



पश्चिम रेलवे  
Western Railway

# OPERATING MANUAL OF WESTERN RAILWAY

*( For official use only)*

**2008**

(Corrected upto CS no.10)

## PREFACE

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1. This is the 2<sup>nd</sup> issue of the Operating Manual of the Western Railway. The First issue was issued during January, 1961. There have been several changes in the operating system and pattern of working on the Railways which have come up due to technology - upgradation and modernisation. Many of the earlier instructions have become obsolete and thus needed to be deleted/modified. General and Subsidiary Rules have, in the meanwhile, been revised. Thus there was a need for revising the Operating Manual.
2. This Manual is intended for guidance of officials and staff concerned with the running of trains, mainly to focus on various activities connected with safe, efficient and economical transport of coaching and freight traffic on the Railways.
3. Obsolete provisions of the earlier Manual have been deleted or modified to suit present requirements of traffic patterns. Considering the increased stress being made of Safety and Accident Management a new chapter (Managing Disasters) has been added for guidance of the staff in the field during emergencies. They may find it very useful and handy.
4. The rules contained in this Manual do not supercede or alter in any way provisions of the General and Subsidiary Rules of this Railway or other statutory publications like Conference Rules, Tariff Rules, etc.
5. Every Railwayman, to whom a copy of this Manual is given, should go through it carefully. In case of any doubt, reference may be made to the Chief Operations Manager through normal official channels.
6. Any suggestions for the inclusion of any matter in this Manual or for the improvement or amendments of any particular instructions contained therein will be welcomed and should be addressed to the Chief Operations Manager through the normal official channels.
7. This Manual is meant solely for official use, and is not for the use or information of the public or for sale to the public..
8. For convenience of indexing and of reference, the system of numbering of the rules according to a four figure system in which the last two figures indicate the number of the rule and the remaining figure or figures, the number of chapter has been retained in this Manual also. Thus, Rule 101 means Rule number 1 of Chapter1 and Rule 1010 means Rule number 10 of Chapter-10 and so on.
9. This Manual supercedes Western Railway's Operating Manual, 1961 edition and abstracts thereof.

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**October, 2007**  
**Churchgate, Mumbai**

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**OPERATING MANUAL**


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CHAPTER – 1

**GENERAL INTRODUCTION TO TRANSPORTATION  
AND RAILWAY OPERATIONS**

**101 Scope of Railway Operations :**

The main objective of the Railway Operations is to provide (1) safe (2) efficient (3) speedy and (4) economic transport. In general, the word OPERATIONS brings together all the activities required to be undertaken for the working of the Railways. Operations in the stricter sense used on the Indian Railways means (a) Planning, Organising, Co-ordinating, Directing, Monitoring, Controlling and Supervising the activities connected with the movement and usage of all the rolling stock, viz. the engines, coaches, wagons and other vehicles that can be placed on the track and (b) handling the problems, which arise in the course of the movement of the stock and utilisation thereof as per the objectives, goals and priorities laid down from time to time. Railway Operations, therefore, calls for utmost devotion to duty, management skills and efficiency. Various assets, viz. P.Way, S&T facilities etc., Traction and Rolling Stock are planned and maintained and replaced by the Technical departments in co-ordination with the Operating Department.

**102 Functions of Operating Department :**

Operating Department has an important role to play in Railway Operations through various other departments provide infrastructure to a great extent in railway transportation. Various assets of the railway are available to operating department for optimum utilisation. Operating Department, thus, harnesses the efforts of all departments and optimises the usage of operational assets. The functions of Operating department can be categorised as under:-

1. Planning of Transport service on short term and long term basis.
2. Running of trains
3. Safety in Train Operations
4. Economy and Efficiency

**103 General Principles of Railway Operations :**

**1. Continuity :**

Railway Operations and Transportation should be continuous both in time and space i.e. these should be round the clock in all seasons on an interconnected network, as justified by the transportation need.

The pattern of traffic should be so regulated that the operations do not lead to excessive bottlenecks and congestion due to concentration of work at one restricted time and / or place.

**2. Unity of control :**

Command and direction should be given by a Central Authority. Since a good transport system is designed to operate continuously as a whole, it can not function efficiently if worked independently in each station or section or zone at cross purposes.

The general directions, priorities and objectives for which the railway system should be working should also be clear as far as possible. A Central Authority is required to control, direct and co-ordinate the operations on a Division, Railway and between the Railways. On the Indian Railways, the authority is vested to CRB in Railway Board. At Zonal level this authority is exercised by COM on behalf of GM and at Divisional level, it is exercised by Sr.DOM/DOM on behalf of Divisional Railway Manager.

### **3. Full and efficient utilisation of existing resources :**

The optimum utilisation of available resources and carrying capacity is an important aspect of railway operations. Therefore, it is essential to move the maximum volume of traffic with minimum increase in capital expenditure. This is monitored and constantly kept in view while taking short term and long term operating decisions.

The Operating Indices are measured, identified and constant endeavour is made to sustain high level of rolling stock utilisation, engine utilisation, staff utilisation, punctuality of trains etc., with reference to the targets and trends of past performance and potential.

### **4. Planned provision of adequate capacity :**

Since the pattern of traffic changes due to various reasons, transport bottlenecks are likely to develop. Transport bottlenecks refer to permanent features at some stations, yards, transshipment points, big freight terminals and saturated critical sections of railway. Such bottlenecks prevent efficient carriage and handling of the available and potential traffic offering, even after fully and efficiently utilising the existing capacity in the normal course. The availability and requirement of additional resources and capacity should be constantly reviewed and planned, provision of adequate capacity of terminals, rolling stock, repair and maintenance centres and control etc. should be constantly done.

## **104 Scope of the Operating Manual :**

This Operating Manual attempts to provide basic understanding of the various aspects of Railway Operations and guidelines for safe, efficient and reliable Rail Transport System. Railway Operations being inherently complex and dynamic, no manual on operations can take into account all the situations and requirements of operational efficiency. Therefore, directions given by the Authorised officer of the Head quarters or Divisions or Area or a Station etc. should be carried out. The Manual also does not, in any way, supersede or modify the General and Subsidiary rules. Accident Manual or any other Act, Code or Traffic Book. In case of any conflict in the interpretation of applicability of any aspect, the provisions of the Act. G&SR, Accident Manual, Codes etc., shall prevail.

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CHAPTER – 2

WORKING OF STATIONS GENERALLY

**201** In the context of Operating Manual the word Station Master includes Station Superintendent/ Station Manager.

**202** **Responsibility of SS/SM :**

**1. Responsibility of the Station Master incharge for the General Working of the Station :**

- (a) As per General Rules 5.01, Station Master is responsible for the efficient discharge of duties by different members of staff at his Station.
- (b) He is also responsible to ensure that the general working of the Station is being carried out in strict accordance with the rules and instructions issued from time to time by the competent authority.
- (c) Station Master must ensure his presence at the station on occasions of emergency and must assume control of the working even if he is off duty.

**2. Responsibility for Discipline of the staff etc. :**

Every Station Master is responsible at his station for the conduct of Railway servants under his command for prompt, civil and courteous behaviour towards the public and passengers of all classes. Station Master must guide the staff working under him in the performance of their duties properly and must ensure that the staff are punctual, courteous and in prescribed uniform while on duty.

**3. Security of station building and property :**

As per GR 2.05(i), Every Station Master is accountable for the security of offices, buildings and other Railway property under his charge. The keys of various equipment must be kept in Station Master's office in a Key Box and the entries of these keys must be made in station diary while taking over/making over charge.

**4. Reports against staff :**

Whenever any staff is found careless, the Station Master shall make out the charges in writing and obtain his defence. If offender disputes the charges, the evidence including evidence of witnesses along with original papers of charges must be sent to Sr.DOM / Sr.DCM concerned with his remarks. Report against unsafe, careless, discourteous working of other than Traffic Department shall be made in writing to the branch officer of the concerned department, endorsing copy to Sr.DOM / Sr.DCM.

**203** **Station Order Book :**

At every station, a Station Order Book must be maintained in which Station Master may issue such instructions, which he may consider necessary for the proper and efficient working of the station. Each Station Order Book must be serially numbered.

## WORKING OF STATIONS GENERALLY

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All such orders must be acknowledged and signed by all staff concerned. It should be explained and read out to illiterate staff and their left hand thumb impression obtained.

### **204 Station Diary/Charge Book and Control Order Book :**

These books shall be maintained by Station Master and Cabinman/Switchman/ Yard Master at every station / yard/ cabin /office.

### **205 Daily handing over and taking over charge :**

Station staff shall hand over charge at the end of their duty hours as prescribed at the station. Such duty hours shall not be changed except with the permission of Sr.DOM/DOM / Sr.DCM/DCM or such other officers as may be authorised in this regard.

### **206 Daily Operating Inspections of Station by Station Masters :**

1. The Station Master in charge at a station shall inspect his station daily with a view to ensure its safe, efficient and complaint free working. Remedial follow up action on the irregularities and deficiencies must be promptly taken by him through other concerned supervisors.
2. Night Inspection of Station:  
The Station Master in-charge must also make periodical night inspections of the station as prescribed.
3. Inspection by Station Master on duty:  
The Station Master Incharge must inspect periodically the cabins, yards, goods sheds and level crossing gates under his charge. Periodicity will be decided by the Sr.DOM / Sr.DCM.

### **207 Cleaning of offices, platforms and yards :**

1. Station Masters are responsible for the sanitation, general cleanliness and smart appearance of station buildings and its surroundings. Offices and platforms shall be swept at least once a day and washed once a week. Sweep refuse should be removed in baskets and should not be swept to the track by the Safaiwalas.
2. Waiting Rooms and drains must be kept scrupulously clean and the disinfectant must be sprinkled as often as necessary.
3. Station Master incharge is responsible for the care and cleanliness of Officers Rest House, Subordinate Rest Rooms and Running Rooms etc. He is also responsible for the care of the furniture and fittings. Adjustments and repairs of the signal and points gear will be done by the signal branch at interlocked stations and by the Engineering branch at non-interlocked stations but this does not relieve the Station Master of his duty of testing of points, locking devices and signals order. If the points, signals or interlocking gear fail to work properly, the Station Master must report the matter immediately to the Division / Area Control and to the Section Engineer (P.Way) / Section Engineer(Signal)/ DEN / DSTE and AEN / ASTE concerned.
4. Testing of Signals and Track Circuits :

The Station Master should daily (during day time when no train movement is there) test and record in the charge book, the working of Points, Signals and Track Circuit to ensure that:

## WORKING OF STATIONS GENERALLY

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- (a) the Signals are back to 'ON' position when the relevant slide/button/ lever is put back.
- (b) it is not possible to take 'OFF' conflicting signals at the same time.
- (c) Signals are not taken 'OFF' until all relevant points are correctly set and facing points locked.
- (d) Any other manner of testing prescribed by the Authorised Officer.

### 208 Deficient water supply at Stations :

Whenever there is deficiency of water at station, it is the duty of Station Master to advise at once to the S.E(Works), AEN and Control and other supervisors concerned.

### 209 Duty list and hours of duty :

1. Sr. DPO/DPO shall fix the duty hours for the staff at stations in accordance with the Hours of employment and regulations in consultation with Sr.DOM/ DOM/ Sr.DCM/DCM. Copies of these duty hours ( roster) must be hung up at each station.
2. Station staff shall hand over charge at the end of their duty hours as prescribed at the station. Such duty hours shall not be exchanged without the permission of the Station Master.
3. Daily Mustering of Staff : The Station Master or the person authorised in this behalf shall fill in the attendance of staff at his station in Attendance Register.

### 210 SM/SS's responsibility for Assurance :

Station Master's responsibility before allowing employees to take independent charge-

1. Station Master must not allow any employee to take independent charge of a post connected with train working without satisfying himself that the employee-
  - (a) possesses the requisite Certificate of Competency.
  - (b) has understood the working rules of the Station and about the duties he has to perform.
2. Before an employee takes independent charge of a post connected with train working for the first time, the pickup period is generally laid down by the DRM(Operating). Following guidelines however, can be observed on first posting or when there is change of system/ means of working –

|                                                         |               |
|---------------------------------------------------------|---------------|
| (a) Junction stations with marshalling yard and lobby - | 8 days        |
| (b) Terminal stations with marshalling yard and lobby-  | 8 days        |
| (c) Large stations or junction stations                 | - 5 days      |
| (d) Medium stations                                     | - 4 days      |
| (e) Road side stations                                  | - 2 to 3 days |

It must cover pickup of all the shifts.

He must read Station Working Rules and must witness the actual performance of these duties for the time specified as 'pick up' time. In emergencies, however, and in cases where the duties are of a simple character and similar to those already performed by an employee at stations where he has worked before, this pick up period may be waived by the Sr.DOM/DOM.

3. An '**Assurance Register**', separately for literate and illiterate staff in duplicate, shall be maintained with Station Working Rules at each Station and the Station Master must ensure that the employees connected with train working give assurance in this Register that they



## WORKING OF STATIONS GENERALLY

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have understood the Working Rules of the Station. This assurance shall be given in writing by the literate staff, and in case of illiterate staff a certificate must be given by the Station Master in token of the fact that the employee has understood these rules only after satisfying himself after a verbal test.

4. One copy of the '**Assurance Register**' will be kept in the Station Master's office and the second copy will be kept by Station Master Incharge in his custody.

### 211 Home Address Register :

1. Every Station Master must maintain a Register containing the name and up-to-date address with telephone numbers of each member of the staff employed at his station.
2. A separate Register must be maintained containing list of all stalls, licensed vendors, licensed coolies, contractors coolies, shoe shine boys or any other person employed at station other than railway employees along with their up to date address and telephone nos., if available.

### 212 Public and Staff notices for exhibition :

The following Notices and Publications, besides those which may be ordered from time to time, shall be exhibited at each station in conspicuous places.

1. Notice Board showing current running of trains in the waiting hall, sheds or at the entrance.
2. Notices regarding hours of business of goods, luggage and parcels – outside the respective offices.
3. Notices regarding restrictions in Goods Booking.
4. Notices regarding Allotment and Distribution of Wagons.
5. Rules regarding Waiting Rooms – Retiring Rooms, Dormitory etc.
6. Notice regarding date of payment of staff.
7. Duty Rosters and Classification lists of staff employed at stations.
8. Extract of Railways Act (24 of 1989) and Payment of Wages Act.
9. Rules for occupation of Rest Houses and Rest Rooms.
10. A list of nearest Doctors and Hospitals, with telephone numbers.
11. A list of home addresses with telephone nos. of staff in Station Master's office.
12. List of persons with telephone nos. from whom conveyance can be requisitioned in emergency
13. List of nearest Fire Stations, Bus depots, Air Ports, POL Companies etc. with telephone nos.
14. List of telephone nos. of Civil, Police, Military and Railway officials.
15. Other prescribed notices.
16. List of Staff qualified in First Aid.

The Station Master must be careful to see that out dated timetables and notices are removed and replaced with current ones whenever necessary. He should also ensure that the telephone nos., are updated from time to time.

### 213 Exhibition of public advertisements :

1. Public advertisements in the form of Boards, Posters, Hoardings, Showcases, Models, Neon-signs, or in any other form should not be allowed to be exhibited at any place within the station limit or premises without the written permission of the competent officer of commercial publicity branch. The Station Master will maintain a register showing full particulars of each advertisement exhibited at the station including expiry date in the prescribed form.



## WORKING OF STATIONS GENERALLY

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2. Station Masters and other railway staff including Guards and Loco Pilots of any train must not permit the display of advertisement matters or flag on engines, passenger coaches and other rolling stock, unless the prior permission of the Divisional Railway Manager concerned has been obtained.

### **214 Rule Books, Manuals etc. at Stations :**

1. The Station Master is personally responsible to see that rules books etc. are kept up-to-date and are available to staff for reference. Also See G&SR 2.01, 5.02 and 5.03.
2. Station Master is also responsible to see that all registers, forms and charts are properly and neatly maintained and that they are not used for purpose other than for which they are printed and supplied.
3. Station Masters are responsible for general accuracy of all periodical returns and for their submission in time. He should sign himself or his Assistant Station Master may sign on it.

### **215 Station Records :**

1. Each book/Register, when completed must be stocked in a bundle with a cover showing dates of commencement and completion.
2. Records must be placed on shelves and almirahs in dry and secure places, where they shall be safe from irregular handling or removal by any unauthorised person.
3. Periods for which Station records must be kept at Stations are given at the end of this chapter. Any records pertaining to court cases/enquiries must not be destroyed until the DRM's permission is obtained.

### **216 Books and Notices at Level Crossing Gates :**

The following books and notices are maintained at a level crossing gate provided with Gate-lodge. Where Gate-lodges are not provided and gate is manned by traffic staff, the books shall be maintained in the Station Master's office.

1. A Book showing the list of equipments.
2. Duty Rosters.
3. A copy of duty list with translation in regional language.
4. Level crossing working instructions which should appear as separate appendix to SWR.
5. Extract of the Station Working Rules.
6. Public Complaint Book.
7. PME test and Competency Certificate of the Gateman.
8. Results of last Traffic Census.
9. Inspection Books.

### **217 Filing of Operating Circulars :**

1. Every Station must maintain subject-wise files of Circulars, Gazette Notifications etc.
2. Each circular must be got noted by staff concerned. In case of Group 'D' illiterate staff, Station Master must record that circulars etc. have been correctly explained.

3. Instructions for Guards : Instructions for Guards issued from time to time must be kept in one file at Guard's Headquarter stations. Guards must make themselves thoroughly acquainted with these instructions and should sign the circulars and assurance register of safety literature file.

**218 Correspondence :**

1. All official correspondence must be attended to by the Station Master, who must open all covers and see that all letters are replied to without delay.
2. All inward and outward letters must be registered in the inward and outward registers respectively.
3. Station Masters are responsible for the accuracy of the information contained in all outgoing letters, which they must sign personally.
4. The Station's name must be stamped on all returns and letters and on envelopes in which they are despatched.
5. Every outward letter must be numbered, dated and must also bear a subject. This must be adhered to in all subsequent correspondence when replying to correspondence, reference must be made to the letter number under reply.
6. Letters from the public asking for information must be replied to as promptly as possible. If there is any difficulty in supplying the required information, the receipt of the letter must be acknowledged and matter referred to the DRM, language used must be polite, respectful and courteous. It should be written legibly.
7. When forwarding letters or complaints from staff working under them, Station Masters must submit their own remarks, wherever necessary, in forwarding letters.
8. Letters received by the Station Master, pertaining to departments under him e.g. Goods Shed, Booking, Parcel offices etc. may be marked by the Station Master to the Incharge concerned, but the Station Master shall be personally responsible for the early compliance of such letters.

**219 Playing of Bands and presentation of Guards of Honour etc. on Station platform :**

The playing of bands and presentation of Guard of Honour etc., on the Station Platform is prohibited, except with the prior permission of the DRM.

**220 Prohibition against Photography/Film shooting on railway premises :**

Such Photography/Film shooting is strictly prohibited within Station limits and on the railway lines, except with the permission of the officers authorised by railway administration.

**221 Religious Edifices within the railway limits :**

Employees are forbidden to institute any kind of praying place, to set up stones painted red or in other colour to erect religious structures of any sort, either permanent or temporary, to plant Peepal trees or to add or alter any existing religious structures on railway land, without the sanction of the General Manager.

**222 Maintenance of Station building and other structures at the Station (petty repair) :**

A petty repair book must be maintained by every Station for the purpose of noting down particulars of repairs necessary to Station buildings and staff quarters. This book shall be examined periodically by the SE/JE(Works) or other engineering subordinates who shall arrange for the repairs carried out.

**WORKING OF STATIONS GENERALLY**

**223 Normal period for which Station Operating Registers and Records are required to be preserved :**

| S.No. of the Book/Form | Description of the Book/Form                                                | Period of preservation from the date of completion |
|------------------------|-----------------------------------------------------------------------------|----------------------------------------------------|
| 1                      | Train passing registers/Books/Forms                                         | 1 year                                             |
| 2                      | Transportation Bio-data Register                                            | Permanent record                                   |
| 3                      | Caution order register and Caution Order books                              | 1 year                                             |
| 4                      | Wagon Exchange Book/Wagon Exchange Register                                 | 3 years                                            |
| 5                      | Sick Wagon and Transhipment Register                                        | 3 years                                            |
| 6                      | Guard's Signature Book                                                      | 3 years                                            |
| 7                      | Wagon Demand/Priority Register                                              | 3 years                                            |
| 8                      | Indent and Loading Register                                                 | 3 years                                            |
| 9                      | Wagon Transfer Register                                                     | 3 years                                            |
| 10                     | Damaged Stock Register                                                      | 3 years                                            |
| 11                     | Siding Voucher Book/Record of Time Wagon Handing over                       | 3 years                                            |
| 12                     | Control Order Book/Conference Book                                          | 3 years                                            |
| 13                     | HQ Leaving Permission Register                                              | 1 year                                             |
| 14                     | Uniform Register                                                            | 3 years                                            |
| 15                     | Record of Station Equipment sent for repairs                                | 3 years                                            |
| 16                     | Register of Inward and Outward Letters                                      | 3 years                                            |
| 17                     | Register of Important Circulars                                             | 3 years                                            |
| 18                     | Station Order Book                                                          | 3 years                                            |
| 19                     | Station Inspection Register                                                 | 3 years                                            |
| 20                     | Muster Roll                                                                 | 3 years                                            |
| 21                     | Register of Home Addresses of staff etc                                     | 3 years                                            |
| 22                     | Spectacles Register                                                         | 1 year                                             |
| 23                     | Station Diary and Charge Book                                               | 3 years                                            |
| 24                     | Sick Wagon Register                                                         | 6 months                                           |
| 25                     | Unconnected Wagon Register                                                  | 3 years                                            |
| 26                     | Load Report Register                                                        | 3 years                                            |
| 27                     | Register showing Analysis of Late starts To Goods Trains at important Yards | 1 year                                             |
| 28                     | Watering Register                                                           | 1 year                                             |
| 29                     | Summary of Daily receipt and despatch of wagons and Work Done               | Local Orders to be issued by DRM                   |
| 30                     | Special Stock Register                                                      | Local Orders to be issued by DRM                   |
| 31                     | Detention to Wagon at Train Marshalling stations                            | Local Orders to be issued by DRM                   |
| 32                     | Register of occupation of reception lines                                   | 6 months                                           |

**WORKING OF STATIONS GENERALLY**

| S.No. of the Book/Form | Description of the Book/Form                                                                                | Period of preservation from the date of completion |
|------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| 33                     | Detention to Trains outside signals and at adjacent stations                                                | 1 year                                             |
| 34                     | Marshalling Register for Inward and Outward trains                                                          | Local Orders to be issued by DRM                   |
| 35                     | Register showing detailed Arrival, Placement, Despatch and Detention particulars of PU, Repack wagons, etc. | Local Orders to be issued by DRM                   |
| 36                     | Register of Long Distance Goods Train run                                                                   | Local Orders to be issued by DRM                   |
| 37                     | Guard's and Assistant Guard Arrival Register                                                                | 3 years                                            |
| 38                     | Register showing Detention to wagons at Break of Gauge Transhipment point                                   | 3 years                                            |
| 39                     | Number Taker Book                                                                                           | 3 years                                            |
| 40                     | Yard Wagon Balance Register                                                                                 | 1 year                                             |
| 41                     | Guard's Duty Register                                                                                       | 3 years                                            |
| 42                     | Guard's Rough Journal                                                                                       | 3 years                                            |
| 43                     | Register of Train Advices                                                                                   | 6 months                                           |
| 44                     | Form of Train Examination advice                                                                            | 1 year                                             |
| 45                     | Register showing load of Goods Trains and Goods trains run under load                                       | 3 years                                            |
| 46                     | Statement of running of Passenger Trains                                                                    | 3 years                                            |
| 47                     | Diary of Yard Supervisor.                                                                                   | Permanent Record                                   |
| 48                     | Unusual Register, other registers and Records maintained in control offices and at specified stations       | Local Orders to be issued by DRM                   |

- Note :-
- (i) In calculating the one year or the three years period, the year to which the books and documents relate, and the year in which they are to be destroyed should be excluded.
  - (ii) Record pertaining to Court Cases, departmental enquiries should not be destroyed till three years from the date the case is decided.
  - (iii) Record pertaining to public claims etc., or those under reference from Home or Foreign railways, should not be destroyed without permission from DRM concerned.

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CHAPTER – 3

WORKING OF TRAINS GENERALLY

**301 Classification of Trains :**

Trains are either scheduled as shown in the Working Time Table or non scheduled, which are run on the following account :-

**1. Traffic Account :**

- (a) Mail/ Express/ Passenger/ Commuter trains for the carriage of passengers and other coaching traffic as scheduled in WTT.
- (b) Holiday Special trains.
- (c) Parcel trains of carriage of coaching traffic only.
- (d) Mixed trains for carriage of passenger and goods.
- (e) Goods trains for carriage of goods and animals etc.
- (f) Military Specials.
- (g) Special trains run on special demands from Central /State Government, General Public or other bodies.

**2. Engineering Account :**

- (a) Material trains.
- (b) Construction and maintenance specials on track Tie Tamping Machines, Rail cum Road Vehicles etc.

**3. Miscellaneous Account :**

- (a) Inspection Special Trains.
- (b) Staff Shuttle.
- (c) Water Special Trains.
- (d) Workmen Train.
- (e) Accident Relief Train (ART)
- (f) Accident Relief Medical Equipment (ARME).
- (g) Crane Special.
- (h) Wiring Special / Tower wagon.

**302 Ordering of Trains :**

In case of trains indicated in the Working Time Table, no train advice is necessary except when these are required to be cancelled or put back or there is any change in the schedule shown in the Working Time Table In case of other trains, Train advice should be issued.

On controlled sections, trains are ordered by CTNL(M) in conjunction with the Power Control and / or Lobby Supervisor. On non controlled sections, trains are ordered by the Station Master of the originating station in accordance with the special instructions laid down by the Sr.DOM/DOM in this respect.

**303 The time train ready before departure :**

The time at which train is required to be ready before departure from the starting station will be laid down by the DRM (Operations). In case of passenger trains, the rake should be placed on the platform in time to allow for loading of mail, luggage, parcel, bed roll, pantry etc as also entraining of passengers, attaching of engines and other prescribed requirements. (Ordinarily a passenger train needs to be placed on the platform at least 30 minutes before the scheduled departure).

**304 Train staff - Equipments :**

1. The minimum equipment of the Guard / Assistant Guard and Loco Pilot is given in the G & SR 4.19. The minimum equipment of other train staff will be laid down by the concerned departments.
2. These equipments should be verified and checked by the SS/SM/LI or Shed incharge (of each Guard, Assistant Guard and Loco Pilot) twice in a year in the first week of January and first week of July. The reports/returns of all discrepancies should be submitted to DRM. Indents for the requisite equipment must be sent well in time.
3. When a Guard, Assistant Guard or Loco Pilot causes any damage to any part of their equipment, they must apply in writing to the SS/SM/LI or shed in-charge of the Head quarter Station for replacement, explaining the cause of the loss or damage, who should replace the equipment and submit the explanation to the Sr.DOM/DOM / Sr.DME/DME / Sr.DEE/DEE Incharge.
4. When such staff retire / leave the service or are transferred permanently to other divisions, they must surrender their equipments including Rule Books and obtain a receipt thereof. Clearance/No objection certificate will not be issued to them unless this is done.
5. Brakevan equipment in passenger train :
  - (a) Portable Fire Extinguishers (Two).
  - (b) Portable Control Telephone.
  - (c) Portable Train lighting equipment.
  - (d) Vacuum Gauge/Air Pressure Gauge in passenger trains.
  - (e) Stretcher (one).
  - (f) Wooden wedges / skids (Two).
  - (g) Any other equipment prescribed by special instructions.

**305 Custody and responsibility of the train :**

After the engine has been attached to a train and during the journey, the Guard shall be in-charge of the train in all matters affecting the movement or stoppage of the train for traffic purpose.

Guards of Passenger, Mixed / Parcel and Goods trains who do not have separate staff to deal with luggage, parcel, goods etc. will be in full charge of such work also. Where separate staff are provided on a train they shall obey the lawful orders of the Guard in-charge and shall assist him, when called upon to do so for safe and punctual running of train.

**306 Booking of running staff :**

The provision for running duty hours and total duty hours shall be applicable to all Running Staff including Loco Pilots (Mail/Express), Loco Pilots (Passengers), Loco Pilots (Freight), Motormen and Guards except wherever stated otherwise.

**Rules for booking and periodical schedules of rest etc. are given below:-**

**(I) Scale of rest at HQrs and outstations to running staff. –**

- (1) Rest at HQrs –
  - (a) For running duty of less than 8 hours – 12 hours.
  - (b) subject to exigencies of service, headquarter rest of all running staff will be 16 hours irrespective of the duration of their incoming trip. Further, in exigencies of service, the existing provision will continue to be the minimum condition. as (1) (a) above.

Note: (i) "Running duty " means duty performed from the time of the actual departure of the train from the starting station till the actual arrival of the train at the destination.

- (ii) In either case a man shall not be called upon to work under 6 hrs. of rest except when unavoidable necessity arises as in the case of accidents or Breakdown.



## WORKING OF TRAINS GENERALLY

- (2) Rest at outstations when working other than short trips  
(a) for running duty of less than 8 hrs. – 2/3rd of duty performed.  
(b) for running duty of 8 hrs. or more – 8 hrs.

Note: Staff may be permitted to sign for rest at outstations to the extent of 6 hrs. if they so desire

- (3) Rest at HQrs. and outstations when working short trips – the interval between trips shall be treated as “duty” if it is equal to or less than 1 hrs. plus time allowed for train or engine attendance after the last trip, plus time allowed for train or engine attendance before the next trip, this period being increased at the discretion of the Railway Administrations, where local conditions, such as, distance of Running Room from the traffic yard etc. warrant such an increase.

(II) **Taking and making over time** : Taking and making over time should count as duty as under :-

1. **Loco Running staff.** -

A. Where charge of engine is taken over in a shed:-

- (i) Diesel- 30 mts. before departure of the locomotive from shed if charge is taken over in shed and 15 mts. after arrival of locomotive in shed.

(ii) Electric –

(a) Where the charge of locomotive is taken over in a shed equipped with servicing facilities 30 mts. before departure of locomotive from shed and 15 mts. after arrival of locomotive in shed.

(b) Where the charge of locomotive is taken over from an intermediary at loco siding or any other similar place without servicing facilities – 40 mts. before departure of the locomotive from loco siding/any other similar place and 15 mts. after arrival.

Note:- Where locomotive is taken over in shed, the time taken for movement of engine from shed to the yard will be over and above 45"/30"/40", as the case may be, and the same should be laid down for each shed by DRM concerned taking in account the local conditions.

B. Where charge of engine is taken over outside a shed:- Diesel/Electric. 15 mts. before the schedule departure of the train and 15 mts. after arrival of the locomotive at the place where it is handed over.

2. **Traffic Running Staff** –

A. **Goods trains** –

(i) At train originating and train examination stations – 45 mts. for taking over and 30 mts. for making over charge.

(ii) Other than train originating and train examination stations – 15 mts. for taking over and 15 mts. for handing over charge.

B. **Passenger trains** –

(i) At train originating and train terminating stations – 30 mts. for taking over and 30 mts. for handing over charge.

(ii) Other than train originating and train terminating stations – 30 mts. or less according to halt of the train subject to a minimum of 15 mts.

3. **Other Running staff** –

(a) Traveling Porters or Hamals- Passenger trains- 30 mts. for taking over and 15 mts. or less according to halt at intermediate station for making over.

(b) Travelling Asst. Goods Clerk – 1 hr. for taking over and 1 hr. for making over.

Add para after the heading ' 306 Booking of running staff :' at page 12  
Substitute the existing para 306 (III) (a) & (b) and add new para (c) & (d) and renumbered (c) & (d) as (e) & (f) at page 14.

## WORKING OF TRAINS GENERALLY

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### III. Counting of hours of duty :-

- (a) Total duty at a stretch (from 'sign on' to 'sign off') for the Running Staff should not exceed 11 hours.
- (b) Running duty at a stretch should not ordinarily exceed 9 hours. Such duty may extend further provided the railway administration gives at least 2 hours notice before the expiry of 9 hours to the crew that they would be required to perform running duty beyond 9 hours, with the stipulation that the total duty from 'sign on' to 'sign off' shall not exceed 11 (9+2) hours.
- (c) In case the train does not reach its destination, normal crew changing point or the point where the reliever has been arranged, within the overall limit of 11 (9+2) hours, and such a point is approximately one hour journey away, the Running Staff shall be required to work to that point provided the maximum hours in that trip does not exceed 12 (9+2+1) hours.
- (d) For loco pilots of all Mail/Express trains, the running duty ( for the purpose of preparation of links only) should not exceed 8 hours. However P&C time shall not be included within 8 hours.

Note: - For the purpose of computing duty at a stretch, time shall be calculated from the actual departure of the train from the starting station.

- (e) Running staff traveling as passenger on duty before or after working the train -
  - (i) will not count as duty if the journey does not exceed 4 hrs.
  - (ii) Staff classified as " Continuous" will be counted as ON duty for 2/3 of the traveling time in excess of 4 hrs.
  - (iii) Staff classified as " Essentially Intermittent " will be counted as ON duty for full traveling time in excess of 4 hrs.
- (f) Waiting at the place of duty and not resting will count as duty during which an employee can be given other suitable work, before he actually starts on running duty

### IV. **Traveling spare** - No rest should be allowed if the journey as spare does not exceed 4 hrs. the scales of rest to be allowed are as under :-

- (a) At outstations – 1 hr. rest if the journey as spare exceeds 4 hrs.  
2 hrs rest if the journey as spare exceeds 7 hrs.  
3hr. rest if the journey as spare exceeds 10 hrs.
- (b) At Hqrs. station -2 hrs. rest if the journey as spare exceeds 4 hrs.  
3 hrs rest if the journey as spare exceeds 7 hrs.  
5 hrs. rest if the journey as spare exceeds 10 hrs.

Note:- Those who are in scheduled links will pick up their schedules.

- (c) Time spent by running staff in crew vans, rest vans or rest rooms, running rooms or compartments provided for their use will count as rest and not as duty.

### V. **Periodic Rest** – Running staff and "Other Running Staff" shall get the following periodic rest–

- (a) Continuous- 4 periods of not less than 30 consecutive hours each or 5 periods of not less than 22 consecutive hours each in a month. Periodic rest given at Hqrs. should always include a night in bed.



## WORKING OF TRAINS GENERALLY

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- (b) Essentially intermittent – 4 periods of not less than 24 consecutive hours each in a month.

Note:- Periodic rest given at Hqrs. should always include a night in bed.

- (c) In the case of other running staff however, some portion of the rest may be given away from Hqrs. and / or at intervals of more than 10 days.

### VI. **General Instructions –**

- (a) In the case of running staff, continual night duty should not normally exceed 6 nights at a stretch.

- (b) Running staff should not normally be kept away from Hqrs. for more than 3 or 4 days at a stretch.

Note:- It is for the Lobby Supervisor or/and Loco Foreman and Station Master on duty to see that running staff booked on ballast train away from Hqrs. returned to Hqrs. within the time shown in para VI (b) above.

- (c) Running staff as far as practicable should be advised of their periodic rest at or before its commencement.

### VII. **Accidents and Emergencies-**

In cases of accidents, actual or threatened or when urgent work is required to be done to the Railway or to rolling stock or in an emergency such as wash-aways, derailments etc. which could not have been foreseen or prevented, staff must remain at their posts as long required, even if it is beyond their normal hours of work under these instructions.

#### **307 Examination of Circulars, Notices, Gazettes etc. before starting :**

Every Guard and Loco Pilot shall examine all the circulars, notices, instructions, gazettes etc., Guard/ Loco Pilot will note the order files and particularly TWO, Caution orders and other warning notices in force issued for their guidance before starting a train at the time of signing on. They shall ascertain whether there is any thing requiring of the railway / section where they have to work.

Station Master/Lobby Supervisor/Loco Foreman or Incharge of Guards and Loco Pilot booking, should ensure that all such files of instructions/orders issued from the DRM office or Head quarters office are properly maintained up-to-date including information required on Notice Boards and are noted in time by the running staff before starting on a trip.

#### **308 Documents to be prepared by Guards & Loco Pilot while working train papers :**

The Documents required to be prepared for a train are discussed in Train Papers. (Chapter – 9).

#### **309 Examination of train before starting :**

Instructions contained in G & SR 4.31 should be observed.

SE(C&W)'s certificate should be obtained on prescribed printed form wherever SE(C&W) is posted.

**310 Additional duties of the Guard while working a train :**

Besides observing the provisions of the G&SRs 4.34, 4.35, 4.42, 4.43, 4.44, 4.45, 4.47 and 4.48, the Guard when taking over charge of a train, should also take the following actions at the originating station and where the train has long halts.

**1. Goods Trains :**

The train Guard should walk from Brakevan towards the engine on one side examining the train and return to the Brakevan examining the other side of the train.

The Guard should verify that :-

- (a) the entries in the vehicle guidance tally with the wagons on the train.
- (b) the wagon doors, including side flaps and end doors are properly closed and well secured.
- (c) the wagons shown as empty in the vehicle guidance are really empty.
- (d) the covered loaded wagons have the seal label on each side and the seal is intact and the wagons required to be riveted on each side are actually riveted.
- (e) Ensure adequacy of effective brake power and amount of air pressure / vacuum as prescribed in the Paras 3104 and 3105 in Chapter 31.
- (f) the heavy consignments are securely fastened to ensure that they do not get shifted while on run.
- (g) any wagon does not appear to be over loaded or unevenly loaded on visual examination.
- (h) the train is correctly marshalled as per marshalling order vide (Chapter – 13) of this book.
- (i) the total number of vehicles and the trailing load (tonnage) of the train does not exceed the limits prescribed in the Working Time Table for the section and for the class of engine working the train.
- (j) minimum prescribed Air Pressure/Vacuum is indicated in the gauge available in the brakevan.
- (k) at every long halt station, crew changing station and after attaching or detaching of any locomotive / wagon enroute, the continuity of brake pipe pressure or continuity of vacuum should be checked before starting of train.
- (l) *working of trains without brakevan, without Guard and without both :*  
Procedure as mentioned in G & SR 4.23 and any special instructions issued from time to time by the competent authority should be followed.
- (m) instructions for working of Air brake goods trains and special type of stock issued from time to time by the competent authority should be followed.
- (n) precautions for movement of ODC – See chapter 12.

**2. Passenger Trains :**

In addition to such instructions as are given under sub para (1) above, which may be relevant to the passenger trains, the Guard, while working a passenger train, shall also verify that :

- (a) the Brakevan equipments are complete.
- (b) proper charge is taken of luggage & parcels unless another staff is separately available for this duty.
- (c) the passenger carriages are clean and filled with water.
- (d) Train, Brake-van lights and fans are in working order.

## WORKING OF TRAINS GENERALLY

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- (e) Brake Power Certificate is current and updated with correct entries.
- (f) during the course of journey, Guard should :-
  - (i) look-after the safety of the train, comfort and security of the passengers particularly the female and children and assist them, if necessary. Similar responsibility rests with Train Superintendent(if provided) Ticket Checking staff, RPF and GRP also.
  - (ii) attend to the complaints of the passengers and have them rectified.
  - (iii)perform the duties of a train conductor when none is provided.

### 3 **General Instructions :**

- (a) Guard must not permit anyone to travel in the Brakevan without a proper authority.
- (b) Fire arms must not be carried in Brakevan except under special instructions.
- (c) Guard must not carry any merchandise including spirituous or fermented liquor, or any other intoxicating substance in their Brakevan.
- (d) In case of outlying sidings where no commercial staff is posted, the responsibility regarding closing of doors, rising and falling of flap doors, rests with the siding holder. The Guard of the train, however shall keep a watch on this on the run.

### 311 **Precautions before starting a train :**

Instructions contained in G & SR 4.35 should be implemented.

### 312 **Additional duties and precautions by the Loco Pilot while working trains :**

The following instructions should also be followed by Loco Pilot in addition to the instructions contained in G & SR and the special instructions.

1. Loco Pilot and others travelling on engine cab must exercise great care in looking out of the engine cab when travelling, on account of the danger from proximity of signals and other fixed structures.
2. When any of the engine crew is working under the engine or attending to motion parts, all the available brake power must be kept in on position.
3. Either Loco Pilot or Assistant Loco Pilot should always be in the loco cab so as to avoid rolling on a gradient while one of them is proceeding to check the rake.
4. Engine Pass : The Loco Pilot must scrutinise the engine pass of any person desiring to travel on his engine and if the pass is not in order, he must not allow him to travel on the engine.
5. Use of goggles is prohibited – Loco Pilot /Assistant Loco Pilot are not permitted to use goggles having tinted glass while working train.

## **GENERAL INSTRUCTIONS**

1. Use of Spectacles : Loco Pilot, Assistant Loco Pilot, Guards, Shunters etc. who pass the eye sight test with spectacles, must wear the prescribed spectacles while on duty, failing which, they render themselves liable to summary dismissal. They must provide themselves with two pairs of spectacles and will wear one pair and carry the other spare pair while on duty.
2. Since the person concerned generally comes to feel about deteriorating eye sight, it is the duty of each of the train working and train passing staff, to immediately report to his supervisor / Railway Medical officer about deterioration in sight, get himself examined medically and take due remedial measures.

3. Eye sight examination after accident : Loco Pilot / Assistant Loco Pilot / Motorman / Shunters who pass a fixed signal at danger must be sent for eye sight examination.
4. Conversation with the Loco Pilot is prohibited : Persons other than the engine crew and those whose business is to supervise the work of Loco Pilot, must not enter into conversation with the Loco Pilot while the engine is in motion.
5. Intoxication: (See G&SR 2.09.)  
Any one suspected of being intoxicated while on duty should be sent to the nearest Railway or Civil Doctor for examination and if certified as such by the Doctors, he will be put off duty pending approval and further order from the competent authority.

**313 Wagon detached out of course :**

1. When a wagon is detached at a way side station short of its destination, the SM should record the particulars in Wagon Exchange Book from the Guard's vehicle Guidance/ Consist Guidance and must verify that these particulars tally with the wagon particulars and labels.
2. Information must be given to Control and SE (C&W) concerned on phone.
3. When a wagon containing treasury is detached out of course for any cause, the SS/SM and Guard must warn the escorts incharge of the treasury.
4. All efforts should be made in coordination with control for clearing such wagons from roadside station.

**314 Stoppage of trains for Railway Officials/Government telecom staff :**

A goods train may be stopped to pick up or detrain such staff, whose duty necessitates his travelling by it with the permission of DOM/AOM. However, in case of a passenger train, the controller on duty must seek order of Sr.DOM/DOM and convey to all concerned accordingly.

**315 Station bell signals :**

The following strokes must be given in the station bell on the occasions quoted :

- |   |                           |
|---|---------------------------|
| On "Line Clear" being given for Up trains.  | : Two pause one.          |
| On "Line Clear" being given for Down trains.  | : Three.                  |
| On an Up train leaving the station in rear  | : Two pause Two pause one |
| On a Down train leaving the station in rear   | : Five.                   |
| On a passenger train approaching the station Platform.  | : One                     |
| Starting bell for Passenger trains.   | : Two                     |
| At stations, where passenger train stops for more than 5 minutes, in addition to the starting bells, 5 minutes before the departure of the train. | : Seven                   |

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## SHUNTING

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### CHAPTER – 4

## SHUNTING

#### 401 Definition :

Shunting means the movement of vehicle(s) with or without a locomotive or the movement of the loco itself or any other self propelled vehicle for the purpose of attaching, detaching or transfer or for any other purpose.

#### 402 Methods of shunting and their definitions :

1. **Hand Shunting** is performed by pushing the vehicles manually from buffer ends or at the sides of vehicles outside the rails without help of an engine.
2. **Flag or Flat Shunting** is the separation of vehicles in an ordinary yard by continuous forward and backward engine movements.
3. **Loose Shunting** means shunting of vehicles which are not coupled with engine and allowed to run forward under their own momentum on being pushed by an engine. It includes hump shunting.
  - (a) *Loose shunting is prohibited in the following cases :*
    - (i) All coaching stock whether loaded or empty;
    - (ii) Vehicles containing passengers and live stock;
    - (iii) Vehicles containing explosives, dangerous and inflammable goods;
    - (iv) Tank wagons of all description loaded or empty;
    - (v) Travelling cranes;
    - (vi) Vehicles with coolies in them;
    - (vii) Vehicles without hand brakes;
    - (viii) Trucks loaded with heavy, bulky or Over Dimensional Consignments or Consignments likely to shift; such as Vehicles on Wheels, Road Rollers, Portable Engines, Rails etc.;
    - (ix) Wagons loaded in pairs;
    - (x) Damaged Vehicles;
    - (xi) Dead Engines;
    - (xii) Vehicles labelled "Not to be Loose Shunted" such as those containing liquid containers.
  - (b) *Loose shunting is also prohibited in the following cases :*
    - (i) In the dead end siding;
    - (ii) During stormy weather or when strong winds are blowing or during foggy weather;
    - (iii) On steep gradients where there is a possibility of vehicles escaping from the station or fouling the main line (see G&SR 5.20) ;
    - (iv) In non-isolated yard, when there is likelihood of vehicles escaping and fouling the running lines.
4. **Hump Shunting** : Hump shunting applies to hump yard and means shunting through the medium of a hump - an artificial grade - over which vehicles are pushed up by an engine on one side and are allowed to gravitate down the opposite slope into appropriate sidings. Hump shunting includes loose shunting.

## SHUNTING

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5. **Gravity Shunting** : Gravity shunting applies to gravity yards, when there is continuous and gradually falling gradient through the reception, sorting and despatch sidings in which wagons are rolled by gravity after the train engine is uncoupled. In such shunting operations, wagons move down the falling gradient on account of force of gravity and are controlled by wagon brakes by Brake Porters.  
On Western Railway, there is no Gravity Yard.
6. **Fly shunting** means uncoupling of an engine while drawing vehicles and switching it into one line or siding and the following vehicles into another line or siding or applies to two or more vehicles or set of vehicles not attached to each other, which, after being pushed by an engine, have to be separated at the points, while on the move, by the points being sharply reversed between the vehicles or sets of vehicles in order to send them on different lines.  
Fly shunting is strictly prohibited.

### 403 Special Precautions during Shunting Operations :

1. **See G & SRs regarding the following items :**
  - G&SR 5.13 – control of shunting
  - GR – 5.15 – shunting at stations under CTC
  - GR – 5.16 – shunting during reception of trains
  - GR – 5.17 – shunting near level crossing
  - G & SR 5.20 – shunting on gradients
  - SR – 4.62 – (13 to 17) material train
2. **Shunting with coupled engines :**

Shunting with coupled engines is generally not allowed.
3. **Shunting of vehicles containing explosives :**

Vehicles containing dangerous and inflammable goods loaded or empty, POL tanks, must be separated from the Diesel/Electric engine by not less than one Guard wagon.
4. **Shunting on through trains :**
  - (a) Through Goods trains should not normally be given shunting work. However, where conditions of traffic warrant, in such conditions, shunting may be allowed at two stations on the crew run in addition to work of attaching, detaching of wagons getting sick enroute.
  - (b) *Following incidental shunting will not affect the nomenclature of through Goods Trains:*
    - (i) Detaching of sick wagons.
    - (ii) Attaching and detaching of Inspection Carriages.
    - (iii) Reducing or increasing the load of a train enroute, to the prescribed maximum permissible load, which may vary on the same run, according to gradients.
    - (iv) Picking up the brake van after train is stabled or attaching the brake van for clearing a stabled load, if necessary.
    - (v) Shunting for observance of rules in connection with train working.

### 404 Responsibility for Shunting :

- In addition to rules contained in G&SRs 5.14 and 3.39, Guards will be responsible for shunting, in following circumstances :
- (a) Where siding is worked by key, the Guard shall take the key from the rear Station Master and deliver to the Station Master of the next block station where section is cleared. The Guard shall take the signature of the SM to whom key is handed over in the Guard's Rough Journal Book.

## SHUNTING

(b) The Guard should observe any other special instructions detailed in the Station Working Rules.

(c) *At the Key-Siding Stations* - The Guard will :

- (i) stop his train clear of fouling mark and before detaching engine, put the brake van hand brakes and if necessary sprag the wheels of the vehicles.
- (ii) see that the signals, indicators, points, traps, scotch blocks are reset to their normal position after shunting is completed.
- (iii) secure the vehicles left in the siding to prevent their escape.

**405 Securing of Vehicles:**

Rules prescribed vide G&SR 5.23 regarding securing of vehicles must be followed.

**406 Loco Pilot not to refuse Shunting :**

Loco Pilots must perform whatever shunting they may be called upon to do. If, however, they consider that such shunting is avoidable, they may mention the matter in their engine tickets.

**407 Shunting at Engine Changing Stations :**

Train engines may be called upon to shunt for the following periods at starting and terminal stations:

| Condition                                                                                                    | Passenger and Mixed Train Engines    | Goods Train Engines                                  |
|--------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------|
| Before departure from or after arrival at engine changing stations, where shunting engines are available     | Upto 15 minutes for their own trains | Upto 30 minutes for their own trains                 |
| Before departure from or after arrival at engine changing stations, where shunting engines are not available | Upto 30 minutes for their own trains | Upto 60 minutes for not necessarily their own trains |

A shunting voucher to the Loco Pilots, covering the period the train engine is actually employed in shunting, must be issued by the Station Master.

**408 Shunting on the Run :**

For Shunting performed by train engines on the run, the first 15 minutes are to be ignored and a shunting voucher issued for the remaining time, fractions of 15 minutes being treated as 15 minutes.

**409 Shunting Vouchers (T-27-B):**

1. **Shunting vouchers shall be issued for shunting performed by train and shunting engine as under :**

- From 1 minute to 15 minutes - 15 minutes
- From 16 minutes to 30 minutes - 30 minutes
- From 31 minutes to 45 minutes - 45 minutes and so on

2. Shunting voucher shall be issued for the actual period shunting engine is employed, subject to minimum of 6 hours provided the shunting engine has left the shed.



## SHUNTING

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- (a) No deduction from the total shunting period shall be made for 15 minutes for change of duty by engine crew.
- (b) *Following periods shall be deducted from the total shunting period :*
  - (i) Shunting engine used for the locomotive department in Loco yard.
  - (ii) Engine sent for fuelling(for Diesel Engines).
  - (iii) Engine repairs in Traffic Yard.
  - (iv) Shunting engine utilised in traffic, other than yard work, e.g. assisting a disabled train, or banking a train, or working a Material Train etc.
- (c) *Split Shift :*
  - (i) If a shunting engine is required at different intervals, it may be ordered in two shifts, separated by not more than 4 hours.
  - (ii) A shunting voucher shall be issued for the actual hours after each shift subject to a minimum of 6 hours for both the shifts. Each voucher should be marked as split shift - 1<sup>st</sup> portion/2<sup>nd</sup> portion.
  - (iii) If the second portion of shift is cancelled by traffic and the first portion is less than 6 hours, another engine voucher must be given to make total voucher time upto 6 hours.
  - (iv) If loco is unable to supply engine for the second shift, no additional voucher shall be issued.

### **410 Other Engine Voucher (G 75 B):**

It is issued to cover actual periods of detention as under :

1. An engine demanded by Traffic department but not used, a voucher for 3 hours shall be issued.
2. The actual time when an engine is waiting before the departure of a train or after arrival of the train till being sent to Loco.
3. Time taken in assisting or banking attached to a disabled train i.e. an assisting required engine.
4. Running its own power attached to a train to prevent its running light, and which is not required for banking or assisting purpose i.e. an assisting not required engine.

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CHAPTER – 5

**STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.**

**501 Introductory :**

General Rules 5.06 enjoins on Railways that, in addition to General Rules and Subsidiary Rules, each station shall be provided with Station Working Rules.

It is, therefore, obvious that Station Working Rules (SWRs) are to be issued for each station, depending on the special features prevailing at the station.

SWRs shall be issued in Bi-lingual i.e. in English and Hindi (Devnagri).

**502 Object :**

The object of issuing SWR is to regulate safe train operations in and between stations depending on local conditions.

**503 Authority to issue SWRs :**

1. Under the provisions of GR 5.06, the authority to issue SWRs rests with the Authorised Officer of Railway. The power to issue SWRs has further been delegated to the Sr.DOM/ Sr.DOM(G)/DOM/DOM(G) for all stations within the Division. The Sr.DSTE/DSTE has also been authorised to issue instructions in the SWRs regarding working of points and signalling at inter-locked stations and on other technical matter connected therewith. They will be responsible to ensure that SWRs are in accordance with the actual layout, signalling, interlocking etc. and are correct and complete in all respect, for safe working of traffic in and between stations.
2. SWRs are issued in conformity with the G&SR and can not, in any way supersede them. In case of any conflict, the provisions of G&SR will prevail.

The standard format issued by Rly. Board vide letter No. 2000/Safety/(A&R)19/36 dtd 27.10.2005 shall be utilised for preparing the SWR.

**504 SWRs requiring sanction of Commissioner of Railway Safety (CRS):**

1. General Rules wherein exception is allowed under approved special instructions, the approval of CRS must be obtained and same shall find place in the SWRs.
2. Railway administration must obtain sanction of the CRS, when the SWRs are revised as a result of any work listed in para 1302 of the Indian Railway's P.Way Manual.
3. Works requiring the sanction of Commissioner of Railway Safety and Notice thereof. (See Appendix B to Ch XV of G&SRs.)

**505 SWR provisions requiring approval of the Authorised Officer :**

1. The Sr.DSTE/DSTE will prepare/amend the Rule Diagram on the basis of signalling plan and send the Rule Diagram and also signalling appendices in case of interlocked station, to the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) for framing Station Working Rules.

## STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.

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2. Since the Rule Diagram has a vital bearing on the preparation of the SWRs, the Sr.DOM/ Sr.DOM(G)/DOM/DOM(G) will scrutinise the Rule Diagram and the Signalling Appendices, if any, and have these checked at the site.
3. The Sr.DOM/Sr.DOM(G)/DOM/DOM(G) will arrange for preparation of the Draft Working Rules by the Transportation Inspector in the Standard Format, after which these will be checked and approved by the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) personally. In case of interlocked stations the Draft Working Rules shall be checked and approved by the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) and the Sr.DSTE/DSTE jointly. Sr.DEE/ DEE (TRD) shall also be associated in electrified sections.
4. If there is a 'D' (Flag Station) and/or 'DK' class station between two Block Stations, the SWRs of the Block Stations on either side shall contain a reference to such D/DK class Station. In the case of a DK class Station, the special instructions for working the siding shall also be incorporated in the SWRs of the Block Stations situated on either side of the 'DK' class Station. A copy of these special instructions along with the Rule Diagram shall be made available at such DK class Stations.
5. The detailed working instructions of Ghat sections shall also be appended on Appendix to the SWRs of adjacent block stations of Ghat section.
6. When the draft SWRs have been finally approved, the Sr.DOM/Sr.DOM(G)/ DOM/ DOM(G) concerned will make the same ready as per the standard format and sign before distribution. In case of interlocked stations, the SWRs will have to be signed by the Sr.DSTE/DSTE also in all cases; one copy of the Rule Diagram supplied by the Sr.DSTE/DSTE / Sr.DEE/DEE (TRD) shall be kept with the SWRs.

### 506 Responsibility of the Officers signing the SWRs :

1. It hardly needs any emphasis that the SWRs are the fundamental rules governing the working of stations, and any deficiency in these rules can endanger safety. Therefore, the officers signing the SWRs will be responsible to see that these have been prepared with utmost care to ensure their correctness and that there is no flaw or deficiency in these rules.
2. Since it may not always be possible for the Sr.DOM / Sr.DOM(G) / DOM / DOM(G) and Sr.DSTE/DSTE / Sr.DEE/DEE(TRD) to go and see the actual layout at the Station, the following precautions should be taken before the SWRs are brought into use :

The Transportation Inspector and the SE(Signal) will jointly certify in writing that the actual layout conforms correctly to what is shown in the Rule Diagram and the number of points and signals quoted therein are correct.

### 507 Reviewing of SWRs:

The SWRs should be reviewed once in every **five years**. In case the review brings out the necessity of carrying out changes, the SWRs should be re-issued. In the event of **more than five correction slips** having to be issued, the SWRs should be reissued without waiting for the periodical review to be conducted every five years as mentioned above.

### 508 Method of correcting SWRs :

1. Whenever any addition/amendment is required to be made in the said rules, the entire page/pages duly signed by concerned officers on which the provisions requiring addition/ amendment appears should be replaced. The method of pasting correction slips by hand in the SWRs is not permitted under the rule.

## STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.

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2. In case where the amendment/modification required to be incorporated cannot be accommodated in one page after typing and it may be necessary to utilise additional pages, the numbering of the pages should be made with the sub-page in relation to the main page number.

Example: If the main page number is 4, the continued portion of the instructions in the additional pages should be numbered as 4/1, 4/2 and so on. The Sr.DOM/Sr.DOM(G)/DOM/DOM(G) and the Sr.DSTE/DSTE / Sr.DEE/DEE (TRD) in case of interlocked stations, shall sign at the bottom of the pages freshly typed.

### 509 Responsibility of Transportation Inspectors (TI) :

1. The Transportation Inspector is responsible to see that SWRs of stations on his section are correct and upto date. He will also be responsible to ensure that the station staff viz. Station Supdt., Station Master, Switchman, Cabinman, Pointsman, Gateman and any other staff who are in any way connected with train passing duties, possess correct knowledge of the Rule Diagram and the SWRs and observe them strictly.
2. Transportation Inspector will also check the SWRs and Rule Diagram and point out irregularities, if any, detected by him. If he finds that certain rules are difficult to observe or are impracticable thereby tempting the staff to infringe them, he shall immediately bring this matter to the notice of the Sr.DOM/Sr.DOM(G)/DOM/DOM(G). If he detects any error or omissions which, in any way, affect safe running of trains, he shall take immediate steps at the spot as necessary for safe working of trains and report the matter to the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) concerned for necessary amendment/modification in the SWRs.

### 510 Responsibilities of SS/SM :

The Station Superintendent/Station Master on receipt of the SWRs must immediately check to ensure that these conform to the local conditions at their stations. If they find any discrepancy in the said rules or anticipates any difficulty in their observance, they shall immediately bring such discrepancies and difficulties to the notice of the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) and Transportation Inspector of the section. The SS/SM shall see that all staff having definite responsibilities in train passing at their stations correctly understand and follow the SWRs.

### 511 Assurance of staff :

1. All the staff who are in any way associated with train passing duties, must sign a declaration in the Assurance Register in token of having studied the SWRs, Rule Diagram and other instructions pertaining to their duties and understand the same and that they are in a position to take up duties independently at the Station. In case of illiterate staff, the SS/SM/Yard Master/Assistant Station Master shall personally explain the SWRs, Rule Diagram and their duties and obtain their acknowledgements in the Assurance Register as a token of their having understood the instructions. The SS/YM/SM/ASM shall also certify that the staff concerned have understood the instructions pertaining to their duties.
2. Fresh assurance shall be obtained in the Assurance Register from the staff concerned when—
  - (a) he joins at the station as a new member,
  - (b) there is any change in the Station Working Rules,
  - (c) he resumes duty at the station after an absence of 15 consecutive days or more.

**STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.**

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**512 Distribution of Station Working Rules :**

Copies of SWRs shall be distributed as under :

1. The concerned station : Two copies or more as per requirement.

Note: (i) Extra copy/copies, as necessary, shall also be supplied according to the number of cabins at the station. One copy will be kept by SM Incharge.

(ii) An extra copy of the SWRs or its relevant extract shall be supplied at the level crossing gate.

2. Sr./DSTE : One copy
3. Sr./DEN/SE(P.Way) : One copy each
4. Sr./DSO/CTNL : One copy each
5. COM/CSO : One copy each
6. CSTE/PCE : One copy each
7. Principal, ZRTI, Udaipur : One copy
8. Loco Foreman : One copy
9. CRS : One copy
10. TI of the Section : One copy
11. Guards HQ : One copy
12. SE(Signal) : One copy

**513 Obsolete SWRs :**

SWRs or amendment slips when superseded by issue of fresh working Rules or amendment slips shall be withdrawn from the stations by the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) concerned for cancellation/destruction.

**514 Standardisation of SWRs :**

To maintain uniformity in the SWRs, the following standard format issued by Rly. Board vide letter No. 2000/Safety/(A&R)19/36 dtd 27.10.2005 shall be used while framing/revising the Station Working Rules for stations. Care may, however, be taken to ensure that –

1. The SWRs framed as per the standard format are self-contained, brief, precise to the point and in unambiguous language, and
2. Long General and Subsidiary Rules need not be reproduced in the SWRs. Relevant GR/SR number, however, may be mentioned in bracket against each para when required.
3. Sr.DOM/Sr.DOM(G)/DOM/DOM(G) and Sr.DSTE/DSTE and Sr.DEE/DEE (TRD) should feel free to include any special item or feature pertaining to the concerned Station, which otherwise is not covered by the format.

**515 SWR format:**

\_\_\_\_\_ Railway  
(\_\_\_\_\_ Division)

No. \_\_\_\_\_

STATION WORKING RULES OF .....(Name of the station).....(BG/MG/NG)

Date of issue \_\_\_\_\_  
Date brought in force \_\_\_\_\_

## STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.

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Note: (i) The Station Working Rules(SWR) must be read in conjunction with General and Subsidiary Rules and Block Working Manual. These rules do not in any way supersede any rule in the above books.

(ii) The SWR must be page numbered with the station name code written on each page and signed by the Divisional Operations Manger and Divisional Signal & Telecommunication Engineer at interlocked stations and at non-interlocked stations by Divisional Operations Manager and Divisional Engineer should sign each page.

(iii)The SWR should be issued afresh after every five years or after issue of five amendment slips and reviewed as and when required.

(iv)Any new innovations introduced to facilitate train operations should be incorporated in the SWRs.

### 1. STATION WORKING RULE DIAGRAM :

SWR Diagram No.....based on CSTE/.....Railway and Signal Inter locking Plan No..... should show the complete layout of the Yard, Points, Signals, gradients and interlocking arrangements of the Station including the non-interlocked sidings, exact and actual holding capacity of all the individual lines in metres, actual inter signal (demarcation point) distances, names of the adjacent Stations and IBH signals, where provided, on either side of the station with their respective distances from the centre line of the station building to the centre line of the adjacent Stations and any other information necessary in the day to day operation of trains. The particulars of date upto which it is corrected should also be mentioned. SWR diagram should show actual distances and not the minimum prescribed. It should be signed by the Divisional Operations Manager, Divisional Signal & Telecom. Engineer and Divisional Engineer. The detection table, Lever Collar Chart and Pull Sheet should be provided in Appendix 'B'. Pull sheet should be reproduced on a board, brightly painted in the cabins to be placed above the Lever Frames.

### 2. DESCRIPTION OF STATION :

#### 2.1 GENERAL (LOCATION):

.....(Name of the station) is a .....class station on the .....(Name of the Section) double/single line Electrified /non-electrified (BG/MG/NG) section of ..... Railway on ..... route. It is situated at KM. .... from ..... ( a nominated point on the Railway). The number of the cabins should be furnished.

#### 2.2 BLOCK STATIONS, IBH, IBS ON EITHER SIDE AND THEIR DISTANCE AND OUTLYING SIDINGS.:

.....station is situated between .....(Name of adjacent station on one side) in the ..... (North/ South/East/West) side at a distance of ..... km. and ..... (Name of adjacent station on the other side) in the ..... (North/ South/East/West) at a distance of .....km.

In case of IBS signal being provided in the adjacent section the mention of the same need to be made as follows.

The section between .....( name of the section on which the IBS is provided) has been

## **STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.**

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split into two Block sections by providing Track Circuit/Axle Counters and Intermediate Block Stop Signal at Km. .... and km. .... on Up and Down lines respectively, which are controlled by Track Circuit/Electronic Axle Counter and Double Line Block Instrument.

In case the adjacent section is provided with the automatic signals, necessary mention of the same need to be made in the SWR literature.

In case of outlying sidings/DK station taking off from the section its name and Km. in Up/Dn direction should be mentioned. Their detailed working instructions should be given in Appendix 'F'.

### **2.3 BLOCK SECTION LIMITS ON EITHER SIDE OF STATION ON DIFFERENT DIRECTIONS**

:

Points upto which block section in rear terminates and the point from which the block section in advance starts should be indicated in the following tabular format:

Between stations	The point from which the "Block Section" commences	The point at which the "Block Section" ends
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### **2.4 GRADIENTS IF ANY :**

The gradients in the yard and the adjacent block sections should be mentioned with their locations. Any gradient which are steep enough to warrant special precautions in train operation should be mentioned.

### **2.5 LAY OUT :**

Under this head, information pertaining to the number of running lines in the main yard, (namely UP Loop, UP Main, DN Main and Common Loop etc.), Goods-sheds/siding, Hot Axle siding, passing sidings, engineering sidings, sidings taking off from the yard with the details whether electrified/non-electrified etc. and how they are isolated from the running lines should be mentioned. The information in relation to provision of low/high level platforms on the running lines/goods sidings should be given.

#### **2.5.1 RUNNING LINES, DIRECTION OF MOVEMENT & HOLDING CAPACITY IN CSR.**

The direction of movements on all the lines and Clear Standing Room of running lines in terms of metres need to be specified.

#### **2.5.2 NON-RUNNING LINES AND THEIR CAPACITY IN CSR.**

#### **2.5.3 ANY SPECIAL FEATURES IN THE LAYOUT :**

Any special feature of the yard such as catch siding, slip siding, non-standard turnouts, curves, spring points etc. having bearing on the operation of trains need to be mentioned.

### **2.6 LEVEL CROSSINGS :**

Detailed working of the gate along with the particulars regarding LC gate No., location, class, normal position, whether interlocked or non-interlocked, whether communication provided or



## **STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.**

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not and whether Train Actuated Warning Device (TAWD) provided or not, how the gate is operated etc, need to be mentioned in Appendix 'A'.

### **3. SYSTEM AND MEANS OF WORKING :**

System of working in force – Absolute/Automatic by using Double line/Single line Token/Tokenless Block Instruments, whether co-operative or non-co-operative, the staff responsible for their operation and custody of keys should be clearly mentioned. Mention should also be made of the availability of block telephone at the station and Telephone provided at IBS posts to establish contact by the Loco Pilot with Station Master in rear, in case of any necessity.

### **4. SYSTEM OF SIGNALLING AND INTERLOCKING :**

**4.1** The standard of interlocking, type of signalling (MLQ/TALQ/MAUQ/MACLS), method of operating the signals/points from Lever Frames / Control Panel/VDU/CTC, provision of axle counters/track circuits on running lines, Calling-On Signals/IBS, special signalling features such as fixed Warner, stop boards at terminal stations, emergency cross-overs, permanently locked points, motor operated points at an otherwise mechanically worked stations, emergency /crank handle keys and their custody, indications (electric /banner type) of Points/trap points/signals/track circuits/ axle counters need to be mentioned. The detailed description of the Lever Frame/control panel/Video Display Unit for route setting using point/signal/gate control switches, individual operation of points, operations of the gates within the station limits, setting of points using the crank handle and the maintenance of proper records of emergency operation counters provided on the panel need to be mentioned here. Procedure for working of stations provided with Train Protection and Warning System and Anti Collision Device need to be mentioned. The procedure for resetting of the system in case of failure of Axle counter on berthing portion as well as IBS section, emergency operation of points, emergency route cancellations, clearing of block etc also need to be mentioned from operational point of view.

(Details of signalling and interlocking should, however, be given in Appendix 'B' and details of Anti Collision Device, if provided, be given in Appendix 'C')

**4.2 CUSTODY OF RELAY ROOM KEY AND PROCEDURE FOR ITS HANDING OVER AND TAKING OVER BETWEEN STATION MASTER AND S&T MAINTENANCE STAFF.**

#### **4.3 POWER SUPPLY**

The source of Power supply for signalling such as Dn AT/Up AT/Local supply (State Electricity Board)/Diesel Generator/UPS/Integrated Power Supply etc. should be mentioned here. It should be clearly mentioned whether the changeover from one source of supply to the other shall be automatic or manual in case of failure of normal source of supply. The procedure for manual changeover should be described.

### **5. TELE-COMMUNICATION :**

The availability of the tele-communication facilities at the station and their operational aspects should be clearly defined.

- i) Section Control/Dy.Control/Traction Power Control Telephone, etc.
- ii) Auto /DOT telephones,
- iii) Magneto telephone with the cabins/gates
- iv) IBS telephone with IBS at km.....

## **STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.**

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- v) Telephone with axle counter reset boxes
- vi) Telephone for yard communication,
- vii) VHF sets, and
- viii) Mobile Train Radio Communication (MTRC)

The action to be taken in case of failure of communication given above to be clearly spelt out.

(Details of working should be given in Appendix 'B')

### **6. SYSTEM OF TRAIN WORKING :**

#### **6.1 DUTIES OF TRAIN WORKING STAFF :**

Duties of the train working operating staff such as Station Master, Switchman, Cabinman, Leverman, Pointsman, Platform Porter, Gateman for train operation should be mentioned in detail in Appendix 'D' giving specific references to the G&SR of Western Railway and the Block Working Manual.

##### **6.1.1 TRAIN WORKING STAFF IN EACH SHIFT :**

The availability of above operating staff provided at the station in each shift with their duties for working of trains should be mentioned in Appendix 'D'

##### **6.1.2 RESPONSIBILITY FOR ASCERTAINING CLEARANCE OF THE LINES AND ZONES OF RESPONSIBILITY:**

Responsibility for ascertaining clearance of lines and zones of responsibility of each of the staff on duty should be clearly mentioned here. Mention should be made that Private Number Book should be under the custody of train passing staff who is authorised to use it.

##### **6.1.3 ASSURANCE OF STAFF IN THE ASSURANCE REGISTER :**

Every train passing staff posted newly at the station or leave reserve staff at the station or regular staff who has resumed his duties after more than 15 days absence must go through Station Working Rules in force and give assurance in the prescribed Assurance Register.

#### **6.2 CONDITIONS FOR GRANTING LINE CLEAR :**

Under this head, principles of the system of working in force at the station should be described briefly and clearly as applicable to the station. Specific points on the track up to which the line is required to be kept clear must be indicated. . Mention of outlying sidings, if involved, may also be made.

##### **6.2.1 ANY SPECIAL CONDITIONS TO BE OBSERVED WHILE RECEIVING OR DESPATCHING A TRAIN.**

- 6.2.1.1 Setting of points against blocked line.
- 6.2.1.2 Reception of train on blocked line.
- 6.2.1.3 Reception of train on non-signalled line.
- 6.2.1.4 Despatch of train from non-signalled line.
- 6.2.1.5 Despatch of train from line provided with common starter signal.



6.2.1.6 Any other special conditions should be mentioned giving reference to the G&SR

**6.3 CONDITIONS FOR TAKING 'OFF' APPROACH SIGNALS :**

This needs to be mentioned here giving reference to the relevant provisions of the G&SR.

**6.3.1 RESPONSIBILITY OF STATION MASTER FOR RESTORATION OF SIGNALS TO 'ON'**

Station Master should ensure that signal is put back to 'ON' after the passage of the train as per G&SR 3.36.2(b).

**6.4 SIMULTANEOUS RECEPTION / DESPATCH, CROSSING AND PRECEDENCE OF TRAINS :**

This should mention the specific setting of points and traps for the purpose of achieving the desired signal overlaps/isolations to Sand humps/sidings etc. while receiving trains simultaneously, crossing and giving precedence to trains at the station.

**6.5 COMPLETE ARRIVAL OF TRAINS :**

Responsibility for verification of complete arrival of trains before closing the block section should be made clear. In case Block Proving by Axle Counter (BPAC) installed on the section, the procedure of block working should be mentioned, giving reference to the relevant provisions of G&SR and Block Working Manual.

**6.6 DESPATCH OF TRAINS :**

Particulars regarding starting of trains from running lines, non-signalled lines, issue of caution orders etc. should be mentioned giving reference to the provisions of G&SR and Block Working Manual. In case IBS is provided, the procedure for despatch of trains up to the IBS and thereafter to the next station should be clearly defined.

**6.7 TRAINS RUNNING THROUGH :**

The provisions given in G&SR should be mentioned.

**6.8 WORKING IN CASE OF FAILURE :**

Working in case of failure of track circuits, points, signals, block instruments, axle counters, Axle Counter Block, procedure for working over damaged points, reception of trains on obstructed lines, non-signalled line including failure to read the occupation of line by trolley or light engine etc. should be mentioned in detail here.

**6.9 PROVISIONS FOR WORKING OF TROLLEYS, MOTOR TROLLEYS / MATERIAL LORRIES :**

Some of the precautions such as given below should be mentioned :

- (i) The section where axle counters are provided in lieu of track circuits, Trolleys, Motor Trolleys, Lories etc., which are not insulated, shall not be allowed to run except on line clear.

## STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.

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- (ii) Motor Trolleys, Tower wagon/ Material Lorries are not likely to actuate the Axle Counter correctly. When they are to run over the section split by Axle counters, the whole section to be treated as one and next train to be started after the last train has arrived complete.
- (iii) In all other respects the working of a light Motor trolley shall conform to the rules laid down for ordinary trolleys while running without block protection and to those laid down for motor trolleys while running under block protection or following another light motor trolley or a motor trolley.
- (iv) Any other restriction on movement of trolleys/motor trolleys/ material lorries/tower wagons etc.

### 7. BLOCKING OF LINE :

The precautions to be taken by the Station Master, when lines are blocked by stabled vehicles or otherwise for maintenance works, to be detailed here.

### 8. SHUNTING :

- 8.1 General precautions.
- 8.2 Shunting in the face of approaching train.
- 8.3 Prohibition of shunting, any special features if any.
- 8.4 Shunting on single line-
  - Within station section
  - Between Last Stop Signal and opposite First Stop Signal.
  - Beyond opposite First Stop Signal
  - During failure of block instrument on single line.
- 8.5 Shunting on double line
  - Block back
  - Block forward
  - Following a train travelling away
  - Upto IBS
  - Beyond IBS
  - During failure of block instrument on double line.
- 8.6 Shunting in the siding taking off from station yard/goods yard.

### 9. ABNORMAL CONDITIONS

#### (a) THE RULES TO BE OBSERVED IN THE EVENT OF ABNORMAL CONDITIONS

The procedure to be followed in the event of following abnormal conditions should be specifically mentioned.

- (i) During partial interruption /failure of Electrical communication instrument.
- (ii) The authority to proceed in the occupied block section in case of obstruction of line or accident etc.
- (iii) Trains delayed in block section
- (iv) Failure/passing of intermediate block stop signal at 'ON'
- (v) Failure of axle Counter Block / BPAC
- (vi) Failure of MTRC.

**(b) PROCEDURE FOR EMERGENCY OPERATION OF POINTS BY CRANK HANDLE**

- (i) The detailed procedure for emergency crank handle operation of motor operated points at different lines at the station from operation point of view should be mentioned here.
- (ii) Procedure for Emergency operation of point with point zone axle counter/track circuit failure and emergency route release, giving reference to GR 3.39 and GR 3.77 should be mentioned here.

**(c) CERTIFICATION OF CLEARANCE OF TRACK BEFORE CALLING ON SIGNAL OPERATION IS INITIATED**

Mention should be made that before taking off Calling –on Signal during failure of track circuit/axle counter, the route and the clearance of the track over which train would pass to be verified by SM/ASM.

**(d) REPORTING FAILURE OF POINTS, TRACK CIRCUIT/AXLE COUNTER AND INTERLOCKING**

- (i) Mention should be made that whenever there is a failure of points, track circuit/Axle counter or any other interlocking gear at the station, the failure should be reported by SM/ASM on duty to the concerned Signalling Maintenance Staff on duty responsible for attending to the failures and only after receipt of the written memo from the Signalling Maintainer for rectification of the fault, SM/ASM should restore the normal working.

- (ii) The entries in failure register to be done with message to the Section Controller.

**9.1 TOTAL FAILURE OF COMMUNICATION :**

Provision of the SR and instructions laid down in Block Working Manual relating to the working of trains during total failure of communication at the station should be briefly summed up giving the action to be taken and by whom and what precautions to be taken giving reference to the relevant provisions of the G&SR.

**9.2 TEMPORARY SINGLE LINE WORKING ON A DOUBLE LINE SECTION :**

**9.3 DESPATCH OF TRAIN UNDER AUTHORITY TO PROCEED WITHOUT LINE CLEAR OR TO ASSIST THE CRIPPLED TRAIN :**

**10. VISIBILITY TEST OBJECT :**

Position of Visibility Test Object in each Zone of operation and the officials authorised to check the V.T.O. from a nominated place at the station should be mentioned here.

**11. ESSENTIAL EQUIPMENTS AT THE STATION :**

The list of the essential equipment should be given in Appendix 'E'.

**12. FOG-SIGNALMEN NOMINATED TO BE CALLED IN CASE OF FOG :**

The foggy or tempestuous weather or in dust storm when V.T.O. cannot be seen from the SM's office, the SM shall send trained men to act as fog signalman. Instructions regarding their selection from Traffic and Engineering Departments, entry of their names in the Fog Signal Register and taking assurance by the SM to be mentioned clearly.

**LIST OF APPENDICES**

APPENDIX 'A'	WORKING OF LEVEL CROSSING GATES
APPENDIX 'B'	SYSTEM OF SIGNALLING AND INTERLOCKING AND COMMUNICATION ARRANGEMENTS AT THE STATION
APPENDIX 'C'	ANTI COLLISION DEVICE (RAKSHA KAVACH)
APPENDIX 'D'	DUTIES OF TRAIN PASSING STAFF AND STAFF IN EACH SHIFT
APPENDIX 'E'	LIST OF ESSENTIAL EQUIPMENTS PROVIDED AT THE STATION
APPENDIX 'F'	RULES FOR WORKING OF DK STATION, HALTS, IBH, IBS AND OUTLYING SIDINGS.
APPENDIX 'G'	RULES FOR WORKING OF TRAINS IN ELECTRIFIED SECTIONS.

(To be jointly signed by Divisional Operations Manager and Divisional Electrical Engineer).

**516 Traffic Working Order :**

Traffic Working order or TWO is an embodiment of detailed instructions issued and circulated by the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) whenever any pre-planned work of signalling, electrical(OHE) or engineering department is to be executed, requiring special safety precautions to be observed by staff.

**517 Circumstances under which 'TWO' is to be issued :**

1. When the nature of work is such, that it will require the imposition of speed restriction for more than one day.
2. In all the cases when addition or alteration in the layout of the yard or to permanent signalling and interlocking arrangements are to be made.
3. Overhauling of the signal and lever frames.
4. The nature of the work involves temporary cessation of working of the trains.
5. For construction of all new installations on or near the track, such as new station, foot over bridge, OHE, renewal of track, providing temporary diversions, etc.

**518 Procedure for preparation of 'TWO' :**

The draft of TWO is prepared by the supervisor concerned viz. SE(P.Way) for engineering works, by the SE(Signal) for signalling and interlocking works and the SE(Elec.) for electrified sections etc. For electrical works detailing the requirement of the works and precautions to be observed. This pre-planning of the work is known as Draft of TWO.

Draft TWO is submitted by the SE(P.Way)/SE(Signal)/SE(Elec.) to their Divisional Officers i.e Sr.DEN/DEN/ Sr.DSTE/DSTE/Sr.DEE/DEE. After the draft TWO is checked and justified by the divisional officer of department concerned, Sr.DEN/DEN/ Sr.DSTE/DSTE/Sr.DEE/DEE will send the draft TWO to the Sr.DOM/DOM who will include instructions for regulation of Traffic during the execution of work and send it to the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) for issuing TWO. Sr.DOM/Sr.DOM(G)/DOM/DOM(G) will issue TWO with detailed instructions including the safety precautions to be observed during execution of work.

**519 Details of 'TWO' :**

1. Number and date of TWO, subject of TWO and station at which or stations between which the work will be undertaken;
2. Nature of the work mentioning details of the work to be undertaken and completed in different phases showing the period of days;
3. Date of commencement to be given if possible i.e. if previously decided by Sr.DEN/ DEN/ Sr.DSTE/ DSTE/Sr.DEE/DEE and Sr.DOM/ Sr.DOM(G)/ DOM/ DOM(G);
4. Duration of work;
5. Measures to be taken for protection of line;
6. Particulars of speed restrictions;
7. Details regarding issue of Caution Orders, including the names of stations that will issue Caution orders for up/down train;
8. Procedure for working of points and signals in details for passage of the trains. It will also include the number of signals to be disconnected;
9. Procedure for train movements in abnormal circumstances;
10. (a) Details of the work, which will be undertaken for blocking of line with duration, the cancellation of trains during such block as per SR 15.08 (3);  
(b) Procedure to be followed for blocking the line on field telephone as per SR 15.08 (4);
11. Details of officials to whom copy of TWO is issued;
12. Procedure to be followed on completion of work;
13. Validity of TWO i.e. three months from the date of issue.

**520 Responsibility of SS/SM and the supervisor concerned :**

1. On receipt of TWO it will be acknowledged.
2. The paper of TWO shall be kept in TWO file. Details of TWO are entered in TWO Register.
3. All the messages received subsequently in reference to the TWO should also be kept on TWO file and all the train working staff should note TWO.
4. The supervisor concerned viz. SE(P.Way), SE(Signal), SE(Elec.) will issue notice to all concerned 48 hours before he proposes to start the work when he has made the necessary arrangement and received TWO from Divisional Office.
5. On receipt of 48 hours notice from the Work Incharge for taking work in hand it will be acknowledged. This will also be repeated to Chief Train Controller through Section Controller supported by private number by Station Master on duty.
6. On receipt of 48 hours notice, SM must ask for additional staff as mentioned in TWO and obtain their signatures in Assurance Register to be opened afresh for this work.
7. On receipt of 48 hours notice, entries regarding particulars of work recorded in red ink in train signal register on the page which will be in use on day of commencement of work should be made. The entry is made in SMs diary and charge book.
8. On the day on which work is to be taken in hand, the work incharge will give relative message to SM, which will be transmitted to CTNL through Section Controller.
9. Before the permission in writing is given to SE(P.Way)/SE(Signal)/ SE(Elec.) to start the work, SM must ensure that necessary additional staff and equipment i.e. erection of goomties, telephone, walkie-talkie facilities, light, water, clamps of standard design,

## STATION WORKING RULES (SWRs) AND TRAFFIC WORKING ORDER.

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pad-locks, HS lamps/flags, detonators, control's permission etc. have been arranged, Caution Order Message has been acknowledged by all concerned supported by private number.

10. Particulars regarding block are recorded in RED ink in TSR.
11. Ensure that during block period, no train is allowed to enter the block section except the material train required at site of work to be sent on authority to proceed without line clear or other proper authority, duly piloted by engineering official.
12. Before giving block in station limits, ensure that necessary signals are disconnected, the line is protected by banner flag and stop collars are used.
13. Before removing the block, ensure that 'track safe certificate' is obtained on completion of work and necessary precautions as per instructions are observed.

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CHAPTER -6

ADVANCE SECTION AND GHAT RULES

A. ADVANCE SECTION

601 **Definition :**

Advance section is a section of line between two Block Stations, where gradients are such that in case of non or partial AVB train, if parting takes place, the rear portion will roll back. Note :- No train is permitted to run as partial AVB/non-AVB, except in case of accident with a view to clear the affected wagon/wagons from the site of accident.

1. Applicability : Advance section rules shall apply to non or partly AVB trains to clear section from the site of accident.
2. Advance sections are classified as A, AB, AC, AD and AE. The details of such sections, if any shall be incorporated in SWRs.

602 **Precautions required to be taken in each type of Advance Section:**

1. **Type – A :**

On such section, prompt and correct application of the Guard's hand brake is necessary to ensure the stoppage of the parted portion within the block section.

2. **Type – AB :**

- (a) After departure of the train, SM must not permit any shunting beyond the outermost facing points, until the train has arrived complete at the Station, in advance.
- (b) On such section, the parted portion will stop up to the first Stop Signal of the Station on prompt and correct application of the hand brake by the Guard.

3. **Type – AC :**

- (a) On such section, Station in rear is provided with a loop line having trap points or a dead-end, which must be kept reserved for the reception of the parted portion. After the passage of such a train, the points for reserved line must be set and the trap or dead end points also must be set to derail or receive the parted portion.
- (b) In this case also, shunting beyond the outermost facing points in the direction of the departed train and on the line not isolated is prohibited.
- (c) The following train should be detained at the first Stop Signal except where special provision for the reception of the following trains are provided and incorporated in the Station Working Rules.

4. **Type – AD :**

- (a) On such sections, even if the brakes are promptly and correctly applied, the parted portion may enter the block section in rear.



## ADVANCE SECTION AND GHAT RULES

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- (b) No other train can be granted line clear or despatched towards the section in rear. On the single line, line must be kept clear of the trains, until complete arrival of the train which is received from the Station in advance.
- (c) After passage of such a train from the Station the SM must keep preferably the main line, clear and the points set to receive/pass the parted portion, if any.
- (d) In this case, shunting or reception on the lines which are not isolated from the reserved lines mentioned in Para (b) above, is prohibited.

### 5. **Type – AE :**

On such a section, the Station in rear is provided with a Catch Siding. After the passage of such a train, the points must be set for Catch Siding to receive the parted portion, or until the train out of section signal is received from the Station in advance. On such section, the shunting is generally prohibited until special dispensation is granted by the authorised officer and incorporated in the SWR.

### **603 Additional precautions to be taken by the Loco Pilot and Guard:**

- 1. The Loco Pilot, Asstt. Loco Pilot and the Guard must acquaint themselves with the advance sections, on the sections, they are required to work. Learning Road Instructions must be strictly observed. Loco Pilot and Guard of a non or partly AVB trains must be very alert and vigilant, particularly while working the train. They must remain watchful to take whatever further precautions are necessary to prevent any accident. After the train has come to a stop, the Guard shall pin down the Hand-Brakes of all the wagons of the rear portion to prevent its rolling back.
- 2. The Station Master, on departure of a non or partly AVB train from his Station, must remain very alert and vigilant until he has received 'Train out of Section' signal for the train concerned. He must see that all special rules regarding Shunting, Train Reception, etc. as laid down in the Station Working Rules, are strictly observed.

## **B. GHAT SECTION**

### **604 Definition :**

Ghat section refers to those sections, which are declared as such by the competent authority on account of steep grades, sharp curves, cuttings and tunnels with a ruling grade of 1 in 60 or sharp and which requires special precautions to be observed from the point of view of safety, during train working.

### **605 Ghat sections on Western Railway :**

On Ratlam division of Western Railway there is only one Ghat Section exist on Metre Gauge situated in Patalpani - Kalakund section. This section consists of steep descending grades, sharp curves, cuttings and tunnels with a ruling Gradient of 1 in 40 for 6.03 kilometres from Patalpani station towards Kalakund station ( 519.82 to 525.85 kilometres)

In addition to the equipment prescribed in Appendix to SWRs all staff concerned with the working of trains over the Patalpani and Kalakund Ghat Section must have in their possession a copy of the Ghat Rules in force. Station Master and Chief Crew Controller, Mhow, should



## ADVANCE SECTION AND GHAT RULES

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maintain a register to show the names of those who are qualified in working over the Ghat. Station Masters, Mhow, Patalpani and Kalakund are responsible for the Group 'D' staff working under them having a thorough knowledge of the Ghat Rules and for obtaining their assurance in the Assurance Register appended to the Station Working Rules.

Only fully AVB trains with 100% effective (operating cylinders) are permitted to run and passage of non-AVB or train piped vehicles are prohibited over the Ghat Section.

