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Requirements of Stairs, Lift in Public Building and Offices

Elevators are medium to decrease human effort and make movement across multiple floors seamless. However adherence to the rules of installing lifts or elevators in residential societies is critical as these norms directly affect the safety and security of the residents and users of a building. Here is enlisted some common concerns on lift rules and regulations in India.

Installation of lifts is no more a premium feature. The usage of lifts has become common in residential buildings of more than two floors. With developers to individuals, all opting for lifts, it is important to stay abreast with the Indian lift regulations. Varying from one State to another, these rules are vast, and users may often be left with unconnected dots and multiple questions in their minds. Hence, here are some concerns regarding lift rules and regulations to help those who plan to install them in their properties.

What is the number or size of lifts required in a building?

No regulations specify any mandatory requirements as far as the number of lifts is concerned. Indian Standards (IS) 14665 Part 2, Section 1, and the National Building Code (NBC) of India 2016 offer guidelines for traffic analysis calculations, which determine the handling capacity and response time. Basis this analysis, there are different recommendations for different types of buildings.

For buildings higher than 15 m, there is a need for an eight-passenger fire lift (with automatic doors and speed sufficient to reach the top floor in 60 seconds), and other requirements as per the Fire Prevention Act and rules of each State. The NBC 2016 highlights that there is a need for a stretcher lift in buildings with a height of more than 30 m. As these requirements vary across States, it is recommended to consult a technical expert for specific cases.

What is the process for procuring a lift permit for an existing building?

Lift licenses are currently required in 10 Indian States, including Maharashtra, Gujarat, Tamil Nadu, Karnataka, Kerala, West Bengal, Assam, Himachal Pradesh, Haryana and Delhi. Every State's Lift Act defines the procedures, fee structure and timelines for obtaining various permissions for lifts and elevators within that State. The Act contains guidelines for obtaining licenses for existing buildings as well.

Are mirrors prohibited inside elevators?

The code of practice prescribed by the Bureau of Indian Standards (BIS) is required to be followed for lifts and their installations. As per IS 14665 Part 4 of Section 3 clause 5.8, mirrors can be used inside the elevator car. However, it is recommended that they should be splinter-proof and not cause injury to passengers in case they are broken due to any abnormalities.

What is the penalty for breaching lift regulations?

The Electrical Inspector, along with Assistant Electrical Inspectors, are responsible to take action against defaulters. There is also a penalty clause in the Bombay Lifts Act, 1939, which imposes a fine of Rs 500 for any breach of the Act or Rules made thereunder, as well as a fine of Rs 50 for each day following the first day when the breach continues.

In Delhi NCR, the Inspector inspects lifts in all buildings to ensure they are in compliance with the Delhi Lift Rules, 1942. In addition to issuing licenses and No Objection Certificates (NOCs) to lifts adhering to the provisions of the Act, the Inspector also issues notices to defaulters for rectification of defects.

A building of over 13 m height should have a lift. The lift should be provided from the ground floor with a capacity of a maximum of six persons. It is recommended to use IS-compliant lifts and escalators for the safety of equipment and passengers in States where a Lift Act is not defined. For home lifts, the recommended standards are IS 14665 and IS 15259. If it does not have a machine room, then IS 15785 or a similar IS 14671 is recommended. As per IS 15259:2002 Clause 5, a home lift shall have a load capacity of not less than 204 kg (three passengers) and not more than 272 kg (four passengers), and a car speed not exceeding 0.2 m per second. Also, a two-person lift is not recommended for various technical reasons.

How many floors are mandatory for lift installation in India?

In India, a lift is required in a building with four or more stories that stands 13 m above ground. The elevator should have the capacity to hold a minimum of six people.

Is AMC Compulsory for a Lift?

The government has mandated AMC (Annual Maintenance Contract) of lifts from a qualified-licensed elevator. It is also necessary for security and convenience.



Things to check before procuring a lift

Here's a checklist to consider before getting a lift:

- Capacity
- Number of occupants of a building
- Safety features such as an automated rescue system
- Speed
- Mechanical features
- Infrared door curtains



For the purpose of obtaining permission to install passenger lifts, you must submit an application on a prescribed form to the Inspector of lifts. Although the lift regulations are complicated with multiple variations, it is advised to engage a technical expert right from the beginning of the project to ensure that all norms are complied with.

