UNIT II RAILWAY CONSTRUCTION AND MAINTENANCE

TWO MARKS QUESTIONS AND ANSWERS

1. What are the purpose of signaling? (AUC NOV/DEC 2012)

1. To provide the adequate safety to trains
2. To give direction Indicators to trains at diverging junction
3. to maintain safety distance of train
4. To provide the necessary facilities
5. To permit the Trains to the restricted speed

2. What is a marshalling Yard? (AUC NOV/DEC 2012)

The main function of a marshalling Yard is to sort out wagons received from the centers to their respective destination. Further all Empty Wagons are stored and allotted as and When needed

3 . Define Heel Divergence? (AUC NOV/DEC 2010)

This is the distance between the Gauge faces of the Stock Rail and the tongue Rail at the Heel of the Switch. It is made up of Flange way Clearance and the width of the tongue rail head lies at the heel

4. What are the sources of moisture in the track (AUC NOV/DEC 2011)

1. By gravity
2. By capillary action
3. From adjacent areas
4. By hygroscopic action

5. What is meant by track Circuiting ? (AUC APRIL/MAY 2011)

Track circuiting is an Electric circuiting Formed by Combining Running rail, Signal and Cabin. It is the prime Function is to Specify the presence of the any train or the vehicle on the track .Various types of the circuiting

1. D.C Track Circuiting
2. A.C Track circuit
3. Electric track circuit

6. Modern methods of track maintenance (AUC APRIL/MAY 2011)

1. Track maintenance
2. measured Shovel Packing
3. Direct Track maintenance

7. What is meant by interlocking (AUC APRIL/MAY 2012)

Interlocking is a system meant to ensure the safety of the trains. By interlocking it is meant that Various lever operating the signals and points follow a certain Defined mechanical Relationship such that no adverse effects are possible

8. What is meant by interlocking by interlocking Signal (AUC APRIL/MAY 2012)

Based on the Signal and telecommunication Equipment is provided ,Interlocking Standards are specified By Indian Railways Based on the Speed of passing train

9.Distinguish Between the point rail and splice rail

The point rail and splice rail are machined to form a nose . The points rail is made to end at the nose Whereas then splice rail is joined a little behind the nose

10. What are the Advantages of using through sleepers (AUC NOV/DEC2010)

Through sleepers are provided for the entire length of Wherever points and crossing are provided on a track. Through sleepers main train several rails at the same level . further it is possible to fix the alignment of the curved track in relation to the straight track

11. What is co acting signal (AUC NOV/DEC2010)

Due to some obstruction if the vision of the signal is prevented, thus another signal is used in its place, preferably on the same post. Such a signal is called as co-acting Signal which ism an exact replica of the original

12.What is meant by fixed signals (AUC MAY/JUNE 2012)

Fixed signals are firmly fixed on the ground by the side of the track and can be further subdivided into caution indicators and stop signal. Caused signals are fixed signals provided for communicating to the driver that the track ahead is not caution indicators and stop signals

13.Distinguish between a railway and railway yard.

A railway station is that the place on a railway track where different types of the traffic are dealt and performs as an authority to grant permission to proceed vehicles forward

A railway yard is a system of tracks laid out in order to deal with the passenger as well as goods

14. What are the track resistant's?

The movement of a train on a track is resisted by various factors . these resisting factors may be due to the friction between the rail and the wheel, irregularities of the on the track profile, atmospheric resistance

15. What are the Fixed Signals

Fixed Signals Re Firmly Fixed on the Ground By the Side of the track and it be further subdivided into caution indicators and Stop Signals

Stop signal are the fixed signals that normally do not change their position. They inform the drivers ahead is not fit running's the train at normal Speed

16 MARKS QUESTIONS AND ANSWERS

1.Draw a neat diagram and Explain the signals used at various locations along the standard Prescribed for such location (AUC NOV/DEC 2010)

Definition

Signaling is used To access the safety of a route .in the real sense signaling forms a medium of communication between the station master to the driver

Objectives of signaling

1. To provide the Adequate safety to trains
2. To give direction Indicators to trains at diverging junction
3. to maintain safety distance of train
4. To provide the necessary facilities
5. To permit the Trains to the restricted speed

Types of Signaling

1.Signal based on function
2. Signal based on location
3.Special Signal

1.Signal based on function

The signal comprises of the signaling the driver of a signal to Stop, move casually ,proceed and to carry out Shunting Operation

1.Stop signal
2. Warner Signal
3. Disk or Ground Signal
4. Colored light Signal

1.Stop signal

Stop Signals are fixed Signals Which are also as semaphore signals .the semaphore signals function in a following Way

