

CHAPTER XXV

DESIGN AND WORKING OF MARSHALLING YARDS

25001. Explanation of terms.- (a) (i) A marshalling yard is a yard with facilities for receiving, classifying and despatching vehicles to their several destinations as quickly as possible. Since some marshalling yards are situated in the vicinity of important industrial centres, they also deal with traffic originating at or destined for these centres.

- (ii) A RECEPTION YARD is a yard in which the loads of incoming trains may stand clear of running lines while waiting for their turn to be dealt with.
- (iii) A CLASSIFICATION YARD is a yard in which trains are broken up on the different lines for the various directions or stations irrespective of stations order, so as to form them into trains and prepare them for correct marshalling.
- (iv) A SORTING YARD is a yard in which wagons are separated in station order and then reformed into trains in special order to meet the requirements of the section ahead or any other special transportation requirement.
- (v) A DEPARTURE YARD is a yard in which loads are kept waiting for departure.
- (b) (i) A SHUNTING NECK is a line leading to marshalling sidings on which the actual shunting of the train may be done clear of any running line.
- (ii) A GATHERING LINE is a line in a yard from which other lines of the yard take off.
- (iii) A TRANSFER LINE is meant for transferring wagons from upside to downside or vice versa in case of separate up and down yards. It may also be provided for transferring wagons between the marshalling yard and the goods shed when they are situated on opposite sides of the running lines.
- (iv) A BY-PASS LINE is a line which skirts the hump and its object is to avoid engines, live stock, tank wagons or any other stock which is not permitted to be hump-shunted having to pass over the hump. It joins the shunting neck at one end and the main hump line short of the King points at the other end.
- (v) AN ENGINE ESCAPE LINE is provided to allow the release of train engines immediately on arrival of a train and to permit movement of engines freely to and from the shed without interference with the yard work.
- (c) (i) KING POINTS are the first pair of points the wagon meets with after passing over the hump summit and these divide the hump yard into two portions.

- (ii) **QUEEN POINTS** are the second pair of points the wagon meets with on either of the two diverging lines taking off from the King points and these divide the classification lines into four sub-portions. These are two in number in each hump yard.
- (d) (i) **CLASSIFICATION OF WAGONS** is the process of separation or breaking up of trains for the different directions on respective nominated lines but not necessarily in station order.
- (ii) **SORTING OF WAGONS** is the process of making up a train by attaching vehicles or groups of vehicles in particular station order upto or beyond the terminal station for that train.
- (e) (i) **FLAT SHUNTING** means the separation of wagons in a yard by continuous forward and backward engine movements.
- (ii) **LOOSE SHUNTING** means the vehicles being pushed by an engine and then being allowed to run forward alone.
- (iii) **FLY SHUNTING** is made when two vehicles are sent forward unattached either together or one immediately after the other, and placed on different lines necessitating the points being reversed after the passage of the leading vehicle. Another description of "fly shunt" is where an engine is hauling a wagon and while both vehicles are in motion they are uncoupled and run on to different lines.

25002. General section of a Marshalling Yard.- (a) The functional division of most marshalling yards is as follows :-

- (i) a reception yard;
 - (ii) a classification yard; and
 - (iii) a departure yard.
- (b) The reception, classification or departure yards can be in the shape of (i) balloon or fan, (ii) ladder or (iii) grid or herring.

25003. Reception yard.- The main features of the reception yard are :-

- (a) The formation, where the topographical conditions permit, is in the shape of a grid, which admits of lines of equal length being provided. The lines converge into one road leading to the hump summit, at the foot of which is by-pass line for engines to leave off. Separate through running roads taking off the reception lines and by passing the classification yard are laid to allow the passage of through trains.
- (b) If the reception yard is balloon or fan shaped, the lines should be arranged in separate groups to permit of greater flexibility of movements.
- (c) The load into the reception lines should clear the main line at least a full train length away, so that a short hold up would not necessitate any train standing on the main line.

- (d) The number of reception lines must be sufficient to allow of trains being received freely as the traffic offers, and thus avoid delay on the running lines. On a rough basis, it would, normally be sufficient to provide one reception line for every four incoming trains.
- (e) The length of reception lines is governed by the maximum permissible train load on the section. Normally on Broad Gauge the length should be 686 metres CSL and on Metre Gauge 625 metres CSL. These lengths allow for 7 per cent margin over and above the effective length of the train.
- (f) It is preferable to provide for the simultaneous entrance of trains arriving from different directions and without interference with humping.
- (g) Certain marshalling yards have combined reception and departure yards where from loads are drawn out, broken in classification yard, reformed and then backed on to the combined reception and departure yards. A better design is the one explained in sub-para (a) above.
- (h) An engine escape line, a short crippled siding with a shunting neck for detaching damaged wagons should be provided.
- (i) If the reception lines converge into a hump summit or if the marshalling yard is a gravity yard, the reception lines should be at a higher level than the sorting siding, so that the hump engine may have less work to do. An up grade into the reception lines will help to stop incoming trains and reduce braking effort.
- (j) Brake power testing plants should be provided on the reception lines.

