Railway Accidents & Safety Measures

Lesson 2

Safety Measures

Safety Organization

1. Introduction:

Transport industry is the only one of its kind where an accident in the courses of its working results in loss of lives and properties of its valued customers. In all other industries providing any kind of service to the general public, an accident generally affects workers of that industry alone and not its customers In view of this somewhat unusual implication of a Railway accident, safety in Railways has always had a special significance for travelling public.

Railways in turn accord a very high priority to Safety in train operations. This is primarily because of the realization that accidents not only cause loss of invaluable lives and properties, but as a consequence of ensuring disruption to rail traffic, such accidents also result in loss of transport capacity, a loss which can never be effectively recouped over a period of time.

2. Set up of the safety organization:

The safety organization on the Indian Railways was created in pursuance of recommendations of the Kunzru Committee, 1962 and enlarged and strengthened on the basis of further recommendations made by the Wanchoo Committee, 1968. It is presently functioning in a 3-tier structure at Railway Board, Zonal Hdqrts and Divisional level. Officers manning the safety organization at all 3 levels are drawn from Traffic, Engineering, Mechanical, S&T and other specified Departments.

At the apex level there is Safety Directorate in Railway Boards' office under the charge of an Executive Director who reports directly to Chairman, Railway Board. ED (Safety) is assisted by two Directors and other supporting inspectorial and office staff.

At Zonal Hdqrts. Safety organization is headed by Chief Safety Officer in Senior Administrative Grade who reports directly to General Manager. He is assisted by a Dy. Chief Operations Manager (Safety)/Senior Transportation Officer (Safety) Assistant Transportation Officers etc. junior.

Administrative Grade/Senior Scale Officers and inspectors of Civil Engineering, Mechanical, Electrical and Signal departments are attached to safety organization and report directly to CSO.

At the divisional level, safety organization is headed by a Sr. Divisional Safety Officer

in Junior Administrative Grade/Senior Scale who reports directly to Divisional Railway Manager. He is assisted by an Assistant Operations Manager (General) and other supporting staff. At divisional level also, inspectors from respective technical department are attached to the safety organization as safety counsellors.

Orders have been issued by Railway Board that at Divisional level also, Junior Scale Officers from technical departments should be attached with safety organization. Similarly, in so far as safety councilors are concerned, there is no uniformity in the composition of the team. On some railways major disciplines like Signalling and Telecommunication, and Electric Traction have no safety councilors at the divisional level.

3. Role of the Safety Organization:

Safety to have a permanent effect must be built into the working of Railways. In the final analysis, safety depends on staff of every department doing his work conscientiously and correctly. Responsibility for ensuring safety is squarely that of different departments and their accountability in this respect cannot be diluted.

Safety organization is essentially a service department helping other departments to discharge their safety functions effectively. It has been structured at all three levels to perform this function effectively, and has not been burdened with direct executive reponsibility of other departments in the name of safety. In a sense it performs a role similar to that of an internal audit on aspects concerning safety in train operation; and viewed from that angle, is highly useful ;and important. An accident generally speaking is nothing but a breakdown in efficiency and safety organization is meant for ensuring a high level of quality control in the sphere of accident prevention.

In addition to above, railways have to keep in view that functioning of safety organization should not result in retarding movement of traffic. The demands of safety have to be balanced and integrated with demands for quicker and faster movement. Moreover, it is extremely important that safety organization should not be superimposed on the normal operating machinery on railways which is, at present, and should continue to be responsible for ensuring safety in train movement. Therefore, safety awareness of the staff at all levels has to be permeated within the normal operating machinery on Railways.

4. Role of the 3 – tier structure:

Safety Directorate in Railway Board focuses attention, at highest level, on matters having a bearing on safety. It analyses long term trends of accidents, examines various suggestions and recommendations to promote safety, and follows-up regarding implementation of recommendations of various committees. Safety Directorate also coordinates the efforts of zonal railways in the field of safety monitoring of problems that have inter – railway ramifications. It also coordinates efforts of various railways for use of mass-media for promotion of safety consciousness amongst staff and public.

At zonal Hdqtrs, main functions of safety organization are conducting on-the-spot checks to detect unsafe practices with a view to eliminate them, highlighting weak links in the system, taking remedial action, keeping a watch on refresher training, organizing safety campaigns, promoting safety consciousness amongst the staff, use of mass media for educating public about unsafe practices and safety hazards, compiling information relating to accidents, under taking analysis of various types of accidents, follow-up action taken on recommendations by various accident inquiry committees.

At divisional level, main functions of safety organization are to carry out preventive and spot checks, safety counselling of staff, conducting of safety propaganda and education, putting up periodic reports to DRM on deficiencies and problems so that he can get executive officers to take action. Monitoring – quality of refresher courses of all staff connected with train operation, dealing with accident cases and arranging inquiries in connection therewith, ensuring implementation of various recommendations made by inquiry committees.

Function of safety councilors is to make personalized contact with and educate staff in observance of safety rules.They give talks on safety matters and hold meetings with staff in their jurisdiction. In addition they also carry out inspections of an intensive nature from a safety point of view.

5. Functions of the Safety Organization:

Although no comprehensive list can be made regarding essential pre-requisites required for ensuring safety some important items which can be readily listed out include the following:

(1) Framing of proper rules and regulations for train running.

(2) Proper training of train passing and running staff.

(3) Proper training of safety category staff of other departments.

(4) Timely medical/night vision, psychological testing etc.

(5) Provision of essential safety equipment.

(6) Ensuring maintenance of assets in good fettle.

(7) Installation of mechanical/electronic safety devices.

(8) Technological upgradation and innovations.

(9) Identifying unsafe practices in the system.

(10) Monitoring, counseling and periodic screening of staff.

(11) Conducting various types of inspections.

(12) Conduction ambush checks, surprise night inspections.

(13) Launching of periodic safety drives.

(14) Preventing carriage of inflammable/explosive materials in trains.

(15) Monitoring follow-up action on recommendations made

(16) Statistical analyses of long-term trends of accidents.

5.1 Framing of rules and regulations for train running:

Need for having rules and regulations:

In roadways as speeds are lower and braking distance are less, vehicles follow one another at close range without danger of collision. However in railways, speeds are high and braking distances are also more as compared to road transport. As such rules have to be framed in such a way that only one train is permitted between two stations, at any point of time This ensures that there is absolutely no chance of collision between two trains with in the same block section.

At stations a minimum of three competent staff are posted to ensure that two trains do not collide with each other at the time of reception and dispatch of trains. Station staff (Station Master, Switchmen, Cabinman etc.) are supposed to ensure proper setting of routes, locking of facing points and ensuring clearance of berthing track physically, to avoid any collision between trains. However, since 60-70% train accidents are caused due to human failure, 92% of stations have been provided with interlocking to facilitate safe reception and dispatch of trains Electro-mechanical aids in the form of track circuits slots, slide controls etc. are also provided.

