Chapter 4 – Mechanical – Zonal Hqrs/Workshops/ Production units

The Mechanical Department is mainly responsible for management of –

- Train operations by ensuring Motive Power availability, Crew Management, Rolling Stock Management and Traffic restoration in case of accidents
- Production Units engaged in production of Locomotives, Coaches, Wheel sets, etc
- Workshops set up for repair, maintenance and manufacturing of rolling stock and related components

The Mechanical Department is headed by Member Mechanical at Railway Board. In each of the zones the Department is headed by a Chief Mechanical Engineer (CME) who reports to the General Manager of the Railway. The office of the Member Mechanical of the Railway Board guides the CME on technical matters and policy. At the divisional level, Sr. Divisional Mechanical Engineers are responsible for implementation of the policies framed by Railway Board and Zonal Railways.

Production Units are managed independently by General Managers reporting to the Railway Board. The Workshops are headed by Chief Works Managers and report to the CME.

The total expenditure of the Mechanical Department during the year 2011-12 was ₹ 36,658 crore. During the year, apart from regular audit of vouchers and tenders etc., 583 offices of Mechanical Department were inspected.

This chapter includes a Thematic Audit on "**Maintenance of locomotives in Indian Railways"** conducted across Zonal Railways. In this theme, audit has assessed the adequacy of infrastructure and the quality and efficiency of repair of locomotives. Audit revealed that 89 *per cent* of the loco sheds had excess holdings of locomotives, which in turn, adversely affected the maintenance schedule and the quality and reliability of the maintenance carried out. The excess detention of locomotives in yards prior to Periodical Overhaul (POH) and after POH as well as delays in transfer of dead locomotives for repairs to the loco sheds resulted in estimated earnings loss of ₹ 241.33 crore.

Besides, three individual Paragraphs covering instances of serious irregularities/ deficiencies in procurement and production operations have also been highlighted in this chapter.

4.1 Maintenance of Locomotives in Indian Railways

Executive Summary

Locomotives are amongst the important assets of Indian Railways and provide vital motive power for both passenger and freight train services. The timely availability and reliability of performance of locomotives are critical to the operation of train services. This in turn requires timely, regular and adequate maintenance. A Thematic Audit on the maintenance of locomotives in Indian Railways covering the period 2009-2012 was carried out during October 2012 to January 2013*. Audit assessed the adequacy of infrastructure available for the repair of locomotives and its quality and efficiency.*

Audit scrutiny revealed that 90 per cent of the loco sheds carried excess holdings of locomotives. Further, in 54 per cent of the sheds, the holdings exceeded the homing capacity by 20 per cent. This in turn, adversely affected their maintenance schedules and the quality and reliability of the maintenance carried out. A test check revealed that during the year 2011-12, the maintenance schedule could not be carried out in 21 per cent of diesel locomotives which were due for maintenance.

The homing shed is responsible for sending their locomotives to the workshop in time for their Periodical Overhaul (POH). A test check revealed substantial delays in sending locomotives for POH, with delays ranging upto 360 days. Further, the quality of maintenance provided was poor as can be seen by the fact that 65 per cent of the overhauled locomotives registered failure within 180 days of POH. Further 17-20 per cent of them failed within one month of POH indicating poor standards of POH and a serious operational lapse in the internal control system of the Railways.

Failures of locomotives lead to unscheduled repairs. A test check of 28 loco sheds revealed that 11626 locomotives were given for 'out of course repairs' during a nine months period and resulted in 15810.64 ineffective engine days and loss of earning capacity of ₹ 281.35 crore. The expenditure on unscheduled repairs was estimated at about ₹81 crore. The figures of unscheduled repairs are much higher than the locomotives failure statistics reported by the Indian Railways and hence require a detailed examination.

The performance of workshops/sheds is judged against the target fixed for the number of locomotives to be POHed/ repaired and their time frame. A test check of 28 loco sheds revealed that there was extra detention for completing scheduled maintenances and POH resulting in loss of earning capacity of ₹ 209.95 crore. Further, the excess detention of locomotives in yards (more than a day) prior to POH and after POH as well as delays in transfer of dead locomotives for repairs to the loco sheds resulted in estimated earnings loss of ₹241.33 crore.

Thus the quality of maintenance provided to the locomotives was poor resulting in their early failure. This in turn leads to enroute detention of trains and unscheduled repairs. In fact, unscheduled repairs for locomotivess were very high and require an in-depth examination of the causes of such failure.

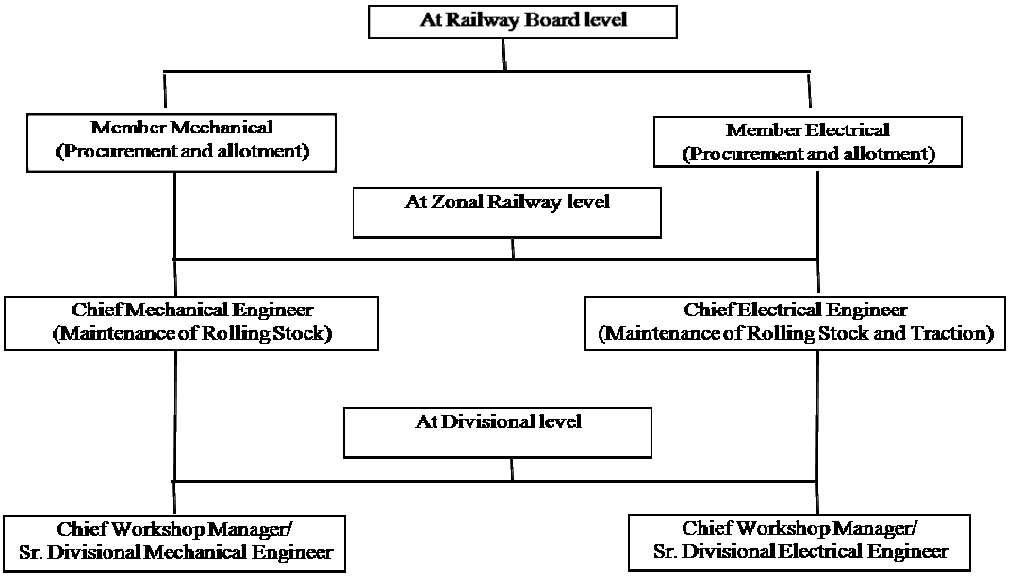
4.1.1 Introduction

Locomotives are amongst the most significant assets of the Railways and provide motive power for train services both passenger and freight. Timely availability and reliability of performance of locomotives are critical to the operation of train services. This in turn requires timely, regular and adequate maintenance for ensuring their good running condition. As on 31 March 2011, Indian Railways(IR) had a fleet of 9213 locomotives (BG, MG and NG[40]) comprising 43 Steam, 5137 Diesel and 4033 Electric Locomotives. Zonal Railways have the responsibility to plan for material, manpower and infrastructure for the maintenance of locomotives.

Each locomotive is assigned to a designated loco shed which is responsible for its maintenance and monitoring of its performance. There are 28 Broad Gauge (BG) Electric loco Sheds and 44 BG Diesel loco sheds in Indian Railways (IRs) for homing and attending to their scheduled and unscheduled maintenance. In addition, there are 12 loco workshops which undertake the periodic overhaul, heavy repairs and mid- term rehabilitation etc. of locomotives.

4.1.2 Organisation Structure

The organisational structure at the Railway Board, Zonal and Divisional levels overseeing the maintenance of Locomotives is as follows:



4.1.3 Previous Audit Reports

Issues of maintenance of locomotives in IR were covered in the Performance Audit on 'Assessment, procurement/production, utilisation and maintenance in Indian Railways' and included in the CAG's Report No.9 of 2003**.** The Report highlighted the following:

[40] Broad Gauge(BG), Meter Gauge(MG) and Narrow Gauge(NG)

- high incidence of un-scheduled repairs indicating poor quality of maintenance; and,
- high incidence of extra time taken for repairs for want of materials and under reporting of locomotive failure.

