

**Report of the
Comptroller and Auditor General of India
for the year ended March 2021
Derailment in Indian Railways**



लोकहितार्थ सत्यनिष्ठा
Dedicated to Truth in Public Interest

Union Government (Railways)
Performance Audit
Report No. 22 of 2022

Report of the Comptroller and Auditor General of India

For the year ended March 2021

Derailment in Indian Railways

Laid in Lok Sabha/Rajya Sabha on _____

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PREFACE

This Report of the Comptroller and Auditor General of India has been prepared for submission to the President of India under Article 151 (1) of the Constitution of India for being laid before the Parliament.

The report contains results of an audit of the Ministry of Railways of the Union Government, on the matter of 'Derailments in Indian Railways'.

The instances mentioned in this Report are those, which came to the notice in the course of the test audit for the period April 2017 to March 2021, as well as those, which came to the notice in earlier years, but could not be reported in the previous Audit Reports.

The audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

Executive Summary

The Performance Audit of ‘Derailments in Indian Railways’ for the period 2017-18 to 2020-21 of the Indian Railways (IR) was conducted during the year 2021-22. The focus of the audit was to ascertain whether measures to prevent derailments/collisions were clearly laid down and implemented by the Ministry of Railways (MoR). Timely conducting of investigations on derailments/collisions and implementation of the preventive recommendations were the other areas of Audit. Emphasis was laid on the deployment of funds in accordance with the guidelines of Rashtriya Rail Sanraksha Kosh (RRSK).

Summary of Conclusions

- There were shortfalls ranging from 30-100 *per cent* in inspections by Track Recording Cars required to assess geometrical and structural conditions of railway tracks.

Para 2.2

- The idling of Track machines was noticed on account of blocks not given by the Operating Department (32 *per cent*), blocks not planned by Divisions (30 *per cent*), operational problems (19 *per cent*), non-availability of staff (five *per cent*) and no scope of work (three *per cent*).

Para 2.4.1

- Analysis of 1129 ‘Inquiry Reports’ of derailment accidents in 16 Zonal Railways (ZRs) revealed 24 factors responsible for derailments in the selected cases/accidents. The total damages/loss of assets in these cases was reported as ₹ 32.96 crore.

Para 3.2.2

- Total 422 derailments were attributable to the ‘Engineering Department’. The major factor responsible for derailment was related to ‘maintenance of track’ (171 cases), followed by ‘deviation of track parameters beyond permissible limits’ (156 cases).

Para 3.3.1

- The number of derailments attributable to the ‘Mechanical Department’ was 182. Defects in ‘wheel diameter variation and defects in coaches/wagons’ were the major contributor (37 *per cent*) to the factors responsible for derailments.

Para 3.3.1

- The number of accidents attributable to the ‘Loco Pilots’ was 154. ‘Bad Driving/Over speeding’ was the major factor responsible for derailments.

Para 3.3.1

- The number of accidents attributable to the ‘Operating Department’ was 275. ‘Incorrect setting of points and other mistakes in shunting operations’ accounted for 84 *per cent*.

Para 3.3.1

- In 63 *per cent* cases, the ‘inquiry reports’ were not submitted to the accepting authority within the prescribed time schedule. In 49 *per cent* cases, there was a delay in the acceptance of the reports by accepting authorities.

Para 3.4.1

- The overall expenditure on Priority-I works from RRSK showed a declining trend from 81.55 *per cent* in 2017-18 to 73.76 *per cent* in 2019-20. The allotment of funds for Track Renewal works declined from ₹ 9607.65 crore (2018-19) to ₹ 7417 crore in 2019-20. The funds allocated to track renewal works were also not fully utilized. Out of 1127 derailments during 2017-21, 289 derailments (26 *per cent*) were linked to track renewals.

Para 4.3 and 4.4

- Fire extinguishers had not been provided in 27,763 coaches (62 *per cent*) in violation of extant norms.

Para 6.2

- Out of 2908 manned level crossings (nine *per cent*) targeted for elimination during 2018-21, only 2059 (70 *per cent*) level crossings were eliminated.

Para 6.3.1

Summary of Recommendations

- *IR should ensure strict adherence to the scheduled timelines for conducting and finalization of accident inquiries.*
- *IR may develop a strong monitoring mechanism to ensure timely implementation of maintenance activities by adopting fully mechanized methods of track maintenance and improved technologies.*
- *Railway Administration must follow the ‘guiding principles for deployment of RRSK funds’ to avoid fund constraints in the area of Priority-I works.*
- *IR may prepare the ‘Detailed Outcome Framework’ for each item of safety work as per the indicative outcomes to gauge whether the benefits derived out of the RRSK funds are in the conformity with the objectives behind the creation of the Fund.*

1: INTRODUCTION

1.1 Background

The Indian Railway (IR) is one of the world's largest railways. It functions as a vertically integrated organization providing Passenger and Freight services. It is a single system which consists of 67,956 route km of track that traverse the country. More than 21648 number of trains ply on IR carrying about 22.15 million passengers and hauling nearly 3.32 million tonnes of freight every day.

Accidents tarnish image and question safe and sound working procedures of IR. Accidents occur on account of acts of omission or commission, evasion of rules, unsafe practices, etc. Out of various categories of accidents, most serious consequences are witnessed in collisions, derailments, fire in running trains and level crossings accidents etc.

1.2 Organizational structure

Indian Railway (IR) is managed at a regional level by 17 Zonal Railways (ZR). Each ZR is headed by a GM and the Divisional Railway Manager (DRM) heads the organization at the division level. Railway Board (RB) is at the apex, a part of the Ministry of Railways (MoR). The RB is headed by a Chairman and Chief Executive Officer who directly reports to the Railway Minister. The GMs of the ZRs and the production units report to the RB.

At RB level, safety issues are dealt by the Safety Directorate under Member (Operations and Business Development) erstwhile Member (Traffic). At Zonal level, Principal Chief Safety Officer (PCSO) under the GM is the coordinating authority and at Divisional level, Senior Divisional Safety Officer/Divisional Safety Officer is the coordinating authority.

Each individual department has the primary responsibility to plan, establish priorities and implement all safety norms in their own areas. Commissioner of Railway Safety (CRS) under the Ministry of Civil Aviation oversees the safety system in Railways through regulatory, inspectorial and investigative functions. All serious accidents are required to be reported to the CRS by the Railway Administration for investigation and report. The framework for inquiry into accidents is shown in *Appendix-A*.

1.3 Audit approach

1.3.1 Audit objectives

The audit objectives were to assess that:

- Measures to prevent derailments were clearly laid down and implemented by concerned officials;

- Derailments were investigated efficiently and recommendations of the inquiring authorities implemented towards bringing out systematic changes; and
- ‘Rashtriya Rail Sanraksha Kosh’ (RRSK) funds were utilized as per the operating guidelines.

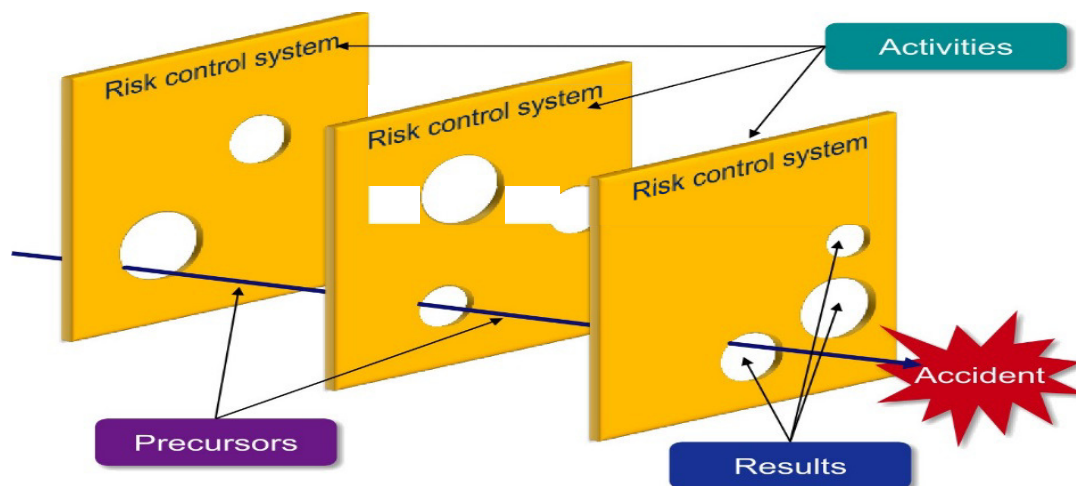
1.3.2 Scope of audit

The audit scope covered examination of records for the period from 2017-18 to 2020-21. Derailments, being the major cause of accidents, were the main area of focus during audit. Within derailments, the audit focus was on two major contributing factors, (i) Track related factors and (ii) Human errors. Though collisions account for only five *per cent* of the total consequential accidents during 2017-21, looking to the seriousness of such accidents, analysis of Inquiry Reports of train collisions was also covered in our audit.

1.3.3 Audit methodology

The ‘Swiss cheese model’¹ was used for analysis of causes of accidents. The model recognizes that accidents happen when the different level of preventive checks fail simultaneously. This is akin to the holes in a cheese. The slices of cheese represent the barriers or risk controls systems that are put in place. The holes in the cheese represent the weaknesses in those defences. Should the holes align (i.e. should failures occur simultaneously) an accident could occur. Figure 1.0 is a pictorial representation of this model.

Figure-1.0: Swiss cheese model of accident causation



Entry conferences with the GM of the different ZRs were held² for discussion on the audit objectives, scope, and audit methodology. Audit reviewed the records of the engineering, operating, mechanical, safety and security department of the selected

¹ Developed by James Reason. The name Swiss cheese model comes from the fact that every layer of protection has weaknesses, gaps, through which hazards can enter the system.

² July-2021 (CR, ECOR, SR, SECR and WCR), August-2021 (ER, NCR, NFR, NWR, SER, SWR and WR), September-2021 (NR and SCR) and October-2021 (ECR).

divisions. Inquiry reports of the selected derailment cases were examined. In addition, survey questionnaires were also filled up by conducting interview of field staff of engineering department. During field audits, preliminary observations were issued to the railway administration concerned. Draft reports were also issued to the GM of the respective ZRs. Besides at ZRs level, exit conference was also held (June 2022) at RB level to discuss the audit findings.

1.3.4 Sources of audit criteria

The audit criteria were sourced from the following:

- Provisions contained in IR Codes and Manuals pertaining to the Departments directly responsible for train operations and the guidelines/instructions issued by RB/ZRs;
- 21st Report of the Standing Committee on Railways (15th Lok Sabha) on ‘Major Railway Accidents during the last five years-Causes and Remedial Measures’ and 12th Report of the Standing Committee on Railways (16th Lok Sabha) on ‘Safety and Security in Railways’ read with the Report on Action Taken by the MoR and
- Recommendations of CRS and other inquiry authorities in their various inquiry reports.

1.3.5 Sampling

The criteria for selection of sample are given below:

Table-1.0: Criteria for sample size

1.	Two Divisions with highest number of derailment cases
2.	Accident Inquiry Reports of selected derailment cases
3.	Two Senior Section Engineers (Permanent Way) in-charge each in the selected Divisions
4.	Two Senior Section Engineers (Ultrasonic Flaw Detection) each in the selected Divisions
5.	Selection of months for vouching of Rashtriya Rail Sanraksha Kosh in the selected Divisions
6.	Feedback from Engineering Field Staff through Survey Questionnaires

The details of sample selection in ZRs are given in *Appendix-B*.

CHAPTER 2: INSPECTIONS AND TRACK RELATED ISSUES

2.1 Background

Proper maintenance of the railway track is a pre-requisite for the train operation without accidents. The track should be maintained either by mechanized maintenance system or by conventional system. The track consisting of concrete sleepers should normally be maintained by heavy on-track machines.

Generally, for regular manual maintenance like through packing, shallow screening, minor lifting etc. traffic block is not required. Special maintenance work like deep screening, major lifting/lowering, and realignment of curve require imposition of train speed restriction. For other work like tamping, deep screening by ballast cleaning machines, ballast-regulating machines, distressing, welding etc. complete block is required. Provision of the essential integrated maintenance blocks/traffic blocks/corridor blocks for timely maintenance of assets on all routes including yard lines has been laid greater emphasis to keep the accidents at the minimum.

Inspection by foot, trolleys, locomotives and rear vehicles enable the permanent way staff to carry out assessment of the quality of track. These inspections, though important, are qualitative and enable assessment based on individual experience. Objective assessment of track is done by track recording cars, etc. Joining rails by improper welding may introduce a variety of defects on the joints as well as in the heat-affected ZR, for example, lack of fusion, cracks, porosity, slag inclusion, structural variation, etc. The quality of weld depends largely on the careful execution of the welding operation.

In October 2018, RB directed for usage of wider and heavier PSC sleepers (RT-8527) on all tracks from 2019-20 onwards. Similarly, action plan for gradual replacement of flash butt (FB) welds in place of Alumino Thermit (AT) welds had been envisaged in Corporate Safety Plan (CSP) 2003-13.

Imparting various types of training courses, as prescribed in manuals, to the officials dealing with track maintenance, training and certification of welders in particular, and also their medical examination/re-examination at prescribed intervals as per their category specified in the Medical manual is also a key area for healthy and up-to-date manpower availability.

Audit examined the records related to above issues for the period from 2017-18 to 2020-21. The audit findings are discussed below:

2.2 Monitoring by Track Recording Cars

The permanent way staff responsible for the maintenance of track, carryout regular periodic inspections to assess the structural and geometrical health of the tracks. The

Broad Gauge (BG) lines have been classified³ into six groups based on maximum permissible speeds as given in **table 2.2.1**:

Table 2.2.1: Classification of Broad Gauge lines

Group	Particulars
A	Speed up to 160 kmph
B	Speed up to 130 kmph
C	Suburban sections of Mumbai, Delhi, Chennai and Kolkata
D-Spl.	Speed up to 110 kmph and the annual traffic density is 20 GMT or more
D	Speed up to 110 kmph and the annual traffic density is less than 20 GMT
E and E Spl.	All other Sections and branch lines with speed up to 100 kmph

As per Indian Railway Permanent Way Manual⁴ (IRPWM), two types⁵ of Track Recording Cars (TRCs) are used in IR. The objective assessment of track geometry and track components is possible by Track Recording Cars. The Manual provides⁶ that the BG routes should be monitored by TRCs as per the frequencies detailed in **table 2.2.2** below:

Table 2.2.2: Frequency of Track Recording

Route Particulars	Frequency of monitoring
Routes with speeds above 130 kmph (Group 'A')	Once in 2 months
Routes with speeds above 110 kmph and up to 130 kmph (Group 'B')	Once in 3 months
Group 'C', 'D' and 'D Spl' routes	Once in 6 months
Group 'E' and 'E Spl' routes	Once in 12 months

Para 611 of IRPWM stipulates that spots (locations) requiring immediate attention, indicated by large peaks should be noted down by the ADEN, JE/SSE (P.Way) accompanying the car and immediate attention should be given to these locations without loss of time.

Audit analysis revealed that there were shortfalls in inspections by Track Recording Cars. The group-wise shortfall in TRC inspection during 2017-21 is detailed in **table 2.2.3** below:

³ Para 202 of IRPWM 2004

⁴ Para 603 of IRPWM-2004,

⁵ Mechanical Track Recording Car (BG) and Electronic Track Recording Car

⁶ Para 606 of IRPWM-2004,

Table 2.2.3: Group wise shortfall in TRC inspections

Group	Zone	Number of inspections due	Number of inspections done	Shortfall	Shortfall (per cent)
'A'	ER	48	24	24	50
'B'	CR	16	10	6	38
	ECR	40	28	12	30
	NCR	64	40	24	38
	SCR	16	8	8	50
	SER	32	16	16	50
	WR	16	9	7	44
'C', 'D' and 'D Spl'	ECoR	32	12	20	63
	NFR	8	3	5	63
	NWR	20	2	18	90
	SECR	8	3	5	63
	WCR	16	7	9	56
	WR	8	4	4	50
	SER	18	3	15	83
'E' and 'E Spl.'	ECR	1	0	1	100
	NFR	2	0	2	100
	NWR	3	0	3	100
	SWR	2	0	2	100
Total		350	169	181	--

It was observed that the shortfall ranged between 30 per cent and 100 per cent in TRC inspections. The shortfall in TRC inspections had adverse consequences on the quality of assets with implications on safe operation of trains on these routes. In one of the inquiry report⁷, it was noticed that a derailment of Seemanchal Express occurred in February 2019 in ECR. In the inquiry report, it was stated that the TRC run over the section was overdue by four months, which could have given vital inputs for defects in track. The main reasons assigned for the shortfall in the inspections was non-receipt of the programme for the running of TRCs to be prepared and finalized by Research Designs & Standards Organization (RDSO), Lucknow.

Thus, non-deployment of TRCs over planned sections, as per schedule, led to non-checking of track parameters having implications on overall safety of train operations including derailments.

⁷ Accident ID 20190210001 (February 2019)

2.3 Outsourcing of track maintenance activities

In December 2013, RB specified that regular exercise for working out the required strength of Trackman for maintenance should be carried out by ZRs every year. RB also specified that Railways should also ensure that mechanism for timely filling up of vacancies is in place. It was also specified that the General Managers should ensure that the track maintenance activities in the field are organized either through departmental resources or through outsourcing or a combination thereof depending on the situation, so as to meet the entire requirement of track maintenance.

As per Para 213 of IRPWM, the Chief Track Engineer shall decide the strength of each maintenance gang. No deviation from the sanctioned strength of gangs and other staff shall be permitted without the approval of the Chief Track Engineer.

Audit assessed the category-wise work force position⁸ of the Civil Engineering Department of ZRs. The review of data revealed the following:

- The status of outsourcing was found to be insufficient against the required number of work force of the Civil Engineering department. The percentage of vacancies in IR for Civil Engineering department ranged between 9-36 *per cent*.
- Out of 10 ZRs, in two ZRs (ECR and WR) the percentage of vacancies in Civil Engineering work force in the selected divisions ranged between 19-30 *per cent*. No outsourcing was done in ECR against the shortage of work force in divisions selected for review. Accident Inquiry reports of the zone revealed that in 23 *per cent* of the total derailments (40 out of 172) in ECR, one of the factors responsible for the derailments was improper track maintenance. In WR, outsourcing was done but the target set for outsourcing could not be achieved and fell short by 23-29 *per cent* for three years⁹ out of four-year period.
- In four ZRs (CR, NR, NWR and SCR), the percentage of vacancies in Civil Engineering department ranged between 10-21 *per cent*. In NWR, no outsourcing was done. Further, only 11 persons were outsourced on NR against vacancies of 154 in the year 2017-18, and for other three years, no outsourcing was done. For SCR no outsourcing was done during 2017-18.
- In three ZRs (NCR, NFR, and WCR), the percentage of vacancies was more than seven *per cent*, however, no outsourcing was done in any of these ZR.

The maintenance was being carried out though there were vacancies in work force and negligible outsourcing; this revealed that required steps were not taken for adequate staffing in safety category. Decrease in deployment of staff for track maintenance has potential of adverse impact on quality of maintenance. The compromise in quantity and quality of maintenance can result in poor performance by

⁸ In respect of Permanent Way(JE/SE/SSE), Bridge inspector, Mate/Keyman/Permanent Way Mistry, Gangmen/Trackman, Engineering Gatemen

⁹ March 2017, March 2018 and March 2020.

engineering permanent way assets having implication on IR's Vision 2020 of making railway operations free of accidents.

2.4 Mechanization of track maintenance activities

Railway track components play different roles in the railway track. Railway track components give the foundation of whole railway track system like steel rail and railway sleeper. Besides, rail components also ensure the railway safety by fixing rails and railway sleepers, such as railway fastening system, railway fishplate and fish bolt etc.

The track should be maintained either by mechanized maintenance system or by conventional system. The conventional maintenance system, normally deployed on tracks consisting of other than pre-stressed concrete sleepers, involves maintenance activities



undertaken by sectional gangs. In mechanized track maintenance system, maintenance of track consisting of concrete sleepers is normally done by mechanized means.

The track structure has become sturdier and less amenable for manual maintenance due to continuous developments in various track components namely rails, sleepers, fastenings, points, crossings etc. This led to gradual proliferation of use of track machines for mechanized maintenance of track. Over the years, extent of mechanized maintenance gained importance for reliable track maintenance with high degree of precision and quality with minimum dependence on human factor.

In the Project Report on 'Recommendations for optimum utilization of Track Machines (May 2017), National Academy of IR (NAIR), Vadodara, *inter-alia*, recommended that; (i) The RB needs to ensure that the distribution of track machines shall be made after judicious assessment of the requirement of the ZRs so as to avoid holding of track machines in excess of requirements; (ii) Quality of maintenance of track machines shall be the focus areas, (iii) Pre/post block preparations shall be done properly and in advance to avoid loss of working time of machine during block, (iv) Action shall be taken on priority to fill-up vacancies in supervisory and track machine staff, (v) To avoid breakdown time of machines, sufficient inventory of spares shall be maintained in depots, and (vi) Track machine staff shall be given stipulated trainings.

2.4.1 Utilization of Track Maintenance machines

Audit examined the utilization of the track machines in selected twelve ZRs. Audit noted that 517 machines were deployed during the period from 2017-18 to 2020-21.

