**Railway crossings and turnouts**

**STATION**: It is a place on a railway line, where trains halt for exchanging passengers, exchanging goods, control of train movement , detaching or attaching of compartments and wagons etc.,

**Requirements that station should be satisfy**

1. **Public** : Station should provide all the facilities required by public like
* Booking office for tickets,
* Goods and passenger platform with or without shed,
* Proper arrangements for drinking water,
* Suitable light and ventilation,
* Waiting rooms and retiring rooms,rest rooms,
* Provision of big display boards for schedule of trains and changes if any,
* Guides from railway department to help illiterate passengers,
* Microphones to announce the arrival and departure time of trains,
* Provision of refrigerator’s for cold drinking water in hot weather other facilities like public telephone etc.,
1. **Traffic Staff and Police Requirements :**
* A station should adequate facilities for traffic staff and police to enable them to perform their duties in a best possible way.
* Proper arrangements such as staff rooms, retaining rooms , quarters etc., for railway staff.
1. **Train Requirements** :
* Arrangements for controlling the movements of trains by means of signal.
* Sufficient No. of sidings for receiving, sorting and departing of trains.
* Sufficient No. of sidings and platforms for handling goods traffic should be provided.
1. **Requirements of Locomotives :**
* Proper arrangements for supply of fuel and water to locomotives.
* Arrangements for cleaning, examining, inspecting and maintaining the locomotives.
1. **Development of Railways :**
* Easy and comfortable roads to stations without causing congestion in traffic should be available.
* Installation of clocks for correct time, guide map of city, separate boards for arrival and departure of trains with platform numbers.
* Availability of collies on the platforms at stations.
* Facilities like escalators, big waiting halls and underground passages leading to important places of city, restaurants etc.,

**SITE SELECTION FOR RAILWAY STATIONS :**

1. **Acquisition of land :**
* Extra area to accommodate additional lines station buildings, platforms, cabins, staff quarters and for future extension, needs to be acquired in the beginning.
* This is the necessary from economic consideration because once the land is acquired, the land values greatly increase due to start of development on adjusting land.
1. **Proximity to town or village :**
* Station site should be close to the town or village as much as possible to facilitate the transport of passengers and goods.
1. **Nature of land area :**
* Land area should preferably be a level ground for convenience and safety of marshaling and shunting wagons.
* Steep gradients may cause the wagons to move even when not in operation due to high wind velocities and may result accidents.
* Therefore max. Permissible for all gauges, in station yards is 1 in 400 desirable values 1 in 1000.
1. **Approach roads to stations site :**
* It is highly essential to encourage rail transport by providing approach roads connecting a town or village.
1. **Station site alignment :**
* Station site should never be located on curves and as far as possible, should not be near the curves also.
* The alignment of track for both approaching and departing trains should be straight otherwise the signals will either be difficult to sight or out of sight.
1. **Site drainage :**
* It should have quick drainage facilities and min. grade 1 in 1000 in recommended.
1. **Station amenities :**
* Like water supply, coal, diesel, electricity etc., should be provided at the station site.
* A plentiful supply of drinking water is essential. Hard water is undesirable for steam locomotives.
1. **Type of station and yard :**
* Stations may be either through type or terminal type station.

**CLASSIFICATION OF RAILWAY STATIONS:**

1. Operational
2. Functional
3. Financial

**OPERATIONAL CONSIDERATIONS:**

Accordance with rules evolved by the Indian railways stations are broadly classified as ‘Block stations’.

Block stations are again classified as – class A, class B, class C in descending order of importance.

Non-Block stations are also called class D stations or flag station.

