


TRANSPORTATION IN UNDERGROUND MINES

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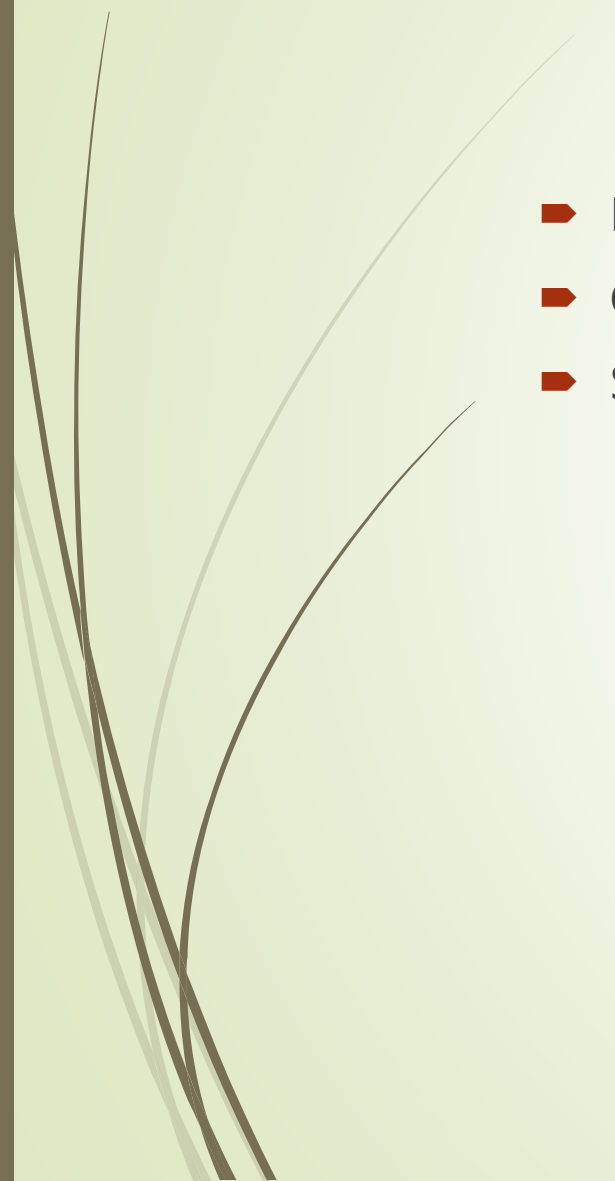


CLASSIFICATION OF TRANSPORTATION

- ORE TRANSPORTATION
 - MAN TRANSPORTATION
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Ore transportation

- Haulages
 - Conveyors
 - Shuttle cars
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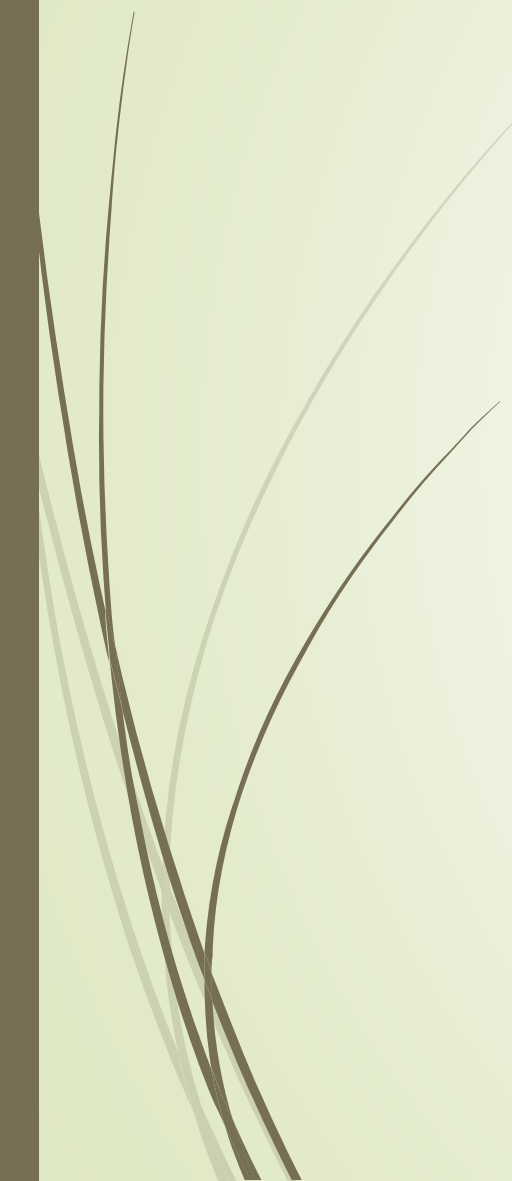