In the Action Taken Note, the Ministry of Railways condoned many of the deficiencies in performances such as detention of locomotives at yards prior to Periodical Overhaul (POH), extra time taken for POH for want of spares and materials etc. by stating that the Railways were able to meet the locomotive requirement of the Operating Department.

Since then a number of Audit Reports have also highlighted instances of abnormal detention of locomotives during their maintenance schedule on account of deficient material management, inadequate manpower and maintenance facilities and the detention of locomotives at exchange yards awaiting POH etc. In the last three years (2008-11) alone four[41] such paras were included in the Audit Reports highlighting issues such as detention of locos during maintenance due to non-availability of spare parts, failure in carrying out maintenance at specified intervals.

4.1.4 Audit Objectives

The objective of this audit was to evaluate whether:-

(i) Adequate capacity and infrastructure exist for maintenance of locomotives;

(ii) Repair and maintenance is being done with optimum efficiency; and

(iii) The quality and periodicity of repairs were sufficient for ensuring safety and optimum level of services.

4.1.5 Audit Scope and Sources of Criteria

The audit was conducted during the period October 2012 to January 2013 and covers the maintenance of Broad Gauge (BG) locomotives on all Zonal Railways except Metro Railways for the period from 2009-10 to 2011-12. It examines the adequacy of infrastructure available at the workshops and loco sheds and the quality of repair carried out. The Indian Railway Code for the Mechanical Department (Workshop), Railway Maintenance Manual of Diesel locomotives, Operating Manual of Indian Railways, Manual of Statistical Instructions of Indian Railways and the policy directives issued by the Railway Board and Zonal Headquarters relating to the maintenance of locomotives were the sources of our criteria while conducting the audit.

4.1.6 Audit Methodology

Records of the Operating, Mechanical and Electrical Departments as well as Workshops and sheds were reviewed in order to obtain the basic data. The reports/periodical returns submitted by the Divisions/ Workshops/ Sheds to the Zonal Railway Headquarters/ Railway Board and the basic records of Workshops and Loco Sheds have also been examined by Audit. These data were analysed and compared with the various norms fixed by the Railway Board and Zonal Railways.

[41] Para 4.1, 4.2 & 4.3 RAR No. 34 of 2010-11 & Para 6.4.6 of CA-19 of 2008-09

The results were then analysed with reference to their causes and conclusions drawn.

Since the volume of data was enormous a sampling procedure as underlined below was adopted for analysis.

4.1.7 Sample Size

4.1.7.1 Loco sheds: Activities of 16 Broad Gauge Diesel sheds (one shed from each Zonal Railway (except Metro Railway) out of the total 44 BG Diesel loco sheds and 12 Broad Gauge Electric loco sheds (one shed each from each Zonal Railway (except Metro Railway) having Electric Loco shed out of total 28 BG Electric loco sheds were audited. This constitutes 39 *per cent* of the total loco sheds.

4.1.7.2 Workshops: All the 12 BG Loco workshops (6 Diesel & 6 Electric) entrusted with Periodic Overhaul (POH) of locomotives were audited with reference to their performance relating to POH versus targets and delay in placement for POH etc.

The sheds and workshops selected are given below:

Table 4.1- Sample selection for micro study

Railway	Selected Diesel loco sheds	Selected Electric loco sheds	Diesel loco Workshops	Electric loco Workshops
CR	Kalyan/ KYN	Ajni	Parel/PRLW	Bhusawal/ BSL
ECoR	Visakhapatnam/VSKP	Visakhapatnam/ VSKP		
ECR	Mughalsarai/ MGS	Gomoh/ GMO		
ER	Andal/ UDL	Asansol /ASN	Jamalpur/ JMP	Kanchrapara/KPA
NCR	Jhansi/JHS	Kanpur /CNB		
NER	Gonda/Gd			
NFR	New Guwahati /NGC			
NR	Ludhiana/ LDH	Ghaziabad/ GZB	Charbagh, Lucknow	Charbagh, Lucknow
NWR	Abu Road /ABR		Ajmer/AIIW	
SCR	Kazipet /KZJ	Vijayawada /BZA		
SECR	Raipur/R	Bhilai/BIA		
SER	Bondamunda /BNDM	Tata	Kharagpur/ KGPW	Kharagpur/KGP
SR	Ponmalai /GOC	Arakkonam /AJJ	Ponmalai/ GOCW	Perambur/PEW
SWR	Krishnarajapuram/KJM			
WCR	New Katni Jn. /NKJ	Itarsi /ITA		
WR	Vatva /VTA	Vadodara Yd./BRCY		Dahod/DHD

4.1.8 Audit Findings

4.1.8.1 Adequacy of Infrastructure (Homing Capacity and Actual Holding) – Loco Sheds

The adequacy of the infrastructure of a loco shed depends on its installed capacity and the number of locomotives assigned to it. Each locomotive is assigned to a home shed which is responsible for its maintenance.

(i) Homing Capacity of Loco Sheds

Homing capacity of a loco shed is its installed capacity to repair a specified number of locomotives allotted to it during a financial year. Infrastructural facilities are designed accordingly. As per Paragraphs 4.1.3 of Indian Railway Maintenance Manual of Diesel locomotives, 1978, revised in 2005, "personalised attention is feasible when the number of locomotives in a shed is limited to a maximum of between 80 and 100. When the number increases beyond 100, attention gets diffused and when it exceeds 120, personalised attention fails".

A review of the total 72 BG loco sheds revealed the following:-

- The homing capacity of 25 sheds (Diesel -7 & Electric -18) had exceeded the 100 locomotive mark where personalised attention gets diffused;
- The homing capacity of 15 sheds (Diesel- 7 & Electric-8)[42] had exceeded the 120 locomotive mark where personalised attention fails;
- The homing capacity of diesel sheds was as high as 160[43] and for electric sheds it even went up to 175.[44]

Thus the guidelines regarding homing capacity were not followed by the Railway Administrations.

(Annexure XX)

(ii) Holdings of Loco Sheds

The holding of a loco shed is the actual number of locomotives assigned to it for homing and attending to scheduled repairs. For meeting the targets of maintenance and minimising the detention of locomotives awaiting maintenance, it is necessary that holdings are limited to the homing capacity of loco sheds.

Audit observed that there was an overall gap between the demands for homing capacity vis-a-vis the availability of homing capacity of sheds. The Railways failed to bridge this gap in capacity during the last three years. While the gap remained constant at 24 *per cent* for Diesel sheds, it widened from 19 to 25 *per*

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[42] **(A) Diesel :**Vishakhapatnam(150), Ludhiana (140), Krishnarajpuram (125), New Katni Jn. -(160)Itarsi (141), Vatva (150), Tughlakabad (150)

(B) Electric: Vishakhapatnam-(150, Mughalsarai- (140), Bhialai (175), Bondamunda (175), Vadodara (150) Ghaziabad (150), Kanpur (150), Jhansi- (150)

[43] New Katni Jn

[44] Bhilai & Bondamunda

cent for Electric loco sheds. This occurred mainly because of greater increase in the number of electric locomotives.

Due to a shortage of loco sheds there was excess holding of locomotives at sheds. In case, the holding of loco sheds exceeds its homing capacity, it adversely affects the quality as well as timeliness of prescribed maintenance schedules. Audit reviewed the position of all loco sheds of IR as on 31st March 2012 and observed the following:

- Sixty five out of 72 locos sheds (90 *per cent*) had excess holding of locomotives;
- Further, in 39 sheds (54 *per cent*), the holding was 20 *per cent* more than homing capacity;
- In 12 sheds (eight diesel and four electric), the actual holding was more than 50 *per cent* of the homing capacity[45];
- In the Ernakulum loco shed, the excess holding was upto 195 *per cent* of the homing capacity (as on 31st March 2012).

