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मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

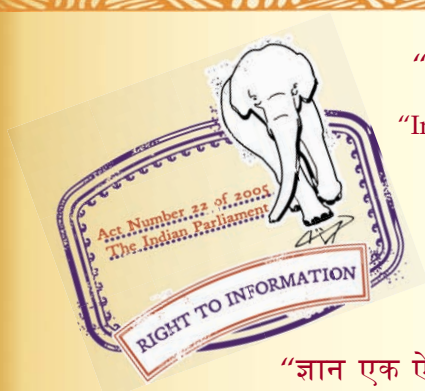
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 14665-3-1 to 2 (2000): Electric Traction Lifts, Part 3: Safety Rules, Section 1: Passenger and Goods Lifts, Section 2: Service Lifts [ETD 25: Lift and Escalators]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS 14665 (Part 3/Sec 1 & 2) : 2000
(Superseding IS 4666 : 1980 and IS 6383 : 1971)

भारतीय मानक
विद्युत संकषण लिफ्टें

भाग 3 सुरक्षा नियम
अनुभाग 1 यात्री और मालवाहक लिफ्टें
अनुभाग 2 सर्विस लिफ्टें

Indian Standard
ELECTRIC TRACTION LIFTS

PART 3 SAFETY RULES
Section 1 Passenger and Goods Lifts
Section 2 Service Lifts

ICS 91.140.90

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

May 2000

Price Group 6

AMENDMENT NO. 2 SEPTEMBER 2012
TO
IS 14665 (PART 3/SEC 1) : 2000 ELECTRIC TRACTION
LIFTS

PART 3 SAFETY RULES

SECTION 1 PASSENGER AND GOODS LIFTS

(Page 2, clause 8) — Substitute the following for the existing clause:

8. TERMINAL SLOW DOWN, NORMAL STOPPING AND FINAL LIMIT SWITCHES

8.1 Terminal Slow Down and Normal Stopping Limit Switches

8.1.1 Every electric lift shall be provided with upper and lower terminal slowdown and normal stopping limit switches arranged to stop the car automatically within the limits of top car clearance and bottom run by (over travel) from any speed attained in normal operation as per Table 1. Such limit switches shall act independently of the operating device and the final limit switches.

Table 1 Terminal Limit Switch Requirements for Elevators
(Clause 8.1.1)

Sl. No.	Elevator Speed m/s	Control Type	Slow Down Limit Switch	Normal Stopping Limit Switch	Final Limit Switch
(1)	(2)	(3)	(4)	(5)	(6)
i)	< 0.7	Single Speed (AC 1)	Optional	Required	Required
ii)	< 0.7	All except (AC1)	Required	Optional	Required
iii)	≥ 0.7	All except (AC1)	Required	Required (see Note)	Required

NOTE — Not required if Slow down switch is monitored or detected as per **8.1.5** and **8.1.6**.

8.1.2 All slowdown and normal stopping Limit switches shall be either electro mechanical, electronic, optical or magnetic type. In case of

Price Group 2

Amend No. 2 to IS 14665 (Part 3/Sec 1) : 2000

electromechanical limits switches, contacts of all terminal limit switches shall be opened positively and mechanically by the movement of the lift car. Electronic, optical or magnetic type terminal limit switches shall be in compliance with **8.1.5**.

8.1.3 Terminal slow down and normal stopping limits switches may be fitted in the lift car or in the lift well or in the machine room, and such switches shall be brought into operation by the movement of the lift car. If such switches are fitted on the car, then the trailing cables used shall conform to **8.4.2.7** and **8.4.2.8** of IS 14665 (Part 2/Sec 1).

8.1.4 When terminal slow down and stopping limit switches are situated in the machine room they shall be mounted on and operated by the slow down and stopping device mechanically connected to and driven by the lift car without dependence upon friction as a driving means. An automatic safety switch shall be provided to stop the machine should the tape, chain, rope or other similar device mechanically connecting the stopping device to the car fail [*see* IS 14665 (Part 4/Sec 4)].

8.1.5 If the terminal slowdown limit switches are of electronic, optical or magnetic type, then a detection mechanism by means of software, to ensure proper functioning of the limit switches, must be in place. Such detection should take place automatically every time the elevator car reached top or bottom terminal landings. In case of failure to detect such limit switches, for proper functioning, the elevator shall be shut down automatically. It shall not be possible to RESET this tripped elevator without manual intervention by competent person.

8.1.6 In the event of having provided such detection mechanism for terminal slow down switches, as per **8.1.5**, normal terminal stopping switches may not be required.'

(Page 2, clause **8.2**) — Substitute the following for the existing clause:

Amend No. 2 to IS 14665 (Part 3/Sec 1) : 2000

‘8.2 Final Limit Switches

8.2.1 Electric lifts shall, in all cases, be provided with final limit switches arranged to stop the car automatically within the top and bottom clearances independently of the normal operating device and the terminal limit switches. The switches shall be so arranged so as to open before the buffers are engaged.

8.2.2 Final limit switches shall act to prevent movement of the lift car under power in both directions of travel and shall after operating remain open until the lift car has been moved by a hand winding or by Emergency Electrical Operation as defined in **9.5** of IS 14665 (Part 3/Sec 1) to a position within the limits of normal travel.

