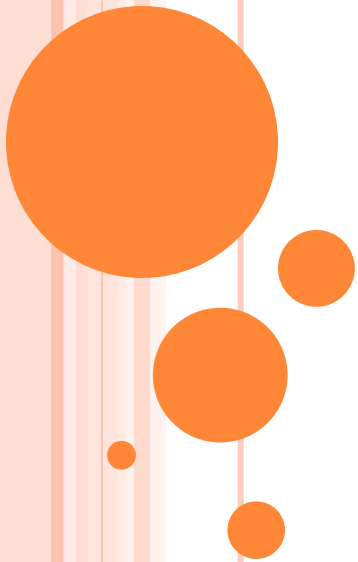


UTILIZATION OF ELECTRICAL ENERGY

ELEVATOR



WHAT IS ELEVATOR ??????

- An elevator (or lift in British English) is a type of vertical transport equipment that efficiently moves people or goods between floors (levels) of a building, or other structure. Elevators are generally powered by electric motors that either drive traction cables or counterweight systems like pump hydraulic fluid to raise a cylindrical piston like a jack.

The first reference to an elevator is in the works of the Roman architect Vitruvius, who reported that Archimedes, Elevator design by the German engineer Konrad Kyeser (1405)



The Elevator

- In 1852, Elisha Otis invented the elevator safety brake.
- The safety brake prevents an elevator car from falling if the lifting cables fail.
- March 23, 1857 - The first successful passenger elevator was installed on this day at 488 Broadway in New York City.



- The elevator is a platform that raises and lowers vertically to transport people or freight.
- Eight steel cables support the car; each cable can handle more than the weight of a fully loaded car.
- The goal for the elevator was to be inexpensive, reliable, and get it to market as quickly as possible.



TWO TYPES OF ELEVATORS

1. Hydraulic

2. Traction



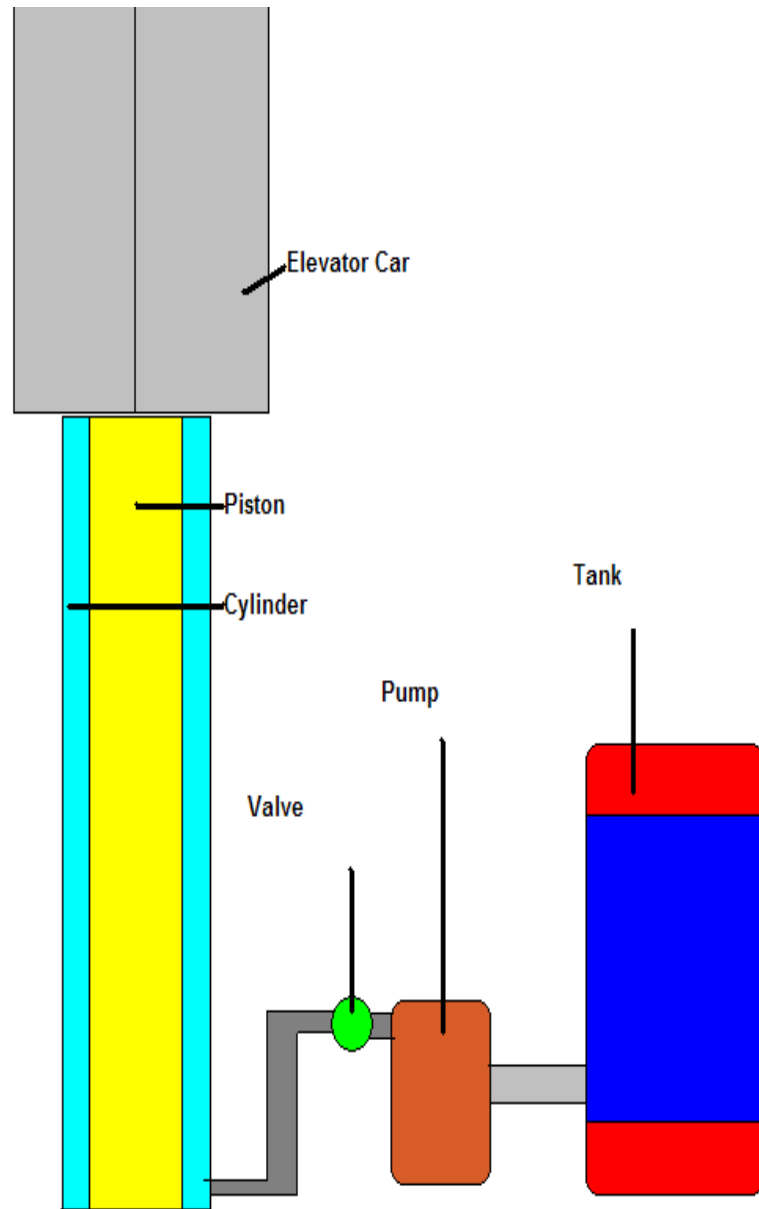
THE CAR IS MOVED
UP AND DOWN
USING “A FLUID
PISTON MOUNTED
INSIDE A
CYLINDER”
(HARRIS).
CONSISTS OF

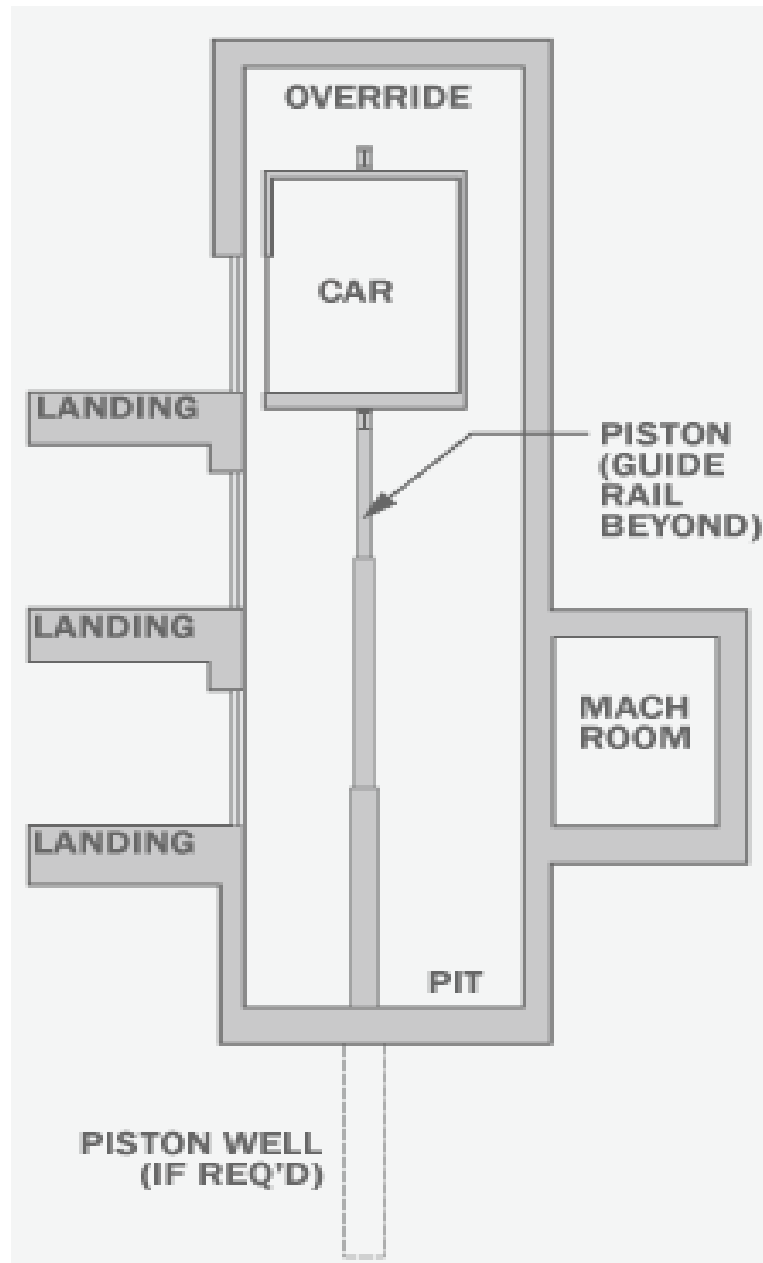
THREE PARTS:

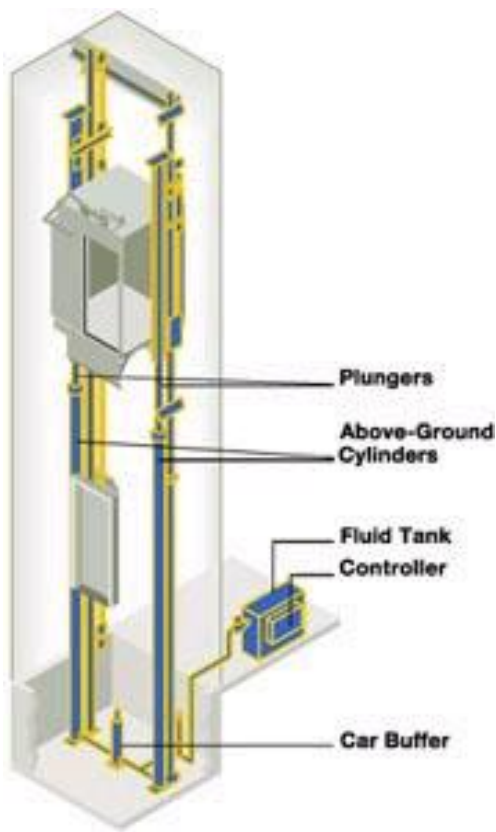
TANK

PUMP

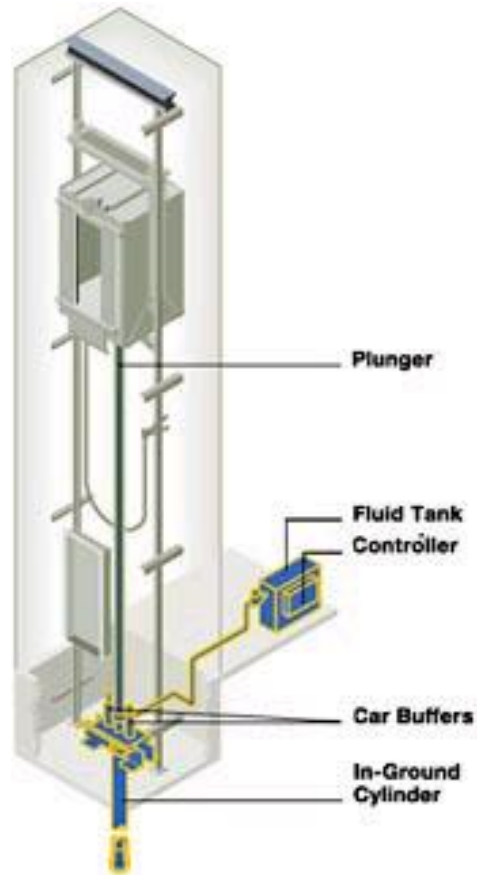
VALVE



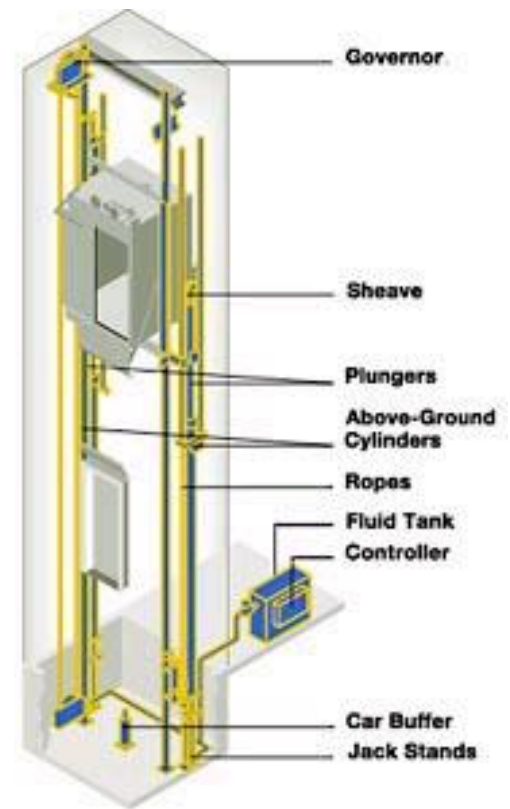




Holeless Hydraulic



Holed Hydraulic

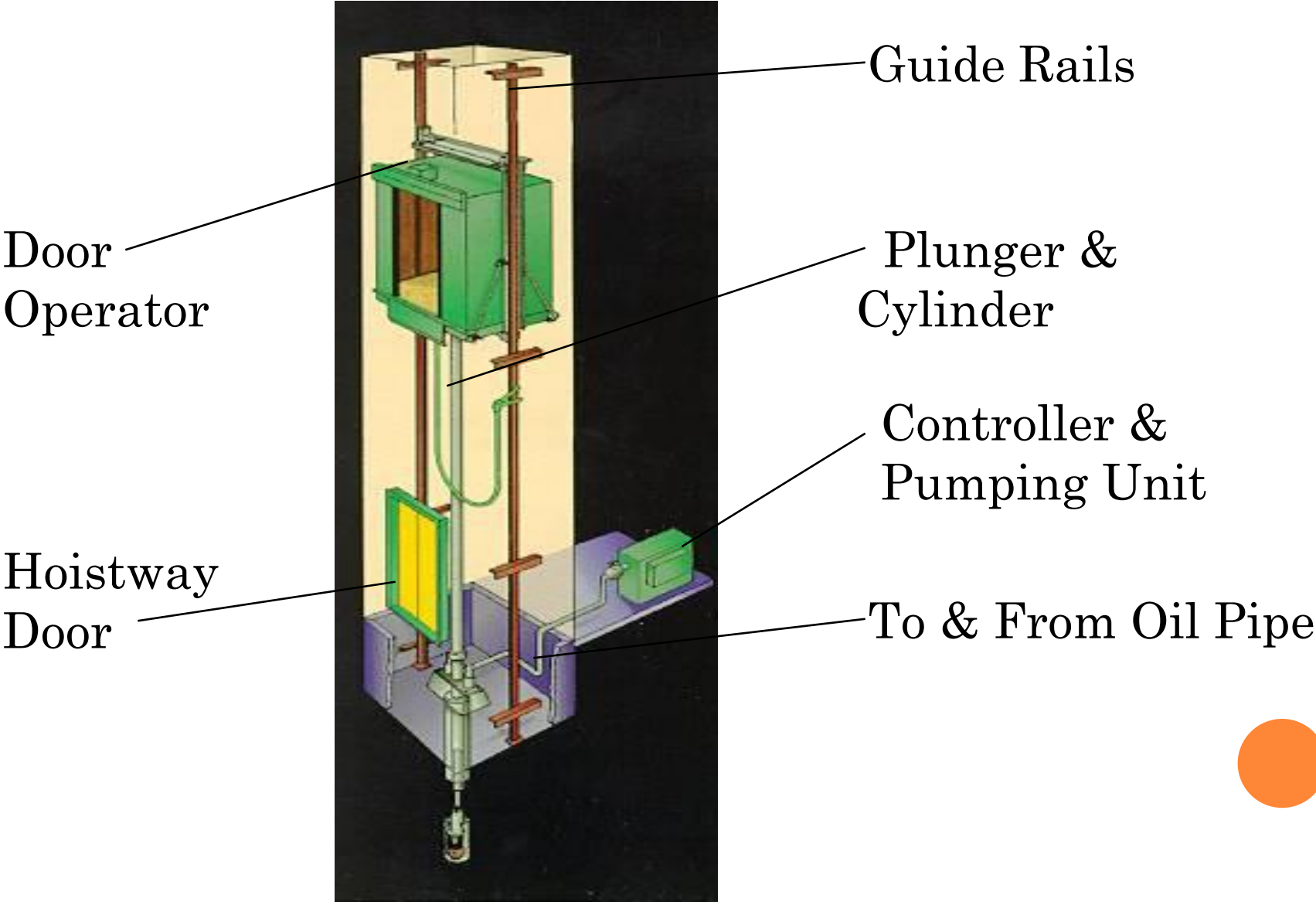


Roped Hydraulic

Hydraulic



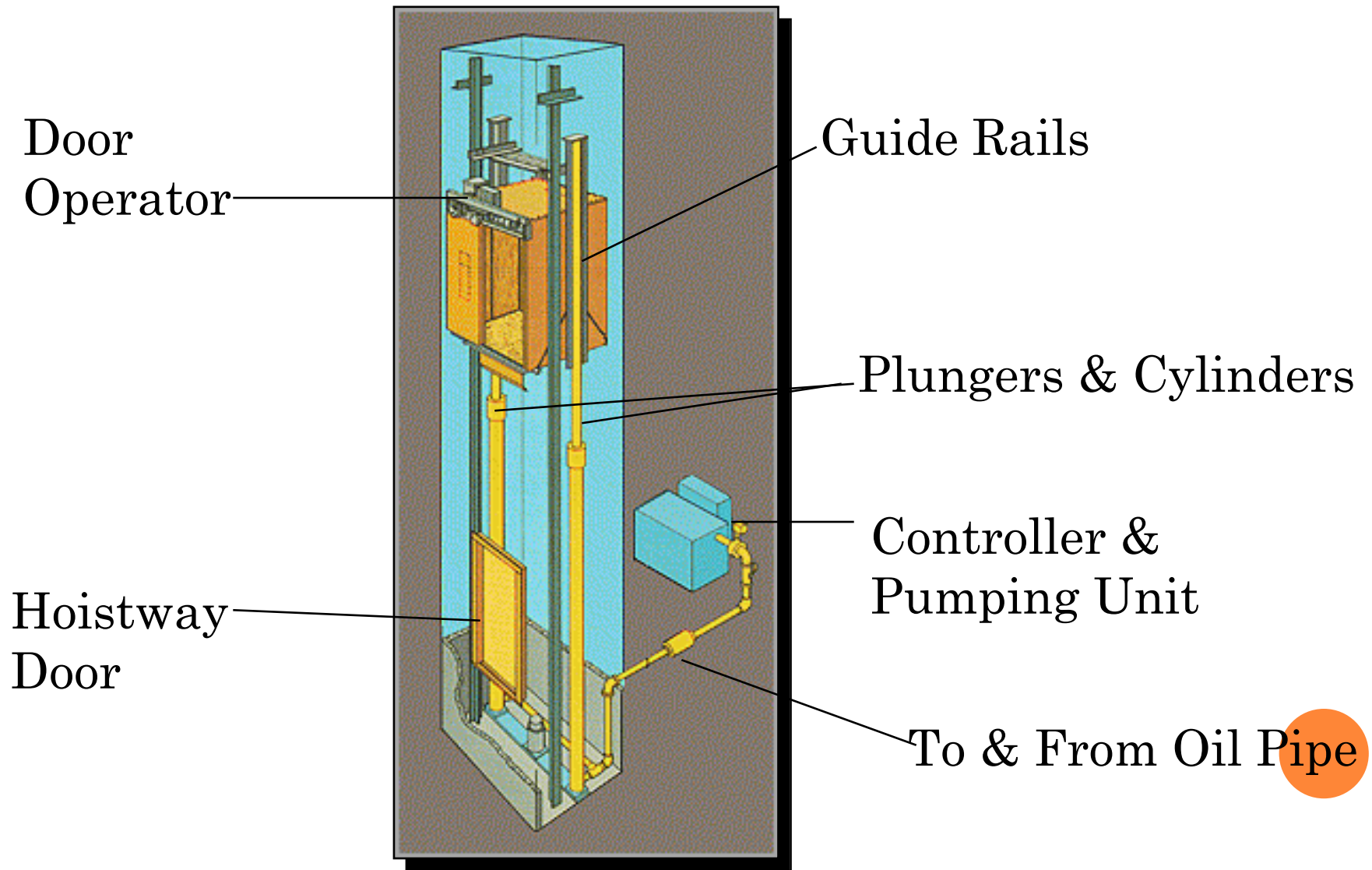
Hydraulic Elevator (holed)



