POINTS AND CROSSINGS

Definition:

- Points and crossings are provided to facilitate the change of railway vehicles from one track to another.
- The tracks may be parallel, diverging, or converging to each other. Points and crossings are necessary due to the inside flanges of wheels of railway vehicles and, therefore require special arrangement to navigate their way on the rails.
- The points or switches aid in diverting the vehicles and the crossings provide gaps in the rails so as to helpthe flanged wheels to roll over them.
- A complete set of points and crossings, along with lead rails, is called a *turnout.*

Turnout:

Turnout is an arrangement of points and crossings with lead rails by which trains may be diverted from one track to another moving in the facing direction.

Parts of a Turnout:

1. A pair of tongue rails
2. A pair of stock rails
3. Two check rails
4. Four lead rails
5. A Vee crossing
6. Slide chairs
7. Stretcher bar
8. A pair of heel blocks
9. Switch tie plate or gauge tie chair
10. Parts for operating points – Rods, cranks, levers etc.
11. Locking system which includes locking box, lock bar, plunger bar etc.

- ***Tongue Rails*** along the stock rails in a turnout form a pair of points or switches. The tongue rails facilitate the diversion of a train from the main track to a branch track.
- ***Stock Rails*** are the main rails to which the tongue rails fit closely. The stock rails help in smooth working of tongue rails.
- ***Check rails*** are provided adjacent to the lead rails, one in main track and another in branch track. These rails check the tendency of wheels to climb over the crossing.
- ***Lead Rails*** lead the track from heel of switches to the toe of crossing.

- ***A Vee crossing*** is formed by two wing rails, a point rail and a splice rail. It provides gaps between the rails so that wheel flanges pass through them without any obstruction.

- ***Slide chairs*** are provided to support the tongue rail throughout their length and to allow lateral movement for changing of points.

- ***Stretcher bar*** connects toes of both the tongue rails so that each tongue rail moves through the same distance while changing the points.

- ***Heel Blocks*** keep the heel ends of both the tongue rails at fixed distance from their respective stock rails.

- ***Switch Tie Plate*** holds the track rigidly to the definite gauge at the toe of switches. These are provided below the slide chairs.

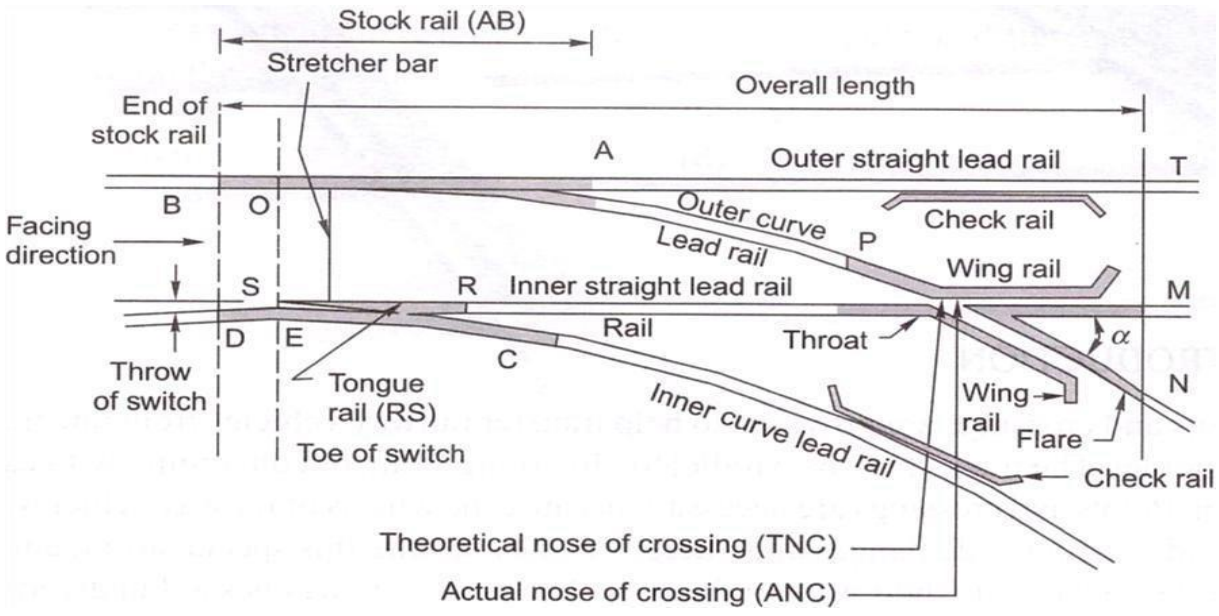
Direction of a turnout:

- A turnout is designated as a right-hand or a left-hand turnout depending on whether it diverts the traffic to the right or to the left.

