

Executive Summary

Indian Railway has 92,084 running track kilometers (as on 1 April 2016). Track or Permanent Way (P-way) is the rail-road on which the trains run. Track structure includes two parallel rails at a specified distance, fastened to sleepers which are embedded in a layer of ballast of defined thickness spread over the formation.

The railway track should be maintained properly in order to enable trains to run safely at the highest permissible speeds and to provide passengers a reasonable level of comfort during the ride. Due to the constant movement of trains, the packing under the sleepers and track geometry gets disturbed, the fittings of the track get undone, there is heavy wear and tear of the track and its components and the gauge and alignment of the track gets affected adversely. The track and its components also get worn out as a result of the weathering effect of rain, sun, and sand. Therefore, if the track is not maintained properly, it will cause discomfort to the passengers and in extreme cases may even give rise to hazardous conditions that can lead to derailments and a consequential loss of life and property.

Track maintenance involve preventive maintenance (periodic maintenance activities), condition monitoring (through inspections and use of technology) and repair of defects noticed. Maintenance activities are carried out using machines as well as manually through a group of railway personnel called track maintainers (trackmen, keyman, gangmen).

The Audit was conducted with a view to assess whether the maintenance of tracks was planned and undertaken following the laid down norms and instructions. Audit also assessed whether the resources/infrastructure required for maintenance of tracks was available and used efficiently and effectively. For this purpose, Audit reviewed 37 selected sections (29 high density routes (HDN) and eight non-HDN routes) of the five Zonal Railways (NCR, ECR, SER, SR and SWR). These section were running with line capacity of 100 *per cent* to 168 *per cent* in 2015-16, except four sections where line capacity was between 90 *per cent* and 99 *per cent*.

Audit observed that track maintenance activities needed to be strengthened and undertaken following the laid down instructions and guidelines. Shortfalls in inspections of tracks by railway officials as per laid down frequency were noticed in the selected sections. Prescribed methods for preventive maintenance of tracks were not being followed effectively/not done adequately. This included ultrasonic flaw detection testing to detect flaws in the track, monitoring of track using track recording cars, installation of wheel impact load detectors to monitor impact of wheels on track in sections where enhanced loading has been permitted, use of GPS based foot plate inspection device etc. There were arrears in periodical maintenance activities such as deep screening of ballast and more efficient methods of welding were not used in all selected sections. Audit noticed that track maintenance activities

were not completely mechanized in all the selected sections. No communication equipment was provided to track maintainers to report any failure, fracture or damage immediately. The formula for assessment of requirement of manpower for track maintenance was frame long back in 2000 and needed revision. Though there were shortages of track maintenance staff in the selected Zonal Railways, many of them were diverted for works other than track maintenance. The block demanded by Engineering Department for maintenance works were not fully made available, and where made available, these were not optimally utilized by the Engineering department.

Important Audit findings

- In NCR and ECR, perspective maintenance plans were not prepared. Though maintenance schedule prescribes planning maintenance works as a preventive measure, SER was doing rectification of deficiencies on inspection. In NCR, ECR and SER, concerned P-way Inspectors who are primarily responsible for maintenance of tracks in the sections were not communicated the Annual Plan in advance for actual deployment of track machines in their sections. Pre-monsoon and post-monsoon inspection activities were not mentioned in the Annual Plan and only need based inspection was carried out in monsoon season in NCR, ECR and SER.

Para 2.1.1, 2.1.2 and 2.1.3

- In NCR, SER and SWR, the beat of the patrol men was not restricted to one km length of UP and DN line on double line section and it was more than one kilometre on both sides in some of the sections checked in audit. Patrol men were not equipped with any communication equipment to report any failure, fracture or damage immediately from the section where shortcomings and defects in track were observed. Indian Railways has a laid down mechanism through which the track is inspected either visually or using equipment/machines in order to detect flaws in various component of track. Audit noticed shortfalls and deficiencies in inspections carried out at different levels. GPS based foot plate inspection device was not procured by any of the selected five Zonal Railways and inspection of track was carried out through traditional means.