Note : Detailed working instructions and description of Ghat section is embodied in the 'Working Instructions of Ghat Rules' issued separately by Sr.DOM/Sr.DOM(G)/DOM/DOM(G)-Ratlam.

### 606 **Slip siding :**

It is a short length siding provided outside the outermost facing points having capacity to hold few wagons. Slip siding may be provided where Station is on up level and there is steep falling gradient towards a block section. Normal position of the points remains set and locked for the slip siding concerned and generally protected by a Stop Signal / Point Indicator. It prevents the obstruction of the block section by holding any wagon/wagons, which may escape accidentally or inadvertently from the Station.

### 607 **Catch siding :**

1. It is provided for safety purpose with a rising gradient and is sufficiently long as to trap a group of vehicles or a train, which might roll from the block section. It also thus controls the speed. Normally the points are set and locked for the Catch Siding. It may be provided within the block section or within the Station limit. The points may be provided with Point Indicator or interlocked with Stop Signal.
2. **Test-Inclined :**  
In a block section there may be one or more Catch Sidings known as Test- Inclined, for ascending trains. It is a check point for the descending trains to test the Loco Pilot's ability to stop his train before entering the steep descending grade and to ensure that brakes are in good working order. Whistle board is provided to indicate the Catch Siding. If provided in SWR, Loco Pilots after stopping the train at the Stop Signal, may be required to sign in the book in token that the brakes are in good working order. After this, the Catch Siding points may be set for the main line and the signal is taken off.
3. **Telephone advice of departing trains to the Signaller at the Catch Siding :**  
SM should inform the Signaller at the Test-inclined of Catch Siding before granting line clear and obtain a private number and record the same in the Train Signal Register. In case of failure of telephonic communications, a Caution Order shall be issued to the Loco Pilot.
4. **Detection Locks at Catch Siding :**  
Detection Locks are provided on the Stop Signal(Home) Post. SM has Detection Lock Keys in his personal custody, which can operate any of the Detection Locks, fitted at the Catch Siding and without using these keys at the Catch Siding, Stop Signal cannot be lowered.
5. **Train Entering Catch Siding :**  
If the train rolls any distance into Catch Siding, the Guard and Loco Pilot should advise

## ADVANCE SECTION AND GHAT RULES

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particulars to the SS/SM concerned, who should report the occurrence to all concerned. The Signaller at the Test Catch Siding will also report the matter to the Station Master. In such case, a train enters a Catch Siding due to defective brakes, an assisting engine should be asked for and train should be pushed back to the Station in rear, where the engine shall be changed or necessary repairs carried out before the train is allowed to proceed again.

### 6. **Testing of Brakes :**

On these sections, only those wagons/vehicles with effective AVB are permitted to run. All goods and coaching stock shall be given a special test at the starting Station and thoroughly examined by the Sr. Section Engineer(C&W) on duty. Before starting the Loco Pilot and Guard must satisfy themselves personally regarding the condition of AVB on the train.

### 7. **Competency Certificate :**

Loco Pilots Assistant Loco Pilot, Guards, Section Controllers, Train passing station staff, Yard staff, Sr. Section Engineer(C&W) are required to pass a special test in Ghat rules and to possess competency certificate before they are permitted to work on the section.

Competency certificate to Mechanical and Operating staff is issued by the Sr.DME/ DME and Sr.DOM/Sr.DOM(G)/DOM/DOM(G) respectively. These competency certificates are valid for 3 years after which a staff have to be re-examined and validity extended. This certificate should be available with the staff while on duty.

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CHAPTER -7

STATION EQUIPMENT AND STORES

**701 Rule Books, Manuals etc. :**

The following Rule Books, Manuals, Pamphlets and other official publications and those which may be specified from time to time, should normally be kept at each Station as part of Station equipment.

1. General & Subsidiary Rules
2. Operating Manual
3. Accident Manual
4. Block Working Manual.
5. Station Working Rules.
6. Rules for :
  - (a) Gateman
  - (b) Switchman, Cabin man, Leverman and
  - (c) Shunting Jamadar, Points-Jamadar and Pointsman etc.
7. Working Time Table
8. I.R.C.A. Red Tariff
9. I.R.C.A. Military Tariff
10. Rules for working of trains on Electrified section.
11. I.R.C.A. Alphabetical List of Railway Stations.
12. Railway Act of 1989.
13. Manual of Station Accounts
14. Rule Books, Manuals and Tariffs as prescribed by Commercial Branch
15. The Railway Map of India
16. Gazette Notification

**At specified Station :**

In addition to the above, following Rule Books are also to be kept as per requirement :

1. Conference Rules, Part I, II and III
2. General Instructions for Train Examining Staff.
3. I.R.C.A. wagon movements pamphlets No. I, II and III
4. I.R.C.A. Wagon Movement Pamphlets No. II
5. Marshalling Orders (Goods Train)
6. I.R.C.A. Axle Load Chart
7. All India Railway Time Table.
8. Rules for payment of running allowance to running staff.
9. Rules for occupation of Rest Houses and Rest Rooms for Officers & Subordinates.
10. Guard Headquarter Station should have spare sets of Rule Books etc. as specified by the DRM for the use of Guards. Those Headquarter Stations are required to work trains to and from other Railways, copies of G&SRs of the Railway concerned may also be kept.
11. Normal composition – Marshalling orders and rake links of Passenger trains.

**702 Essential station equipments :**

The list of essential Station equipments is given in the Appendix – 'E' of SWRs. The essential equipments at the Station and some important instructions regarding them are given below.

## STATION EQUIPMENT AND STORES

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1. Hand Signals (Flags and Lamps) :

Station Master shall see that his Station is supplied with adequate number of red and green Hand Signal Flags mounted on sticks and tri-colour Hand Signal Lamps. These hand Signals should be kept at convenient or easily accessible place.

2. Clamps iron for points :

Every Station shall be supplied with minimum two clamps or as specified in SWRs.

The Station Master shall see that the staff concerned know how to use and secure clamps at points. When not in use, these clamps with their padlocks should be kept in the Station office with SM on duty. Clamps should always be kept clean and well lubricated. The keys of the padlocks on the clamps should be kept in the key case, duly labelled. Should a clamp be found defective or unserviceable, the Station Master shall report to the Sr.DOM/Sr.DOM(G)/DOM/DOM(G), who will arrange to replace it immediately. Defective clamps will be sent to the Traffic Workshop for repair or replacement. To make easy and quick identification, the padlocks and keys of clamps shall be painted in separate colour combination.

3. Scotch Block : See SR 3.50.

4. Wooden wedges :

These are a triangular wooden piece (ramp type) and are used for securing the vehicles. These are placed between the rail head and the tyre of the rearmost and foremost wheels, thus obstructing the movements of vehicles.

5. Pouches

## STATION EQUIPMENT AND STORES

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6. Cattle Board (At specified Stations)
7. Fire Buckets
8. Fire Extinguishers (At specified Stations)
9. Equipments of Level Crossings : See SR 16.02(a).
10. Placards or plaques for Caution Order, Block Failed, Block Suspended, Motor Trolley Following, Material Lorry Working etc.

11. Stop Collars (For Levers and Slides and Buttons) :

Stop Collars are used on the SM's Slide or Handles of the lever or buttons.

Stop Collars are used to remind concerned staff that a particular running line is obstructed. 'Stop-Collars' are provided according to the requirement at a Station as per SWRs.

The lever collars in cabin must be hanged on from a hook, when not in use, to be readily accessible when required.

For placing of stop collars on the handle of lever or slide or button that works/release the points or Signals of an obstructed line See S.R. 5.19(5)(b) and (c). S.R.4.62(20) and S.R. 8.06.

12. Tri colour LED based flashing hand signal lamp -

As a measure of additional safety a red colour LED based flashing hand signal lamp is also used as indicated under SR 3.66.

**13. First Aid Box at Station :**

(a) Standard First Aid Boxes are provided at all the Stations for rendering First Aid to the injured passengers. The Station Master Incharge are responsible to ensure that the 'Boxes' are maintained as per schedule prescribed and kept in the box and to arrange recoument of deficiencies from time to time, with the form duly filled in, through Sr.DMO/DMO concerned in whose jurisdiction the Station is located.

(b) *Other First Aid Equipment :*

List of ARME Scale – I and Scale – II is given in Appendix – 'A' and 'B' of Accident Manual and Working Time Table.

**703 Signal lamps :**

1. The Station Master incharge is responsible to see that his Station is supplied with adequate number of Signal Lamps with imprest as fixed by the Divisional Railway Manager. He should visit the Lamp Room daily and inspect the Lamps to see that these are in good working condition.

When Station Lamps are damaged or rendered unserviceable due to any of the fittings being lost or broken, they must be sent without delay to the Divisional Traffic Workshop for repairs and a report submitted, which should also show the staff responsible for the damage or loss.

## **STATION EQUIPMENT AND STORES**

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### **2. Point/Trap Indicator Lamps and Hand Signal Lamps :**

- (a) Points/Trap Indicator Lamps and Hand Signal Lamps must be inspected daily by the Station Master to see that they have their full complement of Red, White and Green glasses in the case of Hand Signal Lamps, they are fitted with Reflectors.
- (b) All Signal and Indicator Lamps are maintained by the Signal Department, but Station Masters are responsible to see that they burn properly and are always kept clean.

### **704 Lamp rooms :**

1. Pending replacement of lamps by battery / solar operated lamps, care must be taken to see that the oil in Lamp Rooms does not catch fire. Just sufficient sand to form a thin layer must be sprinkled on the floor of Lamp Room near the oil tins and cleaning table. This will absorb any oil which may fall on the floor. Split oil must not be used in Lamps. A tin of sand should always be kept inside the Lamp Room for emergency.
2. Lamp Rooms must be kept scrupulously clean at all times.

### **705 Pouches :**

On single line, where Token/Tablet Block Instruments are provided, the DRM will decide as to the number of Pouches to be maintained at a Station according to the type of line clear instruments provided and the number of trains running on the section.

If any of the token carried has become so distorted due to shock of exchange, it must not be used.

### **706 Station Tarpaulins (water-proof sheets) :**

Station Tarpaulins are meant for covering goods on Station platforms and open goods shed. These form part of the equipment of a Station and are borne on the register of Dead stock maintained at Station. These must not be used to cover the loads in wagons.

### **707 Drinking water for passengers at Stations :**

Cool, fresh and filtered drinking water must be kept at all Stations for supply to the travelling public, indents for water chatties, buckets, water drippers, lotas, tumblers and dungri cloth for filtering water, must be placed by the Station Master in time on the DRM. At stations where water coolers are provided, these shall be kept in working condition in addition to above.

### **708 Stationery, Books and Forms :**

#### **1. Requisition :**

A normal quarterly/half yearly scale of consumption of Stationery, books and forms including an imprest of at least one month stock should be fixed by the DRM for each Station. According to the programme specified on the requisition forms and in accordance with the instructions printed therein, each Station should prepare in ink an indent on prescribed forms for books, forms, covers and Stationery. The amount indented must not exceed the scale fixed minus any surplus stock on hand except when there are special reasons. The requisition should then be forwarded through the CMI/TI to the DRM.

All requisition must be checked by the CMI/TI for their respective items and demand modified wherever necessary. Finally, these should be further checked in the Divisional Office by the Operating/Commercial Officers and forwarded to the DMM concerned for supply.



## STATION EQUIPMENT AND STORES

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2. Supply :

On receipt of supply, the Station Master must check the supplies with his original requisition and return the requisition with his report regarding shortage or non receipt of items, if any, to the Divisional Office. Shortages, if any, against supplies should be recorded on receipt notes.

The Divisional Railway Manager's office will verify the SM's report and will address the stores deptt. only for such items as are 'short supplied' or 'not supplied'.

Station Masters must check all copies of books or forms involving monetary transaction at once and see that they are correctly page numbered before they are brought into use. If any leaves are found deficient or in excess in any book, it must be returned to the stores depot for replacement.

3. Consumption :

Each Station should maintain an account of issue of Stationery in the prescribed form.

### 709 Consumable stores :

1. The DRM will fix a monthly/quarterly scale of every item of consumable store.

2. Supply :

Supplies will be made at fixed intervals by the Stores Department directly to the Station concerned and if they can be checked in the presence of the Stores Delivery Clerk without causing detention to the train, the Station Master must check them and sign for what he received. If the time does not permit for a proper check, the Station Master may sign for them and report immediately to the DRM/DMM and to the stores delivery clerk, any discrepancy noticed.

3. Consumption:

An upto date record of consumable store must be maintained in the prescribed Tally Book Form G-15-B. Transaction must be recorded daily at large Stations nominated by DRM and monthly at other Stations.

Note: The daily or periodical consumption of kerosene oil, as may be laid down by the Sr.DOM/DOM, shall be recorded in a special register maintained for the purpose.

### 710 Dead stock such as Tools and Plant, Furniture, Fixtures etc. :

1. Requisition :

Requisition of 'Dead Stock' should be submitted on the prescribed form in triplicate by the Station Master through the TI, to the DRM. (Form No. G-11-B/RZ)

The DRM office after duly approving of any additional supply, will place indent on the stores, who will supply the articles direct to the Station and send the duplicate copies of the issue note to the Station Master. The Station Master will sign one copy and return it to stores deptt. The other copy will be sent to the DRM office who will inform the TI by letter of the addition to the tools and plant or articles. TI will, on his next visit to the Station, check the list, initial the same and advise the DRM office.

2. Inventory of Dead Stock :

- (a) Every Station should maintain in the prescribed form as amended from time to time for inventory of all articles of 'Dead Stock', showing the names (a brief but clear description) of all the articles and the date of receipt.

## STATION EQUIPMENT AND STORES

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- (b) All receipts and issue of the items of 'Dead Stock' should be promptly entered in the register and duly signed by the official responsible for the maintenance of the 'Dead Stock', each article being allotted a separate page or set of pages. In the case of transfer, a note must be made in the remark column indicating the authority on which the transfer was affected.
- (c) *Article for temporary use :*  
  
Articles received from division or other sources for temporary use on special work should continue to be accounted for in original Stock Holders Register.
- (d) Articles sent for repairs need not be shown as issues.
- (e) Whenever an article is indicated as condemned, it should be entered as an issue.
- (f) No transfer of Tools, Plant and Equipments and articles allotted to a Station must be made to another Station or branch nor any articles returned to the depot. without the orders of the DRM office.
- (g) The equipment with Guard/Assistant Guard /Travelling Assistant Goods Clerk is not required to be entered in the register of 'Dead Stock'. Station Master, where such staff are headquartered, must maintain a separate register for this purpose and submit a quarterly statement to the DRM office which must be prepared by actual count, with remarks as to the condition of the equipment.

### 711 Care of stores :

1. The Station Master is personally responsible to see that stores, Stationery and forms are taken care of, used economically and properly accounted for.
2. *Insufficient Store :*  
Station Master falling short of any store may submit special indents to the DRM office for special or increased supplies giving full justification for the demand.
3. *Returnable Empties :*  
All empty drums, kerosene oil tins, kegs and other containers as specified by DRM/DMM, returned to the stores depot, should be accompanied by an advice note on the prescribed form countersigned by the Sr.DOM/DOM/Sr.DCM/DCM and should be sent under Free Service Way Bill to the DMM concerned.

### 712 Duplicate keys :

All duplicate keys duly painted in different colours must be neatly labelled and kept by the Station Master in a safe place, where he alone can have access to them. Spare keys (not duplicates) must not be kept at Station, but sent to Divisional Office. Duplicate or extra keys, locks of each safe will be kept for safe custody in the Divisional Office.

### 713 Clocks :

The regulating and winding of clocks at Station should be done by a responsible member of the staff. In the event of a clock going out of order, the Station Master must immediately inform the TCI, ASTE, DSTE etc. The supply, maintenance and time setting of Electrical Clocks and drums at Station is done by the S&T Deptt.

## STATION EQUIPMENT AND STORES

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**714 Marking of Tools & Plants :**

All articles of Tools & Plants must be marked as prescribed.

**715 Furniture list :**

Station Master must display in each room a list of tools and plants provided in that room.

**716 Care of Furniture & Fittings at Station :**

Station Masters are personally responsible for the cleanliness and care of tools and plants at their Stations, Rest Houses, Running Rooms etc. under their charge.

**717 Stock taking of Tools and Plants, Stationery etc. on transfer or leave of Station Master :**

When a Station Master is relieved of his duties on transfer or on leave, a list of tools and plants must be prepared by him in duplicate, both copies being signed by the relieving and the relieved Station Master, explanation for every discrepancy or damage being recorded. One copy of the list must be sent to the DRM office.

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## LOADS OF TRAINS

### CHAPTER – 8

### LOADS OF TRAINS

#### 801 Loads of trains generally:

The maximum number of wagons/coaches in terms of units or tonnage, that can be attached to a train is called as maximum trailing load of the train. The load of the train is determined by :-

1. **Hauling capacity of the engine** : Hauling capacity of different types of Diesel/AC engines is given in table below :-

|      | Types of Loco | Hauling Capacity                                                                  | Weight       |
|------|---------------|-----------------------------------------------------------------------------------|--------------|
| AC   | WDM2 & WDM 2A | 3510 tonnes                                                                       | 112.8 tonnes |
|      | WDG 2         | 4750 tonnes on level and varies according to gradient and reduce upto 3300 tonnes | 123 tonnes   |
|      | WCAM1         | 3460 tonnes                                                                       | 117 tonnes   |
|      | WCAM2         | 4800 tonnes                                                                       | 117 tonnes   |
|      | WAP1,3,4,6    | 1500 tonnes                                                                       | 114 tonnes   |
|      | WAP5          | 5000 tonnes                                                                       | 117 tonnes   |
|      | WAG4          | 3460 tonnes                                                                       | 131.4 tonnes |
|      | WAG5          | 4730 tonnes                                                                       | 126 tonnes   |
|      | WAM4          | 3460 tonnes                                                                       | 112.8 tonnes |
|      | WAG7          | 6000 tonnes                                                                       | 123 tonnes   |
| WAG9 | 6000 tonnes   | 123 tonnes                                                                        |              |

Note :- Section-wise hauling capacity of various types of engines is given in Working Time Table.

2. **Ruling gradient of the section** : The steepest gradient, that exists in a section is called the ruling gradient. The ruling gradient determines the maximum load that the locomotive can haul on that section.

Indian Railways do not specify any fixed ruling gradient due to varying topography of the country, speed and traffic.

The following ruling gradient exist in many of the sections :

- In level areas - 1 in 150 appx.
- In hilly terrain - 1 in 100 appx.

which means that if a horizontal distance of 150 metre is travelled then the rise/fall in the vertical direction will be 1 metre.

3. **Speed of the train** : Load of a train affects the speed. The load on high speed trains like Rajdhani/Shatabdi and similar trains is restricted so as to maintain its prescribed speed.
4. **Holding capacity of the loop lines on the section** : The maximum number of the units that can be attached to a train depends upon the loop line capacity (CSR) of the section to facilitate crossing/precedence. Standard length of loop line on Broad Gauge is 686 metres and on Metre Gauge 425 metres.

## LOADS OF TRAINS

5. **Holding capacity of the platform on the section :** Capacity of platform determines the length of a passenger carrying train to facilitate the passengers for entraining and detraining.
6. **Axle load :** Axle load means the load that the track structure can bear. It also affects the maximum load that can be attached to a train.

### 802 Method of counting units of different types of stock :

The length, carrying capacity and tare weight of different types of stock is as under :

#### BROAD GAUGE GOODS STOCK

| Type of Stock                             | Code    | Length<br>Buffer to<br>Buffer<br>(in mm) | Carrying<br>Capacity<br>generally<br>(in tonnes) | Tare weight<br>generally<br>(in tonnes) |
|-------------------------------------------|---------|------------------------------------------|--------------------------------------------------|-----------------------------------------|
| Covered Wagon (Steel) IRS type            | C       | 8433                                     | 22.4                                             | 10.6                                    |
| Covered Wagon (Steel) IRCA type           | C       | 9195                                     | 22.4                                             | 10.7                                    |
| Bogie Rail Truck (Heavy) Class            | BFR     | 14986                                    | 32.0                                             | 16.8                                    |
| Bogie Well Wagon with Roller<br>Bearing   | BWL     | 18644                                    | 50.8                                             | 31.2                                    |
| Bogie Rail Truck (Heavy) Class            | BRH     | 14986                                    | 58.4                                             | 24.2                                    |
| Open Wagon High sided class               | KC      | 7214                                     | 22.2                                             | 10.3                                    |
| Open Wagon Medium sided                   | K(KD)   | 8560                                     | 23.0                                             | 9.6                                     |
| Open Wagon Medium sided                   | KC(KF)  | 7137                                     | 20.3                                             | 7.9                                     |
| Open Wagon Military IRS type              | OM(KM)  | 9652                                     | 21.5                                             | 11.0                                    |
| Bogie Hopper Ballast Wagon                | BOB     | 12852                                    | 55.9                                             | 25.4                                    |
| Bogie Open Wagon                          | BOX     | 12800                                    | 55.9                                             | 25.4                                    |
| Brake Van                                 | BVG     | 7214                                     | 14.0                                             | 10.8                                    |
| Tank Wagon Heavy Oil Insulated            | TOH     | 8280                                     | 17.8                                             | 14.7                                    |
|                                           | TPR     | 8280                                     | 20.6                                             | 12.8                                    |
| Tank Wagon H <sub>2</sub> SO <sub>4</sub> | TSA(TA) | 6756                                     | -                                                | 12.2                                    |
| Tank Wagon Bitumin                        | TBT(TD) | 4877                                     | 10.8                                             | 12.7                                    |
| Tank Wagon Molasses                       | TH      | 8280                                     | 22730 ltrs.                                      | 13.4                                    |
| Tank Wagon Caustic Soda                   | TCS     | 7214                                     | 12640 ltrs.                                      | 11.5                                    |
| Bogie Covered Wagon                       | BCXT    | 15782<br>(Transition<br>Coupler)         | 52.216                                           | 29.064                                  |
| Bogie Covered Wagon                       | BCXR    | 15782<br>(Screw Coupler)                 | 52.216                                           | 29.064                                  |
| Bogie Covered Wagon                       | BCXC    | 15782<br>(Central Buffer<br>Coupler)     | 52.216                                           | 29.064                                  |

## LOADS OF TRAINS

| Type of Stock                       | Code      | Length Buffer to Buffer (in mm) | Carrying Capacity generally (in tonnes) | Tare weight generally (in tonnes) |
|-------------------------------------|-----------|---------------------------------|-----------------------------------------|-----------------------------------|
| Tank Wagon oil                      | TORX(TK)  | 8280                            | 24640 ltrs.                             | 12.94                             |
| Bogie Open Wagon                    | BOXN      | 10713                           | 58.81                                   | 22.47                             |
| Tank Wagon Oil                      | TORXC(TK) | 1940 **                         | 20.5                                    | -                                 |
| Tank Wagon Oil                      | TORT      | 6877                            | 20.627                                  | 12.8                              |
| Bogie Rail Wagon                    | BRNT      | 14986                           | -                                       | -                                 |
| Bogie Covered Wagon                 | BCN       | 15429 **                        | 55.773                                  | 25.507                            |
| Bogie Rail Truck                    | BFR       | 14986                           | 32.0                                    | 16.8                              |
| Bogie LPG Tank Wagon                | BTPGL     | 19282 **                        | 37.60*                                  | 43.5                              |
| Bogie POL Tank Wagon                | BTPN      | 12420 **                        | 54.28                                   | 27.0                              |
| Bogie Open Military                 | BOM       | 19660                           | 35.85                                   | 30.6                              |
| Bogie Tank petroleum Gas A/B        | BTPGN     | 18000                           | 37.6                                    | 41.6                              |
| Bogie Covered A/B optimised         | BCN 'A'   | 15429                           | 55.78                                   | 27.32                             |
| Bogie Covered A/B High Speed        | BCN HS    | 15429                           | 55.78                                   | 27.32                             |
| Bogie Opened Bottom Rapid Discharge | BOB YN    | 12000                           | 54.5                                    | 24.55                             |
| Bogie Rail A/B                      | BRN       | 14645                           | 48.06                                   | 23.36                             |

\* Maximum loading capacity by weight.

\*\* Over Coupler faces.

## BROAD GAUGE COACHING STOCK

| Type of Stock                                   | Code   | Length Buffer to Buffer (in mm) |
|-------------------------------------------------|--------|---------------------------------|
| Bogie Inspection Carriage (Administrative)      | RA     | 12800                           |
|                                                 | RA 26  | 17120                           |
|                                                 | RA 28  | 21386                           |
|                                                 | RA 32  | 22297                           |
| Bogie Mobile Dispensary & Medical Van           | RH     | 21995                           |
| Bogie Store cum Power Van for Relief Train      | RSH    | 21995                           |
| Four Wheeled Inspection Carriage                | ERC    | 10010                           |
|                                                 |        | 10617                           |
| Bogie Air Conditioned Tourist Car               | ACCT   | 21995                           |
| Bogie Tourist Car                               | CT     | 22297                           |
| Bogie Janta Tourist Car                         | CTT    | 21995                           |
| Bogie Buffet Car ICF                            | WCB    | 22297                           |
| Bogie Second Class with Pantry Car              | WSCB   | 22297                           |
| Bogie AC Class with Coupe, Vestibuled           | WACC   | 21995                           |
| AC First Class                                  | WFAC   | 22297                           |
| Bogie AC Two Tier Sleeper Coach                 | WACCW  | 22297                           |
| Bogie AC Two Tier Sleeper Coach self Generating | WGACCW | 22297                           |
| Bogie AC First Class Vestibuled                 | WGFAC  | 22297                           |
| Bogie FA cum SC Three Tier Vestibuled           | WGFSCN | 22297                           |

**LOADS OF TRAINS**

| <b>Type of Stock</b>                                                                                              | <b>Code</b> | <b>Length Buffer to Buffer(in mm)</b> |
|-------------------------------------------------------------------------------------------------------------------|-------------|---------------------------------------|
| Bogie FC with Coupe                                                                                               | FC          | 22297                                 |
| Bogie FC with Coupe, Vestibuled                                                                                   | WFC         | 22297                                 |
| Bogie FC with Coupe and Second Class Carriage                                                                     | FCS         | 22297                                 |
| Bogie SC with Self Generating Electric equipment                                                                  | GSY         | 22297                                 |
| Bogie SC sitting cum Two Tier Sleeper coach                                                                       | GSCG        | 22297                                 |
| Bogie SC sitting cum Partial Three Tier                                                                           | GSCG        | 22300                                 |
| Bogie SC with Ladies Compartment with Self Generating Electric Equipment                                          | GSY         | 22297                                 |
| Bogie SC Double Decker Coach                                                                                      | WGSD        | 21337                                 |
| Bogie SC Double Decker Coach ICF                                                                                  | WGSD        | 22297                                 |
| Bogie SC with Vestibuled ICF                                                                                      | WGS         | 22297                                 |
| Bogie SC                                                                                                          | GS          | 22297                                 |
| Bogie SC with Vestibuled with Ladies Compartment                                                                  | WGSY        | 22297                                 |
| Bogie Second Class Sleeping Car Two Tier                                                                          | WGSCWY      | 22296                                 |
|                                                                                                                   | WSCWY       | 22296                                 |
| Bogie Second Class Three Tier Sleeper Carriage ICF with Vestibuled, Ladies and Self Generating Electric Equipment | WGSCNY      | 22296                                 |
| Bogie Second Sleeper self Generating                                                                              | GSCW        | 22297                                 |
| Bogie AC Chair Car Second Class                                                                                   | WGSCZAC     | 22297                                 |
| Bogie AC Chair Car Second Class                                                                                   | WSCZAC      | 22297                                 |
| AC Chair Car                                                                                                      | WSCZAC      | 22297                                 |
| Brake & Luggage cum Generator Car                                                                                 | WLRRM       | 22297                                 |
| AC Pantry cum Mini Chair Car                                                                                      | WSCBZAC     | 22297                                 |
| Bogie First Class Chair Car (60 Seats)                                                                            | WFCZ        | 22297                                 |
| Second Class (Day Coach) ICF Vestibuled                                                                           | WGSCZ       | 22297                                 |
| Bogie Full Postal Van (BEMN)                                                                                      | PPS         | 22296                                 |
| Bogie Second Class with ¾ Postal Van                                                                              | SPPC        | 21995                                 |
| Bogie Second Class with ½ Postal Van                                                                              | SPP         | 22296                                 |
| Bogie Second Class with 1/3 Postal Van                                                                            | SPQ         | 22296                                 |
| Bogie Second Class with ¼ Postal Van                                                                              | SPPH        | 22296                                 |
| Bogie AC Three Tier sleeper coach                                                                                 | ACCN        | 22297                                 |
| Bogie Luggage and Guard Compartment                                                                               | LR          | 21996                                 |
| Bogie Second Class, Luggage and Guard Compartment                                                                 | SLR         | 21996                                 |
| Bogie Second Class Three Tier Sleeper, Luggage, Guard Compartment, Vestibuled at one end                          | WGSCWLR     | 22297                                 |
| Bogie Stores Delivery Van on IRS under frame                                                                      | RS          | 21996                                 |
| Four Wheeled Stores Delivery Van on IRS under frame                                                               | ERS         | 9650                                  |
| Bogie Tool Van Relief Train                                                                                       | RT          | 21690                                 |
| Bogie Staff Car for ART                                                                                           | RT          | 21995                                 |
| Four Wheeled Parcel Van                                                                                           | EVP         | 8280                                  |
| Bogie Parcel Van                                                                                                  | VP          | 22297                                 |
| Bogie Horse Van                                                                                                   | HH          | 21995                                 |
| Bogie Motor and Parcel Van                                                                                        | BVUVP       | 20725                                 |
| Four Wheeled Motor and Parcel Van                                                                                 | EVPU        | 9652                                  |



## LOADS OF TRAINS

| Type of Stock                                               | Code | Length Buffer to Buffer (in mm) |
|-------------------------------------------------------------|------|---------------------------------|
| Staff Car for Traction Construction Train (Mumbai Suburban) | YRR  | 21316                           |
| Workshop Staff Car for Traction Construction Train          | YRW  | 21962                           |
| Stores Staff Car for Traction Construction Train            | YRS  | 21386                           |
| Equipment Car for Traction Construction Train               | YRM  | 21692                           |
| Four Wheeled Power Van                                      | YERM | 8585                            |
| Bogie Military Car                                          | MS   | 21995                           |
| Crew Rest Van Four wheeled                                  | ERR  | 9652                            |
| Bogie Auxiliary Medical Van                                 | RHV  | 21995                           |

### METRE GAUGE GOODS STOCK

| Type of Stock                | Code             | Length Buffer to Buffer (in mm) | Carrying Capacity generally (in tonnes) | Tare weight generally (in tonnes) |
|------------------------------|------------------|---------------------------------|-----------------------------------------|-----------------------------------|
| Covered Wagon (Steel)        | BC               | 14326                           | 28.20                                   | 12.19                             |
| Bogie Wagon Open MBOC type   | BKC              | 14340                           | 35.4                                    | 12.6                              |
| Coal Wagon                   | BKC              | 12456                           | 20.32                                   | 10.06                             |
| Rail Wagon                   | BFR              | 14395                           | 28.96                                   | 11.40                             |
| Stones Timber Truck MBR type | BFR              | 14340                           | 36.62                                   | 12.14                             |
| Petrol Tank MBTPX type       | BTPX             | 11750                           | 38000 ltrs.                             | 17.73                             |
| Oil Tank                     | BTL              | 10580                           | 18520 ltrs.<br>16 tonnes                | 12.4                              |
| Well Wagon MBW type          | BFU              | 18455                           | 47.5                                    | 25.7                              |
| Oil Tank Vegetable           | BTV              | 10516                           | 18520 ltrs.<br>16.7 tonnes              | 12.8                              |
| Oil Tank Molasses            | BTM              | 10516                           | 18520 ltrs.<br>24.1 tonnes              | 12.8                              |
| Oil Tank                     | TM               | 7787                            | 13530 ltrs.<br>17.5 tonnes              | 6.8                               |
| Petrol Tank                  | BTK              | 10579                           | 30230 ltrs.<br>24 tonnes                | 14.4                              |
| Petrol Tank                  | BTP (Petrol)     | 10580                           | 18240 ltrs.<br>12.9 tonnes              | 12.53                             |
| Petrol Tank                  | BTP (K.Oil)      | 10580                           | 18520 ltrs.<br>14.8 tonnes              | 12.53                             |
| Petrol Tank                  | BTP (Light Fuel) | 10580                           | 18520 ltrs.<br>16 tonnes                | 12.53                             |
| Vegetable Oil Tank           | NTV              | 10580                           | 18520 ltrs.<br>16.7 tonnes              | 12.53                             |

**LOADS OF TRAINS**

| <b>Type of Stock</b>              | <b>Code</b> | <b>Length Buffer to Buffer (in mm)</b> | <b>Carrying Capacity generally (in tonnes)</b> | <b>Tare weight generally (in tonnes)</b> |
|-----------------------------------|-------------|----------------------------------------|------------------------------------------------|------------------------------------------|
| Petrol Tank IRS type              | MBTPZ       | 11101                                  | 41280 ltrs.<br>29.2 tonnes                     | 15.5                                     |
| Covered Wagon Eight Wheeler       | BC          | 11278                                  | 36.3                                           | 12.4                                     |
| Bogie Hopper Wagon MBOB type      | BKH         | 11445                                  | 32.64                                          | 16.13                                    |
| Iron Covered Wagon                | C           | 5944                                   | 10.67                                          | 4.47                                     |
| Iron Covered Wagon IRCA type      | C           | 6706                                   | 12.19 to<br>14.48                              | 5.3 to 6.1                               |
| Iron Covered Wagon IRS type       | C           | 6752                                   | 18.29                                          | 6.0                                      |
| Iron Covered Wagon MCJ type       | CJ          | 7787                                   | 18.03                                          | 6.0                                      |
| Iron Covered Wagon MCM type       | CRW         | 7790                                   | 18.03                                          | 6.0                                      |
| Open Wagon MO type                | KD          | 7787                                   | 18.69                                          | 6.0                                      |
| Open Wagon MOM type               | KM(KL)      | 7787                                   | 18.90                                          | 5.1                                      |
| Open Wagon Box type               | BOX         | 7787                                   | 18.54                                          | 5.0                                      |
| Coal Wagon Four Wheeler           | KC          | 7664                                   | 14.22                                          | 7.1                                      |
| Steel Body Weighted BVG           | VH          | 6706                                   | 2.032                                          | 18.0                                     |
| Brake Van BVG type                | VH          | 6720                                   | -                                              | 18.0                                     |
| Petrol Tank BTPX type (Petrol)    | BTP         | 10580                                  | 18240 ltrs.<br>12.9 tonnes                     | 12.0                                     |
| Petrol Tank BTPX type (K.Oil)     | BTP         | 10580                                  | 18520 ltrs.<br>14.8 tonnes                     | 12.0                                     |
| Petrol Tank BTPX type (Light Oil) | BTP         | 10580                                  | 18520 ltrs.<br>14.8 tonnes                     | 12.0                                     |

**METRE GAUGE COACHING STOCK**

| <b>Type of Stock</b>                                          | <b>Code</b> | <b>Length Buffer to Buffer (in mm)</b> |
|---------------------------------------------------------------|-------------|----------------------------------------|
| Second Class                                                  | GS          | 20283.5                                |
| Bogie Second Class Chair Car                                  | WSCZ        | 20283.5                                |
| Bogie Second Class Three Tier                                 | GSCN        | 20285                                  |
| Bogie Second Class Three Tier Vestibuled                      | WGSCN       | 20133.5                                |
| Bogie Second Class with Ladies Compartment                    | GSY         | 20283.5                                |
| Bogie Second Class ICF                                        | GS          | 19500                                  |
| Bogie Second Class Three Tier Sleeper with Ladies Compartment | WGSCNY      | 20133.5                                |
| Bogie Second Class ICF Vestibuled                             | WGS         | 20285                                  |
| Bogie Second Class with Ladies Jessop Shells                  | GSY         | 18455                                  |
| Bogie Second Class Jessop Shells                              | SMN         | 20285                                  |
| Bogie Second Class, Luggage & Brake Van                       | SLR         | 20283.5                                |
| Power Van and Generator                                       | SNR         | 20283.5                                |
| Power Van and Generator For Mid-on                            | SNMN        | 20283.5                                |

**LOADS OF TRAINS**

| <b>Type of Stock</b>                             | <b>Code</b> | <b>Length Buffer to Buffer (in mm)</b> |
|--------------------------------------------------|-------------|----------------------------------------|
| Vestibuled Second Class Luggage & Brake Van      | WSLR        | 20283.5                                |
| Second Class, Luggage & Guard Steel Body         |             | 20285                                  |
| Second Class Chair Car with Brake Van            | WSYCZR      | 20283.5                                |
| Second Class Chair Car with Brake Van            | WSCZR       | 20283.5                                |
| Second Class Luggage & Brake Van                 |             | 20285                                  |
| Full Postal Van                                  | PPN         | 18445                                  |
| Second Class, 3/8 Postal Van                     | SPPT        | 20284                                  |
| Second Class, 3/4 Postal Van                     | SPPC        | 20284                                  |
| Second Class, 1/2 Postal Van                     | SPP         | 20285                                  |
| Second Class, 1/2 Postal Van Jessop Shells       | SPPH        | 20284                                  |
| Luggage & Brake Van                              | LR          | 18455                                  |
| Luggage & Brake Van Jessop                       | LR          | 18454                                  |
| Luggage Van only                                 | L           | 18440                                  |
| Accident & Tool Van                              | RT          | 17678                                  |
|                                                  |             | Over Head Stock                        |
| Store cum Power Van for Relief Train             | RSM         | 17678                                  |
| Store Delivery Van                               | RS          | 18455                                  |
| Motor & Parcel Van                               | VPU         | 17240                                  |
| Parcel Van                                       | VP          | 18161.5                                |
| Inspection Carriage                              | ERB         | 9158                                   |
| Rail Motor Inspection Carriage                   | EZZRA       | 7315                                   |
| Track Recording Car                              | CR          | 17655                                  |
| Bogie Saloon                                     | RA          | 11846                                  |
| Bogie Inspection Carriage                        | RA          | 11236                                  |
| Bogie Inspection Carriage                        | RA          | 12290                                  |
| Bogie Inspection Carriage                        | RA          | 18455                                  |
| Bogie Saloon                                     | RA          | 15697                                  |
| Dynamo Metre Staff Car No. 1                     | RK          | 20285                                  |
| Saloon Residential (POW)                         | CT          | 18440                                  |
| Tourist Car AC                                   | CTAC        | 18136                                  |
|                                                  |             | Over Head Stock                        |
| Tourist Car                                      | CT          | 15865                                  |
| Saloon Residential (POW)                         | CT          | 17655                                  |
| Second Class Two Tier AC Sleeper Self Generating | WGACCW      | 20183.5                                |
| AC First Class                                   | ACF         | 17784                                  |
| SE (C&W)'s Mobile Training Car                   | RE          | 17525                                  |
| Restaurant Annexe POW                            | CD          | 12802                                  |
| Dining Car                                       | CD          | 13370                                  |
| Auxiliary Van for ART                            | RHV         | 18440                                  |
| Auxiliary Van for ART                            | RHV         | 18355                                  |
| Pantry Car ICF                                   | WCB         | 20183.5<br>(Over Coupler)              |
| Kitchen & Generator Van                          | WRM         | 15697                                  |
| Pantry Car cum Second Class ICF                  | WCB         | 20285                                  |

## LOADS OF TRAINS

| Type of Stock                         | Code    | Length Buffer to Buffer (in mm) |
|---------------------------------------|---------|---------------------------------|
| Medical Relief Van<br>Over Body Stock | RM      | 17673                           |
| Military Ambulance Ward Car           | MA      | 20183                           |
| AC Generator Car                      | RM      | 14935                           |
|                                       |         | Over Body Stock                 |
| Pantry Car                            | CB      | 18455                           |
| Mobile Generator cum Charging Van     | RM      | 18455                           |
| Horse Box                             | HH      | 18455                           |
| Pantry Car                            | CB      | 20283.5                         |
| Pantry, Second Class with Charger     | WSCZCH  | 20283.5                         |
| Bogie First Chair Car                 | WFCZ    | 20283.5                         |
| Pantry, Second Class, Brake Van       | WSCZCNR | 20283.5                         |
| Bogie First Class                     | F       | 18455                           |
| Bogie First Class with Attendant      | FCQ     | 18440                           |
| Bogie First Class ICF                 | FC      | 19500                           |
|                                       |         | Over Head Stock                 |
| Bogie First Class ICF                 | FC      | 20283.5                         |
| Bogie First Class ICF & Second Class  | FSMN    | 20285                           |
| Bogie First Class ICF & Second Class  | FS      | 20183.5                         |

### 803 Method of counting of load :

The load is counted in terms of units and weight(in tonnes). All Broad Gauge and Metre Gauge four wheelers are counted as 1 unit and Broad Gauge and Metre Gauge Coaching Stock is counted as 2 units while Broad Gauge Goods Stock counted as 2 ½ units.

#### Recording load of a train :

The load of the train is recorded as :-

Coaching Stock, including Brake Van/Loaded Wagon units/Empty Wagon units = Total Units/Total weight (in tonnes). For example –

1. If a passenger train is running with 18 coaches its load will be recorded as 36/—/— = 36/540 (in which 36 are coaching units and 540 tonnes are their tare weight).
2. If a goods train of BG is running with 1 Brake Van, 30 Loaded BOXN and 5 Empty BOXN wagons, its load will be recorded as under :  
 $1/75/12\frac{1}{2} = 88\frac{1}{2}/3500$  (Which indicates 1 Brake Van, 75 units loaded wagons and 12 ½ units empty wagons. Total Load 88 ½ units and 3500 tonnes of weight, including the Tare weight and Net Weight).

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CHAPTER – 9

TRAIN PAPERS

**901 Train papers :**

Train papers contain the details of running and performance of trains such as classification, description, composition, load, route and enroute shunting work done etc. These documents should be prepared neatly in accordance with instructions issued from time to time and should be submitted in time. Frequent surprise checks by Inspectors and Supervisory staff should also be made to ensure the correctness thereof.

**902 Documents prepared for a train :**

The following documents shall be prepared in case of each train. (Except in case of Mumbai Suburban section)

1. **Vehicles Guidance (T -152-F) :**

- (a) This document will be prepared in duplicate or in triplicate, the original being handed over to the Guard of the train and the copy being retained as the station record by the Trains Clerk(TNC) or other responsible person deputed for the purpose at the Station/Yard from which the train commences its journey. Overwriting must be avoided and corrections, if any, should be made neatly and initialled by the person carrying out the corrections. It shall include the following details:
  - (i) The number and description of the train concerned, the names in full of its starting and terminal points and via on its scheduled run and the date of commencement of its journey.
  - (ii) The Owning Railway, Printed Number and Type of all vehicles and/or wagons of the train comprising its Load from Engine to the last vehicle/wagon, the Guard Brake Van, the type of vehicle/ wagon in code. Whether L = Loaded or E = Empty, the name of their Booking and Destination stations, the junction(s) via which the wagon/ vehicle is routed and the Tare, Net and Gross weight of each vehicle/wagon in tonnes.
- (b) The 'Wagon Sheet' used on any open wagon, on the train and booked with the vehicle guidance should be shown in the 'Remarks' column against the entry of the wagon on which used, together with the total number of wagon ropes also used with 'Wagon Sheet'.
- (c) Entries of wagons containing goods of the same consignment should be bracketted with the remarks, 'SAME CONSIGNMENT TO TRAVEL TOGETHER'.
- (d) 'PICK UP' orders regarding the number of wagons station-wise, their grand total, gross tonnes to be picked up and destination, from stations enroute, should be shown in the case of Shunting Goods Train and also the total number of packages with their brief descriptions and the destinations to be loaded at stations enroute, in the case of Van Trains.

Note: i) The gross weight = Tare weight + Net weight, in the case of loaded wagons and the Tare weight, only in the case of empty wagons.

ii) Where the Tare weight of dead engines and other vehicles are not ascertainable

## TRAIN PAPERS

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from any stencilled indication on the vehicles themselves, it should be reckoned as mentioned in 'Loads of Trains' chapter – 8.

- iii) The TARE, NET and GROSS weights shall be recorded in tonnes, fraction of half a tonne and below being disregarded, and over half a tonne being reckoned as 1 Tonne.
- iv) The TARE, NET & GROSS weight columns must be totalled separately before the vehicle guidance is handed over to Guard of the train concerned.
- (e) The Vehicle Guidance must show the 'Summary' of the Load.
- (f) The Trains Clerk, or any other person deputed for preparing the Vehicle Guidance, shall be responsible for its correct preparation in time and he must sign his name in full at the top right hand corner of the Vehicle Guidance.
- (g) The Vehicle Guidance must accompany the train from its starting point throughout to its destination. Vehicles detached enroute will be signed for by the Station Master and the vehicles attached from enroute will be entered by the Station Master / Guard in the Vehicle Guidance. The Guard shall be responsible to see that correct vehicles are attached on his train.
- (h) If any vehicles/wagon is detached short of, or over carried beyond its booked destination inadvertently or due to unavoidable circumstances, the Guard concerned must pass an explanatory remark in the vehicle Guidance indicating the reason. A similar remark must also be recorded in the Guard's Journal Book.
- (i) Each Guard working the train must sign his name in full (with date) in the space provided for the purpose at the foot of the vehicle Guidance, indicating the section over which he has worked the train.

### 2. **Consist Guidance (T- 267-B) :**

For all BG trains going in interchange, this form is prepared. Its contents are reported to Railway Board by Tele-printer. It must be prepared neatly and legibly, the letter or the number should be written in columns provided. This form is divided in three parts:

#### (a) *Train Data:*

This part of the form contains number and description of the train, via, name of starting and terminating stations in full, Engine number, its class and date of commencement of journey.

#### (b) *Vehicle Data:*

This part contains the particulars of vehicles/wagons. Their full particulars, such as Owning Railway, printed number, Tare weight, net weight (in case of goods train) and gross weight, commodity loaded, date of loading, from station and to station must be filled in separate columns provided.

#### (c) *Closing Data :*

This part contains the load of the train in units, tonnes and total weight of the train.

### 3. **Guard Journal Book (T- 26-B) :**

- (a) The Guard's 'Journal Book' is an important official record supplied to all the Guards as their personal equipment, as it may be required to be produced as 'Exhibit' in court cases or enquiries into accidents etc. It must be maintained by Guards in a neat and legible manner, all entries being posted in ink. These books must be preserved for a period of three years, after which, they may be destroyed. They must be made available for inspection, whenever required.

## TRAIN PAPERS

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- (b) The Guard Journal may contain the following information, besides any other information considered necessary by the Guard :
- (i) The particulars of Brakevan equipments, i.e. Portable Control Telephone, Portable Train lighting equipment, Fire Extinguishers, Stretcher, Wooden Wedges, Palm-end-Coupler, Gauges–Vacuum/Air Pressure, Walkie-Talkie, UECS set should be recorded by the Guard.
  - (ii) The train particulars viz. train no., engine no., from station, to station, name of Loco Pilot, Asstt. Loco Pilot and Caution Order in-force should also be mentioned in the Rough Journal.
  - (iii) Details of time made-up and lost department-wise i.e. Tfc., Loco, C&W, Engg. and misc. should be made in appropriate columns.
  - (iv) Full details of all particulars required to be given in the original copies of the Divisional and Through Reports of the train.
  - (v) Number of packages loaded/unloaded.  
The particulars of SLR, LR, Road Van with compartment numbers in which dangerous, insured and valuable packages, etc. are loaded, must also be recorded in the journal. (This does not apply to the Mumbai EMU Trains).

Note: When Travelling Assistant Goods Clerks are provided on Van Goods trains, record of all packages worked will be maintained by them –

- (c) Details of documents and packages handed over to the outgoing Guard of the train and/ or the Station Master or any other person deputed for this purpose.
- (d) Record of any discrepancy noted in respect of packages and Way Bills.
- (e) Particulars of Travelling Cash Safe, if any.
- (f) In the event of original Divisional or Through Report being lost or mislaid, the Guard concerned will be required to prepare fresh copies of the same from the particulars recorded by him in his Journal Book.

#### 4. **Combined Train Report (CTR) (T- 288-F) :**

The existing train report form No. T 288-F consists of two parts :

**Part I-** Loco Pilot's portion

**Part II** Guard's Portion

**Part I :** The columns provided in part I of Combined Train Report consists of engine no., class of engine, home shed, train number, from station, to station, time engine left the shed, time engine coupled to train, time engine uncoupled from train, time engine employed on shunting at starting and terminating stations, booked and actual departure of train, time left and made up on traffic, mechanical and engineering account etc.

**Part II :** Train number service, gauge, division, from station, to station, home shed, coaching vehicle separately under heads 'Upper Class', Lower Class, other coaching vehicles, composite Brakevan, misc. vehicles, total coaching vehicles, tare weight of coaching vehicles.

Total type of Goods wagons separately under heads "loaded"/"empty", Brakevan. misc., net weight of wagons, tare weight of wagons, total load of train, gross weight etc.

C.T.R.s are prepared also for train engines, light engines, assistance required engines and assistance not required engines. Out of four copies prepared, one is sent to Compilation office-Ajmer. On receipt of CTRs from the various shed, figures are consolidated division-wise, section-wise, gauge-wise and train-wise.



## TRAIN PAPERS

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The various statistics are prepared from the CTRs, i.e. :

Train engine hours;

Shunting hours;

Other engine hours (starting and terminating);

Vehicle kilometres separately for upper and lower class vehicles;

Other coaching vehicle kilometres;

Brake Van kilometres;

Miscellaneous vehicle kilometres;

Tare Tonne – kilometres;

Loaded and empty wagon kilometres;

Net tonne kilometres;

Gross tonne kilometres.

Details of time made-up & lost - depts.-wise i.e. Tfc., Loco, C&W, Engg. misc. account

5. Loco Pilot's Hand Book (L- 66-B)
6. Miscellaneous and other documents such as :
  - (a) Package guidance (for passenger and mixed train)
  - (b) Cash bags summary of the cash bags deposited in the travelling cash safe in case of trains carrying travelling cash safes.
  - (c) Any other documents, which may be prescribed by the authorised officer for particular trains or particular sections.

### **903 Documents to be prepared for Mumbai suburban trains :**

1. Guard's journal.
2. Motormen's Ticket – Form (E-4-F)
3. Motormen's Memo Book – Form (L-34-B)

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## STOCK REPORT

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### CHAPTER – 10

## STOCK REPORT

#### 1001 Stock Report :

Each Control Office must daily prepare Divisional Stock Report based on station stock reports and on other data regarding Marshalling yard operation, Transshipment operation, Interchange transaction and loading. Separate stock reports are prepared for Goods stock and Coaching stock.

#### 1002 Goods Stock Report :

Following reports are prepared by Station/Yard for Goods stock transactions. To prepare the various reports the required informations are collected either by telephones or statements received by dak. Most of the informations are collected by the Section Controller on control telephone or by Recorders on Deputy Circuit line in respective shifts. Proformas are meant for watching progress of day to day working. Detailed instructions regarding compilation and submission of all these figures from Station to Divisional Office and from Divisional Office to Head Quarter Office are issued from time to time and should be followed.

#### ***Preparation and Submission of Stock Reports :***

##### 1. Yard Report or ABC report :

*ABC Register and yard reports:* A Yard Report is a complete statement of all transactions in a yard during the previous 24 hours and shows the position of the yard as at midnight, except where otherwise specified. The transactions are recorded in 'ABC' Register by TNC as a train arrives and as it leaves the yard station under the different heads shown in the Register. These transactions are to be tallied at the end of the day and reported under the codes given below separately for main and branch lines. Each station is required to submit this report to the Chief Controller's office. In the event of interruption of communication, the stock report message must be sent by train, without delay.

Following codes are used while transmitting ABC report :-

- AU - Loaded wagons local/foreign awaiting despatch in up direction.
- AD - Loaded wagons local/foreign awaiting despatch in down direction.
- BU - Total goods local/foreign registered and on ground in term of wagon load, on hand to be loaded in up direction
- BD - Total goods local/foreign registered and on ground in term of wagon load, on hand to be loaded in down direction.
- AA - Loaded wagons marked 'Not to go' by any reason.
- OWL - Full load wagons loaded for local/foreign destinations from the station.
- OWLS- Wagon loaded with smalls for local/foreign destination from the station.

## STOCK REPORT

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|        |                                                                                                                              |
|--------|------------------------------------------------------------------------------------------------------------------------------|
| OWLR-  | Wagon repacked for local/foreign destinations from the station                                                               |
| OWLTY- | Wagon loaded for local/foreign destination from transshipment.                                                               |
| CU -   | Loaded wagons local/foreign sent by Up trains.                                                                               |
| CD -   | Loaded wagons local/foreign sent by down trains.                                                                             |
| ECU -  | Empty stock covered/open sent by Up trains.                                                                                  |
| ECD -  | Empty stock covered/open sent by Down trains.                                                                                |
| DU -   | Number of loaded wagons local/through/transshipment received for Up direction.                                               |
| DD -   | Number of loaded wagons local/through/transshipment received for Down direction.                                             |
| EDU -  | Number of empty wagons covered/open received by Up trains.                                                                   |
| EDD -  | Number of empty wagons covered/open received by Down trains.                                                                 |
| IWL -  | Inward loaded wagons full load/smalls (excluding JSVs for packing) meant for local goods shed, sidings etc. to be specified. |
| JSVR - | Junction sealed vans and other vans meant for repacking received                                                             |
| PU -   | Inward loaded wagons including smalls meant for local goods shed, siding etc. to be unloaded at 24 hours.                    |
| PUU -  | Inward wagons full load/smalls unloaded in local goods shed, sidings etc.                                                    |
| JSVU - | Junction sealed vans and other vans repacked.                                                                                |
| F -    | Number of wagons loaded/empty separately received from the Branch line                                                       |
| G -    | Number of wagons loaded/empty separately sent to the Branch line.                                                            |
| HL -   | Number of loaded wagons local/foreign separately on hand for despatch to Branch line.                                        |
| HE -   | Number of empty wagons covered/open on hand for despatch to Branch Line.                                                     |
| L -    | Number of BG wagons remained on hand to tranship into MG/NG                                                                  |
| M -    | Number of MG/NG wagons remained on hand to tranship into BG                                                                  |
| N -    | Number of BG wagons transhipped into MG/NG wagons                                                                            |
| O -    | Number of MG/NG wagons transhipped into BG wagons.                                                                           |
| SOH -  | Stock on hand for transshipment at 20 hrs.                                                                                   |
| ESR -  | Empty stock received for transshipment                                                                                       |
| SST -  | Special stock required for transshipment.                                                                                    |
| WS -   | Wagon sheets of local/foreign railways                                                                                       |
| WR -   | Wagon ropes of local/foreign railways                                                                                        |
| WN -   | Wagon Nets of local/foreign railways                                                                                         |

## STOCK REPORT

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Specimen of yard report (ABC Report)

XR

Time :

Date :

From : SS - RTM

To : CTNL-RTM

No. RTM/ABC/1

AD- 110, AU-70, CU-50, CD-40/60, ECU-75, AA-10,  
DD-90, EDU-80, F-120, G-80/60, HE-50, PU-20,  
PUU-15, N-50, L-80, O-55, WR-10, WN-15,  
WS-12

SS-RTM

### 2. Load Report :

Load Report of number of Goods Trains run daily up to mid-night.

This report will be sent by goods train starting station, for trains starting from 0 to 24 hours for the respective sections under the codes given below:

- U - Up Trains run
- D - Down Trains run
- B - Branch Trains run
- LE- Light Engines run
- R - Total permissible load of trains run.
- L - Actual Total starting load of trains
- F - Total Room left for roadside stations

3. Line and stock Position Report
4. Loading and stock on Divisions
5. Yard Balance of Important Yards at midnight
6. Effective Goods train capacity and number of trains run during 24 hours.
7. Particulars of Traffic Registered
8. Position of sick wagons
9. Stabled loads
10. Interchange with adjoining Divisions/Foreign Railways
11. Position of Engines
12. Loading at Ports
13. Receipt of coal wagons from Interchange points
14. Commodity Statistics – Published Daily

### 1003 Coaching Stock Reports (CSR):

1. A complete cabinet control of all the BG and MG coaching stock passenger and non-passenger carrying, is maintained in the Head Quarter office under the supervision of CPTM's office CCG. On divisions, for each coaching stock separate index card is kept to locate the position of any coaching vehicle on a particular day, by Chief Controller.

## STOCK REPORT

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2. At controlled sections, Coaching Stock Report is repeated to the Recorder on Dy.Circuit line, whereas at non-controlled sections, such message in the prescribed proforma will be sent daily by nominated trains.
  
3. The following codes may be used in the CSR report :
 

|       |                                                 |
|-------|-------------------------------------------------|
| A -   | Spare stock (Block) rake or non-block rake      |
| B -   | Reserved stock                                  |
| C -   | Engaged stock                                   |
| D -   | Foreign Railway Stock (with name of the Rly.)   |
| E -   | Sick on C&W account for 24 hours                |
| E/1-  | Sick on C&W account for 48 hours                |
| E/2-  | Sick on C&W account for 72 hours or more        |
| F -   | Sick on Electric account for 24 hours           |
| F/1-  | Sick on Electric account for 48 hours           |
| F/2-  | Sick on Electric account for 72 hours or more   |
| G -   | Sick coaches lying in yard for 24 hours         |
| G/1 - | Sick coaches lying in yard for 48 hours         |
| G/2 - | Sick coaches lying in yard for 72 hours or more |
| H -   | Coaches due for POH                             |

Specimen of CSR message :

XR                                                  Time :                                                  Date :

From : SS - RTM  
 To : COM-CCG                                                  C- Sr.DOM-RTM

No. RTM/CSR/1

- |      |                                            |
|------|--------------------------------------------|
| A -  | GS 42640, FS 4200, CD 3416, EVK 3861, 4369 |
|      | SLR- 1560, LR 8630, 5642, FC 83946         |
| B -  | RA 2560, ERB 8361                          |
| C -  | EVR 4620, VPU 43690, 86390                 |
| D -  | NR SLR 6429, FS – 2642                     |
|      | CR – VPU 86402 GSCNY 8420                  |
| E -  | GS – 6102                                  |
| E/1- | SLR 8302                                   |
| F -  | NIL                                        |
| G/2- | VPU 3462                                   |
| H -  | GS 9520 GSY 1449                           |

SS-RTM

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**CHAPTER – 11**

**BLOCK RAKES**

**BLOCK RAKES FOR COACHING SERVICES**

**1101 Definition :**

'Block Rake' is a set of vehicles nominated and marshalled together to form normal composition of the rakes to run on specified service.

**1102 Advantages of Block Rakes :**

1. Proper and systematic maintenance and over hauling;
2. Regular repairs and replacements;
3. Proper lighting and charging arrangements;
4. Systematic shunting at the terminal stations;
5. Marshalling various kinds of coaches in predetermined order so that passengers can search out their coach without any inconvenience;
6. Operating and maintenance discipline and effective inter-departmental and intra departmental communication;
7. Responsibility for maintenance standards of the Block Rake by the nominated Base Depot.
8. To maintain uniformity of exterior design and appearance.

**1103 Composition of Block Rakes :**

Composition of block rake is given in the book – '*Normal Composition and Marshalling Order and Rake Links of Passenger Trains*'.

Each rake being distinguished by a letter suffixed by a serial number such as B/1, B/2 etc. Each coach belonging to block rake of a particular service will bear at the left hand of the end panels, the number of the train service and the rake to which it belongs e.g. 2903/2904 A/1. Each coach will be provided with destination boards (in English and Hindi) on both the sides showing the names of stations between which it runs and type of service e.g. A-1, B-2, H-1, D-3, C-4, etc.

**1104 Alterations in Block Rake :**

The permanent prescribed composition, if any, shall not be altered except on the authority of Chief Operations Manager. If any coach is detached or replaced, the Station Master concerned should inform the Control and the Base Depot of the coach.

**1105 Detachment and Replacement of Vehicles from a Block Rake :**

No vehicles should be detached from its rake except when marked sick. When a vehicle has to be detached at an intermediate station being unfit to proceed further a memo to this effect may be given by a Section Engineer (C&W) or by the Loco Pilot of the train to the Station Master. The Station Master will inform the Control and the next Junction Station and ask for replacement, if possible, to avoid inconvenience to the passengers. Similar action should also be taken by the Station Master of starting/terminal stations.

The Station Master must give a report with the particulars of the carriage, reason for detaching, date and time etc. to the DRM, COM and concerned staff for necessary repairs.

The Station Master of terminal station should ensure that in place of the coach detached from a Block Rake, a similar type of spare coach is attached as far as possible, in coordination with Control and SE(C&W).

## BLOCK RAKES

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**1106 Action to be taken to restore Vehicle to its proper Block Rake :**

As soon as a block rake coach is received at its starting or terminal station it should be replaced on its proper rake under advice to CTNL and COM.

**1107 Block Rake Vehicles on other trains :**

Block Rake vehicles should not be utilized on other than their own rakes, nor their distinguishing marks obliterated without the specific orders from the COM.

**1108 Sectional and Through Service Coaches :**

**Slip Coach:** Such coaches do not run from originating station to destination station of the train. These coaches are detached/attached enroute.

These are of two types :

1. *Sectional Slip Coaches* : These coaches run between two important stations during train run.
2. *Through Slip Coaches* : These coaches are attached/detached to more than one train.

A list of sectional and through carriages running over the different trains is given in the '*Normal Composition and Marshalling Order and Rake Links of Passenger Trains*' and Time Tables.

If a sectional or a through slip coach is not connected to a train for any reason and no other suitable train is available, the Station Master must promptly refer the matter to the Control for making alternate arrangements.

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## CHAPTER – 12

**MOVEMENT OF OVER DIMENSIONAL CONSIGNMENT, OTHER BULKY CONSIGNMENTS AND SPECIAL STOCK****1201 Definition :**

Consignments, which when loaded upon a wagon, would infringe the maximum standard moving dimensions, at any point, on the entire route, from the booking station to the destination, including via break of gauge is called an Over Dimensional Consignment (ODC).

Therefore, any consignment exceeding the dimension quoted below shall not be registered for booking unless prior sanction for its acceptance has been obtained from the COM-Churchgate.

**1202 Maximum Moving Dimensions from rail level(at any point) :**

| Description      | Gauge                                            |         |             |
|------------------|--------------------------------------------------|---------|-------------|
|                  | BG (MM)                                          | MG (MM) | NG (762 MM) |
| Height at Centre | 4115                                             | 3430    | 3200        |
| Height at sides  | 3505                                             | 3200    | 2895        |
| Maximum Width    | 3050 for Bogie Wagon<br>3200 for 4 wheeled Wagon | 2590    | 2286        |

Note: (i) Above mentioned dimensions include lashing and packing.

(ii) When a dummy truck is used, the maximum weight that may be loaded, in any wagon or truck is distinctly marked on each vehicle and must not be exceeded. Maximum Dimensions of articles which will not ordinarily infringe the maximum moving dimensions on the respective gauges are also given below for general guidance :

| Description                 | Gauge   |         |             |
|-----------------------------|---------|---------|-------------|
|                             | BG (MM) | MG (MM) | NG (762 MM) |
| Length (in 4 wheeled wagon) | 7010    | 4877    | --          |
| (in Bogie wagon)            | 13716   | 13106   | 8839        |
| Height at Centre            | 2794    | 2490    | 2400        |
| Height at sides             | 2185    | 2235    | 2146        |
| Maximum width:              |         |         |             |
| (In Bogie wagon)            | 3050    | 2438    | 2286        |
| (In 4 wheeled wagon)        | 3200    | 2591    | --          |

Note: (i) These dimensions include lashing and packing.

(ii) In case of inter-gauge movement, the lowest dimensions of any gauge will apply.

**1203 Maximum Permissible Dimensions of Rolling Stock :**

Maximum overall dimensions taken from rail level, in order to calculate readily the maximum height of a consignment that can be transported and height of wagon floor from the rail level are shown below for general guidance:

AS 5 dtd. 18.9.18 Modify Para 1204 of Operating Manual Ch. 12 at page 68 & 69 and Para 1206 On Electrified section (3) (c) at Page 71.

**1. Broad Gauge :**

|                                   |         |
|-----------------------------------|---------|
| Floor Height of converted bogie   | 1308 mm |
| Floor Height of four wheeler      | 1232 mm |
| Floor Height of MBFU (Well wagon) | 686 mm  |
| Floor Height of BFU/BWL           | 457 mm  |
| Height of side girder             | 864 mm  |
| Well length                       | 9449 mm |

**2. Meter Gauge :**

|                                  |         |
|----------------------------------|---------|
| Floor MBFU (Well Wagon)          | 603 mm  |
| Well length of MBFU (Well Wagon) | 3810 mm |
| Floor of four Wheeler            | 864 mm  |
| Floor of Converted Bogie         | 1086 mm |
| Floor of USA bogie wagon         | 1105 mm |
| Floor of W.Rly. BWL              | 487 mm  |
| Well length of W.Rly. BWL        | 9754 mm |
| Width of W.Rly. BWL              | 2261 mm |
| Floor Height of W.Rly BWL        | 489 mm  |

**3. Narrow Gauge :**

|               |        |
|---------------|--------|
| Bogie         | 813 mm |
| Four Wheelers | 762 mm |

**1204 Classification of ODC consignment :**

ODCs are divided into 3 classes according to the minimum clearance available between the consignment and minimum fixed structure profile.

**Class 'A':** Those ODC loads, which has a gross clearance of 22.86 cm (9 inches) and above.

**Class 'B':** Those ODC loads, which have a gross clearance of 15.24 cm (6 inches) and above, but less than 22.86 cm (9 inches).

**Class 'C':** Those ODC loads, which have a gross clearance of less than 15.24 cm (6 inches) but not less than 10.16 cm (4 inches).

Note : 1 The class of ODC has been defined with respect to “the minimum clearance available between the consignment and the minimum fixed structure profile” on the section.

Therefore, main concern is the above referred clearance and accordingly, speeds and escorting requirements have been prescribed for the three classes of ODCs.

2. Thus, ODC of a particular class (A, B or C) in particular section can be ODC of other class (A, B or C) in other sections of Indian Railways and, therefore, the authority for sanction, maximum permissible speed and the required escorting by railway personnel also gets changed accordingly.

3. As per the full Board’s communication, it has been considered appropriate that class of ODC shall be decided for each block section or set of such block sections, based on clearance between the consignment and fixed structure profile, as available in that block section.

4. Thus, the ODCs shall move at restricted speed alongwith related escort provision for “B class” or “C class” ODCs only at such few block sections, where it is categorized as “B class” or “C class” and for remaining block section or sections such ODCs may be permitted to run at sectional speed as per requirement “A class ODCs where clearance between the consignment and the fixed structure profile is 22.86 cm (9 inch) and above.

| Class | Sanctioning authority                                                                                                       | Maximum Permissible sanctioned speed         | Movement during day or night | Required to be escorted by      |
|-------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------|---------------------------------|
| A     | Within Division : DRM<br>Inter Division of the zone - PCOM -WR<br><br>Inter Railway :<br>PCOM-WR and PCOM of concerned Rly. | Sectional speed                              | Day and night                | ---                             |
| B     | Local : DRM<br>Inter Division / Foreign Rly.- PCOM                                                                          | BG - 40 kmph<br>MG - 25 kmph<br>NG - 15 kmph | Day and night                | SSE (C&W)                       |
| C     | CRS                                                                                                                         | BG - 25kmph<br>MG - 25 kmph<br>NG - 15 kmph  | Day                          | SSE (C&W)<br>SSE(P.way)<br>& TI |

**Net Clearance :**

The net clearance shall be worked out as under :

The net clearance between the consignment as loaded in the train and any fixed structure should be calculated after making an allowance of 75 mm (3 inches) for lurch (horizontal) and 7.62 cm (3 inches) bounce (vertical) on the straight together with following additional factors applicable only when the structure in question is situated on a curve.

**1. Horizontal Clearance :**

- (a) Allowance for lean due to super-elevation and over hang due to curvature. The lean should be calculated for that point on the profile of the load which is likely to have the smallest clearance from fixed structure the formula being :-

$$\frac{HC}{G}$$

where H = height in feet to the point being considered.

C = Super elevation

G = gauge.

For the central overhang due to curvature, the formula will be :-  $\frac{B^2}{8R}$

where B = distance between bogie centre

R = Radius of curve.

In cases where the overhang at the end of a vehicle may have to be calculated by the formula will be :-  $\frac{L^2-B^2}{8R}$

$$\frac{L^2-B^2}{8R}$$

where L is the length of the vehicle.

- (b) Additional lurch on curves may be taken 38 mm.

**2. Vertical clearance :**

In case where the top width of the consignment exceeds the gauge of the track the vertical tilt should be added to the height of consignment to work out the vertical clearance from the fixed structure.

**1205 Procedure for sanctioning movement of ODC :**

When ODC consignment is offered at a station for booking SS/SM will verify if the consignment exceeds the maximum moving dimensions from originating station to destination station including via. and break of gauge, if involved. He should apply to the Sr.DOM, who will obtain the necessary sanction of the competent authority.

An application must show the length, width, height, and weight of the load accompanied by a sketch in duplicate of the consignment.

In communicating sanction for the movement of ODC, specific route, through which the particular consignment will move, should be indicated, and it will be the responsibility of the SS/SM of the station from which the load originates.

In addition to strictly adhering to the specific route, the restrictions (eg. speed restrictions, night running restrictions, platform restrictions etc.) notified for conveyance of the consignment over the route, must be adhered to, and no relaxation in this regard is permitted.

**1206 Loading :**

On receipt of the sanction, the consignment should be loaded carefully, lashed and packed properly, so as to avoid any change of shifting enroute.

While examining the wagon loaded, the SE(C&W) must pay attention on the following:

1. Load is well secured;
2. Load is within the C.C. of the wagon;
3. Weight on any pair of wheels does not exceed;
4. Axle load restriction, if any;
5. Under gear of the wagon.

After loading the consignment, Sr. SE(C&W) will register the measurement and advise the SS/SM concerned of the various overall dimensions, including the packing and lashing etc., as loaded in truck. SE(C&W) must issue "fit to run" certificate to the effect that the loaded wagon concerned is safe to run via the particular route specified.

SS/SM will inform, then to Sr.DOM/DOM and office of the COM, followed by a confirmation copy, to be sent to COM.

The Operating Branch will arrange to advise the COM of the other Rlys. concerned, with full dimensions of the consignment, as loaded in the truck for issue of necessary final sanction for movement.

Under any circumstance, provisional sanction must not be treated as final sanction and final sanction must invariably be awaited before consignment is despatched.

SS/SM/YS/YM concerned must furnish full particulars of the wagon to the Control, such as Wagon No., Owing Rly., Type of Wagon, Station from and to, route over which it is required to move etc. After this, Control/Divisional office will give necessary permission to the concerned staff to despatch the wagon by a particular train on date advise and obtain their acknowledgement.

A Caution Order will be given to the Guard and Loco Pilot of the train carrying ODC to restrict the speed and observe any other speed restriction at any other point or other precautions as laid down.

**On Electrified Sections :**

In addition to the precautions laid down above, the following special precautions must be observed for transport of over- dimensional loads on the electrified section:

1. In all cases, where oversize consignment is moving, it should be remembered by all staff accompanying the ODC, that the overhead electrical equipment is always 'LIVE', except when a particular power block has been obtained from the Traction Power Controller. Even when a power block has been obtained, it should be remembered that all the lines, other than those for which the power block has been granted, are 'LIVE' at 25000 Volts.
2. No person should climb on the roof of carriages of wagons, when those vehicles are located beneath the overhead equipment, except when the equipment is made 'DEAD' and earthed.
3. The following are the prescribed clearances from contact wire for the passage of ODCs through electrified sections and the special restrictions required :
  - (a) Special speed restriction is not required when the gross clearance is more than 250mm.
  - (b) Speed must be restricted to 15 KMPH, when the clearance is between 250 mm and 200mm. (ODCs would not be stopped under critical locations i.e. where clearance is between 250 mm to 200 mm).
  - (c) Speed must be restricted to 15 KMPH and power to OHE must be switched off when the clearance from contact wire is less than 200mm.
4. No consignment with less than 100 mm gross clearance from the over head contact wire will be permitted over electrified section.
5. A representative of the Traction Department should also accompany all ODC having clearance as specified in item (b) and (c) of sub para (3) above, over electrified section.
6. A representative of the Traction Department should accompany all ODC loads having width of more than 1981 mm for BG and 1910 mm for MG from the centre line of the track.
7. Section Controller and Traction Power Controller must co-ordinate, while an ODC moves in electrified section in order to ensure that OHE masts are not damaged at locations where the clearance is critical.
8. A list of structures, where the clearances are restricted on the electric traction area and also the clearance available under overbridges should be with the Section Controllers and Traction Power Controllers.

**1207 Despatch :**

1. At the originating station the ODC wagon will be moved when final approval has been obtained from the competent authority.
2. At the originating point the number of wagon/wagons carrying ODC should be entered by the Train Clerk/SM in the vehicle guidance in red ink to be handed over to the Guard of the train.
3. SS/SM should advise the Section Controller on duty, before starting the train and while asking line clear, describe the train number with letter 'X' suffixed on it.
4. It will be the duty of the Dy.Chief Controller to keep adjoining Control Office informed about the movement of such ODC, till such time, it is handed over to the adjoining division by specified train. Also ensure that the consignment is moved strictly by the authorised route.
5. Shunting of train with an ODC should be avoided. Loose and rough shunting of ODC wagon and against such wagon is prohibited.
6. When any ODC wagon is detached from the train at any station, SM and Guard are responsible to ensure safe placement and securing of wagon/load.

- 7 Facility for accompanying staff for extra wagon/brake van should be provided if so required.
- 8 (a) When a load is so long that it cannot be accommodated in two trucks (i.e. two 8 wheelers), it must be loaded in three trucks so that the entire weight is carried on the centre vehicle and the end trucks are idlers. The load must be placed on packing in the centre truck, so that it is clear of the floor of the end trucks by not less 152 mm and there must not be less than 304 mm up side clearance in the end trucks between each of load and side of truck.
- (b) If the weight of the load is such that it cannot be carried on the centre truck, then the load must be carried as equally as possible on the trucks and the centre vehicle must be an idler.

**1208 Movement of Special Type of BWS**

1. (a) Description of BWS –
- |                            |   |                                             |
|----------------------------|---|---------------------------------------------|
| Tare                       | - | 90 Tons                                     |
| Carrying Capacity          | - | 130 Tons                                    |
| Gross Weight               | - | 220 Tons                                    |
| Maximum axle load on rails | - | 18.5 Tons                                   |
| Length overhead stock      | - | 26289 mm                                    |
| Length over buffer /CBC    | - | 27559 mm                                    |
| Length (inside)            | - | 6706 mm                                     |
| Width (inside)             | - | 2946 mm                                     |
| Height (inside)            | - | 699 mm                                      |
| Wheel base                 | - | 17247 mm                                    |
| Type of bearing            | - | Roller Bearing                              |
| Number of Wheels           | - | 24 ( comprising of four 6 – wheeled bogies) |

Two cabins at both ends of the wagon from storing of equipments of this permanent crew of the BWS ( Crew consists of one Carriage & Wagon Inspector, 2 Fitters and 4 Khallasis).

- (b) These type of wagons are put into service for the carriage of very heavy articles with more than Maximum Moving Dimensions.
2. (a) Before loading or moving this BWS, instructions as detailed in paras as above must be rigidly observed. In addition to these instructions, the following special instructions must also be observed before moving the BWS.
- (b) A BWS wagon shall only run on sections on which its movement is permitted by the Commissioner of Railway Safety.
- (c) Drilling of holes in the main well girder is prohibited.
- (d) This 130 Tons BWS will not be attached to any Goods train but will run as a special train only. Two BWSs can also be attached by one special train provided that each BWS has its crew accompanying but this should not be done without consulting the Headquarter office in advance. The marshalling orders of the special train shall be as under –
- (i) Marshalling of the Special train– When ONE BWS is attached –
- Engine
  - 6 dummy wagons ( loaded or empty, 4 wagons at least should be covered)
  - 130 Tons CC BWS
  - Carriage or a BVG for the staff accompanying.
  - Guard's Brake Van

(ii) Marshalling of the Special train– When TWO BWSs are attached –

Engine  
6 dummy wagons ( loaded or empty, 4 wagons at least should be covered)  
First 130 Tons CC BWS  
1 Staff carriage ( 8 wheeler)  
Second 130 tons CC BWS  
Staff carriage ( 8 wheeler for second BWS wagon)  
Guard's Brake Van

Note –The BWS wagon will never be attached next to the engine but at an interval of 6 dummy wagons between the engine and BWS.

3. Observance of Restrictions on the Journey :

- (a) The BWS will be moved during the day only, except at other times under the orders of COM.
- (b) The maximum speed of the special train must not exceed 30 kmph at any stage on the run.
- (c) All permanent and temporary speed restrictions in force enroute working order.
- (d) All vehicles on the train must have effective brake power.
- (e) Avoidance of lines provided with platforms on curves where sufficient allowance for curvature of 57 feet bogie centre has not been provided, avoidance of station or platform roofs etc., or any other similar instructions issued at the time of actual movement of the wagon, must be observed.
- (f) The guard of the train at starting and engine-changing stations will instruct the Loco Pilot to avoid sudden accelerations as well as sudden braking.
- (g) No banking engine should be attached to this special train.

Note – These instructions apply in all cases whether there be one BWS or two BWS wagons by special trains.

4. Staff Accompanying and their Responsibilities :

- (a) The BWS should, in addition, to the permanent staff posted on the BWS, be accompanied by a Carriage & Wagon Inspector and a Senior Inspector of Engineering, OHE (for electrified section) and Operating Deptt. Throughout the journey, who shall be responsible to see that safety is ensured. These Inspectors will travel over their respective Divisions or sections and will not leave the train or BWS unless relieved by Inspectors of other Division or section. In case Control has failed or while moving over a non- controlled section, it shall be the responsibility of these Inspectors to advise station ahead. Where precautions have to be observed at stations, such advice shall be transmitted through Station Master in writing, who, in turn, will pass the advise through block telephone or Control telephone, to stations in advance.

These Inspectors will also keep themselves in closed touch with the crew of the BWS and assist each other for safe running of BWS and also the special trains.

Note – These instructions will be followed also in the case of two BWS wagons by train.



- (b) In case the BWS wagon is to go beyond or upto the junction of the other Railway, the Inspectors concerned will jointly issue a memo stating therein, " that they have accompanied the BWS wagon No.,..... Upto .....station and the instructions pertaining to the running of the BWS over the Western Railway have been kept in the Caboose of the BWS wagon". They will obtain the signatures of the Carriage & Wagon inspector of the BWS, S.E. (C&W) and Station Master of the station concerned, on the original copy of the memo and submit the same to the COM for record.
- (c) The Carriage & Wagon Inspector of the permanent crew of each of the wagon, is responsible for the safe movement of the wagon in his charge during the journey, and also to adjust brake gear to suit the loading as detailed in the manual of instructions with the Carriage & Wagon Inspector. He will also be responsible to see that, during running, the Hydraulic Jacks are completely relieved and Well Girder carried on mechanical supports provided for the purpose.

5. Stabling of BWS-

- (a) If it becomes necessary to stable a BWS enroute, it must be stabled on an isolated siding of the station concerned and no shunting shall be performed on this line as far as possible, due care being taken also before and while performing shunting on adjacent lines.

In case the stabling has to be done on account of mechanical defect, Inspectors accompanying the train shall advise Chief Train Controller and others concerned, personally.

- (b) This wagon must not be loose or fly shunted, or shunted against, in any circumstances.

6. Movement Advice :

Movement particulars should be advised to Dy COM(Goods), Headquarter office on the telephone by each Control office everyday in the morning at about 10.00 hrs. and should also be included in the daily statement of special stock, submitted to the HQ.

7. This wagon must not be booked to destinations beyond the Indian territory.

8. These special operating rules are to be exhibited in the Caboose of this wagon.

9. Movement of Empty BWS :

- (a) On being released at the destination, the BWS should be worked to the station as per the instruction from the COM.
- (b) It will not be attached to any goods train but will run as a special train with dummy wagons attached, as indicated in para 2 Above.
- (c) The speed and other precautions to be observed during the journey will be the same as are to be observed during the loaded movement.
- (d) It will not be necessary for mechanical or operating staff to accompany empty BWS, except for the staff employed permanently on the BWS.
- (e) The daily movement of the BWS will be advised to Dy COM(Goods), HQ office daily in the morning by respective Chief Controllers.

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CHAPTER – 13

MARSHALLING

**1301 Marshalling and its Object :**

Marshalling is the operation of attaching vehicles or groups of vehicles on any train into a particular order, destination-wise, section-wise, commodity-wise or in any other specified manner to meet particular requirements. The main object of marshalling a train is to reduce shunting work enroute, engine changing stations and at the ultimate destination. This also ensures safety of trains and the traffic carried by them.

**1302 Marshalling of Mail/Express/Passenger Trains :**

The following general principles shall be kept in view in framing marshalling instructions:

**1. Passenger Trains :**

In the case of trains carrying passengers, marshalling orders should take into consideration the convenience of shunting of through carriages at junctions, position of ladies compartment, easy access to dining car, or catering compartments, loading and unloading of packages and mails, proper dynamo fitted coaches and general appearance of the train. Normally the ladies compartment, dining cars or the catering compartments, air-conditioned and upper class coaches, shall be marshalled in the middle of the train or as near to it as possible unless otherwise laid down in the composition of the block rakes. Non-passenger carrying stock shall preferably be marshalled next to the engine or in the rear of the train.

**2. The Marshalling of SLRs and Anti-Telescopic/Steel-Bodied Coaches on Passenger Carrying Trains:**

The following instructions regarding marshalling of SLRs and anti-telescopic/steel bodied coaches on passenger carrying trains are to be observed (Board's letter No.76-chg. 11/14/1 dated 4.6.77 and 18.10.83).

*(a) Marshalling of Mail and Express trains :*

- (i) One of anti-telescopic or steel-bodied SLRs must be marshalled as the last coach at both ends of the train formation, i.e., next to train engine in the front and as a rearmost vehicle, except when anti-telescopic or steel-bodied slip or sectional coaches are attached outside the SLR due to unavoidable operational requirements.
- (ii) In case of SLRs which have passenger portion on one side, luggage-cum-brake portion on the other, the SLR should be marshalled in such a way that the luggage and brake portion is trailing outermost or next to engine. In case of new design of SLRs with Passenger portion in the middle, these can be positioned in any convenient way. Railway Board vide their letter No.90/Safety-1/3/8 dated 13.2.1978 have clarified that if for any avoidable reason an anti-telescopic/steel-bodied SLR is marshalled with passenger portion of the front SLR next to the engine or of the rear SLR towards the rear, the passenger portion should be locked. In case of shortage of SLRs, an other coaching vehicle such as a VPU may be provided, and in case a coaching vehicle is attached it should be locked and secured that passengers can not occupy it.
- (iii) However on the M.G., if it is not feasible to position the SLR as mentioned in Item (a)(ii) above due to coupler arrangements marshalling, as operational convenience may be allowed.
- (iv) Two anti-telescopic or steel-bodied coaches should be marshalled inside the anti-telescopic or steel-bodied SLRs at both ends.

## MARSHALLING

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- (v) As sufficient anti-telescopic or steel-bodied SLRs are available for use on Mail/Express trains, there should be no occasion to utilise a wooden-bodied SLR on these trains. However, in case it is inescapable to utilise a wooden-bodied SLR on Mail/Express trains, the wooden-bodied SLR should be marshalled inside two anti-telescopic coaches. There should be 2 anti-telescopic coaches between the front SLR and the engine and 2 anti-telescopic coaches outside the rear SLR. The front and rear wooden-bodied SLRs will, therefore, have to be the 3<sup>rd</sup> coach from both ends.
  - (vi) After providing for Mail/Express trains, all the available anti-telescopic or steel-bodied SLRs should be used on main line passenger trains and after meeting this requirement, the rest should be used on Branch Line Passenger trains. Anti-telescopic or steel-bodied SLRs should be marshalled in the same way as in the case of Mail/Express trains.
- (b) *Marshalling of Passenger Train :*
- (i) See para above regarding marshalling of SLRs.
  - (ii) At least one anti-telescopic or steel bodied coach should be marshalled inside the anti-telescopic or steel bodied SLRs at both ends in the first instance and when adequate number of anti-telescopic or steel-bodied coaches are available atleast two such coaches should be attached inside SLR.
  - (iii) In case of wooden-bodied SLRs on passenger trains, it should be marshalled inside two anti-telescopic or steel-bodied coaches.
- (c) *Marshalling of short service trains :*
- (i) In case of short service trains running with single SLR, the SLR whether anti-telescopic, steel-bodied or not, should be marshalled in the middle one anti-telescopic coach each in front and rear should be marshalled as the outermost vehicle in the first phase and two such coaches should be in the front and rear in the second phase. If there are two anti-telescopic/steel-bodied SLRs on a train one should be marshalled in the front and another in the rear (Board's letter No.83/chg.11/14/6 of 18.10.83).
  - (ii) After a careful review, the Railway Board has decided to permit marshalling of three coaches in front of and in rear of the SLR on short trains, repeat short trains, provided they have working brakes and subject to the further condition that two front most and rearmost coaches are anti-telescopic. An Inspection Carriage may be attached as fourth trailer coach on such trains.
  - (iii) The relaxation in the number of trailer coaches allowed behind the SLR on short trains is being made periodically in view of the prevailing shortage of SLRs and accordingly instructions circulated to concerned divisions (Board's letter No.87/chg-11/14/7 marshalling dated 08./14.3.1991).
- (d) *Non-Passenger Coaches:*
- (i) VPs LRs, WLRRMs and other coaching vehicles, which do not carry passengers may be marshalled as convenient operationally. However, as far as possible, these should be preferably marshalled as outermost vehicles at either end to absorb the impact of collision energy.
  - (ii) Inspection carriage, whether anti-telescopic/steel-bodied or not and occupied by Railway Officers or not may be marshalled as operational convenience.
- (e) *Reserved Bogies and Saloons Occupied by VIPs :*
- Reserved bogies occupied by passengers and Inspection Carriages/ Saloons occupied by VIPs should be treated as any other passenger coach and marshalled accordingly. If they are anti-telescopic or steel-bodied they can be marshalled

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anywhere as operationally convenient. If they are wooden-bodied, they should be marshalled inside the required number of anti-telescopic/steel-bodied coaches. If shunting time required to comply with this marshalling is likely to be long, attaching/detaching of such coaches may be made at convenient points and the party advised to entrain/detrain at their destinations enroute.

(f) *Sectional/Through Service Coaches :*

- (i) Sectional/through service coaches, if they are anti-telescopic or steel-bodied, may be marshalled as operationally convenient. However, wherever feasible, they should be marshalled inside the SLR, LR, VP, etc.
- (ii) Sectional/through service coaches, other than anti-telescopic/ steel-bodied, should be treated like other passenger coaches in the train formation and should, therefore, be marshalled inside the required number of anti-telescopic/steel-bodied coaches.
- (iii) While determining the position of marshalling of sectional through service coaches, the fact that these coaches will be attached/detached en-route, leaving the train service coaches exposed as outermost, should be borne in mind and, therefore, the marshalling order of sectional/through service coaches and train service coaches decided in accordance with the instructions contained in paras (a) to (e) above.