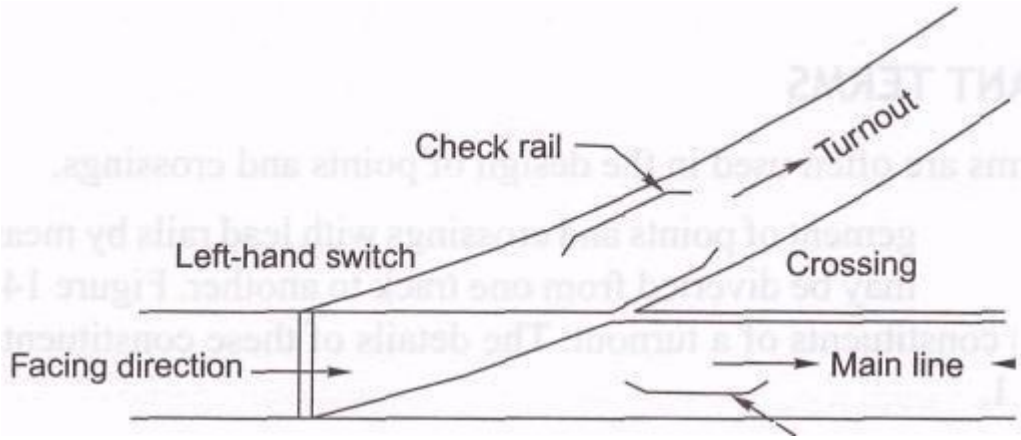
- The direction of a point (or turnout) is known as *the* ***facing direction*** if a vehicle approaching the turnout or a point has to first face the thin end of the switch.

- The direction is ***trailing direction*** if the vehicle has to negotiate a switch in the trailing direction, that is, the vehicle first negotiates the crossing and then finally traverses on the switch from its thick end to its thin end.

- Therefore, when standing at the toe of a switch, if one looks in the direction of the crossing, it is called *the facing direction* and the opposite direction is called the *trailing direction.*



(Constituents of a turnout)



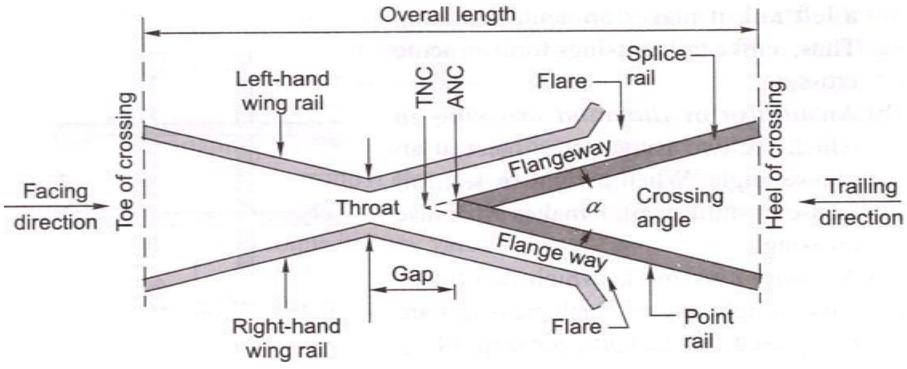
(Left-hand turnout)

Crossing:

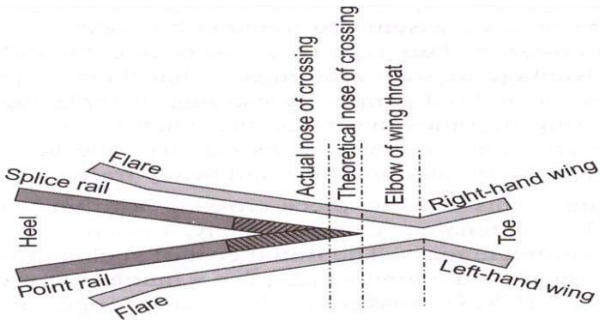
A crossing or frog is a device introduced at the point where two gauge faces across each other to permit the flanges of a railway vehicle to pass from one tract to another (Fig. below). To achieve this objective, a gap is provided from the throw to the nose of the crossing, over which the flanged wheel glides or jumps. In order to ensure that this flanged wheel negotiates the gap properly and does not strike the nose, the other wheel is guided with the help of check rails.

