Kursus Rekabentuk Sistem Lif (Asas)

08 – 09 Mac 2018

PUSAT KECEMERLANGAN KEJURUTERAAN DAN TEKNOLOGI JKR (CREaTE), JALAN KEMUS, SIMPANG AMPAT, 78000 ALOR GAJAH, MELAKA

ISI KANDUNGAN

- Kursus
  - Objektif
  - *Outcome*

OBJEKTIF

Kursus ini adalah bertujuan untuk:

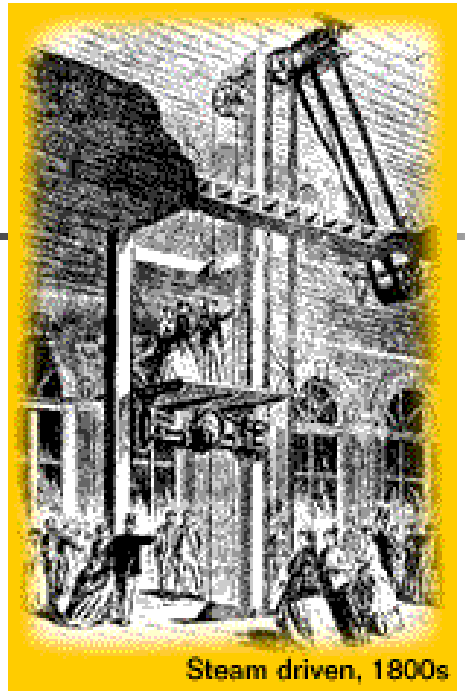
- Memberi pendedahan dan kefahaman kepada peserta mengenai akta / piawaian /garis panduan yang berkaitan.
- Mengenali dan memahami konsep, jenis-jenis dan fungsi komponen sistem lif.

OUTCOME

Di akhir kursus, peserta akan dapat:

- Memahami keperluan akta/piawaian/ garispanduan yang berkaitan bagi sistem lif.
- Memahami konsep dan mengenali jenis-jenis serta fungsi komponen sistem lif.
- Memahami sistem kawalan dan orientasi lif.

Elevator History

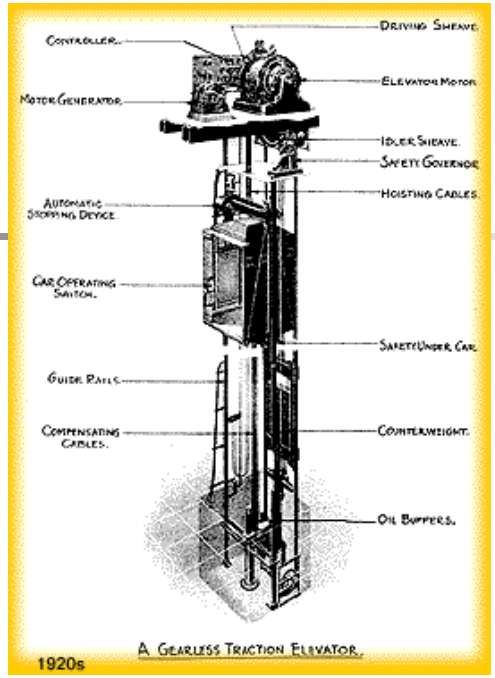

Steam driven, 1800s


Manual hoist, middle ages

In The Beginning...

Rudimentary **elevators**, or **hoists**, were in use during the **Middle Ages** and can be traced back to the **third century BC**. They were **operated by animal and human power** or **by water-driven mechanisms**. The elevator as we know it today was **first developed** during the **1800s** and relied on **steam or hydraulic plungers** for lifting capability. In the latter application, the cab was affixed to a hollow plunger that lowered into an underground cylinder. Liquid, most commonly water, was injected into the cylinder to create pressure and make the plunger elevate the cab, which would simply lower by gravity as the water was removed. Valves governing the water flow were manipulated by passengers using ropes running through the cab, a system later enhanced with the incorporation of lever controls and pilot valves to regulate cab speed. The "granddaddy" of today's traction elevators first appeared during the 19th century in the U.K., a "lift" using a rope running through a pulley and a counterweight tracking along the shaft wall.

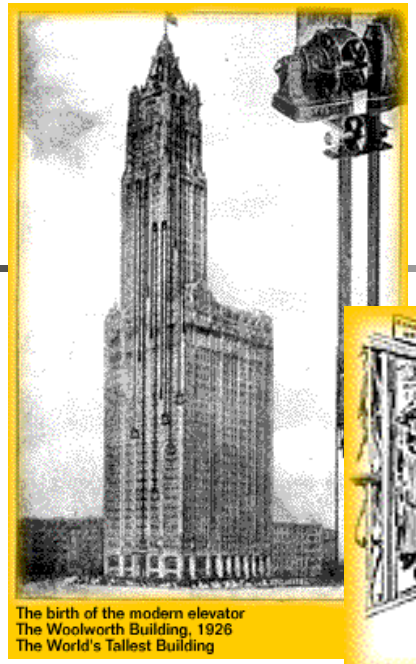
Elevator History



Give Us the Power...

The **power elevator** debuted **mid-19th century in the U.S.** as a **simple freight hoist** operating **between just two floors** in a **New York City building.** By 1853, **Elisha Graves Otis** was at the New York Crystal Palace exposition, demonstrating an elevator with a "safety" to break the cab's fall in case of rope failure, a defining moment in elevator development. By 1857, the country's first Otis passenger elevator was in operation at a New York City department store, and, ten years later, Elisha's sons went on to found Otis Brothers and Company in Yonkers, NY, eventually to achieve mass production of elevators in the thousands. Various other elevator designs appeared on the landscape, including screw-driven and rope-geared, hydraulic models.

Elevator History



The birth of the modern elevator
The Woolworth Building, 1926
The World's Tallest Building

New York City, 1890s

An Electric Moment...

Later in the **1800s**, with the advent of electricity, **the electric motor was integrated into elevator technology by German inventor Werner von Siemens.** With the motor mounted at the bottom of the cab, this design employed a gearing scheme to climb shaft walls fitted with racks. In 1887, an electric elevator was developed in Baltimore, using a revolving drum to wind the hoisting rope, but these drums could not practically be made large enough to store the long hoisting ropes that would be required by skyscrapers. Motor technology and control methods evolved rapidly. In **1889** came **the direct-connected geared electric elevator**, allowing for the building of significantly taller structures.