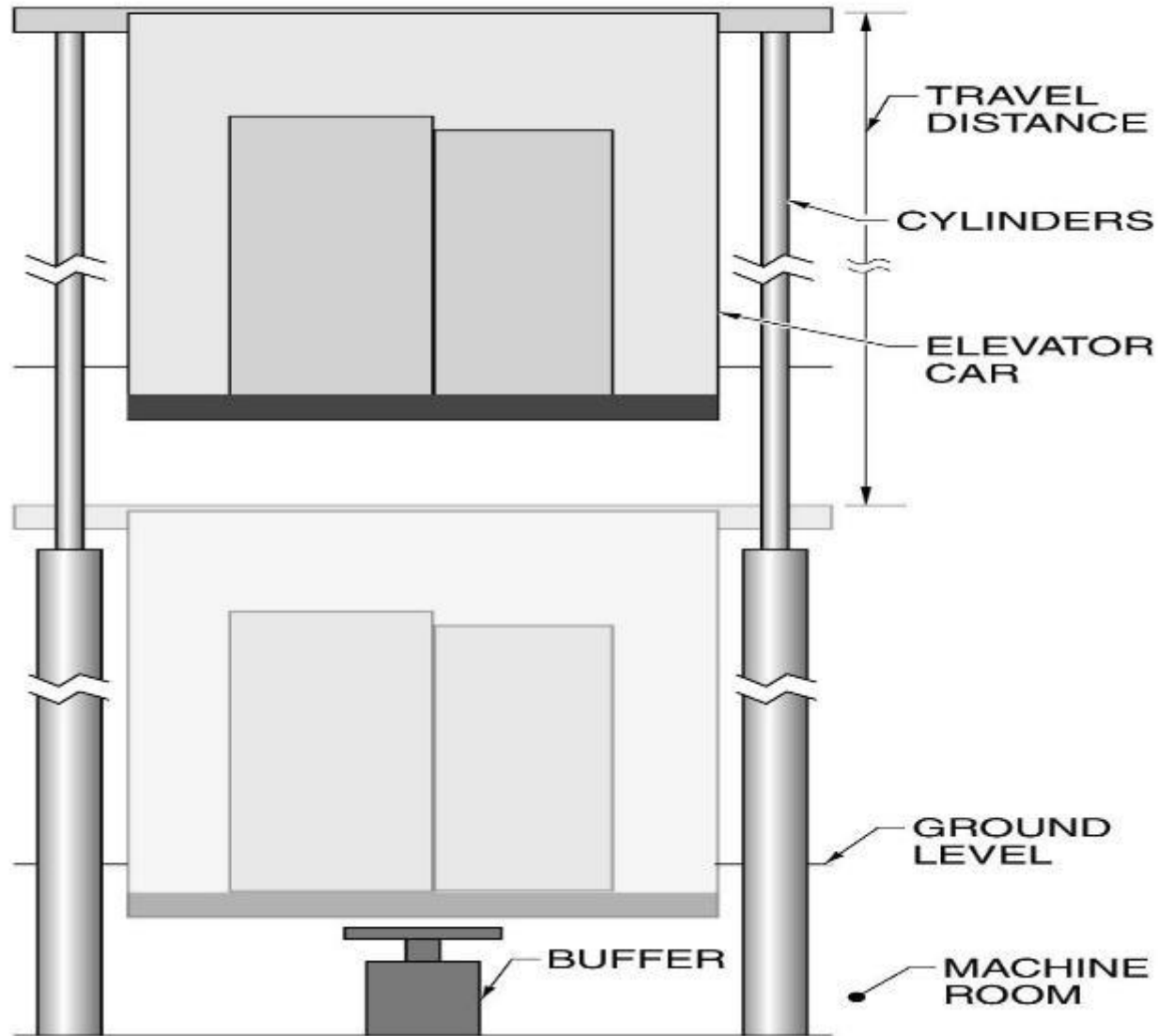
- Rise Limitations: ~ 60 feet
- Speeds: 100/125/150 fpm
- Advantages:
 - low cost
 - no penthouse
 - no structural load on building
- Disadvantages
 - slow
 - energy inefficient



Hydraulic Elevator (holeless)



Holeless Hydraulic Elevators

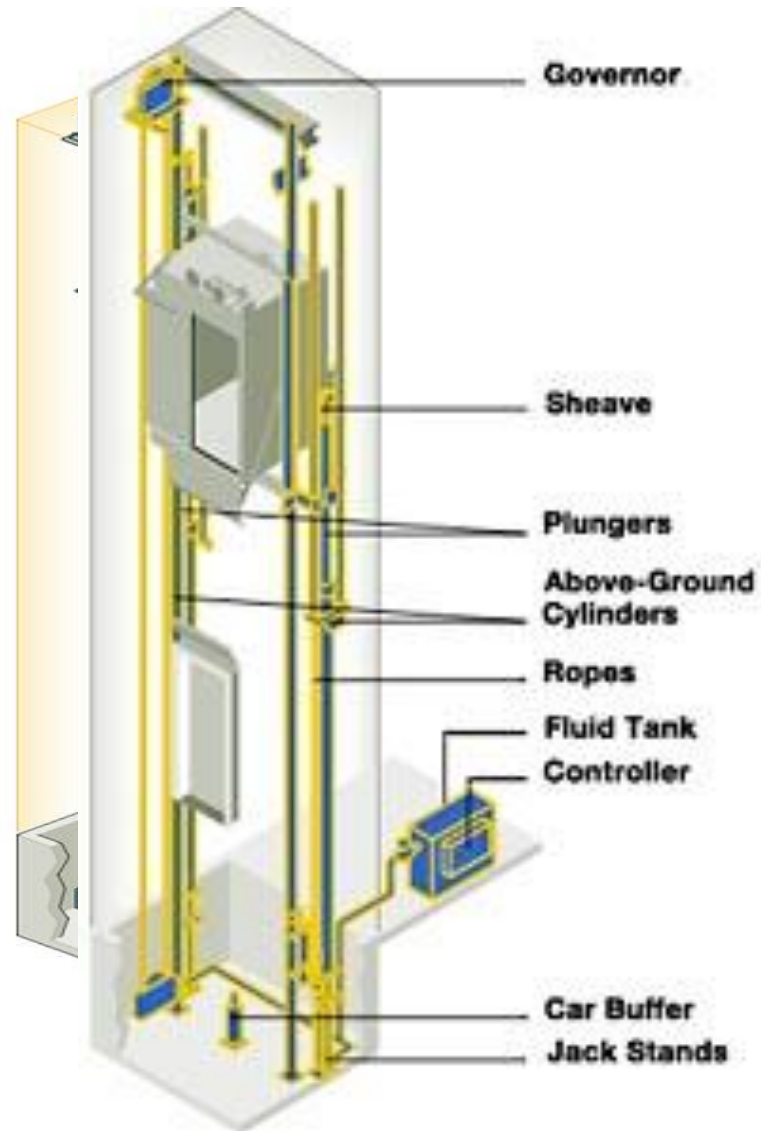


HYDRAULIC ELEVATORS - HOLELESS

- Rise Limitations: 20 feet
- Speeds: 100/125 fpm
- Advantages:
 - no well hole
 - minimizes environmental contamination
- Disadvantages:
 - limited travel



HOLELESS: ROPED HYDRAULIC



HOLELESS:

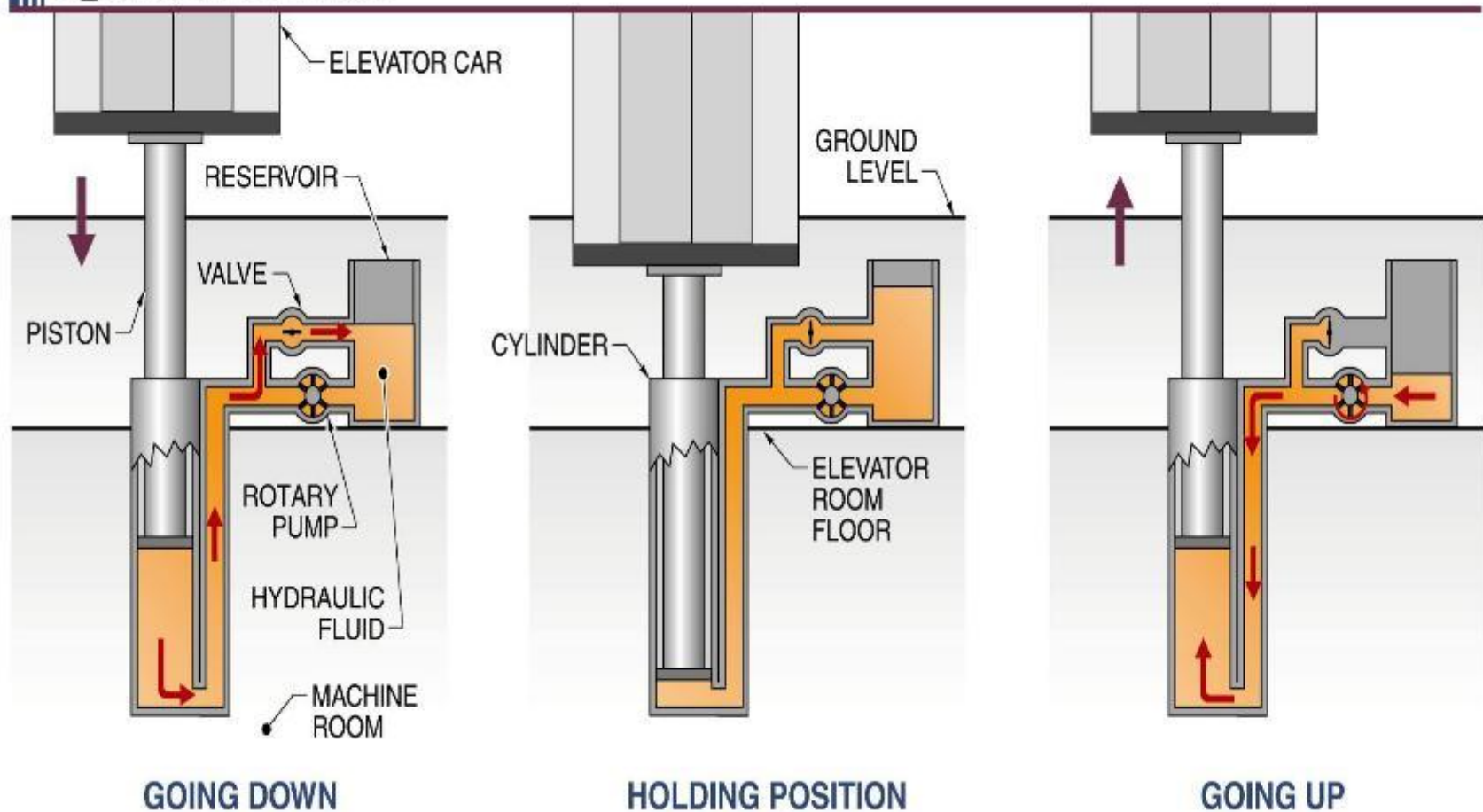
ROPED HYDRAULIC ELEVATORS

- Rise Limitations: 60 feet
- Speeds: 100 - 125 - 150 fpm
- Advantages:
 - Eliminates well hole
 - Same 60' travel range as “holed” hydro
 - Existing Building
- Disadvantages
 - More costly than conventional holed hydraulic



Hydraulic elevators are raised and lowered by pistons filled with fluid.

Hydraulic Elevators

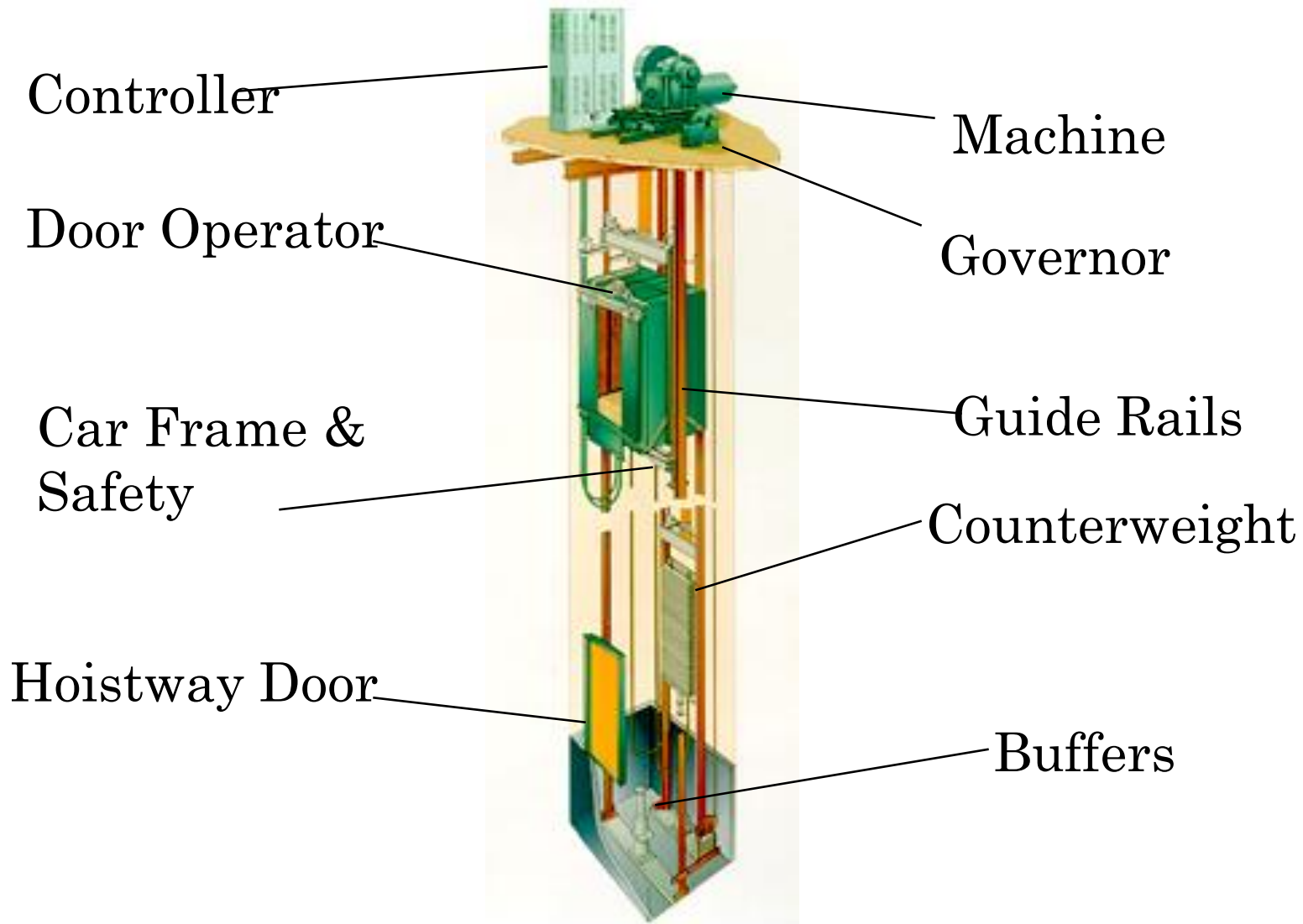


TRACTION

GEARED & GEARLESS



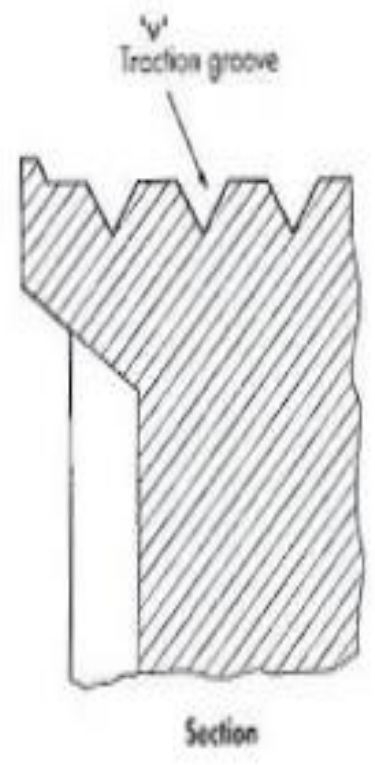
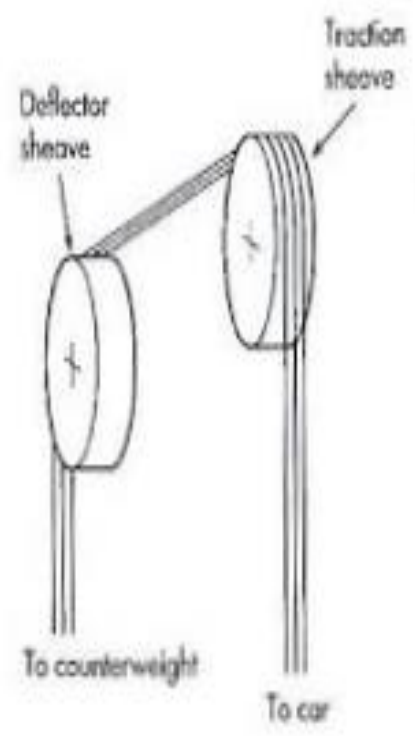
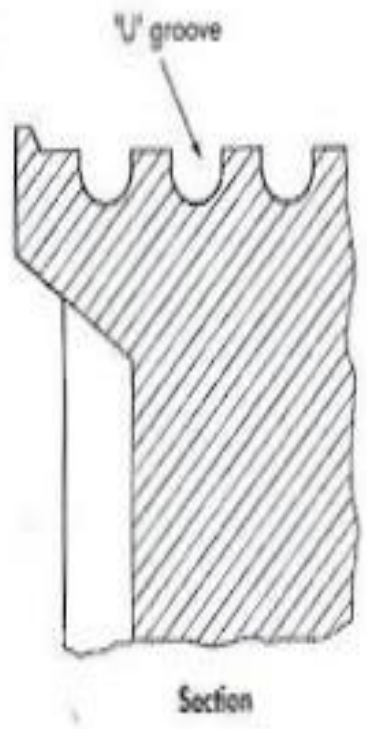
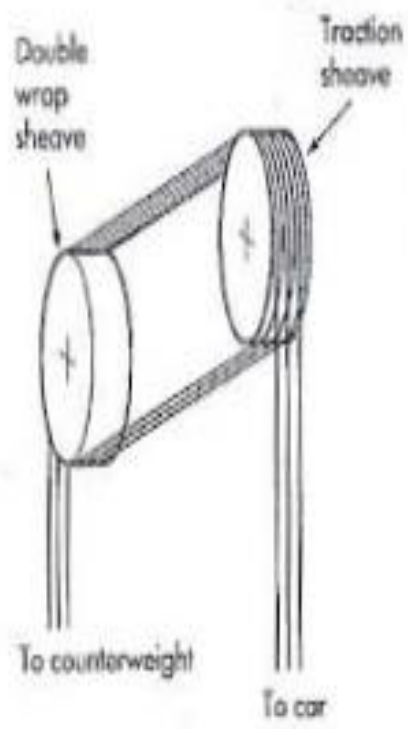
Traction Elevator



TRACTION (DRIVE) SHEAVE

- The powered pulley connected to either the elevator drive motor's output shaft (gearless) or to the output side of the mechanical speed reduction unit (geared).
- The circumference of the sheave has a series of “U” or “V” shaped grooves cut into it , in which sit the elevator suspension or hoist ropes.