25004. Classification yard:- (a) Classification yards can be either (i) flat yards, or (ii) gravity yards or (iii) hump yards, according to the mode of shunting of wagons.

- (b) In flat yards the engine has to perform a protracted series of backward and forward movements corresponding to the number of "cuts" into which the load has to be broken. Although flat yards occupy less space than gravity and hump yards, they entail expensive and dilatory shunting and, as such, are to be recommended only where the volume of traffic to be dealt with is moderate and economy in space an over-riding consideration.
- (c) (i) Gravity yards make use of natural gradients to classify wagons into their appropriate sidings. The reception lines are laid on a gently falling gradient so that classification can be achieved by merely letting incoming loads run down the gradient and setting the points for the various cuts.
 - (ii) Gravity yards are much more economical to operate than flat yards but can be provided only at places where the natural contour of the land is suitable.
 - (iii) In such yards since wagons roll down at high speed under the impulse of gravity, they have to be braked in order to stop them at the right places. This is generally done either by operating the wagon brakes or by using skid shoes.
- (d) (i) In hump yards shunting is done by propelling of wagons over an artificial hump to run down a short but steep slope into the classification sidings. Each 'cut of wagons is previously uncoupled and as it rolls down the slope, it is guided into the appropriate siding

by the manual or electrical operation of points from a cabin situated close to the hump. A two aspect or multiple aspect lower or upper quadrant semaphore signal or a two aspect or multi aspect colour light signal is generally provided near the hump and is controlled by the cabinman to give various indications to the driver of the pilot/shunting engine in connection with humping. For the breaking of wagons the same methods are used as in gravity yards.

- (ii) Hump yards are much more economical to operate than flat yards. However, like gravity yards they occupy more space and are only suitable and economical where a sufficiently large volume of traffic has to be dealt with.

(e) The main features of the design of a hump classification yard are the following :-

- (i) The fan or balloon formation is the one generally favoured, access from the reception lines being normally afforded by a single road laid over the hump.
- (ii) The hump should be of such a height and with such gradients that wagons rolling over it pick up sufficient momentum to get to the places destined for them. There must be a bypass line skirting the hump.
- (iii) The access to the hump should be through a shunting neck of a gradual rising gradient long enough to accommodate the longest train in the section. Any movements on the shunting neck should not come in the way of other yard movements.
- (iv) The lines should be grouped in separate fans and, as far as possible, should be straight and symmetrical about a central line.
- (v) The number of tracks in the classification sidings depends upon the density of traffic, number of destinations, local conditions and on instructions relating to make up of trains. When the density of traffic of any group is sixty to seventy wagons, one line in the classification yard is usually allowed for it. The remaining group are clubbed together in such a manner that each bigger group is about sixty to seventy wagons.
- (vi) The length of classification sidings should generally be 10 per cent over the maximum loop capacity provided on the section, i.e., 2500 feet for Broad Gauge and 2275 feet for Metre Gauge.
- (vii) The central classification lines should be designed and allotted for the busiest destinations and the outer siding for less frequent destinations. Two or more lines must be set apart on the outer side for holding damaged wagons requiring light repairs, one of these lines to receive wagons while light repairs are carried out on the other. The brake-van siding should be one of the last classification lines and should be connected to the bypass line.
- (viii) It should be desirable to have a spike (i.e. finger lines) or grid shaped sorting yard by the side of the classification yard where work trains can be made up and where from they can be started.
- (ix) Short of the King points and also at the tail end of classification yard, short lie-by sidings should be provided, for loco requirements of pilots/shunting engines.

- (x) Weigh bridge siding and sidings to stable brakevans, tank wagons, special stock, cattle vans and material trains, etc. should be provided near the hump.
- (xi) A line by-passing the hump should be provided connecting the reception yard to the classification yard to facilitate movements of engines, and the live stock and tank wagons without the necessity of going over the hump.
- (xii) If the volume of work requires, it may be necessary to have two classification yards, one up and one down, each with a hump. If the configuration and area of the land available permit and the number of wagons to be passed over the hump per day is not very large, a combined yard would be very much better, for it would save the duplication of transfer, local and sick lines and other facilities.
- (xiii) A sick yard should be provided adjacent to the classification yard, with direct access to the hump. The light repair lines mentioned in sub-para (vii) above should be located near the heavy repair shop of the sick yard to facilitate easy movements of men and materials from the heavy repair area to the light repair lines.