(g) *POH/Sick coaches returning to Shops :*

- (i) In the case of POH/sick coaches, which are returned to shops for major repairs and are attached to passenger trains, such coaches should be properly locked and windows secured, so as to prevent entry of any passenger into these coaches. In that case, it is not necessary to attach these coaches according to safety marshalling instructions and can be attached next to the train engine or rearmost as convenient. If for any reason, it is not possible to lock up these coaches, such coaches should be treated like other passenger coaches in the train formation and should, therefore, be marshalled inside the required number of anti-telescopic/steel-bodied coaches.
- (ii) It is also desired that the above instructions on safety marshalling of passenger carrying trains should be made known to all the staff and officers concerned and these should be followed strictly.

Note : Railway Board vide their letter No.82M/(C) 142/7 dated 15.9.82 have authorised to make good the shortage of GSs. In case surplus GSCN/GSCW are available, it should be ensured that GSCN (uncushioned) GSCW (uncushioned) are used in lieu of GSs on various trains.

(h) *Attaching of Coaching & Goods Stock with Passenger Mixed & Goods Trains:* See SR.4.08(1) for BG/MG/NG sections

**1303 Block Rake Composition :**

For block rake composition and marshalling order, 'Normal composition and marshalling order and rake link of passenger trains' are issued by COM-CCG (W.Rly.) from time to time.

**1304 Mixed Trains :**

A train shall run as a mixed train only when authorised by COM. On such a train, coaching and goods stock shall normally, remain in one block (except where a deviation is permitted) and their marshalling will also be laid down by the COM. Normally goods stock should be attached next to engine and coaching stock inside the rear brake van.

**1305 Attaching of Four Wheelers on Passenger, Mixed and Goods Trains:**

1. Rules on the subject are contained in GR 4.08 and in the Extant Working Time Table, which would be implemented.
2. All wagons or four wheeler coaching stock attached to passenger trains should be certified "Passenger fit" by the Sectional Engineer (C&W).
3. A single loaded four wheeler must not be marshalled between an engine, and a bogie vehicle/wagon or between the two bogies/wagons..

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4. On MG and NG the single empty or loaded 4 wheeler must not be marshalled between an engine and bogie vehicle/wagon or between two bogies /wagons. There is no objection if more than one empty four wheeler vehicles/wagons are attached between two empty or loaded bogie or 2 four wheeler loaded wagons. However, on BG above restrictions does not apply to match trucks alongwith Breakdown trains and /or whenever under special instructions four wheeled brake-van attached next to engine provided such stock is fitted with centre buffer couplers.

### 1306 Attaching of Vehicles outside the Rear Brakevan :

Vehicles outside the rear Brakevan can be attached in accordance with the provisions of the following SRs :

- SR 4.23 (2) - Attaching of vehicles in rear of Brakevan in fully vacuum train
- SR 4.23 (3) - Attaching of vehicles in rear of Brakevan in partially vacuum train
- SR 4.23(4) - Attaching of power plant bogies
- SR 4.23 (5) - Attaching of damaged vehicles

### 1307 Marshalling Chart for Passenger/Mixed/Goods Trains :

S.No	Type of Stock	Marshalling order
1	Empty coaching stock, covered motor. trucks etc	As operationally convenient but preferably marshalled as outermost vehicle at either end.
2	Motor car etc. loaded in open wagons covered with wagon sheets.	In the rear of the Train either as a last vehicle or inside the rear brake van
3	Horse Boxes or other vehicles containing animals on passenger and mixed train	In rear of passenger carrying stock or with the train engine.
4	Live stock including sheeps, goats and horses on goods trains	In case of diesel/electric locos anywhere on the train
5	Covered wagons loaded with cotton etc.	In case of diesel/electric locos anywhere on the train
6	Open loaded wagons loaded with goods likely to catch fire and goods packed in wooden crates or boxes covered with wagon sheets.	In case of diesel/electric locos anywhere on the train
7	a) Explosive (Powder-van) (Maximum 10 wagons by goods train and 3 wagons by mixed/parcel train grouping together) b) Petroleum and other inflammable liquids.	In case of diesel/electric locos one guard wagon from engine, passenger coaches, guard brake-van and other wagons not containing dangerous, explosive and inflammable nature of goods (See Red Tariff).
8	Wagons loaded in pairs/ODC	(a) Inside the rear brake-van by Goods Train. (b) In side the rear brake-van where the mixed train runs with goods stock marshalled in rear of the coaches and if the train runs with coaches in rear, then in rear of coaches with additional manned brake van as last vehicle. Other rules regarding ODC will also apply in case of ODC.

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S.No	Type of Stock	Marshalling order
9	Attaching of engines to a train	Not more than two engines coupled together should run except otherwise allowed by the Authorised Officer.
10	Attaching of dead Engine (Diesel/ Electric)	<p>(a) In case of diesel/electric locos, one dead engine next to train engine</p> <p>(b) If more than one dead diesel/electric engines are required to be attached, they should be separated by 12 wagons on BG, 10 on MG and 6 on NG.</p> <p>(c) Diesel/electric dead engines are treated as piped vehicle. As such, behind it 10 fully vacuum vehicles must be attached.</p> <p>(d) There is no objection to provide banking engine to a train worked in any type of tractions.</p> <p>(e) In addition to above instructions refer appendix – 'A' of G&amp;SR Chapter – IV.</p>
11	Banking Engine	<p>(a) On ascending gradients in rear of train.</p> <p>(b) On descending grades in front.</p> <p>(c) Both gradients in quick succession, if any, then in front.</p>

### 1308 Medical Relief Van :

Can be run without brake van except on Ghat section in terms of SR 4.23(7).

### 1309 Inspection Carriages attached to Light Engine :

Maximum three inspection carriages occupied by the officers can be attached subject to provision of SR 4.23. In case more than 3 Inspection carriages are attached, rules regarding running of goods trains without brake van will apply.

### 1310 Attaching of Travelling Cranes :

Provisions of G&SR 4.27 should be followed.

### 1311 Principles of Marshalling of Goods Trains :

Marshalling orders are issued by the competent authority for the guidance of the staff. These marshalling orders can be modified by the DRM/Sr.DOM/DOM with the approval of the competent authority.

The guiding principle in framing marshalling orders for the railway, is to secure long distance trains from the earliest convenient point on the railway to the farthest distance on the Railway or on the other Railways. Some guidelines are given below:



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1. Through traffic should be worked by through trains to the destination in Block rakes. Attempt to form Block Rake should be made by clubbing wagon demands. Organisation of loading in marshalling order at bulk loading points and feasibility of block loading should be resorted to wherever possible.
2. Wagons for longer leads should be placed behind those for shorter leads.
3. Wagons for the section on which a shunting and Van Goods trains are running, should be marshalled in station order from the starting station. Attaching and detaching at the intermediate stations should involve one shunt, as far as practicable. Similarly, wagons picked up from station to another station on the same section should be attached in proper shunt, as far as practicable.
4. The marshalling should be evenly distributed between the different marshalling yards, keeping in view yard working capacity and the operational convenience as per instructions laid down by the COM. The rational distribution of work among various yards, is arranged so that no yard is given more work load than it can cope with efficiently.
5. Each locomotive has its economical load and to get the maximum output from a transport system, it is necessary that each locomotive is given full economical load. It is also most economical if long distance Goods trains should be by passed intermediate yards except for technical or operational necessity.
6. Cases of violation of marshalling orders i.e. wrongly marshalled wagons and excessive number of terminating loads coming to a particular yard should be watched and brought to the notice of the operating officers concerned.

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CHAPTER – 14

**MARSHALLING YARDS AND THEIR WORKING GENERALLY**

**1401 Introduction and Definition :**

“Marshalling Yards are the hearts that pumps the flow of commerce along the tracks; and they may, too, without eternal vigilance become the grave Yard of cars(wagons)”.

A Yard can be defined by the functions it performs. It is the place or the activity centre on a Railway system, where the trains or rolling stock or group of rolling stocks are received, reformed into trains or loads after marshalling and are despatched to their destinations. A Yard is, thus, a classifying and distributing machine with facilities for receiving, sorting and despatching the wagons to their various destinations, after the prescribed attention. This necessarily involves detention to trains and wagons, but it is inherent in railway working to have Marshalling Yards.

A Yard is a specified area laid out with a network of tracks divided into several grids for receiving sorting, forming and despatching of trains.

**1402 Necessity and Significance of Marshalling Yards :**

1. Sometimes it is not possible to get trains in such a manner that the trains are just ready for despatch for their destination by a Yard without any attaching or detaching of wagons. It is not always possible that the freight trains come back to their base depots intact and then resume the cycle. This is possible to some extent in case of block rakes of passenger/goods trains, but even in that case, the block rake coaches/wagons have to be attached, detached/ replaced for various reasons, particularly for sick detaching and maintenance etc.
2. It is not in the interest of operations to have rigid, closed circuit movements. Operational flexibility is required for optimum utilisation of resources. The day to day pattern and operational efficiency requires change in sources of supply of wagons, destinations necessitating change in C&W examination points and different type of number of wagons.
3. The unit of loading is a wagon while the unit of movement is a train. The loads of trains have also to be required as per the haulage capacity of Locos, mode of traction, track, interlocking/signalling, the permissible load on the section and the terminal facilities.

Although Yards perform very important functions, yet the work done in a Marshalling Yard is only indirectly productive. Yards are operational necessity and are even considered as necessary evils. The fewer of Marshalling Yards, better we can do. The ingenuity of the operating man consists in putting in the maximum number of the wagons into the minimum possible number of Marshalling Yards by forming trains for the farthest common points subject to rules and regulations. If the control is analogous to brain of the operating system, a large Marshalling Yard is a kin to the heart and its working to be planned and monitored with considerable care. Constant vigilance and intelligent and efficient work in day to day functions is required as it is one of the important factors governing the capacity and the output of a section. A Marshalling Yard affects not only the traffic it deals with, but also the entire train running on the section, in particular and the working of Railway system in general. The Yard gets easily congested if treated as a holding Yard and if more trains are put in than taken out.

**1403 Classification of Yards :**

Yards can be classified as:

1. Terminal Yard.
2. Marshalling Yard.

**Terminal Yard** : Terminal Yard means the Yard attached to terminal goods sheds where large number of wagons are loaded and/or unloaded. This term is also used for every goods Yard, where a goods train terminates.

**Marshalling Yard** : Yards are nominated as Marshalling Yards on the basis of the work done and wagons dealt with. The Yard which receive and despatch trains without any shunting on them are classified Transit Yard. In such Yard generally change of Crew, Engine or C&W examination etc. only take place in addition to formations of a few loads. In fact the entire resources and operating statistics are affected by the functioning of the Marshalling Yards.

### 1404 Objectives of Marshalling Yards :

#### 1. Quick Transit viz.

- (a) Accepting trains without detention at adjacent station outside the Yard.
- (b) Minimising the detention to wagons in the Yard.
- (c) Timely supply and placement/removal of wagons to the goods shed, transshipment shed, repacking shed, sidings, carriage and wagons depots etc. served by the Yards.
- (d) Forming block loads for the farthest destination.
- (e) Ensuring convenient Marshalling of wagons from the operational efficiency point of view.
- (f) Ensuring right time start to outgoing trains.

#### 2. Economy :

- (a) Maximising productivity of resources and minimising the detention to Train Engine/ Light Engine, Shunting Engine, crew and other connected staff.
- (b) Optimising the Trailing load of the trains.
- (c) Optimising shunting engine utility.

#### 3. Safety:

- (a) Ensuring minimum damage to wagons and consignments loaded on the wagons during the shunting operations.
- (b) Ensuring safe Marshalling and C&W pattern of examination.
- (c) Elimination of Yard accidents.

### 1405 Kinds of Yards :

Marshalling Yards can be classified under three groups on the basis of the method of sorting out trains:-

1. **Flat Yard** : Flat Yards are generally laid on flat or level land where shunting operations are carried out with the help of engine by push and pull method. Such Yard is economical in space but slow in working and wasteful in shunting engine hours.
2. **Hump Yard** : Hump Yards are constructed by providing gradients between reception and the sorting and despatch lines and the grids. The gradients are created by constructing an artificial hump suitable for the purpose. The gradient of the hump is constructed in such a manner that the wagons roll down of their own to specified sorting lines from the summit (apex) of the hump after having been pushed up by the shunting engine. The load is pushed up by engine towards the hump from one side of the hump so that the uncoupled portion of the load rolls away towards another side of the hump in sorting/despatch line. There are generally two humps one for 'Down' and one for 'Up' Yard. These Yards are economical in shunting engine hours as compared to flat Yards.

3. **Gravity Yard** : Gravity Yards are constructed where the natural contour of land permits a suitable falling gradient stretched over a sufficient length. The falling gradient makes it possible to use the Yard to the fullest extent in Marshalling wagons/trains thus minimising the use of engine power. Therefore gravity Yards are more economical than flat Yards but the layout of it is dependent on the availability of plenty of land with the required topography which is seldom possible.

### 1406 Some Terms Concerning Marshalling Yards and its Components :

Some of the components of Marshalling Yards are explained below :

1. **Reception Yard** : Reception Yard comprises of the lines on which the incoming trains are received and stand clear of other running lines while waiting their turn to be dealt with. Incoming trains may be composed of wagons which are to go through after changing of power, Crew and Guard or of wagons requiring sorting and Marshalling. Separate grids may be provided in the reception Yard one for through trains and another for terminating trains. Separate reception Yards may be provided for trains coming from different directions. In a Yard where no separate reception Yards for both up and down trains are laid down behind the common loop, so that the hump is utilised more economically. The grids for through trains by passes the hump.
2. **Sorting Yards** : It is a Yard in which the trains are broken up on the different sorting lines for various directions or specified destinations, as per Marshalling order so as to form them into trains and prepare them for correct Marshalling.
3. **Marshalling Lines** : The lines in which sorted wagons are separated first, if necessary, according to commodity, type of vehicle, Marshalling order, direction and secondly reformed into trains in special order to meet the requirements of the section ahead or any other special transportation requirement.
4. **Departure Yard** : In which load can be held ready for departing trains. Separate departure Yards for trains for different directions are provided in large Marshalling Yard.
5. **Shunting Neck** : It is a line in a Yard leading to sorting lines on which the actual shunting of the trains maybe done clear of any running lines.
6. **Gathering lines** : It is a line on which the turn outs to other lines are arranged.
7. **Transfer lines** : These lines are meant for transferring wagons, generally from up Yard to down Yard or vice versa, in case of two separate Marshalling or hump Yards.
8. **By pass or avoiding lines** : It is a line which skirts the hump and its object is to avoid engine going over the hump. It joins the shunting neck at one end and the main hump line short of the king point at the other. It is also used for vehicles which can not be passed over the hump into the sorting Yard due to various reasons.
9. **Engine Run Round Line** : It is the line reserved for movements of incoming and outgoing train engines to and from the Yard or the loco shed, or for independent movement of shunting engines.

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10. **Engine Escape Line** : It is the line meant for engine movements to and from the loco shed from and to Yard so that engine returning to loco sheds do not interfere with engines, going out of the loco shed, or with any other movements in the Yard.
11. **King Points** : The first pair of points a wagon meets with after passing over the hump are called 'King Points'. They divide the sorting Yard into two portions.
12. **Queen Points** : The second pair of points a wagon meets with on its way downwards are called Queen Points, which further divide the sorting Yards into four portions.
13. **Jack Points** : The third pair of points a wagon meets are called the jack points and these serve to divert the rolling wagons into the different grids of the sorting Yard. Points beyond jack points called 'Ten points'.

**Note:** In a hump Yard there are usually a pair of 'king points' two pairs of 'Queen points' and four pairs of 'Jack points'.

14. **Retarders** : One of the main problems in the working of a hump Yard is to adjust suitably the speed of the humped wagons rolling down so that they may not cause damage by humping down against wagons already standing on the same line. The speed of the humped wagons varies according to the force of the push given by the engine, the height of the hump, the weight, the nature of the axle box (viz. roller bearing or plain bearing), as also on the weather prevailing.

In mechanised Yards, retarders or rail brakes are installed to reduce and keep the speed of the humped vehicles under control. The retarders may be automatic or manually operated.

15. **Skids** : At Yards, where mechanical retarders are not provided, skids are placed on the sorting lines to control the speed of the humped wagons. These skids are placed by skid porters and the skids automatically come out of runways, where provided, or/and are removed after the wagon has come to stop.
16. **Brakevan siding** : In this siding, brakevans of incoming terminating trains etc. may be detached for subsequent attachment to originating trains.
17. **Special stock siding** : These are provided for keeping for special type stock, cattle wagons containing commodities like explosives which can not be humped.
18. **Stabling Lines** : In large Yard, ballast, material or POH special, empty military special trains are sometimes required to be stabled. Moreover there are heavy accumulations of certain classes of stock for various reasons. The stabling accommodation in the Yard should, therefore be ample so that the Yard may retain its mobility inspite of any accumulation of wagons or other set backs.
19. **Sick lines** : Normally sick wagons are sorted out in the sorting Yard, then sent in the sick line. As the time taken in placing wagons into and withdrawing them from a sick line is usually, & often more, the time spent in actual repairs, provisions should be made to carry out whatever repairs are possible in the sorting Yard itself by providing sick lines.

### 1407 Telecom Equipment of Marshalling Yards :

A Marshalling Yard should necessarily have the best possible telecom facility for proper functioning and efficient supervision of work:

1. **Telecommunication arrangement** : Since a Marshalling Yard covers a considerably big area, the distance between its different points and portions becomes naturally long. Therefore extensive telecom network, through an electronic exchange and intercoms between all important points in the Yard, is imperative so that instructions to the supervisory staff can be conveyed quickly over telephone. The Yard should also have direct dialling trunk facilities and Control Telephones, so that instructions to the supervisory staff can be communicated properly and promptly.

2. **Paging and talk-back arrangement** : Major Marshalling Yards are provided with Paging and talk-back sets, through which orders and instructions are issued to the staff concerned, working in different spheres in the Yard, from one central point. Similarly, the staff can also convey any information to the central points. This helps co-ordination between different spheres of the Yard.
3. Loud speakers are also provided at convenient points so that instructions can be conveyed to different staff working in the same area. For example, loudspeakers are provided in the Sorting Yard, so that the incharge of the hump can convey instructions relating to Hump cabin and the skid Porters regarding the line on to which wagons are being shunted. Similarly, arrival and despatch of trains can be monitored.
4. Extensive use of good walkie-talkies will also go a long way in improving the efficiency of the Yards.

### 1408 Yard Organisation :

Yard working is controlled by a Chief Yard Master, though small Yards may be controlled by Yard Master. Big Yards may be under the control of Area Officer. The Yard in charge has two organisations under him.

1. **Executive or field staff** : It includes the Chief Yard Masters, who is overall Incharge of the Yard and Yard Masters in each shift are responsible for operational work. In dual yard system, there may be more than one Yard Masters, e.g. one for Down Yard and another for Up Yard, on the other hand, where the traffic is comparatively low, Yard Masters may be replaced by Assistant Yard Masters. The next level of supervision is generally related to the shunting engines. Each shunting engine may have an Assistant Yard Master/Shunting Master, attached to it, who controls the movements of the shunting engine. Shunting Jamadar may be included in the organisation to assist them for dealing with the shunting work allotted to each engine. Where the shunting work is not heavy or comparatively unimportant, the Shunting Jamadar may be incharge instead of Yard Master. Each shunting engine generally has a batch of three or four Pointsmen, whose duties are usually as under :
  - (a) for Marking the wagons
  - (b) for Uncoupling of wagons
  - (c) for Relaying of signals
  - (d) for Operating the points.
  - (e) For Braking of wagons.

The above staff from the organisation for sorting work besides other staff are also required for various auxiliary functions – cabin staff, call boys, box boys (brake or skid porters in hump Yards) etc. apart from the staff of other departments.

2. **Trains Branch** : CTNC or Head TNC, has over all responsibility for the efficient working of the trains branch. Below them, there are Head TNCs/ Sr.TNCs/TNCs, who may be on shift duties or during day duty only, depending on the work load of the Yard. These Trains Clerks are entrusted with comparatively important work in the trains branch like preparation of Marshalling Yard statistics, maintenance of the Yard Balance Register, Daily Stock Taking etc. The TNCs in shift duties take stock of trains in Reception and Despatching Yard. They also maintain Wagon Exchange Registers, Phasewise Detention Register and stock on line position. The number of TNCs in a Yard will depend on the number of wagons, trains dealt with in a Yard.

### **1409 Yard Working Instructions :**

For proper and efficient working of each Yard, general directions for working in each shift should be laid down in the Yard Working instructions. The instructions should deal with all important aspects of working in detail other than the procedure for reception and despatch of trains, etc., which are required to be given in the Station Working Rules to be useful for the general guidance of staff working in the Yard as well as to the new and the relieving staff. The Yard Working instructions should be prepared generally under the following heads:-

1. Full description of the Yard including no. of lines with their holding capacity etc.
2. Strength of the Yard Staff in each shift.
3. Quantum of inward, outward and internal traffic required to be dealt with by the Yard and their timings.
4. Marshalling Orders in force.
5. Shunting engines available in each shift and their utilisation, generally.
6. Procedure of work to be carried out, generally in each shift.
7. Directions to Shunting Jamadars and Yard Masters on arrival on duty, in general, in regard to advance planning of the work during their shift.
8. Directions to Shunting Jamadars and Yard Masters in regard to position of the Yard at the time of handing over the charge.
9. Important Safety Precautions
10. Miscellaneous instructions.

### **1410 Main Works Required to be Performed by Yards :**

Generally a large Yard is required to perform the following work with due regard to efficiency, reliability, economy and safety:

1. To pass through trains after changing of engine and carriage examination and detaching sick wagons, if any, and adjusting load of the train if necessary.
2. To mark and sort out terminating trains and loads and the local loads originating in the Yard.
3. To form originating through trains for the farthest point possible in accordance with long distance Marshalling orders laid down by the HQ office.
4. To form shunting and van trains for the different sections served by the Yard.
5. To hold back trains and wagons until they are able to go out.
6. To keep wagon detention to the minimum while planning item No. (1) to (5).
7. To move train engines and pilots between the Yard/Loco Shed and sidings.
8. Placement and removal of inward loaded wagons for the goods depots, loco shed, private sidings etc. served by the Marshalling Yard.



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9. Placement and removal of wagons from the repacking shed to the Yard.
10. Placement and removal of Sick/Fit wagons from the sick lines.
11. Assessment of room by the nominated shunting trains for roadside stations.
12. Arrangements for supply of stock as per Indent Register and ODR required by the road side station in accordance with the orders received from the CTNL(Stock).
13. Weighment of wagons in certain nominated Yards as and when required.
14. Maintenance of the correct tally of the daily output of the Yard.
15. Maintenance of record of detentions to other kinds of stock such as local loaded, sick wagons, empties and special stock etc.

### **1411 Some Factors Affecting Working of the Yards Generally :**

1. Lack of proper advance planning and co-ordination between the Control and the Yards, and want of proper co-operation between the Yard staff, loco shed staff and carriage and wagon staff, affects Yard working adversely. For efficient Yard working it is necessary that the Yard staff must plan their work in advance in consultation with control and adjacent Yards, if necessary the different members of the Yard staff should extend co-operation in the efficient working of the Yard as a matter of team spirit.
2. Sometimes, while sorting up the terminating trains, local wagons are not properly collected in specified lines and they remain scattered in the sorting and Marshalling lines or other parts of the Yards thereby causing undue delay in the Yard operations. Endeavour should always be made to collect these wagons in lines specified for the purpose.
3. Late or irregular removal of loads from local areas affecting timely placement of wagons in their appropriate sidings is often a chronic cause of trouble in the working of the Yard. Therefore endeavour must always be made to adhere to the schedules for placement and removal of wagons in the different areas of the Yard in accordance with Yard working instructions.
4. Empty stock should not be allowed to lie scattered all over the Yard. As far as possible empties should be sorted out in the groups in which they are generally required to be worked out, keeping as far as possible special type of stock separately from general wagons. All empties stock so grouped preferably be kept separate in specified lines.
5. Sick wagons and wagons for adjustment of loads and transshipment of contents often lie scattered through out the Yard thus hampering the Yard operations. Even if the number of sick wagons exceeds the repair capacity, these must invariably be kept collected in the specified lines and sick lines placement and removal should be done strictly according to the schedule. Wagons required adjustments of loads and transshipment or contents must always be placed in the appropriate line and attended to with the least possible delay. Where adjustment of loads can possibly be done in the Yard itself, this must be resorted to.



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6. Any tendency on the part of shunting engine Loco Pilot to waste time on loco requirements should be curbed. Shunting engine must not be allowed more than the specified time for loco requirements at fixed intervals.
7. Higher wagons balance in a Yard affects its mobility. It is therefore very necessary that proper analysis of the highest wagon balance beyond which mobility of the Yard is seriously affected, should be worked out and proper co-ordination between the Yard Master, Assistant Station Master, Control and adjacent Yard should be maintained all the time. To prevent excessive inflow of wagons, which seriously affects mobility of the Yard, an eternal watch should be kept on the Yard Balance and steps taken to keep within the working capacity of the Yard.
8. Efficiency of the Yard shunting engine is one of the most important factors on which the working of the Yard depends. Requirement of a better shunting engine or an additional shunting engine during the busy periods, may therefore be found necessary for better working of a Yard. In big Yards, efficiency and sufficiency of the Yard shunting engines should be periodically examined and if frequent engine trouble is reported, supervisors of loco should be posted temporarily with them until the cause of the trouble is removed.
9. Yard lay out : The shunting Jamadar and the Yard Master should carefully watch if any particular feature of the layout, such as wrongly placed cross over, a short shunting neck or isolation of two busy groups of lines is a restrictive factor in the efficient working of the Yard, and if any minor additions and alterations, such as providing an additional crossovers, positioning an existing cross-over correctly, lengthening of a particular line, etc. are likely to improve the working of a Yard, necessary proposals should be forwarded to the DRM(O).
10. Sometimes delay in the release of the wagons by public and departmental consignees cause heavy accumulation of local wagons thus affecting the working of the Yard. Advance intimation given to rake handling parties on the telephone and the departmental supervisors in the local area about the number of wagons awaiting unloading would enable them to make necessary arrangements in time for releasing the wagons.
11. Sometimes identification of any particular traffic, which affects the mobility of the Yard, is required so as to advice to control to restrict the inflow.
12. In case of heavy congestions requiring block back on the neighbouring sections, neighbouring Yard should be called upon or directed by Sr.DOM/CTNL by taking upon them some of the sorting and Marshalling work, the congested Yard would normally have done. If necessary a competent Officer or Inspector should sit in the Yard and direct operations until the congestion is cleared.
13. In the event of an accident temporarily reducing working capacity, steps should be taken to regulate the inflow of trains into the Yard for a day or two, or such a long period as may be absolutely necessary until the emergency is over and the Yard has regained its normal working capacity. The work load on the Yard must be suitably reduced to avoid serious repercussions on the Yard itself and on the neighbouring sections. Accidents should preferably be attended to personally by officers, as far as possible so that re-railing/restoration and clearance work may be done in the best possible manner.
14. Late start of trains from the Yard : Whatever may be the cause of late start of trains from a Yard, this apart from reducing available capacity of the section, in turn, affects the working of the Yard itself by delaying subsequent formations of trains.

## MARSHALLING YARDS AND THEIR WORKING GENERALLY

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15. Yard facilities : Ordinarily a Yard should be adequate enough for its requirements of sorting, handling of local traffic, formation of trains and for holding back stock until it can go out on the sections or to various installations in the local area. If shunting or train movements in one part interferes with similar movement in the other parts, or if simultaneous reception of trains from and despatch to different directions is not possible, or the Yard starting a train from or carrying on shunting in one group of lines while a train is being received in the other group, if prevented, it requires careful attention of Supervisors, Inspectors and Divisional Officers for necessary remodelling. If frequent congestion takes place in a Yard or a Yard shows poor performance, the entire working should be thoroughly examined to determine the root cause of congestion. The causes of strained working may be generally increase in traffic, large increase of traffic from one or two sections or stations, bad working of some installations served by the Yard, small or obsolete shunting engines or their inadequacy etc. all these call for suitable action.
16. Sometimes want of proper working facilities, such as adequate lighting, communication between the different key-points in the Yard and the Yard Master and the Assistant Station Master requiring a number of messenger to run about in the Yard for this purpose, affects the working of the Yard adversely.
17. Some of the other factors affecting the Yard working :
  - (a) Non-rectification of hump gradients.
  - (b) Hump shunting not useful enough for the loads which require pushing of loads.
  - (c) Under load running of outward trains.
  - (d) Trains received mismarshalled.
  - (e) Congestion/interruption on the section or in the intermediate or terminal Yards.
  - (f) Heavy receipts of local wagons.
  - (g) Shortage of engines.
  - (h) Train Crew shortage.
  - (i) Heavy shortage of Yard working staff including C&W staff.

### 1412 Operating Considerations Governing Design of a Yard :

1. The lay-out of the Yard should be such that as far as possible movements of wagons in their several Marshalling operations would be continuous and progressive in the direction of the destination of the wagons because reverse or zig-zag movements reduce efficiency. The reception lines, sorting lines, shunting necks, Marshalling lines, departure lines should, wherever possible, be arranged with this object in view.
2. The layout should also satisfy the basic principles of maximum flexibility in movements consistent with safety so that as many as possible of the different types of movements which are required to be performed may be carried out. At one and the same time it should be possible to perform all the different movements which are to take place at the same time.

The following independent movements within one and the same area should be planned as far as possible.

- (a) Simultaneous reception of trains from different directions.
- (b) Simultaneous despatch of the trains to different directions.
- (c) Two or more shunting engines working, not to interfere with one another, by provision of separate shunting necks.
- (d) Reception of one train not to interfere with the departure of another train and vice-versa.
- (e) Reception of trains in one part of the Yard should not interfere with shunting in another part.

## MARSHALLING YARDS AND THEIR WORKING GENERALLY

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- (f) In large Yards, there should be separate lines for Reception, Marshalling and Despatch. By pass Running lines may be provided if possible, when only crew change is required.
- (g) There must be adequate facility of light and communication in the different parts of Yard. Yard should be so designed as to permit future extensions in each important section, like reception lines, sorting lines/ Marshalling group etc. in the next 25 years though on consideration of economy, requirements of the next five years only may at the first instance be provided.

### 1413 **Marshalling Yard Statistics :** **General Instructions :**

1. The Marshalling Yard statistics should be prepared for selected Yards generally dealing with 20,000 four-wheeler wagons and over per month in respect of BG Yards and 10,000 four wheeler wagons and over per month in respect of MG Yards, prior approval of the Railway Board should however, be obtained for addition or deletion of any Yard.
2. For the purpose of compilation of data for the statements 14, 15, 16 and 17 all wagons should be counted in terms of four wheelers and not as units unless otherwise specified.
3. Brakevans are to be included.
4. The area of each Marshalling Yard is to be carefully defined and no extra allowance is to be made for any work done within that area. A diagram showing the Marshalling Yard area clearly demarcated should be prepared for the Yards for which statistics are required to be compiled by the Railway for the Board. Yard diagram should be readily available at the stations to enable any inspecting officer to obtain a clear indication of the extent of the Marshalling Yard.

Sick lines and repacking sheds, transshipment points, goods sheds, departmental sidings and the industrial sidings etc., may as a general rule, be treated as lying outside Marshalling Yards for purpose of calculation of Marshalling Yard statistics.
5. At places, where there are points like the Goods terminal station and/or Break of gauge transshipment point etc., continuous to the Marshalling Yard, and the detention statistics for each of these Yards are compiled separately either for submission to the Railway Board or for inclusion in the Railway's own Domestic Statistics. The sum total of detention in each Yard should accord with the total detention from arrival of a wagon till its final despatch from that station. To ensure this, the supervisory staff in-charge should exercise a check, at least once in a month, on a random sampling basis. This check should be broad based covering not only the important categories of wagons e.g. four wheelers, BOX wagons, oil tanks etc. but also the main stream of movement of wagons to and from different directions. This exercise should cover at least 10% of the total number of local wagons dealt with in the Marshalling Yard during the previous month and the records of such checks should be properly maintained to be available for scrutiny by inspecting personnel.
6. In the case of wagons whose detention or despatch particulars are not available, their detention should not be omitted but reckoned on the basis of the average detention during the month for similar type of stock while working out the average detention per wagon. The number of such wagons should be indicated separately under through loaded and all wagons for each Yard in a foot-note to the statement.
7. Yards provided with humps are to be denoted by a star and terminal Yards should be specified by a note to that effect.
8. Except where otherwise stated, all results, are to be worked out correct to one place of decimal, but those which are less than 10 should be worked out correct to two places of decimal.

**MARSHALLING YARDS AND THEIR WORKING GENERALLY**

**MARSHALLING YARD STATISTICS**

Statement No. 14

For the month of \_\_\_\_\_

| Item | Name of Marshalling Yards stating<br>broad gauge or metre gauge                                                                                                                                      | Remarks |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| 1    | Wagons despatched-                                                                                                                                                                                   |         |
| 1.1  | Number of wagons despatched –<br>Despatched by trains during the month                                                                                                                               |         |
| 1.2  | Number of wagons placed from Marshalling Yard outside the<br>Yard by pilots in goods sheds, transhipment/repacking sheds,<br>departmental sidings or Yards, military sidings, assisted sidings, etc. |         |
| 1.3  | No. of wagons dealt with during the month                                                                                                                                                            |         |
| 2    | Daily average number of wagons despatched.                                                                                                                                                           |         |
| 3    | Number of trains received                                                                                                                                                                            |         |
| 3.1  | a) Number of by passing trains<br>b) Number of terminating trains<br>c) Total (a+b)                                                                                                                  |         |
| 3.2  | Average detention to by passing trains:<br>Target-<br>Actual -                                                                                                                                       |         |
| 3.3  | Number of wagons carried by –<br>By passing trains included in item 3.01(a)                                                                                                                          |         |
| 4    | Number of trains despatched -                                                                                                                                                                        |         |
| 4.1  | No. of by passing trains                                                                                                                                                                             |         |
| 4.2  | No. of originating trains                                                                                                                                                                            |         |
| 4.3  | Total                                                                                                                                                                                                |         |
| 5    | No. of wagons dealt with per shunting engine hour -                                                                                                                                                  |         |
| 5.1  | No. of pilots working in the station<br>(a) Number of pilots<br>(b) Number of shifts per day                                                                                                         |         |
| 5.2  | Total shunting engine hours outside Marshalling Yards                                                                                                                                                |         |
| 5.3  | Total shunting engine hours of regular shunting engines employed<br>for work inside Marshalling Yard                                                                                                 |         |
| 5.4  | Total shunting hours by train engine employed for work in Marshalling Yard.                                                                                                                          |         |
| 5.5  | Total time taken for locomotive duties and minor repairs                                                                                                                                             |         |
| 5.6  | No. of wagons dealt with per shunting engine hour                                                                                                                                                    |         |
| 6    | Average detention per wagon (Hours)                                                                                                                                                                  |         |
| 6.1  | All Wagons-<br>Target<br>Actual                                                                                                                                                                      |         |
| 6.2  | Through loaded wagons –<br>Target<br>Actual                                                                                                                                                          |         |
| 6.3  | Through empties                                                                                                                                                                                      |         |
| 6.4  | Outward Local                                                                                                                                                                                        |         |
| 6.5  | Inward Local                                                                                                                                                                                         |         |
| 6.6  | Sick wagons                                                                                                                                                                                          |         |

**1414 Procedure for Working Out Marshalling Yard Statistics :**

**1. Wagons despatched :**

Item 1.1 and 1.2 are self explanatory. A wagon should be included under item 1.2 as many times as it leaves the Marshalling Yard.

Wagons on 'bypassing' trains (i.e. through goods trains, as defined in note under item 1 of statement will not be included under item 1.1).

## MARSHALLING YARDS AND THEIR WORKING GENERALLY

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Item No. 1.3 – Item 1.1 + 1.2

**2. Daily average number of wagons despatched :**

Item 2 =  $\frac{\text{Item 1.3}}{\text{No. of days in the month}}$

**3. & 4. Number of trains received and despatched:**

- (a) A train for this purpose is a set of wagons or vehicles worked by locomotive, or any other self-propelled unit, or rail-motor vehicles, empty or conveying traffic when running, under a particular number or a distinct name, from a fixed point of departure to a fixed point of destination.
- (b) All trains, both terminating and by-passing (i.e. through goods trains) are to be included. "Bypassing trains" should be accounted both under the number received and despatched.

**5. Number of wagons dealt with per shunting engine hour :**

Item 5.6 =  $\frac{\text{Item 1.3}}{\text{Items 5.3 + 5.4}}$

Note: (i) While compiling shunting engine hours under item 5.3 and 5.4 the following instructions should be kept in view.

- (a) Shunting engine hours are to include the shunting hours of regular shunting engines and train engines before and after working a train or during its run when employed in shunting goods wagons only in the Marshalling Yard area. The shunting time within the Marshalling Yard area should only be taken into account and not the time spent outside its limits.
- (b) Shunting engine hours are to be reckoned from the time of arrival of the shunting engines in the Marshalling Yard upto the time of their departure from the Yard on the basis of shunting vouchers. The time spent on locomotive duties whether in the Yard itself or outside the Yard is to be included. However, any extra time taken over the normal time prescribed for carrying out legitimate locomotive duties should be excluded, the normal time being determined by the individual railway taking into account the local conditions and indicated in the operating manuals.  
If shunting engine is required to be repaired in the Yard itself, the extra time beyond 30 minutes spent on such repairs in a shift should also be excluded.
- (c) The time spent in the Marshalling Yard for change of crew and/or fuelling, should be accounted for in the same manner as on locomotive duties referred to in Note (i)(b) above.
- (d) Since shunting engines shunt both goods and coaching vehicles, the allocation of shunting engine hours to goods and coaching stock may be fixed for each Yard on a percentage basis after an examination of the work done. This percentage is to be rechecked at least once a year and also when any change occurs in the type of traffic passing through that Yard. Where daily records are kept of the working of shunting engines according to hours spent (i) inside the Marshalling Yard (ii) outside the Marshalling Yard and (iii) in shunting coaching vehicles, it will not be necessary to fix a percentage, as the actual hours spent in the Marshalling Yard in shunting goods vehicles will be available. Time taken by shunting engine in placing wagons in such lines is to be included in shunting hours when such lines form the part of the Marshalling Yard area.



## MARSHALLING YARDS AND THEIR WORKING GENERALLY

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Note: (ii) In calculation of marshalling yard statistics time spent for locomotive duties recorded separately under item 5.5 will include under 5.3 also. Item 5.5 will include the time taken by shunting locomotive for locomotives duties and minor repairs upto 30 minutes per shift as per Note (i)(b) under item 5.

### 6. Average detention per wagon :

- (a) The detention time should have reference only to the detention within the Marshalling Yard territory as defined in para (iv) of General Instructions and the incoming and outgoing wagons from and to the local outlying sheds, sidings, etc. should be counted as many times as they enter the Yard. This will include detention to sick wagons in the Marshalling Yard although their detention is separately shown against item 6.6.
- (b) The average detention is to be obtained by recording in the wagon exchange register or similar record, the hours of detention to each wagon, that is the interval between its arrival and departure. At the end of the month under different types must be totalled, and both detentions and number of wagons for each type must be multiplied by the factor of equivalence to four wheeler and then consolidated to work out the average detention per wagon, the following example will illustrate the method of calculation of the average detention per wagons.

**Example :** Suppose Yard A has despatched 100 four wheelers with a total detention of 400 hours, 200 bogie wagons (Equivalent to 40 four wheelers) with a total detention of 20 hours and 10 Box wagons (equivalent to twenty five four-wheelers) with a total detention of 150 hours. Average detention per wagon will be –

$$\frac{400 \times 1 + 200 \times 2 + 150 \times 2.5}{100 \times 1 + 20 \times 2 + 10 \times 2.5} = 7.1 \text{ hours}$$

The detention of wagons arriving in one month and despatched in the next will be shown in the month in which they are despatched, but the time must be reckoned from the date of arrival. Stations which maintain a wagon card index may obtain the figures therefore instead of from the wagon exchange register. The number and detention of Brakevans will be excluded for the purpose of this item.

- (c) The 'target' detention hours will be fixed by the Railway Board from time to time having regard to the past performance of each Yard and also materialisation of different stream of traffic, Marshalling commitments and the facilities available. A pointer to the correct level of a target would be the best result achieved in the past one or two years, assuming that there has been no noticeable improvement or deterioration in the operating conditions and methods. The target should be somewhat better than the actual recorded performance so that it may call for better effort on the part of the staff concerned to achieve the margin of improvement remaining between the actual and the target.

Item 6.1 – **All wagons** – The term 'all wagons' includes through loaded, through empty, local loaded, local empty and departmental wagons, wagons on 'through trains' (as defined in item 1.1 & 1.2) sick and damage wagons will be excluded. Sick and damaged wagons will be included wherever the sick lines form part of the Marshalling Yard area.

## MARSHALLING YARDS AND THEIR WORKING GENERALLY

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In respect of the Yards which may as well be depots for holding empties, such empties should not be included for the purpose of this item. These Yards should, however, be denoted by a suitable footnote specifying therein the average daily holding of the depot.

The “exit” and “re-entrance” timings may be fixed on the basis of sample observations made once a year. These fixed timings may be rechecked annually and also when any major change occurs in the working of the Marshalling Yard.

Item 6.2 - **Through loaded wagons** – The term “loaded wagons” means loaded wagons which neither originate nor terminate at the station, but which are dealt within the Yard and are not on “by-passing” trains (as defined in item 1.01. and 1.02).

Item 6.3 – **Through empty wagons** – The term “empty wagons” means empty wagons which neither originate nor terminate at the stations, but which are dealt in the Yard and are not on “by-passing” trains (as defined in items 1.01 and 1.02).

Item 6.4 – This item will include detention to local wagons despatched by trains from the Marshalling Yard i.e. from the time of their entry into the Marshalling Yard from the outlying sheds and sidings till their despatch by trains.

Item 6.5 – This will include the detention to local wagons from the time of their arrival in the Marshalling Yard till their placement into the local sidings.

Item 6.6 – Detention to sick wagons in the Marshalling Yard will be included under this item as also under “all wagons”. In case the sick lines form part of the Marshalling Yard the detention in the sick lines will also be included under this item. If the sick lines are outside the Yard, such detention will be excluded.

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CHAPTER – 15

INTERCHANGE OF ROLLING STOCK

**1501 Interchange :**

When the goods stock passes from the jurisdiction of one Railway to another Railway, it is called as Railway Interchange. When the goods stock passes from jurisdiction from one Division to another Division, it is called as Divisional Interchange.

**1502 Definitions :**

1. **‘Owning Railway’ or ‘Parent Railway’** means the Railway to which a vehicle/wagon belongs.
2. **‘Forwarding Railway’** means and includes each railway sending a vehicle or wagon to another railway whether on the outward or homeward journey.
3. **‘Working Railway’** means a railway working a junction.
4. **‘Using Railway’** means a railway using a junction worked by another railway.
5. **‘Receiving Railway’** means and includes each Railway receiving a vehicle or wagon from another railway whether on outward or homeward journey.
6. **‘Booking Railway’** means the railway on which traffic originates.
7. **‘Destination Railway’** means the railway on which the traffic terminates.
8. **‘Intermediate Railway’** means any railway between the booking railway and the destination railway.
9. **‘Junction of interchange’** means junction at which the stock between two or more railways is interchanged.
10. **‘Interchange balance’** is the difference between receipts and despatches from 0 hours to 24 hours at a junction of interchange.
11. **‘Vehicle’** applies only to coaching stock.
12. **‘Wagon’** applies only to goods stock.
13. **‘Rolling stock’** includes both coaching and goods stock. Goods wagons intended for coaching traffic should be such and used for coaching traffic only. They will be treated as coaching stock for interchange purpose but damages and deficiencies will be charged at scheduled rates for goods stock.

**1503 Rules for Interchange for Coaching Stock :**

There are certain rules laid down for interchange of coaching stock. Individual Railway, however, may enter into mutual arrangements between themselves for the interchange of coaching stock other than in accordance with the prescribed rules. Some instructions are given below:

## INTERCHANGE OF ROLLING STOCK

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1. All empty coaching vehicles shall be returned to the owning Railway by the shortest route, except where otherwise agreed to by the owning Railway.
2. Coaching Vehicle may be loaded and sent by the receiving Railway to a station either.
  - (a) on the shortest route or on the route via. which received or
  - (b) on the owning railway.
3.
  - (a) a vehicle which has been dealt with in contravention of para (2) above shall be returned to the owning Railway by the shortest route unless reloaded to or via the owning railway when it shall be sent to the owning railway by the booked route.
  - (b) Special Vans i.e. luggage, parcel, motor van and horse boxes booked by the owning railway as quickly as possible but in any case not exceeding the total period calculated as specified in sub-Para (c) below:
  - (c) A day for every 121 kms or part of 121 kms from the interchange junction to the destination station plus 2 days at the destination. For example the distance between interchange junction and destination is 300 kms. The total time allowed for the vehicle to be returned is 3+2=5 days.
5. In the event of interruption of through communication due to any cause, the railway on which the interruption occurs shall, advise the facts to all railways within 48 hours of the occurrence, whose vehicles are detained on account of interruption.
6. If a railway affixes any fittings on interchange stock in respect of which special instructions are necessary, it must send copies of such instructions to the railway with which such stock is interchanged.

### **1504 Damages caused by Passengers or Troops :**

Prior to the departure of any troops or special trains or before attaching to a train, the individual carriage reserved or chartered for troops, individual or parties, a statement must be prepared by C&W official to show the existing damages or deficiencies, if any, or 'Nil' in the internal fittings of the stock. One copy of the statement will be retained by the despatching Station; one copy will be handed over to the Guard of the train for transmission to destination and one copy will be given to the officer in charge of the troops or the person chartering the special or in the case of individual carriages, the person reserving such carriages. On arrival at destination, all damages, if any, must be reported without delay to the Guard and the Station Master in order that the cost may be recovered from the Officer in charge of the troops train or from the person concerned.

### **1505 Rules for Interchange for Goods Stock :**

Wagons of all railways, irrespective of ownership, are available for loading from any station to any station. Most of the goods stock belongs to this category. The number of wagons received or despatched from 0 to 24 hours will be counted as interchanged wagons.

### **1506 Number Taker's Record :**

Each junction of interchange must maintain Number Taker's Books wherein full particulars of all vehicles interchanged must be recorded. A vehicle shall be considered as interchanged when entered in the Number Taker's Book.

**1507 Daily Junction Return :**

Each interchange junction shall maintain separate returns for wagons/brake vans from and to each Railway for all goods stock interchanged. These shall be written from the Number Taker's Book by means of Carbon in four foils, which shall be dealt with daily as follows:

1. First foil to be sent to the Director, Wagon Interchange, Railway Board.
2. Second and third foils to the COM of the Railway concerned.
3. Fourth foil to be retained at the junction as junction record.

**1508 Daily Junction Messages :**

1. Each railway interchange point must also issue a daily message to the DWI and COM concerned showing total number of wagons received and interchanged in each direction. Separate advices must be submitted for special stock.
2. The following codes have been allotted to the various railways for use in interchange.

Railway	Code	Railway	Code
Eastern	A	North Eastern	G
Western	B	South Eastern	K
Northern	D	South Central	N
Central	E	Calcutta Port Commissioner	M
Southern	F	Pakistan	H
North East Frontier	J	Bangladesh	C
North Western	S	Konkan	P
East Central	R	North Central	T
West Central	V	East Cost	X
South West	Y	South East Central	Z

**1509 Daily Junction Balance :**

It means total number of vehicles received minus number of vehicles despatched up to 24 hours. It is also called interchange balance of date.

**1510 The Target :**

In order to meet with the requirements of various railways and maintain a proper wagon balance between them, the Railway Board (in consultation with COMs of the various railways) fixes periodically a certain number of wagons for a particular railway. This tentative figure is called 'Target' for that Railway.

**1511 Neutral Control examination at Junction of Interchange :**

This examination at a junction of interchange is conducted on arrival and before departure of trains at certain junctions of interchange by the neutral control examining staff appointed by the IRCA. The object is to carry out an impartial examination of trains for interchange to avoid disputes between Railways as to the fitness or otherwise of wagon.

**1512 Wagon Census :**

1. Wagon census including brake van is held every year with a view to ensure that the wagon balances of each Railway are correct and any differences found as a result of each census shall be adjusted by the Director (Computer Services)/Railway Board.
2. After the census, enumerations are checked up with the records of individual railways. It often happens that some wagons remain untraced. These generally come under the following categories:
  - (a) Stock in existence but not enumerated
  - (b) Stock not in existence but enumerated
  - (c) Duplicate enumerations

Such irregularities are rectified by the Computer Services/Railway Board, as far as possible, after scrutiny of records of each Railway.

3. On the basis of the census enumerations, the correct interchange wagon balance of each railway is arrived at by taking the difference between each railway's wagons found on another railway. The correct wagon/brake-van balance shall be adjusted in accordance with the census results.
4. The result of the census are notified in two stages, one as preliminary and other as final. Immediately the total number of enumerations railway-wise is known, preliminary census balance is announced. The final census results are announced after thorough check is made to trace the wagons, which have either missed enumerations or have been enumerated incorrectly. The lists of such wagons are circulated by Railway Board.

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CHAPTER – 16

PASSENGER TRAIN OPERATIONS

**1601 Introduction :**

Passenger transport is an important necessity for the individuals, groups, and the organisations in the country. It affects and in turn is affected by the Socioeconomic and political life. The public, in general, judges the efficiency and reliability of a transportation system by the journey performed by them or their acquaintances, the image formed by a general impression created by the media and expectations they have from the system. It is therefore essential to understand and appreciate the various aspects of passenger train operations and to strive for excellence in this field, to the extent possible, though not as complex as Freight operations. The Passenger Operation is a challenging task for the railways as it involves running of numerous trains punctually and regularly.

**1602 Characteristics of the Passenger Operations :**

There can be no single policy, which would satisfy the divergent needs, aspirations and expectations of the people, Railways have to therefore achieve an effective relationship between the needs of the existing as well as the potential users, the services it has to offer in capacity as a commercial organisation as well as a public utility mass transport system. The passenger trains are, therefore, run on a reasonably predictable, systematic and regular pattern. The train schedules are therefore made known to the public and the efforts are made to run the trains punctually despite unusual occurrences and constraints. The infrastructure is developed and the staff are trained and deployed in such a manner that the complete operation becomes a matter of routine, which works like clock like motion. Efforts have however to be constantly made to see functions required for running of passenger trains viz. placement of empty rakes for train examination, sick detaching, marshalling, placement of the platform, booking of staff, right time start and punctual running etc. are performed timely. The staff at field level have to keep a hawk like vigil and take remedial measures in case of lapses and problems. Any serious dislocation of passenger trains also affects goods train running. Meticulously the passenger train operations are thus not only important from the point of view of the public and Railway's image but also have significant bearing on the freight operations and the efficiency indices of operations.

**1603 Types of Passenger Trains provided by Railways :**

1. **The Mail and Express Trains :** high speed services, which carry passenger and postal mails, stopping only at important stations. These are run between distant places (as inter-regional e.g. 'Mumbai-Delhi' & Ahmedabad- Howrah' etc. or between the important cities (as intercity trains).
2. **Local Passenger Trains :** these trains cover relatively short distances and generally stop at every station including halts.
3. **Mixed Trains :** run on unimportant branch line sections, where enough passenger/ goods traffic is not available for the running of separate passenger and goods trains. Such trains stop at all stations and have comparatively low speed on account of goods wagons.
4. **Suburban Trains :** these are also trains of smaller lengths but of greater frequency serving the Metropolitan cities and the sub-urban areas e.g. EMUs/MEMUs and DMUs services.

**1604 Passenger Train Time Tables :**

It is a 'Schedule' in a time-table form, showing details of arrival and departure of the trains carrying passengers running over the various stations on the Railways. It is issued once in a year on the 1<sup>st</sup> July.

**1605 Types of TimeTables :**

1. **Public time-tables** : are handy volumes for use by the public. In addition to the time schedules, they contain a variety of useful information for passengers, including fare-tables, reservation rules, accommodations available etc. These are published Zonal Railway wise . The trains at a glance is published giving abstract timings of important trains for all Indian Railways.
2. **Suburban Time Tables** : these pocket size time tables contain in detail the timings of all suburban services as well as of other passenger services running over the suburban sections and also the abstract timings of the passenger trains going beyond the suburban section.
3. **Sheet Time Tables** : these time tables contain the tabulated schedules of passenger carrying trains running over area on large sheets of papers and are displayed at platforms and waiting halls.
4. **Working Time Tables** : are issued separately for each division for the information and guidance of the Railway staff, especially the running staff, station staff and control staff. Apart from the schedules of trains, they contain valuable information for the use of Railway Officials.
5. **Manuscript Time Tables** : these are generally prepared and displayed at stations, platforms and waiting halls in case of sudden change in train schedules.
6. **Graphic Time Tables** : graphic time table or Master Charts are prepared and referred to staff connected with framing and revising time tables. These are also kept for regular revision of time tables. It is also used for regular reference by control staff and the operating officers.

**1606 Considerations Governing Passenger Train Time Tables:**

The general principles underlying the preparation of passenger train timetable are briefly described below:

**User's requirement :**

1. The departure and arrival timings of passenger trains are decided taking into account the requirements of travelling public such as-
  - (a) Businessmen going to big commercial centres and returning back after business hours.
  - (b) Litigants attending courts and returning in the evenings.
  - (c) Employees going to attend offices, students attending colleges and schools and workmen going to place of work and returning to homes.
  - (d) Postal mail required reaching important trading centres in morning and leaving in evenings.
  - (e) Long distance passengers desirous of having a full night's sleep during journey.

Note : Although all types of passengers generally want the trains to originate and terminate at the convenient hours. It is however, not possible to accommodate the demand though this can be attempted to the extent possible.

**2. Connections at Junctions :**

Since trains run between selected pair of stations and all trains cannot directly serve all stations, change of trains at junction stations is necessary for the passengers desirous of travelling to other sections. The connections have to be judiciously planned so that neither the passengers arriving by the preceding trains have to wait for long time for connecting train nor the trains are detained for long time for the arrival of the passengers of another train. In general, this interval should not be less than one hour. The prescribed time limit for which a train can be detained for connections is indicated in the working timetable.



3. **Halts for meals etc. :**  
Halts for enabling the passengers to have tea, snacks, drinking water and meals have to be provided at suitable stations. Even when some catering arrangements are available with the travelling catering personnel on the train, halts have to be provided for picking up meals from base kitchens etc.
4. **Overall commercial speed :**  
The long distance passengers are desirous of completing the journey within the least possible time. Therefore, while deciding about the halts at roadside stations; the effect on the journey time for the train is also kept in view. The overall speed or the commercial speed is particularly important in case of peak time traffic in the suburban section and trains like Rajdhani/ Shatabdi.
5. **Requirement of public with different travel range :**  
Passenger train halts and timings have to be taken into account for the convenience of various categories of passengers viz.
  - (a) Short Distance Passengers travelling between major commercial centres or capitals/districts, cities or towns or villages around such major cities commuted to city centres/ industrial centres and return to their hometown in the evening. The travel distances generally ranges between 60 to 100 Kms. Such passengers travel together regularly in-groups at a few places and hence some long distance trains are provided halts for them.
  - (b) *Medium Distance Passengers* : This category consists of the passengers whose travel range falls above 100 to 300 Kms. Some of these passengers travel between two important cities and prefer to have over-night trains. A large number of passengers in this group work in major cities and visit their native places frequently for various reasons.
  - (c) *Long Distance Passengers* : Long distance passengers prefer fast train with increased level of comfort having least stoppages.

### **Requirements of Time Tabling :**

While the users requirements are very important, it has to be understood that the Railway's requirements and the problems connected with these have also to be considered while framing a passenger's Train Time Table. The Railway's requirements are summarised below:

1. Availability of suitable coaches and locomotives
2. The terminal facilities like stabling lines, Carriage & Wagon examination and repair facilities, reception and berthing facilities at the junctions etc.
3. Rake Links and the Primary and Secondary Maintenance needs of the coaches
4. Engine Links change of Locos for the maintenance schedules or their fuelling etc. and change of traction etc.
5. Cleaning and watering of trains.
6. Line capacity and availability of path. Need for precedence to faster trains, and crossings.
7. Maintenance Blocks and Engineering speed restrictions.
8. Attaching/detaching of slip coaches, change of direction etc.
9. Loading/unloading of parcels, luggage etc.
10. Staff requirement viz. change of staff etc. Sometimes, service halts are provided for this purpose, unforeseen circumstances viz. points or signal failure, rail fracture alarm chain pulling, trespasser being run over, delays caused by road traffic at level crossing gates may delay the trains. Traffic recovery (TR) time is, therefore, required to be provided in the time table short of big junctions.



**1607 Factors Necessitating Review of Time Table :**

Broadly, the timetable for a section generally remains static except for minor changes necessitated by the following factors:

1. Introduction of new trains on the section or cancellation of some trains.
2. Introduction/elimination of some halts or changes in duration of halts.
3. Change in traction or type of loco.
4. Change in load of the train, particularly for introduction/ elimination of slip coaches.
5. Change in speed restrictions or the maximum permissible speed.
6. New rake links or engine links
7. New connections or elimination of connections.
8. Improvements in line capacity of the section
9. Improvement in terminal facilities or maintenance facilities.

**1608 Process of Revision of Time Table :**

For process of revision of Time Table, CPTM at the Headquarter Office holds meeting with the Train Controllers of all Divisions having good knowledge in Time Tabling, along with the master charts as well as the Divisional recommendations, staff suggestions, suggestions from individuals, members of public, Divisional Rail User Consultative Committee, Passenger Association. The co-ordinating meetings with various departments viz. Mechanical, Electrical, Civil Engineering, S&T and Commercial are also held by CPTM/COM. Suggestions from postal department, ZRUCC, MPs, MLAs are also kept in view. Before the time table is finalised, Inter Railway Time Table co-ordination Committee Meeting is held by Railway board's co-ordinating Directorate and the CPTM of all the Railways and the Executive Director (Coaching) Railway Board. In this meeting they discuss the timings and arrive at agreement in handing over the Inter Railway Trains at junctions. The feasibility of introducing new trains or extending a train is also consulted with the Railway Board's representative and decisions are taken.

**1609 Military Time Table :**

A military timetable for the movement of troops and military special is also framed at a meeting held annually by Railway authorities with the Joint Director, Military (MILRAIL). The above time table is issued when necessary and is meant for official use only and is strictly confidential.

**1610 Some Important Connotation Used In Connection with the Passenger Train Operations and Time Tabling :**

1. **Maximum Permissible Speed (MPS) :** This is the speed, approved by CRS, which a Loco Pilot cannot exceed. This is also called technical speed and is dependent upon the technical condition of the track, signalling and rolling stock in use. It is generally different for different sections and different trains, which is indicated in the Working Time Table in force.
2. **Booked Speed :** This is the speed which determines the normal running times of the trains and on the basis of which the time table is prepared. This is generally 10% less than the maximum permissible speed.
3. **Minimum Running Time :** This is the time, which a train should take between two stations when running at maximum permissible speed. This is calculated taking into consideration the permanent speed restrictions that may be in force from time to time in the concerned sections. This would be different for different trains and the Loco Pilot in no case is permitted to take less than the minimum running time relevant to his

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train. Guards of the trains and Section Controller keep a watch on this aspect so that in case of over speeding by the Loco Pilots, they may take steps to check them.

4. **Normal Running Time** : This time is based on the booked speed of the train and is generally about 10% more than the minimum running time when running late and is expected to make up time. Calculation of running time is based on a number of factors viz.:
  - (a) Distance between the two stations;
  - (b) Hauling power of the locomotive;
  - (c) Load of the train;
  - (d) Permissible speed;
  - (e) Permanent speed restrictions, if any;
  - (f) Gradients and curves and
  - (g) Time required for acceleration and deceleration.
5. **Authorised Detentions** : This is a time for which a train can be detained at a junction station to wait for another train running late in order to facilitate passengers to maintain connections at the junction stations. Some trains can be detained for a specified period. After this detention the train can give connection to another nominated train so that undue hardship to the passengers is not caused. These are, however, the outer limits and connecting train cannot be detained, if it is not likely to connect the train to be connected within the prescribed limit. This is given in the working timetable.

*Detaining Passenger trains for connections :*  
Subject to exceptions contained in the Working Time Table, passenger train shall wait for connections as follows :

  - (a) Connecting main line trains with main line trains-15 minutes.
  - (b) Connecting main line trains with branch line trains-10 minutes.
  - (c) Connecting branch line trains with main line trains and branch line trains-30 minutes.

In case, where through coaches or reserved carriages have to be transferred from a train running late and misconnections would mean considerable delay and inconvenience to through booked passengers, connecting trains may be detained for some reasonable longer time than the limits laid down above if permitted by the Sr.DOM/DOM/AOM/CTNL. Every such detention must be reported in the daily detention statement for the information of the DRM.
6. **Restricted trains** : are those trains to which extra carriage can be put only with the sanction of Chief Passenger Transportation Manager. Trains may have room for extra coaches, but in view of the risk of losing punctuality of important trains, attaching extra coach is restricted.
7. **Prohibited Trains** : are those trains to which no extra coach can be attached. This prohibition may be for a portion of journey or through out to ensure punctuality. Some times, attaching of Officer's saloon, Inspection Car and Party coaches are also prohibited or a particular class of coach may be prohibited on a train e.g. upper class by Janta Express.

Note: List of restricted and prohibited trains is issued from time to time by the Railway Board.

8. **Engine Links** : Selected Locomotives of prescribed class or different traction are used for the coaching services. The engines are linked in such a way so as to ensure optimum utilisation.
9. **Rake Links** : For running a particular train, specified type of coaches in the prescribed marshalling order are required. Since trains have long runs and the rakes are required to be examined and maintained generally at both the terminals, it is not possible to

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maintain a particular train service with one rake only. Therefore, more than one rake is necessary for most of the trains. However, in order to achieve economic use of rakes, rake links are formed. Thus, one rake link may cater to only one particular train or the rake may run for different trains in a link. The rake link also helps in ascertaining the actual requirement of stock for running the passenger services. One example of the rake link is given below. The rake links are given for the guidance of the staff in the booklet of '**Normal Composition and Marshalling Order and Rake Links of Passenger Trains**'.

| Rake Link            |         |     |                     |
|----------------------|---------|-----|---------------------|
| 2 <sup>nd</sup> day  | 9102 Up | ADI | 1 <sup>st</sup> day |
| BCT                  |         |     |                     |
| 7.10                 | ←       |     | 22.10               |
| 21.40                |         |     | 6.35                |
| Lie-over 14.35 hours | →       |     |                     |
| Repeat               | ←       |     |                     |
|                      |         |     | 22.10 3rd day       |

### 1611 Punctuality :

Punctuality in running of the passenger carrying trains is one of the significant indices of the Railway efficiency. It is monitored at various levels of Railway operations and management. Due to inherent problems in Railway working and the chain reaction of the unusual occurrences etc. it is not possible to ensure 100% adherence to the time table. Yet utmost endeavour has to be made for punctual running of the passenger trains. Punctuality statistics are maintained for trains reaching destinations at right time. Detailed analysis of bad runners, bad sections are made, cause wise, for different areas. Punctuality statistics on Division/ Railway is also maintained so that trains are not late over a particular Division/Railway.

### 1612 Factors Affecting Punctuality :

Some of the important causes of the late running of passenger trains are :

#### 1. Operating :

- (a) Faulty time tabling
- (b) Bad controlling, viz. precedence, crossings, avoidable risks in goods operations etc.
- (c) Late placement of rakes on platform at the starting stations
- (d) Extra time in shunting, loading and unloading of packages.
- (e) Delay on the part of the Station Master/staff in asking, giving and handing over the authority to proceed to the Loco Pilot.
- (f) Signals not taken off in time for despatch or reception of trains.
- (g) Extra time consumed due to passage of passenger trains on the loop lines on account of goods trains occupying the main line or negligence or lethargy on the part of the SM.
- (h) Missing tablets on account of defective pouches and incorrect fixing of loops in the clips.
- (i) To maintain connections with the trains arriving late.
- (j) Late start, due to late formation of trains, delay in shunting etc.
- (k) Late start of trains on account of Guard/Assistant Guard.
- (l) Defective rake links.
- (m) Extra time at roadside stations for shunting.
- (n) Improper planning of terminal facilities.
- (o) Wrong marshalling, necessitating double shunt en-route.
- (p) Defective Guard/ Loco Pilot links.

**2. Mechanical/Rolling stock/Electrical (Loco) :**

- (a) Failure of passenger and goods loco
- (b) Engine defects
- (c) Coach failure
- (d) Hot axle/Flat Tyre
- (e) Late turning out of train engine from the shed.
- (f) Air pressure/vacuum trouble, brake binding etc.
- (g) Delay on the part of Loco Pilots in starting on Guard's signal.
- (h) Missing tablets due to defective pick-up apparatus on the loco.
- (i) Time lost on the run.
- (j) Mismanagement by the engine crew
- (k) Wrong engine pooling
- (l) Loco Pilots taking extra time in taking the charge
- (m) Stalling on banks
- (n) Extra time taken in C&W examination.
- (o) Heavy sick marking of coaches.

**3. Signal Department :**

- (a) Failure of points, track, signalling or inter-locking.
- (b) Missing of tablets due to pick up apparatus at the tablet stand not being on proper place.
- (c) Failures of means of line clear working i.e. block instrument, block telephones etc.
- (d) Failure of control circuit and telephones.

**4. Engineering :**

- (a) Excessive engineering speed restriction over and above the EA (Engineering Allowance)
- (b) Engineering blocks being burst.
- (c) Stopping of trains on banner flags or by showing danger signals
- (d) Slow flow of water in water hydrants.

**5. Electrical :**

- (a) Defective lights and fans in trains resulting in alarm chain pulling by the passengers.
- (b) Tripping / Failures of overhead equipments.
- (c) Failures of water supply due to electrical pumps not working.
- (d) Failures of head lights of the engines or bad focussing thereof.
- (e) Non-pruning of trees and their branches regularly and from time to time, resulting obstruction on OHE.
- (f) Bursting of power blocks, OHE break down.
- (g) Train lighting and air conditioning problems resulting in detention to trains by passengers or staff.

**6. Commercial :**

- (a) Dispute due to duplicate reservations
- (b) Inadequate labour for the work of loading and unloading work
- (c) Reserved compartment left unmanned.
- (d) Overcrowding.
- (e) Alarm chain pulling
- (f) Insufficient halt for loading and unloading packages.

**7. Miscellaneous :**

Such as storm, heavy rain, floods, cattle run over, accident, public agitation, poor visibility on account of fog, dust, storm etc.

- 1613 Divisional Report to Head Quarter regarding Punctuality :**
1. Every division should convey to the Head Quarter Emergency Control telephonically the detailed account of punctuality of all Mail/Express and other Passenger trains. This position should show whether these trains were taken over and made over at the right time or late at the contiguous divisional or other railway junctions. The extent of late running with detailed reasons for the same must also be given.
  2. In addition to the morning position, DRMs are also required to send periodically and monthly statements reflecting the punctuality performance of trains on their divisions.
  3. The HQ in turn transmit similar daily morning position and periodical and monthly position to the Railway Board.
- 1614 Arrival Before Time :**
- Generally no passenger train should arrive at a junction and important station more than five minutes before scheduled time.
- 1615 Departure Before Time :**
- No passenger train should start from a station earlier than the departure time shown in the public time table.
- 1616 Duplication of Passenger carrying Trains :**
- A passenger carrying train may be duplicated, if the original train is either stranded due to accidents or floods or breaches or running so late as would cause serious inconvenience to passengers and disorganise the link.
- 1617 Diversion of Passenger Carrying Train :**
- A passenger carrying train may be diverted to another route due to serious accidents or floods or any obstruction causing dislocation of traffic and blockade of line, under advice to all concerned.
- 1618 Overload and Double Heading :**
1. When it is necessary to attach additional vehicles to a passenger train, over and above the maximum load permitted for such a train, the Station Master or the Yard Master, as the case may be, must obtain permission from DRM(O) through control. In the case of Mail/Express or Passenger Trains running over more than one Division, such permission is given by CPTM.
  2. When double heading is to be done as an operating necessity in the circumstances which are not ordinarily foreseeable, the power to authorise double heading may be delegated to officers not below the rank of senior scale.
  3. Whenever a train is to be strengthened to clear rush of traffic to such extent as to require double heading, it should be well considered because one sided splitting invariably affects track capacity.
- 1619 Cancellation :**
- A passenger carrying train may be cancelled either due to serious accident or due to abnormal working, when two passenger carrying trains arrive together at the same station on the same section or if a duplicate train is run, the original train is then not considered necessary. But in normal circumstances no regular passenger carrying train should be cancelled without prior approval of the Railway Board.
- 1620 Remedial Measures for Improving Punctuality :**
- While punctuality position requires constant analysis and monitoring as well as short term and long term measures including improved design and maintenance of Locos, Track, S&T gears, Security, Commercial and Terminal arrangements, the operating staff has a great role in the punctual running of passenger trains as summarised below:

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### 1. **Control Organisation :**

- (a) The Time Table should necessarily be revised and drafted by experienced and intelligent officials and the crossings, precedence etc. should be properly planned. Major changes demanded in Time Tabling should be particularly examined to see the repercussions on the Passenger Train Services as a whole.
- (b) The Section Controllers and the Dy. Controllers should monitor and control the running of Passenger Trains with due regard to punctuality. The crossing, precedence and connections etc. have to be arranged judiciously and efficiently.
- (c) The avoidable detention to passenger trains should not be allowed to take place and the lethargy on the part of any staff in this connection should be brought to the notice of officers concerned.
- (d) Crossings, precedence to through goods trains over passenger trains should be rarely allowed.
- (e) While a little detention of Passenger Train may save hours of detention to a Goods Train, such a detention should only be allowed only after judging the importance of the passenger carrying train and the time it is likely to make up before being handed over at the next junction.
- (f) Special arrangements should be made for extra traffic. In case of overcrowding, agitations, late running etc., the junctions should be warned.
- (g) Advance information should be given to the Station Staff about attaching, detaching of extra coaches or any special loading, unloading of parcels. The terminal yards and junctions should be asked to ensure that arrangements are made for accepting the trains without detention.
- (h) The Controller should know about the general performance of the various passenger trains, dependability of the Loco Pilot and Guards, behaviour of the passengers, particularly the daily commuters and the nature of the section.
- (i) The Controllers should constantly motivate the staff on line towards achieving punctuality.

### 2. **Station Staff :**

- (a) The Station Master should ensure that the trains are not held up on account of avoidable delays, e.g. extinguished signals, signals not taken off in time, arrangements not made in case of defective signals and abnormal workings, shunting, crossings, precedence, delay in handing over authority to proceed etc. .
- (b) Packages and mails should be stacked at suitable place for prompt loading.
- (c) Shunting on the train should be completed in time.
- (d) The staff should be well trained in their duties particularly in case of emergencies and abnormal working.
- (e) Proper co-ordination with Control, adjacent stations and yards.
- (f) The staff should be alert on their duty and should be time conscious. The station clocks should be synchronised with control and defects, if any, should be got rectified. In case of trains running late, time should be made up by curtailing the halt.
- (g) Proper information should be conveyed to public regarding platform nominations etc.
- (h) The public amenities such as coach watering, train lighting etc. should be monitored and proper co-ordination should be maintained with the Electrical, Mechanical, Engineering and Security Departments.
- (i) Multi Departmental Meetings should be held regularly to achieve the object of punctuality.

### 3. **Guards & Loco Pilots :**

- (a) Attend to their trains well in time with complete equipment and verify that the train is in proper state of function and with complete equipments to travel safely.
- (b) Loading/unloading of the luggage should be prompt.
- (c) Prompt exchange of Alright Signals.
- (d) Getting the prescribed shunting done efficiently.
- (e) Make up time in case the train is running late by reducing duration of halts.



## PASSENGER TRAIN OPERATIONS

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- (f) Motivate the Railway Staff, Catering Vendors and others concerned for ensuring punctual running of the train.
- (g) Take prompt remedial actions in case of unusual occurrences and equipment defects.
- (h) Contact the Control immediately in case of need.
- (i) Ensure that prescribed vacuum/air pressure is available and continuity from Engine to Brake Van is proper.
- (j) Start the train without loss of time.
- (k) Train to be run at maximum permissible speed, subject to restrictions in case the train is running late.

#### 4. **Other Measures :**

- (a) The Carriage and Wagon Staff, Loco Sheds, Engineering Staff, Signal and Telecom Staff and Electrical Staff should identify the causes of loss of punctuality on their account as mentioned in Para 1612 above and eliminate them promptly as well as on long term basis.
- (b) Punctuality drives should be launched from time to time to inculcate the sense of importance of punctuality and to identify the factors responsible for the loss of punctuality of individual trains on particular sections.
- (c) All the Officers, Inspectors and Supervisors while on train or at a station, should keep watch on the punctuality of trains, including the right time start of trains.
- (d) Certain stations or sections which become bottlenecks, should be provided with additional facilities.
- (e) The passenger terminals should be planned carefully.
- (f) The punctuality meetings should be held in the Divisions and Headquarter daily and effective remedial measures should be taken to avoid recurrence of the avoidable detention.
- (g) Rake Links, Engine Links and Staff Links should be realistic.
- (h) The Passenger Trains should not be detained beyond the scheduled stoppages for any reason except in case of emergencies such as accident etc.
- (i) The running of trains beyond capacity of the Loco, Loop Lines or Terminal should be avoided.
- (j) Concrete drives should be launched against Alarm Chain Pulling.

#### **1621 Some Measures for Meeting with the Ever Increasing Demand of Passenger Traffic on Busy Sections :**

- 1. Increasing the carrying capacity of the various types of coaches.
- 2. Adding more coaches to the existing trains to the extent of hauling capacity and loop lengths.
- 3. Designing additional and better Passenger Terminals in place of the old and congested terminals in major cities.
- 4. Reducing the journey time by increasing the speeds by upgradation in technology and operating strategies.
- 5. Curtailing the Train Halts.
- 6. Improving the utilisation of Rakes by rationalising Rake Links and using the lie over time.
- 7. Running the Special Commuter Shuttles for short distance sections only instead of passenger trains with long runs.
- 8. Running of EMU/MEMU & DMU Services, wherever justified and feasible.

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**FREIGHT OPERATIONS**

**1701 Importance of Freight Operations :**

Transportation of Goods by Railway occupies an extremely important place in the socio-economic and political life of our country, a country of vast size and diverse resources. The freight business is the major source of revenue for the Indian Railway. Freight Operations refer to the complex and multifarious activities connected with loading/unloading of consignments, goods trains movement and management thereof. Freight operations require efficient working of terminals, yards, control offices and the train passing stations. Freight operations, therefore, constitute an important part of railway working.

**1702 Broad Classification of Goods Trains :**

**1. Through Goods Trains:**

Through Goods trains means those trains, which generally run from one Marshalling Yard or Terminal to another Marshalling Yard or Terminal without attaching/detaching enroute. (Through trains can also be utilised for shunting at one or two points, which will not change their status).

Through Goods Trains can consist of ordinary stock, Four or Eight Wheeler open or covered like 'C', BC, KC, Wagons, BFRs, BKC's or special stock like BOX, BOXN, BOXN A, BCN, BCX, BRH, TP, TK, BTPN, BOY, or Container etc. moving in block rakes.

**2. Work Trains, Shunting Trains, Pilots etc. :**

These trains generally consist of short distance trains for clearance of roadside wagons or for supply/removal of wagons to and from the sidings or important terminals served by a yard.

**3. Departmental trains:**

Trains such as Material Trains, Relief Trains, Wiring Specials, Crane Specials etc. are known as departmental trains.

**1703 Inherent complexity of goods operations :**

Freight operations, call for excellent information system, adequate infrastructure and management, viz., careful and intelligent planning, organising, regulation, controlling, co-ordination, review, effective and efficient handling of the problems regarding the usage and movement of the Rolling Stock vis-à-vis the traffic pattern on day to day as well as long term basis. Freight operations are generally more complex than passenger train operations for the following reasons:

1. The different characteristics of commodities to be moved, type of wagons required, priority schedules, needs and conflicting requirements sponsored and committed traffic, as well as the seasonal and occasional traffic have to be integrated with operational convenience and efficiency of the area, Division as well as the Railways as a whole.
2. In the case of Passenger trains, willing passengers board the trains in short time. In the case of goods traffic, even where mechanised loading is resorted to, completion of loading/unloading of the rake takes considerable time and sometimes even excessive delay takes place.

3. The Goods Wagons/Rakes have to undergo a series of operations from the stages of inward examination to supply; placement to loading and withdrawal from loading points to formation of full load trains in yards. A series of activities, e.g. Sick Wagons detaching, train ordering, despatching, crew/engine changing enroute and arrival at their destination, (where again the wagons undergo similar operations) require constant monitoring and co-ordination.
4. Moreover, due to the changing pattern and fluctuations in demand for wagons (due to changes in the requirement of the production, distribution and consumption centres) and due to a number of variables and uncertainties, it is not possible to adhere to passenger train like Time Tables.

### **1704 Ordering of Goods Train :**

Each Goods Train is required to be ordered to run under suitable conditions by issuing notice to the yard or station concerned and Crew/Guard booking Lobby under advice to the Power Controller/Traction Loco Controller, that a train should leave from a Station or Yard at a certain time. The message given is known as the Train Notice. The message is, in turn further conveyed to all concerned. The availability of the suitable :- (i) Load (ii) Locomotive (iii) Crew/Guard and (iv) Path has to be kept in view for ordering of goods trains. Some times the light engine without trailing load may have to be ordered to run in the interest of operations. Co-ordination between the Traffic Controller/and the Power Controller (the shed, if fresh power is required); the Yard/Station, C&W staff and the Crew/Guard booking lobby is thus required.

### **1705 Some Aspects Regarding Availability of Loads for Train Ordering:**

Set of empty or loaded wagons is known as load, which can be run upto destination. For ordering of trains load can be available at the following places :-

1. Originating points, viz. the Marshalling Yard, which forms the originating train or at the siding or at the Goods Sheds.
2. **Nominated Crew Change Points :**  
Fresh ordering of even through or bye-pass trains may also be required to be made for crew/engine changing at the nominated points in respect of trains originating in the Division as well as the trains received in interchange from other Divisions/Railways.
3. **Road Side Stations etc. :**  
Clearance of stabled loads, stabled earlier due to operating necessity or equipment problems.

Note :- Regular conference with yards, terminals, and Controllers of the adjoining Division is held by the Control and Operating Officers for exchange of information regarding forecast or expect of readiness of trains in yards; completion of loading/unloading at sidings etc. and expect of interchange with contiguous Divisions. Constant monitoring for expediting loading/unloading at major sidings/goods sheds; is also done by Control and the Station Staff for ensuring the availability of load.

### **1706 Availability and Requirement of the Locomotives :**

#### **1. Power Plan :**

The power plan indicates the daily average number of locos required and planned for various services on the railway, including passenger, goods, mixed, shunting and

departmental. It also takes into consideration the Locos that are required to remain in Loco Sheds for maintenance schedule. The bare requirement of Locos for Traffic use is calculated on the basis of the traffic turn round and average number of trains run on each section, i.e. on the basis of the average time taken to work trains in each direction for each section, (including the yard detention) multiplied by the average daily number of trains required to be run on the section. This represents the average bare number of locos that have to be out on line on a Railway for the use at any time.

### 2. Loco Outage and Loco Utilisation :

Loco Outage means the average number of locos available to traffic use in a day(24 hours). Since the Diesel and Electric Locos have long extended runs and may cover many divisions in a day, the position may be maintained graphically for the entire duration(0 to 24 hours) the loco is on line on the Division. Different colour graphic representation on Bar Chart can represent the time spent by each Loco to serve as a good Management Information System e.g. (a) time taken by running train (b) time taken for Crew Changing (c) time for Fuelling (Diesel Locos) (d) time taken for Loco inspection (e) time for repairs on line (f) time for Light Engine running (g) time taken for Shunting (h) time spent at terminal / destination (i) en-route detention.

Thus, the total hours for which the various Locos were available for Traffic use divided by 24 (number of hours in a day) would give the Loco outage.

$$\text{Loco outage} = \frac{\text{Engine Hours for traffic use}}{24}$$

Loco outage can be prepared service-wise/shed-wise/railway-wise, traction wise etc. The actual Loco outage should generally be around the target fixed for each Division.

However, it should be appreciated that while the target is based on average, the actual requirement of Locos may fluctuate due to bunching of trains, increase in traffic or due to bottlenecks on account of operational reasons, equipment failure or after effect of interruption to traffic.

### 3. Control of Operating Department on Loco running :

Electric and Diesel Locos are maintained by the respective Loco Sheds and Locos once turned out of shed are available for utilisation for a number of days till some prescribed maintenance/inspection schedule is due in the shed or the locos require out of course repairs. Thus, while the operating staff has the operational control over utilisation of Locos as well as flexibility of using the Locos as per operational requirement, they have to keep in view the maintenance/inspection schedules of the Locos and send the Locos to the Shed. Overdue running of locos should be avoided by suitably planning the train running. Similarly, all out efforts should be made to send the dead locos or locos requiring attention in the shed to the required loco sheds. The hauling capacity of the Locos and special restrictions as jointly agreed to by the officers of operations and loco departments should also be adhered to.

While operating department has to optimise the work done by each Loco i.e. moving maximum traffic with the minimum number of Locos by adoption of operational strategies and improving the efficiency, the Shed and the Loco organisation should provide optimum number of Locos in good fettle, keeping in view the traffic needs as shortage of Locos can lead to transport bottlenecks and inability to move the existing and potential traffic. Alongwith the availability, reliability, safety and predictability have to be aimed. Loco failures, Loco troubles en-route and ineffective locos should be kept to the bare minimum.

Balancing of Locos is also required to be done i.e. Locos without loads may be sent to other Divisions where they are required as per the priorities. Reduction in terminal detentions, enroute detention on account of equipment failure or unusual occurrence on operating account have to be reduced. Increasing average speed of goods trains would also improve engine utilisation.

### **1707 Availability of Engine Crew and Guard :**

Running staff for Goods operations are generally booked on the principle of first in and first out, subject to rules regarding providing minimum home station rest, periodical rest, outstation rest and overall cumulative hours of duty etc. Since the staff "sign off" at the end of a trip and may go to their homes or to the outstation running room, sufficient notice has to be given while calling them on duty. Comparatively less notice is required by the outstation crew lodging in running rooms. The notice period may vary depending on the local conditions. Balancing of Crews/Guards by sending staff spare is also required to be done in case the running of trains is not even in both directions on a section. Watch should also be kept on absenteeism and Crew shortage by the operations and power officials and remedial measures initiated in time as crew shortage can cause serious problems in operations. The staff may also be provided relief in case of excessive hours on run as per the extent instructions.

### **1708 Availability of Path :**

1. Theoretically, a Goods Train can always be run when load, power and crew are available and the next block section is clear but despatching a train is of little use, if it is going to suffer excessive detention on account of non-availability of suitable path on the section due to interference of Passenger carrying trains or bunching of trains. It would adversely affect the speed of goods trains, engine utilisation and crew duty hours apart from occupying lines at roadside stations. In fact, it may be difficult to despatch a train from a yard or junction in case of bunching of trains. Therefore the scenario of train running on a section has to be kept in view while ordering and running the goods trains. Generally Mail/Express Blocks, Peak timings of Suburban or Commuter traffic and running behind slow stopping Passenger Trains are avoided. Readiness of the interchange point or the terminal to accept the trains are to be kept in view before pushing a goods train ahead. (However, at times it may become necessary to take trains out of Yards/ Terminals and stable them at nearby stations so as to clear the Yard lines).

#### **2. Master Charts :**

Master Charts incorporating all Passenger carrying trains and realistic goods train paths are prepared in consultation with Operating Officers, Controllers, Yard Staff, Power Controller, Station Masters of important stations etc. in order to:

- a) find out line capacity of the section.
- b) to highlight the set of suitable paths for guidance of Control which can be used for goods train ordering also.
- c) to prepare tentative goods train time table for selected set of goods trains, e.g. Crack Trains, Quick Transit Service (Con-Raj). Trains, Express Goods Trains and Shunting Trains.
- d) for arranging longer duration Traffic Blocks to carry out Engineering, OHE and S&T works.
- e) to introduce new service, making suitable adjustments, if need be, regarding other trains.

### **1709 Lobby System :**

A Lobby is like a Control Office in the field. It is established with the twin aim of reducing

engine detention and crew detention in a Yard or a Crew or engine changing station by realistic ordering of trains and Crew/Guard booking. It is advantageous to have a combined Crew and Guard booking lobby so that both are available simultaneously. The lobby supervisors/staff can take forecast of a train running from the Deputy Controller/Section Controller alongwith details regarding the names of Crew, Guard and their signing in time, loco particulars, last C&W examination etc. They can verify the dates of Loco Schedules from the Chart available with them and keep liaison with the Power Controller/TLC. They also keep watch on expect of train formation, examination, readiness etc. and by constant chasing, planning and updating of information, trains are ordered on realistic expect, Trains may be put back or cancelled, if required and Crew booking and engine allocation changed promptly. Some overlapping Crew/Guard may also be kept in the Lobby to take care of the last minute absenteeism. Shunters may also be kept in the Lobby of big yards/junctions to attach, detach, and run round locos or to pull the Train from Yards upto the Crew changing points, so as to avoid wastage of main line Loco Pilots

The pre-departure detention to the Crew, Crew hours balancing, rescheduling of Locos and Yard detentions to Locos can be thoroughly monitored by the Lobby and remedial measures taken.

### **1710 Role of Various Agencies in Freight Operation :**

Large number of agencies play important role in freight operations and almost all the branches of Division have direct or indirect role. Marshalling Yards, Train Examination, Locomotives and Lobbies have been discussed elsewhere in this Manual. Role of a few agencies is discussed below with special reference to freight operations.

#### **Control Office :**

The function of the Control Office may, for the purpose of understanding be conveniently classified under the heading of planning, execution and review though in practice, all the three activities would be going on simultaneously. Planning is aimed at forecasting and optimising the following :-

1. Interchange
2. Trains to be run section-wise
3. Supply of empties for bulk loading, transshipment etc.
4. Unloading
5. Engineering blocks and special moves

Information regarding the following items is generally required for this purpose:

- (a) Power availability
- (b) Availability of loads
- (c) Disposition of empties and demands for loading
- (d) Analysis of divisional wagon holding

The plan is made by Control in the early hours of morning and reviewed by Operating Officers. Changes in the plan, as deemed necessary, are made at various stages on the basis of updated information received from the activity centres, adjacent divisions and instructions received from the Head Quarters.

#### **Execution :**

The goods operations are executed on the basis of the plans and adjustments being made on the basis of actual materialisation. Control conveys necessary instructions from time to time during the day. It has to control, direct, co-ordinate and motivate various agencies for optimum output as per the plan and priorities for the day.

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Yards, Loco Sheds, Stations, Terminals, Lobbies and C&W depots are actively involved in execution of the plan.

### **Review :**

The trend of the day's position can be reviewed by the Chief Controllers and Officers in the afternoon. Detailed review of the previous day's performance is carried out early in the morning by the Operating Officers with the following objectives:

1. Analysing shortfalls of previous day to take remedial measures and pin-point weak spots.
2. Provide basic data for planning for the current day.