COUNTERWEIGHT

- A tracked weight that is suspended from cables and moves within its own set of guide rails along the hoist way walls.
- This counterweight will be equal to the dead weight of the car plus about 40% of the rated load.



TRACTION ELEVATORS

- Rise Limitations: ~ 300 feet (Geared)
unlimited (Gearless)
- Speeds: 350 - 500 fpm (Geared)
500 - 1800+ (Gearless)
- Advantages of Gearless:
 - smoother
 - approx. twice machine life



Machine Rooms

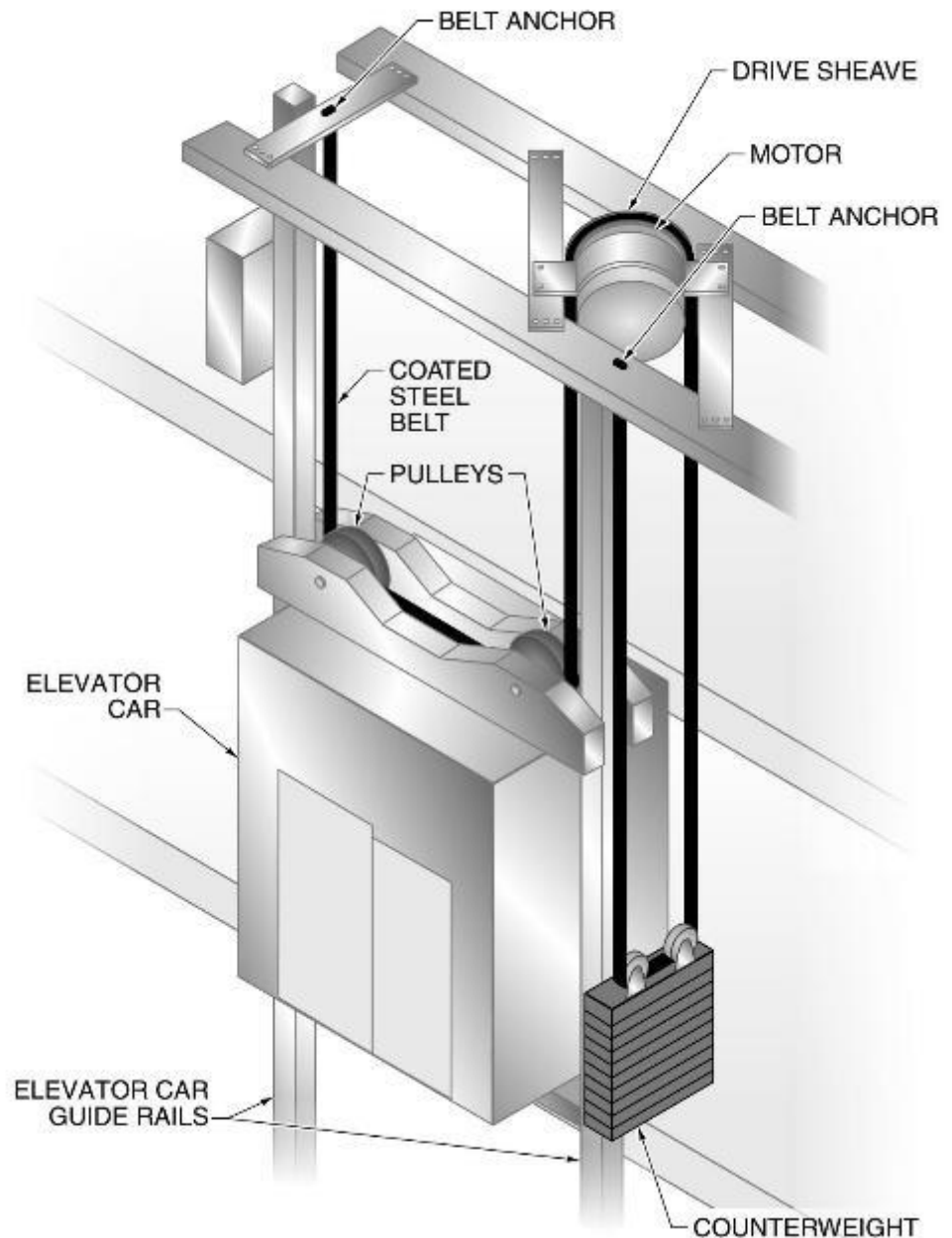


Kone, Inc.

- Most of the equipment needed to operate a traction elevator is located in a machine room above the elevator shaft.

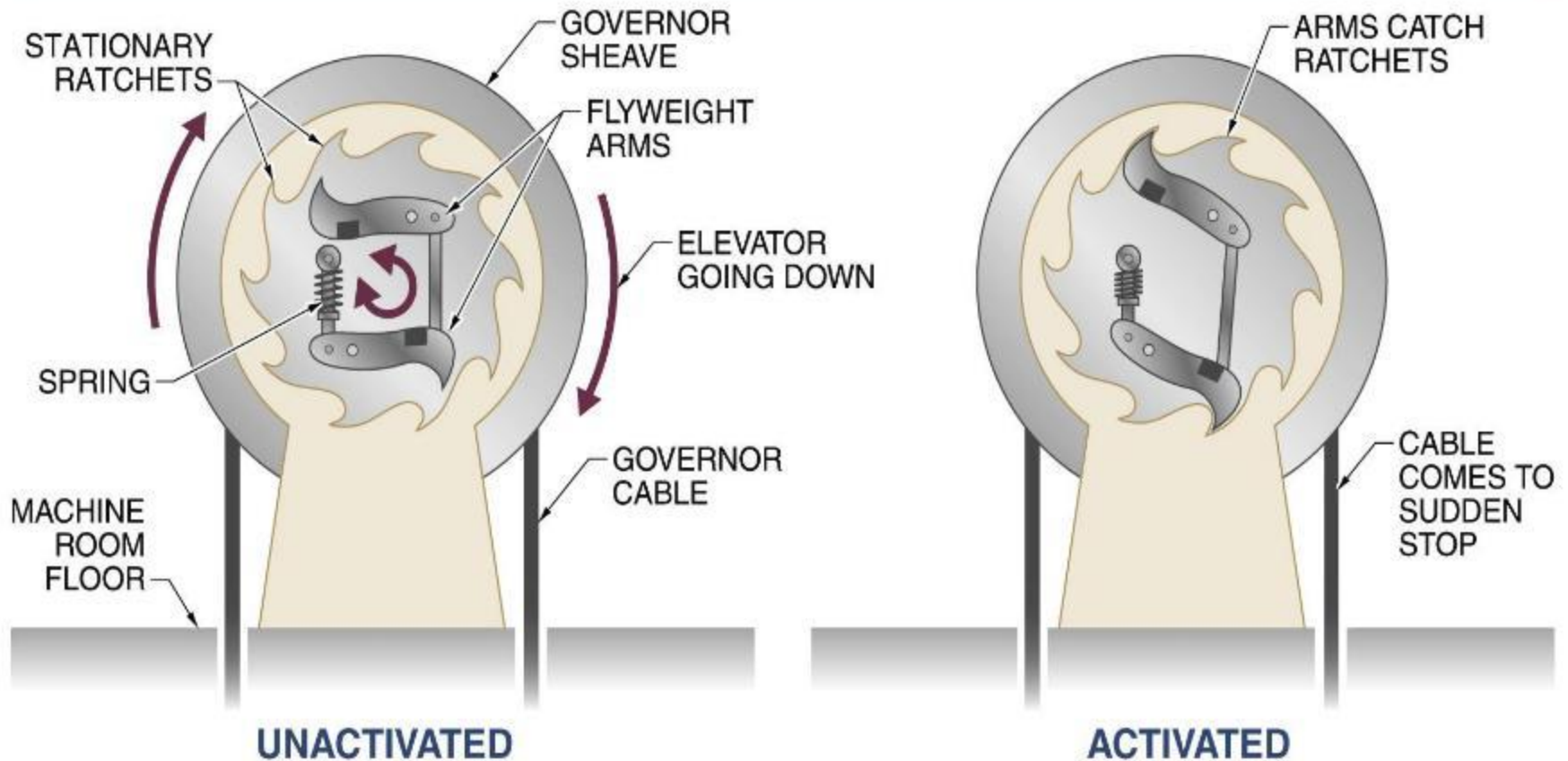


- Machine room-less elevators use a design that reduces the size of the traction equipment enough so that it does not require a machine room



