

Kursus Rekabentuk Asas

29 - 30 Januari 2020

CREaTE, Melaka

KANDUNGAN KURSUS

- ▶ 29 Januari 2020 (Rabu Pagi)
 - Pengenalan
 - Jenis Lif
 - Terminologi Lif
 - Komponen Lif
 - Keperluan JKR (Rekabentuk)
 - Buku Hijau (MSDAIGFAAE 2018)
 - Akta & Peraturan

KANDUNGAN KURSUS (samb)

- ▶ 29 Januari 2020 (Rabu Petang)
 - Analisa Trafik
 - Pemilihan Lif
 - Lukisan Rekabentuk

DEFINISI LIF

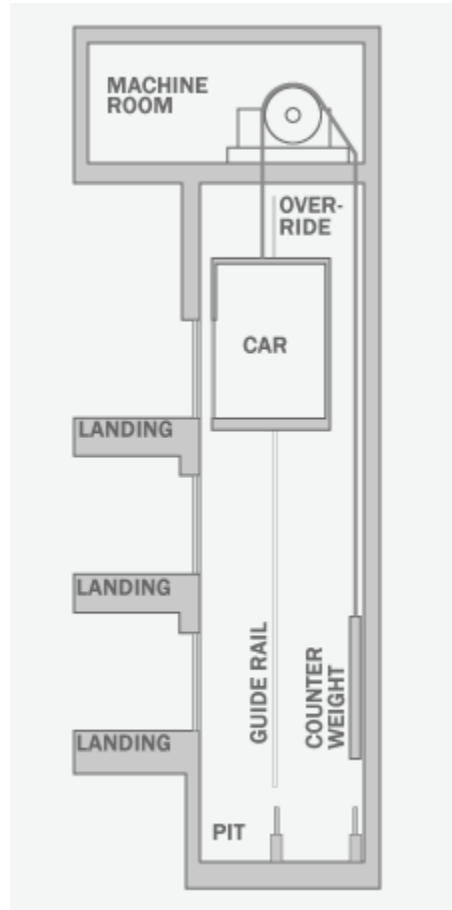
LIF ADALAH MESIN ANGKAT YANG DIGUNAKAN UNTUK MENGANGKUT PENUMPANG ATAU BARANG-BARANG ATAU KEDUA-DUANYA SEKALI DI ANTARA DUA ATAU LEBIH ARAS DALAM ARAH MENEGAK DENGAN MENGGUNAKAN 'LIF KAR' ATAU PELANTAR BERPANDU YANG DIDAPATI MELALUI MOTOR ELEKTRIK YANG DIHUBUNGKAN DENGAN ELEMEN-ELEMEN PENGANGKAT TERMASUK MESIN, TALIDAWAI PENGGANTUNG, RAM HIDRAULIK, PENYOKONG, PENGHADANG DAN YANG BERKAITAN DENGANNYA DAN TERMASUK LIF ELEKTRIK ATAU HIDRAULIK DAN 'PATERNOSTER' ATAU LIF BERSAMBUNG TETAPI TIDAK TERMASUK SANGKAR LOMBONG YANG DIGUNAKAN DI LOMBONG BAWAH TANAH

Pengenalan

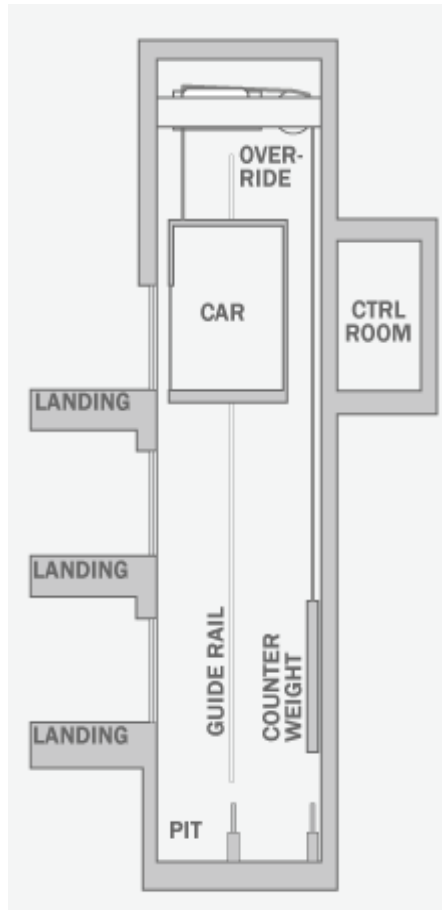
Electric Motor Driven Elevator

- ▶ Hydraulic Elevators
- ▶ Geared and Gearless Traction Elevators with Machine Room
- ▶ Machine-Room-Less (MRL) Elevators

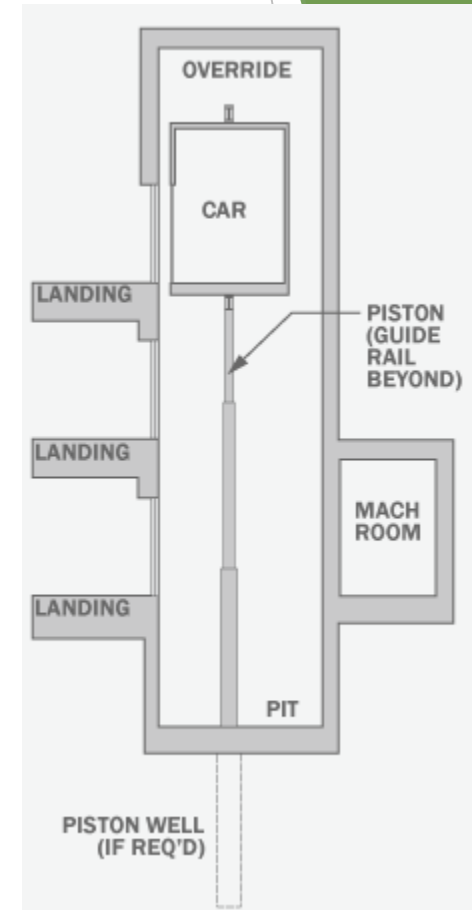
MOTOR ROOM



MOTOR ROOM-LESS



HYDRAULIC



Kategori lif yang biasa didapati bagi sesuatu bangunan :

1. Lif Penumpang (Passengers Lift)
2. Lif Barangan (Goods Lift)
3. Lif Perkhidmatan (Service Lift)

Kategori mengikut Jenis “traction”:

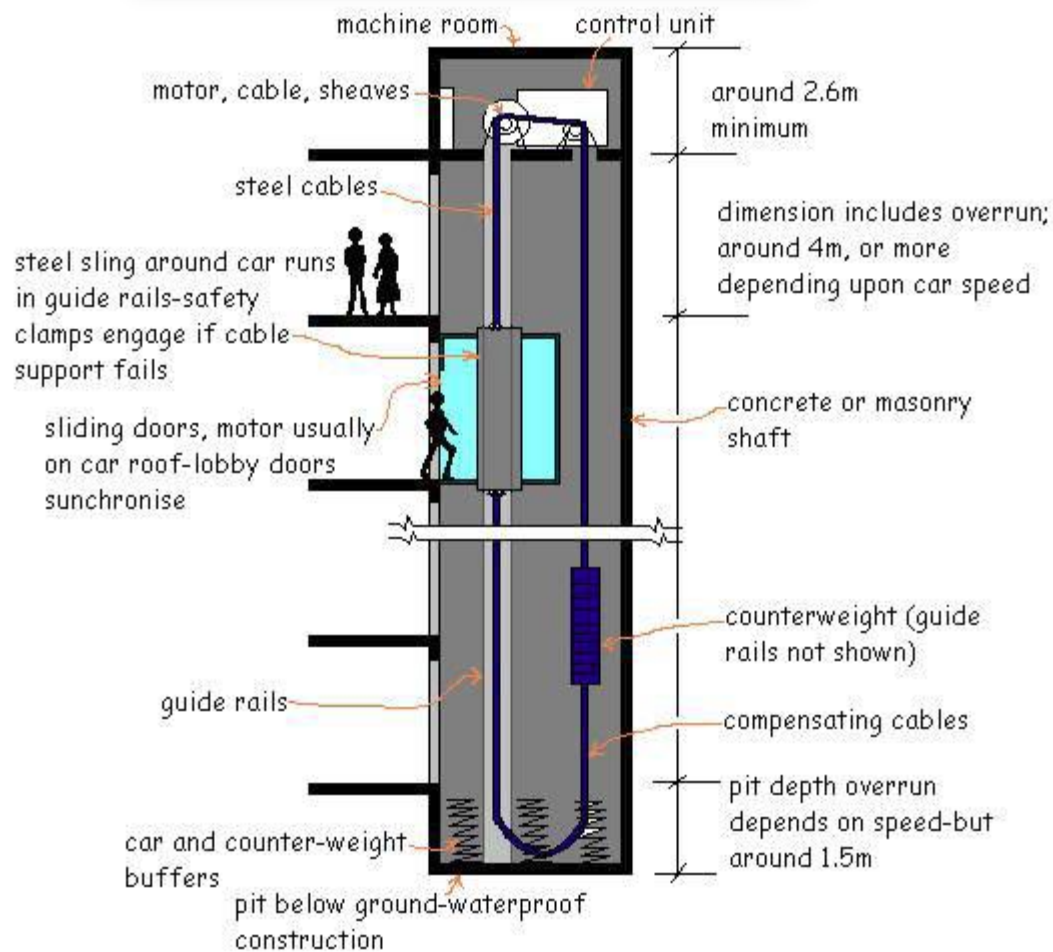
1. Electric traction type or
2. Hydraulic type.

