalators (Safety) Ordinance.
- (2) Electricity Ordinance, Chapter 406, and other subsidiary legislation made under the Ordinance.
- (3) Security and Guarding Services Ordinance, Cap. 460.
- (4) Code of Practice on the Design and Construction of Lifts and Escalators issued by Electrical and Mechanical Services Department, Government of The Hong Kong Special Administrative Region.
- (5) Code of Practice on the Design and Construction of Buildings and Building Works for the Installation and Safe Use of Lifts and Escalators issued by Building Authority, Government of The Hong Kong Special Administrative Region.
- (6) Code of Practice for Energy Efficiency of Lift and Escalator Installations issued by Electrical and Mechanical Services Department, Government of The Hong Kong Special Administrative Region.
- (7) Code of Practice for Safety at Work (Lift & Escalator) issued by Labour Department, Government of The Hong Kong Special Administrative Region.
- (8) Code of Practice for Fire Resisting Construction issued by Building Authority, Government of The Hong Kong Special Administrative Region.
- (9) Code of Practice for Lift Works and Escalator Works issued by Electrical and Mechanical Services Department, Government of The Hong Kong Special Administrative Region.
- (10) Code of Practice for the Electricity (Wiring) Regulations issued by Electrical and Mechanical Services Department, Government of The Hong Kong Special Administrative Region.

- (11) The current requirements of Fire Services Department, Government of The Hong Kong Special Administrative Region, as defined in the latest edition of the Code of Practice for Minimum Fire Services Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment plus all relevant current Fire Services Department Circular Letters.
- (12) Design Manual:- Barrier Free Access issued by Building Authority, Government of The Hong Kong Special Administrative Region.
- (13) Building Services Branch Testing and Commissioning Procedure No. 4 for Lift, Escalator and Passenger Conveyor Installation in Government Buildings of Hong Kong Special Administrative Region issued by Building Services Branch of Architectural Services Department, Government of The Hong Kong Special Administrative Region.
- (14) The General Specification for Electrical Installation in Government Buildings of The Hong Kong Special Administrative Region issued by Building Services Branch of Architectural Services Department, Government of The Hong Kong Special Administrative Region (hereinafter referred to as the Electrical General Specification).
- (15) General Requirements for Electronic Contracts, (Specification No. ESG01) – Electronic Division, Electrical and Mechanical Services Department, Government of The Hong Kong Special Administrative Region.
- (16) General Specification for Monochrome and Colour Closed Circuit Television System, (Specification No. ESG14) - Electronic Division, Electrical and Mechanical Services Department, Government of The Hong Kong Special Administrative Region.
- (17) IEC 60364 – Electrical installations of buildings.
- (18) The relevant electricity supply company's regulations and requirements.
- (19) Relevant International Standards and International Codes of Practice

A2.2 SAFETY REQUIREMENTS

The Lift (passenger, bed/passenger, service and goods) and Escalator/ Passenger Conveyor Installations shall comply with all regulations on safety aspects issued by the Environmental, Transport and Works Bureau, the Labour Department and other relevant authorities of The Hong Kong Special Administrative Region from time to time. These shall include but not limited to the following: -

- (1) Construction Site Safety Manual issued by Works Bureau, Government of The Hong Kong Special Administrative Region.
- (2) Electricity Ordinance.
- (3) Factories and Industrial Undertakings Ordinance.

- (4) Fire Services Ordinance.
- (5) Lift and Escalators (Safety) Ordinance.
- (6) Occupational Safety and Health Ordinance.
- (7) Code of Practice on the Design and Construction of Buildings and Building Works for the Installation and Safe Use of Lifts and Escalators issued by Building Authority, Government of The Hong Kong Special Administrative Region.
- (8) Code of Practice for Safety at Work (Lifts & Escalators) issued by Labour Department, Government of The Hong Kong Special Administrative Region.

A2.3 IN CASE OF CONFLICT

In case of conflict between the requirements of this General Specification and any other requirements, the following order of priority shall apply: -

- (1) All currently in force Statutory Requirements, Legislations and Subsidiary Legislations.
- (2) The Particular Specification and/or the Contract documents for a particular project.
- (3) This General Specification.
- (4) All relevant Codes of Practice and Standards

A2.4 STANDARDS REFERRED TO

The standards referred to in this General Specification are shown in Appendix 5. Alternative internationally recognized standards whenever offered shall be demonstrated to be equivalent in overall technical substance to the relevant standards as shown in Appendix 5.

A2.5 INTELLECTUAL PROPERTY RIGHTS

If the Contractor intends to use the intellectual property rights of another party in performing the Contractor's obligations under the Contract, appropriate licences shall be obtained from the relevant beneficial owners.

Where any software is provided in the Works, the Contractor shall submit documents showing that appropriate permission or licence has been obtained from relevant beneficial owners of intellectual property rights for the use of the software free of all fees for the whole operating life of the Works.

Where O&M manuals and as-built drawings are submitted, the Contractor shall obtain appropriate permission or licence from relevant beneficial owners of intellectual property rights to allow the Supervising Officer, the Employer and the subsequent owners or occupiers of the Works, and all parties responsible for the operation and maintenance of the Works free from all fees to make additional copies of the manuals and drawings.

A2.6 DATE COMPLIANCE

The Contractor shall ensure that no value for current or future date/time will cause any interruption to operation which will affect the performance or functionality of all or part of the systems and/or equipment (including any supplied or supported embedded systems, hardware, software, firmware and micro-code and programmes).

A2.7 INTERNATIONAL SYSTEM OF UNITS

The International System of Units (SI) shall be used in all units of measurement.

SECTION A3

INFORMATION REQUIRED FROM CONTRACTOR

A3.1 PROGRAMME OF WORKS

The Contractor shall submit a detailed programme within 14 days of the acceptance of the Tender showing his intended method, stages and order of proceeding the Works, together with the period of time he has estimated for each and every stage of progress for comment by the Supervising Officer or his/her Representative.

The programme shall include the following:-

- (1) date of order of equipment and materials,
- (2) date of commencement and completion of every stage of the Works in line with the building construction programme,
- (3) date of expected completion of builder's work requirements,
- (4) date of delivery of equipment and materials to Site,
- (5) date of requirement of temporary and permanent electricity supply, and
- (6) date of completion, commissioning and testing

Short term programmes showing the detailed work schedules of coming weeks and months shall also be provided to the Supervising Officer. Programmes shall be regularly updated to reflect the actual progress and to meet the obligations under the Contract.

A3.2 SUBMISSION SCHEDULES

Detailed schedules for shop drawings submissions, equipment offer submissions, and commissioning and testing shall also be submitted in good time to the Supervising Officer for approval. The formats and information to be included in the schedules shall be as required by the Supervising Officer.

SECTION A4 **DRAWINGS AND MANUALS**

A4.1 TENDER DRAWINGS

The general arrangement drawings supplied with the Tender documents are provided for the Contractor's guidance and information when Tendering. Should the arrangement and dimensions shown be inadequate for the Contractor to properly install the equipment as specified, he should draw the Supervising Officer's attention to the fact at the time of submitting his Tender, together with details of amendments required. If no such request for amendments were included in the Tender submission, the Contractor shall be deemed to have satisfied with the arrangement and dimensions shown. Any amendment raised out by the Contractor after the commencement of the Contract shall be subject to the agreement and approval by the Supervising Officer.

A4.2 DRAWINGS TO BE SUBMITTED AFTER PLACING OF ORDER

The Contractor shall submit to the Supervising Officer for approval, within six (6) weeks of placing of the order, nine (9) copies (unless otherwise specified) of drawings giving details of all Builder's Work required for the Lift/Escalator/Passenger Conveyor Installation. Such drawings shall indicate clearly the position and sizes of all holes and cuttings, the loads on beams and structures, and all other requirements in relation to:-

(1) Lift Installation

- (i) Lift machine room and associated equipment, including sub-floor where appropriate;
- (ii) The arrangement of scaffolding required in the lift well for the installation of the equipment;
- (iii) All structural openings, such as landing entrances (including structural dimensions), ventilation openings, etc.;
- (iv) All bases, plinths, channels, holes, grouting-in of fixings, etc.;
- (v) Lifting beams or other facilities for supporting lifting tackle in the machine room and lift well;
- (vi) Permanent means of access to the lift pit;
- (vii) Suitable locations of luminaires for machine room and lift well lighting;
- (viii) Guard rails in the machine room;
- (ix) Hoisting facilities and access required for delivery of equipment to the machine room etc., showing the loading and size of the largest single piece of equipment;

- (x) Details of structural steelwork for lift machinery in the lift machine room;
- (xi) Details of shaft dividing steelwork for supporting guard brackets etc., and inter-well screens for multiple wells; and
- (xii) Method of fixing guide rails.

(2) Escalator/Passenger Conveyor Installation

- (i) Escalator/Passenger Conveyor pits and associated equipment,
- (ii) End supports including escalator layout,
- (iii) Hoisting facilities and access, which should contain similar information as that required in Clause A4.2 (1)(ix).

A4.3 ADDITIONAL DRAWINGS TO BE SUBMITTED BEFORE COMMENCEMENT OF THE INSTALLATION WORK

Before putting any work in hand, the Contractor shall submit to the Supervising Officer for approval six (6) copies (unless otherwise specified) of additional drawings providing relevant information on the following, where appropriate:-

- (1) Equipment
- (2) Power and ventilation requirements
- (3) General illustration and finish of the lift and/or escalator/passenger conveyor installation

A4.4 "AS-BUILT" DRAWINGS

After completion and before the acceptance of the installation, the Contractor shall, unless otherwise specified, provide three (3) sets of micro-films, two (2) sets of computer disks with the as-fitted drawings stored as CAD files, one (1) set of reproducible copy and four (4) sets of print of "as-built" drawings. All these documents shall be approved by the Supervising Officer prior to duplicating.

A4.5 OPERATING & MAINTENANCE MANUAL

The Contractor shall, unless otherwise specified, provide three (3) hard copies and three (3) soft copies in CD-ROMs of approved software format of the operating & maintenance manual of the whole installation. The structure and contents of the operation and maintenance manual shall be as specified in the Contract Preliminaries and approved by the Supervising Officer. All commissioning and testing results, certificates and record photographs as necessary shall be included in the final manuals. The manuals shall have pages of A4 size or A3 size folded where necessary. The pages shall be of good quality paper that is sufficiently opaque to avoid "see through". The manuals shall be bound in durable loose leaf ring binders of the four ring type. Where specified, instead of ring binder, the manuals shall be permanently bound and encased in durable hard covers. The manual shall have labels or lettering on the front and spine of the covers. The number of separate manual volumes required will depend on the size and

complexity of the installation concerned. The Supervising Officer's agreement shall be obtained on this at the draft manual stage.

A4.6 SIZES OF DRAWINGS

The sizes of each drawing to be submitted shall conform approximately to one of the following standard sizes and be agreed with the Supervising Officer:

- (1) 841 x 1189 mm (A0)
- (2) 594 x 841 mm (A1)
- (3) 420 x 594 mm (A2)
- (4) 297 x 420 mm (A3)
- (5) 210 x 297 mm (A4)

SECTION A5 **EXECUTION OF WORKS**

A5.1 BUILDER'S WORKS

The following builder's works in connection with Lift/Escalator/Passenger Conveyor Installation shall be carried out by the Building Contractor :-

- (1) Construction of the lift well and enclosures with pit and machine room in accordance with the Drawings.
- (2) Construction of the escalator/passenger conveyor pits, wells and concrete supporting beams in accordance with the Drawings.
- (3) Provision of necessary holes, chases, openings, plinths, vents.
- (4) Provision and fixing steel joists and scaffoldings required for the hoisting of lift/escalator/passenger conveyor machinery and accessories.
- (5) Provision of concrete fill and/or grouting in for architraves, landing door frames, sills and associated safety guard, etc.
- (6) Provision of structural steelwork for lift machinery in lift machine room.
- (7) For multiple wells, provision of shaft dividing steelwork for supporting guide brackets, etc. and inter-well screens.
- (8) Provision of drain outlet and/or sump pit in lift/escalator pit, where necessary.

All additional openings, holes through the building structure, partition walls and all concrete bases, supports, ducts etc. required by the Contractor beyond those included in the Architectural or Structural Drawings will also be carried out by the Building Contractor, provided that the Contractor shall submit to the Supervising Officer for approval, full details of such requirement, so that due consideration may be given before the Building Contractor commences work in the area concerned. Following approval by the Supervising Officer, the Contractor shall be responsible for marking out the exact position and sizes of all such work or providing detailed information to the Building Contractor to carry out such work as his work proceeds. The Contractor shall check that the builder's works executed by the Building Contractor are carried out to the Contractor's requirements.

A5.2 WORKS PROVIDED BY THE CONTRACTOR

The following works in connection with the Lift/Escalator/Passenger Conveyor Installation shall be carried out by the Contractor:-

- (1) Steelwork other than those mentioned in Clause A5.1, inserts, fixing brackets etc. for fixing the lift machine/equipment in the lift machine room.
- (2) Mounting brackets, bearing plates etc. required for the installation of the lift/escalator/passenger conveyor.

A5.3 CUTTING AWAY AND MAKING GOOD

The requirements of cutting away and making good of builder's work shall be kept to a minimum. If in the opinion of the Supervising Officer the Contractor is fully or partly responsible for the cost of abortive and/or omission work incurred by the Employer as such, the Supervising Officer shall value such cost to the extent the Contractor is responsible and deduct the same from the Contract Sum accordingly.

A5.4 CO-ORDINATION OF CONTRACT WORKS

The Contractor shall co-ordinate his proposed programme of work with that of the Building Contractor and all other contractors and sub-contractors in order to adhere to the latest overall construction programme of the Building Contractor.

A5.5 CO-OPERATION WITH OTHER CONTRACTORS

The Contractor shall co-operate at all times with the Building Contractor and all other contractors and sub-contractors in order to achieve efficient and safe working on Site.

A5.6 SAMPLE BOARD

Prior to the commencement of installation work, the Contractor shall submit to the Supervising Officer for approval in good time sample boards of electrical and mechanical accessories, finishing materials, colour chart and any other items as considered necessary by the Supervising Officer, proposed to be used for the Contract. Each sample shall be firmly fixed onto a rigid wooden or metal board and clearly numbered and labelled. A list shall be affixed to show the item description, make and brand, and country of origin. Only samples deemed to comply with the Specification shall be displayed. Samples rejected by the Supervising Officer shall be replaced as soon as possible. The approved sample boards shall be displayed in the site office throughout the entire contract period.

SECTION A6

ELECTRICITY SUPPLY AND ELECTRICAL INSTALLATION

A6.1 ELECTRICITY SUPPLY

Unless otherwise stated in the Particular Specification, the electricity supply for the electrical machinery will be 380V, 3-phase, 50 Hz and the electricity supply for lighting will be 220V, single-phase, 50 Hz.

A6.2 WORKS PROVIDED BY ELECTRICAL CONTRACTOR

The Electrical Contractor will be responsible for providing the power supply for the electrical equipment. The supply point will be terminated at an isolating switch or switch-fuse at the following location according to the type of installation:-

- (1) Lift installation: - lift machine room
- (2) Service lift installation: - lift machine compartment
- (3) Escalator/passenger conveyor installation: - escalator/passenger conveyor machinery space

From the isolating switch or switch-fuse, all electrical work for the lift, escalator and passenger conveyor shall be the responsibility of the Contractor.

The Electrical Contractor will provide permanent lighting in the lift well and the machine and pulley rooms, and socket outlets in the machine and pulley rooms and the lift pit. The lighting in the lift well will comprise one lamp at 0.5 m from the highest and lowest points in the well with intermediate lamps at 7 m maximum spacing and controlled by two-way switches located in the machine room and in the lift pit. The socket outlet in the lift pit will be of weather-proof type.

A6.3 WIRING

All cables, trunkings, conduits and conduit fittings necessary for the circuits (including power, lighting and control circuits) shall be installed in accordance with the Electrical General Specification, the Code of Practice for the Electricity (Wiring) Regulations and IEC 60364.

All exposed metalwork liable to become electrically charged shall be bonded and earthed.

All wiring installed in the lift machine room and lift well, other than travelling cables, shall be enclosed in galvanised steel conduits or trunkings.

A6.4 TRAVELLING CABLE

Travelling cables between the lift well and lift car terminal boxes shall be suspended by looping over reels or by suitable clamps and terminated at a suitable position that they will not be prone to damage by water seepage.

The construction of the travelling cables shall comply with EN 50214 which in general shall fall within the following 5 types of cables: -

<u>Type</u>	<u>Maximum Speed Limit</u>	<u>Maximum Freely Suspended Length</u>	<u>Remark</u>
Rubber-insulated & sheathed, flexible cable with 4 to 48 cores	1.6 m/s	35 m	Higher limits permissible if strain - bearing material is included
Rubber-insulated & sheathed, flexible cables with 3 to 18 cores	1.0 m/s	15 m	
PVC-insulated, and sheathed, flexible cables with 4 to 72 cores	No limit	No limit	
PVC-insulated and sheathed, flexible cables with 3 to 24 cores	1.6 m/s	35 m	Higher limits permissible if strain - bearing material is included
Rubber-insulated, flexible cables with 36 to 72 cores having strain - bearing centre	No limit	No limit	

Travelling cables shall be hung in the lift well, suspended from one end only, for sufficient time to avoid twisting or kinking before making final connections. Facility shall be provided on both car and well cable anchorages to permit each cable to be rotated to counter accumulated twist. Cables with twelve (12) or more cores shall be used, and all cables that are to be grouped together shall be of the same size unless otherwise approved by the Supervising Officer or his/her Representative.

A6.5 TEMPORARY ELECTRICITY SUPPLY

Temporary electricity supply during the construction period will be provided by the Building Contractor.

A6.6 EMERGENCY LIGHTS FOR THE CONTROL PANELS IN THE LIFT MACHINE ROOM

Emergency lights for control panels in the lift machine room of adequate illuminance shall be provided by the Contractor in the lift machine room. The illuminance at each control panel shall be not less than 50 lux. These lights shall be operated by batteries and shall be manually operated by a switch located at a convenient position inside the machine room.

A6.7 BATTERIES AND CHARGERS

The batteries for each lift shall be capable of maintaining a supply to the connected emergency load for a minimum period of two hours. The batteries shall be of sealed, high rate maintenance free nickel-metal hydride type, or a type of better functions and performance and approved by the Supervising Officer and shall have a guaranteed life expectancy of at least four (4) years. They shall not have any memory effect as to affect their usable life or performance. The nickel-metal hydride battery shall comply with EN61436 and EN61951-2 where appropriate. The battery charger shall be compatible with the batteries used. The charger shall comply with EN 60335-2-29 and be capable of fully re-charge the batteries in not more than 12 hours.

A6.8 SUPPRESSION OF RADIO AND TELEVISION INTERFERENCE

The lift/escalator/passenger conveyor installation shall be adequately suppressed against radio and television interference to limits as laid down in BS EN 55014 and BS 613. Interference suppression components shall not be used in any part of the circuit where their failure might cause an unsafe condition.

A6.9 HARMONIC DISTORTION

The lift/escalator/passenger conveyor installation shall not, by injection of undesirable waveforms into the electricity supply distribution system, adversely affect the power company's system and/or the electricity supply to other users or consumers. The Total Harmonic Distortion (THD) produced by the lift/escalator/passenger conveyor motor drive system measured at the isolator connecting the lift/escalator/passenger conveyor equipment to the feeder circuit of the building is limited to the maximum allowable values specified in Table I. For lift installation, the THD shall be measured at the moment the lift car is moving up with rated load at its rated speed, For escalator/passenger conveyor installation, the THD shall be measured when the escalator/passenger conveyor is operating with no-load at its rated speed.

The Contractor shall be responsible for providing all necessary harmonic filter(s) should the THD of the installation exceed the maximum allowable values as specified in Table I.

Table I - Maximum Allowable THD for Lift/Escalator/Conveyor Motor Drive Systems

Circuit Fundamental Current of Motor Drive	Maximum THD (%)
400A I<800A	15.0
80A I< 400A	22.5
I< 80A	35.0

$$\text{Total Harmonic Distortion (THD)} = \frac{\sqrt{\sum_{h=2}^{\infty} I_h^2}}{I_1}$$

where I_1 = r.m.s. value of fundamental current (A)
 I_h = r.m.s. value of current of the h^{th} harmonic order (A)

A.6.10 PROVISION FOR FUTURE ENERGY AUDIT

Multi-functional metering devices or permanent provisions for connection of such devices as shown on the Drawing(s) and/or stated in the Particular Specification shall be provided in all lift and escalator installations for the purpose of Energy Management. Accessibility and sufficient space for these devices shall be allowed for. Such devices or provisions shall be provided at each electricity supply feeder for the lift and escalator installations, and the measurements shall including the electrical load of the motor drive, auxiliary loads such as ventilation and lightings, voltages (phase-to-phase and phase-to-neutral), currents (line currents and neutral currents), total power factor, energy consumption (kWh), power (kW) and maximum demand (kVA).

