CHAPTER

26

Railway Stations and Yards

Introduction

A railway station is that place on a railway line where traffic is booked and dealt with and where trains are given the authority to proceed forward. Sometimes only one of these functions is carried out at a station and accordingly it is classified as a flag station or a block station. In the case of a flag station, there are arrangements for dealing with traffic but none for controlling the movement of the trains. In the case of a block station, a train cannot proceed further without obtaining permission from the next station and traffic may or may not be dealt with. However, most railway stations perform both the functions indicated above.

26.1 Purpose of a Railway Station

A railway station is provided for one or more of the following purposes.

(a) To entrain or detrain passengers
(b) To load or unload goods or parcels
(c) To control the movement of trains
(d) To enable trains to cross each other in the case of a single-line section
(e) To enable faster trains to overtake slower ones
(f) To enable locomotives to refuel, whether it be diesel, water, or coal
(g) To attach or detach coaches or wagons to trains
(h) To collect food and water for passengers
(i) To provide facilities for change of engines and crew/staff
(j) To enable sorting out of wagons and bogies to form new trains
(k) To provide facilities and give shelter to passengers in the case of emergencies such as floods and accidents, which disrupt traffic

26.2 Selection of Site for a Railway Station

The following factors are considered when selecting a site for a railway station.

Adequate land There should be adequate land available for the station building, not only for the proposed line but also for any future expansion. The proposed area should also be without any religious buildings.

Level area with good drainage The proposed site should preferably be on a fairly level ground with good drainage arrangements. It should be possible to provide

the maximum permissible gradient in the yard. In India, the maximum permissible gradient adopted is 1 in 400, but a gradient of 1 in 1000 is desirable.

Alignment The station site should preferably have a straight alignment so that the various signals are clearly visible. The proximity of the station site to a curve presents a number of operational problems.

Easy accessibility The station site should be easily accessible. The site should be near villages and towns. Nearby villages should be connected to the station by means of approach roads for the convenience of passengers.

Water supply arrangement When selecting the site, it should be verified that adequate water supply is available for passengers and operational needs.

26.3 Facilities Required at Railway Stations

The passenger station is the gateway through which people find their way into a town or community. A first impression is a lasting one and, hence, a well designed station building with well-maintained surroundings is important. Whilst service is the main consideration, the type and finish of a station building should be, as far as practicable, in keeping with the best standards of civic amenities available in that area. A large passenger station should provide for facilities corresponding to the anticipated demands of at least the first 20 years of its life, with provisions for future expansion. The facilities required at stations are broadly classified into the following main groups.

Passenger requirements

This includes waiting rooms and retiring rooms, refreshment rooms and tea stalls, enquiry and reservation offices, bathrooms and toilets, drinking water supply, platform and platform sheds, and approach roads.

Traffic requirements

This includes goods sheds and platforms, station buildings, station master's office and other offices, signal and signal cabins, reception and departure lines and sidings, arrangements for dealing with broken down trains, and station equipment.

Locomotive, carriage, and wagon requirements

This includes the locomotive shed, watering or fuelling facilities, turntable, inspection pits, ashpits, ashtrays, etc.

Staff requirements

This includes rest houses for officers and staff, running rooms for guards and drivers, staff canteens, etc.

26.4 Requirements of a Passenger Station Yard

The main requirements of a passenger yard are the following.

(a) It should be possible to lower the signals for the reception of trains from different directions at the same time. This facility is particularly necessary at junction stations so that all the trains what are to be connected with each other may be received at the same time.
(b) Unless all trains are booked to stop at the station, it should be possible to run a train through the station at a prescribed speed.
(c) In the case of an engine changing station, an engine coming from or going to a shed should cause minimum interference in the arrival and departure of trains.
(d) An adequate number of platforms should be provided so that all trains can be dealt with at the same time.
(e) There should be convenient sidings where extra carriages can be stabled after having been detached from trains or before their attachment to trains.
(f) There should be provision of facilities for dealing with special traffic such as pilgrim and tourist traffic, parcels in wagon loads, livestock, and motor cars.
(g) Stabling lines, washing lines, sick lines, etc., should be provided as per requirement.

26.5 Classification of Railway Stations

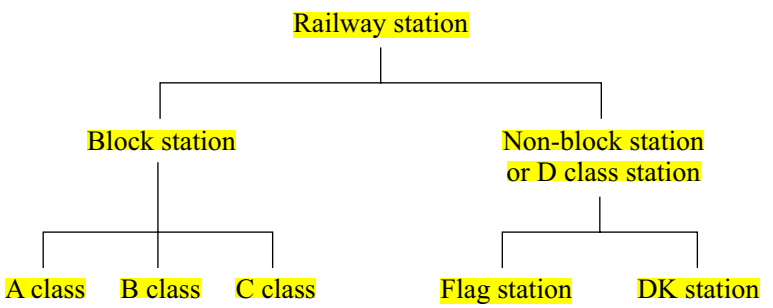
Railway stations can broadly be sorted into various classes on the basis of two main considerations.

Operational considerations

As per the general and subsidiary rules of Indian Railways stations are classified as block stations and non-block stations. Block stations are further classified as A class, B class, and C class stations. Non-block stations are classified as D class or flag stations.

Functional considerations

Stations are classified based on the functions they are required to perform. Under this category, stations are classified as halt stations, flag stations, crossing stations or wayside stations, junction stations, and terminal stations.



The following factors are taken into consideration when classifying a railway station.

(a) Least expenditure with regard to the provision of the least number of signals
(b) Flexibility in shunting operations
(c) Increasing the line capacity
(d) Faster movement of trains

26.5.1 Block Stations

A block station is a station at which the driver has to obtain an 'authority to proceed' in order to enter the next block section. In a railway system that is inclusive of block stations, the entire railway line is divided into convenient block sections of 5 to 10 km and a block station is provided at the end of each block. This system ensures that a suitable 'space interval' is provided between running trains so that there are no collisions and accidents. There are three types of 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 and locked. No shunting can be done after line clear has been granted.

A class stations are suitable for sections where traffic passes rapidly. It is essential for the driver of the train to have an advance knowledge of the layout of the block station. The typical layout of an A class station with two-aspect signalling is shown in Fig. 26.1.