The main features of performance, which can be reviewed, include:

- ★ Interchange failures
- ★ Divisional Wagon Balance (Wagons on Division)
- ★ Train Running – Proforma I of LSR.
- ★ Disposition of empties
- ★ Loading at important terminals – and in case of shortfall, reason for the same.
- ★ Review of unusual occurrences
- ★ Examination of Control Charts
- ★ Particulars of stabled loads
- ★ Yard performance
- ★ Unloading on Division
- ★ Registrations and Loading
- ★ Transhipment performance
- ★ Punctuality
- ★ Power position, utilisation of Locos & Terminal detention
- ★ Sick line working
- ★ Special type of stock

### **1711 Head Quarter's Role in Freight Operations :**

The Division's Freight Operations generally require close co-ordination and assistance from other Divisions and Railways. While direct contact is also maintained by the Control and Operating Officers of various Divisions, the Zonal Head Quarters play a pivotal role in this respect. Some of the functions performed by the Head Quarters are summarised below :

#### **(A) Management Information System:**

1. Important information concerning the position of Freight Operations on various Divisions of Railways is obtained through line and stock report daily telephonically or by Computer Network or Teleprinter or FAX to the Head Quarters (Central Control) from Divisional Control. This includes, loading and stock position, particulars of old outstanding and fresh registration of indents, category wise position of unloading, transhipment, Yard balances, important yards and wagons on Divisions, Train Running on each section, average speed, interchange position, Locomotive position and Locomotive utilisation etc. The position is reviewed and analysed by the COM/CFTM/ Dy.COM(Goods), STM(Goods) CMPE(R&L) and CELE. The important position pertaining to various Departments is conveyed to the Departments concerned as well as the General Manager. The Head Quarter Office also obtains the Statements at the end of each month or whenever required and the performance is compared with (i) The Targets (ii) The figures of the previous month (iii) The figures of the corresponding month of the previous year and (iv) the best ever record etc.

In addition, the Statistical Branch also provides Freight Management Information/Data to the General Manager and the Departments concerned with Operations for detailed analysis and review.



2. Head Quarters also plays important part in planning and co-ordinating freight operations. After detailed conference with the Operating Officers, Head Quarters issues directions and instructions for providing assistance regarding the following items:
  - (a) Interchange transactions (category wise)
  - (b) Loading and Unloading
  - (c) Clearance of Bottlenecks, Yard and Terminal Congestion, Hold ups, Excessive Wagon Balance on the Division etc. Assistance may be provided by Head Quarters by providing extra Locos, Wagons or by regulating particular stream of traffic or by imposing quotas or restrictions on the congested areas.
  - (d) Advising traffic insight from other Railways/Divisions
  - (e) Conveying priorities for the day and setting quantified objectives to be achieved.
  - (f) Reviewing the work done at the important activity centres like Yards, Transshipment Points, Terminals etc.
  - (g) Train and Traffic regulation in case of accidents etc.
  - (h) Certain items of Goods Operation are directly controlled by Head Quarters e.g. Co-ordination and directions regarding rake Loading of programmed and committed traffic, movement of special type of stock, movement of over dimensioned consignments, out of turn allotments and allotment despite restrictions etc.
3. The Planning for the important traffic facility works and augmentation of capacity is another important function of the Operating Department of the Head Quarters.

### **(B) Freight Operation Information System: (FOIS)**

#### **(a) Objective of FOIS:**

Main objective of FOIS is to gain strategic advantage, in the emerging competitive scenario. It has become imperative to introduce IT to take care of our operations & business processes if we have to compete with Road transport. Road transport is being given a major thrust by means of 'Golden Quadrilateral' and 'East-West corridor' projects. In this context computerization of Freight Operations Information Systems (FOIS) has been conceived with the prime objective to provide:

- i) An efficient information system based on absolute current State of Art Technology and efficient communication system.
- ii) A management tool to optimize utilization of costly assets & resources by improving the distribution of Rakes/Wagons, Scheduling & Routing Traffic.

#### **(b) Maintenance of FOIS :**

1. FOIS system has been provided in Western Railway, which connects all divisional control offices, all important offices, various important private sidings, with Central control and Operational Control Centre (OCC) at CRIS New Delhi.
2. This system consists of a central computer, called Server installed at OCC, connected to computer terminals at above locations mentioned in Para 1 by means of Telecomm Data circuits.
3. The Telecomm Data circuits are maintained by S&T deptt. In case of any failure of FOIS system, action should be taken by Operating staff as per Joint Procedure Order dt.25.7.03 in order to test the system, for finding out whether the failure is in local computer or the line.
4. If the local computer and the Router are found OK, after testing as mentioned in Para 3 above, immediate action should be taken by the Operating staff to inform the S&T staff of the division for further action.



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5. S&T deptt maintains the connecting Telecomm circuits between any two FOIS terminals upto Router only. Any problem between Router and PC, shall be responsibility of Operating deptt. Therefore it should be clearly found out by testing, by operating staff, as per joint procedure order mentioned above, whether the failure is between Router and PC or Router and line.
6. The PC alongwith all software and hardware shall be maintained by Operating deptt.

### (c) Features of FOIS

Presently two sub-systems of FOIS are being developed as RMS & TMS. Next module of FOIS, 'Crew Management System' is in progress. FOIS system has been designed in a modular structure which is being developed in a phased manner.

**RMS** covers computerization of various operational functions relating to yard and freight train operations. This module has been developed in 2 phases P1 and P2.

-Phase I (PI module) Provides facility for reporting load summary with only wagon type and number of units. This module involves data entry relating to loads/trains, wagons, loco movement, load formation, forecast, train arrangements, crew assignment, train consist including consignment details besides train departure, train arrival, shunting performed enroute, and likewise other operational activities.

-Phase II (PII module): Provides facility for reporting wagon consists with wagon number details.

**TMS** relates to computerization of commercial activities pertaining to goods shed and siding working. This module has been developed in P3.

Rake Management System – RMS involves following important features,

- Rake based consignment tracking and pipeline
- Train/Rake operation
- Stock Holding in terms of summary of wagon types
- Train and stock Interchange
- Terminal Handling performance
- Loco holding, outage and power on-line
- Reporting to take care of Train/Load on summary basis
- Invoice based consignment tracking
- Wagon wise Stock Holding
- Reporting of consist Wagon wise
- Invoice based loading originating, tonnage and revenues
- Wagon wise Interchange
- Statement of missing Wagons/wrongly delivered
- Terminal detention
- Stable loads
- Outstanding rake & piecemeal

Terminal Management System – TMS involves following features

- Computerized booking and delivery of consignment
- Station Accounting
- RR generation/Transmission
- Improved Customer Interface

(d) **Functioning in FOIS :**

**1. Outward cycle**

First step in Freight Operation is 'Demand Registration'. Party places a demand at a station for transportation of a particular type of commodity to a particular destination. After completing all Commercial and Operational formalities the data is entered in TMS by Commercial staff. All the details such as Demand date/time, Consignor, rake type, traffic type, priority class, quota, ODC, Consignee, expected loading date, From station, destination, commodity, Full wagon load/Less than full wagon load (FWL/LWL) is filled in. Still the procedure is not complete. For completion of demand registration, details of Forwarding note such as, F-note type, No. of F-note, Commodity code, commodity description, weight (usually according to per wagon CC), stock type, no. of units are to be entered.

Depending upon the type of stock required against above demand 'Rake Formation' is done in RMS by Operating staff. After wagon-wise consist reporting Operating placement is done by feeding the time of Operating placement. This rake is now available in TMS for completing Loading of the rake and other Commercial formalities.

This rake is then 'allotted' for loading in TMS. After loading is complete the rake is 'released' after entering date/time of releasing, special handling if any, loading code (mechanical or manual). Invoice numbers are generated automatically by system. After release is marked complete, Forwarding note is met with and demand is marked fulfilled. Progressive loading number is entered and data saved. Rake Removal confirmation task is completed to hand over the rake to RMS so that it may be departed to destination in the system. Railway Receipt (RR) is generated and printed through the system. Charges due are automatically calculated by the system, which is collected by the commercial staff. Payment collection details such as MR no, mode of payment, bank details, amount (generated by system) etc. are entered.

After the rake appears in RMS it is made 'ready' to depart. Details such as Consist reporting, Train ordering, Crew reporting, Loco attachment, BPC reporting is entered. After completing the procedure departure time is entered. This completes outward cycle in FOIS.

**2. Inward cycle**

When loaded rake arrives at destination, operating placement time of such rake for unloading is entered. Now, this rake appears in TMS. After invoice verification commercial placement time/date is entered. When unloading is complete, release time, unloading type (MN/MC), release code is entered. Then rake removal task is completed and confirmation is done. This is followed by completion of other Commercial formalities. Unloading register is completed, Pending posting, RR cut-in is done. There are four options, Normal delivery book, Memo delivery book, Goods on-hand – pending posting, Goods reconciliation. One of the options is selected depending upon the case under which delivery of goods is done. Then removal of consignment is done after collecting the freight/other charges, Wharfage, Demurrage, Local charges if any. Lastly Closure of Delivery book task is completed. After completion of days work 'day end' task has to be executed.

Other data entry of timings of train movement running enroute is responsibility of Dy. Chief Train Controllers of respective Control offices, within which the train is passing. Broadly it can be stated that data entry in RMS is responsibility of Operating staff and data entry in TMS is responsibility of Commercial staff.

### (e) **Benefits of FOIS**

1. Advance information is available regarding movement of stock, this enables judicious planning of movement of empties. This results in enhanced utilisation of stock, reduced wagon turn-round and thereby helping in better management of stock.
2. Correct information is captured at source & manual collection of data is avoided. This makes uniform information availability possible at all levels & releases time for analysis & quality decision making.
3. On-line accurate information of Forecast & Traffic stream available to assist management in planning of train operations.
4. Stock & train movement is available all the time for planning of operations at goods handling terminals.
5. Improves quality of service to customers by giving prompt information to their queries related to the stock demanded or booked & location of goods consigned.
6. Increases customer satisfaction as advance intimation to customers can be given about clearance of their demand. This is possible as advance planning of stock can be done through the information available from Loads-on-run & Pipeline task.
7. The functions, which contribute to Subsidiary Group, shall make it possible to have better intra & inter department co-ordination, as uniform on-line information availability shall become reality.
8. Information on traffic flow & comprehensive terminal position helps in better management of diversion and restriction. Improved terminal management is made possible as the pipeline for the terminal is available in the system.
9. The performance of the terminal vis-à-vis capacity is known. This makes it possible to take decision to avoid congestion resulting in better utilisation of stock.
10. Comprehensive information is available about the outstanding demand, on hand stock, stock under release & pipeline for the terminal. This enables planning of loading in advance, giving intimation to customers to reduce avoidable detentions.
11. Position of Terminal performance enables to pinpoint troublesome spots and improve performance.
12. Maximum advantage is being taken of the Message facility & exchange of messages on telephone has been reduced reducing ambiguity and making messages available instantaneously.

### (f) **Future Prospects**

FOIS is a big step in bringing about complete Computerisation of Freight operations. Basic commercial functions such as Computerised booking & delivery of consignment, station Accounting, RR generation & transmission are covered under TMS, which help in improved customer interface.

Besides these basic modules of RMS & TMS, there are going to be subsidiary modules like Crew management system, Revenue Accounting, Loco & Wagon repair management system etc. which will further help in synchronization of Freight Operations management of Indian Railways.

### **1712 Railway Board's Control on Freight Operations :**

The Railway Board provides Unity of Control and direction for the freight operations. It also has the important role of supervision and co-ordination, which is very much essential for a big network like Indian Railways. The Railway Board's Control Office also remains in contact with the Head Quarter (Central Controls) of the Zonal Head Quarters and watches loading and movement of important streams of traffic, like coal, raw material for steel plants (iron ore), cement, food grains, fertilisers, POL, sugar, export ores etc. it also watches loading,

interchange, power position, goods train running on important sections etc. to ensure that each Railway fulfils its obligation and optimises the use of various assets. The items watched are more or less the same as those watched by the Zonal Head Quarters in respect of the Divisions, but the perspective is wider. Railway Board plays an important co-ordinating role between various Railways and other Central Government Departments and vital sectors of Economy connected with Railways. Policy formulation and Planning, which have important bearing on Freight Operations is also the major function of the Railway board.

### **1713 Role of Some Other Departments :**

Almost every Department of the Railway plays direct or indirect role in the Goods Train Operation. For example, the Personnel Department is responsible for Recruitment and filling up of the vacancies. The Accounts Department providing financial advice through the Statistics and other financial results. The Security Department has to provide security around important activity centres of the Railways and protect the Railway property and the consignments entrusted with the Railways.

The Commercial Department plays an important role in canvassing for Traffic, improving marketing, customer relations in general, booking of traffic, expediting loading/unloading of wagons, quick disposal of unconnected wagons and transshipment of Wagon detached out of course for Hot Axles etc. The various other Departments like Mechanical, Electrical, Civil Engineering and S&T provide and maintain various assets and infrastructure (track, wagons, engines, S&T Network etc.). These departments also ensure sufficient availability, reliability, predictability, safety and reduction in equipment failures; promptness in restoration in case of breakdowns and accidents should also be ensured. They also endeavour for the achievements in technology upgradation alongwith the operating strategies and determine the level of excellence in Railway Operations to a great extent. In nutshell, all the functionaries have to work as a dedicated team.

### **1714 Some Indices of Freight Operation and Efficiency :**

The important Operating Statistics, most of which are indices of Operating efficiency, have been discussed in detail in the Chapter – 21 of this Manual (Operating Statistics). Some Indices of Freight Operations and efficiency are highlighted below:

#### **1. Wagon Holding :**

For a given amount of originating loading and receipts of loaded wagons from other Railways and making an allowance for percentage of stock out of commission for repairs, etc., there are an optimum number of wagons that a Railway, and separately its constituent divisions, should hold to maintain the fluidity of transport system. More wagons than the optimum number might lead to increase in the repairs and maintenance percentage, heavier detentions to wagons and trains and transport bottlenecks, i.e. more congestion in sidings, yards and sections without a proportionate increase in the tonnes lifted, or in the efficiency of operations. Similarly, excessive shortage of Wagons may lead to loss of traffic. Proper estimation and projection of requirement, proper planning and working at various stages of freight operations is necessary for keeping wagon holding low. Ineffective Stock percentage should also be kept minimum.

#### **2. Interchange Balance :**

Maintenance of the interchange target is an indication of a Railway's overall operating performance and its efforts to meet inter railway obligations, hence interchange balance should not be very high, even when maximum trains are interchanged. However, attempts should be made to see that on busy sections, interchange is not only confined to few hours of the day.

### 3. **Load of trains :**

A train is a unit of transport. Depending upon the load, suitable loco is provided for its haulage. In order to get the optimum use of motive power and to increase the capacity utilisation and throughput, each Locomotive is given a load approximately to the maximum permissible, unless operating necessity requires utilisation of a loco for lesser load. The stations should also ensure that wagons are loaded to the carrying capacity or the minimum weight prescribed for some commodities.

### 4. **Loading and Unloading :**

To optimise the loading is one of the most important items in freight operations because it is through loading that Railway earns the maximum revenue. Similarly, unloading is necessary so that wagon becomes available for next loading. Reducing the time taken for loading/unloading by technology upgradation and other strategies in co-ordination with the customers has to be endeavoured.

### 5. **Empty Running :**

Ideally it is waste of transport capacity to run a wagon empty or with light load, but much of empty running is inescapable on account of the unbalanced nature and quantity of outward and inward traffic at terminals and necessity of supplying empty wagons. Certain special type of wagons for POL, Steel, Coal, Natural Gas, Ammonia, LPG etc. have to be generally run empty to the loading points. Operating skill lies in avoiding or reducing the extent of empty haulage and cross movements of similar type of empty stock.

### 6. **Despatch in Block Rakes :**

Despatching of wagons in small numbers always means transit delay while a block load can go direct to the farthest destination skipping many yards, thereby eliminating detention that the wagons might have suffered in the intermediate yards. Piecemeal wagons passing through a number of marshalling yards, where they have to be combined with other wagons to form train loads, cause huge amount of work for the staff and result in loss of efficiency, avoidable delay, anxiety and uncertainty regarding their arrival at destination. Unit train movement, i.e. a train load consigned by single consignee to single consignor, is ideal. Consignees can also be motivated to club their Indents to get train load and block rakes.

Also two point loading on same engine run can improve wagon usage. Close circuit rake movement can also be resorted to between selected pair of stations or rakes. Maintaining the purity of freight rakes has also to be ensured.

### 7. **Long Distance Trains :**

It is an age old principle of operations that full train loads should be formed at the earliest point for the longest possible distance. Long distance trains should have least stoppages like long distance passenger trains. Trains can also be run as "crack trains". A crack train is a train when the same crew (and engine if possible) instead of "Signing off" at the intermediate crew changing point works a train to farther junction. Thus, a train running from Ujjain to Godhra or vice versa without Crew/Guard change at Ratlam can be run as X 'CRACK'. The Crew can also be utilised on 'CRACK' basis when the same Crew perform a round trip without "Signing off" at the outstation and is promptly provided a load so that Crew returns to its Head Quarters within normal duty hours.

### 8. **Wagon Turn Round :**

The interval between two successive loading calculated from the time a wagon is placed for loading till the time it again becomes available for reloading is the actual turn round. As the calculations for individual wagons in the manner stated above are not practicable, the following statistical formula is generally used:



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$$\text{Wagon Turn Round } T = \frac{S}{L+R}$$

Where 'S' stands for the effective daily wagon holding or midnight wagon balance of a day (excluding sick, POH wagons in or waiting for shops, like departmental wagons, wagons lent for departmental use, and the wagons used for coaching traffic). 'L' stands for the total number of wagons loaded on the Division/Railways plus the wagons loaded at Transshipment Point, 'R' stands for the total number of loaded wagons received from other Railway/Divisions. Thus, for example, if a Division loads 350 Wagons on BG (including 50 BG Wagons loaded through transshipment of MG Wagons), 150 inward loaded wagons are received from other Divisions and its effective wagon holding at the end of the day (midnight) is 2250 wagons, the Divisional Wagon turn round will be 4.5 days.

$$\text{i.e. } \frac{2250}{350+150} = \frac{2250}{500} = 4.5 \text{ days WTR (Wagon Turn Round)}$$

### 9. Detention to Trains and Wagons :

#### (a) Detention to Trains:

A check on the detention to trains (1) outside signals or at stations adjacent to Goods Terminals, (2) in shunting operations at road side stations and (3) enroute detentions for various reasons should be exercised regularly.

#### (b) Detention to Wagons :

Close watch should be kept on the areas, e.g. Marshalling Yards, Goods Terminals, Stabling Points etc., where wagons are likely to suffer avoidable detention during various phases. Although this is watched through periodical data, special attention should be paid to pockets, where piecemeal wagons suffer prolonged detention and often remain out of sight.

### 10. Engine Utilisation :

Engines being a critical, scarce and costly asset in Railways, their utilisation have to be carefully monitored. For improving the Engine utilisation, watch has to be kept on terminal detention, speed of goods trains, under load running, ineffective Locos and proper utilisation of spare Locos, if any, running of Goods Trains on proper paths, etc. Some of the measures for improving Engine Utilisation are as under:

- (a) Running of the Goods Trains on proper path: For this, the Master Charts have to be properly framed and consolidated.
- (b) Proper co-ordination between Control and Line Staff.
- (c) Reduction in Terminal detention of Locos by proper monitoring co-ordination and working of Yard Staff, C&W Staff etc.
- (d) Judicious ordering of Trains and Right time starts of Goods Trains.
- (e) Proper Marshalling to avoid extra time in shunting enroute.
- (f) Proper controlling, judicious crossings and preferences.
- (g) Avoiding detentions outside Signals, at the Junctions, at the Stations adjacent to Junctions/ Terminals by keeping lines at the junctions/ terminals clear and giving correct expect of running to the Stations/Yards and Interchange Points.
- (h) Loop Lines on critical block sections should not be generally blocked.
- (i) Stabling and picking up of load should be judicious and properly planned.
- (j) Loco Pilot should run at maximum permissible speed subject to restrictions.
- (k) Light Engines can be coupled or attached to trains in order to save path and energy.

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- (l) Light Engines (Single or Couple) should run at maximum permissible speed, for which they are fit, subject to speed restrictions instead of running to the speeds of normal Goods Trains.
- (m) Signals must be taken off promptly at Stations. Distant/Warner Signals must always be taken off promptly.
- (n) Tangible authority to proceed should be handed over at the appointed place instead of getting the train slowed down in front of the Station for handing over the Authority from the Platform.
- (o) Trains should be run through Main Line (as far as possible) since looping results in extra time on run.
- (p) Locomotives should be in good working order and staff should be well versed in Loco operations and trouble shooting.
- (q) Hauling capacity of the Locomotives should be properly utilised. However, as per the policies to be decided from time to time, the speed of goods trains may be increased by reducing the Trailing load of the Loco.
- (r) Engineering speed restrictions should be regularly reviewed and reduced by maximising the output of the Engineering staff and machines. Due care and foresight in offering blocks for track maintenance should be exercised.
- (s) Line capacity of the Sections should be properly utilised without causing congestion and steps for augmenting line capacity should be taken in time.
- (t) The movement of the Engines to & from Sheds should be monitored.
- (u) Lie over period of Passenger Link Power may be utilised in short distance shuttling etc.
- (v) Effective control over traffic yards to reduce other engine hours, detention to locos at important loading/unloading points and industrial sidings.
- (w) The factors adversely affecting the Locomotive utilisation of speed of goods train, terminal detention etc. should be got analysed by suitable multi departmental teams and remedial measures taken.
- (x) Prompt attention to equipment failure and Loco troubles.
- (y) Prompt restoration of traffic after accidents and judicious diversion of Locomotives in case a line is blocked.
- (z) Incentive schemes for motivation of staff connected with Goods Operation, so as to improve Engine utilisation Special watch on Loco Pilots loosing time on run and not running on maximum permissible speed.

### 11. **Average Speed of Goods Trains :**

The average speed of goods trains is calculated by the following formula :-  
Average Speed =  $\frac{\text{No. of Goods Trains X Distance travelled by each train in 24 hrs.}}{\text{Total time taken by all the Goods Trains run.}}$

The distance and the time taken are calculated from the Control Charts. Thus all detention to Goods Trains enroute enters into calculation and has the effect of bringing down the average speed. The detentions may be on account of traffic, loco, engineering, signalling, carriage and wagons or any other cause. Almost all the factors affecting engine utilisation play part in the average speed of goods trains, the difference being that in the calculation of average speed of goods trains, the detention at originating point and terminating point as well as the Light Engine Running are not taken into consideration.

### 12. **Staff and Supervisions :**

Excellence in freight operations requires that the staff offer their willing co-operation and turn out a high standard of work. To achieve this, effective management and team spirit at the supervisory as well as at the senior officers' level is required. Proper training for constantly developing the knowledge, skills and the desirable attitudes is essential. Inspections, information system and preparedness to deal with accidents, breakdowns and unusual occurrences have also to be effective.



## FREIGHT OPERATIONS

### 13. **Targets and Statistics :**

One of the important means to utilise fully and efficiently the existing carrying capacity of a railway is to set measurable and specific targets for the various performances after taking into consideration all the local conditions. Once the targets are laid down, all possible efforts must be made to attain them.

The targets should be set sufficiently high and reviewed constantly with a view to improving the performance further. Details regarding Statistics pertaining to Railway Operations are given in Chapter No.21 Where targets are not attained within a reasonable period, the causes must be traced and effective remedial action taken, if necessary, revised targets should be laid down.

### 1715 **Planned Provision of Adequate Capacity for Freight Operations:**

Since Railway is a capital intensive and unique industry, it is necessary that not only the efficient utilisation of the existing resources is ensured, but proper planning is undertaken for provision of adequate capacity, including terminal capacity, (Goods Sheds, Sidings, Yards etc.) Line capacity, Rolling Stock, Locomotives and Wagons. In planning additional facilities for dealing with the present and potential traffic demand, due regard must be paid to economy, efficiency, modernisation of technology, creating proper working atmosphere and infrastructure.

### 1716 **Loading and Running of Double stack container -**

Double stacking of 8'-6" (2591 mm) high ISO containers on existing BLC wagon should be strictly done as per table given below –

Series	Container Position		Loading Condition	
	Lower	Upper	Lower	Upper
I	40'	40'	Empty	Empty
II	40'	40'	Loaded	Empty
III	40'	40'	Loaded	Loaded
IV	2 X 20 '	40'	Empty	Empty
V	2 X 20 '	40'	Loaded	Empty
VI	2 X 20 '	40'	Loaded	Loaded

#### **NOTE –**

1. While loading, care should be taken to place loaded containers evenly on wagons as far as possible.
2. In no case, load of top container should be more than the load of bottom container for Series III and combined load of bottom containers for series VI.
3. Payload of 61 t for container wagon implies tare weight of containers + weight of goods in container. This should be strictly followed to prevent overloading of wagon.

#### **GENERAL**

All the permanent and temporary speed restrictions in force and those that may be imposed from time to time due to track, bridges, curves, signaling and interlocking etc. shall be observed. The movement of wagon shall be avoided on platform line.

The bogie container flat wagon loaded with Double Stack Container as shown in RDSO Drg. No. CONTR-05076-S/1 (Alt.1) for A-car(BLCA) and RDSO Drg. No. CONTR-05077-S/1 (Alt.1) for B-car(BLCB) infringes Clause No. 2 (ii), 11, 14, 29 & 30 of Chapter IV(A) Schedule of Dimension BG, Revised 2004. These infringements were condoned by Railway Board vide letter no. 2005/CEDO/SR/19 dtd. 30.12.05 for conducting detailed Oscillation trials of double stack wagons on Jaipur-Pipavav Section as a special case.

Movement of Double Stack containers on existing bogie low platform container wagon type BLCA/BLCB wagons on any section of IR on the basis of this speed certificate will be subject to the final condonation of infringements certificate issued by Railway Board for that particular section.

**1717. PREFERENTIAL TRAFFIC ORDER**

**GENERAL ORDER NO. 80**

( FOR ALLOTMENT OF WAGONS) ( In force from 1<sup>st</sup> April 2006)

Whereas, in opinion of the Central Government, it is necessary in public interest so to do;

NOW, THEREFORE, in exercise of the powers conferred by section 71 of the Railway Act, 1989 the Central Government hereby directs that all Railway Administrations shall give special facilities for or preference to the transport of goods/class of goods at a station/siding as per priority/preference mentioned in the order.

1. PRIORITY 'A'

1.1 Military Traffic, when sponsored by MILRAIL.

2. PRIORITY 'B'

2.1 Goods for emergency relief work for victims of natural calamities, like floods, drought, earth-quake, etc, when sponsored by an officer not below the rank of Deputy Secretary of Central/State Government or a non-official organization nominated by the Central/State Government and mentioned in the sponsorship.

2.2 All traffic sponsored by a central Government Agency and approved by Railway Board/Zonal Railway.

3. PRIORITY 'C'

3.1 All Programmed traffic for which monthly or quarterly programmes are approved by Railway Board/Zonal Railway.

4. PRIORITY 'D'

4.1 All traffic not included in priority 'A' to 'C'.

5. GENERAL INSTRUCTIONS.

5.1 Traffic will have preference over other traffic within the same class of priority in the following order :

a) Traffic covered by contractual obligations and 'or guaranteed under specific Schemes like Wagon Investment Scheme, Freight Forwarder Scheme, Terminal Incentive-cum-Engine-on Load Scheme (TILES) etc.

b) Traffic in rakes loaded from a Siding/Goods Shed having round the clock working.

c) Traffic in rakes from a full rake handling siding having mechanized system of Loading.

5.2 Traffic offered for distance of more than 800 kms. will have preference over other traffic within the same classification and priority.

5.3 Traffic offered in block rakes, including clubbed indents constituting a block rake will be given preference over traffic in piecemeal irrespective of the class of priority and date of registration.

5.4 Traffic offered in single point block rakes ( including clubbed single point rakes) will be given preference over two point/multi point block rakes and mini rakes within the same class of priority.

5.5 Any traffic can be accorded preferential loading and movement under a higher priority under special orders issued by the Ministry of Railways, Railway Board/Zonal Railways.

5.6 Two days in a week shall be reserved and notified for allotment of rakes as per the date of registration irrespective of the class of priority.

6. CURRENCY OF THE ORDER

6.1 This Preferential Traffic Order General Order No. 80 will come into force w.e.f. 1<sup>st</sup> April 2006 and unless cancelled earlier will remain in force upto 31<sup>st</sup> March 2007.

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CHAPTER - 18

CONTROL ORGANISATION

**1801 Introduction :**

The Control Organisation of the Railway is the brain centre of the Railway Operations as it deals with the Planning, Organising, Co-ordinating, Directing, Supervising and Controlling the multifarious activities with a view to move the optimum level of traffic by maximum utilisation of assets. Operating Control means the control over working in its jurisdiction from a Central office connected by telecom/ computer etc. net work to various activity centres such as Railway stations, Locomotive sheds, Yards, Lobby, Carriage & Wagon Depots etc.

**1802 Object of Control :**

Traffic is offered at a large number of stations on the railway and has to be carried by trains from one station to another station. If there is no unified command exercising control over the entire section on which such stations are located, regulation of traffic and trains would be difficult. In order to have co-ordination in working and to avoid delay to trains, control over the movement of trains and traffic is exercised round the clock by Controllers who have the over-riding powers over stations, yards etc. in the matter of movement of trains and traffic.

**1803 Organisation :**

Every Divisional Headquarter has a Control Office. Generally the entire jurisdiction of the Division is controlled by this office.

The Divisional Control Office is headed by a Chief Controller In-charge. The Chief Controller is responsible on behalf of Sr. DOM and DRM for proper planning and execution and review of the programme related to the railway operations in the division. The Chief controller, may be assisted by the Shift Chief Controllers or Dy. Chief controllers who may be looking after the shifts and of different aspects of railway Operations like Goods, Coaching, and Stock working. The Power Controllers or Traction Loco Controllers and other Controllers like Carriage Controller, Commercial Controller, Signal and Engineering Controller, Statistics Controller(LSR), Special Commodity (viz. POL/Coal) Controller etc. are also part of the control organisation. The control boards are manned by Section Controllers. The control office also have number of Trains Clerks. Now a days telephone enquiry staff also function from control office.

Certain far flung area of the divisions or certain specific points, where density of operational activity is intense may require special attention. These important activity centres are generally near the places, where the traffic offering is very high and the commitment of the railway for supply, clearance of the stock to important sections of Industry can not be fulfilled unless whole time attention is paid to the operations affecting them. These may be at the places where, due to operational necessities, the railway establishes big Marshalling Yards. At such points, Area Controls are established. The organisation of such control office is more or less similar to that of Divisional Controls.

**1804 Scope :**

Control work comprises of the following operations :

1. **Train Control** Directing, Regulating and Supervising the movement of trains from station to station on the section so as to avoid delay to trains and to secure the maximum utilisation of the capacity of the section. It is exercised by:-
  - (a) Monitoring movement of trains from station to station expeditiously and recording the movements on the control charts.

## CONTROL ORGANISATION

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- (b) Arranging crossing and precedence of trains.
- (c) Arranging the working of departmental and material trains.
- (d) Adjusting and regulating running of trains in view of the works undertaken by various departments.
- (e) Giving time signal to all stations on the section daily at appointed time
- (f) Fulfilling interchange commitment.
- (g) Arranging proper movement of assisting/banking engines.

2. **Traffic Control** is the general and over-riding control for supervision of the movement of goods and coaching traffic on the section. It is exercised by :

- (a) Collecting information from the various stations on the section in respect of –
  - (i) Registration for wagons outstanding at stations and arrangements for supply of wagons.
  - (ii) Number of wagons loaded and empty awaiting despatch.
- (b) Arranging running, regulation, putting back and cancellation of trains.
- (c) Securing maximum loads for trains.
- (d) Collecting stock position from the different stations, marshalling and terminal yards.
- (e) Monitoring and co-ordinating working of yards, goods sheds, sidings, loco-shed, C&W depots etc..
- (f) Supervising of stock control.
  - (i) Arranging supply of wagons against pending registration.
  - (ii) Securing optimum utilisation of stock, with minimum detention.

Note:- Where density of trains is low and the utilisation of train control circuit comparatively light, the functions of traffic control are also to be carried out by the Section Controller. Even where separate Traffic Control (Deputy control) circuits are provided, the information from stations not connected on the Deputy control circuit with regard to Traffic Control is to be collected and necessary orders passed to the stations by the section controller under the guidance of the Deputy Chief Controller, wherever provided or the Chief Controller.

3. **Power Control** consists of maintaining the positions and co-ordination regarding requirement and utilisation of crews and locos for :-

- (a) Requisitioning engine from loco sheds for all operating requirements, i.e. Train working, Shunting and Banking.
- (b) Ensuring most economical use of engines by close supervision both in Traffic Yards and sheds.
- (c) Ensuring the return of engines to “Home Sheds” at regular intervals for servicing and maintenance.
- (d) Ensuring an even balance of engines from running sheds for meeting demands of traffic,
- (e) Ensuring that light engine kilometres is kept to the minimum.
- (f) Providing guidance to running staff for trouble shooting.

4. **Carriage and Wagon Control** is responsible to assist the train and traffic control :

- (a) To keep a watch over the detachment of sick wagons and to arrange for their early repair and fitness.
- (b) Keeping a watch over availability of vital C&W components, like Hose Pipes, Washers, Clamps etc. to avoid detention to trains.
- (c) To keep a watch over placement of wagons in sick line and their release.
- (d) To keep account of detention of trains on C&W account and take remedial action.
- (e) Any other job entrusted by Sr. DME/DME.
- (f) To provide guidance to running staff for trouble shooting.

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5. **Commercial Control** assists the Traffic and Train Control.
  - (a) To expeditiously dispose off unclaimed and unconnected wagons, loads, smalls and parcel consignments.
  - (b) To keep a watch on detention to trains on Commercial account like Alarm Chain Pulling. Carriage watering, Parcel working etc., and take remedial measures.
  - (c) To ensure quick transshipment of sick wagons by arranging matching stock and labour.
  - (d) To keep a watch over submission of station returns.
  - (e) Monitoring of public complaints lodged at the stations.
  - (f) To ensure proper maintenance of public amenities available at stations.
  - (g) Any other job entrusted by Sr. DCM/DCM.
  
6. **Traction Power Control** is provided to assist in Traffic and Train Control for -
  - (a) Arranging maintenance blocks for OHE
  - (b) Arranging alternative power supply in case of tripping etc., through remote control.
  - (c) Monitoring OHE failures and taking remedial action.
  - (d) Monitoring detention of trains on O.H.E accounts.
  - (e) Guiding running/ station staff in trouble shooting.
  
7. **Engineering and Signal Control** is also provided to assist Traffic and Train Control.
  - (a) To keep a watch over the S&T failures and take remedial action.
  - (b) To co-ordinate works and maintenance blocks. Running of Material trains.

### 1805 **Functions of Control :**

The main functions of Traffic Control are :

1. Continuous supervision of the movement of all traffic in the controlled area with a view to achieve the maximum possible operating efficiency.
2. Systematic maintenance of accurate charts of train movements and the arrangements of crossing and precedence to the greatest advantage.
3. Analysis of detentions to trains,
4. Planning, Ordering and Running of goods trains to the best possible paths.
5. Maintaining the fluidity of marshalling yards.
6. Taking remedial action in the event of yard congestion.
7. Elimination of avoidable detentions to goods stock at loading and unloading points and at transshipment stations.
8. Allotment and distribution of goods stock to stations,
9. Supply of information to adjoining controls, terminals and engine changing stations regarding the movements of trains to enable adequate arrangements for their reception and onward despatch.
10. Arranging of engineering and other departments blocks with minimum detention to traffic.
11. Running of material trains and other track machines, tower wagons etc.
12. Arranging relief for engine crews and Guards.
13. Ensuring maximum utilisation of locomotives.
14. Issuing instructions for train working in case of interruption of communication, failure of block instruments and whenever abnormal methods or working have to be resorted to,
15. Speedy arrangements for relief rescue and restoration in the event of accident.
16. To assist in the realistic planning of time tables and punctual running of passenger trains in co-ordination with various departments, other divisions and other railways.
17. To keep a watch over damaged stock at road side stations, yards and sick lines and to ensure that they are promptly attended to.
18. To rectify immediately the irregularities on the part of line staff and provide them necessary guidance.
19. To provide operations management information.



### **1806 Telecommunication Facilities in Control :**

Extensive, efficient and reliable communication network is necessary for the efficient functioning of the Control organisation. The following telecommunication network is available in control offices.

1. Hot lines are provided between :
  - (a) Headquarters and Divisions
  - (b) Adjoining Divisions and Railways
  - (c) Intercom facility to various Officers and other functionaries concerned with the control is connected with important work centres with STD or Trunk Exchanges.
2. Dy. Control Lines :

This circuit is provided between various functionaries in the control office, stations and important work centres like yards, loco sheds, crew booking lobbies.
3. Section control circuit :

This circuit is connected to all the stations and the section controller, Chief controller etc.
4. Traction Power Control circuit :

This additional telephone circuit is available on the electrified sections, This is connected to T.P.C. in OHE remote control centre, all stations , control-offices and selected work places. The section controller or T.P.C. can also be contacted from the emergency socket provided over the sections of line by means of portable telephone of the control point with indication on the electric mast, direction wise, to the nearest circuit. (See CH – 32 also)

### **1807 Section of Control Board :**

The Section Controller of each section is provided with control board with Telecommunication facilities for communicating with stations, important cabins, big freight terminals, loco shed etc. over a section. For the guidance of section controller, the lay out of all the stations and sidings is painted on a large board.

The station lay out diagram is also provided with details of holding capacity of each of the running & non-running lines, gradients and signals including shunt signals. In electrified area, OHE sectioning diagram is provided. This depicts elementary sections in different colours & other details of sectioning post (SP) and Sub-sectioning post (SSP).

### **1808 Graphs and Plotting :**

1. Trains are plotted on control graphs which consist of horizontal and vertical lines representing distance and time respectively. Along side the vertical lines stations are spaced to a uniform scale. Each one hour is first divided into 6 units of 10 minutes each and each unit is further sub-divided into 5 smaller units of 2 minutes each.
2. Each control graph may have the following information on it :
  - (a) Name and total distance of the section in Kilometres.
  - (b) Distance in Kms. between each station on the section.
  - (c) State of weather in each shift.
  - (d) Engineering restrictions on the section.
  - (e) Code names of each station of the section.
  - (f) Time taken by each train on loco, traffic or engineering account at or between stations.
  - (g) Section Controller's remarks against item (d).
  - (h) Time made up by each train on loco, traffic or engineering account.
  - (i) Guard's troll-time lost on loco, traffic or engineering account at or between stations and remarks.
  - (j) General remarks.
3. In plotting the various types of trains the coloured pencils / ball pens / ink pens shall be used as per instructions of Chief Train controller or operating officers.
4. For judicious crossing and precedence, it is necessary to have plotting of passenger trains at least 2 hours in advance in easily erasable lines.
5. Automatic Graphing.

**1809 Master Charts :**

For every section Master Charts indicating trains run in 24 hours are prepared which show the running of each Mail, Express or passenger trains over the sections according to its scheduled running. In between the running of trains carrying passengers, paths for goods trains are worked out and plotted. They are helpful in revision of time tables and planning the running of any extra train and guidance of section controllers and should be displayed on the boards to which they refer.

**1810 Duties of Control Staff :**

**1. Duties of controllers :**

The main duties of control staff are as under :

These are only guidelines to their day to day working and are not exhaustive.

**(a) Chief Controller (In-charge).**

The Chief controller is the overall in-charge of control office and is responsible for general supervision, co-ordination, planning etc. Some of his duties are :

- (i) Checking control charts and bringing to the notice of the Divisional Operations Manager any avoidable detention to trains.
- (ii) Monitoring punctuality and maintaining all statistics regarding the punctuality of passenger trains.
- (iii) Checking all stock papers before submitting them to the Sr. DOM / DOM.
- (iv) Paying personal attention to interchange obligations.
- (v) Watching detention to stock at stations and transshipment points.
- (vi) Watching the work of marshalling yards.
- (vii) Maintaining liaison with neighbouring Divisions in regard to Goods trains operations.
- (viii) Supervising the preparation of goods trains time tables.
- (ix) Watching the utilisation of loco and their terminal detention.
- (x) Checking total engine hours and shunting engine hours.
- (xi) Checking rest hours of running staff and balancing of crews.
- (xii) Granting engineering blocks, power blocks etc.,
- (xiii) Attending control office in cases of accident unless and otherwise directed by Sr.DOM/DOM and ensuring that action is taken as per directions on the subject.
- (xiv) Planning, reviewing, supervising & directing the work of the control office as a whole.
- (xv) Carry out any other duties allotted to him by the Divisional Operations Manager.

**(b) Chief controller (Movement)/Dy. Chief Controller / Shift duty :**

He is responsible for :

- (i) Arranging running of goods trains so that they run with suitable loads and on suitable path and arranging precedence etc. preparing interchange expect, monitoring interchange, loco utilisation and passenger and goods train operations in general.
- (ii) Giving timely intimation to junctions and terminal stations regarding the movement of trains so as to enable arrangements for their reception and despatch being made.
- (iii) Allotting empty stock to stations in accordance with current priority regulations [where a Dy. Chief Controller (Stock) is not posted].
- (iv) Maintaining constant touch with adjacent divisions and through regular conference to facilitate the working of traffic.
- (v) Dealing immediately with significant detentions or transport bottlenecks and other unusuals.
- (vi) Keeping constant touch with the working of Marshalling yards and taking timely action to deal with congestion.



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- (vii) Giving advice of serious accidents to all concerned, and taking charge of the affected sections.
  - (viii) Supervising the running of oversized consignments.
  - (ix) Maintaining liaison with the Power Controller, Traction Power, Traction Loco, Carriage, Commercial, Security and Engineering Controller.
  - (x) Carrying out any other duties allotted to him by the Chief Controller.
  - (xi) Co-ordinate the work of various Section Controllers.
  - (xii) Maintain discipline among control staff in the absence of Chief Controller.
  - (xiii) Maintain co-ordination and liaison with various functions involved in train running.
- (c) **Chief Controller (stock) / Dy. Chief Controller :**  
He is responsible for :
- (i) Scrutinising the indent register in details with regard to the oldest date of registration, nature of goods and type of stock required for planning loading of Goods stock as per the oldest date of registration.
  - (ii) Checking Divisional stock report and position of empties.
  - (iii) Checking in details and making an assessment of the position obtained at the transshipment points.
  - (iv) Checking of different stock reports received from the various points and planning in advance the daily supply of stock, loading and clearance keeping in view interchange obligation and transshipment commitments and orders received from Operating officers.
  - (v) Checking crane movements and release of crane consignment by contacting on phone the Station Master concerned.
  - (vi) Chasing movements of stock as per supply order issued on the previous day.
  - (vii) Keeping a close watch over sick wagons and their transshipment, special type and unconnected wagons.
  - (viii) Cross checking the daily Restriction Bulletin with Restriction Messages received from HQ office and issuing the same.
  - (ix) Assisting the Sr.DOM/DOM in allotments.
  - (x) Keeping a close watch over the movements of seasonal perishable traffic and supply of suitable stock for quick clearance.
  - (xi) Watching movements of damaged loaded stock in sick line and yards on their division.
  - (xii) Offering comments on public and HQ office correspondence regarding non clearance of traffic and future prospects of its clearance or any other matter.
  - (xiii) Explaining on phone doubts and misgivings regarding restrictions and loading orders to the Station Master.
  - (xiv) Carrying out any other duties regarding control and distribution of stock allotted to him by the Chief Controller or the AOM / DOM.
  - (xv) Optimising loading, unloading, transshipment etc.
  - (xvi) Any other duty allotted by Sr. DOM/DRM.
- (d) **Section Controller :**  
The Section Controller shall be responsible for :
- (i) Reporting for duty at the prescribed time and then ascertaining the position of the section from the relieved section controller.
  - (ii) Recording the movement of trains on the 'Control' graph including crossing, connections and shunting reasons for detentions etc.
  - (iii) Arranging for the supply and clearance of stock as ordered by Dy. Controller.
  - (iv) Arranging as ordered by Dy. Controller the clearance of small consignment from road side stations.
  - (v) Advising stations in advance of the work to be done on shunting and van train.

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- (vi) Informing sheds and stations about the late running of trains to avoid the calling of Crew and Guards earlier than necessary or to put back trains wherever advisable.
  - (vii) Informing big stations and concerned Section Controller about the trains on the section and their anticipated arrivals well in time for arranging reception lines and connecting the trains onwards.
  - (viii) Keeping in close touch with Engineering-blocks and working of material trains so as to give the maximum possible time with least detention to other traffic.
  - (ix) In case of accidents, assimilating the situation promptly and adjusting the movements of trains in view of the circumstances prevailing under the guidance of Deputy and Chief Controllers.
  - (x) Keeping a watch over damaged vehicles detached at road side stations and arranging transshipment of their contents and proper attention on the part of the train examining staff.
  - (xi) Eliminating all possible detention to train and stock.
  - (xii) Watching the working of marshalling yards.
  - (xiii) Making timely arrangements for the relief of Guards whose duty hours are likely to be exceeded enroute.
  - (xiv) Transmitting messages for meals for passengers.
  - (xv) Recording stock report (where stock clerks are not posted)
  - (xvi) Carrying out any other duties allotted to him by the Chief Controller or the Dy. Chief Controller.
- (e) **Power Controller / Traction Loco Controller :**
- (i) Planning and directing engine movements so as to ensure efficient engine utilisation and maintaining the prescribed charts, regulars and statistics.
  - (ii) Co-ordination with sheds and Dy. Chief controllers(movement) for sending scheduled due engines and obtaining time of engines coming out of shed.
  - (iii) Making timely arrangement for the relief of crew whose duty hours are likely to be exceeded enroute
  - (iv) Taking timely action to balance crew so as to prevent cancellation or putting back of trains on account of shortage of crew.
  - (v) Arranging relief in case of accidents as per chapter IV to VIII of Accident Manual.
  - (vi) Maintaining charts indicating engine position.
  - (vii) Rendering advise and assistance to locomotive running staff regarding trouble shooting.
  - (viii) Carrying out any other duties allotted to him by the Sr.DME/DME or Sr.DEE/ DEE from time to time.

### 1811 Duties and Responsibilities of Staff towards Control :

1. Staff to obey orders of control :  
Station staff, Shed staff, Crew and Guards etc must obey orders issued by the Control as long as these orders are consistent with the General and Subsidiary Rules extant instructions and the instructions contained in this Manual.
2. 'Control order register' :  
All orders given to the Station Masters or Running staff and lobby by Control should be entered in the control order register by the staff. Each entry must be initialled with time. At the end of each turn of duty the relieved as well as the relieving Station Master or Loco Foreman must sign their name in full below the last entry in the register. On days when no orders are received from control, "Nil" entry must be recorded and signed as prescribed above. When a station Master or Loco Foreman has received an order from the control and entered it in his register, he may repeat it to the control in order to satisfy himself and the control that he has understood it correctly.
3. No Terminal Station should start a goods or unscheduled train or block the section without the permission of the Controller.

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4. Every Station on the section must report the movement of every train- passenger, goods, special, departmental, light engines, TTMs, Tower Wagons, trollies etc. to the controller.
5. When the control is in function, Line Clear must be asked from the station ahead for every train unless orders to stop it are given by the Controller.
6. The Controller's permission must be obtained before stopping a train that should run through except to avert an accident or dangerous condition.
7. No station should allow a train, which has been stopped out of course, to proceed, without first informing the controller that the train has been so stopped and receiving his further orders.
8. Station Master must advise the controller of any unauthorised or undue detention to trains at their stations with full explanation.
9. Whenever a train, either passenger or goods is detained at a station for longer than the booked halt without the orders of the Controller, on its departure, the Station Master must immediately inform the brief cause of the detention to the Controller.
10. Whenever a hot axle wagon or any other wagon is detached out of course at a station, the Station Master on duty should inform the Controller.
11. Station Master must promptly advise the Controller of any defects of signals, points, interlocking apparatus and line clear instruments at their stations. Information should also be given of any defects in any other station machinery such as cranes, wagon weigh bridges etc.
12. Starting stations to report particulars of outgoing train :  
As soon as a train leaves a train starting station, the Station Master must intimate the following particulars to the control office :  
Number and description of train, Engine number and class, Loco Pilot's name, Guard's name, load of the train (in tonnes and vehicles) particulars of shunting to be done on the journey, time of departure, brief reasons of late start.
13. Intermediate stations to report for arrival and departure time of trains:  
Station Master of intermediate station must communicate to the Control as early as possible, the following information in regard to every train dealt with :
  - (a) In case the train has run through, the time it passed the station.
  - (b) If it is a stopping train, the time of arrival and departure along with the explanation for every detention beyond the scheduled stoppage.
  - (c) If any shunting has been performed, the number of vehicles attached and detached.
  - (d) If any extra time has been taken in loading and unloading of packages, the number of such packages.
14. Terminating stations to report the particulars of incoming trains :  
Station Masters of terminal and engine changing station must as soon as possible after the arrival of a train, communicate to the control the time of arrival and the load of the train.
15. Engine Movements to and from sheds to be reported :  
Loco foreman must communicate to control the time at which train engine leaves from or returns to the shed 'Bahar line'. This in no way, relieves the Station Master of the responsibility for issuing necessary all concerned messages regarding engine failures and engine trouble enroute, to the Controller, who shall record the duration of such defects in his chart, diary and registers.
16. Time to be checked with control :  
Station Master, Loco Foreman and Lobbies must check their time with control at appointed hours every day when control gives a general ring for setting their watches.
17. Staff must obtain Station Master's permission before speaking to Controller.
18. The Control telephone is to be used only for transmitting official information, Private conversation forbidden.
19. Mode of using the control phone :
  - (a) Station Master and others must not ordinarily attempt to speak to control unless they have ascertained by lifting the receiver and listening in, that the line is free.

## CONTROL ORGANISATION

They must then announce the name of the station shed, lobby or site from where they are speaking and wait for its being repeated by the controller before beginning the conversation.

- (b) The following examples illustrate how the Controller's permission should be obtained for starting a train or for announcing the timings of trains to him –

|                            |   |   |                           |
|----------------------------|---|---|---------------------------|
| Asstt. Station Master says | - | - | Sant Road                 |
| Controller                 | - | - | Sant Road                 |
| Asstt. Station Master      | - | - | TKD Spl. Ready 9.05       |
| Controller                 | - | - | Ask Chanchelav line clear |
| Asstt. Station Master      | - | - | Right                     |

The Assistant Station Master is responsible for seeing that TKD Spl. does start at 9.05. If there is any delay likely to occur after he has obtained the Controller's permission and the train cannot start at 9.05, he should again obtain the Controller's permission before starting the train.

Example 2 –

|                            |   |   |                                    |
|----------------------------|---|---|------------------------------------|
| Asstt. Station Master says | - | - | Ratlam                             |
| Controller                 | - | - | Ratlam                             |
| Asstt. Station Master      | - | - | MLDT Spl. Ready 00.50              |
| Controller                 | - | - | Ask line clear following<br>2951Dn |
| Asstt. Station Master      | - | - | Right                              |

Example 3 –

|                            |   |   |                |
|----------------------------|---|---|----------------|
| Asstt. Station Master says | - | - | Runkhera       |
| Controller                 | - | - | Runkhera       |
| Asstt. Station Master      | - | - | 2953 DN 2.46 * |
| Controller                 | - | - | 2953 DN 2.46   |

- - This means that 2953 Dn ran through Runkhera at 2.46.

Example 4 –

|                            |   |   |                       |
|----------------------------|---|---|-----------------------|
| Asstt. Station Master says | - | - | Godhra                |
| Controller                 | - | - | Godhra                |
| Asstt. Station Master      | - | - | 2904 Up arrived 22.00 |
| Controller                 | - | - | 2904 Up arrived 22.00 |

The departure must also be given in precisely the same way using the word 'left' instead.

- (c) When, however an urgent message has to be conveyed and the line happens to be engaged, the station name must be called out and a demand made for the telephone line to be cleared. The Controller will there upon discontinue the conversation in which he has been engaged and attend to the Station making the interruption. Such 'clear line' must be made exceptionally when there is a genuine reason to do so.

20. Station Masters must attend 'Control Call' promptly.

### 1812 Advantages of Control System :

The following are the advantages of control in areas of operations :

1. Ensures the punctual running of mail, express and passenger trains, by a judicious arrangement of crossings and precedence.
2. Secures the maximum utilisation of Goods stock and power.
3. Secures the optimum utilisation of the section capacity.
4. Co-ordinates and rationalises the clearance of traffic.
5. Provides prompt relief measures in case of accident.
6. Maintains avoidance of cross running of empties.
7. Makes efficient efforts in increasing the speed of goods train.
8. Keeps continuity of contact between the field staff of the various departments and the Area/Divisional HQs to help each other for prompt and fruitful results in operation.
9. Achieves economical utilisation of running staff.

10. Inculcates discipline amongst all staff and within individual to gain maximum co-ordination for achieving high standard of efficiency in train operation.

### **1813 Co-ordination between Control and Stations :**

1. Asking line clear : In order to avoid the detention to passenger trains for crossing a less important train, line clear enquiry for the less important train must not be asked until the train is ready to leave and until the Section Controller's permission has been obtained. The Station Master receiving the line clear enquiry must immediately ask the Controller's permission to give line clear before giving the reply. The Station Master on duty is entirely responsible for seeing that the necessary General and Subsidiary rules and Station Working Rules are observed before giving Line Clear.
2. When a Station Master for any reason finds it difficult to carry out Controller's arrangement to receive the train in yard/station due to yard/ station constraints, he must explain his reasons clearly and fully to the Controller.
3. Work at stations : The permission of the Controller must be obtained before the performance of any shunting, Controller must be informed of the likely duration of shunting to enable him to arrange crossing and precedence of trains. In the event of Station Master being unable to start a train on receipt of line clear, he must at once report the circumstances to the Controller.
4. Control order regarding crossings etc. :  
The Section Controller will give definite instructions for crossing or precedence and will not change them except under unavoidable circumstances. Because last minute change of order will result in confusion and unsafe operation. The Station Master is entirely responsible for seeing that the crossing is effected safely and strictly in accordance with the rules. The Controller must see that sufficient time is available for the necessary operations to be carried out. If the Controller fails to do so, the Station Master should represent that delay may occur, but it does not allow him to disregard any rules in order to avoid such delay.

### **1814 General Order of Precedence of Trains :**

Unless specific orders to the contrary are issued by the COM or by those acting on his behalf, the following general orders of procedure shall be observed by control and stations.

1. ARME, ART proceeding to the site of accident.
2. President's and VVIP's specials (Unless otherwise specified in the Time Table).
3. Suburban train in peak rush direction. (For Mumbai division only)
4. Super fast trains like Shatabdi, Rajdhani etc.
5. Mail / Express trains.
6. Military personnel special, if instructed by emergency control/DOM.
7. Fast Passenger train
8. Special engaged by the public.
9. Passenger trains.
10. Mixed trains.
11. Military stores special.
12. Express or special goods train.
13. Through goods train.
14. Accident relief train returning from the site of accident (unless otherwise ordered).
15. Shunting and van goods train.
16. Departmental trains.

Note:-The following general principles are mentioned for the guidance of Controllers but it must be distinctly understood that nothing in these instructions modifies the safety precautions laid down in the rules (General and Subsidiary Rules, Station Working Rules etc.).

- (i) A Passenger train nearing the end of its run should not normally be detained in preference to a train which has a longer run before it, as the later train is more likely to make up time and reach its destination punctually than the former.



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- (ii) A train running to time should not be detained more than 30 minutes to effect crossing on single line.
- (iii) A train running late due to defective engine, or defect in rolling stock or any other cause which is likely to continue to operate against it and prevent it from making up time, should generally give way to a train running properly.

### **1815 Accidents :**

Controllers and other staff should thoroughly understand and act on the guidelines contained in G & SR and Accident Manual.

### **1816 Working of Trains when Control is Interrupted :**

When the control is interrupted and no communication with the Controller is possible, Station Masters will be responsible for the working and regulating of trains, keeping in view the instructions issued by the railway administration.

### **1817 Books / Documents and basic records to be kept in Control Office :**

1. Station Working Rules of all stations.
2. Working facilities available on the transshipment sheds.
3. Schedule of shunting engines in the various yards.
4. Link diagrams of rakes and engines working the passenger services and also of goods trains where laid down.
5. Crew link diagram of the various services, for the running staff.
6. Details of maximum moving dimensions permitted on the various sections of the railway.
7. Map showing the maximum permissible axle load on all the railways with which traffic is interchanged.
8. Charts showing track capacity of the various sections.
9. Index sections and plans of the various sections of the jurisdiction and details of train watering, Engine fuelling etc.
10. Master charts depicting all trains indicated in the working time table in force.
11. Charts showing jurisdiction of the various officials details of :
  - (a) the maintenance branch of the post and Telegraph department responsible for maintaining control circuit wires in good condition.
  - (b) the various departments of the railways,
  - (c) Zone and telephone numbers of Civil, Police, Military authorities.
  - (d) List of various hospitals with Telephone Numbers.
  - (e) List of stations Civil, district-wise.
  - (f) OHE Sectioning diagram.
12. Diagrams showing the layout of line wires of the Control Circuit.
13. Line patrol chart
14. A calendar of returns
15. Cranes and Wagon weigh bridges.
16. Turn tables and Triangles.
17. List of spare coaches based in the division as well as slip coaches running on and across the division.
18. List of coaching Rakes allotted to the division and those passing over the division.

### **1818 Registers generally maintained in Control :**

#### **1. By the Section controller :**

- (a) Section controller's diary and charge book.
- (b) Inward message book.
- (c) Sick wagon register.
- (d) ABC/Yard report register.
- (e) In-coming and out-going trains RD (Running Diary) (other than passenger).
- (f) Train Advice (T. A Book).

## CONTROL ORGANISATION

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- (g) Caution Order Register.
- (h) Caution Order Message Book.
- (i) Morning (6.0 clock) Position Register
- (j) Engine Book.
- (k) Interchange Register.
- (l) Load Register.
- (m) Incoming and Outgoing passenger Train Running Diary.
- (n) Points and S & T Failure Register.
- (o) Important Yard Balance Register.
- (p) Control Failure Register.

### 2. **By the Chief Controller (Movement),(Coaching)/Dy. Chief Controller :**

- (a) Yard Running Balance Register.
- (b) Dy. Chief Controller's Diary & Charge Book.
- (c) Train Advise Book.
- (d) Forecast and Acceptance Book.
- (e) Train Ordering Book.
- (f) Punctuality Register.
- (g) Accident Register.
- (h) HQ's Conference Register.
- (i) Goods Train Performance Register.
- (j) GM's Unusual Occurrence Register.
- (k) CTNL(Movement)/(Coaching)/Dy TNL's Order Book.
- (l) ODC Register.
- (m) Rajdhani Express (and similar trains) Caution Order Register.
- (n) Emergency and General Control Office Message Register (Inward).
- (o) Engine Book.
- (p) Emergency and General Control Office Message Register (Outward.)
- (q) Interchange Register.

### 3. **By the Power Controller :**

- (a) Power Position Book.
- (b) Out Station Loco Pilot Register.
- (c) Power Controller's Diary.
- (d) Engine Link.
- (e) Crew Link.
- (f) Crew Position Register.
- (g) Register of Movement and Diversion of departmental / Diesel / lube oil Fuel Tank Wagons.
- (h) Register showing Undue and Abnormal Detention.
- (i) Shed Conference Register.
- (j) Fuel Balance Register.
- (k) Schedule Dates of Locos

### 1819 **Additional Guidelines :**

Additional information and guidelines regarding control are given in various other chapters of the Manual, particularly the chapters on goods train and passenger train operation.

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CHAPTER - 19

**REGISTRATION OF INDENT, ALLOTMENT  
AND SUPPLY OF GOODS STOCK**

**1901 Registration of Demands for Wagons:**

1. All demands for despatch of goods in wagon loads should be in the wagon demands/ priority register maintained at the stations or goods shed open for booking of goods in wagon loads. The signature of the sender or his representative should be taken in the appropriate column provided in the register after duly filling in all the other columns. The prescribed registration fee will be paid by the sender or his representative at the time of registration of demands for wagons.
2. A limit may be placed by railways on the quantity of goods permitted to be registered at a time by one indenter.
3. Railways may require that indents for wagons are registered in multiples of two wagons or three wagons, wherever considered necessary, to ensure better utilisation of wagons in transshipment.
4. When limits are placed on the registration of goods in the manner indicated above, full details thereof will be exhibited at the Stations.
5. When booking is restricted to a particular Station or a particular route, full details regarding the restrictions including civilban basis will be exhibited at the Stations.
6. The prescribed registration fees are levied as prescribed in goods tariff no. 41 part I vol. I.

**1902 Preferential and Non-preferential Traffic :**

1. Movement of wagon load traffic is regulated by what is known as the Schedule of Preferential Traffic, laid down by the Central Government (Railway Board) under Section 71 of the Railways Act of 1989, and is designed to ensure that certain essential commodities and urgent movements are accorded necessary preference at a time when the available transport is not adequate to meet with all the demands. Traffic is classified into 5 categories viz., A, B, C and D . Commodities registered in the lower categories cannot have preference over those registered in the higher categories, although the former may have been registered much earlier.
2. Special preference to any particular consignment can be accorded only under orders from the Railway Board.
3. For the present, traffic in categories A to C is treated as "Preferential" and that in category E as "Non-Preferential". The details of such traffic is embodied in the booklet issued on the subject separately.

**1903 Sponsored and Non-sponsored Movements :**

1. The movements of traffic on a higher priority basis is planned carefully and with discretion in order to utilise the transport facilities to the best advantage of the country. To ensure this object, list of Officers of various Ministries and State Governments for sponsoring important movements are obtained by Railway Board for final approval.
2. Traffic out side the scope of sub-para (1) above is termed as "Non-Sponsored".

**1904 Allotment :**

Indents must be repeated to Traffic Control daily at the prescribed time.

1. In transmitting fresh indents to Control each item with class of priority, serial order of registration, destination and complete route alongwith other details may be advised, if required by control.

## REGISTRATION OF INDENT, ALLOTMENT AND SUPPLY OF GOODS STOCK

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2. Alongwith the fresh indents, details of cancellation, forfeitures, withdrawals, loading etc. should also be advised.  
All allotment orders shall be issued from the Traffic Control, no wagon is to be loaded by the Station Master or Goods Clerk without allotment order.
3. The allotment branch shall record all the valid items duly summarised in a register specially maintained for the purpose, indicating the following information :-
  - (a) All valid indents are shown under two heads, viz., "Preferential Traffic" and "Non-Preferential Traffic".
  - (b) Station from which the indents have been received.
  - (c) Commodities.
  - (d) Destination station and via.
  - (e) The serial order in the Priority Register and the date of registration at the stations.
  - (f) Quotas fixed for different commodities for the entire divisions should be shown on the top of the Allotment Register in red ink. If specific quotas are allotted to individual concerns, indents from each such concern are to be shown separately, specifying the quotas permitted to them individually.
  - (g) Indents for loading via junctions for which quota limitations are fixed should be shown separately for each such point and the quotas permitted shown on the top of the Allotment Register.
4. The allotment register referred to in sub-para(3) above shall be put to the departmental officer concerned, and he shall, personally, make the allotments.
5. The officer shall make the allotments after taking into consideration the following points:-
  - (a) Stock orders in force.
  - (b) Numbers of wagons to be allotted after taking into consideration the number of empties that are likely to be available after meeting the daily quota for coal-fields or any special interchange order.
  - (c) The loading capacity of a particular station.
  - (d) The capacity of the work Train operating on the section.
  - (e) The importance of the particular Station from the point of view of traffic offering.
  - (f) Requirement of seasonal traffic.

### **1905 Transmission of Allotment Orders :**

After allotments have been made, the same should be transmitted to the various Stations by control phone. A confirmation of the allotment message in writing should be sent to each station concerned subsequently.

### **1906 Advise to the Merchants :**

1. After the allotment has been received at the Station, the Station Master or the independent Goods Clerk concerned shall prepare a statement showing the following :-
  - (a) Number of wagons allotted to each merchant.
  - (b) Commodity.
  - (c) Station to.
2. At Stations, where there are no Merchants Associations, a copy of the statement giving the above information should be put up on the Station and Goods Shed Notice Board each day, and a few spare copies kept, to be made available to any party which may be interested in the matter.

### **1907 Supply of Goods Stock against Allotment :**

After taking permission from the Head Quarter, the allotment orders will be passed to the CTNL/Dy. CTNL for arranging supply of the wagons. The CTNL/Dy. CTNL will issue necessary orders to the Yard Supervisor/Yard Master to ensure the supply. The Yard Master will form the rake as per instructions received from CTNL/Dy. CTNL.

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TRACK CAPACITY AND THROUGHPUT

**2001 Meaning of Line Capacity of a Section :**

The maximum number of trains that can be run during the period of 24 hours on a section is called line or sectional or track capacity of the section. For a single line section, this is calculated as the number of trains that can be run each way during 24 hours. On Double line section, this capacity is worked out separately for both the directions.

The determination of line capacity can help in judging the efficiency of the Railway, thereby facilitating analysis of the existing utilisation of line capacity and the measures to be taken for improvement in line capacity in a planned basis.

**2002 Basic Factors Governing Line Capacity :**

Ideally for running the maximum number of trains on a section with the existing type of rolling stock, following conditions should be fulfilled :

1. There are a number of block sections on a section. Capacity of a block section on which trains take maximum time is critical for the purpose of the capacity of the section. Such a Block section is called “**Critical Block Section**” .
2. All trains do not have similar characteristics in terms of speed acceleration, deceleration etc. Time taken by trains in the Critical Block Section is a limiting factor.  
In addition to this time, there is a little more time required for the purpose of closing the section by normalising the signals and points behind the train, closing the block section by giving “**Train Out Of Section**” report to the station in the rear, granting / receiving line clear for the subsequent train, setting of route and taking ‘off’ signals, etc., before the subsequent train can start. With token working, this time is taken as 5 minutes. This additional time is called “**Block Operation Time**”.
3. Apart from the running time, Block Operating time and critical Block Section, the efficiency factor is very important. From the practical point of view, it is not correct to assume that every time the critical block section is cleared by a train. Another train would be ready at the station to be allowed in the same block section. Even if a train may be available, it may not be ready for despatch due to some work at the station or precedence required to be given to some other trains. Thus cent percent occupation of the critical section can not be ensured and equal spacing between trains can not be ensured. It is generally accepted that the efficiency factor is about seventy to eighty percent. However, the efficiency factor can be increased by technology upgradation as well as by better operational management and reliability of equipments.

**2003 Methods of Calculation of Line Capacity :**

For the sake of convenience, line capacity can be calculated by making use of empirical formula. These give a quantitative relation between line capacity and important factors affecting it e.g. running time, critical section, method of block working, signalling etc. Thus, effect of improvement in various factors by different methods can be judged by the formula. Some of the formulas are briefly given below:-

**1. Scott’s formula :**

Theoretical capacity of single line in each direction.

$$C = \frac{24 \times 60}{(L) + 5} \times \frac{70}{100} \times \frac{1}{2}$$

## TRACK CAPACITY AND THROUGHPUT

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24 x 60 are the number of minutes in a day.

L - is the longest time of run on any one of the block section.

5 minutes are added to the running time for block working etc.

$\frac{70}{100}$  - is the efficiency factor.

100

For calculating theoretical capacity of double line the formula is

$$C = \frac{24 \times 60}{(L) + 5} \times \frac{80}{100}$$

### 2. Steinbeck's formula :

$$C = \frac{24 \times 60}{S} \times y = \frac{1440}{S} \times y = \text{Trains}$$

1440 are the minutes of the day

S - is the time space of the trains in one direction or interval between departures of two trains from a station in the same direction.

Y - is the efficiency factor.

The equivalent of S (Time space of trains) is defined as :-

$$S = t_a + t_b + O_a + W + O_b$$

$t_a$  - is the running time from station 'B' to station 'A'.

$t_b$  - is the running time from station 'A' to station 'B'.

$O_a$  - is the operating time to receive a second train at a station from the opposite direction after arrival of the first train.

W - is the time of the second train has to wait for some reason after its arrival at the crossing station before it can start again.

$O_b$  - is the operating time to start a second stopping train from the station after the arrival of the first train from the opposite direction.

### 3. Central Railway Track Capacity Formula :

$$C = \frac{b}{(TG + B)} \times \frac{85}{100}$$

b - no. of minutes in a day - (a).

a -  $NM(TM + B) + NP(TP + B)$

NM - No. of Mail train.

TM - Longest time for a mail train on any one block section.

NP - No. of Passenger trains.

TP - Longest time for a Passenger train on any one block section.

TG - is the longest time for a goods train on any one block section.

NG - No. of Goods trains.

B - 5 minutes allowed for block working etc. to be added to each TM, TP and TG.

Note. It is, however interesting to note that the results of application of any of the three formulas are more or less the same and any formula, therefore, can be used for rough calculation of line capacity.

### 2004 Implication of Variable Factors in the Line Capacity :

It can be safely impressed from the formula that the maximum capacity can be made to vary by changing the values of the variable factors.

1. The running time depends firstly on the length of the block section and secondly on the booked speed. It also depends upon the rate of acceleration and deceleration and the time lost by Loco Pilot in slowing down while approaching the station according to signal indications or requirements of interlocking and layout of the station. The booked speed, acceleration and deceleration, in turn, depend on the motive power, locomotive, rolling stock, etc. in use. The booked speed also depends on the standards of the track, bridges, grades, curves and standard of signalling and interlocking.
2. The time for Block working which is taken as 5 minutes in formula (1) depends on the method of working trains, standard of interlocking and layout of station yards.
3. The efficiency factor which is included in each of the formula largely depends on the efficiency of the staff involved in reception and despatch of trains at stations, taking off signals, setting of route, granting line clear and also on the standard of efficiency of the railway staff connected with planning, controlling and running of trains. It also depends on the extend of irregular running of trains and other operating disturbances and failures that may be peculiar to a section.

### **2005 Practical Methods of Calculation of Line Capacity :**

#### **1. Charting Method :**

The most reliable and practical way of assessing line capacity, which is adopted by most railway systems, is the charting method – indicating train paths on the Time Distance Graph for 24 hours.

The scheduled passenger and express goods paths are first plotted and then as many additional goods paths are inserted as possible so that it becomes impossible to accommodate even one more train. This gives us maximum line capacity. This method takes into account all the particulars and limitation of the section.

Degree of Track utilisation (of Efficiency Factor) is the ratio between the Practical Capacity and the theoretically calculated Maximum capacity and is on most railway systems taken as 80%.

#### **2. Guidelines for calculation of line capacity on Indian Railways :**

- (a) Charting method should be the basis for assessing line capacity for planning purposes.
- (b) Line capacity charts should not take into account terminal difficulties.
- (c) Capacity assessed by charting method should not be less than as calculated by Scott's formula.
- (d) A section will be considered saturated if the number of trains run daily is 90% or more of the charted capacity. Planning for additional line capacity on such sections should be done.

### **2006 Maximum Line Capacity :**

means maximum number of trains that can be entered in the master chart so that it is impossible to introduce even a single extra train.

### **2007 Practical Line Capacity :**

means the number of trains per day which is obtained from the above mentioned maximum line capacity after allowing for time required for maintenance of Permanent Way, time margin for scheduling and other operational necessities etc. Train scheduling is generally based upon this expression of line capacity.

**2008 Economic Line Capacity :**

means the number of trains, which can be run at minimum cost per train. When the line capacity is under utilised, increase in train services, at first follows the law of increasing returns due to more intensive utilisation of fixed assets. However, as the number of trains on a section grows larger and larger and the section gets saturated, it becomes more and more difficult to increase train services without adversely affecting the utilisation of rolling stock, train crew and maintenance cost of track, as it leads to increase of transportation cost per train Km.

**2009 Measures for Augmenting Line Capacity :**

As the traffic increases more train may be required to be run, necessitating augmentation in line capacity. Since the capacity works are costly, careful planning is necessary to ensure that the capacity to be created as required, by detailed examination, current utilisation, further projections of traffic and various alternatives available. For augmenting line capacity, such measures have to be taken which would reduce running time (T). Block Operation time (t) and by improving Efficiency factor (E), particularly on single line section. Some measures for improving line capacity are listed below.

(i) **Organisational and Operational Measures :**

(a) *Time Tabling and Controlling :*

In the preparation of Master Charts, the personal factor plays a part and its accuracy depends on the ability and sense of objectiveness of the controller preparing it. Time Tabling of Mail, Express and Passenger trains should be intelligently done.

The running time of those sections, which have not been revised for a number of years, should be reviewed and revised with a view to utilise slack periods. The Controller has to have a thorough knowledge of the rules, and the working of the section that he is controlling.

The Controller's intelligence, initiative, efficiency and even personality come into play when, a train is running late or out of path. They should contribute by arranging judicious crossings and precedence. They should infuse zeal in the train crew and station staff and urge them to save time and to improve running.

(b) *Motivation and training of staff and efficiency of them in general.*

(c) *Improvement in asset reliability and efficiency.*

(ii) **Simplification of rules**, e.g. certification of complete arrival, reminder-caution order etc. can also be reduced.

(iii) **Critical block section:**

(a) *Splitting up of the critical block section :*

On a double line section, this is generally done by opening a 'C' class station or by providing Intermediate Block Signalling.

On the single line, construction of a crossing station has to be considered with certain amount of precaution. The choice of a site for a crossing station theoretically would be to split up the block section equally. But on the graded section, the other considerations are that the additional station should be situated on such a level section, as the approach grades would not handicap re-starting of train if stopped at signal or at station. The provision of crossing station on a level just adjacent to the rising grade, specially, the rolling grades causes stalling of trains on the raising grade and, thus results in reduction of train load than what was normally anticipated in the matter of increasing line capacity.



## TRACK CAPACITY AND THROUGHPUT

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New station opened adjacent to the yard / junction should have at least three running lines because of certain amount of regulation of trains outside the yard/junction.

(b) *Improvement in Station Layouts :*

- (i) Provision of simultaneous reception facility
- (ii) Isolation of lines.
- (iii) High speed turnouts.
- (iv) Trailable switches, particularly for catch sidings and slip sidings..
- (v) Independent shunting facility – at important stations so as to avoid interference with reception / despatch of trains.
- (vi) Additional loop lines on stations enroute.

(c) *Improvement in terminal facilities :*

Though, theoretically terminal capacity does not figure in the track capacity formula, in practice, the number of trains, which could be run on a section would definitely increase with the increase and improvement in terminal yard lines and other facilities.

(d) *Easing of Ruling gradient :*

The ruling gradient on a busy single line section tends to increase the running time between stations. The effect on speed and load is greater where the gradient gets steeper. Easing the gradient or running shorter trains or banking the trains are the alternative methods but it is considered that banking offers a quicker and perhaps more economical solution. The running time can be reduced on the ruling block section by banking which would require suitable arrangement for attaching and detaching banking engine in order to minimise detention to goods trains.

(Where there is apex in between two stations, most convenient method of banking could be to send the banker pushing the train un-attached in the rear and to return to the starting station after the train has been pushed over the apex., thus clearing the block section by the time the goods train has reached next station with no loss of capacity on account of extra occupation of the block section by the banker).

(e) Improvement in Track Structure and easing of speed restrictions.

(f) Induction of better locomotives, rolling stock and better modes of traction.

(g) Improved signalling and interlocking technologies.

- (i) Provision of Multiple Aspect Upper Quadrant and Multiple Aspect Colour Light Signalling and Power Signalling instead of Mechanical Signalling.
- (ii) Providing standard III Interlocking.
- (iii) Improved Block Instruments, viz Tokenless Block instruments(including non-co-operative) and Block Proving by Axle Counter etc.
- (iv) Improved location and sighting of signals.
- (v) Provision of Track Circuiting, Panel Interlocking, Route Relay Interlocking, Solid State Interlocking, Centralised Traffic Control, Train Management System.
- (vi) Introduction of Automatic Block System of working on the Bottleneck sections.
- (vii) Changing over from Absolute Block system to Automatic Block System

(h) Doubling of track i.e. either patch doubling or complete doubling of the section.

- (i) Gauge conversion.



### 2010 Throughput :

Through put means the volume of traffic that can be moved across the section in 24 hours. The components of throughput are (1) the number of trains (2) the load per train.

Throughput can be increased either by increasing the number of trains passed over a section by augmenting line capacity as explained above or by running trains with heavier trailing loads. Under Indian conditions, more emphasis is placed on running heavier trains. This results in much more traffic being carried by running the same or less number of trains thereby saving in staff and line capacity works. Ultimately, the objective is to carry more traffic and not merely running more trains, i.e. to increase throughput expressed as gross or net tonne Kms. per route Km. per annum.

### 2011 Additional Measures for Improving the Throughput :

In order to improve the throughput, apart from measures taken for augmentation of line capacity, trailing load has to be increased to improve throughput by :

1. inducting High capacity Diesel and Electric Locos and Multiple operation of locos.
2. improved Rolling stock with CBC couplings and draw bar capacity of 80 tonnes or more.
3. improved roller bearing on Rolling stock.
4. increasing carrying capacity of rolling stock without much increase in length or tare weight.
5. improved braking system, (Air Brake and discs brake system) to maintain desirable braking distance.
6. increasing permissible Axle load and permissible moving dimensions by civil engineering works.
7. increasing loop capacity and strengthening the loop lines.
8. improved system of communication between Engine crew, Train staff, Station and Control..
9. adequate terminal capacity and facility to deal with heavy haul operation.
10. rescheduling and curtailing running of slow stopping passenger trains on heavy haul routes or on dedicated tracks.
11. Integrated mega blocks to prevent frequent departmental maintenance block.
12. Upgradation and modernisation of techniques and methods of attending to trouble shooting and breakdowns.
13. Upgradation in the skill of train running, train passing staff.

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CHAPTER - 21

OPERATING STATISTICS

**2101 Definition :**

Statistics are the aggregate of facts, affected to a large extent by a multiplicity of causes, numerically expressed enumerated or estimated according to reasonable standard of accuracy, collected in a systematic way for a predetermined purpose and placed in relation to each other.

**2102 Railway Statistics :**

The railway statistics are based on four factors viz. quantity, distance, duration and service. When these primary conceptions are expressed in statistical language they are called PRIMARY UNITS.

1. **Primary Units :** Following are the Primary Units :-

- (a) Quantity - Expressed in number of tonnes and passenger carried and earning derived.
- (b) Distance - Expressed in kilometres.
- (c) Duration - Expressed in hours and days
- (d) Service performed - Expressed in trains, vehicles wagons and engines.

2. **Fundamental Units :**

When these primary units are linked together to denote joint conception and are expressed in composite terms called '**Fundamental units**'. The fundamental units express two primary ideas in their relationship to one another viz. Tonne-kms, Passenger kilometres, Train-kilometres, Wagon-kilometres, Engine hours, Wagon days etc.

3. **Derivative Units :**

Finally the eventual conception on which statistics are based i.e., the relationship that exists between two sets of primary or fundamental units and the results thus arrived at are termed '**Derivative Units**'. The process by which this relationship is ascertained is as illustrated in the following examples.

- (a) Passenger earning (Primary): Passenger carried (Primary) = Earning per person.
- (b) Passenger earning (Primary): Passenger kilometres (fundamental) = Earning per passenger per kilometres.
- (c) Passenger kilometre (fundamental): Number of passenger (Primary) = Average distance travelled by each passenger.
- (d) Wagon kilometres (fundamental): Wagon days (fundamental) = Wagon kilometres per wagon day.

These 'Derivative Units' serve to bring out the character of particular aspects of transportation and railway working.

**2103 Classification of Railway Statistics :**

The principal heads under which the railway statistics are generally grouped are indicated below:

## OPERATING STATISTICS

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1. **Economic and financial statistics :**

Under this head are to be included the detailed statistics relating to the advance statement of gross earning and traffic handled in the shape of number of passenger booked and tonnage lifted and wagons loaded for current information and the statistics of revenue and expenditure as booked in monthly and yearly accounts.

2. **Operating statistics :**

Operating statistics may broadly be divided into two viz. (i) Traffic (ii) Power. The traffic statistics include the statistics or wagon loads, wagon mobility, wagon usage, train loads, train mobility, productive and unproductive services, punctuality, wagon detention, marshalling yard, terminal goods station and break of gauge point detention statistics etc.

The power of statistics include the engine usage fuel and energy consumption, Rolling stock repair and engine failure statistics etc.

3. **Commercial Statistics :**

Under this head are included the statistics kilometres, tonne kilometres, average load of traffic etc. Statistics regarding freight traffic and earnings by commodities, claims paid for compensation of goods and parcels lost or damaged are also included in this category.

4. **Rolling stock and workshop repair statistics :**

Under this head are grouped statistics dealing with the repair and maintenance of rolling stock, engine failures, hot boxes etc. as well as out turn and other information relating to workshop activity.

5. **Administrative statistics :**

These statistics relating the staff matters, their numbers, and most by categories and classes of staff etc. Number of stations by classes and by standard of interlocking, medical and engineering statistics etc.

**2104 Compilation of Railway Statistics :**

1. Compilation of statistics of Indian Railways falls broadly under two categories, namely (i) the statistics required to be compiled by the railways for submission to the Railway Board in order to keep the Board generally informed about the different activities of the Indian Railways and (ii) further detailed Railway statistics which individual railway may undertake for their own respective domestic requirements.
2. The statistical compilation work on the Western Railway is in the charge of a Statistical Officer assisted by a Assistant Statistical Officer.
3. The format and the methods of compilation of the monthly Statistical statements and the Annual Statistics required to be submitted to the Board are detailed in the Manual Statistical Instructions, Volumes I and II respectively.

**2105 Operating Statistics :**

1. Operating Statistics for the various Indian Railways are issued in the form of various pamphlets published periodically by the Railway Board. Detailed Statistics relating to each division and gauge of the Western Railway are contained in various parts of the Western Railways 'Domestic' pamphlets issued quarterly (Parts, I, II and II-B & C).
2. Only the more important statistics will be dealt with in this chapter.

**A - Passenger Train Performance.**

**2106 Punctuality :**

A punctuality is the main criteria of judging passenger train performance, some of the statistics compiled separately for 'Mail and Express trains', 'Other Passenger Trains', and 'Mixed' trains are:

$$\text{Punctuality} = \frac{\text{RT} + \text{NLT}}{\text{Total no. of Mail/Express trains}} \times 100$$

RT = Trains arriving Right Time

NLT = Trains not loosing time

**2107 Vehicle Kilometres per Vehicles Day :**

1. This figure indicates by the vehicle days which are the product of average number of coaching vehicles on line and the number of days in the period under reference.
2. This figure indicates the extent to which coaching vehicles are kept 'on the move'. The main factors affecting its value are:
  - (a) The average speed of trains
  - (b) The average length of train run (average load)
  - (c) The idle periods provided for in rake links.
3. Since the lengths of train runs are not susceptible of much change, it is only by increasing the speeds of train and tightening up rake links that an improved performance can be achieved.
4. This result is calculated by dividing the coaching vehicles kilometres by the vehicles days which is the product of average number of coaching vehicles on line and the number of days in the period under reference.

$$\text{Vehicle km. Per Vehicle day} = \frac{\text{Coaching Vehicle Km}}{\text{Vehicle day}}$$

**2108 Average Booked Speeds :**

This figure represents the average time tabled speeds of passenger trains. The higher this figure, the better the service to the passenger and the more intensive utilisation of coaching stock.

## OPERATING STATISTICS

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### 2109 Shunting Kilometres per 100 Train Kilometres (Passenger including proportion of Mixed) :

1. This figure indicates the amount of unproductive service that has to be performed per 100 train kilometres (Passenger including proportion of mixed). Since the amount of shunting to be done on a passenger train depends upon various local factors, the figure will vary from Division to Division and from Railway to Railway, traffic conditions remaining constant, is indicative of wasteful shunting.
2. The figure is arrived at by multiplying by 100 the quotient of shunting kilometres divided by train kilometres (passenger including proportion of mixed). It can be depicted by formula given below :-

$$\frac{\text{Shunting Kms} \times 100}{\text{Train kms.}}$$

### **B – Wagon Usage**

### 2110 Average Starting Wagon Load :

1. This figure is compiled separately for coal and coke, heavy merchandise and light-merchandise, thus affording an indication of the extent to which wagon space is utilised by stations from which traffic originates. It is extremely important that wagons be given as full a load as possible because this means economy, in wagon usage and hence engine power and less strain on line and yard capacity. Even a slight improvement in the starting wagon load can mean a tremendous saving to the Railway.
2. The result is calculated by dividing the number of tonnes loaded by the number of wagons loaded (in terms of four wheelers), CR and TR vans as also wagons used for live stock and departmental purposes, however, are excluded.

$$\text{Average Starting Wagon Load} = \frac{\text{Tonnes Loaded}}{\text{No. of Wagons Loaded}}$$

### 2111 Wagon Kilometres per Wagon Day :

1. This figure is a measure of wagon mobility and indicates the average number of kilometres moved by a wagon, on the average, per day, both loaded and empty journeys being included. Delays in marshalling yards, delays at stations when loading or unloading, delays in clearance from roadside stations, decrease in average speed of goods trains, increase in the number of wagons awaiting repairs, and shorter loads of trains are some of the factors normally responsible for poor mobility.
2. This result is obtained by dividing wagon kilometres by wagon days which is the product of daily average number of wagons on line and number of days in period.

$$\text{Wagon Km. Per Wagon day} = \frac{\text{Wagon Kms.}}{\text{Wagon Days}}$$

## OPERATING STATISTICS

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### 2112 Net Tonne Kilometres per Wagon Day :

1. This unit is a measure of the revenue earning work done by the wagons and reflects both mobility and loading. A decrease in this figure may be due inter alia to any of the causes which effect the figure of wagon kilometres per wagon day. The proportion of loaded to total wagon kilometrage, the average loaded wagon and the relative amount of heavy and light merchandise carried, are some of the other factors which may effect this figure.
2. The numerator in this case is the net tonne kilometres (excluding departmental) and the denominator wagon days.

$$\text{Net Tonne km. Per wagon day} = \frac{\text{Net Tonne kms.}}{\text{Wagon days}}$$

### 2113 Wagon Turn Round :

This figure expresses the ratio between the total number of serviceable wagons on a Railway and the number of wagons required daily for effective use on the railway for its outward, inward and transshipment traffic. Stated in a different way, wagon turn round represents the average period of time in which a particular wagon completes its average loaded trip and after which it again becomes available for loading.

$$\text{Wagon Turn Round} = \frac{\text{No. of effective wagon holding}}{\text{Loaded Wagons} + \text{Loaded received wagons}}$$

### 2114 Average Wagon Load during the Run :

1. This unit is a good index of wagon utilisation as it refers to the average load of all loaded wagons carried. It suffers from the draw back that it does not directly reflect the performance of the division, gauge or railway to which it applies, as only a proportion of the loaded wagons carried is loaded locally and the balance consists of both received traffic and cross traffic.
2. For obtaining this figure net tonne kilometres are divided by loaded wagon kilometres, (the figure relating to departmental trains are excluded).

$$\text{Average Wagon Load during the run} = \frac{\text{Net Tonnes Kms.}}{\text{Loaded Wagon kms.}}$$

## **C – Goods Trains Performance**

### 2115 Average Speed of Goods Trains :

1. This result is calculated separately for 'through goods trains' and all goods trains and is arrived at by dividing the total train kilometres by total train engine hours of the concerned service. Detentions to goods trains at roadside stations enter into the calculations and have therefore the effect of bringing down average speeds.

$$\text{Average Speed of Goods Trains} = \frac{\text{Train kms.}}{\text{Train Engine hours.}}$$

## OPERATING STATISTICS

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2. Some of the factors on which the average speed of goods trains depends are:

- (a) The proportion of the density of trains to the sectional capacity. The nearer a section is worked to its sectional capacity, the proper the speeds obtained.
- (b) Hauling power of the engines used, standard of maintenance of engines and time taken by Loco Pilots for loco requirements.
- (c) Loads of trains.
- (d) Condition of rolling stock, particularly the brake power available.
- (e) Standards and maintenance of signalling and interlocking.
- (f) Facilities at watering stations, facilities at roadside stations to complete shunting in the minimum time and shorter block sections which will increase the sectional capacity.
- (g) Engineering restrictions – permanent and temporary gradients and curves.