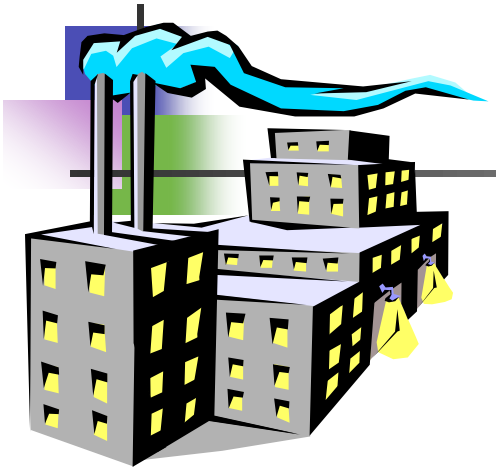
By **1903**, this design had evolved into the **gearless traction electric elevator**, allowing hundred-plus story buildings to become possible and forever changing the urban landscape. **Multi-speed motors** replaced the original single-speed models to help with **landing-leveling and smoother overall operation**. Electromagnet technology replaced manual rope-driven switching and braking. Push-button controls and various complex signal systems modernized the elevator even further. Safety improvements have been continual, including a notable development by Charles Otis, son of original "safety" inventor Elisha, that engaged the "safety" at any excessive speed, even if the hoisting rope remained intact.

LIF (Pengangkutan Menegak) (Vertical Transportation)

Lif adalah peralatan mekanikal di dalam bangunan untuk menggerakkan manusia dan barang-barang. Ia merupakan PENGANGKUTAN MENEGAK hakiki dalam kebanyakkan jenis bangunan.

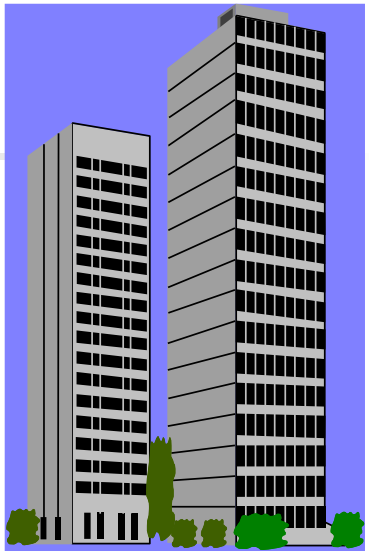
Pada dasarnya sebuah lif terdiri daripada kereta yang membawa penumpang,disokong oleh satu kabel berjalan sekeliling takal dan diimbangkan oleh pengimbang berat (counter weight). Kereta Lif (Lift Car) turun-naik melalui "guide rail" yang dipasang di dalam shaft lif.

Users Expectation on Vertical Transportation

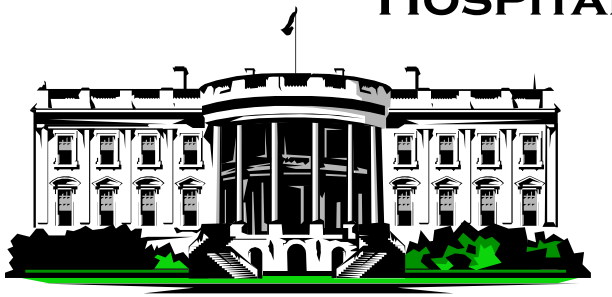


FACTORY

HOSPITAL

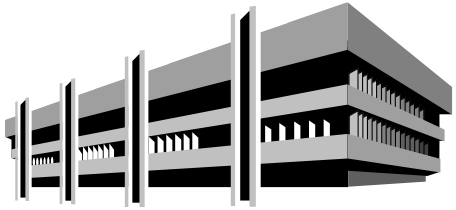


OFFICE/
COMMERCIAL BUILDING



VIP OFFICES

FLATS



PUBLIC BUS STATION

PRIVATE USE

Users Expectation on Vertical Transportation

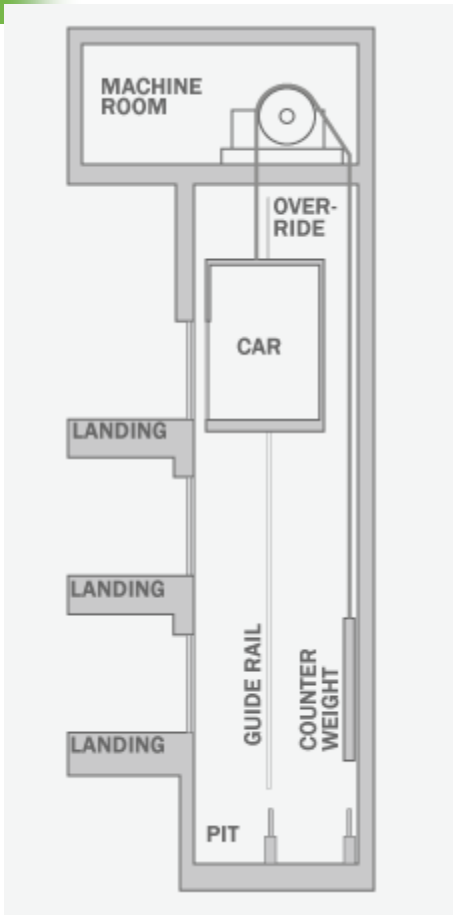
Jenis-Jenis Lif

KATEGORI MENGIKUT JENIS TRACTION

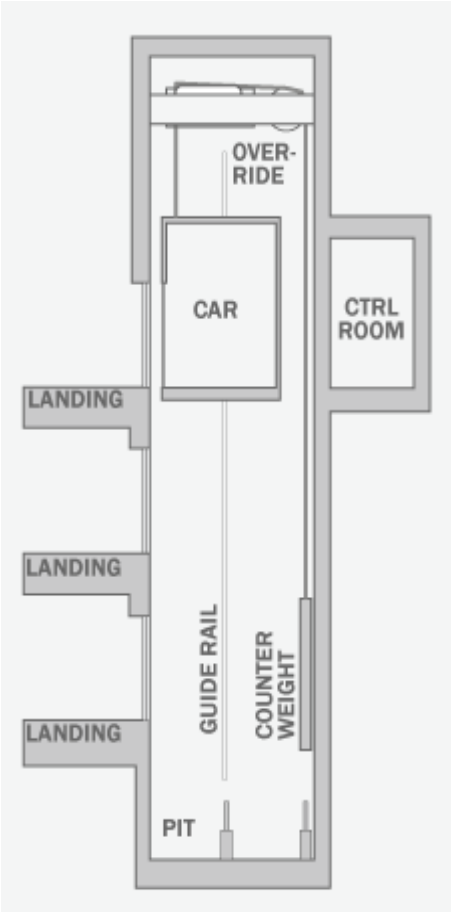
- **Lif Elektrik**
  - Geared and Gearless Traction Elevators with Machine Room
  - Machine-Room-Less (MRL) Elevators
- **Lif Hidraulik**

