

Chapter 3

Implementation of Corporate Safety Plan in Indian Railways

Executive Summary

The primary requirement of train transportation is to ensure safe, speedy, reliable and punctual movement of passengers and goods to various destinations in the country. Over the years, various safety review committees have recommended the formulation of a Corporate Safety Plan indicating the policy/objectives and strategies for achieving the objectives and to set bench marks for safety achievements.

Accordingly the Indian Railways formulated the Corporate Safety Plan for the period 2003 to 2013, with a fund outlay of Rs.31,835 crore. This envisaged a safety action plan directed towards continuous reduction in risk level to its customers. The Corporate Safety Plan was divided into two phases, the first phase to be completed by 2008 and the second phase by 2013.

The progress in achieving the objectives of Phase I of the Corporate Safety Plan and the action plan laid down for implementing Phase II, other than Signalling & Telecommunication and Disaster Management, which were covered earlier, were reviewed in the Performance Audit.

The study revealed that the Indian Railways could not fully achieve the target of Phase I in providing ballast, improvement works at level crossings for road users' safety etc. Target for replacement of overaged locomotives technological improvement on maintenance of track and bridges, upgradation of freight train examination facilities etc. also could not be achieved.

The development of various new technologies for improvement in rolling stock, permanent way etc., that reduce the risk level to Rail users, which was entrusted to the Research, Design and Standards Organisation (RDSO), was behind schedule.

The targets fixed for conducting safety audits and drives by multi disciplinary teams at zonal and Railway Board level could not be achieved in many zones and records of such audits and drives conducted were also not maintained properly in many zones.

Targets fixed for reduction in various defects on track, rolling stock, overhead equipments were also not achieved by many of the zones.

While the overall accident figures have come down over the years, a few types of accidents like level crossing accidents, collisions etc. increased in some zones.

Though human error proved to be the major cause of many accidents and resultant loss of life, the Indian Railways failed to provide improved facilities for the running staff, modernization and upgradation of training facilities. Indian Railways were also not able to fill all the safety category staff vacancies.

3.1 Highlights

- Execution of track renewal work on MG line identified for gauge conversion resulted in infructuous expenditure of Rs.48.26 crore in SCR.
(Para 3.9.1.1)
- There were 223 overaged BG diesel locomotives on line over Indian Railways.
(Para 3.9.1.2)
- Utilisation of funds allocated for undertaking road safety works under Railway Safety Fund was less than 65 percent during the period from 2003 to 2009. The progress in replacement of level crossings with ROB/RUB was very slow. Only 12.62 percent of the identified level crossings have been replaced so far. Progress of other improvement works at level crossings as proposed in CSP was also very slow.
(Para 3.9.1.3)
- Preventive rail grinding works to tackle the problem of gauge corner cracking of rails could not be carried out due to non availability of Rail Grinding Machines. These machines are yet to be procured.
(Para 3.9.1.4)
- 20 percent of the wagons weighed at way side weigh bridges were found overloaded and such wagons were allowed to proceed endangering the condition of the track. Further, targets for reduction in defects on track, rolling stock and overhead equipments could not be achieved in most of the zones.
(Para 3.9.1.5)
- Progress of modernization and upgradation of training centres was very slow. There were vacancies in safety category posts in all the zones.
(Para 3.9.1.6)
- No mid term review has been conducted in the zones except in ECR and NER.
(Para 3.9.2)
- No specific action plan has been drawn in eight zones and Metro Railway, Kolkata for implementation of Phase II of CSP.
(Para 3.9.3)

3.2 Gist of Recommendations

- Better planning needs to be done before undertaking the track renewal works of MG/NG sections so that no expenditure becomes infructuous while taking up the gauge conversion works later on. Adequate ballast hoppers should be provided to the zones so as to clear the deficiency of ballast on the track which is vital for safety of train operations. Overaged locomotives need to be replaced on priority basis.
- Since most of the accidents with maximum casualties are taking place at level crossings, Indian Railways should strictly implement all the

improved safety features at the LCs as recommended in the CSP. Indian Railways needs to take proper action to curtail the undue delay in adoption of improved technology to strengthen track safety as proposed in the CSP.

- Indian Railways and RDSO need to accelerate the research work so as to implement the new technology for speedy and safe train operations.
- Indian Railways needs to focus on implementation of the recommendations of CSP for inspection and management of bridges. Necessary data regarding the defects detected on various items of track, rolling stock, OHE etc. should be maintained for making comprehensive evaluation of the safety risks. Defects should be brought down to the minimum. Overloaded wagons should not be allowed to run on track.
- Indian Railways should take necessary action to complete the periodic safety drives and audits of safety installations and take corrective actions. The monitoring mechanism of Indian Railways should be geared up so as to achieve reduction in accidents and casualties on all zones and also to achieve the overall objectives of Corporate Safety Plan.
- Indian Railways should fill up all safety category posts and also take necessary steps to reassess the requirement of staff, in view of introduction of modern technology, to bring down the requirement to a realistic level.

3.3 Introduction

The primary requirement of train transportation is to ensure safe, speedy, reliable and punctual movement of passengers and goods to various destinations in the country. During the last four decades, four Safety Review Committees have investigated the deficiencies and suggested reforms for improving safety of the Railway system. The Railway Safety Review Committee (RSRC - 1998), which was the last one in the series, in Part-I of its report recommended that Indian Railways (IR) should immediately formulate a comprehensive Corporate Safety Plan which will, interalia:- i) clearly state the safety policy/objectives and strategies for achieving them; ii) unambiguously enunciate the basic tenets and requirements of safety; iii) prioritise the safety related works and indicate the timeframe as also investments proposed; and iv) set bench marks for safety achievements.