A6.11 TOTAL POWER FACTOR OF MOTOR DRIVE SYSTEMS

The Total Power Factor of a motor drive circuit measured at the isolator connecting the lift/escalator/passenger conveyor equipment to the building's feeder circuit or the power source shall not be less than 0.85. For lift equipment, the Total Power Factor shall be measured when the lift car is carrying a rated load at its rated speed in an upward direction. For escalator/passenger conveyor equipment, the Total Power Factor shall be measured when the motor drive is operating under its brake load condition.

$$\text{TotalPowerFactor} = \frac{P}{\sqrt{(P^2 + Q^2 + D^2)}}$$

where P = active power in kW of fundamental component
 Q = reactive power in kVAr not including any harmonic component
 D = distortion power in kVAd contributed from harmonic components

A6.12 MAXIMUM ALLOWABLE ELECTRICAL POWER

(1) Maximum Allowable Electrical Power of Traction Lifts

The running active electrical power of the motor drive of traction lift system carrying a rated load at its rated speed in an upward direction shall be equal to or less than the maximum allowable values specified in Table II, III and IV.

Table II : Maximum Allowable Electrical Power of Traction Lifts (Vc ≤ 3)

Rated Load (kg)	Maximum Allowable Electrical Power (kW) of Traction Lift Systems for various Ranges of Rated speed (Vc) in m/s				
	Vc ≤ 1	1 < Vc ≤ 1.5	1.5 < Vc ≤ 2	2 < Vc ≤ 2.5	2.5 < Vc ≤ 3
L ≤ 750	7	10	12	16	18
750 < L ≤ 1000	10	12	17	21	24
1000 < L ≤ 1350	12	17	22	27	32
1350 < L ≤ 1600	15	20	27	32	38
1600 < L ≤ 2000	17	25	32	39	46
2000 < L ≤ 3000	25	37	47	59	70
3000 < L ≤ 4000	33	48	63	78	92
4000 < L ≤ 5000	42	60	78	97	115
L > 5000	0.0083L+ 0.5000	0.0118L+ 1.0000	0.0156L+ 0.5030	0.0190L+ 2.0000	0.0229L+ 0.5000

Table III : Maximum Allowable Electrical Power of Traction Lifts (3 < Vc ≤ 7)

Rated Load (kg)	Maximum Allowable Electrical Power (kW) of Traction Lift Systems for various Ranges of Rated speed (Vc) in m/s				
	3 < Vc ≤ 3.5	3.5 < Vc ≤ 4	4 < Vc ≤ 5	5 < Vc ≤ 6	6 < Vc ≤ 7
L ≤ 750	21	23	25	30	34
750 < L ≤ 1000	27	31	32	39	46
1000 < L ≤ 1350	36	40	45	52	60
1350 < L ≤ 1600	43	49	52	62	72
1600 < L ≤ 2000	53	60	65	75	88
2000 < L ≤ 3000	79	90	95	115	132
3000 < L ≤ 4000	104	120	130	150	175
4000 < L ≤ 5000	130	150	160	190	220

Table IV : Maximum Allowable Electrical Power of Traction Lifts ($V_c > 7$)

Rated Load (kg)	Maximum Allowable Electrical Power (kW) of Traction Lift Systems for various Ranges of Rated speed (V_c) in m/s		
	$7 < V_c \leq 8$	$8 < V_c \leq 9$	$V_c > 9$
L \leq 750	39	45	$4.887V_c + 0.0014V_c^3$
750 < L \leq 1000	52	60	$6.516V_c + 0.0021V_c^3$
1000 < L \leq 1350	70	80	$8.797V_c + 0.0021V_c^3$
1350 < L \leq 1600	83	95	$10.426V_c + 0.00266V_c^3$
1600 < L \leq 2000	105	120	$13.033V_c + 0.0014V_c^3$
2000 < L \leq 3000	155	175	$19.549V_c + 0.0030V_c^3$
3000 < L \leq 4000	205	235	$26.065V_c + 0.0038V_c^3$
4000 < L \leq 5000	255	290	$32.582V_c + 0.0048V_c^3$

(2) Maximum Allowable Electrical Power of Hydraulic Lifts

The running active electrical power of the hydraulic oil pump motor of hydraulic lift system carrying a rated load at its rated speed in an upward direction shall be equal to or less than the maximum allowable values specified in Table V.

Table V : Maximum Allowable Electrical Power of Hydraulic Lifts

Rated Load (kg)	Maximum Allowable Electrical Power (kW) Under rated conditions
L \leq 1000 kg	28
1000 kg < L \leq 2000 kg	53
2000 kg < L \leq 3000 kg	75
3000 kg < L \leq 4000 kg	97
4000 kg < L \leq 5000 kg	121
L > 5000 kg	$0.0242L$

(3) Maximum Allowable Electrical Power of Escalator & Passenger Conveyor

The running active electrical power of a steps driving motor of escalator/passenger conveyor operating under no load condition shall be equal to or less than the maximum values specified in Table VI (for escalator other than public service escalator), Table VII (for public service escalator), Table VIII (for passenger conveyor other than public service conveyor), and Tables IX & X for (public service passenger conveyor).

Table VI : Maximum Allowable Electrical Power of Escalator Other Than Public Service Escalator Operating Under No-load Condition

Step Width (mm)	Rise of Escalator (m)	Maximum Allowable Electrical Power in Watt for Various Ranges of Rated Speed (Vr) in m/s		
		Vr ≤ 0.5	0.5 < Vr ≤ 0.6	0.6 < Vr ≤ 0.75
600	R ≤ 3.5	1350	1550	1950
600	3.5 < R ≤ 5	1600	1900	2350
600	5 < R ≤ 6.5	1850	2250	2750
600	R > 6.5	212R+455	250R+537	306R+661
800	R ≤ 3.5	1500	1700	2050
800	3.5 < R ≤ 5	1800	2100	2550
800	5 < R ≤ 6.5	2100	2500	3050
800	6.5 < R ≤ 8	2450	2900	3550
800	R > 8	227R+619	267R+731	329R+898
1000	R ≤ 3.5	1600	1900	2300
1000	3.5 < R ≤ 5	2000	2300	2850
1000	5 < R ≤ 6.5	2330	2800	3400
1000	6.5 < R ≤ 8	2750	3200	3950
1000	R > 8	252R+688	297R+812	365R+998

Table VII : Maximum Allowable Electrical Power of Public Service Escalator Operating Under No-load Condition

Step Width (mm)	Rise of Escalator (m)	Maximum Allowable Electrical Power in Watt for Various Ranges of Rated Speed (Vr) in m/s		
		Vr ≤ 0.5	0.5 < Vr ≤ 0.6	0.6 < Vr ≤ 0.75
800	R ≤ 3.5	2100	2500	3100
800	3.5 < R ≤ 5	2500	3000	3700
800	5 < R ≤ 6.5	2900	3450	4300
800	6.5 < R ≤ 8	3300	3900	4850
800	R > 8	295R+804	352R+965	443R+1210
1000	R ≤ 3.5	2250	2650	3300
1000	3.5 < R ≤ 5	2650	3400	3900
1000	5 < R ≤ 6.5	3050	3650	4500
1000	6.5 < R ≤ 8	3450	4100	5150
1000	R > 8	307R+840	371R+1015	463R+1267

Table VIII : Maximum Allowable Electrical Power of Passenger Conveyor Other Than Public Service Passenger Conveyor Operating Under No-load Condition ($V_r \leq 0.75$)

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for Various Ranges of Rated Speed (V_r) in m/s		
		$V_r \leq 0.5$	$0.5 < V_r \leq 0.65$	$0.65 < V_r \leq 0.75$
800	$l \leq 8$	1150	1450	1900
800	$8 < l \leq 12$	1650	2100	2750
800	$12 < l \leq 16$	2150	2750	3500
800	$16 < l \leq 20$	2650	3900	4400
800	$l > 20$	$127l+102$	$186l+149$	$211l+169$
1000	$l \leq 8$	1300	1650	1900
1000	$8 < l \leq 12$	2100	2700	3050
1000	$12 < l \leq 16$	2800	3550	4000
1000	$16 < l \leq 20$	3450	4400	4950
1000	$l > 20$	$164l+131$	$209l+168$	$237l+190$

Table IX: Maximum Allowable Electrical Power of Passenger Conveyor Other Than Public Service Passenger Conveyor Operating Under No-load Condition ($0.75 < V_r \leq 0.90$)

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for Various Ranges of Rated Speed (V_r) in m/s
		$0.75 < V_r \leq 0.90$
800	$l \leq 8$	2250
800	$8 < l \leq 12$	3250
800	$12 < l \leq 16$	4300
800	$16 < l \leq 20$	5300
800	$l > 20$	$253l+203$
1000	$l \leq 8$	2250
1000	$8 < l \leq 12$	3650
1000	$12 < l \leq 16$	4800
1000	$16 < l \leq 20$	5950
1000	$l > 20$	$285l+228$

Table X: Maximum Allowable Electrical Power of Public Service Passenger Conveyors Operating Under No-load Condition ($V_r \leq 0.75$)

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for Various Ranges of Rated Speed (V_r) in m/s		
		$V_r \leq 0.5$	$0.5 < V_r \leq 0.65$	$0.65 < V_r \leq 0.75$
800	$l \leq 8$	1350	1750	2000
800	$8 < l \leq 12$	1650	2100	2750
800	$12 < l \leq 16$	2150	2750	3500
800	$16 < l \leq 20$	2650	3900	4400
800	$l > 20$	$127l+102$	$186l+149$	$211l+169$
1000	$l \leq 8$	1450	1850	2100
1000	$8 < l \leq 12$	2100	2700	3050
1000	$12 < l \leq 16$	2800	3550	4000
1000	$16 < l \leq 20$	3450	4400	4950
1000	$l > 20$	$164l+131$	$209l+168$	$237l+190$

SECTION A7 **MISCELLANEOUS**

A7.1 SOUND REDUCING

The whole of the lift/escalator/passenger conveyor machinery including the opening and closing of the car and landing doors shall be quiet in operation, and sound reducing rubber pads or other means shall be provided by the Contractor where necessary to eliminate vibration and noise transmission.

A7.2 FINISH

All metal work supplied by the Contractor in out of the way locations such as the lift shaft, lift pit, machine room and on the outside of the lift car shall be properly wire-brushed, cleaned of rust, scale, dirt and grease prior to the application of one coat of rust inhibiting primer, with particular attention paid to the priming of outer surfaces of car doors, inner surfaces of landing doors, metal work associated with door assemblies, the underside and the framework of lift cars. Any part of the equipment, including guide rails, which requires greasing or oiling and any components that are supplied unpainted by the manufacturers due to functional reasons shall not be painted.

All normally visible metal surfaces, other than stainless steel and non-ferrous surfaces, shall be finished with one coat of rust inhibiting primer, one under coat/finishing coat and one finishing coat of enamel paint to a colour to be selected by the Supervising Officer.

A7.3 SERVICE CONDITIONS

All electrical, electronic and mechanical equipment shall suit the tropical climate for use in service conditions as stated below :-

Climate	: Hong Kong (tropical)
Temperature range	: Minus 5°C to +40°C
	Average 0°C to 35°C
	(over 24 hours)
Relative humidity	: 99% maximum
Altitude	: Sea level to 1000 metres

A7.4 STAINLESS STEEL

Unless otherwise specified, stainless steel shall be of EN10029, EN 10048, EN 10095, EN 10258 and EN 10259 Grade 316 or equivalent.

PART B - ELECTRIC & HYDRAULIC LIFT

SECTION B1 **GUIDES AND FIXING**

B1.1 STEEL GUIDES SHALL BE USED

Rigid steel guides shall be used for guiding lift cars and counterweights throughout their travel.

B1.2 REQUIREMENTS

- (1) The strength of the guides, their attachments and joints shall comply with Clause 10.1 and 10.2 of EN 81-1 and BS 5655 : Part 9 and be sufficient to withstand the forces imposed due to the operation of the safety gear and deflection due to uneven loading of the car.
- (2) The guides shall have machined surfaces for rated speeds exceeding 0.4 m/s.

B1.3 GUIDE BRACKETS

Guide brackets shall be provided at suitable intervals and shall be embedded into the walls enclosing the liftway or fixed to such walls by one of the following methods :-

- (1) Self-drilling anchor bolts - this method shall be used as the standard practice for fixing guide rail brackets in reinforced concrete walls of 100 mm thick or more.
- (2) Bolts grouted and embedded into the walls - this method shall only be used in special conditions, e.g. brick walled liftways, or reinforced walls of less than 100 mm thickness, or as and when specified in the Particular Specification or by the Supervising Officer.

Wood or fibre blocks or plugs shall not be used for securing any guide brackets.

When method (2) above is used, the Contractor shall ensure that the holes reserved by the Building Contractor for the bolts are properly and correctly positioned. The Contractor shall be responsible for any subsequent cutting of the holes afterwards if these holes are displaced.

SECTION B2

BUFFERS

B2.1 BUFFERS

Buffers shall be provided at the bottom limit of travel for cars and counterweights.

B2.2 ENERGY ACCUMULATION TYPE BUFFERS

Energy accumulation type buffers shall only be used if the rated speed of the lift does not exceed 1 m/s.

B2.3 ENERGY ACCUMULATION TYPE BUFFERS WITH BUFFERED RETURN MOVEMENT

Energy accumulation type buffers with buffered return movement shall only be used if the rated speed of the lift does not exceed 1.6 m/s.

B2.4 ENERGY DISSIPATION TYPE BUFFERS

Energy dissipation type buffers may be used whatever the rated speed of the lift.

SECTION B3 **COUNTERWEIGHTS**

B3.1 GENERAL REQUIREMENTS

The counterweight shall be of metal and constructed from multiple sections, contained and secured within a steel frame, and shall equal to the weight of the complete car plus approximately 40% to 45% of the Contract Load.

B3.2 GUIDE SHOES TO BE PROVIDED

At least, four guide shoes, capable of being easily renewed or having renewable linings shall be provided on the counterweight.

B3.3 COUNTERWEIGHT PULLEYS

If there are pulleys on the counterweight they shall incorporate devices to avoid:-

- (1) the suspension ropes, if slack, leaving the grooves.
- (2) the introduction of objects between ropes & grooves.

B3.4 GUARDING

See Clause B6.3.

SECTION B4 **SUSPENSION**

B4.1 SUSPENSION ROPES

Cars and counterweights shall be suspended from steel wire ropes of best quality, the size and number being in accordance with BS 302 : Part 4, "Specification for ropes for lifts". The factor of safety for the suspension ropes shall be not less than 12 in the case of traction drive with three ropes or more.

B4.2 NUMBER OF ROPES AND SAFETY FACTOR

The minimum number of ropes shall be two and they shall be independent. Where reeving is used the number to take into account is that of the ropes and not the falls.

The safety factor of the suspension ropes shall be at least:

- (1) 12 in the case of traction drive with three ropes or more;
- (2) 16 in the case of traction drive with two ropes;
- (3) 12 in the case of drum drive.

B4.3 MINIMUM NOMINAL DIAMETER

The nominal diameter of the ropes shall be at least 8 mm.

B4.4 COMPENSATION ROPE

For travels over 30 m and/or rated speed of the lift exceeds 2.5m/s, the Contractor shall provide compensation ropes with tensioning pulleys. For speeds of 2.5 m/s or below, quiet operating chains or similar devices may be used as the means of compensation. For speeds above 3.5 m/s, an anti-rebound arrangement of idler tension pulley shall be provided to prevent the counterweight jumping with the application of the car safety gear.

SECTION B5
TERMINAL STOPPING AND FINAL LIMIT SWITCHES

B5.1 NORMAL TERMINAL STOPPING AND FINAL LIMIT SWITCHES TO BE PROVIDED

Each lift shall be provided with normal terminal stopping switches and final limit switches. They shall be positively operated by the movement of the car. These switches shall either be mounted on the car frame or in the lift well.

B5.2 FINAL LIMIT SWITCHES

The final limit switches shall:

- (1) for single or two speed lifts either,
 - (i) open directly by mechanical separation of the circuits feeding the motor and brake, and provisions shall be made so that the motor cannot feed the brake solenoid, or
 - (ii) open, by an electrical safety device, the circuit directly supplying the coils of the two contactors, the contacts of which are in series in the circuits supplying the motor and brake.
- (2) in the case of D.C. variable voltage or A.C. variable speed lifts, cause the rapid stopping of the machine.

SECTION B6 **GUARDING**

B6.1 GENERAL REQUIREMENTS

All dangerous parts shall be effectively guarded. Where applicable, components shall be designed to be inherently safe, obviating the need for external or removable guards.

B6.2 PARTITION IN LIFT WELL

Where two or more lifts are installed in a common lift well, the Building Contractor will provide dividing beam and inter well rigid metal screen to separate each lift from an adjacent lift or its counterweight. The Contractor shall coordinate with the Building Contractor and to check and ensure that the height of the metal screen as provided complies with the following :-

- (1) Where the horizontal distance between the edge of the roof of a car and an adjacent car or its counterweight is 0.3 m or more, the metal screen shall be erected from the bottom of the lift pit to a minimum height of 2.5 m and across the whole depth of the lift well.
- (2) Where the horizontal distance between the edge of the roof of a car and an adjacent car or its counterweight is less than 0.3 m, the metal screen shall be erected from the lift pit to the FULL height of the lift well and across the whole depth of the lift well.

B6.3 COUNTERWEIGHT

Counterweights shall be guarded by means of a rigid metal screen extending from a position 0.30 m above the lift pit floor to a position at least 2.50 m above the lift pit floor.

SECTION B7 **CAR FRAMES**

B7.1 GENERAL REQUIREMENTS

Every lift car body shall be carried in a steel car frame sufficiently rigid to withstand the operation of the safety-gear without permanent deformation of the car frame.

The deflection of the members carrying the platform shall not exceed 1/1000 of their span under static conditions with the rated load evenly distributed over the platform.

At least four renewable guide shoes, or guide shoes with renewable linings, or sets of guide rollers shall be provided, two at the top and two at the bottom of the car frame.

B7.2 SUPPORTING FRAME FOR GOODS LIFT IN MARKETS AND ABATTOIRS

The bottom-supporting frame for car body shall be made of hot-dip galvanised mild steel.

SECTION B8 **CAR ENCLOSURES**

B8.1 NON-COMBUSTIBLE MATERIALS TO BE USED

Lift cars, excluding linings, shall be constructed of non-combustible materials.

B8.2 CAR SHALL BE COMPLETELY ENCLOSED

The car of every lift shall be completely enclosed by solid walls, floor and roof and shall, save for any opening affording normal access of users thereto or for ventilation apertures or as provided in Clause B8.12, not have any openings or open work panels in the sides.

The interior clear height of the car, i.e. height between the finished floor level and the underside of the false ceiling, shall be not less than 2.4 m.

B8.3 PLATFORM LOADING

Car platforms shall be of framed construction. Platforms for passenger lift cars shall be designed on the basis of rated load, this being evenly distributed. Platforms for goods lift car shall be designed to suit the particular conditions of loading.

B8.4 INTERNAL CONSTRUCTION OF PASSENGER LIFT CAR

Unless otherwise specified in the Particular Specification and/or on the Drawings, passenger lift car enclosure shall be of steel with 4mm studded rubber floor to colour and pattern as approved by the Supervising Officer or his/her Representative. The whole of the internal face of the car shall be of 1.5mm thick hairline stainless steel sheet with etched pattern as approved by the Supervising Officer or his/her Representative. 13mm thick plywood backing shall be used to reinforce the car wall panels. A stainless steel handrail shall be provided on three sides of the lift car, extended to within 150 mm of all corners and a stainless steel skirting panel approximately 100 mm deep shall be provided. Hairline finished stainless steel false ceiling with concealed fluorescent luminaires and ventilating fan complete with metal ceiling diffuser shall be provided. The layout of the false ceiling and lighting fittings shall be subject to the approval by the Supervising Officer or his/her Representative. The fan shall be of quiet running type having a noise level not greater than 55 dBA when measured at a distance of 1 m from the fan and it shall be capable of handling at least 20 air changes per hour of lift car volume, with car doors closed. 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 applies for any apertures in the lower part of the car. The car ventilation fan shall be switched off within a period which shall be adjustable from 5 to 15 minutes after the last registered call is answered.

B8.5 INTERNAL CONSTRUCTION OF GOODS LIFT CAR IN MARKETS AND ABATTOIRS

Unless otherwise specified, the complete enclosure of the lift car shall be constructed in stainless steel and as detailed below: -

(1) Car walls

All car wall panels shall be of 1.5 mm thick stainless steel sheet. The side and rear wall panels shall each be provided with three-equally-spaced full length lateral protective oak battens of 200 mm wide by 25 mm thick. The surface of the wood battens shall be covered with 1.0 mm thick stainless steel sheet fixed by stainless steel screws. The top battens shall be fixed at a height of 1100 mm above finished car floor level.