Existing system of train running as described above, is required to be worked according to certain rules. These rules have been codified, published and supplied to each staff of departments concerned. This ensures that every person knows his duties and responsibilities.

Revision of rules is Man on-going process and they are continuously amended, edited, or weeded out to suit requirements of the growing system. Whenever any shortcomings come to light they are suitably modified to cater for new developments.

(ii) Authority to frame rules:

Under the Indian Railway Board Act 1905, Railway Board is authorized to make General Rules for operation of Railways. Responsibility for safety in working and operation of railways rests solely with Railway Board and Zonal railway authorities.

Important manuals and rule books pertaining to train running are as follows:

(a) General and Subsidiary Rules (G&SR).

(b) Operating Manual.

(c) Block Working Manual.

(d) Accident Manual.

(iii) General and Subsidiary Rules:

General Rules carry the sanction of Govt. of India. The authority to issue General Rules vests with Railway Board and any modifications or revision to these rules must have the personal approval of Member Traffic, Railway Board. A general Rule can only come into force after it is duly notified in Gazette. Copy of Gazette notification is circulated to Zonal Railways.

Subsidiary Rules on the other hand are framed by individual zonal railways for taking care of peculiar local conditions pertaining to that particular railway. Authority to issue Subsidiary Rules vests with Zonal Railway and modifications to these rules must have approval of Chief Operations Manager. These are also legally binding on the staff.

An important functions of safety organization is to periodically update and revise existing rules pertaining to train running. Revisions are undertaken as a result of shortcomings highlighted during accident inquiries, or suggestions received.

For example, earlier duties of gateman involved only opening and closing of L-Xing gates for passage of road traffic. To ensure greater safety, G&SR was modified laying down that gateman, in addition to opening gates will also watch safe running of trains. In case of any unsafe condition noticed by gateman, he exhibits danger signal to the train guard and also advises station in advance. As a result of these changes, a competent railway staff is always watching safe passage of trains every 2 to 2.5 Km.

(iv) Operating, Block Working and Accident Manuals:

These three Manuals pertain to train operations with regard to:

(a) Rules for train operation. These include duties of station and running staff, working of trains, control offices, marshalling yards etc.

(b) Block Working Rules governing the movement of a train from one block station to the other.

(c) Accident management including classification, reporting, relief, restoration, accident inquiries and finally disciplinary proceedings.

(v) Station Working Rules (SWRs):

SWRs are issued for individual stations for regulating its working. It is a combination of working instructions and compendium of relevant rules given in manuals as applicable to that station. The format of SWRs are given in Operating Manual of Zonal Railways. The practice with regard to the issue, revision and reissue of SWRs varies. While on some railways SWRs are revised and reissued only after three correction slips, on other railways these are revalidated every 3 to 4 years, regardless of number of correction slips issued.

5.2 Proper training of train passing and running staff:

Proper training of staff is of paramount importance as far as safety is concerned. Extensive training is given to all train passing (ASM, Switchman, Cabin man) and running staff (Drivers, Guards etc.) in order to make them thoroughly familiar with rules enforce.

(i) Zonal Training Center:

Well established Zonal Training Centers exists on each Zonal Railway wherein training in transportation rules is imparted to staff. Theses ZTCs are equipped with suitable training infrastructure for ensuring effective training. Training is imparted through modern means like computers, projectors, slides, audio-visual aids etc. Trainees are imparted extensive training regarding train operation both under normal as well as abnormal conditions. During various lectures staff are also made familiar with real life examples by means of case studies and analysis of some serious accident cases along with implications and lessons learnt thereafter.

Apart from theoretical lectures staff are also given practical training in well equipped model room in ZTCs. Model room contains working models of locomotives, coaches, wagons etc. It also contains different types of signalling systems including RRI, Automatic Signalling and various other types of Block Instruments being used on railways.

(ii) Divisional Safety Schools:

While training of Class III staff is centralized and is carried out at ZTCs, Class IV staff are trained at Divisional Safety Schools. Divisional Safety Schools exist on each division for imparting training in transportation rule to class IV staff. During lectures staff are made familiar with common mistakes made by them resulting in accidents. Real life examples are given from some recent accident cases.

Since Divisional Safety Schools do not have model rooms practical training is given to trainees by taking them out on line and actually demonstrating to them the different systems.

(iii) Safety Camps:

Safety camps of 3 days duration are held on a regular basis and these are attended by train passing and running staff once in 3 years. Safety Camps for both class 111 and class IV staff area conducted at the Divisional Safety Schools in respective divisions.

(iv) Initial Induction Courses:

Staff belonging to safety categories undergo an initial training course whose duration varies depending on their category. During these courses staff are given intensive training regarding rules pertaining to train operation in addition to their own duties and responsibilities. No freshly recruited staff or staff newly promoted to a particular

category is allowed to perform duty unless he has attended and qualified in the initial course meant for that particular category of staff.

(v) Refresher Courses:

Training of an employee does not end with his having learnt rudiments of his job during initial training. Training is an ongoing process and continues throughout his service. For this purpose after a few years of experience, employee goes back to training school to refresh his knowledge, get new ideas, learn new techniques and compare what is being done on the line with what should be done. Apart from this, he also compares notes with colleagues from other places and get his doubts and misunderstandings clarified from instructors. Train passing staff undergo refresher course once every 3 years and obtain a competency certificate. No staff is allowed to perform duty unless he is in possession of a valid competency certificate.

Refresher courses have now been introduced for all categories of staff including those for whom earlier it was not mandatory. This includes categories like motor trolley drivers, TTM operators etc.

(vi) Promotional Courses:

Since an employee needs more advanced training, the higher he rises in the hierarchy; training of an employee due promotion to next higher grade is built into the system. Promotional courses are organized for staff who undergo it as a prerequisite for promotion. This serves the purpose of improving their level of safety consciousness. It also enables them to have up to date knowledge of rules and equips them with advanced knowledge required for their new job.

(vii) Use of Video films:

Efforts are continuously made to improve quality of training being imparted. Video filming of important aspects of train working is undertaken in order to include these as part of training courses and thereby ensure better quality training. Short videos of about 20 minutes duration prepared for different categories show mistakes commonly made by them resulting in accidents. These are periodically shown in the field to improve safety consciousness.

(viii) Seminars and Workshops:

Seminars and workshops on various topics are regularly organised. Seminars are held either at station level in which common subjects concerning more than one category of staff are discussed. At divisional level seminars area held for different categories so as to highlight common problems and difficulties faced by them. Seminars at hdqrts., are used as brain storming session for generating new ideas ands problem solving.