### 2116 Average Net Train Loads (in tonnes) :

This figure refers to the average freight load carried in tonnes, i.e., to that portion of load which earns revenue for the railway.

$$\text{Average Net Train Loads} = \frac{\text{Net Tonne kms.}}{\text{Train kms.}}$$

### 2117 Average Gross Train Loads (in tonnes) :

This figure represents the average overall load of goods trains i.e. the freight load plus the weight of the rolling stock.

$$\text{Average Gross Train Loads} = \frac{\text{Gross Tonne kms.}}{\text{Train kms.}}$$

The principal factors affecting this figure are:

1. The attractive capacities of engines employed, on goods train services.
2. The gradients on various sections of the line.
3. The nature of goods carried.

### 2118 Shunting Engine Kilometres per 100 Train Kilometres :

1. This figure indicates the amount of non-revenue earning work done per 100 train kilometres (Goods and proportion of mixed). Its value is affected mainly by the load of goods trains, and the amount of terminal work involved.

$$\text{Shunting Engine kms. per 100 Train kms.} = \frac{\text{Shunting kms.} \times 100}{\text{Train kms.}}$$

2. However, for the same division or/railway, the pattern of traffic remaining the same, rise in this figure is indicative of wasteful shunting.



## OPERATING STATISTICS

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### 2119 **Net Tonne Kilometres per Engine Hour :**

The figure of net tonne kilometres per Engine hour is a very useful index of the efficiency of freight working on a division. Net tonne kilometres indicate the amount of revenue earning work done while engine hour measure the cost of if doing it.

$$\text{Net Tonne Kilometers per Engine Hours} = \frac{\text{Net Tonne kms.}}{\text{Engine hours}}$$

A decrease in net tonne Kilometres per engine hour may be due to factors such as:

1. Shunting engine hours not using cut down in proportion to the decrease in traffic offering.
2. Increase in departmental, assistance required, assisting not required and light engine running.
3. Decreasing in the average train and or the average speed of goods train.
4. Decrease in the average starting wagon load or in the wagon loads of wagons received from other divisions.
5. Increase in the proportion of unbalanced traffic.
6. The type of traffic carried heavy or light.

### 2120 **Average Detention per Wagon :**

1. All wagons

2. Through loaded wagons:

Detention suffered by stock in a yard depends, interalia, on the layout of the yard and on the number of trains per day that can be despatched in various directions. Target figures have been laid down for each yard for detentions to all wagons and through loaded wagons. Such targets take into consideration the condition of work and facilities available in the yard concerned. Detentions in excess of this figure indicate inefficient yard work. Lesser detentions mean lesser cost of handling wagons in yards.

$$\text{Average Detention per Wagon} = \frac{\text{Total Detention Hours}}{\text{No. of Wagons despatched}}$$

### 2121 **Number of Wagons Dealt with per Shunting Engine Hour :**

The number of wagons that a given yard can deal with per shunting hour depends, interalia, on its lay-out. Accordingly a target figure has been prescribed for each yard to enable the efficiency of yard work to be gauged. As shunting involves cost, the higher this result, greater the efficiency of the yard.

$$\text{No. of wagons dealt with per shunting engine hour} = \frac{\text{No. of Wagons dealt with}}{\text{Shunting Engine hours}}$$

## **D – Locomotive Performance**

### 2122 **Engine Kilometres per Day per Engine in Use :**

This figure is compiled separately for passenger, mixed and goods train services as well as for all services refers to 'engines in use'. This is affected by such factors as:

## OPERATING STATISTICS

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1. The average run of trains.
2. The average speed of trains.
3. The engine links
4. The location of engine shed with respect to the stations which they serve.

$$\text{Engine kms. per day per engine in use} = \frac{\text{Engine kms.}}{\text{Engine days in use}}$$

### **2123 Engine Kilometres per Day per Engine on Line :**

This figure is also compiled by services and for all services put together. The proportion that this figure bears to the corresponding figure of 'engine kilometres per engine day per engine in use' indicates the proportion of available engines 'on line' that were put to effective use during the period in question.

$$\text{Engine kms. per day per engine on line} = \frac{\text{Engine kms.}}{\text{Engine days on line}}$$

### **2124 Quantity of Fuel Consumed per Engine Kilometre by Service :**

This figure indicates the fuel consumption in relation to engine kilometerage. Since, however, it does not take into consideration the loads hauled, its utility is limited.

$$\text{Quantity of fuel consumed per engine km by service} = \frac{\text{Quantity of Fuel Consumed}}{\text{Engine kms.}}$$

### **2125 Quantity of Fuel Consumed per 1000 Gross Tonne Kilometres by Services :**

This figure indicates the fuel consumption in relation to the work done and is, therefore, a better index of fuel consumption than the quantity of fuel consumed per engine kilometer figure. The main factor that influences this result is the gross load of the train. It can be depicted by formula given below :

$$\frac{\text{Quantity of Fuel Consumed} \times 1000}{\text{Gross Tonne kms.}}$$

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CHAPTER - 22

INSPECTIONS

**2201 Objects of Inspections :**

The Railway network is spread over a vast area. It is estimated that for running a train over a section, co-operation and co-ordination of thousands of Railway staff is essential. A vast organisation, such as the Indian Railway system functions on the basis of a carefully arranged system of selective Autonomy, Accountability and Responsibility. Rules and instructions lay down the procedure of work and the staff are properly trained and the officials at various levels monitor, supervise and direct the staff from time to time by different means. Inspection is an important function of management, particularly in the field of Railway Operations.

Following objects shall be borne in mind while conducting inspection :

1. Verify whether every Railway servant is fully conversant with the rules, instructions and procedures relating to his duties.
2. Ascertain that the staff are performing their duties according to rules, instructions and the procedure in force.
3. Detect the undesirable shortcuts or irregularities or unsafe practices being resorted to by the staff and taking remedial action which may be:
  - (a) Educative, in case these are resorted to out of ignorance.
  - (b) Corrective, if there is something wrong in the working conditions, or there are system deficiencies.
  - (c) Punitive, if resorted to wilfully or negligently or even after repeated guidance and counselling.
4. Observe the conditions actually prevailing at the work spots and understanding the difficulties experienced by staff including their personal grievances and seeking on the spot suggestions from the staff.
5. Ensure that full and proper complement of staff and equipment is available and they have knowledge of its operations.
6. Ascertain that registers, documents and other records are being filled in, maintained and preserved according to rules and instructions.
7. Look out for potential Railway Traffic
8. Assess as far as possible that the interest of the public and the Railways are kept in view and safeguarded.
9. Inculcate discipline and building up the moral of the workers.
10. Check the compliance of previous inspection reports is proper.
11. Analyse the efficiency targets vis-à-vis actual work.

Inspections, thus provide the means to achieve efficiency and effectiveness through spot checks and personal contact with the staff on line. In order to accomplish these objectives, inspections have to be carried out both at officer's and at Supervisor's level. The inspecting official has to command the respect and obedience of staff, if he wishes his inspection to be effective and beneficial and as such his conduct should be exemplary.

Check lists of inspections by Transportation Officers / Inspectors are given in Appendix –'A' to Appendix-'Q' at the end of this chapter.

**2202 Kinds of Inspections :**

The following inspections have to be carried out by operating and safety officials not only at various levels but these have also to be of various kinds viz.

- 1 Regular Inspection (six monthly)-**  
Each station on division must be inspected in details atleast once in every six months i.e. January to June and July to December covering the various aspects of safety, operations and allied matters including staff matters. The inspection shall be carried out by the Sr.DOM/DOM/Sr.DSO/DSO/ AOM /ARM/SS/SM/DTI/TI etc. while minor stations are inspected by the TI concerned. The DRM will nominate important stations (including all such stations which do not fall within a jurisdiction of TI, that is those which have SS/SM in grade equivalent to or higher than those of TI of the section) to be inspected by the nominated officers. Each officers will be allotted at least two such a stations. The officials concern shall also spend the night at the station. Regular inspection have to be comprehensive in nature. The check list for regular inspections is given in Appendix 'A'. It will also be worthwhile to advise the Station Master concerned about the expected date of regular inspection.
- 2. Safety Inspections (monthly) –**  
Safety inspections are basically meant to detect and unearth undesirable short cut methods and unsafe practices resorted to by train passing, running and maintenance staff. The irregularities noticed must be personally brought to the notice of the Station Master and remedial measures initiated promptly. In case of any serious irregularity, the inspecting officials must at once inform Sr.DSO / DSO or Sr.DOM / DOM concerned personally or telephonically besides written report.. The check list for safety inspections at station is given in Appendix 'B'.
- 3 Surprise Inspections (Monthly or at any time)-**  
Such inspections must have an element of surprise in them. Officers and Inspectors may inspect a station either while passing through it or during the short time at the disposal or when they want to check some aspect at the station without prior notice. Apart from any special aspect, they intend to check, they must also observe and take note of the irregularities/ deficiencies or good work being done which may come to their notice. They may check as many of items as possible as time permits. Minimum 6 such inspections in a month shall be conducted by the sectional TI. In the automatic signaling territory, besides surprise inspections, ambush checks should also be conducted to check whether the Loco Pilots/ Motormen are observing the rules regarding passing of automatic signal at 'ON' position etc.
- 4 Night Inspections (fortnightly) –**  
Night inspections must be carried out by the Officers and Supervisors frequently to appreciate the working conditions as well as to detect the irregularities. Surprise night inspections may be carried out between 00 hrs. to 04 hrs. because during this period, the staff is likely to be lethargic and negligent in duties. Similarly, instances of staff sleeping on duty, dim signal lamps and indicators, unauthorised absence from duty and many other irregularities, unsafe and undesirable practices may come to notice between 00 hrs. to 04 hrs. Frequent night inspections are must and SS/SM must conduct surprise night inspections fortnightly of their station between 00 to 4 hrs. and take remedial measures to rectify the irregularities and deficiencies noticed. The check list for night inspections at station is given in Appendix 'C'.
- 5 Level Crossing Inspections –**  
Level crossing gates should be inspected in detail with a view to ensure safety of rail and road traffic, availability of safety equipments, knowledge of Gatemen regarding rules pertaining to their duties. The check list for level crossing (Manned & Un-manned) inspections is given in Appendix 'L-1 & L-2'.

- 6 Surprise Inspections by Road –**  
These inspections should have an element of surprise in them. To create a sense of alertness amongst the staff the road inspection should be carried out without informing anybody.
- 7 Individual Footplate Inspections –**  
Footplate Inspections are carried out by travelling on the engine of running trains. These afford an opportunity to the inspecting official to observe and check certain aspects of working on the engine, along the track and at the stations which can not be checked otherwise. An element of surprise should be introduced into these inspections also. To achieve the purpose for which footplate inspections are carried out, it is essential that these are done by day and by night, in clear weather and when the visibility is poor due to thick, foggy or tempestuous weather. . The check list for footplate inspections is given in Appendix 'F'.
- 8 Joint Footplate Inspections –**  
These are carried out jointly with officials of Mechanical, Electrical (Running), Permanent Way and Signalling branches e.g checking the visibility of the signals, their locations, operations, lighting up etc.
- 9. Surprise Speed checks –**  
In order to ensure the maximum permissible speed are not exceeded, permanent and temporary speed restrictions are correctly observed and limits of speed over turnouts and facing points are observed, surprise speed checks should be conducted as per schedule.
- 10. Running Rooms & Crew Lobbies Inspections –**  
During regular, safety, surprise and night inspections opportunity should also be taken to inspect running rooms to ensure that running staff are able to get proper food and resting facilities. Running rooms should also be jointly inspected by the team of officers as nominated and prescribed. Similar joint inspection should also be conducted along with the representatives of recognised trade unions as prescribed. Similarly Crew Lobbies inspections should be carried out to ensure that extant rules and instructions / policies are being scrupulously followed in respect of running staff, booking, ON duty OFF duty and other aspects. The check list for running room inspections is given in Appendix 'H' & check list for inspections of Crew Lobby is given in Appendix –G.
- 11. Ambush checks –**  
It is essential to ensure rigid observation of rules when automatic stop signals are passed in 'ON' position. The inspecting officials should carry out ambush checks with the help of signalling officials who will arrange to put an automatic stop signal to 'ON' position. Such checks should be arranged in consultation with Sr.DOM/DOM.
- 12. Running Trains Inspections –**  
Whenever an operating officer or an inspector is travelling by a train on duty, he must pay special attention in observing the performance of duties by Guards, Loco Pilots, Station staff, Gatemen and others in the course of working. The following inspections have to be carried out by operating and safety officials not only at various levels but these have also to be of various kinds viz., The check list for monitoring of Guard and inspection of brakevan inspections is given in Appendix 'J'.

## INSPECTIONS

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13. **Loco shed inspections** – One loco shed shall be inspected once in 3 months individually as well as jointly.
14. **Depots inspections** - One depot shall be inspected once in 3 months individually as well as jointly.
15. **Accident Relief / Medical Equipment Scale I (ARME)** – Each Medical Van shall be inspected once in 6 months ( see Accident Manual para 611). The check list for Accident Relief / Medical Equipment inspections is given in Appendix 'M'.
16. **Accident Relief Train (ART)** - Each Medical Van shall be inspected once in 6 months ( see Accident Manual para 611). The check list for Accident Relief Train inspections is given in Appendix 'N'.

### **2203 Inspection Quotas :**

The minimum number of regular, surprise, safety and night inspections will be carried out by officers and inspectors as per quota fixed from time to time. The existing schedule of inspection is given at the end of this chapter in Appendix-'R':.

### **2204 General Guidelines for Inspecting Official :**

1. The standard form for transportation inspection of station as given in Appendix-'A' to serve as guide to the inspecting official. However the inspections should not only be limited to the items stated in the form.
2. Before commencing the inspection all inspection books should be called for and the notes made by other inspecting official should be carefully pursued to check whether the staff have complied with their instructions. If any of these instructions have not been carried out written explanation of the Station Master should be obtained.
3. It shall not be enough merely to point out the irregularity of the staff; matters must be put right personally while at the station to the extent possible.
4. All books and registers inspected must be initialled and dated.

### **2205 Technique of Inspections :**

It requires both expertise and experience to carry out intelligent inspections. To evolve a sound technique of inspections an inspecting official should:

1. Have a clear understanding of the station lay out its signalling, special features of working and the instructions in regard to reception, despatch, crossing, shunting and running through of trains. For this he should have a good knowledge of not only General & Subsidiary Rules but also of Station Working Rules.
2. Select the feature of working which he intends to check during his inspection and should have a clear conception about them in his mind. For instance he may like to emphasise on the correct reception and despatch of trains and observance of safety rules by the staff or on utilisation of stock, detention to passenger or goods train, knowledge of staff etc.

## INSPECTIONS

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3. Inspect the aspect of working through an inspection of books, registers, forms and equipments used for operations and secondly by means of personal observation of actual operations.
4. Be selective in choosing :
  - (a) The time and operations of personal observation.
  - (b) The documents, registers and forms for checks and cross checks.
  - (c) The equipments for checking, its availability, adequacy, maintenance and its use.
5. Select specific periods for checking registers books and forms keeping in view the purpose of inspection and time of inspections and time of disposal, should be subjected to concentrated, minute and probing checks and cross checks. It may be worth while to select two or more separate periods. One of these being that immediately preceding the day of inspection. This will help him in not only detecting the irregularities being committed but also whether these have been continuing for the past some time.
6. Discuss the irregularities or lapses noticed during inspection with the staff actually doing the work as well as those supervising their work. Such a discussion will prove to be educative and produce useful results.
7. Discuss, as far as possible, the points common to two or more branches, like the Signalling Interlocking branch or Loco Train Examining, Civil Engineering and Commercial Branches jointly for objectivity and acceptable solutions. This will help in not only arriving at correct conclusions and forming sound views but also in avoiding unnecessary correspondence.



**REGULAR INSPECTION OF STATIONS**

1. Name of the Station.....  
Staff on duty:
2. Whether the Block Instruments indicate the condition of Block section correctly and is corresponding with entries in TSR (Train Signal Register)?
3. Reception/Despatch of trains as per SWR.
4. Use of slide pins/button collars on occupied line.
5. Block Instrument key and Private numbers book to be in personal possession of on duty Station Master/ASM.
6. Check that signals are put to ON immediately after the arrival and departure of trains and whether slots given are put back to normal in its territory in prescribed sequence? Points should be set for vacant/less important line.
7. Check whether the ASM is physically coming out and personally watching that the line on which a train is to be admitted is clear ?
8. Line admission books (where in use) should be properly filled and duly acknowledged and noted by concerned staff (give the train number checked.).
9. Entries in Train Signal Register are properly and neatly made (case of frequent corrections and overwriting should be indicated).
10. Does the Train Signal Register book correctly indicate the appearance of staff on duty?
11. Whether signing ON and OFF duty is being correctly made as per format in Train Signal Register?
12. Check exchange of private numbers between stations for granting line clear.
13. Caution order messages should be brought forward regularly on every Monday.
14. Caution order should be issued in geographical order with correct kilometreage and sections indicated.
15. Acknowledgements of Loco Pilots and Guards should be obtained when caution orders are handed over to them.
16. Whether authority to pass signals at ON (T.369(3b) are being issued correctly and signatures of the Loco Pilot obtained on the counter foil and private number recorded in the space provided ?
17. Whether shunting authority (T/806) is being issued correctly with precise and brief details of shunting and the signatures of both Guard and Loco Pilot obtained on the counter foil ?
18. Starting permit should be issued to all Loco Pilots of train starting from non-signalled lines?
19. Whether Station Working Rules are correct and represent the layout of the station yard correctly.
  - i. Are Station Working Rules current/complete and duly corrected ?  
Indicate the number of correction slips and when due for revision/reissue.
  - ii. Whether staff is conversant with the salient features of SWR's especially the procedure for the reception and despatch of trains (give the names of staff tested) and staff acknowledgement is taken ?
  - iii. Whether any changes in SWR's is considered necessary ?
  - iv. Whether staff observe provisions of SWR's ?
20. Check station staff for -

## INSPECTIONS

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- i. Passage of through trains.
  - ii. Whether Pointsman is deputed on off side ?
  - iii. Whether cabin staff watch the passage of train, during its through passage or on starting after a halt ?
  - iv. Whether train crew/Guard/Loco Pilot/Assistant Guard exchange signals with station staff?
  - 21.i. Whether the Guard exchanges all right signal with Station Master/Cabin Staff after complete arrival of the train ?
  - ii. Whether Cabinman gives private number to Station Master to prove complete arrival of train (indicate train number for which check was made) ?
  22. Whether Block instrument, points, signals and other interlocking gear are functioning properly ?
  23. Whether S&T failure message book for receiving messages from cabins and issuing to ESMs is available ?
  24. Whether S&T failures are correctly recorded in register ?
  25. Check whether First-Aid Box is complete with full compliment of equipment as per list. First Aid Box No....., Date of inspection .....
  26. Whether arm and light repeaters function properly ?
  27. Emergency cross-over points should be tested in each shift and recorded in Station Master's diary/register ?
  28. Points not provided with lock bar should be clamped during shunting ?
  29. Whether guard personally supervise shunting and exhibit correct signals to Loco Pilot after verifying correct setting and locking of points (Name the train No. whose shunting was watched).
  30. Whether full compliment of safety equipments required at the station is available. (Name the equipment which is deficient or unserviceable).
- |                           | <u>Total Nos.</u> | <u>Condition</u>     |
|---------------------------|-------------------|----------------------|
| i. H.S.Lamps              |                   |                      |
| ii. H.S. flags.           |                   |                      |
| iii. Clamps with padlocks |                   |                      |
| iv. Slide pins            |                   |                      |
| v. Detonators             |                   | Manufacturing date   |
| vi. Fire extinguishers    |                   | Last refilling date. |
| vii. Safety chains        |                   |                      |
31. Accident register should be properly maintained and action taken against defaulting staff indicated in register. (State of similar accidents have taken in place at same point?)
  32.
    - a. Inspection registers of Officers/Inspectors.
 

|                  | <u>Last date of inspection</u> |
|------------------|--------------------------------|
| i. TI(Quarterly) |                                |
| ii. Casual       |                                |
| iii. Surprise    |                                |
| iv. Officer.     |                                |
    - b. Whether Station Master has taken action for irregularities recorded in registers ?
  - 33.a. Safety Meeting to be held monthly at the Station and acknowledgement of staff attending meeting obtained.
    - b. Whether items discussed in meeting are having desired results ?
    - c. Whether staff (if any) involved in an accident attended the Safety Meeting ?
  34. Availability of Rule books and Manuals along with Correction Slips (Name the staff who was checked in his knowledge of particular rule)?

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35. Whether badges/labels are properly kept in possession of person required to have them ?
36. Securing of vehicles/wagons stabled in yard.
37. Staff overdue for Medical, Refreshers, Safety Camp.
38. Check disconnection/reconnection register for proper records.
39. Whether messages of weather warning are issued without any delay ? Give details.
40. Availability of safety bulletins (Divisional & Headquarters) and whether acknowledgement of staff including guards has been obtained.  
Last Divisional Bulletin dated.....  
Last Headquarters Bulletin dated.....
41. Whether controllers are taking prompt and proper action in case of Hot Axle, spring breakage, flat tyre.
42. Whether Fog signals are used in thick and foggy weather ?
43. Upkeep of Axle counter, panel counter, IBH counter registers.
44. Whether at Guard booking station checking of Guard's personal stores for vacuum gauge, detonators, HS flag/lamp etc. is done quarterly ?
45. Check stable load register and whether signature of guards and Loco Pilots is obtained at the time of continuity test ?
46. Sick wagon register.
47. Whether signal and point indicators have been properly cleaned and functioning properly ?
48. Joint checks of points and crossings should be carried out regularly by JE (Signal) and JE (Engg.) and compliance of items listed.
49. Whether wagon exchange book is maintained ? Check heavy detention.
50. Traffic statistic Register should be maintained and updated.
51. During abnormal working check whether :-
  - i. Correct authorities issued and procedure followed.
  - ii. Block instrument locked in TOL, crossover points and derauling switches correctly set and clamped.
52. Whether during all communication failure:-
  - i. Loco Pilot/Guard are personally apprised before the authorities are issued.
  - ii. Time interval of 30" on double line is maintained between two trains.
  - iii. Correct authorities/caution orders are issued.
  - iv. Emergency protection done where required.
53. During block failure check whether :-
  - i. T.1425 A/ T 1425 B / Reply book filled up.
  - ii. Repeated cases and duration of failure.
54. When sending assisting engine in Block section check :-
  - i. Correct caution order is issued.
  - ii. Memo/Message issued by Loco Pilot.
55. Whether correct caution order issued by ASM when complaint of rail fracture in section received/lurch experienced by Loco Pilots while on run in section received.
56. Safety posters/safety slogans displayed in Station Master 's / Dy.SS Office.

**CHECKS TO BE CONDUCTED AT STATIONS**

Conduct test check to ensure whether :-

1. Staff is aware of SWR./Safety circular/Extant rules.
2. Observance of procedure during disconnection of gears.
3. Clamping of points during non-signalled move.
4. Changing of points before clearing back of section.
5. Section cleared, when reception signal blank.
6. Points clamped when load stabled.
7. Effective securing of stabled loads.
8. Caution order issued when train detained on double line.
9. Procedure followed when unsafe conditions detected.
10. Use of skid for securing TTM/Tower wagon.
11. Exchange of signals by all concerned.
12. Danger signal watched by crew.
13. Loco Pilot watching Guard's signal before starting.
14. Loco Pilot checking the correctness of authorities.
15. Loco Pilot watching signal aspects continuously till it is passed.
16. Loco Pilot insisting on P/man to show all right signal from the points when starter defective.
17. Guard supervising shunting and ensuring clamping.
18. Loco Pilot stopping at first cabin /ASM's office when coming with parted load or unsafe condition noticed in section (lurch).
19. In case of lurch Loco Pilot giving memo to ASM on duty.
20. Loco Pilot insisting on T.806 & shunting token, when passing Advance Starter for shunting.
21. Block forward taken by ASM during shunting when required.
22. Indirect reception of train in case of Hot Axle.
23. Procedure followed during change of instruction.
24. Reaction of Loco Pilot when flasher light is put ON.
25. Fire buckets, extinguishers can be promptly used.
26. Checking the authorities of TTM/Tower wagon staff.
27. Working of signal gears.
28. Signal aspect disconnected when speed restriction in yard.
29. Loco Pilot/Shunter driving from the cab.
30. Engine kept unmanned.
31. Loco Pilot performing shunting without Pointsman.
32. Loco Pilot performing shunting without T806 / Shunting token..
33. Guard watching the change of points in rear.
34. Guard using the vacuum/pressure gauge.
35. Guard physically checking the last vehicle number, before signing in Train Intact Register.
36. Guard checking continuity/pressure during halt.
37. Guard ensuring securing of wagons before engine is cut off.
38. Staff exchanging signals without observing signal aspect.
39. Testing of emergency crossover.
40. Cabinman/Switchman personally ensuring setting/clamping of point.
41. Cabinman giving private number on arrival of train before ensuring all conditions.
42. Shunting restrictions followed during shunting.

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43. Empty slack adjuster kept in proper position.
44. Station Master/cabin staff locking the panel / Block instrument while leaving the station/cabin.
45. ASM obtaining private number from Engineering gateman, where required.
46. ASM/Switchman locking the block instrument in TOL position during TSL.

**NIGHT INSPECTION OF A STATION**

1. Name/Designation/particulars/alertness of staff on duty.
2. Whether slide pin/button collar./route collar/lever collar are placed in case of blocked lines- Yes/No.
3. Correctness of counter numbers.
4. Entries in TSR should be cross-checked with record of adjacent station ASM/ cabin/gate.
5. Proper entries are made in private no. book - Yes/No.
6. Reception and despatch of trains is being done as mentioned in SWR.
7. In case of stabled load whether points are clamped and stabled load is properly secured.
8. Whether station staff is exchanging all right signal with the train crew.
9. In case of shunting whether guard is supervising shunting and whether points clamped during non-signalled move.
10. Whether block section cleared by ASM without changing the points in rear on complete arrival of preceding train ?
11. Is the line position correctly handed over to the Loco Pilot and checked ?
12. Whether the signals are visible and backlight of the signal in Mechanical signalling area is visible ?
13. Whether all precautions taken during signal blanking ?
14. LV board/tail lamp is being checked by ASM / CASM / Cabinman.
15. Whether on arrival of train the guard ensures the changing of points in rear ?
16. Whether Cabinman/CASM operating points and signal on verbal instructions only ?
17. Whether Cabinman/CASM/ASM on adjacent station are alert and attending promptly on phone?
18. Whether procedure for trains delayed in section and hot axle, flat tyre cases is correctly followed as checked from TSR.
19. Whether unauthorised persons attending instruments and operating the same ?
20. Whether H.S. Lamps and other safety equipments are available as per SWR ?
21. Knowledge of on duty staff.
22. Loco Pilot performing shunting without Pointsman.
23. Whether Loco Pilot performing shunting without T.806 / Shunting token?
24. Whether guard checking continuity/pressure during halt ?
25. Guard physically checking, last vehicle number before signing in Train Intact register.
26. Guard ensuring securing of wagons before engine is cut off.

**INSPECTION OF A CABIN**

1. Name of the staff on duty.
  - i. CASM.....
  - ii. Cabinman.....
  - iii. Leverman.....
  - iv. Switchman.....
2. Alertness of staff.
3. Check whether slide pins/lever collars are placed on slides/levers of occupied lines.
4. Testing of Emergency Cross over and recording in register.
5. Availability of safety equipments as per SWR.
6. Date of last overhauling of lever frame.....  
Date of last interlocking test of lever frame.....  
Date of last painting done of lever frame.....
7. Whether the fouling mark are visible from the cabins ?
8. Is SWR available in Hindi and last date of revalidation of SWR.?
9. Whether line admission books/badges are sent to concerned cabin/shunting master as per SWR?
- 10.. Whether the points in rear are set for a vacant line less important line on complete arrival of a train ?
11. Whether the communication facility provided at the cabin is adequate and found in working condition ?
12. Check whether pull chart and lever collar chart are displayed in cabin.
13. Whether the station yard diagram displayed is corrected to the latest diagram of yard.
14. Exchange of signals with train crew.
15. Whether the log book, private No. book is maintained properly, and last entry recorded in private no. book should be cross checked with the staff with whom it was exchanged?
16. Whether relay room double locking register is maintained properly and entries against relevant columns recorded properly ?
17. Condition of cabin and cabin basement.
18. Display of safety posters.
19. Whether cabinman is aware of following ?
  - i. Procedure for shunting.
  - ii. Procedure for trains working without Guard’s Brake Van.
  - iii. Procedure during signal blanking.
  - iv. Clamping and padlocking of points during non-signalled move.
20. Knowledge of the cabin staff should be tested in regard to following :-
  - i. Symptoms of seizure of roller bearing and brake binding, distinguishing factor between the two.
  - ii. Symptoms of Hot Axle.
  - iii. Action to be taken when any unsafe condition is noticed in passing train.
  - iv. Importance of checking LV board/Tail lamp of a passing train.
21. Whether proper procedure of issuing memo to S&T staff on duty by CASM during failure is followed or not and respective memo No. is recorded in S&T failure register or not ? Yes/No.
22. Check S&T failure register and find out total failures occurred in a month and time taken to rectify the failures Whether entries recorded properly in all the relevant columns or not ? Yes/No.
23. Check joint inspection of points & Crossings register and find out date of last joint inspection done. Whether it is done as per schedule ? Yes/No. Whether the deficiencies recorded of points are complied or not ? Number of points whose deficiencies are yet to be complied ?



**INSPECTION OF PANEL CABIN**

1. Name of staff on duty :-
  - i. Panel Incharge.....
  - ii. Panel Operator.....
  - iii. Recorder.....
2. Station Master’s key of panel should be in possession of authorised person.
3. Whether button collars are properly placed on the signal or point buttons of occupied lines or during shunting movements ? Yes/No.
4. Whether EBPU & RRBU buttons are sealed properly or not ? Yes/No
5. Do the reading recorded of ERRB, EBPU, RRBU, UOS and COGGB counters in the respective registers tally with the counter numbers displayed on panel.
6. Whether the panel counters are working correctly or not.
7. Date of last testing of panel.....
8. Whether crank handle key box is sealed and locked properly or not ? Yes/No.,
9. Check, whether the relay room is provided with double lock and relay room key register is maintained properly.
  - a. Whether all the relays are sealed properly in the relay room.
  - b. Whether points with stand obstruction test with 5 mm test piece or not ? Yes/No.
  - c. Whether sufficient No. of AC units are provided in relay room and all are in working condition.
  - d. Fire extinguishers provided in relay room.
10.
  - a. Check S&T failure register.
  - b. Whether proper system of issuing memo to S&T staff on failure with time properly is recorded.
  - c. Whether proper disconnection memo is given by S&T staff or not whenever interference with any S&T gear is required during maintenance or to attend failure ?
11. Check T.369 (3B) and private no. book entries and cross check with failure.
12. Whether proper memo is given to SE(Sig.) when SE(Sig.) cancellation required ?
13. Check Joint Inspection of points and crossings register and find out date of last joint inspection done and total deficiencies found and compliance is made.
14. Whether emergency cross over are being tested regularly ?
15. Whether SWR has been revalidated and date on which last revalidation done ?
16. Whether safety equipments as mentioned in the SWR is available.
17. Check whether the station yard diagram displayed is corresponding to the latest yard diagram.
18. Availability of safety posters.
19. Condition of panel cabin.

## FOOTPLATE INSPECTION

1. Train No.....  
Engine No.....  
Load.....  
Base.....  
From station.....to station.....  
Departure time.....Arrival time.....
2. Name of Loco Pilot.....Headquarters.....  
Date of last PME.....Next due on .....
- Date of last refresher course attended.....Next due on .....
- Date of last safety camp attended.....Next due on .....
- Date of last Psycho test.....Next due on .....
- Competency certificate for Automatic Signalling working last renewed on..
- Name of nominated LI..... Last counselled on .....
- Whether spare spectacles available with Loco Pilot ? Yes/No (If Loco Pilot uses one)
3. Whether Loco Pilot has following personal equipments?
  - i. G&SR book with all A/S updated.
  - ii. One Hand Signal Lamp with red and green slides intact.
  - iii. 2 red and 1 green flag in good condition.
  - iv. Detonators- 10 nos. Date of manufacturing.....
  - v. Tri colour LED based flashing hand signal lamp
  - vi. One tri-colour hand signal torch.
  - vii. Accident Manual with all A/S updated.
  - viii. Tool box with standard tools.
  - ix. One spare headlight bulb.
4. Name of the Assistant Loco Pilot.....
5. Vacuum/Air pressure gauge.....
  - i. Train engine.....
  - ii. Brake van.....
  - Total No. of cylinders.....
  - No. of effective cylinders.....
  - Brake Power % .....
6. Whether engine equipments Head light/electrical speedometer/mechanical speedometer/flasher lights/marker lights are in working condition ?
7. Whether Loco Pilot checks the brake power of his train at the first opportunity.
- 8., Whether speed recorder is provided ?
9. Whether proper BPC is available with Loco Pilot ?
10. Whether the caution order is issued on proper printed form T401 to Loco Pilot.
11. Check.
  - a. Whether Loco Pilot follows correct procedure while passing a defective signal at ON.
  - b. Whether Loco Pilot follows correct procedure while passing a automatic signal at ON/IBS at ON.
  - c. Whether the Loco Pilot checks personally authority to proceed i.e. T 369(3B), T 806 / Shunting token etc. when delivered to him by Station staff.
12. Whether engine crew exchange all right signal correctly with the Guard of train, station staff, with train crew of train passing on adjacent lines.
13. Whether Loco Pilot and Assistant Loco Pilot whistle freely while approaching W/L Boards upto level crossing gates and running through stations.

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14. Whether the engine crew look back frequently particularly on curves to ensure safe and complete running of train ?
15. whether the Loco Pilot observes following correctly:-
  - i. Permanent speed restriction.
  - ii. Engineering temporary speed restriction.
  - iii. Speed limits while entering and leaving from loop line.
  - iv. Maximum permissible speed of Mail/Express/Passenger/Goods train.
  - v. Other speed restriction.
16. Whether the Loco Pilot stops and starts the train without jerk?
17. Whether the Loco Pilot ensures while stopping his train that fouling mark is clear?
18. Calling out of signal aspect between Loco Pilot/Assistant Loco Pilot.
19. Whether engine crew are watching safe passage of trains on adjacent line and checking tail board or guard's signal on adjacent line.
20. Whether Loco Pilot checks continuity of air pressure enroute ?
21. Whether ghat competency certificate is available?
22. Whether any unusual occurrence observed on run ?
23. Whether any unauthorised person is travelling in loco ?
24. Loco Pilot's knowledge to be tested in following :-
  - i. Protection of adjacent line on top priority during accident.
  - ii. Use of flasher light, when train stopped in section.
  - iii. Train delayed in block section.
  - iv. Train stalled in rising gradient.
  - v. Procedure to be followed to pass IBS at ON.
  - vi. Procedure to be followed when experienced jerk in section.
  - vii. Ghat working rules.
  - viii. Procedure for working load without BPC.
  - ix. Loco Pilot's duty during TSL working.
  - x. Loco Pilot's duty during all communication failure.
  - xi. Working of trains during train parting.
  - xii. Knowledge of whistle codes.
  - xiii. Speed of train when headlight bulb is fused.
  - xiv. Working of train when headlight and marker light both are failed or not working.
  - xv. Whether Loco Pilots and Asst. Loco Pilots are in habit to write defects of signals and track in books kept in lobbies?
25. Availability of safety equipments.
  - a. Wooden wedges - 2 Nos.
  - b. Fire extinguishers - 2 Nos. (last refilling date)
  - c. Field telephone set.
  - d. Audio visual indicators for air flow metre in working condition.

**INSPECTION OF CREW BOOKING OFFICE/LOBBY**

1. Staff on duty.  
Crew Booking supervisor  
Shedman/detail clerk
2. Sign ON and Sign OFF register are properly maintained and all the entries are properly recorded in the relevant column.
3. Bio-data register- how many Loco Pilots/Guards are due for PME/Refresher/Safety Camp.
4. Breathlyser instrument in working condition and total breathlyser equipment available.
5. Board displaying staff wearing glasses displayed in lobby ? Yes/No.
6. Broad displaying correct safety circulars, safety bulletins and headquarter bulletins is displayed in lobby - Yes/No.
7. Acknowledgement of Loco Pilot/Guard are obtained in token of having read:-
  - i. Safety circular
  - ii. Order/Instruction book
  - iii. Caution order register
  - iv. Safety bulletins.
8. Whether caution order foils are daily received and filed correctly and brought forward in caution order register every Monday ?
9. Whether illuminated caution order boards display caution orders imposed section wise as per caution order.
10. Register indicating Loco Pilots screened in ABC category and their monitoring by the respective LI's is maintained.
11. Unusual incidences register is maintained at the lobby and Loco Pilots/Guards are recording entries in the same - Yes/No.
12. Staff detail books are properly maintained.
13. Signal failure/signal defect register is maintained properly and failures recorded by the Loco Pilots are repeated promptly to test room/PCOR on duty and compliance recorded of the same.
14. Whether First-Aid Box available in lobby is having the medicines as per FA Box list and is being regularly checked.
15. Check safety meeting register and find out whether safety meeting is being conducted every month.
16. Whether G&SR, Accident Manual with the latest Amendment Slips posted upto date are available with LF/Lobby Incharge.
17. Whether PCT/ECP duly tested by S&T staff is kept ready in the lobby.
18. Whether staff coming on duty are in proper uniform and in possession of safety performance card.
19. General Up keep of the lobby.
20. Whether list of accident prone staff is available with lobby Incharge.
21. Whether list of staff addicted to alcoholic drinks is available with lobby Incharge.
22. Whether the list of senior goods Loco Pilots who have been screened and found fit to work on passenger trains is available with lobby Incharge.
23. Staff available in lobby should be tested in regard to very important duties of Loco Pilot & Guard during train operation, about latest instructions and various corrections made in G&SR.
24. Safety posters and safety slogans are displayed in the lobby

**INSPECTION OF RUNNING ROOM**

1. Name of Running Room/Station.
2. Date of Inspection
3. Staff on duty :-  
Janitor  
Cook  
Bearer
4. General cleanliness - Premises including Bed Rooms/Reading Room/Toilets/Dinning Rooms/Kitchen.
5. Accommodation - Adequate/congested/short. Any proposal formulated for overcoming the shortages.
  - i. Sufficient number of beds available - Yes/No.
  - ii. Sufficient number of blankets available - Yes/No.
  - iii. Sufficient number of mosquito nets available- Yes/No.
  - iv. Sufficient number of table and chairs available- Yes/No.
  - v. Adequacy of stock of linen- Adequate/Inadequate.
  - vi. Availability of crockery, cutlery, cooking- Adequate/Inadequate.
  - vii. Adequate provision of light, fans night lamp, water cooler, desert coolers- Adequate/Inadequate. If any of the above items found inadequate, details of additional requirement.
6. Condition of cots- Sagging/old/good.
7. Condition of Mattress/Pillows- Good/bad/satisfactory.
8. Condition of linen i.e. bed sheets, pillow covers, mosquito nets- Torn/Good. Frequency of changing.
9. Condition /quality of blankets and whether these are being washed periodically. Quality of washing.
10. Condition of kitchen- Good/Satisfactory/bad. If not what improvements are necessary.
11. Condition of bathroom- Good/Satisfactory/bad. If not what improvements are required.
12. Are newspapers being supplied.
13. Is there any nuisance from outsiders.
14. Are the cook and bearer clean and hygienic.
15. Complaint book available or not. Nature of complaint recorded- Action taken.
16. Staff- Vacancy position, Medical staff attached to R/Room.
17. Availability of safety posters and fire extinguishers.
18. Any suggestions to improve the condition of Running Room.

**INSPECTION OF STATION YARD/POINTS AND CROSSINGS.**

1. Name of the station yard.
2. Whether the yards are properly cleaned and provided with proper drainage.
3. Whether any spot is found water logged due to water seepage of any under ground pipe or overflow of water.
4. Provision of standard fouling marks for covering line and indication of the line capacity in terms of wagons painted on the fouling mark.
5. Whether the berthing track has clean ballast and ballast is not touching the rails.
6. Whether the block and insulated joints are maintained in good condition and having all fittings intact. ?
7. Whether joint inspection by section JE(Engg.) and JE(S&T) is carried out as per the schedule laid down and compliance carried out promptly.
8. Inspection of points and crossing following items should be checked from safety aspect:-
  - i. Condition of tongue rail, whether damaged or worn out.
  - ii. Whether tongue rail are out of square.
  - iii. Whether tongue rail homing properly against stock rail ?
  - iv. Whether tongue rail fittings i.e. stretcher bar, switch stops, stud bolts etc. are intact and effective.
  - v. Whether proper heel block with heel distance blocks are provided maintaining specified heel diversion.
  - vi. Whether proper bent fish plate is provided at loose heal joint.
  - vii. Whether throw of switch is maintained in the range of 95 mm to 115 mm.
  - viii. Whether clearance of first stretcher bar under the rail is 1.5 mm.
  - ix. Whether correct gauge and cross level is maintained at toe of switch.
  - x. Whether crossing assembly is worn out on vee rail and using rails.
  - xi. Whether all the fitting and bolts are provided in built up crossing assembly.
  - xii. Whether correct gauge and cross level is maintained at the nose of the crossing.
  - xiii. Whether correct clearance of check rails opposite the crossing is maintained.
  - xiv. Whether the sleepers of turn out are worn out.
  - xv. Whether proper packing is given in switch and crossing portion.
  - xvi. Whether proper clearance between vee and wing rail at nose of the crossing is maintained.
  - xvii. Whether full compliment of spike (i.e. 4 Nos. at each rail seat is provided in turn out).

**MONITORING OF GUARD AND INSPECTION OF BRAKEVAN.**

1. Name of Guard.....HQ.....  
Train No.....  
Load.....  
Brakevan No.....  
Date of Inspection.....
2. Check the following Brakevan equipments :-
  - i. Electric Box No.....(ETL BOX)
  - ii. Stretcher
  - iii. Field telephone (PCP/ECP)No.....
  - iv. Wooden wedges- Yes/No.
  - v. Fire extinguishers- Yes/No. If provided type and last refilling date.
  - vi. First Aid Box- Yes/No.
3. Record the following information of Guard:-
  - i. Date of last Medical examination.....
  - ii. Date of last Refresher Course attended.....
  - iii. Date of last Safety Camp attended.....
  - iv. Competency certificate for working in Automatic Territory.....
  - v. Competency certificate for vacuum/Air brake stock working.....
  - vi. Last counselled on.....by.....
4. Check the following personal equipments:-
  - i. G&SR Hand book with last Amendment Slip No.....updated.
  - ii. Accident Manual with last Amendment Slip No.....updated.
  - iii. Vacuum gauge/pressure gauge last dated tested on.....
  - iv. LED based flashing Tail lamp available- Yes/No.
  - v. First Aid Box No..... last refilled on date.....
  - vi. Pad lock with keys available- Yes/No.
  - vii. Detonators.....Nos. with date of manufacture.
  - viii. Parcel loading pamphlet available- Yes/No.
  - ix. LED based HS lamp with red and green slides intact available- Yes/No.
  - x. 2 Red & 1 Green flag in good condition available - Yes.No.
  - xi. Complaint book available- Yes /No.
  - xii. Guards Memo book available - Yes/No.
  - xiii. Tri colour LED based flashing hand signal lamp available -Yes/No.
  - xiv. Working Time Table available- Yes/No.
  - xv. Washers.....Nos. available.
  - xvi. Tri-colour battery operated torch available- Yes/No.
  - xvii. Whistle available- Yes/No.
  - xviii. Guard’s certificate book available - Yes/No.
  - xix. Guard’s journal book available- Yes/No.
5. Whether exchange of signal by station staff with Guard is OK.
6. Whether Guard is in possession of printed caution order inforce on date in section.
7. Knowledge of Guard to be tested in following :-
  - i. Knowledge of engine whistle codes and action to be taken.
  - ii. Working of part load from section.
  - iii., Protection of train in rear when train stopped at first stop signal and IBH signal for more than laid down time.
  - iv. Protection of train in rear in case of accidents.
  - v. Checking of continuity in case of air brake stock.
  - vi. Action to be taken when train stalled on gradients.
  - vii. Procedure for shunting at wayside stations.



**ENGINEERING ASPECTS.**

1. Track maintenance – longitudinal level, cross level, alignment and correct curvature and super elevation on curve.
2. Condition of track – Rails, sleepers, tight and complete fittings, specified ballast in required profile and stable formation.
3. Schedule of inspection by Engg. Officials and compliance of deficiencies notices.
  - i. Section inspection by push trolley/motor trolley/L.V./engine.
  - ii. Points and crossings
  - iii. Curve
  - iv. Creep
  - v. Gap survey
  - vi. Level crossing
  - vii. Joint inspection by engg. with other department i.e. with S&T
  - viii. Track testing by USFD/SPURT CAR
  - ix. Bridge/Tunnels /Cuttings
  - x. Water training at river.
  - xi. SEJ
4. Deployment of competent and capable staff at work site for departmental as well as contractor’s work.
5. Replacement of IMR and REM marked rails by USFD.
6. Replacement of unserviceable rail, sleepers and fittings in time.
7. Pre Monsoon precautions-
  - i. Cleaning/ making side / catch water/cross drains.
  - ii. Preparation of monsoon patrol chart.
  - iii. Arraignments of tools/equipment for patrolling,
  - iv. Selection and training for patroller for action to be taken in emergency.
  - v. Clearing water ways at bridges.
  - vi. Stock of boulders/coal ashes at nominated location.
  - vii. Monsoon rake ready loaded with boulders/coal ashes.
  - viii. Attention to major/Minor repairs to the bridges.
  - ix. Removal of land/boulders slide location.
  - x. R.H. girders and Iron test.
  - xi. Painting of HFL, DFL on bridges.
  - xii. Inspection and getting timely repair of Rly. affected tanks.
8. Observing correct method as regard to :-
  - i. Issue of Caution Order.
  - ii. Track protection.
  - iii. Work to be done under caution order or under block protection.
  - iv. Planting of temp. caution /speed/termination indicator boards.
9. Record of weather warning and action taken after its receipt.
10. Stacking of P.Way material as per current instruction and well away from running track.
11. Issue of tools/equipment to Engg. staff.
12. Field telephone \First Aid boxes provided to SE (P.way).
13. Effective sand hump and provision of buffers in yard.
14. Provision of cotter bolting arrangement to Hand point.
15. Provision of wind velocity meter.

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16. Provision of fouling mark in yard.
17. Removal of rail closure from running track.
18. Maintaining ZMF (Zero missing fittings).
19. Adequate precautions during special track work involving safety aspect.
20. Adequacy of P.way material on break down train.
21. Maintaining a list of vulnerable locations in section and special watch on such locations.
22. Training to the staff for Hot weather patrolling during summer.
23. Action to be taken to remove Worn out, corroded and broken P.Way material from track.
24. Temperature record.
25. Distressing of LWR in correct manner and in correct temperature.
26. Timely pulling back of rails and provision of adequate expansion gap at fish plated / ..... expansion joint.
27. Provision of adequate ballast on outer side of curve.
28. Special attention to :-
  - i. Fish plated joints, SEJ
  - ii. Points & Crossings
  - iii. Availability of adequate gap at fish plated and SEJ
  - iv. Unstable formation patches.
  - v. Approaches of girder bridge, level crossings, points and crossing junction of two type of track structure having different strength potential.
  - vi. Steep gradient.
  - vii. Curve particularly transition curve and vertical curves.
  - viii. Lubrication of fish plated joints, SEJ in time.
  - ix. Greasing of outer side of rails on sharp curves where side wear is found.
  - x. Fracture prone areas.
  - xi. Condition of switches and crossings on points and crossings.
  - xii. Junction fish plated joints.
  - xiii. Scabbed, battered and hugged rail joints.
  - xiv. Scabbed or/and roaring rails.
  - xv. Track in deep cutting and on high back/Turn out and turn in curve.
  - xvi. Track having poor ballast cushion, scanty ballast and loco and inadequate cess.
  - xvii. Stretches having mud pumping.
  - xviii. Booking of staff for PME, Refresher course.
  - xix. Watching the behaviour of SEJ, LWR/CWR and timely action for gap adjustment and distressing to prevent buckling.
  - xx. Provision of whistle boards for level crossings , Red/warning, height gauge on electrified section.
  - xxi. Land / Boulders slide locations.

**INSPECTION OF MANNED LEVEL CROSSING GATE**

1. Level Crossing Gate No.  
Location –  
Interlocked / Non-Interlocked  
Gate leaf / lifting barrier.
2. Name of the Gateman :  
PME done on  
Refresher course attended on
- PME due  
Due on
3. Gateman's competency certificate
4. Gate census available.  
Date and TVU's
5. Safety equipments available  
Availability of banner flags.
6. Gate connections in working order.
7. Gate working instructions available in Hindi.
8. Records available at gate.
  - i. Gate working instructions
  - ii. Gateman's Rule book.
  - iii. Gate inspection book
  - iv. Duty roster.
  - v. Public complaint book.
9. Gate protection diagram painted in gate lodge.
10. Private nos. exchanged with adjacent SM, cross check 5 private nos.
11. Log book maintained properly.
12. Whether SM/JE (P.way) /JE (S&T) are inspecting the gate regularly.
13. Whether chains provided are of correct length and has proper hooks at either end for immediate use with locking arrangement.
14. Compliance of deficiencies notices in inspections.
15. Display of safety posters/safety slogans.
16. Provision for whistle boards for trains are provided at 500 m distance on either side.
17. Condition of road surface.
18. Whether road sign is provided.
19. Any irregularities noticed as per TSR.
20. Whether stop board are available along with spare board.
21. Speed breakers.
22. Sign boards are put at proper location and painted with fluorescent paint.
23. Approach road surface.
24. Effective wicket gate available.
25. Whether height gauge available at proper location on either side (for gates located in electrified section).
26. Whether relay room at the gate is sealed and keys available with S&T staff and not with gateman.
27. Functioning of gate bell.
28. Whether adequate fencing to restrict unauthorised movement is provided.
29. Whether the gate has a visibility of 600 m for rail and road users.
30. Whether the gate lamps are clean and properly focused on the road.
31. Channel between guard and stock rail is clear of ballast.

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32. General upkeep of the gate and condition of gate lodge.
33. Whether effective interlocking is available at gate.
34. Whistling by train crew continuously from whistle board to level crossing.
35. Is there necessity to upgrade the gate (Justification should also be given).
36. Is there necessity to interlock the gate (Justification should also be given).
37. Whether any other suggestion is made (give it in detail)
38. Whether Gateman conversant with following rules:-
  - i. Symptoms of seizure of roller bearing and brake binding and distinguishing factor between the two.
  - ii. Symptoms of hot axle/flat tyre.
  - iii. Train parting precautions to be taken.
  - iv. Use of Whistle
  - v. Knowledge of gate working instructions.
  - vi. Precaution to be taken when gate signals blank.
  - vii. Use of Tri colour LED based flashing hand signal lamp.
  - viii. Precaution to be taken while opening the gate.
  - ix. Action to be taken when unsafe condition is noticed and gate phone has gone defective.

**INSPECTION OF UNMANNED LEVEL CROSSING GATE**

1. Level Crossing Gate No.  
Location of the gate
2. Whether W/L board provided on both sides of gate at proper location.
3. Whether check rails have been provided.
4. Whether Sign boards are provided at proper location and painted with fluorescent paint.
5. Whether speed breakers are provided.
6. Whether height gauge is provided at proper location (for gates located in electrified section).
7. Whether the road surface is found Good/Bad/Satisfactory.
8. Whether channel for wheel flange is kept clean with proper gap.
9. Whether the gate is visible to Rail/Road users from 600 m.
10. Whether warning boards have been provided at the proper location.
11. Whether stop board of size (675 mm x 525 mm) provided 5m from centre line of track.
12. Whether train crew whistling continuously from whistle board to the level crossing.
13. Ambush checks- Whether road users are following the following instructions-
  - a. Stop start of sign board.
  - b. Loco Pilot /Conductor get down
  - c. Watch in either direction for approaching train.
  - d. Pass cautiously.
  - e. Do not take risk of crossing in the face of an approaching train.
14. Check the traffic census figure.
15. Suggestions for :-
  - a. Closing unmanned gates.
  - b. Manning the unmanned gates.
  - c. Improving visibility for rail/road users.

#### **ACCIDENT RELIEF MEDICAL VAN.**

The name of the Doctor in-charge & the last inspection should be pasted inside the Medical Van. The internal condition of Medical Van should be absolutely clean of dust etc. The other items to be checked for Medical Vans are detailed as under:-

1. Condition of Operation table and working of lifting/lowering arrangement.
2. Condition of light for Operation Table.
3. Oxygen Cylinder and the quantity available in the same.
4. Sterilisation facility for Operating Tools.
5. Availability of gas cylinder.
6. Condition of rubber gloves for handling of gas cylinders.
7. Condition and the quantity of availability of medicines and to ensure that the expiry date is not over.
8. Availability of fresh cloth pieces (shrouds) for covering the dead bodies.
9. Availability of :
  - Disposal syringes.
  - Refrigerator in working order.
  - Drinking water and the date of cleaning and filling the water.
  - Light weight aluminium folding stretchers.
  - Milk powdered and tea leaves etc.
  - Biscuits and snacks.

**ACCIDENT RELIEF TRAIN**

1. Condition of Rolling stock.
2. Hydraulic Re-railing equipment - Lucas /MFD equipment.
  - a. Running of Power pack, under load and on No load condition.
  - b. Condition of wire ropes, ropes and packing required during salvaging operation.  
Confirm that no wire ropes are overdue testing.
3. Generators (fixed or portable)
  - a. Running of DG generators and portable generator.
4. Lighting equipment -
  - a. check all lightening i.e. Flood light stands, their reflectors, glass for their proper fitness condition.
  - b. Check whether spare bulb pins, switches, available, cables are available with sufficient length.
  - c. Condition of Halogen lamps and their stands with their securing arrangements.
5. Petromax:-
  - a. Check petromaxes for their proper burning/lighting.
  - b. Check mantles and their condition.
6. S&T equipment:-
  - i. Public Address System.
  - ii. VHF sets :-
    - a. Check whether the set is in proper working condition and gives clear voice and its frequency range is correct.
  - iii. Walkie-Talkie-
    - a. Check whether all the walkie talkie sets are in proper working condition
  - iv. Field telephone:-
    - a. Check whether Field telephone proper working and voice and their connecting stands are properly junctioning and condition of cables.
    - b. Check the portable telephones for proper functioning and voice check whether regular inspection /testing being carried out by S&T department and record is being maintained in the Register and Inspection book.
7. Fire Fighting equipment:-
  - a. Check whether all sand and water buckets are filled with sand and water and hung properly on the stand.
8. Detonators :-
  - a. Check the drawn date and replacement month/year of the detonators.
9. Compressor:-
  - a. Check the running of compressor in idle and in working condition.
10. Availability and adequacy of other equipment:-
  - i. Jacks/Hydraulic/Screw (manual)
  - ii. Hard wood packing-
    - a. Check whether the wooden packings are in good condition and their both ends are secured with iron strips to avoid cracking /breakage.
    - b. Check whether wooden wedges are available as per standard list and they are kept in good condition and some of them provided in all the coaches for emergency requirements.
  - iii. Gas cutting equipment-
    - a. See both acetylene and Oxygen cylinders are available as per ART's requirement.



## INSPECTIONS

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- b. Inspect whether these cylinders are placed properly on their stand and their securing arrangement.
  - c. Check that both the cylinders are replaced as per schedule and when exhausted /used at site and their replacement date are observed.
  - iv. Cold cutting equipment-
    - a. Check the running of cold cutting equipment.
    - b. If necessary take practical demonstration by operating the same.
  - v. Camera-
    - a. Check the camera and its flash for its proper operation.
  - vi. Kitchen Ware, Cooking Gas etc.
    - a. Check all the kitchen ware for its proper cleanliness.
    - b. Check whether the raw material for cooking food are available in fresh stock.
    - c. Check the cooking gas cylinder and its connections are properly fitted.
  - vii. Tools and equipment-
    - a. Check the tools and equipment list and see that the tools, gauges, spanner etc are available in ART as per revised list.
    - b. Check all the measuring instrument are also kept as per requirement.
  - viii. First aid equipment-
    - a. Check the stretchers and their condition.
    - b. Check whether the first aid box material has been inspected and replaced as per schedule.
11. Steam crane/Diesel crane.
- a. Check examination date and due date of wire rope and chain of the crane.
  - b. Check steam brake and hand brake of the crane for its proper working and all brake riggings.
  - c. Check all spring, hangers and their condition.
  - d. Check the date of Boiler examination (i.e. DBI's inspection.)
  - e. Check all operating levers and connection for free operation.
  - f. Check all the brakes i.e. of main and Auxiliary hoses, turning table Jiti's operation etc, whether they operate properly.
  - g. Check that schedule repairs are carried out.
12. Miscellaneous items-
- a. Check inspection register whether the inspection of ART has been carried out as per directives.
  - b. Check chain and wire rope testing register, whether the entering of testing wire rope and chains have been made regularly as per schedule.
  - c. Check G&SR & Accident Manual whether the latest Amendment Slips have been included in them.
  - d. Check ART Log book whether the entries of the ART movements at the site of accident whenever ordered is made till date of inspection.
  - e. Check that the ART is kept in one formation and can be taken out with minimum delay.

**ITEMS IN THE AUXILIARY VAN**

1. Condition of Power Pack for working the expander and cold cutting equipment. The Power Pack should be periodically checked.
2. Availability of petromax/Gas burners for illumination.
3. Working of diesel driven electric generator for “Illuminating” the site of accident.
4. Availability of Walkie-talkie.

**COACHING STOCK INSPECTION**

1. Brake power check :-  
Count effective Nos. of Distributors Valves (DVs)/Vacuum Cylinders and divide the same by the total No. of DVs/Vacuum Cylinders available on the train for calculating the available brake power of the train.
2. Continuity of Air Pressure /Vacuum from loco to brakevan upto the last vehicle, i.e Brakevan should be checked by operating the guards Van Valve.
3. Condition of Brake Blocks and their gripping against the tread of the wheels for getting effective brake power.
4. Condition of Slack Adjusters (SABs) and the proper “A” Dimensions for effective brake power.
5. Position of angle Cocks: The position of angle cocks in line with the feed pipe and the brake pipe shall indicate open position, and if it right angles to the feed pipe/brake pipe it should indicate closed position.
6. Position of isolating handle of the DV: If the isolating handle is vertical to the ground, it will be termed as DV Isolated and if horizontal to the ground , then the DV shall be termed as Non-isolated and connected to the air brake system.
7. Under gear checks:
  - a. Availability of safety loops for brake beam/push rod/pull rod etc.
  - b. loose hanging parts if any and if found so they should be secured properly.
  - c. Condition of wheel profile for sharp flange, thin flange, flat tyre etc.
  - d. Condition of buffers :  
The buffer plungers generally have a curved profile so as to have only a point contact between the two buffers. In service, the buffers worn out and the buffer screw may come out which may entangle with the adjacent buffer on curves and cause derailments.
  - e. Condition of primary suspension and bolster coiled springs. No springs should be cracked or broken.
  - f. Condition of Dash-pots oil level.
  - g. Oil level in side - bearers.
  - h. Height of buffers from the rail level. Not more than 50 mm difference between the two adjacent buffers is allowed.

**General Checks:**

1. Condition of vestibule - Whether UIC Type of Bellow Type - Check connection along with condition of fall plates.
2. Clamping/Padlocking of angle cocks so as not to be operated by miscreants.
3. Functioning of Alarm Chain Pull on vacuum brake trains and Passenger Emergency Alarm system in air-braked passenger trains.
4. Availability of ACP Resetting key with crew of the train.

**FREIGHT TRAIN EXAMINATION**

1. Brake Power check -
  - a. No. of effective DVs/Vacuum cylinders working (to be counted and divided by total No. of DVs/Vacuum cylinders to obtain Brake Power percentage).
  - b. Condition of Hose Pipe/BP-FP to be checked to see whether there is leakage from these pipes.
  - c. Empty/Loaded hand brake lever to be seen whether kept in empty or loaded condition.
  - d. Angle cock condition and position to be examined.
  
2. Under gear check:
  - a. Availability of safety loops for beak beam/push rod/pull rods etc.
  - b. Loose hanging parts if any and if found so they should be secured properly.
  - c. Condition of wheel profile for sharp flange, thin flange, flat tyre etc. etc.
  - d. Condition of buffers :

The buffer plungers generally have a curved profile so as to have only a point contact between the two buffers. In service, the buffers worn out and the buffer screw may come out which may entangle with the adjacent buffer on curves and cause derailments.
  - e. Condition of primary suspension and bolster coiled springs. No. springs should be cracked or broken.
  
3. General :
  - a. Whether load has been secured in case of stabled trains.
  - b. Validity of Brake Power Certificate.
  - c. Whether doors of the wagons are closed in case of both empty and loaded stock.
  - d. Condition of brake regarding working van valve.
  - e. Availability of vacuum/pressure gauge in the Brake-van.

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**INSPECTIONS**

**Appendix-R**

**Schedule of Safety Inspections by Operating Officers and Transportation Inspectors**

AS 7 dtd. 2.3.2020 ,Replace Appendix- R of Chapter 22 of Operating Manual at page 183 & 184

| Sr. No | Type/ Nature of Inspections                            | Sr.DOM/ DOM        | Sr.DOM (G)/ DOM(G)                       | Area Manager/ Area Officer               | AOM(M)/ ATM/ AOM(C)                      | AOM(G)                                   | TIs                                                               |
|--------|--------------------------------------------------------|--------------------|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------------------------------|
| 1      | Detail Inspection (Half Yearly)                        | 01 (Major station) | 01 ( Major station)                      | 01                                       | 01                                       | 02                                       | All stations once in their jurisdiction                           |
| 2      | Safety Inspection (Every Month)                        | 01                 | 02                                       | 02                                       | 01                                       | 04                                       | All stations in their jurisdiction                                |
| 3      | Surprise Inspection (Min. Every Month)                 | 01                 | 02                                       | 02                                       | 01                                       | 02                                       | 04                                                                |
| 4      | Level Crossing Inspection during Day (Every Month)     | 01                 | 01                                       | 01                                       | 01                                       | 02                                       | 03                                                                |
| 5      | Footplate Inspection (Every Month)                     | 01                 | 02 (01 each by Coaching & Goods train)   | 02 (01 each by Coaching & Goods train)   | 02 (01 each by Coaching & Goods train)   | 03 (01 by Coaching & 02 by Goods train)  | 03 (01 by Coaching & 02 by Goods train)                           |
| 6      | Night Inspection (LC/ Station/ Footplate (Every Month) | 01                 | 01                                       | 01                                       | 01                                       | 02 (01 Footplate in Goods train)         | 03                                                                |
| 7      | Joint Footplate Inspection.                            | 01 (in a year)     | All sections to be covered within a year | All sections to be covered within a year | All sections to be covered within a year | All sections to be covered within a year | Covering entire jurisdiction with supervisors once in six months. |
| 8      | Brake-van Inspection (Quarterly)                       | 01                 | 01                                       | 01                                       | 01                                       | 02                                       | 03                                                                |
| 9      | Surprise Speed Checks (Quarterly)                      | 01                 | 02                                       | 02                                       | 01                                       | 02                                       | 03                                                                |

**INSPECTIONS**

| <b>Sr. No</b> | <b>Type/ Nature of Inspections</b>                             | <b>Sr.DOM/ DOM</b>                                                                     | <b>Sr.DOM (G)/ DOM(G)</b>                                                                      | <b>Area Manager/ Area Officer</b>                                                     | <b>AOM(M)/ ATM/ AOM(C)</b>           | <b>AOM(G)</b>                                                  | <b>TIs</b>                                                                                    |
|---------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 10            | Joint inspection of Running Room                               | 01 Major Running Room as identified by DRM, once in a year along with Sr.DEN & Sr.DEE. | 01 Major Traffic Running Room as identified by DRM, once in a year along with Sr.DEN & Sr.DEE. | 01 Major Running Room as identified by DRM, once in a year along with local officers. | 01 Running Room along with AEN &AEE. | All Traffic Running Rooms, once in a year along with AEN &AEE. | Each running room under their jurisdiction alongwith concerned supervisors once in 03 months. |
| 11            | Ambush Check , in Automatic Signalling Territories (Quarterly) | --                                                                                     | 01                                                                                             | 01 ( in night)                                                                        | 01 ( in night)                       | 02 (01 each during day & night)                                | 02 (01 each during day & night)                                                               |
| 12            | Loco Shed Inspection                                           | --                                                                                     | 01 (Quarterly)                                                                                 | 01 (Every Month)                                                                      | 01 ( Every Month)                    | --                                                             | --                                                                                            |
| 13            | Depot Inspection                                               | --                                                                                     | 01 (Quarterly)                                                                                 | 01 (Every Month)                                                                      | 01 (Every Month)                     | --                                                             | --                                                                                            |
| 14            | Accident relief medical equipments (ARMES/ SPARMES )           | --                                                                                     | 01 (Every six Monthly)                                                                         | 01 (Every six Monthly)                                                                | 01 (Every six Monthly)               | --                                                             | --                                                                                            |
| 15            | Accident relief trains (ARTs/ SPARTs)                          | --                                                                                     | 01 (Every six Monthly)                                                                         | 01 (Every six Monthly)                                                                | 01 (Every six Monthly)               | --                                                             | --                                                                                            |

**CHAPTER - 23**

**RUNNING OF SPECIAL TRAINS, CARRIAGES, RESERVED COACHES OF PARTIES AND MELA TRAFFIC**

**2301 Procedure of Registration :**

Applications by the party for reservation of carriage/tourist car and Special Trains should be sent to the COM, Western Railway, Churchgate, Mumbai. Application shall be submitted within the minimum/maximum limit as specified from time to time. Necessary advance money can be deposited at any station and money receipt obtained. In case the Railway Administration is not in a position to reserve and provide the desired coach/tourist car or to run the special trains due to paucity of coaching stock or some other reasons, the amount deposited by the parties will be refunded in full for which the application should be addressed to the CCO Western Railway Churchgate, Mumbai.

**2302 Charges :**

Rules regarding reserved Coaches/Tourist Cars and Special Trains are given in IRCA Coaching Tariff No. 25 Part-I Vol.-I.

**2303 Tourist Cars/Coaches :**

Number of Tourist Cars/Coaches and the number of maximum days for which such carriages can be allotted is decided by CPTM as per availability of the Coaches/Tourist Cars.

**2304 Empty Haulage Charges for Special Trains and Reserved Coaches :**

If a particular type of carriage is wanted, the Railway can endeavour to provide the same from the nearest Station/Base Station, where each carriage is stabled and a haulage charge will be levied for the actual distance hauled empty from end to the Base station (Refer Rule nos. 308 and 401.3 of IRCA Coaching Tariff No. 25 Part-I Vol.-I).

**2305 Mela Traffic :**

1. As special measures are necessary to deal with heavy traffic on account of large fairs, religious, social or political gatherings, marriage season, holidays, tourism, exhibitions, tests, tournament matches etc., it is essential to have details concerning such traffic, as early as possible, so that running of adequate number of trains can be reviewed in time and existing trains can be strengthened.
2. Whenever such special traffic is expected, the Station Master should obtain the particulars noted below and any other information from the local authorities or from the organisers of the events and convey the same to the DRM.
  - (a) Duration of the fair or gathering :
    - (i) Probable dates of commencement, closing, and
    - (ii) Dates of peak traffic.
  - (b) Estimated number of passengers (Inward/Outward).
  - (c) Probable requirement of additional coaching and goods stock.



- (d) Approximate timings of arrival and departure of requisite special trains.
- (e) RPF, Police, Medical and Ticket checking arrangements.
- (g) Arrangements for the supply of drinking water and refreshments to passengers.
- (h) Particulars of additional staff required.
- (i) Particulars of additional stores required.

**2306 Information to Headquarters by DRM :**

1. On receipt of this information, the DRM will take all necessary arrangements and will provide necessary facilities to deal with the traffic. He should inform the COM of the exceptional anticipated traffic and seek necessary instructions. He should request the Transportation, Commercial or other departments of the Headquarters office for such assistance as may be beyond his control. Except where otherwise authorised, augmenting of trains and running of special trains shall only be done on the specific sanction of, COM.

2. **Facilities at Mela Station for dealing increased outward traffic :**

- (a) To deal with such traffic, whether a new station is opened or the existing one is remodelled, load peculiarities largely affect the scheme of construction, but the main principles in such cases are to give:

**On the outward journey.**

- (i) Adequate facilities for quick disposal of trains.
- (ii) Adequate facilities for access from platforms.

**And on the return journey :**

- (i) Adequate facilities to ensure a quick availability of trains with due regard to the sectional capacity and terminal capacity.
- (ii) Adequate facilities for access to platforms and for regulating the crowds.

3. Detailed instructions will be issued by the Division to deal with the Mela Traffic to concerned stations.

**2307 Transportation Arrangements :**

The following are some of the points to be kept in view for the proper handling of special or Mela traffic:

1. Block huts or crossing stations may, temporarily, be opened to provide greater sectional capacity to permit more trains being run.
2. As far as possible, and practicable, the Principal Mela station should be of the terminal type.
3. The platform of such a Station should be long enough and capable to hold at least two rakes, of 12 to 15 coaches at a time.

## **RUNNING OF SPECIAL TRAINS, CARRIAGES, RESERVED COACHES OF PARTIES AND MELA TRAFFIC**

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4. If a fair covers a large area, an Area Control may be established with telephonic connection with the Principal Station.
5. As coaching stock is required in a large number, careful planning in this direction is necessary.
  - (a) Asking for assistance from other Divisions and Railways for spare coaches.
  - (b) Withdrawal of certain coaches from certain trains on non-Mela sections.
  - (c) Getting POH/ROH coaches extended temporarily as per extant instructions.
  - (d) Extensions or diversions of trains or through service coaches to the Mela area.
6. Initially, trains may only be augmented and then diversions or duplications of trains or running of special trains may be resorted to if and when necessary. Ordinarily a greater number of specials with all second class coaches should be run rather than upper class specials.
7. Standard composition of train will also help in reservation.
8. Surplus rakes may be kept at adjoining stations (where the flow of traffic is not heavy), so that they may be commissioned in service when required.
9. If passenger traffic is expected to be very heavy, it may be worthwhile imposing drastic restrictions on the booking of reserved and Inspection Carriages.
10. During dispersal, the running of specials may be arranged on the following basis:
  - (a) Certain slow stopping trains may be run for local short distance passengers.
  - (b) A few fast trains, stopping at large stations only, may be run for long distance passengers.
  - (c) For passengers coming from a greater distance, but from roadside stations, a few other specials may be run which may stop at large stations only up to a certain point and then stop at all stations.
11. Every endeavour must be made to run the Mela Specials to the scheduled timings.
12. Control must be kept in touch with regard to the general movement of passengers and the information given to the Control must be prompt and accurate. The Controller must keep all concerned informed of relevant information.

### **2308 Other Arrangements :**

1. The Station Master of main Station should be directly connected with telephone with such points as Loco Shed, Control, various enclosures and control towers.
2. It is necessary to install public address system at suitable points for publicity, directions to passengers and instructions to staff stationed at distant points. Pictorial Boards depicting the various information for the guidance of passenger may also be provided.

## **RUNNING OF SPECIAL TRAINS, CARRIAGES, RESERVED COACHES OF PARTIES AND MELA TRAFFIC**

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3. Well-trained and experienced staff should be deputed. If necessary, additional staff may be borrowed from other Divisions/Railways.
4. The importance of minimum interference with ordinary traffic facilities should be realised. Regular travellers generally take the view that it is unjust to put them to inconvenience for the sake of pleasure seeker.
5. Schedules should be carefully arranged in order to secure the fullest possible use of Rolling Stock, Loco's power and Staff available.
6. Arrangement should be made to ensure free traffic movement and avoid crowds being held up at barriers awaiting access to trains.
7. Actual operation of traffic at Terminal Station and other important points should be closely watched by responsible officials so that immediate action may be taken in the event of emergency.
8. Closest possible co-operation with the organisers of event should be maintained with a view to remove mutual difficulties.
9. Attempts must be made to see that the passengers do not travel on foot-boards or roofs of the carriages.

### **2309 Advice of Running :**

Advice of the running of special trains is issued to all concerned by the COM by a special time table or message.

### **2310 Special Time Tables :**

Guards and Loco Pilots of trains, who are deputed to work a train for which a special Time Table has been issued, should be supplied with copies of such special Time Table.

### **2311 Supervision :**

1. The supervision of the whole arrangements must be proper and when necessary one or more Officers and Inspectors/Supervisors should be deputed for the specific functions and one of the officers co-ordinating the entire supervision as Mela Officer.
2. At the close of the Mela fair the Officer/Official incharge of the arrangements must submit a complete report to the DRM with a copy to COM.

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CHAPTER - 24

INSPECTION CARRIAGES

Inspection Carriages or Saloons are used for the purpose of inspection, while travelling on duty by High Government Officials or Railway Officers to facilitate their inspection.

**2401 Requisitions for Allotment of Carriages/Saloons :**

Requisitions for allotment of Carriages/Saloons should be submitted in writing sufficiently in advance and should be accompanied with a complete tour programme.

Requisition for Inspection Carriages/Saloons from Headquarter pool, should be placed to CPTM-Churchgate and from Divisional pool may be sent to Sr.DOM. The Officer proceeding to a station, where Rest House accommodation is available should not, ordinarily, ask for Inspection Carriages.

**2402 General Instructions for Allotment, Attaching/Detaching of Inspection Carriages / Saloons :**

The allotment of Inspection Carriages/Saloons, except those allotted to the Divisions, is controlled by the COM/CPTM. At Divisional level, the allotment is controlled by the Sr. DOM.

The following points are to be taken into consideration for allotment :

1. No inspection carriage shall be attached to 'Prohibited' and 'Restricted Trains', except that in the later case Inspection Carriages of the officers allowed by the Railway Board's orders may be attached to a 'Restricted Train' with the permission of the CPTM, or in case of journeys within a Division with the permission of Sr.DOM/DOM.

Note :

- (i) **"Prohibited Trains"** are those trains by which due to operational reasons, the haulage of saloons, inspection carriages and other extra carriages is not considered feasible without detriment to the punctuality of trains or as prohibited by Railway Board due to certain specified reasons.
  - (ii) **"Restricted Trains"** are those trains by which the haulage of saloons, inspection carriages etc. is normally restricted from the operating point of view either during the complete journey or at certain vulnerable sections.
  - (iii) Prohibited and Restricted Trains are notified by the Railway Board from time to time.
2. Availability of Inspection Carriages/Saloons and Fitness Certificate from C&W.
  3. Load permits or when permission of COM/CPTM has been obtained to attach overload.
  4. Attaching and detaching can be done within the allowed time of their halt in the case of Mail, Express and Fast Passenger trains. In the case of other Passenger and Mixed trains, it should be kept in view that extra detention shall not affect the punctuality of the train.

## INSPECTION CARRIAGES

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5. In case of through Goods trains attaching and detaching of an Inspection Carriage is only permitted at stations where such trains are to halt. The Sr.DOM /DOM may, however, authorise relaxation of this restriction in the case of emergent movement of officers.
6. At Stations where no shunting engines are available, Inspection Carriages may be attached/detached by train engine.
7. Availability of Saloon Siding/Other sidings at Station for placement to avoid blocking of running lines for the purpose.
8. If the Inspection Carriage/Saloon is to run over the Foreign Railway, prior permission of the Railway concerned must be obtained.
9. No reduction shall be made in the accommodation for the public in order to attach an Inspection Carriage/Saloon without the permission of COM.
10. No train shall be double headed in order to haul an Officer's Carriage/ Saloon.
11. Maximum number of Inspection Carriages/Saloons on a train :
  - (a) On Mail and Express trains, more than one Inspection Carriage/Saloon must not be attached.
  - (b) On Passenger trains, not more than two Inspection Carriages on the Broad Gauge, three on Metre Gauge and one on the Narrow Gauge shall be attached to any train at one time.
  - (c) In case of Goods train, see G&SR 4.23.

### **2403 Marshalling of Inspection Carriages/Saloons :**

1. Normally an Inspection Carriage/Saloon may be marshalled in front or at the rear end of the train, as convenient subject to other rules regarding marshalling of vehicles (See Chapter-13). It may be marshalled in side the Brakevan only at such Stations where shunting engines are available at the arrival time of the train concerned.
2. **Reserved bogies and Inspection Carriage/Saloon occupied by VIPs :**

Reserved bogies and Inspection Carriages/Saloons occupied by VIPs should be treated as any other passenger coach and should be marshalled accordingly. If they are anti-telescopic or steel-bodied, they could be marshalled anywhere as operationally convenient. If they are wooden-bodied, they should be marshalled inside the required number of anti-telescopic/Steel bodied coaches. If shunting time required to comply with the marshalling is likely to be long, attaching/detaching of such coaches may be made at convenient points and the party advised to entrain/detrain at their destinations enroute.
3. For attaching of Inspection Carriage/Saloon to a Light Engine, See G&SR 4.23.

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CHAPTER - 25

MILITARY TRAFFIC

**2501 Military :**

The word 'Military' includes the Army, the Navy and the Air-Force and other forces declared as 'Military' by the Central Government from time to time.

**2502 Military Special Train :**

Military special train means a train intended exclusively for the use of military which may be run as passenger, mixed or goods train.

**2503 Coaching Stock Demand for Military Movements :**

Coaching vehicles required for military trains or for the transportation of military personnel in reserved carriages are drawn either from general service stock or military stock, the latter being controlled by MILRAIL, Quarter Master General's branch, Army Head Quarters, New Delhi. This section informs the indenting officer and others concerned, either directly or in case of the Railway, through the General Manager concerned normally of the timings allotted. In case of movement of parties by ordinary trains, the trains are allotted and advice is sent to all concerned by the COM. In emergent cases, when time does not permit of the procedure being followed, the local military commanders are empowered to make necessary arrangements direct with the Railway authorities concerned.

**2504 Ordering of Military Trains :**

1. Requisition for Military trains indicating the composition of the trains and the paths to which they should run are placed on Railway Authorities by authorised Military officials. Orders regarding running of the trains are then issued to all concerned by the Railway's Operating Officers through Control & other messages.

2. **The following codes are used for the various types of Military special trains :**

P	-	Personnel
SP	-	Combined Personnel and Baggage
CP	-	Combined Personnel and Animals
VP	-	Combined Personnel and Vehicles
S	-	Stores
V	-	Vehicles
C	-	Live Stock & Other Animals
L	-	Petrol, Oil and Lubricants

**2505 Military Block Rakes :**

1. A certain number of block rakes consisting partially of military stock and partially of general service stock are earmarked for military personnels. These rakes are under the control of MILRAIL.
2. Except where otherwise specified in the Military tariff or special instructions issued by the Chief Operations Manager, ordinary rules of marshalling will also apply to Military specials.
3. General Composition of Military Special may be as under :  
Engine + 1 SLR + 1 MS + 1 MF + ..... + BVG.
4. Goods Stock for Military Movements :  
Goods stock is normally provided by the railway. However, MILRAIL controls a certain number of military stock i.e. BRH/BFU/NBWT/MBWZ/ MBWXA, Ramp Wagons etc.
5. Loads of Military Trains :  
The maximum load permitted for military trains on various sections of the railway will be given in the appropriate Military Time Table. A table showing the maximum and

minimum number of vehicles for military special trains, which can be attached to trains carrying passengers may be found in relevant ANNEXURE of IRCA military tariff. Attaching of reserved carriages to ordinary trains is made by COM, on receipt of requisition from 'MILRAIL'.

**2506 Military Train Time Tables :**

It is a 'Secret' Time Table to be kept in secret custody and referred to when such special trains are to run. Special Time Table may also be issued for running of such trains. Like the Working Time Table, they are meant for the use of concerned railway staff only. Time Table for the military personnel, stores, vehicles and trains may be issued from time to time, as and when required, by the Headquarter Office. The paths provided for the various trains are based on the requirements of the Defence department. Military Trains may be detained at the starting station or enroute to suit the needs of the Military Personnel. In such cases the Officer incharge of the train must give a written message mentioning the delays to the Guard of the train. The Guard must attach this message with the documents for further action, if necessary.

**2507 Halt for Meals :**

In case of Military trains running late, halt for meals as authorised must be arranged in consultation with the Officer incharge of the train. The SS/SM at the Station, where military specials are required to halt must personally ensure that all the required arrangements are up to date. They must arrange to have plenty of drinking water for troops and animals and also other arrangements as per instructions. Railway staff are expected to render all assistance to them. Sanitary arrangements and washing facilities at stations of halt will be made by the military authorities in consultation with the Railway authorities.

**2508 'In-reports' – 'Out-reports' and 'Passage Reports' :**

To enable 'MILRAIL' to keep a watch on the movements of military coaching stock, particulars of such stock running by ordinary trains or by military trains must be advised to MILRAIL by the SS/SM's of starting, terminating and interchange Stations by the fastest means of communication available, followed by written confirmation in the prescribed proforma, if any.

**2509 Shunting and Marshalling of Military Special Trains, Reserved Carriages and Wagons Containing Explosives :**

Special instructions, as issued by the COM or Sr.DOM, for shunting and marshalling of such carriages, wagons or special trains must be observed.

Whenever any vehicle is detached from such a train, being unfit to run, SS/SM must immediately advise all concerned, including military authorities. For marshalling conditions, refer relevant rules of IRCA Military Tariff.

Destination Station should stable military stock till the orders are received from Divisional Control.

**2510 Damage and Deficiency Report**

A joint damage & deficiency report is to be prepared of coaching stock and live stock carriage by Operating representative and Section Engineer ( Carriage and Wagon) with either armed force officer or non commissioned officer.

One copy is to be given to the Guard of the train, who will make entry in his rough journal in red ink. In case of change of Guard, the working Guard will be given the said report who in turn hand over to Station Master of destination station. After reaching at destination station, again a joint report is to be made by same staff and the relevant entries to be made in Military Tariff Appendix- 'F' and 'G'. The damage and deficiency cost is to be recovered immediately from commanding officer.

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CHAPTER - 26

GOVERNMENT MAIL

**2601 Introductory :**

Railways render certain services to the Postal Department ,as under :

1. Haulage of vehicles specially constructed or converted as Postal Vans at the cost of Postal Department.
2. Haulage of ordinary coaching vehicles, in which, accommodation is reserved by the Railway for the conveyance of Mails.
3. Conveyance of Postal Mail bags and Parcels under the weighment system in luggage-vans or compartments under the charge of the Guards, either as a regular daily service according to a list supplied duly approved by a competent Railway Authority for six months or other prescribed period., or as occasional despatches under the authority of a voucher from the Postal Department for each despatch.

**2602 Provision of Postal Vans :**

The requirement of daily accommodation of the Postal Department for carriage of Mails, etc. in Postal Vans to a particular destination by different trains is conveyed to the COM-Churchgate, by the Post Master General of the area concerned. The Headquarter Office advises all concerned from time to time the individual numbers of Postal Vans or composite Postal Vans to be attached to different trains on different sections. This advice also includes the individual numbers of the standby Postal Vans, for utilisation, when the original van is detached for any reason. Marshalling of such Parcel Vans is given in the book 'Normal Composition -Marshalling Order and Rake Links' of passenger trains.

**2603 Additional Accommodation :**

1. Requirement of any additional reserved accommodation for the carriage of Mails will be advised well in time by the Superintendent, Railway Mail Service(RMS) concerned to the COM, giving copies to all concerned. Ordinarily, no additional coach on Postal account» will be attached to any train without the permission of COM. However, in emergency or during interruption of communication, DRM may issue orders for attaching extra coach on Postal account for a particular journey, advising COM of the circumstances under which such additional accommodation was provided.

**2. Statement of Additional Accommodation provided :**

The Station Master providing the additional accommodation should submit a statement along with the requisitions to COM, specifying the number and type of coach provided, its carrying capacity, trains by which attached, Stations to and from and reference of the postal requisition. Copy of this statement should also be submitted to DRM concerned, CCM-Churchgate, Dy.CAO(TA)-Ajmer and others, as per instructions issued by the CCM from time to time.

**3. Returns of Accommodation supplied :**

The accommodation supplied on the 21<sup>st</sup> January and 21<sup>st</sup> July each year must be physically checked and noted at the same time as the Mails carried under the weighment

## GOVERNMENT MAIL

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system and a Return in the prescribed form, duly countersigned by the Postal Official concerned must be submitted by the Station Master of terminal stations of the run to the Dy.CAO(TA)-Ajmer.

### **2604 Replacement of Mail Vans :**

1. When a Mail Van has been marked sick or sent for POH at a starting or terminal Station, the SE (C&W) concerned, should advise all concerned including the Superintendent of the RMS Control and the Station Master sending the coach, as to when the Mail Van will be fit again.
2. Mail Vans earmarked for a particular section should invariably be attached on the same section. In case any Mail Van is removed due to some unavoidable circumstances, spare Mail Van earmarked for the section concerned, or a suitable IInd Class compartment, or a coach fitted with safety devices, catches and lathes should be provided.

### **2605 Mail Vans Running Hot Enroute :**

1. It will be the personal responsibility of the SE (C&W) of terminal station, or any other persons in charge of the rake/coach maintenance, to see the Mail Vans are maintained in the most efficient manner to minimise incidence of detaching them enroute due to hot axle or any other mechanical defect.
2. If, however, an occasion should arise to detach a Mail Van enroute, it should, if possible, be detached at a junction station, where a spare Postal Van or a bogie IInd Class, may be available for replacement.
3. If, however, no spare coach of any description is available, at a station, where the Mail Van has to be detached, the next junction station should be advised about this through Control phone to keep a spare Postal Van or IInd Class coach ready with RMS staff to be attached to the train from that station. The RMS staff of the sick Mail Van should be helped by the station staff in the unloading of Mail bags, etc. which shall be despatched by the following trains. If there is room in the luggage compartment, the Guard may carry sealed bags duly booked under Free Service Way Bills to the destination if so desired by the Head Sorter of the sick Mail Van.

### **2606 Movement of Government Mails during Breaches or Interruption of Communications:**

1. The information pertaining to breaches or interruption of through communication should be conveyed on telephone to the Superintendent of RMS concerned and Post Master General of the state, detailing therein, if possible, the approximate duration of interruption, arrangements for transshipment at the site of accident or breaches, and the number of trains that will be transhipped.
2. At, the accident site, if only transshipment of passengers is required to be done, the Government Mails should also be transhipped along with passengers, and the official in charge at the site should endeavour that such transshipment is completed before the train is allowed to leave the site.
3. In case of any difficulty arising for the conveyance of Mails during the period of interruption the Station Master or any other senior official will inform the DRM and act according to the instructions received.

4. If during the breaches and interruptions, it becomes necessary to divert Mails to an alternate longer route, it should not be done without the written requisition from the RMS authorities.