(2) Car roof

The car roof shall be of 1.5 mm minimum thickness stainless steel sheet. It shall be able to support the weight of two persons, i.e. to withstand a vertical force of 2000N at any position without causing permanent deformation.

Ceiling lights shall be of recessed type and be protected by stainless steel metal bars.

A recessed ceiling fan complete with heavy duty metal diffuser and capable of providing 20 air changes per hour in the car shall be provided. The fan when running shall have a noise level not greater than 58 dBA measured at a distance of 1 m from the fan.

The internal clear height of the car shall be not less than 2.5 metres.

(3) Car floor

The car floor shall be constructed of stainless steel plate with 2 mm high multi-grip non-slip pattern, making a total thickness of 5 mm. The floor construction shall be in the form of a metal drain pan, the rear and side edges shall be folded up by 100 mm from the floor to form the drain pan. All joints and the corners of the pan shall be welded to prevent water leakage. The finished car floor level shall be made to fall to a drain outlet located at a rear corners position. A stainless steel drain water storage tank of not less than 0.035 m³ holding capacity shall be provided at a suitable location under the drain pan to collect water from the drain outlet. The tank shall be completed with a mechanically operated automatic emptying device as shown in Appendix 3.

(4) Drain water storage tank

The drain water storage tank shall be constructed with 1.5 mm thick stainless steel and of sizes 350 x 350 x 300 mm(H) approximately. The tank cover of sizes 250 x 250 mm with stainless steel flat bar grating on top shall be removable to facilitate future maintenance and shall form part of the car floor. Holes of approximate 4 mm diameter shall be drilled through the cover for draining of water into the tank. A 25 mm dia. stainless steel pipe shall be provided with one end connected to the bottom of the tank and the other end left open-ended but controlled by a stop valve. The stop valve shall be kept close by a spring on one side and a roller connected to the other side. A metal bar of 450 mm long approximately shall be fixed at the bottom of the lift pit and when the lift reaches its lowest floor, the roller will

be pressed by the metal bar which then open the stop valve and release the water collected in the tank into the lift pit. A float switch shall be provided in the water storage tank which upon operation shall transmit a signal to call for the car to descend to its lowest floor position. Water collected in the pit will be pumped away by submersible pump provided by others.

A sketch showing the tank arrangement is attached at Appendix 3.

(5) Control and indication

Car control buttons shall be of vandal resistant stainless steel push button type as specified in Clause B9.5.

Position indicators shall be of vandal resistant type with stainless steel protected pressel held rigid in a chromium plated solid bezel that is secured by nuts to the threaded studs welded to the back of the faceplate. The faceplates shall have tamper-proof fixings. Legends shall be etched into the stainless steel face in black 13 mm high characters and the indication of floor shall be by means of illumination of not less than 4 LED units with relays producing a halo of red light between the pressel and bezel.

B8.6 INTERNAL CONSTRUCTION OF GOODS LIFT CAR

Unless otherwise specified, goods lift cars shall be constructed in accordance with Clause B8.5, except that the floor drain system is not required.

B8.7 INTERNAL CONSTRUCTION OF SERVICE LIFT CAR

Unless otherwise specified, the entire internal surfaces of the service lift car shall be 1.5 mm thick stainless steel sheet. A recessed ceiling light shall be provided. A removable stainless steel shelf shall also be provided unless otherwise specified.

B8.8 MAINTENANCE FACILITIES

A 13A 3 pin switched socket outlet protected by R.C.C.B. shall be provided on both the top and bottom of the lift car. The R.C.C.B. will be provided by the Electrical Contractor. A permanent light, suitably protected and separately switched, shall also be fitted on top of the lift car.

B8.9 CAR ILLUMINATION

Unless otherwise specified, every lift car shall be adequately illuminated by a minimum of two energy efficient electric fluorescent luminaires with separate electronic ballast. The illumination level shall not be less than 150 lux on the lift floor level.

B8.10 EMERGENCY LIGHTING

Every lift car shall be provided with emergency lighting operated by a rechargeable battery supply. The lighting shall be automatically switched on in the event of failure of normal power supply to the lift. One of the fluorescent luminaires as specified in Clause B8.9 shall be self-maintained emergency type with rechargeable batteries having a capacity sufficient to maintain the lighting for two hours upon failure of the normal lighting supply.

B8.11 EMERGENCY ALARM DEVICE

An emergency alarm push button together with a buzzer (or an alarm bell), an intercom and a closed circuit television (CCTV) camera shall be provided in the lift car and be connected to the building management office or the caretaker's office and the machine room. A buzzer (or alarm bell, in addition to the one provided at the main entrance lift lobby or lift pit) and indication light(s) (one for each lift) shall also be provided at the building management office or the caretaker's office with 24-hour attendance and backed up by an emergency supply. Another buzzer (or alarm bell) connected to the alarm push button in the lift car shall also be provided at high level on the landing of designated point of entry (refer Section B20 for detailed requirements). The electricity supply for these alarm devices, except the CCTV, shall be fed from the batteries as stated in Clause A6.7.

The pattern of lift alarms shall be distinguishable from that of fire alarms and shall be of the following two-tone pattern:

Low frequency:	600 Hz (\pm 15%)	Duration: 600 ms (\pm 20%)
High frequency:	920 Hz (\pm 15%)	Duration: 300 ms (\pm 20%)

B8.12 EMERGENCY EXITS

Each lift car shall be provided with an imperforate emergency exit in the roof of minimum size 500 mm x 350 mm or 400 mm in diameter.

Panels for emergency exits shall: -

- (1) be opened only from the outside;
- (2) be clear of any apparatus mounted above the roof of the lift car;
- (3) be capable of being opened, re-closed and re-locked without a key;
- (4) be provided with an electric safety device which will prevent operation of the lift when the panel is not locked, operate the buzzers (or alarm bells) and also cause the car top ventilation fan to stop.

SECTION B9

CONTROL AND INDICATION IN CAR

B9.1 CONTROL STATION IN CAR

Each lift car shall have a flush mounted control station comprising:-

- (1) Call buttons with acceptance signals engraved in Arabic number to correspond with the landing served;
- (2) An alarm push button with protection from being operated accidentally; the colour of this button shall be yellow;
- (3) "door open" and "door close" push buttons;
- (4) Audible and visible signals in connection with the overload device;
- (5) Light switch, alarm reset switch, fan switch and cleaner's "Stop-switch" keeping the car door open in the form of key switches or housed in a recessed metal box with hinged or sliding lid which will be key-locked.
- (6) Two-way intercom speaker - the intercom system shall be as specified in Clause B20.4.

All wordings shall be engraved in both English and Chinese characters. The material for the control station shall be stainless steel with a thickness of not less than 2.5 mm. The control station shall be fixed onto the car panel by stainless steel screws of secret-head type.

B9.2 ADDITIONAL CONTROL STATION

For passenger lifts of 21 persons capacity or larger, two car control station, one on either side of the car doors, shall be provided such that one shall have the above functions (1), (2), and (3) only and one shall have all the functions (1) to (6).

B9.3 CONTROL STATION EQUIPPED WITH ATTENDANT CONTROL

For lifts equipped with attendant control, the control station shall also incorporate:-

- (1) A non-stop button for the purpose of bypassing landing calls, but the calls shall remain registered until answered. This button shall be inoperative unless the lift is operated by an attendant.
- (2) A key-operated attendant control switch to be included in Clause B9.1 (5).

The additional functions specified in this clause shall be provided in the Control Station in Clause B9.1.

B9.4 CAR DIRECTION AND POSITION INDICATOR

The direction indicators shall be of illuminated directional indicator with an illuminated area not less than 1125 mm². The position indicator shall be of digital type display with lamp matrix actuated by solid state circuitry unless otherwise specified.

The position indicator shall have a minimum height of 50 mm and easy to read even from a wide angle of view and under an illumination level of 500 lux.

The indicators shall be mounted onto the back of at least 2.5 mm stainless steel faceplates by weld studs and screws.

Voice annunciator shall be provided for passenger lift, bed/passenger lift and goods lift to announce the floor due to be stopped. Unless otherwise specified, the announcement shall be in Chinese (Cantonese) and English. Voice synthesiser or similar device shall be submitted to demonstrate the quality of announcement and a voice tape shall also be submitted to verify the context of the announcement prior to installation.

B9.5 PUSH/ELECTRONIC TOUCH BUTTON

All push buttons except for cars in office buildings shall be vandal-resistant design and flush mounted construction.

Electronic touch buttons or micro-movement push buttons shall be provided in place of vandal-resistant buttons for office buildings and where specified in the Particular Specification.

The push/electronic touch buttons shall have acknowledgement of the call by illumination. The halo shall be formed with flame retarding polycarbonate. Shock loads due to pressing of the pressel must be borne by the body of the unit and not by the contacts.

B9.6 CAR TOP CONTROL

A control station shall be fitted on the car roof and it shall be so made that when in use :-

- (1) it is not possible to control the car from any other position;
- (2) the car will only travel at a speed not exceeding 0.63 m/s;
- (3) the car will not move until all safety devices are in, and remain in, the safe position;
- (4) the car will move only whilst two buttons are subjected to continuous pressure.

The control station shall comprise the following switches clearly marked:-

- (1) 'STOP' switch;
- (2) 'NORMAL/INSPECTION' switch;
- (3) directional inspection buttons, protected against accidental operation; and
- (4) movement buttons, protected against accidental operations.

SECTION B10

CAR AND LANDING DOORS

B10.1 GENERAL REQUIREMENTS

Each car entrance shall be provided with an imperforated car door which shall extend the full height and width of the car opening. The top track of the door shall not obstruct the car entrance.

All landing openings in lift well enclosures shall be protected by imperforated doors which shall extend the full height and width of the landing opening. The top track of landing door shall not obstruct the entrance to the lift car. Every such door shall have an F.R.P. of not less than one hour.

Where lift landings are not isolated by fire resisting enclosures or lifts that are completely surrounded by stairwells (as stipulated in paragraph 11.2 of the Codes of Practice for Fire Resisting Construction 1996 issued by the Buildings Authority), the Contractor shall provide lift doors that are constructed to satisfy both the criteria for integrity and insulation in accordance with BS 476:Parts 20 to 24 unless otherwise specified.

Any projections on or recesses in the exposed parts of the car doors or landing doors shall be kept to a minimum in order to avoid finger trapping between sliding parts of the door and any fixed part of the car or landing entrance.

The clearance between panels or between panels and any fixed part of the car or landing entrance shall not exceed 6 mm.

Sliding car and landing doors shall be guided on door tracks and sills for the full travel of the doors. The distance between the car and landing sills shall not exceed 35 mm.

The clear height of all entrances on car and landings shall not be less than 2 m.

B10.2 PASSENGER LIFT

Unless otherwise specified in the Particular Specification, the doors for passenger lifts shall be of metal construction, and the internal face of the car door shall be lined the same as the car. The doors shall be two panels, centre opening with automatic power opening and closing unless otherwise specified.

B10.3 BED/PASSENGER LIFT

Unless otherwise specified in the Particular Specification, the doors for bed/passenger lifts shall be of similar construction as the passenger lift, and shall be two speed, multi-panel, side opening with automatic power opening and closing. The car shall be equipped with an electronic door sensor which can detect an obstruction at the car entrances and controls the closing of the doors. This prevents the passenger, wheeled stretcher and wheeled chair from getting bumped by the closing doors, and relieves the user from holding down the OPEN button. The sensor shall scan for any object across the full height of the car entrance. The doors shall reverse immediately if the sensor detects any

obstruction at the car entrances, and reverse operation is possible up to 2 times.

B10.4 GOODS LIFT

Landing and car doors for goods lift shall be of the construction as indicated in the Particular Specification and/or Equipment Schedule and shall be one of the following constructions:-

(1) Manually operated, horizontally sliding doors

The doors shall be of stainless steel construction, robust for goods lift use.

(2) Power operated, automatic, horizontally sliding doors

The doors shall be multi-panel of stainless steel construction, similar to those for passenger lifts, but strong enough for goods lift use.

A timer shall be incorporated in the door opening circuitry to function as follows. Whenever the "DOOR OPEN" button on the car control panel is pressed, the doors shall remain open for a pre-set period of time, adjustable by the timer between 2 and 10 minutes. By the end of the period, a buzzer shall sound prior to the closing of the doors. Pressing of the "DOOR OPEN" button a second time shall set the timer for another period of time. However pressing of the "DOOR CLOSE" button on the same control panel shall cause the doors to close immediately. The doors shall not remain open for the pre-set period of time, but operate normally, unless the "DOOR OPEN" button is pressed.

An instruction, in English and Chinese engraved on a 1.5 mm thick stainless steel plate notifying the user of the facility, shall be displayed conspicuously adjacent to the car control panel.

(3) Vertically bi-parting doors, manually operated or power closing

The doors shall be of stainless steel construction and shall only be used on goods lifts which are generally accompanied by people and for vehicle lifts. They shall be vertically bi-parting, manually operated or power closing. For power closing doors, all the following conditions shall be fulfilled: -

- (i) closing is carried out under the continuous control of the users;
- (ii) the average closing speed of the door panels is limited to 0.3 m/s.
- (iii) the car door is of perforated or mesh panel construction;
- (iv) the car door is at least two thirds closed before the landing door begins to close.

B10.5 FINISHES FOR GOODS LIFT IN MARKETS AND ABATTOIRS

For goods lifts in markets and abattoirs, the landing doors, car doors, architraves, door sills, supporting frames, door head apron, and fascia plate, etc., shall be of all stainless steel construction without ferrous metal backing.

B10.6 VISION PANELS FOR GOODS LIFT WITH MANUALLY OPERATED DOOR

In order to ensure that the user before opening the door must be able to know whether the car is there or not, the landing doors shall be provided with one or more transparent vision panels conforming to the following conditions :-

- (1) the panel shall be made of an approved material or glass of a tempered or laminated type;
- (2) minimum thickness of 6 mm;
- (3) minimum area per landing door of 0.015 m² with a minimum of 0.01 m² per vision panel;
- (4) the size and shape of the panel shall reject a sphere having a diameter of 100 mm or bigger;
- (5) no part of the panel shall be at a height of less than 1 m above a lift landing;
- (6) width of at least 60 mm.

B10.7 SERVICE LIFT

Unless otherwise specified in the Particular Specification, the doors for service lifts shall be manually operated, vertically bi-parting of 1.5 mm thick stainless steel construction.

B10.8 ELECTRICAL DEVICE FOR PROVING THE CAR DOORS CLOSED

Every car door shall be provided with an electrical switch which will prevent the lift car from being started or kept in motion unless all car doors are closed. A mechanical locking device shall also be provided such that the car door cannot be opened from the inside while the car is outside the unlocking zone.

B10.9 LANDING DOOR LOCKING DEVICE

Every landing door shall be provided with an effective locking device so that it shall not normally be possible to open the door from the landing side unless the lift car door is in that particular landing zone.

It shall not be possible under normal operation to start the lift car or keep it in motion unless all landing doors are in the closed position and locked.

B10.10 DOOR LOCKING DEVICES TO BE INACCESSIBLE FROM LANDING OR CAR

All door locking devices and door switches, together with any associated actuating rods, levers or contacts, shall be so situated or protected as to be reasonably inaccessible from the landing or the car.

B10.11 DOOR RE-OPENING DEVICE

Door re-opening device shall be fitted to the leading edge of both car door panels, which shall automatically initiate re-opening of the door in the event of a passenger being struck (or about to be struck) by the door in crossing the entrance during the closing movement. It shall be so designed and installed that for centre opening doors the obstruction of either leading edge when closing will cause it to function. The device shall extend from not more than 25 mm above the sill (measured to the extended position of the protective device) to a minimum height of 1.8 m above the sill.

Where specified, electronic safety edge may be employed in lieu of the mechanical door re-opening device in which a solid-state detector shall be located on or besides the leading edge of the car door(s). The electronic safety edge shall produce a detection field which shall cover the entire car opening width and extend from not more than 25 mm above the sill to a minimum height of 1.8 m above the sill. When the detection field is interrupted, the device shall initiate re-opening of the car doors.

The door re-opening device for a fireman's lift shall not be of light, flame, heat or smoke sensitive type.

B10.12 "DOOR-OPEN" ALARM FOR MANUALLY OPERATED DOORS

For manually operated doors and power assisted doors, a 'door open' alarm shall be provided in the car to draw attention to a car or landing door which has been left open for an adjustable period up to 10 minutes.

B10.13 EMERGENCY LANDING DOOR UNLOCKING DEVICE AND KEY

Every landing door shall be provided with an emergency landing door unlocking device which, when operated by an authorized person with the aid of a key to fit the unlocking triangle as defined in Annex B of EN 81-1 and Annex B of EN 81-2, would open the landing door irrespective of the position of the lift car for rescue purpose. This unlocking key shall not be able to remain in the unlocked position with the landing door closed, when there is no action to unlock.

In the case of coupled car and landing doors, the landing doors shall be automatically closed by means of weight or springs when the car is outside the unlocking zone.

B10.14 EMERGENCY DOOR IN LIFT WELL

Where there is a long stretch of lift well without a landing door, an emergency door shall be provided at a distance apart not exceeding 11 m for evacuating the passengers. The emergency doors shall, unless otherwise specified, be provided by others, except item (5), and the Contractor shall coordinate with the party responsible for the work, and to check and ensure that the doors provided comply with the following:-

- (1) have minimum dimension 1.8 m x 0.5 m with an F.R.P. of not less than one hour;

- (2) not open towards the interior of the lift well;
- (3) be located in a position readily accessible to rescuers;
- (4) be provided with a lock of such a type that it can be opened from the outside with a key only and from the inside without a key and can be re-locked and re-closed without a key;
- (5) be provided with an electrical safety device by the Contractor of such a type to secure that the lift cannot be set or kept in motion unless the door is fully closed, and
- (6) bear on its outside surface a permanent notice in English and Chinese.

B10.15 ARCHITRAVE

At each landing entrance the Contractor shall provide, unless otherwise specified, architraves of 1.5 mm thick stainless steel of hairline finish or heavy gauge sheet steel profiled to an approved design and spray painted to an approved colour, and shall include all packing and filling (or grouting) as necessary. All surfaces of architrave shall be formed true and gaps between sections will not be allowed. Bolts shall not be visible on the exposed surfaces of the architraves. The architrave shall extend to enclose the thickness of the enclosing front wall.

SECTION B11 **LANDING FIXTURES**

B11.1 POSITION AND CONSTRUCTION

Unless otherwise specified in the Particular Specification a landing fixture will be mounted adjacent to the lift landing entrance for "simplex" control lift and between the landing entrances for "duplex" control lifts, or group control lifts.

This fixture shall consist of landing call button(s) and illuminated call acceptance signal, with a stainless steel cover plate. The button(s) shall be of vandal-resistant design and flush mounted construction similar to the buttons inside lift car. Electronic touch buttons or micro-movement push buttons shall be provided for office buildings and where specified in the Particular Specification.

B11.2 EMERGENCY KEY SWITCH FOR BED/PASSENGER LIFT

- (1) An emergency key switch system comprising the following facilities shall be provided for bed/passenger lifts:-
 - (i) An on-off key switch above the landing fixture at each landing and on the lift car control station.
 - (ii) "Emergency Use" indicator both in Chinese and English at each landing and on the lift car control station.
- (2) The emergency key switch shall be operated as follows:-
 - (i) When the key switch at the required landing is operated, the lift will immediately stop at the next floor in the direction in which it is travelling. Lift doors will remain closed and lift will immediately go to the floor at which the key switch has been operated. Should the lift be already travelling in the direction of the floor where the key switch has been operated the lift will go to that floor without stopping. At the same time of the key switch operation, an indicator will illuminate on the car control station, and on each landing to warn the passengers that the lift is required for 'Emergency Use' only.
 - (ii) On arrival at the requesting floor the lift will stop, doors open and remain open until the same key is used to operate the key switch in the lift car. Should the key switch in the lift car is not operated for an adjustable period of 5 minutes, the lift shall return to its normal operation.
 - (iii) With the same key to operate the key switch in the lift car, the person requiring the lift will gain full control over the lift. The lift shall return to its normal operation when the key switch in lift car is returned to its 'off' position.

- (iv) The key at each landing shall be of the spring-loaded type to ensure that the switch returns to 'off' position. The key in lift car shall be withdrawn at 'off' position only. The operation of key switch in lift car shall override the 'on' position of key switch at any landing. The 'Emergency Use' indicators shall remain illuminated until all the key switches are returned to their 'off' positions or when the pre-set period of time has been expired.

This emergency key switch shall not override the Fireman's Switch.