Out of the total available machine days 7,54,820¹⁰, the machines remained idle for 1,20,135 (16 per cent) machine days. The reasons for idling of track machines in twelve ZRs are indicated in **table 2.4.1**:

Table 2.4.1: Reasons of idling of Track Machine during 2017-18 to 2020-21

Reasons for idling of Track Machines	Number of Machine days idle	Per cent to total number of Machine days idle
Block not given by the Operating Department	38,088	32
Block not planned by Divisions	35,944	30
Stabled due to operational problems ¹¹	22,874	19
Programme not planned by TMO	12,689	11
Non-availability of Track Machine Staff	6,459	05
No scope of work	4,081	03
Total machine idle days	1,20,135	--

The ZR wise analysis was also carried out to know the reason for idling of track machines. The details are given in **table 2.4.2** below:

Table 2.4.2: ZR wise idling of Track Machine during 2017-18 to 2020-21

Reasons for idling of Track Machines	Range of number of days Machine remained idle	Number of ZR
Block not given by the Operating Department	465 to 7566	12
Block not planned by Divisions	214 to 7811	10
Stabled due to operational problems ¹²	473 to 4086	12
Programme not planned by TMO	212 to 3368	10
Non-availability of Track Machine Staff	13 to 1881	11
No scope of work	186 to 1667	05

Thus, idling of track machines due to ‘block not given by the Operating Department’ and ‘Stabled due to operational problems’ was found in all the twelve ZRs. In eleven ZRs, the track machine was kept idle for 13 to 1881 machine days due to ‘non-availability of track machine staff’. The idling of track machines due to ‘block not

¹⁰ 517 machines x 365 days x 4 years

¹¹ Repairs, want of spares, engine break, oil etc.

¹² Includes repairs, want of spares, engine break, oil etc.

planned by divisions’ and ‘programme not planned by Track Machine Office’ was noticed in ten ZRs.

In May 2017, National Academy of IR in the Project Report on ‘Recommendations for Optimum Utilization of Track Machines’ highlighted the reasons of idling of track machines and made recommendations. Nevertheless, track machines were kept idle by the ZRs.

The objective of mechanization of track maintenance activities like ballast handling and cleaning, tamping, maintenance of points and crossings etc. with use of track machines may not be achieved, if the machines required for mechanization lie idle. The under-utilization of the track machines to their optimum capacity hampered the track maintenance activity having implications on safety of train operations.

2.5 Introduction of wider and heavier pre-stressed concrete sleepers

The IR had been contemplating to increase throughput to keep pace with increased freight traffic by allowing higher axle load on existing track. Therefore, there was a need to upgrade and standardize the existing track structure for 25 tonne axle load on IR, as the existing sleepers were slender and lightweight. The existing sleepers were less fit for higher impact load caused by flat wheels, which results sometimes to premature failures of sleepers. Considering the above factors, Research Design and Standard Organization (RDSO) had developed a new wider and heavier pre-stressed concrete sleeper (RT-8527) for IR.

The RB approved (July 2018), the use of RT-8527 sleepers from 2019-20 onwards. The RB issued directives (October 2018) regarding use of RT-8527 sleepers which *inter-alia* specified the following:

- If the adjoining patches are likely to be renewed within five years. It would be advisable to use RT-8527 sleepers only except for very short patches of less than say 500 meter length,
- If ‘Through Track Renewal (TRR)’ were to be carried out within five years, it would be advisable to carry out ‘Complete Track Renewal (CTR)’ in such cases with RT-8527 sleepers and 60 kg rails.
- The RB allowed the ZRs to procure ordinary line sleepers for track renewal of sanctioned patches, which were less than two kilometer in a continuous length, ‘Through Sleeper Renewal (TSR)’ required for track patched which have 52 kg rail and for keeping imprest of sleepers for maintenance of track and accident restoration work. The decision should be taken with the approval of Chief Track Engineer (CTE).

Audit collected data regarding use of RT-8527 sleepers in sanctioned patches above two kilometer length, from 2019-20 onwards. It was observed that in following ZRs, the RT-8527 sleepers were not used, as shown in **table 2.5.1**:

Table 2.5.1: Details of use of RT-8527 sleepers

Zone	Type of works of sleeper renewal	Number of works of sleeper renewal	Number of works where provision of RT-8527 sleeper not made (<i>per cent</i>)	Overall <i>per cent</i> age
Eastern Central Railway	CTR	4	3 (75 <i>per cent</i>)	78 <i>per cent</i>
	TSR	4	3 (75 <i>per cent</i>)	
	TRR	1	1 (100 <i>per cent</i>)	
Eastern Railway	CTR	20	8(40 <i>per cent</i>)	41 <i>per cent</i>
	TSR	6	3(50 <i>per cent</i>)	
	TRR	1	1(100 <i>per cent</i>)	
Northern Railway	CTR	13	8 (62 <i>per cent</i>)	70 <i>per cent</i>
	TSR	5	4 (80 <i>per cent</i>)	
	TRR	2	2 (100 <i>per cent</i>)	
Total		56	32	57 <i>per cent</i>

From the above it is observed in 32 number¹³ of works (57 *per cent*), provision for RT-8527 sleepers were not made.

ZR-wise analysis revealed the following:

- In ECR, as against nine works planed, only two works were carried out by using RT-8527 sleepers. The reasons quoted by the zone in respect of not using RT-8527 sleepers in respect four works was non-availability of rate reference in IRPSM for RT-8527 sleepers at the time of preparation of detailed estimated for CTR (one work) and TSR (three works). However, no reasons were quoted for the remaining three works.
- In ER, as against 27 works planned, 16 works were carried out by using RT-8527 sleepers. The reasons quoted by the zone in respect of not using RT-8527 sleepers in respect 11 works was that the sanctioned track renewal was done with normal PSC sleeper as per availability of sleeper and matching fittings.
- In NR, as against total 20 works planed, only six works were carried out by using RT-8527 sleepers. The reasons quoted by the zone in respect of not using RT-8527 sleepers in respect of four works was non-availability of rate reference in IRPSM for RT-8527 sleepers at the time of preparation of detailed estimated for CTR (three works) and TRR (one work). No reasons were quoted for the remaining ten works.

The reasons quoted by the ZRs are not acceptable, as RB had already directed (July 2017) the ZRs that rate references (Unit costs) should first be entered in IRPSM by CTE's office to help divisions to draft proposals for the track renewal works. The non-use of RT-8527 sleepers by ZRs resulted in non-adherence to the directives of the RB.

¹³ Break up of 32= CTR-18, TSR-10, and TRR-4

2.6 Alumino Thermit and Flash Butt Welding

The rail joint is an important part of the track system. On IR, Alumino Thermit (AT) welding, and Flash Butt (FB) welding processes are used for welding of rail joints. The AT welding is used to repair or splice together existing continuous welded rail segments. This is a *manual* process, which uses molten iron to weld the gap between rails. The AT bonded joints are less reliable and more prone to fracture.



The preferred process of FB welding involves an automated track-laying machine running a strong electrical current through the touching ends of two un-joined pieces of rail to form a strong weld. The FB welding was being done on ZRs departmentally, using stationary FB welding Plants. Mobile FB welding Plants, capable of in-situ FB welding of rail joints, were also in operation on some of the ZRs.

Corporate Safety Plan of IR (2003-13) emphasized that as the AT welds are weak links in track, its population was to be gradually reduced and replaced by FB welds.

In view of the importance of the FB weld over the AT welds, Audit examined the records relating to AT welds and FB welds executed by the IR. The details of AT welding and FB welding executed over thirteen ZRs during 2017-21 is shown in **table 2.6.1** below:

Table 2.6.1: Details of AT and FB welding's in ZR

Type of welds	No. of welds carried out during 2017-18 to 2020-21			Per cent of shortfall
	Target	Actual	Shortfall/ Excess (+)	
(A) Alumino Thermit	367952	1111041	(+) 743089	(+) 201.96
(B) Flash Butt-Plants	1206472	797665	408807	33.89
(C) Flash Butt-Mobile	528789	456632	72157	13.65
(B+C) Total Flash Butt	1735261	1254297	480964	27.72

It can be seen from the above that the targets in respect of AT weld were achieved. There was, however, shortfall in achievement of targets in case of FB welds. Audit analysis further revealed the following:

- The FB welding fell short by 4,80,964 welds (27.72 per cent) against the target of 17,35,261 welds. In FB welds executed in plants, there was shortfall of 4,08,807 (33.89 per cent) welds as against the target of 12,06,472 welds. Similarly, in Mobile FB welds, there was shortfall of 72,157 (13.65 per cent) welds as against the target of 5,28,789 welds.

- In case of FB welding at plants, in five ZRs, the shortfall was more than 40 *per cent*, and in three ZRs, the shortfall was 23-34 *per cent*. In case of Mobile Flash Butt (FB) welding, in five ZRs, the shortfall was more than 40 *per cent*, and in two ZRs, the shortfall was 6.68-18.12 *per cent*.

The reasons provided by the Zonal Railway Administration for execution of higher number of AT welds than targeted were attributed to unavailability of use of AT welds for regular maintenance (ECoR), use of AT welding where FB welding is not economical (SER and WR), non-fixation of targets for removal of AT Welds (NCR and SR) and isolated welding (WR). The fact, however, remained that the Railway administration failed in implementing the directives issued on rail welds in ‘Corporate Safety Plan of IR’ (2003-13).

Thus, the objective of achieving rail safety through replacement of AT welds by reliable FB welds was not achieved.

2.6.1 Contracts for Rail Welding

The details of contracts awarded by ZRs for AT welds and FB welding are given in **table 2.6.2** below:

Table 2.6.2: Details of welding contracts awarded during 2017-18 to 2020-21

Year	Number of contracts awarded	Number of Contracts involving		Per cent of ATWeld contracts
		ATWeld	FB Weld	
2017-18	110	91	19	82.73
2018-19	93	79	14	84.95
2019-20	100	90	10	90.00
2020-21	76	66	10	86.84
Total	379	326	53	86.01

It can be seen from above that 379 contracts were awarded in fifteen ZRs during the period from 2017-18 to 2020-21.

Further analysis revealed the following:

- In all the years, the percentage of total contracts awarded for the AT welding were more (above 80 *per cent*) than that of total FB welding contracts. As against total contracts awarded (379) for welding, the contract awarded for FB welding was only 53 which constitute only 13.99 *per cent*.
- In selected division of two ZRs, no contract for FB weld was awarded during review period and all contracts (19 numbers) awarded were for AT welds. In respect of selected divisions of six ZR, contracts for welds included FB welds for a period of one year out of review period of four years.

The reasons for award of higher number of contracts involving AT welds were mainly attributed to high number of AT welds due in yards, isolated works, and FB not economical for isolated works.

The reply may be viewed in the light of the fact that, the MoR in reply to a recommendation of Standing Committee on Railways¹⁴ *inter-alia* stated that “Technology upgradation in the laying and maintenance of track is being carried out continuously, switching over to Mobile FB Welding technology in place of AT welding to carry our weld renewals. The quality of Mobile FB Welding is superior to AT welding”.

The RB reiterated (August 2019) that the elimination of AT welding except in emergency shall be the way forward. Audit, however, noted that the AT welding was given more weightage over FB Welding as seen from the audit analysis.

2.7 Ultrasonic Flaw Detection Testing

To ensure safety, the rails and welds were routinely tested by ultrasonic testing procedures at the prescribed frequency as per the ultrasonic flaw detection (USFD) manual. The testing of rails and welds using USFD machines has been prescribed in Para 302 (i) (d) of IR Permanent Way Manual (IRPWM). The Rail and weld testing is carried out by SSE (USFD) either departmentally or through contracts. The work of SSE is subject to supervision by Assistant Divisional Engineer and Sr. Divisional Engineer. As per IRPWM, the Assistant Engineer/Assistant Divisional Engineer is generally responsible for the maintenance and safety of P.Way¹⁵ and works in his charge including USFD test check of welds¹⁶.



Audit scrutiny of USFD testing of rails and welds revealed that:

- There were shortfalls in USFD testing in rails and welds during the period of four years (2017-2021).
- In NR, in respect of USFD testing in rails, there was shortfall of 50 *per cent*. In NWR, the shortfall was 11 *per cent* and in SWR, the shortfall ranged between 4-41 *per cent*.
- In SER, the shortfall in USFD testing on welds ranged between 04 and 42 *per cent*. In WR, the shortfall ranged between 10-37 *per cent*. In NFR, the shortfall ranged from 4-23 *per cent* and in ECoR, the shortfall was up to 100 *per cent*.

The NR administration stated that shortfall in testing in rails was due to testing priority of main line. The reasons for shortfall on SWR were not made available by

¹⁴ Report No. 1 of the Standing Committee on Railways (2014-15).

¹⁵ In a permanent way, rails are joined by welding or by using fish plates and are fixed with sleepers by using different types of fastenings. The sleepers are properly placed and packed with ballast. Ballast is placed in the prepared subgrade called formation.

¹⁶ USFD Test check is done by both SSE (in-charge) as well as ADEN on monthly basis for a minimum of 02 hours during trolley inspection

Railway Administration. In respect of shortfall in testing of welds, it was stated that the shortfall was due to non-availability of welds, shortage of manpower, scarcity of USFD operators, etc.

The USFD testing was to be carried out at the prescribed frequency. There was shortfall in USFD testing. Timely testing by USFD may help in early detection of vulnerable points and initiating necessary remedial measures to reduce the probability of accidents. The reply of the Railway administration was, therefore, not acceptable.

2.8 Provision and Utilization of Integrated Maintenance Blocks

In railways, maintenance blocks are must for maintenance of infrastructure facilities. A 'Block' is an arrangement of blocking of track against movement of traffic over a particular section duly allowing the required maintenance.

There were four types of blocks in use, such as, 'line block'¹⁷, 'power block'¹⁸, 'shadow block'¹⁹ and 'integrated block'²⁰. The IRPWM-2020 *inter-alia* provides that the traffic blocks are necessary depending on the method of relaying adopted in track renewals. A minimum block of two to three hours duration is necessary where renewal works are carried out manually. In the case of mechanical relaying, a minimum block of three to four hours is desirable.

Corporate Safety Plan-2003-13²¹, *inter-alia* provided for implementing the concept of preventive maintenance, granting of adequate time for maintenance of assets, both fixed and movable. It also emphasized that efforts should be made to make optimum use of all such granted blocks and standard output achieved. Computerized database should be maintained at divisional level for keeping accurate record of all aspects of working connected with maintenance blocks. Since granting of maintenance blocks is an expensive proposition, all the concerned Departments will simultaneously utilize each maintenance block granted.

Audit collected one month data (March 2020) related to 'AT' welding renewal works carried out manually, renewal works carried out with machines, and integrated corridor block. The shortfall noticed on test check of data for the month March 2020 of seven ZRs is shown in **table 2.8.1** below:

¹⁷ Line block included blocking the line for engineering purpose and not permitting any train except Material Train and Track Machine'.

¹⁸ Power Block includes blocking the movement of electric traction traffic and is exclusively used for maintenance of Over Head Equipment (OHE).

¹⁹ Shadow Block is a block, which may or may not be a line; power or integrated block viz., changing of bridge girders, changing of contact wire etc.

²⁰ Blocking the portion of a line for maintenance work by more than one department.

²¹ Para 6.25, Chapter VI.

Table 2.8.1: Shortfall in provision of integrated maintenance block in March 2020

Maintenance Activity	Minimum block required (Hours)	Shortfall in grant of Blocks (Hours)	Blocks (Numbers)
Alumino Thermit Welding	1:10-1:15 ²²	1876:10	1400
Renewal Works carried out Manually	2-3 ²³	172:05	132
Renewal Works carried out by Machine	3-4 ²⁴	307:46	236
Integrated Corridor Block ²⁵	4	27:35	37
Total	--	2383:36	1805

It could be seen from the above table that, there was a shortfall of 2383:36 hours for 1805 number of blocks by the ZRs to carry out the integrated maintenance activities.

The ZRs and Division-wise analysis revealed that:

- In ‘AT’ welding the shortfall was maximum (833:59 hours for 584 number of blocks) in Varanasi division of NER, followed by Asansol division of ER where the shortfall was 444:30 hours for 87 number of blocks.
- In the category of renewal works carried out manually, the maximum shortfall (53:35 hours for 39 numbers of blocks) was in Mysuru division of SWR, followed by Deen Dayal Upadhyaya division of ECR, wherein the shortfall was 46:10 hours for 19 numbers of blocks.
- In respect of renewal works carried out by machines, the maximum shortfall (261:40 hours for 197 number of blocks) was in Lucknow division of NR.
- In ‘Integrated corridor’ category, the maximum shortfall (20:00 hours for 20 number of blocks) was noticed in Jaipur division of NWR.

Thus, the ZRs failed to provide minimum hours to carry out the permanent way maintenance activities.

2.9 Maintenance of ‘Yard Lines’

As per Para 632 of IRPWM, the defects noticed during the inspection of yard lines shall be attended by deploying the gangs or machine. Preferably, track machines should maintain all passenger loop lines and other loops can be maintained by manual/mechanized methods.

²² Para 306 of IRPWM-2020

²³ Para 707 of IRPWM-2020

²⁴ Para 707 of IRPWM-2020

²⁵ RB (December 2016) introduced ‘fixed time Integrated Corridor Block’ concept with the duration of 4 hours each or two blocks with the duration of 2.5 hours every day.

The planning and execution of maintenance activities in the yard lines in the sections over the selected divisions of the ZRs were examined to verify whether the maintenance in yards were carried out as per prescribed schedules, and also whether the necessary maintenance blocks were being granted for the same.

Audit examination revealed that there was wide variation in the demanded hours and hours actually granted for maintenance of block in five ZRs as detailed in **table 2.9.1**:

Table 2.9.1: Details of blocks demanded and granted for yard line maintenance

Year	Maintenance Block (In hours)		Percentage Granted
	Demanded	Granted	
2017-18	1649:38	1035:34	62.77
2018-19	1854:47	1148:07	61.90
2019-20	1731:29	1078:41	62.28
2020-21	2103:34	1405:34	66.81
Total	7339:28	4667:56	63.59

Analysis of above table shows that as against the demand of 7339:28 hours for Yard line maintenance, only 4667:56 maintenance block hours were granted by the ZRs during 2017-18 to 2020-21. Thus, there was a shortfall of 2671:32 (36.41 per cent) maintenance block hours.

Further analysis of maintenance of yard lines at divisional level revealed that:

- In Prayagraj division of NCR, maximum shortfall (45 per cent, demanded 1916:20 hours, granted 1058:15 hours) and in Howrah division of ER, the minimum (18 per cent²⁶) shortfall was noticed during 2017-21.
- In Nagpur division of CR, there was a shortfall of 33 per cent²⁷ and in Nagpur division of SECR, the shortfall was 39.53 per cent²⁸. In Ahmedabad division of WR, the shortfall was 26.25 per cent²⁹.

The reasons for the shortfalls were attributed to (i) the agencies not turning up to execute the work in time, (ii) less block granted against those demanded, (iii) non-availability of material, etc. Because of shortfalls in maintenance activities, the conditions of track would become unsafe, adversely affecting the safe movement of trains.

2.10 Inspection of Civil Engineering Department

The laying and maintenance of Track are specialized activities, which need to be undertaken as per the laid down procedure and practice. To keep the track in a safe condition, it is the duty of the permanent way (P.Way) officials to be vigilant and stick to the inspection schedules. The details of various inspections with periodicity to

²⁶ Demanded 251:10, Granted 204:47 hours

²⁷ Demand 2737:30, Granted 1825:00

²⁸ Demanded hours 94296, Granted 57015 hours

²⁹ Demanded hours 853:30, Granted 629:40 hours

be conducted by officials of Civil Engineering Department are prescribed in IRPWM³⁰.

In order to bring efficiency and effectiveness in management practices, Railways has also introduced e-enabled track maintenance practices on Web-Enabled IT platform known as Track Management System (TMS).

As per the Schedules laid down in IRPWM-2020, the Assistant Divisional Engineer, in charge of the sub-division are required to conduct 24 types of inspections and the Senior Section Engineer (SSE)/P.Way, In-charge are also required to conduct 28 types of inspections.

In view of the importance of the inspections, maintenance, and safety of all P.Way and works in IR, Audit examined the data of inspections in 32 selected divisions over 16 ZRs, by the officials of Civil Engineering Department in respect of 16 out of 24 inspections.

Audit analysis of the quantum of scheduled inspection conducted during 2019-20 and 2020-21 revealed considerable shortfall in the various types of inspections. Review of the status of compliance of the various schedules of inspection by the P.Way officials of 32 selected divisions over 16 ZRs revealed the following.

