

UNIT-IX

TRANSPORT SYSTEM

RANGE

- By the end of this unit you will be able to understand:
- TYPES OF VERTICAL & HORIZONTAL TRANSPORT SYSTEMS
- COMPONENTS OF CABLE ELEVATORS
- ESCALATORS

TRANSPORT SYSTEM

- Elevators, escalators & stair ramps are major vertical transportation systems for passenger as well as product movement in buildings.
- HIGH RISE BUILDINGS:
- VERTICAL TRANSPORTATION FOR TWO OR THREE FLOORS:
- HORIZONTAL MOVEMENT

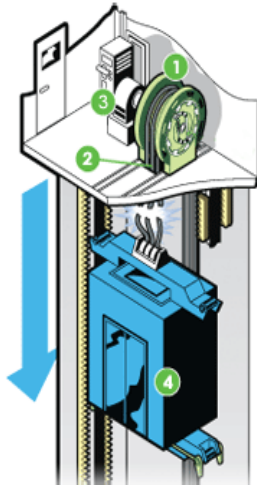
TYPES OF TRANSPORT SYSTEMS

- VERTICAL TRANSPORTATION TECHNIQUES: consists of four techniques. They are :
 1. Elevators
 2. Escalators
 3. Stairwells
 4. Passenger ramps.
- ELEVATORS: There are two types of elevator systems used :
 1. CABLE ELEVATORS
 2. HYDRAULIC ELEVATORS.

COMPONENTS OF CABLE ELEVATOR

- CABLE ELEVATOR SYSTEM: This consists of:
 - A. SHAFT
 - B. GUIDE RAILS
 - C. COUNTER WEIGHTS
 - D. SHAFT SAFETY DEVICES
 - E. ELEVATOR CAR
 - F. CABLES
 - G. ELEVATOR MACHINE
 - H. COMPONENTS OF ELEVATOR SYSTEM

ELEVATORS, ESCALATOR, HYDRAULIC ELEVATORS, PASSENGER RAMPS

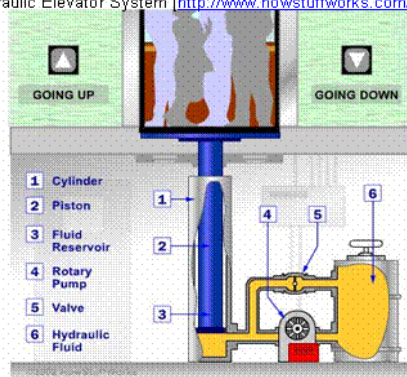


- 1 Steel cables bolted to the the car loop over a sheave.
- 2 The sheave's grooves grip the steel cables.
- 3 The electric motor rotates the sheave, causing the cables to move, too.
- 4 As the cables move, the car is lifted.

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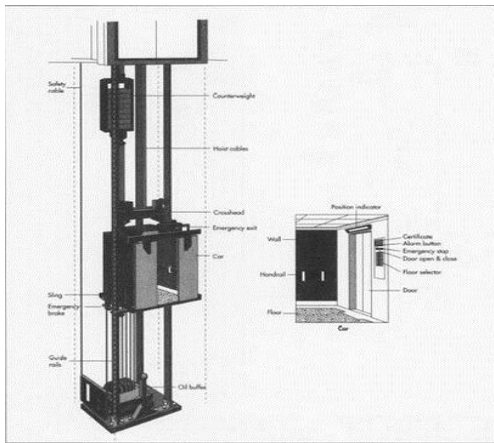
raulic Elevator System <http://www.howstuffworks.com/el>



SHAFT, GUIDE RAILS, COUNTER WEIGHTS

- **SHAFT** : The shaft extends from the lowest point of the building to the highest point. It is a large vertical opening between floors & the elevators are positioned in vertical shafts.
- **GUIDE RAILS**: The shaft has the provision for guide rails & the elevator car moves on these rails.
- **COUNTER WEIGHTS**: These weights move in the direction opposite to that of the elevator car.
- **SHAFT SAFETY DEVICES**: There are two limit switches. Spring or bumper acts as shock absorber.

ELEVATOR SHAFT, GUIDE RAIL, COUNTER WEIGHTS, SHAFT SAFETY DEVICE



ELEVATOR CAR

- This is the part of the entire elevator system which is exposed to the guest hence it should be well maintained.
 1. It should be made of materials which are easy to clean.
 2. It should have handrails for guest to grasp.
 3. It should be well illuminated
 4. Ventilation should be provided in the form of exhaust fan.
 5. It can have music system. In case of P/A system, it should be connected to car speaker.

ELEVATOR CAR(CONTND.)

6. Smoking must be prohibited.
7. It should have clearly visible controls with overhead indicators, stop switch, alarm, emergency telephone
8. The car should have a set of doors which open at floor levels.
9. The doors should be provided with hydraulic edges or sensors which keep the door open in case of blockage.