(ix) Handbook of DOs and DONTs:

Category-wise handbooks are an indispensable part of educatioinal process and safety

organization ensures that these are available and periodically updated. DOs and DONTs for various categories of staff are prepared, printed and issued laying stress on different aspects of their duties so as to serve as contsant reminder to them.

(x) Safety circulars and bulletins:

Safety circulars and quarterly safety bulletins are issued from divisions and hdqrt. office, These highlight recent accident cases and lessons learnt from them. Important issues relating to safety, latest instructions and circulars are given wide publicity through these safety bulletins. Files containing consecutive issues of safety bulletins are maintained at all work places such as stations, running rooms, lobbies etc. and these are persued by staff concerned.

(xi) Safety posters:

Safety posters containing essence of rules related to safe working are displayed at work places as a constant reminder. These are displayed at stations, cabins, gate lodges, running rooms, lobbies etc. where they serve as a quick reference guide. These posters are used, especially after a serious accident, for conveying messages regarding shortcut methods and unsafe practices to be avoided.

5.3 Training of staff of other departments:

Training regarding rules and technical training is imparted to staff of other departments. For running staff, simulators have been provided at Diesel and Electric training schools. They area used for imparting initial training to drivers. During refresher courses also, simulators help them in improving their engine-handling and driving skills under different condition.

IR have introduced sophisticated equipment in various fields of railway operation, viz., signaling, motive power, rolling stock, permanent way etc. Modern gadgets require technically qualified and trained staff for handling and operating them. In view of this the earlier practice of imparting on the job training during the courses of installation of the equipment has been dispensed with and training programs are developed by respective departments.

5.4 Periodic Medical Examination and Psychological testing:

(i) Periodic Medical Examination:

All running, train passing and safety category staff of other departments are subjected to Periodical Medical Examination. PMEs are carried out once every 4 years up to the ages of 45 years and thereafter once every 2 years up to the age of 55 years and beyond that once every year. PME also includes tests for night vision and colour blindness. Staff who fail are declared unfit. They are medically de-categorized and are absorbed in categories whose medical criteria is less stringent.

(ii) Breathalyzer Tests:

Drivers are subjected to breathalyzer tests for alcoholic drinks at the time of signing on and signing off in order to ensure that they are not under the influence of alcohol while on duty. During surprise inspections, particularly night inspections, train passing staff are also subjected to breathalyzer tests by inspecting officials.

(iii) Psychological testing of staff:

Psycho test in certain categories for determining suitability to particular jobs have been introduced for quite some time. Psycho Technical Cells on each zonal railway conduct psycho tests at the time of recruitment as well as promotion for safety category staff. They assess the essential psychological attributes possessed by an employee to be able to carry out the job in a safe manner. Theses include tests of intelligence, personality, distribution of attention, concentration, form and depth of perception, reaction time and other attributes special to each category.

5.5 Provision of safety equipment staff:

Train passing and running staff are provided with certain essential equipment required for discharge of their duties. These include items which are either part of guards or driver's equipment, or part of station safety equipment, or part of L-Xing equipment. Their availability is monitored during various inspections.

5.6 Ensuring maintenance of assests in good fettle:

This subject has been dealt with under the heading "Role of other departments in improving Safety".

5.7 Installation of mechanical/electronic safety devices:

(i) Flasher Lights on Locomotives:

Flasher light on Locomotives is an important safety device for saving multiple accidents. It is positioned to the right of headlight at the same level. When switched ON it emits an amber light of high intensity.

Driver of an accident affected train (or of any other train which is in distress) must immediately switch ON his flasher light to warn drivers of trains approaching from the opposite direction that his train has met with an accident and the adjoining track is likely to be fouled. This is the first action which a train driver is supposed to take after his train has met with an accident especially on double/multiple line sections.

Visibility of amber coloured flasher light is as follows:

(a) With headlight in ON position : 600mts.

(b) With headlight in DIM Position : 1.5kms.

(c) With headlight in OFF position : 4.5kms.

On numerous occasions, flasher lights have prevented multiple accidents.

(ii) Automatic switching ON of Loco flashers:

In the above system, loco flasher has to be switched ON by the driver after an accident. However, there is some time gap between occurrence of an accident and the driver realizing the same and switching ON his flasher.

An electrical circuitry has now been introduced which enable automatic switching ON of loco flasher in case of derailment resulting in train parting.

(iii) Improved Locomotive headlight:

Loco headlights presently available have visibility of 250mts. Taking into consideration reaction time of the driver and emergency braking distance of 600 mts., this visibility is inadequate. New headlights have now been developed having improved visibility of around 500 mts. This would enable train drivers to reduce the speed of their train from 100 kmph., to around 30 kmph after sighting an obstruction on the track.

(iv) Audio visual indicators on locomotives:

All air braked locomotives have been fitted with audio visual indicators for giving warning of drop in air pressure due to alarm chain pulling, train parting etc. this will enable the driver to immediately stop his train in case of emergency communication from passengers.

(v) Vigilance control device on locomotives:

Vigilance control device has been provided in locomotives of Shatabdi/Rajdhani Expresses ands on DMU trains to enhance alertness of Drivers and Asstt. Drivers.

(vi) Flasher Lights on the rear of SLRs:

Flasher lights on SLRs will ensure that in case of any out of course detention to a passenger carrying train in the block section, the guard can immediately switch the flasher light to ON position and thereby protect his train from the rear. This will provide yet another safeguard against rear end collisions which are basically due to cases of human failures.

5.8 Technological up-gradations and innovations:

(i) Flashing Tail Lamps:

Electronic LED based Flashing Tail Lamps have been provided to guards. This type of battery operated electronic lamps are a technological upgradation and their visibility is around 1.5 kms as against 400 meters for conventional kerosene lit tail lamps. With this range of visibility the driver of a train entering any lock section gets adequate pre-warning for controlling his train in case the section ahead happens to be blocked.

(ii) Flashing Hand Signal Lamps:

Electronic LED based Flashing Tricolour Hand Signal Lamps have also been provided to guards. In this case also visibility is around 1.5 kms as against 400 meters for conventional kerosene lit hand signal lamps. Presently, the above hand signal lamps are being supplied to drivers ands guards. Thereafter, they are planned to be supplied to staff on stationary duty at stations, cabins, yards etc.

(iii) Flashing Gate Signal Lamps for Level Crossing Gates:

Electronic LED based Flashing Gate Signal Lamps for Level Crossing Gates having 1.5 kms visibility have been successfully tested during field trials and are being installed.

5.9 Identifying unsafe practices in the system:

(i) Vacancies in essential safety categories:

Shortage of staff in safety categories has been the bane of railways. Despite repeated emphasis and special efforts at the field level, vacancies continue to be to some extent or the other. Although such vacancies have never featured as the cause of any accident, nevertheless, this is an undesirable feature of railway working.