Rope haulages

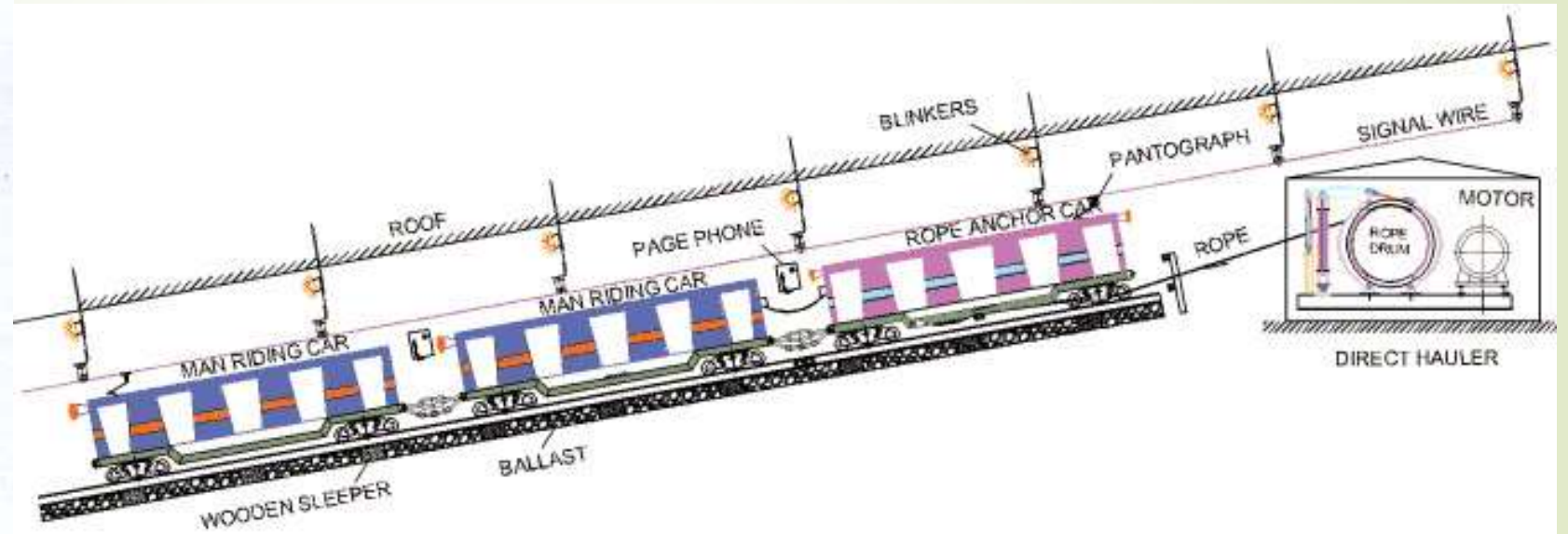
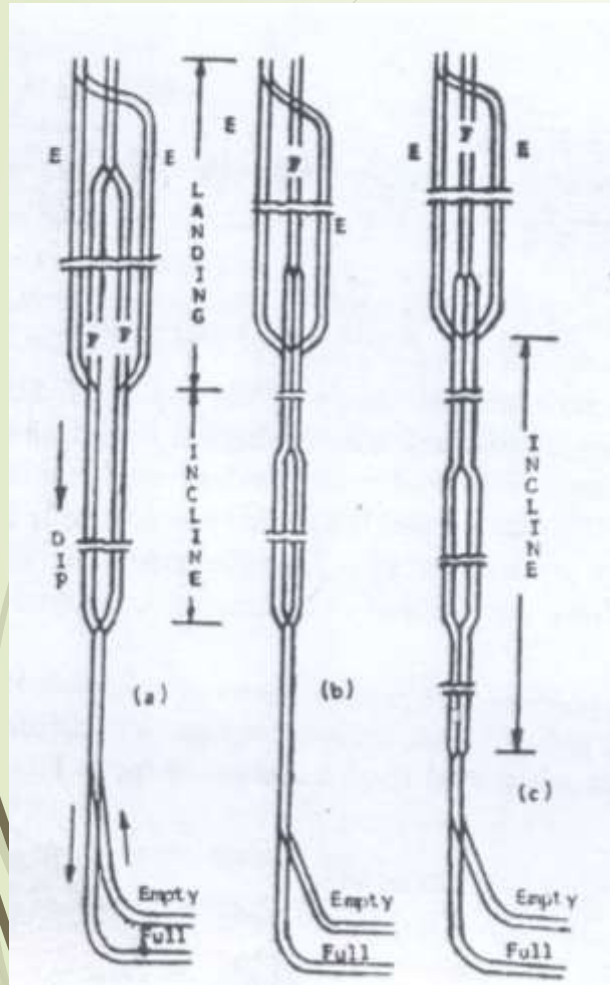
- Direct rope haulages
 - Endless rope haulages
 - Main and tail rope haulages
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Direc rope haulage