B11.3 DIRECTION AND POSITION INDICATOR

Audible and visual direction indicators shall be provided on each landing. The indicator shall sound once for an arriving lift that is travelling upwards and twice for downwards. Audible signal shall be at least 58 dBA measured at 1 m from the landing door while the visual signal shall be an illuminated directional indicator with an illuminated area not less than 1125 mm². The visual direction indicator shall be designed with a minimum protrusion of 10 mm to give a better visual effect to the passengers waiting.

Illuminated position indicator shall be provided only at the landing of the designated point of entry and on other floors when specified in the Particular Specification. The construction of the position indicator shall be as Clause B9.4 or formed by a section of the message indicator as in Clause B11.5.

B11.4 PRE-ARRIVAL SIGNAL FOR GROUPED PASSENGER LIFTS

For group control of two or more lifts, the audible and visual signal provided for each passenger lift at each landing shall be activated before the arrival of each lift. The time between activation of the signal and the arrival of the lift shall not be less than 2 seconds.

B11.5 MESSAGE INDICATOR FOR PASSENGER LIFT

An illuminated indicator made with minimum 120 x 16 dot-matrix type LED display shall be provided for each lift except service lift at each landing to display messages such as 'Out of service', 'Overload', 'Full load', 'Used by firemen', 'On emergency service', 'This lift serves the following floors'. The indicator shall be able to display up to 32 messages. These messages shall be displayed alternatively in English and Chinese and shall be on site programmable. The message shall shift from right to left with speed adjustable. The diameter of the pixel shall be 2.8 mm with luminous intensity of 3500 µcd.

SECTION B12

CAR CAPACITY AND LOADING

B12.1 PASSENGER LIFT

The available car area, rated load and number of passengers shall be determined from Table 1.1 and 1.2 of Clause 8.2 in EN 81-1 and EN 81-2.

B12.2 BED/PASSENGER LIFT TO BE TREATED AS PASSENGER LIFT

To avoid the possibility of serious over-loading of bed/passenger lifts in hospitals, such lifts shall be treated as passenger lifts.

B12.3 GOODS LIFT

The requirements of Clause B12.1 shall be applied and in addition, design calculations shall take into account not only the load carried but also the weight of handling devices which may enter the car.

B12.4 SERVICE LIFT

A service lift shall have a rated load of not more than 250 kg.

SECTION B13
LOAD PLATES, NOTICE BOARDS AND INSTRUCTIONS

B13.1 LOAD PLATE SHALL BE FITTED IN CAR

A stainless steel plate engraving the rated load of the lift shall be fitted in each lift car in a conspicuous position.

B13.2 RATED LOAD SHALL BE GIVEN IN PERSONS AND WEIGHT

The rated load shall be given in persons and in kg with reference to Section B12.

B13.3 NOTICE BOARDS

The following stainless steel notice boards engraving conspicuously in both English and Chinese characters shall be provided and rigidly mounted:-

- (1) the name of the company, telephone number and emergency instructions at the terminal landing lift lobby,
- (2) "No Smoking", which shall be in each car,
- (3) "When there is a fire do not use the lift" in each car and on each landing floor.

B13.4 EMERGENCY RELEASE EQUIPMENT AND INSTRUCTIONS

A board or suitable container for the necessary tools, together with clear instructions on the method for releasing the brake and moving the lift car in an emergency shall be positioned in the machine room in a conspicuous manner.

It shall also be stated on the board/container "Emergency release operation shall only be undertaken by authorized person."

SECTION B14

SAFETY GEAR AND OVERSPEED GOVERNOR

B14.1 PROVISION OF SAFETY GEAR

Every lift other than a service lift shall be provided with a safety gear capable of operating only in the downward direction and capable of stopping a fully laden car, at the tripping speed of the overspeed governor, even if the suspension devices break, by gripping the guides and holding the car there.

If accessible spaces do exist underneath the counterweight, the counterweight, as well as the car, shall be provided with safety gears.

B14.2 REQUIREMENTS OF SAFETY GEAR

Safety gears shall comply with the following general requirements:-

- (1) The release of the safety gear on the car (or the counterweight) shall only be possible by raising the car (or the counterweight).
- (2) Each safety gear shall be tripped by its own overspeed governor.
- (3) The operation of the safety gear shall not cause the car platform to slope at more than 1 in 20 to the horizontal.
- (4) Vibration of the car shall not in any case cause a safety gear to operate.
- (5) The tripping of safety gears by devices which operate electrically, hydraulically or pneumatically is forbidden.

B14.3 TYPES OF SAFETY GEAR

Car safety gear shall be of the progressive type if the rated lift speed exceeds 1 m/s. It shall be of: -

- (1) the instantaneous type with buffered effect if the rated lift speed does not exceed 1 m/s, or
- (2) the instantaneous type if the rated lift speed does not exceed 0.63 m/s.

The safety gear of the counterweight shall be of the progressive type if the rated speed exceeds 1m/s, otherwise the safety gear may be of the instantaneous type.

B14.4 OVERSPEED GOVERNOR

Overspeed governor shall be of the centrifugal type which shall operate the safety gear at a speed at least equal to 115% of the rated speed and in accordance with Clause 9.9.1 of EN 81-1. The means for adjusting the overspeed governor shall be sealed after setting the tripping speed.

B14.5 OPERATION OF THE OVERSPEED GOVERNOR

The motor control and brake-control circuits shall be opened before or at the same time as the governor trips and cause the lift motor to stop in compliance with Clause 9.9.11 of EN 81-1.

B14.6 CONSTRUCTION OF GOVERNOR ROPES

The governor ropes shall not be less than 6 mm in diameter and shall be of flexible wire rope. The rope shall be tensioned by a tensioning pulley and the pulley (or its tensioning weight) shall be guided.

B14.7 BREAKAGE OR SLACKENING OF GOVERNOR ROPE

The breakage or slackening of the governor rope shall cause the motor to stop by means of an electrical safety device. The device shall be of bi-stable type requiring manual reset.

B14.8 ASCENDING CAR OVERSPEED PROTECTION MEANS

Ascending car overspeed protection means shall be provided to a traction drive lift and shall act:

- (1) to the car, or
- (2) to the counterweight, or
- (3) on the rope system (suspension or compensating), or
- (4) on the traction sheave.

If the ascending car overspeed protection means requires external energy to operate, the absence of energy shall cause the lift to stop and keep it stop. This does not apply for guided compressed springs.

SECTION B15
OVERLOAD DEVICE AND FULL LOAD DEVICE

B15.1 PROVISION OF OVERLOAD DEVICE

Every lift shall be provided with an overload device which shall operate when the load in the car is 10% or more in excess of the rated load of the lift.

B15.2 OPERATION OF OVERLOAD DEVICE

The overload device, when in operation, shall

- (1) prevent any movement of the car,
- (2) prevent the closing of any power operated door whether fitted to the car or to the landing at which the car is resting, and
- (3) give audible and visible signals inside the car.

The lift shall resume normal operation automatically on removal of the excessive load. The overload device shall be inoperative while the lift car is in motion.

B15.3 FULL LOAD DEVICE

Every lift other than a service lift shall be provided with a full load device having an adjustable setting range from 80% to 100% of the rated load and when operated, it shall by-pass all landing calls. When the load in the car is reduced, the car shall stop for landing calls as normal.

B15.4 FLOATING CAR PLATFORM TYPE NOT ACCEPTABLE

Overload device and full load device activated on floating car platform principle are NOT acceptable.

SECTION B16

LIFT MACHINERY FOR ELECTRIC LIFT

B16.1 LIFT MOTOR

For A.C. lifts the driving motor shall be of A.C. induction type to BS 4999 and BS 5000 : Part 99. The motor shall be designed to operate for an unlimited period according to the expected duty of the lift. The A.C. motor may be supplied and controlled by static elements when A.C. variable speed system is specified.

Other proven motor types may also be used subject to the approval by the Supervising Officer.

B16.2 MOTOR GENERATOR SET

The motor generator set, when offered, shall comprise a motor and a generator built as a complete unit directly coupled and mounted on a single bedplate, and the motor and the generator shall be suitably rated to deal with the load and speed specified. Controls shall be provided so that the set shall start up on the registration of a landing call or car call and shall continue to run for a period which shall be adjustable from 5 to 15 minutes, after the last registered call is answered.

B16.3 BEARING AND GEAR CASE

Bearings shall be of the ball bearing type or sleeve ring type with oil ring bearings. Gear cases shall be provided with journal and thrust bearings suitable for the application.

B16.4 EMERGENCY OPERATION BY MANUAL DEVICE

For geared lift machines, the hoisting machine shall be provided with a smooth wheel which may be fitted to the shaft to move the lift car up or down by manual operation. The direction of movement of the car shall be clearly indicated on the machine.

If the wheel is removable, it shall be located in an easily accessible place in the machine room. Also see Clause B 13.4.

B16.5 EMERGENCY OPERATION BY ELECTRICAL SWITCH

For machines where the manual effort to raise the car together with its rated load exceeds 400N, an electrical switch for emergency operation shall be installed in the machine room.

Directional push buttons protected against accidental operation shall be provided in the machine room such that when the emergency electrical switch is operated, the car can be moved up or down by applying constant pressure on the buttons. The car speed under the emergency operation shall not exceed 0.63 m/s.

The emergency electrical switch and its push buttons shall be so placed that the machine can readily be observed during operation. Also see Clause B13.4.

B16.6 ELECTRO-MECHANICAL BRAKE

Every lift machine shall be provided with a brake which is capable of stopping the machine when the car is travelling at its rated speed and with the rated load plus 25%. It shall also be fitted with a manual emergency operating device capable of having the brake released by hand while a constant manual pressure is required to keep the brake open.

B16.7 'RUN/STOP' SWITCH TO BE PROVIDED WHERE LIFT EQUIPMENT IS HOUSED IN SEPARATE COMPARTMENT

Where lift equipment is housed in a compartment separated from the motor room or lift well, a switch shall be provided in that compartment which, when placed in the "STOP" position, shall cause the lift to stop and refrain from being started until the switch is placed in the "RUN" position.

B16.8 'RUN/STOP' SWITCH TO BE PROVIDED IN PIT

A switch as specified in Clause B16.7 shall be provided in each lift pit.

SECTION B17 **CONTROLLER**

B17.1 CONSTRUCTION

The controller shall be constructed in accordance with IEC 60947 and shall be mounted in a ventilated steel cubicle with hinged front doors and removable hinged rear panels, in which all contactors, solenoids, relays, motor starting equipment etc., shall be fitted. All steel sheets shall be no less than 1.2 mm thick and comply with Clause A7.4 of this General Specification.

B17.2 GENERAL REQUIREMENTS

The controller shall comply with the general requirements as stated in EN 81-1, and in particular, the following features shall be included: -

- (1) Materials used in the construction of the control equipment shall not support combustion.
- (2) The components shall be designed and mounted in a manner which will facilitate easy inspection, maintenance, adjustment and replacement. Wirings shall be terminated in such a way that the wires are not damaged. Accessible terminals suitably marked, shall be provided for incoming and outgoing cables.
- (3) Control circuits at normal mains voltage shall be connected between phase and neutral and shall be supplied through double wound isolating transformer.
- (4) Where rectifier is used it shall be of the full wave silicon type fed from a transformer.
- (5) The control circuit shall be protected by suitably rated over-current circuit breakers or HRC fuses independently.
- (6) The brake solenoid and any retiring cam shall operate on direct current.
- (7) Motors connected to polyphase a.c. power supplies shall incorporate means to prevent the motor from being energised in the event of phase failure.

B17.3 SOLID STATE CONTROLS

Microprocessor-based control shall include the following design features:-

- (1) The system hardware shall be capable of supporting fully software based supervisory and motor control systems.
- (2) Interruption of the electrical supply to the lift shall not affect the system memory or software.
- (3) It shall be possible to change the supervisory control algorithm to meet a change in the use of the building by re-programming the instruction memory.

- (4) It shall be possible to interrogate, by means of communication access/test points on the controller, the system operating functions by use of a portable unit using diagnostic routines.
- (5) Visual indicators, e.g. LED'S, shall be provided on the controller to display information on the operational status of the lift.
- (6) Multiplexing techniques may be employed to reduce the number of trailing cables normally required, if considered cost effective to do so.

B17.4 PROVISIONS FOR FUTURE REMOTE MONITORING OF LIFT

The Contractor shall provide dry contacts of the following output signals for each lift installation in a stainless steel cabinet to serve as the interface unit for future connection by others:

- (1) Normal/Fault status
- (2) Duty/Standby status
- (3) Power Supply Normal/ Fault status
- (4) Normal/ Essential Power status
- (5) Passenger trapped alarm

This interface unit shall be located at the management office/caretaker's room next to the lifts monitoring panel unless otherwise specified on the Drawing or in the Specification.

SECTION B18 **AUTOMATIC CONTROL SYSTEM**

B18.1 AUTOMATIC FULL LOAD BY-PASS

To eliminate the inconvenience of having fully-loaded cars stop for landing calls, all lifts other than service lifts shall be equipped with a full load device which detects the load condition in the car and allow landing calls to be by-passed.

B18.2 AUTOMATIC PUSH BUTTON CONTROL FOR SINGLE LIFT

Automatic push button control shall allow only one call to be registered at a time. The car answers one call before another can be registered. All car and landing doors must be properly closed before the car will respond to either a landing or car call. On stopping, a short period elapses during which no landing call is effective and priority is given to the car pushes to allow passengers to enter the car and register a car call.

If no car call is registered after the car stops at a floor and the car and landing doors remain closed then a landing call may be registered after an adjustable time delay of not more than 8 seconds, when the lift becomes free.

B18.3 DOWN COLLECTIVE CONTROL FOR SINGLE LIFT ("SIMPLEX" CONTROL)

All calls shall be stored in the system and answered in sequence regardless of the order in which they are registered.

When travelling in the 'Up' direction, the car travels to the highest call, stopping at any intermediate floor for which a car call has been registered. On stopping for the highest call, preference is established for the 'Down' direction.

When travelling downwards the car stops for all car and landing calls that have been registered. When all calls have been answered, the car remains with doors closed at the floor to which it last travelled.

B18.4 DOWN COLLECTIVE CONTROL FOR TWO INTER-CONNECTED LIFTS ("DUPLEX" CONTROL)

In addition to the features as required in Clause B18.3, it shall include the following control features :-

When both cars are away from the landing of designated point of entry and all calls have been answered, one car will return automatically to the landing of designated point of entry and is referred to as the 'Next' car. The second car remains at the floor at which it last deposited passengers and is referred to as the 'Free' car. Both cars stand with doors closed.

With the cars standing with doors closed as described above the first landing call will be answered as follows :-

- (1) for a landing call from the landing of designated point of entry, by the 'Next' car.
- (2) for any other floor landing call, by the 'Free' car.

With the 'Free' car answering calls, the 'Next' car will not start for 'Down' calls behind the 'Free' car until the "Free" car is descending.

The passenger entering the 'Free Car' at the landing of designated point of entry would be able to register a call and travel to any destination. With both cars standing at the landing of designated point of entry with doors closed, the 'Next' car (i.e. the one that arrived first) will answer the first landing call. Directional preference should be maintained when a car stops for its last call until the doors close.

B18.5 DIRECTIONAL COLLECTIVE CONTROL FOR SINGLE LIFT

All calls shall be stored in the system and answered in sequence regardless of the order in which they are registered.

When the car is travelling in a given direction it shall travel to the further-most call, answering any car call or landing call for the corresponding direction of travel.

Landing calls for the direction opposite to that in which the car is travelling shall be by-passed but shall remain stored in the system to be answered when the car returns in the opposite direction.

When the car stops for the last call in its direction of travel, preference is given to car call(s) for an adjustable period.

When all calls have been answered the car remains with doors closed at the floor to which it last travelled.

B18.6 DIRECTIONAL COLLECTIVE CONTROL FOR TWO INTER-CONNECTED LIFTS

In addition to the features as required in Clause B18.5, it shall include the following supervisory features :-

When both cars are away from the landing of designated point of entry and all calls have been answered, one car shall return automatically to the landing of designated point of entry and is referred to as the 'Next' car. The second car remains at the floor to which it last travelled and is referred to as the 'Free' car. Both cars stand with doors closed.

With the cars standing with doors closed as described above, the first landing call shall be answered as follows :-

- (1) for a landing call from the landing of designated point of entry, by the 'Next' car.
- (2) for any other floor landing call, by the 'Free' car.

With the 'Free' car answering calls, the 'Next' car shall not start for 'Up' calls or 'Down' calls behind the 'Free' car until the 'Free' car is descending. If the 'Free' car is delayed for a pre-determined time which is adjustable, the controller shall operate to dispatch the 'Next' car.

With both cars standing at the landing of designated point of entry with doors closed, the 'Next' car shall answer the first landing call.

The passenger entering the 'Free Car' at the landing of designated point of entry shall be able to register a call and travel to any destination.

B18.7 AUTOMATIC GROUP SUPERVISORY CONTROL FOR 2-8 INTER-CONNECTED PASSENGER LIFTS

This group control system when specified in the Particular Specification shall incorporate a micro-computer or other similar solid state devices which continuously monitor the transportation demand and automatically adjust the group operation to suit the prevailing traffic pattern and to optimize passenger waiting time.

In the case of a fundamental change in the use or occupancy of the building, the system shall be re-programmable to cater for revised traffic pattern without inconvenient hardware modifications.

Facility shall be provided in the system such that the fault record and the actual traffic pattern of the lifts could be printed out when required.

Control system features to be included are generally as described below but by no means exhaustive which may be either included as standard or specified elsewhere in the Particular Specification.

(1) Flexible service sectors

The lifts shall operate as an interconnecting collective group and the system shall arrange for cars to answer demands in accordance with priorities established by recording the time that calls have been registered. The lifts are to operate as completely flexible units and shall not therefore invariably make round trips, or park at specific floors, or operate to specified programmes, or in accordance with despatch times.

Landing calls shall be grouped into 'UP' and 'DOWN' sectors, the number of floors included in each sector depending on the anticipated traffic and the degree of priority to be accorded to the occupants of the floors. The priority of each sector shall be determined by the length of time that calls have been registered in the sector. It shall be possible to increase or reduce the priority of a sector by reducing or increasing the units of time for a sector.

When not answering calls, cars shall park with doors closed at the floor at which the last passenger is discharged. When a call is registered, the nearest parked car shall answer the call and when travelling to the floor at which the call is registered it shall by-pass calls in sectors through which it may have to pass. Should there be more than one call in sectors embracing

several floors the car shall travel to the highest call in a 'Down' sector or the lowest call in an 'Up' sector.

When a car has answered all the landing calls in a sector to which it is assigned and the resulting car calls, it shall park at the final floor and become available for further assignment. When under normal condition of two way traffic, any car which has answered the calls in its assigned sector and is not fully loaded, shall answer landing calls in the same direction in any sector through which it is passing while answering the car calls resulting from the assignment. The presence of an intense local demand shall be detected and additional cars assigned to this demand as required, provided always that elsewhere are of lower priority.

(2) Heavy “Up” traffic

The heavy 'Up' traffic shall be detected through a load-weighing device and when cars loaded to 60% or more at the landing of designated point of entry two cars shall be assigned automatically to the landing of designated point of entry for a specific period. When lifts assigned to the landing of designated point of entry arrive, they shall stand with their doors in the open position with direction arrow illuminated. Cars not assigned to the landing of designated point of entry shall continue to answer demands elsewhere in the building in the normal manner.

(3) Heavy “Down” traffic

When heavy 'DOWN' traffic is experienced, the condition shall be detected when downward travelling cars are loaded to 80% capacity. Under this condition the despatching system shall ensure that lift service is equally distributed through the building and fully loaded cars shall automatically bypass landing calls in order to prevent unnecessary stops.

(4) Light traffic

As traffic requirements diminish, cars shall complete their assignments and park with closed doors wherever they happen to be. After a preset period the M.G. sets if provided shall shut down. Any subsequent landing calls shall cause the M.G. set of the nearest car to the call to start up.

(5) Pre-arrival chiming system

See Clause B 11.4.

(6) Traffic sentinel

An electronic detection system shall be incorporated to reduce the preset waiting time to landings and to supplement the operation of the door safety edge. After an adjustable period of time, the starting of the car shall be initiated immediately when the detection system detects that passenger movement across the threshold has ceased.

Should the sensor of the traffic sentinel be failed for an excessive period, the doors shall commence to close slowly after a pre-determined time delay.

(7) Car preference

It shall be possible to withdraw any car or cars from service for maintenance purposes or for attendant control by means of a key operated switch. Under this condition, other cars in the bank shall continue to answer calls in the system. If required, a car or cars shall be able to be withdrawn from the group and assigned to serve a selected floor/floors only.

(8) Car separation

An out-of-order car or cars shall be automatically separated from the group, while the remaining ones shall continue to operate under group supervision.