- Foot inspection of routes having speed more than 110 Kmph were found short of the schedules in nine divisions of six ZRs by the sectional JE/SSEs, in four divisions of four ZRs by the in-charge SSEs, in four divisions of three ZRs by the ADENs of respective units. Foot inspection in other routes were also found short of the schedules in nine divisions of eight ZRs by the sectional JE/SSEs, in eight divisions of eight ZRs by the in-charge SSEs and in six divisions of six ZRs by the ADENs concerned;
- Trolley inspection of routes having speed above 110 kmph were found to be inadequately done in three divisions of three ZRs by the sectional JE/SSEs, in three divisions of three ZRs by in-charge SSEs, in four divisions of four ZRs by the ADENs and in three divisions of two ZRs by the Senior DENs. Trolley inspection of other routes were also found lacking in 10 divisions of nine ZRs by the sectional JE/SSEs, in eight divisions of seven ZRs by the in-charge SSEs, in three divisions of two ZRs by the ADENs and six divisions of four ZRs by the Senior DENs;
- Loco/Break van/Rear window inspection, which were scheduled for inspections by the in-charge SSEs fortnightly and the sectional JE/SSEs monthly were found not done as per schedule in 20 divisions of 14 ZRs and 21 divisions of 15 ZRs, respectively;
- Level crossing inspection were not conducted as per schedule by the sectional JE/SSEs and the in-charge SSEs in seven divisions of five ZRs, by the ADENs in three divisions of two ZRs and by Senior DENs in 12 divisions of 10 ZRs;

³⁰ *Para 103, 106 and 109 of IRPWM.*

- Shortfall in inspection of LWR/SEJs were observed in two divisions of two ZRs by the JE/SSEs, in two divisions of two ZRs by the ADENs and in 10 divisions of seven ZRs by the Senior DENs;
- Track on bridges along with their approaches were found to be not inspected as per schedule in five divisions of three ZRs by the JE/SSEs and in six divisions of four ZRs of by the ADENs;
- AT welding sites were not inspected as per schedule by the in-charge SSEs in 11 divisions of nine ZRs and by the ADENs in nine divisions of five ZRs;
- Test check by USFD locations were not done as per schedule by the in-charge SSEs in 15 divisions of 10 ZRs and by the ADENs in 13 divisions across nine ZRs;
- Hot weather patrolling were found not done as per schedule by the in-charge SSEs in nine divisions of six ZRs, and by the ADENs in eight divisions over five ZRs;
- Night Foot Plate inspection were not conducted adequately by the sectional JE/SSEs in 18 divisions of 12 ZRs, by the in-charge SSEs in 20 divisions of 13 ZRs, by the ADENs in 16 divisions of 12 ZRs and by the Senior DENs in 13 divisions across nine ZRs;
- Joint inspection of Points & Crossings with Signal and Telecom department, which were scheduled to be conducted by the sectional JE/SSEs and in-charge SSEs once in three months on rotation basis, were not conducted as per schedule in six divisions across five ZRs;
- Small Track machines due for inspection, once in three months, by the in-charge SSEs were found not complied in nine divisions of seven ZRs and once in six months by the ADENs were not fully complied in nine divisions of seven ZRs. Similarly, various types of track machines due for inspection by Senior DENs were found not complied in five divisions over three ZRs.

No specific reasons for the shortfalls in the various types of inspections against the prescribed schedule were reported by the ZRs (except ER, NR, SER and SCR). The NR, SER and SCR administration cited extra load of work with limited manpower and Covid pandemic restrictions as the main reason, for the shortfalls in inspection. ER Administration stated that due to unfamiliarity with online working on computer, few officials failed in making entry of their inspection reports.

Audit observed that records of inspection either were not made available to audit teams or were not maintained properly. In absence of records, impact of shortfall in inspections could not be verified in audit. Audit also observed that the information regarding inspections, though available on Track Management System³¹ (TMS), the

³¹ *TMS is Web based application that integrates track. Structure data, inspection data to assist railways and checks level of maintenance and accuracy. The main purpose of introducing TMS in IR is to enhance level of safety of passengers and goods.*

same were not available in the inspection module which are supposed to generate alerts as and when the inspection becomes due.

Thus, failure in conducting the periodical inspections of the permanent way as provided in the IRPWM-2020, would lead to poor condition of track and resultant accident. Possibility of derailment due to poor condition of track cannot be ruled out

2.11 Inspections by Higher Authorities

As per IRPWM, the Assistant Engineer/Assistant Divisional Engineer is generally responsible for the maintenance and safety of P.Way³² and works in his charge, and is also responsible wide variation in number of inspections conducted over various ZR by the higher officials as detailed in **table 2.11.1**:

Table 2.11.1:Details of Inspections carried out by Higher Authorities

Zone	Route Kms	Number of inspections carried out				Total	Ratio- Route Km to Number of inspections ³³
		2017-18	2018-19	2019-20	2020-21		
CR	3853	10	2	14	5	31	498:1
ECoR	2800	4	4	2	0	10	1120:1
ER	2820	7	12	6	0	25	627:1
NCR	3222	21	3	27	7	58	223:1
NEFR	4152	409	320	345	196	1270	14:1
NER	3102	1	2	2	0	5	2482:1
NR	7062	61	61	64	37	230	123:1
NWR	5248	13	15	15	11	54	389:1
SCR	6206	36	10	14	7	67	371:1
SER	2713	25	24	17	11	77	141:1
SR	4914	3	5	5	1	14	1404:1
SWR	3578	1	1	2	1	5	2863:1
WCR	3011	8	5	3	4	20	603:1
WR	4885	1	4	18	6	29	674:1
Total	57566	607	468	534	286	1895	122:1

Regarding compliance to the inspection notes, audit observed that;

- In WR, though inspection notes in respect of the inspections were uploaded in Track Management System³⁴ (TMS) portal, compliance to the notes was available

³² *In a permanent way, rails are joined by welding or by using fish plates and are fixed with sleepers by using different types of fastenings. The sleepers are properly placed and packed with ballast. Ballast is placed in the prepared subgrade called formation.*

³³ *Ratio is calculated by averaging number of inspections conducted year-wise with route kilometers.*

³⁴ *TMS is a web based application that integrates track structure data, inspection data to assist railways and checks level of maintenance and accuracy.*

in only nine out of 83 cases³⁵ (Vadodara division). Thus, the in-built monitoring mechanism of the TMS portal was not found to be operational.

- Information pertaining to closure of the inspection notes was not found filled in the portal. Moreover, during the visit to the field offices copies of inspection notes/compliance pertaining to the section under the jurisdiction of two-selected Senior Section Engineer (SSEs) were not found available in their offices. In absence of the details in TMS or in the concerned offices, the compliance to the notes could not be verified in Audit.

Railway Administration stated (December 2021) that TMS being a single portal for all ZRs; it was an evolving process with improvements being done from time to time.

In this connection, audit observed that the track management system was launched (January 2016) to monitor track maintenance and inspection online. The non-availability of information pertaining to closure of the inspection notes shows laxity on the part of Railways Administration in implementation of the track management system. The reply of the Railway Administration was, therefore, was not acceptable.

Audit also observed stark differences in the ratio of route kilometers with average number of inspections (for review period of four years) as given below:

- On two ZR, the ratio was more than 2400 km for one inspection, i.e. for average one inspection; there were more than 2400 km. On two ZR, the ratio was more than 1100.
- For seven ZR, the ratio was more than 220 km for one inspection and the ratio ranged between 223 to 674. In three ZR, the ratio was 141, 123 and 14 respectively.
- Audit noted that, in SECR, higher officials did not carry out any inspection, though the zone has 2348 route km (around 4 percent of total of Indian railway) BG line.

As no standard criterion was set for number of inspections to be conducted by higher authorities, there is no accountability for meagre number of inspections.

Audit is of the view that the delay in compliance of issues noticed during inspections by higher authorities may lead to issues remain unattended. Regular inspections by higher officials, may lead to enhanced overall safety in the operations of the trains.

2.12 Periodical medical examination of officials

Para 1408 of the IRPWM *inter-alia* provide that “in order to secure continuous effective service and to ensure that one shall not possess any disease, unfitting him or likely to unfit him for that Service, regular medical examination of railway staff should be done”.

³⁵ *This includes inspections by the various authorities including higher authorities.*

Further as per Para 514 of the IR Medical Manual, to ensure the continuous ability of Railway employees in Category A-1, A-2, A-3, B-1 and B-2 to discharge their duties with safety, they will be required to appear for re-examination at stated intervals throughout their service, as detailed in **table 2.12.1**.

Table 2.12.1 Details showing periodicity of medical re-examination

Category	Re-examination Intervals
A-1, A-2 and A-3³⁶	At the termination of every period of four years, calculated from the date of appointment, until they attain the age of 45 years, and then every two years until the age of 55 years and then thereafter annually, until the conclusion of their service.
Category B-1 and B-2	On attaining the age of 45 years, and thereafter at the termination of every period of 5 years.

Audit collected details of periodical medical re-examination(PME) of officials of Civil Engineering Department (A-3 and B-1 category) for the period from 2017-18 to 2020-21, in respect of 16 ZRs, and 32 divisions (two divisions in each zone). The details of the shortfall in PME of officials are given in **table 2.12.2**:

Table 2.12.2: Details of shortfall in medical re-examination of the officials

Category	Designation	Number of re-examinations (2017-18 to 2020-21)		
		PME due	PME done	Shortfall
A-3	SSE/JE/P.Way, Trolley man	455	278	177
B-1	Gang mate, Key men, Track maintainer	1684	1351	333
	Total	2139	1629	510

It can be seen from the above table that there was shortfall in PME in both the categories. As against 2139 PME due, 1629 PME were carried out and there was a shortfall of 510 (23.84 *per cent*) PME during the four years period.

Further review of data of the Zonal and division revealed the following:

- In ‘A-3’ category, in 12 divisions over nine ZRs, the shortfall in PME ranged between 01 and 68. The maximum shortfall was noticed in ‘Danapur’ division of ECR.
- Similarly, in ‘B-1’ category, in 12 divisions over 10 ZRs, the shortfall in PME ranged between 03 and 157. The maximum shortfall was noticed in ‘Danapur’ division of ECR.

³⁶ A-1 (Loco Pilot, Motorman, Shunter), A-2 (Guards, Shunting Master, Points man, Traffic porters, Station master Traffic Apprentices etc), A-3 (Loco inspector, JE/SE C&W, JE/SE P.Way, Trolley man, Gatekeeper, etc), B-1 (Gang men, key man, Trackman, Permanent way khalasis, Patrolman, ESM/Tech Signal, Train Examiner staff, etc) B-2 (Ticket checking staff).

Non-adherence of the prescribed schedules of frequency and standard of medical test by the Railway Administration consequently leads to non-qualification of desirable medical standards by the P.Way officials.

2.13 Training of track maintenance officials

Para 1401 of IRPWM prescribes four different types of training courses for P.Way officials namely Initial/Induction/Basic Courses, Promotional Courses, Refresher Courses and Special Course. Para 1407 of the IRPWM, further provides for training and certification of Welders and Supervisors as per the provisions of “Indian Railway Standard Specification for Fusion Welding of Rails by the Alumino-Thermit process”.

Audit collected the data regarding training to officials of eight divisions over seven ZRs. The year-wise data in respect of seven ZRs where shortfall in training was noticed during the 2017-21 is given in **table 2.13.1**:

Table 2.13.1: Training due but not imparted to officials dealing with track maintenance

Category of Officials	Type of Training	Number of officials not trained				Total
		2017-18	2018-19	2019-20	2020-21	
JE/SSE (P.Way)	Induction	06	06	06	04	22
SSE (P.Way)	Promotion	10	09	09	08	36
JE/SSE (P.Way)	Refresher	21	18	21	18	78
Track Maintainer	Induction	23	03	70	86	182
	Refresher	104	114	72	147	437
Welder	Refresher	--	--	01	02	03
JE/SSE-Welding Supervisor	Initial	10	10	08	08	36
Total		174	160	187	273	794

As seen from above, 794 officials dealing with track maintenance activities were not given training in seven ZRs.

Further analysis of the training data at Zonal and divisional level revealed the following:

- The induction/initial training was not given to 240 officials and refresher training was not imparted to 518 officials of the selected ZR.
- Though the requisite trainings reported to have been imparted in majority of the ZRs, the same was lacking in eight divisions over seven ZRs .It can be seen that the shortfall in imparting training to "Track Maintainers” either at their induction level or at refresher course level had been reported by all the aforementioned seven divisions Shortfalls in trainings at supervisory level, such as, SSE/JE/P. Way were also seen in two divisions.

The reasons for the shortfall in imparting training at various levels were mainly attributed to Covid-19 situation, staff not being spared due to special work and other assignments, non-receipt of training schedule in the units, and non-updation of information of employees in Track Management System (TMS), etc.

Audit noted that the RB in its guidelines (February 2010) for ‘Training modules for Permanent Way staff’ inter-alia stated that the main objective of induction training is imparting of knowledge about track engineering and methods of its maintenance and building skill base of trainees as the subject matter is basically in the nature of an ‘Applied Science’.

Thus, the trainings not being imparted at induction level would deprive the employees of the technical knowledge of the department, and trainings not imparted at refresher course level would deprive the staffs to enable them to keep themselves abreast with the latest rules and techniques.

2.14 Survey of Permanent Way staff

Questionnaires for conducting structured interviews with the different categories of field staff³⁷ were devised with the help of Indian Railway Institute of Civil Engineering (IRICEN), Pune. The objective of the survey was to identify, whether the track maintenance staff and Sectional Engineer/ P.Way were facing any constraints during the course of maintenance/ inspection and to obtain suggestions of the field staff to improve reliability/ avoid derailments and accidents. The important issues emerged during the course of interview with 921 field staff are highlighted in **table 2.14.1**.

Table 2.14.1: Result of Survey of Permanent Way Staff

Category	Result of survey
Safety Standard of Field Staff	<ul style="list-style-type: none">Majority of Track Maintainers felt to be at risk when working alone/in group and in greater risk when working with Contractor's labourers on the other hand some asked for Companion.It was suggested that Rakshak Device introduced by Railway administration by which it was possible to get early information regarding approaching trains, be given to every field staff.Marking by luminous paint was required at work sites to enhance the visibility.Walky talky devices should be provided to field staff.

³⁷ *Keyman, Patrolman, Track Maintainer, Blacksmith, Watchman, Welder, Senior Section Engineer/Junior Engineer (P. Way), Senior Section Engineer (USFD)*

	<ul style="list-style-type: none"> • Torch provided was of poor quality and GPS was not working properly. • Safety helmets were not provided to all staff, size of hand gloves was not proper and Shoes issued were of inferior quality. • Transportation facilities not appropriate at site to carry out inspection. • Adequate safety equipment/ lighting arrangement/ Marking by luminous paint were required at work sites to enhance safety at work sites. • Provide temporary fencing for safer working of motor vehicle near track. • Safety rubber gloves are not very comfortable/handy in terms of grip, so mostly they have to work in electric section barehanded leaving them vulnerable to electric shocks. Safety shoes, gloves provided should be of good quality and raincoats also to be provided. Safety belt should be provided while working on bridges. • Staff needs official means of communication to communicate higher officials in emergency. • Caution order requires to be accepted by operating as and when demanded. • Tools and equipment requires to be replaced within Codal life. • No embankment /platform besides a railway track which makes it difficult to work when trains pass by.
<p>Quality Consciousness</p>	<ul style="list-style-type: none"> • Regular safety seminars should be arranged for field staff at the lower level along with specific training. • Sufficient manpower should be provided to ensure high quality work. • Tamping Machines were not available for tamping of ballast. • Conversion of 52 kg assets to 60 kg for better stability of track. • Proper maintenance activity needed for reducing the possibility of derailment. • Parameters like specified duty hours, mandatory weekly rest might enhance the quality of work and as well as causality. • Delay in renewal of switches, cast manganese steel (CMS)

	<p>crossings, deep screening, shallow screening, renewal of fittings, Elastic Rail Clip (ERC) greasing may cause causality.</p> <ul style="list-style-type: none"> • Track maintainers suggested for replacement of old rails / sleepers and provision of proper drainage system in yard for reducing yard derailment. • Reporting of unusual occurrence on track was not taken seriously some times. • The cause of derailment, where buffer height was found to be out of permissible limits, was attributed to mechanical ground. This should be looked into at the appropriate level. • Not giving mandatory weekly rest to SSE, which sometimes leads to slackness in attending to works throughout the week. • In respect of combination welds-welds between different types of rails as 52kg/60kg, no proper method of USFD testing was available.
<p>Skills and work specific Knowledge</p>	<ul style="list-style-type: none"> • Contractor's labourers were not skilled and thus became a liability to departmental staff instead of being of help. • Training on operation of track machine, modern track structure should be imparted to senior section engineers (SSEs). • The gap of five years for repetition of Refresher Course was required to be reduced to 2-3 years. • Specialized training was required in the area of quality assurance of material/ equipment.
<p>Adequacy of resources</p>	<ul style="list-style-type: none"> • Some equipment needed to be replaced within its Codal life due to excessive use but such equipment could not be condemned within their Codal life. Equipment bags are required to be provided. • Maintenance activities suffered due to Shortage of tool and equipment, non-availability of machines, unavailability of equipment to communicate driver / station master during unusual occurrences in track like train parting, hot axle and flat tyre, deep screening, dewelding, overhauling track activities suffer more. • During heavy rain / storms, no shelter was available between patrolling beats, which made it difficult to carry out the regular work.

The Railway Administration may consider the above suggestions to ensure higher safety standards and improved efficiency of the track maintenance staff.

2.14.1 Conclusion

IR needs to develop a strong monitoring mechanism to ensure timely implementation of maintenance activities. This can be done by adopting fully mechanized methods of track maintenance and improved technologies. IR must adhere to the action plan as envisaged in Corporate Safety Plan 2003-13 for replacement of AT welds by FB welds and introduction of wider and heavier pre-stressed concrete sleepers for safe running of trains. IR should put in place an inbuilt monitoring for compliance of inspections by the railway officials and unsure provision of specific controls in the Track Management System to generate alerts as and when the inspections become due. Railway Administration should ensure sensitizing the Permanent Way staff by imparting the prescribed training courses on time.

Recommendations:

- IR needs to develop a strong monitoring mechanism to ensure timely implementation of maintenance activities by adopting fully mechanized methods of track maintenance and improved technologies.
- Railway Administration should ensure sensitizing the Permanent Way staff by imparting the prescribed training courses on time.

Chapter 3: Accident Inquiry Reports

3.1 Accidents in Indian Railways

Indian Railways (IR) classified accidents, as an occurrence in the course of working of Railway, which does or may affect the safety of the Railway, its engine, its rolling stock, permanent way and works, fixed installations, passengers or servant or which affects the safety of others or which does or may cause delay to train or loss to the Railway. For ensuing safety of railway property and passengers, each department defined its own safety parameters.

3.1.1 Classification of accidents

The accidents are classified under five heads, (i) Train Accidents, (ii) Yard Accidents, (iii) Indicative Accidents, (iv) Equipment Failures, and (v) Unusual Incidents. The IR, for statistical purposes further made detailed classification of accidents in various categories from A to R³⁸.

3.1.2 Train accidents

Railway Board (RB) issued directives in respect of definition and reclassification of accidents on IR from time to time. Accordingly, ‘Accident Manuals’ were formulated separately by the respective ZR. Based on the impact caused, the train accidents were further divided into two categories³⁹ as shown in **table 3.1.1** below:

Table-3.1.1: Categories of train accidents

1	Consequential train accidents	It include train accidents having serious repercussion in terms of either one or many or all of the following:- (a) loss of human life, (b) human injury, (c) loss of Railway property, (d) Interruption to Rail traffic.
2	Other train accidents	All other accidents, which are not covered under consequential train accidents, are covered under ‘Other train accidents’.

The details of ‘consequential train accidents’ and ‘other train accidents’ are given in **table 3.1.2** and **table 3.1.3** below:

³⁸ For statistical purpose IR classified accidents in ‘A to R’ categories excluding I and O, viz., (A-Collisions), (B-Fire or explosion in trains), (C-Accidents at Level crossings), (D-Derailments), (E-Other Train Accident), (F-Averted Collisions), (G-Breach of block rules), (H-train passing signal at danger), (J-failure of engine and rolling stock), (K-Failure of permanent way), (L-Failure of electric equipment), (M-Failure of signaling and telecommunication), (N-Train Wrecking), (P-Casualties), (Q-Other incidents), and (R-Miscellaneous).

³⁹ In terms of RB letter No.2000/Safety (A&R)/19/20, dated 31/10/2000

Table-3.1.2: Details of consequential train accidents

Type of Accident	2017-18	2018-19	2019-20	2020-21	Total
Collisions	3	4	3	1	11
Derailments	55	48	45	15	163
Accidents at Manned Level Crossing	3	3	1	1	8
Accidents at Unmanned Level Crossing	10	3	0	0	13
Fire in Train	3	6	8	3	20
Miscellaneous	0	1	1	0	2
Total	74	65	58	20	217

It can be seen that out of 217 consequential accidents, the maximum accidents (163 derailments) were due to derailments, which constituted around 75 per cent of the total consequential accidents, followed by accidents due to fire, which was around nine per cent.

Table-3.1.3: Details of other train accidents

Accident Category	Accident Type	2017-18	2018-19	2019-20	2020-21	Total
Equipment Failure	Failure of engine/rolling stock	11	20	13	40	84
Indicative Accident	Train passing signal at danger and other incidents	57	67	52	35	211
Other Train Accidents	Derailments	63	89	117	74	343
	Fire	6	6	3	4	19
	Others including MLC/UMLC	19	26	6	3	54
Unusual Incidents	Casualties, train wrecking and other miscellaneous incidents	19	44	24	48	135
Yard Accident	Derailments	143	383	241	119	886
	Other incidents	16	21	29	2	68
Total		334	656	485	325	1800

In the category 'Other Train Accidents', total 1800 accidents took place. The derailments accounts for 68 per cent (1229 derailments). Out of 2017 consequential and non-consequential accidents (1800 plus 217), the accidents due to derailments were 1392⁴⁰ (69 per cent) during 2017-18 to 2020-21.

⁴⁰ 163 + 343 + 886 = 1392

In view of maximum accidents in the category of derailments, Audit focus was on the accidents due to derailments.

3.2 Derailments on Indian Railways

Derailments are off-loading of wheel or wheels causing detention or damage to rolling stock/permanent way.

3.2.1 Causes of derailment

As per IR, a derailment may be sudden or gradual due to failure of one or more of factors related to track, train operations, Mechanical/ Rolling Stock and Signal and Telecommunication.