1.The semaphore arm is capable of making two positions
2.The horizontal position of the signal indicates a stop or danger and said to be “on position”
3.When it is lowered at an angle of 45°-65° .it indicates proceed and is said to be “OFF position”
4.The important features of the this types ,if anything goes to bad with the apparatus, the signal Should Show the Stop position

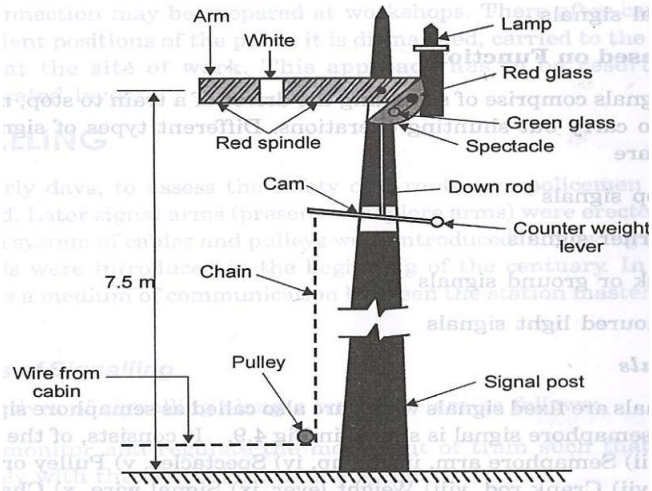


Figure 4.9 Semaphore signal
(Source: Chandra and Agarwal, 2009)

2. Warner Signal

Warner signals are similar to semaphore Signals with a difference that a V-notch is provided at the free end. The signal is placed ahead of semaphore signals. The main function of the signaling is to warn the driver about the presence of a Stop Signal Ahead

Working position of Signal

1.When in Horizontal or in "on position" it signifies that the Signal Ahead in Stop or Danger position

2.When in inclined position it signifies that the signal ahead of "OFF-POSITION".
i.e. the driver can proceed at speed without any danger

3. Disk or Ground Signal

Disk or Ground Signal are miniature Signals Which are to used for Shunting of Vehicle in Station yards. these are called Shunting Signals .

The disk is removed by a suitable arrangement. Two holes one is provided are for red lamp and the other for the green lamp

When the red band assumes inclined position as Shown it indicates the proceed While at horizontal position it Signifies Stop.

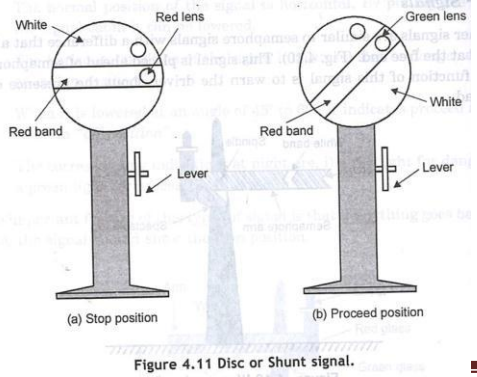
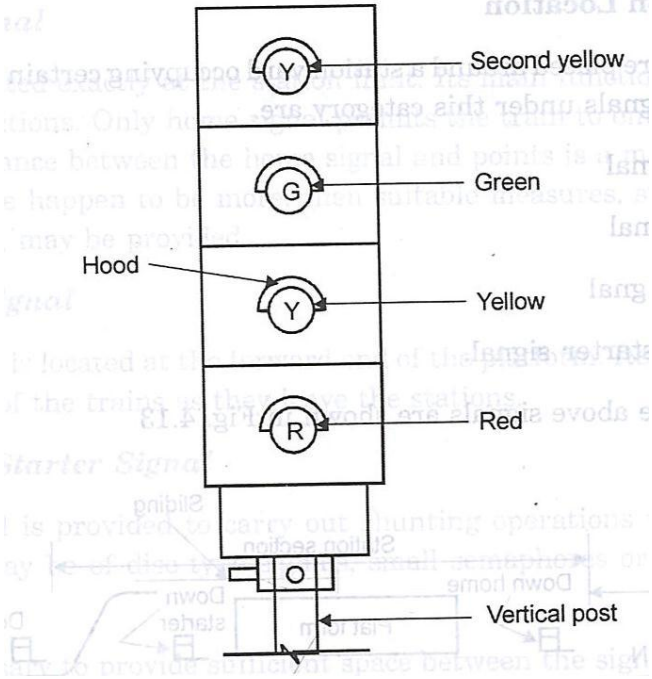


Figure 4.11 Disc or Shunt signal.