* **Block stations:**
* Block sections are sort of compartments into which the railway line is divided, these are established is as to safety spacing between the consecutive trains.
* Block stations are at ends of block section and are equipped with signal like which democrat the limits of block sections.
* A station which the driver of a train has to obtain on authority to proceed to approach and ’permission to proceed’ are granted to trains only at the stations.
1. **A class stations** :
	1. These are normally provided on double –line sections.
	2. A ‘line clear’ signal is necessary for receiving a train approaching from the previous block.
	3. No shutting operations are permitted after the line clear has been granted.
	4. A class stations are suitable for sections in which fast trains run.
* **Warner** : Located a particular distance from the home signal, it indicates that whether the section beyond is clear or not.
* **Home** : This is first stop signal. It has number of diverging lines , use is protect whether sidings are occupied or not placed 180m from starter.
* **Starter** : Placed at a adequate distance from home signal, if makes the point up to which the line should be clear for the should be clear for the train to give permission to approach.

|  |  |
| --- | --- |
| Advantages | Disadvantages |
| 1. Use of power signals.
2. Trains stop within the station limits normally.
3. Enhanced safety due to provision of warner before home signals.
 | 1. No shutting operations are permitted once line clear has been given.
2. A line has to be kept clear up to the starter signal for receiving a train, reducing the flexibility of operation.
 |

1. **B class stations :**
	1. Provided on single line as well as double line section and are most common type on India railways due to the greater flexibility of working.
	2. In B class line has to clear up to an adequate distance beyond the outer signal befor ‘permission to approach’.
	3. Speed to be 0.54 km for B.G. and 0.4km for M.G.
* Outer : (first stop signal) Sometime it can be below the warner also.
* Home : Placed at an adequate signal from outer signal. Protects facing points.
* Starter :
* Warner : Fast traffic can be allowed while permitting shutting operations even when clear signal is given.
1. **C class station:**
	1. Here no passengers are booked.
	2. It is used to split a long block section so that the interval between successive train is reduced.
	3. Trains usually do not stop at these stations
	4. Minimum signals required are :
* Warner : Paced at an adequate distance ahead of the home signal.
* Home : It is first signal.

C class increases line capacity by achieving faster movement of trains.

* **Non Block Stations:**
* It is also called D block stations.
* Located between two block stations.
* D class station without any siding is called flag stations
* These are neither telegraphically connected to adjacent stations nor have any staff for controlling the movements of trains.

**FUNCTIONAL CLASSFICATION:**

Classify based on function which a station is required to perform station may be halt /flag station, wayside or Non block station , Junction station and Terminus stations.

1. **Halts** :
	1. Simple station where trains can stop only rail-level platform is provided with a name board at either end.
	2. A small waiting shed, if provided can also serve as a booking office.
	3. No yard or station building is provided.
	4. Train stops for one or two minute for entraining and detraining passenger.
2. **Flag Station :**
	1. More important than station with building and staff.
	2. A control is provided for communication.
	3. A small waiting hall, booking office, platforms with benches and drinking water are also provided.
	4. Sometimes siding also provided for stabling wagons.
3. **Way side or Non Junction stations :**

These stations are consists of arrangement for crossing an up and down trains for overtaking slower train.

* 1. Wayside station on a single line :
* It consist of through line, loop line to enable trains cross each other, apassenger platform, station building and a goods loop and goods platform.
	1. Wayside station on a double line :
* In this 1 or 2 passengers platform may be provided depending upon the facilities required.
* A platform which is surrounded by tracks are known as ‘Island Platform’
* So a crossover is provided to facilitate movement of trains from one line to another.
* Over bridge pr subway may be provided to facilitate movement of passengers.

A refuge line also provided for fast moving trains to overtake the slow moving trains in the same direction.

* Many other facilities like goods platform, a goodsshed, station buildings, a shutting track and sand hump also provided.
	1. Way side station on a Triple line :
* In this main line consist of 2 loops on either side for simultaneous reception all up trains should be received on one loop and all down trains are received on other loop.
* In this only one passenger platform is generally provided because of 2 platform required to provide foot over bridge for passengers other facilities can be provided.
	1. Junction stations :
* When 3 or more lines coming from different directions meet, a junction station is provided at such a point.
* Usually at junctions trains arrives from branch lines and return to their originating stations or proceed to other stations.
* **Features of Junction :**
	1. 2 –platforms, one for main line and the other, an island platform.
	2. Main line as well as branch line trains receive on main platform.
	3. Foot over bridge connecting the two platforms.
	4. Good siding and a good shed to deal with goods traffic.
	5. A turn table for reversing the direction of engine.
	6. Emergency cross overs on either side to.

