Railway, Harbour, Tunelling and Airports — Chandu. S

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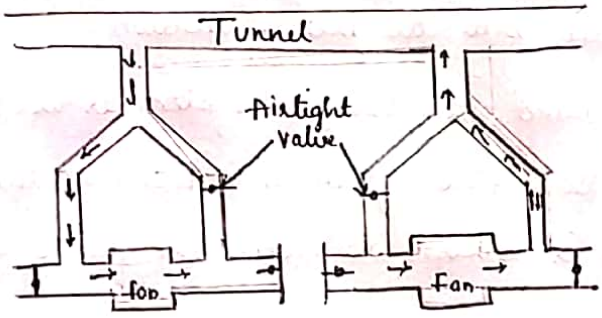
1) The different ventilation methods used in tunnels are:



* Natural method of ventilation: This achieved by drilling a shift through the tunnel from portal to portal. In most cases natural ventilation is not Sufficient and artificial ventilation is still required.

* Mechanical ventilation by blow-in method: • In the blow in method, fresh air is forced through a pipe or fabric duct by the means of a fan and supplied near the working face. This method has the advantage that a fresh air supply is guaranteed where it is required the most..

• The Disadvantage is that the foul air and fumes have to travel a long distance before they can exit the tunnel and in process it is possible that the incoming fresh air will absorb some dust & smoke particles.

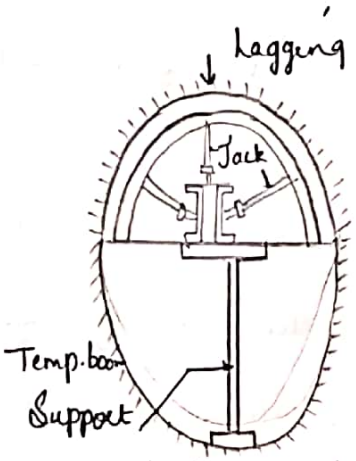
* Mechanical ventilation by exhaust method: • In the exhaust or blow-out method, foul air and fumes are pulled out through a pipe & is expelled by a fan. This sets up an air current that facilitates the entrance of fresh air into the tunnel.

• This method has the advantage that foul air is kept out of the working face. The disadvantage, however, is that fresh air has to travel a long distance before it can reach the working face during which period it may absorb some heat & moisture.

* Combination of blow-in & blow out methods :- By combining the blow in and blow out methods using a blower & an exhaust system, respectively a tunnel can be provided with the best ventilation.

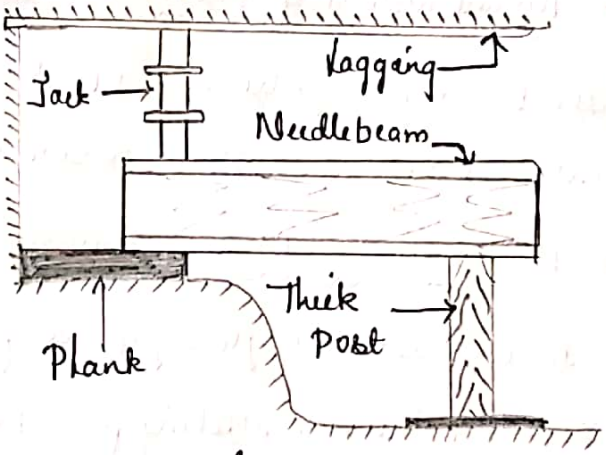
• After blasting the ground, the exhaust system is used to remove the smoke & dust. After some time, fresh air is blown in through the ducts & the rotation of the fans is reversed to reverse the flow of air.

% a) Needle beam method :



Needle beam Section

Front face



Support of needle beam.

Longitudinal Section

* The needle beam method is adopted in terrains where the soil permits the roof of the tunnel section to stand without support for a few minutes.

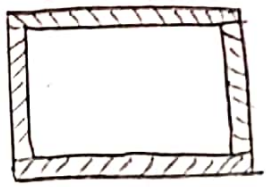
* In this method, a small drift called monkey drift is made.