4. Colored light Signal

In order to Signify the track conditions to the driver at all times ,these Signals used colored light. Further to Ensure good visibility of the lights Even in Day time Special Electrical connection Using lenses are made



Types

1.two aspect, namely red and green

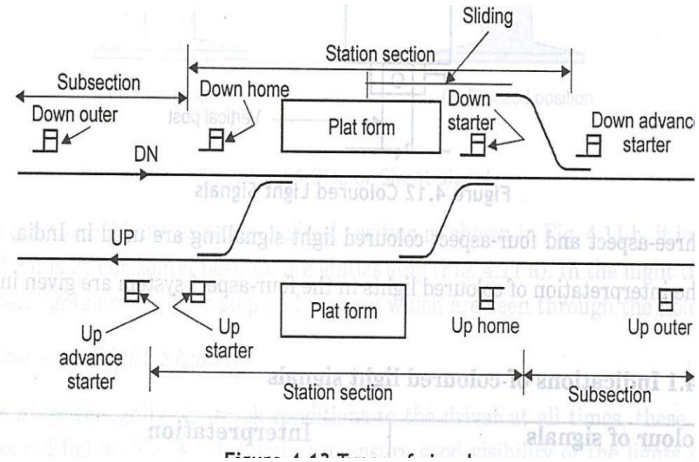
2. three aspect, namely red, yellow and green

3. four aspect, namely red and green, yellow(twice)

2.Signalling based on the function

These signals are placed around a station yard occupying certain defined location. different types of signal under this category are

1. outer Signal
2. Home signal.
3. Starter Signal
4.Advance Starter Signal



1. outer Signal

Bringing a train an motion to Stop Depends on the Weight of the trains ,Brake the power of the locomotive, Speed of the train and gradient at the site

The distance travelled is nearly Equal to 0.54km for B.G and 0.40 km for M.G for the maximum allowable Speed in India

2. Home signal.

This is located Exactly at the Station limit. its main functions is to be Safeguard the Station and junctions.

Only home signals permit the train to entire platform. the unprotected distance between the home Signal and Points is a maximum of 180m

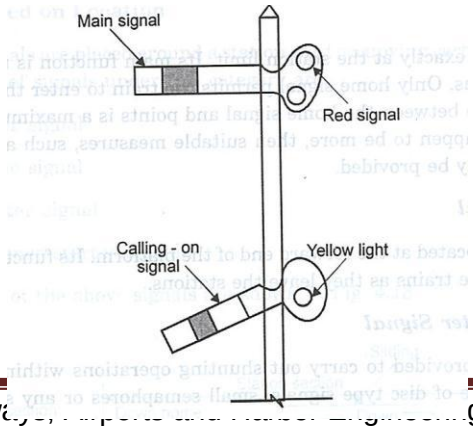
3. Starter Signal

This signal is located at the forward end of the platform. Its function is to control the movement of the trains as they leave the Stations

4.Advance Starter Signal

This signal is provided to carry out Shunting operation within its protection. these Signals may be of disk types Signals ,Small Semaphores or any Suitable form of small lights

It is necessary to provide sufficient Space between Signals and the sliding so as to allow the maximum likely length of the train



2. Explain the various types of Level crossings and remedial measures. Give all in detail (AUC NOV/DEC 2010)

Definition

Railway lines to cross the a road at the different elevation. If the level of the passing and traffic is the same as that of the railway track, the crossing is called as the level crossing

Types of level crossing

Level Crossings are may be Guarded or unguarded. In the case of guarded some method of preventing the movement of the train of the road vehicles is done ,this method may be Swing type gates

These gates of manned crossing are either operated automatically or by watchman of rails. Incase of Unguarded leveling no watchman is provided

Classifications

1. **Special class level Crossing**
2. **Class A level crossing**
3. **Class B level crossing**
4. **Class C level crossing**
5. **Class D level crossing**

1. Special class level Crossing

These Types of level Crossing are the busiest ones in terms of road traffic. All level Crossings in National Highways are Special Classes. The Gates of the Level crossing are interlocked with the signal. These Crossings are generally Guarded for 8 – hour Shifts

2. Class A level crossing

Most of the important roads are provided with this types of level Crossings. This is also a busy Level Crossing in terms of road traffic. Other Provisions are Similar to Special Aspect with only two Gateman are provided to work on 12 –hour shift basis

3. Class B level crossing

These crossings are relatively less busy. These are Provided on metal led roads . These gates of the Crossings are Closed to road traffic and open to traffic provided that the gates are interlocked with signals. Here also only two gateman are assigned to work on 12-hour shift basis

4. Class C level crossing

These are provided mostly on un medaled roads. Evidently the volume of the traffic is less. For the reason Some of these Crossings are unguarded. If manned only ones gateman is provided.