Bigger junction station is one where two main lines and two branch lines meet, traffic with 4 different directions.

* 1. Terminal Station :
* Station at which a railway line terminates.
* Reception line terminates at dead ends, with a provision to turn around and move the engine to other end.
* Facilities provided here are servicing of locomotives, cleaning, washing and watering of coaches and all other tasks relating to goods wagons.

**FINANCIAL CONSIDERATIONS:**

Depending on passenger/goods earnings stations are classified as following

**A station** : Main lines stations with high annual earnings, divisional and zonal headquarters.

**B station** : Station with tourist traffic and Junction stations.

**C station** : Suburban stations.

**D station** : District Head Quarters and stations of local importance.

**E station** : Non suburban stations with low earnings.

**F station** : Halt stations.

Following desirable criteria’s of financial classification:

1. Least cost
2. Least No. of signals.
3. Flexibility of shutting operations.
4. Line capacity and maximum utilization
5. Faster movement of trains
6. Increasing passengers and goods earnings.
* **LOOPs:**

A branch line from a main line again terminates at the same main line.

1. **Slit Turn-out** : Unsuitable for fast through trains because they have to reduce their speed while approaching the facing points.
2. **Trailing Turn-out:** It is less objectionable as compared to split turn out because slight reduction in speed of trains.
3. **Straight Turn-out**: Suitable for fast through trains as there is no reduction in speed.
* **Sidings:**

A branch line from main line and terminates at a dead end with sand hump.

* Basic function of a siding to provide temporary storage of wagons.
* Foe medium and large stations generally separate sidings for inward and outward wagons are provided.
1. **Trap sidings :** Goods sidings are separated from main line.
2. **Shutting Neck:** Whenever trap-sidings are of sufficient length, shutting operations also can be performed without causing any interference with traffic on running line.
3. **Catch-sidings :** These are provided in case of hilly tracks where the gradients near the station are steep. In such cases separate sidings are provided for catching such wagons against movement of vehicle under gravity.
4. **Private and assisted sidings:** Provided to private parties for commercial goods business. They may either be government assisted or Non-government sidings. The sidings cost is laid and maintenance is bare by private owner.
* When sidings is laid and maintaining by railway department it is known as ’Assisted Siding’.

**STATION YARD:**

A system of tracks lay usually on a level within definite limits for receiving storing, sorting, making up new trains, dispatch of vehicles and for other purpose over which movement of trains is not authorized by a time table.

**TYPES OF STATION YARDS:**

1. **Passenger bogie yards:**
2. Main function if passenger bogie yard is to provide facilities for safe movement of passengers.
3. Passenger platforms as already discussed may be regarded as passengeryard.
4. This yard is of specific important at terminal stations or functions where extra passengers bogie are accommodated and cleaning, washing or sorting is done.
5. It should cover for a minimum distance of 60m of their length.
6. Minimum width of 3.66m of platform should be paved.
7. End of the raised platform should be in the forms of a ramp with a maximum slope of 1:6.
8. Adequate arrangement of lighting should be in the form made for efficient and safe running of trains at night.
9. Adequate drinking water facilities should be provided and necessary sanitary arrangements be made.
10. Names of stations should be written on a R.C.C. board in bold letters in Hindi, English and any regional language. Those boards are placed at Extremities of the platform and right angles to the moving track and height of board from platform level is generally kept 1.8m.
11. **Goods yards:**
12. Main function is to provide facilities for receiving, loading and unloading, delivery of goods and the movement of goods vehicle.
13. Practically all stations except flag stations provided with goods yards.
14. Good platform treated as goods yards.
15. Loading and unloading is done on goods platform whereas sorting is done in goods shed.
16. In addition, separate goods sidings are also provided for sorting delivery of goods.
17. It is used for loading and unloading of goods.
18. Goods shed should are generally higher so as to negotiate with high wagon floors weighing arrangements should be made on platforms.
19. Proper drainage facilities should be provided.
20. Facilities for direct access from the goods platforms to the goods sidings and to marshaling yard should be provided.
21. Minimum width of goods platform is 3.1m
22. Permissible heights are on B.G. 1.07m