GENERAL LAYOUT OF LIFT

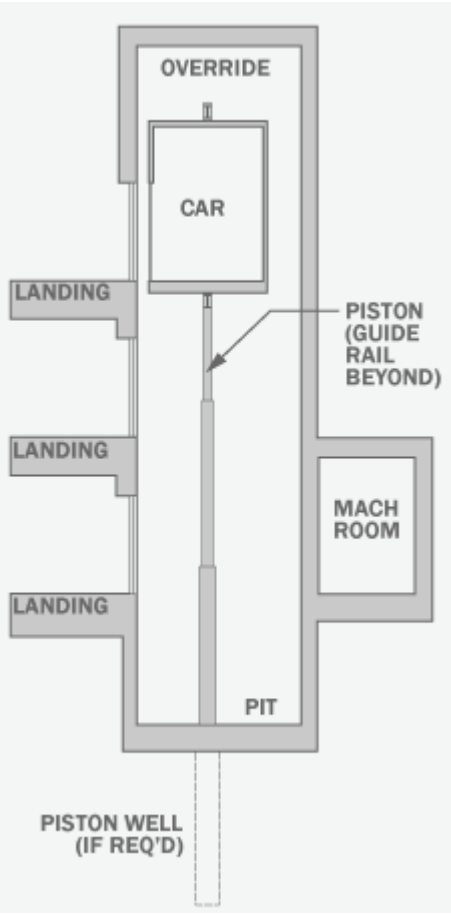
MOTOR ROOM



MOTOR ROOM-LESS



HYDRAULIC

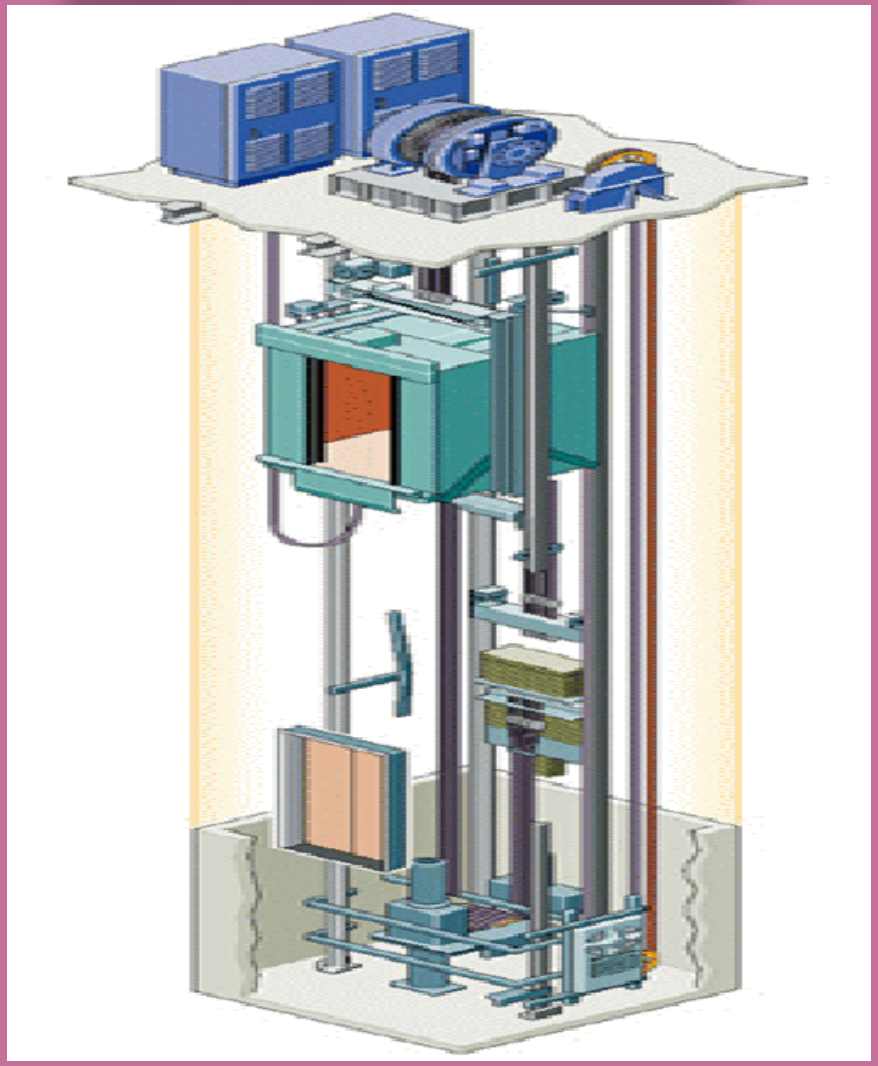


BUILDING ELEVATOR SYSTEMS (LIFT)