Accordingly the IR formulated the Corporate Safety Plan (2003-2013) in August 2003 which envisaged a safety action plan directed towards continuous reduction in risk level to its customers, implementation of suggested system reforms, imbibing better safety culture, enhancement of asset reliability etc. Though the Corporate Safety Plan (CSP) was made for 10 years, most of its achievable targets were divided into two phases. Phase-I covered the period between 2003-08 and Phase-II the remaining period up to 2012-13. This was done to have a mid-term assessment with changed circumstances, advancement of technology and assimilation of devices. The funds required for safety enhancement works, including SRSF, outlined in the CSP were Rs.31,835 crore.

3.4 Organisation Structure

Though the Railway Board retains the ultimate responsibility for ensuring safety, various departments like Civil Engineering, Mechanical, Electrical, Signalling and Telecommunication were responsible for implementing the CSP with the Safety Department being the nodal department to monitor the implementation. At the Zonal Railway level, the General Managers were ultimately responsible for achieving the safety objectives and all the above departments at Zonal Railways were responsible for implementation of the CSP with safety department being the nodal department for monitoring the implementation.

3.5 Audit objectives

The objectives of the Performance Audit were to assess:-

- Whether the targets of the CSP (Phase-I) up to the period 2008 have been achieved?
 - Whether the replacement / renewal of assets have progressed as planned?
 - Whether the introduction of new technology / improved design has taken place as planned?
 - What has been the progress in the areas identified for research for safety improvement?
 - Whether the steps identified, for improving maintenance practices/ improving asset reliability and thereby inculcating a safety culture, have been taken?
 - Whether the planned investment in human resources has taken place?
- Whether the progress of the CSP has been reviewed through a mid term review at the zones / Railway Board?
- Whether any action plan has been laid down for the items to be implemented in the latter half of the CSP?

3.6 Audit criteria, methodology and scope

Scope: Phase-I of CSP was to be implemented from 2003 to 2008. Hence the Performance Audit covered the five year period 2003-08. However the aspects in respect of Signalling and Telecommunication and Disaster Management in the CSP have been excluded from the scope as they have already been covered in Report No. 26 of 2008-09 and Report No. 8 of 2008 respectively.

Criteria: The criteria adopted was the benchmarks indicated in the Corporate Safety Plan (2003-13), RSRC (1998) Report, guidelines and instructions issued by the Railway Board and relevant codes and manuals of the IR.

Methodology: The audit methodology followed was examination of records at the Railway Board, Zonal/Divisional Headquarters and field offices. Data collected from Zonal/Divisional Headquarters was verified with that of basic

records available in field offices. Physical Inspection, surveys and interviews were also used wherever found necessary. Entry and exit conferences were held in zones and Railway Board to obtain the views of the Railway executives.

3.7 Sample Selection

At the macro level data was collected from all Divisions, Workshops and Zonal Headquarters. For micro analysis of specific issues the sample selection was made as detailed in Annexure III.

3.8 Acknowledgement

The audit objectives, scope, methodology and findings were discussed by the Principal Directors of Audit in the zones with the respective General Managers/concerned departmental heads in entry and exit conferences. The input provided on various aspects including suggestions and support provided by railway officials while conducting the audit is acknowledged with thanks. The co-operation extended by Railway Board during the course of audit is also appreciated. The findings presented in this review were discussed with the Railway Board in an exit conference held in February 2010 and their suggestions/remarks are included in the report.

3.9 Audit Findings

The results of audit are given in the following sections:

3.9.1 Achievement of Targets of Phase I of Corporate Safety Plan for the period up to 2008

3.9.1.1 Track related works

A. Track Renewals

Periodic renewal of the railway track is necessary to ensure its continued ability to withstand the expected traffic. IR assessed the total track renewal at the beginning of April 2003 as 10705 km and provided an amount of Rs. 4894 crore (net) for the purpose under SRSF. The work was to be completed by March 2007 as envisaged in the CSP. A review of track renewal works under SRSF revealed that by March 2008 two zones (NWR and ECR) could not achieve the target in spite of exceeding the final grant of expenditure. This was mainly due to increase in cost of material, delay on the part of contractors in execution of work etc. It was also noticed that in eleven out of sixteen zones (CR, ER, NR, NWR, SCR, SER, NER, ECR, SECR, SWR and WCR) the expenditure exceeded the final grant under SRSF, whereas remaining five zones could not fully spend the funds allotted to them. At the end of March 2008 an amount of Rs.597.73 crore remained unutilized in SRSF which was later transferred to DRF. It was further noticed that in CR, funds worth Rs.19.75 lakh were diverted for other than track renewal works.

IR in February 2010 stated that as the ground reality differs on each Railway the progress cannot be uniform and there has been a complete track renewal on almost 100 percent of the identified track, because of which there has been

a vast reduction in number of derailments. The track renewal works under SRSF were almost completed and the funds allocated under SRSF were fully utilized. However the fact remains that IR almost completed the track renewal only by March 2008, i.e. after a delay of more than one year, and still a small portion of track is yet to be completed.

B. Track renewals/maintenance of MG/NG sections

CSP identified 9000 kms of Metre Gauge/Narrow Gauge (MG/NG) track for conversion to Broad Gauge (BG) which would take up to the year 2013. It was further proposed that track renewal works on these tracks would be done using mixed gauge PRC sleepers so that at the time of gauge conversion, no part of expenditure becomes infructuous. During the review it was noticed that in WR three works of track renewal on the section identified for gauge conversion were taken up. In NER, fourteen works on the identified sections were taken up. Similarly in ECR three works were taken up and in NFR ten works were taken up, where gauge conversion was proposed. However mixed gauge PRC sleepers were being used only on two sections of NFR. This would render the expenditure on sleepers used on other sections infructuous when gauge conversion is carried out by the year 2013.

Railway Board directed (June 2003) that where gauge conversion work is sanctioned and is likely to be completed by March 2007, keeping in mind the economy measures and financial interest of the Railway along with the safety parameters, heavy investment should not be made on the lines which have already been included in the Gauge Conversion Plan. In SCR it was noticed that gauge conversion was sanctioned on Guntakal-Dharmavaram-Pakala section in April 2003. Despite the above orders, track renewal work was taken up and completed in 2006-07. The stretches of track between Kalluru-Dharmavaram was abandoned within three months after completion of work rendering an expenditure of Rs.6.05 crore infructuous. This has already been commented in the Railway Audit Report No.CA 19 of 2008-09. Later the entire section of Guntakal-Dharmavaram-Pakala was also closed within seven months after completion of track renewal works, for taking up gauge conversion work rendering an expenditure of Rs.48.26 crore infructuous.