 M.G. 0.69m

 N.G. 0.61m

1. **Marshaling yards:**
2. It is said to be ‘machine to receive , break-up, re-form and dispatch trains onwards’.
3. Simply where goods trains are received, sorted out and new trains are formed according to their destinations, with wagons arranged in station order and properly marshaled and dispatched in the appropriate routes.
4. Some of the wagons may be empty for further booking at different stations while other may be loaded.
5. It consist of sub yards one each for function of reception of trains sorting of wagons/trains and departure of formed trains.
* **Factors should be considered for efficient function of marshaling:**
* Shutting operations not interfere with the time-table of regular trains.
* Better efficiency there should done minimum detention of wagons in the yard so that sorting of wagons is done as fast as possible.
* It should be provided with all facilities to place and withdraw wagons from various points in the local area.
* Future extension of yard due to increase in goods traffic should be kept in mind while designing.
* This should be constructed at all important junction stations.
* Multiple yards i.e. separate yards for up and down trains should be constructed.
* Separate platforms known as Transship platforms, for exchange of goods should be provided on one or more sidingsof the marshaling yards. These sidings are generally reserved for sick or defective wagons. Goods can be exchanged from defective wagons to working transits platforms.
* **Types of Marshaling Yards:**
1. **Flat yards:**
* Entire space of yard is almost level and all the sorting works or movements of wagons are carried out by means of engines running to and fro.
* This arrangement is construct to when the power in the use of engines.
* We use to construct when the available space is limited for the layout of marshaling yards.
1. **Gravitational yards:**
* In this tracks are laid at such a gradient, that wagons can move of their own under the action of gravity.
* Movement of wagons is controlled by wagons brakes manually.
* The success of such gravitational yard requires certain slope for the formation.

But topography of yards site may not permit for such a formation.

1. **Hump Yards:**
* In this artificial hills are provided and wagons are pushed upon a hump by this engine.
* This hump is provided at entrance of sidings. The wagons are tehn allowed to more into the sidings down the hump under the action of gravity.
* Therefore, a hump yard can be said to be gravitational yards as shutting operations are done under gravity.
* Modern practices are to use in hump yards because shunting operations are done more quickly than flat or gravitational yards.
* This yards also economical as no power is required to move the wagon.

**Desirable gradients:**

* Initial stage, raising gradient 1in 150 or 1 in 175 is provided at pushing end.
* Middle stage hump is provided on a level stretch
* Falling gradients of 1 in 150 or 1 in 300 and then brought to level.

Individual wagon or group of wagons are pushed up the hump and from there, they roll down to appropriate sidings. The stopping of wagons rolling down in hump yards at the exact place is carried as

1. **Manual Method :**
* Men to run along the wagon and apply the wagon brakes at the exact place of stoppage.
1. **Automatic Method:**
* In some countries automatic braking is also employed to moving wagons.
* In this fixing type blocks or bars known as Retarders are used on either sides of rails.
* These Retarders are operated electrically or electro pneumatically so that they press against the sides of moving wheels and brings the wagons to stop.
1. **Skid Method:**
* In these placing skids on rails has been tried.
* A rolling wagon drags the skid and friction thus developed stops the further movement of the wagons.
1. **Locomotive Yards:**
* In which locomotives are housed and where the facilities for coaling, watering, repairing, oiling, cleaning etc., are provided for serving and stability of locomotives.
* These constructed on same side as the marshaling yards and installed at junction stations.
* Loco yards contain a no. of tracks leading to the engine shed, ash pits, inspection pits, turn table, coaling site, repair shed etc.,

Servicing at a steam engine includes removal of ashes from the fire-box, blowing down steam, filling water from water-column, loading coal and carrying out minor repairs.

* **Requirements of Loco yards:**
1. Tracks in loco yards be arranged that servicing of the engine may be done in proper sequence.
2. Line from traffic yard to the turn table should be clear.
3. One extra emergency entrance line from the traffic yard known as subsidiary line should be provided for use when main entry is blocked due to derailment etc.,
4. Turn table shouldn’t act as an obstruction to any of the locomotives which are entering the yard.
5. Length of loop line for the fuel platform should be such as to accommodate the longest train.
6. No. of length of sidings should be sufficient to accommodate the maximum no. of engines (likely to use the yard at a time).
7. Sick- sidings should be easily accessible from the loco yards.
8. Sufficient space should be left in the yard for future expansion.