JADUAL JENIS LIF DAN KEGUNAAN

JENIS	KEGUNAAN	CONTOH
Penumpang	Untuk penumpang sahaja.	Pejabat, hotel,
Katil/Penumpang (Serbaguna)	Untuk penumpang termasuk pesakit atas katil.	Hospital, Apartment
Perkhidmatan	Penumpang & Barangan	Pejabat, Hotel, Hospital
Barangan	Barangan dengan satu/dua orang penumpang	Kilang

BUILDING ELEVATOR SYSTEMS (LIFT)

ELECTRIC TRACTION TYPE



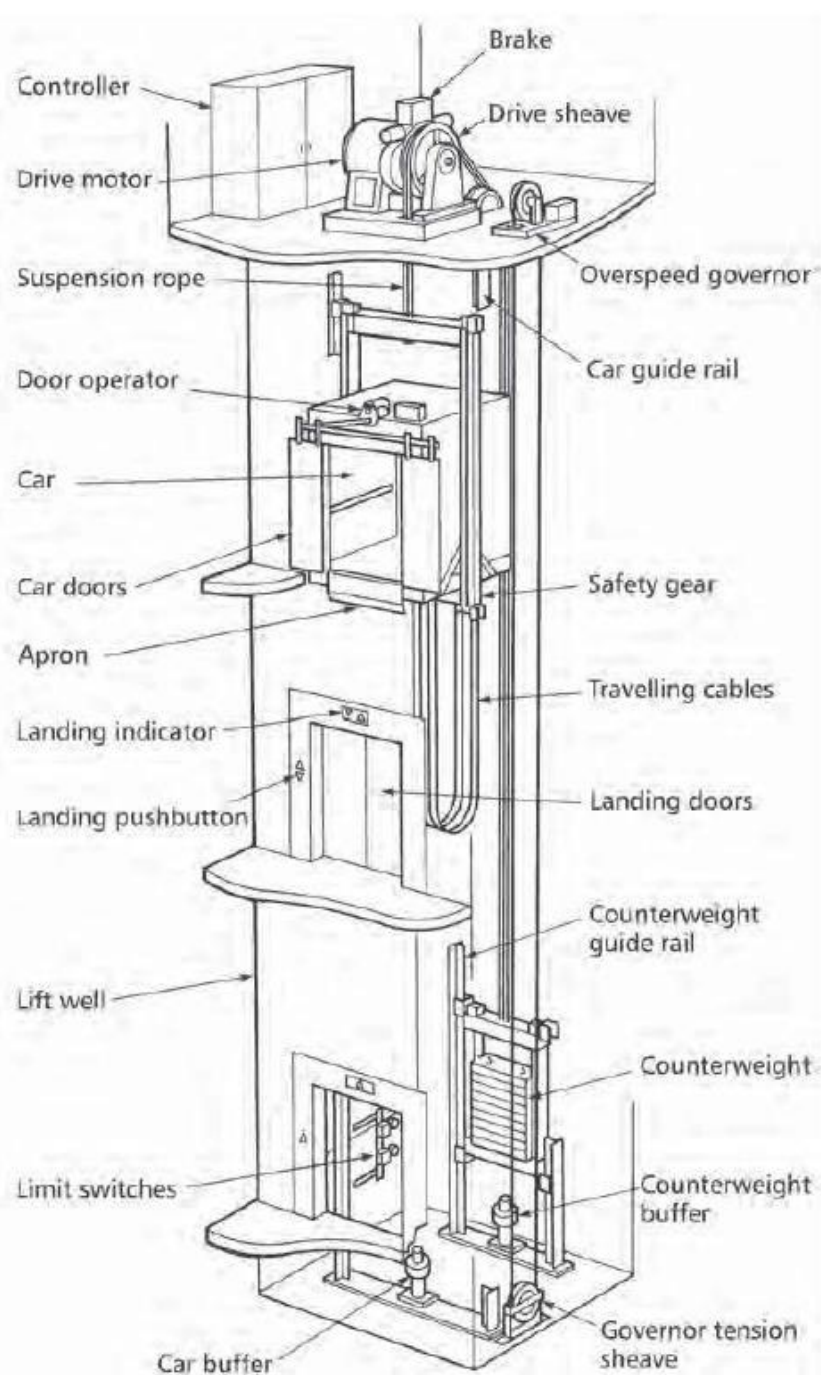


Figure 5.1 General arrangement of an electric traction passenger lift

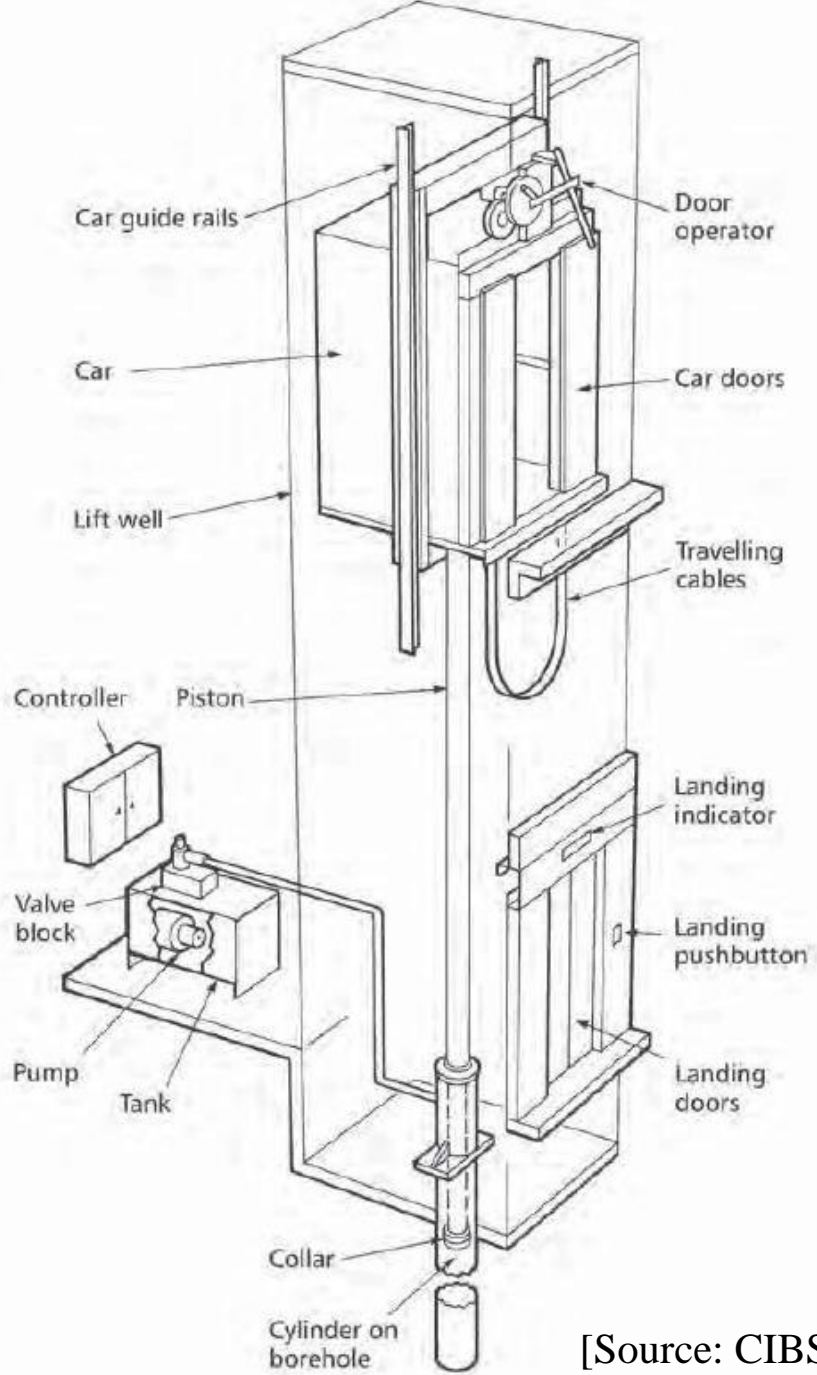


Figure 5.2 General arrangement of a hydraulic passenger lift

[Source: CIBSE Guide D]

COMPONENTS OF LIFT

Item	Description
Main Switch	<i>Provides the main electrical power to the lift. The power is usually 415 volts A.C, 3 phase.</i>
Lift Controller	<i>Controls the lift's movement and signals using electrical and electronic circuits.</i>
Hoisting Motor	<i>Provides force for vertical movement of the lifts.</i>
Brake	<i>A very important Safety Equipment in the lift system. The Brakes hold the lift in its position when the lift is not travelling.</i>
Gearbox (For Geared Machine)	<i>Changes the force ratio and rotation to attain the desired travelling speed.</i>
Bearing	<i>To reduce friction during rotation of the pulley, wheels and gears.</i>
Governor	<i>An automatic device which brings the lift car or counterweight or both to rest by operating the safety gear in the event of the speed in a downward direction exceeding the predetermined speed limit. Stop the lift if the speed exceeds certain value. <i>It is actuated by centrifugal force and trips a switch when the motor speed has increased 20 percent over its rated nameplate speed.</i></i>

