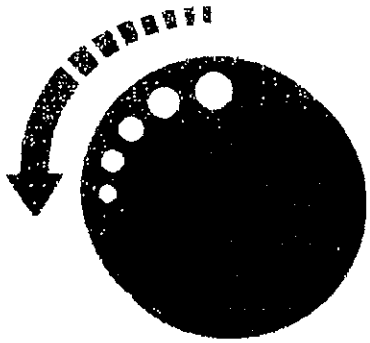
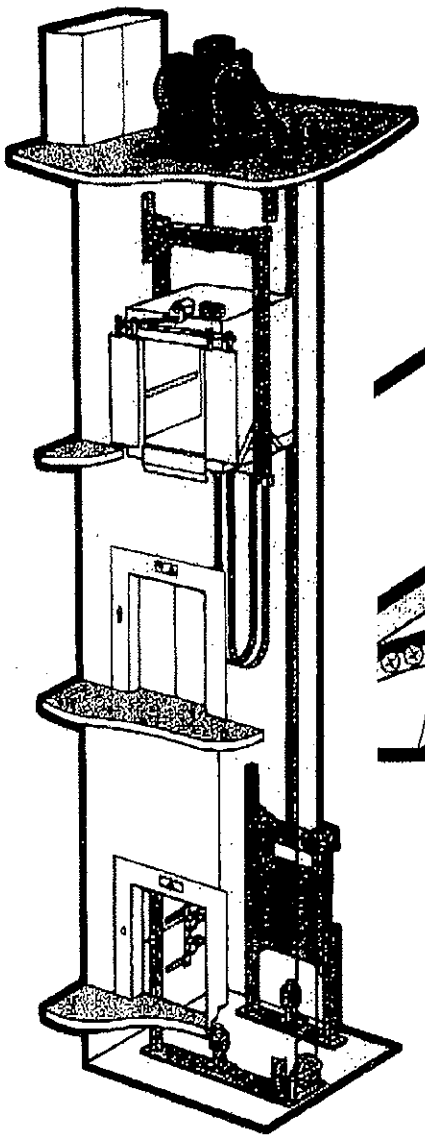
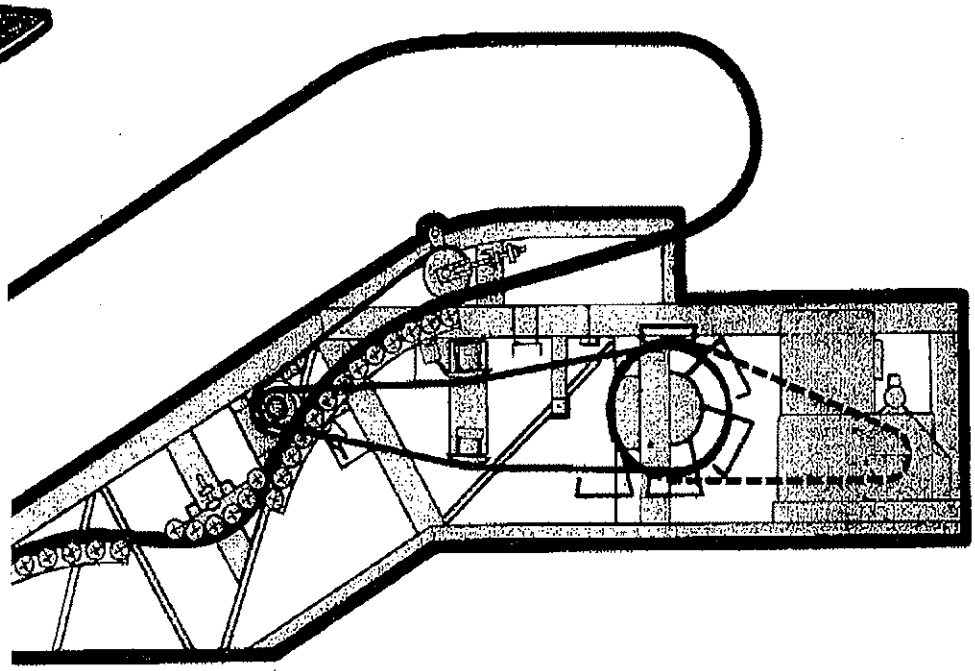
CODE OF PRACTICE FOR

Energy Efficiency of Lift and Escalator Installations

2000 EDITION







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Electrical and Mechanical Services Department
The Government of the Hong Kong Special Administrative Region

Foreword

The Code of Practice for Energy Efficiency of Lift and Escalator Installations aims to set out the minimum requirements on energy efficiency of lift and escalator installations in buildings. It forms a part of a set of comprehensive Building Energy Codes that addresses energy efficiency requirements on building services installations. Designers are encouraged to adopt a proactive approach to exceed the minimum requirements of this code.

