دانشجویان محترم متن زیر را به فارسی ترجمه نمایید.

An **elevator** (US and Canada) or **lift** (UK, Ireland, Australia, NZ, India, South Africa, and Nigeria) is a type of vertical transportation machine that moves people or freight between floors, levels, or decks of a building, vessel, or other structure. Elevators are typically powered by electric motors that drive traction cables and counterweight systems such as a hoist, although some pump hydraulic fluid to raise a cylindrical piston like a jack.

In agriculture and manufacturing, an elevator is any type of conveyor device used to lift materials in a continuous stream into bins or silos. Several types exist, such as the chain and bucket elevator, grain auger screw conveyor using the principle of Archimedes' screw, or the chain and paddles or forks of hay elevators. Languages other than English may have loanwords based on either *elevator* or *lift*. Because of wheelchair access laws, elevators are often a legal requirement in new multistory buildings, especially where wheelchair ramps would not be possible.

Hydraulic elevators


Pit of a hydraulic scenic elevator with metal grating on bottom. This elevator travels 7 stories.

- *Conventional hydraulic elevators*. They use an underground hydraulic cylinder, are quite common for low level buildings with two to five floors (sometimes but seldom up to six to eight floors), and have speeds of up to 1 m/s (200 ft/min). For higher rise applications, a telescopic hydraulic cylinder can be used.[*citation needed*]
- *Holeless hydraulic elevators* were developed in the 1970s, and use a pair of above ground cylinders, which makes it practical for environmentally or cost sensitive buildings with two, three, or four floors.
- *Roped hydraulic elevators* use both above ground cylinders and a rope system, allowing the elevator to travel further than the piston has to move.

The low mechanical complexity of hydraulic elevators in comparison to traction elevators makes them ideal for low rise, low traffic installations. They are less energy efficient as the pump works against gravity to push the car and its passengers upwards; this energy is lost when the car descends on its own weight. The high current draw of the pump when starting up also places higher demands on a building's electrical system. There are also environmental concerns should the lifting cylinder leak fluid into the ground.[32]

The modern generation of low-cost, machine room-less traction elevators made possible by advances in miniaturisation of the traction motor and control systems challenges the supremacy of the hydraulic elevator in their traditional market niche.[*citation needed*]

Controlling elevators

Manual controls


Otis 1920s controller, operational in a New York City apartment building

In the first half of the twentieth century, almost all elevators had no automatic positioning of the floor on which the cab would stop. Some of the older freight elevators were controlled by switches operated by pulling on adjacent ropes. In general, most elevators before WWII were manually controlled by elevator operators using a rheostat connected to the motor. This rheostat (see picture) was enclosed within a cylindrical container about the size and shape of a cake. This was mounted upright or sideways on the cab wall and operated via a projecting handle, which was able to slide around the top half of the cylinder.

The elevator motor was located at the top of the shaft or beside the bottom of the shaft. Pushing the handle forward would cause the cab to rise; backwards would make it sink. The harder the pressure, the faster the elevator would move. The handle also served as a dead man switch: if the operator let go of the handle, it would return to its upright position, causing the elevator cab to stop. In time, safety interlocks would ensure that the inner and outer doors were closed before the elevator was allowed to move.

This lever would allow some control over the energy supplied to the motor and so enabled the elevator to be accurately positioned — if the operator was sufficiently skilled. More typically, the operator would have to "jog" the control, moving the cab in small increments until the elevator was reasonably close to the landing point. Then the operator would direct the outgoing and incoming passengers to "watch the step".


Manual pushbutton elevator controls

Automatic elevators began to appear as early as the 1920s,[citation needed] their development being hastened by striking elevator operators which brought large cities dependent on skyscrapers (and therefore their elevators) such as New York and Chicago to their knees. Self service elevators were not allowed in New York City until 1922. Prior to this, non-luxury buildings that could not afford an attendant were built as five-story walk ups. These electromechanical systems used relay logic circuits of increasing complexity to control the speed, position and door operation of an elevator or bank of elevators.

The Otis *Autotronic* system of the early 1950s brought the earliest predictive systems which could anticipate traffic patterns within a building to deploy elevator movement in the most efficient manner. Relay-controlled elevator systems remained common until the 1980s and their gradual replacement with solid-state, microprocessor-based controls are now the industry standard. Most older, manually-operated elevators have been retrofitted with automatic or semi-automatic controls.