3.2.2 Category-wise derailments

The total number of accidents due to derailments is shown in **table 3.2.1** below:

Table-3.2.1: Category-wise derailments on Indian Railway during 2017-21

Category	2017-18	2018-19	2019-20	2020-21	Total
Consequential Accidents	55	48	45	15	163
Other Train Accidents	65	91	116	75	347
Yard Accidents	137	387	238	120	882
(A) Total Derailments	257	526	399	210	1392
(B) Overall Total Accidents	408	719	542	348	2017
Derailment <i>per cent</i> to overall accidents	63	73	74	60	69

Analysis of 1129 ‘Inquiry Reports’ (81 *per cent*) of 1392 derailments accidents in 16 ZRs and 32 divisions revealed that the total damages/loss of assets was reported as ₹ 33.67 crore in the selected cases of derailments.

Audit also revealed that 23 factors responsible for derailments in the selected 1129 cases/accidents over 16 ZRs. The maximum derailments (395) were in ‘Engineering Department’ followed by ‘Operating Department’ (173). Out of 23 factors, the major factor responsible for derailment was related to ‘maintenance of track’ (167 cases), followed by ‘deviation of track parameters beyond permissible limits’ (149 cases) and ‘bad driving/over speeding’ (144 cases).

3.3 Analysis of accident inquiry reports

The main objective of an inquiry is to ascertain the cause of an accident and to formulate proposals for preventing their occurrence. In the process it is ascertained if any inherent defect exists in the system of working or in the physical appliances, such as, tracks, rolling stock and other working apparatus. Measures for rectifying the



On 19 August 2017, the 18478 Puri–Haridwar Kalinga Utkal Express derailed in Khatauli near Muzaffarnagar, Uttar Pradesh

defects and irregularities are then proposed based on the findings. As per the Accident Manual⁴¹, the accidents inquiries are classified as inquiry by CRS, Major Joint Inquiry⁴², Minor Joint Inquiry and Departmental Inquiry.

As per safety framework in Indian Railways, all serious accidents shall be inquired into by the Commissioner of Railway Safety (CRS). All other consequential train accidents shall be inquired by Deputy Chief Safety Officers from Safety Department to be nominated by the General Manager of the ZRs. with the GM as accepting authority. Some of the accidents are also inquired into by a Committee of Sr. Scale or Junior Scale Officers as decided by respective Divisional Railway Manager. Apart from Safety department, the role of other departments in the ZRs are as follows:

- I. Civil Engineering Department is required to ensure safe movement of passengers and goods on newly constructed lines, which demands constant vigil on his part.
- II. Mechanical Department is responsible for maintenance of rolling stock including passenger coaches, freight wagons, diesel locomotives, DMUs and cranes. The department also formulates plans for procurement of rolling stock, machinery & plant and ensures safety and reliability of stock in train operation
- III. Operating Department frame rules for working of trains based on optimal safety parameters and exercising control over the operations as per the rules so laid down.
- IV. Signal and Telecommunication Department is responsible for ensuring existence of proper mechanism for installation, operation and maintenance of related equipment for safe operation of trains.
- V. Electrical Department is responsible for installation, maintenance and upkeep of Over Head Electric Traction for safe running of train on electrified routes on Indian Railways.

⁴¹ Each Zone of Railways is preparing separate 'Accident Manual'.

⁴² Includes (a) Senior Administrative Grade Officers inquiry, (b) Junior Administrative Grade Officers inquiry, (c) Divisional Officers inquiry, and (d) Junior scale Officers/ Assistance officers' inquiry.

3.3.1 Leading Indicators/factors arising out of Accident Inquiry Reports

Every inquiry gives its findings about the cause of the accident, fixes responsibility and suggests measures to prevent accidents. The number of derailments attributable to each factor has been further categorized department-wise. The cases indicated below are combination of factors and not mutually exclusive.

A. Engineering Department

Defects in ‘Permanent Way’ were identified as one of the factors responsible for derailments in 37 per cent cases⁴³. These factors have been categorized in the table 3.3.1 below:

Table-3.3.1: Major factors responsible for Derailments-Engineering Department

Sr. No.	Risk factors identified in accident reports	Number of reports (N2)	Per cent of reports (N2/N1)	Number of consequential derailments
1.	Other issues of maintenance of track	167	42 per cent	33
2.	Deviation of track parameters beyond permissible limits	149	37 per cent	22
3.	Improper Loading by Engineering Department	18	5 per cent	1
4.	Water Logging/ improper drainage on track/ weak formation	10	2 per cent	2
5.	Bad-layout-yard remodeling required	17	4 per cent	3
6.	Existence of Sharp curve	17	4 per cent	0
7.	Mechanization issues	16	4 per cent	1
8.	Deficiencies in new construction	14	3 per cent	5
	Total	395 (N1)		

B. Mechanical Department

The defects in ‘wheel diameter variation and defects in coaches/wagons’ attributable to the Mechanical Department was the first major (33 per cent) contributor to the factors responsible for derailments. This was one of the causes identified in 15 per cent cases⁴⁴ as per details given in the table 3.3.2 below:

⁴³ 395 out of the 1129 derailments (including two collision cases).

⁴⁴ 173 out of the 1129 derailments (including two collision cases)

Table-3.3.2: Factors responsible for derailments-Mechanical Department

Sr. No.	Risk factors identified in accident reports	Number of reports (N2)	Per cent of reports (N2/N1)	Number of consequential derailments
1.	Wheel diameter variation and defects in coaches/wagons	57	33 per cent	6
2.	Incomplete POH/Sick wagon	42	24 per cent	8
3.	Deficiencies in coach/wagon maintenance	43	23 per cent	3
4.	Technological deficiency	15	8.3 per cent	2
5.	Maintenance slackness	8	4.4 per cent	3
6.	Equipment failure	8	4.4 per cent	2
	Total	173 (N1)		

C. Loco Pilots (Mechanical and Electrical Department)

The 'Human error' was the major factor responsible for derailments attributable to the Loco Pilots. This was one of the causes identified in 13 per cent cases⁴⁵ as per detailed in the table 3.3.3 below.

Table-3.3.3: Factors responsible for derailments-Loco Pilots

Sr. No.	Risk factors identified in accident reports	Number of reports (N2)	Per cent of reports (N2/N1)	Number of consequential derailments
1.	Bad driving/over speeding	144	96 per cent	18
2.	Invalid Brake Power Certificate	5	03 per cent	0
	Total	149 (N1)		

D. Operating Department

The factors responsible for derailments attributable to 'Operating Department' constituted 24 per cent⁴⁶ cases of derailments as detailed in table 3.3.4 below:

Table-3.3.4: Factors responsible for derailments-Operating Department

Sr. No.	Risk factors identified in accident reports	Number of reports (N2)	Per cent of reports (N2/N1)	Number of consequential derailments
1.	Incorrect setting of points and other mistakes in shunting operations	224	86 per cent	13
2.	Poor Working/Failure of Station Master	37	14 per cent	02
	Total	261 (N1)		

⁴⁵ 150 out of the 1129 derailments (including two collision cases)

⁴⁶ 261 out of 1129 derailments (including two collision cases).

E. Signaling and Telecom Department

The major (74 *per cent*) factor noticed was ‘System/technological deficiencies/visibility issues’. The factors responsible are detailed in **table 3.3.5**:

Table-3.3.5: Factors responsible for derailments-Signaling Department

Sr. No.	Risk factors	Number of accident reports (N2)	Per cent of accident reports (N2/N1)	Number of consequential derailments
1.	System/Technological deficiencies/ Visibility issues	20	74 <i>per cent</i>	7
2	Inspection schedule not followed	3	11 <i>per cent</i>	2
3.	Failure in attending scheduled maintenance	4	12 <i>per cent</i>	2
Total		27 (N1)		

F. Electrical Department

There were 10 (N1) cases of derailments in Electrical Department excluding Loco Pilots. in four ZRs. The major factor (8 out of 10 cases) noticed was ‘non-observance of safety at worksite’ in WR as detailed in **table 3.3.6**:

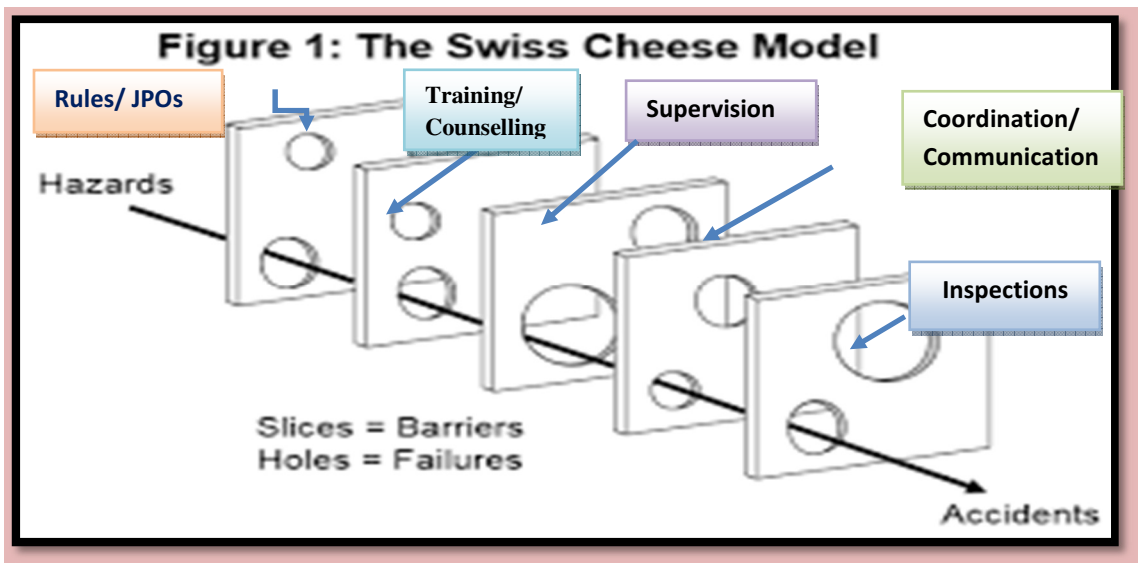
Table-3.3.6: Factors responsible for derailment-Electrical department

Sr. No.	Risk factors	Number of accident reports (N2)	Per cent of accident reports (N2/N1)	Number of consequential derailments
1	Non observance of safety at worksite	8	80 <i>per cent</i>	1
2	Overhead equipment (OHE) obstruction	2	20 <i>per cent</i>	1
Total		10 (N1)		

Audit analysis of the accidents and causes of accidents as brought out in the inquiry reports revealed that in each accident multiple factors attributable were collectively responsible for the derailments. Slackness in supervision/inspection, training and counseling requirements was the main areas of concern highlighted by the inquiry committees in most of the cases across the ZRs. All out efforts at the every level of staff and broader perspective at the highest level with proper coordination among all the departments is therefore required to fill these holes to put strong layers of defense to prevent derailments.

3.4 Audit analysis using ‘Swiss Cheese Model’ in IR

The causes of derailments on IR were analyzed in accordance with the ‘Swiss Cheese Model’. From the review of the derailment cases, the cascading factors of series of failures have been identified which includes (i) Rules and Joint Procedure Orders (JPOs), (ii) Training/Counselling of staff, (iii) Supervision of operations, (iv) Coordination and communication between staff of different departments and (v) Scheduled Inspections, in the IR System. These could be considered as the layers of ‘Swiss Cheese Slices’ or ‘defense barriers’ for prevention of accidents as depicted in figure below:



Based on the results of the accident investigations, several factors that lead to the derailments were obtained. These factors translated into ‘Swiss Cheese Model’ and a straight line was drawn to connect one factor of each layer to obtain a conclusion. From the above figure, it can be concluded that most of the derailments occurred due to simultaneous failures of each of the five barriers. Examples of individual cases of derailments occurred due to simultaneous failures of each of the five barriers depicted in the figure are shown in **table 3.4.1** below.

Table 3.4.1 Examples of simultaneous failures of barriers

Case-1: Accident ID- 20191008002, dated 17/10/2019, Western Railway, Ahmedabad Division	
Cause of derailment	Sudden derailment caused by sudden mounting and dropping of wheels of loco due to settlement of formation (less ballast & loose packing) of newly overhauled level crossing on a 3 degree curve.
Slice-1/Hole (Rule/JPO)	Weakness in Rule/policy, TSR 30 KMPH if checkrail not provided (Engg.) Train derailed even at speed of 20 KMPH

Slice-2/Hole Training/Counseling	Lack of safety checks before clearance of block.
Slice-3/Hole Supervision	Supervisor failed to ensure safety checks before clearance of block.
Slice-4/Hole Coordination	Lack of coordination between Engineering and operating staff.
Slice-5/Hole Inspection	Higher officer did not do inspection of site during execution of work.
Case-2: Accident ID-20201013003, dated 08/10/2020, North Central Railway, Allahabad	
Cause of derailment	Obstruction by PRC sleeper kept nearby track in sleeper stack.
Slice-1/Hole (Rule/JPO)	Shunting staff did not ensure that track is free from obstruction before allowing shunting movement.
Slice-2/Hole Training/Counseling	Commercial staff did not follow all safety parameters before loading/ unloading.
Slice-3/Hole Supervision	Loading was not properly supervised.
Slice-4/Hole Coordination	Lack of coordination between Shunting loco pilots and operating staff.
Slice-5/Hole Inspection	Site of stacking of Sleepers remained uninspected. Engineering staff should stack the sleepers at adequate distance from the track.

The audit findings on analysis of accident reports as depicted in *Appendix-C* can be used as a reference for strengthening the above barriers to avoid occurrence of similar incidents. The issue was brought to the notice of MoR (May 2022); response of the Ministry was awaited (July 2022).

3.4.1 Timeliness in completion of inquiries/investigations

In February 2006, RB prescribed the timeline for completion of accident inquiry at Zonal level. The inquiry committee shall convene the inquiry into the accident within the day of accident plus three days (D+3), the time for submission of inquiry report to competent authority is day of accident plus seven days (D+7) and inquiry report is to be accepted by the competent authority within day of accident plus ten days (D+10). However, for inquiries being conducted at the level of CRS, the schedule of completion/acceptance of the inquiry report is day of accident plus 180 days (D+180). Audit noted delays in different stages of accident inquiries as detailed in **table 3.4.2**:

Table-3.4.2: Details of delay in Accident Inquiries

Stages and Number of cases	Range of delay (in days)	Number of cases	ZR involved
Delay in initiating inquiry 185 cases (22 per cent)	No delay	670 (78 per cent)	-
	1-25	148 (17 per cent)	CR, ER, ECoR, NR, NCR, NER, NFR, SR, SER, SECR, SWR, WR & WCR
	26-100	27 (03 per cent)	CR, ECoR, NCR, NER, NFR, SR, SER & WR
	> 100	9 (01 per cent)	CR and NER
	Total	854	
Delay in submission of inquiry report 540 cases (63 per cent)	No delay	314 (36 per cent)	No data -71 (8 per cent)
	1-25	366 (43 per cent)	CR, ER, ECoR, NR, NCR, NER, NFR, NWR, SR, SER, SECR, SWR, WR and WCR
	26-100	141 (17 per cent)	CR, ECoR, NR, NCR, NER, NFR, NWR, SR, SER, WR & WCR
	> 100	33 (4 per cent)	CR, ECoR, NR, NCR, NER, NWR, SR, SER, SWR & WR
	Total	854	
Delay in acceptance of inquiry report 421 cases (49 per cent)	No delay	433 (51 per cent)	No data -126 (15 per cent)
	1-25	218 (26 per cent)	CR, ER, ECoR, NR, NCR, NER, NFR, NWR, SR, SER, SECR, SWR, WR & WCR
	26-100	158 (18 per cent)	CR, ER, ECoR, NR, NCR, NER, NFR, NWR, SR, SER, SECR, SWR, WR & WCR
	> 100	45 (5 per cent)	CR, ECoR, NR, NCR, NER, SR, SER & WR
	Total	854	

The RB (February 2006) emphasized that the prescribed time limits were the maximum period of time and ZRs should make efforts to finalize the inquiry reports as early as possible but not beyond the prescribed time limits.

Audit observed that the ZRs concerned could not adhere to the timeline prescribed by the RB for completion of enquiry and implementation of the recommendations of the Inquiry Committee.

3.5 Safety Information Management System

In order to put in place a faster and efficient system for accident reporting, analysis and sharing of information between ZRs and RB, a web based application “Safety

Information Management System” (SIMS) was developed (2016) by the Safety Directorate of RB.

The SIMS has seven major modules viz., (i) Accident reporting module, (2) Safety drive module, (3) Inspection module, (4) Level crossing module, (5) Stabling of load module, (6) Safety audit module and (7) Management information system module.

Review of SIMS application revealed the following:

- The feature of updating the status and action taken on deficiencies pointed out had not been adopted in case of accident reporting module. As a result, there was no provision in the application for exhibiting and monitoring of the compliance to the preventive actions recommended by the accident inquiry committees.
- The detailed analysis of the accidents by different departments as stipulated in the accident manual and reporting the consolidated position to the Chief Safety Officer had not been incorporated in SIMS.

IR achieved the objective of faster and efficient reporting, analysis, and sharing of information pertaining to accidents on IR. It had, however, failed in achieving the important objective of monitoring preventive action in respect of the recommendations made by the inquiry committees, as the same has not been made part of the SIMS.

Recommendations:

- IR should ensure strict adherence to the scheduled timelines for conducting and finalization of accident inquiries.
- IR should strive to achieve a robust safety management system which would enable to create a system of checks and balances whereby existence of proper control in one or more of the barriers would minimize the chances of accident due to ‘failure of’ or ‘weakness in’ one or more of the remaining barriers.

Chapter 4: Rashtriya Rail Sanraksha Kosh

4.1 Rashtriya Rail Sanraksha Kosh

The Minister of Finance in Budget Speech 2017-18, announced a Fund namely 'Rashtriya Rail Sanraksha Kosh' (RRSK) under capital segment of Budget. The RRSK had been created in 2017-18 with a corpus of ₹ 1.00 lakh crore over a period of five years with an annual outlay of ₹ 20000 crore, which includes ₹ 15000 crore from Gross Budgetary Support and ₹ 5000 crore out of Railways Internal Resources. The Ministry of Finance had issued (July 2017) guidelines for 'Operation of RRSK' by the MoR. The mandate of RRSK is to finance critical safety related works of renewal, replacement and augmentation of assets. The Planning Directorate of RB has been assigned the task of regularly monitoring physical and financial progress of works funded through RRSK.

4.2 Funding of RRSK

The Standing Committee on Railways⁴⁷ recommended (March 2018) the MoR that "at the time when there is rapid growth in net revenue of Railways and a lot of funds were needed for capital asset creation, funding to and expenditure from RRSK for safety purposes should be ensured at highest level in order to accord paramount to the safety".

As brought out above, there has been assured funding of ₹ 15000 crore out of the 'Gross Budgetary Support', and ₹ 5000 crore (25 per cent) of the annual contribution to this fund is to be met from Railways internal resources. Audit noted that the Gross Budgetary Support ₹ 15000 crore had been contributed; however, the actual generation of internal resources of Railways for the remaining funding of ₹ 5000 crore per year to RRSK had been falling short of target during the years 2017-18 to 2020-21 as shown in table 4.2.1 below:

Table 4.2.1: Appropriation to RRSK through Railways Internal Resources

Year	Amount (₹ in crore)			
	Budget	Actual	Deficit	
			Amount	Percentage
2017-18	5000	0	5000	100.00 per cent
2018-19	5000	3024	1976	39.52 per cent
2019-20	5000	201	4799	95.98 per cent
2020-21	5000	1000	4000	80.00 per cent
Total	20000	4225	15775	78.88 per cent

⁴⁷ Standing Committee on Railways (2017-18)

Due to adverse internal resource position, there was shortage (₹ 15,775 crore during 2017-18 to 2020-21) of actual deployment of funds by Railways to the RRSK. Audit noted that the Standing Committee on Railways⁴⁸ observed, “the purpose of RRSK is gradually being eroded due to non-appropriation of required funds from internal resources of Railways”.

Thus, short deployment of funds by Railways from internal resources to the tune of ₹ 15,775 crore (78.88 per cent) out of the total share of ₹ 20,000 crore had defeated the primary objective of creation of RRSK to support absolute safety in Railways.

4.3 Utilisation of RRSK

4.3.1 Areas of expenditure from RRSK

Safety related works on IR were mainly funded through Railway Safety Fund. All track renewals works were earlier financed out of Depreciation Reserve Fund (DRF), which included track renewals, re-building of bridges etc. Identifying a range of inter-departmental safety initiatives, the Internal Committee⁴⁹ of Senior officials of MoR projected (December 2015), a funding need of ₹ 1,54,000 crore on safety related measures⁵⁰. Out of this, funding of around ₹ 1,19,000 crore was to be met from RRSK. The RRSK had been created (2017-18) with a corpus of ₹ 1.00 lakh crore only, indicating that all safety works requested by Committee cannot be funded through RRSK.

4.3.2 Prioritization principles

Pursuant to the Budget 2017-18 announcement, the MoR requested (February 2017) NITI Aayog to extend help in the task of identifying other critical areas and guiding principles for deployment of RRSK funds for bringing out perceptible improvement in safety scenario over IR. Accordingly, based on the recommendations, the Guidelines for operating of RRSK by the MoR were issued (July 2017) by the Ministry of Finance wherein it was categorically stated that the said guidelines are to be followed mandatorily for implementation of the railway safety works, out of the RRSK. The guidelines laid down the prioritization principles for funding of works from RRSK as given in **table 4.3.1** below:

Table 4.3.1: Prioritization principles for funding of works from RRSK

Priority-I	Priority-II	Priority-III
Civil Engineering Directorate has been identified as responsible for	The second charge on RRSK shall be on those works/ initiatives of	The balance RRSK funds should be deployed on works/

⁴⁸ Demands for Grants (2020-21) of the Ministry of Railways. The Standing Committee consists of members from Lok Sabha, and Rajya Sabha.