- ✓ Consist of one pulling rope and one haulage drum for hauling minerals in tubs or mine cars up a gradient which is generally steeper than 1 in 10.
 - ✓ The haulage engine is situated at the top of an inclined roadway.
 - ✓ The train of tubs is attached to one end of the rope, the other end being fixed to the haulage drum
 - ✓ The empty tubs attached to the end of the haulage rope travel on the down gradient by their own weight and do not require power from the haulage engine
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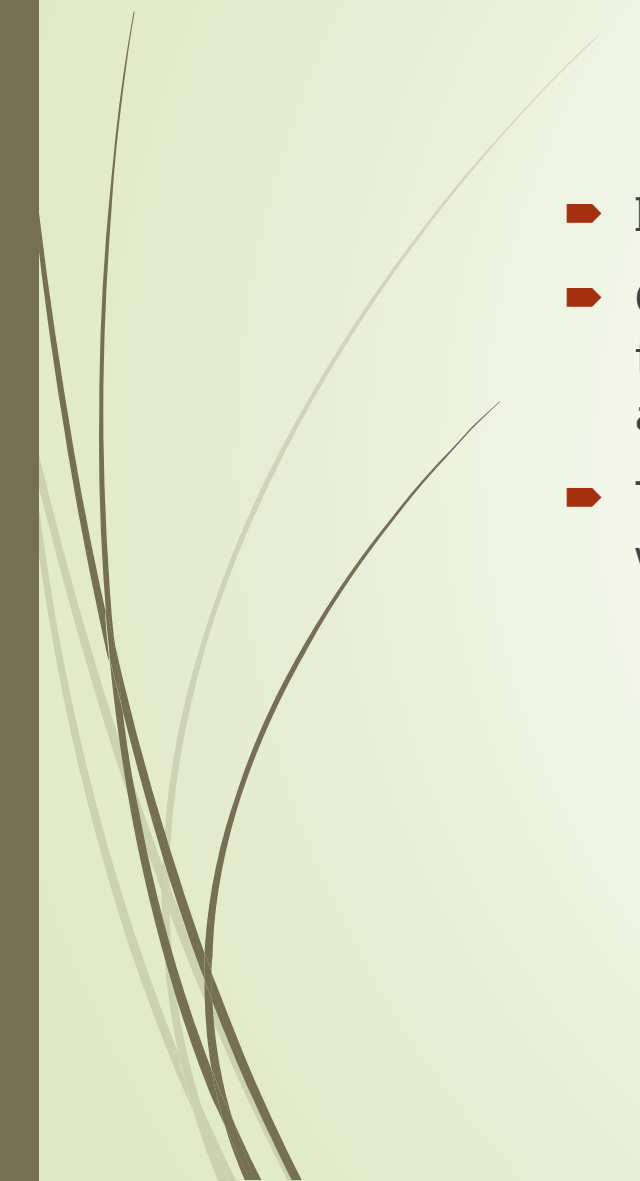
Direct rope haulage and track layout



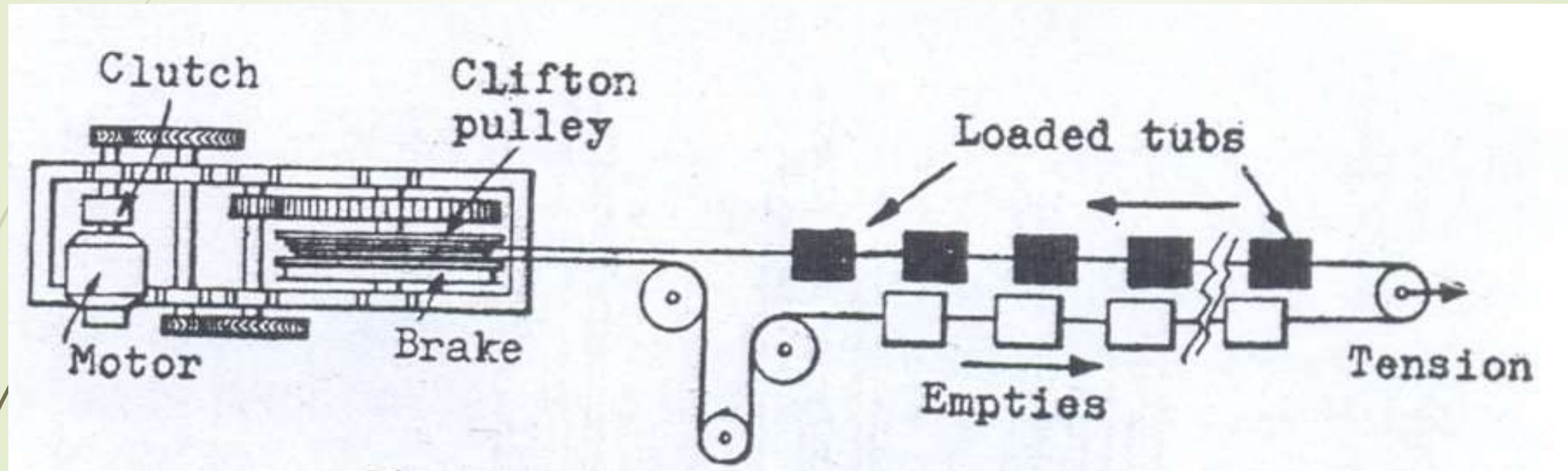
<http://www.aphmel.com/images/inner/man-riding-car-system-img2.jpg>