This code was developed by the Task Force on Lift and Escalator Energy Code that was established under the Energy Efficiency & Conservation Sub-committee of the Energy Advisory Committee. The Task Force members include:-

Convenor:	Mr. K.K. Lam	(Electrical & Mechanical Services Department)
Secretary:	Mr. H.K. Wong	(Electrical & Mechanical Services Department)
Members:	Dr. Albert T.P. So	(The Hong Kong Institution of Engineers)
	Mr. K.W. Cheung	(The Hong Kong Institution of Architects)
	Dr. Patrick Yaping Du	(The Hong Kong Polytechnic University)
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	(prior to May 1999)	Mr. Eddie W.K. Wu (Electrical & Mechanical Services Department)
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Other representatives from The Lift and Escalator Contractors Association	Mr. Edmond I.S. Mui
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1. SCOPE

1.1 This Code shall apply to passenger lifts, freight lifts, lifts used for vertical transportation of motor vehicles, bed passenger lifts, escalators and passenger conveyors in all buildings, with the exclusion of the following installations :

a) *Builders' lifts used for vertical transportation of persons in a building construction site*

b) *Hoists used for vertical transportation of materials*

c) *Service lifts*

d) *Lifts and hoists installed in a performance stage*

e) *Lift equipment for building maintenance*

f) *Traction lift equipment with load > 5000kg and rated speed > 3m/s*

1.2 This Code shall apply to new installations and upgrading of motor drive and controller in relations to lifts, escalators and passenger conveyors.

2. DEFINITIONS

The expressions that appear in this Code are defined as follows:-

"Bed Passenger Lift" means a lift used for transportation of passenger and bed including stretcher.

"Building" has the meaning assigned to it in section 2 of the Buildings Ordinance (Cap. 123).

"Builders' Lift" means a lifting machine-

(a) that has a cage;
(b) the operating controls for which are located inside the cage;
(c) the cage of which is raised and lowered by means of a rack and pinion suspension system or rope suspension system;
(d) the direction of movement of which is restricted by guide or guides, and is used for construction work, and includes the supports, liftway and enclosures and the whole of the mechanical and electrical apparatus required in connection with the operation and safety of the builder's lift;

"Commercial Building" means a building, or that part of the building, constructed or intended to be used for business, trade or entertainment.

"Composite Building" means a building that is partly domestic and partly non-domestic.

"Domestic Building" means a building constructed or intended to be used for habitation and the expression "domestic purpose" shall be construed accordingly.

"**Escalator**" means an inclined, continuous stairway which is driven by mechanical power and used for raising or lowering passengers

"**Freight Lift**" means a lift mainly intended for the transport of goods, which are generally accompanied by persons handling the goods. A general freight lift is one which:-

- the loading in the lift will normally be evenly distributed over the floor of the car;
- the weight of any single piece of freight, or the weight of any single truck, which may be used in the loading of the lift, and the load therein, will be not more than a quarter of the rated load of the lift;
- the lift will be loaded only manually or by means of trucks which are not driven by any form of power.

An industrial truck loaded freight lift is one which will be loaded and unloaded by industrial truck, and the loading is not necessarily evenly distributed over the floor, and the weight of any single piece of freight and its truck can exceed a quarter of the rated load of the lift.

"**Hotel**" means any building used wholly or in part primarily for the purpose of accommodation on a commercial basis.

"**Hydraulic Lift**" means a lift which the lifting power is derived from an electrically driven pump transmitting hydraulic fluid to a jack, acting directly or indirectly on the lift car.