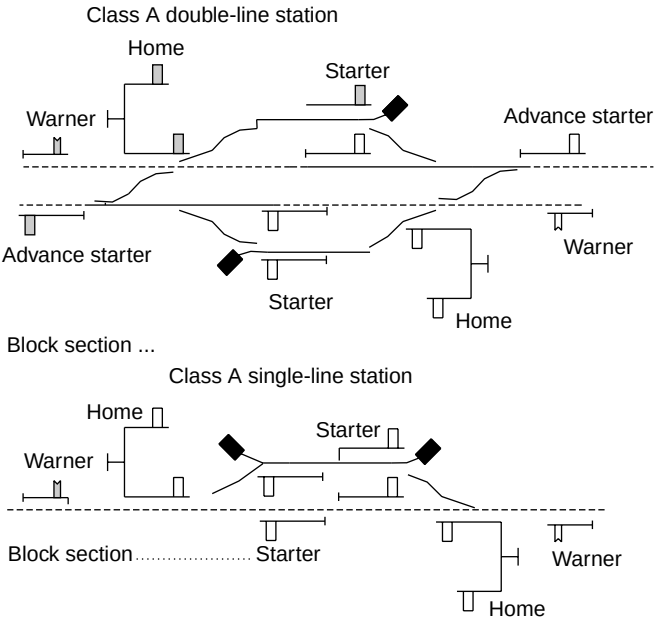


Fig. 26.1 A class station

The signals required at an A class station are as follows.

Warner A warner signal is placed at a warning distance from the home signal, the main function of which is to indicate whether the section beyond is clear or otherwise.

Home A home signal, which is the first stop signal.

Starter A starter signal is placed at an adequate distance from the home signal and marks the point up to which the line should be clear so that the train can be given permission to approach.

Advance starter This signal is optional and is provided to allow the drivers to further increase the speed of the trains.

Advantages

(a) More economical vis-à-vis B class stations because of the use of fewer signals.
(b) Ensures the safety of the train because of the provision a warner signal ahead of a home signal.
(c) Trains normally stop within the station limits.

Disadvantages

(a) No shunting is possible once line clear has been granted.
(b) Another clear disadvantage of A class stations, is that a line at the station has to be kept clear up to the starter signal once the line clear signal has been given, and as such the flexibility of working and shunting is restricted.

B class station

This is the most common type of station and is provided on single-line as well as double-line sections. At a B class station (Fig. 26.2), the line has to be clear up to an adequate distance beyond the outer signal before 'permission to approach' can be given to a train. The minimum signals required at a B class station are as follows.

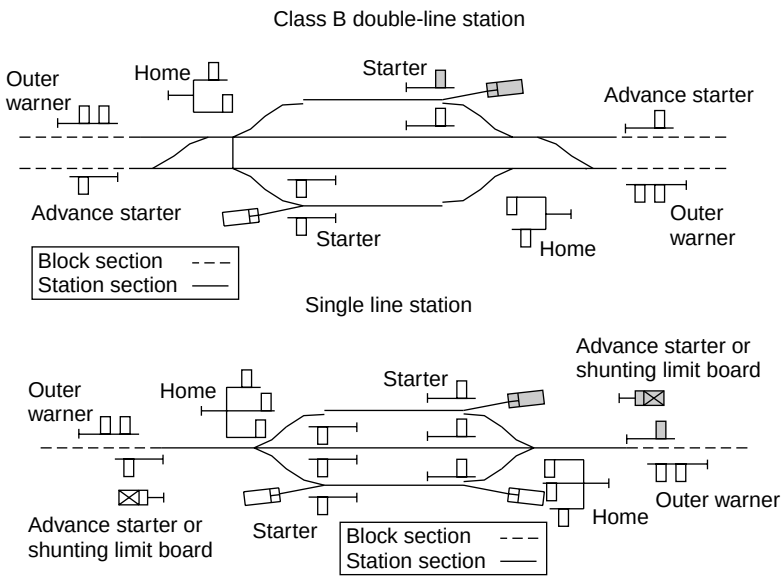


Fig. 26.2 B class station

Outer An outer signal, which is the first stop signal. The outer signal can also be below the warner also.

Home A home signal, which protects the facing point and is placed at an adequate distance from the outer signal.

Starter A starter signal is also provided on a double-line section.

The B class station is the most common station in use on Indian Railways because it offers greater flexibility of working. By providing a warner on the outer arm post, this station can also cater to fast traffic while permitting shunting of vehicles even when a clear signal has been given.

C class station

The C class station (Fig. 26.3) is only a block hut where no booking of passengers is done. It is basically provided to split a long block section so that the interval between successive trains is reduced. No train normally stops at these stations. The minimum signals required are as follows.

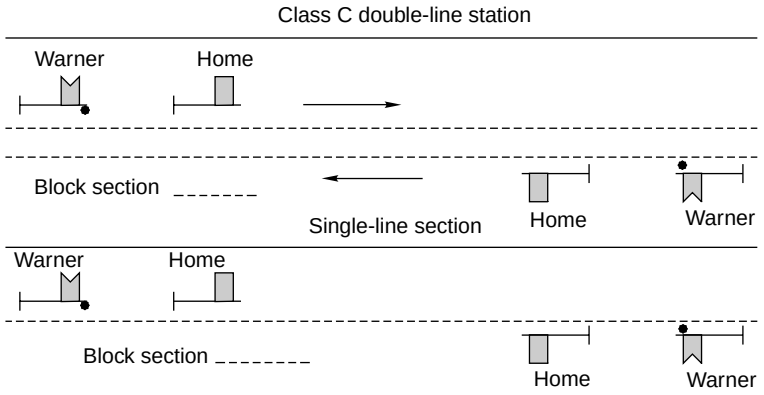


Fig. 26.3 C class station

Warner A warner signal placed at an adequate warning distance from the home signal to indicate whether the section ahead is clear or not.

Home A home signal, which is the first stop signal.

The advantage of a C class station is that it ensures the faster movement of trains and increases line capacity. The disadvantage, however, is that no shunting is possible and trains cannot stop at these stations.

26.5.2 Non-block Stations or D Class Stations

D class or non-block stations are located between two block stations and do not form the boundary of any block section. No signals are provided at D class stations.

A D class station that serves an outlying siding is called a *DK station*. At such a station, the siding takes off through a crossover, which can be operated only with the help of a key, which in turn is released with the help of a ball token. A D class station that serves no siding is called a *flag station*.

26.5.3 Functional Classification of Stations

The layout of stations varies in size and importance according to the type and volume of traffic handled and according to their locations with respect to cities or industrial areas. Broadly speaking, the layouts required for passenger stations and their yards can be divided into the following categories for the purpose of study.

(a) Halts
(b) Flag stations
(c) Roadside or crossing stations
(d) Junction stations
(e) Terminal stations

Halt

A halt (Fig. 26.4) is the simplest station where trains can stop on a railway line. A halt usually has only a rail level platform with a name board at either end. Sometimes a small waiting shed is also provided, which also serves as a booking office. There is no yard or station building or staff provided for such types of stations. Some selected trains are allotted a stoppage line of a minute or two at such stations to enable passengers to entrain or detrain. The booking of passengers is done by travelling ticket examiners or booking clerks. A notable example of the halt is a Gurhmukteshwar bridge halt, which is situated on the bank or river Ganga.