8.2.3 Final limit switches shall be mounted in the lift well or on the lift car and shall be operated by the movement of the lift car in the lift well. Trailing cables used shall conform to **8.4.2.7** and **8.4.2.8** of IS 14665 (Part 2/Sec 1).

8.2.4 Final limit switches shall be electro-mechanical type. Contacts of final limit switches shall be opened positively and mechanically by the movement of the lift car.

8.2.5 Final limit switches shall not control the same devices on the controllers as those controlled by the normal terminal limit switches unless two or more separate and independent devices are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel. When the final limit switches control the same device or devices on the controller as the operating device or the terminal limit switches, they shall be connected in the control circuit on the opposite side to the terminal limit switches.

8.2.6 Final limit switches designed to open the main circuit of the motor may control the same device or devices on the controller as those controlled by the terminal limit switches, but when such

Amend No. 2 to IS 14665 (Part 3/Sec 1) : 2000

final limit switches are employed on direct current power supplies, they shall be provided with additional contacts to control the brake circuits. All final limit switches shall be enclosed type and shall be securely mounted. The contacts of all such switches shall be opened positively and mechanically by the movement of the lift car.'

(Page 2, *clauses 8.3, 8.4, 8.5, 8.6, 8.7 and 8.8*) — Delete.

(Page 3, *clause 9.4*) — Add the following new clause **9.5** after **9.4**:

'9.5 Emergency Electrical Operation

9.5.1 If the manual effort required to move the car in the upward direction with its rated load does not exceed 400 N, the machine shall be provided with a manual means of emergency operation allowing the car to be moved to a landing with the aid of smooth spoke less wheel.

9.5.2 It shall be easily possible to check from machine room whether the car is in unlocking zone. The check may be made, for example, by means of marks on the suspension media.

9.5.3 If the effort defined in **9.5.1** is greater than 400 N, alternatively, a means of emergency electrical operation satisfying following conditions may be provided on lift controller with available power supply.

9.5.3.1 Operation of the emergency electrical operation switch shall permit, from the machine room, the control of car movement by constant pressure on buttons protected against accidental operation. The direction of movement shall be clearly indicated;

9.5.3.2 After operation of the emergency electrical operation switch, all movement of the car except that controlled by this switch shall be prevented. The effects of the emergency electrical operation shall be overridden by switching on the inspection operation;

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9.5.3.3 The emergency electrical operation switch shall render inoperative by itself or through another electrical switch following electric devices:

- a) Those mounted on the safety gear;
- b) Those mounted on the over speed governor;
- c) Final limit switches; and
- d) Those mounted on the buffers.

9.5.3.3 The emergency electrical operation switch and its push buttons shall be so placed that the machine can be readily observed when using them;

9.5.3.4 The car speed shall not exceed 0.7 m/s.

**AMENDMENT NO. 1 FEBRUARY 2011
TO
IS 14665 (PART 3/SEC 1) : 2000 ELECTRIC TRACTION
LIFTS**

PART 3 SAFETY RULES

Section 1 Passenger and Goods Lifts

(Page 1, clause 6.1, first para) — Substitute the following for the existing sentence:

‘The net inside car areas for various passenger capacities with corresponding minimum rated loads have been given in Table 1.’

(Page 1, clause 6.1) — Add the following new clause 6.2:

‘6.2 Every passenger lift shall be provided with an overload device, which will prevent the lift from starting in case the lift car is loaded to 110 percent of the rated capacity of the lift or more. **Lift shall remain stationery with door open.** Audio & visual warning device shall be provided to alert the passengers in case of overload.’

(Page 2, Table 1) — Substitute the table given on page 2 for the existing table.

(Page 3, clause 9.4) — Add the following new clause 9.5:

‘9.5 Battery operated Automatic Rescue Device (ARD) shall be provided on all lifts to take the lifts to the nearest possible landing in case of power failure. In case of lifts equipped with back up generator **with AMF (Automatic Mains Failure) panel**, the provision of ARD is optional. For all lifts with ARD, an audio & visual indicator shall be provided inside the lift car to alert the person trapped inside that he/she is being rescued. Capacity of battery shall be such that minimum three rescue operations can be performed without recharging.’

Amend No. 1 to IS 14665 (Part 3/Sec 1) : 2000

No. of Passengers	Minimum Rated Load, kg	Minimum Net Inside Car Area, m ²	Maximum Net Inside Car Area, m ²
(1)	(2)	(3)	(4)
4	272	0.68	0.77
5	340	0.85	0.95
6	408	1.00	1.12
7	476	1.16	1.28
8	544	1.31	1.45
9	612	1.46	1.60
10	680	1.61	1.76
11	748	1.77	1.91
12	816	1.92	2.05
13	884	2.06	2.20
14	952	2.23	2.34
15	1 020	2.35	2.47
16	1 088	2.48	2.61
17	1 156	2.62	2.74
18	1 224	2.75	2.87
19	1 292	2.88	3.00
20	1 360	3.01	3.13
21	1 428	3.14	3.25
22	1 496	3.26	3.38
23	1 564	3.39	3.50
24	1 632	3.51	3.61
25	1 700	3.62	3.73
26	1 768	3.74	3.85
27	1 836	3.86	3.96
28	1 904	3.97	4.07
29	1972	4.08	4.18

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Lifts and Escalators Sectional Committee had been approved by the Electrotechnical Division Council.