Excess holdings in about 90 *per cent* of loco sheds and the extent of excess holding reaching upto double the homing capacity is a high risk factor and adversely impacts the schedule of maintenance and the reliability of locomotives. The high incidence of locomotive failures resulting in unscheduled repairs pointed out in subsequent Para No.4.1.8.6 (ii) is also indicative of this. Further, it can be seen from Para No. 4.1.9.10 that progress of works for upgrading /enhancing capacities of sheds was tardy in a number of cases.

(Annexure XXI)

4.1.8.2 Maintenance of Locomotives

Scheduled Maintenance of Locomotives and Shortfall in Maintenance

In accordance with Chapter 3 of Indian Railways Maintenance Manual for Diesel Locomotives, IR follows the system of preventive maintenance for its Rolling Stock. This envisages maintenance attentions at regular specified intervals and replacement of components before they actually fail in service due to ageing, wear and tear. Accordingly, IR prescribed fortnightly, monthly, quarterly and yearly maintenance schedules to be carried out by the homing sheds. Maintaining locomotives as per periodicity is of utmost importance for ensuring reliability and availability of locomotives**.** IR, in their Corporate Safety Plan 2003-2013 reiterated that they would strictly adhere to preventive maintenance by taking up proactive treatment consisting of checks, examination and supervisory inspection.

Audit examined the position of four types of maintenance schedules[46] out of six types of schedules prescribed for diesel locomotives and three[47] out of six types of

[45] **(A) Diesel Sheds**: Eranakulam (195%), Hubli (81%), Mughalsarai (65%), Jhansi(61%), Gonda (60%), kalyan (57%), AMV (57%),Patratu(55%)

(B) Electric sheds: Vijayawada (63%), GOMOH (63%), Lallguda (62%), Kalyan (55%)

[46] M-4, M-12, M-24 and M-48 schedules

[47] IC, AOH and IOH schedules

schedules prescribed for Electric locomotives for one year (2011-12) in respect of the selected 28 loco sheds. This revealed that against 4102 diesel locomotives where maintenance was due as per schedule, they were done only in 3244 locomotives, a shortfall of 21 *per cent*. However, there was no overall shortfall in carrying out maintenance schedules for Electric locomotives.

Audit examination (June to September 2012) of shed wise performance of maintenance schedules revealed the following:

- One hundred and twenty one diesel locomotives in the year 2011-12 altogether skipped some of the prescribed maintenance schedules mainly in three sheds [Jhansi(NCR), New Guwahati C(NFR) and Gonda (NER)];
- Thirty seven locomotives fell dead enroute in four loco sheds[48] during the year 2011-12, where maintenance schedules were skipped/delayed
- The shortfall in maintenance in the locomotives due for maintenance was 42 *per cent* in Jhansi (NCR) and 42 *per cent* in Raipur (SECR) Diesel loco sheds.

The delays and skipping of the scheduled maintenance is a risk factor adversely affecting safety and reliability of locos.

[Annexure XXII (a) and (b)]

4.1.8.3 Locomotives Overdue for POH in Service

As per Railway Board's instructions dated 18.01.2001, 21.12.2001 23.02.2007 and 25.04.2011, POH is a major activity required to be undertaken at an interval of 8 years (diesel locomotives) and 6 – 12 years (electric locomotives) depending on the type of locomotive. During POH, all major sub-assemblies are stripped, over hauled and reassembled. The POH of locomotives are carried out in loco workshops.

It is the responsibility of the homing shed of locomotives to send their locomotives to the workshop for POH in time. Running of locomotives which are overdue for POH is a safety risk. However, knowingly or unknowingly locomotives due for POH are not sent for POH but retained for service (hauling trains).

(a) Locomotives sent late for POH

Loco sheds frequently delay sending locomotives for POH. Audit examined the position in respect of the selected 28 sheds and in the following sheds the delays in sending locos for POH was maximum.

[48]Gonda, NER (23), Abu Road- NWR (6), New Guwahati shed of NFR (5) and Raipur- SECR(3)

Table 4.2- Sheds wise instances of locomotives sent late for POH

Railways	Shed	Traction	Instances	Average delay in days	No. of years in which delays repeated
NEFR	New Guwahati	Diesel	17	99	2
NCR	Jhansi	Diesel	10	80	3
WCR	New Katni	Diesel	8	71	2
NER	Gonda	Diesel	5	70	2
NCR	Kanpur	Electric	10	32	3
WR	Baroda	Electric	8	50	2

From the above, it can be seen that the loco sheds of NCR were repeated defaulters and sent locomotives late for POH every year. However, New Guwahati shed of NFR had the highest incidence of default (17 instances); the average delays in sending locomotives for POH was also maximum there (99 days).

Test check in Audit further revealed that 47 diesel locomotives and 26 electric locomotives were sent late over a period of three years with average delays of 86 days /82 days respectively.

[Annexure XXIII (a)]

(b) POH overdue locomotives that were not sent for POH

The position of locomotives that were overdue for POH but were still in service as on 31st March 2012 is given below:-

Table 4.3 -Staement showing locomotives overdue for POH running online

Railway	Shed	Traction	No of locomotives on line as on 31st March 2012	Total no. of locomotives overdue	Average overdue period in which the locomotives remained on line (in days)	Range
NCR	Jhansi	Diesel	108	6	95	5 to 187 days
NER	Gonda	Diesel	149	3	57	23 to 90 days
NEFR	New Guahati	Diesel	78	2	330	300 to 360 days
WCR	New Katni	Diesel	188	16	60	30 to 90 days
NR	Gaziabad	Electric	146	1	130	130 days

The above Table reveals that locomotives over due for POH have been kept on line for up to 360 days. This is a serious system failure and a safety risk.

While in most of the cases, the reasons for such delays were not supplied to audit, in some sheds the reason stated was 'being utilised in traffic'. Ghaziabad shed attributed it to 'Not demanded by Workshop' while BRCY shed stated that the locomotives had not completed 1.5 years since their Interim Over Haul(IOH) (a scheduled repair to be carried out in four to six years). However, the Rules do not permit a dislocation of schedule of repairs prescribed on the basis of time. Further, it is the responsibility of the shed to ensure that the maintenance schedule is maintained.

There is an inherent risk in running of POH overdue locomotives for the purpose of transport and is against the preventive maintenance policy adopted by the Railways. Not doing timely repairs is a safety hazard and likely to affect Railway operations and needs to be avoided.

(Annexure XXIII (b))

4.1.8.4 Failure of Locomotives

Reliability of locomotives is critical to the operation of train services enabling locomotives to run without failure till due for a scheduled maintenance. Their reliability in turn depends upon good maintenance. The indices generally used for judging the reliability of locos is 'loco failure per Loco on line'. Nevertheless statistics of other failures such as locomotives failed within 180 days of POH etc. are monitored by Railway Board.

IR in their Corporate Safety Plan 2003-2013 stated that equipment failure would be treated at par with accidents and all efforts would be made to reduce the frequency of equipment failures. To ensure this, periodic analysis of equipment failure will be carried out for identification of problems/ shortcomings in maintenance.