A crossing consists of the following components:

- **Two rails, point rail and splice rail**, which are machined to form a nose. Tic point rail ends at the nose, whereas the splice rail joins it a little behind the nose. Theoretically, the point rail should end in a point and be made as thin as possible, but such a knife edge of the point rail would break off under the movement of traffic. The point rail, therefore, has its fine end slightly cut off form a blunt nose, with a thickness of 6 mm (1/4"). The toe of the blunt nose is called the ***actual nose of crossing*** (ANC) and the theoretical point where the gauge faces from both sides intersect is called the ***theoretical nose of crossing*** (TNC). The 'V rail is planed to a depth of 6 mm (1/4") at the nose and runs out in 89 mm to stop a wheel running in the facing direction from hitting the nose.
- **Two wing rails** consisting of a right-hand and a left-hand wing rail that converge to form a throat and diverge again on either side of the nose. Wing rails are flared at the ends to facilitate the entry and exit of the flanged wheel in the gap.
- **A pair of check rails** to guide the wheel flanges and provide a path for them, thereby preventing them from moving sideways, which would otherwise may result in the wheel hitting the nose of the crossing as it moves in the facing direction.



(Details of a crossing)



(Point rail and splice rail)

SIGNALIZING AND INTERLOCKING

- The purpose of signalling and interlocking is primarily to control and regulate the movement of trains safely and efficiently.
- Signalling includes operations and interlocking of signals, points, block instruments, and other allied equipment in a predetermined manner for the safe and efficient running of trains.
- Signalling enables the movement of trains to be controlled in such a way that the existing tracks are utilized to the maximum.

OBJECTIVES OF SIGNALLING

The objectives of signalling are as follows:

- To regulate the movement of trains so that they run safely at maximum permissible speeds
- To maintain a safe distance between trains those are running on the same line in the same direction
- To ensure the safety of two or more trains that has to cross or approach each otherTo provide facilities for safe and efficient shunting
- To regulate the arrival and departure of trains from the station yard
- To ensure the safety of the train at level crossings when the train is required to cross the path ofroad vehicles

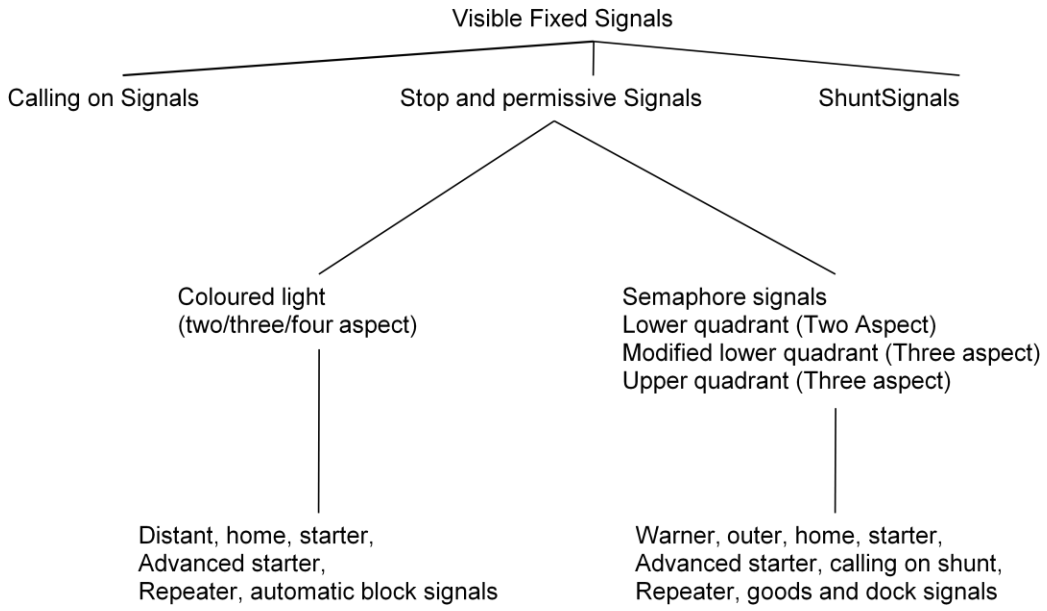
CLASSIFICATION OF SIGNALS

Railway signals can be classified based on different characteristics as presented in Table below.

Characteristics	*Basis of classification*	*Examples*
Operational	Communication of message in visual form	Fixed signals
Functional	Signaling the loco pilot to stop, move cautiously, proceed, or carry out shunting operations	Stop signals, permissive Signals, shuntsignals
Locational	Reception or departure signals	Reception: Outer, home, Departure: Starter, and advanced starter signals
Constructional	Semaphore or colour light signals	Semaphore: Lower quadrant or upper quadrant. Colour light: Two aspects or multiple aspects.
Special characteristics	Meant for special purposes	Calling-on signals, repeater signals,coaching signals, etc.