**PLATFORM:**

A raised level surface, from where either passengers board and alight from trains or loading and unloading of goods is done is known as PLATFORM.

**Passenger platform :** It is meant for passengers who are using the types of railways.

**Requirements are**,

* It should cover for a minimum distance of 60m of their length.
* Minimum width of 3.66m of platform should be paved.
* End of the raised platform should be in the forms of a ramp with a maximum slope of 1:6.
* Adequate arrangement of lighting should be in the form made for efficient and safe running of trains at night.
* Adequate drinking water facilities should be provided and necessary sanitary arrangements be made.
* Names of stations should be written on a R.C.C. board in bold letters in Hindi, English and any regional language. Those boards are placed at Extremities of the platform and right angles to the moving track and height of board from platform level is generally kept 1.8m.

**Length and width of passenger platform:**

* Length of platform is governed by the length of longest train (excluding engine length).
* Minimum length specified for passenger platform is 180m for all the gauges except B.G. In case of B.G. 305m length is provided.
* Width of passenger platform varies in accordance with the importance of station but minimum permissible width in front of a station building for all gauges is 3.66m.

**Goods Platform:**

* It is used for loading and unloading of goods.
* Goods shed should are generally higher so as to negotiate with high wagon floors weighing arrangements should be made on platforms.
* Proper drainage facilities should be provided.
* Facilities for direct access from the goods platforms to the goods sidings and to marshaling yard should be provided.
* Minimum width of goods platform is 3.1m
* Permissible heights are on B.G. 1.07m

 M.G. 0.69m

 N.G. 0.61m

**POINTS AND CROSSINGS:**

Points, crossings, turnouts, crossovers are arrangements by which different routes either parallel or diverging are connected and afford the means for trains to move from one route to another.

i.e. These connections are not only useful for trains to move from one route to another but also help for marshalling and shutting works in yards.

**Necessity of Points and Crossings:**

1. Points and crossings provide flexibility of movement by connecting one line to another according to requirements.
2. Also helps for imposing restrictions over turnouts which necessarily retard the movements.
3. From safety aspect, it is also important as points and crossings are weak kinks or points in the track and vehicles are susceptible to derailment of these places.

**TURNOUTS:**

It is simplest combination of points and crossings which enables one track either a branch line or a siding, to take off from another track.

**Types of turnouts**

1. Left hand turnout
2. Right hand turnout

 **Parts of Turnouts :**

1. A pair of points or switches.
2. A pair of stock rails
3. A crossings
4. Two check rails
5. 4 lead rails
6. Switch-tie or gauge tie chair and crossings tie plate.
7. Studs or stops
8. Bearing plates, slide chairs, cranks, levers etc.

 **Points of switches:**

* A switch consists of a stock rail and a tongue rail.
* A set of switches or points consists of left-hand switch and a right hand switch.
* Switches are tapered rails with the thicker end known as the heel fixed to the main track and thinner end known as the toe movable by means of which the flanged wheels of the trains are diverted from one route to another.

**Various component parts:**

1. pair stock rails
2. pair of tongue rails
3. heel block or distance block
4. stretcher bars
5. switch tie plate or gauge tie plate
6. slide chairs or sliding plates
7. studs or stops
8. **A pair of stock rails:**
* These are main rails of track to which made of (steel rail) rail steel the tongue rails fit closely them against.
1. **A pair of Tongue Rails:**
* These rails lie between the two rails
* Tongue rails are supported on sliding plate and each pair of tongue rails is connected by stretcher bars near the toe of switch.
* So that both the tongue rails move together through the distance or gap of maintain the gauge.
1. **Heel blocks or distance blocks:**
* Heel blocks are inserted between the heel of the tongue rail and stock rail.
* These are made of C.I. and are used provide a clear gap i.e. to maintain proper heel divergence.
* Distance block provided between check rail and running rail to provide clearance distance.
1. **Stretcher bars:**
* The toes of both the tongue rails are connected together by means of stretcher bars , so that each tongue moves through the same distance or gap while changing the points.
* Generally two or three bars are used near and behind the toe.
1. **Switch tie plate:**
* This is provided below the slide chairs at the toe also known as ‘stops’ at the ends to ensure the definite location of slide chairs.
1. **Slide chairs:**
* Which are provided under the stock and tongue rails.
* These are essential because tongue rails have to move towards or away from stock rail.
* On these sliding plates, the stock rail have to move towards or away from stock rail.
* On these sliding plates, the stock rail remains fixed while the tongue rails are able to slide.
1. **Slides or stops:**
* These are fixed between the stock rails and tongue rails.
* Used to prevent the lateral bending of the tongue rail and subsequently maintain correct alignment when the wheels rollover the points.