(i) Locomotive failure per locomotive on line

'Locomotive failure per locomotive on line' indicates the percentage of failure with relation to locomotives online. Audit examination of locomotive failure to online locomotives over the Zonal Railways revealed 'locomotive failure to locomotive online' was 86 *per cent* for Diesel locomotives, while it was 45 *per cent* for Electric locomotives. The overall position of locomotive failure was 67 *per cent* (5153 failures in 7733 locomotives online). This indicates a very high failure rate of locomotives[49] as the benchmark established by some Railways such as SCR, SWR, SER, SECR etc. is 30-40 *per cent.*

(Annexure XXIV)

(ii) Failure of locomotives within 180 days of POH

POH is a comprehensive maintenance carried out in workshops, taking a period of about 30 days and costing on an average ₹0.84 crore per locomotive. Apart from the inspection carried out before release of POHed locomotive from the workshop, a pre commissioning inspection is carried out in sheds before putting such POHed locomotives online. Thus failure of POHed locomotives should be rare and far between. Frequent failures of locomotives within six months of their POH reflects poor standard of maintenance in workshops and also indicates a defective inspection system.

Audit carried out a test check of such failures in the pre selected 16 diesel and 12 electric sheds. The findings are indicated in the Table below:

[49] As stated in Railway Board's letter No.2011/M(L)/466/6(7) dated 23 May 2011

Table – 4.4 Locomotives failed within 180 days of POH

Diesel locomotives	Electric locomotives
969 locomotives pertaining to 16 diesel sheds were POHed in various workshops during the period 2009-12. Out of the above, 614 Diesel locomotives (63%) failed within 180 days and 194 of them (20%) failed within 30 days.	791 locomotives pertaining to 12 electric sheds were POHed in different workshops during 2009-12. Out of the above, 537 Electric locomotives (68%) failed within 180 days and 139 of them (17.57%) failed within 30 days.

Audit also examined the shed wise position of such failures. This position is given in the Table below:

Table 4.5 - Shed wise analysis of locomotive failure within 180 days

Diesel Sheds	Electric Sheds
Sheds where such failure was maximum Percentage of failure within 180 days was 260 *per cent* in VSKP shed of ECoR, 220 *per cent* in VTA shed of WR, 180 *per cent* in JHS shed of NCR and 168 *per cent* in LDH shed of NR. Above indicates that locos failed repeatedly within 180 days of POH.	Sheds, where such failure was maximum Percentage of failure within 180 days was 223 *per cent* in BIA shed of SECR, 188 *per cent* in CNB shed of NCR and 185 in BRCY shed of WR.
Sheds, where such failure was minimum Percentage of failure within 180 days was minimum in GOC shed of SR i.e. just 9 *per cent* while it was 17 *per cent* in KYN shed of CR and 21 *per cent* in Andal of ER.	Sheds, where such failure was minimum Percentage of failure within 180 days was 13 *per cent* in PER shed of SR while it was 7 *per cent* in ASN shed of ER and 21.4 *per cent* in TATA shed of SER.

Para No 11.3 of Chapter 2 of CAG Report No.9 on Railways of 2003 highlighted the incidence of loco failure within 180 days of POH in 15 sheds. The average percentage of failure observed was 42.09 *per cent* during 1998-99 to 2001-02. Audit observed that during the period 2009-10 to 2011-12 this failure rate increased to 63 *per cent* in case of diesel locomotives and to 68 *per cent* for electric locomotives. Further, 20 *per cent* of them failed within 30 days of POH; both were alarming trends.

From the above Table, it can be seen that failure of locomotives within 180 days of POH remained above 60 *per cent* for both electric and diesel locomotives. This indicates a very serious operational lapse in the internal control systems of the Railways. The above highlights poor quality of maintenance provided in the workshops. Further a vast consistent difference in percentages of failures among workshops depicts that there is a wide variation in the quality of maintenance in different workshops in Indian Railways. This results in unnecessary expenditure on repairs as well as unnecessary detention of locomotives.

There is need for improvement in quality of POH as well as efficacy of the inspection conducted for passing the locomotives after POH in workshops. In the above context, DLS/VSKP of ECoR had stated that "POH quality of the KGPW/SE Railway needs improvement. Further the 'must changing' items during POH stipulated by RDSO have not been adhered to by KGPW resulting in continuation of problems for the locomotives till the next major schedule and/or replacement of the defective components." Thus, laxity in maintenance standards was admitted by Railway officials themselves.

(Annexure XXV)

4.1.8.5 Causes of locomotive Failure

Locomotive failure can be caused either by way of defective material/ equipments or poor workmanship.

Audit examined the causes leading to locomotive failures over the period 2009-10 to 2011-12. This revealed the following:

Table 4.6 - Causes of locomotive failure

Diesel sheds	Electric sheds
In 7 sheds[50], locomotive failure on account of material defects accounted for more than 60 % of the total failures.	In 3 sheds[52] where locomotive failure on account of material defect accounted for were more than 60 % of the total failures.
In 5 sheds[51] locomotive failure on account of bad workmanship accounted for more than 25 % of failures.	In 2 sheds[53] locomotive failure on account of bad workmanship was accounted for more than 25 % of failures

From the above, it is seen that in all the three years, defective materials/equipments and bad workmanship remained the single largest cause of loco failures. Use of defective material causing locomotive failures is a matter of concern as it compromises safety of train operations.

Thus, Railway's commitment expressed in their Corporate Safety Plan for periodic analysis of equipment failure and identification of problems/shortcomings in maintenance and their resolvements has not been met.

(Annexure XXVI)

4.1.8.6 Impact of locomotive failures

The repercussions of locomotive failures are enroute detention of trains and unscheduled repairs etc. leading to decline in the efficiency indicators.

[50] KZJ (73%), R (72%), VSKP (69%), JHS (67%), KJM (66%), UDL (66%), ABR (61%)

[51] GD (D) 38.9 %, LDH(D) 25.4%, BNDM (D) 28.8% GOC (D) 29.5% VTA (D) 29.1%

[52] GMO (E) 68.0%,Ajni (60.5%) and GZB(E) 76.5%

[53] AJJ(E) 62.2% and BZA 25%

(i) Enroute detention of trains due to locomotive failure

Failure of locomotives can lead to enroute detention of rolling stock. A review of the position on 16 zones, revealed:

- That out of total 672155 cases of enroute detentions in IR during the period from 2009-10 to 2011-12, locomotives failures were the reason for detention in 28060 (4.17 *per cent*) cases.
- On an average 9353 trains were detained per annum due to locomotive failures.

The enroute detention of trains on account of locomotive failure was maximum in the following Railways:

- Eastern Railway - 799 out of 1253(63.77%)
- East Central Railway - 761 out of 1568(48.53%)
- West Central Railway -403 out of 1386(29.08%)
- North East Frontier - 1324 out of 5693(23.26%)

The enroute detention of trains leads to idling of the entire rolling stock resulting in substantial loss of earning capacity.

(Annexure XXVII)

(ii) Unscheduled Repairs

Another repercussion of locomotive failure is unscheduled repairs. For attending failure of locomotives on line or when a serious problem with their working is reported by the drivers, an unscheduled repair is resorted to. High incidence of unscheduled repairs is a reflection of the deficiency in the quality of maintenance. Unscheduled repairs are attended to by the home sheds as well as other sheds located nearby.

The position of unscheduled repairs viz a viz holdings in respect of 16 diesel and 12 electric sheds(assuming that the locomotives of foreign Railways attended by all sheds are of equal proportion) was reviewed for three months from January to March of the years 2010, 2011 and 2012. The audit revealed that:

Table 4.7 – Unscheduled repair of locomotives

Diesel locomotives	Electric locomotives
Against the total holdings of 2025 locomotives , 3197 locomotives were given out of turn repair in nine months in 16 loco sheds;	Against the holdings of 2014 locomotives, 8429 locomotives were given out of repair in nine months in 12 loco sheds;
Thus the unscheduled repair per locomotive per annum averaged 2 per locomotive	Thus the unscheduled repair per locomotive per annum averaged 4 per locomotive.