End less rope haulages

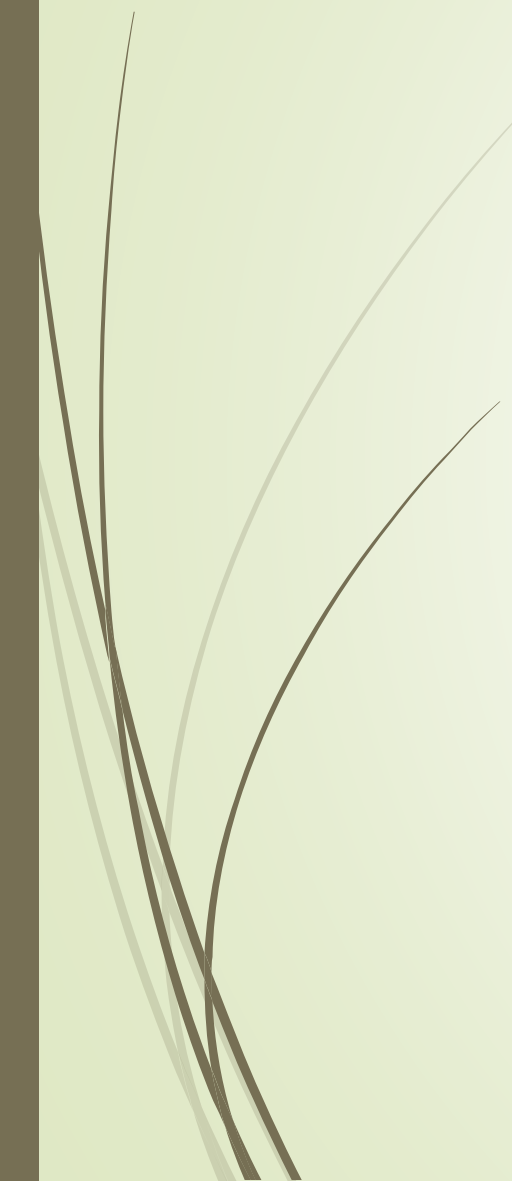
- ▶ In this system there are two parallel tracks side by side.
 - ▶ One for loaded tubs and another for empty tubs and the endless rope passing from the driving drum located at out bye end of the haulage road to the in bye end and back again via a tension bogey.
 - ▶ The tubs loaded as well as empties are attached to the rope with regular interval with the help of clips so that the entire rope length has tubs on it at intervals
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Endless rope haulage



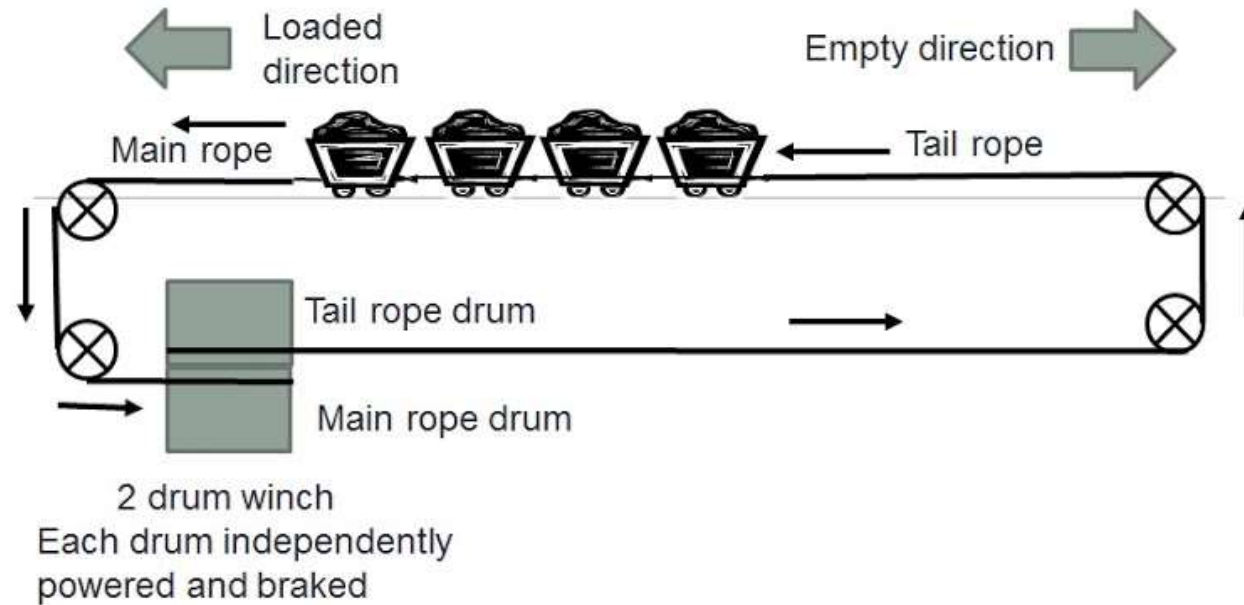


Main and tail rope haulage

- The hauling engine is provided with two separate drums one for the main rope, which haul the full train out and one for the tail which haul for the empty train in.
 - When one drum is in gear, the other revolves freely on the shaft but controlled when necessary, by the brake to keep the rope taut.
 - The main rope is approximately equal to the length of the plane and the tail ropes twice this length.
 - Only one track is required.
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Main and tail rope