"**Lift**" means a lifting machine or appliance having a car or platform the direction of movement of which is restricted by a guide or guides, but does not include an escalator.

"**Lift Bank**" means a lift system with two or more lift cars serving a zone.

"**Passenger Conveyor** means a continuous walkway which is driven by mechanical power and used for the conveyance of passengers on the same or between different traffic levels.

"**Passenger Handling Capacity**" for a lift bank is defined as :

$$\frac{5\,\text{min} \times 60 \times 0.8 \times \text{Lift Car Contract Capacity (no. of persons)}}{\text{Up Peak Interval} \times \text{Population Above Terminal Floor of Zone}} \times 100\%$$

"**Passenger Lift**" means a lift which is wholly or mainly used to carry persons.

"**Rated Speed**" of an escalator or a passenger conveyor means the speed of a no-load escalator or passenger conveyor in the direction of the moving steps, pallets or the belt at which the steps, pallets on the belt move and for which the escalator or passenger conveyor has been built and normal operation is guaranteed by the manufacturer.

"**Round Trip Time**" of a lift car refers to a value calculated by Up Peak Model. The Round Trip Time (RTT) is obtained from the following equation:

$$RTT = 2Ht_v + (S+1)t_s + 2Pt_p$$

where RTT = Round Trip Time (in seconds)
H = Highest call reversal floor (H)
S = Average number of stops
t_v = time to transit two adjacent floors at rated speed (in seconds)
t_s = time consumed when making a stop (in seconds)
t_p = passenger transfer time for entering *or* exiting the lift car (in seconds)
P = 0.8 x contract capacity of lift car (in person)

The time consumed when making a stop is obtained from the equation:

$$t_s = t_{fl} - t_v + t_o + t_c$$

where t_{fl} = Single floor jump time (in seconds)
t_o = Door opening time (in seconds)
t_c = Door closing time (in seconds)

The highest call reversal floor (H) and the average number of stops (S) are obtained from the following equations:

$$H = N - \sum_{j=1}^{N-1}\left(\sum_{i=1}^{j}\frac{U_i}{U}\right)^P$$

$$S = N - \sum_{i=1}^{N}\left(1 - \frac{U_i}{U}\right)^P$$

where N = Number of floors above main terminal floor
U = Total population of zone above main terminal floor
U_i = Population at the *i* th floor

"Service Lift" means a lift, used or intended to be used exclusively for carrying goods, having a rated load of not more than 250 kg and a car in which the area of the floor is not more than 1 m^2 and whose height is not more than 1200 mm.

"Sky Lobby" means a terminal floor at the highest floor served by a low zone group of lifts, where passengers may wait for service by a high-rise group of lifts.

"Terminal Floor" means the principal floor in a building zone from which lift cars can load and unload passengers.

"Total Power Factor" $= \dfrac{P}{\sqrt{P^2 + Q^2 + D^2}}$

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

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

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)

"Up Peak Traffic Condition" means the traffic condition when the dominant or only traffic flow is in an upward direction with all or the majority of passenger entering the lift system at the main terminal of the building.

"Up Peak Interval" of a lift bank is equal to the Round Trip Time (in sec) at the Up Peak traffic condition divided by the quantity of lifts in the lift bank.

"Vehicle Lift" means a lift which is suitably dimensioned and designed for carrying motor vehicles.

3. GENERAL APPROACH

This Code sets out the minimum requirements for achieving energy-efficient lift, escalator and passenger conveyor installations. The Code's requirements entail the following aspects :

a) Maximum allowable electrical power of lifts, escalators & passenger conveyors

b) Energy management of lifts, escalators & passenger conveyors

c) Handling capacity of lift systems

d) Traffic design of lift system

e) Total harmonic distortion and total power factor

Exemption on the "*Handling Capacity of Lift Systems*" requirement and the "*Lift Traffic Design*" requirement in this Code can be given for upgrading of motor drive and controller projects, or any traction lift installations for which the alteration on the existing traffic arrangement to comply with these requirements is considered infeasible or impracticable. However, traffic design calculations and information as required in this Code are still required in the submission as part of the information for application for this exemption.