(9) Group operation of lifts under emergency power supply

Where a group of lifts are to be operated from the same emergency power source which is not sufficient to operate all the lifts at the same time, the Contractor shall provide an automatic selector switch such that upon the availability of emergency power, one lift at a time shall travel to and park at the landing of designated point of entry to release passengers. After all lifts are parked at the landing of designated point of entry, the emergency power supply shall remain connected to one of the lifts.

In case where the group of lifts consists of fireman's lift(s), sufficient emergency power shall be available for the operation of the fireman's lift(s) and the sequential returning of the other non-fireman's lift(s) of the group to the designated point of entry at the same time. The operation of the fireman's lift(s) shall not be affected in any case.

The Electrical Contractor will provide conduit/trunking facilities for the interconnections between different lift machine rooms, where applicable. The interconnecting control cables shall be provided by the Contractor.

B18.8 ENERGY MANAGEMENT OF LIFT SYSTEM

The following energy management provisions shall be included in the lift control system for a bank of lifts:

- (1) Under normal operating status, at least one lift car of a lift bank shall operate under a standby mode during off-peak period when the traffic demand on the vertical transportation system is low.
- (2) Under a standby mode of operation, a lift car shall not respond to passenger calls until it returns to the normal operation mode. If the lift is utilizing DC MG motor drive, the driving motor of the DC MG motor drive system shall also be shut down during this standby mode operation.
- (3) For each lift car within a lift bank, when it has been idling for 2 minutes with the lift doors closed, the lift car's ventilation shall be shut off automatically until the lift car is activated again by passenger call.

SECTION B19

POWER SYSTEM APPLICATION

B19.1 SPEED AT AND BELOW 1.75 M/S

For lift speed at and below 1.75 m/s, the power system shall be either D.C. geared variable voltage, or A.C. variable voltage (ACVV), or A.C. variable voltage variable frequency (ACVVVF) system, with levelling accuracy ± 10 mm. The motor rating shall be 180 starts per hour.

B19.2 SPEED ABOVE 1.75 M/S

For lift speed above 1.75 m/s, the power system shall be either D.C. gearless variable voltage, or A.C. variable voltage (ACVV), or A.C. variable voltage variable frequency system (ACVVVF), with levelling accuracy of ± 10 mm. The motor rating shall be 180 starts per hour.

B19.3 BED/PASSENGER LIFT

The power system shall be either A.C. variable voltage (ACVV), or A.C. variable voltage variable frequency (ACVVVF), or D.C. variable voltage system. The lift shall be steady in acceleration and deceleration with a levelling accuracy of ± 10 mm. The motor rating shall be 180 starts per hour.

B19.4 HYDRAULIC LIFT

Except where specified in the Particular Specification, all hydraulic lifts shall have a maximum speed not exceeding 0.5 m/s with levelling accuracy of ± 5 mm. The hydraulic system shall be rated for 45 motor starts per hour.

SECTION B20
ALARM BUZZER / BELL SYSTEM,
SUPERVISORY CONTROL PANEL, INTERCOM SYSTEM,
TELEPHONE AND CLOSED CIRCUIT TELEVISION

B20.1 ALARM BUZZER / BELL SYSTEM TO BE PROVIDED

Where additional alarm device is specified in the Particular Specification and/or on the Drawings in addition to the system specified in Clause B8.11, The Contractor shall be responsible for the provision of all cabling, buzzers (or alarm bells) and indicator board(s) in connection with all alarm system specified in this General Specification.

The alarm buzzers/bell and indicator board(s) shall also be connected to the batteries specified in Clause A6.7.

The indicator board(s) shall have visual and audible alarms for all lifts and shall include a mute switch for silencing the alarm buzzer(s) / bell(s) and a reset switch to reset the alarm. The alarm buzzer(s)/bell(s), after muting, shall have audible signal again when there is a second alarm. The indication light(s) shall remain on until all alarms are cleared by resetting at the indicator board(s).

B20.2 CONDUIT/TRUNKING FACILITIES BY ELECTRICAL CONTRACTOR

The Electrical Contractor or others will be responsible for the provision of conduit facilities for the alarm buzzers/bells and the supervisory control panel at the landing of designated point of entry between the lift shaft and the position of the panel. The Contractor shall furnish sufficient information to the Supervising Officer in good time before the conduit installation work is commenced on site. The Contractor shall be liable for all expenses incurred due to his failure to comply with the above requirement.

B20.3 SUPERVISORY CONTROL PANEL

Where supervisory control panel is specified in the Particular Specification and/or Drawings, the Contractor shall be responsible for the provision of all cabling, visual and audible signal components, and controls for the supervisory control panel from all lifts to the supervisory control panel that is located in the caretaker's office at the landing of designated point of entry unless otherwise specified.

The supervisory control panel shall include at least, but not exclusive, the following basic facilities :-

- (1) 'In service/Out of service' LED lights for each lift.
- (2) Floor/position indicators for each lift.
- (3) Up/Down direction indicator arrows for each lift.
- (4) System fault alarm buzzer / bell and LED indication lights.

- (5) Mute button for alarm buzzer / bell, and alarm reset button.
- (6) Power on indicator.
- (7) Lamp test button
- (8) Repeater master unit for intercom system as specified in Clause B20.4
- (9) 'Under Fireman control' LED light for each Fireman's lift

The conduit/trunking facilities from the lift shaft at the landing of designated point of entry to the position of the supervisory control panel will be provided by others as in Clause B20.2.

B20.4 INTERCOM SYSTEM FOR PASSENGER, BED/PASSENGER AND GOODS LIFTS

An intercom system, or similar device powered by the emergency supply specified in Clause A6.7 shall be provided by the Contractor for all passenger, bed/passenger and goods lifts between the lift car and the lift machine room. The intercom system shall comprise a 2-way speaker in each lift car station and a master control station located in the lift machine room. The master control station shall have the following facilities:

- (1) a 2-way speaker to allow communication between lift cars and the master control station.
- (2) a master switch of spring return type to allow simultaneous communication between the master control station and all lift cars.
- (3) Selective switches of spring return type to allow communication between the master control station and each lift car, one at a time.

Where specified in the Particular Specification and/or on the Drawings, a repeater master unit shall also be provided in the caretaker's office. The conduit/trunking facilities to the caretaker's office will be provided by the Electrical Contractor or others. All cabling shall be carried out by the Contractor.

B20.5 TELEPHONE

Where specified in the Particular Specification and/or on the Drawings, the Contractor shall provide a recess cabinet in the lift car panel for the installation of a wall mounted type telephone set. The door of the cabinet shall match with the control station panel and be boldly engraved "Emergency Telephone" in red English and Chinese characters. The telephone set will be provided by others but the Contractor shall co-ordinate and provide the appropriate telephone cable(s) from the lift car to a connection terminal at a location as specified in the Particular Specification and/or on the Drawings. The conduit/trunking facilities will be provided by others as in Clause B20.2.

B20.6 CLOSED CIRCUIT TELEVISION

For all passenger lifts, bed/passenger lifts and goods lifts, the Contractor shall supply and install a colour Closed Circuit Television (CCTV) system which shall have the following facilities:

- (1) a CCTV camera mounted on the ceiling of the lift car;
- (2) a colour CCTV monitor located at the lift machine room;
- (3) a colour CCTV monitor located at the building management office or the caretaker's office or at a location as specified in the Particular Specification and/or on the Drawings;
- (4) separate and independent lift travelling audio/video cable(s) for the CCTV system connecting between the CCTV camera installed in the lift car (with the corresponding power supply MCBs in the MCB boards in the lift machine room) and the CCTV monitor(s) respectively;
- (5) a suitable CCTV camera mounting frame/provision on top of the lift car for the installation of the CCTV camera;
- (6) a suitable CCTV monitor mounting frame/provision in the room as specified in the Particular Specification and/or on the Drawings for the installation of the CCTV monitor;
- (7) all the conduit and trunking facilities inside the lift shaft and the machine room (conduit and trunking facilities outside lift shaft and lift machine room will be provided by others unless otherwise specified);
- (8) the following provisions are required when interfacing with the display monitor(s) of burglar alarm and security system is specified in the Particular Specification:-
 - (i) The lift supervisory control panel shall be installed adjacent to the security control console. The exact location of the panel shall be subject to the Supervising Officer's direction on site.
 - (ii) Sub-clauses (3) and (6) above are no longer applicable. The Contractor shall not be required to install an independent set of CCTV display monitor adjacent to the security control console. The images captured by the lift CCTV camera shall be displayed at the monitors of the security control console. The Contractor shall integrate a set of CCTV video signal and emergency alarm signal output connection sockets on the lift supervisory control panel for others to connect the signal output through appropriate plugs to the display monitors of the security control console based on the following conditions:
 - (a) the security control console will be supplied and installed by others;

- (b) the emergency alarm signal shall be the one from the emergency alarm bell inside each lift car as specified in Clause B8.11 and it shall enable the security control console to immediately switch a monitor to display the lift car image on receiving such alarm;
- (c) the CCTV video signal and emergency alarm signal output connection sockets on the lift supervisory control panel shall be BNC panel sockets;
- (d) the Contractor shall supply associated connection plugs, which shall suit the BNC panel sockets on the lift supervisory control panel and shall not be less than the sockets in quantity, to the security control console specialist contractor who shall then be responsible for the wiring from the security control console to the plugs;
- (e) the BNC connection plugs and sockets shall be of 75 ohm impedance type, service voltage up to 500 V peak and frequencies up to 4000 MHz, and accept common RF cable;
- (f) the video signal shall be 1.0 V p-p composite; and
- (g) the Contractor shall also co-ordinate with the security control console specialist contractor to ensure that the video signal and alarm signal outputs are compatible with the security control console by providing all necessary built-in transducers (the signal outputs to the security control console shall be either analogue or digital as specified in the Particular Specification).

In addition to the above requirements, the CCTV system shall also comply with the latest version of the General Specification for Monochrome and Colour Closed Circuit Television Systems (Specification No. ESG14) issued by the Electrical and Mechanical Services Department, Government of the Hong Kong Special Administrative Region.

The CCTV system shall be supplied, installed and maintained by licensed security contractor or workers under the Security and Guarding Services Ordinance, Cap.460.

SECTION B21

FIRE SERVICES REQUIREMENTS

B21.1 FIREMAN'S LIFT

Where called for in the Particular Specification, Fireman's Lift(s) provided shall satisfy the following conditions :-

- (1) Lift shaft openings shall be provided with automatic self-closing fire-resisting doors.
- (2) It shall be of a minimum size of 1.35 m² net internal car floor area, with a minimum rated load of 680 kg.
- (3) It shall be provided with a suitable control switch at the landing of designated point of entry to enable the Fire Services personnel to gain immediate control over the lift and return it to designated floor. When a Fireman's Switch is operated the lift shall return to the landing of designated point of entry without stopping for car or landing calls. Sole control of the lift shall then be rested in the car control station, and the Fire Services personnel need only take three simple steps to operate the lift :-
 - Press the desired floor button or 'door close' button continuously to close lift door and register call.
 - On arrival at the desired floor, press 'door open' button continuously until lift doors are fully open.
 - If another floor is desired, press floor button of that floor.

In case of power interruption or changeover from the normal power supply to the emergency power source after the Fireman's Switch is operated, the fireman's lift shall continue to be in the "Fireman" control mode as soon as the power supply to the fireman's lift is made available.

The following conditions shall be complied with: -

- (i) The fireman's lift shall immediately continue to return automatically to the landing of designated point of entry without stopping for car or landing call if the fireman's lift was returning to the landing of designated point of entry upon operation of the Fireman's Switch before the power interruption.
- (ii) If the fireman has gained control of the fireman's lift and the fireman's lift stopped at a certain floor with the doors not fully closed before the power interruption, the doors shall automatically open.

The opening and closing of the doors shall be by pressing continuously the respective control buttons as under fireman's lift operating mode and the lift shall operate according to (iii) when the lift doors are fully closed.

- (iii) If the fireman's lift was travelling, or the lift doors were closed before the power interruption, the fireman's lift shall start to travel to the desired floor when that floor button is pressed, or as an alternative, return to the landing of designated point of entry or the nearest landing below and resume the fireman's control mode.
- (4) The electric fan on top of the lift car shall be stopped automatically upon the opening of the safety hatch.
- (5) The speed of the lift car shall be such that it will reach the topmost discharge point of the building in not more than 1 minute, calculating from the time when the lift doors on the lowest discharge point are completely closed to the time when the lift doors at the topmost discharge point start to open.
- (6) The opening of the lift door shall not be less than 800 mm wide and 2000 mm high. The doors shall be fitted with power operated automatic self-closing device.

B21.2 FIREMAN'S SWITCH

The fireman's lift shall be provided with a suitable control switch, clearly indicated in English and Chinese as Fireman's Switch, at the designated point of entry to enable Fire Services personnel to gain control over the lift which, upon operation shall override the instructions registered and return to the designated point of entry as quickly as mechanically possible.

For easy identification of Fireman's lift which conform to this standard, a red and white diagonal striped backing shall be provided behind the glass of the Fireman's switch.

The Fireman's Switch shall be of a type which does not require a key for operation. Where a two-button switch is used the operated button shall remain depressed to indicate which button is in operation. Where a toggle switch is used the "down" position shall correspond to the "on" position. The Fireman's Switch shall be located adjacent to the lift opening at the designated point of entry and shall be at a height of approximately 2 m above the floor level. Where two or more lifts are installed together, the switch shall be labelled such that there is no doubt as to which lift it controls.

B21.3 HOME LANDING OPERATION

Every lift shall be provided with a facility to bring the lifts to the designated point of entry in case of fire by manually operated key switch installed at the designated point of entry.

B21.4 ALL LIFTS TO RETURN TO LANDING OF DESIGNATED POINT OF ENTRY UPON ACTUATION OF FIRE ALARM SYSTEM

Where specified, the Contractor shall connect the lift control to the fire alarm system so that all lifts shall return to the landing of designated point of entry upon actuation of the fire alarm devices (other than smoke detectors) at the appropriate zone. Upon reset of the alarm system, the lifts shall only return to normal service after positive reactivation.

B21.5 RELEVANT LIFTS TO RETURN TO LANDING OF DESIGNATED POINT OF ENTRY UPON ACTUATION OF FIRE ALARM SYSTEM

Where specified, the Contractor shall connect the lift control to the fire alarm system so that upon actuation of the fire alarm devices (other than smoke detectors) at the particular zone, all lifts serving that zone shall return to the landing of designated point of entry. Upon reset of the alarm system the lifts shall only return to normal service after positive reactivation.

B21.6 REFUGE FLOOR

The doors of a fireman's lift, opening on to a Refuge Floor through a protected lobby shall not be opened until automatically released upon actuation of the Fireman's Switch, i.e. only the Fireman's Switch will have the capability of opening the lift doors at the Refuge Floor.

B21.7 NOTICE

A permanent notice of prominent size indicating which is(are) the fireman's lift(s) by the words in English and Chinese 'FIREMAN'S LIFT' (消防升降機) and the floors served, shall be displayed adjacent to the Fireman's Lift at the landing of designated point of entry. The notice shall be made of at least 0.8 mm thick stainless steel sheet or other approved material with engraved red letters in English and Chinese.

SECTION B22

REQUIREMENTS FOR BARRIER FREE ACCESS

B22.1 GENERAL

The lift for barrier free access shall also comply with the requirements stated in the Design Manual, Barrier Free Access 1997 issued by the Buildings Department, Government of the Hong Kong Special Administrative Region. The lift car shall have minimum dimensions of 1500 mm x 1400 mm with a clear minimum door width of 850 mm.

B22.2 LIFT CONTROL BUTTONS

Essential lift controls buttons such as the emergency alarm button, intercom button, door opening button, call buttons on landings, floor buttons in the lift car, shall not be lower than 900 mm or higher than 1200 mm above finished floor level. Braille and tactile markings shall be placed either on or to the left of the control buttons. Such markings shall be minimum 15 mm in height and 1 mm raised. All lift control buttons shall have a minimum dimension of 20 mm.

The graphics for tactile markings for 'Door Open', 'Door Close', 'Emergency Alarm', 'Designated Point of Entry' should be as shown in Figure 14 of the Design Manual, Barrier Free Access 1997. The tactile markings shall be of high contrasting colour background.

B22.3 HANDRAIL

A tubular stainless steel handrail between 45 mm and 51 mm in diameter shall be provided on 3 sides of the lift car, extending to within 150 mm of all corners. The handrail shall be 25 mm or more clear of walls and other obstructions, and shall be 1000 mm above finished floor level.

B22.4 LANDING AND CAR DOORS

On arrival of the lift to a landing in response to a car call or landing call, the landing and car doors shall be open automatically and be kept open for a pre-determined period before closing. This period shall be adjustable from 5 seconds to 30 seconds. An audible signal shall be provided to signify the closing action of the doors. A sensitive door re-opening device shall be provided to automatically initiate the re-opening of the doors in the event that a person is about to be struck by the doors in crossing the entrance during the closing movement.

B22.5 EMERGENCY ALARM PUSH BUTTON AND INTERCOM

There shall be an emergency alarm push button together with an indication light, a buzzer and an intercom inside the lift car such that the person inside can speak to the Building Management Office or the caretaker's office as the case may be. The indication light for acknowledgement shall be in the form of a blinking light adjacent to the intercom speaker and a notice "When light blinks, please speak or press alarm button again" (in English and Chinese) as approved by the Supervising Officer shall be provided next to the indication light.

In the Building Management Office or caretaker's office, there shall be a buzzer, an indication light and an intercom connected to the lift car or cars. A reset switch shall also be provided for the buzzer and the indication light.

The pressing of the emergency alarm push button inside the lift car shall actuate both buzzers and indication lights. The buzzer inside the car shall sound only while the emergency alarm push button is pressed. The emergency alarm push button shall have tactile marking of a bell and coloured yellow.

The system shall be connected to the battery and charger of the lift.

B22.6 DOOR JAMB

Tactile in Arabic numerals and Braille floor designations shall be provided at each lift entrance on both sides of jambs, by means of minimum 60 mm high, raised 1 mm and centred 1200 mm above the finished floor level.

SECTION B23

REQUIREMENTS FOR HYDRAULIC LIFT

B23.1 DRIVE SYSTEM

- (1) The lift car shall be driven by either direct acting or indirect acting (suspension) hydraulic system.
- (2) In case of direct acting system, the hydraulic ram shall be located either at the side, or the back. Unless otherwise specified, direct acting underneath the lift car is not acceptable.

B23.2 HYDRAULIC MACHINERY

(1) General

Hydraulic equipment and piping shall be accessible and shall be mounted in a position that will not interfere with equipment adjustment or affect maintenance. All pressure and volume controls shall be so constructed that they are not adjustable outside the safe working range of the system of which they form a part.

(2) Manual emergency operation

Readily accessible manual devices for emergency operation shall be provided in the machine room.

(3) Anti-creep device

Provision shall be made to automatically return the car to the landing level at a speed not exceeding 0.15 m/s in the event of a leakage in the hydraulic system causing the car to move downward for more than 75 mm but within the unlocking zone.

(4) Ram

Ram shall have smooth cylindrical external surfaces and, if hollow, shall be of approximately uniform thickness. Grey cast iron or other brittle material shall not be used for rams or connecting links. Grey cast iron, where used in other parts of the ram assembly shall have a safety factor of not less than 10. Rams shall not be subjected to bending stresses or eccentric loading.

(5) Valves

The hydraulic system shall incorporate all the components necessary to ensure safety and to give smooth starting and stopping, and the control valves shall be adjusted to suit general passenger/goods traffic. A stopcock shall be provided between the control valves and the cylinder(s), and also between the reservoir tank and the pump if the pump is mounted outside the tank.

(6) Cylinders

Cylinders shall be so mounted that they are subjected only to axial loads. All necessary supports, and mountings of the cylinders shall be provided by the lift manufacturer, including covers for any boreholes. The neck of a cylinder shall incorporate an efficient gland, a wiper ring and a drainable cup to gather wiped oil.

(7) Suspended system

Where the car is suspended, the cylinders shall be solidly mounted on the building structure and the head of the ram adequately guided or supported to carry the rope pulley. A device shall be incorporated which will initiate the closing of the lowering valve in the event of the car being prevented from descending by an obstruction. The device may be either a low pressure switch in the hydraulic line or a slack rope switch.

(8) Pump and motor

The pump and pump motor shall be mounted on one robust bedplate or within the power unit assembly if it is suitably rigid. The motor pump and bearing(s) shall be so mounted and assembled that proper alignment of these parts is maintained under all normal operating conditions. The power unit shall be generously rated and shall operate with minimum noise and vibration. The unit shall be mounted on vibration insulators above the machine room floor. A silencer unit shall be fitted in the hydraulic system to minimise the transmission of pulsations from the pump to the car and the elimination of airborne noise. An oil filter shall be fitted on the pump inlet. A stopcock shall be provided to enable the filter to be cleaned or changed without significant loss of oil. The pump motor shall be of the single speed squirrel cage or slip ring type and it shall run with minimum noise and vibration. It shall be capable of a continuous duty cycle of at least 45 motor starts per hour.