CABLES

- The elevator car is attached with cables & the other end of cables are attached to machine & also counter weights.
- The life expectancy of cable depends on the number of kilometers traveled, number of starts and stops.
- Changing cable is the single largest repair cost.
- Wear & tear of cable can be observed by physical check or by the number of kilometers traveled.
- Distance traveled depends on building height & the number of floors serviced.

ELEVATOR MACHINE

- Cables connecting the car ride over the sheave.
- The sheave is a multi-grooved pulley.
- Each single cable ride in each groove.
- Machine is of two types:
 - 1) GEARED TRACTION
 - 2) GEARLESS TRACTION

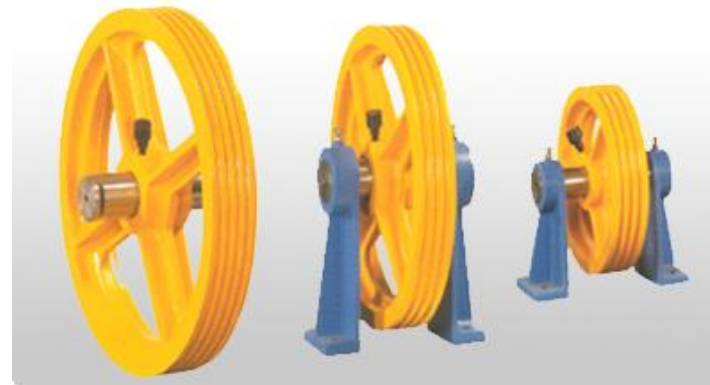
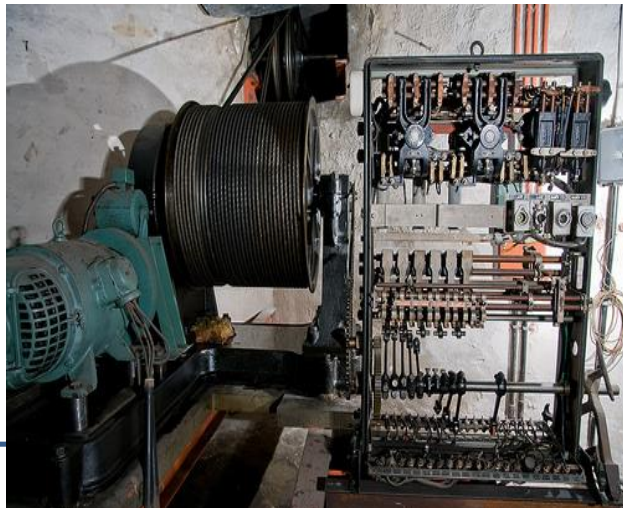
ELEVATOR MACHINE

- GEARED TRACTION
- In geared traction, the motor is connected to a system of gears which result in variable speeds.
- The driving motor can be either driven by a 3-phase alternating current motor or D.C. motor.
- The motor can be connected to the rheostat.
- Motors can be connected in series or parallel circuit.
- In case D.C. current is not available for D.C. motor, MGM can be used.

ELEVATOR MACHINE

- GEARLESS TRACTION
- The gearless machine has a D.C. motor connected to the sheave.
- They have a high installation cost but low operation & maintenance cost.
- They have high speeds which can even cross 400 feet per minute(2 meters per second).
- It has a high operating efficiency than geared motor.
- HYDRAULIC POWER:

ELEVATOR, ELEVATOR ROPES, ELEVATOR MACHINE, SHEAVE



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ELEVATOR CONTROL SYSTEMS

- It consists of all push buttons located on floors, control panel for car passengers & controls for various safety & speed devices.
- It is of three types:
 - A. COLLECTIVE CONTROLS
 - B. SEMI-COMPUTERIZED CONTROL SYSTEMS
 - C. COMPUTERIZED CONTROL SYSTEMS

FREIGHT ELEVATORS

- They are cable type, rheostat as well as geared elevator machines.
- They are a low cost system with a push button operator or a collective control system.
- They can be hydraulic elevators also.
- Capacity of freight elevators is measured in pounds (kilograms)..
- **SIDE WALK ELEVATOR:** It is the basic type of freight elevator which will service main outside level & one or more basement levels. They are also used as platform lifts for stage shows.

GRAVITY FLOW DEVICES

- **DUMB WAITERS:** They are meant for carrying dishes, food etc. from one room or storey of a house to another. It is not meant for passenger movement.
- **GRAVITY CHUTES & DROPS:** For e.g. linen chutes. They are basically used to drop materials. They are meant to increase employee productivity. Some hotels use gravity chutes to drop soiled linen.