The total number of ineffective days of locomotives on account of unscheduled repair totalled 15810.64 days (7384.16 diesel and 8426.48 electric) resulting in loss of earning capacity of ₹ 281.35 crore (Diesel ₹120.10 crore and Electric ₹ 161.25

crore). The expenditure on unscheduled repair is estimated at about ₹ 81 crore (₹diesel - ₹26 crore and electric - ₹55 crore) in respect of 11,937 locomotives. The repair cost per locomotive thus averaged ₹81 thousands per diesel locomotive and ₹ 63 thousand per electric locomotive.

The detention of locomotives and consequent loss of earning capacity and actual cost of repair would be substantial if the total unscheduled repairs are taken into account. The reasons attributed for unscheduled repair were mainly air leakage, lubricating oil leakage; pneumatic defects etc. which shows the poor level of maintenance during the schedule repairs. This call for an in-depth examination of causes for such large number of locomotive failure requiring unscheduled repairs at sheds and initiation of steps to bring down such instances to the minimum.

The High Level Safety Review Committee (Railways) while reviewing the asset failures including locomotive failure stated that the assets failure statistics maintained by Railways is apparently a fraction of actual position in the field.

The above statement of the Review Committee is supported by the audit findings which indicate an average number of unscheduled repairs per loco per annum as two and four for diesel and electric locomotives respectively.

(Annexure XXVIII)

4.1.9 Performance of workshops and sheds

Performance can be defined as an accomplishment of a given objective measured against preset known standards of completeness, accuracy, speed and cost. The performance of workshops and sheds are judged against the target fixed for the number of locomotives to be POHed/ repaired and the time frame given for completion of POH/repairs

4.1.9.1 Performance of workshop against the targets of POH

The POH of locomotives are carried out in Railway workshops. The targets of POH of Workshops are decided in the POH co-ordination meeting held every year by the Railway Board and attended by representative from RDSO and Zonal Railways.

(a) Target of POH &Actual Nos. POHed

Audit reviewed the performance of all the workshops of IR against targets fixed for POH for the period 2009-12. This revealed the following:

Shortfall in number of locomotives POHed against target for Workshops

- During the period 2009-12, Audit observed no overall shortfall in six Electric and two Diesel workshops.
- There were marginal shortages in some years in three Diesel Workshops (Ajmer, Kharagpur, and Jamalpur).
- However, there was consistent shortfall in Charbagh, Diesel Workshop of Northern Railway with an average shortfall of 33 *per cent*. The reason was stated to be less feed of locomotives by sheds/ Zonal Railways

(Annexure XXIX)

(b) Time frame fixed for POH and actual time taken

A time frame is prescribed for completing POH of locomotives and it varies from workshop to workshop. It is imperative that the given time is adhered to. Any extra detention of locomotives than due during POH results in the idling of locomotives, one of the costliest asset of IR, and consequent loss of its earning capacity.

A test check by audit over 12 loco workshops of IR for the last three years revealed the following:

Table 4.8 – Extra time taken in POH of locomotives in 12 BG loco workshops of IR

Diesel workshops	Electric workshops
Out of 986 locomotives POHed, in the case of 653 locomotives (66%) excess time was taken. Average excess detention was 9.70 days and ranged between 4 and 20 days. There was excess detention of 6984 days resulting in loss of earnings capacity of ₹112.75 crore.	Out of 929 Electric locomotives POHed in the case of 347 locomotives (37%) excess time was taken. Average excess detention was 10.30 days and ranged between 1and 46 days. There was excess detention of 3572 days resulting in loss of earnings capacity of ₹ 68.43 crore.

(Annexure XXX)

4.1.9.2 Causes of extra time taken in POH

The workshops attributed the reason for extra time taken for POH to shortage of spares, lack of capacity; want of manpower and to bunching, to poor workmanship and extra work. The workshops where maximum detention was on account of shortage of spare parts were as follows:

Table 4.9 - Workshops where extra time taken in POH due to want of spares parts was maximum

Name of workshop	No.of locomotives POHed	Extra time taken due to shortage of spares(No of locomotives)	Percentage of locomotives which took extra time with relation to no. of locomotives POHed
Parel	194	150	77
KGP	175	84	48
Perambur	182	36	20

In the Perambur workshop of SR, out of 182 locos POHed, extra time had been taken in 42 (23 *per cent*) locomotives due to poor workmanship. The excess time taken for POH was not justifiable especially as substantial portion of this detention was caused by manageable factors like non availability of materials, spare parts, poor workmanship etc. This could have been avoided with effective planning and co-ordination among Mechanical/Electric and Store Departments.

Audit further observed that in Ponmalai workshop (SR) and Jamalpur Workshop (ER), there was no system for recording the actual causes of detention. It would thus not be possible for the Administration to take corrective action in bringing down the POH time in the absence of any records.

It is essential that Railway Board streamlines the system and make it mandatory for the workshops to analyse causes that led to excess time taken in POH and to minimise the same through better monitoring and coordination.

(Annexure XXX)

4.1.9.3 Performance of loco sheds

It was observed that for each type of scheduled maintenance of electric locomotives, the time frame for completion of work has been prescribed by the Railway Board. However, for diesel locomotives no such time frame has been prescribed by it. However, Zonal Railways themselves (except SECR, WCR and WR) have fixed different time frames for different schedules.

Audit examined the time taken against the time fixed for maintenance schedules for the month of March 2012 in respect three types of maintenance schedules[54] in the selected 16 Diesel loco sheds and three types of maintenance schedules[55] in the selected 12 electric sheds. In sheds where no time shedule was prescribed, the minimum time taken by that shop for that particular maintenance schedule was taken as the time prescribed. The findings are tabulated below:-

Table 4.10 - Statement of excess time taken in scheduled maintenance of diesel and electric locomotives

Traction	Name of Schedule	Total no. of locomotives attended in March 2012 in selected sheds	No. of cases where excess time taken and *per cent* 3/2*100	Loss of engine days	Range of delays
1	2	3	4	5	6
Diesel	M 12 (D)	59	26(44%)	177.91	3 days to 31 days
Diesel	M 24 (D)	36	21(58%)	344.56	2 days to 59 days
Diesel	M 48 (D)	17	9(53%)	258	11 days to 70 days
Electric	IC	275	171(62.18%)	376.73	10 hrs to 1527 hrs (prescribed time 8 hours)
Electric	AOH	70	44(62.86%)	246.42	3 to 15 days (prescribed time 6 days)
Electric	IOH	26	19(73.08%)	87.78	1 to 11 days (prescribed time 12 days)

As can be seen from above that excess time for scheduled maintenance was taken in 52 *per cent* of the Diesel locomotives and 66 *per cent* of the Electric locomotives. As a result, there was a loss of 780.47 loco days of Diesel Locomotives entailing monetary loss of ₹14.54 crore in March 2012 alone and the loss was ₹ 14.23 crore in respect of Electric loco sheds.

[54] M12, M24 and M48
[55] IC, AOH&IOH

The extra time taken for scheduled repairs was stated to be mainly on account of shortage of manpower, waiting for repairs in respect of diesel sheds; whereas infrastructure constraint, shortage of manpower, non-availability of materials etc. were the reasons given in respect of electric loco sheds.

The reasons attributed for excess time taken for maintenance were avoidable through effective planning and better monitoring. Railway Board needs to take action to bring down the unnecessary detention of locomotives during the scheduled maintenance. Further they need to prescribe the time period for carrying out various scheduled maintenances in respect of diesel sheds.

(Annexure XXXI (a) & (b))

4.1.9.4 Detention of locomotives sent for POH

The locomotives sent for POH should be admitted for POH in workshops within the shortest possible time to avoid unnecessary detention of the valuable asset at exchange yards.