5. Class D level crossing

These types of level Crossings are provided for pedestrians to move or for cattle's to move

3. Draw a neat Sketch of Points and crossings. Describe its components in detail
(AUC NOV/DEC 2011)

Definition

Points and Crossing are provided to transfer railway vehicle from one track to another track. The tracks may be of converging type or diverging types. As the wheel of the railway vehicle are made with Flanges, there is need of points and Crossings for Easy movements for easy movement

Points or Switches

A Switch forms a combination of a pair of tongue and stock rail properties connected

Crossing

A crossing is a device provided at the junction of two rails .This is to permit the wheel flange of a railway vehicle to pass from one track to another track

Points or Switches

A set of points or Switches comprises of the following components

1) A pair of Stock rails

2) A pair of tongue rails of Switch rails, PQ and RS, which are machined so as fit with the Stock rail. The tapered end of a tongue rail is called the toe and the thicker end is called heel

3) A pair of heel blocks are provided Which hold the heel of the tongue rail at the Standard clearance

4) A number of Slide Chairs are Provided in order to support the tongue rail and thereby enable its movement towards or away From the Stock Rail

5) In order to hold the tongue rails are closed to the toe at a fixed Distance two or more Stretcher bars are connected

6) A gauge tie Plate to fix Gauges is provided and also to Ensure correct gauge at the points

Types of Switches

1. stud Switches

In stud switches , no separate tongue rail is provided. These Switches are not in use in Indian Railways, and has been Replaced by Split Switches

2.Split Switches

Split Switches are Consist of a pair of Stock rails and a pair of tongue Rails

Types

1. Loose Heel type

2. Fixed type

Crossings

A crossing is a device provided at the point at the Two Gauge Faces Cross Each other. This arrangement is made to permit the Flanges of a railway Vehicle to pass from one track to another

Crossing Comprises of the Following Points

1)The points rail and Splice rail are machined to form a nose. The point rail is made to end at the nose whereas the splice rail is joined a little behind the nose

2) two wing rails one of the right hand and other of the left hand are arranged to form a throat and Again and again diverge on either side of the nose. In order to facilities the entry and exit of the flange wheel in the Gap.

3. A pair of the Check rails are provided to guide the Wheel Flanges and to route a path of them

Crossings are classified into Three Types

1.Acute angle Crossing

2.Obtuse angle Crossing

3.Square Crossing

1. Acute angle Crossing

It is also called as an "V crossing" in Which the two Gauges faces intersect at an acute angle. Such a Situation Arises When a right a right rail Crosses a left rail

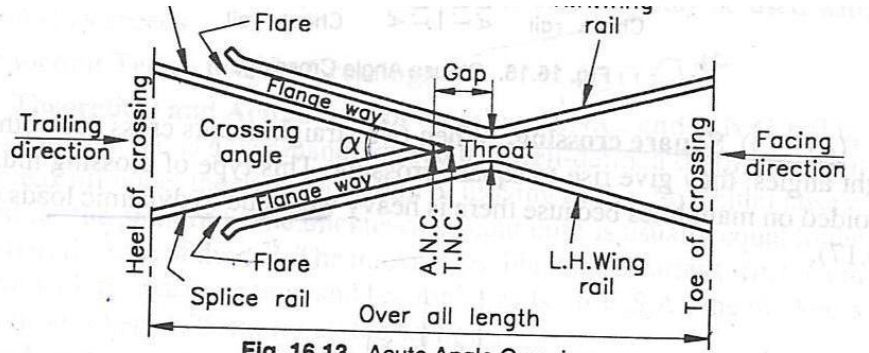


Fig. 16.13. Acute Angle Crossing.

2.Obtuse angle Crossing

It is also called as diamond Crossing in Which two Gauge Faces meet at an Obtuse Angle

3.Square Crossing

It is one of the tracks cross at right angles. Such a situation rarely occurs in practical

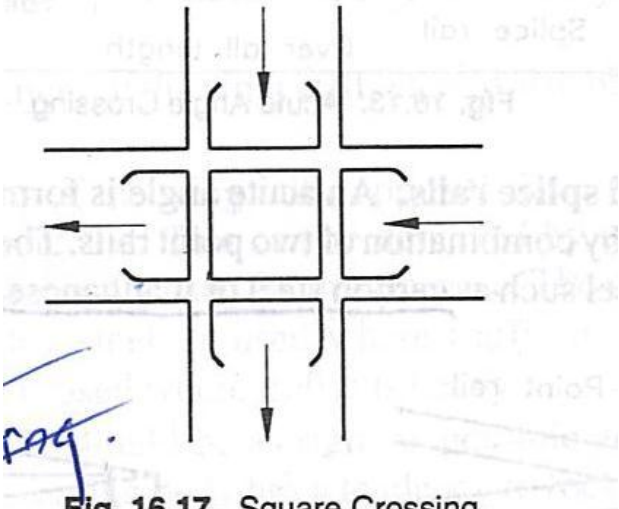


Fig. 16.17. Square Crossing.