* In monkey drift the top half of the circular tunnel is excavated & the bottom half is retained for about 1m in length

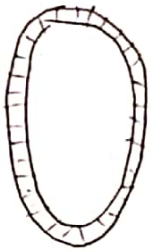
* The roof is supported using planks & then the sides are supported using planks & jacks.
* In the bottom of the monkey drift a wooden plank is placed
* It is inserted and the front lies on the wooden plank on the monkey drift & rear end is placed on a stout wooden post placed on the floor of the tunnel.
* Jacks are fixed on the needle beam & the tunnel section is excavated by suitably incorporating timber.

b) Types of tunnel :

* Rectangular shape : These tunnels are usually adopted by the cut and cover method. It is particular suitable for pedestrian and highway tunnels

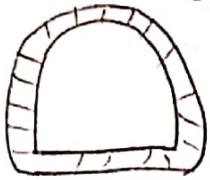


* Elliptical tunnel : These tunnels have the advantage for the transportation of sewer. The smaller cross section at the bottom maintains the flow at the required self cleaning velocity. However due to the difficulty in construction, circular shapes are more common



* Circular shape : A circular shape tunnel has the greatest cross sectional area to perimeter ratio. They are often associated with TBM or the shield tunelling method

* Horseshoe : Commonly used for rock tunelling. It has the advantage of utilising the compressive strength of concrete in resisting the loading by means of arch action & the base is wide enough for traffic

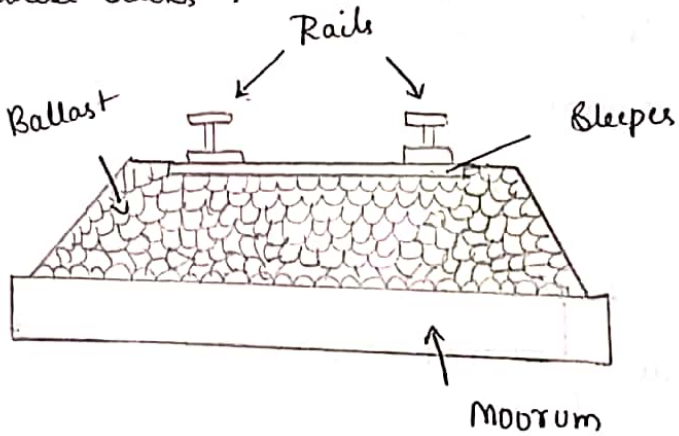


3) Stabilisation of track on poor soil :

* Layer of Moorum
* Cement Grouting
* Sand piles
* Use of Chemicals .

Layer of Moorum :

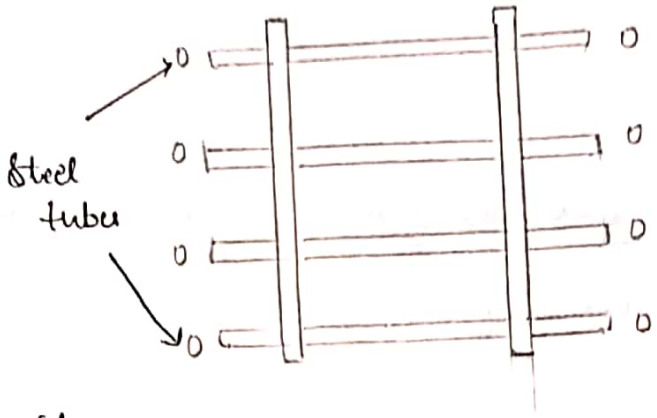
* This method is widely used & is adopted if a poor quality soil comes across a track such as black cotton soil which is a fine black loomy soil.
* This soil has the tendency of expanding when moist and of caking & cracking heavily when dry.
* Tracks laid on formation of maintain. In rainy season, the soil fills up ballast interest less, the track in the worst places gets sodden & spongy track is reduced.
* In hot weather, the cracks are formed & the ballast is lost in filling up these cracks.