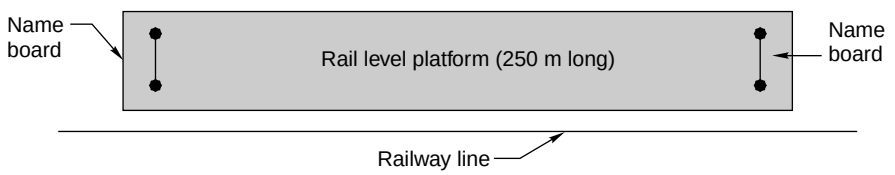


Fig. 26.4 Layout of a halt station

Flag station

A flag station (Fig. 26.5) is more important as a stop-over for trains than a halt and is provided with a station building and staff. On controlled sections, a flag station is equipped with either a Morse telegraph or a control phone, which is connected to one of the stations on either side to facilitate easy communication. A flag station is usually provided with a small waiting hall and booking office, platforms and benches, and arrangements for drinking water. Sometimes a flag station is also provided with a siding for stabling wagons booked for that station.

Wayside or crossing station

After a flag station comes the wayside or crossing station. While a flag station has arrangements for dealing with traffic but none for controlling the movement of the trains, a crossing station has arrangements for controlling the movement of trains on block sections. The idea of a crossing station was initially conceived for single-line sections, to facilitate the crossing of trains going in opposite directions so that there may be a more rapid movement of trains.

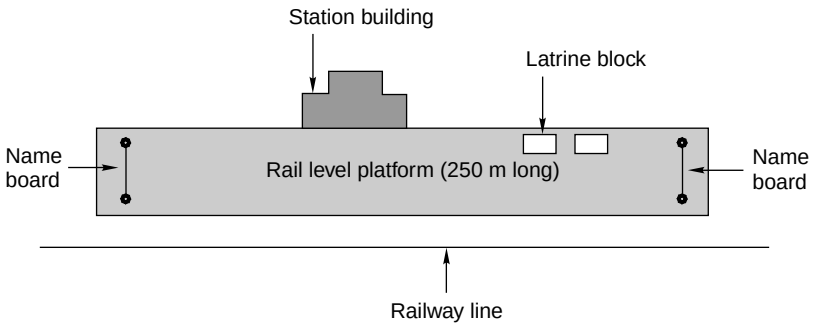


Fig. 26.5 Layout of a flag station

Crossing stations may be further classified as (a) Roadside small- and medium-sized stations and (b) Major stations. Some of the important tasks dealt with these stations are the following.

Operating work The main operations performed at these stations include attending to the passing and crossing of trains, giving precedence to important trains, and other miscellaneous works done for stopping passenger trains. Slow passenger trains mostly stop at small stations whereas mail and express trains stop at major stations.

Goods traffic These stations mostly deal with parcel traffic only. Piecemeal wagon load goods traffic is now being accepted on roadside stations as per the new policy of the Railway Ministry with effect from December 1994.

Operation of points and signals The operation of points and signals is controlled either by a central cabin or two cabins at either end of the station.

Reception and dispatch of trains The reception and dispatch as well as shunting of trains is handled as per the instructions laid down in the 'station working order'. Block instruments are provided either in the station master's office or in the cabin, but the entire responsibility of carrying out these operations lies with the station master.

Station master's duty for run-through trains When a train runs through the station, the station master should stand opposite his office in proper uniform and exchange 'all right' signals with the driver and guard of the train. He should watch the running train carefully and if there are any unusual occurrences such as the incidence of a hot box, he should instruct the station officials in advance to stop and examine the train.

Wayside or crossing station on a single-line section Increasing traffic on a single-line section necessitates the construction of a three-line station, which provides an additional line as well as more facilities for passing traffic. A typical layout of a three line station providing one additional line and simultaneous reception facilities is given in Fig. 26.6. It may be possible to improve the facilities further by introducing an additional line to deal with goods traffic.

The following are some of the important features of this track layout.

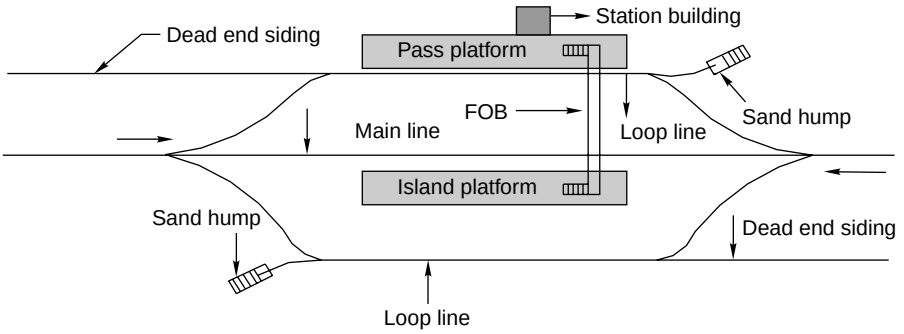


Fig. 26.6 A wayside or crossing station on a single-line section

(a) It is a three-line station and provides facilities for the simultaneous reception of trains from both sides because of the proximity of sand humps in each direction.
(b) There are two platforms, namely, an island platform and a platform near the station building. The island platform can deal with two stopping trains simultaneously. Also, if a goods train has to be stopped at an island station, it can be accommodated on the loop line of the platform, thus keeping the main line free for run-through traffic. Important trains can be made to halt on the platform near the station building.
(c) There is a dead end siding at either end of the station to accommodate wagons that are marked sick.
(d) The foot over bridge (FOB) helps the passengers to reach the island platform from the station building and vice versa.

Double-line crossing station with an extra loop In the case of a double-line section, which consists of separate up and down lines to deal with traffic moving in either direction, the layout of a station yard is somewhat different.

Figure 26.7 shows a double-line station with three lines receiving, with one common loop for trains coming from both sides. Some of the important features of this layout are as follows.