(9) Pipes

Rigid steel pipe shall be used. All welded joints shall comply with BS 2633. Hydraulic piping shall be effectively isolated from the building structure to minimise the transmission of vibration.

(10) Design pressure

All cylinders, rams, pipes, valves, and fittings shall be designed such that under the forces resulting from a pressure equal to 2.3 times the full load pressure, a safety factor of at least 1.7 referred to the proof stress is assured.

(11) Oil storage tank

The tank shall have sufficient capacity to provide an adequate reserve to prevent the entrance of air or other gas into the system. A sight glass tube shall be provided for checking the oil level and the minimum level mark shall be clearly indicated. An oil level monitoring device shall be provided, and if operated, shall maintain a visual and audible signal in the control panel until the fault is rectified.

B23.3 SUSPENSION

Where the raising of the lift is achieved by the use of steel wire ropes interposed between the ram and the car, the steel wire ropes suspension shall be arranged in such a way that the cylinders impose only vertical loads on the building structure.

B23.4 TRANSFER OF LOADS TO CAR FRAME GUIDES

The car platform frame shall be so designed and constructed that all eccentric loads are transferred to the guides and not to the ram attachments.

B23.5 SAFETY GEAR

- (1) Instantaneous car safety-gear shall not be fitted to direct acting hydraulic lifts. When any other form of car safety-gear is fitted to a direct acting lift, provision shall be made to absorb any impact loading at the cross-head due to the inertia of the ram and attachments.
- (2) All hydraulic cylinders shall be fitted with an integral or flange-bolted rupture valve which shall stop the descent of car cage.

B23.6 LEVELLING

(1) Levelling accuracy

The control system shall be provided with a floor levelling device which shall automatically bring the lift car to a stop within ± 5 mm of level with any floor for which a stop has been initiated, regardless of the load or direction of travel.

(2) Re-levelling device

An automatic re-levelling device shall be provided which shall be arranged to automatically return the lift to the floor should the lift creep down from floor level for a distance not exceeding 75 mm.

SECTION B24

REQUIREMENTS FOR SERVICE LIFT

B24.1 DEFINITION

Service lift means a permanent lifting equipment serving defined landing levels, comprising a car, the interior of which is INACCESSIBLE to PERSON on account of its dimensions and means of construction.

The car floor area shall not exceed a value determined from the table below:

<u>Rated Load (kg)</u>	<u>Maximum Floor Area (m²)</u>
10	0.15
50	0.50
100	0.75
200	1.00
250	1.00

Neither the internal depth nor the internal width of the car shall exceed 1.40 m.

The overall internal height of the car shall not exceed 1.20 m.

The rated load shall not exceed 250 kg.

B24.2 LIFT CAR AND METHOD OF DRIVE

Service lift cars shall be of rigid construction and totally enclosed except for service openings. The car shall not be made of inflammable materials. Two pairs of renewable guide shoes shall be fitted.

Unless otherwise specified, removable shelves shall be fitted inside the car and be so retained that they shall not be displaced by the movement of the car.

Cars shall be provided with imperforate doors to prevent goods projecting outside the car.

The method of drive for the lift shall be one of the following:

- (a) by traction, i.e. sheaves and ropes; or
- (b) by positive drive using drum and ropes without counterweights.

B24.3 GUIDE

The car and counterweight shall each be guided by rigid guides.

Guides and their fixings shall be capable to withstand the application of the safety-gear (if provided) when stopping a fully loaded car or counterweight.

B24.4 BUFFER

Buffers shall be provided under all cars and counterweights.

A lift with positive drive shall be provided with additional buffers on the car top to function at the upper limit of travel.

The buffers used shall be one of the following types:

- (1) spring;
- (2) rubber; or
- (3) resilient plastic.

B24.5 COUNTERWEIGHT

Counterweights shall be of metal. A metal frame shall be provided to prevent their displacement.

In the case of drum drive, there shall be no counterweight.

B24.6 SUSPENSION

Cars and counterweights shall be suspended by means of round strand steel wire ropes. The factor of safety of suspension ropes shall not be less than 10.

The minimum number of ropes shall be two and they shall be independent. The diameter of sheaves or pulleys shall not be less than 30 times the rope diameter.

B24.7 SAFETY GEAR

Safety gear tripped by an overspeed governor shall be provided for the car where:

- (1) the rated capacity is 250 kg;
- (2) accessible spaces exist beneath the lift well; or
- (3) gross car roof area equals to or greater than 0.37 m^2 .

Where there is an accessible space beneath the well, the counterweight shall be equipped with safety gear.

B24.8 LOAD PLATE AND WARNING NOTICE

A load plate giving the contract load of the lift in kg shall be fixed in a prominent position at each landing entrance.

A warning notice in both English and Chinese bearing the words 'Persons are forbidden to enter the lift car or enclosure' as approved by the Supervising Officer shall be prominently fixed at each landing entrance.

B24.9 CAR AND LANDING DOOR

All landing openings in the lift well shall be protected by doors. Every car or landing door shall be provided with an electric safety device which shall prevent the lift from being operated when any car or landing door is open.

It shall not be possible during normal operation to open a landing door unless the car is in the unlocking zone.

The landing doors shall be provided with the facility of being unlocked from outside with the aid of a special purpose key provided for use only by a competent lift worker.

B24.10 TERMINAL STOPPING SWITCHES

Service lifts shall be provided with terminal stopping switches to stop the car automatically at or near the terminal service levels.

B24.11 INSTRUCTIONS FOR EMERGENCY OPERATION

In the machine room or the interior of the machine enclosure, the Contractor shall provide a framed notice of reasonable size with detailed instructions to be followed in the event of lift breakdown particularly concerning the use of the device(s) provided for manual emergency movement and the unlocking key for landing doors. Details of the framed notice shall be approved by the Supervising Officer.

The direction of movement on the car shall be clearly indicated on the machine.

SECTION B25

REQUIREMENTS FOR MACHINE-ROOM-LESS LIFT

B25.1 DEFINITION

A machine-room-less lift is a lift installation where all its driving machinery and safety components are installed inside the lift shaft and the requirement for a lift machine room is not necessary.

B25.2 STATUTORY REQUIREMENTS

The machine-room-less lift proposed by the Contractor shall be of a type approved by the following Government Departments of the HKSAR:-

- (1) The Electrical and Mechanical Services Department
- (2) The Fire Services Department
- (3) All other relevant government departments

Any deviations from statutory requirements shall also be highlighted by the Contractor at the time of Tender submission.

The Contractor shall be responsible for preparing and arranging all necessary submissions to the relevant government departments for applying modifications/exemptions, where applicable.

B25.3 SPECIFIC REQUIREMENTS

The following specific requirements shall be complied with:

- (1) Maintenance, repair, major alteration, replacement and examination of the overspeed governor and machine shall be able to be carried out on the car roof safely and without difficulty;
- (2) Both the overspeed governor and motor brake shall be able to be observed through a window of the control panel provided by the Contractor outside the lift well or by an inspection door at the lift well provided by the Building Contractor. The position and dimensions of such inspection door shall be designed by the Contractor and approved by the Supervising Officer;
- (3) Tripping and re-setting of the overspeed governor shall be able to be remotely controlled outside the lift well;
- (4) The motor brake shall be able to be remotely released outside the lift well;
- (5) When the counterweight buffer is completely compressed, the over-travel of the lift car above the upper terminal landing floor level shall not exceed a dimension that will hinder the release of passengers in a safe manner;

- (6) Sufficient lighting shall be provided for illumination of the overspeed governor and machine in the lift well; and

B25.4 CONTROL PANEL

When the control panel is located outside the lift well, it shall be lockable and only accessible by authorized person. Position of the control panel shall be as specified in the Particular Specification and/or on the Drawings. It shall be enclosed by a rigid enclosure constructed of stainless steel frame and stainless steel sheet of minimum 1.5mm thick unless otherwise specified. The door(s) of the enclosure shall not open towards the control panel and shall be fitted with a lock which can be open without a key from inside and can be locked without a key from outside. It shall bear on the outside face a notice in English and Chinese in letters and characters not less than 25mm high as follows:-

UNAUTHORIZED ACCESS PROHIBITED
LIFT CONTROL PANEL
CLOSE AND LOCK THIS DOOR
不得擅進
升降機控制柜
請關閉並緊鎖此門

When the control panel is located inside the lift well, it shall be located at a position that will enable the lift maintenance personnel to carry out inspection and maintenance work in a safe and efficient manner. All necessary working platform and access to the control panel shall be provided by the Contractor.

B25.5 PROVISIONS FOR RESCUE OF PASSENGERS

The following facilities shall be provided by the Contractor and be readily available for use by the rescue personnel:-

- (1) Car lifting tool for moving the car in case it is stuck.
- (2) Weights for adding to the car in case of balanced loading condition where the car cannot be moved by releasing the motor brake, or other means to move the lift car as approved by the relevant Authorities and the Supervising Officer.

PART C - ESCALATOR AND PASSENGER CONVEYOR **INSTALLATION**

SECTION C1 **STEPS**

C1.1 STEP DEMARCATION

The surface of the steps shall be horizontal at all positions exposed to passenger.

The nominal width of steps shall be 1000 mm unless otherwise specified. Yellow lines of 25 mm width shall be marked on both sides and front of the leading/trailing edges of the steps with durable and wear resistant materials to show demarcation between comb and cleat.

C1.2 INTEGRAL DIE-CAST ALUMINIUM STEP TREAD AND RISER

The step treads shall be die-cast aluminium with closely spaced cleats designed to provide a secure foothold, the latter being grooved parallel to the travel of the steps to mesh with the comb teeth at the entrance and exit. Step risers shall also be die-cast aluminium integral with the step treads and shall include vertical cleats designed to pass between the cleats of the tread on the adjacent steps thus providing a combing action with minimum clearances.

C1.3 ROLLERS

Each step shall be supported on four rubber or synthetic material tyred ball bearing rollers, grease sealed for life and so mounted that tilting and rocking of steps is prevented whilst ensuring smooth quiet operation in service.

C1.4 TRACTION

Traction to the steps shall be by means of two endless roller chains.

C1.5 DIMENSIONS OF STEP

The depth of any step in the direction of travel shall not be less than 400 mm.

The rise of any such step shall not be more than 240 mm.

C1.6 CLEAR HEIGHT ABOVE STEP

The clear height above the steps at all points shall not be less than 2.30 m.

C1.7 FLAT STEPS

There shall be at least a length of two complete steps i.e. 0.80 m at either end of the escalator travelling horizontally from the comb line.

SECTION C2

STEP CHAINS

C2.1 STEP CHAIN

The steps shall be driven by at least 2 steel link chains of which at least one shall be located at each side of the step.

C2.2 MATERIALS

The step chains shall be made of high tensile steel links with hardened and ground pins, unless otherwise specified.

C2.3 QUIET OPERATION

The rollers shall accurately engage with the drive sprockets to ensure smooth and quiet operation.

SECTION C3

TRACKS

C3.1 CURVED SECTION

All the curved sections of the tracks shall be manufactured in steel or aluminium pressure die-castings.

C3.2 STRAIGHT SECTION

The straight sections of the tracks shall be of steel or aluminium extrusions. The tracks forming both running surfaces and guards over the trailing rollers shall essentially be channels or of such formation as to prevent derailing.

SECTION C4

LANDING OPENING AND LANDING PLATE

C4.1 OPENING

Openings of adequate size in the floor will be provided by the Building Contractor on both upper and lower landings. The Contractor shall indicate on site the exact dimensions of the openings, excavation, drains and ventilation holes required.

C4.2 LANDING PLATE

Removable floor landing plates shall be provided by the Contractor over the openings to give access to the mechanism for maintenance purpose. These landing plates shall be of stainless steel or wear resistant aluminium alloy which shall afford a secure foothold. Alternative material will not be accepted without the prior approval of the Supervising Officer.

C4.3 LANDING GAP

The gap between the balustrade exterior panelling and the wall or obstacle shall not exceed 100 mm.

SECTION C5

COMBS

C5.1 COMBS

Combs shall be provided at the top and bottom landings and shall be wear resistant aluminium alloy with anti-slip pattern.

C5.2 COMB TEETH SECTION

The comb teeth sections shall have fine pitch teeth to allow the cleats of the step tread to pass them with a minimum of clearance. The comb teeth sections shall be made of synthetic resin, metal or equivalent material.

Each such comb teeth sections shall be such that

- (1) it is adjustable horizontally and vertically; and
- (2) sections forming the same are readily removable in case of emergency.

The teeth of every comb teeth section shall be so meshed with and set into the slots of the tread surface of the steps of the escalator that the points of such teeth are always below the upper surface of such tread surface.

SECTION C6 **BALUSTRADING**

C6.1 BALUSTRADES

Solid balustrades shall be installed on each side of the escalator and shall consist of the following components:-

(1) **Skirting**

The skirting panels shall be vertical and constructed of smooth hairline finish stainless steel with thickness of not less than 2 mm. Embossed, perforated or roughly textured materials shall not be used.

(2) **Interior profile**

The interior profile shall be of hairline finish stainless steel with thickness not less than 2 mm. The interior profile and the balustrade interior panelling shall have an angle of inclination of at least 25° to the horizontal.

(3) **Interior and exterior panelling**

Both the interior and exterior panelling shall be of hairline finish stainless steel with thickness of not less than 1.5 mm. If glass balustrade is specified, the glass shall be of a laminated or splinter-free one-layer safety glass (tempered glass type) and shall have sufficient mechanical strength and rigidity. The glass panels shall be at least 6 mm thick.

(4) **Balustrade decking**

The decking shall be of stainless steel or extruded aluminium, polished and anodized in natural colour. The decking is to be situated under the handrail and forms the top cover of the balustrade panelling. Appropriate measure shall be provided to discourage people from sliding along the decking.

(5) **Extended newel**

The newel including the handrails shall project beyond the root of the comb teeth by at least 0.6 m in longitudinal direction.

C6.2 DRESS GUARD

Dress guards of brush bristles type shall be provided along the full length of the lower part of the skirting panels.

Brush bristles type dress guard shall be made of nylon filaments. The nylon filaments shall not support combustion and shall be durable and with flagged ends to give a soft face and be securely held within a pressed steel holder. The assemblies shall be easily removed when replacement is necessary. It shall consist of anodised aluminium carrier which is suitable for the escalator sidewall. The bottom of the carrier shall have chamfer angle to eliminate trapping of feet, trolley wheels and parcels, etc. The carrier shall be fixed onto the skirting panel

by secret fixings which are concealed by the filaments but are easily removable.

C6.3 EXTERNAL CLADDING

Unless otherwise specified, the external cladding of the undersides and sides of the escalator will be of materials having a F.R.P. of not less than half an hour and will be provided by the Building Contractor.

C6.4 GUARD FOR ADJACENT BUILDING OBSTACLES AND CRISS-CROSS ESCALATORS

Where building obstacles and criss-cross escalators can cause injuries to passengers riding on escalators, appropriate preventive measures shall be taken. In particular, at floor intersections and criss-cross escalators, a set of vertical obstruction guard shall be provided and placed above the balustrade decking.

For vertical building obstacles or columns, unless other approved preventive measures (e.g. buffer protection surfaces) are taken, fixed guards shall be installed. The fixed guards would not be required if the vertical building obstacle or column has a radius of curvature of not less than 300 mm. The part of the vertical building obstacles or columns facing the escalator shall form part or whole of a smooth continuous surface extending from at least 100 mm below the top of the handrail to a height of at least 2100 mm above the step, pallet or belt of the escalator.

The position of the obstruction guards shall be such that it can effectively prevent injuries to the passengers. The guard shall be of light and durable material such as plastic as approved by the Supervising Officer.

It is not necessary to comply with the requirements as mentioned in this Clause when the distance between the centerline of the handrail and any obstacle is equal to or greater than 600 mm.

C6.5 SLIM TYPE ESCALATOR

For escalator with the horizontal distance between the balustrade interior panelling greater than the distance between handrail, the following additional requirement must be met :-

- (1) rated speed shall not exceed 0.5 m/s;
- (2) normal width of the step shall be at least 0.8 m; and
- (3) the distance between projection of the comb intersection line and the point at the newel where the handrails change their direction of the movement shall be at least 1.2 m.

SECTION C7 **HANDRAILS**

C7.1 RUBBER HANDRAIL

The handrails shall be constructed of multi-layered canvas with the exposed surface covered with smooth black abrasion resistant rubber which shall be vulcanised into an endless loop.

C7.2 SPEED

The handrails shall move in the same direction and substantially at the same speed as the steps. The speed of the handrail is permitted to deviate from the speed of the steps, pallets or belt within the limits of 0% to +2%.

C7.3 SAFETY GUARD

Safety guards shall be provided where the handrails enter and leave the escalator newels to prevent pinching of fingers and hands.

C7.4 HANDRAIL GUIDE

The handrail guides shall be in specially formed section to allow easy movement of the handrail but properly shaped as to retain the handrail always in its place.

C7.5 WIDTH OF HANDRAIL

The width of the handrail shall be between 70 mm and 100 mm.

C7.6 HANDRAIL CLEARANCE

The horizontal distance between the outer edge of the handrail and walls, adjacent criss-cross escalators or other obstacles shall under no circumstances be less than 80 mm and shall be maintained to a height of at least 2100mm above the steps, pallets or belt of the escalator/passenger conveyor.

SECTION C8

TRUSS

C8.1 CONSTRUCTION

The structural steel truss shall be a rigid steel fabricated structure and shall be capable of carrying a full complement of passengers together with mechanism of the escalator, the balustrades and the weight of exterior covering. The supporting structure shall be designed in a way that it can support the dead weight of the escalator plus a passenger weight of 5000N/m². The factor of safety used in the design of structural members of the escalator trusses shall not be less than 5 based on static load.

C8.2 STEP CHAIN BREAKING

The entire tracking system shall be so designed that in the unlikely event of a step chain breaking, there shall be no likelihood of the steps lifting out of place.

C8.3 MACHINERY SPACE

The upper section of the truss shall contain the drive machine and shall be fitted with a trap door. In cases where several drive machines are placed along the length of an escalator, suitable means of access to the drive machines shall be provided.

SECTION C9 **LUBRICATION**

C9.1 LUBRICATION

Effective means for lubricating the bearings and moving parts as required shall be provided with easy access.

C9.2 OIL PAN

Oil tight drip pans shall be provided for the entire length of the escalator to contain any waste and lubricants within the truss. Where necessary, the oil tight drip pans shall be removable to give access to both the machinery space and the return station for maintenance.

SECTION C10 **DRIVING MACHINERY**

C10.1 INDEPENDENT DRIVING MACHINE

Each escalator shall be driven by at least one machine of its own.

C10.2 REDUCTION GEAR

The driving machine shall incorporate a reduction gear system employing worm gear, planetary gear or other proven gear types.

(1) Worm gear system

The driving machine shall incorporate a worm reduction gear with a vertical flange-mounted motor or other proven design. It may be connected by chain or other proven means to the main drive shaft of the escalator. The worm shaft and worm wheel shall be housed in a substantial cast iron housing which shall also hold the lubricant.

(2) Planetary gear system

The motor, planetary gears and brakes shall be fully enclosed and form a unique, compact no-chain unit. Motor and bearings shall have life-time lubrication.

C10.3 MOTOR

The motor shall be integrally mounted, A.C. squirrel cage, three phase induction motor of continuous rating, reversible type with high starting torque and low starting current and specially designed for escalator application.

Other proven motor types may also be used subject to the approval by the Supervising Officer.

C10.4 SPEED

The rated speed of the escalator shall not be more than 0.75 m/s and 0.5 m/s for an escalator with an angle of inclination not exceeding 30° and 35° from the horizontal respectively.

The rated speed of passenger conveyors shall not exceed 0.75 m/s. However, this rated speed may be increased to 0.9 m/s maximum provided that:

- (a) the width of the pallets or the belt does not exceed 1.10 m;
- (b) at the landings, the pallets or the belt move horizontally for a length of at least 1.60 m before entering the combs.

C10.5 BEARING

The motor shall be fitted with grease lubricated ball bearings.

SECTION C11 **BRAKING**

C11.1 ELECTRO-MECHANICAL BRAKE

Each escalator shall be provided with braking that is mechanically applied and electrically held off type of sufficient capacity to efficiently bring the escalator to rest with uniform deceleration when travelling at full contract speed in either direction.

C11.2 AUXILIARY BRAKE

Escalators and inclined passenger conveyors shall be equipped with auxiliary brake(s) acting immediately on the non-friction part of the driving system for the steps, pallets or the belt (one single chain is not considered to be a non-friction part), if

- (a) the coupling of the operational brake and the driving wheels of the steps, pallets or the belt is not accomplished by shafts, gear wheels, multiplex chains, two or more single chains; or
- (b) the rise exceeds 6 m;
- (c) the operation brake is not an electro-mechanical brake;
- (d) they are "Public Service Escalators" as defined in the Code of Practice on the Design and Construction of Lifts and Escalators.