Cement Grouting :

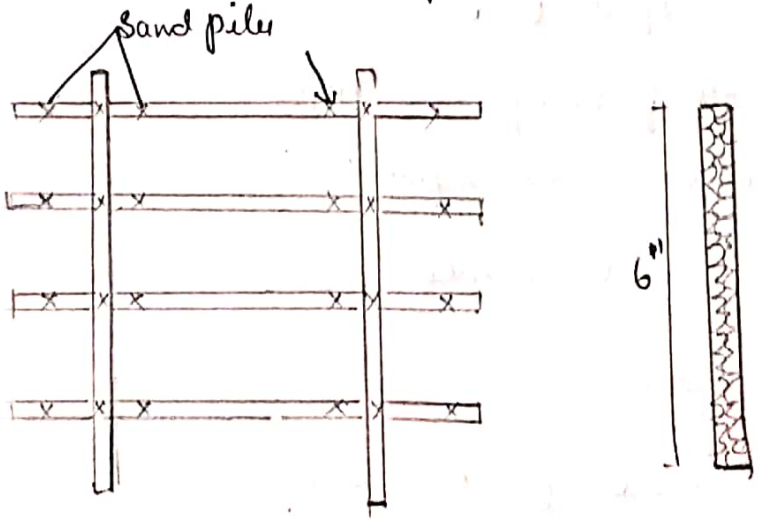
* In this method, steel tubes of 1 1/4 in diameter & 5ft long are driven into the formation at every alternate sleepers & near their ends as shown in figure :

* The tubes are driven into the foundation at an angle such that the end of tube is nearly under the rail.
* The cement grout is forced under a pressure of 100 psi through these tubes.
* The proportion of cement grout depends on the type & condition of formation.



Sand piles:

* This method of strengthening the track laid on poor is most widely used in development countries like America.
* In this method, a vertical bore about 15" diameter is made in the ground by driving a wooden pipe.
* The wooden pile is then withdrawn and the space is filled with sand & is well rammed.
* The sand piles are driven in the pattern as shown.



The use of chemicals :

In this method, chemicals are used in place of cement grout to consolidate the soil. For example, silicate of soda followed by calcium chloride is effective for sandy soils containing less than 35% of silt & clay.

4). Maintenance of track :

* The railway track requires proper watch & ward for security reasons.

Maintenance of railway track consists of.

i) Daily maintenance

ii) Periodic maintenance.

i) Daily maintenance :

For daily maintenance the track is divided in to sections of 5 to 8 kms lengths.

* Each section is look after by a gang.
* The daily maintenance consists of
* General inspection of the track
* Checking up of all fastenings & fittings
* Tightening of bolts wherever required
* Reporting by unusual occurence.

ii) Periodic maintenance :

It is carried out after an interval of 2 to 3 years, during periodic maintenance the gauge, levels, alignment, points & crossing etc. are thoroughly checked, the defects are detected, the causes are

- determined and remedial measures are taken

In general following aspects are checked in periodic maintenance

* Maintenance of track alignment.
* Maintenance of track clearance.
* Maintenance of track components.
* Maintenance of Level Crossing.

5) Types of classification of railway stations are

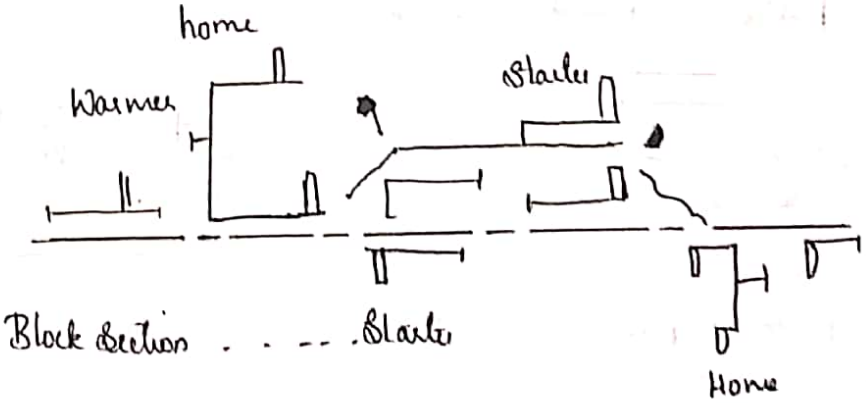
1. Block Stations - Class A, Class B & class C
2. Non Block Stations - class D Stations & flag Stations
3. Special class stations.

Block Stations: The Stations at the end the block Sections are called Block Stations

A class Station: * A class stations are normally provided on double line Sections.

+ At such Stations a 'line clear' Signal cannot be granted at the rear of a station unless the line on which a train is to be received is clear and the facing points set & locked.

* No shunting can be done after line clear has been granted.