Figure. below shows further classification of signals and Table below lists the signalling requirementsof various classes of stations.

* Under revision



Signals required at stations

Classificatio nof station	Minimum requirement of signal s	Remarks
A class	Warner, home, and starter	An outer signal can be provided after obtaining special permission
B class	Outer and home	In multiple-aspect upper quadrant (MAUQ) areas, distanthome and outer signals are provided
C class	Warner and home	In MAUQ areas, the warner signal is replaced by a distant signal

FIXED SIGNALS

The various types of fixed signals used on railways are as follows.

Semaphore signals

The word 'semaphore' was first used by a Greek historian. 'Sema' means sign and 'phor' means to bear. A semaphore signal consists of a movable arm pivoted on a vertical post through a horizontal pin as shown in Fig. below.

* Under revision

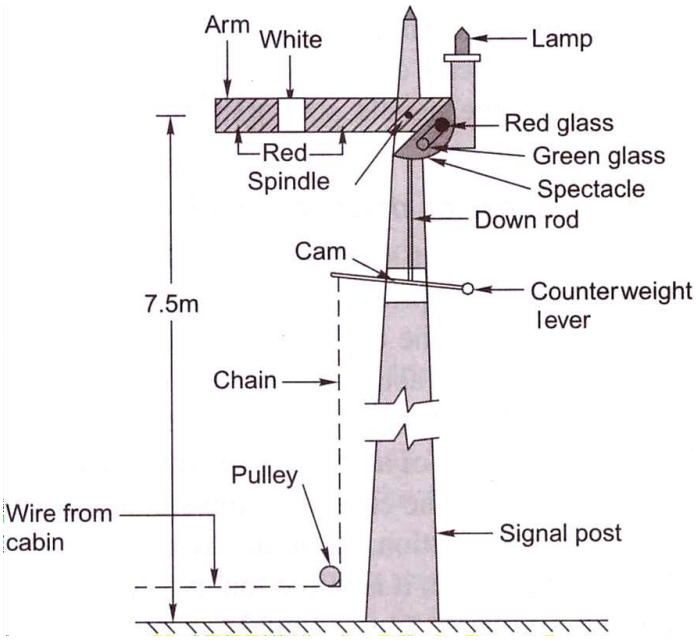


Fig. Semaphore signal

Lower quadrant semaphore signals move only in the fourth quadrant of a circle and have only two colour aspects. In order to provide the drivers with further information, multi-aspect upper quadrant signalling (MAUQ) is sometimes used on busy routes. In this system, the arms of the semaphore signals rest in three positions and the signals have three colour aspects, namely red, yellow, and green associated with the horizontal, 45° above horizontal and vertical directions, respectively. Details of MAUQ are given in subsequent paras.

Stop signal in MAUQ, Signaling

In case of multi-aspect upper quadrant (MAUQ) signaling of semaphore stop signal with a square ended arm, there may be three situations (Figure below) as indicated below in Table below:

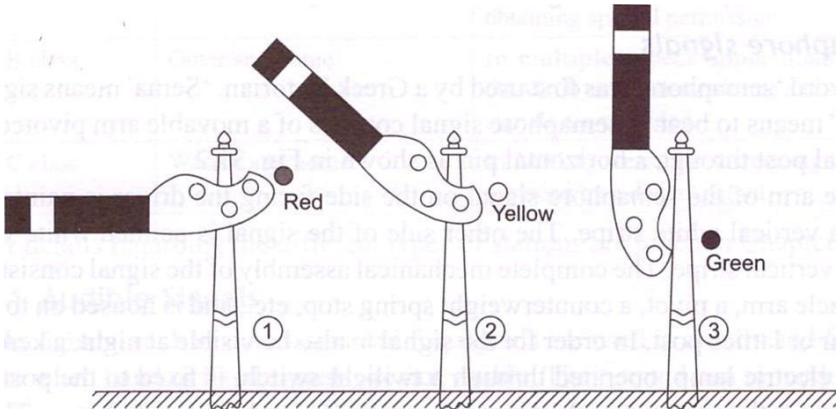


Fig. Semaphore stop signal in MAUQ signaling

Track circuit

The track circuit is an electric circuit formed along with the running rails and connected

* Under revision

to the signal and cabin. Its function is to indicate the presence of a train (or vehicle) on the track. In order to set up a track circuit, the ends of the rails forming the circuit are isolated by insulating the rail joints.

The various types of track circuits used on the Railways are as follows.

(a) Direct current track circuit

(b) Alternating current track circuit

(c) Electronic track circuit, which are audio-frequency track circuits

* Under revision