Requirements of Stairs, Lift in Public Building and Offices

Staircase is an important component of a building providing us the access to different floors and roof of the building. It consists of a flight of steps (stairs) and one or more intermediate landing slabs between the floor levels. Different types of staircases can be made by arranging stairs and landing slabs. Stairs can be made of concrete, stone, wood, steel or combination of any of these.

Primary Functions of Staircase

- Provide an access from one floor to another.
- Provide a safe means of travel between floors.
- Provide an easy mean of travel between floors.
- Provide a suitable means of escape in case of fire.
- Provide a mean of conveying fittings and furniture between floor levels.



General terminologies used in Staircase

1. **Steps** - A series of horizontal open treads with a space between the treads with a space between the treads or as enclosed steps with a vertical face between the treads as shown in the figure below.

- **Tread** – horizontal surface of a step
- **Riser** – vertical surface or near vertical of a step

2. **Nosing** - In some cases the tread is projected outward to increase the space. This projection is designated as nosing.

3. **Waist** - The thickness of the waist-slab on which steps are made is known as waist. The depth (thickness) of the waist is the minimum thickness perpendicular to the soffit (the underside) of the staircase. The steps of the staircase resting on waist-slab can be made of bricks or concrete.

4. **Going** - Going is the horizontal projection between the first and the last riser of an inclined flight.

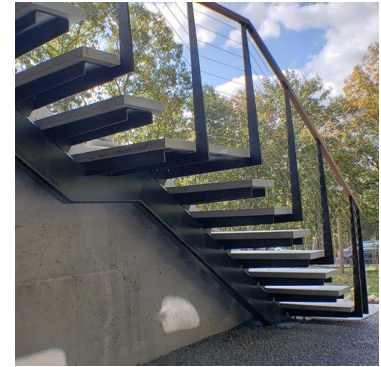
5. **Flight** – It is an uninterrupted series of steps between floor and landing, or between landing and landing. A flight should have no fewer than 3 steps and no more than 16 risers. The rise and tread in one flight and landings between Floors should be equal. The rise and tread should have the same size to avoid interruption in the rhythm of going up or down. The dimension of the riser and thread will determine whether the stair is steep or shallow. The steeper stair will save more space and is accepted for houses because the occupants are more familiar with the stair. The shallow stair requires more area but suitable for public building to minimize danger to the public escaping via stair during emergency.

6. **Head Room** – It is a clearance height between the pitch line of the stair and the underside of the stairs, landings and floors above the stair. Minimum 2 m clearance from the pitch line for a convenience of human and goods movement.
7. **Baluster** – It is a vertical stand that supports handrails for security purposes. It can be made from timber or steel. It is bolted to the sides of flights or through the material, grouted or set in mortises either cast or cut in the material.
8. **Handrail** – It is a horizontal member fixed on the top of series of balusters. It can be made from timber or steel.
9. **Balustrade** - A series of baluster, capped by a handrail.

Materials used for staircase construction

1. **Timber** – It is constructed from timber board and it is commonly used for domestic work. The design of stairs flight landings or tapered steps is depend on the space to accommodate it. The handrail balustrade is of mere importance which provides visual and practical safety barrier to the side of stairs.
2. **Precast Concrete** – Using this kind of material variety of stair types and arrangements are possible, which of having its own appearance, characteristic and method of construction. It is commonly use as it is non-combustible, stronger and hardwearing. Will maintain its strength and integrity for a reasonable period during an outbreak of fire. Therefore, it is more suitable than timber stair as an escape route.

3. **Cast-in-situ** – There is a possibility of framing variety of stair types and arrangements, which of having its own appearance, characteristic and method of construction. It is non-combustible, stronger and hard wearing. It can maintain its strength and integrity for a reasonable period during an outbreak of fire. Therefore, it is more suitable than timber stair as an escape route.



Typical in-situ RC stairs are:

- a. Inclined slab stair
- b. Cranked slab stair
- c. String beam stair
- d. Cantilever stair

4. **Metal** – It can be produced in cast iron, mild steel or aluminium alloy for both external and internal used. It is usually is custom made, therefore is more expensive. The steel channel section serves as stringer. The treads can be in the form of steel pan filled with concrete, steel flat plate with textured top surface or bar grating. It can be painted or covered with concrete for fire safety reason. The main advantage is there is no need of formwork during construction but the main disadvantage is regular maintenance is required in the form of painting.

Functional Requirements of Good Stair Case

A good stair should provide an easy, quick and safe mode of communication between the various floors of the building. General requirements of good stairs are as mentioned below.

Location - it should preferably be located centrally, ensuring sufficient light and ventilation.