The necessity of lifts in multi-storeyed buildings has been so well recognized that no multi-storeyed building is planned without proper provision for lifts. The installation of lifts has been governed in cities by different *Lifts Act* and *Rules* thereunder, which are intended to ensure safe installation and operation of the lifts. However, there is no uniformity in these rules regarding minimum standards of installation which should be fulfilled for safe working of lifts, and this standard is intended to give the necessary guidance for safe installation, operation and maintenance of electric passenger, goods and service lifts.

This standard is one among the series of standards finalized by the Lifts and Escalators Sectional Committee as detailed below. This was done with a view to align the Indian Standards with the latest developments in the field of lifts and escalators and also to align the standards with the European Norms on Lifts and Escalators EN 81. Moreover, these standards are published with a view to have a uniform code for electric traction lifts all over the country, where presently different rules are being followed by different states.

New IS Series

Superseding IS

14665 Electric traction lifts :

Part 1 Outline dimensions

3534 : 1979 Outline dimensions of electric lifts (*first revision*)

Part 2 Code of practice for installation, operation and maintenance

Section 1 Passenger and goods lifts

1860 : 1980 Code of practice for installation, operation and maintenance of passenger and goods lifts (*first revision*)

Section 2 Service lifts

6620 : 1972 Code of practice for installation, operation and maintenance of service lifts

Part 3 Safety rules

Section 1 Passenger and goods lifts

4666 : 1980 Electric passenger and goods lifts

Section 2 Service lifts

6383 : 1971 Electric service lifts

Part 4 Components

Section 1 Lift buffers

9803 : 1981 Buffers for electric passenger and goods lifts

Section 2 Lift guide rails and guide shoes

10191 : 1982 Car and counterweight guide rails, guide rail supports and fastenings for lifts; and

11615 : 1986 Car and counterweight guide shoes for electric passenger and goods lifts

Section 3 Lift carframe, car, counterweight and suspension

11706 : 1986 General requirements of carframe for electric passengers and goods lifts

Section 4 Lift safety gears and governors

9878 : 1981 Safety gears and governors for electric passenger and goods lifts

Section 5 Lift retiring cam

10448 : 1983 Retiring cam for passenger and goods lifts

(*Continued on third cover*)

*Indian Standard***ELECTRIC TRACTION LIFTS****PART 3 SAFETY RULES****Section 1 Passenger and Goods Lifts****1 SCOPE**

1.1 This standard (Part 3/Sec 1) applies to the construction and safety of new passenger and goods lifts suspended by ropes and employing a guided lift car.

1.2 This standard does not apply to platform lifts, amusement devices, skip hoists, conveyors or similar apparatus used for raising, piling or tiering.

2 REFERENCES

The following standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
10580 : 1983	Service conditions for electrical equipment
12360 : 1988	Voltage bands for electrical installations including preferred voltages and frequency
14665	Electric traction lifts:
(Part 2/Sec 1 and 2) : 2000	Part 2 Code of practice for installation, maintenance and operation, Section 1 Passenger and goods lifts; Section 2 Service lifts
(Part 4/Sec 4) : 2000	Part 4 Components, Section 4 Lift safety gears and governors

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 14665 (Part 2/Sec 1) shall apply.

4 MATERIALS

All materials, fittings, appliances, etc, including electronic equipment shall work satisfactorily under normal operating conditions (*see* IS 10580 and IS 12360).

5 FACTOR OF SAFETY

The factor of safety for any part of the lift shall not be less than five. Higher factor of safety for various parts shall be applicable wherever specified in the relevant

parts and sections of this standard.

6 CAPACITY AND LOADING**6.1 Rated Load and Net Inside Car Area Measurements**

The minimum rated load of a passenger lift car corresponding to the net inside car area shall bear the relationship given in Fig. 1, the net inside car area being evaluated as shown in Fig. 2. The net inside car areas for certain selected values of minimum rated loads have been given in Table 1.

NOTES

1 The graph given in Fig. 1 is based on the following formula :

$$W = 35.05 A^2 + 325.66 A$$

where

$$W = \text{rated load in kg, and}$$

$$A = \text{net inside areas in m}^2.$$

2 For rated loads exceeding those covered by the graph, values may be evaluated from the formula given in Note 1.

3 To avoid the possibility of serious overloading of bed lifts, it is recommended that such lifts should be treated as passenger lifts.

4 The minimum rated load for goods lifts shall be based on a load of not less than 3.45 kN/m² of the net inside car area.

5 When the load in a goods lift consists of pallets, or similar single piece loads loaded by means of a power truck, it is necessary during loading and unloading to take into account the total load on the car platform, the capacity of the brake, and the resistance to slipping of the ropes on the sheave of a traction machine. Similarly, guide rails, guide fixings, car frame and platform shall be designed to withstand the horizontal thrust imposed by power trucks, motor vehicles and the like.