If conflict(s) occur between the requirements of this Code of Practice and the latest edition of the following publications/Ordinances and their subsequent amendments, the requirements of the conflicting publications/Ordinances shall supersede the conflicting requirements of this Code of Practice:

- Code of Practice For The Electricity (Wiring) Regulation *published by Electrical & Mechanical Services Department, Government of The Hong Kong Special*

Administrative Region

- Code of Practice On The Design and Construction of Lifts and Escalators *published by Electrical & Mechanical Services Department, Government of The Hong Kong Special Administrative Region*

- Code of Practice on the Examination, Testing and Maintenance of Lifts and Escalators, 1996 Edition *published by Electrical & Mechanical Services Department, Government of The Hong Kong Special Administrative Region*

- Code of Practice on the Building Works for Lifts and Escalators, 1993 Edition, *published by Buildings Department, Government of The Hong Kong Special Administrative Region*

- Code of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment *published by Fire Services Department, Government of The Hong Kong Special Administrative Region*

- Circular Letters relating to Lift and Escalator issued by the Electrical & Mechanical Services Department.

- The Building (Construction) Regulations and Building (Planning) Regulations, Cap. 123.

- The Lifts and Escalators (Safety) Ordinance, Cap.327.

- The Electricity Ordinance, Cap. 406.

- The Noise Control Ordinance, Cap. 400.

4. REQUIREMENTS ON LIFT

4.1 Maximum Allowable Electrical Power

4.1.1 Maximum Allowable Electrical Power of Traction Lifts

The running active electrical power of the motor drive of any 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 indicated in Table (4.1.1a), Table (4.1.1b) and Table (4.1.1c).

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 (4.1.1a) : 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				
	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 (4.1.1b) : 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		
	7 < Vc ≤8	8 < Vc ≤9	Vc > 9
L ≤ 750	39	45	$4.887Vc+0.0014Vc^3$
750<L≤1000	52	60	$6.516Vc+0.0021\ Vc^3$
1000 < L ≤ 1350	70	80	$8.797Vc+0.0021Vc^3$
1350<L≤1600	83	95	$10.426Vc+0.00266\ Vc^3$
1600 < L ≤ 2000	105	120	$13.033Vc+0.0014Vc^3$
2000 < L ≤ 3000	155	175	$19.549Vc+0.0030Vc^3$
3000 < L ≤ 4000	205	235	$26.065Vc+0.0038Vc^3$
4000 < L ≤ 5000	255	290	$32.582Vc+0.0048Vc^3$

Table (4.1.1c) : Maximum Allowable Electrical Power of Traction Lifts (Vc >7)

4.1.2 Maximum Allowable Electrical Power of Hydraulic Lifts

The running active electrical power of the hydraulic oil pump motor of any 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 indicated in Table (4.1.2).

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

Table (4.1.2) : Maximum Allowable Electrical Power of Hydraulic Lifts

4.2 Energy Management of Lift Systems

a) 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.

b) Under a standby mode of operation, a lift car does not respond to passenger calls until it returns to the normal operation mode. If the lift is utilising DC M-G motor drive, the driving motor of the DC M-G motor drive system shall also be shut down during this standby mode operation.

c) Metering devices or permanent provisions (including suitable accessibility and sufficient space) for connection with such devices shall be provided for each electricity supply feeder for the vertical transportation systems, including the electrical load of the motor drive and the auxiliary loads such as ventilation and lightings, for measurement of 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) for the lift system.

d) 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.

4.3 Handling Capacity of Lift Systems

The following requirements apply to passenger lift system excluding those enlisted in the exclusion section of this clause:

(i) A lift bank serving a *sky lobby* shall have a passenger handling capacity not less than 20 %.

(ii)A lift bank serving *zones* shall have a passenger handling capacity not less than 10 %.

Exclusion: The following lift systems are exempted from this requirement-

- Lift system serving domestic buildings including those on top of podium or commercial centres (shopping complex).
- Lift system is **not** the main mode of vertical transport.
- Disable platform.