C. Provision of Ballast

Provision of adequate ballast is very essential for proper up-keep of track. To wipe out huge arrears of ballast deficiency it was proposed under CSP to procure 3800 Hopper wagons by 2008 through Rolling Stock Programme. Though most of the zones placed indents with the Railway Board for ballast hoppers, the combined total of hoppers received by the zones was only 3036 as of March 2008. The deficiency in provision of ballast as of March 2008 was 1148839 CUM over IR and the deficiency over zones ranged from 4000 CUM (0.50 percent) in SER during 2005-06 to 614867 CUM (58.06 percent) in SR during 2004-05.

IR in February 2010 stated that recently in view of higher axle load running and universalisation of CC+6+2 tonne load running, track standards have been upgraded. Large deficiency of ballast was mainly due to this upgradation.

Every year more than 100 lakh CUM ballast sufficient for 10,000 track KM is being taken and progress of deep screening and ballast supply has been consistently good and targets were almost achieved in procurement. However the fact remains that despite achieving the target of procurement the deficiency of ballast over IR was 11.49 lakh CUM as of March 2008 mainly due to non availability of adequate ballast hoppers, which affects the safety of track.

Recommendation

Better planning needs to be made before undertaking the track renewal works of MG/NG sections so that no expenditure becomes infructuous while taking up the gauge conversion works later on. Adequate ballast hoppers need to be provided to the zones so as to clear the deficiency of ballast on track which is vital for safety of train operations.

3.9.1.2 Rolling Stock – Replacement of overaged locomotives

CSP proposed the replacement of overaged locomotives by new locomotives with enhanced safety features. Year-wise replacement plan was also drawn up by the CSP. The replacement of overaged diesel locomotives, which were 213 as on March 2003 and estimated to go up to 819 by the year 2013, was planned to be 90 locos per year from 2003 to 2008 and 74 locos per annum from 2008 to 2013.

During the review of records at zonal Railways it was noticed that after replacing 382 locomotives, IR was holding 223 overaged BG diesel locomotives as against a total stock of 4163 locomotives as of March 2008. In case of MG Diesel locomotives, after replacing 31 locomotives during the review period, IR was holding 82 overaged locomotives as against a total of 444 locomotives on line as of March 2008. Though many of the overaged locomotives were reported to be used for inferior services such as shunting operation etc., IR was compromising the safety of Railway users by engaging the overaged locomotives for Railway operations as possibility of derailments/accidents remain.

IR in February 2010 stated that locomotives are expensive assets which are the backbone of train running. It is therefore a policy that the locomotives are replaced on age-cum-condition basis, instead of only on age basis. Production capacity is being increased in the locomotive production units to replace the over-aged rolling stock and to meet the future condemnation requirements. However the fact is that IR will have overaged locomotives on line, compromising the safety aspects, till the above steps materialize.

Recommendation

As the stock of overaged diesel locomotives was very high and its replacement was very minimal, IR needs to look into this area to replace the entire overaged rolling stock.

3.9.1.3 Improvement works and introduction of new technology/improved design as per plan

A. Improvement works at Level Crossings for Road Users’ safety

In order to curb accidents at Level Crossings (LCs), CSP envisaged a multi-pronged strategy of widening of roads in Railway land at high density locations, modified design of stop boards in retro-reflective sheets at unmanned LCs, provision of manned LCs in the next five years at unmanned LCs as per revised criteria for manning etc. As per the revised criteria, wherever the Train Vehicle Units (TVUs) are more than one lakh per day, the LCs are to be replaced with Road Over Bridges/Road Under Bridges (ROBs/RUBs) on the basis of cost sharing with State Governments.

The table below shows the target and actual work of ROB/RUB done as of March 2008 at LCs with more than one lakh TVUs.

Particulars	Target	Actual as of March 2009
Physical (Nos.)	1252	158
Financial (in Crore)	8000	1050.87

From the above table it is seen that out of the 1252 ROBs/RUBs targeted to be completed by 2013 only 158 (12.62 percent) have been constructed as of March 2009, indicating very slow progress. It was noticed that work of ROB/RUBs has been planned/undertaken only at 438 LCs over 11 zones (SR-74, CR-71, ER-33, WR-5, SCR-126, SER-10, NCR-39, ECR-26, ECoR-31, and SWR-23). The reason for the slow progress of construction work was attributed to unwillingness of the State Governments to share the cost of construction, public agitation in acquiring the land, delay in acquisition of land etc. It was further noticed in ER that replacement of LCs was being planned only when proposals were initiated by the concerned State Government agreeing to share the cost and accepting the Railway’s stipulations.



Trespassers after closing the level crossing at Diva Station (CR) endangering their lives

Out of the 171 LCs test checked (92 manned and 79 unmanned) by Audit on the zones, it was noticed that many of the safety features were not provided at the LCs. Reflectors on stop disc on both sides of gate for the road users were provided only at 80 LCs and interlocking was done only at 62 LCs. Wicket gates or stiles for pedestrians have been provided only at 47, lamps were provided only at 83 and locking arrangements were provided for both gates only at 90 LCs. It was further noticed that the distance of lifting barriers from centre of track was less than five metres in respect of 65 manned LCs. In NWR and SER the distance of lifting barriers was less than five metres at all the LCs test checked. It was also found that in ER four manned LCs were not provided with telephones (Annexure IV).

The table below shows the year-wise funds allocation and utilization under Railway Safety Fund for undertaking road safety works for the period 2003-04 to 2008-09.