COMPONENTS OF LIFT

Item	Description
Guide Rail	<i>Installed inside the lift shaft. Its function is to guide the car and counterweight vertical movement inside the lift shaft.</i>
Overrun Clamp	<i>A safety device. Keeps the lift within fixed upper and lower limits. Will stop the lift if the limits are exceeded.</i>
Car Operating Panel	<i>Installed inside the lift car, normally nearest to the car entrance. The COP consists of push button or other device employed to actuate the control equipment of the lift car.</i>
Car Door	<i>Means the hinged or sliding portion of a lift car controlling access to the lift car.</i>
Counterweight	<i>To counter balance the lift car. Normally the counterweight is 50% of the car capacity plus the overall weight of an empty lift car.</i> <i>Balance the lift to reduce the power usage.</i>
Compensating Ropes	<i>Rope or chain suspended from the car frame and / or the counter weight to balance the weight or part of the weight of the suspension ropes throughout the travel of the lift car.</i>

COMPONENTS OF LIFT

Item	Description
Landing Indicator	<p>A device that indicates the position of the elevator car in the hoistway.</p> <p>It is called a hall position indicator when placed at a landing, or car position indicator when placed in the car.</p>
Buffer	<p>A device at the lift pit. It is designed to stop a descending car or counterweight beyond normal limit of travel by storing or absorbing and dissipating the kinetic energy of the car or counterweight.</p> <p>Act as a cushion .</p> <p>-SPRING BUFFER : FOR SLOW SPEED LIFT</p> <p>-OIL BUFFER : FOR HIGH SPEED LIFT</p>
Landing Door	<p>Door installed at every landing where the lift serves the floor. The landing doors will remain closed when the lift is not there. This landing doors open and close automatically when the lift car is at that particular landing.</p>
Locking	<p>A device that is installed at all landing doors and gates. The unlocking is controlled by the position of the lift car and includes the gate lock. A special key allows authorised personnel to unlock and open the doors. Client are discourage to be in possession of any landing door keys.</p>

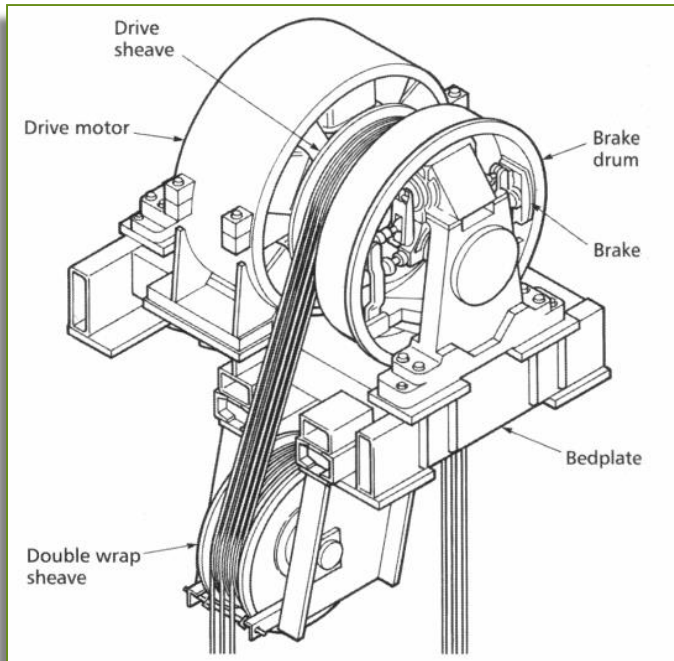
COMPONENTS OF LIFT

Item	Description
<i>Landing Calls (Call Button)</i>	<i>Enable the users to call the lift.</i>
<i>Wire Ropes :</i>	
<i>Main Hoisting Ropes</i>	<i>Used to suspend the lift car and counter weight.</i>
<i>Governor Rope</i>	<i>To operate the overspeed governor and safety gears.</i>
<i>Magnetic Switch</i>	<i>A switch that triggers when a magnetic field passes it.</i>
<i>Shaft Information</i>	<i>Contains a magnets that work in conjunction with the magnetic switches. There are other types of shaft information that are installed with the more advance lift (e.g : Dual Tacho Feedback). Basically the shaft information sends electrical signals to the lift controller via travelling cables so that the controller knows where the lift is and able to instruct the lift to slow down and to stop accurately at the landing, to open or close the lift door.</i>

LIFT SYSTEM

- ▶ *Major lift components:*
 - ▶ *Prime mover*
 - ▶ *(electric - geared/gearless & motor roomless or hydraulic)*
 - ▶ *Lift car (car frame, the car itself)*
 - ▶ *Counterweight*
 - ▶ *Guide rails*
 - ▶ *Entrances/Doors*
 - ▶ *Safety gear & overspeed governor*
 - ▶ *Buffers (energy accumulation, energy dissipation)*
 - ▶ *Car & landing fixtures (buttons, indicators & switches)*
 - ▶ *Roping systems (compensating ropes, traction ropes)*

GEARLESS MACHINE



Gearless

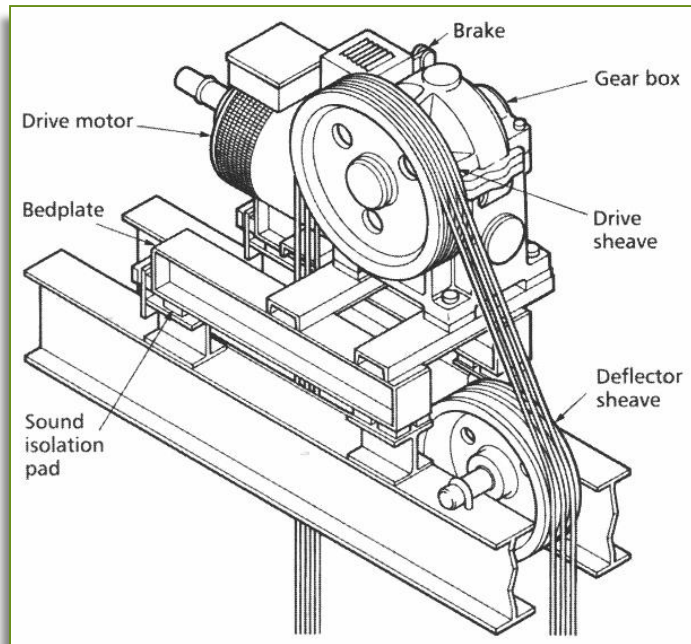
In gearless elevators the motor turns the sheave directly. A brake is mounted between the motor and drive sheave to hold the elevator stationary at a floor. This **brake** is usually an **external drum type**, which is actuated by spring force.

Gearless traction elevators are specified for **high-speed applications** having effective speeds varying from **2.5 m/s (400 fpm) to 10.0 m/s (2000 fpm)**. These are generally used on taller structures with more than **10 stories**. In terms of energy performance, gearless drive has no gear transmission loss thus have a transmission efficiency of 100%.

Gearless traction machines use low torque electric motors (generally DC motors) driven by motor generator (MG) drive or silicon-controlled rectifiers (SCR).

Modern gearless traction machines use variable-voltage; variable frequency (VVVF) drives systems.

GEARED MACHINE



Geared

In a geared machine, the motor turns a gear train that rotates the sheave. Geared traction machines are used for medium-speed applications and have effective speeds from 0.5 m/s (100 fpm) to 2.0 m/s (400 fpm). The slower speeds are for freight operation, while the higher speeds are typically used for passenger service in mid-rise buildings of ten stories or less.