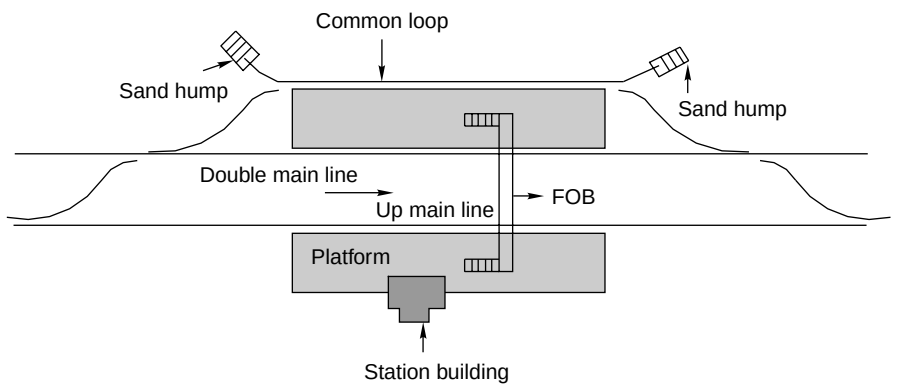


Fig. 26.7 Double-line crossing station with three lines

(a) This is a wayside station for a double-line section with almost minimum facilities.
(b) In addition to two main lines an up line and a down line, there is a common loop that can receive trains from either direction. There is a total of three lines only.
(c) It consists of two platforms, one an island platform and the other a platform beside the station building.
(d) There is a foot over bridge to connect the station building to the island platform and back.
(e) There are emergency crossovers provided on either side of the station so that it can be converted into a single-line station in the case of an emergency.

Double-line crossing station with four lines The more common layout of a station yard on a double-line section has four lines station as shown in Fig. 26.8. The important features of this layout are as follows.

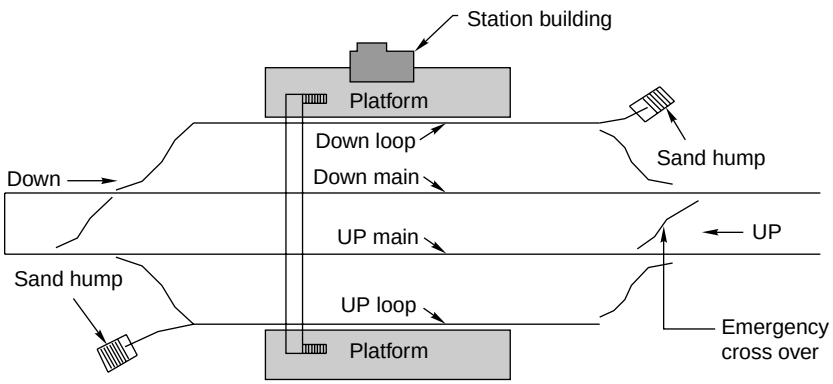


Fig. 26.8 Double-line crossing station with four lines

(a) This is a four-line station, where, apart from two up and down main lines, there are two extra loops. These loops are directional loops, i.e., one is known as a down loop as it is meant for down trains while the other is an up loop and is meant for up trains.
(b) There are two platforms provided with connection loops. One of these platforms can also be an island platform.
(c) There is provision of a foot over bridge to connect the two platforms.
(d) Two emergency crossovers are provided on either side of the station so that is can be converted into a single-line station in the case of an emergency.

Junction stations

A junction station is the meeting point of three or more lines emerging from different directions. Normally at junctions, trains arrive on branch lines and return to the same station from where they started or proceed to other stations from where they again return to their originating stations.

The typical layout of a junction station with a single main line and a single branch line is shown in Fig. 26.9. The important features of junction stations are as follows.

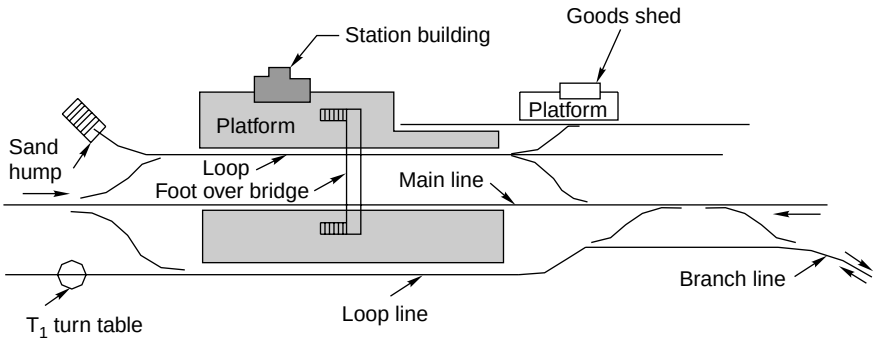


Fig. 26.9 Junction station with single main line and single branch line

(a) There are two platforms—one is the main line platform and the other is an island platform. In case the timings of two trains match, both the trains can be received and made to wait on either side of the island platform. This helps in the easy trans-shipment of passengers and luggage. Also, main line as well as branch line trains can be received on the main platform.
(b) A foot over bridge is provided for passengers to move between the station platform and the island platform.
(c) It is provided with a small goods siding and a goods platform to deal with goods traffic.
(d) A turntable is provided for reversing the direction of an engine, if required.
(e) The emergency crossover on provided either side of the station helps in switching to a single-line set-up in the case of an emergency.

A few examples of junction stations are the Ghaziabad, Allahabad, Itarsi, Nagpur, and Jabalpur junctions. The typical layout of a junction station on a double-line section with one or two branch lines coming in from one or two different directions is shown in Fig. 26.10. The most important feature of this layout is that such a station receives traffic from four different directions, i.e., up main line, down main

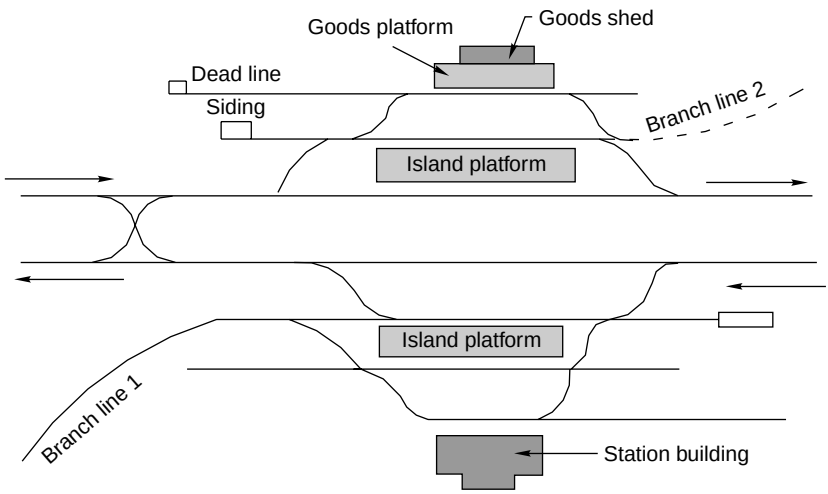


Fig. 26.10 Junction station with double main line and two branch lines

line, branch line 1, and branch line 2. Most of the facilities provided at this station are almost the same as described for the layout shown in Fig. 26.9.

Terminal station

The station at which a railway line or one of its branches terminates is known as a terminal station or a terminal junction (Fig. 26.11). The reception line terminates in a dead end and there is provision for the engine of an incoming train to turn around and move from the front to the rear of the train at such a station. In addition, a terminal station may need to be equipped with facilities for watering, cleaning, coaling, fuelling, and stabling the engines; storing, inspecting, washing and charging the carriages; and such other works.