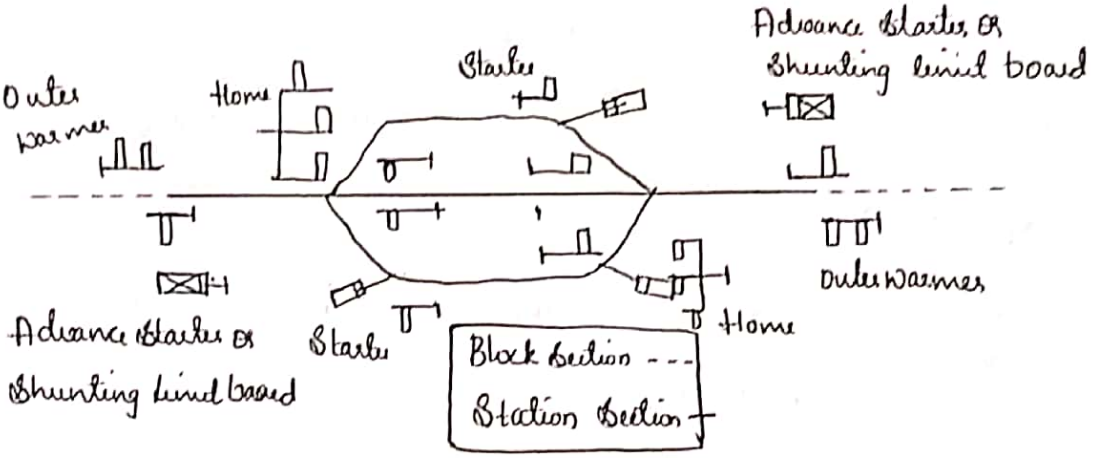


A class Section.

B class Section : * This is the most common type of Station & is provided on Single line as well as double-line Section.

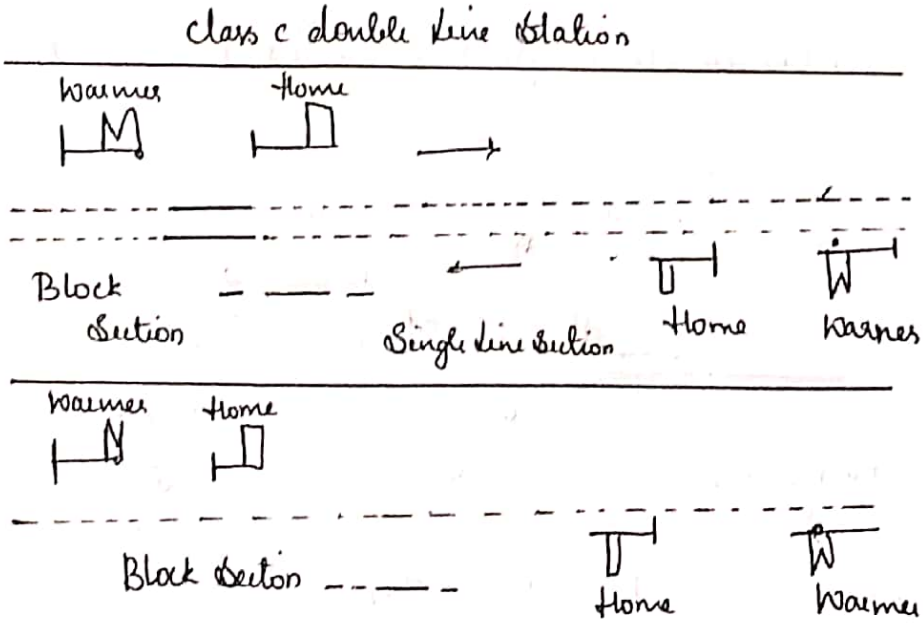
* At a B class Station, the line has to be clear up to an adequate distance beyond the Outer Signal before permission approach can be given to a train.

* The minimum Signals required at a B class Station are as follows.



C Station : * The C class Station is only a block hut where no booking of passenger is done.

* It is basically provided to split a long block Section so that the interval b/w Successive trains is reduced. No train normally stops at these Stations.



Non-block Stations or D Stations:

+ D class are located b/w 2 block stations & do not forms the boundary of any block section

+ No Signals are provided at D class section