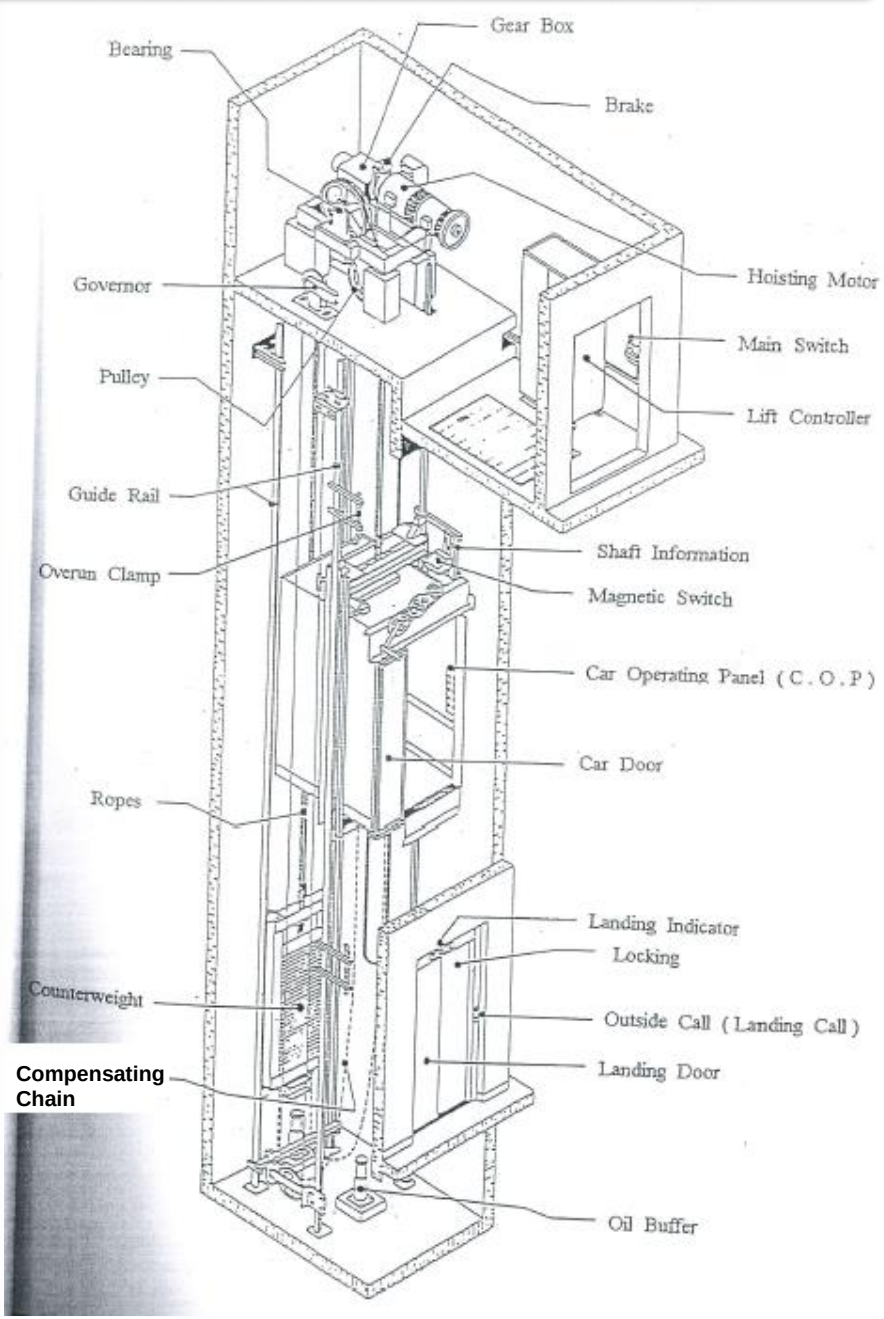
ELECTRIC TRACTION TYPE	HYDRAULIC TYPE
• *Traction elevators have an **elevator car** and **counterweight** attached to opposite ends of hoist ropes. The **hoist ropes** pass over a **driving machine** that raises and lowers the car. Traction elevators run on load-bearing rails in the elevator hoistway.* • *Traction elevators are most often used in **mid-rise** and **high-rise** buildings with **five or more floors.***	• *Hydraulic elevators, on the other hand, are raised by forcing **pressurized oil** through a **valve** into a **steel cylinder** located above ground or underground. The pressure forces a **piston** to rise, lifting the **elevator platform and car enclosure** mounted on it. The car is lowered by opening the valve and allowing the weight of the car to force oil from the cylinder in a controlled manner. When the valve is closed the car is stopped. Since the weight of hydraulic elevator cars is borne by the piston, there is **no need for a structural framework** or load-bearing rails.* • *Hydraulic elevators are commonly found in **low-rise** buildings with **two to five floors**.*

BUILDING ELEVATOR SYSTEMS (LIFT)