(Figures in crores)

Year	Total Grant	Actual Expenditure	Saving	Percentage of saving
2003-04	433.00	166.19	266.81	61.62
2004-05	401.03	201.58	199.45	49.73
2005-06	711.39	262.87	448.52	63.05
2006-07	710.94	360.28	350.66	49.32
2007-08	1050.69	533.55	517.14	49.22
2008-09	1300.28	565.57	734.71	56.50

It is seen that in all the years the Railway Administration was surrendering about 50 percent or more of the funds allotted for road safety works. This was mainly due to slow progress of works, delay in land acquisition, non completion of detailed estimates and formalities before making payment to State Governments towards the cost of road approaches in respect of various ROB/RUBs etc. Surrender of funds shows that the Railways are not carrying out all the works planned at level crossings where most of the accidents take place with maximum casualties. The fatality numbers on level crossing accidents were 454 out of the total 714 fatalities for the period from 2005-06 to 2007-08.

IR stated in February 2010 that most of the unmanned LC accidents, which constitute 45 per cent of the total number of consequential train accidents, are caused due to negligence of road users. IR have therefore started comprehensive social awareness programmes and publicity campaigns through electronic and print media to educate the road users about the precautions to be observed while negotiating the unmanned LCs. They further stated that the criteria for manning have been reviewed and in order to wipe out all arrears, IR has taken steps to increase the pace of manning and the target for manning has been substantially raised, sanctioning process for manning has been simplified to increase the pace. State Governments are being interacted at a higher level for expeditious decisions regarding sharing of cost of construction of ROB/RUB, timely acquisition of land etc. Limited

height and normal height subways are being constructed in lieu of level crossing gates, traffic being diverted to adjacent level crossings to reduce the number of level crossings. For the purpose of manning the unmanned level crossings, efforts such as recruitment of new gateman, re- engaging retired employees etc. are being taken. While admitting the points raised by Audit, IR stated that instructions are also being issued to provide basic infrastructure at the level crossings and adequate measures would be taken to overcome shortcomings.

B. Improved Thermit Welding

Thermit welding, carried out in open line, generally suffers from poor quality. It was proposed in the CSP to acquire the latest technology of Thermit welding and the most modern equipment for testing each weld. As early as in April 2000 Railway Board asked RDSO to study the quality of rail welding and the technology of Ultrasonic flaw detection (USFD) and accordingly a Technology Development Group (TDG) was formed. They submitted the report in October 2001 in which it was stated that the specification of AT welding on IR was of international standards and no changes in the present specification were warranted. They further stated that emphasis should be given for training of welders and availability of adequate equipments. Despite this Railway Board insisted for adoption of improved technology and allocated Rs.30 crore under SRSF for the project. Accordingly RDSO in February 2003 identified two international firms and trial kits were obtained in May 2004 and February 2005 from them. A team of officers also visited the firms' works in France and Germany to study the aspects of new AT welding technology. Based on the study and various tests with the trial kits, RDSO framed specification for acquiring the new AT welding technology. Though the Railway Administration called for international bids with the new specification, the same was not successful as the technology offered by the international firms were not conforming to the bench mark set by RDSO. Thus the Railways are still continuing with the existing thermit welding technology and even after nine years since April 2000 and spending an amount of Rs.12 lakh for the trials etc. the improved technology could not be adopted in IR so far.

While accepting the delays, IR in February 2010 stated that keeping in view the sensitivity of welds in safety scenario, long drawn trials, lab evaluation, tests, analysis, extended trials, time consumption in the process are unavoidable before introduction of the same into field.

C. Reduction in thermit welds by mobile flash butt welding

It was planned in CSP that as the Alumino-Thermit welds are weak links in track, its population was to be gradually reduced and replaced by Flash Butt welds to be executed with the help of mobile flash butt welding plants. As a first step this was to be introduced in construction projects by the year 2004 and gradually extended to other areas in the next five years. However it was noticed during the review that the use of alumino thermit welds, due to which tracks are prone to frequent weld failures, is still widespread and the use of mobile flash butt welding is yet to be introduced in open line in eleven out of sixteen zones (SR, ER, WR, NWR, SER, NER, NCR, ECR, SECR, SWR and

WCR) and in Metro Railway Kolkata. In three zones (CR, NR and SCR) where the mobile flash butt welding was introduced, the use of the same is negligible. Reason for slow progress in introduction of mobile flash butt welding was stated to be that mobile flash butt welding plants are bulky and consume more space and require traffic blocks of long spells.

IR while furnishing figures of weld joints using alumino thermit welding and weld joints at departmental flash butt welding plants stated in February 2010 that the figures furnished by Audit appear to be incorrect. However the comparison made by IR is incorrect as IR has adopted the details of weld joints done through stationary departmental welding plants and not the weld joints done on open line with the mobile flash butt welding plants. The comparison should have been made between the alumino thermit weld details and mobile flash butt weld details of open line. The number of weld joints executed by mobile flash butt welding plants in four zones (SR,SWR, SCR and NWR) for the period from January 2006 to March 2008 against the Railway Board's contract was only 49696 joints as stated by IR which is negligible as compared to the figures of alumino thermit weld joints during the two years 2006-08 which was 838748.

Recommendation

Since most of the accidents with maximum casualties are taking place at level crossings, IR should strictly implement all the improved safety features at the LCs as recommended in the CSP. Further, IR should put greater efforts to bring in the State Governments' co-operation in construction of ROB/RUBs wherever necessary. IR needs to take proper action to curtail the undue delay in adoption of improved technology so as to strengthen track safety.

3.9.1.4 Progress in the areas identified for research for safety improvement

A. Preventive Rail Grinding

Because of the heavier loads and also to minimize wear from the harder steel used for the cast wheels especially for the new BOXN wagons, 90 UTS (Ultimate Tensile Strength) rails were being used on IR. Though these rails have greater hardness, they have a tendency of gauge corner cracking due to rolling contact fatigue. Gauge corner cracking can result in accidents due to rail fractures. Gauge corner cracking can be prevented by rail grinding to remove the fatigued top layer of rail metal. Out of the four Rail Grinding Machines proposed for procurement, contracts have been awarded by the Railway Board in February 2009 for procurement of two machines which are expected to be received by July 2010. Thus IR was not able to tackle the problem of gauge corner cracking which can lead to rail fracture accidents.