⁴⁹ Committee was set up vide RB letter Number ERB-1/2015/23/44 dated 21/10/2015.

⁵⁰ Department-wise works, such as, Civil Engineering, Mechanical, Electrical and Signaling.

Priority-I	Priority-II	Priority-III
disproportionate contribution to accidents and deterioration or yardderailments and LC related accidents in particular, have been identified to contribute to 90per cent of all the accidents. Keeping this in view funding requirement of Civil Engineering works (for minimizing derailments) and Level Crossing (LC) related works should be met, with first charge on RRSK. Priority may be accorded to A, B, C, D and Special routes (in that order), with savings passed on to other unfunded works in Priority-II and III.	Electrical and Mechanical Engineering Directorates which target minimizing or eliminating derailments via., up-grading rolling stock maintenance infrastructure, technologies to monitor wheel profile cracks, broken parts, adopting coaches with improved safety features (LHB/ICF Coaches with CBC ⁵¹), crew friendly cabs, audio-video recording in cabs, etc.	initiatives which target reducing chances of human errors in critical areas of operations viz. improving working conditions and training of safety critical staff such as loco pilots, strengthening signalling systems to avoid instances of Signal Passing at Danger (SPAD), using technology to monitor health of tracks/ wheels/ rolling stock components relevant for wheel tract interactions etc. Further, initiatives that eliminate opportunities of relying primarily on people need priority emphasis.

The MoR had already decided the priority for utilisation of RRSK, and the same had to be followed mandatorily for implementation of the Railways safety works out of the RRSK.

4.3.3 Allocation/utilization of RRSK funds

The Standing Committee (March 2017) on Railways⁵² had “*expressed their apprehensions about the financing of RRSK and had recommended dedicated financing for it*”. In its 19th Report the Standing Committee again recommended (March 2018) the Ministry “*to ensure that the RRSK funds should be re-appropriated, and stress upon the Ministry to ensure prudent deployment of the fund strictly on the works it has been assigned. RRSK was created with a vision to have a single head in order to cater all safety related needs and if the Ministry is not able to utilize the funds judiciously from RRSK, the sole purpose of having a dedicated fund becomes futile*”.

The details of Plan Head wise expenditure from RRSK on IR during the period from 2017-18 to 2020-21 is given in the **table 4.3.2** below:

⁵¹ Linke Hoffmann Busch, Integral Coach Factory, Centre Buffer Couplers.

⁵² 13th Report on Demands for Grants (DFG) 2017-18.

Table 4.3.2: Details of expenditure from RRSK funds on IR

Priority	2017-18		2018-19		2019-20	
	Expenditure ₹ in crore	Percentage	Expenditure ₹ in crore	Percentage	Expenditure ₹ in crore	Percentage
Priority-1 ⁵³	13,652	81.55	14,787	77.91	11,655	73.76
Priority-2 ⁵⁴	2,574	15.38	3,316	17.47	3,072	19.44
Priority-3 ⁵⁵	53	0.31	40	0.21	70	0.44
Non-Priority ⁵⁶	463	2.76	837	4.41	1,004	6.36
Total	16742	100	18,980	100	15,801	100

Note: The above table does not include the figures related to 2020-21 as a new fund source Extra Budgetary Resources (EBR-Special) was introduced by RB (January 2021). The outlays provided under Capital, Railway Safety Fund, or RRSK in BE 2021-21 were brought under the new fund source EBR-Special.

Analysis of utilisation of RRSK fund revealed the following:

- In 2017-18, the expenditure on Priority-I works from RRSK was ₹ 13652 crore, which declined to ₹ 11655 crore in 2019-20. It can be seen that the overall expenditure on Priority-I works from RRSK showed a declining trend from 81.55 per cent in 2017-18 to 73.76 per cent in 2019-20.
- During the years from 2017-18 to 2019-20, it was seen that the RRSK funds deployed for Priority-I on all the ZR was utilized above 60 per cent, except in WR (2019-20), where the utilization was only 44.36 per cent.
- The expenditure on non-priority areas rose from 2.76 per cent (₹ 463 crore in 2017-18) to 6.35 per cent (₹ 1004 crore) in the year 2019-20. In the year 2018-19, two ZRs (CR and WR), have utilized RRSK funds for non-priority works, which ranges between 12-13 per cent. Similarly, in the year 2019-20, three ZRs (CR, NFR and WR), have utilized the RRSK funds for non-priority works for which expenditure ranged between 10-25 per cent.



⁵³ Plan Head-16 (Traffic Facilities), 29 (Road Safety Work), 30 (Road Over/Under Bridge), 32 (Bridgework).

⁵⁴ Plan Head-21 (Rolling Stock), 36 (Other Electrical works excluding Traction Distribution-TRD), 37 (Electrical Works), 41 (Machinery & Plants), 42 (workshops including production Units).

⁵⁵ Plan Head-33 (Signaling & Telecommunication), 65 (Training/HRD).

⁵⁶ Items which are not covered in Priority but was taken up by Railways

From the above, it can be concluded that the increasing trend towards expenditure on non-priority works are against the guiding principles of RRSK fund deployment framework, which stipulates that the Priority-I works should be met with first charge on RRSK, with savings passed on to other unfunded works in Priority-II and Priority-III. The issue was brought to the notice of MoR (May 2022); response of the Ministry was awaited (July 2022).

4.4 Expenditure on Track Renewals

The document ‘Safety Performance (2015-16)’ of the MoR states, “Track forms the backbone of railway transportation system and therefore needs to be maintained in a safe and fit condition. To this end, it is essential to carry out not only the track maintenance operations, but also to renew the track as and when it becomes due for renewal”.

A ‘White Paper on IR’ (2015) *inter-alia* state that “IR’s network has 1,14,907 km of total track length. Of this, 4500 km of track should be renewed annually. However, due to financial constraints, the progress in track renewals is constantly coming down over the last six years. Arrears of track renewal are accumulating which will result in disproportionately high maintenance effort. This will also result in reduced reliability of assets”.

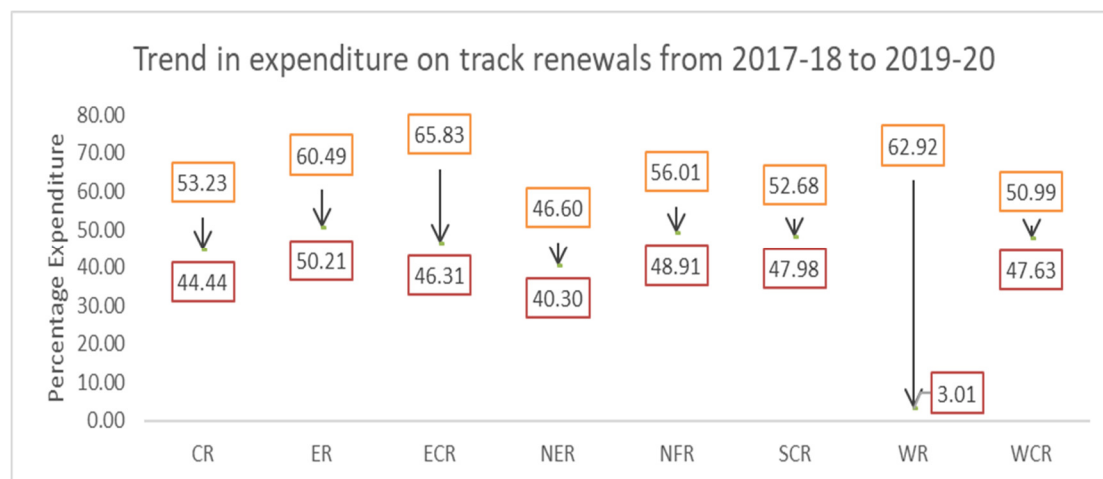
The Standing Committee on Railways (2016-17) observed (December 2016) that “the target kept for track renewals are not commensurate with the actual requirement on ground. The physical as well as financial targets in respect of track renewals need to be enhanced as per the annual requirement for track renewals for safety”.

The RRSK was being utilized to finance safety-related works under plan-heads. The complete track renewal work⁵⁷ is a component of civil engineering works. The criteria for track renewal includes incidence of rail fractures/failures, wear on rails, maintainability of track to prescribed standards, expected service life in terms of gross million terms carried and plan based renewals.

Audit analysis of expenditure on track renewal works revealed the following:

- In eight ZRs, the expenditure on track renewal works showed a *decreasing trend* from the year of introduction of RRSK as shown below:

⁵⁷ Under Plan Head 3100



- In WR, during 2019-20, out of the total expenditure of ₹ 689.90 crore, the expenditure on track renewal works was only ₹ 20.74 crore (3.01 per cent).
- During 2017-18 to 2019-20, the percentage utilization of RRSK for Track renewal works was more than 50 per cent in six ZRs.
- The targeted complete track renewal (CTR) works of selected divisions of ZRs were not achieved during 2017-18 to 2019-20⁵⁸. The shortfall was attributed to non-supply of materials for track renewal works. This clearly indicates improper planning in execution of priority work.

Further analysis of allotment and surrender of funds, revealed that;

- The allotment of funds (Final Grant) for Track Renewal works declined from ₹ 9607.65 crore (in 2018-19) to ₹ 7417 crore in 2019-20.
- In the year 2017-18, seven ZRs, surrendered funds to the tune of ₹ 299 crore. Similarly, in the year 2018-19, nine ZRs, fund amounting to ₹ 162.85 crore was surrendered. In 2019-20, five ZRs surrendered fund amounting to ₹ 11.68 crore.

Above analysis shows, there was decline in funds allotted for track renewals. The funds allocated to track renewal works was also not fully utilized. The decline in fund allocation and non-utilization of allocated funds would have adverse impact on timely completion of track renewal works. As brought out in Para number 2.4 of the Report, out of 1129 derailments during 2017-18 to 2020-21, 289 derailments (around 26 per cent) were linked to track renewals.

The Railways Administration failed to act in accordance with the observation of the Standing Committee on Railways (2016-17) wherein it was observed that the physical as well as financial targets in respect of track renewals need to be enhanced as per the annual requirement for track renewals for safety.

⁵⁸ In 2017-18, there was a shortfall of 304.104 CTR units (Target 2186.34.14-Actual 1882.23), in 2018-19, the shortfall was 684.54 CTR units (Target 2723.89-Actual 2039.346) and in 2019-20 the shortfall was 321.696 CTR units (Target 2484.15-Actual 2162.453).

4.5 Planning of works under 'Priority-I'

The overall expenditure of ₹ 51521 crore⁵⁹ from RRSK was reviewed to see if there was any deviation of fund to areas other than the works covered under Priority-I, of the guiding principles of deployment of RRSK. The maximum bookings under Priority-I from RRSK comprised of Plan Head 31 (Track Renewal Works) with 50.78 per cent utilization, followed by Plan Head 30-Road Safety Works⁶⁰ with 17.46 per cent utilization.

Audit analysis of the Priority-I work revealed that:

- In five ZRs under Plan Head 3100, out of the 878 works proposed for approval, 86 works amounting to ₹ 619.54 crore⁶¹ were not approved for inclusion in 'Pink Book' or list of approved works, during the years 2017-18 to 2020-21. The non-approval of safety works coming under the purview of Priority-I is against the vision of the MoR⁶², which has committed to achieve a safe and secure railway-operating environment leading to "Near Zero Fatalities" within five years.
- Under Plan Head 3000, in Bangalore Division of SWR, out of four works⁶³ sanctioned during 2018-19, two works have not been taken up and other two works was delayed due to 'Paucity of funds'.
- Similarly, works-in-progress under the Plan Head 30 (ROB/RUBs), over Mysore Division revealed that six works (provision of height gauges for RUBs) sanctioned during 2017-18 were not taken up due to 'Paucity of funds'. Audit noted that one consequential accident over Mysore Division⁶⁴ was due to non-provision of height gauge. Audit also noted that on one hand, funds were not allocated to priority work, and the other hand, in Mysore Division, ₹ 12.19 crore was surrendered during 2017-18 under the same Plan Head.

The above instances indicated that the purpose of creating a separate dedicated fund for financing safety related works was partially defeated, as safety related works are held up due to fund constraints.

4.6 Booking of expenditure in RRSK

Accounting entries/booking of expenditure must be supported by vouchers. Hence, auditing of Vouchers is equally important as passing of original entry in the books of accounts. If original entry is wrong, it will affect every process of accounting and its

⁵⁹ Pertaining to the years from 2017-18 to 2019-20.

⁶⁰ Road Under Bridges and Road Over Bridges.

⁶¹ ER-45 works amounting `187.98 crore, NER-5 works, ` 51.55 crore, SER-6 works, `95.18 crore and WR-28 works, ` 284.83 crore, CR-8 works (money value not available).

⁶² IR-Vision and Plans 2017-19 released by Ministry of Railways in January 2017

⁶³ Two works for elimination of Level Crossings and two for improvements to RUB at Level crossings

⁶⁴ Accident ID 20170515001(0) dated 17.05.2017

impact will be till the end result. Thus, audit of expenditure is incomplete without vouching.

A test check of vouchers⁶⁵ pertaining to RRSK for one month (December 2017, March 2019, September 2019 and January 2021) in each financial year⁶⁶ was done in respect of two selected divisions of each ZR.

Result of vouching revealed the following:

- During audit of vouchers involving a money value ₹ 2995.58 crore, bookings of expenditure to RRSK, which do not come under the purview of Priority-I, II or III were noticed. The incorrect bookings of expenditure to RRSK are detailed in **table 4.6.1** below:

Table 4.6.1: Incorrect booking of expenditure to RRSK

Sl. No	Description of expenditure incorrectly booked	Name of ZRs	Amount (₹ in crore)
1.	Salary and Bonus	ER (₹ 0.08 crore), SR (₹ 0.87 crore), WR (₹ 4.10 crore)	5.05
2.	Others works of revenue nature booked to RRSK	WR (₹ 0.05 crore), WCR (₹ 2.72 crore)	2.77
3.	Passenger amenities, viz., provision of lifts, escalators, raising/extension of platforms	CR (₹ 10.93 crore), ER (₹ 3.03 crore), ECR (₹ 1.11 crore), ECoR (₹ 3.37 crore), NER (₹ 0.48 crore), NWR (₹ 1.01 crore), SCR (₹ 0.56 crore), SECR (₹ 0.76 crore), SER (₹ 0.66 crore) SWR (₹ 3.93 crore), WR (₹ 5.00 crore)	30.84
4.	Works for staff quarters and officers rest house, hostel, provision of elevated booking office/passenger reservation system office	ER (₹ 0.52 crore), ECR (₹ 0.25 crore), ECoR (₹ 0.47 crore), NCR (₹ 0.12 crore), NWR (₹ 0.14 crore), SER (₹ 0.35 crore), SECR (₹ 0.14 crore), WCR (₹ 0.002 crore), SWR (₹ 0.26 crore)	2.27
5	Purchase of furniture, utensils, crockery, kitchen/ electrical appliances	ER (₹ 0.27 crore), ECoR (₹ 0.05 crore), NWR (₹ 0.02 crore), SCR (₹ 0.007 crore), SR (₹ 1.13 crore)	1.48
6.	Hiring of vehicles	NCR (₹ 0.007 crore), NER (₹ 0.007 crore), NWR (₹ 0.04 crore), SER (₹ 0.01 crore), SCR (₹ 0.01 crore), SWR (₹ 0.01 crore)	0.085

⁶⁵ A total of 11464 vouchers were selected for detailed scrutiny

⁶⁶ 2017-18, 2018-19, 2019-20 and 2020-21.

7.	Purchase of computers, Xerox machine, printers, laptops, AMCs, cartridge, toner, etc.	ER (₹ 0.01 crore), ECoR (₹ 0.10 crore), NWR (₹ 0.06 crore), SER (₹ 0.04 crore), SCR (₹ 0.01 crore), WR (₹ 0.02 crore), SR (₹ 0.11 crore)	0.35
8.	Erection of flag	ECR (₹ 0.64 crore)	0.64
9.	Construction of toilet rooms	ER (₹ 0.03 crore), ECR (₹ 0.12 crore), NER (₹ 0.03 crore)	0.18
10.	Others viz., development of garden/ waiting hall/ circulating area, imprest, sewage treatment plant, stationery purchase, provision of ACs, temporary electricity connection, intercom, power cable, CCTV, LAN, LED/ street light, fee to pollution control board, foot massager, winter jacket.	ER (₹0.20 crore), ECR (₹ 0.41 crore), ECoR (₹ 0.06 crore), NR (₹ 0.002 crore), NWR (₹ 0.73 crore), SCR (₹ 0.53 crore), SER (₹ 0.87 crore), SECR (₹ 0.63 crore), SWR (₹ 0.20 crore), WR (₹ 0.40 crore), SR (₹ 0.13 crore)	4.54
Total			48.21

It is evident from the above that in selected four months out of 48 months, the incorrect booking to RRSK was to the tune of ₹ 48.21 crore.

Further analysis revealed that;

- Items of Revenue expenditure⁶⁷ were booked under RRSK in contravention to Para 7.7 of the RRSK Deployment Scheme which states that revenue works are not proposed to be funded through RRSK. The incorrect bookings have resulted in misclassification of expenditure between Revenue Grants and RRSK, amounting to ₹ 7.82 crore.
- Expenditure incurred on passenger amenity works, purchase of almirahs, utensils, crockery, furniture, etc⁶⁸., amounting to ₹ 40.39 crore were booked to RRSK, though these do not fall under the purview of safety works.
- Though the expenditure was to be restricted to works under Priority-I, II and III, sizeable expenditure on non-priority works was booked to RRSK, as seen from only four months of vouchers audited. The total expenditure booked on non-priority work would be much more if bookings during all the 12 months for

⁶⁷ Serial number 1 and 2 of table 4.3

⁶⁸ Serial number 3 to 10 of table 4.3

all the four years 2017-18 to 2019-20 are considered. This reflects laxity and lack of internal control on the part of ZRs; while booking of the expenditure to RRSK.

Thus, though prioritization principles have been clearly laid down for deployment of RRSK, bookings not falling under RRSK category have been accepted under RRSK. These incorrect bookings denote misclassification of expenditure and consequently end up with reduced fund availability for RRSK priority works.

4.7 Preparation of detailed outcome framework

As per Para 16 of the ‘Guidelines for Operating RRSK’⁶⁹, the RRSK outlays shall also be mandatorily linked with specific measurable outcome indicated as under:

- Each project/work undertaken through RRSK shall be listed with clearly identified and measurable physical/financial targets, over the Short term (Annual), Medium term (2-3 years) and Long term (over the 5 year period);
- All outputs/outcomes shall be linked directly and specifically to each project undertaken through RRSK;
- The above would require respective Directorates⁷⁰ to design specified Short/Medium/Long Term outcomes against initiatives funded from RRSK;
- The indicative outcomes of various safety measures relating to various Directorates as suggested by Dr. Bibek Debroy would be taken as a guideline for preparing a detailed outcome framework for each item of the safety work. The suggested Outcomes for each Directorate are given in **table 4.7.1** below:

Table 4.7.1: Outcomes of RRSK outlays

Directorate	Suggested Outcome measures for measuring impact of RRSK outlays
Civil Engineering	<i>Per cent</i> reduction in rail fractures/ defects ⁷¹ ; <i>Per cent</i> increase in fractures/ defects detected through USFD/ Broken and technology ⁷² ; <i>Per cent</i> reduction in derailments/ accidents on routes where investment made ⁷³ .
Mechanical & Electrical	<i>Per cent</i> reduction in accidents attributed to these Directorates. <i>Per cent</i> increase in wheel failures detected through new technology.
Overall ⁷⁴	<i>Per cent</i> reduction in LC accidents and derailments. <i>Per cent</i> reduction in casualties or injuries related to LC and derailments.

⁶⁹ Issued by Ministry of Finance on 5 July 2012

⁷⁰ Civil Engineering, Mechanical and Electrical

⁷¹ Measuring impact of track renewals

⁷² Measuring impact of using new inspection technologies

⁷³ Overall investment impact

⁷⁴ The deliverables/ outcomes shall be linked to the ‘Overall Outcomes’ of reduction in LC accidents and Derailments and reduction in related casualties or injuries.

The information in respect of the Outcomes of the RRSK outlays had been called for (February 2022) from the Railway Administration. The reply of the Ministry was awaited (July 2022).

Recommendations:

- Railway Administration must follow the ‘guiding principles for deployment of RRSK funds’ to avoid fund constraints in the area of Priority-I works and expenditure on non-priority item of works be avoided. IR should prioritize the planning and execution of track renewal work to eliminate the accidents because of Permanent Way defects.
- IR should prepare the ‘Detailed Outcome Framework’ for each item of safety work as per the indicative Outcomes suggested by the Niti Aayog, to gauge whether the benefits drive out of the RRSK funds are in the conformity with the objectives behind the creation of the Fund.

CHAPTER 5: PARLIAMENTARY STANDING COMMITTEE- RECOMMENDATIONS

5.1 Parliamentary Standing Committee on Railways

Parliamentary Standing Committee is a Committee appointed or elected by the House or nominated by the Speaker and presents its report to the House or to the Speaker. Parliamentary Standing Committees on Railways were also set up to consider the demands for grants, to examine such bills, to consider the annual report, to consider national long term policy documents presented to the House, and to examine the subjects selected by the Committee and make reports on thereon.