ELECTRIC TRACTION TYPE



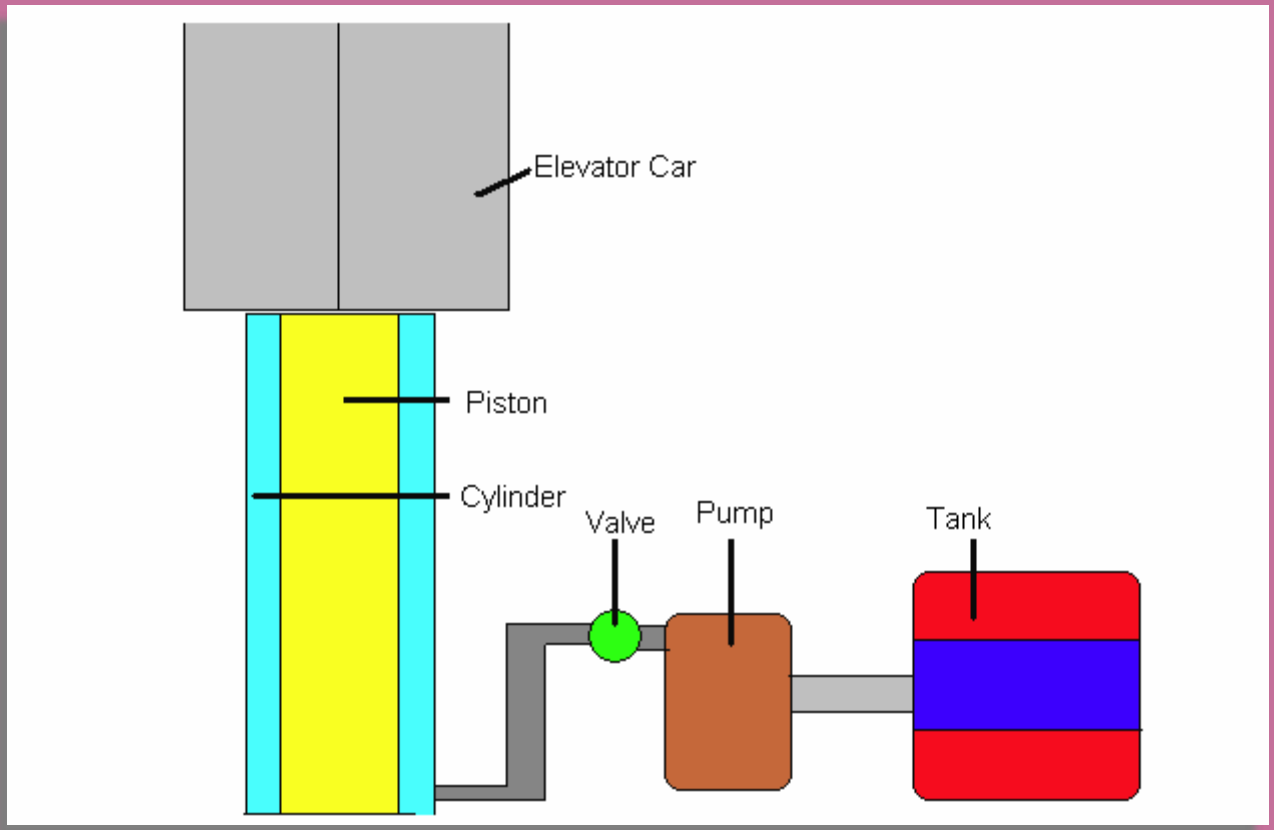
ELECTRIC TRACTION LIFT



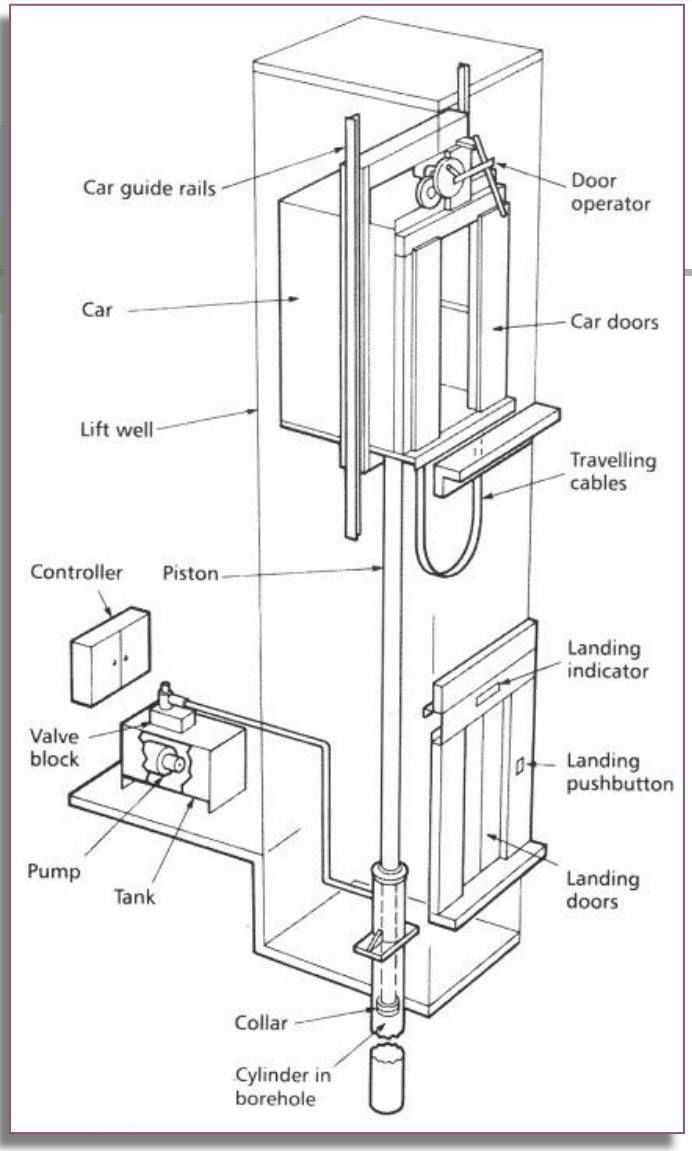
[Source: CIBSE Guide D]

BUILDING ELEVATOR SYSTEMS (LIFT)

HYDRAULIC TYPE



HYDRAULIC LIFT



Hydraulic lift

– *Advantages:*

- *Capacity for **very heavy loads** (eg. Goods Lift)*
- ***Accuracy** in floor leveling*
- ***Smooth** ride characteristics*
- ***Low-level** plant room*
- ***No structural loads** from winding gear*
- ***Pump room** can be located up to **10 m** from the shaft*
- *Maximum travel of **21 m**; speed up to **0.75 m/s***

Hydraulic lift

– *Jack arrangements*

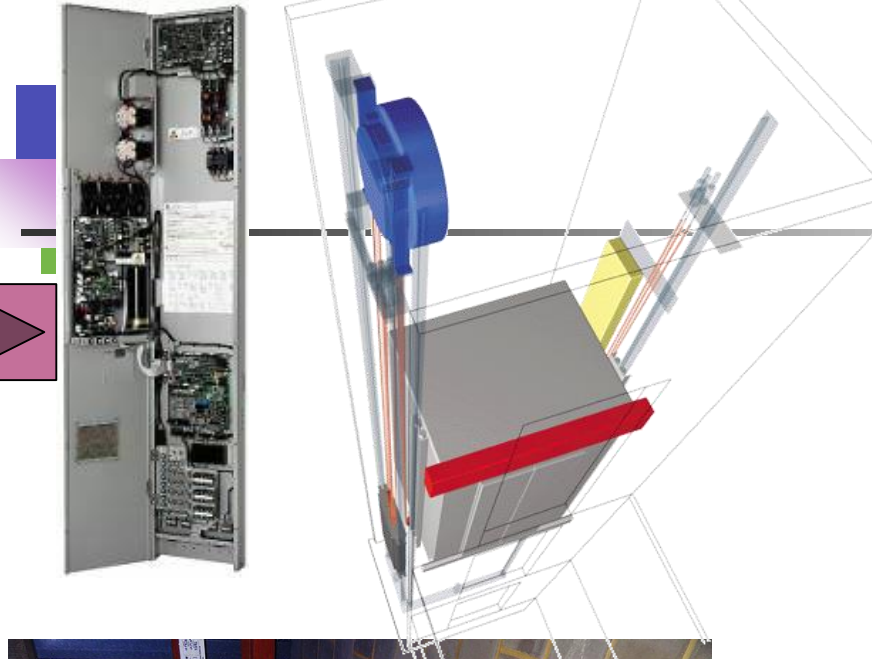
- *Direct-acting*
- *Single side-acting: direct or indirect*
- *Twin side-acting: direct or indirect*

