Chapter 19: Elevators, Lifts, Escalators (IS 3696, IS 14665)

Introduction

In modern buildings—especially those intended for public use—vertical transportation systems such as elevators, lifts, and escalators play a crucial role in ensuring accessibility for all, including persons with disabilities (PwDs), the elderly, and individuals with temporary mobility impairments. Universal Design principles mandate that such systems be inclusive, safe, and convenient to use. Indian Standards like **IS 14665** (Lifts) and **IS 3696** (Safety in Construction) provide the legal and technical framework for design, installation, and operation. This chapter explores the design parameters, accessibility considerations, and safety measures essential in implementing barrier-free vertical transportation.

19.1 Definitions and Terminologies

- **Elevator/Lift**: A permanent lifting equipment serving two or more landing levels, equipped with a car that moves vertically within guides.
- **Escalator**: A moving staircase for transporting people between floors of a building.
- **Passenger Lift**: Specifically designed to carry people, incorporating accessibility features as per standards.
- **Accessibility Lift/Platform Lift**: Meant for transporting a wheelchair user and possibly an attendant.
- **Universal Design**: Design that caters to all people, regardless of age, disability, or other factors, without the need for adaptation.

19.2 Legal and Regulatory Framework

IS 14665 (Parts 1 to 5):

This Indian Standard covers:

- Basic requirements for the design, installation, and maintenance of lifts.
- Specifications for mechanical, electrical, and safety aspects.
- Requirements for lift enclosures, car dimensions, signaling, and control systems.

IS 3696 (Part 1 & 2):

- Pertains to **safety during construction**, including safe use and maintenance of temporary lifts and hoists used during building development.

Other Relevant Codes:

- **National Building Code (NBC) of India, 2016** (particularly Part 3 and Part 4)
- **The Rights of Persons with Disabilities Act, 2016**
- **Harmonised Guidelines and Standards for Universal Accessibility in India (2021)**

19.3 Accessibility Requirements for Elevators and Lifts

19.3.1 Car Dimensions and Capacity

Category	Minimum Internal Size
Standard Passenger Lift	1100 mm × 1400 mm
Wheelchair-accessible Lift	1500 mm × 1500 mm
With Attendant	2000 mm × 1100 mm or larger

- Door width must be at least **900 mm** to accommodate a wheelchair.
- Door should remain open for a **minimum of 20 seconds** or be equipped with door sensors.

19.3.2 Landing and Car Controls

- Control buttons must be placed at **900 mm to 1200 mm** above the floor.
- Buttons must have **tactile markings** and **Braille inscriptions**.
- **Auditory floor indication** for visually impaired users.
- Illuminated indicators for deaf or hard-of-hearing persons.
- Emergency call system linked to a 24×7 helpline.

19.3.3 Door Operation

- Automatic sliding doors preferred.
- Must have infrared sensor or pressure-sensitive edges to prevent accidents.
- Manual doors must have lever-type handles at accessible height.

19.3.4 Floor Leveling and Safety

- Accurate floor leveling mechanism to prevent tripping hazards.
- Anti-slip flooring inside the lift car.
- Safety gear, buffers, overspeed governor, and emergency brakes to comply with **IS 14665**.

19.3.5 Signage and Visual Indicators

- High-contrast, large font signage both inside and outside the lift.
- Floor numbers and directional arrows with tactile and Braille equivalents.
- Flashing lights in case of emergency stops or fire alerts.

19.4 Escalators and Moving Walks

Though escalators are not recommended for PwDs due to difficulty in use, their design can still incorporate Universal Design principles for wider public usability.

19.4.1 General Design Standards

- Step width: **Minimum 1000 mm** (preferably 1200 mm)
- Inclination: Typically **30 degrees**, never more than **35 degrees**
- Speed: Not more than **0.5 m/s**
- Step riser height: Uniform, max **220 mm**
- Must include handrails on both sides, moving in sync with steps

19.4.2 Safety Features

- Emergency stop buttons at both landings
- Skirt panel safety devices
- Step demarcation in contrasting colors
- Adequate lighting at landings
- Anti-slip tread surface

19.4.3 Accessibility Enhancements

- Tactile ground surface indicators (TGSIs) near landings
- Warning signs about escalator usage
- Voice alerts and visual displays for direction and caution

19.5 Platform and Stair Lifts (Where Elevators Are Not Feasible)

These are installed where spatial constraints or cost prohibit full-scale elevators.

19.5.1 Platform Lifts

- Used for vertical travel of up to 2–3 meters
- Speed: **Maximum 0.15 m/s**
- Should have adequate platform space to accommodate wheelchair user
- Controls accessible to seated persons
- Equipped with non-slip flooring, rails, and emergency stop

19.5.2 Inclined Stair Lifts

- Installed along staircases
- Suitable only if stairs are wide enough (>1100 mm)
- Seat with seatbelt or platform with safety barrier
- Foldable when not in use

19.6 Fire and Emergency Considerations

- Lifts should **not be used in case of fire** unless specifically designed as **firefighting lifts**.
- Evacuation lifts must be fire-resistant, with separate power supply and pressurised lobbies.
- IS 14665 mandates fire rating for lift shaft doors and enclosures.
- Refuge areas must be accessible by lifts or ramps as per NBC.

19.7 Maintenance and Inspection Requirements

- Routine monthly and annual inspection logs must be maintained.
- Emergency rescue drills should be conducted periodically.
- Preventive maintenance as per manufacturer's guidelines.
- Compliance certificates must be issued post-installation, reviewed annually.