**2607 Disposal of Postal Requisitions :**

Except where otherwise specified, the Station Masters concerned should carefully preserve all requisitions received from Postal Department, and submit them to the Dy. CAO (TA), Ajmer. The copy of the covering letter should also be sent to the DRM concerned, CCM and COM CCG.

**2608 Maintenance of Log Book in Postal Van or Compartment :**

1. In order to ensure personal attention to rectify defects such as Train Lighting Equipment, Wax Heater and other technical defects, in the Postal Vans, the RMS staff in Postal Vans should be issued with a Log Book as proforma given at the end of this chapter for each Postal Van, for perusal of and necessary action by:
  - (a) The Guard of the train enroute
  - (b) The maintenance staff in train and enroute
  - (c) The maintenance staff at terminal stations.

The Log Book should remain in the custody of RMS staff on the coach and should be handed over to the local RMS staff at terminal stations and be thus available to the maintenance staff for perusal and necessary action.

**2. Instructions for Maintenance of Log Book of Postal Department :**

- (a) The Log Book should be endorsed 'No Complaint' at commencement of the journey by the Electrical and Mechanical Supervisors concerned, and be countersigned in token of acceptance by RMS representatives.
- (b) All signatures should be legible.
- (c) Staff attending to defects at Stations enroute should write the work done by them.
- (d) Staff, attending at terminal stations, should state the reason, if defects could not be attended.
- (e) In case of non-attendance, RMS staff should send extract to the Superintendent of RMS of the Division concerned, with a copy to the local Electrical or Mechanical Supervisor.
- (f) The up-keep of Log Book will be the duty of RMS staff.
- (g) If no defects are noticed enroute, a 'NIL' entry should be made at the terminal station by RMS staff.

**2609 Detention of Trains for Mails :**

On request, on rare occasions, Trains Carrying Mails may be detained for Postal purposes only on written authority from the postal official and with the prior permission of the Sr.DOM. In no circumstances, however, should a train be detained for more than 5 minutes on this account.

**GOVERNMENT MAIL**

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**2610 Guards to see Mail Bags are not left behind :**

Guards must, before giving the starting signal, satisfy themselves by reference to the RMS Official, if necessary, that all the Mails have been loaded.

**2611 Cases of delays to Trains on RMS account:**

Cases of delays to trains on account of RMS officials should be brought to the notice of all concerned:

**LOG BOOK OF POSTAL VAN NO. \_\_\_\_\_**

| <b>Train No.</b> | <b>Defect noticed at</b> | <b>Signature of RMS staff</b> | <b>Signature of Guard of the Train (Necessary only when defects developed enroute)</b> | <b>Action taken by Maintenance staff</b> | <b>Signature of Maintenance Staff (Elec. Or Mech.)</b> | <b>Remarks</b> |
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CHAPTER - 27

ACCIDENTS, THEIR CAUSES AND PREVENTION

**2701 Definitions :**

1. **Accident :**

Accident for the purpose of these rules, unless the context otherwise requires, means any occurrence in the course of working a Railway which affects or may affect the Safety of the Railway, its Engines, Rolling stock, Permanent Way, Works, Passengers or Servants or which affects the Safety of others or which causes or may cause delays to trains or loss to the Railway.

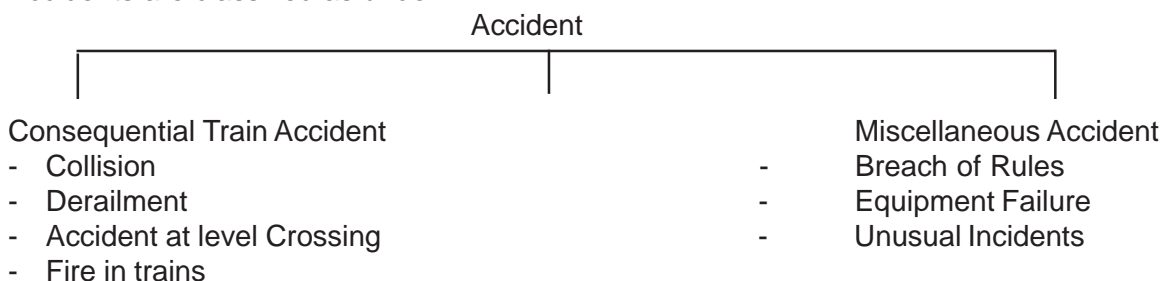
2. **Serious Accident :**

Every accident whether caused to or by a train which is attended with loss of human life or with grievous hurt or with injury or damage to Railway property of the value exceeding Rs. 25,00,000 or which causes serious interruption/dislocation of traffic shall be deemed to be a serious accident.

The instructions for working of Traffic in the event of accidents and accident management are given in General & Subsidiary Rules and Accident Manual. This chapter aims at highlighting common causes of consequential train accidents and some measures for prevention thereof.

**2702 Classification of accidents :**

Accidents are classified as under :-



Note : For details refer Chapter IV of Accident Manual.

**2703 Role of Supervisors in Prevention of Accidents :**

In minimising the incidence of accident, the Supervisor and inspecting staff have an important role to play. Effective supervision, directions and control on their part is a must. They should have extensive and intensive inspections, regular as well as need based monitoring on the job training and counselling of the staff, proper upkeep and maintenance of equipment pertaining to safety, positive leadership, good support to staff and human approach to their small personal problems. The Supervisors and Inspectors must also watch the trends of accidents, analyse the causes thereof and keep the senior officers informed. They must sincerely implement the guidelines given for improving safety.

**2704 Causes of Collision:**

Collisions are the serious most accidents, many times resulting in loss of life and property. Common causes of collisions are :

## ACCIDENTS, THEIR CAUSES AND PREVENTION

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1. Starting a train without obtaining proper line clear.
2. Despatching a train into a block section already occupied.
3. A train entered into a block section without authority to proceed or with wrong authority to proceed.
4. Incoming token is handed over to the outgoing train Loco Pilot without passing through block instrument.
5. Station Master at the wrong end may extract the Tablet/Token or Tokens at both ends due to failure of block instruments.
6. SM fails to satisfy personally about the complete arrival of the train and permit another train to enter on same line.
7. Signal lever is returned to normal position yet signals arms remain drooping and SM grants line clear to the station in rear.
8. The reception line is not clear upto adequate distance.
9. Points are not correctly set and locked for the reception of trains.
10. Disregarding of signal by Loco Pilots.
11. Tail lamp/ Tail board is not fixed by the Guard on the last vehicle of the train.
12. Guard fails to ascertain complete arrival of train and train standing without clearance of fouling marks.
13. Loco Pilot fails to stop his train 1 minute during day and 2 minutes during night when an Automatic Stop signal is in 'ON' position.
14. Section Engineer (P.way) issue clearance certificate before completion of work.
15. Motor Trolleys, Push Trolleys and Material Lorries are not being protected in the block section as per rules.
16. Non-securing of vehicles at station yard or siding.
17. Loose shunting on non-isolated line adjacent to those on which trains are being passed resulting in the obstruction of the latter.
18. Procedure for reception of a train on obstructed line is not followed.
19. Points are not altered against the blocked line after arrival of the train at station and Loco Pilot of the following train failed to control his train outside the stop signal. SR 5.19(5).
20. Non-observance of rules regarding Ghat Section, Dangerous Section, Catch Siding and Slip Siding.
21. SM on duty fails to observe various conditions for granting line clear, taking 'OFF' signals and provisions mentioned in SWRs.
22. Failure on the part of Engine Loco Pilot or the Rolling Stock ( Engine or train ) :
  - a) Failure of brake system of engine
  - b) Poor Brake Power
  - c) Passing signal at danger
  - d) Excessive speed and / or failure to control train when required.
  - e) Failure to check brake continuity upto last vehicles.
  - f) Neglecting the restrictive aspect of the signals, observance of precautions when coming across defective, flickering or bobbing or blank signals.
  - g) Leaving the Working Loco unmanned.
  - h) Failure to protect adjacent lines fouled by his train.

### **2705 General Guidelines for prevention of Collision :**

#### **For Loco Pilots and Guards :**

1. Immediately switch 'on' the flasher light provided on the locomotive as detailed in SRs. 4.16 (4), 6.03(a).
2. Ensure adequate and prescribed Brake Power of the train before start.
3. Keep a sharp look out and observe signals. Always call out aspect of signals and engineering indicator boards with Assistant Loco Pilot.

## ACCIDENTS, THEIR CAUSES AND PREVENTION

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4. Ensure that no engine is allowed to be in motion on any running line, unless the Loco Pilot or the Assistant Loco Pilot are manning upon it. When engine is shut down, its hand brakes must be properly applied.
5. Ensure adequate vacuum/air pressure on engine.
6. Train crew should take proper rest both at HQ and at Running Room before working a train.
7. Do not pass a stop signal at danger/blank aspect/flickering or bobbing signal, stop, check, confirm and only then pass.
8. Loco Pilots /Motormen should pass an Automatic Stop signal at danger as per rules.
9. In case of thick and foggy weather :observe relevant G&SR 3.61.
10. Before starting from a block station ensure that proper authority to proceed has been obtained and correct signals are taken "OFF" for your train.
11. While signing-on duty, check thoroughly the Caution Orders, speed restrictions, order book etc. Before starting, check brake power certificates, engine equipment and vacuum/ Air pressures. Also check locomotive brake power, horns whistles, headlights, flasher light, speedometer availability of speedograph etc.
12. On arrival at a Station, Train crew should ensure that the train is standing clear of fouling mark.
13. Avoid over speeding or sudden accelerating or sudden braking.
14. Never disregard danger aspect of signals and do not pass any defective stop signal unless authorised.
15. On hearing four short sharp whistles given by the Loco Pilot, the Guard should first protect the adjacent line/lines and the same line as per G & SR 6.03.
16. Whenever an EMU train stops out of course for more than two minutes at a station or immediately between section, Guard must switch 'ON' amber colour electric flashing light

### **For Station Masters :**

17. Before granting line clear, ensure that the Block Section is clear of train/obstructions.
18. Ensure that whole of the previous train has arrived complete and standing clear of fouling marks.
19. The points behind the said trains on double line and at either end on single line are reversed and set for a vacant line /less important line ( SR 5.19(5) ).
20. Before taking 'OFF' reception signals, ensure that the line, including the signal overlaps is clear and path of the trains is clear of obstructions.
21. Ensure that relevant points are correctly set and the facing points are set and locked properly.
22. Stop collars/collar buttons are used on the lever/slide/knobs pertaining to the occupied lines.
23. Personally verify that proper signals are taken 'OFF' correctly for reception/despatch of trains.
24. Exchange alright signals with the train crew of running through trains to ensure that train is running in safe manner.
25. Ensure that proper action has been taken for the run away train and information is given to the Gateman/SMs of the concerned Station and Control.
26. Ensure that vehicles/wagons stabled at your station are secured properly and protected by a red light at both ends during night as per SR 5.19(b).
27. Shunting is performed as per provision mentioned in SWRs.
28. Special precautions should be observed in case of trains being run without Brakevan, without Guard etc. Refer concerned G&SRs.
29. Procedure during failure of Block Instruments on single line and double line must be observed strictly.



30. In case of rainy season ensure that patrolling of tracks is as per patrol charts. If patrolman does not turn up within fifteen minutes as scheduled, permit trains into the block section only after issue of caution orders and ascertain reasons for non-arrival of patrolman.
31. During thick and foggy weather and dust storms, light up signals and warn Loco Pilots by placing detonators and also issuing Caution Orders. See G & SR 3.61.
32. Watch all trains, running through your station from station side by SM and off side by a Competent Railway Servant to detect any abnormality. If any abnormality is noticed, stop the train by showing danger signals / put back signals to attract attention of Loco Pilot and an information to the Station ahead by giving stop and examine signal. Control and TPC to switch off OHE supply in OHE section.
33. Do not adopt short cut and unsafe methods.
34. Cancel the Block only after clearing obstruction completely.

### **Miscellaneous Staff :**

35. Do not work lorries without block/protection.
36. Ensure correct display of engineering signals, when the work is in progress.
37. Ensure that the prescribed visibility is maintained both for train Loco Pilots and for the road vehicle Loco Pilots by trimming the over grown trees etc.
38. Required percentage of effective Brake Power is available on the train.

### **2706 Causes of Derailment :**

#### **1. Permanent Way Defects and Unsafe Practices :**

- (a) Uneven Cross Level
- (b) Widening of Gauge
- (c) Perishing of Sleepers
- (d) Line Sinking
- (e) Defective or Broken Rail or Fishplate
- (f) Gaping in Point
- (g) Defective points and crossings
- (h) Buckling of track
- (i) Non-observance of Rules by Gateman at level crossing gate
- (j) Loose packing of track
- (k) Jamming of Check Rails at level crossings
- (l) Obstruction on Line

#### **2. Engine Defects and Unsafe Practices :**

- (a) Defective spring or suspension
- (b) Broken Axle
- (c) Defective Axle Box
- (d) Defective wheel or Tier
- (e) Breakage due to flaw of metal
- (f) Defective engine brakes or failing of brakes
- (g) Mismanagement by Engine Crew.
- (h) Excess speed by the Loco Pilot

#### **3. C&W Defects and unsafe practices :**

- (a) Defective Springs
- (b) Defective Axle Box
- (c) Coupling failure
- (d) Defective Wheel or Flat tier of Vehicles
- (e) Broken Axle

- (f) Defective Buffer
- (g) Defective Bogie
- (h) Defective brake block hangers
- (i) Breakage due to flaw of metal

**4. Traffic Defects and unsafe practices :**

- (a) Movement on defective or damaged points.
- (b) Rough shunting
- (c) Wrong setting of points
- (d) Overloading or uneven loading
- (e) Not showing Hand Signals properly
- (f) Gap in points
- (g) Attaching one Four Wheeler between two Eight Wheeler wagons
- (h) Changing of points when vehicles are passing over them
- (i) Fouling Mark not cleared by first train in crossing or precedence and signals taken off for second train.
- (j) Loose / Fly Shunting
- (k) Wrong manipulation of Points
- (l) Obstruction caused by unloaded material
- (m) Wagon doors, fitting, chain etc. are not properly secured
- (n) Improper coupling of wagons
- (o) Buffer steps – loads backed into buffer step sidings must not be more than the capacity of the siding ,as shown in the SWRs.
- (p) Movement over trailed through points / Spring loaded points.

**5. Miscellaneous Causes :**

- (a) Cattle run over
- (b) Sabotage
- (c) Trees or Electric or Telegraph poles falling on line.

**2707 Guidelines for Prevention of Derailments:**

**1. Permanent Way Staff**

- (a) Do not work lorries without block/protection
- (b) Cancel the Block only after clearing obstruction completely.
- (c) Ensure that the Gatemen are conversant with rules and they place the detonators as per rules, if required.
- (d) Ensure patrolling of the tracks and watch vulnerable and soft spots, continuously carry out checks and prevent following monsoon hazards:
  - i. Checking of side and catch water drains
  - ii. Clogging up of ballast
  - iii. Water logging of track, particularly on cuttings and in station yards.
  - iv. Erosion of banks
  - v. Seepages and sinkages
  - vi. Slips / fallings of boulders and rubble in cuttings, wash away and breaches.
- (e) **Avoid track failures such as :**
  - i. Incorrect super elevation and cross levels
  - ii. Worn or broken rails and fish plates
  - iii. Slackness or tightness of gauge
  - iv. Loose sleepers
  - v. Inadequate spiking

## ACCIDENTS, THEIR CAUSES AND PREVENTION

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- vi. Undertaking track maintenance work without taking adequate precautions .
- (f) Ensure proper Whistle Boards/Road Signals are available at all unmanned level crossing gates.
- (g) Ensure correct display of Engineering signals, when the work is in progress.
- (h) Ensure that the prescribed visibility is maintained both for train Loco Pilots and for the road vehicle Loco Pilots by trimming the over grown trees etc.
- (i) Road portion over the track is well maintained.
- (j) Loose boulders and unstable trees have fallen down or near the track.

### 2. Carriage and Wagon Staff::

- (a) **Ensure that :**
  - i. Rolling in examination and feel test of trains is done.
  - ii. Wheels are tapered by experienced workmen.
  - iii. Warmness of axles is felt immediately after the arrival of train.
  - iv. Various gears function properly and no part / component is loose or hanging.
  - v. Required percentage of effective Brake Power is available on the train.
  - vi. Brake Power Certificate is prepared only after actual amount of vacuum/air pressure has been registered in the gauge.
- (b) It should be ensured that BP and FP hose-pipes of the locomotive are coupled to train load. Any misconnection of BP with FP, anywhere on the Passenger rake, can lead to serious disaster.
- (c) Always give special attention to running gears, wheels and axles, bogie suspension and its assemblies.
- (d) Ensure correct buffer height and correct coupling on train.
- (e) Do not allow wheels with sharp/thin flange, hollow tyres, flat spaces, loose tyre etc. of wagons/vehicles.
- (f) Check proper and correct loading of wagons and securing of lashing chains of loads on flat/open wagons.
- (g) Check whether the empty / loaded box lever handles in loaded position or in empty position according to the conditions of the wagons and set the same correctly.
- (h) Do not allow any wagon/vehicle with broken springs and shifted buckles, clamped springs, worn out bent or expanded axle guards, loose or deficient rivets on axle guards, bridle bar or tie bar.
- (i) Ensure repacking/oiling to prevent hot boxes whenever done and timely booking of wagon/vehicle for POH.
- (j) Check the condition of scroll iron, sole bar, head stock of shuckle plates & shuckle pins, catters, split pins, brake gear and brake gears fitting securing of safety brackets for brake beam or pull/push rods etc. safety brackets for brake beam or pull/push rods etc.
- (k) Maintenance/work shop staff should ensure that all brake apparatus including emergency/dynamic brakes are in good working order.
- (l) Staff must ensure that sufficient fire extinguishers are available in pantry cars/inspection carriage/AC coaches/ postal vans/both front and rear brake vans of all passenger carrying trains and that they are tested and functioning properly.

### 3. Miscellaneous staff :

- (a) When any points/ signals/relays /any interlocking gear is to be disconnected, obtain permission from SM through dis-connection memo, invariably, if required.
- (b) All precautions should be taken to avoid uneven loading and overloading. Loading of explosives should be done in the nominated van only.

**2708 Causes of Accident at Level Crossing Gate :**

1. Failure on the part of the Drivers of the road vehicle to observe the safety precautions while approaching near/passing through gate.
2. Negligence of road users while approaching/passing manned/unmanned level crossing gates.
3. Loco Pilot passing Gate signal at 'ON' position without observing proper rules.
4. Carelessness of On duty Gateman.
5. Gateman fails to protect the obstruction at Level Crossing Gate.
6. Gateman fails to protect the line during thick and foggy weather as per rules at Engineering Level Crossing Gates.

**2709 Guidelines for Prevention of Accidents at Level Crossing Gates:**

**1. For Station Masters :**

- (a) Level crossing gates are closed and locked against the road traffic before any movement across the Level Crossing..
- (b) Issue a 'Caution Order" to Loco Pilot if SM fails to contact Gateman on telephone.

**2. For Loco Pilots and Guards :**

Whistle continuously from the whistle boards till LC gate is passed.

**3. For Gatemen :**

- (a) Be vigilant, close and lock the level-crossing gate as prescribed in Gate Working instructions.
- (b) During day, hold red and green flags furled up on separate sticks, the green flag in left hand and red flag in right hand, for use in case of necessity.
- (c) During night keep hand signal burning brightly with white light pointing towards train in hand for use in case of necessity.
- (d) Watch running through trains carefully to detect any abnormality. If any abnormality is noticed, display danger hand signal as warrants to attract the attention of train crew to stop the train.
- (e) During thick and foggy weather Gateman of Engineering level crossing gates should place detonators on the track in terms of S.R.3.61(i).
- (f) If any obstruction is noticed on line, arrange to remove it at once. If unable to do so, protect the obstruction by red hand signal/ red flashing hand signal lamp/detonators as per G&SR 3.62 and SR 16.07.
- (g) When gate is kept in open to road traffic, plant modified red flag / red light on either side of the track as per extent instructions to attract the attention of approaching Train Loco Pilots.

**4. For Miscellaneous Staff :**

Launch safety campaign to educate road users.

**2710 Causes of Fire Accident :**

1. Passengers carrying inflammable articles such as Kerosene, Petrol, LPG cylinders, fire works. etc.
2. Hawkers carrying lighted stoves, 'sigris' and naked flames for making tea/coffee or keeping eatables warm.
3. Hot axle of coaches and wagons of running trains.
4. Planting of bombs or explosives on track and train for sabotaging.
5. Tank wagons valves are not properly secured and wagons not marshalled as per rules.
6. Short circuiting in case of electric fire.
7. Booking and loading of explosives without observing the rules laid down in Red Tarrif.
8. Throwing of lighted cigarettes butts, bidies, match sticks in the compartment.
9. Rough shunting of vehicles loaded with inflammable goods.

10. Accumulation of news papers waste, rags, fruit baskets in vestibule passages/Toilet etc.

**2711 Guidelines for Prevention of Fire Accidents :**

**1. Carriage and Wagon Staff should ensure:**

- (a) Prescribed type/number of FIRE EXTINGUISHERS are provided in Dining / Pantry Cars, Postal Vans, AC Coaches, Inspection Carriages and Brake Van of all passenger carrying trains.
- (b) Fire extinguishers should not be overdue for testing/refilling.
- (c) Sufficient spare FIRE EXTINGUISHERS are available in depots for replacement, whenever necessary.
- (d) Vestibules are cleaned thoroughly and are free from waste papers etc. Vestibule canvas cloth should be provided with fire retarding paint.
- (e) Valves of Oil Tank Wagons are tested, before loading, for leakages.
- (f) No naked lights/flames are carried by staff while attending leaking Oil tanks and wagons loaded with inflammables.

**2. Loco Shed Staff should ensure :**

Prescribed number/type of fire extinguishers are available in Electric/Diesel Locomotives. They should not be overdue for testing/refilling.

**3. Loco Pilots should ensure :**

No naked lights/flames are carried near leaky oil tanks and wagons loaded with inflammables.

**4. Station Staff/Guards should ensure:**

- (a) Trains are watched carefully to detect any leaky oil tanks.
- (b) No naked lights/flames are carried near leaky oil tanks and wagons loaded with inflammables.
- (c) In case of fire, unaffected coaches/wagons are isolated immediately from the vehicles/wagons on fire.
- (d) Fire fighting equipments are available, complete in all respects.
- (e) Updated information in regard to fire fighting agencies located in the vicinity is kept at the stations.
- (f) Loose/fly/hump or rough shunting of wagons loaded with inflammable should not be done.

**5. Electrical Staff should ensure ::**

- (a) There should be no loose connections.
- (b) Terminal connections in junction boxes, switches, lights, fans, regulators and panels are properly secured.
- (c) Fuses/MCBs of proper rating/capacity are used. No sub-standard fittings should be used.

**6. Ticket checking staff/ Coach Attendants/ RPF staff/ Luggage staff should ensure:**

- (a) Passengers do not carry packages containing petrol, kerosene, crackers and other inflammable goods as luggage in the compartment. Checks to be made if luggage is suspected to contain such items.
- (b) No naked lights/stoves/flames are allowed in the passenger compartments.
- (c) Passengers and Railway Staff are not permitted to smoke within Railway premises and on train.

**2712 Duty List and Check Lists of various staff :**

Refer para 801 of Accident Manual.

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CHAPTER - 28

FIRE

**2801 Object :**

Safety against fire hazards of passengers and goods entrusted to the Railway is of the utmost importance and Railway staff should ensure that all precautions are taken to avoid losses caused by fire.

The instructions given below are issued for general guidance of all Traffic Staff. All Traffic Staff must make themselves thoroughly familiar and act when necessary in accordance with these instructions.

**2802 Fire Prevention :**

Most fires are caused primarily due to negligence in one form or the other. If not detected and extinguished in their incipient stage, these may result in heavy loss of life and property.

Some important precautions against fire which should be kept in mind and observed, are given below :-

1. Smoking or lighting a flame in railway premises and in trains is prohibited which should be strictly implemented.
2. Places of work should be kept clean and free from waste paper cuttings, scrap, rubbish etc.
3. Dustbins must be provided for throwing scraps and combustible waste materials and these should be kept at a safe distance from the building.
4. Over loading of electric circuit should be avoided and electrical installation should be checked periodically.
5. Petrol, paints, explosives materials and gases should not be kept in stores and godown which do not conform to the standard specification for such storage as specified in IRCA Red Tariff No. 20.
6. Adequate nos. of fire buckets and fire extinguishers for offices, stores, workshops and shed etc. should be provided.
7. Rules for marshalling and shunting of inflammable, explosives and other dangerous goods as laid down in Operating Manual Para 1307 and Red Tariff No. 20 should be strictly observed.
8. Supervisory staff should ensure that staff working under them are conscious of fire hazards. Circulars and standing orders issued from time to time on this subject are got noted by all the staff and strictly followed.



**2803 Fire Extinguishers fitted in Postal Vans, Pantry Cars, AC Coaches, Inspection Carriages, Brake Vans :**

1. On arrival of a train at a terminal station the train examining staff shall take over charge of fire extinguishers along with other portable equipments of the brake vans and shall be responsible for its safe custody till they are sent out again with outgoing trains. In the same manner, the train examining staff shall also be responsible for properly taking and making over and also of safe custody of fire extinguishers kept in the Postal Vans, Pantry Cars, A.C. Coach, Inspection Carriage etc.
2. Guards of Passenger carrying trains should ensure availability of fire extinguishers in Brakevans.
3. Frequently checks should be conducted to ensure the efficacy and availability of adequate number of fire extinguishers as prescribed.
4. When taking over charge of a train the Guard must examine each extinguisher and if found empty, defective or the plunger driven in he shall report the matter in writing to the Station Master/SE (C&W) who shall replace the extinguisher with one in proper working order.

**2804 Action to be taken in case of Fire :**

1. Any Staff whether on or off duty noticing fire shall :-
  - (a) Raise the fire alarm immediately,
  - (b) Take all possible action to extinguish the fire without any loss of time,
  - (c) Use the available fire extinguishing appliances properly and promptly,
  - (d) Inform the control of Railway Fire Brigade, City Fire Brigades, Civil Police, RPF Control/Post, giving them in brief the correct location of fire and also the material involved, if possible.
2. In addition to above immediate information should also be given to concerned Railway officials of the department whose property is involved in the fire.
3. The seniormost Railway official present at the site of fire, shall see that every action is being taken to extinguish fire also to prevent theft and other miscreant activities. RPF/Police official present at the site of fire will be responsible to guard the property during the occurrence and after. The seniormost fire fighting official present at the site of fire, will ensure proper utilisation of the Fire fighting facilities.
4. Rescue anyone in danger and send the injured immediately to the nearest hospital, salvage documents and property.
5. As far as practicable, the documents and all moveable property adjacent to the fire, should be removed to a safer place under the direction of the responsible staff of the department concerned. A list of the property/ documents so removed should be prepared in duplicate.
6. In case of fire in a sealed wagon, the seals, locks/rivets should be immediately broken (in absence of key of the lock) and the door opened in presence of Station Master/Yard Master/Goods Supervisor/Goods Clerk as the case may be or in presence of Guard when fire on a wagon is in mid-section.
7. In case of fire in electrical installations, switch off the mains before using any fire extinguisher or water on it. In case this is not done, it may prove fatal as water is a good conductor of electricity.



## FIRE

8. Keep the doors and windows of the room, coach wagon etc. closed till such time fire appliances are ready for use on fire or till the time of arrival of fire brigade, if the fire has flared up, keep the gates open and road free from obstructions for easy access of fire brigade engines.
9. Push away coaches and wagons and remove other combustible materials, if any, from the vicinity of fire in order to check its spread and all shunting movement in the vicinity of the affected area should be stopped.
10. The senior most officer/official on the spot should organise bucket chair system, fire fighting party, rescue party, salvage party and watch party, for carrying out operations methodically and efficiently.
11. Appropriate fire appliances available should be used immediately to put out the fire. If fire hydrants and hose pipes are provided on the premises, a line of hoses should be laid out from the hydrant and water jet should be brought into action.

Water column or any other source of water supply can be used freely for fighting fires, if required. If fire breaks out in a wagon or coach the same should be placed immediately beneath nearest water or hydrant if the fire is detected in a sealed wagon, the seal, lock and rivets should be immediately broken (in absence of key of the lock). In case of fire in locked goods shed and parcel shed, the lock should be opened after breaking it and action taken to extinguish the fire.

12. On arrival of the fire brigade, the fire officer should immediately be apprised of the nearest source of water the risk involved and risk apprehended and be given any other co-operation that may be needed. The senior most official of the Fire Brigade will be responsible for efficient working of the unit on the fire.
13. Cause of fire should be investigated and ascertained without delay and any material, clue found or detected must be preserved, if sabotage or inclinarism is suspected.

### 2805 Equipment :

At places where mobile units are not provided only simple fire fighting equipment such as hydrants, fire extinguishers and fire buckets are provided. Normally, the following is the minimum quota of fire buckets, drums and fire extinguishers at stations according to the importance.

| Description                                                          | Fire Bucket stand with chain & lock | Fire Bucket 11 to 14 Ltrs round bottom | Fire Drum 2000 Ltrs | Fire Extinguisher                     | Fire bell |
|----------------------------------------------------------------------|-------------------------------------|----------------------------------------|---------------------|---------------------------------------|-----------|
| Small stations (crossing and flag)                                   | 1                                   | 6                                      | 2                   | -                                     | 1         |
| Medium stations (Goods booking)                                      | 2                                   | 12                                     | 2                   | 4<br>(2 in stn. & 2 in Parcel office) | 1         |
| Goods Shed                                                           | 2                                   | 12                                     | 2                   | 4                                     | 1         |
| Parcel Office                                                        | 1                                   | 8                                      | 2                   | 2                                     | 1         |
| Large station according to the local requirements and justifications |                                     |                                        |                     |                                       |           |

**2806 Inspection of Fire Appliances :**

The supervisory office-in-charge of a place viz., Station, Goods Shed and Yard, Parcel Depot, is responsible for the following Fire prevention duties.

1. To see and ensure that Fire prevention instructions issued from time to time are strictly observed.
2. That 'No-smoking' Notice Board are provided specially where smoking is considered dangerous.
3. That Notice Boards indicating current telephone numbers of the nearest Railway and City Fire Brigade are provided and displayed at stations, Goods Shed, Parcel Offices, yards and staff know how to summon a Fire Brigade.
4. Where water tanks, barrels or buckets are provided, Station Master must see that they are always kept full of water and conveniently placed in suitable position. A little kerosene oil should also be dropped in the water to prevent breeding of mosquitoes. Water should be replaced periodically.
5. At least two fire buckets out of six must be filled with sand or earth, which should be topped or changed at least once every month.
6. The water receptacles and all fire appliances must be kept in a position where they can be had within a moment's notice, and all the staff should know where to find them.
7. That any defects, noticed in the fires appliances are got remedied with least possible delay by writing to the authorities concerned.

**2807 Maintenance of Fire Extinguishers :**

Maintenance is done either on contract basis or departmentally as directed by the DRM.

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CHAPTER - 29

SIGNAL ENGINEERING

**2901 Fixed Signal :**

Fixed signal means a signal of fixed location indicating a condition affecting the movement of a train and includes a semaphore arm or disc or fixed light for use by day and fixed light for use by night.

**2902 Signals :**

These are used to ensure and enhance the safety and efficiency in train operations. The use, placement, description and working of signals is detailed in chapter-III of G&SR book.

**2903 Points :**

Points are the movable tapered pieces of rail by which either of two routes may be set. Each piece is usually known as tongue or blade or switch. It has a toe (the thin end) which fits against the stock rail, the other end being known as the 'Heel'.

Points are further classified as:

1. **Facing Points :**

Points, the toe of which faces traffic approaching them and which can be directly diverted from the line upon which it is running are called facing points.

2. **Trailing Points :**

Points, the heel of which faces traffic approaching in the normal direction are called trailing points.

3. **Coupled Points :**

When two or more points are worked by the same lever, they are called coupled points.

4. **Cross Over :**

It is a permanent way connection between two lines where they cross or join one another.

5. **Trap points :**

These are the points provided in a line to prevent unauthorised movements from that line to another line. These are having only one Tongue rail, which remains in normal position. After their proper settings, movements can be allowed. It is a derailing switch connected to a line for the purpose of isolation.

**2904 Locking of Points :**

1. **Positive lock :**

A plunger lock is attached to hand worked points for locking them. The lock is released by a key, whenever the points are to be operated.

2. **Cotter and Bolt :**

These are provided to lock the nose of the switch rail set with the stock rail. It can be locked also with the help of padlock to keep the points locked in the required position.

3. **Lock Bar :**

A metal bar mounted along side the running rail and connected with a lever or an operative units in such a manner that the lever or unit is prevented from being moved so long as the presence of vehicle prevents the bar from being raised. Minimum length of lock bar on BG is 1280 cm and on MG 1220 cm. An inside lock bar lies 38 mm below the top of the rail. Facing points lock must be fitted on the gauge tie plate.

4. **Detector :**  
A detector is an appliance which when provided at facing points ensures the points being correctly set before the relevant signals can be taken off. It also prevents the points being worked until the signal has been put back to 'ON'.

**2905 Main Components of Points and Signals :**

1. **Compensator :**  
It is an appliance for compensating the expansion or contraction caused by change of temperature in a run of rodding or wire line connecting points/signals.
2. **Disengager :**  
It is an appliance for breaking the continuity of control. When provided in the outer signal wire run, it prevents the outer signal from being lowered before the Home signal has been taken off.
3. **Mechanical signal replacer :**  
When a semaphore signal is taken off for the train, the depression of rails caused by the weight of the train, while passing the signal actuates this device which is fixed to the rail and connected to the signal and puts the signal to the "ON" position.
4. **Electrical signal replacer :**  
A device operated electrically is used to put the signal to the "ON" position. This works in conjunction with a mercury treadle or track circuit. The ESR is fitted on the signal post.
5. **Electro pneumatic :**  
A system of power signalling where points or signals are worked by means of compressed air controlled electrically from the signal cabin.
6. **Gauge tie plate :**  
A metal plate is fixed on the sleeper at the toe of points to maintain gauge.
7. **Slotting :**  
This is a process by which signals are controlled by two or more persons. Where signals are slotted such signals can only be taken off by the combined efforts of all persons slotting the signal but can be put back to danger by anyone of the persons. This may be mechanical or electrical arrangement.
8. **Crank :**  
It is an appliance fitted with the rodding to change the direction of the motion given by the lever.
9. **Clutch resetting lever :**  
A lever used to re-set a double wire clutch wire lever which has trailed due to overload wire breakage or obstruction between stock rail and tongue rail. This lever is kept in possession of the SS/SM and sealed on a bracket or box.

**2906 Mode of Operation of Signals :**

1. **Single wire :**  
Single wire system was introduced to suit the operation of two aspect lower quadrant signals mechanically. Following major equipments are used for operating the signals by single wire:
  - (a) **Lever frame :** A lever does the dual function for operating the signal and also actuating to ensure safety. Lever frames used on Indian Railways are of two types:
    - (i) Direct locking lever frame
    - (ii) Catch handle type lever frame.

(b) **Signal transmission :**

A steel galvanized wire is used for signal connections from lever frame to signal post.

(c) **Supports of transmission :**

Signal wires are carried on pulleys which are mounted on pulley stakes firmly driven into ground.

(d) **Cabin wire adjuster :** A pull up type wire adjuster is provided in the cabin.

(e) **Signal posts and fittings.**

2. **Double wire :**

Double wire signalling system employs two wires for the transmission of stroke from the lever to the operated functions viz. points, signals, locks, detectors etc. A double wire transmission consists of silico steel galvanised wire carried on pulleys which are mounted on pulley stakes firmly driven into ground. This is an arrangement on the safe side which also ensures that the signal takes up its position corresponding to the position of the lever in the cabin.

The operation of the signal lever from 'Normal' to 'Reverse' or from 'Reverse' to 'Normal' is positive and smooth. Double wire signalling has a number of advantages over single wire signalling in terms of ease of operation, display of definite aspect by MAUQ signals, no drooping, longer range of operations for points and signals and less operating staff requirements etc.

3. **Power operated :**

Certain signals installed at a station are beyond the working range of mechanical signalling as such electrical motors are being used to operate the signals. Moreover, colour light signals are generally electrically operated.

**2907 Braking Distance :**

This is the distance required for a train to come to a stop when running at the maximum permissible speed of the section.

This distance varies with the gradient, speed, brake power and weight of the train. Braking distance is also kept in view while fixing the location of reception signals.

**2908 Sighting Distance :**

Is the distance between the place where a Loco Pilot first sights a signal and the signal.

**2909 Minimum Visibility Requirement for Signal in Lower Quadrant Signalling :**

Outer (for speed 100 kmph)	1200 metres
(for speed less than 100 kmph)	800 metres
Home	400 metres
Main Line Starter	400 metres
Loop Line Starter	200 metres

**2910 Power Signalling Devices :**

An efficient signalling system not only provides mechanical methods of signalling but also uses electric energy devices like slotting etc. For more advanced methods of signalling, operation of points and signals is arranged through Electric power or Electro-pneumatic power. The common devices in power signalling are

### 1. Relays :

A relay is an electrically operated device which has basically two conditions, either it is energised or de-energised. When it is energised the set of contacts are made called front contact, and when de-energised are termed back contact. These two conditions cannot be made at the same time as they are contradictory and this is made use of achieving the relay interlocking. Thus if the locking relay is energised its back contact is not available and hence the other relay is locked as it cannot be energised. Based on this property a whole set of circuits is developed to set the points, clear the signal, slotting etc. These sets of circuits interlock among each other to achieve essentials of interlocking.

### 2. Track circuits :

- (a) A track circuit consists of portion of running rails insulated on both ends. It is fed electrically at the end and a track relay connected at other end.

The track circuit is employed to indicate to the SS/SM on duty the presence of a train vehicle at a portion of line which may be out of his sight and to control the signals or block instrument.

Track circuits can be of following types –

1. AC Track circuits – used in DC traction area.
2. DC Track circuits – used in AC traction & Non electrified area.
3. AFTC- Audio Frequency Track Circuits –used both in AC & DC traction areas and as well as non-electrified areas.

Axle Counter Track circuits – used both in AC & DC traction areas and as well as non-electrified areas. In this track circuits rail is not continuous part of track circuit.

### (b) **Application of track circuit :**

- (i) Automatic signalling installation, on double and single line
- (ii) Intermediate Block Signalling
- (iii) Panel Interlocking
- (iv) Route Relay Interlocking
- (v) Centralised traffic control
- (vi) Power signalling installations
- (vii) Mechanised hump yards
- (viii) Track circuiting of run through and reception of lines for giving indication to SM/In charge of cabin
- (ix) For tokenless block instruments on single line sections.
- (x) To replace a signal at danger.
- (xi) To provide approach locking and lighting of signals and back locking of points.
- (xii) To provide automatic warnings of an approaching train to the Gateman of a level crossing.

### (c) **Failure of Track Circuits :**

Track circuits should be considered to have failed in following cases when:

- (i) Track circuited section is occupied but does not give red illumination on the panel.
- (ii) Track circuited section being unoccupied shows red illumination on the panel.
- (iii) Track circuited section gives red illumination on the panel and signal controlled by it can be taken off on noticing such defects, the signal concerned should be treated as defective and the train should be worked under rules for defective signals.
- (iv) Failure of track circuits, which control block instrument, should also be treated as

failure of Block Instrument.

- (v) In the event of failure of track circuit controlling the points, the panel ASM on duty should first verify that the concerned track is not occupied by any vehicle or train then should reset the points.
- (vi) Failure of IBS track circuit will also result in failure of Advanced Starter and Home signal (IBS/IBP), then procedure as detailed in G&SR 3.75 should be followed.

**3. Axle Counter :**

- (a) It is a device for counting the number of axles of the vehicles comprising a train passing over a given point. The apparatus provided at two points proves whether the complete train has passed over the section of line between them. The main components of axle counting system are the detection points and the counting equipments. In axle counter a counting action is produced at two detection points which is compared to check whether the axles passing at one point is equal to the number of axles leaving at the other end. The condition of section whether 'Free' or occupied is indicated by means of counter. For every entering axle, the count is increased by one and for every exit it is decreased by one. Thus zero position indicates in clear section. It is fully electronic system which counts the axles. It consists of –

- (i) Outdoor equipment (Detection Sets)
- (ii) Transmission Cables
- (iii) Indoor equipment (Counting Machine) :

The two detection sets are mounted on rail by means of clamps. Counting machine is provided in indoor equipment.

**(b) Reset Button :**

A reset button is provided in the SM's cabin to normalise the axle counter equipment in the event of any failure. Such resetting is done only after verifying from the station in advance that the preceding train has arrived there complete. Procedure given in SWR/Block Manual should be followed.

**2911 Tappet Locking :**

To prevent conflicting routes from being set or conflicting signals being taken 'OFF' in the Mechanical Signalling Systems, it is necessary that levers operating various points are locked with each other on a certain pattern. The locking generally required is:

1. One lever locking another when pulled. This is known as "Normal locking".
2. One lever releasing another when pulled is known as "Reverse or Release locking".
3. One lever locking another in either position is known as "Both way locking".
4. One lever locking or releasing another when third lever is either normal or reversed is known as "Special or conditional locking".

The 'TAPPET' is a flat bar of Milled steel attached to each lever which can move perpendicularly to channel provided by 'Applet Ways' fixed in a locking tray, generally placed below the lever frame in the cabin. The tappets have notches cut in the sides whereas in the channel there are wedge shape blocks which can fit into the notches of the tappet and once these fit into the notches, the tappet can not be moved and hence the lever is locked unless they can be pushed by operation of the lever.

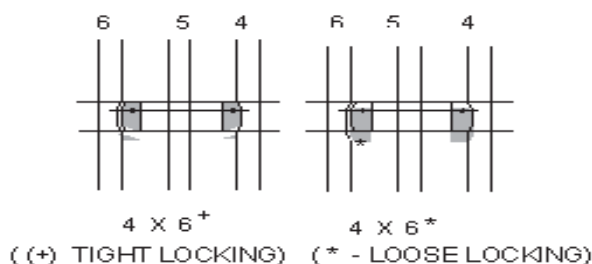
There are two types of Tappet locking:

- (a) Tight locking- if the tappet notch is more than the locking dog it is loose locking
- (b) Loose locking - if size of the tappet notch is equal to the locking dog tight locking is achieved

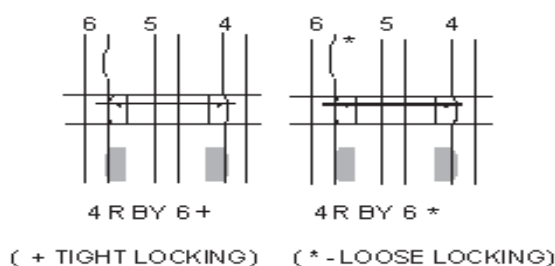


- (c) Tight locking achieves the safety where as loose locking will give better operational flexibility in the yard.

**Tappet locking plans for loose & tight locking are given below**



a) LOCKS NORMAL



b) RELEASE BY LOCKING

**2912 Isolation :**

It means an arrangement, secured by the setting of points or by other means, to protect the line so isolated from the danger of obstruction from other connected line or lines.

**Means of isolation :**

1. By setting of points
2. Trap points/derailing switch
3. Permanently locked points
4. Sand hump of approved design
5. Snag dead ends
6. Short dead end siding of not less than 180 metres length
7. Catch siding/slip siding
8. Scotch Block

**2913 Speed on Facing Points :**

The maximum speed that can be permitted on a section is dependent on strength of track and bridges, radius of curves, density of sleepers, ballast cushion, gradients, type of rolling stock, braking and motive power of locomotive, load of the train and type of signalling and interlocking including structure of the points, turn out etc. Curvature of a turn out restricts the speeds on loop line.

**2914 Interlocking :**

It means an arrangement of points, signals and other appliances operated from a panel lever frame etc. so interconnected by mechanical locking or electrical locking or both that their operation must take place in proper sequence to ensure safety.

**2915 Basic Principles of Interlocking :**

1. It shall not be possible to take off conflicting signals at one and the same time.
2. It shall not be possible to take off signals for a running line unless:
  - (a) All the points on the running line are correctly set and facing points locked.

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- (b) All points, giving access to the running line from the sidings and goods line are set against the running line.
  - (c) Level crossing gates controlled by interlocking are closed and locked across the road traffic.
  - (d) The running line referred to above should include adequate distance also.
3. Once a signal lever is pulled to take off signal it must lock or back lock as necessary the levers operating the points and gate locks referred to above.
  4. When a signal is in the 'ON' position all points which would be locked by taking it 'OFF' must be free for shunting purposes.
  5. It must be impossible to take off a Warner signal until all the relative stop signals in advance have first been taken off and when taken 'OFF', it must back lock all such signals.
  6. Advanced starter/last stop signal cannot be taken off unless line clear has been obtained from the block station in advance.

### 2916 Indirect Interlocking :

Indirect interlocking means that the points are set and locked from one place and signals are operated from another place and another lever frame. The interlocking is effected by means of keys carried from one place to the other.

### 2917 Direct Interlocking:

It means that all levers viz. the points levers, the point lock levers and the signals levers are concentrated in one lever frame and worked there from, the interlocking is effected by means of rigid connections between levers by mechanical and/or electrical means.

### 2918 Standard of signaling and interlocking

Interlocking of stations is standardised into four different classes i.e. Std. I, II, III & IV. The operations are as follows-

SN.	Item	Standard -I	Standard -II	Standard -III	Standard -IV
1	Allowable speed (kmph.)	Up to 50	Up to 110	Up to 140	Up to 160
2	Isolation	Y *	Y	Y	Y
3	Two Aspect (2A) Semaphore / Multi Aspect (MA) Signalling	2 A / MA	2 A / MA	MA	MA
4	Double Distant	N	Y **	Y	Y
5	Point Operation	Mech.	Mech./ Elect.	Mech./ Elect	Elect.
6	Point Locking	Key / FPL + / HPL x	FPL / Point Machine	FPL / Point Machine	Clamp type direct %
7	Point Detection	Mech./ Elect.	Mech./ Elect.	Mech./ Elect.	Elect.
8	Lock Detection	N	Y	Y	Y
9	Interlocking	Key / Mech.	Mech./ Elect. / Electronic	Mech./ Elect. / Electronic	Elect. / Electronic
10	Track Circuiting	N	Mech. Interlocking : Run through lines (Main), Elect./ Electronic : All Running lines	All Running lines	All Running lines
11	Block Working (Minimum)	Token	Token / SGE	# SGE / TC	# SGE / TC
12	Preventing signal passing at danger	N	N	N	Y %

\* - Isolation is not compulsory provided that condition laid down in the second paragraph of the General Rule 4.11 are complied with 'Limits of speed' while running through stations-

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- 1 No train shall run through an interlocked station at a speed exceeding 50 kmph or such less speed as may be prescribed by approved special instructions unless the line on which the train is to run has been isolated from all other lines by the setting of points or other approved means, and interlocking is such as to maintained this condition during the passage of the train.
2. In every case in which trains are permitted to run through on a non-isolated line, all shunting shall be stopped and no vehicle unattached to an engine or not properly secured in accordance with rule 5.23 may be kept standing on a connected line which is not isolated from the through line.

\* \* - Double Distant on sections where goods trains have braking distance of more than 1 km.

FPL + - Facing Point Lock

HPL x - Hand Plunger Lock

% - Desirable –

# -At stations provided with Central Panel Interlocking (CPI) or High Density routes: Means for verifying complete arrival of trains by suitable means.

Note -These new / revised features will only apply to future signalling and interlocking installations. Where existing installations do not fulfil these requirements, existing speed of operation may be permitted to continue.

### 2919 Failure of Interlocking :

In the event of failure of interlocking or key locking station, station will be worked as non-interlocked under the line labels and badges system or in accordance with special instructions contained in the Station Working Rules.

### 2920 Painting of Levers :

1	Warner signal (two aspect) lever	'Green'
2	Distant signal (Multiple aspect) Lever 45° aspect	'Yellow'
3	Distant signal (Multiple aspect) lever 90° aspect	'Green'
4	Other stop signal levers	'Red'
5	Slot lever mechanical	Same colour of the lever slotted with 15.2 cms/6" wide 'Blue' band in the middle.
6	Slot lever electrical	Same colour as of the lever slotted with 15.2 cms/6" wide 'Yellow' band in the middle.
7	Points lever	'Black'.
8	Facing point lock lever	'Blue'
9	Economical facing point lock lever.	Upper half 'Black' Lower half 'Blue'
10	Station Master's control lever	Upper half 'White' Lower half 'Black'
11	Level crossing gate control lever	'Chocolate'
12	Release lock lever	'Black' with a 15.2 cms/6" wide "Blue band" in the middle.
13	Detector lever (DW)	'Red and Blue' bands 15.2 cms/6" wide alternatively.
14	Route lever	Upper half 'Red'; Lower half 'Black'
15	Siding key control level	'Black'
16	King lever	'Red and White' bands 15.2 cms/6" wide alternatively.
17	Spare lever	'White'

**2921 Symbols and Plan Reading :**

Diagram at Annexure shows the symbols generally used on the station yard diagram to represent the apparatus and their method of working.

**2922 Adjustment of Signal Wires :**

Refer to instructions contained in GR 5.01 (2).

**2923 Carrying Out of Signalling and Interlocking Works of Maintenance, Repairs, Additions, Alterations etc. :**

Refer to instructions contained in G&SR 3.68, 3.77, 15.06, 15.08, 15.16.

**2924 Sighting/Warning Boards :**

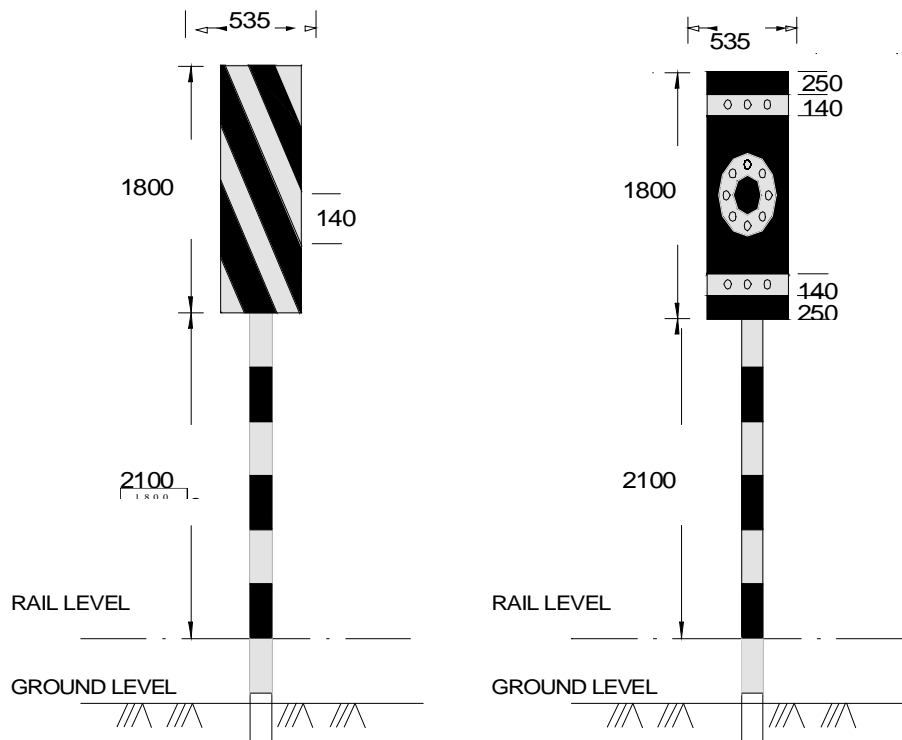
1. The sighting board is an indication to the Loco Pilot that he is approaching the First Stop Signal of a station or a gate signal. This board however does not indicate to the Loco Pilot the aspect displayed by the signal. There are two types of sighting boards:

- (a) Passenger sighting boards
- (b) Goods sighting boards

Sketches of the two types of the board are given below:

**(a) Passenger Sighting Board**

**(b) Goods Sighting Board**

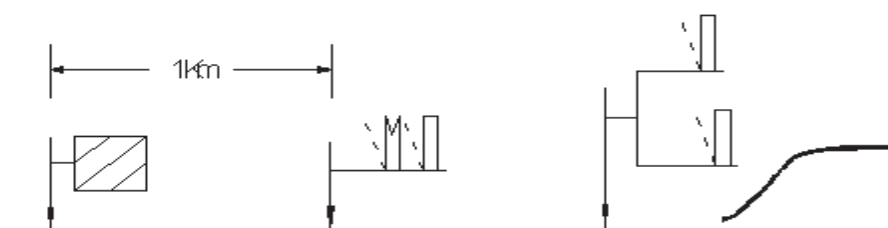


**2. Passenger Sighting Board :**

For speeds above 72 KMPH. on B.G. and 48 KMPH. on M.G. warning sighting board is provided at a distance of 1000 Metres in rear of the First Stop Signal. A Sighting Board need not, however, be provided where the First Stop Signal is preceded by a Warner or Distant Signal and the distance between Warner, Distant Signal and the First Stop Signal is 1000 Metres or more.

**Illustration of Sighting Board is given below:**

**Lower Quadrant Signalling with Warner below outer signal**

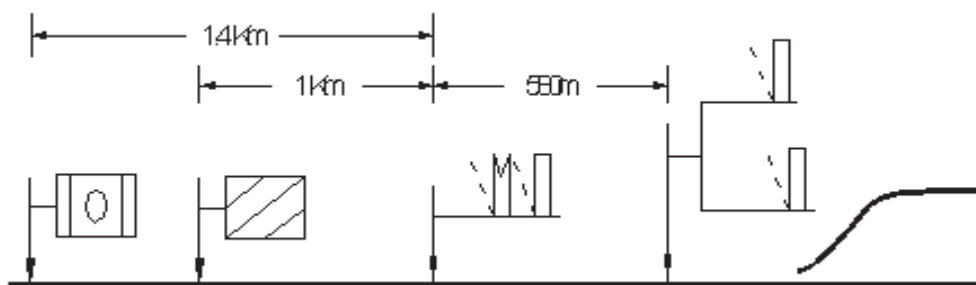


**3. Goods Sighting Board (2<sup>nd</sup> Sighting Board) :**

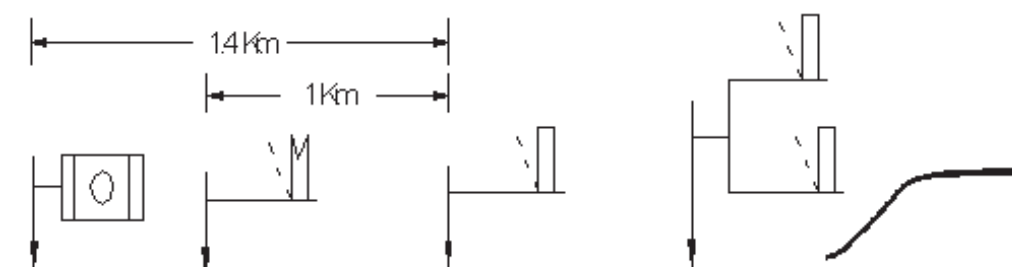
Irrespective of gauge or sections where the maximum permissible speed of goods trains is more than 72 KMPH, goods sighting board is provided at a distance of 1400 Metres in rear of the First Stop Signal.

**Some illustrations are given below:**

**(a) Lower Quadrant Signalling**



**(b) Lower Quadrant Signalling with Warner on a separate post**



(c) Upper Quadrant Signalling

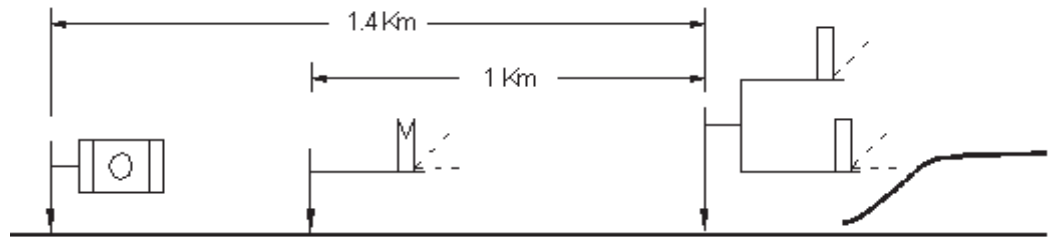
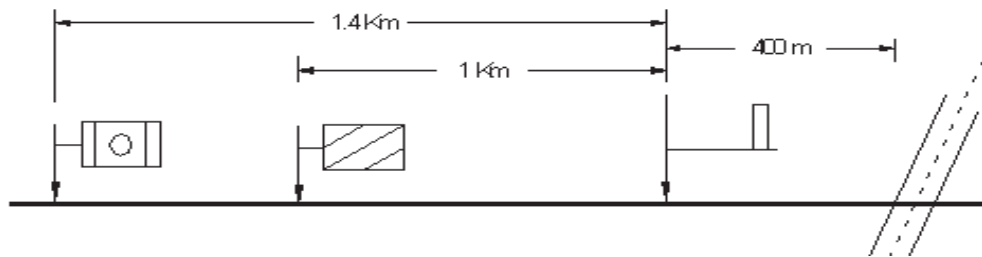


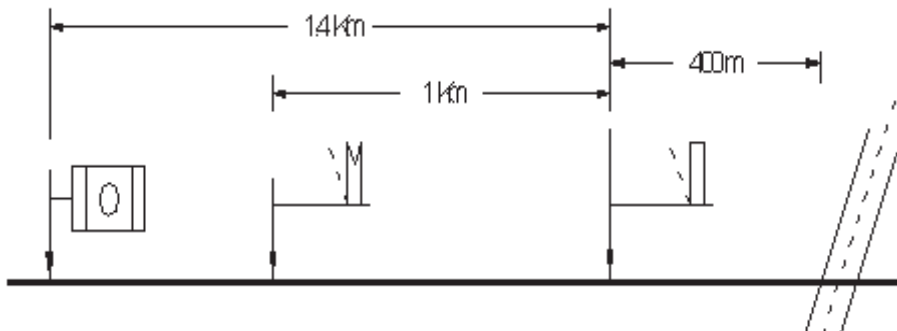
Illustration of Sighting Board for L.C. gates are given below:

(a) Lower Quadrant without separate Warner



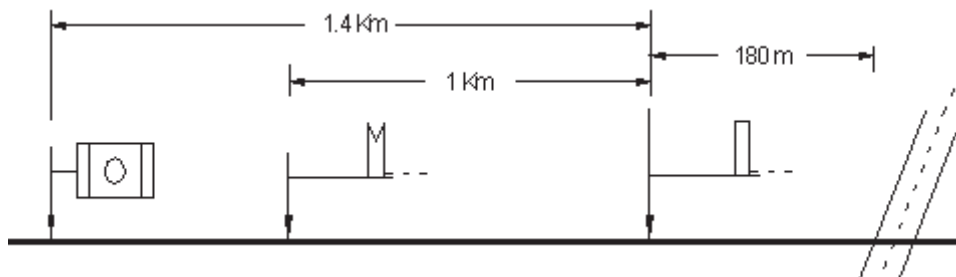
Note: A goods sighting board is to be provided only when the sectional speed is more than 72 KMPH. for goods trains.

(b) Lower Quadrant with separate Warner



Note: A goods sighting board is to be provided only when the sectional speed is more than 72 KMPH. for goods trains.

(c) Upper Quadrant Signalling



Note: A goods sighting board is to be provided only when the sectional speed is more than 72 KMPH. for goods trains.

4. On various sections of Rajdhani route where a maximum permissible speed of 120 KMPH. has been permitted. Goods Sighting Boards have been shifted farther from this stop signal as indicated below to allow for longer braking distances where First Stop Signals are on, or approached by, falling gradients:

1 in 500 falling 1500 metres

1 in 250 falling 1550 metres

1 in 200 falling 1600 metres

5 **Important :**

If the First Stop Signal is not visible from or before a sighting board, either directly or through the Distant/Warner signal, the Loco Pilot should control the speed of his train as if the First Stop Signal is at 'ON'.

### 2925 **Panel Interlocking :**

1. (a) Panel interlocking is a system of centralised operations of points and signals provided normally at a small station. Generally it is provided in colour light signals, electrically operated points machines and track circuit or axle counters. In this system, all the functional operations for a train movement relating to track are controlled by knobs or push buttons through a net work of electrical circuits with relays and automatically checked by inter-related control circuits to suit safety requirements:

The system requires that:

- (i) All points in the route overlap and isolation are set individually to the required position.
  - (ii) The route is set to the required line and signal cleared afterwards.
  - (iii) As the train passes and clears the route and operating switches are restored to the normal position, the route clears and get released.
- (b) The panel depicts/schematic reproduction of the entire track layout of the station with different track circuits being painted in different colours. The points, signals as well as train routes are controlled by means of push buttons, located within the track layout diagram of the panel at their respective geographical position.
- (c) Indications regarding setting and locking of the points, setting and locking of route and signal aspects are given on the panel.
- (d) The panel is also equipped with SM's lock up key to enable the SM on duty to lock the panel. The SM on duty must not permit unauthorised persons to operate the control panel and must lock the panel whenever he leaves his seat. No operation can take place without the use of SM's key.
2. **Description of various push buttons :**
- (a) Route or track buttons
  - (b) Signal buttons
  - (c) Points buttons
  - (d) *Group buttons :*
    - (i) Common group buttons
    - (ii) Group slot button



- (iii) Common calling on signal button
- (e) *Emergency buttons* :
  - (i) Emergency buttons for point operation (EBPU)
  - (ii) Emergency signal button for throwing a signal to danger in case of emergency or cancellation of route (EGBS)
  - (iii) Route section release button/route overlap release button provided for cancellation of route section, with counter on the panel (RRBU/UOS).
  - (iv) Emergency route release button for releasing the whole route when locked (ERRB)
  - (v) Signal failure button to be pressed to silence the buzzer (GXN).
  - (vi) Points failure button to be pressed to silence the buzzer.
  - (vii) Some other buttons are also used where IBS and axle counter arrangements are provided as such:
    - Axle counter resetting button with counter
    - IBS resetting button with counter, in case of previous train passed IBS at ON.
    - Common permission button for resetting of Axle counter.
    - Hooter off button for silencing when train passed IBS at ON.

Note: Description of individual button is given in SWR diagram.

### 3. **Siemens system :**

The control panel used in this system consist of 'DOMINO' pattern rectangular pieces all arranged to form control panel. Self restoring push buttons are used. The geographical lay out of the yard is reproduced on the control panel with different buttons for points, signals routes etc. provided at their corresponding position. This system also used the 'NX' system of working and a signal button at the entrance end and route button at the exit end. To achieve this interlocking several group buttons which are common to certain functions are also provided on the panel as mentioned above.

### 4. **Panel operation in Siemen's system :**

The points are first set by operating the individual point button and the common group point button. Every time the buttons are operated, the points are turned from one position to another, it is indicated by white strip of light.

After the individual points in the route overlap and isolation are set to the required position, the route is set by pressing the concerned signal button and also the relevant route button simultaneously. This operation of keeping both the button pressed simultaneously about 2 to 3 seconds signal comes to "off" position.

The signal indication is given by a green light only which shows that the signal is in "off" position irrespective of the position of signal outside. The route set on the panel is also indicated by white light extending from the signal to the next signal in advance and overlap position also.

As the train occupies and clears the track circuit in a sequential order, the route indication turns from white to red and thereafter white, after a train clears a particular sub route only, then that route is released. Thus the whole route gets released automatically by

the occupation and clearance of track circuits when the signal has been cleared by the above process, the points in the route, overlap and isolation get electrically locked which is indicated in the panel by a strip/dot at the converging point. Use of various group buttons emergency buttons etc. is incorporated in the station working rules.

### **2926 Route Relay Interlocking (RRI) :**

1. The route relay interlocking is an improvement on the panel interlocking and generally adopted for big yards, junctions having large number of points and signals and frequent yard movements. In this system, points in the route overlap and isolation get set automatically to the required position when a route setting is initiated from a signal to a required route.

Entrance- exit (N-X) system is being adopted on Indian Railway but generally N-X type Siemen's system is adopted on Western Railway.

The principle adopted is based on operating two or more than two buttons simultaneously for 2 or 3 seconds and releasing them. In some cases it would not be possible to reach the two extreme buttons on the either side of the operator, hence to avoid this difficulty two panels one for operation and one for indication have also been adopted.

#### **2. Indications on panel in RRI :**

The normal indications available are points by means of straight slit for normal and diagonal slit for reverse and the signal indications by a small red light, independent shunt signals by a small white straight slit. The additional facility in Siemen's system for indicating abnormal conditions of point or signal indication is given by means of a flashing indication. When a point flashes in normal it shows that point is not set properly at site or detector contacts are not making properly. Slot indication is also shown where necessary. Indication for prolonged operation of buttons, points and signal lamp failure etc. are also indicated.

#### **3. Colouring scheme for buttons/track circuits :**

The various buttons are provided for the points main signals, shunt signals, routes, emergency, special and other group buttons for points and signals etc. These buttons are self restoring, to identify these buttons different colouring scheme is adopted. Colouring scheme is also adopted to identify track circuits. Every track circuit on the panel is represented by prime colour except black colour indicates a non-track circuited area.

#### **4. Operation of RRI :**

The panel is also equipped with SM's lock up key to enable the SM on duty to lock the panel. The SM on duty must not permit the unauthorised persons to operate the control panel and must lock the panel whenever he leaves his seat. Except in Emergency of putting back the signal to danger, no operation can take place without the use of SM's key. If the points are required to be operated individually for testing and maintenance purposes, the concerned points button and common group point button (COPB) is pressed simultaneously and released. This action turns then point from one position to other i.e. N-R Operation of the same buttons for the second time will bring back the point of R-N position. The points remain in the last operated position. For clearing the signal, the signal button is pressed in conjunction with the relevant route button and the buttons are released after 2 or 3 seconds. This operation sets all the points in the route, overlap and isolation to the required position and then clears the signal. The whole

route from that signal to the signal in advance is also set. This is indicated by white light continuously including the overlap. If all the conditions for taking off signals are fulfilled one signal clears 'OFF' aspect.

The whole route from one signal to the next signal comprises of one or more sub-routes. Each sub-route is generally formed of one point. Points lying for the straight and for turn out are considered as two route sections for that particular sub-route. The facility of route sections and sub-route is very much useful to effect sectional route, route release and to increase operational flexibility of the yards. As the train passes the signal and occupies and clears the track circuits in a sequential order the sub-route gets released automatically one by one till the train comes to on berthing track. The sub routes released in this way in the rear can be immediately used for any subsequent movement involving that sub-route. The overlap position gets released after a time lapse provided the train has occupied the berthing track in rear of the overlap and last sub-route in rear has released. The time delay ensures that the points in the overlap do not get released when the train is approaching. The approach and back locking is also provided. A set route from one signal to next signal in advance can be released by ERRB 3 button operation which is recorded by a counter. This cancellation facility is possible after a lapse of 120 seconds in case of approach locking. This operation is also recorded by a counter. Emergency button release operation is also permitted to release whole route by RRBU cancelling all sub-routes. But this operation being of extreme emergency requires the co-operation of signal maintenance staff and the operator. The special key is kept sealed by the maintenance staff. This is also recorded by another counter called RRBU.

Special facilities exist for converting a particular signal or signals to Semi-Automatic working. The voltage of signal lamp can be increased in the day time and reduced in the night time by the use of day and night buttons. All panel buttons operations are explained in SWR of the station

### **2927 Centralised Traffic Control (CTC) :**

It is the centralised operation of all points and signals at the various stations on a section of the Railway at one single location into the hands of a single controlling official. CTC consists the following elements:

1. Provisions for electrical operations of points and signals with panel interlocking located in the Station Master's office.
2. Complete track circuiting/axle countering of the controlled section.
3. Remote control of points and signals at all stations on the controlled section and remote monitoring of the stations of points, signals, track circuit etc. from the control office.
4. Provision of intermediate block signalling for increasing line capacity.

All the movements in the section are centrally directed and usual system of block operation is dispensed with. The section controller is connected by means of control telephones to all SM's stations in his section who furnishes information to him about running of trains in the section. Generally both the human agencies i.e. SM and controller are involved in train operation, one controlling from central office and other actually obtaining line clear, setting up routes, taking off signals often relaying on cabin men to perform these functions, certain amount of delay and inefficiency creeps in. But in CTC system operator not merely train control but also have train operation over a section.

Generally CTC is provided at a central place controlling stations on either side. The operator is provided with a control panel on which entire section under his control is depicted. Operating knobs for signals, route, points, local control, remote control etc. are located at the relevant junction. The indication regarding the occupation or otherwise of the tracks is also depicted. The operator has a full view of the section and therefore to formulate the movements of trains he is in a better position.

The control from the operator can also be transferred to SM if necessary for operation of equipment by satellite stations locally thus enabling the SM to control the field stations in case of emergencies.

A modern CTC installation may have a television monitor wherein the required station details can be called for and projected in front of the operator.

### 2928 AWS-Auxiliary Warning System

To avoid accidents mainly due to the Human error which contributes 80% of the train accidents AWS has been provided on the Mumbai suburban section of Churchgate -Virar. It provides following facilities or aids to the motorman:-

- Instantaneous visual indication on the cab panel of the signal just passed
- An audible indication on the cab panel of the signal just passed which is other than Green and double yellow
- Compulsory acknowledgement within 4 seconds, else penalty brake will apply
- If motorman does not control speed to 38 KMPH before 290 m of approaching the next signal, first service and then emergency braking stops the train.
- If motorman passes a signal at danger, the AWS system applies emergency brakes to stop the train immediately.
- It continuously monitors the authorized speed & alerts the motorman through an audible alarm whenever the permissible speed is exceeded by motorman.

#### **AWS system broadly consist of following parts-**

- Track Equipments – consisting of track magnet fixed at rail level on right side of track, coupled with signal aspects through an opto coupler card.
- Cab Equipment- consist of an Indication panel mounted in front of motorman and consist of various audio- visual indications for guidance of motorman. In addition to this digital speed indicator Vigilance& Reset button and counter are also provided on this panel.
- The central processing unit receives inputs from interacted engine magnet & Tacho generator which are evaluated by AWS system and accordingly provides Audio- visual indications on the panel in front of Motormen. This also monitor the responsive actions of Motormen and generates commands for brake applications as required.
- In case of equipment becoming defective it can be isolated by means of isolating unit to prevent malfunctioning.

#### 1. **Operational Instructions –**

**Motormen to ensure the following before starting the journey.**

- a) AWS isolation switch is in on position and sealed.
- b) AWS MCB is in ON position.'

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- c) Feed cut off magnet valve isolating cock no.2 (on thick pipe) is in closed position (90) to the pipe.
- d) Exhaust Magnet valve isolating cock no.2 (on thin line) is in open position. (parallel to the pipe).

Note –The normal position of various switches/cocks as indicated above should not be changed except under failure condition of AWS equipment.

1.1 When Motorman switches ON the AWS equipment, following indications should appear on the indication panel-

- a) blue and white lamp lit.
- b) blue lamp extinguishes and relit steady.
- c) White lamp flashes and relit steady.

1.2 Before a Motorman starts his train, he has to carry out functional test to see that AWS equipment is ready for use. In this test vigilance button is pressed for more than 8 seconds. White lamp flasher, blue, red and yellow lamp lit steady.

When vigilance button release, hooter sounds and white lamp lit steady, red and yellow lamp extinguishes. Steady blue and white lamp indicates that AWS equipment is in order.

1.3 At the exit of car shed brake test is carried out by the Motorman, in this while passing testing magnets corresponding to red aspect, at the exit of car shed, emergency brake should apply with continuous hooter and red lamp lits steady, reset by pressing green button, proceed with 15 kmph speed upto next signal.

1.4 During failure condition of AWS track device / AWS cab equipment, Motorman has to isolate the AWS by operating the isolation switch and note down the isolation switch counter reading in the equipment isolation card kept in the driving cab.

1.5 At the time of reversing or rolling back the AWS rake by more than 2 metres, service brake will be applied with hooter and red lamp flashing. If the distance exceeds 5 meters emergency brakes are applied automatically with hooter and steady red indication. On stoppage of train brakes are released.

1.6 Motorman and Guard should ensure that the control switch of their respective cab is in off position before leaving the cab.

2. Instructions in the event of mal-functioning of AWS -

- If the AWS malfunction, the Motorman makes entry on the relevant card and isolate it.
- The rake moves to destination with AWS isolated.
- On the return trip the Motor cab will become the brake cab. However, when this cab again becomes Motorman's cab, the Motorman will reactivate the AWS. If it malfunctions more than 3 times in a day, it shall be closed till it is attended by the car shed staff.

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**Operational chart**

<u>Sr. No</u>	<u>Signal Aspect</u>	<u>Action by motorman</u>	<u>Max speed</u>	<u>Visual indication</u>	<u>Audible Indication</u>	<u>Acknowledge</u>	<u>REMARKS</u>
1	Green or double yellow	None	80 km/h	Blue lamp goes off for 4 second	None	No	No speed regulation by AWS in case of passing the Green and double yellow aspects of signal:
2 (a)	Yellow (Location where distance to next signal is <700 m)	Press Vigilance button within 4 seconds when hooter sounds	60 km/h	Yellow study and fast flashing after 290 M	Hooter sounds	Yes	(a)Motorman must not exceed 60 KMPH while passing Yellow signal except in case diversion breaking distance between Yellow and next red signal is less than 4 M .Speed should be reduced to 38 KMPH after passing Yellow signal
2 (b)	Yellow without route (Distance to next signal is >700 M)	Press Vigilance button within 4 seconds when hooter sounds reduce speed to 38 KMPH within 290 M after passing ATM	60 km/h	Yellow flash 7:1 upto ATM and becomes steady after 290M Yellow flashes 1:1	Hooter sounds	Yes	AWS does not regulate the speed on passing the signal. The speed is regulated on passing the ATM so Motorman should regulate the speed on getting yellow steady indication
2 (c)	Yellow distance more than 700 M ATM is connected with next signal	Press Vig. button within 4 sec. when hooter sounds reduce speed to 38 KMPH within 290 M after passing ATM if signal ahead is red Else if signal is taken OFF while passing ATM pick up normal speed	60 km/h	Yellow flashes 7:1	Hooter	Yes	AWS does not regulate the speed on passing the signal. The speed is regulated on passing the ATM so Motorman should regulate the speed on getting yellow steady indication  <u>Note:-</u> When route is set for diversion speed should be regulated appropriately by the Motorman
			60 km/h	Yellow steady & flashes 1:1	Hooter	No	
			80 km/h	Yellow Extinguishes	No Hooter	No	



## SIGNAL ENGINEERING

<u>Sr. No</u>	<u>Signal Aspect</u>	<u>Action by motorman</u>	<u>Max speed</u>	<u>Visual indication</u>	<u>Audible Indication</u>	<u>Acknowledge</u>	<u>REMARKS</u>
3	Permissive RED	Stop dead before the signal & then observe G&SR Press Vig. Button within 4 Seconds as hooter sounds	15 Km / hr	Red	Hooter	yes	Proceed with 15 Km/h upto next signal and then proceed as per the aspect of that signal.
4	Absolute RED	Stop dead in the rear of the signal in 100 meters .After receiving the authority press SFBB( Red) button	15 Km / hr	Red Fast flashing	Hooter	yes	Proceed with 15 km/h upto next signal Note down the counter reading. Observe G&SF and proceed. Press vigilance button within 4 second when hooter sounds.
5 (1)	Blank Signal Permissive	Stop dead before the signal & then observe G&SR Press Vig. Button within 4 Seconds as hooter sounds	15 Km / hr	Red steady	Hooter	yes	Proceed with 15 Km/h upto next signal and then proceed as per the aspect of that signal.
5 (2)	Blank Signal Manual	Stop dead before the signal & then observe G&SR Press Vig. Button within 4 Seconds as hooter sounds	15 Km / hr	Red Fast flashing	Hooter	yes	Proceed with 15 Km/h upto next signal and then proceed as per the aspect of signal. Note down the counter reading. Observe G&SF and proceed. Press vigilance button within 4 second when hooter sounds

### 3. Signal Displaying more than one aspect

In such cases AWS equipment registers and acts on more restrictive aspect of the aspects displayed and less restrictive aspect is ignored. However the motorman should treat the signal as if displaying RED and the procedure as laid down in relevant G & SR for passing such signals.

Note : Penalty brakes will be initiated by AWS , when vigilance button is not pressed within 4 seconds on hearing hooter sound after passing signal. OR Motorman passes a signal at danger without observing rules.



## SIGNAL ENGINEERING

- In case of over speeding by 1 to 5 kms Intermittent warning hooter sounds without braking.
- Exceeding speed limits by 5 to 10 Kms per hour EP brakes with Red lamp flashing & hooter sounds till speed is reduced to prescribed limits.
- If speed is exceeded >10 Km/h emergency brakes are applied with Red lamp steady and continuous hooter sound till speed is reduced to prescribed limit

Failure Conditions:-	Action to be taken
(i) AWS track device is considered failed when display on the Loco Pilot's panel is not carrying with the aspect displayed on the signal	Press vigilance button on hearing hooter and act as per aspect indication or signal aspect displayed whichever is more restrictive

NOTE:-Note down such failures and if there is no track magnet found near the foot of the signal, then inform MUI / CCG who will inform to Signal fault controller.

Failure Conditions:-	Action to be taken
(ii) AWS Cab equipment failure : If AWS initiating Emergency Brakes on passing signal and re-setting is not possible <p style="text-align: center;">OR</p> AWS initiating Emergency brakes <p style="text-align: center;">OR</p> Train refuses to move.	(i) Isolate the AWS by operating the Isolation after breaking its seal. (ii) Switch OFF the AWS MCB (iii) Reverse AWS cocks to non-AWS side (iv) Note down the isolation switch counter reading in the equipment isolation card, kept in the driving cab. Enter the failures in the Unit Defect Chart maintained in MUI CCG's Office. MUI CCG will pass the information to EMU controller.

### 2929 Block proving by Axle Counters :

In conventional Block signalling last vehicle check is done by the Cabin man / ASM of receiving station to ensure complete arrival of train. Human error can play a vital role in correct detection if a parted bogie stays in the block section. This can be avoided if block is proved by the Axle counter.

Axle counter block working monitors the train movement to the block section. Automatic checking up of the clearance of track upto Block overlap and restoration of all signals to ON position. After arrival of last train with locking of relevant points ensure reduction in block operating time.

The SMs at both the stations get automatic display of status of the track (line closed and train on line) and direction of train movement (train going to / train coming from). The Axle counter block working is possible for both single line and double line section. In single line sections one axle counter is placed at either side of the station. The track device are mounted on the advance track circuit of both ends of the block section. In double line section both up and down lines have axle counter at the receiving station. Track device are mounted on the advanced starter and home signal track circuits of each line.

The system consists of relay logic circuit and combiner / converter units at both ends and relay status data is exchanged by using fails safe digital multiplexing. As in count of axles at despatching station are tallied with out count of axles at receiving station for block proving, the possibility of leaving any stock in the block section is nullified. In case of failure of axle counter block resetting is possible with co-operation from the other end Station Master. Details of block working are given in Block Manual.

### **2930 Train Management System( TMS )**

Train management system provides an effective system to tackle the unique problem of having high density of train and large number of stations as well as large volume of passenger traffic. On Western Railway this system has been installed on Mumbai Suburban section from Churchgate to Virar. The TMS system use on line display of movement of all trains on Video monitors as well as over view indication panel of all stations located in control room at TMS center. Automatic recording and retrieval of train movement , inter facing with train indicator boards, Video display units at stations and generation of MIS (Management Information System) reports and train graphs is achieved by TMS.

The Station Masters at each station displays expected arrival of time of next two trains on each line and flashing information about diversion/cancellation of trains to make timely announcement and operation of indicator boards.

The commuters get on line indication of scheduled arrival as per Time Table along with expected arrival of next two trains on each line.

The system comprises of Control Office equipment like Master Controller, operators terminal, Mimic Wall Display Panel, Communication net work and un-interrupted power supply.

At stations in ASM's office, ASM can have display of track lay out on his Monitor which shows train occupancy. At originating stations ASM can enter the train identification and their location. Automatic announcement system for station as well as for train passengers in the EMUs is done by TMS through dedicated communication net work .

Mobile train communication between Motorman, Guard and various controllers in TMS Central Control is also provided for Emergency communication. Motorman can contact EMU controller or any other controller of S&T / Engg / Power department in case of problems / failures for immediate assistance, guidance and information to all concerned from their driving cab.

### **2931 Solid State Interlocking (SSI)**

Relay Interlocking requiring thousands of relays and wirings has inherent limitation in regards to flexibility, high cost of installation, requiring large space and regular/preventing maintenance schedules. These factors lead to the high cost of operations which is overcome by new type of interlocking system called Solid State Interlocking (SSI) are being installed on Indian Railways. Reduction in Relay room sizes, air conditioners and power requirements are other advantages in addition to reduced cost for installation and alterations even in case of major yard alterations.

The operating domino type panel is used by SM for operating SSI. Push buttons of the panel are read by input modules of SSI and panel indications are provided through separate panel processors which is connected to SSI through a serial data link. Same software operates in different time slot in two processors and two out of two voting logic is used in all vital decisions.


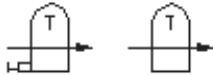

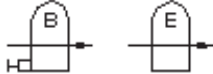








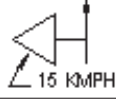



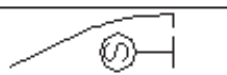

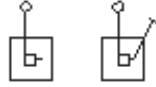



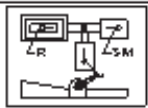



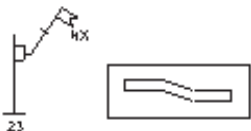
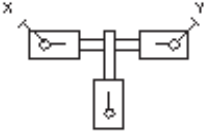
Two panels can be provided for End panel operation. A data logger logs the input and output of SSI with time stamping for later off-line operational and failure analysis. A maintainer terminal is provided to monitor SSI status including failures. The reliability of SSI system is very high as the processors are not only duplicated but additional state is provided in Hot standby mode. A safety monitor detects the processor failures and switches to standby processors automatically. In addition to this duplication of communication channels, noise filtering, isolation and protection, CRC error detection etc. are provided. To ensure deadlock avoidance and reliable fault tolerant external serial communication.

In short this technology provides maintenance free and easy fault localizing system of interlocking giving fault indications on the faulty unit. If the hot stand by is not available for automatic change over, faulty unit is replaced by maintenance staff immediately.

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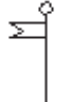


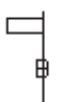

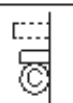












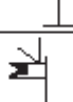







## SIGNAL ENGINEERING

### BOARDS, INSTRUMENTS.


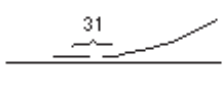

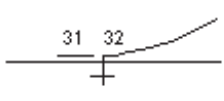

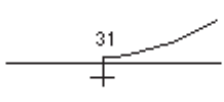
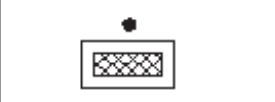
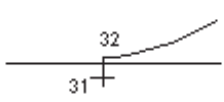
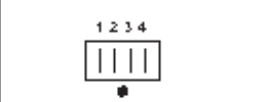

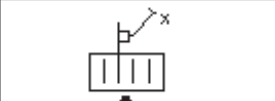
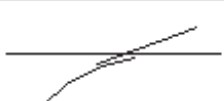
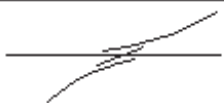
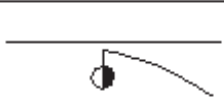
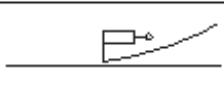
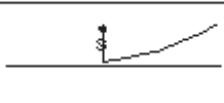

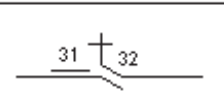
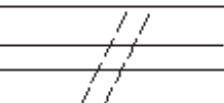

BOARDS WARNING BOARD		SINGLE LINE TABLET TOKEN BLOCK INSTT. WITH OR WITHOUT KEY RELEASE	
WARNING BOARD (PASSENGER)		SINGLE LINE BALL TOKEN BLOCK INSTT. WITH OR WITHOUT KEY RELEASE	
SHUNTING LIMIT BOARD		DOUBLE LINE TO KENLESS BLOCK INSTT.	
BLOCK SECTION LIMIT BOARD		SINGLE LINE TO KENLESS BLOCK INSTT.	
STOP BOARD		TO KEN KEY EXCHANGER	
DEAD STOP(CLS)		SMs BLOCK PANEL	
SPEED INDICATOR		AXLE COUNTER EVALUATOR	
LAND MARK		AXLE COUNTER RESETTING BOX	
SIDING MARK		AXLE COUNTER LINE VERIFICATION KEY BOX	
CNTRLOL FROM PANEL (WITH OR WITH OUT KEY RELEASE)		ELECTRIC KEY TRANSMITTER ( 'P' INDICATES - NOMENCLATURE OF KEY)	
PROVISION OF VHF (COMMUNICATION BETN STATIONS)		ARM AND LIGHT REPEATER FOR STOP SIGNAL ( NO. 28 INDICATES THE SIGNAL NUMBER )	
CLUTCH RESETING HANDLE RELEASE		ARM AND LIGHT REPEATER FOR DISTANT/ WARNER	
SINGLE STROKE BELL		TREMBLING BELL	
INTERLOCKING OF CRANK HANDLE FOR LEVER OPERATED ELECTRIC POINT MACHINE ( CASE TO BE SEALED & PAD LOCKED)		TRIPPLE LOCK	

## SIGNAL ENGINEERING

### MECHANICAL SIGNALS

STOP SIGNAL		SIGNAL THE LEVER OF WHICH IS RELEASED BY TOKEN	
WARNER SIGNAL		SIGNAL THE LEVER OF WHICH IS INTERLOCKED WITH KEY RELEASED FROM BLOCK IN ST.	
DISTANT SIGNAL		SIGNAL THE LEVER OF WHICH IS RELEASED BY BLOCK AT "LINE CLEAR" POSITION.	
FIXED ARM SIGNAL		CALLING ON SIGNAL	
FIXED ARM DISTANT / WARNER SIGNAL		SHUNT SIGNAL DISC TYPE	
POWER OPERATED STOP SIGNAL		SHUNT SIGNAL DISC TYPE POWER OPERATED	
POWER OPERATED WARNER SIGNAL		GOODS STOP SIGNAL	
POWER OPERATED DISTANT SIGNAL		LOCO STOP SIGNAL	
STOP SIGNAL PROVIDED WITH ESR		SLOTTED SHUNT SIGNAL	
WARNER PROVIDED WITH ESR		CO-ACTING STOP SIGNAL	
DISTANT PROVIDED WITH ESR		BRACKETTED HOME SIGNAL	
GATE STOP SIGNAL			
REPEATER SIGNAL		BRACKETTED HOME SIGNAL WITH POST LOCK ON LOOP HOME SIGNALS	
SLOTTED STOP SIGNAL			

BOARDS, INSTRUMENTS POINTS.