Para 2.2.1.1, 2.2.1.2 and 2.2.1.3

- Testing of rails using Ultrasonic Flaw Detection (USFD) machines was not being carried out as per the prescribed norms. Test check of five *per cent* of the USFD testing done by the contractor was to be done by railway staff, which was not found to be done in selected sections of NCR and SWR. Also, while provision for capturing scanned images/peak patterns exists in the USFD machine, same were not saved and utilized for scrutiny/analysis during successive USFD tests.

Para 2.2.1.4

- The Track Machines and Monitoring Directorate of Research, Designs and Standard Organisation (RDSO) is required to monitor the track using Track

Recording Cars (TRC) for assessment of the condition of track, identification of locations needing maintenance and providing data to Railway Board and Zonal Railways. During 2016-17, out of the available four TRCs, none of the TRCs were run whole of the year in the planned section due to remaining under repair for long period. Further, TRC did not have an uninterrupted run at uniform speed in the planned sections due to heavy traffic, due to which it was not possible to obtain comparable results between successive recordings.

Para 2.2.1.5

- In Indian Railways dual detection system comprising of track circuiting as well as axle counters simultaneously are used on the same track length of the automatic block section. The use of dual detection system ensures that signal remains in a clear position, even if there is an electrical discontinuity in the circuit due to power failure/rail fracture. As long as either of the two i.e. track circuiting or axle counter gives a clear signal, the signal to the locomotive driver would be clear. From the control panel located at the station, the Station Master would know if there is a failure of track circuiting without knowing the reason for the same. In such circumstance, he can switch over the system to axle counter mode only and allow the train movement on the basis of signal based on axle counter mode. The existing operation instructions do not require the Station Master to look into the reasons for failure of track circuiting and take any action like imposing speed restriction on the movement of the trains or issue any alert. Audit noticed that an accident of Train no. 12987, Sealdah-Ajmer Express occurred at Rura on 28.12.2016 at 5:30 hrs in which over 50 persons were injured. Though DC track circuit failure incident occurred at 2:16:47 on 28 December 2016, no follow up action was taken by Station Master on the incident of failure of track circuiting. A number of trains travelled on the track between 2:16 to 5:30, before the Train no. 12987 derailed. As per the records of joint observation note of supervisors on accident, the probable reason was rail fracture.

Para 2.2.1.6

- Deep screening of ballast is required to restore the resiliency and elasticity of the ballast bed and for improving running quality of track. Audit noticed significant arrears in deep screening work and found that deep screening was overdue for one to 22 years in the sections of five Zonal Railways test checked.

Para 2.2.2.1

- The safety of track is vitally affected by locked up thermal stresses, which can result in rail buckling or fractures. De-stressing is a technique to avert rail track problems in long welded rails/continuous welded rails. Audit noticed deficiencies in de-stressing in the selected sections, which may lead to stress getting locked up in the rails and may result in rail buckling or fractures.

Para 2.2.2.2

- In respect of maintenance by departmental staff, there is a requirement of the concerned staff being trained and skilled, however, similar, requirement is not there in respect of maintenance being done through contractors.

Para 2.2.2.3

- Audit noticed 274 cases of rail fractures and 465 cases of weld failures during 2015-16 and 2016-17 in the selected section of five Zonal Railways. During this period, seven accidents occurred due to rail fractures/ weld failures in these five Zonal Railways.

Para 2.2.3.1

- Operation of wagons with load in excess of carrying capacity of 8 tonnes with tolerance of 2 tonnes (CC+8+2t) was permitted in certain sections from August 2006 with a set of strict conditions and instructions issued in this regard. Though instructions were issued eleven years ago, Wheel Impact Load Detectors (WILD) system were yet to be installed at all identified locations. Where installed, corrective action was not being taken on the basis of the information/data generated from WILD as Railway Administration ignored most of the critical alarms generated through WILD in Mughalsarai.