4.1.9.5 Detention of locomotives at yard awaiting POH

The locomotives coming to workshops for POH will remain in the exchange yard of workshop manned by the Operating Department till they are admitted in the Workshop for POH. Normally there should not be any delay for their admission in the Workshop. However, frequently due to bunching and extra time taken for POH of admitted locomotives etc. these locomotives have to wait in the exchange yards. Any undue detention of locomotives at yards results in loss of their earning capacity.

Audit examined the position (delay in yard of more than a day) in 12 loco workshops of IR for the period 2009-10 to 2011-12. The result is as follows:

Table 4.11 - Extra detention of locomotives at exchange yard awaiting POH

Diesel locomotives	Electric locomotives
Out of 883 Diesel locomotives brought for POH, 469 locomotives (53%) suffered detention at exchange yard of the workshop.	Out of 486 Electric locomotives brought for POH, 104 locomotives (21%) suffered detention.
Average detention was 5.31 days.	Average detention was 3.53 days.
The total loss on earning capacity was ₹42.41 crore for 2489 detention days.	The total loss on earnings capacity was ₹ 6.93 crore for 367 detention days.
The number of instances of delay was maximum in Parel Workshop, CR - 60 *per cent* (117 out of 194 POHed) whereas the total detentions was maximum in Ponnamalai workshop SR-991 days in 175 cases (5.66 days per locomotive).	

The reasons for such detention were mainly attributed to shortage of crew, want of berth and bunching. Had action been taken in time to overcome these constraints, these detentions could have been avoided. Thus, the responsibility for the delays vested with the Railways and it adversely impacted locomotives' earning capacity

by way of idling of engine hours. Railways need to take urgent action to reduce the detention period.

(Annexure XXXII)

4.1.9.6 Delay in despatch of locomotives after POH

Normally as soon as the POH is complete, the locomotives should be returned for traffic use. There are however, a number of cases where there has been delay in despatch of locomotives after POH. A review carried out by Audit in 12 Railway loco workshops for the period 2009-12 revealed the following:

Table 4.12 - Extra detention of locomotives after POH at yards

Diesel locomotives	Electric locomotives
Out of 654 locomotives POHed 179 locomotives (27%) were detained in the yard after POH in 3 Diesel[56] workshops.	Out 318 locomotives POHed 47 locomotives (15%) were detained in yard after POH in 2 Electric[57] workshops.
The average detention was 7.47 days.	The average detention was 32.8 days.
Total earning loss on the above detention was ₹ 22.28 crore (1337 locos days).	Total earning loss on the above detention was ₹ 29.37 crore (1540 loco days).
In Parel workshop of CR, detention was 56 *per cent* (108 locomotives were detained out of 194 POHed) and total detention was 990 days.	In Perambur workshop of SR, the total detention was 1539 loco days in 46 cases.

From the above, it is obvious that the detention of locomotives after POH at exchange yards was considerable resulting in loss of earning capacity. Jamalpur (ER) and Ponmalai (SR) Workshops have attributed the delays to the failure of Operating Department of Zonal Railways in taking over the POHed locomotives. Thus there is a coordination problem between the workshops and Operating Department at the zonal level and results in idling of locomotives after their POH hampering operational efficiency.

(Annexure XXXIII)

4.1.9.7 Delay in transfer of dead locomotives to shed

As per Railway Board's instructions dated January 2008, all dead locomotives should be attended to in the nearest sheds. If the dead locomotives were overdue for monthly (M-2) or higher maintenance schedules they should be attended at home sheds. Faster movement of dead locomotives would result in their being repaired early thus leading to increase in availability index of locomotives. It is, thus, necessary to have a system that ensures prompt delivery of dead locomotives to the sheds for necessary repairs.

[56] Parel, Jamalpur and Ponnamalai
[57] Perambur and Dahod

The time taken for bringing the dead locomotives to the sheds was reviewed by Audit (after allowing 1 day as a reasonable time) in respect of the test checked sheds (16 Diesel sheds and 12 Electric sheds) for the period 2009-2010 to 2011-2012 which revealed the following:

- 3572 locomotives fell dead and were brought to 12 diesel loco sheds after a delay of 1,59,064 Hours resulting in earning capacity loss of ₹107.80 crore.
- Similarly, 633 electric locomotives fell dead and were brought to six electric loco sheds after a delay of 40414 Hours resulting in earning capacity loss of ₹32.54 crore.

The incidence of locomotives falling dead enroute and extra time taken to send them to sheds are substantial. Thus there is scope for substantial reduction in detention of locomotives on this account.

(Annexure XXXIV)

4.1.9.8 Ineffective Locomotives

Ineffectiveness of locomotives represents those locomotives not available to traffic on account of repairs etc. Railway Board prescribes percentage of such ineffectiveness as targets, depending on the type of locomotive. Since 2001, the ineffectiveness percentage varies from 5 *per cent* (for WDG4 locomotives) to 12.5 *per cent* (for WDP1 and WDP2 locomotives).

The review of targets and actual ineffectiveness in respect of all 44 BG Diesel loco sheds for the period 2009-10 to 2011-12 revealed that on an average, 38 sheds out of total 44 (86 *per cent*) were able to keep their ineffective percentage within the ceiling limit of the target fixed. Further, 23 sheds (61 *per cent*) were able to keep their ineffective percent at 25 *per cent* less than the target.

Zonal Railways attributed induction of sophisticated locomotives, modified components, and improved systems etc. as factors for their ability to keep the ineffective percentage much below the target fixed. As such the ineffective percentage targets fixed were too low and were easily achievable. In view of above, there is a need to revisit the targets fixed for ineffective locomotives and for re-fixing them.

Audit further observed that in addition to the ineffective percentage allowed for repairs, an additional five to ten *per cent* was allowed for minor repairs for estimating the availability of Diesel locomotives for freight purposes. Therefore, the cushion provided for actual ineffectiveness is much more than the normal figures quoted as the ineffective *per cent* of locomotives.

(Annexure XXXV)

4.1.9.9 Comparison of unit cost of POH among workshops

The average unit cost of POH of IR was as follows:

Table 4.13 - Statement of Average Unit Cost of POH (₹ in crore)

Year	2009-10	2010-11	2011-12
Diesel	0.75	0.76	0.89
Electric	0.70	0.70	0.79

During the entire period 2009-10 to 2011-12, the POH cost of Diesel locomotives was higher than that of Electric locomotives. The average unit cost of POH of locomotives among the workshops for the year 2009-10 to 2011-12 was as follows:

Table 4.14 - Workshop wise unit cost of POH

Traction	Workshop/ Railway	Avg. cost of POH (₹ in crore)	Traction	Workshop/ Railway	Avg. cost of POH (₹ in crore)
Diesel	Charbagh /NR	0.95	Electric	KPA/ER	0.85
Diesel	Goc /SR	0.86	Electric	BSL/CR	0.80
Diesel	Ajmer/NWR	0.80	Electric	KGP/SER	0.69
Diesel	Parel/CR	0.80	Electric	PER/SR	0.68
Diesel	KGP/SER	0.73	Electric	Dahod/WR	0.62
Diesel	JMP/ER	0.63			

From the above, it can be seen that the unit cost difference of POH between the highest and lowest was ₹32 lakhs per loco in respect of Diesel locomotives (Charbagh/JMP) and ₹23 lakhs in respect of Electric locomotives (KPA/Dahod). The total extra expenditure incurred on POH over three years in respect of Charbagh, Workshop, NR is ₹103.04 crore [0.32*322 (total locomotives POHed)] while in respect of Kanchrapara Workshop of ER it was ₹50.37 crore (0.23*219 total locomotives POHed).

In view of the enormous financial implication, the wide variation in average unit cost of POH in different Workshops needs to be addressed by the Railway Board.