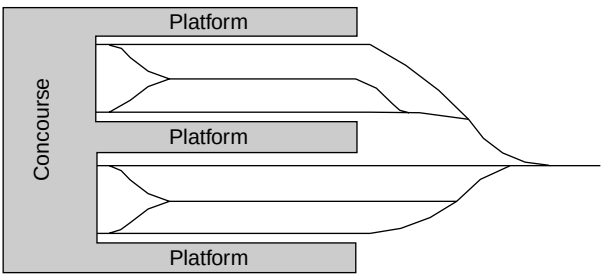


Fig. 26.11 Terminal station with run round line

On unimportant branch lines, the terminal station will have only one platform, but there are big terminal stations such as the Howrah and Mumbai stations, which are provided with elaborate facilities. The general layout of a big terminal station is shown in Fig. 26.12.

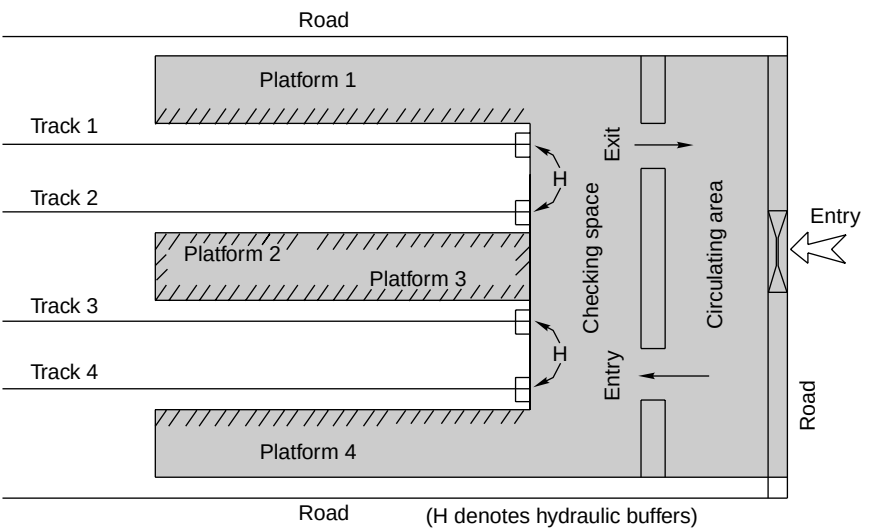


Fig. 26.12 Layout of a big terminal station

It may be noticed that access from one platform to another is via a concourse and that there are no overbridges provided for this purpose.

Grand Central Station at New York Figure 26.13 depicts the circular loop provided at the Grand Central Station, New York. The provision of circular loops enables the trains to pass through a terminal station without any delay. A further advantage attached to the loop system is that it enables the provision of special stations for dealing with suburban traffic at underground locations away from the congested area of the main terminal and in close proximity to business districts, thus affording direct connections with other stations.

26.6 Station Platforms

Station platforms are provided for the entraining and detraining of passengers. Platforms can be rail-level, low-level, or high-level platforms depending upon the expected passenger traffic at each station. The general policy of Indian Railways is to provide high-level platforms at all important main line stations, low-level platforms at less important main line stations, and rail-level platforms at unimportant wayside stations.

The height of rail level platforms coincides with the rail level, low-level platforms lie at a height of 455 mm (1′–6″), and high-level platforms lie at a height of 760 mm to 840 mm (2′–6″ to 2′–9″) in the case of BG lines and 305 mm to 405 mm (1′–0″ to 1′–4″) in the case of MG lines. Other details of these platforms are given in Table 26.1.

Table 26.1 Important features of passenger and goods platforms

Item	*Details*	
Passenger platforms		
Height of platform	High-level platforms (for all important main line stations)	0.76–0.84 m on BG, 0.305–0.405 m on MG
	Low-level platforms (less important than these for main line stations)	0.455 m on BG
	Rail-level platforms (for unimportant wayside stations)	At rail level
Length of platform	Enough length to accommodate the longest passenger train on the station. Minimum length of platform to be 180 m. Normally, a platform of a length of 450 m is provided on a main line to accommodate 20 bogies.	
Width of platform	Platform to be wide enough to accommodate the entire train load of passengers. The suggested yardstick for the width of a platform is 1.5 m^2 per passenger for main line and 1.0 m^2 per passenger for suburban trains. Minimum width of platform to be 3.66 m.	
End of platform	A ramp is provided with a slope of 1 in 6.	

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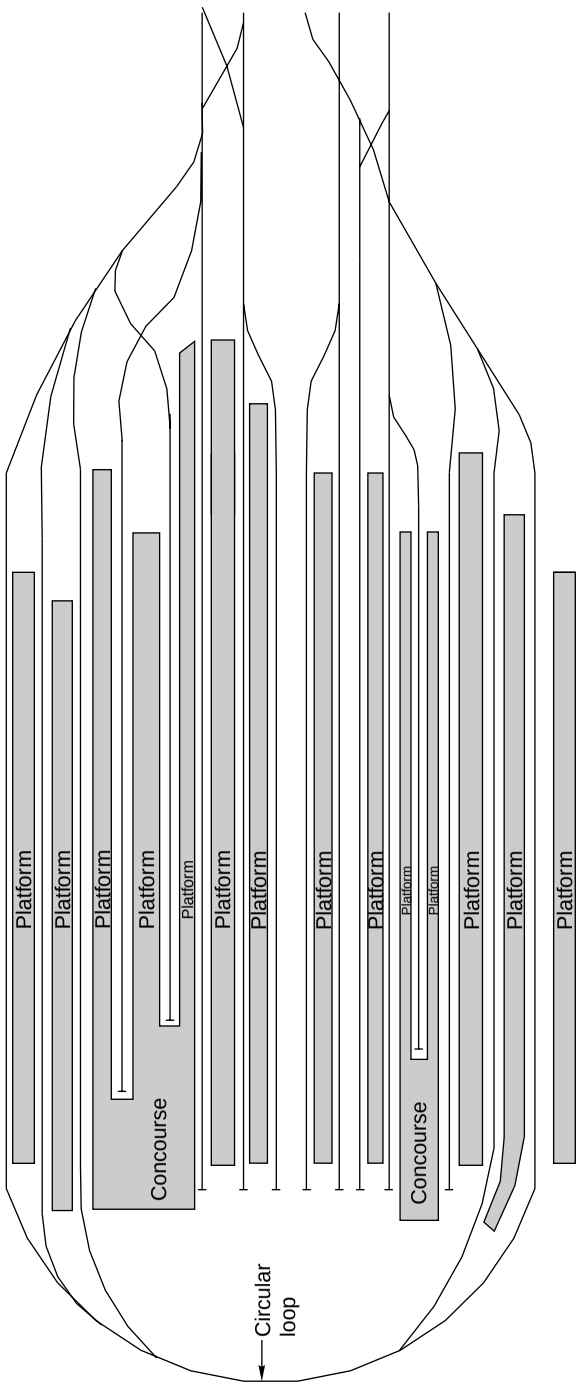