Width of stair - the width of stairs for public buildings should be 1.8 m and for residential buildings 0.9 m.

Length - the flight of the stairs should be restricted to a maximum of 12 and minimum of 3 steps.

Pitch of stair- the pitch of long stairs should be made flatter by introducing landing. The slope should not exceed 400 and should not be less than 250.

Head room - the distance between the tread and soffit of the flight immediately above it, should not be less than 2.1 to 2.3 m. this much of height is maintained so that a tall person can use the stairs with some luggage on its head.

Materials-stairs should be constructed using fire resisting materials. Materials also should have sufficient strength to resist any impact.

Balustrade - all open well stairs should be provided with balustrades, to avoid accidents. in case of wide stairs it should be provided with hand rails on both sides.

Landing - the width of the landing should not be less than the width of the stair.

Winders- these should be avoided and if found necessary, may be provided at lower end of the flight.

Step proportions- the ratio of the going and the rise of a step should be well proportioned to ensure a comfortable access to the stair way.

Following empirical rules may be followed.

Treads/Goings in cm + 2 (rise in cm) = 60

Treads/Goings in cm x (rise in cm) = 400 to 450 appx.

Treads/Goings in cm + (rise in cm) = 40 to 45 appx.

Standard sizes: Tread 30 cm, Rise 14 cm

Other combinations of rise and going can be calculated by subtracting 20 mm from going and adding 10 mm to rise. Thus other combinations of rise and going would be :-

Rise 15 cm x Tread 28 cm

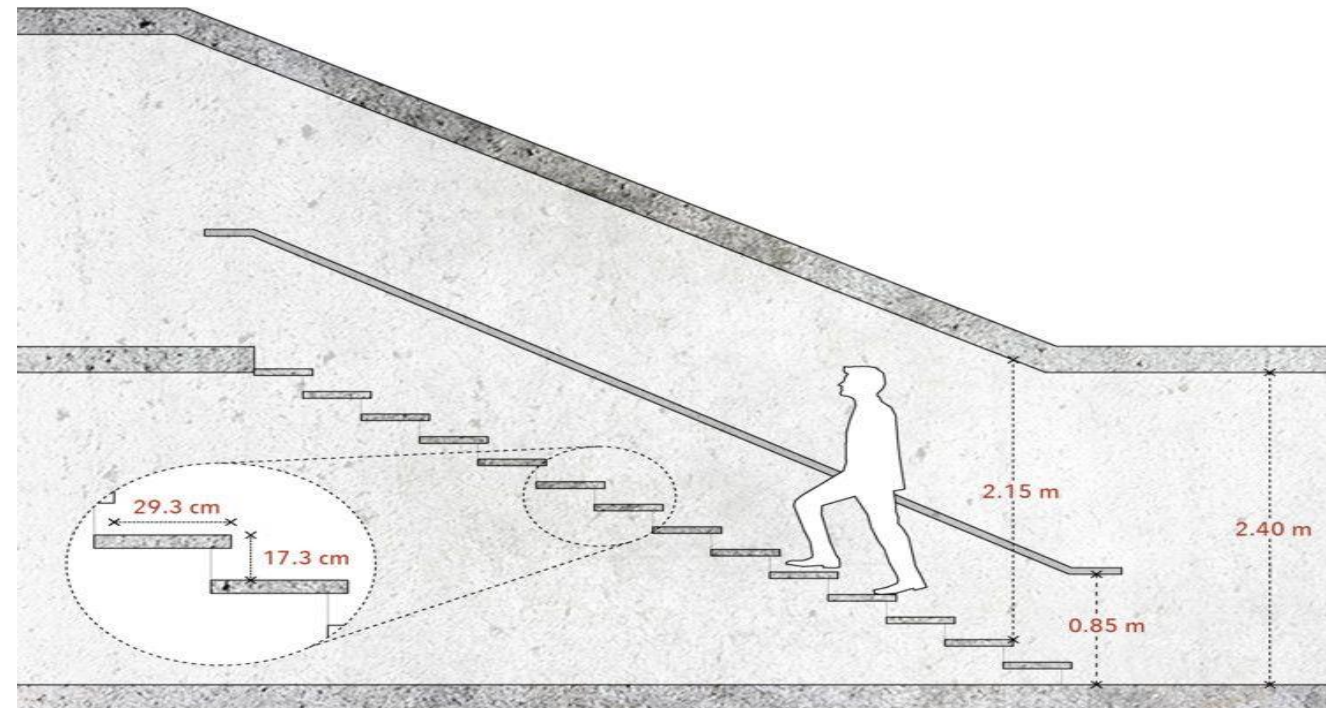
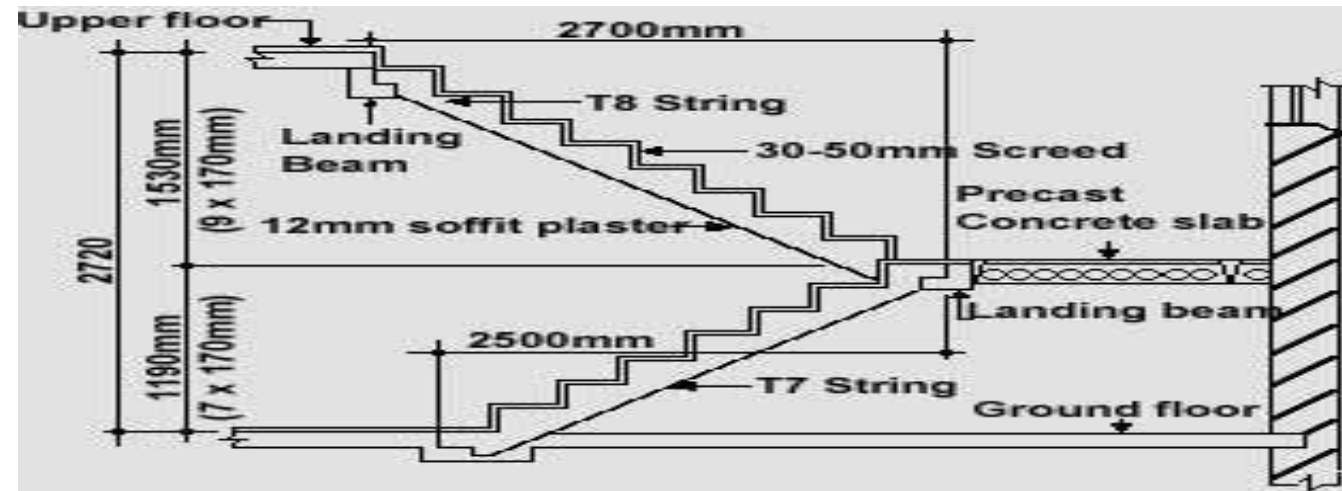
Rise 16 cm x Tread 26 cm