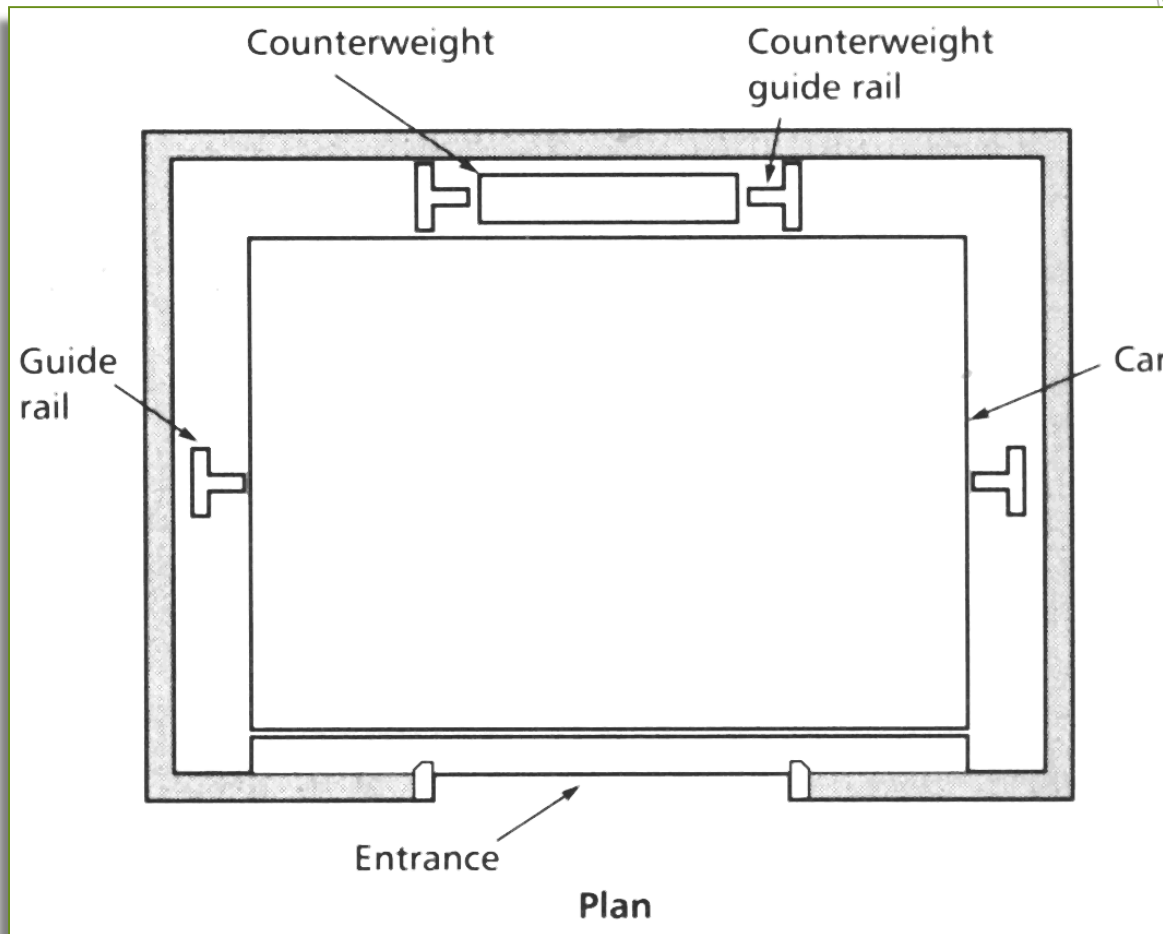
The geared elevator system most commonly use a worm gear reducer, which is composed of a worm gear, typically called the worm, and a larger round gear, typically called the worm gear.

These two gears which have rotational axes perpendicular to each other that not only decreases the rotational speed of the traction pulley, but also change the plane of rotation.

By decreasing the rotation speed, we are also increasing the output torque, therefore, adding the ability to lift larger objects for a given pulley diameter.

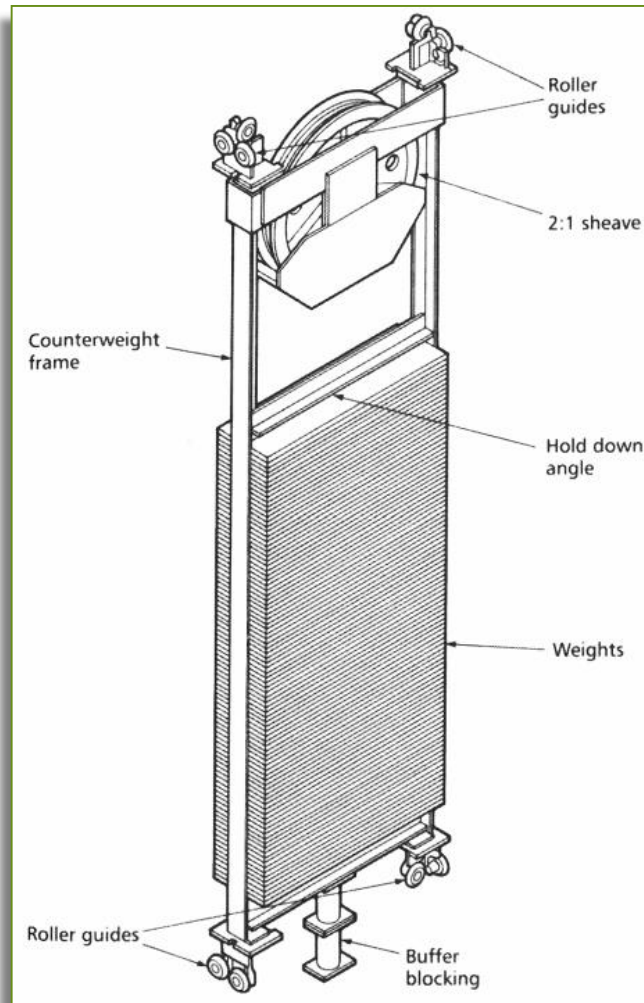
A worm gear is chosen over other types of gearing possibilities because of its compactness, precise speed control, quiet operation and its ability to withstand higher shock loads. It can also be easily attached to the motor shaft and has high resistance to reverse shaft rotation.

POSITION GUIDE RAIL



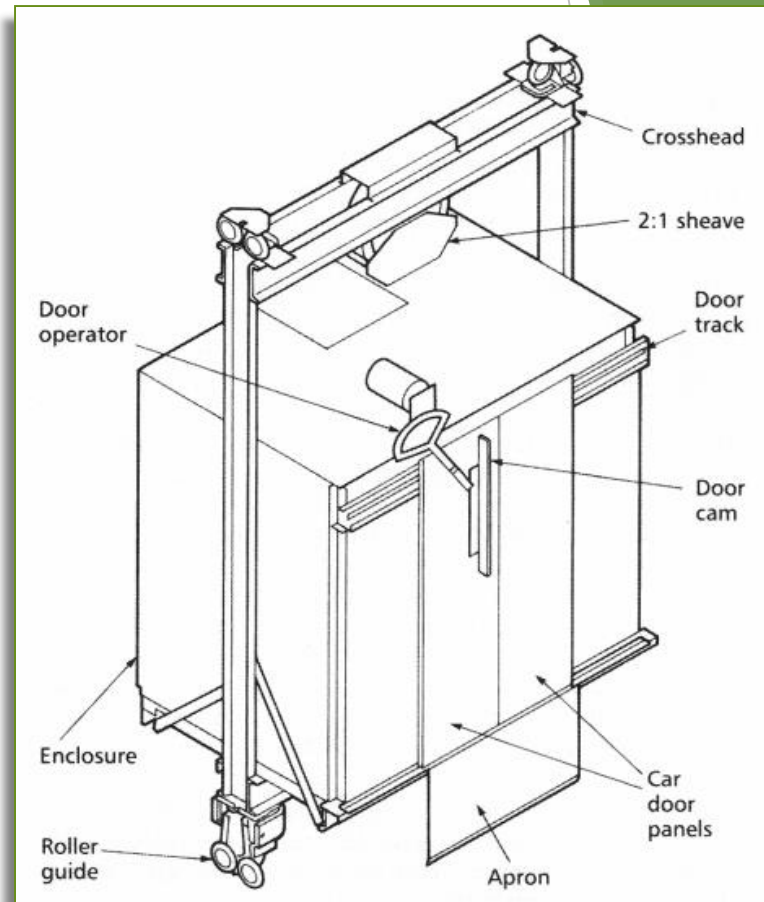
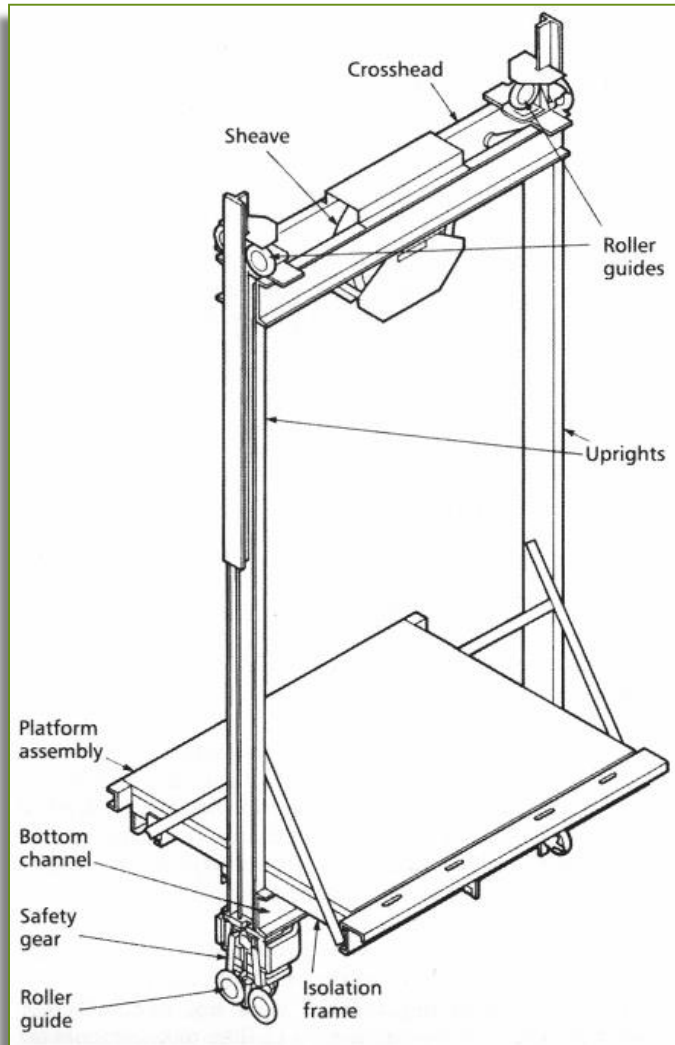
GUIDE RAIL: Installed inside the lift shaft. Its function is to guide the car and counterweight vertical movement inside the lift shaft.