Fig. 26.13 Circular loop at Grand Central Station, New York

Table 26.1 (*contd*)

Item	*Details*
Platform cover	Platform to be covered as per passenger requirement. Minimum length of platform cover to be 60 m.
Water supply	The number of taps approved is two taps per 100 passengers.
Toilets, urinals, and bathrooms	The prescribed scale is four toilet seats per 100 passengers, one urinal per 100 passengers, and one bathroom per 200 passengers.
Station name boards	Two station name boards to be placed, one on each side of the platform, perpendicular to the track. Name of the station to be written in Hindi, English, and the regional language. Height of underside of boards to be 1.8 m.
Goods platforms	
Height of platform	BG 1.07 m, MG 0.69 m, and NG 0.61 m
Length of platform	Adequate enough to deal with goods received or dispatched; normally not less than 60 m.
Width of platform	Depends upon volume of traffic, minimum width specified is 3.1 m.
Other facilities	Weighing facilities, direct access road, paved platform, etc.

26.7 Main Building Areas for Different Types of Stations

The main facilities provided in the case of a small station are a waiting hall, booking hall, assistant station master's (ASM) office, and storeroom. Different designs have been standardized for each type of station by the various railways, which provide all the facilities required by small and medium-sized stations. When considering big stations, however, the design of an individual station building has to be drafted based on the requirement of passenger traffic with due regard to its architectural features.

Central Railways has prepared a type drawing for wayside stations, which provides different facilities for different types of station buildings as summarized in Table 26.2.

Table 26.2 Facilities at different types of stations

Type of station	*Plinth area (m^2)*	*Scale of facilities*
Type A	118.6	Waiting hall, booking and ASM office, and storeroom
Type B	159.3	Waiting hall, booking and ASM office, parcel office, and storeroom.
Type C	269.4	Waiting hall, booking and ASM/SM office, parcel office, inspection room, and storeroom.
Type D	406.0	II class waiting hall, upper class waiting hall, booking office, ASM/SM office, storeroom, parcel office, inspector's waiting room

26.8 Types of Yards

A yard is a system of tracks laid out to deal with the passenger as well as goods traffic being handled by the railways. This includes receipt and dispatch of trains apart from stabling, sorting, marshalling, and other such functions. Yards are normally classified into the following categories.

Coaching yard

The main function of a coaching yard is to deal with the reception and dispatch of passenger trains. Depending upon the volume of traffic, this yard provides facilities such as watering and fuelling of engines, washing of rakes, examination of coaches, charging of batteries, and trans-shipment of passengers.

Goods yard

A goods yard provides facilities for the reception, stabling, loading, unloading, and dispatch of goods wagons. Most goods yards deal with a full train load of wagons. No sorting, marshalling, and reforming is done at goods yards except in the case of 'sick' wagons or a few wagons booked for that particular station. Separate goods sidings are provided with the platforms for the loading and unloading of the goods being handled at that station.

Marshalling yard

A goods yard which deals with the sorting of goods wagons to form new goods trains is called a marshalling yard. This is discussed in detail in Section 26.8.1.

Locomotive yard

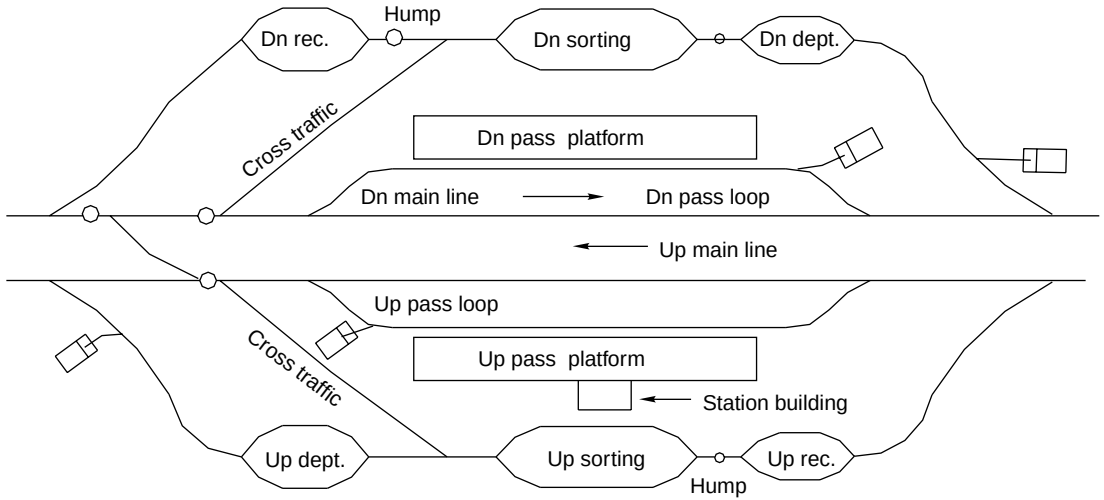
This is the yard which houses the locomotive. Facilities for watering, fuelling, examining locomotives, repairing, etc., are provided in this yard. The yard layout is designed depending upon the number of locomotives required to be housed in the locomotive shed. The facilities are so arranged that a requisite number of locomotives are serviced simultaneously and are readily available for hauling the trains. Such yards should have adequate space for storing fuel. The water supply should be adequate for washing the locomotives and servicing them.

Sick line yard

Whenever a wagon or coach becomes defective, it is marked 'sick' and taken to sick lines. This yard deals with such sick wagons. Adequate facilities are provided for the repair of coaches and wagons, which include examination pits, crane arrangements, train examiner's office and workshop, etc. A good stock of spare parts should also be available with the TXR (train examiner) for repairing defective rolling stock.

26.8.1 Marshalling Yard

The marshalling yard (Fig. 26.14) is a yard where goods trains are received and sorted out, and new trains are formed and finally dispatched to various destinations.