(Annexure XXXVI)

4.1.9.10 Infrastructure upgradation works in sheds during five years (2007-08 to 2011-12)

Audit had reviewed the ongoing and completed works for up-gradation of infrastructure in sheds each costing more than ₹ 1 crore, during the five years (2007-08 to 2011-12). Out of the 47 number of works taken up for review, nine works had been completed, 32 works were in progress, four works were yet to be commenced, one work had been dropped and one work was frozen.

It is observed that at least in 10 cases, the maintenance activity suffered due to delay in completing the works. The reasons were attributed to various factors including shortage of funds, delay in procuring of Machines and Plants, non-availability of regular power, delay in handing over site to contractor, delay in finalisation of tenders and contractor's failure in completing the work. From the above, it can be inferred that despite acute shortage in homing capacity of loco sheds, Railways did not attach priority to complete the infrastructure augmentation projects thereby affecting the repairs and maintenance.

(Annexure XXXVII)

4.1.10 Conclusions

Locomotives play a vital role in the Railways. Audit examination revealed that in many instances locomotives are not getting repaired/ POHed as per schedule and running overdue. Such locomotives create operational problems and are a safety risk in the system.

Quality of maintenance provided was poor. Sixty five *per cent* of locomotives overhauled were failed within 180 days. There were heavy incidences of unscheduled repairs and enroute detention of locomotives.

The figures of unscheduled repairs estimated by audit are much higher than the locomotives failure statistics reported by the Indian Railway's and hence require a detailed examination.

In addition there were incidences of extra time taken for POH and other scheduled repairs. Locomotives were found detained before and after POH in the exchange yards. There were inordinate delays in bringing back the dead locomotives to Loco sheds for repairs and putting them back on line within the prescribed time frame. The above incidences can be controlled by effective planning and management.

The total loss of potential earning capacity and the extra expenditure incurred brought out by audit was estimated as ₹733 crore and ₹234 crore respectively.

The matter was brought to the notice of Railway Board in June 2013; their reply has not been received (July 2013).

4.2 South Eastern, Western, : Northern and South East Central Railways — *Loss for train parting due to failure of Centre Buffer Coupler (CBC) components*

Procurement of poor quality Centre Buffer Coupler (CBC) components from RDSO approved firms with poor past performance led to train partings and consequential estimated loss of ₹ 125.27 crore

Centre Buffer Coupler (CBC) is a mechanism for connecting rolling stock in a train. Its components including knuckle, coupler body, coupler lock, coupler yoke etc. are safety items and procured by Zonal Railways from RDSO approved firms after inspection by RDSO. Whenever any portion of a train, while in motion, becomes detached, a parting occurs and results in loss of section capacity by way of disturbance to train operations, detention and consequential financial loss to the Railways.

The issue relating to the quality of CBC components, has been a cause of concern to Railway Board since 2006 due to marked deterioration by about 40 *per cent* in the parting of freight trains. Railway Board directed (March 2006) Zonal Railways to comply with directives issued by RDSO for improving the quality of CBC components and address operational problems. Accordingly, South Eastern Railway (SER) started intimating the position of train parting cases to RDSO and Railway Board.

Detailed analysis in Audit (October 2012 to March 2013) of the failure reports for the period from January 2008 to February 2011 sent to RDSO/Railway Board by the Mechanical Department revealed 260 trains parting cases due to manufacturing defects of CBC components only. The manufacturers of the components could be identified in only 145 (55.77 *per cent*) of the cases. In fact two firm's viz. M/s Raneka Industries Ltd (RIL) and M/s Orient Steel Industries Ltd. (OSIL) together contributed 96 cases (66.21 *per cent*) of the total identified cases.

The Railway Administration requested (November 2009) Railway Board to advise RDSO for deregistering the firms for supply of critical safety items like knuckle lock etc. as a penal measure. Instead of deregistering the firms, RDSO downgraded (March 2010) M/s RIL and M/s OSIL from Part- I to Part II. The penal action taken by RDSO was not acknowledged as sufficient by the Railway Administration. In view of the gravity of the situation, they once again requested (July 2010) RDSO to delist the above two firms for supply of critical CBC components.

Overlooking the sub-standard quality and poor past performance, during the period from 2006-07 to 2011-12, twenty-one purchase orders for supply of 12013 nos. of various CBC components valuing ₹ 7.94 crore were placed by Stores Department of SER on M/s RIL. During 2007-08 to 2011-12, 76 train parting cases occurred due to defective components supplied by M/s RIL/OSIL. According to an assessment by SER (March 2010), there was an average loss of 6.8 goods trains per incident and opportunity cost of approx. ₹ 9 lakh for each goods train lost.

A review by audit (October 2012 to March 2013) of the loss suffered by four other Zonal railways due to purchase of sub-standard CBC components from M/s RIL/OSIL during (2006-07 to 2011-12) is tabulated below:

Table 4.15

S. No.	Name of Railway	Quantity ordered/ PO issued/supplied	Train parting cases noticed	Loss as per SER assessment i.e. 6.8 goods train per incident	Total opportunity cost loss @ ₹9 lakh for each goods trains lost
1	SER	13748 (2007-08) to 2011-12)	76 (2007-08 to 2011-12)	76x6.8=516.8	516.8x9=46.51 crore
2	WR	6297(2006-07 to 2011-12)	32(2006-07 to 2011-12)	32	32x9=2.88 crore
3	SECR	6703(2007-08 to 2011-12)	92(2007-08 to 2011-12)	92x6.8=625.6	625.6x9=56.30 crore
4	NR	Not known	32 (Jan-08 to Sep-12)	32x6.8=217.6	217.6x9=19.58 crore
	Total		**232**	**1392**	**₹ 125.27crore**

It was observed that a total of 232 train partings occurred during the period 2007-2008 to September 2012, due to defective CBC components provided by M/s RIL and M/s OSIL.

The matter was taken up (February 2012) with the South Eastern Railway Administration. In reply, they stated (October 2012) that considering the findings of the audit team, an additional measure, has been implemented in SER to check marking details on CBC components at POH shops and all the depots before fitting on the wagons. Store field officers have also been instructed to ensure the availability of marking at the time of receiving the materials. A drive was conducted in February 2012 at stores depots on new materials when 943 locks, 3208 knuckle throwers and 112 knuckles were rejected due to 'no marking'. The Zonal Railway Administration has accepted the audit contention and started checking marking details on CBC components at POH shop and all the depots before fitting on the wagons.

Thus, due to lacunae in the system of inspection a large number of defective CBC components from a particular manufacturer got inducted in the system. The Zonal Railway Administration was aware of the issue relating to quality of products of this particular firm since July 1999 but failed to resolve the issue.

Despite being aware of the poor quality control in the CBC components being provided by M/s RIL and M/s OSIL, these continued to be fitted on trains and resulted in 232 number of train partings and an estimated loss of ₹ 125.27 crore during the period 2007-08 to September 2012.

The matter was brought to the notice of Railway Board in March 2013; their reply has not been received (July 2013).

4.3 Southern Railway: Infructuous expenditure on procurement of material for manufacture of hybrid coaches

Inadequate planning before taking up production of new type of hybrid coaches resulted in surplus material worth ₹ 44.04 crore procured for their manufacture; the possibility of using surplus material is remote as production of such coaches has now been stopped

The Railways generally use conventional type of coaches made of corten steel for their Mail/ Express trains. Corrosion is a major problem on these coaches. This problem was not faced in the Stainless steel (SS) coaches of LHB design (Linke Hofman Busch) generally used in Rajdhani /Shatabdi train services. To derive the associated life cycle cost advantages of LHB design and overcome the problem of corrosion, Railway Board directed (November 2007) Rail Coach Factory (RCF) and Integral Coach Factory (ICF) to switch over to the manufacture of Self Generating (SG) Stainless Steel (SS) hybrid coaches i.e. coaches with SS shell of LHB design and conventional bogie of ICF make. A prototype of the hybrid coaches was developed by RCF. Railway Board decided (October 2007) that capital investment required for the switch over should be kept to a minimum and the Production Units could get ready-to-use sub-assemblies from vendors for manufacture of coaches.