TYPICAL COUNTER WEIGHT



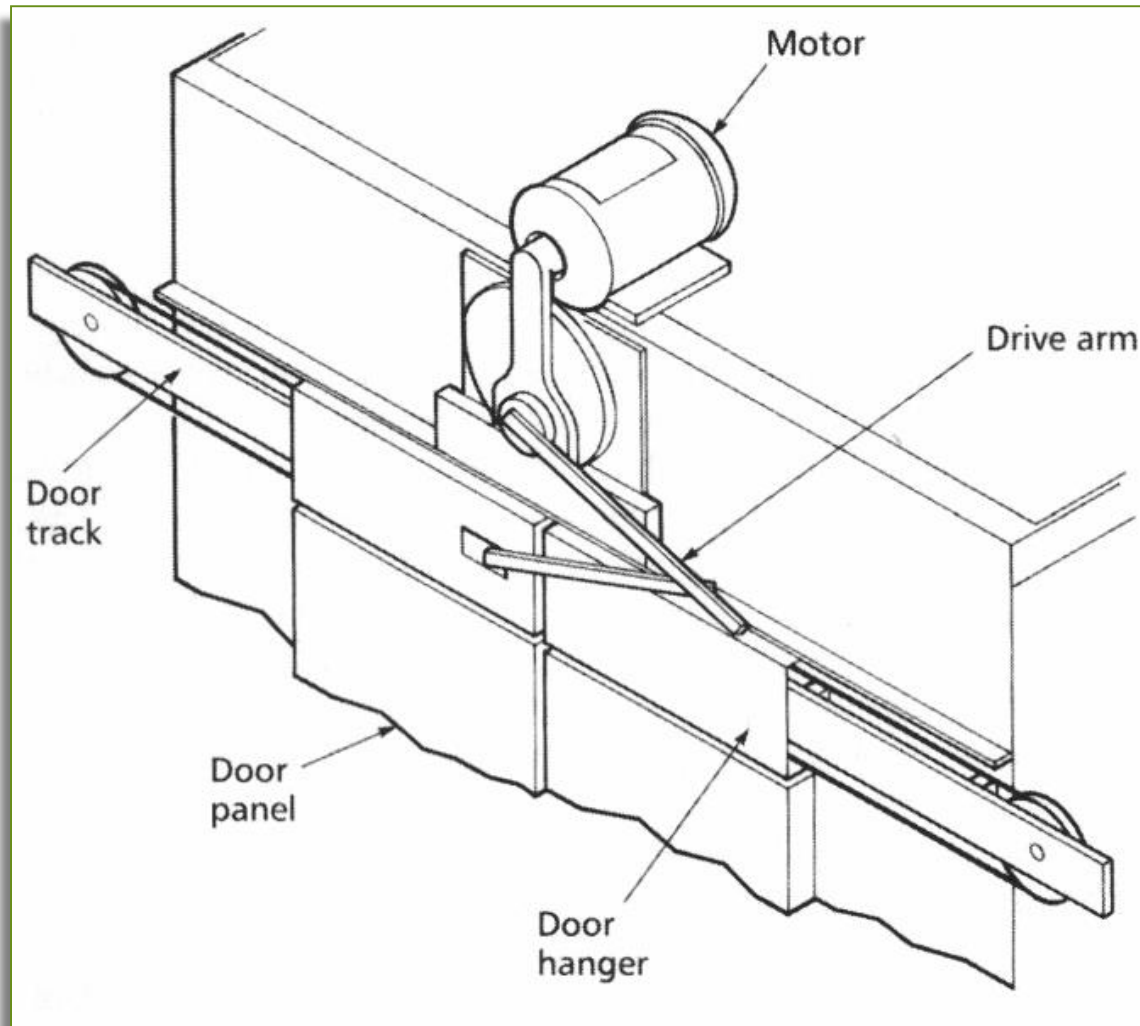
COUNTER WEIGHT : To counter balance the lift car. Normally the counterweight is 50% of the car capacity plus the overall weight of an empty lift car. Balance the lift to reduce the power usage.

TYPICAL CAR FARM AND CAR CONSTRUCTION



[Source: CIBSE Guide D]

TYPICAL DOOR OPERATOR

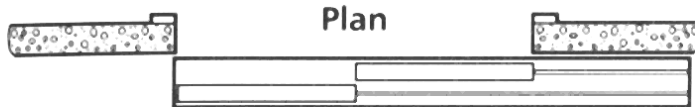


DOOR OPERATOR : A motor-driven device mounted on the car which opens and closes the car doors.

HORIZONTAL POWER-OPERATED SLIDING DOOR



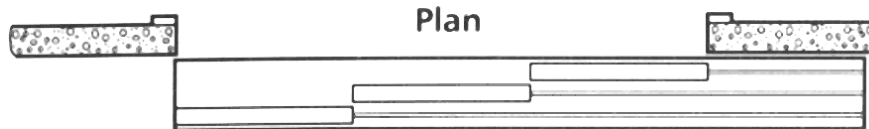
Single slide



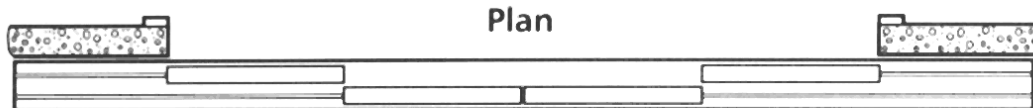
Two-speed side opening



Single-speed centre opening



Three-speed side opening



Two-speed centre opening

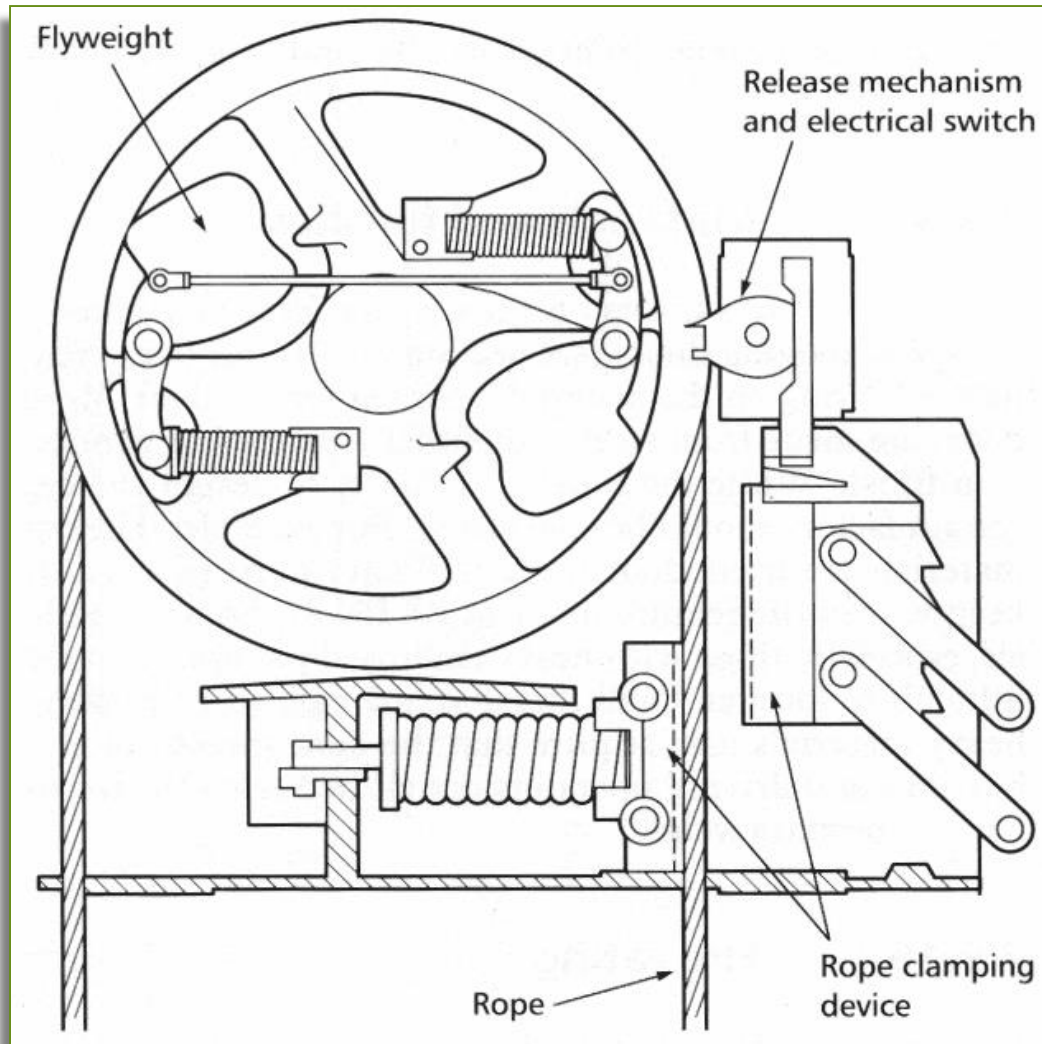
LANDING DOOR:

Door installed at every landing where the lift serves the floor. The landing doors will remain closed when the lift is not there. This landing doors open and close automatically when the lift car is at that particular landing.