25005. Departure yard.- (a) When a classification yard is to be worked to its full capacity, a separate departure yard is considered necessary.

- (b) The classification or sorting siding at the departure end converge into one or more roads which should, then, fan out into departure lines.
- (c) Facilities for simultaneous despatch of trains to different directions should be provided and if the reception and departure yards are the same, there should be facilities for simultaneous reception and despatch of trains.
- (d) Departure lines usually correspond with the reception lines and the same principles as to their number and length apply.
- (e) At the converging of lines from where trains are to be started, a short siding with water column facilities is to be provided.
- (f) Brake power testing apparatus should be provided to ensure that trains are having adequate brake power before despatch.

25006. Transshipment and goods sheds.- The siting and layout of goods and transit siding should ensure that :-

- (a) The transit shed is invariably laid by the side of the classification yard away from the main lines. The goods shed should be laid adjacent to the transshipment shed.
- (b) In case of separate up and down yards, access to them should be available from both the yards by means of separate transit shed lines.
- (c) The length of tranship lines and platforms depend upon the work obtained.

25007. General features of yard design.- (a) The ideal location of various groups of siding in a yard should be such that with every move wagons are taken forward and do not have to travel in the reverse directions to their destination. Reverse movements reduce efficiency and ensure extra

kilometrage, extra engine hours, greater wear and tear and retards the through vehicle speed generally.

(b) The whole yard, or in case of two yards, both up and down yards should be on the same side of running lines. In case of double line the best position is between the two main running line. The advantages are that :-

(i) transfer from one yard to the other is easier,

(ii) shunting engine hours are reduced.

(iii) supervision can be more easily and effectively exercised and economies in staff and appliances in the flow of traffic effected.

(iv) the engine shed can be located at a place more convenient for incoming and outgoing engines and the initial costs are less.

(c) The loco shed should be so situated that there is minimum engine kilometrage between the shed and the yard and the movement of the engine to and from the yard does not come in the way of other yard movements. The entry from the loco shed should be on the side of the reception group, and exit on the side of the departure group of sidings.

(d) Layout and interlocking should permit simultaneous independent movements in the different parts of the yard to secure fluidity and flexibility.

(e) Yard should be laid out at suitable points. Old and out of date yards should be remodeled on the basis of a well compiled date.

(f) The yard should have adequate accommodation for all the stock it is required to hold at any one time, due provision being made for any sudden rush of traffic or accumulation on account of temporary inability on the part of the section to receive the traffic freely.

(g) Interference should be avoided not only from rail movements, but also from road/traffic.

(h) Layout should provide the shortest total length of the yard.

(i) The whole yard should be well illuminated at night with higher intensity of illumination required at places where staff work or have to observe details and should have a net work of communications to ensure that the different key points are connected with one another.

(j) There should be some room for future expansion.

25008. Yard capacity.- (a) The maximum number of wagons a yard can accommodate at any one time is its holding or standstill capacity.

(b) The amount of traffic that can be received, dealt with and disposed of by a yard at any one time without affecting its fluidity is known as its working capacity. The working capacity of a yard is obtained by dividing the holding capacity of the yard in 24 hours by the total average detention to wagons in hours.

25009. Yard congestion.- (a) When a yard including goods shed or transit shed is unable to cope with the traffic offering or any kind of trouble reduces its working capacity, it causes holdups to rolling stock. The mobility of the yard is curtailed or lost and an accumulation of unhandled traffic takes place. It leads to strained working and is called congestion.

(b) The causes of yard congestion should be carefully analysed and necessary remedial measures applied. Generally, such expedients as transferring some work load to adjacent yard and asking them to make only through loads, introduction of night working in transit sheds, restriction and diversions, relaxation of marshalling instructions, better spacing of trains, better power arrangements or reduction in the number of engineering restrictions would meet the situation.

25010. Yard performance.- The performance of a yard is judged by the following figures for the month :-

- (a) Number of wagons dealt with during the month.
- (b) Daily average number of wagons detached.
- (c) Daily average number of wagons despatched.
- (d) Number of trains received and despatched.
- (e) Number of wagons dealt with per shunting engine hour.
- (f) Average detention per wagon (a) All wagons (b) Through loaded wagons.

25011. Marshalling yards on N.E.Railway:- The Marshalling yards in operation generally deals with 20,000 BG or 10,000 MG wagons in terms of 4 wheeler per month. As such yards on N.E.Railway system situated at Gorakhpur and Gonda on BG, Gonda and Bareilly City on MG are functioning as terminal yards and not as Marshalling yards.