Marshalling yard with separate humps and separate sorting lines

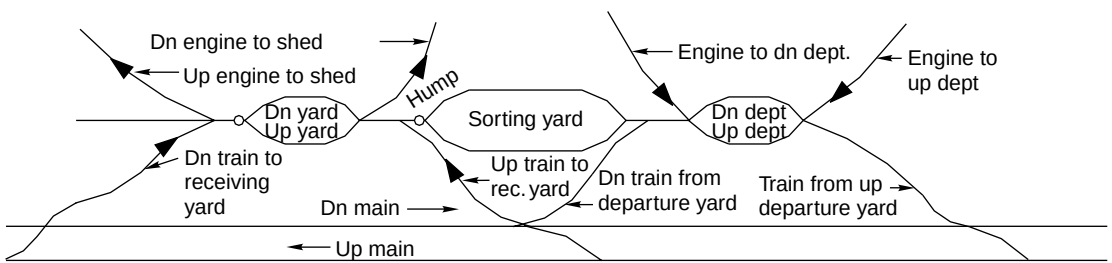


Fig. 26.14 Marshalling yard with a common hump and common sorting yard

This yard receives loaded as well as empty goods wagons from different stations for further booking to different destinations. These wagons are separated, sorted out, properly marshalled, and finally dispatched bearing full trainloads to various destinations. The marshalling of trains is so done that the wagons can be conveniently detached without much shunting en route at wayside stations.

Functions

A marshalling yard serves the following functions at the specified locations within the yard itself.

Reception of trains Trains are received in the reception yards with the help of various lines.

Sorting of trains Trains are normally sorted with the help of a hump with a shunting neck and sorting sidings.

Departure of trains Trains depart from departure yards where various lines are provided for this very purpose. Separate yards may be provided to deal with up and down traffic as well as through trains, which need not be sorted out.

Principles of design

A marshalling yard should be so designed that there is minimum detention of wagons in the yard and as such sorting can be done as quickly as possible. These yards should be provided with the necessary facilities such as a long shunting neck, properly designed hump, braking arrangement in the shape of mechanical retarders, etc., depending upon the volume of traffic. The following points should be kept in mind when designing a marshalling yard.

(a) Through traffic should be received and dispatched as expeditiously as possible. Any idle time should be avoided.
(b) There should be a unidirectional movement of the wagons as far as possible.
(c) There should be no conflicting movement of wagons and engines in the various parts of the yard.
(d) The leads that permit the movement of wagons and train engines should be kept as short as possible.
(e) The marshalling yard should be well lighted.
(f) There should be adequate scope for the further expansion of the marshalling yard.

Types

Marshalling yards can be classified into three main categories, namely, flat yards, gravitation yards, and hump yards. This classification is based on the method of shunting used in the marshalling yard.

Flat yard In this type of yard, all the tracks are laid almost level and the wagons are relocated for sorting, etc., with the help of an engine. This method is costly, as it involves frequent shunting, which requires the constant use of locomotive power. The time required is also more as the engine has to traverse the same distance twice,

first to carry the wagons to the place where they are to be sorted and then to return idle to the yard. This arrangement, therefore, is adopted when

(a) there is limitation of space,
(b) there is a severe limitation of funds, or
(c) the number of wagons dealt with by the marshalling yard is very low.

Gravitation yard In this yard, the level of the natural ground is such that it is possible to lay some tracks at a gradient. The tracks are so laid that the wagons move to the siding assigned for the purpose of sorting by the action of gravity. Sometimes, shunting is done with the help of gravity assisted by engine power. However, it is very seldom that natural ground levels are so well suited for gravitation yards.

Hump yard In this yard, an artificial hump is created by means of proper earthwork. The wagons are pushed up to the summit of the hump with the help of an engine from where they slide down and reach the sidings under the effect of gravity. A hump yard, therefore, can be said to be a gravitation yard as shunting is done under the effect of gravity. The gradients normally adopted in this regard are listed in Table 26.3. These are, however, only recommended gradients and the final gradient for a particular yard is decided after a test run of the trains over the humps, taking into consideration the rolling quality of different types of wagons and the spacing between successive groups of wagons. The topography of the location of the yard also plays an important role in deciding the gradient.

Table 26.3 Gradients in marshalling yards

Item	*Gradients to be adopted for*	
	Mechanical yards	*Non-mechanical yards*
Rising gradient of approach	1 in 50 to 1 in 125	1 in 50 to 1 in 100
Top of hump	Level	Level
First falling grade after apex of hump	1 in 17 to 1 in 20	1 in 25 to 1 in 35
Intermediate grade up to the point where the trains start	1 in 50 to 1 in 60	1 in 80 to 1 in 200
Final falling gradient up to clearance of points	1 in 200 to level	1 in 80 to 1 in 200
Gradient of the sidings	Down-gradient eased off and then an up-gradient given to stop wagons at the end	Falling gradient 1 in 400 to 1 in 600

Regulation of speeds in hump yards The speed of the wagons is regulated to ensure that they are kept in a stable condition in the siding where they are to be sorted, so that there is least damage to them. The regulation of speed is done as follows.

Mechanical method In this method, wagons are slowed down automatically with the help of 'retarders' (Fig. 26.15). Retarders' normally in the shape of bars fixed on either side of the track, operate electrically or electromechanically and offer resistance to the movement of wagons by pressing against the sides of the moving wheels. This finally stops the wagons at the appropriate place. Such mechanical retarders are used extensively in Germany and on other developed railways.

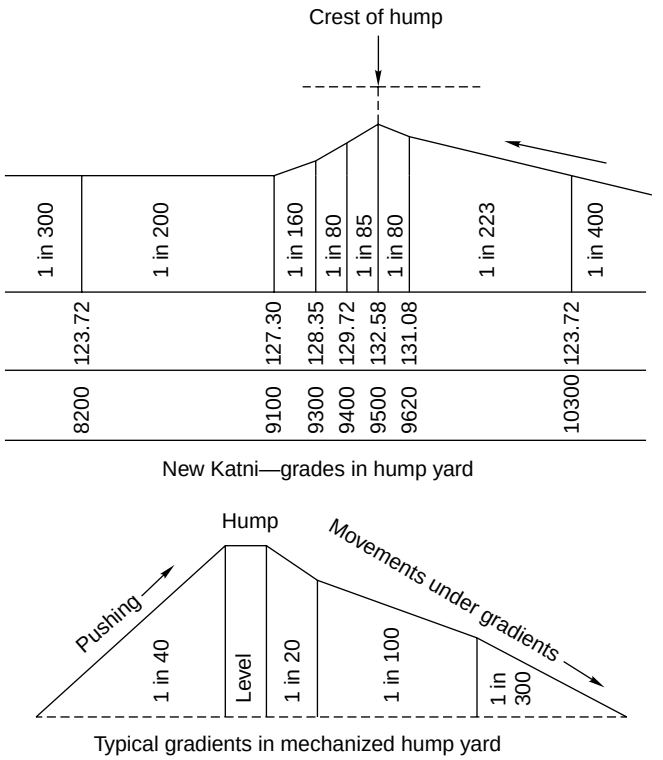


Fig. 26.15 Gradients in mechanical hump yard

Non-mechanical yard In a non-mechanical yard, the speed of the wagon is regulated manually with the help of hand brakes or skids. A shunting porter runs alongside the wagons and applies a hand brake to the wagon at an appropriate place, making the wagon slip and stop. Skids are also used to slow down the wagons. Skids are placed on the track; they get dragged by the rolling wagon and the friction thus developed reduces the speed of the wagon and stops it at the desired location.