CAR DOOR:

Means the hinged or sliding portion of a lift car controlling access to the lift car.

CENTRIFUGAL SPEED GOVERNOR



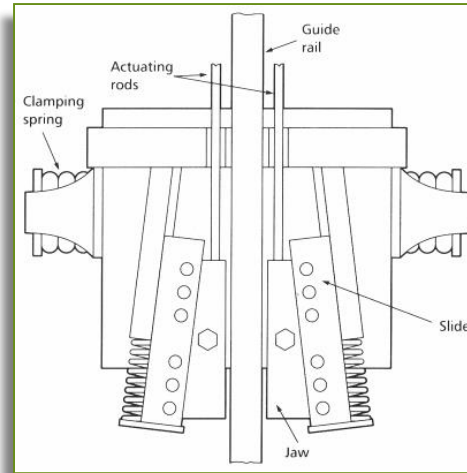
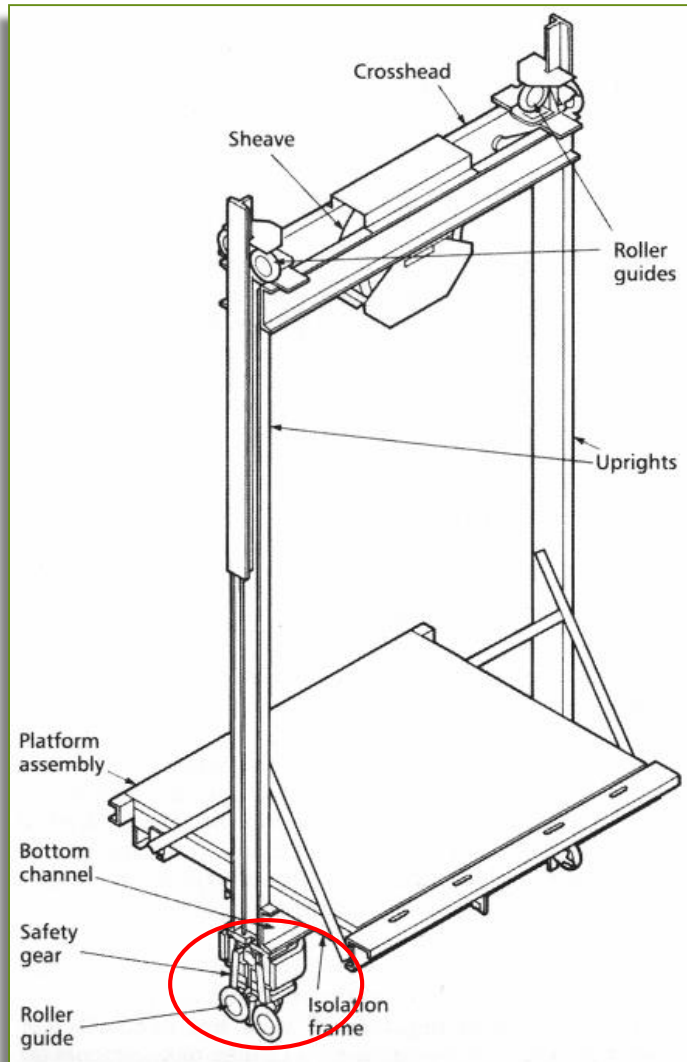
GOVERNOR:

An automatic device which brings the lift car or counterweight or both to rest by operating the safety gear in the event of the speed in a downward direction exceeding the predetermined speed limit.

Stop the lift if the speed exceeds certain value.

- Consist of a sheave, flyweights and rope clamping device.

SAFETY GEAR

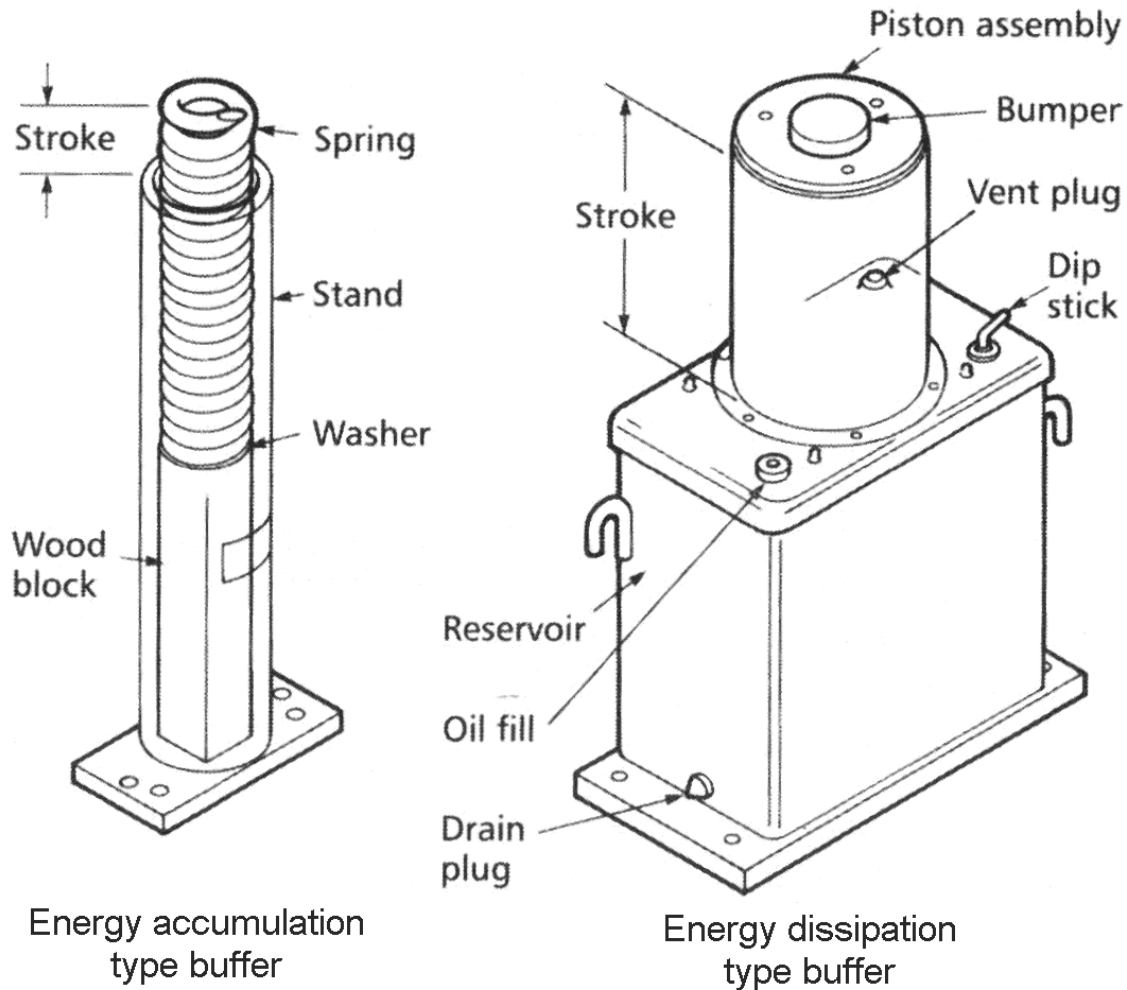


SAFETY GEAR

Is the term given to a mechanical clamping device located on the car, the prime function of which is to grip the guide rails to prevent the uncontrolled descent of the car if the lifting ropes were to part.

The safety gear will usually be located under the car frame.

BUFFERS



BUFFERS:

Are placed below the car and counterweight to arrest them should they over travel into the lift pit.