4. Explain about Track Drainage, and how Surface and Sub surface Water Can be removed From Railway track. Give all in Details (AUC NOV/DEC 2011)

Definition

Drainage of a track, Station Yards and platforms are the three places Where Drainage arrangements are needed. Track Drainage Comprises of Interception, Collection and disposal of from the track. This is done by adopting proper Surface and Subsurface Drainage System

Types of track Drainage

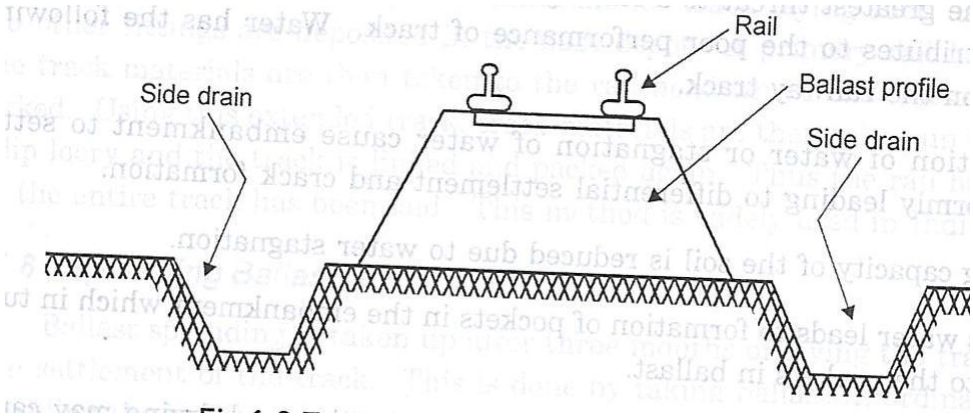
Surface Drainage

Surface Water due to rain or Snow or Flow From Adjacent areas have to be Disposed of Through Surface Drainage. Surface Drainage has to be attended to in three locations. Drainage in mid- Section Between railway Stations

1.Drainage in mid-section
2.Drainage in Station Yards
3.Drainage at Station Platforms

1.Drainage in mid-section

A typical arrangement of cross Section of a mid-section. Side Drains may be unlined or lined. At a level Crossing all water should flow to the side Drains. In cutting catch water Drains Have Been Provided Wherever Necessary. All Extra Ballast on the Side Should be Recovered Which Encourage Growth of the vegetation.



2.Drainage in Station Yards

Open Surface Drains-Shaped Drains, Longitudinal Drains and Open Drainage are Provided to Free Station Yard From Water

A typical surface drainage system with open Drains for a Station Yard .Every Station Yard is Provided with a network of Cross and Longitudinal Drains.

In Station Yard the vulnerable points are water columns and carriage watering points with washing Hydrants.

3.Drainage at Station Platforms

For Drainage of Station Platforms the following Points Should be Taken into account

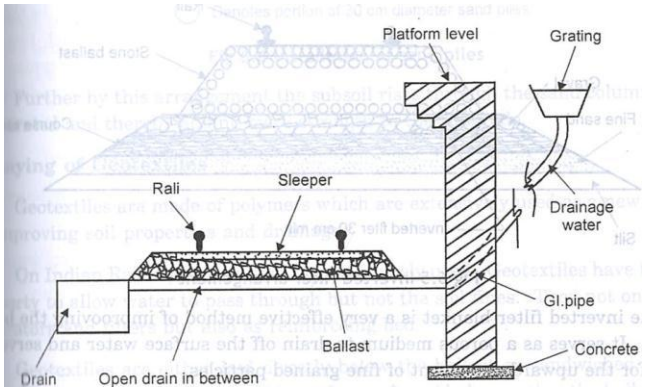
1.Slopes away From the track

2. Discharge on non-Track Side

3. Discharge not towards Ruin-through lines

In general all end of platforms should be sloped away From the Track. all other Discharges Form tea Stalls, Toilets, Water taps. If there is need be , covered longitudinal Drains Should Be Provided

Incase of island platforms, all Drains Should discharge on the less important side of the track



2.Sub-Surface Drainage

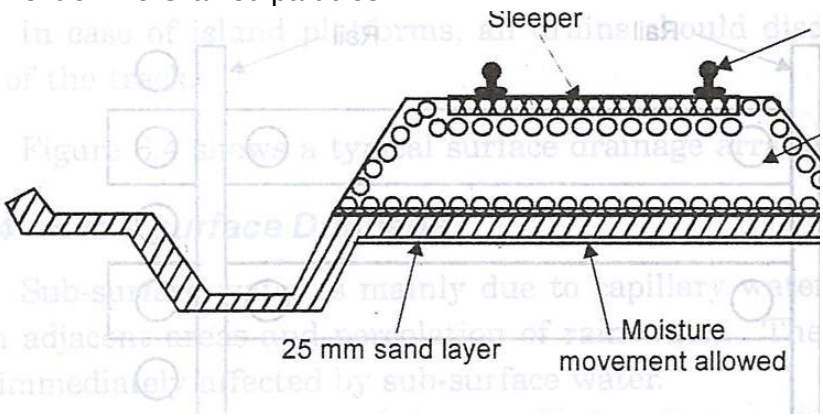
Sub-surface water is due to the capillary water. Other sources are seepage from adjacent areas percolation of rain water. The sub grade and the formation are immediately affected by the Sub-Surface irrigation