Para 2.2.3.2

- Track Management System (TMS) provides benefits in the form of prioritization of works, need based deployment of Gang and Machine, overall economy in Track Maintenance, monitoring of overdue inspections, listing of features needing attention, optimization of maintenance inputs by virtue of centralized database. In NCR, asset, store, caution orders, traffic block, ballast supply and insertion and accident reporting modules were not working in TMS. In SER, updation of data in TMS was not regular as internet connection was poor. ECR was not uploading the reports of inspection done at Senior Section Engineer / Permanent Way level and compliance thereof at all the levels in the system was being done selectively.

Para 2.2.3.3

- Audit noticed 294 permanent speed restrictions imposed on the selected sections of five selected Zonal Railways because of track vulnerability.

Para 2.3.1

- During 2014-15 to 2016-17, 16 accidents/derailments took place due to deficient track maintenance in the selected five Zonal Railways. The reasons were rail fracture, weld fracture, track defects, defects in point, track buckling, etc.

Para 2.3.2

- As per Indian Railway Vision 2020, Railways has to develop infrastructure in maintenance of tracks. The upgradation of infrastructure and using of modern mechanized techniques in maintenance activities was assessed by Audit.

- In ECR and SER, Rails were not being procured in long panels of 120 meters, which increases the number of welds. AT welds were used more than the flash butt welding, though weld failure percentage is significantly high for AT welds.
- In NCR, ECR, SER, track maintenance activities in selected sections were not completely mechanised.
- Human dependence in the form of push trolley inspection, foot-plating, patrolling, etc. for detection of flaws and deficiencies in track parameters were not eliminated/reduced.

Para 3.1

- A formula for assessment of requirement of manpower for track maintenance was derived by the railways in 2000. The formula was not being used by the five Zonal Railways checked in Audit, to assess the manpower requirement and fill the gap for track maintenance activities during the past three years. This criteria may not be relevant after 17 years due to significant changes in methods of track maintenance and introduction of mechanised means in a larger number of activities. A maintenance gang consist of 10-15 track maintainers who are responsible for protecting the line during regular maintenance work and in emergency. Audit observed shortages of staff in different safety categories responsible for track maintenance in selected Zonal Railways ranging from nine to 22 *per cent*. The situation was made worse by diverting available track maintainers to works other than track maintenance. Further, the jurisdiction of SSEs varied from 16.65 kms to 149 kms in various selected sections. The sanctioned strength of track maintainers per km also had wide variations and the criteria on the basis of which the sanctioned strength had been assessed was not objective and scientific. More track maintainers have been posted to bigger cities than remote locations though the requirement for the whole section may be uniform.

Para 3.3.1

- Check of competency certificate in selected sections of NCR, SER, ECR and SWR revealed that no system existed to ensure that only trained staff was posted in the section responsible for maintenance work. 37 *per cent*, 15.7 *per cent* and 4.6 *per cent* of the total staff of NCR, SER and SWR respectively, deployed in LWR/CWR section had not been imparted training. Similarly, 60 *per cent* of staff deployed for operation of small track machines were not trained.

Para 3.3.2 and 3.3.3

- There was sub-optimal utilisation of track machines due to reasons such as non-availability of block, under repair/breakdown/ maintenance, no fuel, machine under shifting, etc. Further, the small machines were not available in the selected sections as per requirements. Where available, these could not be used optimally due to various constraints such as frequent breakdowns, non-availability of blocks, non-availability of utility vehicles

for transportation of these machines at work sites, non-availability of spares, non-availability of imprest to handle repair and maintenance of these machines etc.

Para 3.4

- Audit noticed shortage of about 50 *per cent* blocks against the block demanded by engineering department for track maintenance work. The time allotted was also less than the prescribed norms. In all these selected sections, line capacity utilisation of 2013-14 to 2015-16 ranged between 90 per cent and 168 per cent. As such, these sections required adequate blocks for proper track maintenance. However, blocks provided were much less than blocks demanded which impacted track maintenance.