**Types of Switches:**

1. Sub switch
2. Split switch
3. **Sub switch:**
* In this no separate tongue rail provided and same portion of switch of the track is moved from side to side.
* It is old form of switch and has got many objectionable features in its performance.
* This type is no more in use and has replaced by the spilt switch, Which is now universally adopted.
1. **Spilt switch:**
* In this type a tongue rail is combined with the stock rail again spilt. Switches are classified as
1. On the basis of fixation at heel
2. Loose heel type or articulated type
3. Fixed heel type or spring type or flexible type.
4.
5. Under cut switches
6. Over riding
7. Straight cut switches
	* 1. **Loose heel types :**
* In this tongue rails are joined to lead rails by means of fish plates. This is suitable for short length switches.
* Front two bolts are kept loose to allow the throw of switch and these bolts are kept tight when the tongue is open.
	+ 1. **Fixed heel type:**
* This is improvement over loose hell type switch.
* In this and bolts are tight when the tongue is closed.
* It has given quite satisfactory results when long tongue rails are used
* Therefore, fixed heel type switch is suitable with long tongue rails only.
	1. **i) Under cut switches:**
* In case the height of stock and tongue rails is same, it is desirable to cut out a portion of flange at the foot of stock rail.
* So that the toe of tongue rail is accommodated under the head of stock rail.
* Disadvantage is it becomes weak because a flange portion is cut out.
* This is generally used on narrow gauges lines.

 **ii) Over riding switches:**

* In this separate rail sections of stock rails and tongue rails are adopted.
* The stocks rails of heavy section and tongue rail of light section are used instead of cutting the flange like in case of undercut switches.
* Tongue rail, in this type rides over the flange of stock rail. Such switches.
* This is generally used on B.G. and M.G. tracks.
* Modified form of over-riding switch commonly used in U.S.A.

In this tongue rail is kept higher by 6mm than stock rail.

**Straight cut switches:**

* The tongue rail is cut straight in the line with the stock rail and hence formed as
* This is done to increase the thickness of toe tongue rail, which as a result increases the strength.

**CROSSINGS:**

Crossing or flag is a device which provides two flange ways through which the wheels of the flange may move, then

The flanged wheels of the train jump over the gap from ‘throat’ to ‘nose’ of crossing and to check the wheel flanges from striking the nose, the opposite wheel flanges are guided by use of ‘check rails’ inside the running rails.

**Requirements of good crossing:**

1. Assembly of crossings has to be rigid to stand against serve vibrations which cause loosening of the compartments.
2. The wear on parts of wing rails, opposite the nose and also the nose itself must be protected it can be achieved by use of special steel alloy steels are generally used for this purpose.
3. Crossing body should be rigid and as long as practicable.
4. Nose of crossing should have some thickness, from practical considerations.