C11.3 HANDWINDING

Provision shall be made for handwinding the escalator in either direction, and shall be suitably marked for "UP" and "DOWN" operation. Crank handles and perforated hand wheels are not permitted. Instructions for handwinding devices in English and Chinese shall be displayed prominently in the machinery space. If the handwinding device is detachable, it shall not be accessible to unauthorized persons. The handwinding device shall be painted yellow.

C11.4 STOPPING DISTANCES

The stopping distances for unloaded and downward moving loaded escalators shall be between the following values :-

<u>Rated Speed</u>	<u>Stopping distance between</u>
0.50 m/s	min. 0.20 m and max. 1.00 m
0.65 m/s	min. 0.30 m and max. 1.30 m
0.75 m/s	min. 0.35 m and max. 1.50 m

The stopping distance for an unloaded escalator shall be close to the minimum value, while for a downward moving loaded escalator it shall be close to the maximum value.

The stopping distances for unloaded and loaded passenger conveyors shall be between the following values :-

<u>Rated Speed</u>	<u>Stopping distance between</u>
0.50 m/s	min. 0.20 m and max. 1.00 m
0.65 m/s	min. 0.30 m and max. 1.30 m
0.75 m/s	min. 0.35 m and max. 1.50 m
0.90 m/s	min. 0.40 m and max. 1.70 m

For escalators/passenger conveyors with intermediate speeds the stopping distances are to be interpolated.

The stopping distances shall be measured from the time the electric stopping device is actuated.

SECTION C12

FOOTLIGHTS AND STEP LIGHTS UNDER LANDINGS

C12.1 FOOTLIGHT

Footlights shall be provided on either side of the interior of the skirting at both upper and lower landings and energy efficient fluorescent luminaires shall be used. The intensity of illumination shall be not less than 50 lux for indoor; or shall be not less than 15 lux for outdoor escalators or passenger conveyors at the landings, measured at floor level.

C12.2 STEP LIGHTS UNDER LANDINGS

Energy efficient fluorescent luminaires shall be provided underneath landings to illuminate the clearance between steps, steps and skirting, steps and comb, at the horizontal steps portion of the escalator. The colour of these lights shall be green.

C12.3 REPLACEMENT OF LAMP

Facility shall be incorporated for the easy replacement of lamp.

SECTION C13 **SUPPORT BEAMS**

C13.1 CONCRETE SUPPORT

Concrete supporting beams will be provided by the Building Contractor at both landings and the intermediate support if required by escalators with a large vertical rise.

C13.2 MOUNTING FACILITIES

All other supports and mounting facilities, e.g. R.S.J. beams, mounting brackets, bearing plates, etc. required for the installation of the escalator shall be provided by the Contractor.

SECTION C14

SAFETY DEVICES

C14.1 SAFETY DEVICE

(1) Emergency stopping devices

Emergency stop devices shall be placed in conspicuous and easily accessible positions at or near to landings of the escalator. For escalators with rise above 12 m, and for passenger conveyors with a length of the treadway of more than 40m, additional emergency stopping devices shall be installed.

(2) Broken step chain device

The broken chain safety device shall be incorporated as part of the tension carriage, and they shall operate if the bottom sprocket moves unduly in either direction in the event of either both step chains breaking or becoming unduly lengthened due to wear of the pins, or tension in either chain dropping below a pre-determined value.

(3) Broken drive chain device

A device shall operate for breakage of the chain between the driving machine and the escalator main drive shaft. Auxiliary brake if provided shall also operate.

(4) Broken step device

If any part of the step is sagging so that meshing of the combs is no longer ensured, switching off shall be operated at a sufficient distance before the comb intersection line to ensure that the step which has sagged does not reach the comb intersection line. The control device can be applied at any point of the step.

(5) Broken handrail device

Broken handrail devices shall be situated inside both balustrades at the lower end of the incline, which shall be actuated if either or both handrails break.

(6) Non-reverse device

A non-reversing device shall be arranged to prevent a travelling escalator to slow unduly or attempts to reverse its direction of travel. The escalator shall be stopped once the device is operated and it shall only be started again by the key operated switch.

C14.2 OPERATION OF THE SAFETY DEVICE

The operation of any one of these safety devices shall cause the electrical supply to the driving motor to be disconnected and the electro-mechanical brake to be operated thus bringing the escalator to rest.

SECTION C15 **CONTROL**

C15.1 CONTROL STATION

(1) Position

Control station shall be provided at both the upper and lower landing newel, which shall contain an emergency stop switch, two key operated direction switches, an audio alarm switch and if specified a foot light switch. The station shall be so positioned as to enable any person operating any of the switches to afford a full view of the escalator.

(2) Type of switch

The emergency stop switch shall be push button type with a red button and shall be suitably protected against accidental operation. But the up and down directional starting switch shall be of the key-operated spring off type.

(3) Marking

All control switches shall be provided with clearly engraved markings both in English and Chinese.

C15.2 AUTOMATIC OPERATION

Escalators which start automatically by the passing of a user shall start to move before the person walking reaches the comb intersection line. This can, for instance, be accomplished by light-rays or contact mat.

The escalator shall be stopped automatically after a sufficient time (at least the anticipated passenger transfer time plus 10 seconds) the passenger has actuated the automatic starting device.

C15.3 PROVISION FOR FUTURE REMOTE MONITORING OF ESCALATOR

The Contractor shall provide dry contacts of the following output signals for each escalator installation in a stainless steel cabinet to serve as the interface unit for future connection by others:-

- (1) Normal/Fault status
- (2) Duty/Standby status
- (3) Power Supply Normal/ Fault status
- (4) Normal/ Essential Power status
- (5) Emergency stop button activated

This interface unit shall be located at the management office/caretaker's room next to the escalator monitoring panel unless otherwise specified on the Drawing and/or in the Particular Specification.

SECTION C16 **CONTROLLER**

C16.1 CONTENT

The controller shall be a self-contained unit containing all the necessary electromagnetic switchgears including a residual current circuit breaker, local control push buttons, d.c. power supply, etc.

C16.2 LOCATION

The controller shall be located in the truss at the upper landing, and provision shall be made for easy access for maintenance.

C16.3 METAL CABINET

The controller shall be fitted inside a dust proof 1.2 mm thick stainless steel cabinet.

SECTION C17 **MAINTENANCE FACILITIES AND NOTICES**

C17.1 MACHINERY SPACE LIGHTING

A permanent light, suitably protected, will be provided in the machinery space by the Electrical Contractor, and which can be switched without passing over or reaching over any part of the machinery.

C 17.2 SWITCHED SOCKET OUTLET

A 13 amp. 3 pin switched socket outlet will be provided by the Electrical Contractor in each escalator machinery space. The socket outlet will be fitted adjacent to the light switch.

C17.3 EMERGENCY STOP SWITCH IN MACHINERY SPACES

A stop switch for the machinery shall be provided in each machinery space where means of access to the space is provided.

The stop switch shall:-

- (1) be of a manually opened and closed type;
- (2) be conspicuously and permanently marked "STOP".

EXCEPTION : A stop switch needs not be provided in a machinery space if the main switch is located therein and close to the machinery.

C17.4 NOTICE ON THE ACCESS DOOR

On each access door to the machinery space in upper and lower landing a notice of durable materials with the inscription of the following message in English and Chinese shall be fixed :-

"Machinery space - danger, access prohibited to unauthorized persons".

C17.5 MARKING OF ESCALATOR

At least at one landing, the name of the manufacturer & the manufacturer's serial number shall be indicated, visible from outside.

C17.6 NOTICE FOR AUTOMATIC START

In the case of escalators starting automatically, a clearly visible and audible signal system, e.g. road traffic signals, shall be provided indicating to the user whether the escalator is available for use, and its direction of travel.

C17.7 NOTICES NEAR ENTRANCES OF ESCALATOR

The following notices for the user shall be fixed in the vicinity:-

- (1) Small children must be held firmly.
- (2) Dogs must be carried.
- (3) Stand facing the direction of travel; keep feet away from sides.
- (4) Hold the handrail.
- (5) Transportation of bulky and heavy loads not permitted.

Whenever possible, these notices shall be given in the form of pictographs. The minimum size of the pictographs shall be 80 x 80 mm. Pictographs shall be used as defined in Appendix 4.

SECTION C18
ALARM BUZZER/BELL

C18.1 ALARM BUZZER / BELL PROVIDED BY THE CONTRACTOR

An alarm buzzer / bell shall be supplied and installed in the machinery space which shall be sounded when any emergency safety device operates.

C18.2 TYPE OF ALARM BUZZER / BELL

The pattern of the alarms shall be distinguishable from that of fire alarms and shall be of the following two-tone pattern:

Low frequency:	600 Hz (± 15%)	Duration: 600 ms (± 20%)
High frequency:	920 Hz (± 15%)	Duration: 300 ms (± 20%)

SECTION C19
REQUIREMENTS FOR WEATHER-PROOF ESCALATORS OR
ESCALATORS IN MARKETS

C19.1 PROTECTION AGAINST WEATHER

The escalator(s) will be protected by a canopy or other similar structure constructed by the Building Contractor.

C19.2 PROTECTION AGAINST CORROSION

(1) Truss and metal work of escalator

The entire truss and metal work of the escalator other than moving parts shall be hot-dipped galvanized or adequately protected against corrosion by epoxy paint coating system designed for marine application.

The surface of the completed truss and metal work shall be prepared and treated in accordance with the epoxy paint coating manufacturer's recommendation. All rust and dirt on the surface of the truss and metal work shall be removed by wire brushing and the truss and metal work shall be thoroughly degreased by degreasing solvent prior to application of any paint coating.

The number, thickness and method of application of paint coating shall be in accordance with the epoxy paint coating manufacturer's recommendation but in any case at least three coats of epoxy paint coating system primer shall be applied followed by at least three coats of finishing epoxy paint coating. Each coat of paint shall be thoroughly dried before application of the next coat.

All the above-mentioned degreasing and painting process shall be carried out at the factory and painting of truss and metal work at site is not permitted without prior approval except for touching up of damaged paint coating during installation at site.

Welding carried out on site on the truss or any metal work that will damage the protective paint coating is not permitted unless prior approval is given. Where rust appears on the parts of the truss or metal work due to damage of paint coating, it must be thoroughly removed by wire brush, degreased and followed by application of the same number of paint coatings as in the factory to the satisfaction of the Supervising Officer.

Information on the epoxy coating system including details of surface preparation, method of application, number of coatings and samples of paints shall be submitted for approval prior to manufacture.

(2) Moving parts

Moving parts of the escalator including step driving chains, sprocket gears, steps, etc. which require greasing or oiling and any metal components which for functional reasons, shall not be painted.

These parts shall be constructed of corrosion resistant materials such as stainless steel or heavily electroplated with corrosion resistant materials such as nickel or chromium. These moving parts shall be adequately lubricated all the time by automatic oilers specified in Clause C19.3 and suitably protected from water entering into the escalator interior.

All ball or roller bearings such as those installed on the step driving chain, driving mechanism shall be of the sealed type.

C19.3 LUBRICATION

Automatic oilers shall be provided for chain lubrication and operated in pre-determined period. Device for separation of oil and water shall be provided if the lubrication system is of re-circulating type.

C19.4 DRIVING MACHINE

The driving motor shall have a degree of protection of at least IP 54. Watertight cover shall be provided on all bearings.

C19.5 ELECTRICAL WIRINGS AND ACCESSORIES

All exposed wiring terminals, junction boxes, switches, etc. shall have a degree of protection of at least IP 54.

C19.6 DRAINAGE

The Contractor shall provide effective drainage facilities for the escalator. A permanent drain point will be provided by the Building Contractor at the bottom of the escalator pit.

An additional drain point at the upper pit of an escalator shall be provided by the Contractor if found practicable so that water can be collected and directed to the nearest drain pit provided by others. An alarm giving a warning of flooding at the lowest escalator pit coupled with a timer to stop the escalator after a preset time shall be provided by the Contractor.

PART D – TESTING, COMMISSIONING AND MAINTENANCE

SECTION D1 **TESTING AND COMMISSIONING**

D1.1 ADJUSTMENTS, PERFORMANCE TESTS AND COMMISSIONING

The Contractor shall commission the installation and carry out complete performance tests for all equipment and systems installed by him, making all necessary adjustments including setting all controls and checking the operation of all protective and safety devices in accordance with the manufacturers' instructions, the requirements of the statutory rules and regulations and to the satisfaction of the Supervising Officer. Prior to any tests, the Contractor shall submit detailed procedures and a programme for testing and commissioning to the Supervising Officer for approval

D1.2 LABOUR AND MATERIALS

The Contractor shall employ a Registered Lift/Escalator Engineer under the Lifts and Escalators (Safety) Ordinance to undertake examination, testing and commissioning of the complete installation. All labour, materials, tools and instrument necessary for carrying out the work shall be provided by the Contractor. The Building Contractor will provide the necessary electricity supply but the Contractor shall coordinate with and to inform the Building Contractor his requirements.

D1.3 TESTING

The tests and examination undertaken by the Registered Lift/Escalator Engineer shall include those specified in the Code of Practice on the Design and Construction of Lifts and Escalators, the Code of Practice for Lift Works and Escalator Works and those recommended by the lift/escalator/passenger conveyor manufacturer. The relevant forms/certificates as required by the Lifts and Escalators (Safety) Ordinance shall be signed and submitted by the Registered Lift/Escalator Engineer to the Supervising Officer on completion of the lift/escalator/passenger conveyor installation.

Test and examination certificates as shown in the Appendix of BSB Testing and Commissioning Procedure No. 4 for Lift, Escalator and Passenger Conveyor Installation shall be submitted together with the relevant statutory forms upon completion of the installation.

Tests which purely demonstrate the performance characteristics of the lift shall be performed in the presence of the Supervising Officer or his/her Representative at the acceptance of the installation.

All instruments used in the testing and commissioning shall be calibrated as required. The period between calibration and testing shall not exceed the calibration period as recommended by the instrument manufacturer or twelve (12) months whichever is shorter.

At the end of the period of free maintenance as defined in Section D2 hereinafter, a thorough test shall be carried out by the Contractor and any defects found shall be rectified by the Contractor without charge to the Employer.

SECTION D2

MAINTENANCE DURING PERIOD OF FREE MAINTENANCE

D2.1 FREE MAINTENANCE

The Contractor shall, in addition to his obligations under the General Conditions of Contract, furnish maintenance free of charge for the entire installation for the whole Maintenance Period following the certified date of completion of the Contract. The extent of work required to be carried out is as follows:-

Planned maintenance

- (1) To be responsible for any repairs necessary to maintain the installation in good and safe working order at all times.
- (2) To despatch competent workers once weekly during normal working hours to maintain each lift in accordance with Appendix 1A - Maintenance Schedule for Electric Passenger, Goods and Service Lifts or Appendix 1B – Maintenance Schedule for Hydraulic Lifts, and to maintain each escalator/passenger conveyor in accordance with Appendix 1C – Maintenance Schedule for Escalator and Passenger Conveyor.
- (3) To supply all lubricants, cleaning materials, rope preservatives etc.
- (4) Replace all burnt out lamp bulbs/tubes with bulbs/tubes of correct rating.
- (5) To provide, repair or replace at no additional cost to the Employer such mechanical and electrical parts of the installation necessary for the safe and normal operation of the installation.

Emergency maintenance

- (1) To provide a 'call-out' service during and outside normal working hours to carry out emergency maintenance by competent workers.
- (2) To attend to any breakdowns reported to him by telephone (or other means) with the utmost effort and in no circumstances attendance to the breakdown shall exceed 30 minutes after the call is received. The Contractor's performance in this aspect will be reflected in the Contractor's Performance Appraisal Report for the Contract.

Statutory examination and testing

- (1) To carry out the periodic examination and periodic testing of the safety equipment as stated in the Lifts and Escalators (Safety) Ordinance and to provide such copies of the test certificates, duly signed by a Registered Lift/Escalator Engineer.

- (2) Provided always that any renewals or repairs necessitated by reason of negligence or misuse of the equipment by others or by reason of any other cause beyond the Contractor's control with the exception of normal wear and tear, these works shall be carried out by the Contractor, if so required by the Employer, at an additional cost to be negotiated by both parties.
- (3) All works under this maintenance provision shall be performed by the Contractor's directly employed competent workers under the supervision of the Contractor.

The Contractor shall at his own expense, make all suitable arrangements to avoid damage to the installations and works provided by others.

D2.2 FAULTS AND REPAIRS TO BE REPORTED AND RECORDED

A report in duplicate shall be sent to the Supervising Officer immediately following a major repair, or repeated breakdowns of service due to system or equipment fault of similar nature, or as and when required by the Supervising Officer.

The report shall include the cause necessitating such a repair, the reason of such a breakdown of service, the time and date that the repair carried out, the remedial actions taken, and the time and date that normal service is resumed. A list of equipment replaced shall also be attached to the report.

Reports on routine visits are not required to be sent to the Supervising Officer except where it is necessary to draw the attention of the Supervising Officer to the defects that could not be rectified during the routine visit. Each routine or callout visit shall be recorded on a logbook provided by the Employer. This logbook shall be retained in the lift machine room, or a location designated by the Supervising Officer. The format of the logbook is as shown in Appendix 2A. Instructions, as shown in Appendix 2B, for filling the logbook are provided inside the logbook.

D2.3 MAINTENANCE SCHEDULES

The Contractor shall carry out periodic inspections, tests, repairs, adjustments and maintenance of the installation during the Maintenance Period as stipulated in Appendix 1A, Appendix 1B and Appendix 1C.

APPENDIX 1A

MAINTENANCE SCHEDULE FOR ELECTRIC PASSENGER, GOODS AND SERVICE LIFTS

Schedule No.	Description of Job	Frequency
1	(a) Top up lift machine gearbox and lubricate bearings.	Weekly
	(b) Check brake for correct mechanical action. Ensure linings and drums are free from oil or grease. See Note 1	Weekly
	(c) Clean overspeed governor and lubricate.	Weekly
	(d) Inspect bearings of drums, sheaves and pulleys. Lubricate.	Weekly
	(e) Inspect motor/generator/exciter commutators and sliprings operating under working conditions and stationary. Lubricate bearings.	Weekly
	(f) Clean, inspect and adjust controller contacts, interlocks and dashpots. Lubricate. Observe and adjust operation sequence and timing of contactors.	Weekly
	(g) Clean floor selector, check action and adjust. Lubricate drive gear.	Weekly
	(h) Top up counterweight guide shoes lubricators.	Weekly
	(i) Clean up lift well as necessary. Clean pit. Inspect condition of lift well enclosure.	Weekly
	(j) Clean guides and lubricate where applicable.	Weekly
	(k) Check limit switches, direction switches and their operating devices. Ensure rollers and spindles are free to rotate. Lubricate.	Weekly

Schedule No.	Description of Job	Frequency
	<p>(l) Inspect car exterior and clean car top. Top up car guide shoe lubricators. Inspect tensioning devices for correct adjustment. Clean and inspect door operating gear and check for oil leaks. Lubricate.</p> <p>(m) Check door locks for safe operation. Ensure rollers and spindles are free to rotate. Lubricate. See Note No. 2.</p> <p>(n) Check that car and landing doors operate freely and bottom tracks are clear of debris.</p> <p>(o) Ride in car, observe and record irregularities in starting, stopping and general running.</p> <p>(p) Check for correct operation: - Car controls, car door switches, door re-opening device, emergency stop, alarm bell and intercom system. Inspect condition of car interior and floor covering. Observe levelling accuracy.</p> <p>(q) Test operation of landing buttons, indicators, and fireman switch.</p>	<p>Weekly</p> <p>Weekly</p> <p>Weekly</p> <p>Weekly</p> <p>Weekly</p> <p>Weekly</p>
2	<p>(a) Inspect lift machine gearing and bearings. Ensure keys and fixing bolts are secure.</p> <p>(b) Inspect brake coupling and linings for wear. See that keys and fixing bolts are secure. Check that brake release gear and hand winding wheel are readily available.</p> <p>(c) Check drums, sheaves and pulleys for visible cracks, ensure keys and fixing bolts are secure. Inspect bearings and sheave grooves. See Note No. 3.</p>	<p>Monthly</p> <p>Monthly</p> <p>Monthly</p>

Schedule No.	Description of Job	Frequency
	(d) Check condition of wire ropes. Ensure suspension ropes are evenly tensioned. See Note No. 4.	Monthly
	(e) Inspect overspeed governor for wear. Ensure keys and fixing bolts are secure.	Monthly
	(f) Extract dust from interiors of motors and generators. Inspect bearings, ensure fixing bolts are secure.	Monthly
	(g) Inspect floor selector bearings. Check connections and flexes. Inspect driving rope, tape or chain for wear and correct tension.	Monthly
	(h) Inspect and operate by hand the slack rope switch, safety-gear switch, broken tape or rope switch and overspeed governor switch.	Monthly
	(i) Inspect guides for wear and ensure fixings are secure.	Monthly
	(j) Check counterweight clearances for rope stretch. Inspect rope equaliser. Ensure main tie bolts are secure. Inspect guide shoes for wear and “float”. Ensure filler weights are properly positioned and secure. Check safety-gear for guide clearance and free movement.	Monthly
	(k) Open, clean and inspect limit switches, direction switches. Inspect fixed ramps and inductor plates.	Monthly
	(l) Ensure spring buffers are secure. Clean oil buffers and top up. Check for oil leaks.	Monthly
	(m) Inspect conditions of landing and car sill nosings and check car clearance. Inspect lock beaks, door rollers and spindles for wear. Inspect door inter-connecting wires or chains for wear and correct tension.	Monthly

Schedule No.	Description of Job	Frequency
	<p>(n) Ensure car frame bolts are secure. Check guide shoes for minimum “float”. Ensure car body is secure in frame. Check safety-gear for guide clearance and free movement. Check tension of safety rope. Inspect door operating mechanism for wear and ensure driving sprockets, keys and fixing bolts are secure. Ensure that the “pick-up” between car and landing doors is correctly aligned. See Note 5.</p> <p>(o) Open, clean and inspect car controls, floor switches, door switches. Check action of emergency opening and movable floor. Inspect car lighting.</p> <p>(p) Inspect travelling cables and their anchorages.</p> <p>(q) Open, clean and inspect landing button boxes and ensure that they and any indicator boxes are securely fixed.</p>	<p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p>
3	<p>(a) Open, clean and inspect landing door locks. See Notes No. 6.</p> <p>(b) Carry out electrical load test on emergency lighting, batteries and battery charger for a period of 1 hour.</p>	<p>Three monthly</p> <p>Three monthly</p>
4	<p>(a) Renew wire rope. See Note No. 4.</p> <p>(b) Test safety gear on no load.</p>	<p>(i) After major repair</p> <p>(ii) Every year</p>

Schedule No.	Description of Job	Frequency
	(c) Test overspeed governors and safety gear on full load.	(i) After major repair (ii) Every 5 years

NOTES TO APPENDIX 1A

The attention of all personnel engaged on lift maintenance services is drawn to the need for the proper observance of all safety rules, regulations and statutory requirements. It is essential that all apparatuses are rendered, and kept, safe during servicing operations. Protective clothing and other safeguards shall be worn or used by the maintenance personnel. All defects in tools, steps, ladders and other items are to be reported immediately and the equipment shall not be used until the fault is rectified.