Main and Tail rope





Locomotive haulage

- ▶ Diesel locomotive
 - ▶ Storage battery locomotive
 - ▶ Over head wire locomotive
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Diesel locomotive

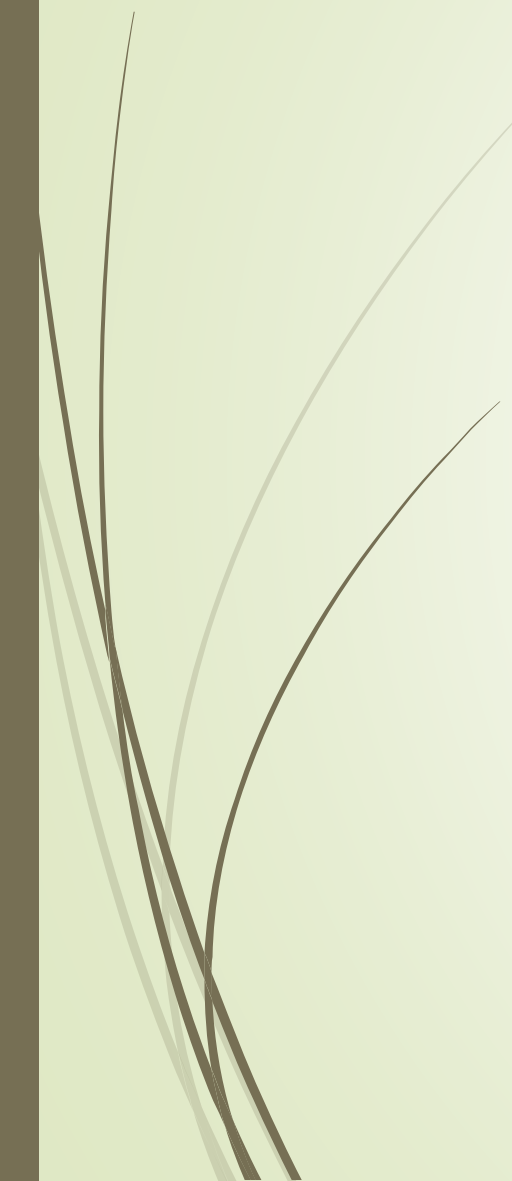
- ▶ It is commonly used. Their weight ranges from 3 to 15 te and the power from 15 to 75 KW
- ▶ The power unit is a diesel engine with 2,3 or 4 cylinders of 4 stroke cycle, compression ignition type.
- ▶ Heavy duty locos are of 6 cylinders
- ▶ The intake air going to the engine passes first through a filter and then through a flame trap. Similar flame trap is fitted on the exhaust side of the diesel engine

Diesel locomotive





Electric battery locomotive

- The power unit is a DC electric motor receiving its current from a storage battery carried in a casing on the upper part of the chasis.
 - It is for light and medium duties as they are less powerful, though battery locos of 13 te weight available in our country.
 - It is quiet in operation and produces no objectionable fumes, produces less heat, can meet an appreciable overload of short duration.
 - Range is from 4 – 70 KW continuous rating.
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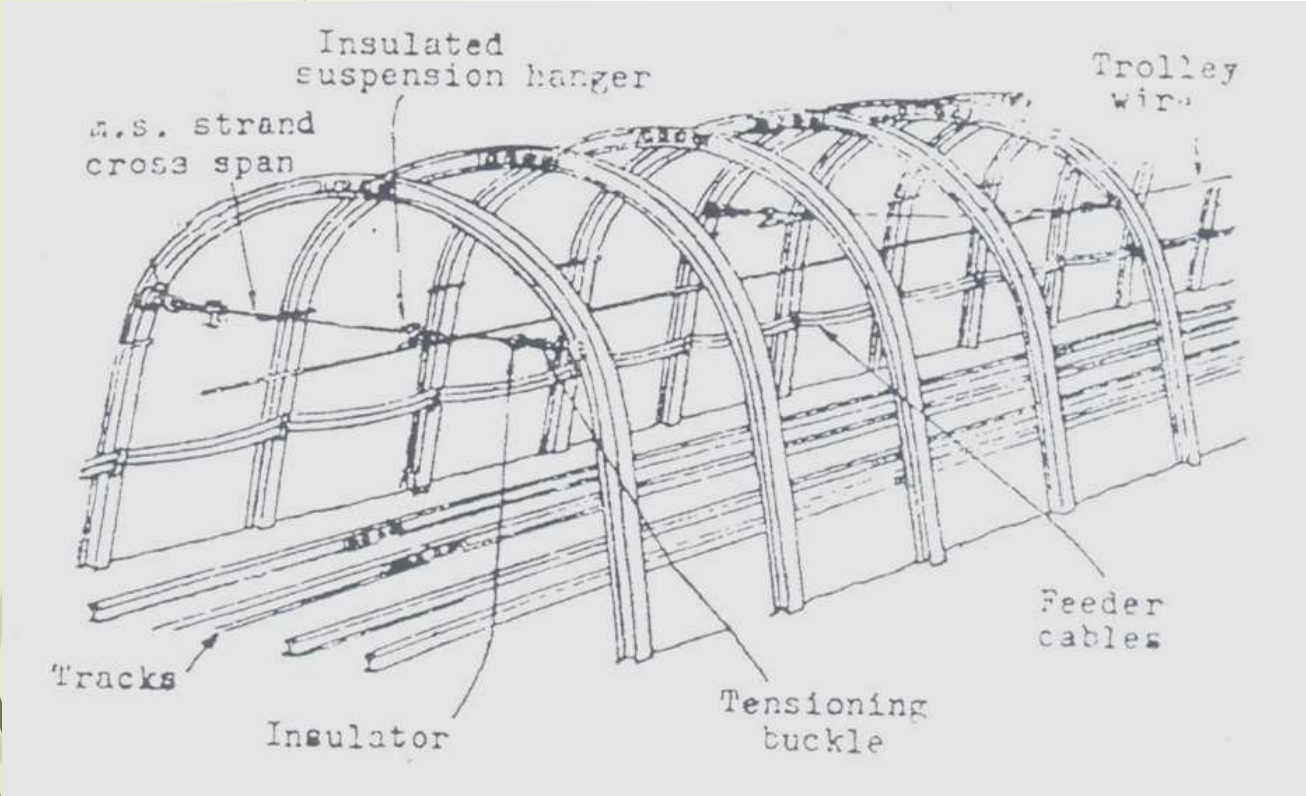
Electric battery locomotive