IR stated in February 2010 that they are making all the efforts after careful consideration of suitable technology to tackle the problem of gauge corner cracking.

B. Role of RDSO in adopting new technology

For testing and conducting applied research for development of railway rolling stock, permanent way etc., Research Designs and Standards Organisation

(RDSO) was established in Lucknow in 1957 by integrating the then Central Standards Office and Railway Testing and Research Centre. The primary quality policy of RDSO is to develop safe, modern and cost effective Railway technology complying with statutory and regulatory requirements, through excellence in research, designs and standards and continual improvements in quality management system to cater to growing demand of passenger and freight traffic on the railways. The CSP envisaged development and implementation of certain new technologies in improving the safety in train operations, which were entrusted with RDSO to develop them within a time bound programme. However it was noticed in audit that the following technologies could not be made operational even after one year of completion of phase I of CSP.

- (i) **Lubrication of gauge face and friction modifier on top of rails** – though these were to be completed by 2005-06, only the rail mounted lubricators were commissioned in April 2008, whereas no action was initiated for friction modifier by RDSO stating that the technology has not matured globally so far.
- (ii) **Development of trackside bogie monitoring system** – A pilot project with an estimated cost of Rs.4.36 crore was sanctioned in September 2005 and the system was procured from abroad at a cost of Rs.3.47 crore in March 2009. However, the commissioning work has been completed (August 2009) after delayed arrangement of power supply at nominated site and extensive trials are being conducted.
- (iii) **Development of test track facility** – Though the project was sanctioned way back in 1985, the same was abandoned after spending Rs.3.16 crore but again proposed in September 2001. The project could not be started due to non finalisation of proper site for the testing facility.
- (iv) **Vibration signature analysis and development of rail vehicle based testing car** – the project for assessing the bridge condition quickly by using vibration signature technique was sanctioned in March 2005 and was to be carried out through IIT Mumbai. However due to delay in finalizing contract the work could not be completed so far.

IR stated in February 2010 that IR and RDSO are continuously working towards identifying new projects and adopting the advanced technology to match with those of other countries, as and when required, to suit the Railways' requirement. However the pace of adoption of new technology does not match with the safety requirements.

Recommendation

Since innovation in technology is necessary under the changing conditions of train operations where speedy operation and maintenance would be inevitable, IR and RDSO should accelerate the research work so as to implement the new technology for speedy and safe train operations.

3.9.1.5 Steps identified for improving maintenance practices/improving asset reliability and thereby inculcating safety culture

A. Modern Bridge Inspection and Management System

Modernization of bridge inspection and assessment system was contemplated in the CSP by implementing a modern bridge management system with the following focused areas:

- a) Underwater Inspection of bridges
- b) Mapping of unknown foundations and integrity testing of foundations.
- c) Non-destructive testing techniques like Ultra Sonics, Acoustic Emission, Strain Gauging and Radar etc.
- d) Fatigue life and residual life assessment techniques
- e) Bridge management system.



Mobile Bridge Inspection Unit manufactured at RCF, Kapurthala

Only Projects from (a) to (d) above were approved by IR (2003). After their completion, the technologies were to be adopted over the entire system in a period of three to four years thereafter. Mobile Bridge testing laboratories with some Non-Destructive Testing (NDT) were also approved (2003) for 16 zonal Railways and these laboratories were to be implemented on the zonal Railways in the next five years with the balance complement of essential NDT equipment like Impact Echo testers etc.

It was however noticed in Audit that while two mobile bridge inspection units manufactured at RCF, Kapurthala are under commissioning, mapping of unknown foundations was not being done in any of the zones except Northern Railway where it was carried out through an outside agency as a pilot project. In other zones this is yet to be arranged as training is still to be provided to the staff for this job. Similarly fatigue life and residual life assessment technique was also not being adopted in 10 out of 16 zones (SR, NWR, SCR, SER, NER,

NCR, ECR, SECR, WCR and NFR). Computerisation of information about bridges was not done in 11 zones (CR, NWR, SCR, SER, NCR, ECR, SECR, ECoR, SWR, WCR and NFR); while in Southern Railway it was computerized. Delay in provision of the modern system was on the part of COFMOW, who were to arrange the mobile bridge testing laboratories to zones. Various items of testing for nine initial zones for which contracts have been placed are still under procurement (October 2009).

It was further noticed in Audit that there was a huge shortfall in under water inspection of bridges. Out of the 209 bridges on which under water inspection was required to be done over Indian Railways, the inspection was done only on 128 bridges leaving a shortfall of 81 bridges (38.76 percent). NDT technique was not adopted in six zones (ER, NR, SCR, SWR, WCR and NFR) on 61 of the 128 bridges inspected. In WR though one mobile bridge-testing laboratory with NDT technique was commissioned in 2003 with one set of structural scanning equipment, staff was not trained to operate the equipment, leading to non-functioning of the laboratory costing Rs.0.98 crore.

While accepting delay in modernization of bridge management system, IR in February 2010 stated that the two mobile bridge inspection units have been commissioned in NR and CR. Under water inspection of bridges has been carried out in 269 bridges out of 327 bridges identified as of March 2009. This shows that still there is a shortfall of 58 bridges (17.74 percent).

B. Upgradation of freight train examination

Upgradation of freight stock maintenance infrastructure at some major Routine Overhauling (ROH) depots, freight train examination points and sick lines was proposed in the CSP to be completed during the plan period for which funds were to be arranged through the normal plan outlay. However it was seen that out of the 137 freight train examination points in IR, 86 were identified for upgradation, of which only 27 (19.71 percent) were upgraded as of 2007-08. Out of the 45 ROH depots, 34 were identified for upgradation, of which only 12 (26.67 percent) were upgraded so far. Similarly, out of the 120 sick lines, 59 were identified for upgradation, out of which 18 sick lines (15 percent) were only upgraded as of 2007-08. Slow progress in upgradation work was resulting in taking more time for attending to sick wagons and rectification of defects. Reasons for delay in upgradation were reported to be delay in completing the ancillary works such as electrical connection etc.