(ii) Overtime working:

Closely related to vacancies is the phenomenon of overtime. Despite great stress being laid on working conditions of staff, excessive duty hours of staff has not received due attention on account of continuing vacancies. There have been accidents where it was found that staff had been working for more than 16 hours leading to excessive fatigue and loss of concentration. The subject of overtime working and vacancies is periodically reviewed so that the incidence of excessive hours of work is reduced to the minimum.

(iii) Duty hours of running staff:

The problem of overtime working in case of field staff translates to over hours duty in case of running staff. Continuous duty for running staff should not ordinarily exceed 10 hours at a stretch but such duty may extend up to a maximum of 12 hours provided the appropriate authority gives at least 2 hours notice before the expiry of 10 hours., to the concerned staff. On a fortnightly basis their overall duty hours should not exceed 104 hours. Notwithstanding the fact that schedule of trains are prepared as per rules, in many cases, actual duty hours exceed the stipulation resulting in long hours of duty of goods train drivers.

(iv) Staff overdue refresher courses:

A fallout of vacancies in safety categories is large number of staff overdue refresher courses. Backlogs arise for two main reasons. Firstly, going on training has never been popular with the staff irrespective of who has to go and where he is required to go. As such there is a general reluctance on their part to go on training. Secondly, due to shortage of staff, supervisors find it difficult to spare them in time since relief position

is always critical. This is an undesirable situation. Safety organization monitors the number of staff overdue for refresher training.

(v) Condition of Running Rooms:

The condition of running rooms and facilities provided in them have an important bearing on safety. Since drivers are under pressure to perform at their optimum level, railways ensure that they get their due rest under reasonably relaxing conditions. The state of maintenance and facilities provided in running rooms are conducive to providing them full and complete rest. Running rooms are periodically inspected by safety officers and supervisors for improving their conditions and bringing them up to the mark.

(vi) Running of trains without guards/brake vans:

This is another off shoot of shortage of staff. Whenever there is a shortage of guards trains are run without a guard. As per G&SR, running of trains without a guard or brake van is permissible, subject to certain safety precautions being taken. However, there is always the danger that this relaxation is likely to be misused. Once staff gets used to running of trains without a guard or brake van there is possibility that this practice will fall into the general pattern of train running. It is likely to be resorted to without fulfilling requisite pre-conditions for ensuring safety.

(vii) Time Tabling mistakes:

In certain cases, unsafe situations arise due to mistakes made in time tabling. There have been case where normal running time was less than minimum running time resulting in over speeding by the driver to ensure right time arrival.

Another instance arises when acceleration and deceleration time provided is inadequate especially at major junction stations. Here again there are chances of the driver losing time on run and thereafter over speeding to maintain the schedule. Such instances of incorrect time tabling are rectified in order to eliminate unsafe situations.

(viii) Shortage of stores:

There are complaints in workshops/C&W maintenance depots regarding poor supply position of components required for repair and maintenance of rolling stock. Due to shortages, cannibalization is resorted to.

(ix) Theft and vandalism:

One factor which has assumed great importance in recent years is the disturbed law and order situation in the country. In certain parts of the country this has become a real menace to safety.

Perhaps, the most serious aspect that affects safety adversely, is rampant pilferage of railway property. Thefts of signal gears, telephone wires, track fittings, rolling stock components and even wires and fittings from overhead electrical installations is gradually becoming common place. Such thefts pose direct hazards to trains by

rendering safety devices and signalling inoperative. They also create indirect hazards by making it impossible to maintain rolling stock, track and signalling gears to the required safety standards. One of the main reasons for shortage of stores for maintenance of rolling stock is the increase in requirements due to large scale thefts.

(x) Financial Constraints:

A major threat to safety on railways arises from the fact that adequate financial resources, facilities and materials are not available for optimum upkeep of existing track, rolling stock, signalling equipment etc. At the same time, railways area under constant pressure to extend services, lay new lines etc. A judicious balance has to be struck between meeting people's demands on one hand and capability of railways to devote adequate resources for proper upkeep of assets on the other.

5.10 Monitoring, counseling and periodic screening of vulnerable staff:

Review of serious accidents has repeatedly brought out the fact that failure of railway staff is the main cause for largest number of serious accidents. In the category of important accidents it has been analysed that around 95% of collisions and about two-thirds of derailments were due to failure of railway staff. This highlights the importance of human element in railway safety.

(i) Monitoring of staff:

Safety organization monitors the performance of staff to identify those who are 'accident prone', these include staff who are weak in rules and its implementation or those who are safety hazards in view of their past record of adopting unsafe practices and short cut methods. During various inspections these identified staff are specially targeted with a view to evaluating their on line performance. In case they are still found to be requiring more inputs, they are booked for undergoing refresher training.

(ii) Counseling of staff:

Staff counseling is of paramount importance for ensuring safety. For this purpose, trained persons of various disciplines are selected for the post of safety councilors to counsel the staff regarding various safety aspects, rules, implementation etc.

(iii) Periodic screening of staff:

Staff in safety categories are required to be periodically screened by their supervisors regarding adequacy of their knowledge for safe working. Based on these screening staff are categorized into 'A', 'B' or 'C' categories. Grade 'A' is given to those whose knowledge regarding rules, performance etc. is found to be excellent. Grade 'B' is given to those found good. Remaining staff whose performance is required to be kept under watch are graded as 'C'.

Drivers are given green, yellow or red cards depending upon their categorization. Those receiving red cards are intensively counseled and sometimes even sent for Refresher

Course immediately. Similarly, train passing staff placed in 'C' category are counseled and sent for training courses.

5.11 Conducting various types of Inspections:

Accidents caused by staff are attributable not only to their lack of knowledge of rules but also to their negligence and carelessness in observing them; combined with the failure of their supervisors to detect them in time and to correct them by close and detailed checks.

It is essential that prescribed systems are constantly monitored to ensure that they are followed by one and all, in an efficient and effective manner. Department-wises detailed check-list of various inspections have been issued. These specify areas to be covered in a fool proof manner.

Jurisdiction of supervisors of different departments have been revised and measure of uniformity accomplished. By local adjustments modular matching of jurisdiction of supervisors of all departments has been brought about. This means that for the same section there would be the same Traffic Inspector, the same Permanent Way Inspector, the same Signal Inspector etc. Thus they would form a permanent team for the section and each supervisor would have to deal with only One counterpart of his from the sister departments. This is a major deviation from the earlier system where one TI had to sometimes deal with as many as 3 PWIs for his entire section. The above modular matching has also helped in enabling supervisors to undertake joint inspections of their respective sections and there by solve inter-departmental problems on the spot.