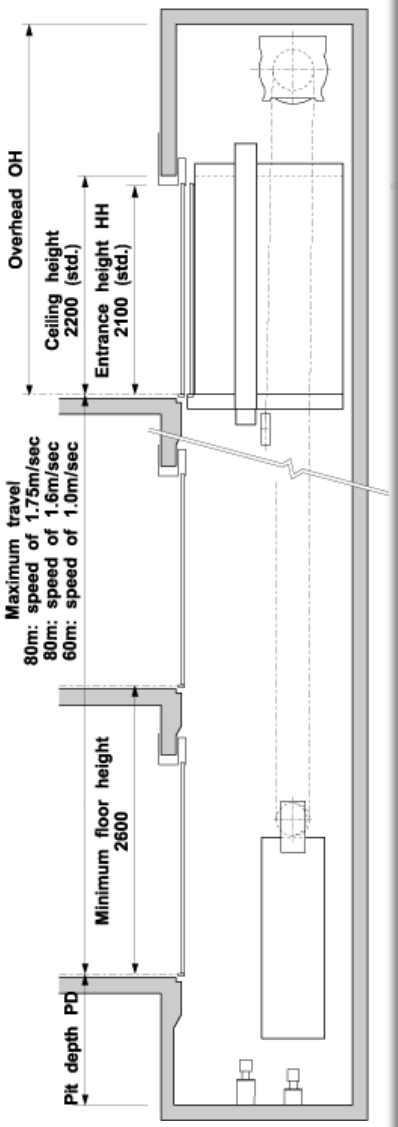
– *Power units*

- *Tank or oil reservoir*
- *Pump*
- *Pump motor (e.g. single-speed AC induction type)*
- *Flow control valve block*

[Source: CIBSE Guide D]

MACHINE ROOMLESS LIFT SYSTEM





Advantages :

- ***Need no motor room***
- *The entire lift system located within the lift shaft.*
- *The **smooth and quiet driving** unit (situated within the head of the shaft) work most efficiently with the counter-weight system greatly reducing power consumption.*
- *These systems are also **simple to maintain**, without the need of oils that need replacing after a number of years.*

Disadvantages :

- *Not suitable for heavy use.*

Specifications:

- *Capacities of 4 persons up to 33 persons.*
- *Maximum travel – 80m.*

Note :

Amalan JKR :-

4 tingkat atau kurang jika tiada motor room

PERBANDINGAN DIANTARA LIF ELEKTRIK DAN LIF HIDRAULIK

BIL	PERALATAN	LIF ELEKTRIK	LIF HIDRAULIK
1	KERETA LIF	ADA	ADA
2	CONTROLLER	ADA	ADA
3	COUNTERWEIGHT	ADA	**TIADA**
4	GUIDERAIL	ADA	ADA
5	TRACTION ROPE	ADA	**TIADA**
6	PISTON	**TIADA**	ADA
7	KUASA PENGANKAT	MOTOR ELEKTRIK	HIDRAULIK (PAM HIDRAULIK)
8	KEGUNAAN	HIGH RISE	LOW RISE

PERBANDINGAN DIANTARA LIFT (MOTOR ROOM) DAN LIFT (MOTOR ROOMLESS)

BIL	PERALATAN	LIF (MOTOR ROOM)	LIF (MOTOR ROOMLESS)
1	KERETA LIF	ADA	ADA
2	CONTROLLER	ADA	ADA
3	COUNTERWEIGHT	ADA	ADA
4	GUIDERAIL	ADA	ADA
5	TRACTION ROPE	ADA	ADA
6	KUASA PENGANKAT	MOTOR ELEKTRIK	MOTOR ELEKTRIK
7	MOTOR ROOM	ADA	TIADA
8	KEGUNAAN	HIGH RISE & LOW RISE	LOW RISE (AMALAN JKR)

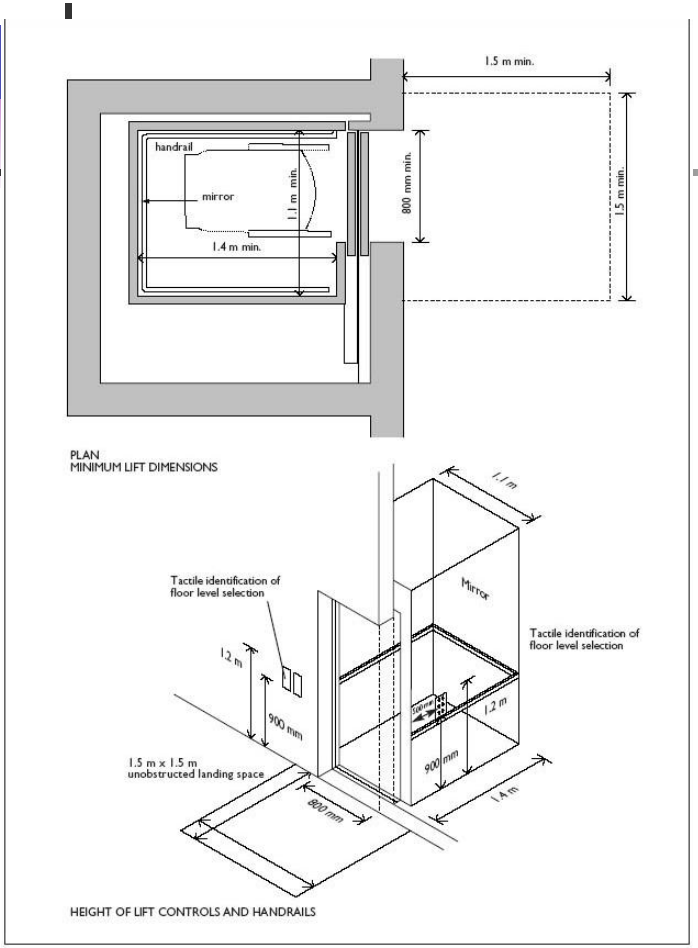
Kategori dan Ciri-Ciri Lif

KATEGORI-KATEGORI LIF

- PASSENGER LIFTS
- BED / PASSENGER LIFTS
- GOOD / SERVICE LIFTS
- BOMBA LIFT

Ciri-Ciri Lif

PASSENGER LIFTS



- PASSENGER LIFT

-Capacity 6 to 23 people (1600kg)