Over head wire locomotive

- ▶ It is equipped with electric motor fed with current from overhead electric wire through a long pole which is kept pressed against the overhead conductor by spring tension.
- ▶ Only direct current is supplied to the overhead wires though in some foreign countries A.C. is permitted
- ▶ The D.C supply to overhead wires is at 250 volts.
- ▶ It is used in coal mines near Kurasia colliery and few other coal mines of degree-1 gassiness



CONVEYOR SYSTEMS

BELT CONVEYOR
SCRAPER CONVEYOR
RIGID CONVEYOR

BELT CONVEYOR

The belt conveyor is basically an endless belt in a straight line stretched between two drums, one driving the system and the other acting as a return drum.

- ❖ In coal mines and other mines of stratified deposits, where the underground mineral is won by longwall method, the transport media often consists of conveyor.

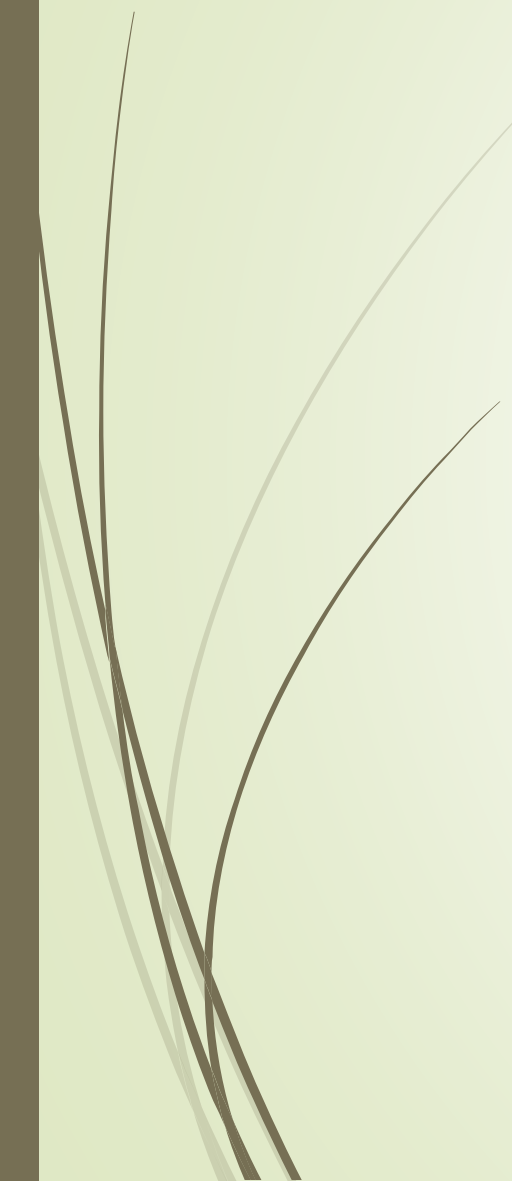


SCRAPER CHAIN CONVEYOR

- ✓ The capacity of a commonly used scraper chain conveyor is 30 to 40 tph on a level roadway, nearly 50 m long and the drive motor is of 12- 15 KW.
- ✓ The main application of scraper chain conveyors in underground is transportation at the face and adjoining short workings, where they are ready to withstand mining condition.
- ✓ They are also used to haul the coal along gate roads over short distances before it is feed to gate belt conveyor.
- ✓ They are also used for transporting on inclines having an angle of inclination exceeding 18° where belt conveyors are not used.
- ✓ They are also used on the surface for conveying coal from shaft to bunker as well as in screening and washing plants.