6 For motor vehicle and other special purpose lifts for transportation of light weight and heavy volume loads, the lift car inside dimensions mutually agreed between manufacturer and purchaser will be permitted, with the provision of a device to prevent the lift room starting from a landing in case of overloading.

7 LOAD PLATE**7.1 Load to be Marked in the Lift Car**

A load plate giving the rated load of the lift shall be

fitted in each lift car in a conspicuous position. For passenger lifts, the rated load shall be given in number of persons and kilograms. For goods lifts, the rated load shall be given in kilograms or other convenient units and in persons. For the purpose of this clause, a person shall be regarded as weighing 68 kg.

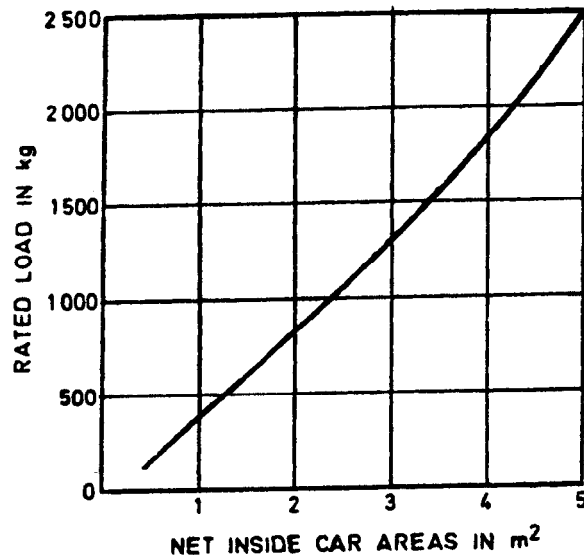


FIG. 1 MINIMUM RATED LOADS FOR PASSENGER LIFT CARS

Table 1 Maximum Net Car Areas for Various Rated Loads
(Clause 6.1)

Rated Load	Maximum Net Inside Car Area
kg	m ²
272	0.77
340	0.95
408	1.12
476	1.28
544	1.45
612	1.60
680	1.76
748	1.91
816	2.05
884	2.20
1 000	2.43
1 500	3.38
2 000	4.22
2 500	4.99

8 TERMINAL STOPPING AND FINAL LIMIT SWITCHES

8.1 Every electric lift shall be provided with upper and lower normal terminal limit switches arranged to stop the car automatically within the limits of top car

clearance and bottom runby (overtravel) from any speed attained in normal operation. Such limit switches shall act independently of the operating device, the ultimate or final limit switches and the buffers.

8.2 Normal terminal limit switches may be fitted in the lift car or in the lift well or in the machine room, and such switches shall be brought into operation by the movement of the lift car.

8.3 When terminal limit switches are situated in the machine room, they shall be mounted on and operated by stopping device mechanically connected to and driven by the lift car without dependence upon friction as a driving means. An automatic safety switch shall be provided to stop the machine should the tape, chain, rope or other similar device mechanically connecting the stopping device to the car fail [see IS 14665 (Part 4/Sec 4) : 2000].

Provided that when the floor controlling or selector of an automatically operated lift is driven in accordance with this requirement, the floor stopping contacts for each terminal floor may serve as normal terminal floor stopping devices.

8.4 Ultimate or Final Limit Switches

Electric lifts shall, in all cases, be provided with ultimate or final limit switches arranged to stop the car automatically within the top and bottom clearances independently of the normal operating device and the terminal limit switches. The switches and the oil buffer shall be so arranged that the opening of the switch and the engagement of the buffer shall be as nearly simultaneous as is possible. When spring buffers are employed, the switch shall open before the buffers are engaged.

8.5 Ultimate or final limit switches shall act to prevent movement of the lift car under power in both directions of travel and shall, after operating, remain open until the lift car has been moved by a hand winding to a position within the limits of normal travel.

8.6 Ultimate or final limit switches shall not be mounted on the lift car and shall be operated by the movement of the lift car in the lift well.

8.7 Ultimate or final limit switches shall not control the same switches on the controller as those controlled by the normal terminal limit switches unless two or more separate and independent switches are provided, two of which shall be closed to complete the motor and brake circuit in each direction of travel. When the ultimate or final limit switches control the same switch or switches on the controller as the operating device or the terminal limit switches, they shall be connected in the control circuit on the opposite side to the terminal limit switches.