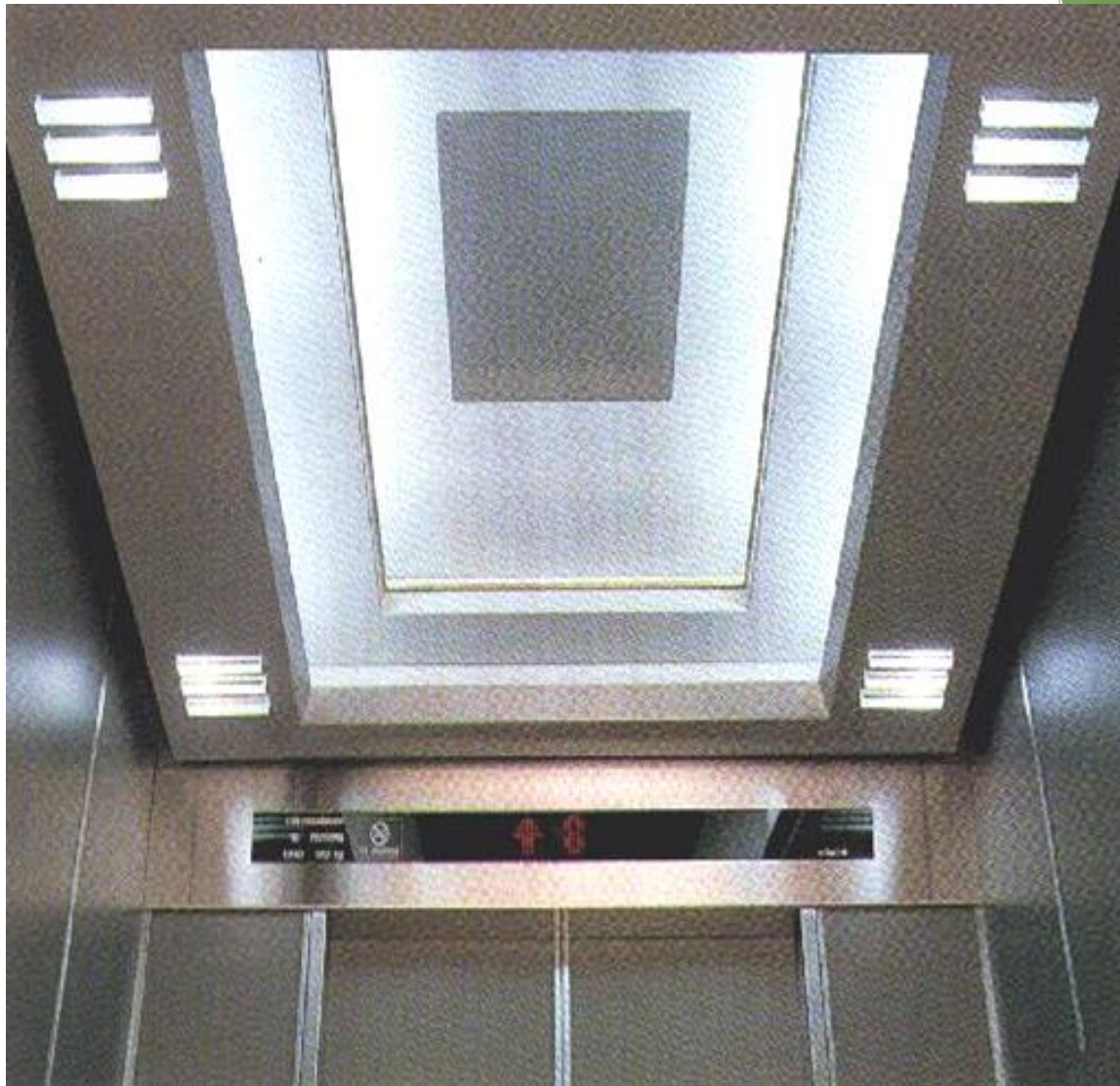
There are two type of buffers :

***SPRING BUFFER :** For slow speed lift.*

***OIL BUFFER :** For high speed lift.*

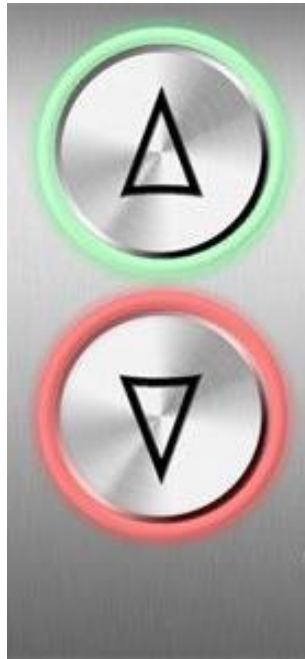
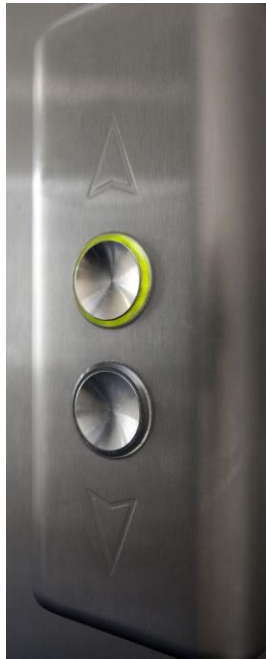
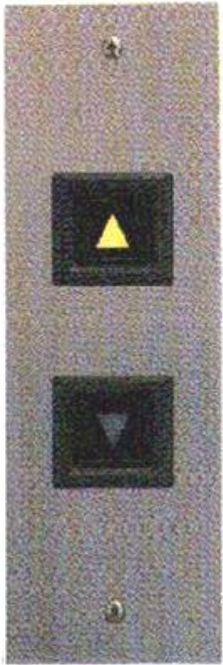
Typical lift machine room





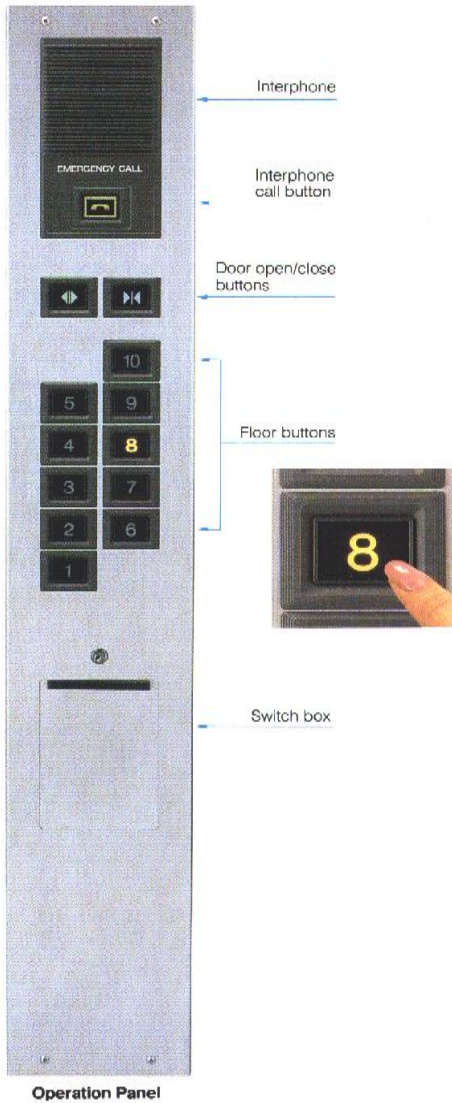
CEILING PANEL





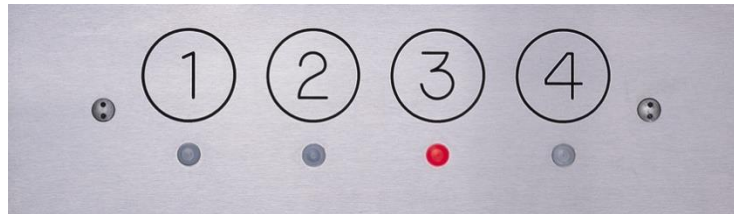
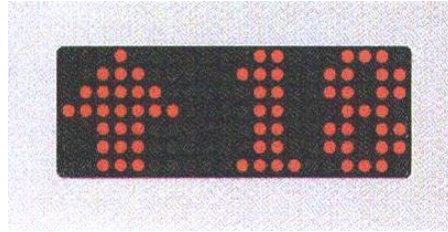
CALL BUTTON





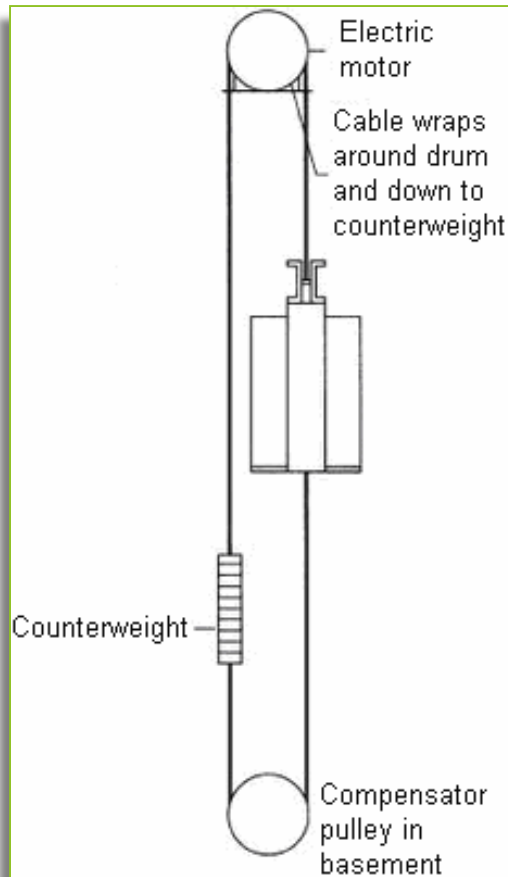
CAR OPERATING PANEL (COP)



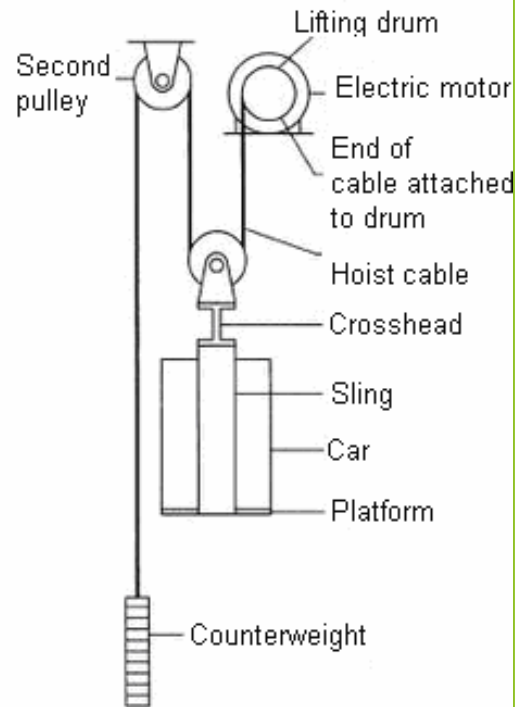


INDICATOR

ROPING SYSTEM



Traction Drum Arrangement



Lifting Drum Arrangement

Roping Arrangements :

A roping system is used to attach the motor/gear reducer, the elevator car and the counterweight. There are many different kinds of arrangements that can be used; the two most common are:

1. One to One roping (1:1) also called traction drum arrangement
1. Two to One Roping (2:1) also called lifting drum arrangement.

