

2.5 CONSTRUCTION AND MAINTENANCE OF RAILWAY TRACK

The construction of railway lines is a complicated, challenging and interesting activity of civil engineering. Most of the present railway lines were built by the British during the latter half of the 19th century. After independence, the Indian Railways have taken up some challenging tasks, which involved large bridges, tunnels and laying of tracks in hilly terrain. Recently, the Indian Railways have accomplished the construction of the Konkan Railway over a length of 700 km, which involved many tunnels, bridges, and massive earthwork. The conversion of the metre gauge to broad gauge is yet another challenging task undertaken by the railways now. The doubling of many trunk routes is also a commendable achievement.

The construction of a railway line covers the following major activities:

1. Earthwork
2. Drainage
3. Bridges
4. Tunnels
5. Track laying

Earthwork

Laying a railway line involves a considerable amount of earthwork. Earthwork involves cutting and formation of embankment. These operations are preceded by clearing and grubbing, which, involves removal of shrubs and cutting of trees from within the designated areas. Roots and stumps are also removed to a nominal depth below the existing ground.

Drainage

Water is one of the most unwanted commodity in a railway track and must be drained off and efficiently as possible. Water comes as surface run-off from rains. Water from seepage in cut sections and by capillary action from below.

The capillary rise of water can be arrested by having a blanket of sand or coarse material below the ballast layer. Water cannot rise in a medium having such coarse

fraction. In a soil having predominantly clayey fractions, capillary rise can be a serious problem. An example of such a soil is the black cotton soil found in many parts of the country.

Bridges

Bridges have many unique features. Since they are exclusively meant for railway movement there is no need for pedestrians to be accommodated. For providing safety to gangmen and maintenance staff, a safe refuge may be given at convenient intervals. When steel bridges are used the sleepers are laid on the girders and fastened to them, dispensing with the ballast. When RCC, prestressed concrete or masonry arch bridges are adopted, ballast is provided under the sleepers.

Tunnels

Tunnels are needed for negotiating hills, which fall in the alignment and where detours are costly or not feasible. When the excavations become deep and uneconomical, it is economical to opt for a tunnel. The Mumbai-Pune railway line and the recently commissioned Konkan Railway have numerous tunnels.

The alignment of a tunnel should be preferably straight, but many tunnels exist which are on curves. The gradients of the track should be gentle. Even though site conditions do not require a grade, a gentle grade facilitates quick drainage. Tunnels in hard rock do not normally need any lining. But tunnels in soft strata always need a lining. A concrete lining is the standard practice.

Laying of Track

The work of laying a railway track on a prepared formation is known as plate laying. It is, the normal practice to initially lay the sleepers and the rails directly on the formation without placing the ballast. This is done so that the track can settle in the initial stages when the embankment is still in a loose state. Ballast is packed subsequently.

The point, up to which the track has been laid, is known as the railhead. The point from which the track is started is known as the base.

There are three common methods of plate laying:

- 1) Side method (also known as tram line method)
- 2) Telescopic method
- 3) American Method

The side method is followed when there is a track already by the side of the new track to be laid. This is the case when a track is to be doubled. The track materials are carried in special material trains and dumped on the new formation. The track is then assembled. Sleepers are laid out and the rails are fastened. If a track does not exist, the materials are carried by road or over a temporary rail line.

The telescopic method uses the track already laid to transport the material. The fresh material is then assembled in front of the track already laid and connected to it. Fresh material is brought by wagons on the newly laid track. The works proceed in short stretches, forming sub-depots as the work proceeds. The work may be carried out by specialised gang of labour, grouped as :

- 1) Material gang for unloading and carrying of track materials;
- 2) Linking gangs for fixing sleepers, rails and fastening; and
- 3) Packing gangs for packing the earth underneath the sleepers and bringing the track to proper profile and alignment.

The American method involves assembling the sleepers and rails in units at a central workshop, moving the assemblies to site and linking. The work is highly mechanised using equipment for loading and unloading and transporting.

RAILWAY MAINTENANCE

Importance of Maintenance

The need for and the importance of railway maintenance arise out of the following considerations:

1) The track rests on a yielding foundation of ballast. As a result the track settles over a period of use and it needs to be restored to design level constantly.

2) The track is subjected to severe dynamic loads, which set up vibrations in the track and cause it to lose its geometry. Restoration of track parameters becomes a continuous requirement.

3) The various track elements are subjected to wear due to traffic. For example, the fishplates and fastenings undergo considerable wear and tear. When these get worn out, the track loses its rigidity, gauge, profile and alignment. The ballast stones get abraded and crushed. The sleepers get worn out.

4) Environmental factors add to the wear of track and damages to the permanent way. The influence of wind, rain, floods and temperature variation on track elements is also damaging.

5) The maintenance of an accurate gauge is the key to safety of rail movement. Accidents can be disastrous.

6) A well maintained track gives comfortable ride.

7) Energy consumption on a well-maintained track is low.

Maintenance of Formation

As the wheel loads have tended to increase over the years since the railway lines were built more than a century ago, the formation is being subjected to heavy stresses. Intrusion of soil into the ballast is common. The situation can be remedied by providing a blanketing layer of sand below the ballast.

Maintenance of Drains

Pre-monsoon clearance of siltation and vegetation growth in drains is of great importance. The performance of drains during the monsoons must be watched and rectification of defects after cessation of rains must be done.

Bridges and Culverts

Pre-monsoon inspection and close vigilance during rains of bridges and culverts is part of good maintenance. The performance of bearings, the condition of protective works (guide bunds, flooring and curtain walls), evidence of scour and cracks in the structural components - these are some of the items that deserve close inspection.

Maintenance of Fastenings

Screws, spikes and keys must be tightened and secured periodically. Worn out components should be replaced. Base plates wear out due to constant rubbing of rail. They must be inspected and defective ones replaced.