The observations/recommendations of the Committee on subjects examined in their Reports are presented to Lok Sabha/laid on the table of Rajya Sabha by the Chairman and the authorized Members. These recommendations of the Committee have persuasive value and are treated as considered advice given by the Committee. The MoR is required to take action on the recommendations contained in the Report and furnish action taken replies thereon. The Committee examines action taken notes (ATNs) received from the Ministry which are then presented to Lok Sabha/laid on the Table of Rajya Sabha.

5.2 Recommendations of Standing Committee on Railways

The Standing Committee on Railways (2016-17)⁷⁵, had submitted (December 2016) its Twelfth Report on 'Safety and Security in Railways'. The action taken by the Railway Administration on the observation/recommendations of the Standing Committee on 'Accidents due to derailment' and 'Collisions due to Failure of Railway Staff' were seen in audit as discussed in subsequent paragraphs:

5.2.1 Accident due to derailment fixing targets for track renewal activities

The Standing Committee observed⁷⁶ that track forms the backbone of the rail transportation system and therefore needs to be maintained in a safe and fit condition. 4500 km track should be renewed annually; however, the targets kept for track renewals were not commensurate with the actual requirement on ground. Taking into account that MoR accord highest priority to safety, the Committee believed that the physical as well as financial targets in respect of track renewals need to be enhanced as per the annual requirement for track renewals.

In Action Taken Replies⁷⁷, the MoR have stated that; "Track renewal was an ongoing process which was undertaken as and when a stretch of track became due for renewal on age-cum-condition basis. Track Renewal works were planned every year, their execution was prioritized according to the condition of track, and overall availability

⁷⁵ *Sixteenth Lok Sabha*

⁷⁶ *The Para 7 under 'Accidents due to derailments'*

⁷⁷ *15th Report of the Standing Committee on Railways (2016-17).*

of funds ensuring all the time that track is in a sound condition for safe running of trains. The physical targets are fixed as per financial outlay.”

On the Action Taken Reply, the Standing Committee *inter-alia* observed that; “the Committee were dissatisfied with the pattern of track renewals over the past few years where targets for track renewal continued to lag behind actual requirement and had not been commensurate with actual requirements which had resulted in huge backlogs. While reiterating their earlier recommendation the Committee desired the Ministry to keep their targets realistic keeping in view the annual requirement for track renewals”.

In light of the recommendation/observations of the Standing Committee, and the Action Taken Reply of the MoR, Audit examined the position about ‘Track Renewal Works’ carried out by the IR during the audit period.

Audit collected data regarding complete track renewals (CTR) works of 31 divisions of the 16 ZRs is given in **table 5.2.1**:

Table 5.2.1: Details of CTR works in selected divisions of ZRs

Year	Complete Track Renewal Units			Per cent of shortfall
	Target	Actual	Shortfall	
2017-18	2186.34	1882.23	304.11	13.91
2018-19	2723.89	2039.34	684.55	25.13
2019-20	2484.15	2162.45	321.70	12.95
2020-21	1883.79	1900.34	(-) 16.55	--
Total	9278.17	7984.36	1293.81	13.94

Thus, there was shortfall in complete track renewal work. The targets set for complete track renewal were not achieved during the initial period of three years. In 2020-21, the targets were reduced due to covid-19 pandemic, and the same were achieved.

Further analysis revealed that;

- At ZRs, in complete track renewal works, in the years 2017-18 and 2019-20, the maximum shortfall of 52.04 *per cent*⁷⁸ and 63.10 *per cent*⁷⁹ respectively was noticed in Waltair division of ECoR. During 2018-19, the maximum shortfall of 65.28 *per cent*⁸⁰ was in Mysuru division of SWR, and in 2020-21, the shortfall of 100 *per cent*⁸¹ was noticed in Lumding (LMG) railway division of North Frontier Railway.
- In NWR, no targets were set in Jaipur division (JP) and Ajmer (AII) division for complete track renewal work during the period of four years. Similarly, in Northeast Frontier Railway (NFR), no targets were set in Alipurduar (APDJ)

⁷⁸ Target 28.9, Actual 13.86

⁷⁹ Target 37.32, Actual 13.77

⁸⁰ Target 66.35, Actual 23.04

⁸¹ Target 11.5, Actual ‘Nil’

railway division, and in Lumding division, the targets were set only for 2018-19 and 2020-21. Audit noted that, in the said four divisions 70 derailments took place in four years, out of which 16 derailments (23 *per cent*) were stated to be due to track related defects.

- During the said four years' period, there were 890 derailments in the 16 ZRs; track defect was the cause for 216 (24 *per cent*) derailments.

Audit noted that in the 12th Report of the Standing Committee on Railways (2016-17) on 'Safety and Security in Railways' the Committee observed that, "track forms the back bone of the rail transportation system and therefore needs to be maintained in a safe and fit condition. It is evident that the targets kept for track renewals are not commensurate with the actual requirement on ground". However, the Railways Administration failed to take corrective steps in respect of track renewal, as the targets fixed for track renewal work were not achieved, and there was shortfall in track renewal work.

5.2.2 Collisions due to Failure of Railway Staff

The Standing Committee on Railways (2016-17), in Para 11 under the 'Accidents due to failure of railway staff', *inter-alia* observed/recommended that; "The most serious form of accidents involved is Collision and Signal passing at Danger (SPAD) for which particularly loco-pilots are responsible. There has been substantial increase in number of signals because of various intermediate block stations, huts, various gate signals, loco pilot encounters a signal almost every kilometer of his run and almost every minute he has to see a signal and accordingly control the train. There is no technological support available to the loco-pilots and they have to depend on vigilant watch of the signal for controlling the train. The Ministry has failed to assess the root cause of continuous and possible repeated lapses by railway staff and therefore have failed completely to curb such accidents. The Ministry was therefore advised to deliberate on the issue to check the faults of the railway staff and take required corrective measures".

In action taken notes⁸², the MoR had stated that; "Each and every accident was analyzed in detail and Safety Meetings are regularly conducted at all levels in which corrective measures required or lapses brought out are duly addressed. Safety Counselors' personally counsel staff on line, informing them of latest instructions and Safety bulletins".

On the action taken reply, the Standing Committee *inter-alia* observed/ recommended that; "The Committee had regretted the lack of technological support to loco pilots for avoiding SPAD and collisions. The Committee had also advised the Ministry to thoroughly investigate the reasons for the increasing trend of accidents due to failure on the part of railway staff. In reply, the Ministry had simply stated that lapses were duly investigated while remaining silent on issue of technological aids for loco pilots.

⁸² 15th Report of the Standing Committee on Railways (2016-17).

The Committee was not happy with the replies and recommended that the Ministry should outline the steps taken in this regard”.

In view of the above recommendation/observations, Audit examined the position in respect of ‘Collisions due to Failure of Railway Staff’ in IR during the audit period. The year wise data of SPAD and Collision due to SPAD’ of 32 divisions⁸³ of the 16 ZRs is indicated in **table 5.2.2** below:

Table 5.2.2: Cases of Signal Passing at Danger at selected divisions

Year	Number of SPAD cases	Number of collisions due to SPAD
2017-18	33	Nil
2018-19	34	Nil
2019-20	38	02
2020-21	23	Nil
Total	128	02

Audit noted that the RB have issued (April 2017) instructions in respect of SPAD and advised the ZRs to strictly follow the instructions with an emphasis on proper counselling/monitoring of running staff.

Review of the data collected in respect of 16 ZRs revealed the following:

- Despite operation of fewer Passenger trains due to the covid-19 Pandemic, 23 SPAD cases were reported in 2020-21. The highest number of SPAD cases during the period of review were noticed in SCR (19) followed by WCR (15), CR (14) and ECR (14).
- As observed from the Accident Inquiry Reports⁸⁴, the main cause of SPAD cases were due to violation of instructions contained in IR (Open Lines) General Rules. The violations were mainly because of Rule 3.78⁸⁵, Rule 3.80⁸⁶, Rule 3.81⁸⁷, and 3.83⁸⁸. These violations accounted for 47.66 *per cent*⁸⁹ of the total SPAD cases.

There were cases of SPAD due to working beyond stipulated duty hours i.e., running duty at a stretch exceeding 10 hours, defective vigilance Control Device (SECR-01), absence of route learning of loco crew in four cases, and due to refresher course and PME (ECR-01).

The repeated instances of SPAD, especially due to failure on the part of Railway staff clearly indicated that ZRs were unable to completely curb occurrences of SPAD, despite detailed instructions issued by the RB.

⁸³ Two divisions in each ZRs.

⁸⁴ As discussed in Chapter-2.

⁸⁵ Duties of engine crew in respect of Signals.

⁸⁶ ‘Duties of Loco Pilot when an approach stop signal is ‘ON’ or defective’.

⁸⁷ ‘Duties of Loco Pilot when a departure stop signal is ‘ON’ or defective.

⁸⁸ Assistance of the engine crew regarding signals.

⁸⁹ 61 of 128 SPAD cases.

Instances of collisions due to SPAD (one each in ER and NCR) indicated the gravity of the SPAD and its impact on safety in operations in IR.

Recommendations:

- IR should prioritize the planning and execution of track renewal work to eliminate the accidents because of Permanent Way.
- SPAD being a potential case of accidents need to be minimized strictly. This further emphasized the need of developing and providing technological aid (TPWS-Train Protection and Warning System, TCAS-Train Collision Avoidance System) to the Loco-Pilot at a greater pace to prevent SPAD.

CHAPTER 6: OTHER SAFETY ISSUES

6.1 Background

The Standing Committee on Railways⁹⁰ inter-alia stated that not only humans, but also animal lives are often lost in railway accidents. Unmanned level crossings (ULCs) continue to be the biggest cause of maximum casualties in rail accidents. Further, the instances of accidents due to fire in trains are not many yet the casualties in such cases are usually very high.

To examine the 'Other Safety Issues', such as fire extinguisher facilities, level crossings, and accidents involving animals, audit collected information/data in respect of the selected ZRs for the period 2017-21. The audit findings are discussed in subsequent paragraphs:

6.2 Fire accidents in coaches

The RB, in Corporate Safety Plan (2003-13), stated that Fire accidents constitute two *per cent* of total accidents and account for two *per cent* of total fatalities. Fire accidents and consequent fatalities would reduce by 80 *per cent* by adoption of 'fireproof coaches' and 'fire retardant material' in the existing coaches. Fire accidents cannot be totally eliminated as some of them occur because of *unidentified elements* on which Railways have little control. The major reasons of fire on trains are as given in **table 6.2.1** below:

Table 6.2.1: Reason and sub-reasons of fire on trains

Reasons	Sub Reasons
Passenger	Bidi, Cigarette, inflammable material carried by passenger etc.
Electrical	Short circuit, expresser, burning of coils/leads etc.
Mechanical	Leakage from flexible pipes
IRCTC/Private party	Negligence by pantry car staff, lease contractor
Others	Maintenance failure

The Standing Committee on Railways (2016-17), urged the MoR to ensure that combustible or high inflammable material are not carried by the passengers on the trains through public awareness as well as through a system of rigorous inspection.

Audit pointed out⁹¹ several lapses on the part of Railway Administration in the measures required to be taken to prevent fire prone activities at stations/ passenger trains. In the Action Taken Note received from the MoR⁹², different actions were

⁹⁰ Twelfth Report of 2016-17 on 'Safety and security in IR' (December 2016)

⁹¹ Audit Report No.29 of 2015

⁹² November 2016 and June 2017

stated to have been initiated/proposed for prevention of fire accidents in IR. The Fire Accidents on 15 ZRs during the period 2017-18 to 2019-20 are shown in **table 6.2.2**:

Table 6.2.2: Details of fire accidents on ZRs from 2017-18 to 2020-21

ZR	Number of fire accidents	Number of casualties of Railway Staff	Number of persons injured other than railway staff	Loss of Railway Property (₹ in lakh)
Central Railway	8	1	0	296.20
Eastern Railway	2	0	0	116.02
East Central Railway	10	0	2	86.70
East Coast Railway	3	0	0	53.87
Northern Railway	6	0	0	282.17
North Central Railway	9	0	0	83.93
North Eastern Railway	2	0	0	0.17
North Frontier Railway	2	0	0	71.47
North Western Railway	1	0	0	0
Southern Railway	2	0	0	0
South Central Railway	4	0	0	56.79
South East Railway	1	0	0	414.78
South East Central Railway	1	0	0	15.00
Western Railway	5	2	0	48.10
West Central Railway	1	0	0	0
Total	57	3	2	1525.20

Audit noted that the loss of property of ₹ 4.15 crore was due to short circuit in power car.

The reasons quoted by the ZRs are of controllable nature by way of proper maintenance of coaches, and also through public awareness as well as through a system of rigorous inspection, as observed (December 2016) by the Standing Committee of Railways. Audit further reviewed the position of the major offenses responsible for fire incidents, the audit findings are discussed below:

6.2.1 Enforcement of security under Railways Act, 1989

The extent of violation of the provisions laid down in Railways Act 1989 by the passengers and unauthorized vendors/hawkers on platforms and inside the trains was examined by Audit. Audit collected data in respect of offenses during the period from

2017-18 to 2020-21. The data related to offenses under section 144, 164 and 167 of the Railways Act, 1989 is given in **table 6.2.3**:

Table 6.2.3: Details of offenses under Railways Act, 1989

Under section	Offense Category	Number of offenders prosecuted				Total
		2017-18	2018-19	2019-20	2020-21	
Section 144	Prohibition of hawking etc. and begging	1,86,662	2,02,318	1,92,603	36,206	6,17,789
Section 164 ⁹³	Unlawful bringing dangerous goods on Railway	387	407	200	31	1025
Section 167	Smoking	43,839	38,596	23,797	2739	1,08,971
Total		2,30,888	2,41,321	2,16,600	38,976	7,27,785

Thus, in comparison to 2017-18, though there was an overall reduction in the cases of offenses related to smoking, the number of offenders for unlawful carrying of dangerous goods, and unauthorized vendors/ hawkers increased in 2018-19.

The ZR wise analysis revealed that:

- SCR accounted for the major chunk of cases in the categories of “unlawful carrying of dangerous goods” (55 per cent)⁹⁴ and “Persons indulging in smoking in Railway premises” (38 per cent)⁹⁵.
- The cases in the remaining 15 ZRs ranged from 1-10 per cent of the total cases in categories of “unlawful carrying of dangerous goods and “Persons indulging in smoking in Railway premises”.
- In the category of unauthorized vendors/hawkers majority of the cases were noticed in CR (18 per cent), WR (15 per cent) and NR (11 per cent) whereas in the remaining 12 ZRs, it ranged from three per cent to seven per cent of the total cases on IR.

Sufficient preventive measures and their strict implementation along with conducting safety drives from time to time were thus required to ensure fire safety.

6.2.2 Provision of Fire extinguishers in non-AC Passenger Coaches

As per the norms of International Union for Railways-UIC⁹⁶ (UIC 564-2), one extinguisher in each vehicle with seated places and two extinguishers in each sleeper coach are required to be provided.

⁹³ In contravention of section 67 (Carriage of dangerous or offensive goods)

⁹⁴ 564 Out of 1025

⁹⁵ 41174 Out of 108971

⁹⁶ International Union for Railways

Audit pointed out⁹⁷ shortfall in compliance of UIC 564-2 norms in provision of fire extinguishers in non-AC Coaches. It was pointed out that non-provision of fire extinguishers would expose the traveling public to enhanced fire risk and delay the dousing of fire in passenger coaches. The RB replied (April 2015) that a decision had been taken to provide fire extinguishers in General Seating Coach and non-AC coaches on trial basis.

To verify the compliance by the Railways, Audit collected data of 16 ZRs, in respect of provision of fire extinguishers in non-AC Passenger Coaches in IR, for the period from 2017-18 to 2020-21. The detailed position of fire extinguishers in non-AC Coaches on IR is given in **table 6.2.4**:

Table 6.2.4: Provision of fire extinguishers in non-AC coaches

ZR	Number of non-AC coaches identified	Number sanctioned	Number fitted	Coaches without fire extinguishers	Per cent shortfall
Central Railway	760	NMA ⁹⁸	712	48	6.32
Eastern Railway	2300	2300	2244	56	2.43
East Central Railway	3604	750	685	2919	80.99
East Coast Railway	1698	1500	980	718	42.29
Northern Railway	7047	2447	675	6372	90.42
North Central Railway	550	550	550	0	0
North Eastern Railway	NMA	900	869	31	--
Northeast Frontier Railway	725	725	615	110	15.17
North Western Railway	647	647	647	0	0
Southern Railway	7613	2100	1232	6381	83.82
South Central Railway	10050	2300	2300	7750	77.11
South Eastern Railway	2406	1500	1045	1361	56.57
South East Central Railway	621	621	621	0	0
South Western Railway	1500	1500	1098	402	26.80
Western Railway	2600	2600	2600	0	0
West Central Railway	2286	671	671	1615	70.65
Total	44,407	21,111	17,544	27,763	62.52

Thus, in 27,763 (62 per cent) coaches on 12 ZRs, fire extinguishers have not been provided. As per the ZRs, the reasons for non-provision of fire extinguishers were

⁹⁷ *Audit Report No.29 of 2015*

⁹⁸ *Not made available to audit*

delays in tendering processes (ER), failure of firm to supply the fire extinguishers (ECoR and WCR), supply awaited/under progress, stabling of rakes at outside station due to covid-19 pandemic (NR and NEFR) and outsourced work delayed due to covid-19 pandemic as stated by SCR.

The delay in installation of fire extinguisher, a safety item, shows laxity on the part of Railway Administration. The important risk area pertaining to capacity enhancement for firefighting in non-AC coaches remained largely compromised, even after a lapse of more than six years after being pointed out by Audit.

6.3 Level Crossings on IR

Level crossing is an intersection of road with lines of rail at the same level. Train running into road traffic at level crossing (manned/un-manned) is classified as a level crossing accident. Level crossings are the weakest link, most unsafe element and source of accidents on railway tracks. The IR is stated to have eliminated (2019) all unmanned level crossings on BG routes. As of November 2018, there were around 21150 manned level crossings (MLCs) in IR. The MLCs are prone to accidents due to human error on the part of railway staff as well as forcible opening/crossing by road users.

Audit noted that the RB instructed (November 2018) ZRs to expedite completion of the work of elimination of MLCs by constructing Road Over Bridges (ROBs) and Road Under Bridges (RUBs).

Audit scrutiny of records/data related to level crossings revealed the following.

6.3.1 Status of Manned Level Crossings

Audit noted that there were 20,471 MLCs (April 2019) on 15 ZRs⁹⁹. Out of these, only 2908 MLCs (nine *per cent*) were targeted for elimination during the period from 2018-2019 to 2020-2021 and only 2059 (70 *per cent*) of these targeted MLCs were eliminated by the ZRs as detailed in **table 6.3.1**:

Table 6.3.1: Details of elimination of MLCs during the period from 2019-20 to 2020-21

ZR	Number of MLCs			<i>per cent</i> Shortfall	Number of accidents at Level crossings
	Targeted	Actual	Shortfall		
Central Railway	151	112	39	26	0
Eastern Railway	44	32	12	27	1
East Central Railway	281	109	172	61	1
East Coast Railway	103	70	33	32	0
Northern Railway	439	284	155	35	3
North Central Railway	230	144	86	37	0

⁹⁹ Data in respect of ECR was not furnished.

North Eastern Railway	260	165	95	37	NMA ¹⁰⁰
Northeast Frontier Railway	47	32	15	32	2
North Western Railway	241	247	0	0	0
Southern Railway	256	139	117	46	0
South Central Railway	234	208	26	11	0
South Eastern Railway	119	91	28	24	1
South East Central Railway	78	47	31	40	0
South Western Railway	148	122	26	18	0
Western Railway	183	172	11	6	NMA
West Central Railway	94	85	9	10	1
Total	2908	2059	849	29	9

Thus, except for NWR, in 15 ZRs, the shortfall ranged from six *per cent* (WR) to 61 *per cent* (ECR). The level crossings are potential safety hazards and nine accidents had occurred on level crossings during 2019-2021. Audit further analysed the reasons for non-elimination of level crossings. The audit examination revealed the following:

6.3.2 Proposals pending with State Governments

Audit noted that as on 31 March 2021, 452 proposals of construction of ROB/RUB in lieu of level crossings, sent to State Governments by 12 ZRs were pending for want of 'No Objection Certificate' from the State Governments.

The delay was reported to be on account of State Government and the major issues cited for the same were Land/location (encroachment and rehabilitation) issues, delay in submitting combined General Arrangement Drawing, no objection certificate/consent from Area Collector, non-finalization of cost sharing issues (SCR and SECR) and section/detailed project report awaited from State Government (NEFR and WCR).

Thus, lack of coordination between the Railway Administration and the State Government resulted in delay in elimination of level crossings.

6.3.3 Delay in completion of road over bridge/road under bridge

Audit noted that 86 works of construction of ROB/RUB in lieu of level crossings, the works were not completed (on 15 out of 25 selected divisions on 11 ZRs) even though a period of more than three years had elapsed after the sanction/commencement of the work.

¹⁰⁰ NER and WR failed to provide the data.

The main reasons cited for delay in completion of the work was delay in finalization of drawing/delay in general arrangement drawing and plans, delay in preparation and sanction of detailed estimates (ER, and WR), issues related to land acquisition, encroachment, obstructions and feasibility issues, delay by State Government in completion of their portion of work (SR and SCR), consent/ no objection certificate awaited (NCR, SR and SWR) and non-finalization of cost sharing issues (ER and NCR).