The lubricants used shall be of the brands and grades recommended by the component manufacturer or their approved equivalents. Ensure adequate lubrication, but avoid excessive. Spillage shall be wiped off. Oily rags or waste shall be removed.

The following items are general guidance for the proper maintenance of the lift installation. These items are by no means exhaustive. The maintenance personnel shall follow all instructions and guideline as recommended by their relevant manufacturer.

1. A brake operating solenoid shall be adjusted to the shortest stroke that will expand the brake bands equally with minimum clearance, consistent with free running of the brake drum.
2. It is essential that a lift will not operate with a car or landing door open, and that landing doors are kept locked except when a car is standing at that floor.
3. (a) Wear on rope grooves of sheaves shall not be such as to cause rope slip.

(b) All grooves must be equal, i.e. all ropes shall sit to the same depth.

Sheave grooves shall only be allowed to be re-cut once to satisfy the above conditions.

4. Wire ropes should be renewed when any one of the following conditions exists :
 - (a) The visible number of broken wires in any length of eight diameters exceeds 10% of the total number of wires in the rope.
 - (b) Where undue stretching occurs after the initial stretch has taken place.
 - (c) There is corrosion/rust.
 - (d) There is birdcaging of strands.
 - (e) The rope has been damaged.
 - (f) The rope is more than six years old.

Wire ropes are well lubricated during manufacture and have a certain amount of reservoir lubricant. If no lubricant is apparent in the interstices between wires, apply a thin coating of a dressing recommended by the rope maker, or approved equivalent, i.e. an acid-free grade material such as petroleum jelly.

5. Where a power limiting device is incorporated in the door operating mechanism, it shall, when a door is obstructed, clear of the safety edge, operate at a force not exceeding 150N.
6. Door locks are to be examined internally at least once every six months (except if fitted with transparent covers, permitting observation of working parts and no defects are apparent). The opening up and internal examinations are to be carried out in sequence and spread evenly over the period.

Remarks : The word “Door” in the Schedule means any sliding or hinged part which gives access to the car or liftwell enclosure.

APPENDIX 1B

MAINTENANCE SCHEDULE FOR HYDRAULIC LIFTS

Schedule No.	Description of Job	Frequency
1	(a) Inspect ram and cylinder, adjust gland, lubricate.	Weekly
	(b) Check control, pilot and levelling valves and adjust. Lubricate.	Weekly
	(c) Inspect control rope and chain, rope gripper and terminal stops.	Weekly
	(d) Inspect bearings of sheaves and pulleys. Lubricate.	Weekly
	(e) Clean, inspect and adjust controller contacts, interlocks and dashpots. Lubricate. Observe and adjust operation sequence and timing of contactors.	Weekly
	(f) Clean floor selector, check action and adjust. Lubricate drive gear.	Weekly
	(g) Clean guides. Top up lubricators.	Weekly
	(h) Clean up lift well as necessary. Clean pit. Inspect condition of lift well enclosure.	Weekly
	(i) Check levelling switches. Ensure rollers are free to rotate.	Weekly
	(j) Check that doors operate freely and bottom tracks are clear of debris.	Weekly
	(k) Inspect car exterior and clean car top	Weekly
	(l) Observe and record irregularities in starting, running and stopping of the lift.	Weekly

Schedule No.	Description of Job	Frequency
	<p>(m) Check for correct operation: - car controls, car door switch, alarm bell and intercom system. Inspect condition of car interior and floor covering.</p> <p>(n) Check action of landing buttons and indicators.</p> <p>(o) Check door locks for safe operation. Ensure rollers and spindle are free to rotate. Lubricate. Check that emergency door release key is readily available. See Note 1</p>	<p>Weekly</p> <p>Weekly</p> <p>Weekly</p>
2	<p>(a) Ensure that keys and fixing bolts of sheaves and pulleys are secure and check for visible cracks and corrosion. Inspect bearings and rope grooves.</p> <p>(b) Check condition of wire ropes. Ensure suspension ropes/chains are evenly tensioned. Clean and lubricate. See Note No. 2.</p> <p>(c) Ensure ram head bolts and cylinder fixing bolts are secure. Check for visible signs of corrosion. Check action of air release cock and anti-syphon valve.</p> <p>(d) Ensure pipework, joints, bolts and fixings are visibly sound and free from corrosion and leaks. Check stop valve. Inspect oil reservoir and pump.</p> <p>(e) Open, clean and inspect: control valves, pilot and levelling valves. Check overrun and cut-off devices. Check over-load relief valve.</p> <p>(f) Inspect pump motor when operating and stationary.</p> <p>(g) Inspect floor selector bearings. Check connection and flexes. Inspect driving rope, tape or chain for wear and correct tension.</p>	<p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p> <p>Monthly</p>

Schedule No.	Description of Job	Frequency
	(h) Inspect safety gear switch and operate it by hand.	Monthly
	(i) Check counterweight clearances for rope stretch. Ensure main tie-bolts and filler weights are secure. Check guide shoes for wear and 'float'.	Monthly
	(j) Inspect 'Jigger' counterweight assembly for visible signs of corrosion. Ensure fixings are secure. Check guide shoes for wear and 'float'.	Monthly
	(k) Inspect travelling cables and their anchorages.	Monthly
	(l) Inspect guides for wear and ensure fixings are secure. Check spring buffers.	Monthly
	(m) Inspect condition of landing and car sill nosings and check car clearances. Inspect lock beaks, door rollers and spindles for wear.	Monthly
	(n) Ensure car frame bolts are secure. Check guide shoes for wear and 'float'. Ensure car body is secure in frame. Check safety gear for running clearance and free movement. Check tension of safety rope.	Monthly
	(o) Open, clean and inspect car controls, door switches and levelling switches. Check operation of emergency opening. Inspect car lighting.	Monthly
	(p) Open, clean and inspect landing button boxes and ensure that they and any separate indicator boxes are securely fixed.	Monthly
	(q) Open, clean and inspect landing door locks. See Note No. 3.	Monthly

Schedule No.	Description of Job	Frequency
3	(a) Carry out electrical load test on emergency lighting, batteries and battery charger for a period of 1 hour.	Three monthly
4	(a) Renew wire rope. See Note No. 3. (b) Test safety gear on no load.	- (i) After major repair (ii) Every year

NOTES TO APPENDIX 1B

The attention of all personnel engaged on lift maintenance services is drawn to the need for the proper observance of all safety rules, regulations and statutory requirements. It is essential that all apparatuses are rendered, and kept safe during servicing operations. Protective clothing and other safeguards shall be worn or used by the maintenance personnel. All defects in tools, steps, ladders and other items are to be reported immediately and the equipment shall not be used until the fault is rectified.

The lubricants used shall be of the brands and grades recommended by the component manufacturer or their approved equivalents. Ensure adequate lubrication, but avoid excessive. Spillage shall be wiped off. Oily rags or waste shall be removed.

The following items are general guidance for the proper maintenance of the lift installation. These items are by no means exhaustive. The maintenance personnel shall follow all instructions and guidelines as recommended by their relevant manufacturer.

1. It is essential that a lift will not operate with a car or landing door open, and that landing doors are kept locked except when a car is standing at that floor.
2. Wire ropes should be renewed when any of the following conditions apply
 - (a) The visible number of broken wires in any length of eight diameters exceeds 10 % of the total number of wires in the rope.
 - (b) Where undue stretching occurs after the initial stretch has taken place.
 - (c) There is corrosion/rust.
 - (d) There is birdcaging of strands.
 - (e) The rope has been damaged.
 - (f) The rope is more than six years old.

Wire ropes are well lubricated during manufacture and have a certain amount of reservoir lubricant. If no lubricant is apparent in the interstices between wires, apply a thin coating of a dressing recommended by the rope maker, or approved equivalent, i.e. an acid-free grade material such as petroleum jelly.

3. Door locks are to be examined internally at least once every six months (except if fitted with transparent covers, permitting observation of working parts and no defects are apparent). The opening up and internal examinations are to be carried out in sequence and spread evenly over the period.

Remarks: The word "Door" in the Schedule means any sliding or hinged part which gives access to the car or liftwell enclosure.

APPENDIX 1C

MAINTENANCE SCHEDULE FOR ESCALATORS AND PASSENGER CONVEYORS

Schedule No.	Description of Job	Frequency
1	(a) Check the clearance between the steps/pallets and the skirt guard to ensure adequate clearance.	Weekly
	(b) Inspect bearings of drums, pulleys and all moving parts. Lubricate.	Weekly
	(c) Clean up the machine room as necessary.	Weekly
	(d) Ride in escalator/passenger conveyor, observe whether the operation is normal. Check whether there is undue vibration.	Weekly
	(e) Check for correct operation of all safety devices; i.e. skirt guard safety devices, handrail inlet safety switches, emergency stop buttons, step/pallets chain safety switches, step/pallets safety switches, step/pallets roller switches driving chain safety switches, comb safety switches, etc.	Bi-weekly
2	(a) Check and inspect the main drive system.	Monthly
	(b) Check and lubricate the step/pallets rollers.	Monthly
	(c) Check and inspect the handrail to ensure adequate tightness and proper functioning. Clean the inside surface of the handrail.	Monthly
	(d) Check and inspect the control box.	Monthly
	(e) Check and record the braking efficiency.	Monthly

Schedule No.	Description of Job	Frequency
3	(a) Check the landing comb for completeness.	Three monthly
	(b) Check the lubricating pump to see if there is enough lubricating oil. Check the quality of lubricating oil.	Three monthly
	(c) Check and clean the motor gear box.	Three monthly
	(d) Check the lighting system	Three monthly
4	(a) Remove all steps/pallets and clean the rail.	Bi-yearly
	(b) Check for correct operation of the current overload and safety switches and non-reversal switches.	Bi-yearly
5	(a) Replace all the lubricating oil.	5-yearly

NOTES TO APPENDIX 1C

The attention of all personnel engaged on escalators/passenger conveyors maintenance services is drawn to the need for the proper observance of all safety rules, regulations and statutory requirements. It is essential that all apparatuses are rendered, and kept safe during servicing operations. Protective clothing and other safeguards shall be worn or used by the maintenance personnel. All defects in tools, steps, ladders and other items are to be reported immediately and the equipment shall not be used until the fault is rectified.

The lubricants used shall be of the brands and grades recommended by the component manufacturer or their approved equivalents. Ensure adequate lubrication, but avoid excessive. Spillage shall be wiped off. Oily rags or waste shall be removed.

APPENDIX 2A

(1) CONTRACTOR CALL-OUT		(2) ARRIVED ON SITE		(3) TYPE OF SERVICE		(4) PLANT IDENTITY 機械裝置	(5) WORKS DONE/PARTS REPLACED 工作說明/更換部份	(6) SERVICE RESUMED		(7) MECHANIC'S NAME AND SIGNATURE	(8) REMARKS 備註
DATE 日期	TIME 時間	DATE 日期	TIME 時間	EMERGENCY 緊急	ROUTINE 例行			DATE 日期	TIME 時間		

APPENDIX 2B

Notes on Entry of Logbook

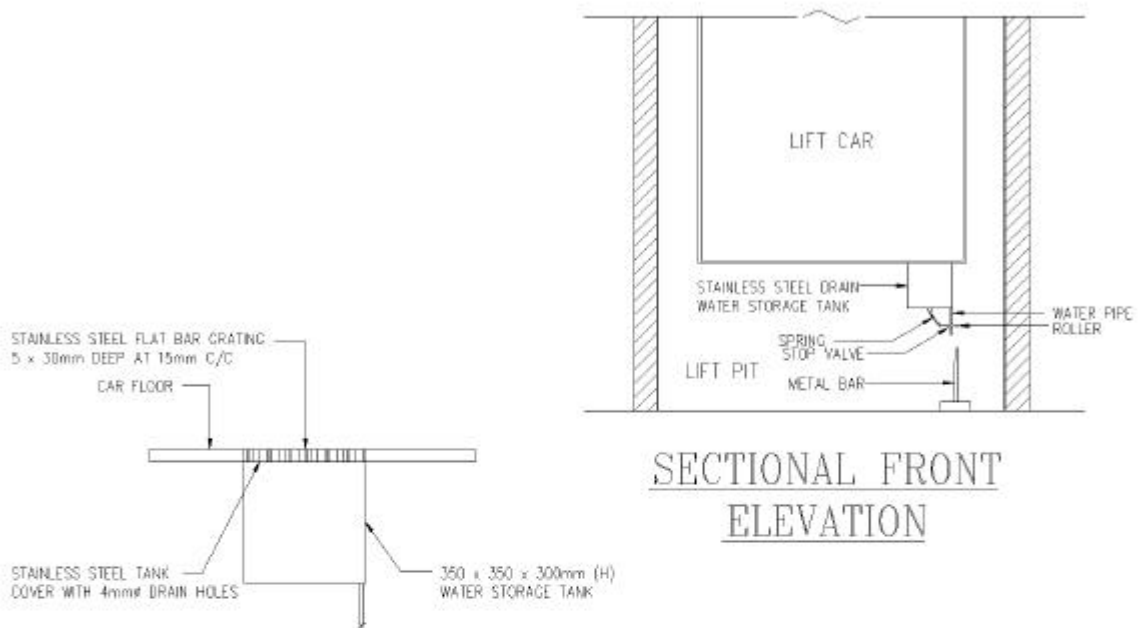
Column 1 Date and time at which call-out is received by Contractor.

Column 2 Date and time at which mechanic arrived on site.

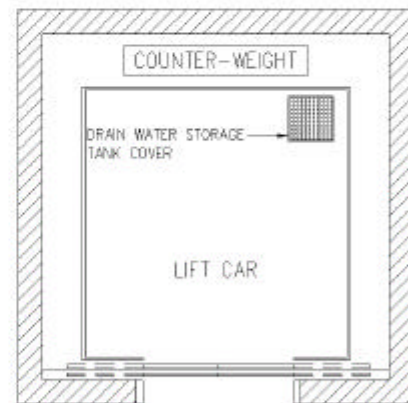
Column 4 Plant identity, e.g. Lift No. X, compressor motor No. Y, etc.

Column 8 Comment on the cause of any abnormal fault (e.g. vandalism), reason for non-clearance of fault, etc.

APPENDIX 3



SECTION OF DRAIN
WATER STORAGE TANK



PLAN

ARRANGEMENT OF DRAIN WATER STORAGE TANK FOR GOODS LIFT CAR IN MARKET & ABATTOIR

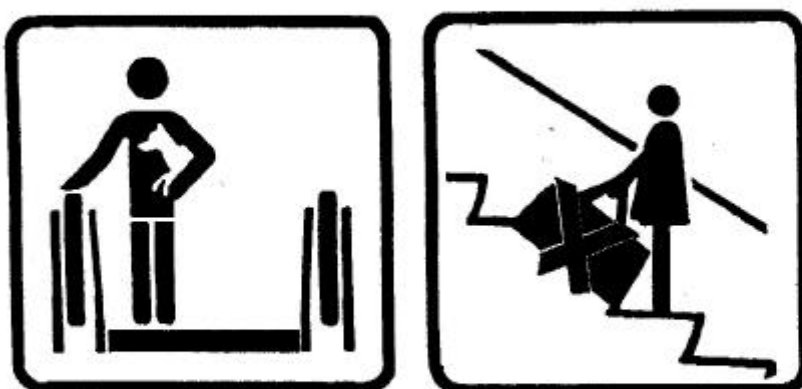
(NOT TO SCALE)

APPENDIX 4



COLOURING

- BLUE COLOUR ON WHITE BACKGROUND
- THE INDICATION SIGN 'X' IN THE PICTOGRAPH IN RED COLOUR



NOTICES NEAR ENTRANCES OF ESCALATOR

APPENDIX 5

LIST OF STANDARDS REFERRED TO IN THE GENERAL SPECIFICATION

Standard	Description	Clause No.	Remarks
EN 81-1	Safety rules for the construction and installation of electric lifts	B1.2 B10.13 B12.1 B14.4 B14.5 B17.2	Replaces BS 5655-1
EN 81-2	Safety rules for the construction and installation of hydraulic lifts	B10.13 B12.1	Replaces BS 5655-2
EN 10029	Specification for tolerances on dimensions, shape and mass for hot rolled steel plates 3 mm thick or above	A7.4	Replaces BS 1449:Part 2
EN 10048	Hot rolled narrow steel strip. Tolerances on dimensions and shape	A7.4	Replaces BS 1449:Part 2
EN 10051	Specification for continuously hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels. Tolerances on dimensions and shape	A7.4	Replaces BS 1449:Part 2
EN 10095	Heat resisting steels and nickel alloys	A7.4	Replaces BS 1449:Part 2
EN 10258	Cold-rolled stainless steel narrow strip and cut lengths. Tolerances on dimensions and shape	A7.4	Replaces BS 1449:Part 2

Standard	Description	Clause No.	Remarks
EN 10259	Cold-rolled stainless and heating resisting steel wide strip and plate/sheet. Tolerances on dimensions and shape	A7.4	Replaces BS 1449:Part 2
EN 50214	Flexible cables for lifts	A6.4	Replaces BS 6977
EN 55014	Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Emission. Product family standard.	A6.8	Replaces BS 800
EN 60335-2-29	Specification for safety of household and similar electrical appliances. Particular requirements. Battery chargers	A6.7	
EN 61436	Secondary cells and batteries containing alkaline or other non-acid electrolytes. Sealed nickel-metal hydride rechargeable single cells	A6.7	
EN 61951-2	Secondary cells and batteries containing alkaline or other non-acid electrolytes. Portable sealed rechargeable single cells. Nickel-metal hydride	A6.7	
IEC 60364	Electrical installations of buildings.	A2.1	
IEC 60947	Specification for low-voltage switchgear and control gear	B17.1	BS EN 60947 Identical

Standard	Description	Clause No.	Remarks
BS 302 Part 4	Specification for ropes for lifts	B4.1	
BS 613	Specification for components and filter units for electromagnetic interference suppression	A6.8	
BS 2633	Specification for Class I arc welding of ferritic steel pipework for carrying fluids	B23.2	
BS 4999	General requirements for rotating electrical machines. General introduction information on other Parts	B16.1	
BS 5000 Part 99	Rotating electrical machines of particular types or for particular applications. Machines for miscellaneous applications	B16.1	
BS 5655 Part 9	Specification for guide rails	B1.2	