General controls

A typical modern passenger elevator will have:

- Outside the elevator, buttons to go up or down (the bottom floor only has the up button, the top floor only has the down button, and every floor in between has both)
- Space to stand in, guardrails, seating cushion (luxury)
- Overload sensor – prevents the elevator from moving until excess load has been removed. It may trigger a voice prompt or buzzer alarm. This may also trigger a "full car" indicator, indicating the car's inability to accept more passengers until some are unloaded.
- Electric fans or air conditioning units to enhance circulation and comfort.
- A control panel with various buttons. In many countries, button text and icons are raised to allow blind users to operate the elevator; many have Braille text besides. Buttons include:

- Call buttons to choose a floor. Some of these may be key switches (to control access). In some elevators, certain floors are inaccessible unless one swipes a security card or enters a passcode (or both).
- Door open and door close buttons.

The operation

External controls

An external control panel

Elevators are typically controlled from the outside by a call box, which has up and down buttons, at each stop. When pressed at a certain floor, the button (also known as a "hall call" button) calls the elevator to pick up more passengers. If the particular elevator is currently serving traffic in a certain direction, it will only answer calls in the same direction unless there are no more calls beyond that floor.

In a group of two or more elevators, the call buttons may be linked to a central dispatch computer, such that they illuminate and cancel together. This is done to ensure that only one car is called at one time.

Key switches may be installed on the ground floor so that the elevator can be remotely switched on or off from the outside.

In destination control systems, one selects the intended destination floor (in lieu of pressing *"up"* or *"down"*) and is then notified which elevator will serve their request.

Modernization

An elevator test tower

Most elevators are built to provide about 30 to 40 years of service, as long as service intervals specified and periodic maintenance/inspections by the manufacturer are followed. As the elevator ages and equipment become increasingly difficult to find or replace, along with code changes and deteriorating ride performance, a complete overhaul of the elevator may be suggested to the building owners.

A typical modernization consists of controller equipment, electrical wiring and buttons, position indicators and direction arrows, hoist machines and motors (including door operators), and sometimes door hanger tracks. Rarely are car slings, rails, or other heavy structures changed. The cost of an elevator modernization can range greatly depending on which type of equipment is to be installed.

Modernization can greatly improve operational reliability by replacing mechanical relays and contacts with solid-state electronics. Ride quality can be improved by replacing motor-generator-based drive designs with Variable-Voltage, Variable Frequency (V3F) drives, providing near-seamless acceleration and deceleration. Passenger safety is also improved by updating systems and equipment to conform to current codes.

Passenger service

A passenger elevator is designed to move people between a building's floors.

Passenger elevators capacity is related to the available floor space. Generally passenger elevators are available in capacities from 500 to 2,700 kg (1,000–6,000 lb) in 230 kg (500 lb) increments.[citation needed] Generally passenger elevators in buildings of eight floors or fewer are hydraulic or electric, which can reach speeds up to 1 m/s (200 ft/min) hydraulic and up to 3 m/s (500 ft/min) electric. In buildings up to ten floors, electric and gearless elevators are likely to have speeds up to 3 m/s (500 ft/min), and above ten floors speeds range 3 to 10 m/s (500–2,000 ft/min).[citation needed]

Sometimes passenger elevators are used as a city transport along with funiculars. For example, there is a 3-station underground public elevator in Yalta, Ukraine, which takes passengers from the top of a hill above the Black Sea on which hotels are perched, to a tunnel located on the beach below. At Casco Viejo station in the Bilbao Metro, the elevator that provides access to the station from a hilltop neighbourhood doubles as city transportation: the station's ticket barriers are set up in such a way that passengers can pay to reach the elevator from the entrance in the lower city, or vice versa. See also the Elevators for urban transport section

IOT elevators

Internet of things (IOT) technology application is being used in elevators to improve performance, operations, monitoring, maintenance with help of remote diagnostics, real time notifications and predictive behavioural insights.[84]

World's fastest elevators

The Shanghai Tower holds the current record of world's fastest elevators with their cars travelling at 73.8 km/h (45.9 mph). The elevator, that was installed on 7 July 2016, was manufacturedMitsubishi Electric[85]