5.12 Conducting surprise night inspection and ambush check:

One of the objectives of inspections is the element of surprise which is attached to it and the opportunity to observe and evaluate performance of staff under actual working conditions. For this purpose it is essential to undertake surprise night inspections at work places in isolated areas like road side stations, L-Xing gates in block section etc. Staff found sleeping on duty, adopting unsafe or shortcut methods and general violating laid down safety norms are counseled, warned or even taken up.

There are a number of checks which can never be conducted during regular inspections. For example, during footplate inspection, drivers normally tend to follow laid down rules since there is an inspecting official on the locomotive. Under such circumstances it would never be possible to find out whether that driver follows the laid down rules regarding passing an automatic signal at danger. The only way of identifying such defaulting drivers is by means of ambush cheaks. In this particular example, such ambush checks would be conducted from the ground by standing near an automatic signal post that has been deliberately put in the ON position for the duration of this check.

5.13 Safety drives:

Weak areas from safety point of view are identified and targeted for special attention. For this purpose safety drives are launched for periods of 15 days to one month. These safety drives are generally ordered by divisions based on shortcomings observed during routine inspections, or by zonal hdqrts., based on repetitive causes of accidents. Following a major accident, safety drives are also launched by Railway Board.

During safety drives, attention is paid to monitoring of specific areas requiring attention. Safety councilors of various disciplines are deputed to counsel staff on aspects for which safety drives have been launched.

On completion of safety drive, reports are examined, and consolidated. Corrective steps are then listed out and remedial measures adopted.

5.14 Preventing carriage of inflammable materials in trains:

Fire in trains is a cause of casualties as and when such accidents occur. While a few cases are attributable to electrical short circuiting, majority of cases are due to carriage of inflammable/crackers in trains. Presence of open flames carried by vendors etc. is a perennial source of fire. Responsibility for such accidents have to be shared by both railways and travelling public.

Safety organization educates public by means of posters, advertisements in newspapers, radio spots and quickies on televisions etc. highlighting the risk which passengers are exposing themselves to by such wanton acts of recklessness.

5.15 Monitoring follow-up action on recommendations made:

Safety organization monitors follow-up action on recommendations made by accident enquiry committees. Registers are maintained, containing list of short, medium and long term recommendations made and progressive stages of their implementation by departments involved.

The highest priority is given to recommendations made by CRSs which have been accepted by railway administration. Compliance of these recommendations are given to CRS within a time bound period. Follow up action on recommendations made by other inquiry committees are similarly monitored.

5.16 Statistical analyses of long-term trend of accidents:

Regular statistical analyses of long-term trend of accidents are carried out by safety organization. These indicate vulnerable sections where certain types of accidents are repetitively occurring. They also indicate vulnerable categories who are more prone to accidents thereby highlighting the need for improving the quality of training presently being imparted.

6. Role of other departments in improving Safety:

Departments concerned with safety are Civil Engineering, Mechanical Engineering, Signal Engineering, Electrical Engineering and Operating. In order to ensure safety, it is necessary that each department should do its bit in the best possible manner. Civil engineering department must ensure that the track is properly maintained. Mechanical department must ensure that locomotives, coaches and wagons are in good fettle. Similarly Signal and Electrical departments must ensure that their equipment functions properly. Lastly, the department responsible for transportation which is the end product of all railway activity must take care that train movement takes place according to laid down rules as trains pass from one station to another.

6.1 Civil Engineering:

Some derailments take place on account of rail fractures/weld failures during winter and buckling during summer. Accidents also take place on account of failure to maintain proper track geometry. The health of railway track is important from point of view of safety, comfort of rail travel, and also life of rolling stock and locomotives. Following action has been taken for improving maintenance of track, as a result of which train derailments on account of Permanent way have come down considerably.

6.1.1 Track Renewal:

Track renewal is not only an aspect of maintenance, it has an important bearing on safety.

In 2013-14 2885, 2014-15 2424 and 2015-16 2794 Kms of track was renewed. As on 08-06-2017, Indian Railways has total track length of 61503 Km (BG) and 3978 Km (MG).

6.1.2 Upgradation of Track Structure consisting of pre-stressed Concrete (PSC) sleepers, 52 Kg/ 60 Kg high strength (90 Kg/ mm2 ultimate tensile strength) rails on concrete sleepers, fanshaped layout on PSC sleepers, Steel Channel Sleepers on girder bridges has been adopted on most of the routes.

6.1.3 Standardization of track structure with 60 Kg Rails and PSC Sleepers:

Track structure is being standardized with 60 kg rails and PSC sleepers on all the Broad Gauge routes, especially on high density routes to reduce fatigue of rails under higher axle-load traffic. New track construction and replacement of over-aged tracks is being done by PSC sleepers only.

6.1.4 Long welded rails:

For improving maintenance and better asset reliability, Railways are consistently eliminating fish plated joints on tracks by welding the joints to convert all single rails into long welded rails to the extent possible. During relaying/construction of new lines/ gauge conversion also, long welded rails are laid on concrete sleepers to the extent

possible. Mobile Flash Butt welding is being done on priority in construction projects and through weld renewal works. Mobile Butt welding plants are being arranged in Zonal railways for welding work of construction/Open line. Turnouts are also being improved systematically. Now Thick Web Switches are being used to improve asset reliability and to cope with higher axle load and increased volume of traffic. Now Weldable Cast Manganese Steel Crossings have been planned to be provided on identified routes in a phased manner to improve asset reliability and to cope with higher axle load and increased volume of traffic.

6.1.5 Flash Butt Welding :

There is progressive shifting to Flash Butt Welding which is superior in quality as compared to Alumino Thermic (AT) welding.

6.1.6 Ultrasonic testing of rails and welds:

Other measures taken in this direction include use of modern diagnostic aids like Digital Ultrasonic Rail Flaw Detectors (USFD), track recording cars, use of on-track machines for maintenances of track to higher standards controlling/reducing rails and weld failures and ensuring quality of rails during manufacture. Analogue type USFD machines have been replaced with digital type machines which have the facility of freezing scan and storing data during rail and weld testing. Vehicle Borne USFD Testing of Rails/Welds is also planned to test about 30400 Track km length on Rajdhani route which is capable of on line recording of data and run over run analysis, by which defect growth rate can be monitored and timely action taken to remove such defects before it actually fails.

6.1.7 Monitoring of track structure:

Along with modernization of permanent way, methods of track maintenance have undergone improvement. Maintenance with heavy on track machines and directed track maintenance have been introduced in a big way. Major strides have also been made in inspection and monitoring by mechanized means.

For monitoring of track geometry and running characteristics of track, sophisticated track recording Oscilliograph cars and portable Accelerometers are used. Track maintenance practice has been standardized and track is regularly maintained by qualified P-Way Inspectors and their staff. AEN/DEN/DSEs monitor quality of maintenance on a regular basis and take corrective measure.