Railway Board indicated (September 2008) a tentative plan for manufacture of SGSS coaches for rakes of identified/ un-identified trains. ICF, without ensuring their preparedness to produce the new type of coaches, projected a plan (September 2008) to manufacture 600 hybrid coaches in the tentative Production Programme for 2009-10 that was approved by the Railway Board (April 2009) for 303 coaches. ICF planned to obtain ready-to-use side walls, end walls and roof assemblies from trade and initiated procurement action for manufacture of 303 Nos SGSS coaches.

Audit observed in February 2012 the following:-

- The procurement action initiated by the ICF for obtaining ready- to- use sub-assemblies for 303 coaches was associated with a number of problems. Technical issues such as Garnet blasting and Skin tensioning involved in the series production of these coaches, which were raised in the 'Coach Production and Review Meeting' held in Railway Board (March 2009), were not addressed adequately. There were delays in the identification and development of capable vendors and their capabilities were not properly assessed. Further, the purchase orders for roof and side wall assemblies were placed as per drawings adopted by RCF. These posed problems while furnishing the hybrid coaches as furnishing requirements of ICF were different from RCF and alterations were required.
- ICF could not commence the manufacture of hybrid coaches till September 2009. Since the supply of side wall and roof assemblies from vendors was expected only by November 2009, ICF expected a likely shortfall in meeting their targets. They approached the Railway Board (October 2009) to revise the production target from 303 coaches to 80; this was approved. Even the

reduced target of 80 coaches could not be achieved. In fact, ICF did not manufacture even a single hybrid coach during 2009-10.

- ICF manufactured only 29 shells during three years (2009-12) out of which 15 shells were utilized for production of 15 hybrid coaches. Remaining 14 shells valuing ₹ 8.46 crore were lying unutilized (March 2012). It is pertinent to mention here that RCF met their annual targets fixed by the Railway Board and manufactured 410 hybrid coaches during 2008-09 to 2011-12.
- Railway Board decided (August 2011) to stop the production of hybrid coaches in view of their speed limitations and maintenance problems besides established superiority of LHB type coaches. As a result, stock comprising of 425 items valuing ₹39.27 crore procured for hybrid coaches were rendered surplus (January 2012). This stock increased to ₹ 44.04 crore by the end of September 2012 due to further receipt of material. In RCF, there was also a surplus of such items valuing ₹ 2.17 crore.
- Member Mechanical issued instructions (July 2010) to stop fresh procurement of material for hybrid coaches and operate minus option clause to reduce the ordered quantities of existing orders by 30 *per cent*. However, the clause was not operated in 198 Purchase Orders. Had it been done the inventory value would have been lower by ₹14.27 crore.

Inadequate planning by the ICF Administration before taking up production of new type of hybrid coaches resulted in non-achievement of production target and surplus of material worth ₹ 44.04 crore procured for a specific purpose. With Railway Board's decision to stop production of hybrid coaches (August 2011), the possibility of using the surplus materials appeared remote; save some material that can be used after some modification. This also defeated Railway Board's initial intention to keep the Capital investment on switch over to a minimum.

The matter was brought to the notice of Railway Board in March 2013; their reply has not been received (July 2013).

4.4 South Western Railway: Idling of asset and non-realization of anticipated savings

Inordinate delay in commissioning of Oxygen Lancing System resulted in idling of an asset for which payment of ₹ 7.30 crore had been made and non- realization of anticipated savings of ₹15.20 crore up to July 2012

Railway Board sanctioned (April 2007) fitment of sidewall mounted Oxygen Lancing System including Carbon injector (Lancing System)[58] on three furnaces in Rail Wheel Factory, Yelahanka (RWF) at an estimated cost of ₹ 8.82 crore during augmentation of production capacity Phase-II. A continuous supply of liquid oxygen is essential for this system.

[58] The Lancing System provides benefits in the form of increase in productivity and reduction in consumption of electricity, electrodes and refractory consumption. The oxy fuel burner of the system heats up the scrap up to red-hot condition through which the oxygen can cut and melt the scrap. The carbon lost in scrap due to use of oxygen is compensated by blowing carbon into metal. This carbon also helps to generate the heat by exothermic reaction.

RWF floated a tender (July 2007) for the supply and fitment of the Lancing System. The oxygen was to be supplied through cryogenic low pressure liquid oxygen tanks. Against this tender, a single offer was received (September 2007). The tender was discharged (May 2008) in view of changes required in scope of the tender specifications mainly due to proposed installation of a liquid oxygen in-house Plant (BOOT Oxygen Plant)[59] in RWF. Fresh tender was floated (September 2008) with revised technical specification and contract[60] awarded (February 2009) to a Kolkata based firm at a cost of ₹10.34 crore. As per contract, the work was to be completed by November 2009.

Audit observed in May 2012 the following:

- As per Letter of Acceptance (LA) issued (February 2009), the contractor's offer was accepted strictly under the terms and conditions stipulated in the contract documents that included technical specifications. As per Clause 5.2.1.9 of the revised specification, the tenders were required to indicate specifically the benefits by fitting the proposed Lancing System with reference to certain parameters and minimum savings prescribed therein were to be ensured. Tender offers not meeting prescribed minimum savings were to be considered as unsuitable. With reference to LA, the contractor communicated (April 2009) that savings after fitment of Lancing System would be ₹ 1.90 crore per annum per furnace and this figure had been based on conservative calculations whereas savings in real terms would be much higher. Thus, savings at least to such extent were to accrue after the commissioning of the Lancing System.
- The contractor supplied the Lancing Systems (2009) and payment of ₹7.30 crore was released. The Lancing System however, could not be commissioned for any furnace (December 2012).
- As per technical specifications, the capacity of Oxygen Plant set up in November 2009 was capable of producing continuous supply pressure of 12 kg/ sqcm of oxygen at the consuming points. Thus, Lancing Systems supplied by the contractor could have been made operational on all the three furnaces in November 2009. However, it could not be commissioned due to insufficient liquid oxygen supply from the Plant and the Railway Administration felt the necessity of an additional Oxygen Plant (October 2011).
- Neither did the Railway Board's sanction for capacity augmentation Plan Phase II include any provision for an additional Oxygen Plant nor had RWF sent any proposal to Railway Board (July 2012).

[59] Scope of the work required a change as existing specification for Lancing System needed revision as BOOT Oxygen Plant provides nitrogen for oxygen lancing and facilities for putting oxygen Plant and storage of gases instead of cryogenic low pressure liquid oxygen tank were necessary.

[60] Design, manufacture, supply, erection, testing and commissioning of Sidewall mounted Oxy fuel burner and Oxygen lancing with Carbon injection system in the existing three Arc Furnaces as per technical specification and with associated facilities and modifications if any required in the existing system.

Due to non-commissioning of Lancing System on three furnaces in November 2009, RWF Administration could not reap the benefit of anticipated minimum saving of ₹ 1.90 crore per annum per furnace from 01.12.2009 to 31.07.2012 totaling ₹ 15.20 crore besides idling of an asset for which payment of ₹ 7.30 crore had been made in 2009.

RWF Administration while accepting the delay in commissioning the Lancing System stated (August 2012) that delays were due to inadequate arrangement of oxygen supply. Audit observed that the specification of Lancing System was revised keeping in view the specification of the proposed Oxygen Plant. As such, the RWF Administration failed to correctly match the specific oxygen requirement for the Lancing System resulting in idling of a costly asset procured for a specific purpose besides non-realization of proposed savings, which is of recurring nature.

The matter was brought to the notice of Railway Board in March 2013; their reply has not been received (July 2013).