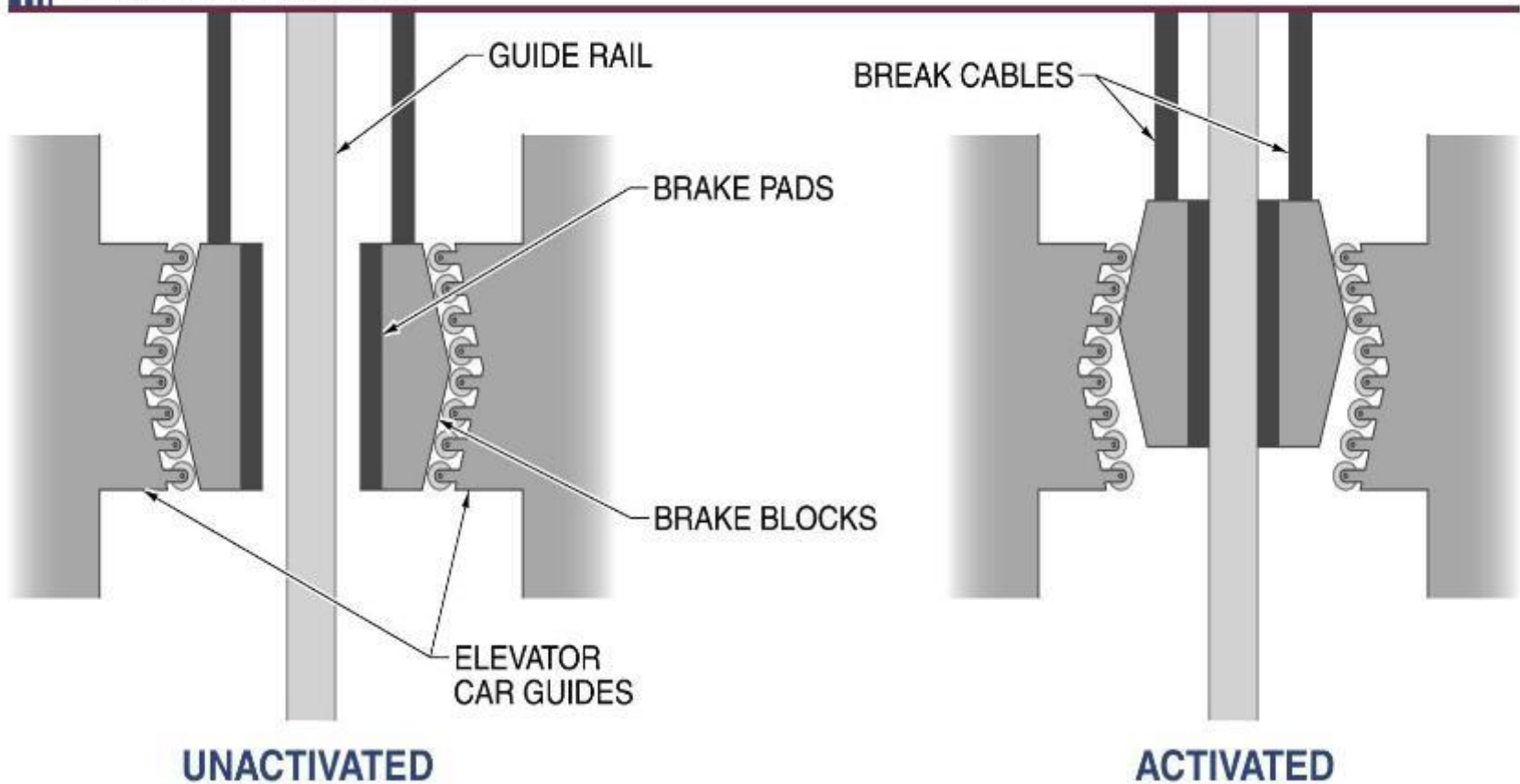
THE GOVERNOR SHEAVE ENGAGES THE EMERGENCY BRAKE SYSTEM IF THE ELEVATOR FALLS TOO RAPIDLY.

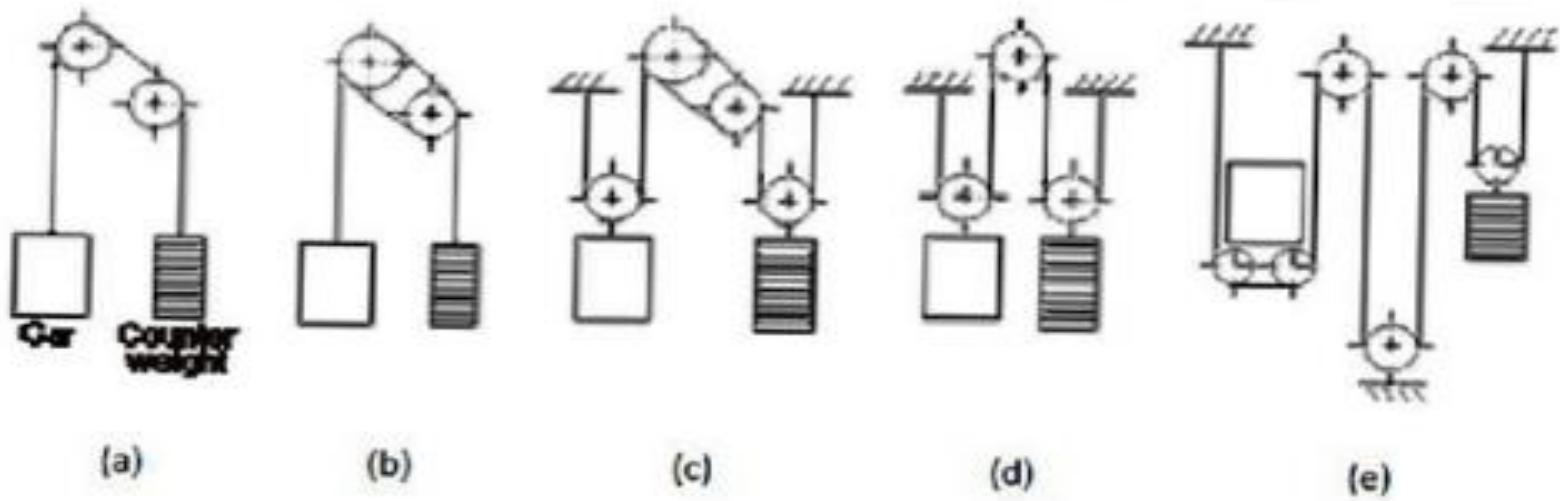
Governor Sheave



WHEN ENGAGED, EMERGENCY ELEVATOR BRAKES WEDGE UP AGAINST THE RAILS GUIDING THE ELEVATOR CAR, SLOWING IT TO A STOP.

Elevator Brakes





Commonly used roping systems (source: Mitsubishi)

a	1:1	Single wrap	Mid-, low-speed lifts
b	1:1	Double wrap	High-speed lifts
c	2:1	Double wrap	High-speed lifts
d	2:1	Single wrap	Freight lifts, Machine-room-less lifts
e	2:1	Single wrap	Machine-room-less lifts



BUFFERS

- A Buffer is a device designed to stop a descending car or counterweight beyond its normal limit and to soften the force with which the elevator runs into the pit during an emergency.
- They may be of polyurethane or oil type in respect of the rated speed.



- There are two principal types of buffers in existence:
 - A- Energy accumulation: accumulate the kinetic energy of the car or counterweight.
 - B- Energy dissipation: dissipate the kinetic energy of the car or counterweight.
- Polyurethane buffers which are energy accumulation type with non-linear characteristics are used for lifts that have rated speed not more than 1 m/sec.



THE MAIN TYPES OF ELEVATOR BUFFERS ARE:



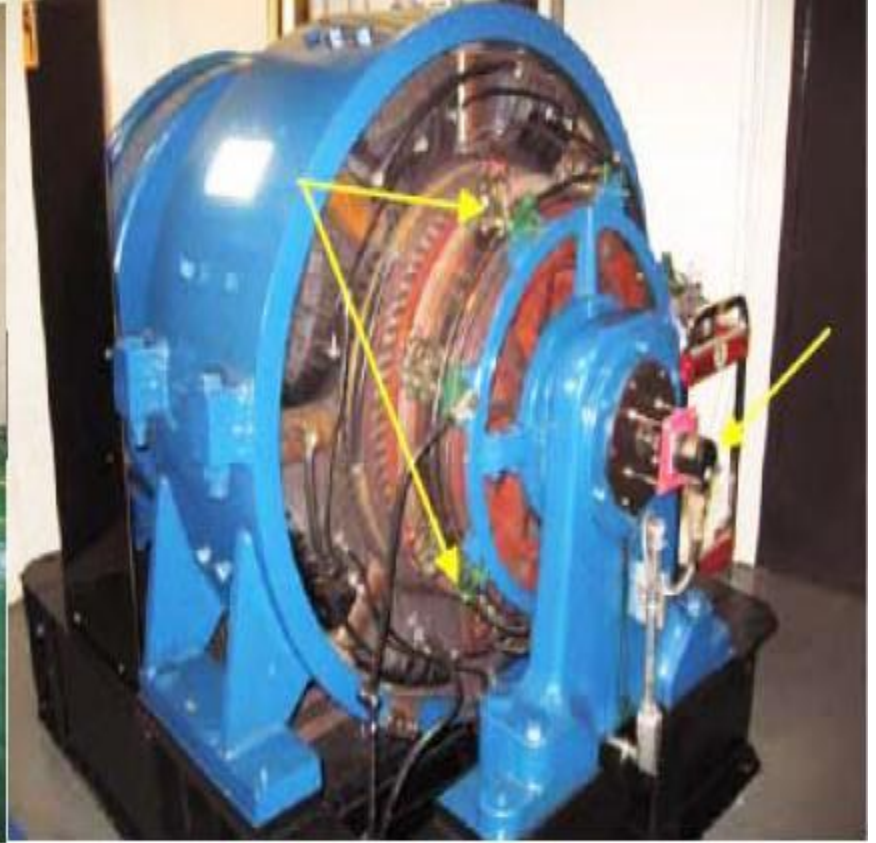
Spring Buffer



Oil Buffer



GEARLESS MACHINE

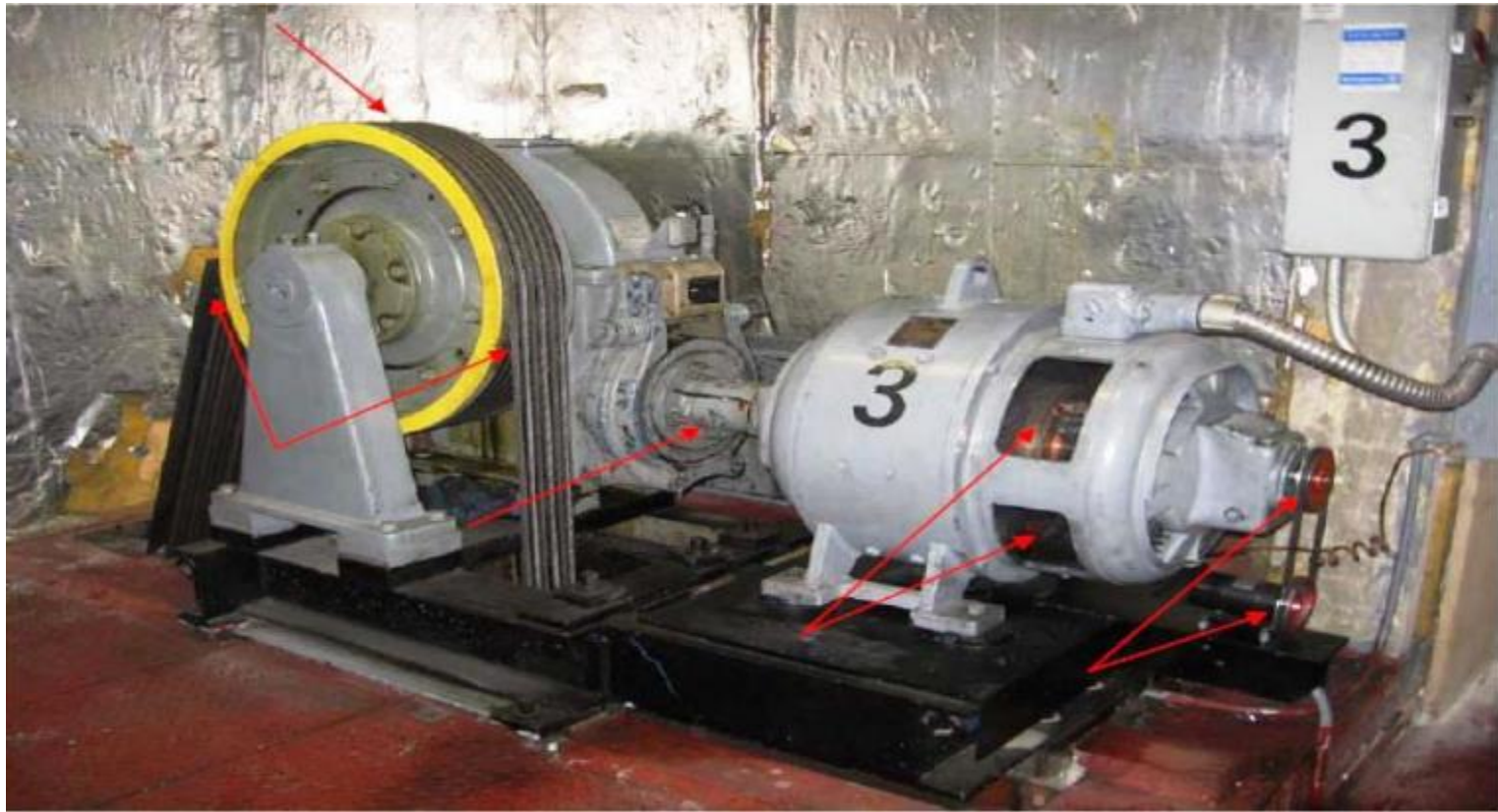


GEARED MACHINE

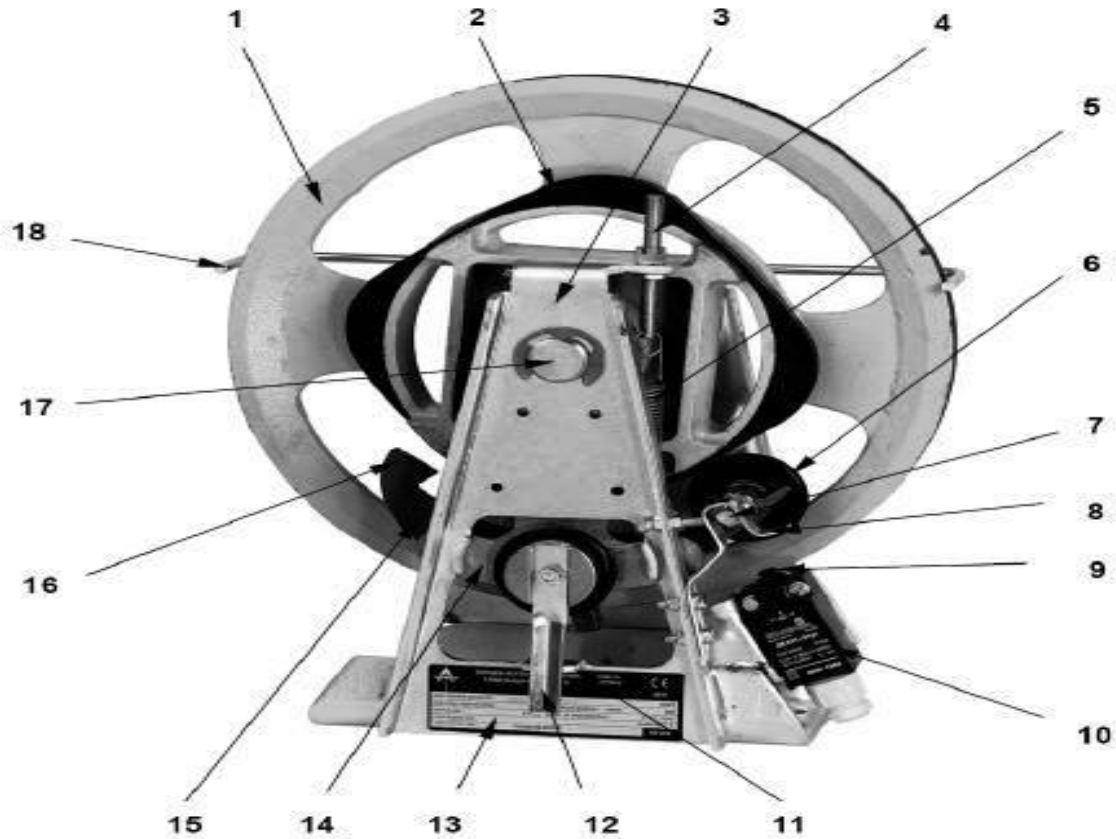


DRUM MACHINE



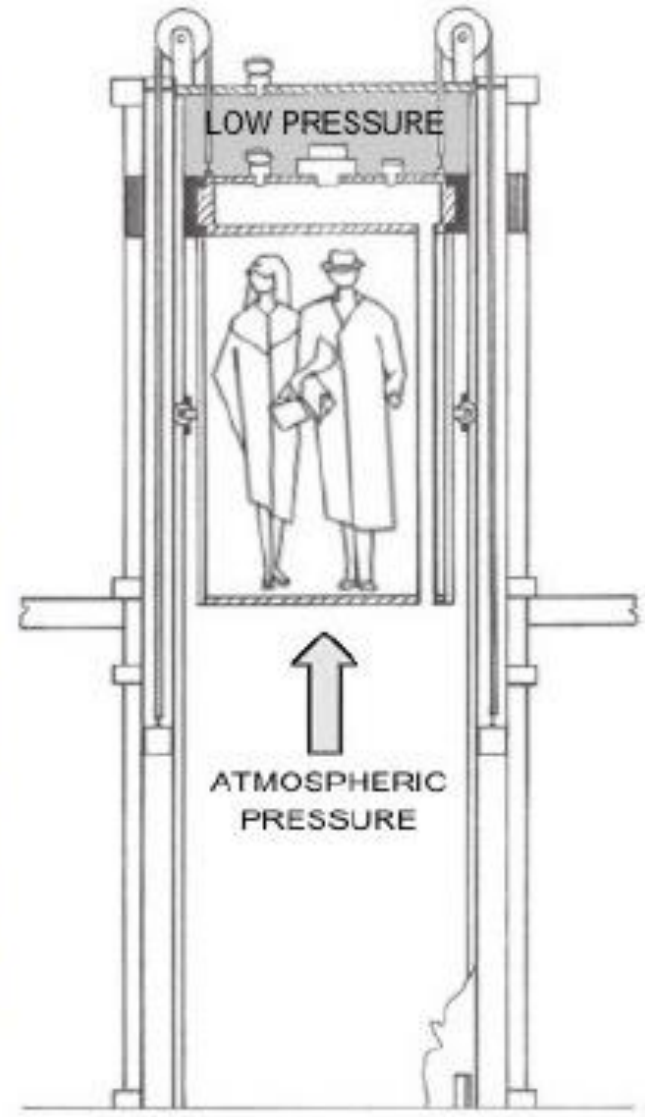
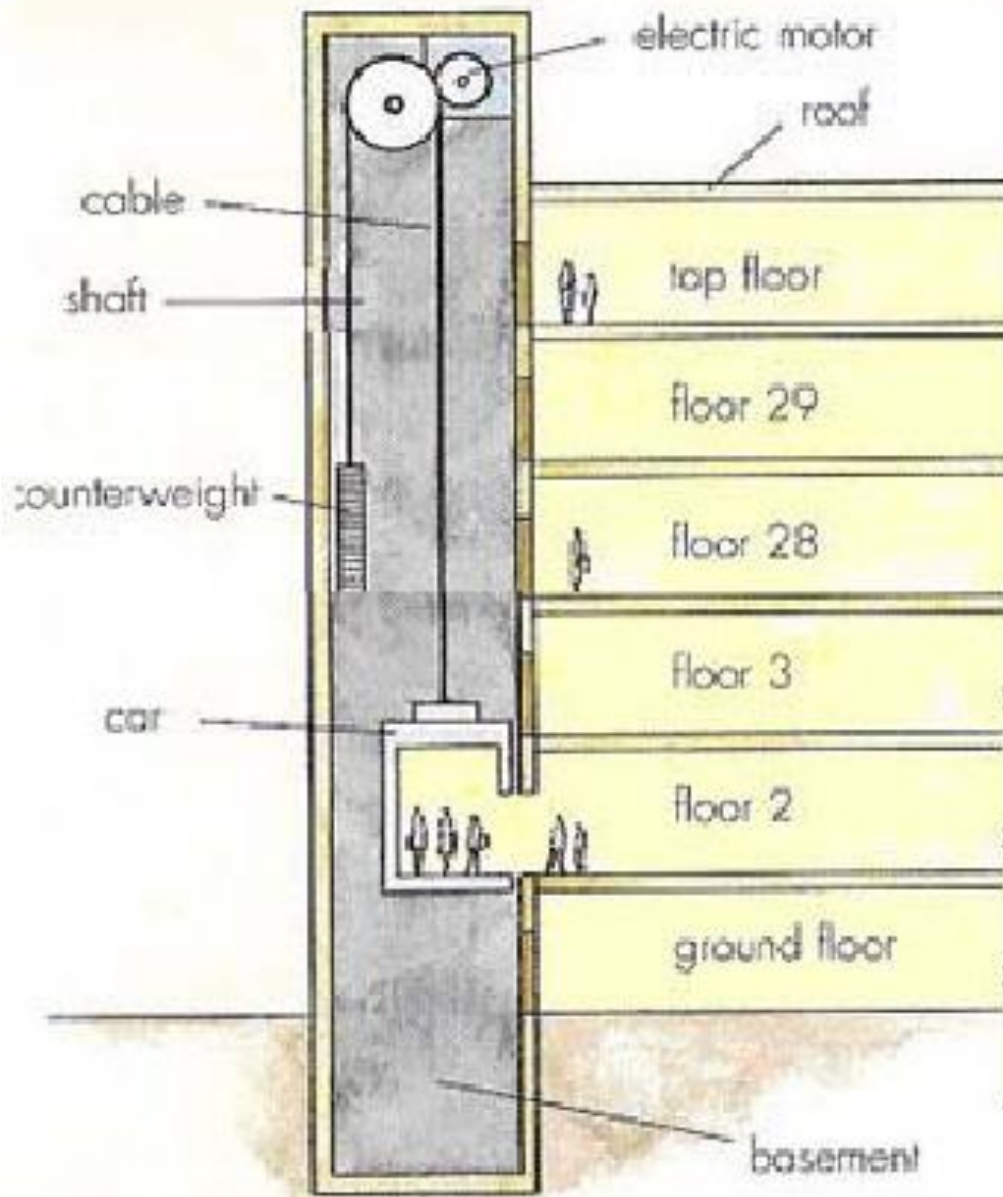


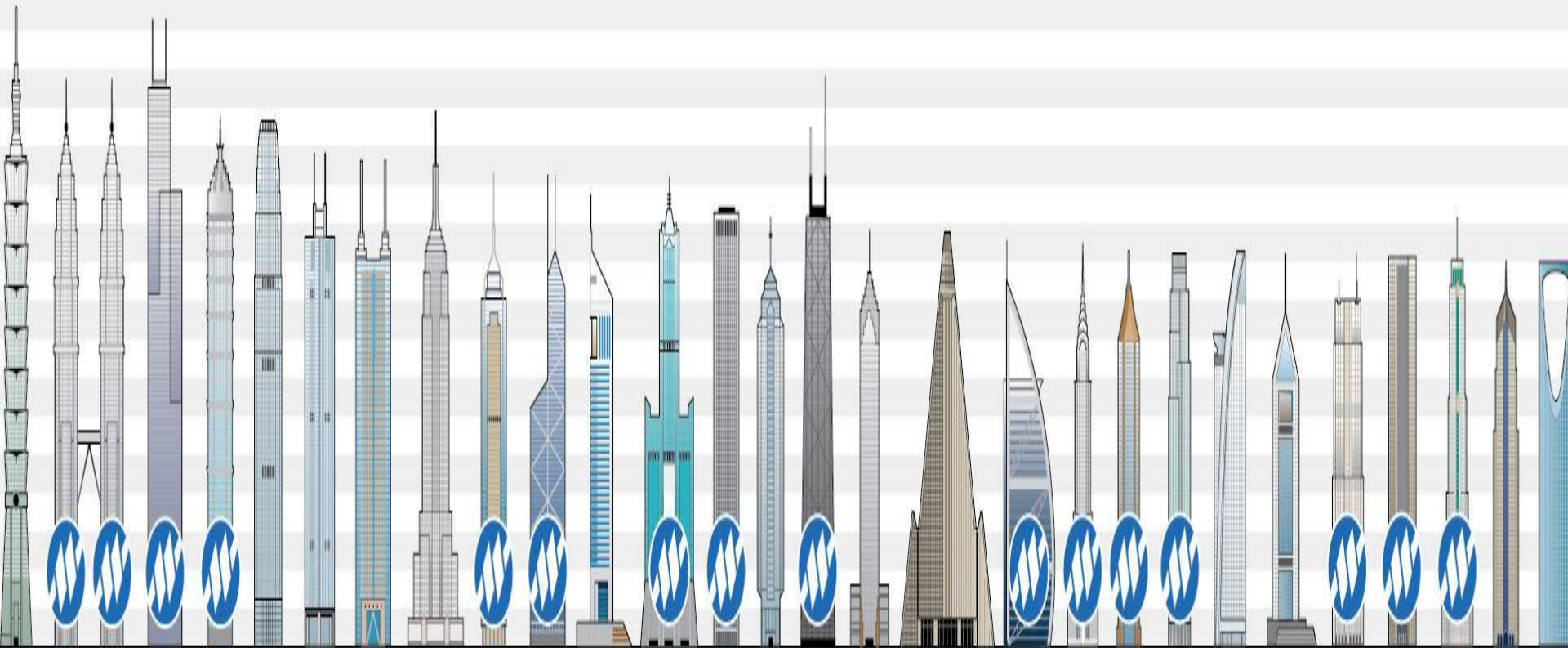




1	Governor pulley	10	Safety contact
2	Cam curve	11	Locking plate
3	Base	12	Leaf spring
4	Adjusting bolt	13	Name plate
5	Tension spring	14	Lever
6	Roller	15	Rocker
7	Bolt	16	Pawl
8	Hat-type spring	17	Axle
9	Contact tappet	18	Rope fixing beam







- 1 Burj Khalifa, Dubai
- 2 BurjDubai, Dubai
- 3 BurjDubai, Dubai
- 4 Sears Tower, Chicago
- 5 J10 World Tower, Jeddah
- 6 J100 International, Jeddah
- 7 Citic Plaza, Chicago
- 8 Jeddah Tower, Jeddah
- 9 Empire State Building, New York
- 10 Center 21 Plaza, Jeddah
- 11 Bank of China Tower, Hong Kong
- 12 Citigroup Office Tower, Chicago
- 13 Trump Sky Tower, Las Vegas
- 14 Aon Center, Chicago
- 15 The Citicong, Chicago
- 16 J100 Hancock Center, Chicago
- 17 Jeddah International, Jeddah
- 18 Jeddah Tower, Jeddah
- 19 Burj Al Arab, Dubai
- 20 Chrysler Building, New York
- 21 Bank of America Plaza, Jeddah
- 22 U.S. Bank Tower, Los Angeles
- 23 Jeddah Tower, Jeddah
- 24 Jeddah Tower, Jeddah
- 25 Jeddah Tower II, Jeddah
- 26 Jeddah Tower III, Jeddah