6.1.8 Mechanized Track Maintenance:

Conventional manual maintenance, has been replaced by mechanized track maintenance on trunk routes. Different types of Track Machines area presently being used. These include Ballast Cleaning Machines, Tie Tamping Machines, Track Relaying Machines, etc. Rail Grinding Machines are working on high density routes of Indian Railways for enhanced reliability of Rails.

6.1.9 Integrated Maintenance Blocks on main Line Sections:

Maintenance corridors have been provided on main line sections and Integrated Maintenance Block are provided for Civil Engineering, Electrical TRD and Signal departments in order to ensure proper maintenance.

6.1.10 Joint Inspection of Points & Crossings

Majority of derailments occur on points & crossings due to defects on either Engineering or S & T account. A system of joint inspection of points & crossings by PWI and SI is undertaken. For this purpose a "Joint Inspection of Points & Crossings Register" is maintained in Station Master's Office so that it can be easily inspected by Inspecting Officials. Separate pages are allocated for each Point & Crossing and data on important aspects are entered during each such joint inspection. Corrective action taken regarding deficiencies noticed, if any, are also jointly certified.

6.1.11 Video Filming of sections for quicker restoration work:

In order to ensure speedier restoration work after an accident has occurred, work of video filming of main line sections is proposed to be taken on hand. Video filming will be done from loco cab and dept in control offices. This will give a graphic visual of site conditions so that requisite relief arrangements can be undertaken with minimum of delay without waiting for officers to reach the site.

6.2 Mechanical:

Main C & W defects responsible for derailments are broken springs or suspensions, broken axles or journals, defective wheels or tyres and breakage of undergear, vacuum or brake fittings. Proper maintenance of rolling stock is important not only from the point of view of safety and comfort of rail travel. It also contributes significantly to the life of rolling stock, locos and p-way.

Specifications of springs have been revised to provide better tolerances for their manufacture and repair. The type of steel being used for their manufacture has also been improved. As far as breakage of axles, joints, under gear parts and brake fittings are concerned use of non-destructive testing methods has been extended and additional flaw detecting equipment procured. With greater use of these equipment it is possible to reduce the extent of failures in service.

6.2.1 Coaches/wagons and their maintenance:

6.2.1.1 Centre Buffer Coupler:

Progressive fitment of tight lock Center Buffer Couplers (CBC) in lieu of screw coupling on new manufacturing of ICF design coaches has been carried out with a view to prevent the coaches from climbing over each other in an unfortunate event of an accident. So far, 4,400 LHB coaches, 425 Hybrid Stainless Steel Coaches & 1,340 conventional ICF design coaches have been manufactured with CBC. Design of CBC has been

upgraded to mitigate the problem of jerks during acceleration/ deceleration of trains.

6.2.1.2 Crashworthy features of Passengers Coaches:

To improve upon the standards of safety, a "crashworthy" ICF coach design, in conjunction with a Centre Buffer Coupler (CBC) , was evolved. Such a design enables absorption of significant amount of energy during the impact/collision. About 530 such crashworthy ICF design coaches have been manufactured so far. LHB AC Double Decker coaches introduced first time on Indian Railway have also been provided with enhanced crashworthy features. On similar lines, principal design for a crash worthy LHB coach shell has been manufactured and crash test for design validation on this coach has been completed at RDSO. Enhancing crashworthiness of coaches therefore remain continuous endeavour of Indian Railways which minimizes injury/loss of life in the event of collision when compared with ICF designed conventional coaches.

6.2.1.3 Progressive use of Air Springs:

For enhancing safety and reliability of passenger coaches, the suspension systems are being redesigned with air springs at secondary stage capable to maintain constant height at variable loads. Air springs have been developed and are being fitted on all the newly built EMU & DMU coaches for sub-urban trains. Air springs have now been developed for mainline coaches as well and have been fitted in limited number of coaches. In future, more coaches inducting LHB coaches have been planned for provision of Air spring.

6.2.1.4 Proliferation of LHB coaches for improving Safety:

LHB type coaches have interior crashworthy and anti climbing features. There is plan for complete switchover to production of LHB type coaches in future. Hitherto these coaches were inducted into premier services such as Rajdhani, Shatabdi and Durantoes but now these are also being inducted into Mail & Express trains as well.

6.2.1.5 Provision of Automatic entrance doors and Bi directional swing doors in coaches:

Provision of Automatic entrance doors have been planned on coaches to prevent accidental falling of passengers from running trains. One air-conditioned EMU (Electric Multiple Unit) rake with Automatic doors, similar to Metro coaches for Mumbai, Western Railway has been manufactured at Integral Coach Factory (ICF) Chennai. ICF has turned out coaches for Kolkata Metro with Automatic door closure mechanism. Automatic entrance doors have been provided in the design of coaches of one Linke Hofmann Busch(LHB) rake with a higher speed potential of up to 200 kmph. Besides, for faster evacuation in case of emergency, AC compartment doors have been made with Bi- directional swing and fitment started in newly manufactured coaches. Retro fitment is also being done in all AC coaches in a progressive manner.

6.2.1.6 Improvement in wagons:

8-wheeler wagons having roller bearing axles, improved designed bogies, central buffer

couplers and air braked systems with greater strength and stability features area manufactured. Improved bogie structure is not only heavier and thereby more stable but is also able to withstand higher speeds thereby reducing chances of derailments. Existing lot of 4-wheeler wagons are being gradually phased out.

6.2.1.7 Standardization of maintenance:

Maintenance practice for coaches and wagons have been standardized. Mail/Express/ Passenger trains are examined at their primary and secondary maintenance depots. Separate rake links have been issued for long distance superfast mail/Expresses and short distance passenger trains thereby ensuring improved level of attention for the former. Besides this, induction of new type of DMU, MEMU rakes which require less frequent but more intensive maintenance has also insured quality output.

6.2.1.8 Improvement in Brake Power:

In cases of accidents that are attributed to failure of drivers, the absence of adequate brake power sometimes constitutes a contributory factor. This is partly due to the increase in trailing loads and higher speeds.

New coaches being manufactured are Air Braked. With induction of these technically superior coaches into Mail/Express fleet, 100% brake power of passenger carrying trains is ensured thereby reducing chance of an accident. Train guards have now been given portable vacum gauges/air pressure gauges as personal equipment thereby ensuring that level of vacum/air pressure in SLR/Brakevan are continuously monitored.

6.2.1.9 Rationalization of Pattern of Examination:

With end to end running of freight trains and longer engine runs, the earlier concept of examination of a freight train every 500 kms. or so has changed. The pattern of examination of freight train has been revamped as per streams of inter railway traffic. Nominated examination points have been identified for specific streams of traffic in order to ensure that no train escapes examination.