Rise 17 cm x Tread 24 cm

Generally adopted sizes of steps are:

Public buildings: (27 cm x 15 cm) to (30 x 14 cm)

Residential buildings: 25 cm x 16 cm



Conclusion

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards on 16 May 1988, after the draft finalized by the Fire Safety Sectional Committee had been approved by the Civil Engineering Division Council. Indian Standards relating to fire safety of buildings have been formulated covering general principles and fire grading, details of construction, exposure hazard and exit requirements. This standard covering the last aspect was formulated in 1960. In the past 25 years, useful data has been made available by the research institutes of this country as well as from other advanced countries like USA, UK, Canada, etc. The provision in this revision has, therefore, been made based on the data adopted by these countries, and therefore, have been completed modified. The exit requirements and personal hazard dealt with in this standard is considered as at least of equal importance to all other aspects; in fact in most cases, it is paramount because of the density of population associated with particular occupancy; an example is that of a cinema or similar densely occupied building when contrasted with a basement of similar occupancy. Density of population varies from one building to another and also in the same building from time to time; one example is that of a large general or mixed bazar, emporium or stores where a great variety of goods are displayed for sale; and at certain periods may be offered at special attractive bargain prices, with the result that normal population will be rapidly exceeded, more so during peak shopping hours when an outbreak of fire would cause considerable confusion, possibly panic; therefore, the closet attention to design and maintenance of escape routes including any staircases, cannot be over-emphasized. Likewise special consideration is essential to arrangement of display of any highly flammable articles or materials for sale in such risks because of the danger normal escape routes being made unsafe or altogether useless. It would be neither possible nor advisable to rely on electrical or mechanical devices, such as lifts for moving the population of various floors to a place of safety because of the probability of fire rendering these devices inoperative.

Therefore, staircases with associated escape routes become all important and staircases considered in this code are the means of communication in an up and down direction of a building and serve not only as escape routes for occupants but also afford a direct means of access to the source of fire by the fire fighting staff. In fact, staircase landings of buildings which present a serious hazard are required to have fire fighting equipment mounted thereon comprising hydrant stand, pipes and accessories. 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

THANK YOU