19.8 Key Responsibilities of Stakeholders

Stakeholder	Responsibility
Architects	Incorporate lift cores, space planning, and circulation flow for inclusive access.
Engineers	Ensure compliance with IS standards and NBC.
Contractors	Follow installation protocols with trained staff and quality checks.
Maintenance Teams	Ensure uptime, regular servicing, and emergency preparedness.
Building Owners	Periodic audits, user training, signage installation.

19.9 Universal Design Enhancements Beyond Minimum Code

While IS standards and NBC define *minimum* requirements, best practices in Universal Design go further to ensure dignity, independence, and safety for all users—especially persons with disabilities. These enhancements improve usability and reduce discrimination or segregation.

19.9.1 Redundant Accessibility Features

- **Dual control panels** in lifts (one on each side) so users with limb differences can operate them easily.
- **Mirror placement** in lifts to help wheelchair users back out safely.
- **Voice command-enabled elevators** for enhanced usability, particularly for blind users.
- **Remote call systems** or app-integrated elevator panels for users with mobility or speech impairments.

19.9.2 Inclusive Aesthetics

- Use of **color psychology** for calming, visible, non-distracting interiors.
- **Warm lighting** instead of stark white fluorescent tubes to reduce sensory discomfort.
- **Acoustic control** inside lift cars to prevent echo, especially for hearing-aid users.

19.10 Lift Lobby and Circulation Design

19.10.1 Lift Lobby Requirements

- Minimum lobby width: **1800 mm**, allowing turning radius for wheelchair users.
- Provision of **tactile guiding paths** from main entrance to lift.
- Placement of **directional signage** at eye level and in multiple formats (visual, tactile, auditory).

19.10.2 Visual and Tactile Communication

- Braille maps and floor directories at each lobby.
- Directional arrows and lift identification symbols in raised characters.
- Floor selection maps for large buildings.

19.10.3 Waiting Bench and Rest Zone

- Resting provision with a **bench or seating arrangement** for senior citizens or fatigued users.

- Adequate lighting and security (CCTV) to ensure comfort and safety.

19.11 Technology Integration for Smart Accessibility

Modern vertical transportation systems now use IoT and AI-based features to improve accessibility and efficiency.

19.11.1 Touchless Operation

- QR Code or **NFC-based elevator call systems**.
- Mobile app integration to preselect destination floor.
- Facial recognition entry (optional, with consent).

19.11.2 AI-based Optimization

- AI routing to reduce waiting time and avoid crowding (especially useful for visually impaired and elderly users).
- Predictive maintenance alerts to ensure fewer breakdowns.

19.11.3 Assistive Connectivity

- Bluetooth or Wi-Fi-enabled elevator interfaces linked to personal assistive tech like screen readers or hearing devices.
- Real-time status notifications through smartphones.

19.12 Vertical Circulation in Transport Hubs and Public Complexes

Public places like railway stations, airports, and government buildings require additional layers of inclusive design:

19.12.1 High-Usage Lift Systems

- Multiple synchronized elevators with central control systems.
- Staggered or grouped lift banks with clear route demarcations.

19.12.2 Escalator Integration with Accessibility Routes

- All escalators must be paired with either ramps or lifts for accessible alternatives.
- Clear visual paths and sound signals near escalators.

19.12.3 Crowd Management Features

- Colored queuing lines and sound alerts for order and safety.
- Emergency detour guidance and audible exit indicators.

19.13 Case Studies and Model Projects

19.13.1 Delhi Metro Rail Corporation (DMRC)

- All metro stations include **accessibility-compliant elevators** with Braille buttons, audio announcements, and tactile paving.
- **Real-time train arrival displays** visible from elevator lobbies.

19.13.2 TCS Chennai Office Complex

- Advanced **destination control lifts** minimize crowding and ensure efficient flow.
- **Multi-sensory panels** for inclusive navigation.

19.13.3 India Habitat Centre, New Delhi

- Retrofitted with **wheelchair platform lifts** at auditoriums and restaurants.
- Escalator-adjacent signage with tactile cues and audio instructions.

19.14 Retrofitting Guidelines for Existing Buildings

Adapting older structures to meet accessibility requirements is a key component of Universal Design.

19.14.1 Assessing Existing Systems

- Conduct **access audits** focusing on vertical transport points.
- Identify gaps in dimensions, control systems, or signage.

19.14.2 Retrofit Solutions

Gap	Retrofit Solution
Narrow car space	Replace with compact accessibility lifts
Manual doors	Upgrade to automatic doors with sensors
No Braille buttons	Install retrofit button panels with tactile markers

Gap	Retrofit Solution
No visual indicators	Add LED indicators and display panels

19.14.3 Government Support and Mandates

- Schemes like **Sugamya Bharat Abhiyan (Accessible India Campaign)** promote retrofitting in public infrastructure.
- Funding and tax incentives available under state disability programs.

19.15 Sustainability and Energy Efficiency in Lift Design

Environmental sustainability is now central to building design, including elevators and escalators.

19.15.1 Green Building Standards

- **Regenerative drives** that convert descending car energy into electricity.
- **LED-based lighting** with motion sensors inside lift cars.
- Use of **low-emission materials** in interiors.

19.15.2 LEED and GRIHA Certifications

- Elevators with low standby power consumption contribute to **LEED points**.
- Use of smart systems for **load balancing and scheduling** enhances efficiency.