IR stated in February 2010 that there have been several reasons for delay including funding and award of contracts. They further stated that the upgradation of infrastructure is being expedited.

C. Way side detection of overloaded rolling stock by in-motion weigh bridges

A number of rail/weld failures are caused by over-loaded wagons. In motion-weigh bridges help detection of over-loaded wagons. CSP therefore proposed to install in-motion weigh bridges selectively on identified routes at originating points and ensure the functioning of these weigh bridges. It was noticed in Audit that while 93 weigh bridges were installed at various locations over IR, the proper functioning of these weigh bridges was not being

ensured. None of the weigh bridges was working on all the days of the year during 2005 to 2008. Further, 50 percent of the weigh bridges were not installed at originating points (46 locations out of 93) defeating the purpose of detection of over-loaded wagons. It was further noticed that out of 92.60 lakh wagons weighed on these weigh bridges during the three year period from 2005 to 2008, 18.57 lakh wagons (20.05 percent) were detected as overloaded. Even after detection of overloaded wagons, they were allowed to proceed without adjustment of the load as noticed in SR, which has serious repercussions for the track. In SER, overloading was detected in 30.62 percent of wagons weighed at the in-motion weigh bridges during 2005 to 2008. The rail fracture and weld failure cases reported in 2007-08 were also on the higher side in SER as compared to the previous year. The impact of enhanced loading on infrastructure is being covered separately in the Performance Audit on Freight services.

IR stated in February 2010 that the weighbridges do remain under repair and calibration and due to some operating constraints unloading of overloaded wagons cannot always be carried out en route. They further stated that the 20 percent overloaded wagons calculated by Audit do not seem to be correct and no scientific study has related weld failures to overloading of wagons. The remarks of IR are not tenable. The figures of 20 percent arrived at by Audit shows the percentage of overloaded wagons to the total number of wagons weighed on way side weigh bridges and not the percentage of the entire fleet of loaded wagons carried by IR. Further the fact remains that overloaded wagons could be detrimental to track life.

D. Integrated maintenance blocks

For implementing the concept of preventive maintenance, granting of adequate time for maintenance of assets – both fixed and movable – is absolutely essential. To over-utilise an asset and temporarily neglect its maintenance is bound to be counter-productive in the long run. It was therefore proposed in the CSP that efforts be made to make optimum use of all maintenance blocks (suspension of traffic in a specified period for maintenance purposes). Following actions are proposed in the CSP:

Computerised database to be maintained at divisional level for keeping accurate record of all aspects of working connected with maintenance blocks. Each maintenance block granted to be simultaneously utilized by all departments as granting of maintenance blocks is an expensive proposition. Integrated maintenance vehicles on the pattern of accident relief train (ART), have to be procured so that staff and materials of all departments can move together. Working of maintenance staff is to be geared up to ensure that they are in a position to avail of night maintenance blocks also, especially on over-saturated sections.

During the review of records it was noticed that the concept of integrated maintenance block was not in vogue in eleven out of sixteen zones (ER, NR, NWR, NER, NCR, ECR, SECR, ECoR, SWR, WCR & NFR). Computerized data was being maintained in CR and maintenance blocks were being used by all departments simultaneously in Mumbai Division. However in Nagpur

Division the allotment of blocks was always less than the demand. In SR computerized database on maintenance blocks was not being maintained. Though corridor blocks are stipulated in the working time table which are to be used by all departments simultaneously as per zonal arrangements, blocks are also granted separately to each department outside these corridor blocks during exigencies and night maintenance blocks are also granted on over saturated sections. However no integrated maintenance vehicle on the pattern of ART has been procured in SR and SCR. In Ahmedabad Division of WR, the allotment of maintenance blocks were less than demanded and in SER out of the two divisions test checked the integrated maintenance blocks was being availed in one division only.

While accepting the above IR stated in February 2010 that the shortcomings are identified and measures are being taken for the full utilization of integrated maintenance blocks.

E. Safety Audit and safety drives

Inspections generally single out individual failures. Safety audits are expected to identify system failures and generic shortcomings. CSP proposed that periodic safety audits be undertaken at various levels for making an in-depth assessment of safety systems. These safety audits were to be done by multi-disciplinary team from Railway Board, inter-Railway, multi-disciplinary headquarters team, inter-divisional etc. During the review of records of zonal Railway it was noticed that no records indicating the safety audit conducted by the multidisciplinary team from Railway Board were available in any of the zones other than NWR, where only once it was done during the period from 2005-06 to 2007-08. On a specific query the Safety Directorate of Railway Board stated that the multi disciplinary team from Railway Board conducted the safety audit and the shortcomings identified have been pointed out to the zones for rectification. However no records were provided by the Directorate to Audit in this regard stating that the issue was very elaborate and Safety Directorate does not get all the correspondence. The safety audit by inter divisional team has also not been conducted in the zones except in SER and SECR.

IR in February 2010 stated that Railway Board directed zonal railways to constitute a team of five Senior Administrative Grade officers from various departments along with similar number of inspectors to audit/inspect at least one unit of their Railway for at least two consecutive days bi-monthly. They further stated that they have evolved the concept of inter-railway safety inspections to have better security, objectivity and comprehensive enrichment of field practices.

F. Defects on Track and Rolling Stock

CSP had proposed a reduction in track defects from the level of 10.58 defects per billion GTKM as of August 2003 to 6.35 defects as of 2007-08. It was noticed that:-

- (i) while eight zones (NWR, SCR, SER, NCR, SECR, ECoR, SWR and WCR) have achieved the reduction proposed in CSP, in three zones, SR,

NER & NFR, the defects were above 12 and showed an upward trend. In other zones (CR, ER, NR, WR, ECR and Metro/Kolkata) the figures were not made available.