**TYPES OF CROSSINGS:**

1. **On the basis of shape crossings:**
	* 1. **Acute angle crossings or V crossings or frog:**
* This type of crossing widely used. This crossing is obtained when a left-hand rail of one track crosses a right-hand rail of another track.
* If the angle of intersection of the approaching rails is acute angle it is termed as acute crossing.
* It consists of point and splices rails and check rails.
	+ 1. **Obtuse angle crossing :**
* This crossing obtained when left-hand rail of one track crosses right-hand of another track or vice versa at an obtuse angle.
* Diamond crossing, a pair of special crossing is used which is called ‘obtuse crossing’.
	+ 1. **Square crossing**:
* When 2(trucks) straight cross each other at right angles, they give rise to square crossings. This type of crossing must be avoided on main line because there is heavy wear due to dynamic loads.
1. **On the basis of assembly of crossing:**
2. **Spring or movable crossing:**
* In this one wing rail is movable is held against the vie of the crossing with a strong helical spring. By doing this, it makes the main track continuous and this crossing becomes very useful when there is high speed traffic on main tracks and light speed traffic on branch line or a turnout.
* This type used in U.S.A but in India spring crossing is not favored because there is a danger of accidents in case of spring failure.
1. **Ramped crossing:**
* In case of complicated yard with heavy but slow speed traffic. This type of crossing may be used with safety for slow speeds.
* **Check rails :** These are subsidiary rails parallel to the running rails. These are provided on the opposite side of the crossings angle to serve the derailment at level crossing.
* **Wing rails:** These are bent at the ends. One end of the wing rail is connected to rail whereas other end is flared. This flaring is done to facilitates the entry and exit of flange wheels to the gap.
* **Lead rails:** Lead rails are the length of the rails from the heel of the tongue rail to the toe of the crossings.
* **Bearing plate:** To reduce the intensity of pressure, particularly on soft variety of sleepers ,a rectangular plate of mild steel or cast iron is introduced between the rails and the sleepers. It distributes load over a larger area of timber sleepers.

 **Level crossings:**

* When railway line and a road cross each other at the same level, it is called a level crossing.
* Surface of the load is kept at rail level and grooves are left in the road surface along the inner edges are provided with guard rails which are spiked to wooden sleepers.

Types of facilities provided at level crossing depends upon 3 factor’s

1. Nature of the road
2. Nature of the traffic on road
3. No. of trains passing over the level crossing.

**Types of level crossings:**

1. Special class : Traffic is exceptionally heavy.
2. A Class : Level crossing on grand trunk roads.
3. B Class : Level crossings on metal roads.
4. C Class : Level crossings on un metal roads.
5. D Class : Cattle ‘ramps used for cattle and pedestrians only.

**Special Class:**

 On very important roads a special class of crossing is provided to suit individual site conditions. The design of such special class will not follow the rules as given for other types of crossings. It is also possible that an over-bridge or under-bridge may be required and level crossing may be avoided depending on site condition and traffic.

**A Class:**

* All the classes of level crossings may be guarded or unguarded.
* In case of guarded level crossings, gates or movable barriers are placed to check the movement of vehicles on the road while the train is passing over the crossing.
* The gates or barriers are operated by watchmen of railways for safety movement of trains and road vehicle.
* In case of ungrounded level crossings, no such arrangements are made and there is every possibility of accident between moving train and crossing road vehicle.
* So it strongly recommended that unguarded crossing should be avoided even on unimportance roads as far as possible.

**A class level crossing must satisfy the following condition:**

1. Angle of crossings should be preferably 90 degrees but no class should less than 45degress.
2. Minimum 2 watchmen should take care of level crossing and hut of watchmen should obstruct the clear view of gate crossings.
3. Minimum gate width of 7.3m should be fully paved.
4. At least a level length of 7.5m to act as a platform for waiting vehicles, beyond each gate should be provided.
5. View of level crossing should be clear from approach roads.
6. Approach roads meeting at level crossing should be straight at least for 30m on either side of railway line.
7. Minimum radius of approach is 45m and Maximum gradient should be 1 in 30.

**Class B:**

All rules for crossing A, also to class B except

* Minimum gate width may be 3.7m
* Minimum radius for approach road 30m.
* Minimum one watch men should be appointed to care of level crossing.

**Class C:**

* Gate width should be at least 3.7m.
* Width of metal road portion should be 2.7m
* At least a level length of 7.5 m should be provided.
* Maximum gradient for approach should not be more than 1in 20.

**Class D:**

* This type is provided on unimportant roads this crossing is unguarded crossing and only on inlet into the fencing for pedestrians and cattle to pass is provided .