- 27 Jeddah Tower IV, Jeddah



ELECTRICAL MOTOR

- Electrical Motor is used to raise and lower the elevator cab, the direction of motor rotation and speed (rpm) are directed and supervised by devices located within the elevator controller.
- The motor component of the elevator machine can be either a DC motor or an AC motor .



A) DC MOTOR:

DC motors use carbon brushes to control or regulate the operational speed of its motor.

- It is an important maintenance task to regularly inspect, repair and replace these brushes.
- Failure to do so in a timely fashion can result in equipment mis-operation and lead to significant motor damage.



Advantages of using DC motors:

- Has a good starting torque.
- Ease of speed control using a DC generator with a variable output or static converters.



B) AC MOTOR

Advantages of using AC motors:

- More regularly used because of its ruggedness and simplicity.
- More ride quality.



TYPES OF ELECTRICAL TRACTION DRIVE SYSTEMS

A- Geared traction control, which includes:

- Single speed AC motor.
- Two speed AC motor.
- Variable voltage AC motor (VVAC).
- Variable voltage, variable frequency AC motor (VVVFAC).
- Variable voltage DC motor(VVDC).



B- Gearless traction drives, which include:

- Variable voltage DC motor (VVDC).
- Variable voltage, variable frequency AC motor(VVVFAC).