Rigid chain conveyor

- ▶ A rigid chain conveyor essentially consists of stationary steel troughs, each usually 2m long, connected together end to end, and an endless chain with flights moving in the troughs.
 - ▶ Adjacent troughs are secured together and to the frame underway both
 - ▶ The capacity is 30- 40 tph on a level roadway, nearly 50m long and 15KW motor.
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Armoured chain conveyor





Shuttle cars

- ▶ A shuttle car is a pneumatic tire mounted, electrically driven and low-height transport vehicle of 5-7 te capacity with an open topped and open-ended body, used for transport of mineral from face to a central loading point.
- ▶ One shuttle car operating within 90 m range and fed by a 4 te/min mechanical loader is capable of transporting nearly 150 te of coal per shift.



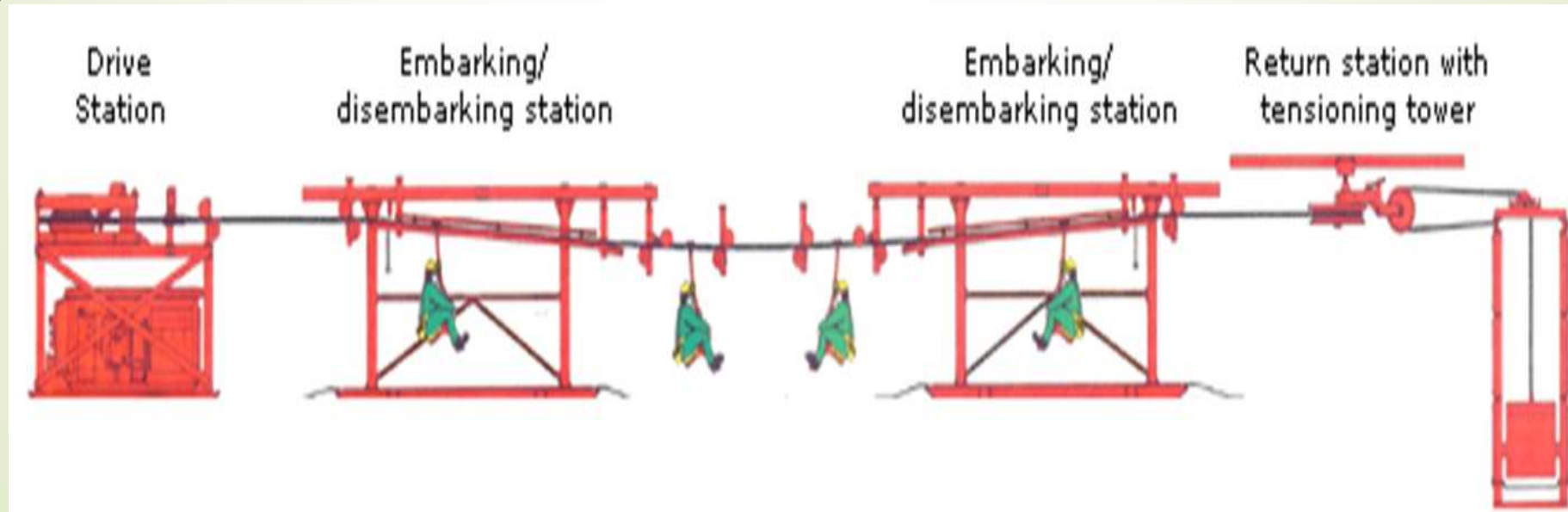


Men transportation

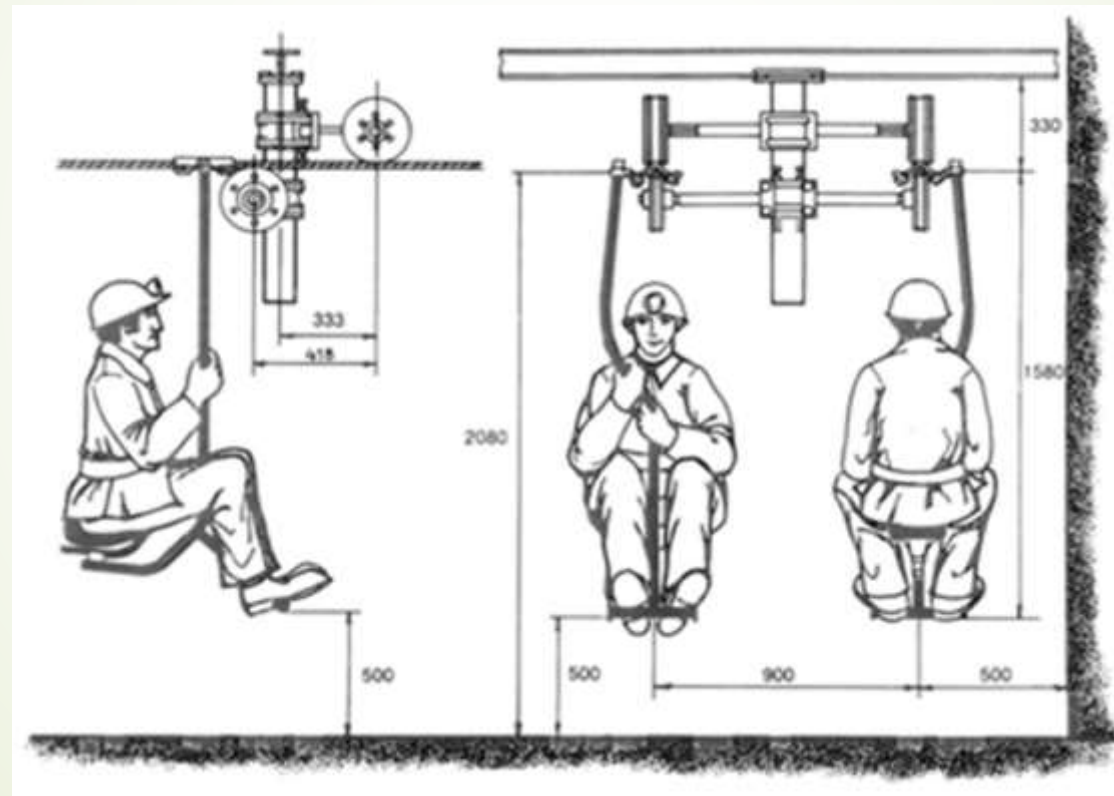
- Man riding systems
 - i) man riding chair lift system
 - ii) man riding car system


Man Riding Chair Lift or Ski Lift System

- Two way men riding simultaneously.
- The pulley carriages are spaced at 11 m interval in a roadway.
- A distance of 15 m is maintained between two chairs.