4.4 Lift Traffic Design

For any passenger lift system which form the main mode of vertical transportation and fulfilling all of the following conditions, a lift traffic analysis has to be carried out to optimise lift traffic flow:

(i) the rated speed of any lift car in a lift bank exceeds 1.5 m/s

(ii) a building that requires lift service and has at least 10 storey

(iii) the building usage shall be of the zone type as indicated in Table 4.4(c)

Unless there are sufficient technical information on the door opening and closing times for the lift equipment, the door operating figures in Table (4.4a) and (4.4b) shall be used as a minimum figure for the lift traffic analysis:

Panel arrangement	**Door Size** *(note 1)*			
	0.8 m		**1.1 m**	
	Ordinary	**Pre-Open** *(note 2)*	**Ordinary**	**Pre-Open** *(note 2)*
Side opening	2.5s	1.0s	3.0s	1.5s
Centre opening	2.0s	0.5s	2.5s	0.8s

Table (4.4a) : Minimum Door Opening Times To Be Used For Lift Traffic Analysis

Panel arrangement	**Door Size** *(note 1)*	
	0.8 m	**1.1 m**
Side opening	3.0s	4.0s
Centre opening	2.0s	3.0s

Table (4.4b) : Minimum Door Closing Times To Be Used For Lift Traffic Analysis

note 1: For door size other than 0.8m and 1.1m, the operating time shall be calculated by interpolation.

note 2: Also known as Advanced Door Opening. The door panels of the lift car start to open when the car has entered the door zone e.g. say some 0.2m from a landing level. The time is taken from the first application of the brake to doors 90% open.

When a lift traffic analysis is carried out the passenger transfer time shall be assumed to be 1.0 second.

The Highest Call Reversal Floor (H) and the Average Number of Stops (S) shall be evaluated with the equations in paragraph 2 of this Code. Other internationally recognised methods can

be used with the detailed calculation steps clearly indicated in the analysis.

In case a lift traffic analysis is required, the *Up Peak Interval (INT)* at the terminal floor of a lift bank serving a zone of a particular building usage shall not exceed the maximum values specified in Table (4.4c).

Zone Type	Maximum Interval of a Lift Bank (s)
Office Zone	30
Hotels	40
Institutional Zone	45
Commercial Zone (Shopping Complex)	30
Industrial Zone	55
Composite Zone	the smallest value of various *Maximum Intervals* that apply to different zone types of a composite zone *(see note 3)*

Table (4.4c) : Maximum Intervals of Lift Banks for Various Zone Types

note 3: premises in a composite zone which do not occupy more than 1.5 percentage of the gross floor area (e.g. estate management office, mutual-aid office within a domestic block) of the zone may be considered not constitute an independent zone type.

4.5 Total Harmonic Distortion of Motor Drive Systems

At the moment a lift car is moving up with rated load at its rated speed, the *Total Harmonic Distortion (THD)* produced by the lift motor drive system measured at the isolator connecting the lift equipment to the feeder circuit of the building is limited to maximum allowable values specified in Table (4.5) :

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

Table (4.5) : Maximum Allowable THD for Lift Motor Drive Systems

4.6 Total Power Factor of Motor Drive Systems

The *Total Power Factor* of a motor drive circuit measured at the isolator connecting the lift equipment to the building's feeder circuit shall not be less than 0.85 when the lift car is carrying a rated load at its rated speed in an upward direction. In case the Total Power Factor is less than 0.85, design calculations are required at design stage of a building project to demonstrate adequate provision of power factor correction to achieve the minimum *Total Power Factor* of 0.85.

5. Requirements On Escalators & Passenger Conveyors

5.1 Energy Management of Escalators & Passenger Conveyors

Metering devices or permanent provisions (including suitable accessibility and sufficient space) for connection with such measuring devices shall be incorporated into each electricity feeder for the escalators or passenger conveyors for measurement of 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).

5.2 Maximum Allowable Electrical Power of Escalators & Passenger Conveyors

For any escalator other than public service escalator operating under *no-load condition*, the running active electrical power of a *steps driving motor* shall be equal to or less than the maximum allowable values shown in Table (5.2a).

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

Table (5.2a) : Maximum Allowable Electrical Power of Escalator other than public service escalator operating under no-load condition

For any public service escalator operating under *no-load condition*, the running active electrical power of a *steps driving motor* shall be equal to or less than the maximum allowable values shown in Table (5.2b). An escalator can be considered as public service escalator when all the following conditions apply:

(i) They are part of a public traffic system including entrance and exit points (for example escalators connecting a traffic station and a premise); and

(ii) They are suitable for regularly operating for approximately 140 hours/week with a load reaching 100% of the brake load during periods lasting for at least 0.5 hour during any time interval of 3 hours.