6.2.1.10 Automation of workshops and depots:

For improving rolling stock condition, infrastructure facilities at Workshops, Coaching Maintenance Complexes, Wagon Maintenance Depots and Sick Lines etc. have been upgraded and augmented. Regular and periodic maintenance of coaches and wagons e.g. Routine overhaul (ROH), Periodic Overhaul (POH), Non-Periodic Overhaul(NPOH) etc. have been introduced. Manufacture of bearing spring of coaches and wagons has been centralised in nominated workshops to ensure quality and reliability of springs. Special attention is being given to brake gear, roller bearing and bogie frame repairs during ROH/POH. To prevent cases of cold breakage of journal all ROH depots have been equipped with ultrasonic testing equipment for timely detection of cases of flaws developing in axles.

6.2.2 Locomotives and their maintenance:

Infrastructure facilities at Locosheds have been upgraded for ensuring better maintenance of locomotives. Loco maintenance practice have been standardized. Periodic maintenance of loco like trip, fornightly, quarterly, monthly ROH/POH etc, are being ensured by close monitoring.

6.3 Signal and Telecommunication:

Railway differs from other forms of locomotion as the train remains confined rigidly to the track. The driver has no option in regard to his course and can avoid a collision only by stopping. Even when there are a number of tracks over which he can take his train, the choice does not rest with him but with station master. Therefore, responsibility for safety of a train is shared between the station master and the driver. To provide necessary coordination between the two is the function of signaling system.

The object of modern signaling is to give the driver accurate and clear information regarding the state of the line ahead. This information must be communicated to the driver in such a manner that he can obey them within the time and distance available to regulate his train. Following action has been taken for improving the maintenance of signaling gears.

6.3.1 Route Relay Interlocking (RRI):

RRI is a technological upgradation and reduction of dependence on human element. In order to minimise cases of collisions due to conflicting movements in major passenger terminals, multiplicity of conventional cabins are replaced by RRI.

6.3.2 Panel Interlocking (PI):

Panel Interlocking is yet another technological upgradation which reduces dependence on human element. All cabins at road side stations are progressively being replaced by PI.

6.3.3 Track Circuiting of Main Lines:

Collisions which take place are cases of human failure. While block section collisions are likely to reduce as a result of provision of flasher lights on locomotives and SLR, as also introduction of electronic flashing tail lamps, cases of collisions within station section can be controlled by means of track circuiting, so that reception on blocked lines is not possible.

Track circuiting of the main line portions has been undertaken on a massive scale. Track circuiting ensures that as long as a vehicle is standing on the track it will not be possible for the ASM or Cabinman to lower reception signals even by mistake.

6.3.4 Track Circuiting between starter and advanced starter:

In order to further minimize cases of collisions within station section, work of track circuiting of portions of running line between starter and advance starter has also been undertaken recently. This being capital intensive, track circuiting is being provided

progressively.

6.3.5 Other Technological Upgradations:

A number of other technological upgradations are being undertaken with a view to reducing chances of human failure. Some of these are listed below.

(i) Block Proving Axle Counters:

Block working through axle counters are being tried out at stations on trunk routes. This ensures that instead of existing manual system of physical verification of last vehicle, axle counters will provide a fool proof check regarding the complete arrival of train.

(ii) Auto Reversal of Main Line Starter Signal:

Auto reversal on main line starter signal to 'ON' aspect has been provided. This ensures that the unsafe practice on the part of Switchmen of not putting back the starter signal after departure of a train is prevented.

(iii) Modification of Home Signal Slot:

Home signal slot circuit has been modified so that departure end cabin can give slot only after putting back to 'On' position the starter and advanced starter signals, which had been lowered for a preceding train.

(iv) SM's slide control on Advanced starter:

SM's slide control on Advanced starter has been provided at stations. This ensures that the final control regarding sending a train into the block section remains with ASM and not to the discretion of a Switchman.

(v) Provision of repeater signals with SM:

Provision of repeater signals for displaying aspects of Home, Starter and Advanced starter signals in the ASM's office has also been taken on hand.

(vi) Auxiliary Warning System(AWS):

In this system, advance warning about signal aspects is conveyed to the driver of a running train and the system automatically stops the train if the driver does not respond within a pre-determined time interval. This system has already been provided on the suburban sections of Bombay Area.

(vii) European Train Control System-11 (ETCS-11):

A pilot project of ETCS-11 was sanctioned for Palwal- Mathura section of Central Railway. This system is an advanced version of the AWS and conveys the aspect of approaching signals to locomotives and in case the driver does not reduce his speed when the signal is at danger, train brakes are automatically applied.

(viii) Anti Collision Device (ACD):

Another pilot project of ACD was sanctioned for extensive field trials on Jallandhar Amritsar section of Northern Railway. In this system equipment is kept on locos and brake vans and train brakes are automatically applied if two trains approach each other on the same line.

(ix) Block Proving Axle Counter (BPAC):-

To enhance safety, automatic verification of complete arrival of train, Block Proving Axle Counter (BPAC) is being provided at stations having centralized operation of points and signals.

(x) Automatic Block Signalling:

For augmenting Line Capacity and reduce headway on existing High Density Routes on Indian Railways, Signalling provides a low cost option by provision of Automatic Block Signalling. As on 31.03.2016, Automatic Block Signalling has been provided on 2,752 Route Kms.

(xi) Protection and Warning System (TPWS):

Train Protection and Warning System (TPWS) based on European technology ETCS L-1 is a proven ATP System to avoid train accidents/ collisions on account of human error of Signal Passing At Danger (SPAD) or over-speeding. As a pilot project, TPWS has been provided on Chennai-Gummidipundi Suburban Section of Southern Railway (50 RKms). In another pilot project on Hazrat Nizamuddin – Agra Section of Northern/ North Central Railway (200 RKms), commercial trials with 35 locomotives in nominated trains have been completed. Gatiman Express running at 160 Kmph on Delhi-Agra section has been equipped with TPWS. TPWS has also been provided on Dum Dum-Kavi Subhash section of Kolkata Metro (25 RKMs) and introduced in commercial service on all the EMU rakes. Work for provision of track side equipments of TPWS on Basin Bridge-Arakonam Section (67 RKms) of Southern Railway is under progress. Based on experience gained, TPWS has been approved for 3,330 Route Kilometers (RKMs) covering Automatic Signalling Sections of Indian Railways (IR). In first phase the implementation of TPWS works has been taken up on 1,244 RKms, automatic Signalling sections on Zonal Railways where EMU services ply with onboard equipments on EMUs rakes only. Further, Railways have been advised for implementation of the balance sanctioned work of TPWS on 2,086 Rkms on HDN-1/ HDN-2/HDN-3 Routes.