- Electric motor upto 70 KW.
- Gradients upto 30° and distances upto 2500 m.



Man riding chair lift system



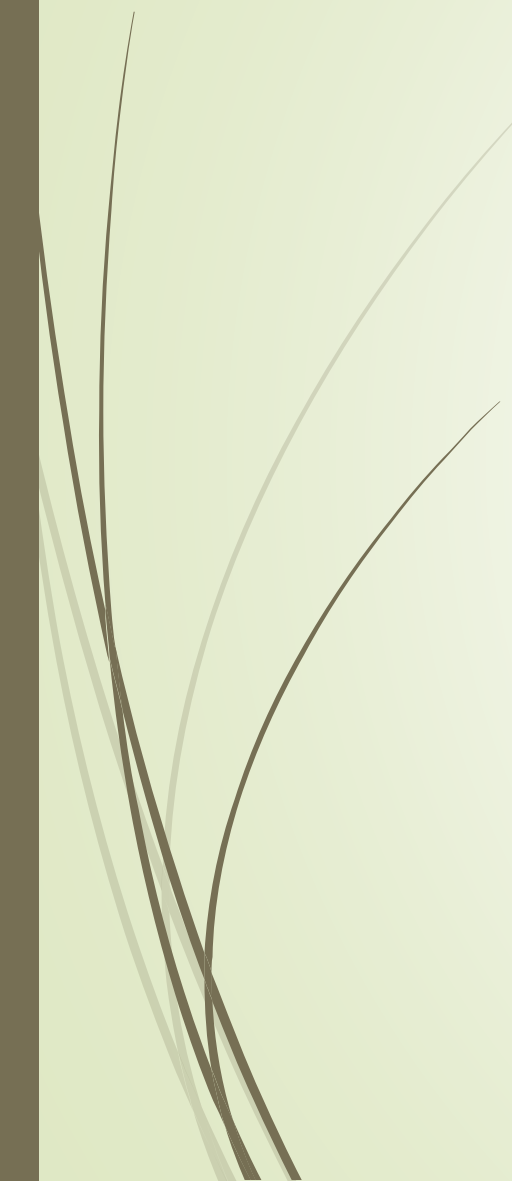


Chair lift man riding systems used in GDK mines:-

- ❖ It negotiates a curve of 30 degree gradient
- ❖ 2000 m long.
- ❖ 2m wide roadway
- ❖ Speed of 2 m/s
- ❖ Transport 100 men/h




Man riding chair

- ▶ A rope hauled monorail system embodies an overhead I section rail suspended from roadway supports or roof bolts carrying a train of trolleys, lifting beams or man riding cabins or chairlift man riders which run on the bottom flanges with captive rollers engaging the web.
 - ▶ One end of the endless rope is attached to the trolleys etc. whilst the other terminates at a rope storage drum attached to and forming part of the train of trolleys.
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Man riding car system





Man riding car system specifications used in GDK mines:-

- ❖ Type of Man riding System : Chair Car
- ❖ Cost of the Project : 211 lakhs.
- ❖ Length of the road way : 1.2 k.m.
- ❖ Speed of the rope : 8 kmph
- ❖ Total cycle time / 1 trip : 22 min.
- ❖ Capacity of Man Riding System / Hour : $84 \times 3 = 252$ persons