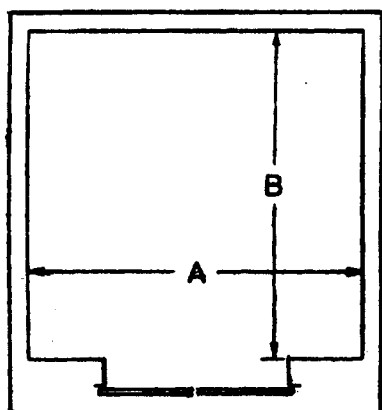
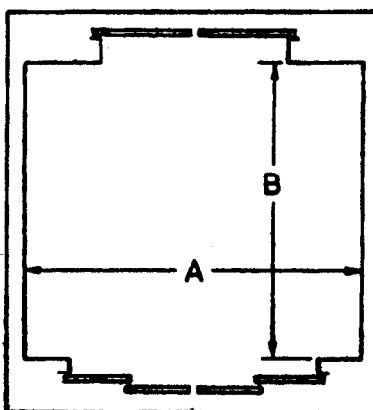
NET INSIDE CAR AREA = $A \times B$ NET INSIDE CAR AREA = $A \times B$

FIG. 2 NET INSIDE CAR AREAS FOR PASSENGER LIFTS

8.8 Ultimate limit switches designed to open the main circuit of the motor may control the same switch or switches on the controller as those controlled by the terminal limit switches, but when such ultimate limit switches are employed on direct current power supplies, they shall be provided with additional contacts to control the brake circuits. All ultimate or final limit switches shall be of enclosed type and shall be securely mounted. The contacts of all such switches shall be opened positively and mechanically by the movement of the lift car.

9 OPERATION

9.1 A manually operated mains disconnecting switch shall be installed in the main circuit cables of electric lift machines or motor generator sets. This switch shall be placed close to and visible from the machine or motor generator sets it controls.

9.1.1 When there are more than one lift machine in machine room, each machine shall have a disconnecting switch. These switches shall be numbered to correspond to the number of the driving machine which they control and they shall be conveniently situated with respect to the driving machine they control.

9.2 Automatic (push button operated) lift shall conform to the following requirements.

- a) It shall not be possible to start the lift car under normal operation unless every landing door and car door is in the closed position.
- b) The landing push buttons shall be inoperative during the whole time an occupied lift car is in use. The landing push buttons shall remain inoperative until the person or persons, using the lift, have vacated the lift car and the landing door has been again closed, except that with

the collective control, the push button may be utilized for this purpose provided they do not in any way interfere with the direction of current journey and that provision shall be made for a reasonable time lag between the stopping of the lift car and its being restarted.

9.3 When the control and facilities for inspection are fitted on top of car, it shall be so ensure that when in use :

- a) It is not possible to control the car from any other position;
- b) The car will travel only at a speed not exceeding 1.0 m/s in case of drives with two speed motors and dc motors;
- c) The car shall not move until all safety devices are in and remain in the safe position;
- d) The car shall move only whilst the corresponding button is subjected to continuous pressure; and
- e) An emergency switch with the positions marked thus 'STOP' and 'RUN' (or 'TEST SLOW'), shall be provided in this control station. When the switch is in 'STOP' position it shall not be possible to move the car.

9.4 An emergency stop switch may also be fitted on the top of every lift car for use by persons working thereon.

10 LEVELLING ACCURACY

10.1 Every lift car under automatic attendant control (other than car switch control) shall stop at landing with car sill fairly in level with the landing sill. The difference in levels shall not exceed the distances

indicated as :

Levelling Accuracy, Max

- | | |
|--|---------|
| ¹⁾ a) Lifts up to speed of 0.65 m/s and capacities up to 550 kg | ± 75 mm |
| ²⁾ b) Lifts upto speed of 1.0 m/s and drives with two speed motors having a ratio of 1 : 4 between high speed and low speed | ± 25 mm |
| c) Lifts with electronic motor control / ward leonard control (any speed and any load) | ± 12 mm |

11 TESTING

11.1 General

Sufficient tests and inspection shall be made during manufacture of the lift components to ensure that they comply with relevant standard.

11.2 High Voltage Test

The dielectric of electrical apparatus (excluding motors, generators and instruments which are tested in accordance with the appropriate Indian Standards wherever they exist) shall be capable of withstanding a test voltage of ten times the working voltage, with a maximum of 2 000 V when applied :

- a) between the live parts and case or frame with all circuits completed,
- b) between main terminals or equivalent parts with all circuits open, and
- c) between any live parts of independent circuits.

NOTE — Owing to the impracticability of applying test (b) and (c) mentioned above on controllers and similar apparatus after controller wiring has been completed, these tests may be made at convenient stages of manufacture.

11.2.1 The method of applying the voltage shall be as follows:

11.2.1.1 Method of applying high voltage

The test shall be made with alternating voltage of any convenient frequency, preferably between 40 Hz and 60 Hz. The test voltage shall be of approximately

¹⁾ For speeds higher than 0.65 m/s and loads higher than 550 kg the levelling accuracy will be wider.

²⁾ Normally drives with two speed motors are not used for speeds higher than 1 m/s. The maximum capacity to achieve the accuracy also varies with the ratio of the high speed to low speed in two speed motors.

sinewave form, and during the application of voltage, the peak value, as would be determined by spark gap by oscillograph or by any other approved method, shall not be more than 1.45 times the rms value. The rms value of the applied voltage shall be measured by means of a voltmeter used with a suitably calibrated potential transformer or by means of a voltmeter used in connection with a special calibrated voltmeter winding or testing transformer, or by any other suitable voltmeter connected to the output side of the testing transformer.

11.2.1.2 Duration of high voltage test

The test shall be commenced at a voltage of about one-third of the test voltage which shall be increased to the full test voltage as rapidly as is consistent with its value being indicated by the measuring instrument. The full test voltage shall be maintained for 1 min. At the end of this period, the test voltage shall be rapidly diminished to one-third of its full value before switching off.