1. **Provision of an inverted fillers**
2. **Sand piling**
3. **Laying of Geotextiles**
4. **Other Methods**

1. Provision of an inverted fillers

An inverted fillers blanked of adequate thickness is provided between the ballast and the week formation. The Blanket is of non-Cohesive material with enough bearing capacity to sustain the load thereon

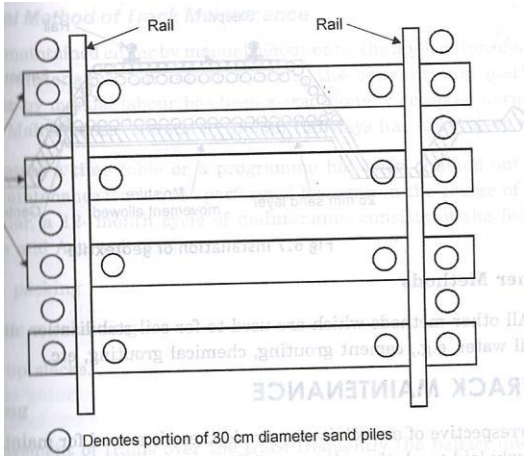
The inverted fillers Blanket is a very effective method of improving the bearing capacity. It serves as a porous medium to drain to drain off the Surface Water and Serves as a barriers for the upward movement of fine Grained particles



2. Sand piling

Sand filling is an effective technique . A series of 30cm diameter vertical holes are drilled inside and outside the rail to a depth of 2-3m. the holes are filling with clean sand and the surface is resurfaced. The area covered by the Sand piles Should be About 20% of the formation area. Sand piles provide a mechanical support and the Drainage of the Sub grade improves

Further by the arrangement of the Subsoil rises through the sand column And get evaporated.



3. Laying of Geotextiles

Geotextiles are made of polymers which are Extensively as a new Technique in improving the Soil Properties and Drainage

On Indian railways Geotextiles are Extensively used. Geotextiles are having the unique property to allow water to pass through but not the soil fines. They not only Work as separate and filters But also as reinforcement bed

Geotextiles are either laid directly below the ballast or sandwich between a 50mm layer of sand on top and a 25mm layer so sand below so that the ballast directly does not rest on Geotextiles . and thereby preventing tear and puncture of textiles .

4. Other Methods

All other methods Which are used to for Soil Stabilization may be used to arrest Sub-Soil water. Cement Grouting , Chemical Grouting

5. Draw a neat diagram of simple right hand turnout and Show its various components. Explain the Working Principal of Turnout (AUC NOV/DEC 2012)

Definition

Turnouts are the simplest Combination of the Points and crossing Which enables one track to another track either a branch line or a sliding, To take off From Another From another track

Parts of the Turnout

1. A pair of points or Switches
2. A pair of Stock Rail
3. A vee Crossing
4. Two Check Rails
5. Four Lead Rails
6. Stud or Stops
7. Bearing plates

Important terms used in Turnouts

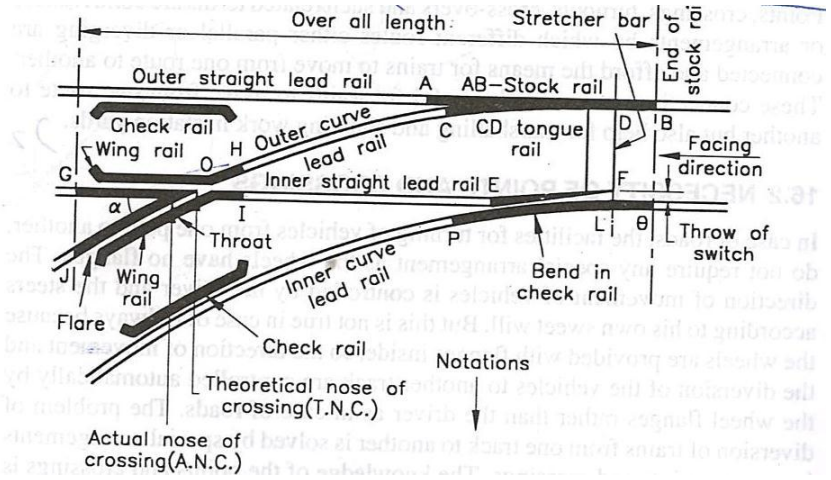
1.Facing direction
2. Trailing Direction
3. Facing point of Turnout
4. Trailing point of Turnout
5. Right hand and left hand turnouts
6. Right hand and left hand Switches