Para 3.5

Recommendations

Planning and monitoring

- 1. All Zonal Railways should prepare integrated track maintenance plans for day to day as well as periodical maintenance and condition monitoring using machines/ equipment such as USFD machine, Track Recording Cars, etc., duly incorporating timelines and resource requirement/ availability. The plan should include mechanised and non-mechanised components of track maintenance. It should also incorporate addressing arrears of deep screening of ballast, de-stressing and prescribed requirements for operations of CC+8+2 / 25t.***
- 2. The integrated annual maintenance plan for track maintenance of a Zonal Railway should be promptly communicated to the divisional and field formations for its effective implementation.***
- 3. Patrolling and inspections should be done as per norms and the teams should be equipped with GPS enabled devices. Output of patrolling, inspections should be incorporated into Track Maintenance System through GPS based devices, which can be used for monitoring of patrolling, inspections, etc.***
- 4. Monitoring of preparation and implementation of integrated annual maintenance plan for track maintenance over Zonal Railways should be treated as a key results area for Principal Chief Engineer and key performance area for the Chief Track Engineer for Zonal Railways. Co-ordination issues between departments related to monitoring of preparation and implementation of integrated track maintenance plan***

should be a key performance area for Divisional Railway Managers and key results area for the General Managers.

Strengthening the process of track maintenance

- 5. RDSO prescribed guidelines regarding storage of USFD output and subsequent review / test check / post check should be implemented. Output of USFD should be uploaded to a centralised data base in real time and analysed for monitoring the conditions of the rails.*
- 6. Availability, maintenance and operations of Track Recording Cars should be ensured for checking track parameters at prescribed frequency.*
- 7. Dual detection has been provided to improve the reliability of signals and decrease the failure of signals. As a side effect, it allows the signals to remain green even when there is a rail fracture and the track circuit has dropped. In such a case when the signal would be green and the train would be moving at maximum permissible speed, there is a risk of accident. Track circuiting system has the potential for detecting rail fractures. Safety Committee had recommended that the signal should be put to yellow aspect as soon as track circuit drops in the dual detection territory so that the train speed is controlled to lower speed while passing the affected zone, which may have rail fracture. Railways may consider using this feature of track circuiting effectively to avert accidents. When a track circuit fails due to any reason, the signal could be put to yellow and the train could be passed only at cautious speed, till the track is certified fit by the P-Way Inspector and there is no rail fracture.*
- 8. Application system like the TMS should be used efficiently to its full potentiality. Need based access to TMS should be provided to all related functional departments and units namely Operating, Safety, Accounts and Signal & Telecommunication, instead of restricting to the Engineering department only. This will enable effective planning by these departments and enable them to align their operations and maintenance activities to the integrated maintenance plans for the track maintenance. This will also enhance efficiency and effectiveness of block utilisation.*

Adequate provision and effective utilisation of resources

- 9. Railways may consider revising/re-working the formula for calculation of manpower requirement for track maintenance and re-assess the manpower requirement in view of the changed scenario, wherein, more*

and more mechanised means are going to be used for track maintenance. Diversion of man power provided for maintenance of track for other work should not be permitted. Selection criteria for track maintainers may be aligned with the requirement of their job which includes physical work as well and persons with defective attitude should be adequately sensitized. Deployment of man power should be monitored to ensure proper maintenance of the entire route length.

- 10. To ensure effective co-ordination between various departments involved, it may be considered to entrust Divisional Railway Managers with the responsibility of monitoring block availability and utilization for regular and periodical maintenance activities.*
- 11. The routes, where enhanced loading over and above the carrying capacity has been permitted, should be equipped with necessary infrastructure. This would include installation of Wheel Impact Load detectors (WILD) to assess impact of enhanced loading on the track structure, installation and utilisation of weighbridges to detect and prevent overloading, up-gradation of track infrastructure, addressing concern of rail grinding, weld protection through joggled fish plates and USFD testing of rails at shorter intervals.*
- 12. Officials of the field formations engaged in track maintenance should be equipped with mechanised and digital equipment including Personnel Digital Assistants, GPS enabled communication devices and small track machines. Necessary skills and training should be imparted to the personnel engaged in track maintenance. Appropriate funds in the form of imprest should be provided to enable expeditious maintenance of these machines and equipment. Availability of spares for these machines should also be ensured.*