The reply is not acceptable. The reasons quoted viz., delay in finalization of drawing/delay in general arrangement-drawing, delay in preparation and sanction of detailed estimates, were of avoidable nature, and could have been avoided by proper planning by Railway Administration. Thus, stringent efforts were required to complete works, for early elimination of level crossings.

6.4 Accidents involving Animals

The MoR circulated (June 2015) the recommendations of World Wildlife Fund-India (WWF) to stop elephant deaths on Railway tracks to six ZR. The detailed recommendations/ suggestive measures in respect of prevention of death of elephants in forest passages on IR had already been highlighted in the Audit Report No.5 of 2021(Railways)¹⁰¹.

The status of animal deaths on ZRs during the review period was examined in Audit. Total cases of Animal deaths during 2017-18 to 2020-21 is given in the **table 6.4.1:**

Table 6.4.1: Position of Animal deaths on IR

ZRs	Elephants	Other Animals (including cattle)
Central Railway	0	205
Eastern Railway	0	0
East Central Railway	0	946
East Coast Railway	4	100
Northern Railway	6	1166
North Central Railway	0	23201
North Eastern Railway	4	4209
North Frontier Railway	30	0
North Western Railway	0	6740
Southern Railway	11	0
South Central Railway	0	1491
South Eastern Railway	13	0
South East Central Railway	1	2219
South Western Railway	4	7
Western Railway	0	5327
West Central Railway	0	17734
Total	73	63,345

¹⁰¹ Covering Audit Period from April 2016 to March 2019.

Audited noted that to prevent train accidents involving elephants, General Advisories approved by Ministry of Environment and Forests and MoR had been jointly issued to Railways in 2010. The advisories include clearance of vegetation on the sides of railway track, under passes/ overpasses across the railway track to allow elephants to escape, signage boards to pre-ward the train drivers, sensitizing programmes for train drivers, guards and station masters, engagement of elephant trackers, and to keep Railway track free from food waste that attract elephants.

Joint inspections were conducted in 102 sections across 18 divisions on nine ZRs by officials of Audit Department and Engineering Department of ZRs to verify the status of implementation of measures in identified reserve forest passages of the ZRs. The observations made during the Joint inspection are given in **table 6.4.2**:

Table 6.4.2: Implementation of measures to curb animal deaths on IR

Measures stated to have been taken to curb animal deaths	Number of sections involved	Sections in which measures not implemented	Per cent of shortfall
Imposition of speed restrictions at identified locations	101	2	2
Provision of signage boards	102	0	0
Sensitization of Train Crew and Station Masters on a regular basis	53	3	5
Construction of underpasses and ramps for the movement of elephants at identified locations	100	76	76
Provision of fencing at isolated locations	55	48	41
Forest department staff deployed in railway control offices ¹⁰²	14 divisions in seven ZR	Nine divisions in seven ZR	64 per cent

It can be seen that, the important precautionary measures related to provision of signage boards, construction of underpasses, provision of fencing and deputation of forest staff in divisional offices had not been implemented in many sections, even after a lapse of more than 10 years period from the issue of Joint General Advisories by Ministry of Environment & Forests, and MoR.

6.4.1 Safety of Asiatic Lions in GIR Forest

On WR forest, passages exist in the ‘Gir Forest’ in the Bhavnagar Division and these forests are the abode of Asiatic lions. It was observed that there were two accidents involving run over of four lions as per details in **table 6.4.3**:

Table 6.4.3: Details of accidents in the Gir Forest

Item	2018-19	2019-20	2020-21	2021-22 (upto Sept-21)
No. of accidents	01	0	0	01
No. of Lions ran over	03	0	0	01
Total	04	00	00	02

¹⁰² *To liaison with railway and elephant trackers engaged by forest department for timely action by alerting Station Master and Loco Pilots*

For safety of Asiatic lions in railway premises from accidents with trains, a Standard Operating Procedure (SOP) was signed between officers of Bhavnagar Division of WR and the Forest Department in December 2014. The precautions to be observed by the staff of Railway as well as Forest Department were laid down in the SOP. As per the SOP and the minutes of the coordination meeting, following precautions were required to be taken:

- Speed restriction was to be imposed in identified sections where lion movement was frequent.
- Clearance of vegetation along track was to be ensured so that train pilots could see the movement of lions.
- Signage boards were required to be erected at identified locations along the railway track.
- Forest department was to coordinate with Sr. DOM for training of staff and review to be done on six monthly basis jointly by AOM/PRCL and forest officials of Amreli.

A joint inspection on motor trolley was conducted (November 2021) by the Officers of Audit Department and Engineering Department from Pipavav to Rajula Junction. During the joint inspection, it was noticed that the above instructions contained in the SOP were not complied to. Further, the following lapses on the part of Forest Department were communicated during the coordination meeting on 02 January 2019 with Railways:

- Forest department had not provided details of locations and contents of the signage boards to be erected in the Railway premises.
- Details of sites for establishment of temporary Watch towers/Machans were not furnished by the Forest Department.
- No initiative had been taken by the Forest department to identify suitable devices, such as, CCTVs or early warning systems etc. for testing on the sites.
- It was suggested by DRM, Bhavnagar Division that Joint site inspection by officials of Railways, Forest and Gujarat Info Petro Limited to understand the area and scope for kind of technology (for consultancy service) that can be adopted to prevent death of lions. However, no such joint inspection had been conducted as on November 2021.
- Forest department had not sent the required proposal for the fencing as done along the Pipavav to Rajula section to be extended up to Savarkundla/ Lilya Mota Station as suggested by DRM, Bhavnagar.

In Reply the Forest Department stated (March 2022) that content of signages had been provided to the Railway Administration¹⁰³, training program was organized¹⁰⁴, sites were identified for building Machans¹⁰⁵ and suitable methods were being identified for testing early warning systems on the sites. Further, steps have been taken by the

¹⁰³ *May 2014 and January 2019*

¹⁰⁴ *February-March 2014.*

¹⁰⁵ *January 2019*

Railway Administration to limit the speed of the trains and stop¹⁰⁶ running of trains during night hours.

During the joint inspections conducted by Audit with the Railway Engineers, sufficient signages, fencing and watch towers were not provided at vulnerable locations. This implies that action towards safety of Asiatic lions was lacking on the part of Railway Administration.

Recommendations:

- Indian Railways should take stringent efforts to complete the work for early elimination of level crossings to reduce the safety hazards.
- Indian Railways should ensure that the 'joint advisories' issued by the Ministry of Environment & Forest and MoR be followed scrupulously to prevent animal deaths, which in turn will also help in preventing derailments on this account.

¹⁰⁶ *A meter gauge comes out of the forest, in which four trains run but trains do not run from 8 at night to 6 in the morning.*

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

Investigation of the factors responsible for derailments done by the Inquiry Committees is an important exercise, which highlights the main factors responsible for the accidents. Leading and lagging indicators of weaknesses in the defenses as brought out in the inquiry reports represent the holes in the barriers or the risk control systems that are put in place by various departments of IR. Once such safety performance indicators are identified and though all the departments are taking necessary corrective actions, a systematic mechanism for monitoring of implementation of the policies, processes and procedures to prevent reoccurrence of such incidents at other locations was found to be missing. The deficiencies in setting up a foolproof system of learning from past mistakes are a serious impediment to fulfillment of one of the main objectives of the accident inquiry reports of preventing recurrences of incidents of derailments.

In each accident, multiple factors attributable to the one department or to more than one department combined and were collectively responsible for the derailments. Most of the derailments occurred due to simultaneous failures of each of the five barriers namely (i) Rules and Joint Procedure Orders (JPOs), (ii) Training/Counselling of staff, (iii) Supervision of operations, (iv) Coordination and communication between staff of different departments and (v) Scheduled Inspections.

The ZR could not adhere to the timeline prescribed by RB for schedule of procedure for completion of enquiry in 49 *per cent* of derailment cases. The Railway administration had failed in achieving the important objective of monitoring the preventive action in respect of the recommendations made by the Inquiry Committees as the same has not been made part of the SIMS, the online real time reporting system.

The IR managed the maintenance activities with vacancies in work force and with nominal outsourcing. This revealed that required steps were not taken for adequate staffing in safety category, which can impact quality of maintenance. The compromise in quantity and quality of maintenance can result in poor performance by engineering Permanent Way assets having implication on IR Vision 2020, which aims at making railway operations free of accidents, be it derailment, collision or fire on trains.

Non-deployment of track recording cars over some of the planned sections, under-utilization of the track machines, incomplete switching over to use of pre-stressed concrete RT-8527 sleepers, replacement of Alumino-Thermit (AT) welds by reliable Flash Butt (FB) welds by ZRs and shortfall in Ultra Sonic Flaw Detection testing of welds resulted in non-adherence to the directives of the RB and can have implications on overall safety of train operations including derailments. The ZRs failed to provide minimum hours to carry out the permanent way maintenance activities as required under IRPWM and as instructed by the RB in December 2012.

Track Management System (TMS) is a web based application for online monitoring of track maintenance activities. The in-built monitoring mechanism of the TMS portal was, however, not found to be operational. Information pertaining to closure of the inspection notes were not filled in the portal.

The Railways Administration also failed to act in accordance with the observation of the Standing Committee on Railways (2016-17) wherein it was observed that the physical as well as financial targets in respect of track renewals need to be enhanced as per the annual requirement for track renewals for safety.

There was increasing trend on IR towards expenditure on non-priority works against the guiding principles of Rashtriya Rail Sanraksha Kosh (RRSK) deployment framework. The sole purpose of creating a separate dedicated fund for financing safety related works was defeated, as safety related works were held up due to fund constraints. Further, Incorrect bookings denoting misclassification of expenditure led to reduced RRSK fund availability for priority works.

7.2 Summary of recommendations

- *IR should ensure strict adherence to the scheduled timelines for conducting and finalization of accident inquiries.*
- *IR may develop a strong monitoring mechanism to ensure timely implementation of maintenance activities by adopting fully mechanized methods of track maintenance and improved technologies.*
- *Railway Administration must follow the ‘guiding principles for deployment of RRSK funds’ to avoid fund constraints in the area of Priority-I works.*

- *IR may prepare the ‘Detailed Outcome Framework’ for each item of safety work as per the indicative outcomes to gauge whether the benefits derived out of the RRSK funds are in the conformity with the objectives behind the creation of the Fund.*



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Dated: 5 September 2022

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Dated: 6 September 2022

List of Abbreviations	
CR	Central Railway
DAR	Discipline and Appeal Rules
DEN	Divisional Engineer
DRM	Divisional Railway Manager
ER	Eastern Railway
ECR	East Central Railway
ECoR	East Coast Railway
GMT	Gross Million Tonnes
GPS	Global Positioning System
HRD	Human Resource Development
ICF	Integrated Coach Factory
IRPSM	IR Projects Sanctions & Management
NR	Northern Railway
NCR	North Central Railway
NER	North Eastern Railway
NFR	North Frontier Railway
NWR	North Western Railway
OMS	Oscillation Monitoring System
PSC Sleepers	Pre-stressed Concrete Sleepers
SR.DOM	Senior Divisional Operating Manager
SR	Southern Railway
SCR	South Central Railway
SER	South East Railway
SECR	South East Central Railway
SWR	South West Railway

Appendices

Appendix-A (Ref: Para 1.2)

Safety Framework in Indian Railways
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<p>Railway Board vide PED/Safety Board's letter no. 2005/Safety(A&R)/6/4 Pt. Dated 14.12.2017 clarified the level of authorities that shall conduct inquiries of different accidents as under:</p>
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|--|
| <p>1. All serious accidents shall be inquired into by the Commissioner of Railway Safety.</p> |
| <p>2. In case Commissioner of Railway Safety or Chief Commissioner of Railway Safety is not in a position to inquire into serious accident cases involving coaching train, notified to him under section 113 of Railway Act, the inquiry shall be carried out by a committee of SA grade Officers and CSO of the Railway shall be Convener / Chairman of such committee. The Accident inquiry Report of the Committee shall be accepted by the General Manager of the Zonal Railway.</p> |
| <p>3. All cases of collisions falling under A1 to A4 categories shall be inquired into by Committee of SAG officers unless the same is being inquired by CRS with GM as the accepting authority.</p> |
| <p>4. All other consequential train accidents shall be inquired by by Dy.CSOs from Safety Department to be nominated by Gm with the GM as accepting authority.</p> |
| <p>5. All other accidents shall be inquired into by a Committee of Sr. Scale or Junior Scale Officers as decided by respective DRMs with DRM as the accepting authority.</p> |
| <p>6. All yard accidents shall be inquired into by a Committee of Senior Supervisors with Senior DSO/DSO as the accepting authority.</p> |
| <p>7. All cases of Indicative Accidents shall be inquired into by a Committee of Senior or Junior Scale Officer with DRM as the accepting authority except all cases of Signal Passing at Danger (SPAD) which shall be inquired into by a JA Grade Committee of officers at divisional level with Sr. DSO/DSO as one of the members.</p> |
| <p>8. General Manager or DRM can have the inquiry conducted by a committee of higher levels of officers than the above mentioned levels depending upon the seriousness of accident.</p> |
| <p>9. In accident cases wherein the Inquiry Committee determines responsibility on the staff of Foreign Railway, the Inquiry Report should be put up to the Principal Head of the Department of the concerned department of the Railway on which the accident took place through CSO after which such inquiry report shall be accepted by the AGM (instead of DRM). Finalization of Inter-railway DAR cases arising out of such inquiry reports be followed up by the Principal Head of the Department of the concerned department of the Railway on which the accident took place. If suitable response is not received from the respondent Railway at General Managers' level, then the case should be referred to</p> |

	Railway Board. In case Foreign Railway staff is held 'blameworthy' only, the accident inquiry case may be accepted by DRM.
10.	All cases of equipment failure shall be inquired into by Senior Supervisors/ Supervisors of respective departments.
11.	All inquiries will be ordered by the concerned DRM except for inquiries falling under item (ii), (iii) & (iv) of the above wherein General Manager will order the inquiries.
System of Accident Inquiries in Indian Railways	
The inquiries of different types/categories of accidents are conducted by different levels of officers in Indian Railways as brought out in preceding paragraph (1.4). For application of the Swiss cheese model in the area of maintenance of permanent way by the Engineering department of Indian Railways, a study was conducted to analyse the accident inquiry reports pertaining to the incidents of derailments.	
I.	The Commissioner of Railway Safety: Section 113 of the Railways Act, 1989 required intimation of serious accidents to be sent to the Commissioner of Railway Safety. Under the Statutory Investigation into Railway Accidents Rules, 1998 issued by the Ministry of Civil Aviation, a statutory inquiry by the Commissioner of Railway Safety is obligatory in every serious accident to a train carrying passengers which is attended with loss of human life, or with grievous hurt, as defined in the Indian Penal Code, to a passenger or passengers in the train or with serious damage to railway property of the value exceeding ₹ 2 crore in each case. While holding statutory inquiry, the Commission not only examines affected passengers but also invites members of the public to give evidence in person during the inquiry or to write to the Commission.
While, the Railway Board in the Ministry of Railway are the safety controlling authority and are responsible for laying down and enforcing safety standards for the Indian Railways, the main task of the Commission is to direct, advise and caution the railway executives through its inspectional, investigatory and advisory functions and thereby assist them in ensuring that all stipulated measures are taken in regard to the soundness of rail construction and safety in train operation.	
II.	Other Inquiring authorities: In addition to CRS, the accident investigations are also carried out by other authorities of Indian Railways depending on the type and nature of the accident as directed by Railway Board vide PED/Safety Board's letter no. 2005/ Safety(A&R)/6/4 Pt. Dated 14.12.2017 mentioned above.
Role of Other Departments in safety in Railways	
Individual executive and technical departments look after and are accountable for safety within their own departments. In the specific area of Railway transport, the department wise broad responsibilities are given below:	
Civil Engineering: Civil engineer is required to involve himself in the construction of new lines. After a new railway line is constructed, the line is thrown open for the public carriage of passengers. The civil engineering department is required to ensure safe movement of passengers and goods on such a line, which demands constant vigil on his part.	

Mechanical Department: It is responsible for maintenance of rolling stock including passenger coaches, freight wagons, diesel locomotives, DMUs and cranes. The department also formulates plans for procurement of rolling stock, machinery & plant and ensures safety and reliability of stock in train operation

Operating Department: The operating department has to issue rules for working of trains based on optimal safety parameters and exercising control over the operations as per the rules so laid down.

Signal and Telecommunication Department: It is responsible for ensuring existence of proper mechanism for installation, operation and maintenance of related equipment for safe operation of trains.

Electrical Department is responsible for installation, maintenance and upkeep of Over Head Electric Traction for safe running of train on electrified routes on Indian Railways.

Appendix-B (Ref:- Para 1.3.5)

The derailment cases in the Zonal Railways were examined based on the following criteria:

- I. 100% of all derailment cases in the selected Divisions
- II. Out of the remaining cases, adequate number of derailment cases were selected using random sampling in IDEA so that the overall sample size arrives as mentioned below:
 - Consequential derailments- 75%
 - Yard derailments- 50%
 - Other train derailments - 20%
- III. Cases of collisions of trains being less in number (11 cases), 100% of all such cases under consequential train accidents were examined for the analysis included in Part-II of the Inquiry Report.

Sl. No.	Name of Zones	Category of derailments	Total derailments	Division wise bifurcation of selected derailments					
				Division -1		Division -2		Remaining Divisions (Numbers)	Total selected
				Name	Number	Name	Number		
1	Central Railway	Consequential	25	Mumbai	15	Nagpur	3	6	24
		Yard derailments	67		21		11	18	50
		Other train derailments	24		11		9	1	21
		Total	116		47		70	23	25
2	Eastern Railway	Consequential	3	Howrah	0	Asansol	2	1	3
		Yard derailments	12		3		2	4	9
		Other train derailments	5		4		1	0	5
		Total	20		7		12	5	5
3	East Central Railway	Consequential	17	Pandit Deen Dayal Upadhyay	3	Danapur	4	9	16
		Yard derailments	95		27		22	24	73
		Other train derailments	60		12		15	8	35
		Total	172		42		83	41	41
4	East Coast Railway	Consequential	9	Khurda Road	5	Waltair	4	0	9
		Yard derailments	68		55		12	1	68
		Other train derailments	11		4		7	0	11
		Total	88		64		87	23	1

5	Northern Railway	Consequential	27	Lucknow	10	Delhi	12	5	27
		Yard derailments	67		11		22	17	50
		Other train derailments	51		21		9	5	35
		Total	145		42		85	43	27
6	North Central Railway	Consequential	9	Prayagraj	6	Jhansi	0	3	9
		Yard derailments	72		39		20	6	65
		Other train derailments	28		16		8	2	26
		Total	109		61		89	28	11
7	North Eastern Railway	Consequential	8	Lucknow Junction	4	Varanasi	4	0	8
		Yard derailments	28		13		9	3	25
		Other train derailments	19		9		5	1	15
		Total	55		26		44	18	4
8	North Frontier Railway	Consequential	8	Lumding	6	Alipurduar Junction	1	1	8
		Yard derailments	30		19		3	5	27
		Other train derailments	10		5		2	1	8
		Total	48		30		36	6	7
9	North Western Railway	Consequential	10	Ajmer	3	Jaipur	4	3	10
		Yard derailments	36		10		6	11	27
		Other train derailments	12		5		6	1	12
		Total	58		18		34	16	15
10	Southern Railway	Consequential	9	Chennai	2	Thiruvananthapuram	2	5	9
		Yard derailments	67		42		10	9	61
		Other train derailments	7		4		0	3	7
		Total	83		48		60	12	17
11	South Central Railway	Consequential	10	Secunderabad	3	Vijaywada	2	4	9
		Yard derailments	107		53		23	18	94
		Other train derailments	33		5		12	4	21
		Total	150		61		98	37	26
12	South Eastern Railway	Consequential	9	Chakradharpur	2	Adra	1	5	8
		Yard derailments	100		7		33	0	40
		Other train derailments	38		18		15	0	33
		Total	147		27		49	5	81

13	South East Central Railway	Consequential	1	Bilaspur	0	Nagpur	1	0	1
		Yard derailments	46		24		16	6	46
		Other train derailments	14		10		0	0	10
		Total	61		34		17	6	57
14	South Western Railway	Consequential	5	Bengaluru	3	Mysore	2	0	5
		Yard derailments	9		0		0	1	1
		Other train derailments	4		5		4	1	10
		Total	18		8		6	2	16
15	Western Railway	Consequential	9	Ahmedabad	4	Ratlam	1	3	8
		Yard derailments	51		12		9	15	36
		Other train derailments	15		3		5	2	10
		Total	75		19		15	20	54
16	West Central Railway	Consequential	4	Jabalpur	3	Bhopal	1	0	4
		Yard derailments	30		16		8	3	27
		Other train derailments	13		7		5	1	13
		Total	47		26		14	5	44
Overall Indian Railway	Consequential	163	Total 16 Divisions						158
	Yard derailments	886							718
	Other train derailments	343							253
	Total	1392		913		216	1129		