11.3 Tests at Site

The lift shall pass the following tests when carried out at site and before it is put into normal service. The necessary test weights and instruments shall be provided by the lift manufacturer and the electric power at the declared voltage (and frequency) required for adjusting and testing shall be supplied by the purchaser:

- a) Test to determine that the insulation resistance between power and control lines and earth is not less than 0.5 megohms when measured with a dc voltage of 500 V should be carried out with the conductors so connected together as to ensure that all parts of every circuit are simultaneously tested.

NOTE — The dampness in a new building may prevent a reading of 0.5 megohms from being obtained, in which event the lift may be provisionally accepted by the purchaser with an insulation resistance of 0.25 megohms and re-tested before being finally accepted.

- b) Test to determine that the earthing of all conduit switch castings and similar metal work is continuous and of low resistance. Tests should be made from all terminal points by means of a substantial current to ensure that the resistance of earth path is sufficiently low to enable fuses or circuits to operate under faulty conditions.
- c) Test to determine that the motor, brake, control equipment and door locking devices and limit switches function correctly. Brake to be tested to check whether it can sustain a car at rest

with contract load plus 25 percent of contract load.

- d) Test to determine that the lift car raises and lowers rated load.
- e) Tests to determine that the lift car at least achieves the contract speed.
- f) Tests to determine that the safety gear stops the lift car with rated load. Overspeed tests

shall be made with ropes attached and all electrical apparatus operative except the overspeed switch on the governor, the stopping distance of the lift car is the actual slide as observed from the marking on guides.

NOTE — The safety gear of a lift having an ac motor driven machine may be tested by manually tripping the governor where the speed attained by a loaded lift car descending, with brake released, is insufficient to operate the governor.

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Indian Standard

ELECTRIC TRACTION LIFTS

PART 3 SAFETY RULES

Section 2 Service Lifts

1 SCOPE

1.1 This standard (Part 3/Sec 2) prescribes the constructional and safety requirements and the methods of test for electric service lift.

1.2 This standard does not apply to platform and motor vehicle lifts, amusement devices, skip hoists, conveyors or similar apparatus used for raising, piling or tiring.

2 REFERENCES

The following standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
401 : 1982	Code of practice for preservation of timber (<i>third revision</i>)
2365 : 1977	Steel wire suspension ropes for lifts, elevators and hoists (<i>first revision</i>)
3109 (Part 1) : 1982	Short link chain, Grade M (4) : Part 1 Non-calibrated load chain for lifting purposes (<i>second revision</i>)
12360 : 1988	Voltage bands for electrical installations including preferred voltages and frequency
14665	Electric traction lifts:
(Part 2/Sec 1 and 2) : 2000	Part 2 Code of practice for installation, maintenance and operation, Section 1 Passenger and goods lifts; Section 2 Service lifts
(Part 4/ Sec 3) : 2000	Part 4 Components, Section 3 Lift carframe, car, counterweight and suspension
(Part 4/ Sec 4) : 2000	Part 4 Components, Section 4 Lift safety gears and governors

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 14665 (Part 2/Sec 1) and the following definitions shall apply.

3.1.1 Service Lift (Dumb-Waiter)

A lift with a car which moves in guides in a substantially vertical direction; has net floor area, total inside height, whether or not provided with fixed or removable shelves, and capacity not exceeding 1 m², 1.25 m and 250 kg respectively; and is exclusively used for carrying materials and not any person.

4 MATERIALS

4.1 All materials, fittings, appliances, etc, used in lift installation shall conform to the relevant Indian Standards wherever these exist. The materials for which Indian Standards do not exist shall be approved by a competent authority.

4.1.1 Indian Standards published so far for some of the materials and equipment used in the lift are as given in Annex A.

5 FACTOR OF SAFETY

The requirements of Section 1 of this standard shall apply.

6 GUIDES

The requirements of Section 1 of this standard shall apply except that angle section guide rails may also be used and the requirements of IS 14665 (Part 4/ Sec 4) shall apply only when safety gear is used.

7 BUFFERS

Spring, rubber or timber buffers shall be used. Timber shall be seasoned and treated in accordance with IS 401.

8 LIFT CAR

8.1 The service lift car shall be made of wood or metal, reinforced at the point of suspension. The material used shall be of such strength and stiffness that it withstands the contract load. Two pairs of renewable guide shoes shall be provided.

8.2 Any removable shelves shall be so retained that they are not displaced by the movement of the car.

8.3 Car constructed with openings on opposite sides shall be provided with some form of protection to prevent the goods from projecting outside the car. Where gates are used, they shall have pickets spaced with centres not more than 125 mm apart.

8.4 Where safety gear is provided, steel car frame of sufficient rigidity to withstand the operation of the safety gear shall be provided.

9 STRUCTURAL STRENGTH AND LOADING

9.1 Rated Load and Net Inside Car Area Measurements

Driving machine, car and counterweight, suspension means, overhead beams and supports, buffers and buffer supports, guides and brackets and all other members subjected to load during operation shall be designed on the basis of rated load calculated as follows:

$$L = 250 A^2$$

where

L = rated load in kg, and

A = net inside area in m^2 .