- (ii) Targets were also included in the CSP for reduction in various Rolling Stock defects such as Coach defects, Wagon detachments, Poor Brake power (Goods), incidence of train parting (Goods), Diesel loco defects, Electric loco defects, OHE defects etc. It was noticed that the actual coach defects/failures were more than the target in NER, NCR, SECR and NFR, whereas data was not made available in four zones (CR, NR, WR and ECR) and Metro Railway, Kolkata.
- (iii) The targets for wagon detachments/failures were achieved by twelve zones (SR, ER, SCR, SER, NER, NCR, ECR, SECR, ECoR, SWR, WCR and NFR), whereas the data was not made available in other zones.
- (iv) The incidences of Poor Brake Power were significantly higher than the target in ECR, data was not made available in four zones (CR, NR, WR and NWR) and Metro Kolkata while in remaining zones the target was achieved.
- (v) Incidences of Train Parting were higher than the targets in SR, NER, ECR and SECR, while data was not made available in four zones (CR, NR, WR and NWR) and Metro Kolkata while other zones achieved the target.
- (vi) Motive Power defects (Diesel locos) were higher than the target in seven zones (SR, NWR, SCR, NER, SECR, ECoR and NFR) whereas data was not made available in three zones (CR, NR and WR). Motive Power defects (Electric locos) were more than the target in SCR and SECR, while data was not made available in CR.
- (vii) It was noticed that in six zones (SR, ER, NR, SER, ECR and SECR) the incidents of Overhead Equipment (OHE) defects as of 2007-08 were more than the level of August 2003. In two zones (NCR and SWR) the incidents of OHE defects were slightly higher than the proposed level, while the figures were not made available in CR, WR and Metro Kolkata. Only three zones (SCR, ECoR and WCR) could achieve the proposed target of reduction in OHE defects.

IR stated in February 2010 that the data for coach failures is maintained and available for individual zonal Railways as well as consolidated position for IR, adequate measures are being initiated to overcome the various equipment failures and there has been a consistent improvement in the reliability of the equipments. However the fact remains that there were cases in many zonal Railways where the target could not be achieved in various equipment failures, which affect the safety performance.

G. Accidents

The table below shows the number of accidents during the period 2003-08.

Type of Consequential accidents	(Average of 3 years from 2000 to 2003)	Extent of reduction proposed	Accidents during the year					Average of five years
			2003-04	2004-05	2005-06	2006-07	2007-08	
Collisions	22	--	9	13	9	8	7	9
Derailements	282	60%	197	136	130	95	100	132
LC accidents	90	No change	95	70	75	79	77	79
Fire accidents	14	80%	14	10	15	4	5	10
Misc.	5	--	5	3	4	8	4	5
Total	413		320	232	233	194	193	235

While the overall accident figures of IR have come down considerably, figures of accidents in a few zones increased during 2007-08 as compared to the figures of 2002-03. Level crossing accidents increased in WR and NWR and collisions increased in SER.



Collision accident near Mathura Station (NCR) on 21.10.2009 in which 22 persons were killed

IR stated in February 2010 that accidents are caused due to failure of a combination of factors. All these accidents are analyzed and various remedial measures taken to stop recurrences. They further stated that the level crossing accidents in WR remained at the same level of 9 accidents in 2008-09 as in 2002-03. However it was noticed from the data maintained in Chief Safety Officer's office in WR that the number of level crossing accidents was 21 (consequential – 10 and non consequential – 11) in 2008-09 and 14 (8 + 6) in 2002-03.

Recommendation

Necessary data regarding the defects detected on various items of track, rolling stock, OHE etc. should be maintained for making comprehensive evaluation of the safety risks. Defects in track and rolling stock should be brought down to the minimum so as to improve safety. IR should also ensure that whenever overloading of wagons is detected, the load in such wagons is adjusted so as to avoid adverse impact on the track.

Further, since safety audit and safety drives are important features of the CSP, IR should take necessary action to complete the periodic safety drives and audits and take corrective actions on the safety installations, wherever necessary. The monitoring mechanism of IR therefore needs to be geared up so as to achieve reduction in accidents and casualties in all zones and also to achieve the overall objectives of Corporate Safety Plan.

3.9.1.6 Investment in human resources as planned

A. Constitution of Human Resource Cell

To promote devotion, dedication and sincerity towards duties, it was proposed in the CSP to constitute Human Resource Development (HRD) cells at zonal and Divisional headquarters involving dynamic and knowledgeable supervisors to study – working habits of ground level staff, factors leading to short cuts and to reduce fatigue, minimize monotony and improve safety consciousness. It was noticed in Audit that no HRD cell was formed in any of the zones except in WR, where it was formed in zonal headquarters and in Mumbai Divisional headquarters which has not yet started functioning. Non creation of HRD cell in other zones implies that human resource development was not getting proper attention as envisaged in CSP.

B. Modernisation and upgradation of training centres

Main training centres over IR have been granted Rs.73.50 crore under SRSF for upgradation. Remaining centres including Basic Training Centres spread over IR under various departments were also proposed in the CSP to be modernized with provision of necessary infrastructure at an overall outlay of Rs.220 crore (inclusive of allotment already made under SRSF).

It was noticed in audit that out of the 96 training centres identified for upgradation/ modernization, work on 20 training centres only has been completed so far. While work was in progress on 59 centres, no work was sanctioned on four training centres.

C. Strength of staff and vacancies

It was proposed in the CSP that staff requirement would be worked out afresh for zero based assessment of manpower. Based on such exercise, sanctioned strength of staff is to be revised and made uniform. It was further envisaged that all safety category vacancies would be filled up on urgency basis. A review of staff position in zonal Railways revealed that vacancies existed in all departments under safety category in all zones. The vacancy ranged from 3.68 percent (in Mechanical Dept. of NWR) to 37.10 percent (in Civil Engineering Dept. of SWR) (Annexure V).