Selection of Divisions and Senior Section Engineers

Sl. No.	Name of Zones	Name of selected Division (As per para 1.3.5, Table-1.0, Sr. No.1)	Selected SSE-P-Way (As per para 1.3.5, Table-1.0, Sr. No.2)	Selected SSE-USFD (As per para 1.3.5, Table-1.0, Sr. No.3)
1	Central Railway	Mumbai	SSE/P Way/Lingti	SSE/USFD/BY
			SSE/P Way/Igatpuri	SSE/USFD/Igatpuri
		Nagpur (NGP)	SSE/P Way/Nagpur	SSE/USFD/Nagpur
			SSE/P Way/Buti Bori	SSE/USFD/Betul
2	Eastern Railway	Howrah (HWH)	SSE/P Way/Howrah	SSE/USFD/Howrah
			SSE/P Way/Barddaman (East)	SSE/USFD/Barddaman (East)
		Asansol	SSE/P Way/Asansol	SSE/USFD/Asansol
			SSE/P Way/Mankar	SSE/USFD/Andal

3	East Central Railway	Pandit Deen Dayal Upadhyay	SSE/P Way/Gaya	SSE/USFD/Dehri-on_Sone
			SSE/P Way/Chandauli Majhwar	
		Danapur	SSE/P Way/Danapur	SSE/USFD/Danapur
			SSE/P Way/Patna	SSE/USFD/Patna
4	East Coast Railway	Khurda Road	SSE/P Way/Talcher	SSE/USFD/Khuda Road
			SSE/P Way/Gorakhnath	SSE/USFD/Cuttack
		Waltair	SSE/P Way/Koraput	SSE/USFD/Visakhapatman
			SSE/P Way/Rayagada	SSE/USFD/Vizianagaram
5	Northern Railway	Lucknow	SSE/P Way/Barabanki	SSE/USFD/Sultanpur
			SSE/P Way/Unnao	SSE/USFD/Rae Bareli
		Delhi	SSE/P Way/New Delhi	SSE/USFD/Team 8/(NDLS-GZB-CYZ)
			SSE/P Way/Ghaziabad	SSE/USFD/Team 9/(NDLS-PWL)
6	North Central Railway	Prayagraj	SSE/P Way/Prayagraj	SSE/USFD/Prayagraj
			SSE/P Way/kanpur Central/HQ/W	SSE/USFD/Kanpur Central
		Jhansi	SSE/P Way/Jhansi	SSE/USFD/Jhansi
			SSE/P Way/Gwalior/W	SSE/USFD/Gwalior
7	North Eastern Railway	Lucknow Junction	SSE/P Way/Gorakhpur	SSE/USFD/Lucknow
			SSE/P Way/Basti	
		BSB (Varanasi)	SSE/P Way/Varanasi	SSE/USFD/Varanasi
			SSE/P Way/Madhosingh	
8	North Frontier Railway	Lumding	SSE/P Way/Plain/Lumding	SSE/USFD/Lumding
			SSE/P Way/Hill/Lumding	
		Alipurduar Junction	SSE/P Way/New Maynaguri	SSE/USFD/Alipurduar
			SSE/P Way/Malbazar	
9	North Western Railway	Ajmer	SSE/P Way/North/Ajmer	SSE/USFD/Ajmer Team 1
			SSE/P Way/Abu Road	SSE/USFD/Ajmer Team 3
		Jaipur	SSE/P Way/Rewari	SSE/USFD/Rewari/Team 1
			SSE/P Way/Phulera	SSE/USFD/Phulera/Team 6
10	Southern Railway	Thiruvananthapuram	SSE/P Way/Aluva	SSE/USFD/Aluva
			SSE/P Way/Ernakulam	SSE/USFD/Ernakulam
		Chennai	SSE/P Way/Arakkonam	SSE/USFD/MAS-GDR
			SSE/P Way/WSTA	

11	South Central Railway	Secunderabad	SSE/P Way/Kazipet	SSE/USFD/ Secunderabad
			SSE/P Way/Vikarabad	
		Vijayawada	SSE/P Way/Ongole	SSE/USFD /Vijayawada
			SSE/P Way/BZA (South)	
12	South Eastern Railway	Chakradharpur	SSE/P Way/Chakradharpur	SSE/USFD/Chakradharpur
			SSE/P Way/Tatanagar	SSE/USFD/Tatanagar
		Adra	SSE(East)/P Way/Adra	SSE/USFD/Adra
			SSE/P Way/Bankura	SSE/USFD/Bankura
13	South East Central Railway	Bilaspur	SSE/P Way/Korba	SSE/USFD/Raigarh T1 & T2
			SSE/P Way/Champa	SSE/USFD/Champa (CPH)/T3 & T10
		Nagpur	SSE/P Way/Dongargarh	SSE/USFD/Rajnandgaon
			SSE/P Way/Kamptee	SSE/USFD/Gondia (G)
14	South Western Railway	Bengaluru	SSE/P Way/Bengaluru	SSE/USFD/Bengaluru - Mysuru
			SSE/P Way/Yelahanka	SSE/USFD/Bengaluru - Dharmapuri
		Mysore	SSE/P Way/Chitradurga	SSE/USFD/Davangere
			SSE/P Way/Mysore	SSE/USFD/Mysore-1
15	Western Railway	Ahmedabad	SSE/P Way/Gandhidham	SSE/USFD/ Gandhidham
			SSE/P Way/Kalol	SSE/USFD/Mahesana
		Ratlam	SSE/P Way/Ujjain /South	SSE/USFD/Ratlam
			SSE/P Way/Nagda	SSE/USFD/Dahod
16	West Central Railway	Jabalpur	SSE/P Way/Katni (North)	SSE/USFD/Katni
			SSE/P Way/New Katni	SSE/USFD/Satna
		Bhopal	SSE/PWAY/Yard/Itrasi	SSE/USFD/Itrasi
			SSE/PWAY/Guna	SSE/USFD/Vidisha

Appendix-C (Ref: Para 3.4)

Analysis of Accident Reports based on 'Swiss Cheese Model'

Sl. No.	Accident ID	Cause of derailment	Slice-1/Hole	Slice-2/Hole
			Rule/JPO	Training/Counseling
1	2	3	4	5
1	20191008002 17/10/2019 WR/ADI	Sudden derailment caused by sudden mounting and dropping of wheels of loco due to settlement of formation (less ballast & loose packing) of newly overhauled level crossing on a 3 degree curve	Weakness in Rule/policy TSR 30 KMPH if check rail not provided (Engg) Train derailed even at speed of 20 KMPH	Lack of safety checks before clearance of block
2	20190708002 16/07/2019 WR/BVP	The derailment on Non-interlocked hand point No.104 at PBR occurred due to "Failure of Railway Staff as well as inadequate infrastructure to handle large No. of Coaching trains"	Multiple No. of authorities and instructions issued to Points Jamadar for conflicting movements issued by the Dy. SS. Verbal instructions issued and use of mobile phones for shunting was done in contravention to the rules	Drunkenness on duty 8 of the operating staff tested positive for alcohol consumption in the post accident medical examination Competency certificates as required, were not issued to any of the cabin men.
3	20210208002 23/02/2021 WR/ADI	The track was newly laid and given fit on 22.02.21 at 20.30 hrs. Track deficiencies were noted like twist, gauge, ballast thickness etc. in the joint track observation readings as well as during proceedings of accident enquiry. It was found that track was not properly laid.	Track parameters beyond permissible limits	The fault in the wagon was not detected during regular inspection
4	20180608002 17/06/2018 WR/ADI	To check release of Brakes in Load, Loco Pilot was moving the train ahead but could not stop in time and passed over the trap point. Loco No. 12735 derailed by 7 wheels of front trolley at Trap Point No. 158 of line No. 1 in Viramgam Yard.	Failure of LP and ALP for not observing shunt signal SH-72 which was in on position resulted in derailment of the engine on normal (open) trap point.	Both LP and ALP were not aware of rule and working of trains at VG Yard. Assistant Loco Pilot allowed the Pointsman to board the train and failed to observe the points

5	20180508008 29/05/2018 WR/RJT	Movement of D. P 11230 WDM 3D on open trap point No.102 Loco was derailed by front trolley on trap point No. 102 while shunting. This was due to Long hood movement of shunting performed on hand signal shown by Pointsman.	Violations in Shunting operation -use of hand signals	Incorrect deployment of pointsman, incorrect operation of points
6	20180608004 27/06/2018 WR/ADI	While passing KM 609/7, 02 wagons (6 & 17th from br van) derailed by front trolley between VSV and JTX of Train No KDLP/PBN/DAP. The accident resulted from combination of Track as well as Wagon defect.	SSE/ P.Way GIM failed to maintain bogie dimensions within specified limits during ROH repairs	Improper maintenance of Rolling Stock (Wagon)
7	20180408004 30/04/2018 WR/RJT	On date 30.04.2018, Freight Train No. MARIK MEOM N Dn while on run passing MLC 147, 08th wagon No. BTPNE NF 91073 derailed. Due to both combination of forces, the vertical force generated and wheel jumped and derailed outside.	Zigzag alignment and variation in verisine beyond the permissible limits	Operating staff was not trained counseled about the correct procedure to be adopted during shunting operations
8	20171108003 16/11/2017 WR/ADI	LE no 40471 WDP4, derailed with all wheels of front trolley in point no 466 at KKF yard due to disregard of the Shunt Signal by Loco Pilot	SPAD Disregard of Shut signal by Loco pilot (Goods)	Guard failed to apply emergency brakes after noticing train rolling back
9	20180708002 25/07/2018 WR/BCT	Derailment due to careless working, Loco No.36533 WDS-6 DA derailed at Point No.102 in BDTS yard and caused inconvenience in traffic	SM BDTS failed to follow the rules and found careless working while asking line clears for light engine No.36533, WDS-6	LP passed departmental signal without ensuring proceed hand signal by competent railway servant on defective Signal No.42
10	20171106001 11/11/2017 SR/TVC	While starting Train No.66302 QLN-ERS MEMU Passenger from Road 1 loop line, the last coach MC-13026 one pair of wheels derailed Due to partial rail cut, not properly secured by	The SSE (P.way) failed in inspection and maintenance of track in his jurisdiction violated IRPWM para no 136	Rail end cropping and welding to be done under line block protection as stated in IRPWM para no 804 (2) (i) G. In this case partial rail cut done

		fishplates on LH side of the track before the passage of MEMU 66302. (Failure of Railway staff)		without block protection.
11	20200906001 13/09/2020 SR/TPJ	Description: Derailment of wagon no NCR 31130512835 BCN (9th wagon from BV) near OHE mast no 1076A Cause: Failure of Engineering staff. (Failure of Railway staff)	The SRR yard is having 86 points and crossings and 13 roads (running line and non-running line). Considering the equated track kilometer, 1 Keyman is insufficient to take care of the daily routine.	Check rails were not provided in the curved location considering the vulnerability of the curve.
12	20170506001 14.05.2017 SR/MAS	Point 110B got operated after setting of route and point came in middle position and signal 1 'A' flew back to danger. LP has started train without getting restarting memo from SM and not adhering speed of 15 KMPH when LP is aware of signal flew back to danger and ran at 37 KMPH.	Non adherence to SR by Station Master, Loco Pilot and Guard.	Electrical OP-Lack of Knowledge about Working Rules by LP/ALP LP Operated train at higher speed of 57 KMPH instead of 15KMPH though signal flow back to danger. Train was not started with restarting memo. SM
13	20201013003 08/10/2020 NCR/ALD	Obstruction by PRC sleeper kept nearby track in sleeper stack.	Shunting staff should ensure that track is free from obstruction before allowing shunting movement.	Commercial staff should follow all safety parameters before loading/unloading.
14	20181213001 12/7/2018 NCR/ALD	Overlook of shunt signal	General rules was avoided by Shunter as he was found alcoholic on duty	Incorrect location of Shunt Signal (Visibility issue)
15	20181213002 12/14/2018 NCR/ALD	Defect in trolley of wagon.	Maintenance during ROH should be carefully managed	Poor condition of AR supporting channel welding
16	20180813005 8/17/2018 NCR/ALD	Careless working of Shunting staff.	Wrong shunting operation by Shunting Loco Pilot	Wrong shunting operation by Shunting Loco Pilot
17	20200313004 3/17/2020 NCR /AGC	Derailment Careless/unlawful shunting	Lack of checks and balances in rules and procedure.	Unauthorized mode of shunting used

18	20200913005 9/12/2020 NCR /AGC	Open door of wagon & Dashing with Newly fabricated FOB column (Lying on PF)	Non observance of PCE/ Safety/ Circular no. 103 dated 20.11.2019.	Door of wagon was not closed properly.
19	20190113002 1/22/2019 NCR /JHS	Derailment due to Broken wagon door	Wagon door and locking arrangements not checked carefully by C&W staff	Rejectable defect material was not attended in the yard properly
20	20210201001 31/01/2021 CR/BB	(Failure of Railway Staff) Derailment occurred due to poor maintenance of cross over where deficiency of ballast cushion, abrupt variation in versine, variation in gauge and poor fastening of rails observed.	Excessive cross level between Station 0 and -1 i.e. 33 mm (Permissible limit is 9 mm)	Excessive cross level variation at gauge. Knowledge of SSE/P.Way/BY & SSE/P.Way/Sectional was poor.
21	20200901002 19/09/2020 CR / CSMT	(failure of Railway Staff) Due to excessive cross level between Station 0 and -1 i.e. 33 mm (Permissible limit is 9 mm) and insufficient ballast to hold the track properly at the curvature (before POM up to 50 meters), there was very less shoulder and crib ballast available on the track, the missing track fittings causes increase the lateral force on wheel flange, resulting right hand wheel off loaded at POM and further due to curvature the right wheel mounted on the rail and fallen outside the track (RHS) leading to derailment of coach No 5304A.	Excessive cross level between Station 0 and -1 i.e. 33 mm (Permissible limit is 9 mm)	Lack of knowledge on precautions required for operating TRT block machine
22	20201201001 23/12/2020CR / SUR	(Failure of Railway Staff) Due to falling of spring, adapter and elastomeric pad of wagon leads to increase in destabilizing forces on wagon which caused erratic movement of wagons with unbalanced loads acting on rails while negotiating the curvature. Since LH rail	Testing of defective welds has not been followed as per USFD Manual.	Deficiency in C & W is indicative of lack of knowledge on the checks required to be exercised.

		having flaw of more than 80 % in rail head portions thus the uneven resulting forces and uneven load resulted breakage of LH rail. The RH rail was also broken at the same location. Further LH and RH rail broke at 6 and 7 places respectively in the damaged portion (approximately 226m length).		
23	20200301002 18/03/2020 CR / NGP	Derailment due to weld failure at location 807/24.	The periodicity of USFD testing not done as per USFD manual	Deficiency in P-Way maintenance.
24	20191001004 26/10/2019 CR/BB	(Failure of Railway staff)Track with 52kg Rail on 60kg notched Sleepers in absence of conversion liners caused poor gripping of Rail leading to it's tilting which resulted in leading RH Wheel of leading trolley of Coach No. 08481 GS dropping inside of RH Rail and LH wheel remaining on LH Rail. Track gauge at stations 0,1,2,3 was found to be +59, +51, +44, +37 mm respectively.	Deficiency in P-Way maintenance.	Absence of conversion liners caused poor gripping of rail resulting to its tilting
25	20190701001 28/06/2019 CR/BB	Under load weld failure and wide gauge.	Non standardization of blocks for Engineering works	Defective track parameters

Sr. No.	Accident ID	Slice-3/Hole	Slice-4/Hole	Slice-5/Hole
		Supervision	Coordination	Inspection
1	2	6	7	8
1	20191008002 17/10/2019 WR/ADI	Supervisor failed to ensure safety checks before clearance of block	Lack of coordination between Engineering and operating staff	Inspection of site was not done by higher officer during execution of work
2	20190708002 16/07/2019 WR/BVP	SSE/Pway/C failed to ensure correct layout of the track. This is also indicative of failure in proper supervision of his work by higher authorities	Lack of coordination between Engineering and operating staff. The increased number of passenger trains forced utilization of line no. 5 (Goods line) taking shelter of G&SR S.10 which permits reception of passenger trains on the goodline only during emergency.	Inspection schedule not followed Joint inspection of Points by SSE-Pway not followed as per prescribed schedule
3	20210208002 23/02/2021 WR/ADI	The fault in the wagon was not detected during regular inspection	Track declared fit without ensuring compliance to deficiencies noted in joint inspection	Track deficiencies were noted like twist, gauge, ballast thickness etc. in the joint track observation readings
4	20180608002 17/06/2018 WR/ADI	Carelessness by Guard and yard master in supervising the shunting operation	Lack of coordination between Loco pilots and operating staff	Chief Loco Inspector failed to ensure that the LP and ALP nominated for the train had proper knowledge of VG yard operation.
5	20180508008 29/05/2018 WR/RJT	Goods Guard who was in-charge of the shunting operation, failed to supervise the shunting operation.	Multiple authorities on single signal, incorrect deployment of Points man, incorrect operation of points.	Guard HQ/VTA failed to apply emergency brakes after noticing derailments. Points man and gateman were not stopped from boarding the train
6	20180608004 27/06/2018 WR/ADI	SSE/P way Bajana failed to ensure track parameters	Station master (yard) failed to ensure proper coordination with the shunting staff during the shunting operations.	Train clerk and guard failed to remove sick wagon (POH overdue) before permitting shunting operations

Sr. No.	Accident ID	Slice-3/Hole	Slice-4/Hole	Slice-5/Hole
1	2	6	7	8
7	20180408004 30/04/2018 WR/RJT	Yard Master failed to ensure observance of JPO during shunting operations	Lack of coordination between Shunting loco pilots and operating staff	Overdue POH and wear in Pivot was not detected
8	20171108003 16/11/2017 WR/ADI	The shunting operation was not properly supervised	Loco Pilot was under the impression that his loco was to be taken to KKF Shed whereas as per Dy.SS-ADI and PCR/ADI, the loco was planned for KKF Yard	Infrastructural constraints existed for shunting operation
9	20180708002 25/07/2018 WR/BCT	Operation of train at defective signal was left unsupervised.	Lack of coordination between Loco Pilot and Assistant Loco Pilot	Train allowed up to destination despite invalid Brake Power Certificate (BPC)
10	20171106001 11/11/2017 SR/TVC	Engineering Department - Non supervision of track work by the supervisors.	Operating Department - Lack of sufficient block time for Engineering works	Gauge Retention Clamps used in Road 7 of GOC were supplied on trial version and not finally approved by RDSO
11	20200906001 13/09/2020 SR/TPJ	Engineering Department - Non monitoring of results of proto type equipment	Track patrolling not done effectively by the Track Maintainers	Non provision of check rails remained unnoticed
12	20170506001 14.05.2017 SR/MAS	Engineering and Signaling supervisors did not ensure adoption of correct procedures	Engineering staff failed to stack the sleepers at adequate distance from the track.	Improper maintenance of Point machine. After changing the cables of point machine. The machine was not locked by Sr. Tech.
13	20201013003 08/10/2020 NCR/ALD	Loading was not properly supervised	Lack of coordination between Shunting loco pilots and operating staff	Site of stacking of Sleepers remained uninspected Engineering staff should stack the sleepers at adequate distance from the track.
14	20181213001 12/7/2018 NCR/ALD	Yard master was not physically present at site for effective supervision	Lack of coordination between Shunting loco pilots and operating staff	Delay in getting medical examination of

		when shunting was being done.		Chief Yard Master.
15	20181213002 12/14/2018 NCR/ALD	Wagon found running over due ROH	Shunt Signal no. 245 is on right side and having comparatively less height; it should be on left side and bit higher.	Failed to detect poor condition of AR supporting channel welding
16	20180813005 8/17/2018 NCR/ALD	Junior staff (Group D) deputed for supervision of loading work.	Lack of coordination between Shunting loco pilots and operating staff	There was failure of communication between Yard master and shunting staff
17	20200313004 3/17/2020 NCR /AGC	Unloading was not supervised by Railway officials	Lack of coordination between the commercial department and the consignee.	Overdue of joint point and crossing inspections
18	20200913005 9/12/2020 NCR /AGC	Guard failed to ensure proper locking of door of wagon	Lack of coordination between Engineering staff and Station Manager.	Improper supervision by loading staff and Engineering staff at platform
19	20190113002 1/22/2019 NCR /JHS	Improper locking of door by commercial staff	Lack of coordination between commercial staff and C&W staff	Rejectable defect material was not attended in the yard properly
20	20210201001 31/01/2021 CR/BB	There was poor fastening of rails which is indicative of improper supervision by Loading supervisor	Lack of coordination between loading staff and Engineering staff	Inadequate Ballast cushion as per last inspection report of SSE/Pway/BY on 21-01-2021.
21	20200901002 19/09/2020 CR / CSMT	Intactness of fitting of tracks not ensured before clearing the TRT block machine.	Lack of coordination between Engineering staff and Track Machine operator	Insufficient ballast to hold the track at the curvature
22	20201201001 23/12/2020CR / SUR	Existence of defective welds is indicative of improper supervision of the welding work	Lack of coordination between welding staff and Engineering supervisors.	Falling of spring, adapter and elastomeric pad of wagon is indicative of improper inspection of wagon by C&W officers.
23	20200301002 18/03/2020 CR / NGP	Improper supervision of yard remodeling work and USFD testing	Lack of coordination between welding staff, operating staff and Engineering supervisors.	Damaged drainage system during remodeling of IGP yard remained unnoticed.

24	20191001004 26/10/2019 CR/BB	Tilting of RH rails due to poor fastening.	Lack of coordination between loading staff and Engineering staff	Dumping of muck, debris and other waste material by the occupant of the hut men causing mud pumping and other drainage problem.
25	20190701001 28/06/2019 CR/BB	Improper supervision by SSE/ P.Way-Defective track parameters	Lack of coordination between Engineering and operating staff. Insufficient block granted	Inspection compliance issue. OHE structure Identified for correction was not corrected.

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