-Speed 1 to 3 m/s

BEDS/PASSENGER LIFTS

•BEDS/PASSENGER

- Capacity 23 people (1600 kg)
- Speed 1 to 1.6 m/s

GOODS/SERVICE LIFTS

•GOODS/SERVICE LIFT

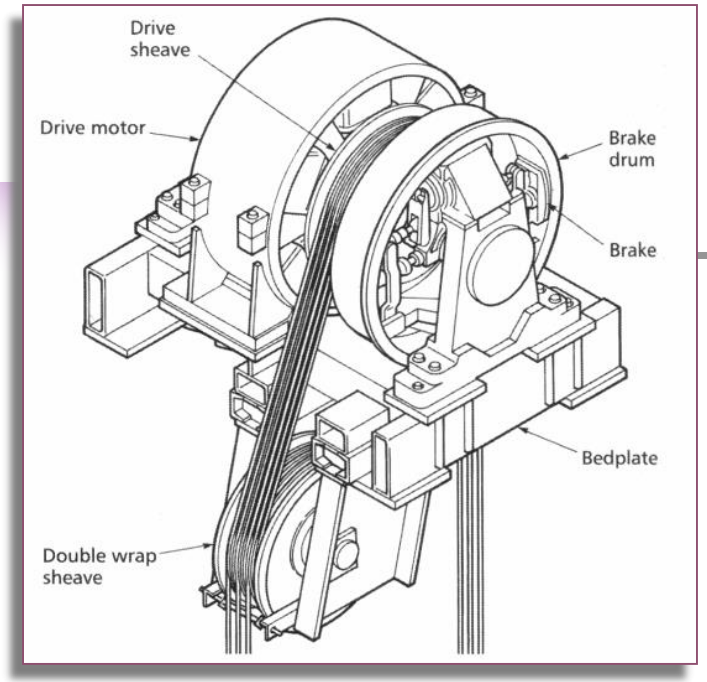
- Capacity >900 kg
- Speed 0.5 to 3.5 m/s

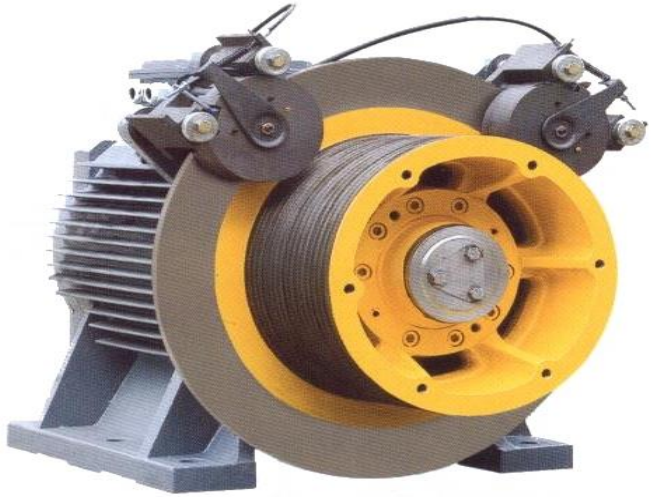
BOMBA LIFTS

•BOMBA LIFT

- Capacity 6 to 23 people
- Can be operated during fire situation

GEARLESS MACHINE





[Source: CIBSE Guide D]

Gearless

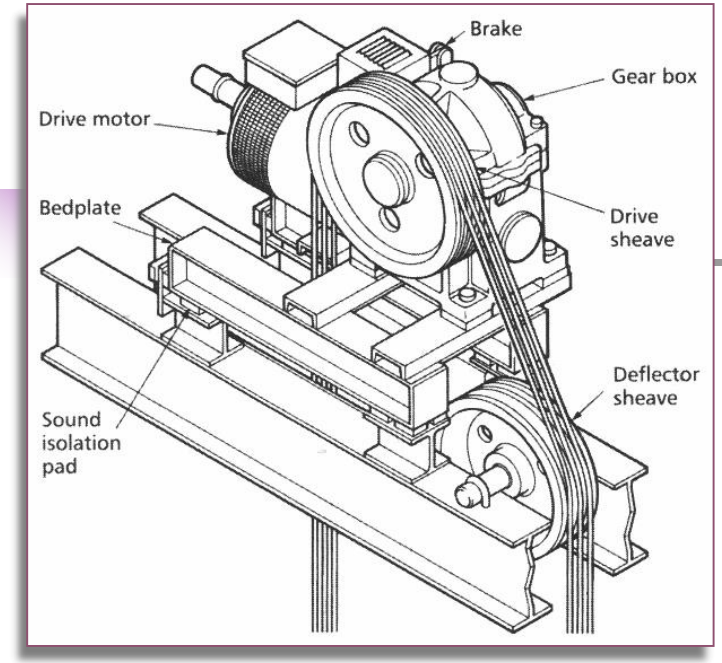
In gearless elevators the motor turns the sheave directly. A brake is mounted between the motor and drive sheave to hold the elevator stationary at a floor. This ***brake*** *is usually an* ***external drum type****, which is actuated by spring force.*