CATAGORIES OF LIFTS

PASSENGER LIFTS

BED / PASSENGER LIFTS

GOOD / SERVICE LIFTS

FIREMAN'S LIFT

OKU LIFT

NEXT



CHARACTERISTICS

PASSENGER LIFT

Capacity : 6 to 23 people (1600kg)

Speed : 1 to 3 m/s

BEDS/PASSENGER

Capacity : 23 people (1600 kg)

Speed : 1 to 1.6 m/s

NEXT



CHARACTERISTICS

GOODS/SERVICE

Capacity : >900 kg

Speed : 0.5 to 3.5 m/s

OKU LIFT

Capacity : 1430KG

Speed : 1m/s

Floor Area : 1800mm. X 1800mm (For Whleed Chair)

For Building More Than 7.4m

NEXT



CHARACTERISTICS

Firefighting or fireman's lift

Specific provisions include

Break-glass key switch (at G/F to control the lift)

Min. duty load, say 630 kg (for firefighting equipment)

Min. internal dimensions (m), 1.1(W) x 1.4(D) x 2.0(H)

An emergency hatch in the car roof

Manufactured from non-combustible material

A two-way intercom

1 hour fire-resisting doors of 0.8 m (W) x 2 m (H)

A max. of 60 sec to run full building height

Dual power supplies (normal + emergency)



NEXT



CHARACTERISTICS

Lift Shaft

Lift shaft should have the following features:

Water-tightness (Water proofing)

Means of drainage

Smooth painted finish

Permanent inspection lights

Have no other services (except this for the lift)

SAFETY FEATURES OF LIFT



SPEED GOVERNOR

Mechanical and electrical, stop the lift when over speeding (prevent overspeeding) - 110% of rated speed.

BUFFER

Spring or oil, to stop lift car and/or counterweight should it overtravel downwards.

SAFETY GEAR

Stops the lift should it overspeed in the downwards direction.

BRAKE

Stops the lift in the failure of Normal supply and when the lift stops at a landing.

SAFETY FEATURES OF LIFT

WORM GEAR

Non slipping even when machine is not running.

ELECTRICAL FUSES

Prevent overloading of electrical equipment and components.

ROPES

Sufficient ropes with generous safety factor to prevent any mishap (a minor mistake or accident) 10 - 15 % safety factor.

SAFETY FEATURES OF LIFT

OVERLOAD NON-START

Micro switches beneath lift platform to prevent starting of lift when it's overload

DOOR INTERLOCK

To ensure both car and landing doors are fully closed before the lift starts moving. This is an electro-mechanical interlock.

DOOR SAFETY

Retractable shoe, light ray, electronic door to prevent closure of doors when an object e.g. a person etc is present between the doors.

FEATURES OF LIFT (JKR REQUIREMENTS)

No.	The following shall be required and installed as indicated :	JKR REQUIREMENT **
1	Load weighing device / Load By-Pass (80% of rated load)	Required
2	Limited door reversal Control (Safety Edge) (The door will automatically stop and reverse when obstructed)	Required
3	Door knudging control	Required
4	Advance Door Opening (For High Speed Lift Only - 2.5 m/sec and above)	Required
5	Automatic fan and light cut-off (For Energy Saving)	Required

FEATURES OF LIFT (JKR REQUIREMENTS)

6	Dual Tacho Feedback	Required
7	Anti-Nuisance Function	Designer's Decision
8	Attendant Service Control	Required
9	Fire Alarm Operation Mode	Required
10	Emergency power operational mode with Generator Set Power Supply.	Required
11	Lift Intercom System	Required
12	Rechargeable nickle cadmium battery with trickle charger unit via a change over contact (For 3 hr operational of exhaust fan & fluorescent lamp)	Required

FEATURES OF LIFT (JKR REQUIREMENTS)

13	Multibeam light curtain sensor	Required
14	(EBOPS) Emergency Battery Operated Power Supply: A batteries operated device to provide power for the lighting and fan in the lift car when there is a power failure. The batteries are trickle charged by the main power under normal circumstances. The minimum operation time shall be no less than two (2) hours.	Required
15	Overload-Protection Device which shall operate such that when the car becomes overloaded the lift car shall not start and an alarm both audio and visual on the car panel shall be activated.	Required
16	Emergency Car Light which shall cut in and illuminate the car during a power failure. The emergency car light shall be powered by a Ni-Cd battery which shall be able to provide illumination for not less than 3 hours.	Required

FEATURES OF LIFT (JKR REQUIREMENTS)

17	<u>Lift Intercom System</u> Communication between the master unit on ground Floor/Control Room, each lift car and the machine room.	Required
18	Lift supervisory board : a. Computerised * b. Non - Computerised *	Required
19	Battery Power Supply : A heavy duty 12V, rechargeable Nickel-Cadium battery with trickle charger unit shall be provided for each lift to serve the alarm bell, lift intercom system, emergency lighting and ventilation fan, via a changeover contact upon failure of normal electrical power supply.	Required
20	Fan Switch	Required

FEATURES OF LIFT (JKR REQUIREMENTS)

21	Light Switch	Required
22	A lift Attendant switch on the car operating panel to facilitate loading and unloading of goods. - For Goods Lift	Required
23	<u>Car Locking Device</u> The device that prevents lift car from being opened from inside the lift car when the car is not positioned within the landing zone. This will prevent trapped passengers exposing themselves to the danger of falling down to the lift shaft when trying to escape from the lift car unaided	Required
24	Leveling accuracy to be within +/- 5 mm	Required

FEATURES OF LIFT (JKR REQUIREMENTS)

25	Fire Rating for Landing Door i) Protected Lobbies ---- 1 hr ii) Unprotected Lobbies ---- 2 hrs	Required
26	Automatic Rescue Device/ARD. The Lifts shall be provided with electronically controlled automatic rescue device. The device shall operate automatically to take the lift car to the nearest floor and open the door in case of power failure. The unit shall be wired and assembled in an independent box and shall be supplied complete with battery charger.	Required
27	**150mm wide stainless steel c/w rubber crash / bumper rails shall be provided at suitable heights all round the lift car. (optional features for designers to decide) - Only for goods lift	Required/Not Required

FEATURES OF LIFT (JKR REQUIREMENTS)

Full load bypass

If the car load has exceeded 80% of the rated load or capacity of the elevator, the elevator will automatically ignore all the hall calls in the direction of service and respond car calls only. The hall calls remain registered and will be served on the next trip (single car), or by another elevator (group).

FEATURES OF LIFT (JKR REQUIREMENTS)

Nudging

If door are prevented from closing after an extended period of time, nudging takes place (unless probihited by law). During nudging, the doors start to close at a reduced speed, and the door warning buzzer sounds until the door fully closed.

FEATURES OF LIFT (JKR REQUIREMENTS)

Anti-nuisance function

All calls are automatically cancelled to avoid unnecessary stops caused by registration of nuisance car calls registered do not correlate with the car load.

CIRI-CIRI LIF YANG BAIK:

1. Masa menunggu yang singkat pada sebarang tingkat dalam bangunan.
2. Kecekapan yang selesa (comfortable acceleration).
3. Pengangkutan yang cekap dan mudah (rapid transportation).
4. Berhenti dengan baik dan cepat – tidak bergegar atau terhentak-hentak, perjalanan licin.
5. Mengaras dengan cara automatik dengan lantai tempat berhenti (automatic leveling at landing).
6. Pengangkutan dan pemunggahan yang cepat dan mudah di tempat berhenti – (rapid loading & unloading at all stops) – sama ada mudah keluar masuk orang atau barang.
7. Operasi pintu yang baik dan senyap.
8. Ada petunjuk tingkat lantai di dalam kereta pengangkut dan tempat menunggu.
9. Kereta pengangkut dan butang penekan yang mudah dikendali.
10. Pemasangan lampu yang sempurna.
11. Alat perhubungan masa kecemasan.
12. Pengudaraan yang baik.