The rated load shall be not more than 250 kg and the net inside platform area shall be not more than $1 m^2$.

10 LOAD PLATE

A metal plate giving the rated load in not less than 6 mm high letters and figures shall be fastened in a conspicuous place in the car.

11 COUNTERWEIGHT

11.1 The counterweight shall be of metal.

11.2 The counterweight consisting of sections and without frame shall have not less than two suspension rods extending throughout the counterweight. The nuts on the suspension rods shall be retained by split pins, concrete in metallic frame or equivalent positive means.

12 SAFETY GEAR

12.1 A safety gear shall be provided for the car and counterweight of the service lift working over an occupied space or corridor, where the bottom of the pit cannot support the impact load of the freely falling loaded car or counterweight.

12.2 The safety gear may be of the instantaneous type operated by an independent steel wire rope running over an independent pulley at the top of the lift well; governor operation and switch to cut the control circuit is not required.

13 MEANS OF SUSPENSION AND FASTENINGS

13.1 The car and counterweight shall be suspended by one or more steel wire suspension ropes conforming to IS 2365 or silent type roller, block or multiple link chains [*see also* IS 3109 (Part 1)].

13.2 All the ropes and chains anchored to a winding drum shall have not less than one turn [*see also* IS 3109 (Part 1)] on the drum when the car or counterweight has reached the extreme limit of its overtravel.

13.3 The factor of safety of the suspension means, based on the static load of the car with structural capacity load or of the counterweight, shall be not less than:

$4.5 + 1.4 V$ for ropes, and

$5.6 + 1.75 V$ for chains.

where

V is the speed of the rope or chain in m/s.

13.3.1 For the purpose of this standard, the factor of safety is given by:

$$\frac{F \times n \times k}{W}$$

where

F = nominal breaking strength of the rope or chain;

n = number of separate suspension ropes or chains under load;

k = roping factor, that is, 1 for 1 : 1 roping, 2 for 2 : 1 roping and 3 for 3 : 1 roping; and

W = load on the car rope or chain when the car is stationary and loaded to the structural capacity load of the service lift.

13.4 No car or counterweight rope shall be repaired or lengthened by splicing.

13.5 The winding drum ends of the car and counterweight ropes shall be secured by clamps on the inside of the drum.

13.6 The car and counterweight ends of the suspension ropes shall be fastened by spliced return loops, clipped return loops or individual tapered babbitted sockets. Loops shall not bear directly on their fixings, but shall be lined with proper thimble eyes or equal protection.

13.7 In all the cases the fastenings shall be capable of sustaining a load not less than the ultimate strength of the suspension ropes based on a factor of safety of 80 percent of the specified factor of safety for suspension ropes.

13.8 Means shall be provided to equalize the load on the individual suspension ropes or chains.

13.9 Tensioning devices for compensation ropes, safety ropes and the like shall be protected against damage due to falling objects.

14 SHEAVES AND PULLEYS

The requirements of IS 14665 (Part 4/Sec 3) shall apply.

15 SHAFT FILLETS AND KEYS

The requirements of IS 14665 (Part 4/Sec 3) shall apply.

16 DRIVING MACHINE

16.1 The driving machine shall be of either of the following types:

- a) Drum type, and
- b) Traction type.

16.2 The driving machine and sheaves shall be designed with a factor of safety, based on the static load (the structural capacity load plus the weight of the car, ropes, counterweight, etc), of not less than

- a) 6 for steel, and
- b) 9 for cast iron and other materials.

16.3 The driving machine shall have electrically released brake applied automatically by springs in compression or by gravity when the power is removed from the motor.

17 LANDING DOORS

All landing openings in the lift well enclosure shall be protected by doors, shutters or close picket type collapsible gates.

18 LOCKING DEVICES FOR LANDING DOORS

Every landing door, shutter or gate shall be equipped with an electromechanical lock which shall prevent the lift from moving whilst any landing door, shutter or gate is open.

19 CONTROLLERS AND OPERATING DEVICES

19.1 A manually operated mains-disconnecting switch shall be installed in the main circuit cables of electric driving machine. This switch shall be visible readily accessible from the machine.

19.2 When metal-to-metal contacts are used in the controller switch for opening the main circuit or for stopping the driving machine, at least two independent current breaks shall be incorporated in the design. In the event of an earth fault or with any door open, the lift shall not work.

19.3 Operation of a spring or springs in tension or the completion of another electric circuit shall not be depended upon to break the circuit to stop the lift at terminal landings.

19.4 An interruption of the electrical circuit shall stop or prevent the movement of the car.

19.5 When the driving machine is operated by a polyphase ac motor, it shall be protected against phase reversal or failure.

19.6 No control system shall be used which depends on the completion or maintenance of an electrical circuit for the interruption of the power supply and the application of the electro-mechanical brakes when the lift car reaches the terminal floors.

19.7 The control circuits shall be fused or otherwise protection against faults or overloads, independently of the main circuit.