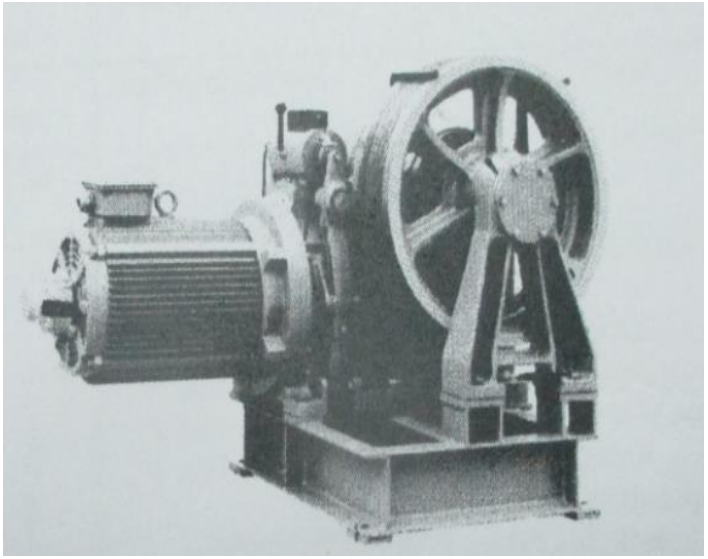
Gearless traction elevators are specified for ***high-speed applications*** *having effective speeds varying from* ***2.0 m/s (400 fpm) to 10.0 m/s (2000 fpm).*** *These are generally used on taller structures with more than* ***10 stories****. In terms of energy performance, gearless drive has no gear 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





[Source: CIBSE Guide D]

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.*

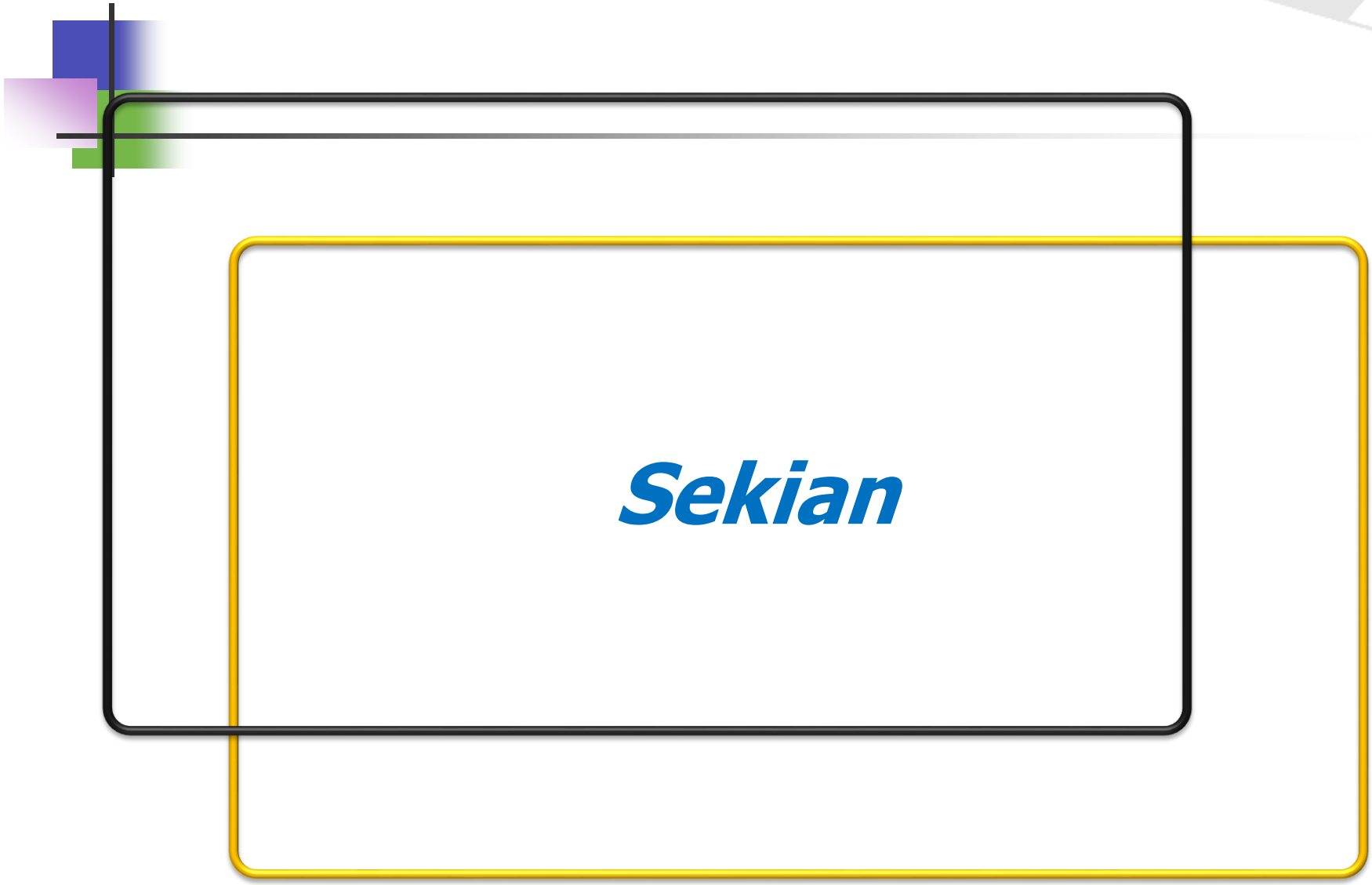
These two gears which have rotational axes perpendicular to each other that not only decreases the rotational speed of the traction pulley, but also change the plane of rotation.

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, quite 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.

PERBANDINGAN DIANTARA GEARLESS LIFT DAN GEARED LIFT

BIL	PERKARA/ PERALATAN	GEARLESS LIFT	GEARED LIFT
1	KUASA PENGANGKAT	MOTOR ELEKTRIK	MOTOR ELEKTRIK
2	MOTOR ROOM	ADA	ADA
3	CIRI-CIRI	1. UNTUK KELAJUAN MELEBIHI 2M/S 2. LEBIH TAHAN DAN SELESA 3. SENYAP 4. KURANG SENGGARAAN 5. HARGA PEMASANGAN MAHAL 6. UNTUK BANGUNAN YANG TINGGI	1. KELAJUAN SEHINGGA 2M/S 2. LEBIH TAHAN LASAK 3. LEBIH TINGGI SENGGARAAN 4. HARGA PEMASANGAN LEBIH MURAH


Sekian