FREIGHT ELEVATOR, DUMB WAITER, LINEN CHUTE



VERTICAL TRANSPORTATION DESIGN FACTORS

- It is done by the elevator manufacturing company representative of elevator contractor.
- Designing depends on four factors:
 1. Handling capacity
 2. Travel time
 3. Interval time
 4. Car location

ESCALATORS

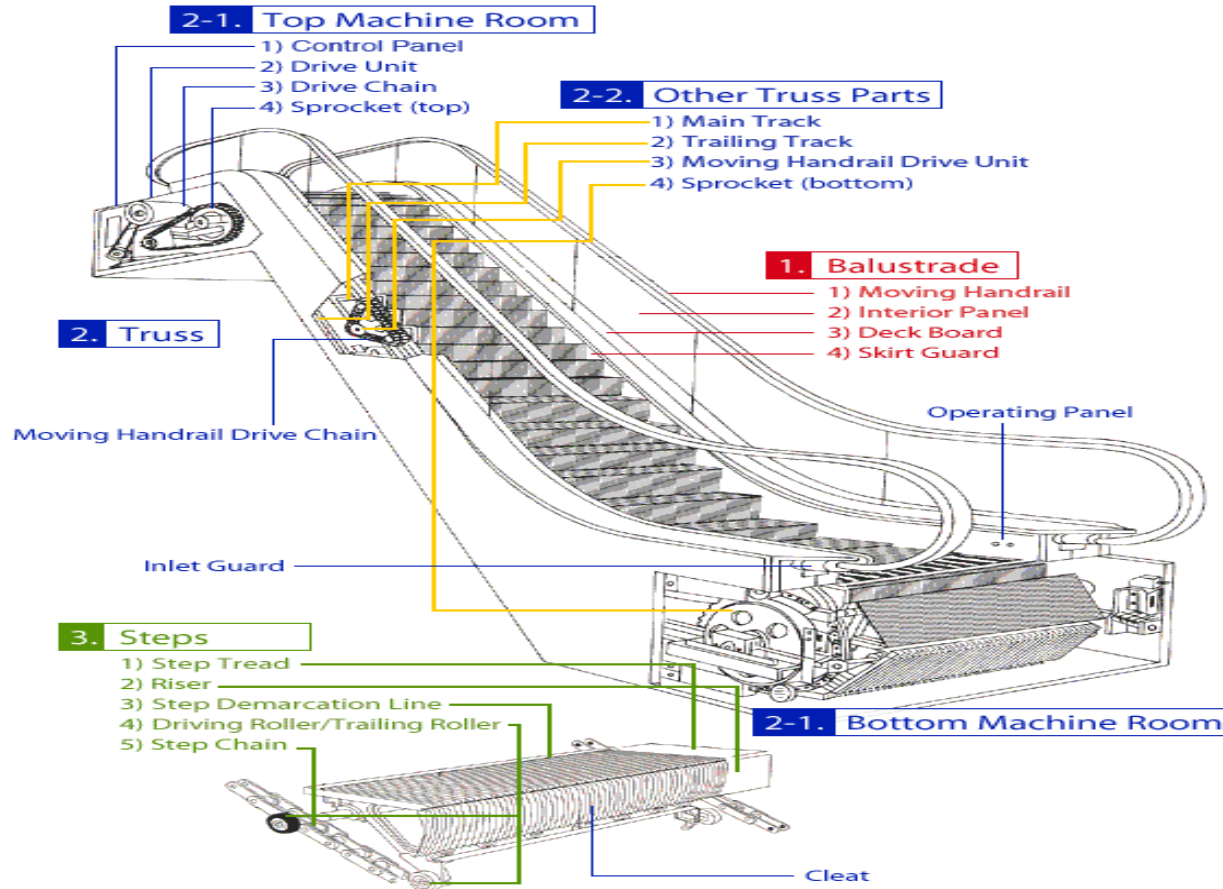
- Escalators consist of moving stairs.
- One unit of stairs goes down & the other unit goes up.
- Escalators can be used as staircase when not working.
- The **STEP RISE** i.e. the vertical distance between stairs is much greater than on stairs. The escalators are inclined at an angle of 30° angle.
- Escalators only reduce number of elevator cars.

ESCALATORS CONTROL SYSTEMS

- It consists of driving machine & the control system.
- The stairs & handrails which move at equal speeds.
- The moving steps descend & convert into comb plates which look like hair combs.
- The assembly around the steps & the handrail is called the **BALUSTRADE**.
- The balustrade is attached to the **TRUSS** which is the support system of the escalator.

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BALUSTRADE, TRUSS IN ESCALATORS



WALKWAYS,STAIRWELLS



ENERGY MANAGEMENT SYSTEM

- There must be one serviceable elevator that can service all floors.
- More than one elevator may have to be used incase of more floors with zone elevators.
- Both semi-computerized or computerized systems can be programmed to cycle elevators during high energy demand periods.
- Although kilowatt hour consumption is less, but consumption may be high incase all units start functioning.

REVIEW

- Components of cable elevators
- Gravity flow devices
- Vertical transportation design factors
- Escalators & its components
- Walkways & stairwells
- Energy management systems

ASSIGNMENT

- Explain the following:
- A) Dumb waiter b) Balustrade c) Truss d) safety devices in elevators e) Sheave f) Walk-aways g) Escalators h) Guide rails i) Freight elevators.
- Explain energy management system in elevators
- What are the different components of cable elevators?

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➤ TEXT BOOK OF HOTEL MAINTENANCE BY
N.C. GOYAL & K.C. GOYAL

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