19.8 The voltage of any controller-operating circuit shall not exceed the low voltage as defined in IS 12360. The control circuits shall be suitably protected independently of the main circuit and they shall be so arranged that an earth fault or open circuit shall not create an unsafe condition.

19.9 Controller operate by hand ropes, levers or similar devices shall not be permitted.

20 TERMINAL STOPPING AND FINAL LIMIT SWITCHES

20.1 A device shall be provided to remove power automatically from the motor and brake at the top and bottom terminals independently of the operation of the normal operating device. This device may be located in the machine room in the car or in the lift well.

20.2 When the lift is provided with drum type driving machine, it shall also have stopping limit switch operated by the machine.

21 TESTING

The requirements of Section 1 of this standard shall apply except the test specified in 11.3 (f) of Section 1.

22 GENERAL INFORMATION TO BE GIVEN WITH ENQUIRY AND ORDER

When enquiring for and ordering an electric service lift in accordance with this standard, the particulars given below shall be supplied:

- 1) Type of lift (in this case, electric service lift);
- 2) Number of lifts required;
- 3) Load to be carried in kg;
- 4) Rated speed in m/s;
- 5) Travel in m;
- 6) Number of floors and entrances to be served;

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- 7) Names of floors served;
 - 8) Method of control;
 - 9) Position of machine room;
 - 10) Size of lift well;
 - 11) Position of counterweight;
 - 12) Size of car platform;
 - 13) Construction, design and finish of car body-work;
 - 14) Particulars of car entrances;
 - 15) Particulars of landing entrances;
 - 16) Particulars of electric power supply, namely :
 - a) wattage,
 - b) voltage,
 - c) whether ac or dc,
 - d) number of phases,
 - e) frequency in Hz, and
 - f) type of wiring system;
 - 17) Whether neutral wire is available for control circuits;
 - 18) Particulars of electric supply for lighting, namely;
 - a) voltage,
 - b) whether ac or dc, and
 - c) frequency in Hz;
 - 19) Whether the premises are subject to *Lifts Act/Rules*;
 - 20) Proposed date for commencement on site;
 - 21) Proposed date for completion;
 - 22) Particulars of additional items, for example, safety items, required; and
 - 23) Whether booklet giving complete details of maintenance schedule and circuit diagram is required.
- NOTE — The following items are usually excluded from the lift contract:
- a) Builder's work, such as cutting away and making good;
 - b) Lift well enclosure (landing doors are usually included in the contract).
 - c) Overhead beams or other steel work, or the drilling of any steel work;
 - d) Scaffolding;
 - e) Temporary guarding of lift well;
 - f) Power and lighting cables to lift machine room and lighting cables to halfway point in lift well;
 - g) Main switches and fuses or circuit breakers in machine rooms, and main switches and fuses for isolating main cables to machine rooms; and
 - h) Surveyor's or other professional fees.

ANNEX A
(Clause 4.1.1)

INDIAN STANDARDS FOR MATERIALS USED IN ELECTRIC SERVICE LIFT

A-1 Indian Standards published so far for some of the materials used in the electric service lift are as follows :

<i>Material</i>		<i>Indian Standard</i>	<i>Material</i>	<i>Indian Standard</i>
			Sockets for wire ropes	IS 2485 : 1979 Drop forged sockets for wire ropes for general engineering purposes (<i>first revision</i>)
Thimbles for wire ropes	IS 2315 : 1978 Thimbles for wire ropes (<i>first revision</i>)		Worm gears	IS 3734 : 1983 Dimensions for worm gearing (<i>first revision</i>)
Grips for wire	IS 2361 : 1994 Bulldog grips ropes (<i>second revision</i>)		Capping metal for wire ropes	IS 3937 : 1974 Recommendations for socketing of wire ropes (<i>first revision</i>)
Steel wire ropes	IS 2365 : 1977 Steel wire suspension ropes for lifts, elevators and hoists (<i>first revision</i>)		Steel eyebolts	IS 4190 : 1984 Eyebolts with collars (<i>first revision</i>)

ANNEX B

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(Continued from second cover)

<i>New IS Series</i>		<i>Superseding IS</i>
Section 6	Lift doors and locking devices and contacts	7759 : 1975 Lift door locking devices and contacts; and 11633 : 1986 Lift doors
Section 7	Lift machines and brakes	10913 : 1984 Brakes for electric passenger and goods lifts
Section 8	Lift wire ropes	—
Section 9	Controller and operating devices for lifts	—
Part 5	Inspection manual	—

This standard IS 14665 (Part 3/Sec 1 and 2) will supersede:

IS 4666 : 1980 Electric passenger and goods lifts (*first revision*); and

IS 6383 : 1971 Electric service lifts.

Details about installation, maintenance and operation of electric traction lifts, passenger and service lifts are covered in IS 14665 (Part 2/Sec 1 and 2). This standard (Part 3/Sec 1) on passenger and goods lifts is intended to cover constructional and safety aspects of these types of lifts.

Section 2 of this standard lays down the specific requirements of service lifts; and for various other requirements and test methods, reference have been made to Section 1 of this standard, which is a necessary adjunct to this standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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Amendments Issued Since Publication

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