(xii) Train Collision Avoidance System (TCAS):

TCAS is being developed indigenously by RDSO for Collision Prevention as well as

Protection against Signal Passing At Danger (SPAD) by loco pilot. RDSO has finalized the Specification after successful proof of concept trials. Extended field trials with multi-vendor, interoperability features are being conducted by RDSO on 250 km section on South Central Railway. After completion of field works in the pilot section (250 Rkm), extended field trials on 2 pair of trains have commenced on 15.02.16. System's performance under field conditions is being monitored and corrective action being taken based on regular analysis of trial results by RDSO. Operational deployment of TCAS on Railways on Absolute Block Signalling sections will be considered after conclusion of the extended field trials successfully and safety validation of system to Safety Integrity Level-4 (SIL-4) by an Independent Safety Assessor (ISA).

(xiii) Train Management System (TMS):

TMS helps in real-time monitoring of trains in the control room. The arrival status of local trains is displayed on indicators installed on platforms in the form of a countdown (in minutes) to the train's arrival on the platform accompanied by automatic announcements on platforms. TMS has been provided on Mumbai suburban section of Western and Central Railway. TMS work is near completion on Howrah Division of Eastern Railway.

(xiv) Accidents at Level Crossings have been a major area of concern. Indian Railways have provided interlocking with Signals at 10,776 Level Crossing Gates to enhance the safety at Level Crossings. Initiative has been taken to Interlock Level Crossing gate with Train Vehicle Units of 20,000 and above.

6.3.6 Standardisation of maintenance:

With sophisticated gadgets coming into use and with technological upgradations of recent years it is becoming important to ensure that maintenance practices are rigidly followed. Maintenance practices of S & T gears have been standardized. These are being maintained by competent and trained technicians as per Schedule of Maintenance laid down for each gear.

6.3.7 Walkie – Talkie communication between driver, guard:

5 W hand held Walkie – Talkie sets have been provided to all drivers and guards for better communication between them on a running train. The range of theses sets is around 2kms.

6.3.8 Walkie – Talkie communication between running train and station:

Apart from the 5W Walkie – Talkie sets provided to running staff, railways are now providing 25W master sets of Walkie – Talkies at road side stations. These sets which are more powerful have a range of around 10 kms. and enable a train driver to keep in touch with stations on either side.

6.3.9 Train Radio Communication:

In order to provide mobile communication between the driver and guard of a running train and the station/control office staff, Train Radio Communication is being tried out as a pilot project. In case of an accident where the adjacent line has also been fouled, Train radio will ensures timely conveying of information by the train crew to both control office as also station staff.

Communication facilities between Driver, Guard and ASM of adjoining stations within 5 Kms. radius will be provided. All Shatabdi/Rajdhani expresses have now been provided with such communication and their further extension to other important trains will be done gradually depending on the availability of resources.

7. Level Crossings:

Level crossing accidents pose a danger primarily to road users. However, with higher speeds of trains and increase in traffic density for both rail and road, level crossings also pose considerable threat to safety and efficiency of train operations. It is in this context that provision of improved safety measures for rail and road traffic at level crossings assumes importance.

6.25% of the Diesel Cess imposed by the Central Government is being passed on to railways for level crossing related works.

7.1 Manned Level Crossing Gates:

(i) Construction of Road Over Bridges (ROBs):

ROBs are to be constructed at manned level crossing gates having TVU of > 100000. At present there are more than 1000 manning level crossings which come in this category. With the creation of diesel cess and availability of more funds, construction of ROBs will be speeded up.

(ii) Interlocking of Level Crossing Gates:

In order to ensure greater safety at manned level crossing gates, some of the busier ones having very high traffic density are being progressively interlocked with signals on a planned basis. This will result in complete protection for both rail as well as road traffic since the train cannot pass the level crossing unless the gate has been closed and gate signal taken off.

(iii) Provision of Telephones at Level Crossing Gates:

Provision of telephones at manned gates is also a priority item from the safety point of view. This ensures timely advice to gateman regarding arrival of an approaching train and enables him to close the gate in time instead of depending on his own judgment.

(iv) Lifting Barriers:

Lifting barriers are an important facility which enable the gateman to quickly open

close the level crossing gate simultaneously on both sides. Leaf type of swing gates are gradually being replaced by lifting barriers thereby improving the safety at these crossings.

(v) Banner Flags:

Revised instructions have been issued that gateman at a manned level crossing gate will protect his gate by means of a banner flag when the same is in an open condition. The banner flag replaces the earlier red flag being used earlier which was smaller in size and not very visible. Use of the banner flag informs the train driver that the manned gate is in an open condition and enables him to bring his train to a stop before the level crossing gate.

7.2 Unmanned Level Crossings:

Responsibility for negotiating an unmanned level crossings, is that of road users, and they are required to stop short of the level crossing, observe that no train is approaching and thereafter cross the same. However, railway undertakes the following measures in order to enhance safety at unmanned level crossings:

(i) Shifting of Whistle Boards:

Recently instructions have been issued for shifting of Whistle Boards at unmanned level crossings on Single Line Sections from 600 mts. to 350 mts. This ensures that while approaching unmanned level crossings. train drivers whistle all the way from the W/L Board till the level crossing.

(ii) Train Actuated Warning Device:

For improving safety at unmanned level crossing gates installation of audio-visual alarm is being considered. A number of such equipments manufactured by M/s BEL have been installed in different sections of the Indian Railways.

(iii) Publicity and Public Awareness:

To educate road users about hazards of unmanned level crossings various types of publicity campaigns are undertaken by railways. This includes cinema slides, quickies on TV, posters, pamphlets, hand bills etc. Nukkad Nataks are staged in villages and video cassettes exhibited. Ambush checks are also being regularly organized along with.

(iv) Joint ambush checks:

Joint ambush checks are conducted along with road transport and police authorities to prevent disregard of rules by road users while negotiating level crossings. Such checks are also organized with the help of Bharat Scouts and Guides and other voluntary organization for educating road users.

(v) Whistling by train drivers:

As per statistics, most unmanned L-Xing accidents have following characteristics:

(a) 85% of trains involved are passenger carrying.

(b) Majority take place on single line sections.

(c) Most of them occur during daytime.

(d) 85% take place at level crossings having clear visibility

(e) 30% of road vehicles are tractor trolleys.

The above pattern indicates that road users have probably not got used to higher speeds of passenger carrying trains which cover 25 mts./sec. at 90kmph. While the train appears to be 150m or even 200m away, in actual fact it is only 6 to 8 seconds away. For this a twofold strategy is followed. Firstly, train drivers whistle continuously from W/L board to the L-Xing. Secondly, publicity campaign is undertaken to educate road users regarding this aspect of high speed train movement.

(vi) Innovative Publicity and Public Awareness Campaigns:

For purposes of better and wider publicity, Railways have obtained permission from oil companies for displaying L–Xing safety posters at retail Petrol Pumps. Railways have also obtained permission from State Governments for displaying L-Xing safety posters at Village Panchayat Offices.

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