Design of various constituents

The design details of the various components of a marshalling yard are discussed below.

Spacing of marshalling yards This depends upon the average distance that a long-distance train can go. If the lead is 500 km and the section train can go up to 100 km, the approved spacing of a marshalling yard is 400 km.

Siting of marshalling yard A marshalling yard is normally sited at a junction point, a depot yard to a group of collieries, a feeder yard for a big terminal point, or a steel plant, etc.

Reception yard The number of lines to be included in a reception yard depends upon the number of trains to be received and on the frequency of their arrival. Normally one reception line is provided for every three to four trains. The approved length of a siding is normally 700 m for BG and 650 m for MG.

Shunting neck The length of the shunting neck should be longer than the longest train.

Hump The hump should be designed to meet the following objectives.

(a) It should be such that even the wagon whose movements are affected the worst by the most adverse weather conditions can clear the fouling mark, when sent to the outermost siding.
(b) It should be such that a successive group of wagons are separated from each other to the extent that it enables the point between them to be operated upon so that the wagons can be sent to various sidings.
(c) The hump should be such that the speed of the wagons is so regulated that there is no damage to the wagons when they bump against each other in the sorting lines. The figures given in Table 26.4 can be taken as a rough guide for choosing the design of the humps.

Table 26.4 Design of humps

Design element	*Suggested value*
Average gradient from the hump to the end of switching zone	2% for empty and 1.5% for loaded wagons
Average height of ordinary hump	2.5–3 m (8–10 ft)
Average height of mechanized hump	3.5–6 m (12–20 ft)

Sorting yard The number of lines to be included in the sorting yard depends upon the number of destinations for which the trains are to be assembled. The length of each sorting line is about 15 to 20% more than that of a normal train so that there is provision of some space behind the wagons. The layout of the sorting yard may be of the ladder or the balloon type. The speed of the wagons is controlled by hand brakes while the skids and the mechanical retarders are controlled by manual and mechanical means, respectively.

Departure yard The number of lines to be included in a departure yard depends upon the number of trains proposed to be dispatched from the yard and on the frequency of their departure. Some engineers feel that there is no need for a separate dispatching yard because it unnecessarily increases the length of the marshalling yard. According to them, trains should be dispatched straight from the sorting lines. This arrangement, however, runs into problems if the departure of the trains is delayed on account of operational reasons.

The pattern of transportation of goods traffic has changed drastically in the recent past. Now, most goods traffic is carried as trainloads from point to point. The loading of piecemeal wagons has also been drastically reduced. Consequently, the need and importance of goods marshalling yards has reduced considerably.

26.9 Catch Sidings and Slip Sidings

Catch sidings are provided in the case of hilly terrains, where the gradients near railway stations are very steep. The purpose of catch sidings is to arrest the movement of the vehicles if they start to roll down the grade, which may eventually foul up the running lines. A separate siding is provided outside the station yard so that the vehicles can be collected there.

In Fig. 26.16, DEF is a running line and AB is a dead end siding. BC is the catch siding connected to the dead end siding preferably by the means of a spring-operated point. The catch siding lies on a rising gradient and its length is so designed that the vehicle loses its kinetic energy when it reaches the dead end. Thus the vehicle is protected from damage and the safety of the trains on the running line is ensured. There is a sand hump provided at the end of the catch siding to prevent any minor damage to the vehicle.

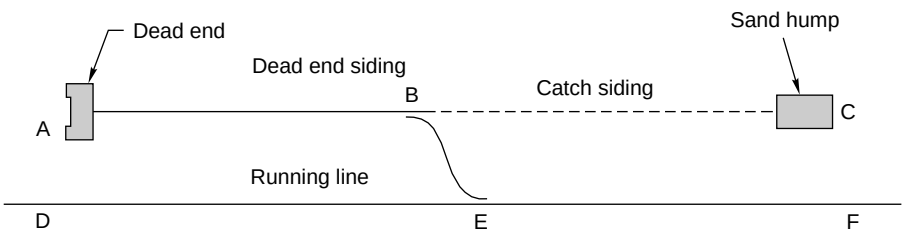


Fig. 26.16 Catch siding

In the case of hilly terrains, normally one siding is provided at each end of the station as explained here.

Catch sidings These are provided at the higher level or upper end of a station when it starts to slope downwards along the track in an unauthorized manner from the previous station.

Slip sidings These are provided at the lower level on the lower end of the station. If by chance the vehicle is not caught in a catch siding and enters the station premises, the same will be caught and shipped into the slip siding.

Clapham Junction (London) of the Southern Region on British Railways is probably the greatest junction station in the world. It has 17 platforms but 12 of these lines are used by trains that either make only an ordinary station stop or do not stop at all. The other five platforms are used for miscellaneous purposes and are chiefly provided for trains transporting milk and other similar articles, which require a significant stop before the lines can be cleared. Thus, as many as 2500 trains can

run daily with ease from this station, as very few trains occupy the platform for more than a minute or so.

Summary

Stations and yards are provided to control the movement of trains, passengers, and goods. Stations are classified based on their operational and functional characteristics. The facilities to be provided at a station depend upon the type of station it is. Similarly, yards are also classified as coach yards, goods yards, marshalling yards, or locomotive yards depending upon their purpose. The efficiency of a station largely depends on the efficiency of its yards.

Review Questions

1. (a) What are marshalling yards and where are they usually located?
   (b) Enumerate the principal types of marshalling yards and the basic facilities that should be provided with each one of them.
   (c) Approximately estimate the yard capacity of a marshalling yard that is required to deal with 1000 wagons a day with an average detention of wagons of 18 hours during the peak season. To ensure proper fluidity, assume a suitable yard balance.
2. (a) Name the different types of marshalling yards. With the help of a neat sketch explain how goods train arriving at such a yard from different directions could be rearranged into their proper order.
   (b) Explain the following.
      (a) Flag station and block station
      (b) Island platform and dock platform
      (c) Junction and terminal
3. What is the purpose of providing marshalling yards? What are the points to be considered in the design of marshalling yards? What are the main siding features of marshalling yards?
4. What are the functions of a railway station? Explain briefly the various requirements of a railway station at an important city.
5. Draw a diagrammatic and dimensioned layout of a BG three liner crossing station with the minimum provisions for goods handling. Also mark the signals at either end at the appropriate distances. Assume the station to be a B class station with standard III interlocking and 70 wagons loop capacity.