CABIN (OPERATORS BACK TO TRACK)		POINTS WITH LOCK AND BAR (SLW/EFL, ONE LEVER)	
CABIN (OPERATORS FACING TO TRACK)		POINTS WITH LOCK AND BAR (TWO LEVERS)	
CONTROL TOWER (ROUTE RELAY INTERLOCKING)		POINTS WITH LOCK WITHOUT BAR (ONE LEVER)	
CONTROL PANEL		POINTS WITH LOCK WITHOUT BAR (TWO LEVER)	
GROUND FRAME (NO. OF STOKES INDICATE NO. OF LEVERS)		KEY LOCKED POINTS	
GROUND FRAME (LEVER WITH KEY RELEASE)		SLIP POINT (SINGLE SLIP)	
		SLIP POINT (DOUBLE SLIP)	
		POINT WITH POINT INDICATOR	
		MOTOR OPERATED POINTS	
		SPRING LOADED POINTS	
		TRAP POINT WITH TRAP INDICATOR	
		TRAP POINT WITH LOCK & BAR (TWO LEVERS)	
		LEVEL CROSSING GATE (NON INTERLOCKED)	
		LEVEL CROSSING GATE (INTERLOCKED)	

**SIGNAL ENGINEERING**

**COLOUR LIGHT SIGNALS**

MULTI UNIT SIGNALS	NORMAL RED	NORMAL YELLOW	NORMAL GREEN		
2 ASPECT				REPEATER SIGNAL (ILLUMINATED 'R')	
3 ASPECT				SIGNAL WITH STENCIL TYPE OR MULTI LAMP TYPE ROUTE INDICATOR	
4 ASPECT				SHUNT BELOW STOP SIGNAL	
SIGNAL RELEASED BY BLOCK AT 'LINE CLEAR' POSITION				SLOTTED SIGNAL	
SIGNAL WITH ROUTE INDICATOR				CALLING ON SIGNAL	
PERMISSIVE SIGNAL/ DISTANT SIGNAL				GATE SIGNAL	
SEMI-AUTOMATIC SIGNALS				SEMI-AUTOMATIC SIGNALS WITH ILLUMINATED 'AG' MARKER	
SEMI-AUTOMATIC GATE SIGNAL				SEMI AUTOMATIC WITH CALLING ON, ILLUMINATED 'AG' & SHUNT SIGNAL	
SHUNT POSITION LIGHT				SHUNT PERMIT INDICATOR	
AUTOMATIC SIGNALS		OR		OR	
				INTERMEDIATE BLOCK STOP SIGNAL (WITH TELEPHONE)	



CHAPTER - 30

TRAIN LIGHTING

**3001 System of Train Lighting on Indian Railways :**

Following systems of train lighting are in vogue on Indian Railways :

**1. Axle driven 2 wire 24 Volts D.C. System :**

In this system all coaches carrying passengers are fully equipped and fitted with generator and battery whereas coaches like parcel van, motor car van etc. are trailers and provided with wiring for lighting only. Trailers depend for electric supply on adjoining 'equipped' coaches, provided through emergency feed terminal couplers.

In this system the batteries supply current flow when the train is stationary or running approximately 20 KMPH (beyond the generating speed). The generator supply the current to lights and fans and also charge the batteries. The battery consists of 24 volts obtained by connecting 12 Nos. lead acid cells in series. Important coaches like first class, postal van, buffet cars etc. are provided with double battery set connected in parallel. The batteries are provided in battery boxes, suspended to coach frame. The generators are Alternator (A.C.) type mounted with coach under frame in case of flat belt drive, and transom mounted/bogie mounted in case of V belt drive. The generators are driven by a pulley fixed in the carriage axle with the help of a flat belt or V belts.

The lighting circuits are controlled by two main switches and fans circuit by one main switch. For light and fans switches are provided in switching cabinet cum junction box fixed inside of the compartment. The main switches are either of MCB type or rotary switch type. The rotary switch can be operated with a key by rotating it in either direction.

**2. Axle Driven 2 wire 110 Volts DC System :**

This system is similar to 24 Volts D.C. system except generating voltage is 110 Volt D.C. These are provided with a single set battery consisting of 18 monoblock cells, each monoblock contains 3 cells. The generator is brushless type alternator which is transom/bogie mounted, V-belt drive from coach axle pulley.

The lights & fans are controlled by rotary type main switches provided in switching cabinet cum junction box installed in side the coach.

**3. 110 Volt AC end on generation system:**

The end on generation (EOG) system of train lighting is provided in air conditioned express trains like Rajdhani express and Shatabdi express.

In this system, power supply is generated by diesel generating sets at 750 Volts AC and distributed from power car to the coaches at 415 Volts AC (3 Phase) at double feeders. The power cars are provided at the end of rake. Air conditioning equipments provided in the coaches, work on 415 volts, AC three phase supply whereas lights and fans work on 110 Volts AC supply obtained by a step down transformer provided in individual coach. Dining car equipments like hot plate refrigerator, deep fridge, water coolers etc. work on 230 volts AC supply. Electrical staff accompanies the train in power car to operate D.G. sets, AC equipments and to attend passenger complaints on T.L and AC account.

**4. 110 Volt DC motor generator set system for EMU rakes :**

This system of train lighting is used on EMU trains. The motor generator set generates

## TRAIN LIGHTING

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110 Volts DC and supply to the lights and fans provided in the coaches. The motor generator set is mounted on under frame of motor coach. The light and fans are supplied 110 Volts

DC by controlling main switches provided in Motorman's/Guard's cabin to be operated by Guard. Emergency lighting circuit is also provided in the centre line of the coaches. The emergency circuit lights are automatically 'switched on' in case of failure of normal supply and automatically 'switched off' on resumption of normal supply. The emergency circuit gets supply from battery provided in the under frame of motor coach.

The EMU trains working on 25 KV AC, are provided with motor alternator set which supplies 110 Volts AC for lights and fans provided in coaches.

In recently introduced dual voltage DC/AC EMUs the auxiliary circuit of light and fan is fed by auxiliary converter which supplies 141 V AC single phase 50 Hz for light and fan in the passenger area.

### 3002 Control of Lights and Fans in Coaches :

1. Switching 'on' and 'off' of lights and fans circuits in a rake is effected by operating rotary switches or MCBs, provided in the switching cabinet cum junction box fitted inside the individual coach. Switching 'on' and 'off' of lights and fans, in the coach is the duty of train lighting staff posted at important stations.
2. Guards are responsible for ensuring that electrical equipments and fittings of all coaches are functioning satisfactorily, where any defect or deficiency is noticed, they should inform to train lighting staff on duty or advice through control to the next station where TL staff is provided by giving nature of defect, coach number, location of coach.
  - (a) Guard should mention in Rough Journal and report the defects at the station ahead and also at the terminal station.
  - (b) Whether the defect was brought to the notice of train lighting staff and if so whether by control message or through other means. They should mention the station's name, the TL staff of which were advised.
  - (c) They should indicate what action if any was taken by TL staff where all defects were rectified.
3. In the train having electrical staff accompanying the train, train lights and fans in the coaches shall be switched 'on' and 'off'. Passenger complaints on electrical defects received through conductor/Guard will also be attended by electrical staff with the train, where provided.
4. In EMU trains, the lights and fans circuits shall be switched 'on' and 'off' by the Guard. The defects and / or complaints shall be attended by Motorman or electrical staff posted at nominated stations.

### 3003 Economy in Current :

The train Guard must see that:

1. Lights and fans of all un-occupied compartments are switched 'off' by operating individual switches (not by main switches).
2. Lighting circuit No. Two (which is not essential) should be switched 'off' of both the coaches i.e. failure coach & adjoining coach if emergency feeding is provided from neighbouring healthy coach.

### **3004 Train Lighting defect Requiring Immediate Attention of Guards and other Staff on Duty :**

Due to low voltage of train lighting system, the current wires are heavy and any defect in the wiring, if neglected, can result in overheating and even fire, leading to loss of property and fatal accident of burns. Secondly equipments fitted with under frame if hanging loose and fall on the track, may cause derailment. Since in most of the trains, no train lighting staff is available, immediate measures have to be taken on the spot by the Guard to avoid accidents. However in case of an EOG system of train lighting electrical staff is always available on the power cars and they should be contacted immediately in case of any suspicion of wiring defects which may lead to short circuits.

In the trains having axle drive generation system (24 Volts DC and 110 Volt DC) of train lighting some of the usual precautions required to be taken by the Guard are indicated below:

1. **Shunting :**

Care should be taken to avoid rough shunting during shunting operation. Rough shunting may result in damage to suspension of generator and battery box or TL equipments fitted on under frame. Electrical disconnection to be ensured before shunting operation.

2. **Insecure under frame equipment :**

If any under frame equipment is observed to be unsafely hanging, efforts to be made to secure the equipment by tying it with strong rope or wire, then train should be allowed to proceed on restricted speed, to the next station where it can be attended either by electrical or mechanical staff. Alternatively such equipment maybe removed. In both the cases the incident should be reported to the train lighting staff at the next station where TL staff is posted.

3. **Obstruction permanent way :**

Damages to generator and other under frame equipment or their suspension can also be damaged by obstruction on the track or by flying ballast. In such case under frame should be examined, if it is found that any equipment is hanging unsafely, the same action should be taken as in para 3004(2) above.

4. **Electric fire :**

The overheating and fire can be caused due to short circuit in the wiring of the connection. In such case the Guard should remove the battery fuses, switch 'off' lights and fans from Junction box, should remove the emergency feeding connection wire from neighbouring coach if any and extinguish the fire. Advise the Section Controller to send train lighting staff on train if available, and also to the next train lighting station.

5. **Total failure of lights in a coach :**

This may be due to generation failure, loss of belt, battery fuse blown or junction box fuse blown. In such cases, T.L. staff at the next train lighting station should be informed to attend the defects on arrival of the train.

6. **Dim lights :**

The usual defects which can cause dim light are:

- (a) No Power generation due to missing of generator belt or loose belt or due to any other defects. Under this condition, lights and fans get supply from battery and battery are getting discharge due to absence of charge from generator. This causes dim light. The coach should get immediate attention at the next train lighting station. Train lighting staff at the next station should be advised through control for providing missing belt.

(b) *Run down batteries :*

In case of batteries are not in fully charged condition or train is running late, the batteries are run down or discharged fully. This also happens when lights and fans are left in 'on' position or put 'on' very early before the scheduled departure of the train. In these cases train lighting staff should be contacted, who will provide external charging, if time permits. In most of the cases, the lights become normal during the run of the train and battery also gets charged.

(c) *Short circuit on the coach :*

This may happen enroute and occasionally, it may also lead to smoke and fire. Action to be taken already been indicated above.

7. **Fans not working :**

If all the fans of the coach stop working, which may be due to fan circuit fuse blown or fans main switch having not been operated. The Train lighting staff should be contacted at the next train lighting station. If individual fan is not working, it may be due to carbon brush not bedding or individual fan point fuse blown or any defect in the fan. Train lighting staff should be contacted.

8. **All lights not burning in a coach :**

This may happen when either main switch for lighting circuit is not switched 'on' from the junction box, or lights circuits fuse in junction box blown or all the bulbs have fused. In such case Train lighting staff should be contacted at the next train lighting station.

9. **Co-operation with train lighting staff :**

Electrical staff are responsible for ensuring proper functioning of all the electrical equipments and fittings before handing over a rake for service. The electrical and operating staff through out the service must co-operate with each other to ensure observance of safe practices for providing passenger amenities and operational safety.

10. No electrical connection should be provided between the coaches, having different systems of train lighting wiring. It may cause fire.

**3005 D.R.S. (Deficiency In the Rolling Stock) Card :**

In order to localise loss of electrical equipments due to theft the originating station train lighting staff enters the deficiencies of electrical equipments and fittings of all coaches of the train in D.R.S. card. This card is signed by T.L. staff, RPF and Guard of the train when handed over to the Guard at the originating station. Train lighting staff at enroute station shall also examine the defects and deficiencies of T.L. equipments and give remarks on the space provided for, with initial and station code. This card is finally handed over to the train lighting staff at destination station by the Guard to set right the defects and deficiencies during scheduled maintenance and to register theft cases to RPF staff if any.

**3006 Portable Train Lighting Equipment:**

1. This Equipment is used for providing lighting at the site of train accident during night time. The Power supply for the equipment is derived from coach batteries. The Portable train Lighting equipment is provided to the Guard of passenger carrying train as brake van equipment at the train originating station in sealed condition. The equipment can be tested for proper working in sealed condition by connecting it with external supply by T.L. staff. Train lighting staff is responsible for keeping equipment in working order, the Guard has to take care of it in the train, and to operate it when required so.

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The emergency lighting equipment consists of the following items :-

- (a) Telescopic tripod stand with adjustable legs, extentionable stalk and grip screws.
- (b) Two head light projectors mounted on a platform complete with lamp holders, 24/110 V 30 W lamps and 30 metres long two single core flexible PVC cables with two crocodile clips at the other end.
- (c) Wing screw
- (d) One hand lamp of 24/110 V 30 W complete with two crocodile clips and 20 meter. long two single core flexible PVC cable.
- (e) One plier
- (f) Two Nos. spare lamps of 24/110 V 30 W in box there in.
- (g) One operating instructions leaflet with drawing.
- (h) One GI sheet or Aluminium box with inspection holes and testing sockets.
- (i) One journal for recording the entries regarding the utilisation of the equipment.

### 2. Erection procedure :

- (a) Break the seal of the Portable train Lighting equipment and lift the tripod stand in collapsed position from the box.
- (b) Loose the grip screws, pull out the three leg extensions to equal length slowly & tight the grip screws.
- (c) Keep the tripod stand on the ground resting on the leg extension.
- (d) Open out the stand by pulling the legs apart and tighten the screw on the stand.
- (e) Place the head light projector assembly on the telescopic rod of the stand and fix by wing screw.
- (f) Turn the head light in the direction where the light is required by loosing individual screws of the projector and then tighten.
- (g) If more height is required for throwing light to a greater distance take step as follows:
  - (i) Raise the telescopic rod/extension stalk by loosing the grip screws.
  - (ii) Tighten the grip screws after adjusting the height required.
- (h) Having set the emergency light fitting as per procedure stated above connect the two crocodile clips to the emergency feed terminals provided on either ends of the coach.
- (i) Movable hand lamp may be connected to the emergency feed terminal at the other end of the coach or to the adjoining coach.

### 3. Rewinding procedure :

Proceed in the reverse order as mentioned for erection above.

### 4. Special instructions for rakes having end-on Generating System :

Emergency lighting equipment operates on 24 V system. Some trains like Rajdhani Express, Shatabdi Express which are having End-on generating system operate at 400/110 V system. The 24 V supply is available only in the power car. Therefore while using the equipment in the above trains the Guard will erect the ETL equipment as stated above near the generator van (WLRRM) and will ask electrical staff accompanying the train to provide the necessary 24 V supply connection.

### 3007 Marshalling and Shunting Instructions:

1. Exclusive block rakes should be maintained for the coaches having MOG system of wiring.
2. Exclusive block rakes should be maintained for the coaches having 110 Volts DC system of wiring to avoid interconnection with other coaches having 24 Volts DC system of wiring by mistake which may cause fire. Minimum three coaches of 110 Volts D.C or 24 Volts D.C. should be marshalled in one group in a mix rake.



3. Exclusive block rakes should be maintained for the coaches having EOG system of wiring.
4. Power car should be marshalled in middle of the rake in MOG rakes.
5. Electrical disconnection must be ensured by obtaining assistance from electrical staff, before performing any shunting work.
6. 24 Volt DC or 110 DC system of wiring coach can be attached outside of block rake of MOG or EOG system with prior approval of Electrical and Operating Officer.

**3008 Working of Trains in Electrified Section of Railways:**

Rules regarding working of trains in electrified sections are given in chapter XVII of G&SR book.

**3009 Over Head Equipment - TRD**

- 1 Traction Distribution (TRD) on Western Railway comprises of 25 KV AC Traction system in the Mumbai, Vadodara, Ahmedabad and Ratlam Divisions of Western Railway.
- 2 Traction Distribution (TRD) mainly comprises of OHE (overhead equipment) and PSI (power supply installations). The OHE is comprised of conductors, brackets, jumper, isolators, neutral sections and structures where as PSI comprises of TSS (Traction substation), SPs (Sectioning and Paralleling post), and SSPs (Sub Sectioning and Paralleling posts) and Remote Control Centre (RCC) (Also known as Traction Power Control/TPC).
- 3 Details of TRD organisation in each Division of Western Railway:-

3.1 Mumbai Central (Churchgate- Virar section) :

This section is electrified on 25 KV AC. There are 05 Traction substation in the Section. The system is managed by Sr.DEE (Sub.) BCT who is assisted by DEE (TRD), AEE (OHE) and AEE(Sub.). There are 05 Nos. OHE Depots which are supervised by SSE/ JE (OHE). These are at Mumbai Central, Bandra, Andheri, Borivali & Bhayandar. There are 09 Nos. PSI and other depots. These are at Mahalaxmi, Bandra, Jogeshwari, Borivali, Bhayandar, Grant road (cable), Mumbai Central (relay), Mumbai central (works)& Mumbai central (stores). There are 03 Nos. 8-wheeler and 05 Nos. 4-wheeler Tower wagons for the purpose of inspection and maintenance of OHE as well as for attending to the breakdowns. The TPC (Traction Power Control) is at Mumbai central with SCADA system.

3.2 Mumbai Central (Virar – Surat section & Udhna-Jalgaon ):-

The section between Virar and Surat on main line and Udhna-Jalgaon on chord line (also known as Tapti Valley line) is electrified on 25 KV AC System. This is managed by Sr. DEE/TRD/Valsad who is assisted by AEE/TRD/BL and DEE/TRD/NDB . There are 09 Nos. 25 KV AC TSSs at Palghar, Gholvad, Atul, Bhetsan, Madhi, Navapur, Nandurbar, Nardana & Dharangaon. There are 10 Nos. SPs and 24 Nos. SSPs. The OHE depots at Palghar, Gholvad, Vapi, Valsad, Navsari, Madhi, Navapur, Nandurbar, Amalner and Dharangaon. The PSI depots are at Palghar, Valsad (N), Valsad (S), Madhi, Nandurbar and Amalner. There are 05 Nos. 8-wheeler and 04 Nos. 4-wheeler T/Wagons for the purpose of inspection and maintenance of OHE as well as for attending to the breakdowns. The TPC (Traction Power Control) is at Valsad for main line and at Nandurbar for chord line with SCADA system.

3.3 Vadodara Division:-

Vadodara Division comprises of section Surat-Godhra and Vadodara-Geratpur on main line , Anand-Godhra & Bharuch- Samni – Dahej Section on chord line. This is 25 KV AC system. There are 08 Nos. TSSs i.e. at Bharuch, Vagra, Lakodara, Makarpura, Anand, Mahemdabad, Samlaya and Godhra. There are 8 Nos. of SPs and 24 Nos. of SSPs. The OHE depots are at Kosamba, Bharuch, Vishwamitri, Anand, Dakor, Godhra, Samni, Vadodara-Yard. The PSI Depots are at Bharuch, Vishwamitri, Mehamdabad, Godhra. There are 03 Nos. 8-wheeler and 06 Nos. 4-wheeler T/wagons for the purpose of inspection and maintenance of OHE as well as for attending to the breakdowns. The TRD Organisation is managed by Sr.DEE/TRD/

BRC, assisted by AEE/TRD/BRC and AEE/Godhra. The TPC (Traction Power Control) is at BRC with SCADA system.

- 3.4 Ratlam Division comprises of section Godhra- Nagda on the main line and Nagda- Bhopal , Ujjain- Mhow (DADN) with Dewas- Maksi Section on chord line. This is 25 KV AC system. There are TSSs at Limkheda, Dahod, Bamnia, Ratlam, Nagda, Naikhedi, Maksi, Mohamadkheda, Sehore & Mangliagaon. There are 10 Nos. of SPs and 20 Nos. of SSPs. The OHE depots are at Piplod, Dahod, Bamnia, Ratlam, Nagda, Ujjain, Maksi, Shujalpur, Sehore, Dewas & Laxmi Bai Nagar. The PSI Depots are at Dahod, Bamnia, Ratlam, Nagda, Ujjain, Maksi, Shujalpur, Sehore & Laxmi Bai Nagar. There are 04 Nos. 8-wheeler and 09 Nos. 4-wheeler T/Wagons for the purpose of inspection and maintenance of OHE as well as for attending to the breakdowns. The TRD Organisation is managed by Sr.DEE/TRD/ RTM, assisted by DEE/TRD/RTM and AEE/TRD/ Ujjain. The TPC (Traction Power Control) is at RTM with SCADA system.
- 3.5 Ahmedabad Division comprises of Section Geratpur- Sabarmati-Chandoliya- Khodiyar-Gandhinagar and new electrification in Sabarmati– Khodiyar- Kalol- Mahesana – Palanpur and Gandhinagar- Adrajmoti –Kalol on 25 KV AC system. There are at present one TSS at Gandhinagar and 02 Nos. are under construction at Ambliyan & Dharewada. There are 03 SPs and 09 SSPs. The OHE Depot are at Maninagar and Mahesana.The PSI Depot is at Maninagar. There is one 8-wheeler Tower Wagon for the purpose of inspection and maintenance of OHE as well as for attending to the breakdowns. The Division is controlled by Sr.DEE who looks after entire Electrical Department and is assisted by one DEE/TRD/ADI. The TPC (Traction Power Control) is at ADI with SCADA system.

### 3010 Power Blocks and Permit –To- Work

#### 1 Operation of Isolator Switches

- 1.1 Before considering the procedure for obtaining power blocks, attention is drawn to the precautions to be taken in opening an isolator switch. Manually operated isolator switches are provided at different points on the main line to sectionalize the OHE into elementary sections and at large yards to isolate different elementary sections for maintenance of the OHE.
- 1.2 The operating handle of every Isolator switch shall always be kept locked either in the open or closed position. Any loss or damage of a padlock or key shall be reported Immediately to the OHE Section Chageman, Chief Traction Foreman (OHE) and TPC.
- 1.3 An isolator switch is not meant for breaking a current, but only to break a circuit when no current is passing through it. If an attempt is made to open a switch when it is actually carrying current, severe arcing will occur at the switch contacts and may result in serious consequences including danger to the operator. AN ISOLATOR SWITCH SHALL NOT BE OPENED WHEN CURRENT IS PASSING THROUGH IT.
- 1.4 Isolator switches on the main line may only be opened provided the corresponding sub-sector is first made dead by TPC. The person operating the Isolator switch shall not open it, unless specifically asked to do so by TPC by a clear message supported by a private number or after receipt of a separate permit-to-work for the section which includes the elementary sections on either the Isolator switch. TPC shall ensure that the sub-sector is dead before he orders opening of an Isolator switch in it.
- 1.5 Isolator switches, however, can be closed by a duly authorised person even if the adjacent interruptors are closed (i.e. on load) provided the closure is made swiftly in one motion. It is imperative that once the fixed and moving contacts have met, the contacts are not separated.

#### 2 Isolators in Yards and Sheds

- 2.1 Isolator switches provided for isolating sidings and yards and also to feed OHE inside running sheds, may be opened provided the official concerned makes it certain that -



- (i) the entire section is visible; and
- (ii) there is no locomotive with raised pantograph in the section.

### 3 Maintenance Blocks

3.1 There are generally two types of blocks required for maintenance work on electric traction installations.

- (i) **Traffic Block** : Where a line is blocked against movement of vehicles whether electric or diesel locomotive hauled. This will be required whenever heavy repairs have to be carried out. A traffic block will be granted by the Section Controller In consultation with the TPC.
- (ii) **Power Block**: Where a section of line is blocked against movement of electric locomotive- hauled vehicles or EMUs only i.e., a section where 25 KV electric supply to the OHE is switched off and the section made dead. Power block will be required whenever light repairs to or maintenance- of the OHE has to be carried out and the nature of the work is such that traffic block is not necessary. Power blocks are granted by TPC in consultation with the Section Controller. Whenever a power block is granted by TPC, movement of vehicles hauled by other than electric power, i.e. diesel may be permitted, provided a caution order is issued as per General and Subsidiary Rules drawing the attention of the Loco Pilot to the fact that the OHE staff are working at the kilometerage specified and he should exercise caution when passing over the section and obey signals displayed at the place of work.

### 4 Power Blocks

Power blocks are of three different types:

Emergency power block, Pre-arranged power block, Locally arranged power block.

#### 4.1 Emergency Power Block

An “Emergency Power Block” shall be arranged by the TPC and 25 KV supply to the OHE affected shall be switched off by him immediately on receipt of an advice of any break-down of the OHE or injury to persons or damage to property particularly in the following cases :

- (i) The whole or part of the OHE or a feeder or a cable falling down and/or persons or animals or falling trees or vehicles coming in contact with or likely to come in contact with live equipment;
- (ii) A damaged catenary or contact wire fouling the vehicle gauge;
- (iii) A failed electric locomotive getting damaged to rectify which the Loco Pilot requires the permit-to-work;
- (iv) Derailment or any other traffic accident on the electrified lines, where cutting off of 25 KV power supply is considered necessary by TPC or the Section Controller, in the interest of safety.

##### 4.1.1 Reporting Abnormalities in OHE

It is the duty of every railway official to report immediately any abnormalities on the OHE such as of tracks, masts/ structures or pantographs of locomotives as may adversely affect. safety of train movements, to the TPC either directly or through any Station Master, Section Controller or through the nearest available telephone. If the damage is heavy or the moving dimensions are infringed he should take steps to protect the lines in accordance with General and Subsidiary Rules.

### 4.1.2 Request for Emergency Power Block

- (i) The person who gives the first information of break-down on the OHE shall invariably give all essential information such as his name, designation, kilometrage where the abnormality has been noticed, its nature and place from where he is reporting. He should leave the place only with the permission of the TPC.
- (ii) The reason for asking for an emergency power block should be brief and to the point, but explicit. Much time and trouble can be saved if the first information given is clear and unambiguous, to enable the TPC to decide upon the course of action to be taken.

### 4.1.3 Action to be taken by TPC

On receiving the information, the TPC shall immediately arrange to switch off power supply to the section affected (the details of defects being obtained after the supply is switched off). He shall at the same time advise the Section Controller on duty regarding the section made dead by him. The Section Controller in turn should arrange with the Station Masters concerned to take protective measures in accordance with "Station Working Rules".

### 4.1.4 Precautions after Emergency Power Block is Imposed

Once an emergency power block is imposed, no work on the affected lines shall be commenced until an authorized OHE official arrives at site and earths the OHE at two points or more as per rules. Power supply to the section concerned shall not be restored by TPC until the authorised official at the site issues a message supported by private number.

### 4.2 Prearranged Power Block

- (i) The Station Master shall ensure that the protection as specified in the Station Working Rules is carried out and confirm it to the Section Controller with exchange of Private Numbers.
- (ii) The Section Controller on receipt of assurances from the concerned Station Masters will advise TPC that the power block may be given.
- (iii) If the power block message is given by TPC in the prescribed printed form the Section Controller will sign the same and send it to the TPC; if it is given over the telephone, the Section Controller will grant the power block through a message with exchange of Private Numbers.
- (iv) On receipt of the above message TPC will open the interrupters concerned and issue messages to the field staff for operation of the required isolators. On receipt of the confirmatory message that the isolators have been opened, TPC will close the interrupters restoring power supply to all parts, except over the particular elementary section where work has to be done. He will then issue a permit-to-work message in the prescribed form to the authorized person in charge of the maintenance gang.
- (v) On cancellation of the power block by the TPC, the Section Controller will advise the Station Masters concerned regarding the cancellation by exchange of private numbers, and to resume normal working of the trains.

### 4.3 Local Block

- (i) Power supply for sidings which do not affect movement of trains on the main lines e.g. loop lines and reception and despatch yards, is controlled by manually operated isolators.

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Keys for these isolators are usually in the custody of the Station Master concerned. Power blocks on such sidings can be granted by the Station Master, who will also take precautions as per SWR to protect the lines over which Local Power Block has been granted by him.

- (ii) TPC shall be informed before and after the shutdown is affected.
- (iii) Isolators may only be opened after due precautions.
- (iv) Earthing of equipment and issue of permit-to-work is done as prescribed in these rules.
- (v) Local power blocks shall be recorded in form ETR-4 prescribed for the purpose.

### 5 Persons Authorised to Open Interrupters and Isolator Switches

- (i) No staff of rank lower than a linesman working under the Traction Foreman (OHE) is authorised to open or close the interrupters or isolators controlling power supply to the overhead traction wires in the watering section.
- (ii) A list of names of the authorized linesmen, duly signed by the Traction Foreman (OHE) shall be exhibited prominently in the office of the ASM and the SE (C&W) of the station concerned. Each such linesman should also carry an identity card with photograph or specimen signature.
- (iii) At watering stations, it will be the duty of the linesman concerned to report to the ASM on duty at least half an hour before the scheduled arrival of the train. No linesman on duty shall leave his place of duty until he has been properly relieved by his reliever, and that too, after his reliever has been introduced by him to the ASM on duty at the time.
- (iv) In case of emergency, it will be the duty of Station Masters / Station Master/ on duty Pointsman to operate isolators as instructed by the TPC.

### 6 Custody of Keys

- (i) The keys of the interrupter enclosures and isolators shall be inscribed with the distinguishing marks and locked in glass-fronted Key box and kept in the personal custody of the ASM on duty. The keys should never be kept in a bunch, but hung on individual pegs provided for each. The description of each key shall be painted above each peg to avoid confusion.
- (ii) When the watering section of a particular platform is required to be made dead and earthed for watering of carriages, the ASM on duty shall give the key of the lock of the enclosure of the controlling interrupter/isolator of the platform to the linesman on duty and getting his acknowledgment in a "Key Register" to be provided for the purpose at the station. This key shall be handed over immediately on arrival of the passenger train concerned, if hauled by an electric loco. If, however, the train, the carriages of which are to be watered, is not hauled by an electric locomotive, the key may be handed over to the linesman even prior to the arrival of the train in question so as to save time, provided the earlier isolation of the watering section does not interfere with the movement of the other train. (It is to be understood that the handing over of the key of the interrupter enclosure to the linesman amounts to the requisition for a power block).
- (iii) The ASM shall ensure that no electric locomotive with raised pantograph is allowed to enter a watering section till the watering linesman returns the key back to the ASM and signs in the Key Register.

### 7. Precautions to be observed at stations

7.1 Each watering station shall have a key register for recording the interchange of keys between the ASM on duty and the linesman. This key register will have the following columns:

- (i) Date.
- (ii) Description of the key.
- (iii) Watering Section No.
- (iv) Train No.
- (v) Time of handing over of the keys.
- (vi) Signature of the linesman.
- (vii) Time returned.
- (viii) Signature of the linesman.
- (ix) Brief reasons for delay, if any.
- (x) Signature of ASM on duty.

7.2 Safety depends essentially on the proper exchange of the keys and correct record of the same. All exchange of keys shall take place directly between the persons concerned and not through messengers. The custody of any key shall be the responsibility of the person possessing the same at the time.

### 7.3 Loss of Key :

- (i) In case of loss or damage to any key controlling the switching arrangements to the watering section, the same should be reported at once to the TPC over phone and by XXR message addressed to the Sr. DEE(TRD), Sr. DOM and Chief Controller of the Division. The Sr. DEE(TRD) shall make immediate arrangements for the provision of a new locking system requiring a different set of keys.
- (ii) During such period the SE (C&W)-in-charge of the watering shall personally be responsible for making dead and earthing the overhead traction wires of the watering section concerned. He shall arrange to lock the operating handles of the interruptor 'L' and isolator switches S1 and S2 by his own padlocks, the keys of which shall be in his personal custody, till the watering is completed and the brass badges authorizing his staff to go on the top of the carriages for watering are returned to him.

### 7.4 Protective Measures for Power Blocks

It is essential that every Railway official concerned with the movement of trains on the electrified section, have a thorough understanding of the precautions to be taken to ensure safety of staff working on the OHE under power blocks. The reasons for the precautions and the nature of the precautions are therefore given at some length in the following paragraphs. The protective measures are :

- (i) **Longitudinal Protection:** To stop movement of electric rolling-stock running on the same track on which a section has been made dead and power block has been granted.
- (ii) **Transverse or Cross Protection:** To stop movement of electric rolling-stock running into a section, which has been made dead, from another track or from a siding through crossovers.

### 7.5 Procedure for Arranging Longitudinal and Transverse Protection

- (i) Before a power block is granted, the Section Controller should advise the Station Master, Yard Masters and Cabin Assistant Station Masters concerned to protect the dead sections, both longitudinally and transversely. It is only when all the Station Masters and Cabin Assistant Station Masters concerned have confirmed that this has been done, the Section Controller can advise TPC agreeing to the grant of power block. The Station Master, Yard Master and Cabin Assistant Station Master concerned will continue to maintain protection till the power block is cancelled by the Section Controller.
- (ii) The Section Controller will in turn permit removal of protection only after the power block is cancelled by TPC.

### 7.6 Station Working Rules for Longitudinal and Transverse Protection

- (i) In view of the large number of possible movements which may accidentally energize a dead section under a power block, the various protective measures to be taken by each Station Master, Cabin Assistant Station Master and Yard Master when power block is granted for the various sectors, sub-sectors or elementary sections should be catalogued in the Station Working Rules for each station. It is the duty of every Station Master, Yard Master and Assistant Yard Master to be thoroughly familiar with these instructions so as to be able to carry out efficiently and quickly the protective measures prescribed.
- (ii) The Station Working Rules should contain :-
  - (a) rules to be generally observed by all stations;
  - (b) chart giving exactly what precautions have to be taken for granting power, blocks on each sector, sub-sector or elementary section; and
  - (c) drawing showing the wired and unwired tracks as well as the sectionalizing arrangements including, the position of signals and points referred to in the chart mentioned above.
- (iii) This drawing is the only valid document to be referred to, for the purpose of granting power block. No modification of the installation shall be done without its first being incorporated in the above drawing.
- (iv) In case of large stations, a. copy of Station Working Rules may be issued to each cabin.

7.7 Every Station Master/Yard Master/Asstt. Station master shall be trained for the purpose and be fully conversant with all the local switches/isolators/cross-overs and special instructions applicable to the equipment provided at the station and as laid down in the Station Working Rules to enable him to operate Isolators under instruction from TPC

## 8 Protection of Dead Section

8.1 Protection of a dead section is achieved by the following means:

- (i) In the normal running direction, movements of trains are generally controlled by signals. Protection is obtained by placing a "Red Warning Collar" on the signal lever controlling the concerned signals, painted with inscription "Beware - No Voltage".
- (ii) If the points and signals are locally operated, they should be locked and the keys controlling the lever or lever frames should be kept with the Station Master on duty.

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When the signal cabin or lever frames are controlled electrically by a Station Master or a Cabin Assistant Station Master, the Station Master or Cabin Assistant on duty shall place the warning collars on the relevant slides of electric slide instruments or on the relevant keys of electric transmitters or Interlocked key boxes.

8.2 This action must be taken by the Cabin Assistant Station Master or the Station Master as the case may be, in respect of each and every movement prescribed in the Station Working Rules and after completion, confirmation should be given to the Section Controller to enable him to agree for the power block to be issued by the TPC.

8.3 In a large yard several warning collars may be required. Sufficient number of warning collars should be kept in each station/cabin. The exact number provided should be indicated in the corresponding Station Working Rules.

8.4 Once a warning collar is placed on the signal lever, it shall not be removed except after exchange of messages with private number.

### 8.5 Shunting Movement Towards Dead Section

(i) In cases where no signal exists for controlling the entry of an electric train into the dead section, the Station Master should arrange a hand stop signal to be exhibited at the point upto which alone the electric locomotive is allowed to proceed.

(ii) If it is necessary for an electric locomotive to carry on shunting movement towards the dead section, the red warning collar placed on a lever may be removed to permit the movement, provided that a hand stop signal as above is exhibited and the Loco Pilot is specifically instructed not to move the loco beyond the point.

(iii) The lever controlling the signals should have "red warning collars" placed on them to give protection to the dead section. However, if it is essential to carry out a shunting operation with an electric locomotive situated at point 'A' on the loop line to move into the main through the turn out, this may be permitted provided that the shunting movement is carried out only upto limiting mast 'P', short of the overlap span, where a hand signal is to be exhibited to prevent all movements beyond the point 'P'.

(iv) Train or shunting movements by other than electric locomotives, i.e., by diesel locos, may be permitted to enter the dead section, provided that the Station Master ensures by personal inspection that the train formation does not include an electric locomotive or OHE Inspection Car or EMU with pantograph raised. The "red warning collars" may be permitted to be removed to allow such movements.

(v) Whenever a "red warning collar" has been removed for permitting a movement it shall be replaced back on the signal control lever immediately after the movement is completed.

(vi) For purposes of the above rule, the term "Electric Rolling Stock" does not include electric rolling stock hauled 'dead' as a vehicle or OHE Inspection Car with its pantograph removed or securely locked down.

### 9 Movement of Other than Electric Trains

9.1 Goods or Passenger trains hauled by other than electric locomotives may be allowed to pass through the dead section subject to the following condition :-

(i) This has not been prohibited specifically in the power block message.

(ii) Diesel engine or trains hauled by such engines shall be brought to a standstill at the



station preceding the station/section at which power block is granted and the Station Master of this station shall satisfy himself by personal inspection that there is no electric locomotive in the train in question.

- (iii) He shall also give a Caution Order to the Loco Pilot of such engine or train warning him of the power block ahead and instructing him to watch for hand signals and observe them.
- (iv) No Station Master shall give line clear or lower signals for a train to run over a section under Power block unless he has received an assurance (supported by Private Number) from the Station Master of the preceding station that there is no electric locomotive or Inspection Car with pantograph raised in the train.

### 10. **Breakdown of Tele-Communication Between TPC and Sub-Stations, Switching Stations etc.**

- 10.1 If the TPC circuit becomes defective for any reason, several alternative channels of telecommunication are available. Should the P&T cable itself break-down all circuits through it may be inoperative. In such cases, essential messages may be passed through the P&T telephones, railway local telephones network, railway wireless network or microwave network. Urgent messages from TPC to traction sub-stations could also be passed through the Operators of grid sub-stations.
- 10.2 Close co-ordination should be maintained between the officials of the Traction Distribution Branch, S&T branch and DOT authorities to ensure quick restoration of normal communication facilities.

### 3011 ISOLATION OF HEALTHY LINES-

#### 1. **Safety measures to be observed in case of Unusual Occurrences on Electrified Sections**

##### 1.1 **Duties and responsibilities of Traction Power Controller, Section Controller and StationMaster in case of No Tension-Fault Tripping in Over-head equipment:-**

###### **(a) Fault Isolation:**

- (i) In an electrified section in the event of Over-head equipment failure, Traction Power Controller shall immediately identify and localize the faulty section and isolate the same. In case of double and multiple line sections, he shall also isolate healthy section on adjacent track on the same route length as faulty section. The Traction Power Controller shall then advise the Section Controller in writing or on phone under exchange of private number, of the section found faulty and healthy section temporarily isolated.
- (ii) On receipt of the advice from Traction Power Controller, the Section Controller shall take action as under:-
  - (a) Section Controller shall, under exchange of private number, advise Station Masters of stations on either side of isolated sections to treat the faulty section as if the same is under emergency power block and take action accordingly.

###### **On double line section -Healthy section temporarily isolated.**

- (b) The Section Controller shall check whether any train has entered in the faulty section. If not he shall advise the concerned SM to issue caution order to the Loco Pilot of the first train on unaffected section to '*keep a sharp look out on the adjacent line/lines to see if there are any OHE abnormalities*'. On reaching the next station, Loco Pilot, should report whether or not the section over which they have passed is safe for train movement. Then Section Controller will advise the Traction Power Controller in writing to re-energize



the healthy section that was temporarily isolated.

- (c) If however, a train has entered in faulty section, the Section Controller shall immediately inform SMs of all stations who are concerned with working of train in the faulty section and also in the section in which healthy Over Head Equipment is temporarily isolated, under exchange of private number, that they shall not allow any train to enter the affected block sections unless both Loco Pilot and Guard of the first train in unaffected section have been issued caution order to this effect.
- (i) "Proceed with speed not exceeding 60 kmph during day when visibility ahead is clear and not exceeding 30 kmph during night / during day when visibility ahead is not clear subject to observance of other speed restrictions."
- (ii) "Keep a sharp look out and be prepared to stop short of any obstruction, which may be due to any infringement from the adjacent line / lines and also keep a sharp look out on the adjacent line / lines to see if there are any Over Head Equipment abnormalities. On reaching the next station report whether or not the section over which they have passed is safe for train movement".
- (iii) Only after taking this action the Section Controller shall advise the Traction Power Controller in writing that necessary precaution have been taken to ensure safety of the train. The Traction Power Controller shall then restore the feed to the healthy section, which was temporarily isolated.
- (iv) Action to remove speed restrictions shall be taken by the Section Controller in consultation with Station Master on receipt of report from the Loco Pilot and the Guard that the section is free of obstruction. Section Controller shall also advise the Traction Power Control of the report of Loco Pilot / Guard of the train indicating whether or not there are any infringements or abnormalities in Over Head Equipment. Till such time, it is decided to remove speed restriction, subsequent train shall be allowed to enter into the section only with permission from the Section Controller and shall continue to be issued caution order prescribing clearly the speed restriction and other precautions, as pointed out in (c)(i) above.

### **1.2 Duties and responsibilities of Traction Power Controller and Section Controller in the event of any abnormality in train on Electric Traction necessitating 'Switching off' of Over Head Equipment supply –**

- i) As soon as Traction Power Controller comes to know about unsafe condition of a train working on Electrified Traction, he shall immediately switch 'Off' the over-head equipment supply of both the lines of relevant Sub-Sector. Traction Power Controller shall then advise in writing, the Section Controller of sections in which Over Head Equipment has been switched 'Off'.
- ii) On receipt of advice from Traction Power Controller, the Section Controller shall, under exchange of private number, advise Station Masters of all stations, who are concerned with working of trains in the affected section to treat the Dead section as if the same is under emergency power block and to ensure that no train is allowed to enter into the section.

#### **Healthy section temporarily isolated:**

- iii) Station Masters will not allow any train to enter even healthy line of the affected section unless both Loco Pilot and Guard of the first train of unaffected section have been issued caution order to proceed with the restricted speed not exceeding 60 kmph during day when view ahead is clear and 30 kmph during night / during day when view ahead is not clear subject to observance of other speed restrictions and keep a sharp look out and be prepared to stop short of any obstruction, which may be due to any infringement

or Over Head Equipment abnormalities from the adjacent line / lines. Also advise Loco Pilot to report immediately on reaching the next station whether or not the section over which they have passed, is safe for the train movement.

- iv) If Loco Pilot of unaffected section contacts him on phone, the Over Head Equipment of unaffected portion should be resumed and he will be asked to proceed with the restricted speed not exceeding 60 kmph during day when view ahead is clear and 30 kmph during night / during day when view ahead is not clear subject to observance of other speed restrictions and shall keep a sharp look out and be prepared to stop short of any obstruction, which may be due to any infringement from the adjacent line / lines. On reaching the next station Loco Pilot will report whether or not the section over which they have passed, is safe for train movement.
- v) After ascertaining that there is no infringement to adjacent track, the Caution Order as indicated shall be withdrawn immediately.

### **Section-having affected train:**

- vi) After getting information from the Crew of the affected train about the nature of abnormality, decision regarding recharging of the Over Head Equipment shall be taken by the Section Controller in consultation with Chief Controller/ Dy.Chief Controller (Shift duty) and controller of concerned department.
- vii) If the Loco Pilot of the affected train contacts Traction Power Controller/Control and no defect is detected in the train, on resumption of Over Head Equipment he will be asked by control to clear the block section with the restricted speed not exceeding 60 kmph during day when view ahead is clear and 30 kmph during night/ during day when view ahead is not clear subject to observance of other speed restrictions and shall keep a sharp look out for any abnormality in the train. On arrival at the station the staff of concerned department should check the train. If no abnormality detected the train should resume at normal speed.

### **1.3 Duties and responsibilities of the Loco Pilot and the Guard in case of Over Head Equipment tripping /No tension in Over Head Equipment:-**

- (i) In cases of transient Tripping of Over Head Equipment the Loco Pilot shall resume normal traction and keep a sharp look out including on the adjacent line / lines to see if there are any abnormalities/obstructions and will inform to the Guard through walkie-talkie or whistle code about tripping in Over Head Equipment. The Guard of the train will look out for any abnormality on his train. The Assistant Loco Pilot should look back and observe his train for any abnormality.
- (ii) If no tension in Over Head Equipment continuous, the Loco Pilot shall immediately switch 'ON' the loco flasher and control the speed (not exceeding 60 kmph at night) so as to be able to stop short of any obstruction and stop his train close to first emergency socket and will communicate with the Traction Power Controller/Control to know the reason for no tension in Over Head Equipment. The Crew should act according to advice of control.
- (iii) If it is not possible to communicate with the Traction Power Controller/Control immediately, the Loco Pilot shall depute the Assistant Loco Pilot to get down and check the train with the Guard in order to look for any abnormality for any defect in his train including locomotive. After the train has been checked, the Loco Pilot/Guard shall inform Section Controller of the abnormality, and assistance required, if any, or otherwise, through emergency phone of other line, Walkie-Talkie, Level Crossings gate or through train of other direction or by any other means of communication and act in accordance with advice of control. In case no abnormality is noticed in his train, Loco Pilot should switch 'Off' the loco flasher.
- (iv) If in the meantime, Power supply to Over Head Equipment gets restored, the Loco Pilot shall resume normal traction no sooner he comes to know of such resumption of supply.

### 2 Information to Traction Staff :

All information regarding any unusual occurrence received from Station Masters etc. shall be given by the Section Controller to the TPC to assist him to quickly locate faults.

### 3 Action to Rectify OHE Fault :

- (i) The Section Controller shall give top priority for the movement of the maintenance staff (by train, OHE Inspection Car or motor trolley) to reach the faulty section. It is the duty of all concerned to reach the break-down site either by rail or by road in the quickest possible time. They should carry with them a portable emergency telephone and keep in touch with TPC.
- (ii) The TPC after locating the fault shall reduce the section under power block to the elementary section concerned by arranging either by trained station staff or TRD staff, the opening of isolator switches. They shall, after inspecting the fault, inform TPC, the time expected to be taken for rectifying the same. TPC shall pass on this information to the Section Controller.
- (iii) The OHE staff shall then take a permit to work and proceed to rectify the fault duly observing the rules for the purpose.

### 4 OHE BREAKDOWNS

#### 4.1 Protective Steps in case of OHE Break-downs:

On receipt of information about OHE break-down, the SM/Section Controller shall also take such steps as deemed necessary to regulate traffic on the affected lines and issue caution order where required. Single line working may be introduced, if feasible.

It is the duty of every railway servant who notices hanging OHE conductors to take immediate preventive steps to ensure that no person comes into contact with them treating such conductors as live until an authorized person from OHE section arrives at site and makes the OHE dead and earth it.

#### 4.2 Breakdown Staff

- (i) On receipt of the first report about the breakdown, TPC shall direct the nearest OHE maintenance gang to proceed to site immediately with available breakdown vehicles for despatch of staff without waiting for full details of the breakdown.
- (ii) A quick assessment should be made on the basis of information available and where necessary one or more gangs from both sides of the site may be asked to proceed to the site. If the accident spot cannot be reached by rail-borne vehicles on account of the line being blocked by other trains, road vehicles equipped with emergency stores, tools and staff may be directed to the site. In sub-urban sections with large number of roads running along side the track, this method may help in tackling the repairs much more quickly.
- (iii) If the OHE Inspection Car or wiring train is required to attend to the break-down, the Section Controller, on request from TPC shall arrange for quick passage of the OHE Inspection Car or wiring train to the site of the accident.

#### 4.3 Assistance to be Sought

- (i) It should be remembered that restoration of traffic in the event of accident or breakdown is the responsibility of the Division as a whole. The Electrical Department Officer in-charge of the restoration work should, wherever required, ask for assistance from the Engineering, Traffic or other Officers as necessary. He should also keep the DRM fully posted with arrangements made and the expected time of restoration.

- (ii) When circumstances warrant, the assistance of OHE gangs of another contiguous Division may be sought for by contacting AEE(TRD) or Sr.DEE/DEE(TRD) of the Division concerned. The Officers who receive such requests from neighbouring divisions should treat the matter as of utmost importance and render all possible assistance.

#### 4.4 **Safety Rules to be Observed**

While speed is the essence of emergency working, rules prescribed for safe working shall never be infringed. Repair work may commence only after an emergency power block has been obtained and all other precautions necessary for protection of the staff taken. On completion of the repair work, the power block may be cancelled according to the prescribed procedure.

#### 4.5 **Temporary Repairs for Restoration of Traffic**

In the first instance, repairs to the OHE should be kept to the barest minimum necessary for restoration of traffic with least possible delay. Work must proceed simultaneously at many points. After effecting temporary repairs, the Officer or Supervisor in-charge of the work should personally check the whole area and satisfy himself that the installations are in order and safe. He may impose such speed restriction as necessary for movement of electric and other than electric trains till permanent repairs are carried out. Permanent repairs should be arranged and speed restrictions removed and normal operation restored at the earliest opportunity.

#### 4.6 **Clearance of Line for Diesel Traction**

If the breakdown is extensive and restoration of electric traction is unlikely in a short time even with temporary repairs, the line should be cleared for diesel traction as soon as possible, so that traffic may be kept moving until repairs to the OHE are completed. After diesel traction is introduced full precautions should be taken for protection of staff working at site.

#### 4.7 **Protection of Staff**

In addition to ensuring that work on OHE is commenced only after obtaining a power block, the supervisor in-charge shall take all measures for protection of staff and for exhibition of hand-signals as per G&SR, particularly when the line under repair and the adjacent lines are not blocked for other traffic.

#### 4.8 **Use of Cranes**

Special care is necessary when hand cranes are used at the site of break-down. The movements of the cranes shall be carefully controlled by the person in-charge so as not to come within 2 m. of live OHE, in addition to the usual precautions necessary to prevent infringement of adjacent tracks, which have not been blocked for other traffic

### 3012 **Working of Tower Wagons**

- 1 The validity of the competency certificate TR-4 for Tower wagon Drivers shall be 3 years as in the case of Train Loco Pilots. The Tower Wagon Drivers shall undergo refresher course and safety camp trainings as prescribed for Train Loco Pilots. The refresher course for Train Loco Pilots shall include operation and maintenance of Tower Wagons.
- 1.2 Tower Wagon Drivers must possess certificate of medical fitness in 'A-1' category issued by a Railway Medical Officer which shall be reviewed periodically, as prescribed for train Loco Pilots.
- 1.3 Tower Wagon must be equipped with headlights, flasher and tail lights. While moving in Convoy, the tail board/tail lamp should be fixed only on the last Tower Wagon in the direction of movement.
- 1.4 While working more than one Tower wagon in the same block section in uncoupled condition, the following rules shall be observed :

- (a) For working more than one Tower Wagon in the section, the Tower Wagon In-charge, who shall not be of grade lower than Junior Engineer shall give explicit memo regarding the requirement of operation of the Tower Wagons to the Station Master and shall ensure that the sequence of operation of Tower Wagons is not changed.
- (b) The Station Master, in turn will give memo to the Tower Wagon In-charge giving the sequence of operation of the Tower Wagons and station where they will clear the section.
- (c) The Station Master shall also issue “Authority to pass the signal at danger” on the prescribed format T/ 369 (3b) to the Tower Wagon Drivers giving the details of all the vehicles being permitted in the Section.”
- (d) The Tower Wagons shall not move at speeds more than 10 kmph and shall be ready to stop.
- (e) When not working i.e. when moving into a section for entering or clearing it, the Tower Wagons should maintain a minimum distance of 120 mtrs. between them.
- (f) After completion of the work, the official In-charge of the Tower Wagon who entered last in the section shall certify at the clearing station, about clearance of the section by all the Tower Wagons.

### **3013 Passing of Over-Dimensioned Consignments**

#### **1 Definition of Over-Dimensioned Consignment (ODC)**

- 1.1 When a consignment whose length, width and height are such that one or more of these infringe Standard Moving Dimensions at any point during the run from start to destination, then the consignment is called an Over-dimensioned consignment (ODC). It is also known as out-of-gauge loads.
- 1.2 If any consignment exceeds the following dimensions, it is to be treated as ODC or over dimensioned consignment:

	<b>BG</b>	<b>MG</b>
a) Length	13716 mm	12192 mm
b) Height		
i) at centres	2743 mm	2540 mm
ii) at corners	2134 mm	2134 mm
c) Width	2997 mm	2540 mm
d) Top width	610 mm	610 mm

#### **2 Classification of ODCs :**

- 2.1 ‘A’ class ODC having clearance (i.e. clearance measured under stationary conditions) of 228.6 mm and above from the fixed structures but infringes the standard moving dimensions.
- 2.2 ‘B’ class ODC having gross clearance of 152.4 mm.
- 2.3 ‘C’ class ODC having clearance of 152.4 mm but more than 101.6 mm.

#### **3 Precautions for Movement of ODCs in 25 KV ac Electrified Sections :**

The following precautions must be observed for transport of ODCs in the electrified sections:

- 3.1 Movement of ODC shall be undertaken only after sanction of competent authority has been obtained.



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- 3.2 In all cases where ODC is to be moved, staff accompanying the ODC shall remember that the OHE is 'live' except when a power block has been obtained from the traction officials. Even when a power block has been obtained, all lines other than those for which the power block has been granted are to be treated as 'live' at 25 KV.
- 3.3 The following are the prescribed clearances from contact wire for the passage of ODCs through electrified sections and the special restrictions required :
- 3.4 Special speed restriction is not required when the gross clearance is more than 250 mm.
- 3.5 Speed must be restricted to 15 kmph when the clearance is between 250 and 200 mm. with power ON.
- 3.6 Speed must be restricted to 15 kmph and power to OHE must be switched off when the clearance from the contact wire is less than 200 mm.
- 3.7 No consignment with less than 100 mm clearance from the overhead contact wire will be permitted in a 25 KV electrified section.
- 3.8 A representative of the OHE section should accompany all ODCs having clearances as specified in items 3.6 and 3.7 above, to supervise safe movement of the ODC at locations where clearance from the contact wire is critical.
- 3.9 A representative of the OHE section should also accompany ODCs having width more than 1981 mm for BG (and 1910 mm for MG) from centre line of track.
- 3.10 Section Controller and Traction Power Controller must coordinate while an ODC moves in electrified section in order to ensure that OHE masts are not damaged at locations where the clearance is critical.
- 3.11 A list of structures where the clearances are restricted in the electrified section and also the clearance, available under the over-bridges should be with the Section Controller and TPCs.
- 3.12 To facilitate checking of clearance from the Contact wire for over-dimensioned consignments, the Operating and Engineering branches at the Divisional and Headquarter level should have with them up-to-date charts showing location of the minimum height of contact wire and clearances of OHE structures in the electrified section. The Operating Department may permit movement of ODCs on the basis of clearance checked with the help of the above mentioned charts subject to the speed restrictions. However, when sanction of CRS is required to be obtained for movement of any particular ODC, a specific reference should be made to CEE and a certificate obtained from him in the following form:  
 "Certified that the minimum height of contact wire on the section over which the consignment is to move is not less than..... except at the following locations where restrictions as indicated below should be observed":-

Section	Location contact wire	Height of or 'off'	Power 'on' in kmph	Speed Restriction
1	2	3	4	5

#### 4 **Power Blocks for Movement of ODC :**

- 4.1 When an ODC is permitted to be moved in an electrified section with the OHE power off, it will be the responsibility of the Section Controller to arrange with the TPC for power to be cut off before admitting the ODC into the section. An authorised representative of the Traction Distribution Branch will obtain confirmation from TPC by message supported by private number that power has been switched off and then

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issue a memo to the Guard or other traffic official in-charge of the train to the effect that power has been switched off over the specified section. Only on receipt of such memo, may the train carrying the ODC be allowed to enter the section.

**Note:** Since such a memo is not a "permit-to-work" earthing of the OHE is not necessary.

### 3014 Other Precautions

1. Whenever station staff notices in a passing train worked by an electric engine anything unusual such as a hot axle, smoke/fire emanating from a wagon coach or with any vehicle running in a dangerous condition or any other abnormalities likely to endanger safety of train/passenger, the Station Master/Cabin incharge must immediately take steps to stop the train in case they have failed to stop such a train by normal means as laid down, they should immediately inform the Traction Power Controller either directly or through the Section Controller, with exchange of private numbers to switch off the power supply of the OHE of the affected section. In case Traction Power Controller is directly informed, the Section Controller should also be informed subsequently.
2. Similar action to switch off the power supply shall also be taken when a running through train worked by Diesel also is noticed in a dangerous condition likely to endanger safety of trains on the adjacent line(s). [Also see S.R.4.17(2)].
3. The switching off of OHE takes place on the graded section and there is a chance that the train may roll back, action as prescribed in SR 6.04 (2) shall be taken by the train crew to prevent rolling back. Besides this, engine crew shall also make use of wooden wedges.
4. Movement of Rubber Tyre Vehicles on Railway Wagons. All metallic parts of rubber Tyre vehicles which are transported on railway wagons through 25 KV electrified area shall be earthed to avoid the effect of induction. For earthing of rubber tyre vehicles, suitable jumpers with clamps shall be provided by the party (military or any other). These jumpers shall be connected between vehicle and wagon firmly by SSE/C&W under the supervision of SSE/OHE. Escorting staff shall ensure that these are not detached during journey. Since these jumpers will be property of party (Military or any other ), same will be retained by party at end of journey with unloading of vehicle at destination.

Escorting staff will be briefed by Division (TRD) about the safety rules to be followed in 25 KV AC electrified section. Minimum 02 meters working clearance shall be maintained from live OHE all the time by escorting persons. In no case, escorting staff is allowed to climb over the roof of consignment. In case same is unavoidable for any reason, the escorting staff shall inform the Chief Traction Power Controller through Dy.SS/SS of nearby station and obtain "Permit to Work" from authorised Traction Distribution staff duly switching off OHE supply and providing discharge / earthing rod.

#### 5 Hoarding Boards

- 5.1 Hoarding boards provided in the vicinity of electrified tracks should be located at a safe distance from the track so that in the event of their supporting structures being damaged during agitation or storms, it should not fall on the OHE or infringe the track. For this purpose, CCM and CPRO will ensure that while granting approval for erection of hoardings boards, it must be ensured that not only these are located at a safe distance from the track but also their structural arrangements are properly secured.

#### 6 Standing on the roof of Diesel/Electric Engines:

- 6.1 Staff are warned of the danger of standing on the roof of Diesel/Electric Engines when stabled under live OHE as it may result in electrocution.

#### 7 Engines owned by outside parties

- 7.1 The safety precautions mentioned above are equally applicable to locomotives owned by Steel Works or other factories in the neighbourhood of electrical sections that are likely to work in electrified sidings for shunting or other purposes. The special safety rules to be observed in electrified sections should be advised by Sr.DEE(TRD) to parties owning such locos and their written assurance obtained that their operating staff have been made familiar with these rules.

### 3015 WORKING OF TRAINS ON ELECTRIFIED SECTIONS OF RAILWAYS

- 1 Shutdown required for removal of crow-nest or stray wires in the vicinity of live equipment - S.R.17.09 (3) should be followed



- 2 Blocking Train Movement in an Emergency - S.R. 17.09 (4) should be followed.
- 3 Shutdown on Churchgate-Virar Section on 2.2 KV distribution lines and 22 KV transmission lines for the purpose of maintenance of repair work - S.R. 17.09 (5) should be followed.
- 4 **Accidents - Responsibility of Electrical Department.** [Ref. S.R. 17.09 (6)]
  - 4.1 In the event of any accident occurring in which electric coaching stock/loco is involved or where damage to overhead structures or equipment takes place, the Railway servant who notices it, shall take necessary precautions against danger of electric shock and shall inform the nearest Station Master, Train Controller and Traction Power Controller who will take immediate action to cut off power supply, to the affected tracks if necessary, restore the equipment after ascertaining that it is safe to do so. The line is not to be reopened for traffic until a responsible official of the Electrical Department inspects the site and certifies that the line is safe for the passage of trains.
  - 4.2 **Authorisation to issue “Permit to Work”** (Ref. S.R. 17.09 (7))

The only authorised person to issue permit to work is the Traction Power Controller, who will sign the prescribed form for Senior/Divisional Electrical Engineer (Traction Distribution) of the section. Any “authorised person” may issue the certificate that the line is safe for passage of trains, as required under S.R.17.04(5).
- 5 **Loading and unloading of petroleum products**
  - 5.1 **Precautions to be Observed :**

In order to avoid any sparking during loading or unloading of petroleum products at the petroleum siding, electrical continuity must be maintained between the earth systems of petroleum installations, the track and electric overhead traction installation. The loading zone should be insulated from the rest of the railway network during loading and unloading operations. The following precautions / arrangements would be necessary.
  - 5.2 **Arrangements :**
    - (i) Provision of an equipotential link between the earth system of petroleum siding installations and the track via a switch.
    - (ii) Setting up of neutral zones (insulating joints) in the track to avoid any risk of propagating stray current.
    - (iii) Setting up neutral zones/sections in the contact and catenary wires similar to loco inspection pits.
    - (iv) Provision of longitudinal bonds on both the rails as well as transverse bond (30 m intervals) on the track. All masts and metallic structures in the vicinity of the track/siding should be provided with structure bond.
    - (v) Provision of 10 Ohm earth connected to the petroleum siding on each side at the insulated joint.
  - 5.3 **Precautions**
    - (i) No oil tanker is permitted to stable under live OHE for inspection purpose.
    - (ii) Fuelling to be done by side filling arrangements only.
    - (iii) Pipelines in the vicinity of the track should be properly earthed.
    - (iv) Minimum 2 m electrical clearance from live OHE of the adjacent track or any other equipment nearby must be maintained.
    - (v) During service operations, the continuity of track and the contact wire should be set up at the same time the link between the track and petroleum facility should be opened.
    - (vi) The isolators at the neutral section of OHE should be kept open, OHE made dead and earthed.

### 6 Competency Certificate

#### 6.1 Competency Certificate and Courses for Assistant Station Masters/Guards of EMUs :

All staff who are required to work in electrified territory must have undergone a course in Electric traction so that they are made familiar with the working rules in the electrified sections. ASMs are also sometimes required to operate isolators at the station premises for which necessary training is to be imparted. Similarly, the Guards of the EMUs are also required to undergo an operational course for the working of EMUs and are to undergo a refresher course at regular intervals of 6 months at Electrical Training Schools. Operating department will ensure that only those staff who have undergone the course in Electric traction and possess competency certificate issued by Sr.DEE/ DEE/TRD or his authorised Inspector, are posted in electrified areas.

### 7 Identification of Sectors, Sub-Sectors and Elementary Sections :

7.1 It is vitally important for every Railway official who has occasion to ask for power block to know the correct method of identifying and describing any section of the OHE where shutdown is required. He should have with him the upto-date Station Working Rule Diagram for the section, showing all relevant particulars such as station names, position of all isolators, interrupters, circuit breakers, “up” and “down” tracks, cross-over section insulators, sectors, sub-sectors and elementary section numbers.

- (i) **Sectors:** These are described by referring to a section of OHE of a track which can be energized by closing a feeder circuit breaker at the substation/ feeding post. It covers the section between sub-station/feeding post and adjacent neutral sections.
- (ii) **Sub-sectors:** These are described by the names of two limiting switching stations in the order in which the train moves and adding the name of the track, e.g., Sub-sector Kendposi- Tabu Dn.
- (iii) **Elementary Sections:** are referred to by four/five digit numbers. The sections are numbered serially in the direction of power supply i.e., from the feeding post/substation towards the neutral section or the terminal point. At each feeding post/sub-station a new series of numbers starts. The first two/three digits represent the interrupter controlling feed to the section and the last two digits the serial number of the elementary section. Up line elementary sections have progressively odd numbers and Down line elementary sections have progressively even numbers. e.g., elementary section 0202 means the first elementary section from the feeding post/sub-station on the down line, fed by interrupter 02.

Whenever there is a doubt in the description, the person asking for power block shall state clearly the track and OHE structure numbers between which work is to be done.

### 8 Telephone Messages

All messages relating to shut-down and restoration of power supply, permits-to-work, etc. issued over the telephone shall invariably be supported by exchange of Private Numbers.

### 9. Securing of wagon doors

Staff must close and secure the wagon doors properly after the same have been unloaded at unloading points. One of the staff should be posted in the yard to close the wagon doors. He must see that no wagon is allowed with its door opened to run.

10. **Extension of Traction feed**

In case of power supply failure at any sub-station or in the event of grid supply failure at one or more traction sub-stations, the OHE supply is extended from healthy sub-stations nearby. In such cases, it is necessary for the Section Controller to regulate goods trains, on receipt of message from Traction Power Controller.

**3016 ACCIDENTS**

1 Every electrical accident shall be inquired into by an officer and a report submitted to the Chief Electrical Engineer (functioning as the Electrical Inspector for the Railways) giving complete information within one week of the accident. The report should, in particular, cover the following points :

- (i) A clear description of the locality and a sketch showing all the relevant details;
- (ii) An analysis of the evidence recorded;
- (iii) Findings as to the exact cause of the accident;
- (iv) Fixing up of responsibility of staff negligence, if any, indicating whether the "Rules for Safe Working on Electrical Equipment" have been followed or not;
- (v) Recommendations for preventing such accidents in future; and
- (vi) Any special features peculiar to the case.

2 Until the official inquiry is conducted, all material evidence should be preserved by the official in-charge, to facilitate the inquiry. Where restoration of supply is likely to obliterate marks on the premises or in any other way, destroy evidence which may be of use in an inquiry, the Senior Electrical Official who first arrives at the site should carefully make notes and sketches and preserve the evidence as far as possible, for production at the inquiry.

3 **Resuscitation from electrical shock**

3.1 **Instructions to be Displayed :**

Instructions in English and the Regional language regarding the treatment of persons suffering from electric shock shall be exhibited in all inspection sheds, stabling depots, repair shops, stations, sub-stations etc. and it is the duty of every authorized official to make himself thoroughly familiar with such instructions, and to be able to render artificial respiration when necessary.

3.2 Electrical shocks are easily received but are as easily avoided if proper precautions are taken in maintaining and handling electrical equipment.

3.3 **Removal from contact :**

If the person is still in contact with the apparatus that has given him the shock, the rescuer should, if possible, stand on a dry wooden chair while removing the victim. Otherwise pull him free by using a dry coat, dry rope, coconut matting or stick, preferably standing on a rubber mat or any other dry mat handy. Never touch the man's body with bare hands.

3.4 Extinguish any sparks if the patient's clothes are smouldering; ascertain if he is breathing and send for a Doctor.

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CHAPTER - 31

**BRAKE SYSTEMS ON RAILWAYS AND PASSENGER ALARM APPARATUS**

**3101 Brake Systems :**

1. An efficient and reliable brake system is needed for stoppage of vehicle in minimum possible distance. The system should be such that vehicles should not experience jerks and should stop smoothly.
2. The railway brake system should have the following features:
  - (a) *Automatic application* : The brakes should apply automatically in case of train parting.
  - (b) The brakes should apply as fast as possible.
  - (c) The brakes should simultaneously apply on each vehicles of the train.
  - (d) The brake force should not reduce with passage of time.

**3102 Brake Systems on Indian Railways :**

Following are the brake systems in use on Railways :

1. Hand Brake
2. Automatic Vacuum Brake
3. Air Brake
4. Dynamic brake

Note - Brake System on Electrical Locomotive and EMUs is given in Para 3107.

**3103 Hand Brake :**

Hand Brakes are fitted to wagons, Brakevans and Locomotives. A big lever known as hand brake lever is employed which when pressed down in the toothed-rake engages the brake block through levers on the wheel tread with a force depending on the leverage ratio and force applied. Hand Brakes are not taken into account for the purpose of brake power except where specially provided viz. on Ghat sections etc.

In view of some operating difficulties lever operated hand brakes are replaced with hand brake wheels on some goods stock viz. BOX, BOXN, BCN etc.

1. Whenever the Loco Pilot requires additional brake power, the Guard must apply the hand brakes of as many wagons as the Loco Pilot may consider necessary.
2. On trains carrying passengers, the Guard shall apply hand brakes in the Brakevan. On goods trains, hand brakes of atleast one third of the wagons on the train or 10 wagons behind the engine and 5 wagons inside the brake van, whichever is more, shall be pinned down, in addition to the application of Guard hand brake in the Brakevan. Special care shall be taken for the train with special type of wagons such as BOX, BOBs, BOI,BOY, BRH etc. which are fitted with roller bearings, while taking the above precautions.
3. While stabling a load or wagon the hand brakes whether side lever operated or rotating wheel operated must be fully tightened. If a rake/load of wagons fitted with roller bearing is stabled, atleast six wagons from either end must have their brakes on.
4. The brakes should be operated by Pointsman or Shunting Porter under the personal supervision of the Guard or Station Master.
5. In case of train parting, hand brakes should be applied as given in para (2) above.

- The hand brake must be released fully before moving out the wagon/train.

**3104 Automatic Vacuum Brake :**

**1. Definition of Vacuum :**

Perfect vacuum is an empty space devoid of all air. In practice perfect vacuum is never obtained and it is not also necessary to create it.

**2. Atmospheric Pressure and its Measurement :**

The atmospheric pressure is the pressure exerted by the air. This pressure is approximately 1.033 kg/cm<sup>2</sup> and it is exerted equally in all directions.

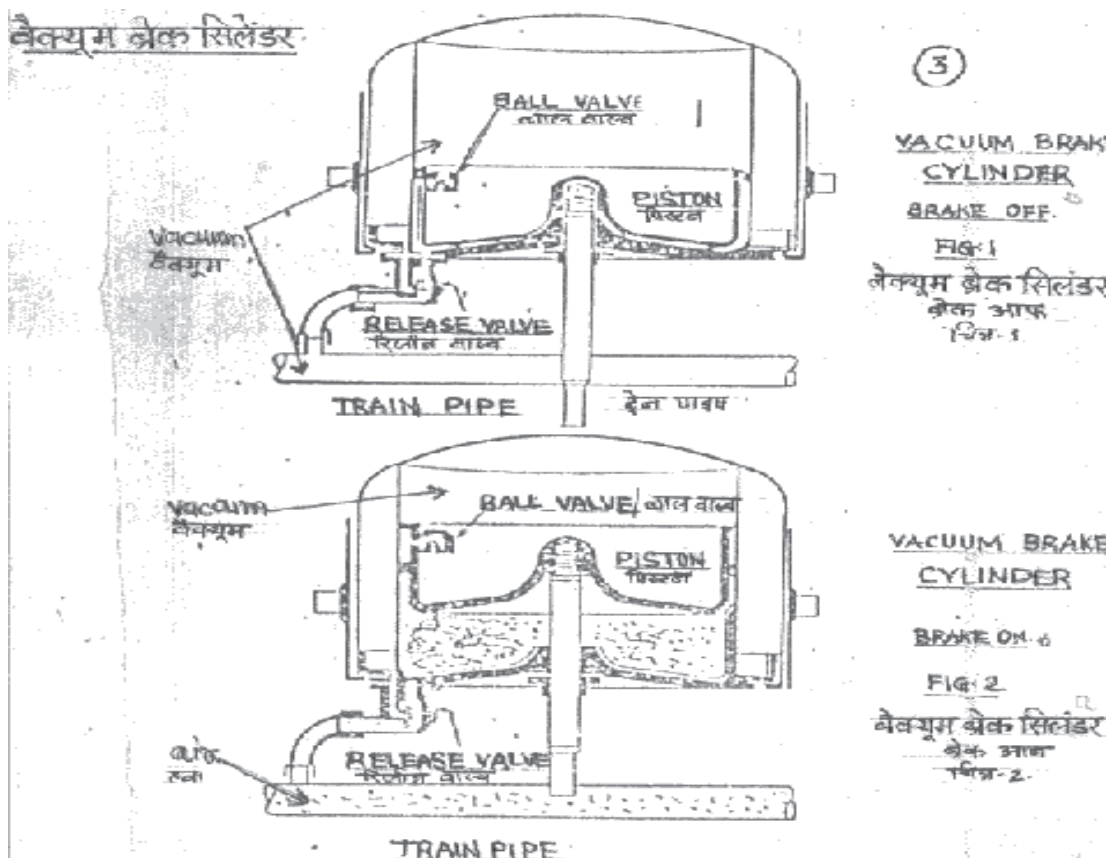
The atmospheric pressure can also be measured in centimetres of mercury. 76.2 centimetres of mercury is appx. equal to 1.033 kg/cm<sup>2</sup>.

Vacuum is also measured in centimetres of mercury or simply called centimetres. 76.2 centimetres of vacuum is perfect vacuum.

Since in practice it is impossible to maintain perfect vacuum with the vacuum exhauster on a locomotive, the quantity of vacuum generally maintained is about 50.8 centimetres which corresponds to a pressure of about 0.703 kg/cm<sup>2</sup> of atmospheric air.

**3. Vacuum Brake Cylinder :**

The action of the vacuum cylinder is as follows :



**Train Pipe :**

- When the Vacuum exhauster is started on the locomotive and when the train pipe is coupled upto the last vehicle and when the hose pipes at the rear end of the train and front end of the engine are connected to the dummy plug, air is withdrawn from the train pipe and all the vacuum cylinders. Air from both below and above the piston in the vacuum cylinder is thus withdrawn. The air from the upper portion of the piston is withdrawn through the ball valve in the piston itself.

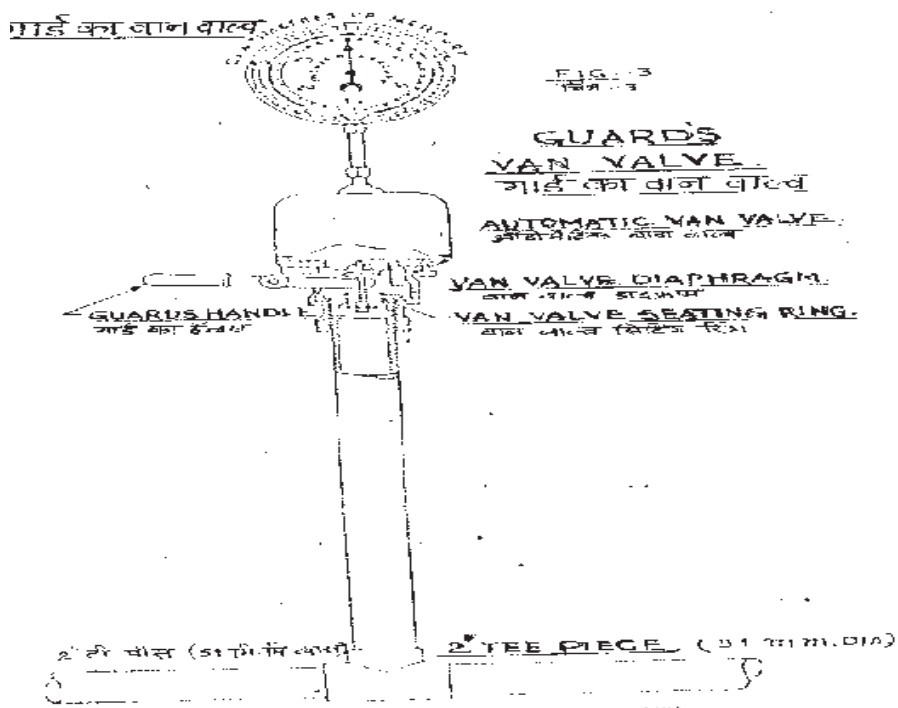
- (b) To apply brakes, air is admitted to the train pipe by destroying the vacuum by Loco Pilot or by the Guard by opening his vacuum brake valve or by any person in the train pulling the Passenger alarm chain. All these three admit air into the train pipe which goes to the lower portion of the vacuum cylinders and forces the pistons up. The upward movement of the piston is utilised to operate the brake gear which applies the brakes on to the wheels.
- (c) The brakes can be released by :
  - (i) The Loco Pilot recreating vacuum which again draws out the air from the train pipe and vacuum cylinder allowing the pistons to drop by their own weight resulting in the brakes being released;
  - (ii) By pulling the release wire to open the release valve which opens a communication between the lower and upper side of the piston resulting in the pressure on the two sides of the piston being equalised and the piston dropping by its own weight, thus releasing the brakes.

**4. Release Valve :**

It is the valve which is used for releasing the brakes. When the release wire is pulled, the valve is removed from its seat, making connection between train pipe and vacuum chamber, thus releasing the brakes.

**5. Guard's Van Valve and Gauge :**

- (a) This valve is fitted on the main train pipe and enables the Guard to admit air into the train pipe and apply the brakes by pressing down the handle.
- (b) The Guard's Vacuum Gauge indicates vacuum in the train pipe.
- (c) The valve have small holes through its stem and is secured at the top by a diaphragm to a small dome like chamber, to which is fitted a vacuum gauge, while chamber is exhausted when vacuum is created in the train pipe. If a gradual application is made, the vacuum in this chamber is destroyed as quickly as in the pipe. When, however, the brake is applied suddenly, the vacuum beneath the valve is destroyed much more quickly. The pressure of the atmosphere on the diaphragm then lifts the valve, which remains open until the vacuum is destroyed in the dome like chamber through the small holes and it then closes by gravity.





**6. The minimum vacuum levels prescribed for the locomotive and Brakevan are :**

<b><u>Broad Gauge</u> - Type of Services</b>	<b>Locomotive</b>	<b>Brake Van</b>	<b>Average</b>
Mail/Express	53 cm	47 cm	50 cm
Passenger	50 cm	44 cm	47cm
Goods	46 cm	38 cm	42 cm
<b><u>Metre Gauge</u> - Type of Services</b>	<b>Locomotive</b>	<b>Brake Van</b>	
Mail/Express	46 cm	38 cm	
Passenger	46 cm	38 cm	
Goods	46 cm	23 cm upto 70 unit 20.4 cm upto 90 unit	
<b><u>Narrow Gauge</u> - Type of Services</b>	<b>Locomotive</b>	<b>Brake Van</b>	
Mail/Express	46	38	
Passenger	46	38	
Goods	46	38	

**7. Communication between Passengers and Train staff :**

- (a) Passenger vehicles are fitted with an alarm signal apparatus worked by a chain which runs along both sides of the inside of the carriages just, below the junction between the roof and the sides of the carriages. This chain is easily accessible by passengers. On certain sections, however, the passenger communication apparatus takes the form of an electric bell in the Loco Pilot's cab which can be operated from each carriage as well as from the Guard's van by means of a bell push. This apparatus, however, is not connected with the brake system.
- (b) The pulling of this chain opens a valve, there by admitting air into the train pipe and causing a sudden but partial destruction of vacuum, registering a drop of 10 to 13 centimetres in the Vacuum Gauge on the engine and in the Brakevan. This, as also the train pulling heavy as a result of partial application of the brakes, at once attracts the attention of the Loco Pilot and the Guard.
- (c) On observing a drop in the vacuum indicator, the Loco Pilot must bring his train to a stand as quickly as possible at a suitable place and he must at the same time give the prescribed whistles viz. Two short and one long. This whistle code must be repeated while the train is being brought to a stand and until the Guard shows a red flag by day and red light by night indicating that he understands the situation.
- (d) If it is noticed that communication chain has been pulled at a place which shall result in the train being stopped on a bridge or a viaduct or in a tunnel or other unsuitable spot, the Loco Pilot may recreate vacuum and work the train on to a safe place to stop, advising the Guard that he is doing so.
- (e) The Guard, on noticing that the communication chord has been pulled shall apply the vacuum brake very cautiously as not to part the train.
- (f) When the train has been brought to a stand both the Guard and the Assistant Loco Pilot shall proceed at once to the carriage from which the chain has been pulled and make enquiries from the passengers travelling in the compartment or at each compartment of the coach, if necessary, to find out whether there is any thing wrong. The Guard shall walk on the left side of the train and the Assistant Loco Pilot on the right, both keeping a sharp lookout for any passenger running away from the train.
- (g) When the chain is pulled, a red disc projects outside on some carriages or revolves from the horizontal to the vertical positions on others, on both sides and at the end of



the carriage where the clappet valve is fitted. The carriage from which the alarm chain is pulled can be ascertained by the position of the red disc and the particular compartment by the slackness of the chain inside the compartment.

- (h) If it is found that the reason for the stoppage of the train will necessitate a halt of more than ten minutes, the train must be protected in accordance with the extant rules.
  - (i) Should it be found that the alarm chain has been pulled mischievously or for an unjustifiable cause or the hose pipe been disconnected by some miscreants, the Guard in charge must ascertain the name of the person who pulled the chain or disconnected the hose pipe. His name and address with those of other occupants must be obtained and the Guard should make a report regarding the alarm chain pulling or the hose pipe disconnection incident and hand over the same to SM of the station at which the incident occurs, if time permits or at the next stopping station, who will take action in lodging the report with the GRP of the station in whose jurisdiction the incident has occurred.
  - (j) The Guard shall record the fact in his Rough Journal and Combined Train Report and also report to the Section Controller.
  - (k) The alarm signal apparatus may be blanked off in trains of a particular section if the administration is satisfied that mischievous use of the same is being made with the approval of Headquarter.
8. **Testing of alarm signal apparatus :**
- (a) At the starting station the alarm signal apparatus in all passenger vehicles must be tested by the train examination staff, within 24 hours before occupation by passengers. This test must be carried out by pulling the chain on both sides of the compartment from the end of the coach where the chain is anchored i.e. farthest away from the end where the clappet valve is fitted. An apparatus is considered effective when the indication disc operates correctly and the admission of air into the valve can be heard distinctly. At station where train examining staff are not provided, this test will be carried out by the Guard of the train and Guard and Motorman of an EMU train.
  - (b) In addition, an examination of the alarm signal apparatus fitted to each passenger vehicle shall be carried out once in every three months by the SE (C&W), and the date of examination as well as the code initials of the station shall be stencilled on the outer casing of the valve.
9. **Testing Vacuum Brake before descents and stoppages :**  
Loco Pilots must test the vacuum brake before descending steep inclines.
10. **When descending gradients :**  
In controlling trains on descending long and heavy grades, Loco Pilots are cautioned against allowing the vacuum above the pistons, to fall too low, which it will do unless periodically restored by exhauster. The destruction of vacuum above the pistons, owing to leaks, is always taking place during the continuous application of the brake while descending long down grades, and it is of the utmost importance that the vacuum above the pistons should be restored by exhauster. But before using the exhauster, the speed should be reduced to allow for the increases of speed which will take place when the exhauster releases the brakes. Care should be taken that the speed during the release of the brakes is not allowed to increase beyond a safe limit. Neglect of this rule may lead to run away.
11. **When standing on gradients :**  
The fact that after the brake has been applied the vacuum above the pistons gradually decreases, owing to leaks and that in less than half an hour the brakes may leak off together, must not be forgotten, when a train is brought to a stand on a gradient steeper than 1 in 200. In all such cases measures must be taken to guard against the possibility

of a run away. All hand brakes must be applied and if the grade exceeds 1 in 100, one pair of wheels of every third vehicle must be spragged. When ready to start a proper vacuum must be created and the vacuum brake applied before the hand brakes are released and the sprags removed. Guard should carry the sprags on steep gradient sections.

12. **Smooth stopping :**

When approaching a station at which the train has to stop, the Loco Pilot must destroy at least 10 to 13 centimetres of vacuum at once. Just before the train comes to a stand, however, the Loco Pilot should put his handle into the "Running" position to release the brakes slightly to prevent a sudden jerk.

13. **Guards applying Vacuum Brake :**

When a Guard has to apply brake in an emergency, he should operate his van valve handle in such a way that about 10 to 13 centimetres of vacuum is destroyed at once. Thereafter, if necessary, he should further destroy vacuum gradually.

14. **Testing of locomotive in case of vacuum trouble:**

In case the desired vacuum level is not created the identification of problem on diesel and electric locomotives, is to be carried out with the help of following tests:

(a) *Blockage test :*

With one exhauster on electric loco/diesel loco running at idle, remove vacuum hose pipe on one side of the loco from dummy and raise it upward (to avoid suction of dirt etc.). Normally with hose pipe open, the vacuum should drop to zero but if it is more than 8 cm, it indicates blockage in the system. Repeat the procedure from the other end of the loco.

(b) *Efficiency Test :*

Electric/Diesel locomotives be tested to ascertain that on 5/16" dia (8 mm) leak hole in 3 mm plate, with single exhauster working at slow speed on electric locomotive and with engine working at idle speed on diesel locomotive, the vacuum level of 53 cm is achieved.

Loco	Vacuum Loco		Dual Brake Loco	
	Dummy	Disc -3 mm (8 mm hole)	Dummy in cms	Disc - 3 mm (8 mm hole)
Diesel	56 cms	53 cms	58 cms	53 cms
Electric	56 cms	53 cms	58 cms	53 cms

On newly manufactured, rebuilt and POHed locomotives, the difference between the dummy and 8 mm hole disc should not be more than 3 cms.

(c) *Leakage Test :* If the above conditions are achieved, then tests may be carried out to ensure that maximum leakage rate on diesel/electric locomotives is not more than 7 cm/min.

The blockage and efficiency tests on diesel and electric locomotives should be carried out not only before turning it out from the shed but also in the yard to rule out loco defects whenever the train is held up for creation of vacuum.

The leakage test on the locomotives should be carried out in the shed only.

15. **Creating of initial vacuum on electric locomotive :**

In case of electric locomotives, at the time of initial creation of vacuum as well as after full application of brakes the vacuum should be created by running both the exhauster till 45 cm of vacuum is obtained. Thereafter only one exhauster will run.

16. **Instructions for Guards :**

(a) The guard must apply brake, by emergency brake valve of guard van valve, in case of emergency only.

(b) The guard must see that all hose pipes between engine and last vehicle are properly connected, hose pipe of last vehicle should be placed on dummy plug.

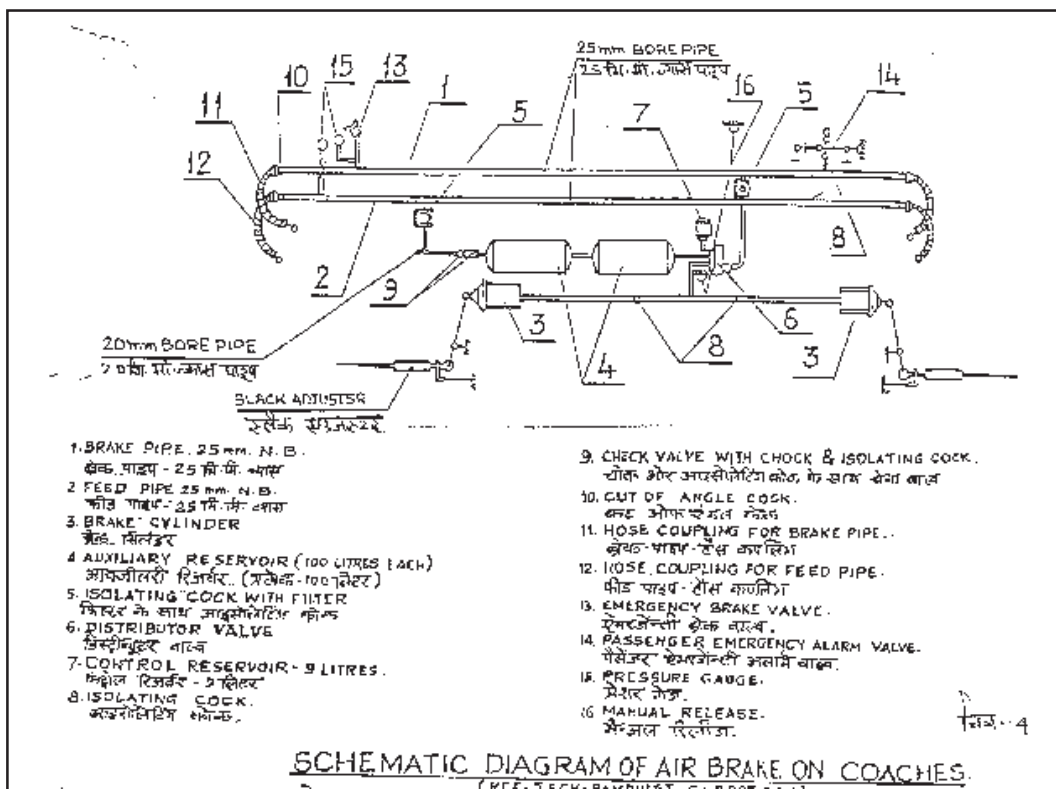
(c) The guard and Loco Pilot must report to train examining staff at the next station about any irregularity in vacuum brake.