1.Facing direction

If someone Stands at the toe of Switch and looks towards the Crossing, then the Direction is Called “Facing Direction”

2. Trailing Direction

If someone Stands at the Crossings of Switch and looks towards the Crossing, then the Direction is Called “Trailing Direction”



3. Facing point of Turnout

In this train pass over the Switches and then they pass over the crossing first and then they pass over the crossing. These are important to Specify the The direction of movement of Trains is reserved for facing direction

4. Trailing point of Turnout

Those opposite sides of the Spacing points in Which the trains pass over the Crossing first and then pass via Switches. These are important to Specify When the Direction of Movement of trains is reserved for trailing direction only.

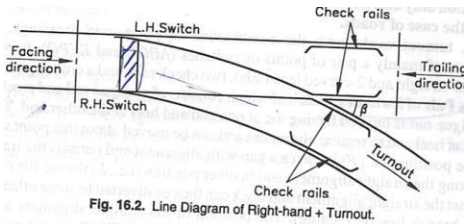


Fig. 16.2. Line Diagram of Right-hand + Turnout.

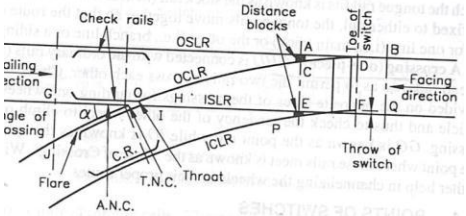
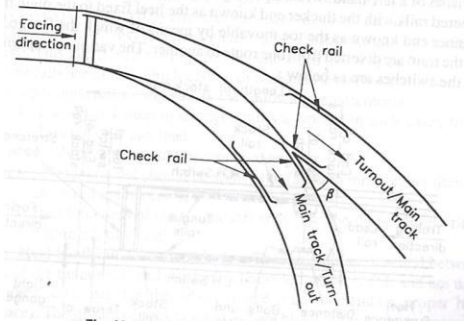


Fig. 16.3. Line Diagram of Left-hand Turnout.



5. Right hand and left hand turnouts

If a train From a main track is diverted to the right of the main route in the facing direction .then the diversion is Known as an Right-hand Turnout. If a train From main Track is Diverted to the left of the main route in the Facing Direction, Then the Diversion is Called left hand turnouts

6. Right hand and left hand Switches

These are termed as Left-Hand or right hand Switches Depending upon the left of Right When Seen From The facing Direction, i.e. Stand at the Points and look Towards the Crossing

6. How are stations classified? Explain the features of each station. (AUC NOV/DEC 2012)

Definition

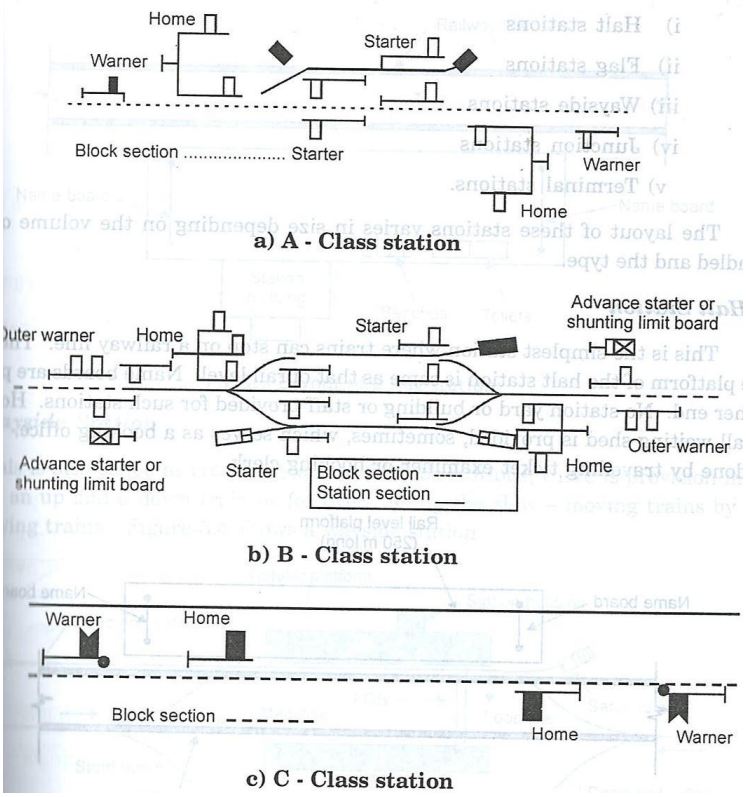
Stations and Yards are field control units of the communication System. Further they also provide waiting places and repairing places for the locomotives and wagons