During the planning stage it should be specified if it will be a public service escalator.

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 (5.2b) : Maximum Allowable Electrical Power of Public Service Escalators operating under no-load condition

For any passenger conveyor other than public service passenger conveyor operating under *no-load condition*, the running active electrical power of a *steps driving motor* shall be equal to or less than the maximum allowable values shown in Table (5.2c) and Table (5.2d).

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for various Ranges of Rated Speed (Vr) in m/s		
		Vr ≤ 0.5	0.5 < Vr ≤ 0.65	0.65 < Vr ≤ 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 (5.2c): Maximum Allowable Electrical Power of Passenger Conveyor other than Public Service Passenger Conveyor operating under no-load condition (Vr≤0.75)

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for various Ranges of Rated Speed (Vr) in m/s
		0.75 < Vr ≤ 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 (5.2d): Maximum Allowable Electrical Power of Passenger Conveyor other than Public Service Passenger Conveyor operating under no-load condition (0.75 < Vr ≤ 0.90)

For any public service passenger conveyor operating under *no-load condition*, the running active electrical power of a *steps driving motor* shall be equal to or less than the maximum allowable values shown in Table (5.2e) and Table (5.2f). A passenger conveyor can be considered as a public service passenger conveyor when all the following conditions apply:

(i) They are part of a public traffic system including entrance and exit points (for example passenger conveyors connecting a traffic station and a premise); and

(ii) They are suitable for regularly operating for approximately 140 hours/week with a load reaching 100% of the brake load during periods lasting for at least 0.5 hour during any time interval of 3 hours.
During the planning stage it should be specified if it will be a public service passenger conveyor.

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for various Ranges of Rated Speed (Vr) in m/s		
		$Vr \leq 0.5$	$0.5 < Vr \leq 0.65$	$0.65 < Vr \leq 0.75$
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	$l > 20$	$164l+131$	$209l+168$	$237l+190$

Table (5.2e): Maximum Allowable Electrical Power of Public Service Passenger Conveyors operating under no-load condition (Vr≤0.75)

Step Width (mm)	Nominal Length of Conveyor (m)	Maximum Allowable Electrical Power in Watt for various Ranges of Rated Speed (Vr) in m/s
		$0.75 < Vr \leq 0.90$
800	$l \leq 8$	2350
800	$8 < l \leq 12$	3250
800	$12 < l \leq 16$	4300
800	$16 < l \leq 20$	5300
800	$L > 20$	253*l*+203
1000	$l \leq 8$	2450
1000	$8 < l \leq 12$	3650
1000	$12 < l \leq 16$	4800
1000	$16 < l \leq 20$	5950
1000	$l > 20$	285*l*+228

Table (5.2f): Maximum Allowable Electrical Power of Public Service Passenger Conveyors operating under no-load condition ($0.75 < Vr \leq 0.90$)

5.3 Total Harmonic Distortion of Motor Drive Systems

When an escalator/conveyor is operating with no load at its rated speed, the Total Harmonic Distortion (THD) produced by a motor drive system measured at the isolator connecting the escalator equipment to the building's feeder circuit is limited to a maximum allowable value specified in Table (5.3):

Circuit Fundamental Current of	Maximum THD (%)
$I < 80A$	35.0
$80A \leq I < 400A$	22.5

Table (5.3) : Maximum THD of Motor Drive Systems for Escalators and Passenger Conveyors

5.4 Total Power Factor of Motor Drive Systems

The *Total Power Factor* of a motor drive measured/calculated at the isolator connecting the escalator/conveyor equipment to the power source shall not be less than 0.85 when the motor drive is operating under its *brake load* condition. Manufacturer's documentation are required to be submitted as proof. In case the Total Power Factor is less than 0.85 or manufacturer's documentation is not available, design calculations are required at design stage of a building project to demonstrate adequate provision of power factor correction to achieve the minimum Total Power Factor of 0.85.