IR stated in February 2010 that the number of vacancies remained static over the past several years, with constant upgradation on technology the efficiency of the man-power is increasing, the assets renewed under SRSF require miniscule maintenance in the initial years and the vacancies have not resulted in any decline in the safety performance of the IR. This is not tenable, if the vacant posts are not required to increase efficiency of the performance of machinery assets, there is need to reassess the requirement of manpower to bring it to a realistic level and to surrender excess posts.

D. Crew friendly cab in locomotives

It was stated in the CSP that an ergonomic design of loco cab has been developed to provide easy approach to various control handles/buttons. Providing new features would ensure fatigue-free driving for long hours. However, it was noticed that while Diesel Locomotive Works (DLW), Varanasi turned out almost all the locos with crew friendly cab during the period from 2003 to 2008, Chittaranjan Locomotive Works (CLW) lagged behind. The locos turned out with crew friendly cab ranged from 18.6 to 51 percent in CLW during the above five years. No reasons were found on record for the slow progress in providing crew friendly cab in all locomotives.

IR stated in February 2010 that the slow progress was due to the fact that modification of crew cab required re-location of various equipments, reducing size of silicon rectifier, redesign of equipment panels etc.

E. Upgradation of running rooms and crew lobbies

It was stated in the CSP that the existing running rooms are being upgraded on an urgent basis and the new running rooms would be built with improved lay out and proper amenities. It was also proposed that crew lobbies also need to be upgraded by providing basic amenities, facility for proper display of various instructions, computer and software package for proper booking of crew and ensuring adequate rest for running staff. In a test check it was noticed in audit that out of the 187 running rooms available in selected divisions on all zones 70 have been upgraded and 44 are under upgradation. While 27 are proposed for upgradation, no action has been taken for remaining 46 running rooms. Similarly out of 165 crew lobbies test checked 95 have been upgraded. While 32 are under upgradation and 15 are proposed for upgradation, no action has been taken on remaining 23 crew lobbies (Annexure VI).

IR stated in February 2010 that adequate measures are being taken to expedite the upgradation of balance running rooms and lobbies.

F. Crew Management

It was proposed in the CSP that to assess the actual problems faced by the running crews, proper record would be maintained at crew lobbies and follow up action taken within 24 hours of observations made by drivers. The deficiencies noted during crew runs would be identified and corrected expeditiously. A test check of records maintained in selected divisions revealed that though registers to record the defects noticed by drivers were being maintained in crew control offices and defects were communicated to the respective department through control office for corrective actions, feed

back was not available on record in crew control office, hence the corrective action taken could not be monitored.

IR stated in February 2010 that the delays on this process are being plugged.

G. Coaching Maintenance Terminals

The CSP envisaged zero based review of sanctioned strength of staff at all existing coaching maintenance depots, specification of time in terms of man-hours per coach for primary and secondary maintenance, provision of adequate pit lines for proper maintenance of all rakes and computerization of coach history. However during the test check in Audit on few coaching terminals in each zone it was noticed that zero based review of sanctioned strength was not being done in four zones (ER, SER, SECR and ECoR) and Metro Railway Kolkata. In some other zones (NR, NER and NFR) the review was not done at all the depots. Similarly computerized database of coach history was not available in any of the depots in NER, NCR, SECR, ECoR and SWR. In few other zones (ER, NR, NWR, SCR, ECR, NFR and Metro Kolkata) the computerized data base was not available in some of the depots. Time for primary maintenance was not laid down in three zones (ER, NR and ECR) in some depots and for secondary maintenance it was not laid down in six zones (ER, NR, NER, NCR, ECR and ECoR).

IR stated in February 2010 that instructions for carrying out a zero based review of sanctioned strength of staff at all coaching maintenance depots have been reiterated to the Railways for compliance.

Recommendation

Since human error contributes to a major part of accidents, IR should strictly ensure that the modernization and upgradation of training facility to the staff is completed on time. Further IR should take immediate action to fill up all the vacancies in safety category posts and also take necessary steps to reassess the requirement of staff, in view of introduction of modern technology, to bring down the requirement to realistic level.

3.9.2 Review of Progress of Corporate Safety Plan through Mid Term Review

Though the Corporate Safety Plan was formulated for the period up to the year 2013, most of its achievable targets were divided into two phases. Phase I was to cover the period 2003-08 and Phase II would span its safety activities up to the year 2012-13. This was done to have a mid-term assessment with changed circumstances, advancement of technology and assimilation of devices. However it was noticed in audit that even though periodical progress of the implementation of CSP was being monitored and action plan was being drawn every year, no specific suggestion for modification of the already chalked out programme has been made by the Railway Administration. No mid term review has been conducted in the zones except in ECR and NER where no mid course correction has been suggested in the mid term review.

IR stated (February 2010) that the Ministry of Railways is monitoring works with the zonal Railways. Safety directorate is the nodal directorate for

consolidating progress and Chief Safety Officers of zonal Railways have been advised to monitor the works of CSP concerning their Railway.

3.9.3 Action Plan for the items to be implemented in Phase II

The CSP had envisaged a broad action plan for all the works to be carried out for the entire plan period (2003 to 2013). While in eight zones (SR, CR, ER, WR, NER, NCR, ECR and NFR) specific action plan has been drawn for undertaking the proposed work in the phase II, in other zones and Metro Railway Kolkata no such action plan has been drawn up so far.

IR stated in February 2010 that by 2008 there has been overall 62.2 per cent of financial progress, which is more than pro-rata and considered satisfactory and therefore 100 per cent achievement in stipulated works under CSP can be assumed. They further stated that there may not be a need to prepare emergent plans to give focus on certain lacking items in view of substantial overall progress. However, zonal Railways have been advised to prepare an action plan with revised targets for all those works where the progress is not satisfactory.

New Delhi
Dated:

(NARENDRA SINGH)
Deputy Comptroller and Auditor General

Countersigned

New Delhi
Dated:

(VINOD RAI)
Comptroller and Auditor General of India