A railway Station is that places on a railway track Where different types of traffic are dealt and performs as an authority to grant permission to proceed vehicle forward

Purpose of Railway Stations

1. To control the incoming and outgoing movement of a train
2. To collect food and water for passenger
3. To load and load goods or parcels

4. To enable the locomotives to refill, diesel, water and coal
5. To provide facilities for a change of engine



Classification of railway Stations

Railway Stations are Classified based on two Broad Categories. That are Given below

1.Railway Station Based on operational Consideration

2. Railway Station Based on functional classifications

1.Railway Station Based on operational Consideration

As per the Indian Railway, railway Station are classified as block Station or non-Block Stations.

1.Block Station

Incase of Block Station no traffic is dealt but trains have to get the permission to proceed further. Block Stations are further classified as A,B,C Classes

Class A

The lines on Which the in Coming Trains is received after clearing at least a distance of 400m beyond the home Signal

Class B

Permission to the incoming trains is given before the receiving lines is made clear within the Station section

Class C

These are the stations where trains do not stop

2. Non-Block Station

Non Block Stations are classified as D-Class of Flag Stations. In this station only traffic is dealt and there are no arrangement made to Control the movement of the trains. They are located in Between Two block Stations

2. Railway Station Based on functional classifications

Here the Stations are classified Based on the function they are Expected to perform. Under this Category the Following Stations are Grouped

1. Halt Station
2. Flag Station
3. Wayside Station
4. Junction Station
5. Terminal Stations

1. Halt Station

This is a Simplest Station Where Trains Can Stop on a railway line. The level of the Platform of the halt Station is same as that of rail level. Name Board are Placed on Either end. No Stations Yard or Building or Staff Provided for Such Stations.

However, A Small waiting Shed is Provided, Sometimes, Which Serves the as a book office. Booking is done by Travelling ticket Examiner or booking Clerk

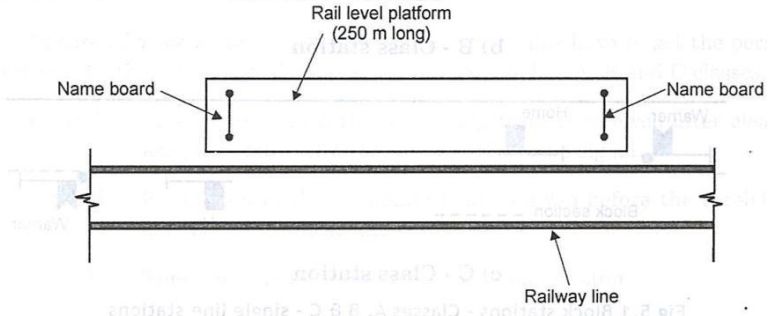


Fig 5.2 Layout of a halt station

2. Flag Station

A Flag Station is Provided with a Station Building and Staff. This is better that a halt Station. The Stations Buildings Accommodates a Small Waiting hall and a booking office

Further a Platform, Benches and Drinking Water Facilities are made Available Sometimes Siding is also Provided For Stabling of Wagon booked for that Station

3. Wayside Station

This is also Called as Crossing Station. In Such Stations, There is Provision made to Cross an up and a down trains or for over taking the Slow – Moving trains by the Fast-moving trains

A track Layout Has been Specific Advantages

1) It is a three-lines Station Which Can Be receive trains From Both Sides.

2) As they are two platforms , regular and an island platforms , trains may be Stopped simultaneously. Land line may be used for goods train and the Important trains may be halted near the Station Buildings.

3) Dead end Siding Are also provided on both Sides Which will Help to accommodate sick-wagons

4) The footing over Bridge Can Be Used to Move and to go or Return Through Both the Platforms

4. Junction Station

A junction Station is the Meeting Point of three or more lines coming different from different conditions

a) There is feasibility to interchange of traffic between main and Branch line

b) There is possibility to Clean and Repair Vehicle Which terminate at the junctions

This Junctions may occurs between a single main line and a single or a single or double main lines or between the double branch line and main tracks

5. Terminal Stations

A Station at Which a railway lines or one of its Branches ends or terminates Without Further proceeding is termed as terminal Station or Terminal Junction

Terminal Stations are Provided with facilities to reserve the locomotives, Examination pits, additional Sidings, Etc. Hydraulic Buffers are provided at the Ends

The Circulating Area is Provided with ticked office, restaurant, Etc Directly connected to road Such that the passenger can make use of road vehicles easily