**17. Testing of train in case of vacuum trouble :**

**Coaching Trains** — On Passenger carrying train maximum leakage rate should not be more than 5 cms/minute. On one vehicle 13 cms/ minute and for the full rake as per IRCA pt. IV Appendix D para 2.2 (d)

**Freight Trains** – On goods train maximum leakage rate should not be more than 5 cms/minute. On one vehicle as per IRCA pt. III Appendix E, Clause E-5.4.

**3105 Air Brake System :**



**1. Introduction :**

The demand for running trains at higher speeds has necessitated a better braking system which is the evolution of 'Air Brakes', to control the speed of the trains and stop it within a reasonable distance, irrespective of length, load of the train, distance covered and altitude of the section.

**2. Types of Air Brake System :**

There are two types of Air Brake systems -

- (a) Twin pipe system in which there are two pipes, one is brake pipe for brake application and release and the other is feed pipe for charging air pressure to auxiliary reservoir. This is provided on coaching trains.
- (b) Single pipe in which only one brake pipe is designed for charging and brake application. This system is provided on goods trains.

**3. Description of Air Brake Systems :**

The brake pipes of all coaches/wagons are to be connected with the flexible air hoses and then to the brake pipe of locomotive. Then all the angle cocks to be kept in open position but front angle cock of leading loco and rear angle cock of brake van or last vehicle to be in closed position. Similarly the feed pipes are also to be connected on coaching trains.

## BRAKE SYSTEMS ON RAILWAYS AND PASSENGER ALARM APPARATUS

Note: It should be ensured that B.P. & F.P. hoses of wagon / coaches are coupled to B.P. & F.P. hoses of loco and also with other wagons/ coaches . For correct connection and for easy recognition **Brake Pipe** is painted with '**Green**' colour and **Feed Pipe** is painted with '**White**' colour.

- (a) *Charging*  
Feed pipe is charged with air pressure of  $6 \pm 0.1$  Kg/cm<sup>2</sup> and brake pipe with  $5 \pm 0.1$  kg/cm<sup>2</sup> throughout the length of the train and the indication of the continuity is noticed in the rear brake van with feed pipe pressure of 5.8 to 6.0 kg/cm<sup>2</sup> and brake pipe pressure of 4.8 to 5.0 kg/cm<sup>2</sup>.
- (b) *Brake Application :*  
While applying brake Loco Pilot operates A-9 valve in the loco in application position and destroys brake pipe pressure. Brake application is proportional to the reduction of pressure in brake pipe.
- (c) *Brake releasing or recharging :*  
For releasing the brakes the air pressure in the brake pipe is restored to 5 Kg/cm<sup>2</sup> by setting A-9 Handle/valve to release position. Brake cylinder automatically connects to atmosphere through distributor valve. Air pressure from brake cylinder is exhausted to atmospheres and brakes get released. The brake release is proportional to the rise in the brake pipe pressure.
- (d) *Manual Release :*  
When engine is detached from the train the release valve lever provided in the bottom of distributor valve is pulled, there by the air pressure from the brake cylinder is vented out through distributor valve making brakes to get released.
- (e) *Coupling and uncoupling of air hoses :*  
The coupling palm ends of the feed pipe are of opposite design to those of the brake pipe. The coupling palm ends are identified with white paint for the Feed pipe and with green paint on the Brake pipe. The Feed pipe and Brake pipe palm end couplings cannot be coupled together because of their different design.
- (f) *Guard's emergency brake valve:*  
This is provided in the Brakevan painted with red colour, fitted on the Brake pipe for emergency application of the brakes by the Guard. At the time of operating this valve the pressure should be reduced gradually as sudden reduction of BP pressure may lead to train parting.  
In twin pipe system, there are two pressure gauges provided in the Brakevan to indicate Brake Pipe and Feed Pipe pressure on the run. While in single pipe system only one pressure gauge is provided to indicate Brake Pipe pressure.

- (g) *Brake pipe and feed pipe pressure :*

### Goods Trains:

	<u>Locomotive</u>	<u>Brakevan</u>
BP pressure	5.0 kg/cm <sup>2</sup>	4.8 - 5.0 kg/cm <sup>2</sup>

**Note :** Main reservoir pressure should be between 8 to 10 kg/cm<sup>2</sup>

### Passenger Trains:

	<u>Loco</u>	<u>Brake Van (SLR)</u>
BP pressure	5.0 kg/cm <sup>2</sup>	4.8 - 5.0 kg/cm <sup>2</sup>
FP pressure	6.0 kg/cm <sup>2</sup>	5.8 - 6.0 kg/cm <sup>2</sup>

- (h) *Shunting (Detaching and Attaching of coaches/wagons) :*  
The Guard of the train shall be personally responsible for supervision of shunting enroute.

### **Procedure for detachment of a coach :**

Following procedure should be adopted in case of detachment of a coach on account of sickness or due to any other reason:

- (i) Uncouple the electric and telephone couplers.
- (ii) Uncouple the vestibules.
- (iii) Uncouple the screw couplings.
- (iv) Open the safety clamps provided on the angle cocks of the adjacent coaches.
- (v) Close the angle cock of the feed pipe and the brake pipe at both ends of adjacent coaches.
- (vi) Uncouple the hose couplings of the feed pipe and brake pipe.
- (vii) Release the brake cylinder manually.
- (viii) Now detach the coach from the train.
- (ix) After detachment of the coach recouple all the fittings, screw couplings, electric and telephone couplers, vestibules and hose couplers.
- (x) Open the angle cocks of brake pipe and feed pipe and secure by safety clamp.
- (xi) Charge the brake pipe and feed pipe by connecting to locomotive.
- (xii) Fill up the Brake Power Certificate (Mechanical V-5) jointly with the Loco Pilot and Guard in proof for having tested continuity of brake pipe.

### **Procedure for detachment of wagon :**

- (i) Close both the angle cocks of B.P. of concerned wagon as well as the adjacent wagon in rear and front.
- (ii) Disconnect the air hose pipe couplers and destroy B.P. pressure of the rear load by opening B.P. angle cock to avoid rolling.
- (iii) After shunting, adopt the procedure given above to disconnect the hose couplers of the front wagons.
- (iv) The detached wagons should be left with brakes 'on' and opening B.P. angle cock. The hose couplings should be kept on suspension brackets.
- (v) After re-joining of loads, ensure correct coupling of CBCs. B.P. couplers should be connected first and then open their angle cocks.
- (vi) Ensure that the prescribed B.P. pressure is obtained in engine and Guard's brake van.
- (vii) Conduct the continuity test as per SR 4.32(9).

### **(i) Brake power percentage :**

- (i) Passenger trains.: Originating from primary depot should have brake cylinder operative percentage of 100%. While enroute the amount of operative brake cylinders should not fall below 90% in any case.
- (ii) Goods trains : the percentage of operative brake cylinders should not be less than 85% for other than close circuit (CC) rakes from the originating station. For close circuit (CC) rakes above percentage shall be 100%.
- (iii) To gauge the operative percentage of brake cylinders, gripping of brake blocks on wheels should be checked.

### **(j) Passenger Emergency Alarm Signal Device (PEASD) :**

This device is fitted on the end wall of each coach and is connected through a passenger emergency alarm valve to the brake pipe. When a passenger pulls the alarm chain, the PEASD operates the passenger emergency alarm valve to connect brake pipe to exhaust the brake pipe air in atmosphere resulting in brake application. The buzzer and Lamp Signal For Air Flow (LSAF) lamp is provided on the locomotive to indicate the Loco Pilot of alarm chain pulling.

- (i) On observing a drop in the air pressure, the Loco Pilot must bring his train to a stand as quickly as possible at a suitable place and he must at the same time give the prescribed whistles viz. Two short and one long. This whistle code must be repeated while the



train is being brought to a stand and until the Guard shows a red flag by day and red light by night indicating that he understands the situation.

- (ii) If it is noticed that communication chain has been pulled at a place which shall result in the train being stopped on a bridge or a viaduct or in a tunnel or other unsuitable spot, the Loco Pilot may recreate pressure and work the train on to a safe place to stop, advising the Guard that he is doing so.
- (iii) When the train has been brought to a stand both the Guard and the Assistant Loco Pilot shall proceed at once to the carriage from which the chain has been pulled and make enquiries from the passengers travelling in the compartment or at each compartment of the coach, if necessary, to find out whether there is any thing wrong. The Guard shall walk on the left side of the train and the Assistant Loco Pilot on the right, both keeping a sharp lookout for any passenger running away from the train.
- (iv) When the chain is pulled, the diaphragm goes upwards due to difference in air pressure and air comes out from the choke as the choke is connected with BP giving following indications on the coach:
  - White bulb fitted at the side of coach is illuminated
  - Disc provided on coach comes to horizontal position.
  - Whistling sound comes from the coach

To reset the PEASD the resetting key fitted with the device should be turned clockwise to bring the disc in normal position i.e. vertical position and the Guard should ensure that the coach from which chain is pulled as well as the coaches at both ends attached to it are released.

- (v) If it is found that the reason for the stoppage of the train will necessitate a halt of more than ten minutes, the train must be protected in accordance with the extant rules.
- (vi) Should it be found that the alarm chain has been pulled mischievously or for an unjustifiable cause or the hose pipe been disconnected by some miscreants, the Guard in charge must ascertain the name of the person who pulled the chain or disconnected the hose pipe. His name and address with those of other occupants must be obtained and the Guard should make a report regarding the alarm chain pulling or the hose pipe disconnection incident and hand over the same to SM of the station at which the incident occurs, if time permits or at the next stopping station, who will take action in lodging the report with the GRP of the station in whose jurisdiction the incident has occurred.
- (vii) The Guard shall record the fact in his Rough Journal and Combined Train Report and also report to the Section Controller.
- (viii) The alarm signal apparatus may be blanked off in trains of a particular section if the administration is satisfied that mischievous use of the same is being made with the approval of Headquarter.

The Guard of the train can also apply brakes through the Guard's van valve provided in the Brakevan.

- (k) *Empty/Loaded device fitted on special type bogie wagons :*
  - (i) The special type bogie fitted wagon with higher carrying capacity are provided with a mechanical device known as empty/load device, by the manipulation of which, the brake power of a wagon can be increased or decreased.
  - (ii) This equipment has been provided to ensure that the train has adequate brake power in the empty as well as loaded condition of the wagon to enable it to be kept under proper control at all times.
  - (iii) When the wagon is loaded, its brake power must be increased and this is done by operating a small Empty/Loaded device handle (provided at the side of the wagon just below floor), from the "Empty" position to the "loaded Position". These two positions are clearly marked on the plate on which the handle is fixed, by legend and also by colour.

- (iv) When, however, the wagon is empty and as such increased brake power is not necessary, the Empty/Loaded device handle MUST BE set at the “Empty” position.
- (v) All station and yard staff both operating and commercial, also train examining and running staff should be fully acquainted with the operation of the Empty/Load device fitted on special type bogie fitted wagons. The following instructions should be strictly observed
  - The handle of Empty/Loaded device should be at the “Empty” position when the wagon is empty or when it is loaded with light materials like bamboo etc. so that the gross weight of the wagon is not likely to exceed 42.5 tonnes. The handle should be set to “loaded” position when the wagon is fully loaded or if the gross weight is above 42.5 tonnes.
  - The Train Examiner will be responsible for the correct setting of the Empty/Load device handle at all originating stations where the train is examined and certified fit by the Carriage & Wagon staff and at stations where the trains are passed by them. This should be recorded in the Air pressure brake certificate also.
  - The Guard will ensure for the correct positioning of Empty/Loaded device handle at wayside stations where any shunting is done or when a stabled load is picked up.
  - The staff responsible for loading or unloading of the wagons are responsible to ensure that the handle of Empty/Load device is correctly set during loading or unloading. Just before unloading commences, the Empty/Loaded device handle should be changed to “Empty” position.

**3106 Dynamic brake** - Dynamic brake is an electrical brake which creates braking effort on traction motor armatures, in moving condition of locomotive/trains, which ultimately controls the speed of train through locomotive.

Dynamic brake is used on Diesel locomotives by using traction motors ability to work as a generator. Dynamic brake can be used without use of air or vacuum brakes. Use of Dynamic brake helps in reducing brake block and wheel wear of both locomotives and coaches / wagons as during dynamic braking brake blocks are not used.

Dynamic brake has braking effect when used from higher speeds upto a speed of 30 kmph. At lower speeds it does not contribute to braking.

### **3107 (i) Brake system on Electrical Locomotive and EMUs—**

#### **1. Rheostatic Braking ( Dynamic Braking)**

Rheostatic Braking or Dynamic Braking is an electrical braking. The mechanical energy of the momentum of the train is first converted to electrical energy and then the same is dissipated through Dynamic Braking Resistors (DBR) in the form of Heat. For converting the mechanical energy of the train to electrical energy, the DC traction motors are used as DC generators by suitably changing the connections to the magnet poles of the traction motor.

The process of converting the train energy from mechanical to electrical to heat does not involve friction, hence wear and tear of wheels and brake blocks is minimized, unlike in friction braking. Higher life of wheel discs & reduced consumption of brake blocks is thus achieved.

The braking effort through Dynamic Braking gradually increases with drop in speed from higher speed to lower speed upto 30 Kmph. However, at speeds lower than 30 Kmph., the Dynamic Braking is not effective.

This type of braking is provided on WAG5 & WAG7 locomotives.

#### **2. Regenerative Braking**

This is a form of electrical braking. In this, the mechanical energy of the momentum of the train is first converted to electrical energy by using the DC traction motors as DC generators as in case of rheostatic braking. However, electrical energy thus created is fed back to the OHE.



In this type of braking, apart from the advantage of no wear & tear of wheels and brake blocks, the net power consumed by the locomotive gets reduced as a result of feed back of regenerated power to the power supply system. This results in improved "Specific Energy Consumption" (SEC).

This type of braking is available on WAP5 locomotives and dual voltage AC/DC EMU rakes.

### (ii) Air Brakes on EMUs

There are 3-types of brakes on EMUs

- a) Auto Brakes
- b) Electro-Pneumatic Brakes (EP Brakes)
- c) Regenerative Brakes

**A. Auto Brakes:** - These are similar to twin pipe air brake system provided on coaching trains as described in para 3105.

**B. Electro Pneumatic Brakes (EP Brakes):** - EP brakes are initiated by the EP units mounted on the under frame of each EMU coach. These EP brake units are electrically actuated with the help of brake controller provided in the driving cab:-

The EP brake have three distinct position.

#### (1) EP Application: -

In this position, when the EP brakes are to be applied, the Holding Magnet Valve (HMV) and Application Magnet Valve (AMV) of the EP units are energized by the movement of brake controller through train line and 'B' intervehicular jumper.

HMV closes the exhaust ports of the brake cylinders and AMV admits compressed air from MR pipe to EP unit. The compressed air passes through Positive Acting Check Valve (PACV) and limiting valve to the brake cylinder and brakes are applied.

The PACV allows the air flow in unidirectional from AMV to brake cylinder only. The Limiting valve limits the MR pressure passing to brake cylinder to a set value of 1.8 kg/cm<sup>2</sup> only.

#### (2) E P Holding (LAP): -

With the movement of brake controller handle to LAP position the required pressure can be maintained in the brake cylinder resulting in desired brake power with the help of self lapping mechanism.

Self-lapping mechanism acts like a close loop control. On EP application the pressure in brake cylinder of leading bogie on driving coach is tapped to feed self-lapping mechanism which is proportionate to brake controller movement, feed to AMV is cut off and thus further compressed air supply to brake cylinder is stopped. Since HMV is still in energized state the brake cylinder pressure is maintained and EP hold situation is achieved.

#### (3) Release & Running: -

In this position, both HMV & AMV are de-energized. AMV stops further admission of air feed from MR & HMV opens the exhaust of brake cylinder whereby compressed air of brake cylinder escapes to atmosphere and brakes are released.

### C. Regenerative brakes: -

During regenerative braking on DC/AC EMUs the mechanical energy of the momentum of the train is first converted to electrical energy then fed back to OHE.

In this type of braking, apart from the advantage of minimum wear and tear of wheels and brake blocks, the net power consumed by the EMU motor coach gets reduced as a result of feed back of regenerative power to the power supply system. This result in improved specific energy consumption (SEC)

This type of brake is available on DC/AC EMUs equipped with three phase drive.

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CHAPTER - 32

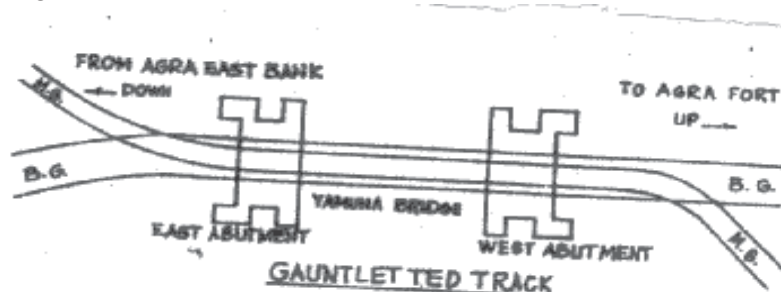
PERMANENT WAY ENGINEERING

3201 ENGINEERING TERMS :

- 1 **Abutment** : A masonry or concrete structure which is designed to support one end of the girders or arch or slab of the end span of a bridge. It also retains the earth of the Railway embankment.  
(In case of single span, both end supports are abutments)
- 2 **Alignment** : The horizontal location of a Railway track with reference to straight lengths and curves.
- 3 **Axle load** : The weight of a vehicle and its contents on one pair of wheels including the weight of the axle and its pair of wheels.
- 4 **Ballast** : Selected material such as stone, sand, cinders, kunkar etc., spread over the formation on which the sleepers are laid and which acts as an elastic bed for the permanent way.  
Any material spread over the formation but below the ballast proper is known as Sub-Ballast.  
Portion of the ballast between two adjacent sleepers is called Crib Ballast. The portion of the ballast between the ends of the sleepers and the toe of the ballast slope is referred to as Shoulder Ballast. To box the track means to neatly dress the ballast to the required profile of ballast section.
- 5 **Bearing Plates** : Cast iron or mild steel plates with or without cant, fixed on wooden sleepers upon which flat footed rails rest.
- 6 **Bridge** : A structure built across a river or a valley or a road for the passage of permanent way.
  - (a) *Minor Bridge* : Bridges having a linear water way less than 12 metres for single span and total linear water way less than 18 meters for multiple spans are termed as Minor Bridges.
  - (b) *Major Bridge* : Bridge having linear water way of 12 metres or more for single span and total linear water way of 18 meters or more for multiple spans is termed as a Major Bridges.
  - (c) *Important Bridge* : Those bridges whose water way area is 1000 sq. mtr. or more or linear waterway **300 mtrs or more.**
  - (d) *Culvert* : Very small bridges are called culvert. Generally bridges having water way less than 6.0 mtrs. are called as Culverts.
- 7 **Check Rails** : These are rail of any suitable section attached to running rails at nominated locations to ensure safety. They are used :
  - (a) With points and crossings opposite to the crossing in order to guide the wheel flanges into the gap between the nose and the wing rail over the crossing and also to prevent the wheel hitting against the nose of crossing.
  - (b) On the sharp curves along the running edge of the inner rail to prevent the tendency of the outer wheels to ride over the outer rail particularly in case of less super elevation and high speed thereby avoiding any possibility of derailment.
  - (c) On level crossing to keep the way for wheel flanges clear as the space between the rails has to be filled for making up the road surface.

- 8 **Cant** : The inward inclination of the rail in the track usually 1 in 20, is termed as cant.
- 9 **Chord** : a straight line joining any two points on a curve.
- 10 **Curved Switch** : A switch with curved tongue rail is termed as Curved Switch. These are provided for smooth movement of rolling stock over the switch portion diverting from one track to another.
- 11 **Classification of Routes** :
- Broad Gauge** :
- |                   |                                                       |                                      |
|-------------------|-------------------------------------------------------|--------------------------------------|
| Group A route -   | Max. Permissible speed                                | - 160 Kmph                           |
| Group B route -   | Max. Permissible speed                                | - 130 Kmph                           |
| Group C route -   | Suburban Section i.e. Mumbai, Kolkata, Delhi, Chennai |                                      |
| Group D route -   | Max. Permissible speed - Upto                         | <b>110 Kmph annual GMT &lt; 20</b>   |
| Group D Special - | Max. Permissible speed                                | <b>- 110 Kmph annual GMT &gt; 20</b> |
- (Where the traffic density is very high or likely to grow substantially in future)
- |                 |   |                        |                      |
|-----------------|---|------------------------|----------------------|
| Group E route   | - | Max. Permissible speed | - <b>100 Kmph</b>    |
| Group E Special | - | Max. Permissible speed | - Less than 100 Kmph |
- (Where the traffic density is very high or likely to grow substantially in future)
- Meter Gauge** :
- |               |   |                  |                     |
|---------------|---|------------------|---------------------|
| Group Q route | : | Sanctioned speed | - More than 75 Kmph |
|---------------|---|------------------|---------------------|
- (Traffic density More than 2.5 GMT)
- |               |   |                  |           |
|---------------|---|------------------|-----------|
| Group R route | : | Sanctioned speed | - 75 Kmph |
|---------------|---|------------------|-----------|
- (Traffic density More than 1.5 GMT)
- |               |   |              |                     |
|---------------|---|--------------|---------------------|
| Group S route | : | Branch lines | - Less than 75 kmph |
|---------------|---|--------------|---------------------|
- (Traffic density less than 1.5 GMT)
- 12 **Curve** : Alignment of track in circular form. A circular curve having only one radius is called Simple Curve. Compound Curve is one which is made up of two or more simple curves of similar flexure. A curve consisting of two simple curves of opposite flexure is a Reverse Curve.
- The rail nearer to the centre of the curve is referred to as inner rail of the curve while the other which is farther from the centre of the curve is called the Outer Rail.
- 13 **Creep** : It is longitudinal sliding movement of rails in track.
- 14 **Cutting** : A cut or excavation made through a hill or high ground for laying the rail road to specified grades.
- 15 **Drainage** : Interception, collection and removal of surface, sub-surface water by means of pipes, drains etc.
- 16 **Embankment** : A bank of earth or other materials constructed above the natural ground surface to enable a Railway line to be laid to specified grades.
- 17 **Expansion Gap** : The space left between the rail ends at specific temp. to allow for their expansion due to variation in temperature is termed as expansion gap.
- 18 **Flange way clearance** : The distance between the running edge of the track rail and the check rail.
- 19 **Flange Way Depth** : The vertical distance from the top surface of rail to the top of the filler or distance block fitted between the running rail and check rail.
- 20 **Flare** : A tapered check rail of the flange way formed by bending or splaying the end of a guard rail / check rail away from the gauge line.
- 21 **Flexure** : It is the curvature of the circular alignment of the line.
- 22 **Formation** : The formation is the level of the top of the embankment and of the bottom of the cutting for a Railway ready to receive the ballast. This is also called sub grade.

- 23 **Fouling point** : It is a point where the distance between two converging tracks starts infringing the fixed standard dimensions.
- 24 **Gauge** : The minimum distance between the rails of a track, measured from inside edge to inside edge of the rail heads. This edge which is the running edge of a rail is known as the Gauge Face.
- 25 **Guard Rails** : These rails are attached to sleepers at specified distance with running rails and provided at following locations:
- (a) On the girder bridges with open floor in order to prevent derailing wheel from falling off the bridge. Here the check rails are known as guard rails.
- (b) Where the derailment will produce serious results.
- 26 **Gauntleted Track** : Where it is necessary for a double track to be narrowed down over a short distance to utilise the space occupied by a single track, the tracks are gauntleted as in sketch below. It is useful where one side of a double track bridge or tunnel is temporarily disabled or required for repairs or improvement. The two track simply run together on the same sleeper.



- 27 **Levelling the Track** : Bringing the top surface of rails, to correct level and grade i.e. putting the rails and track to a uniform plane.
- 28 **Main Line** : The principal route of a Railway, Single Line is the one on which trains are operated in both the directions. Instead of operating the trains in both the directions on a single line, sometimes where the traffic is heavy two tracks are provided, one each for the movement in only one direction. Such a line is called Double Line. When the traffic is still more heavy as in the case of big cities, two tracks may be provided for movement of trains in each direction bringing the total number of tracks to four which is known as Quadruple Line.
- 29 **Normal Position** : The position to which the points, its levers and the corresponding signals are normally kept set.
- 30 **Pier** : The intermediate structures of bridges of multi-spans which support the girders or slabs or arches as the case may be.
- 31 **Rigid Wheel Base** : The distance between the extreme axles held in a rigid frame.
- 32 **Running Rail** : The rail on which the wheels of a vehicle run as distinguished from a check rail.
- 33 **Span** : The horizontal distance between abutments or two adjacent piers of a bridge.
- 34 **Square Joints** : When rail joints of one side rails are exactly opposite to the joints on the other side in a track, they are said to be square joints or even joints.
- 35 **Staggered joints** : When joints of the side rails are not exactly opposite the joints of the other side rails, they are said to be staggered.
- 36 **Supported Joints** : Those rail joints which are directly supported over a sleeper, i.e. the ends of the rails are directly resting over a sleeper.
- 37 **Suspended Joints** : The ends of the rails are midway between the two supporting sleepers.

- 38 **Super elevation** : On a curved track the outer rail is raised a little above the inner rail to maintain a steady balanced movement of the train. This difference in the levels of the two rails is known as super-elevation. The theoretical super-elevation on curves calculated for a particular speed is the Equilibrium Super-elevation. The difference between the equilibrium super-elevation for the maximum permissible speed of passenger trains and the actual super-elevation provided is known as the CANT-DEFICIENCY. The difference between the actual cant provided and the maximum super-elevation required for the lowest speed of Goods Train is called CANT EXCESS.
- When a branch track takes off as a curve from a main track which is also in a curve but in opposite direction then the outer rail of the curved branch track will be at a lower level than the inner rail on account of the super-elevation provided on the main track. This is called NEGATIVE SUPER-ELEVATION.
- 39 **Switch** : Switch is used to transverse a vehicle from one line to another line. Switch is part of point & crossing.
- 40 **Transition Curve** : It is an easement curve provided at the ends of a circular curve to gradually vary the radius from infinity at the straight to the radius of the circular curve at its junction with the curve.
- A circular curve which has been provided with transition curves at its both ends is a TRANSITIONED CURVE.
- 41 **Transverse Sleepers** : Sleepers in the track supporting the rails and having their lengths placed across the rails.
- 42 **Turn Table** : A circular revolving platform placed in a circular pit on a central pivot supported by wheels at the circumference, running on circular rails and used for turning engines from one direction to another.
- 43 **Versine** : The perpendicular distance from the centre of the chord to its arc i.e. at gauge phase side of rails.
- 44 **Vertical Curve** : When a change occurs in the gradient of the track namely when a rising gradient is followed by a falling gradient or vice-versa or a rising or falling gradient is increased or decreased, an angle or a vertical kink is formed in the track at the junction of the gradient. This angle or kink cannot be allowed to remain in the track and is removed by connecting the two gradients by a curve in a vertical plan which is called a vertical curve.
- 45 **Catch siding** :— It is a siding designed and provided to catch-up and absorb the momentum of any ineffectively controlled train or part of a train running down a grade without being wrecked. They are provided at stations where the gradient in the vicinity is so steep that danger is apprehended from vehicles running back and entering into collision with other vehicles or trains in those station yards.
- 46 **Derailing switch** – A safety device provided in the track to guide vehicles off the track at a selected spot for protection against collisions or other accidents.
- 47 **Gravity or Hump Yard** — A yard in which sorting of wagons on nominated lines is done by pushing the wagons over a summit or hump beyond which they run by gravity.
- 48 **Siding** – An auxiliary line in a station yard provided for crossing, receiving and stabling of rolling stock.
- 49 **Scotch Block** – A derailing arrangement in which a wedge block rests on the top of a rail to derail any vehicle and purpose are divided into 2 categories –
- (a) Those whose function is to protect “running line” i.e. those lines which are reserved for the reception and despatch of trains, whether passenger or goods. These will be painted in RED.



- (b) Those which are used anywhere else within a goods or stabling yard e.g. on a dead end siding to prevent wagons running into another stabling line. These will be painted WHITE to distinguish them from red ones.
- 50 **Trap point** :— One switch provided in a siding to derail and prevent vehicles from running into the running line.
- 51 **Trap siding** – This is to prevent vehicles or wagons from running out of stations and fouling the main line while being shunted or when blown by wind. Since it is required to trap only wagons, it will be of a smaller magnitude.
- 52 **Yard** – A system of tracks within defined limits provided for receiving, forming, despatching or stabling trains.

### 3202 TRACK STRUCTURE :

#### 1. **Typical Track Structure** :

The combination of formation, Ballast, Sleepers, Rails and Fastenings forms the typical track structure.

#### 2. **Formation** :

##### (a) *Definition:*

It is a part of track structure consisting of series of cuttings, embankments on a prepared and dressed up ground of certain fixed dimensions on the surface to maintain the surface level within ruling gradient for easy haulage of specified train load.

##### (b) *Functions of Formation* :

- (i) To provide smooth and uniform bed to track structure.
- (ii) To bear the load transmitted through ballast.
- (iii) To provide stability to track.
- (iv) To facilitate drainage.

##### (c) *Typical section of Formation* :

The formation above ground level is called embankment and below ground level is called cutting.

#### 3. **Ballast** :

##### (a) *Definition* :

It is a part of track structure used in the form of layer of broken stone under and around the sleepers for distributing the load from sleepers to formation.

##### (b) *Functions of Ballast* :

- (i) To distribute load over formation over wider area.
- (ii) To provide lateral and longitudinal stability to track structure.
- (iii) To absorb shocks, vibrations and noise.
- (iv) To provide elasticity to the track.
- (v) To facilitate drainage.

##### (c) *Ballast Profile* :

Cushion below sleeper  
Shoulder ballast

#### 4. **Sleepers** :

##### (a) *Definition* :

Sleepers are transverse ties on which rails are laid.

(b) *Functions :*

- (i) To hold the rails to correct gauge.
- (ii) To give firm and even support to rails.
- (iii) To transfer the load evenly.
- (iv) To absorb shocks and vibrations of moving loads.
- (v) To provide lateral and longitudinal stability to track.

(c) *Different type of sleepers :*

- (i) Wooden - Durable and non-durable
- (ii) Cast iron - Plate & Pot
- (iii) Steel - Fixed lug, loose jaw & bolted.
- (iv) Concrete - Mono block and twin block.

5. **Rails :**

(a) *Definition:*

The rails are the longitudinal ties fastened to sleepers at a fixed distance apart to carry the moving loads.

(b) *Functions :*

- (i) To provide a continuous and level surface to the rolling stock.
- (ii) To provide a lateral guide to the rolling stock.

(c) *Types of Rails :*

- (i) Double headed (No more in use on I.R.)
- (ii) Bull headed (No more in use on I.R.)
- (iii) Flat footed.

(d) *Parts of Flat footed rails :*

Head  
Web  
Foot

(e) *Length of rails :*

The standard lengths of rails are as under:

BG - 13 metre, **26 Meters, 65 Meters**  
MG - 12 metres

(f) *Weight of rails :*

Weight of rail is taken as weight/unit length, Lbs/yard in FPS system and KG/metre in metric system say 90 lbs/yard or 52 kg/m.

(g) *Axle Load :*

The weight of the rail is governed by the heaviest axle load which it is expected to support.



(h) *Standard rail sections prescribed on Indian Railways :*

The standard sections of rails prescribed on Indian Railways on the criteria of axle loads, speeds and traffic density it has to carry are as under:

| <u>Gauge</u> | <u>Standard rail sections prescribed</u> |
|--------------|------------------------------------------|
| BG           | 60 Kg/m 52 Kg/m                          |
| MG           | 52 Kgs./m <b>90 R / 75 R</b>             |
| NG           | <b>50 R</b>                              |

**6. Fastenings :**

These are of two types:

(a) *Rail to Rail Fastenings :*

(i) **Fish plates :**

The function of a fish plate is to hold the two rails together both in horizontal and vertical planes.

(ii) **Combination Fish Plates :**

Combination or Junction fish plates are used for connecting the rail lengths of two different rail sections.

(iii) **Fish bolts :**

The fish bolts are used for fixing the rail ends with the help of fish plates. For each joint 2 fish plates and four fish bolts are used. The distance between centers of two fish holes is known as pitch.

(b) *Rail to Sleeper Fastenings :*

(i) **Rigid Fastenings :**

Fastenings of wooden sleepers :

1. Dog spikes:

Dog spikes are used for fixing rail to the wooden sleepers.

The number of dog spikes used are as under:

|     |                                         |   |       |
|-----|-----------------------------------------|---|-------|
| (a) | On straight track                       | - | Two   |
|     | (One on either side and duly staggered) |   |       |
| (b) | On curved track                         | - | three |
|     | (Two outside and one inside)            |   |       |
| (c) | Joint sleepers                          | - | four  |
| (d) | Bridges sleepers                        | - | four  |
| (e) | Turn out sleepers                       | - | four  |
| (f) | Ash pit timbers                         | - | four  |

2. Bearing Plates:

The bearing plates are used for fixing the rail on wooden sleepers.

The different types of the bearing plates being used on the Indian Railways are as under:

- (a) MS canted bearing plates.
- (b) MS flat bearing plates.

- (c) Cast iron anti-creep bearings plates.  
Fastening of steel trough sleepers :
1. Two way keys
  2. Loose jaws
- Fastening of cast iron sleepers : Two way keys.  
Note : No rigid fastenings are provided on concrete sleeper.  
Fastenings of Concrete Sleepers :

- (ii) Elastic fastenings – Elastic Rail Clip **ERC Mk-III** etc. and their attachments.  
Note : Elastic Fastenings can also be used on wooden and metal sleepers as well.

### 3203 CURVES:

1. **Definition :**  
A curve is defined as a deviation of a straight in radial form.
2. **Necessity of a Curve :**
  - (a) To bye pass obstacles.
  - (b) To pass through desired location.
  - (c) To have easier gradient.
3. **Degree of Curve :**  
The degree 'D' of a curve is the angle subtended at the centre by a chord of 30.5 m in length.
4. **Versine of Curve :**  
The versine of a curve is defined as an offset taken on a curve at the centre of a chord of certain length.
5. **Type of Curve :**
  - (a) *Horizontal Curves :*  
The horizontal curves are employed for effecting the deviation in the straight alignment of the track due to what ever reason it may be.
  - (b) *Vertical Curves :*  
The vertical curves are employed for easing the junctions of two gradients meeting in opposite directions /same directions such as rising gradient followed by the falling gradient and vice-versa.  
The horizontal curves are further sub-classified as:
    - (i) Simple Curve
    - (ii) Compound Curve
    - (iii) Reverse Curve
    - (iv) Transition Curve

Simple curve is the curve which is having same degree and radius through out its length.

A compound curve is formed when simple curves of different degree and radii join together having a common tangent. All the simple curves in the compound curve deviate from straight line in the same direction.

A reverse curve consists of two or more simple curves having different/same degree and radius, but contrary flexure join together and have a common tangent at their meeting point.

Transition curve is an easement curve between straight and circular curve in which the degree of curvature and gain of super elevation is uniform throughout its length starting from 0 at the tangent point to the specified value at the beginning of the circular curve.

6. **Super elevation on Curve :**

(a) *Definition :*

It is the amount by which the outer rail on a curve is raised above the inner rail.

(b) *Super Elevation (Ce<sub>q</sub>) :*

Super Elevation in which both the rails bear equal load during motion of a vehicle, or centrifugal force is fully balanced, is called equilibrium S.E. or Ce<sub>q</sub> for particular speed.

**3204 TRACK GRADIENTS AND POINTS AND CROSSING :**

1. **Track Gradients :**

When a train moves along a rising gradient, the locomotive has to exert a greater pull and extra force is required to lift the train up the height through which it rises in every metre it traverses along the gradient.

If a track rises 1 meter in 100 metres the gradient is called as 1 in 100 or 1% grade.

If a track rises 1 meter in 200 metres the gradient is called as 1 in 200 or ½% grade.

If a track rises 1 meter in 50 metres the gradient is called as 1 in 50 or 2% grade.

If the weight of the train is 1000 tonnes and it has to climb a gradient of 1 in 100 then the locomotive requires an extra force of approx.  $1000/100 = 10$  tonnes to exert up the height. through which it traverses in every meter. It is therefore desirable to climb a slope as flatter as possible. Therefore for each section of railway the steepest gradient at which a track is laid is defined and is known as 'Ruling Gradient'.

A ruling gradient is defined as the steepest gradient in a section for a locomotive to haul a specified economical train load fixed for the section without any additional effort.

2. **Horizontal Curve on Ruling Gradient :**

If a curve lies on a Ruling gradient then the total resistance increases in that portion due to curvature which is beyond the maximum limit set for the Ruling Gradient. At such portions the gradient is reduced in order to keep the resistance within limits of Ruling Gradient. This reduction in grade is known as the grade compensation due to curvature on the Ruling Gradient.

3. **Points and crossing and nomenclature of their parts :**

(a) Points and crossing is the name given to the whole contrivance consisting of the switches and crossing with their connecting straight and curved rails, the points being the switches. The idea of laying points and crossing is to divert railway vehicles from one track to another. All switch and crossing works, however, complicated, are built up of two units termed:

(i) Switches

(ii) Crossings (acute or obtuse)

(b) A switch consists of one side stock rail and one side tongue rail. Two switches, one on the left and the other on the right form a set of points. Switches are termed as 'right hand' or 'left hand' as viewed from a facing direction, i.e. looking from the points towards the crossing. Set consisting of pairs of tongue rail & corresponding rail of stock rail is called switch.

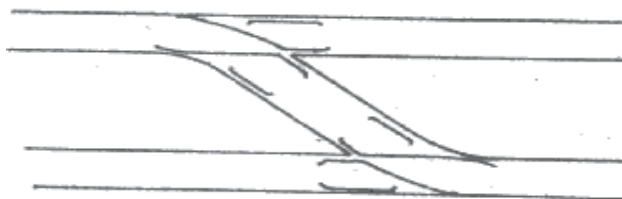
(c) A Tongue Rail is a movable rail fixed to a stock rail at its heel. It is tapered over a

considerable part of its length. The tapered end is called the 'Toe'. A tongue rail is also called a switch rail and is termed as 'Right Hand' or left hand.

- (d) A Stock Rail is the fixed rail against which the tongue rails operate and houses with it. It is termed 'Right Hand' or 'Left Hand'.
- (e) A crossing is a device at the intersection of two rails and is used to pass the wheels running upon one rail of one track across a rail of another track. It consists of a pair of wing rails and a pair of rails – one point rail and the other a splice rail both spliced together at the nose. It's end towards the points is called the 'Nose' and the other end the 'Heels. It is termed 'Right Hand' or 'Left Hand'. According to the position of its splice rail viewed from its nose to the heel. A crossing is acute or obtuse, as its angle is acute or obtuse. It is either cast or built up from rail pieces.
- (f) Each of the outer rails of a built-up crossing is called a Wing rail. Its one end forms the toe of the crossing and the other is flared or splayed. It is termed 'Right Hand' or 'Left Hand' as viewed from the nose of the crossing to its heel.
- (g) Out of the two rails forming the 'V' of the crossing, the longer rail which extends right upto the blunt nose of the crossing is called the 'Point Rail'.
- (h) The rail other than the point rail forming the 'V' of the crossing is called the 'Splice Rail'
- (i) The number of a crossing is usually defined to be the cotangent of the angle formed by its gauge faces and if 'N' be this number, the crossing would be described as 1 in N crossing.
- (j) *How to measure the number of crossing* : It is measured by the distance from the theoretical nose of the crossing on either of the point or splice rail when perpendicular distance of the other rail is unity.
- (k) *Crossings are described as follows* :
  - (i) Facing points or facing turn-outs are those where trains pass over the switches first and then over the crossing.
  - (ii) Trailing points or trailing turnouts are those where trains pass over the crossing first and then over the switches.
  - (iii) Lead of crossing is the distance from the heel of switch to the theoretical nose of crossing measured along the straight.
  - (iv) Throat of crossing is the closest gap between the wing rails.
  - (v) Theoretical nose of crossing is the imaginary point of inter-section of the gauge lines of a crossing.
  - (vi) Actual or Blunt Nose of crossing – The tapered end of the point rail which is (1.7 MM to 19.1 MM) in thickness is called the actual or blunt nose of the crossing.
  - (vii) Heel divergence is the distance from the gauge face of the stock-rail to the gauge face of the tongue rail at the heel of switch. Measured perpendicular to stock rail.
  - (viii) Throw of switch is the opening between the stock rail and the toe of the tongue rail when wide open.
  - (ix) Switch box or tumbler lever or spring lever is a device for working points.
  - (x) **Stretcher Bar** - There are two or more bars which keep the two tongue rails at a fixed distance. The one near the toe is called leading stretcher bar and the other following stretcher bar:
  - (xi) Pull Rod is the bar with which the points are worked. It connects the points to the tumbler lever.
- (xii) Slide chairs are the chairs interposed between the stock rail and the sleepers. Upon

these chairs rest the tongue rails which slide over them.

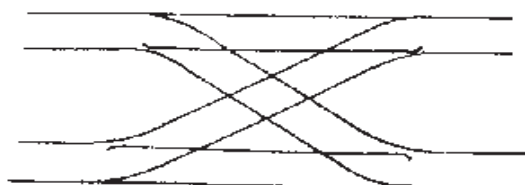
- (xiii) Heel Block is a block of cast iron by means of which the tongue rail is connected to the stock rail.
- (xiv) Crossing Chairs are cast iron or mild steel chairs used for fixing the crossing on wooden sleepers. Crossing bearing plates are mild steel flat plates used on wooden sleepers for fixing the crossing.
- (xv) Heel Bolts are the bolts with which the heel block is held between the tongue rail and the stock rail.
- (xvi) Crossing bolts are the bolts with which the block are held between wing rails and the V piece and also between the point, splice and check rails of the crossing.
- (xvii) Locking Bolts are the bolts meant for locking the tongue rail to the stock rail when both are in contact with each other.
- (xviii) Cotter Bolts are the bolts which fix the slide chair to the stock rail.
- (xix) Stud Bolts are the cotter Bolts of special design which restrict bending of the tongue rail to the extent required, when a vehicle is passing over it.
- (xx) Gauge plate or Switch Tie Plate is a plate placed on the sleeper under the toes of the tongue rails to prevent the gauge from spreading at the points.
- (xxi) Crossing Tie Plate is a plate placed on the sleeper under the nose of the crossing to prevent the gauge from being disturbed at this point.
- (xxii) **Cross-over** is a road which connects two roads. It consists of two turnouts and a length of ordinary road between them.



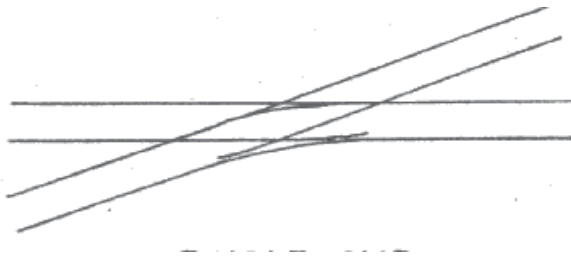
- (xxiii) **Diamond Crossing** : When one track crosses another at an angle less than a right angle, a diamond is formed comprising of two acute and two obtuse crossings.



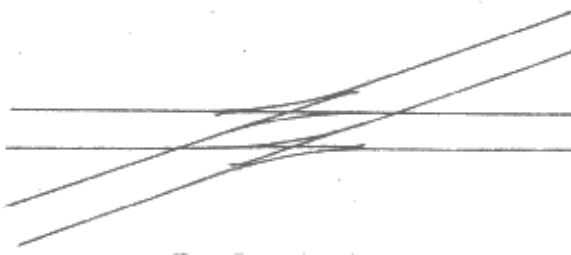
- (xxiv) **Scissors or Double Crossovers** : These consist of two crossovers usually between adjacent parallel tracks which cross each other and form a diamond between the tracks. This layout is used where space does not permit for two separate crossovers being used.



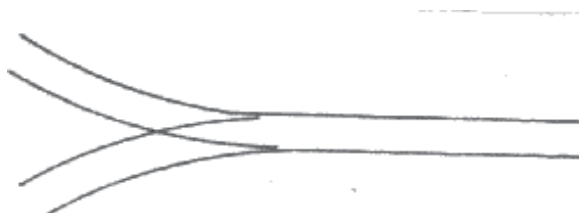
- (xxv) **Single Slip** : It is formed by the provisions of two pairs of switches within a flat diamond to enable vehicles to pass from one track to the other in one direction



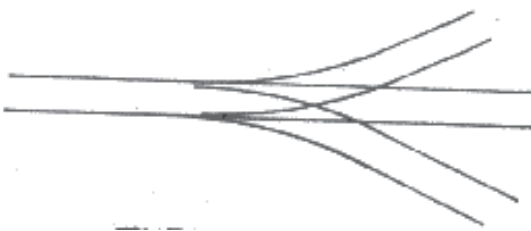
- (xxvi) **Double Slips** : These are formed by the provision of four pairs of switches within a flat diamond to enable vehicles to pass from one track to the other in both direction.



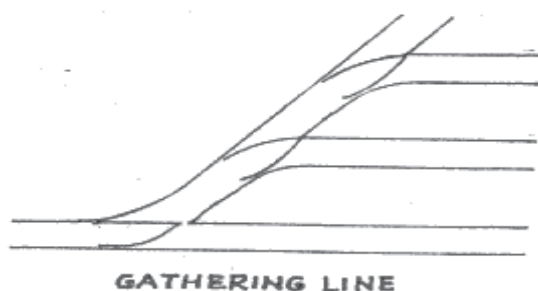
- (xxvii) **Symmetrical Splits** : It is a turnout from a curved track curving in the opposite direction with the same radius as the main track. It is a very useful connection as by its use easy turnout radius is obtained.



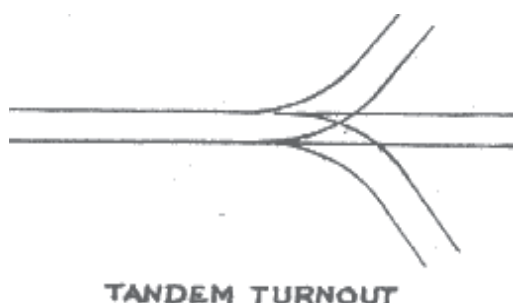
- (xxviii) **Three Throw** : When a line divides into three, two sets of switches and three crossings are required forming what are called three throw points. A 'Three Throw' consists of two turnouts, the tongue rails of which are side by side and the heels of switches generally opposite to each other and there is only one stock rail on each side. It is an old fashioned connection used in congested areas in order to economise in space.



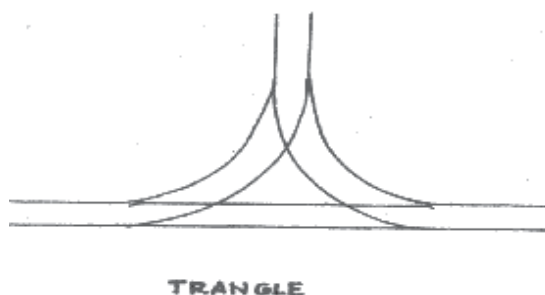
- (xxix) **Gathering Line or Ladder Track** : A gathering lines is a sloping line from which any number of parallel sidings take off and the angle which the sloping line makes with the sidings is the angle of the gathering lines.



- (xxx) **Double or Tandem Turnouts** : The arrangement of two turnouts where the switches of one turnout come in the lead of the other is known as double or tandem turnout.



- (xxxi) Triangle or Wye is used for turning engines where it is inexpedient to put down a Turn Table.



### 3205 DEFECTS OF TRACK AND THEIR EFFECTS :

1. Following are some of the defects of track which may cause bad running or, if neglected, may get magnified and cause derailments.
  - (a) Variation in gauge causes oscillation or swinging from side to side with lurches and transverse jolts.
  - (b) *Uneven Cross Levels* : the level of the two rails at a section being different causes rolling (rocking).
  - (c) Loose packing of sleepers causes up and down movement of the vehicles and rolling.
  - (d) *Kinks* : They usually develop at rail joints and give unpleasant jerks to vehicles passing over them.
  - (e) Perished sleepers
  - (f) Defective fish-plates and bolts



- (g) Incorrect super-elevation on curves
  - (h) Defective working of points, or gapping of points.
  - (i) Improper housing of tongue rails with stock rails.
  - (j) Tongue rails not resting on evenly on slide chairs.
  - (k) Incorrect clearances at heels of switches and at nose of crossings.
2. Following are the common causes which result in derailments and accidents and which are to be detected and repaired promptly.
- (a) Buckling of Rails which causes distortion of the line.
  - (b) Wash aways or Breaches of the line leaving the track unsupported.
  - (c) Breakage and removal of fish-plates.
  - (d) Obstructions placed or fallen on the line.

**3206 WELDED TRACK :**

1. Earlier two rails of the track used to be joined by using a Fish plate. Such type of track is not suitable for high speed traction as well as it is comparatively more prone to sabotage. To avoid these short comings now a days, Fish plated track is being replaced by welded track. This type of track is not only suitable for higher speed, but also is less sabotage prone and results in the higher degree of comforts to the travelling public as the ride is smoother and noise is less. The welded track needs less attention than the conventional Fish Plated Track.

The welded track may however be sub-divided into 3 categories viz. Short Welded Rail Track (SWR) Long Welded Rail Track (LWR) and Continuous Welded Rail Track (CWR).

2. **Definitions :**

- (a) *Short Welded Rails (SWR)* : It is a welded rail, which expands or contracts throughout its length due to temperature variations.

The Three rail length SWR has been standardised on Indian Railways viz.

3 x 13 m = 39 m on BG

3 x 12 m = 36 m on MG

- (b) *Long Welded Rails (LWR)* : It is a welded rail, the central part of which does not undergo any movement due to temperature variations. A length of greater than 250 metres on BG and 500 metres on MG will normally function as LWR. The maximum length of LWR under Indian conditions shall normally be restricted to one block section.
- (c) *Continuous Welded Rails* : The CWR is a long welded rail, the de-stressing of which is required to be carried out in parts.
- (d) In the conventional type of Fish plate track any increase/decrease in the length of rail on account of increase/decrease in the temperature can be accommodated in the fish plate joints. In case of LWR track, this increase/decrease is large, which can be accommodated through special devices. A few of such devices are described below:
- (i) **Breathing Length** : It is that length at each end of LWR which is subjected to expansion or contraction on account of variation in temperature.
  - (ii) **Switch Expansion Joint (SEJ)** : It is an expansion joint installed at each end of LWR to permit expansion or contraction of the adjoining breathing lengths due to temperature variation.
- (e) *Destressing of LWR* :  
Since the rail is not free to expand or contract, continuous variation i.e. increase and decrease in rail temperature results in building up of internal stresses in the LWR/

CWRs. An operation for destressing of such welded rails has to be undertaken at regular intervals to avoid track failures, otherwise it will result in deformation of rails in the forms of buckling etc.

During destressing operations, the rails are pulled either manually or through a mechanical device (like Rail Tensor etc.) lengthwise, to release the stresses developed inside the Rails. This destressing operation is performed within a specified temperature range.

## **3207 TRACK MACHINES :**

### **1.0 Track Machine Organisation**

To carry out each of the above functions, Chief Track Engineer is assisted by one or more Deputy Chief Engineer(s)/Senior Engineer(s) depending upon the convenience for functioning of Track Machine Organisation.

Senior Section Engineer(s) incharge of machines in the field is to inspect the machines frequently, especially where a group of machines such as tamping machine, ballast cleaning machines are deployed, with the objective of monitoring the health of machines and to ensure that the officials concerned are carrying out their duties satisfactorily.

### **2.0 Features And Working Principles Of Various Track Machines**

#### **2.1 Types of Machines**

Following are major on-track machines, which are in use on Indian Railways:-

#### **2.2. Tamping Machines :**

##### **i) Plain Track tamping Machines**

- a) 06-16 Universal Tamping Machine (UT)
- b) 08-16 Unomatic
- c) 08-32 Duomatic
- d) 09-32 Continuous Action Tamping Machine (CSM)
- e) 09-3x Tamping Express

##### **ii) Points and crossings tamping machine**

- a) 08-275 Unimat
- b) 08-275-3S Unimat

##### **iii) Multi-purpose Tamper**

At present, tamping Machines available on Indian Railways are of M/s. Plasser make. The main functions of tamping machines are:

1. Correction of alignment
2. Correction of longitudinal and cross level, and
3. Packing under the sleepers

Some of the machines have provisions for ballast consolidation and automatic precision mode working also.

#### **2.3 Dynamic Track Stabilizer ( DTS)**

During maintenance operations such as tamping, lifting, slewing, deep screening etc, the lateral resistance of track gets reduced which rebuilds gradually with passage of trains. This consolidation can also be achieved faster and more effectively by causing "controlled settlements " of track by means of a Dynamic Track Stabilizer.

## **2.4 Ballast Machines**

### **2.4.1 Ballast Handling Machines**

During maintenance of track, ballast is required to be handled in many ways. Ballast handling machines are categorised as under depending upon their functions:

1. Ballast Cleaning Machines
2. Ballast Regulating Machines

### **2.4.2 Ballast Cleaning Machines**

- a) RM-80 for plain track
- b) RM-76 for points and crossings

The function of the Ballast Cleaning Machine is to carry out cleaning of ballast by removing muck, thereby improving drainage of track and resilience of the ballast bed. Basically, the machine excavates and picks up ballast by means of cutter chain and carries it to a set of vibrating screens where muck is separated and thrown out by a chute and the clean ballast is transferred back to the track.

Ballast Cleaning Machines have following basic units :

1. Excavating unit
2. Screening unit
3. Conveyer system for distribution of ballast and disposal of muck
4. Track lifting and slewing unit
5. Recording unit

Three types of ballast cleaning machines are available on Indian Railways.

- a. Plain Track Ballast Cleaning Machine RM-80
- b. Points and Crossings Ballast Cleaning Machine RM-76
- c. Shoulder Ballast Cleaning Machine (SBCM)

### **2.4.3 Shoulder Ballast Cleaning Machines**

- a) FRM-80 Plasser Make
- b) KSC-600 Kershaw Make

The machine is used for cleaning of shoulder ballast to improve the drainage of track. Two types of shoulder Ballast Cleaning Machines are available on Indian Railways. These are-

1. Shoulder Ballast Cleaning Machine – FRM 80 (Plasser make)
2. Shoulder Ballast Cleaning Machine – KSC 600 (KERSHAW make)

### **2.4.4 Ballast Regulators**

#### **Ballast Regulating Machines –(BRM)**

The main application of Ballast Regulating Machines is ballast transfer, spreading and profiling operation as ballast regulation and profiling becomes necessary primarily due to the following :

1. After a maintenance operation such as tamping of track or screening of ballast
2. After relaying of track
3. After training out ballast

Ballast Regulators available on Indian Railways are of Kershaw make. These machines have their main application in ballast transfer, spreading and profiling operations. For

this purpose, a front mounted one pass transfer plow, left and right ballast wings and a rear mounted track broom are provided as standard equipments. The machine can move ballast towards centre of track or away from centre of track, transfer ballast across the track and transfer ballast from a surplus zone to deficient zone.

## **2.5 Track Laying Machines**

### **2.5.1 Plasser's Quick Relaying system (PQRS)**

It is essentially a semi-mechanised system of track renewal. PQRS consists of self propelled cranes (Portal cranes) which move on an auxiliary track of **3400 mm** gauge having the same centre line as that of track to be relayed. These portal cranes are capable of self loading and unloading from BFRs.

### **2.5.2 Track Relaying Train (TRT)**

TRT is a system for complete mechanisation of track renewal process. The jobs carried by TRT are:

- i. Threads out old rails from track.
- ii. Removes old sleepers.
- iii. Levels and compacts ballast bed.
- iv. Places new sleepers.
- v. Threads in new rails into track.

### **2.5.3 Points and Crossing Changing Machine T-28 (AMECA- Make)**

The machine available on Indian Railways is manufactured by M/s. AMECA of Italy and is used for relaying of turnouts on PRC sleepers. It consist of the following

- i. Self propelled portal crane.
- ii. Motorised rail trolley
- iii. Non-motorised rail trolley
- iv. Jib crane.

### **2.5.4 Sleeper Exchanger and Crane**

## **2.6 Other Special Purpose machines**

- i) Rail – cum – Road vehicle
- ii) Utility vehicle

## **3.0 Block working of Track machines.**

All "On Track" machines and track relaying machines shall be worked with the permission of the concerned Station Master and in accordance with special instructions as laid down in the G & SR.

The Traffic block must be obtained before entering the machine in block section, as per the procedure and rules laid in the APPENDIX 'A' of chapter XV of G&SR.

## **4.0 Standard Period, Distance to be covered.**

The stipulation of Traffic block to be availed shall be as per the Guide lines laid by the Railway Board through the Joint Note signed by ME & MT for each machine as under: "One Block of 4 hours or 2 blocks of 2 ½ hours each."

The machines are to be entered into the block from the nearest block section to the working site in order to prevent any wastage of block. Once a block is granted the movement of machine shall be only to avail the block.

**5.0 Distance of Speed Restriction Board.**

As per the procedure laid down No person employed on the Way, works or bridges shall commence any operation which would obstruct the line without obtaining the written permission of Station Master who shall ensure that all necessary signals have been placed at "ON". In addition the Railway servant In-charge of the work shall also ensure that the necessary stop signals like banner flags and detonators and hand signal flags have been placed/exhibited at prescribed locations.

**5.1** The Engineering works can be broadly divided into three categories-

- 1) Category 1- Works of routine maintenance requiring no speed restriction, no exhibition of hand signals and involving no danger to trains or traffic. These include works as through packing, picking up of slacks, overhauling of track etc.
- 2) Category 2- Works of short duration.
  - (a) Works such as casual renewals of rails and sleepers , adjustment of creep and lubrication of rail joints which are completed by sunset of the day of commencement and no restriction of speed thereafter is required , are termed " works of short duration".
  - (b) Hand-signal and banner flags and fog-signals shall be used at specified distances for protection to trains.
- (3) Category 3 – Works of long duration :
  - (a) Works such as relaying, bridge construction, diversions which extend over a few days, or weeks during which period a continuous restriction of speed is to be in force, are termed as " Works of long duration".
  - (b) Temporary engineering fixed signals shall be used at specified distances to afford protection to trains . These works should be carried on a programmed basis about which all concerned will be advised in advance.

The Protection in block section and procedure for passing of trains – Before commencing any work of such categories are described in detail in Chapter 8 of the Indian Railways Permanent Way Manual.

**3208 Integrated Blocks :**

In order to ensure safety and reliability of the system the maintenance and repairs to the track, points and crossings, Bridges, Signals and Overhead equipments etc. is inevitable. To make best use of available time integrated blocks are planned in co-ordination with different departments to undertake the maintenance works simultaneously instead of piecemeal blocks taken by different departments separately. Duration of the integrated blocks are determined on the basis of margins available in the Master charts and passenger operations. The details of integrated blocks are notified in the working time tables separately for each division indicating the section, up and down lines, duration of block period and their implications, if any. These blocks are subject to minor adjustments depending upon running of trains. However, all out efforts should be made to ensure that the blocks are permitted as prescribed in the working time tables. The running of trains particularly goods trains should be adjusted by the Sr.DOM and Chief Train Controllers of respective divisions to avoid detentions during the block on account of temporary single line working and precedence being given to passenger carrying trains. Except for the works given in the TWOs, no other maintenance block shall be given to any department. All works shall be allowed within the Engineering allowance provided for each division.

One of the Sr.DEN of the division is nominated by Principal Chief Engineer, who shall co-ordinate the operation of blocks and maintenance works by all other departments. The works to be executed shall be planned in advance in block meetings attended by Officers of

concerned department with all preparatory arrangements made well in advance for the smooth and timely execution of blocks without causing undue detention of traffic and inconvenience to passengers.

All concerned should ensure that blocks are not burst as to avoid adverse effect on running of trains and inconvenience to travelling public.

### **3209 Action to be taken in the case of Rail fractures/Weld failures-**

- (1) It is of paramount importance that whenever a fracture of rail/welded joint is noticed, immediate action is taken to restore the track, if necessary with restricted speed, with the least possible delay.
- (2) The Mate/Keyman/Gangman, as soon as notices the rail fracture/weld failure should first protect the track, while the repairs are being carried out . He should also send information to the Section Engineer (P.way) and the Station Master of the nearest station.
- (3) In case of rail fracture, depending upon the situation and size of the gap, engineering staff may allow movement of trains after clamping. In case where a small portion or piece of rail has come off or in the case of multiple fracture, the rail may has to be changed.
- (4) In the case of weld failure, joggled fish plates and clamps are to be used.
- (5) After doing the emergency repairs the trains may be passed at 20 kmph. by a Mate/Keyman, until the Permanent Way Official replaces the rail and restores normal speed.
- (6) If there is a spate of rail fractures, additional Keyman's patrol should be introduced in the early hours of the morning.

### **3210 Engineering Restrictions :**

Routine maintenance works such as through packing, picking up slacks and overhauling of track etc., and works of short duration such as casual renewals of rails and sleepers, adjustment of creep and lubrication of rail joints which are completed by sunset of the day of commencement, do not require restriction of speed. However Hand –signal and banner flags signals are to be used at specified distances to afford protection to trains. Rail renewal & creep adjustment however require traffic block.

- (1) Temporary Speed Restrictions.  
In case of works of long duration such as relaying, bridge construction, diversions which extend over a few days, or weeks during which period a continuous restriction of speed is to be in force, temporary Engineering fixed signals shall be used at specified distances for protection to trains. These works should be carried on a programmed basis, about which all concerned will be advised in advance.
- (A) Preliminary arrangements :
  - (i) For doing such works the Engineering Department will arrange with the Operating Department for the issue of the circular notice as per extant instructions.
  - (ii) The concerned Divisional Engineer will be responsible for obtaining the sanction of Commissioner of Railway Safety wherever necessary and sending Safety Certificate on completion of such works.
  - (iii) The Section Engineer (P.way) should obtain permission to commence work form DEN/ AEN and should arrange to block the line when work is proposed to be done under block with the permission of the Controller /Chief Controller on the day of block and issue a notice to the Station Master on either side.
  - (iv) Caution orders will be issued by the Station Master concerned as necessary.
  - (v) The necessary temporary Engineering fixed signals as prescribed should be provided.



- (vi) In an emergency, when it is necessary on considerations of safety, the Section Engineer (P.way), or Authorised Railway servant may commence such work before issuing the notice, under the protection of track by hand signals and banner flags. As soon as possible, he should issue the notice and replace the hand signals and banner flags by temporary engineering fixed signals.

**(B) Protection of line in block section-**

- (a) In case where stop dead restriction is to be imposed and is to last for more than a day, the following temporary Engineering indicators should be exhibited at the appropriate distances :-
- (i) Caution indicator.
- (ii) Stop indicator.
- (iii) Termination indicators.
- (b) In case where the train is not required to stop (non-stop restriction) and the restriction is likely to last for more than a day the following temporary Engineering indicators should be exhibited at the appropriate distances:-
- (i) Caution indicator.
- (ii) Stop indicator.
- (iii) Termination indicators.
- (c) When, during the course of the work, on consideration of safety it is not desirable to pass trains over the site of work for the time being, the track should be further protected by hand signals and banner flags, by the authorized Railway servant.

**(C) Protection of line in station limits –**

Special instructions will be issued by the Divisional Railway Manager (Operating) after consultations with Divisional Signal and Telecommunication Engineer in regard to the use of temporary Engineering signal in conjunction with station fixed signals. In urgent cases these will be issued by the Station Master at the request of Section Engineer (P.way).

**(2) Periodical notice of Engineering Restrictions –**

For works involving restriction of speed of trains the Divisional Engineering Dept. will arrange publication in the periodical gazette of the railway furnishing following details :-

- (a) The names of the block stations on either side of the site where the engineering work will be undertaken in order that caution orders may be issued.
- (b) Kilometrage of site of work.
- (c) Restricted speed and stop dead restriction to be observed by the Loco Pilot.
- (d) Nature of work being undertaken or reasons for restriction.
- (e) Probable duration.

**(3) Permanent Speed Restrictions -**

Permanent speed restrictions in force are notified in working time-tables. The speed indicators are erected to indicate to the Loco Pilots the speed restrictions to be observed over a particular stretch due to weak/non standard track/bridges, restrictions on curves, grades, points and crossings etc.

*Board indicating speed over points* – Where the speed over the points at a station is less than the speed sanctioned at other stations on the same section, a permanent speed indicator should be fixed on the first approach signal of the station.



**3211 TRACK RECORDING**

- (1) **Introduction** – Inspection by foot, trollies, locomotives and rear vehicles enable the Permanent Way staff to carry out assessment of the quality of track. These inspections, though important, are qualitative and enable assessment based on individual experience. Objective assessment of track is done by track recording cars, Oscillograph cars and portable accelerometers.
- (2) **Track Recording by Mechanical / Electronic Equipment** –  
The following track recording equipments are in use in Indian Railways at present :–
  - (a) Track recording **cum research cars**.
  - (b) Oscillograph car.
  - (c) Portable accelerometers.
- (3) **Track Recording Car** –  
**The track recording cars currently in use on Indian Railways are fully electronic and computer based..** With these track recording cars, it is possible to have a continuous record of the track geometry under loaded conditions, by running the cars at nominated intervals.
- (4) **Arrangements for running track recording car** –  
On receipt of track recording car programme from the RDSO, the Zonal Railways should arrange for suitable power and path for the special along with telecommunication arrangement between the track recording car and the locomotive. The Headquarters should advise the Divisions concerned for making necessary arrangements to ensure that the Track Recording Car has an uninterrupted run.

**3212 The working of Trollies, Motor Trollies and Lorries**

- (1) **General instructions** –  
The Rules for working trollies, motor trollies and lorries are contained in Paras 15(18) to 15(27) of chapter XV-B of General & Subsidiary Rules (2008), supplemented by the subsidiary rules issued by individual railways. The instructions contained in this chapter are in amplification of these rules and will not supersede the G&SR of Railways.
- (2) **Distinction between Trolley, Motor Trolley and Lorry** –
  - (i) A vehicle which can be lifted bodily off the line by four men shall be deemed to be a trolley. Any similar but heavier vehicle (which includes Dip Lorry) shall be deemed to be a lorry.
  - (ii) Any trolley which is self-propelled, by means of a motor, is a motor trolley.
  - (iii) A trolley shall not, except in cases of emergency, be used for the carriage of permanent way or other heavy material, and when a trolley is so loaded, it shall be deemed, to be a lorry.
- (3) **Attachment to Trains Prohibited** –  
No trolley / motor trolley/ lorry shall be attached to a train.
- (4) **Conveyance of Trollies/ Motor Trollies/ Lorries by Trains** –
  - (i) No trolley, motor trolley/ lorry should be loaded in a train without the consent of the Guard in-charge of the train, who will direct where it is to be placed.
  - (ii) In the case of an accident/emergency, trollies/ motor trollies may be carried by Mail / Express trains on which there are restrictions normally for loading of trolley/ motor trolley.

- (iii) When loading a motor trolley with petrol in the tank, the following rule extracted from Para 1106 of the I.R.C.A. Coaching Tariff No. 21, Part I / 1972 as applicable to carriages, motor-cars, boats etc., should be adhered to –

“ ..... a quantity of petrol not exceeding 9.00 litres may be left in the tank provided that,

- (a) The flow of petrol in the carburettor has been cut off;
- (b) Any pressure has been released from the tanks;
- (c) The tank is in sound condition and closed by a well fitting cap;
- (d) The engine has been run by the official-in-charge until the carburettor has become exhausted and the engine stops automatically.”

**(5) Working of Trolleys –**

**(1) Working under Block protection –**

When working under Block protection Trolleys will be worked in the same manner as trains.

**(2) Working without Block protection –**

In sections with restricted visibility [specified sections, Ref-Para 1118(3) (d)] when the official-in-charge, is not able to block the section and work under Block protection, he will follow the following procedure :-

- (i) The Station Master will on receipt of advice from official-in-charge (in triplicate on Form Annexure 11/3) giving his trolley programme ascertain and fill in particulars of trains running on the section, retain one copy and return the other two to the official-in-charge of the trolley.
- (ii) As a reminder that the block section is occupied by the trolley and caution orders must be issued, a small placard with words “Trolley on line”, will be hung in front of the block instrument, until advice of the removal of the trolley is received.
- (iii) If telegraph and telephone communications are interrupted and the Station Master/Signalman is unable to communicate with the station at the other end of the block section, the official-in-charge of the trolley will be advised of this fact and form Annexure 11/3 endorsed accordingly. When communication between the two stations is restored, the messages referred to above will be exchanged, if the trolley has not cleared the section or removal report has not been received.
- (iv) From the time of exchange of the messages, until intimation has been received that the trolley has cleared the block section, the Station Master/Signalman at both ends of the block section shall issue caution orders to Loco Pilots of all trains entering the block section. On the double line, caution order should be issued for both up and down trains.
- (v) On arrival of the trolley at the other end of the block section, the person-in-charge of the trolley shall fill in the removal report and send it to the Station Master/Signalman who will return the third copy signed. The Station Master/Signalman will then advise the Station Master/Signalman at the other end of the block section of the trolley having cleared the section.
- (vi) If the trolley is removed from the track at the station not provided with telegraph or telephone instruments or in the block section and if it is not intended to place it on the track again, the official-in-charge of the trolley shall fill in the removal report and send it to the Station Master at the nearest block station. In the former case, the Station Master will send written advice by the first train in either direction to the next block station. The Station Master at the latter station should then advise the Station Master at the other end of the removal of the trolley.

- (vii) Station Masters/Signalmen at the both ends, of the block section will enter remarks in the train registers pertaining to the block section concerned showing the times at which the trolley entered and cleared the block section and the number of the trolley.

**(6) Working of Motor trollies –**

- (1) *Working under block protection –*
- (a) A motor trolley should be run only under block protection (i) during night, (ii) during day time, when the visibility is poor due to fog or dust storm.
- (b) When a motor trolley that is worked under block protection breaks down in the block section, the official-in-charge should remove it clear of the line and send a written advice to the nearest Station Master / Block Hut -in-charge returning the line clear ticket or token or in the case of a motor trolley when the token has been clamped for a preceding train the key of the padlock. He should not replace the motor trolley on the line without the written permission of either Station Master / Block Hut-in-charge at the end of the block section concerned. On arrival at the other end, the official-in-charge will deliver the authority to the Station Master after the trolley has arrived complete.
- (2) Following a Train /Motor trolley – Motor trolley may follow a fully vacuum brake train or another motor trolley in the same block section during day light hours and in clear weather under special instructions issued by the Railway Administration.

**(7) Working of Lorries –**

- (1) Working without Block protection –  
Procedure for working –
- (i) When a lorry is to enter a block section without line clear, Form **Annexure 11/3** should be prepared by the official-in-charge in triplicate and necessary particulars filled in by the Station Master who will retain one copy and return the other two to the official-in-charge.
- (ii) Until the “lorry removed from section” signal has been despatched and received, both Station Masters / Signaller shall issue caution orders to the Loco Pilots of all trains entering the section on which the lorry is working. All trains booked to run through and extra, special and other out of schedule trains should be stopped at the station in order that this advice may be given.
- (iii) On completion of work, the lorry removal report in Form **Annexure 11/3** should be completed and handed over to the Station Master concerned and his acknowledgement obtained.

**3213 Working of Material Trains and Track Machines**

- (1) **Rules for Working** – The rules for the working of material trains are outlined in – Appendix IX of the Indian Railway Code for the Engineering Department, and in Paras 4.62 to 4.65 of G&SR.

When the quantity of material is such as could be conveniently trained out in stages, wagon-loads may be attached to goods trains by arrangement with the Operating Department.

- (2) **Material Train** – Material Train means a departmental train intended solely or mainly for carriage of railway material when picked or put down for execution of works, either between stations or within station limits. The railway material may include stone boulders, ballast, sand, cinder, moorum, rails, sleepers and fittings etc.
- (3) **Ordering of material Trains – Authority Ordering**– Operating Department is the authority for ordering a material train. On receipt of requisition from the Assistant Engineer/Divisional Engineer, the Divisional Operations Manager shall advise the staff concerned by letter, detailing the composition of train, the loading kilometrages, the

sections over which the train will work, the date of commencement of work, the station at which the rake will be stabled and the engineering official who will be deputed to be in-charge of the train. The notice to be given by the Engineering department should not normally be less than a week.

(4) **Issue “Fit-to- Run” Certificate –**

Before a material train is allowed to work, the complete rake should be examined by the carriage and wagon staff and a “fit-to-run” certificate issued to the Guard. The rake may also be examined by the carriage and wagon staff each time it arrives at the train examining station and whenever possible, once a week .

(5) **Official-in-charge in Material Train-**

whenever a material train is worked it shall be accompanied by a Guard. As the Guard is not qualified to carry out such duties as working of hoppers, distribution of ballast/materials, supervising loading unloading, maintaining muster rolls and daily reports of labour preparation of daily reports on material train working a qualified engineering official should be deputed on the train to ensure working of material train to the programme specified by Assistant Engineer.

(6) **Testing of Brake Power –**

- (i) Before starting from a station, the Guard should ensure that the train is equipped with requisite brake power prescribed for the load.
- (ii) Each vehicle of material train whether or not provided with vacuum brake, must be provided with an efficient hand brake capable of being fastened down.

(7) **Working in Block section –**

- (i) A material train shall be worked with the permission of the Station Master on either side and in accordance with the provisions and system of working in force on the section. Before a Material Train enters a block section for work, the Station Master should advise the Loco Pilot and the Guard in writing of the time by which the train must clear the block and whether it is to proceed to the block station in advance or return to the same station.
- (ii) On double line, a material train must not push back to the Station in rear but should run through to the station in advance and return on proper running line except when otherwise directed.

Where provided, lever collars or other visual indicators must be used to remind Station Master that the material train is working in the block section.

- (iii) The Guard/Engineering official-in charge shall ensure efficient and proper working and adhere to sanctioned time and occupation of block section. Materials should not be left fouling the track, signal wires and interlocking gears. If it is necessary for the train to leave the site of work before this is done, it should be ensured that sufficient labour is left to do so, in-charge of a competent railway servant and that the site is protected until the work is completed.
- (iv) When a material train enters a block section to work under instructions of other than under the normal system of working, the Guard and the Loco Pilot of the train shall ensure that the train is protected from the direction a train is approaching on double line and in both directions on a single line in accordance with General Rules.

If for any reason, it becomes necessary to detach the engine of a material train in the block section to run to the station in advance, the Guard should ensure that the train is protected both in front and rear.

- (v) On stopping a material train on a grade the Loco Pilot should give a long blast of the whistle to call the attention of the Guard and thereafter three sharp blasts, the signal for application of hand brakes. The brakes must not be released until the Loco Pilot has signalled for this by giving two sharp blasts.

Before entering a section on which a ballast train is required to stand on a grade of 1 in 50 or steeper, the engine should be so attached that when the train is standing the engine is at the down-hill end of the train.

- (vi) A material train should not be divided outside station limits except in an emergency. Before the train is divided the Guard should put the hand brake in the brake-van hard on, and pin down the hand brakes of sufficient number of vehicles and if necessary, lock by means of safety chains or sprags a sufficient number of wheels, in each portion of the train. He should further ensure that the workers/labour are detrained before dividing the train.. Vehicles should not be detached from a material train on a grade of 1 in 100 and steeper. The engine itself may be detached with the Guard's permission after he has ensured that hand brakes on each vehicle are properly applied and the wheels spragged against any movement.

**(8) Pushing of Material Trains –**

On down gradient steeper than 1 in 100, pushing is not permitted. On gradient easier than 1 in 100 ascending or descending pushing may be permitted at a speed not exceeding 25 Kmph. provided the brake-van occupied by Guard is the leading vehicle. The speed will be restricted to 10 Kmph., if the brake van is not leading.

**(9) Procedure to be followed while pushing back –**

When it is necessary for a material train to push back into the station from which it started to work in the block section, the following procedure should be observed :–

- (i) No train must be allowed to push back without a written authority from the Station Master of the station from which it entered the section. Where line clear tickets are in use, the Station Master shall endorse the line clear ticket as follows “ to push back to this station”.
- (ii) The Station Master of a station where the train starts from and pushes back to, must advise the station in advance on the telephone or telegraph instrument and also the Controller on controlled sections that the train will push back to the station. He will then obtain the acceptance of the “is line clear for a train stopping in the section” signal on the block instruments or on the VHF, where block instruments are not provided from the station in advance and then give the “train entering section” signal in the usual way.
- (iii) On the return of the train, the Guard will intimate that the whole of the train has returned to the station complete, from the section and sign in the trains register book to the effect and return the “authority to push back” to the Station Master which must be cancelled by the latter. The Station Master will then give “cancel last signal ” signal on the block or on the VHF, as the case may be, and endorse the remarks that “ train pushed back” in the trains register book or the line clear enquiry book against the entry of the train.
- (iv) When it has been arranged for a train to push back from the section, it must always do so and not go through to the station in advance.
- (v) Before starting, a green flag must be tied to a convenient fixture in front ( or on the tender if running tender- foremost ) of the engine and also at the back of the rear brake-van to indicate to men working on the line that the train will push back.
- (vi) On the double line, when the train is required to be pushed back into a station, the train must come to a stand outside the advance starting signal and the Loco Pilot shall



whistle, when, if a line is clear for its reception, it must be piloted into the station. If there is no advance starting signal, the train must be brought to a stand opposite the outer signal pertaining to the opposite direction and then be piloted into the station.

- (vii) On the single line, when a train is required to be pushed back into an interlocked station, it must come to a stand outside the outer signal and whistle, when, if a line is clear the home and the outer signals may be taken "off" for its reception. At a non-interlocked station, the train must also come to a stand outside the outer signal whence it must be piloted into the station on signals being lowered.
- (viii) Except in an emergency, material trains may push back during day-light only. If in case of an accident or for any other unavoidable reason, a train has to push back during the night, it must do so at a walking pace and the Guard or a competent railway servant must walk at least 600 metres on B.G. and 400 metres on M.G. and N. G. in advance, exhibiting a danger signal until the train comes to a stand as detailed in sub-paras 6 & 7.

**(10) Running on Ghat Section and Descending Grade –**

- (i) On Ghat sections, it may be necessary to attach an engine to bank the load in addition to the engine in front.
- (ii) When a material train is descending a long and continuous steep grade, the brake levers of as many wagons as may be necessary to assist in controlling the speed, should be notched down by the Guard under arrangements with the Loco Pilot.

**(11) Stabling of a material train –**

- (i) Material train shall not be stabled on running lines at a station, except in unavoidable circumstances.
- (ii) When a material train is stabled at a station it shall be protected in the following manner and Station Master shall ensure that –
  - (a) The vehicles of the material train have been properly secured and are not fouling any points and crossings,
  - (b) All necessary points have been set against the line on which the material train is stabled and such points have been secured with clamps or bolts and cotters and padlocks, and
  - (c) The keys of such padlocks are kept in his personal custody until the material train is ready to leave the siding or line.
- (iii) The Guard shall not relinquish charge until he has satisfied himself that the material train has been protected as prescribed in this rule.
- (iv) When the train is ready to leave, the Guard must advise the Station Master in writing. The Station Master must then arrange for correct setting of the points.
- (v) When a material train is stabled in an outlying siding, the Guard must ensure that it is inside the trap, clear of fouling marks and clear of running line. He must pin down sufficient number of brakes and if necessary, lock by means of safety chains or sprag the wheels.

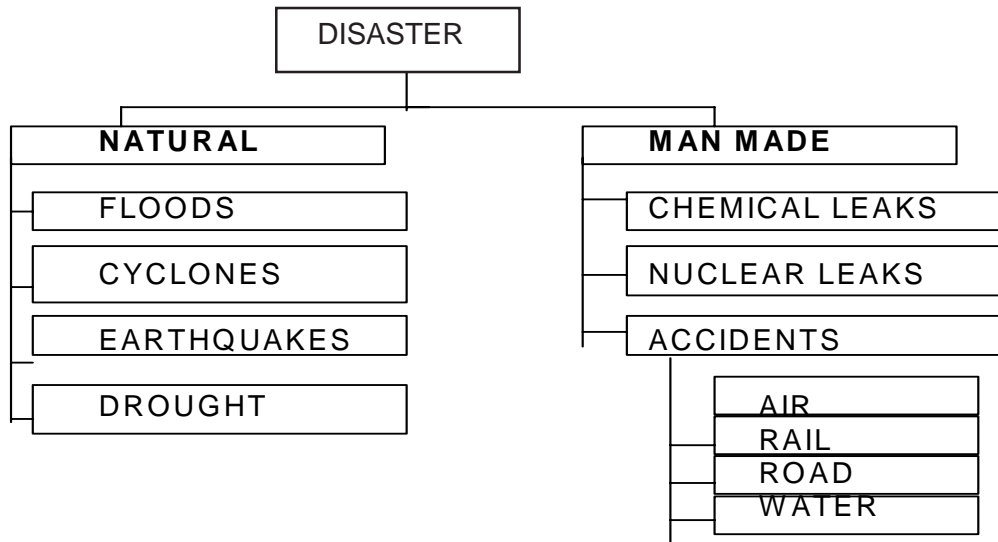
- (12) **Working of Track Maintenance Machines** –All 'on track' machines shall be worked only under traffic block with the permission of the concerned Station Masters and in accordance with the special instructions issued in this regard.

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MANAGING DISASTERS

3301 INTRODUCTION

Any system or mechanism, which affects life adversely, is termed as “Disaster”.



“Disaster”, in Railway’s parlance generally refers to train accident unusual occurrence, untoward incident involving injury or death to the travelling passenger or to anybody by the movement of train.

All out efforts are necessary to avoid disaster. However, one can’t expect absolute disaster-free working. This chapter indicates the precautions and measures to handle the post-disaster situation.

- Train accidents
- Floods
- Cyclones
- Earthquakes, etc.

3302 DISASTER MANAGEMENT

There are two facets of Disaster Management.

- i) Advance Prediction
- ii) Timely Control

**They help in**

- (a) Minimizing disaster effects
- (b) Saving lives
- (c) Minimizing injuries and mitigating sufferings
- (d) Minimizing socio-economic consequences and costs.

3303 DISASTER PLANNING:

Planning for Disaster is vital to minimize the effects, recover quickly, resume normalcy and satisfy customers. A Disaster Plan may not be able to prevent one, but it can minimize the impact.



## MANAGING DISASTERS

A good disaster plan strikes balance among the following conflicting factors.

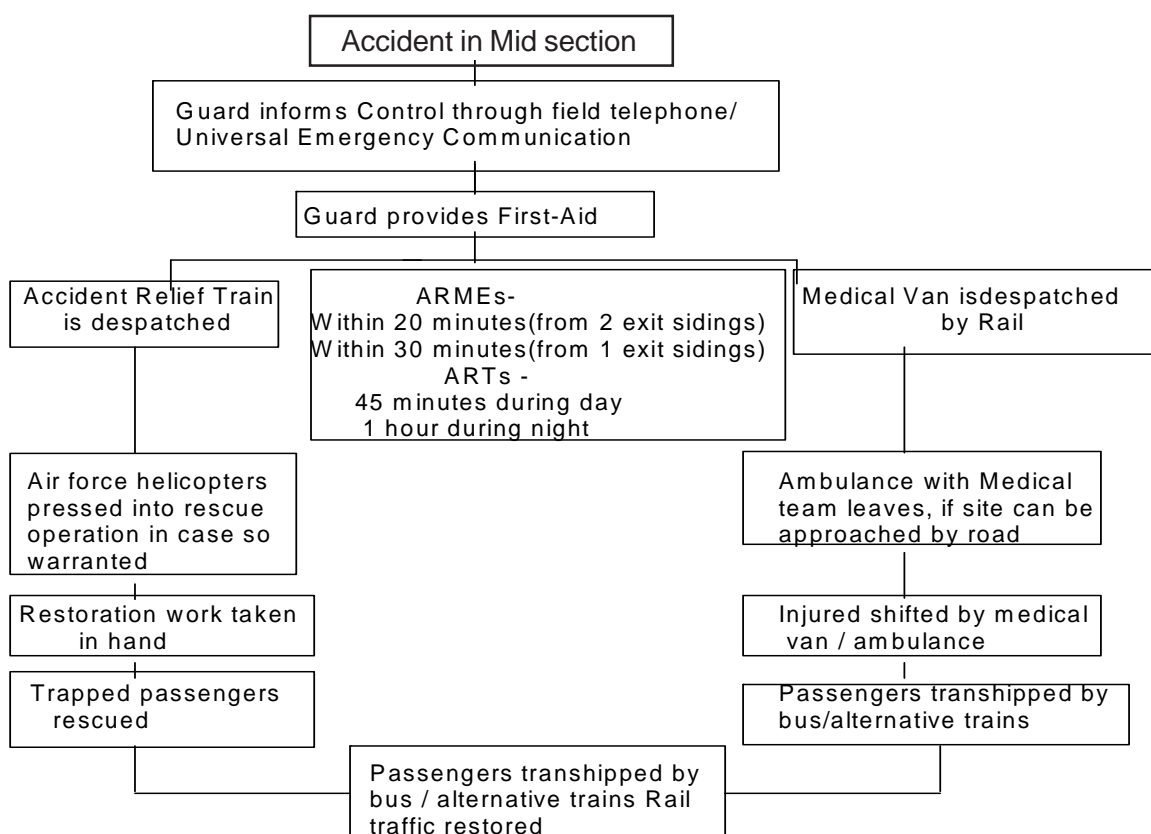
- i) Priorities attached to victim care
- ii) Restriction of traffic
- iii) Financial Propriety

Disaster Planning, in fact, manifests in Disaster Response Mechanism. The response to a disaster can be improved through

- i) Training of personnel responsible for rescue,
- ii) Mock-drills to test the alertness of Breakdown staff
- iii) Co-ordination among various agencies involved in rescue operations.

### 3304 ACCIDENT RELIEF OPERATIONS ON INDIAN RAILWAYS

Indian Railways have well drafted set of rules and procedures to be observed by staff and officers involved in accident relief. This is depicted in the flow chart as given below:



On many occasions, Railways are criticised for poor handling of relief operations. The major reasons are :

- i) Late medical relief to injured passengers.
- ii) No food and water or delay in supply of eatables to stranded passengers.
- iii) Incorrect, untimely, inadequate information about dead or injured.
- iv) Delay in clearance of stranded passengers.
- v) Unsatisfactory arrangements for preserving and transporting dead bodies.

The above delays & deficiencies must be completely ruled out through meticulous planning and preparedness as mention in Para 3303.

**3305 VARIOUS PHASES OF DISASTER MANAGEMENT**

The activities from the occurrence of disaster to the total restoration can be divided in four phases:

- Phase-I      Period immediately after an accident till help arrives.
- Phase-II     Arrival of help to arrival of relief train.
- Phase-III    Victims brought to nearest station or hospital.
- Phase-IV    Restoration of normal traffic.

**Phase-I**

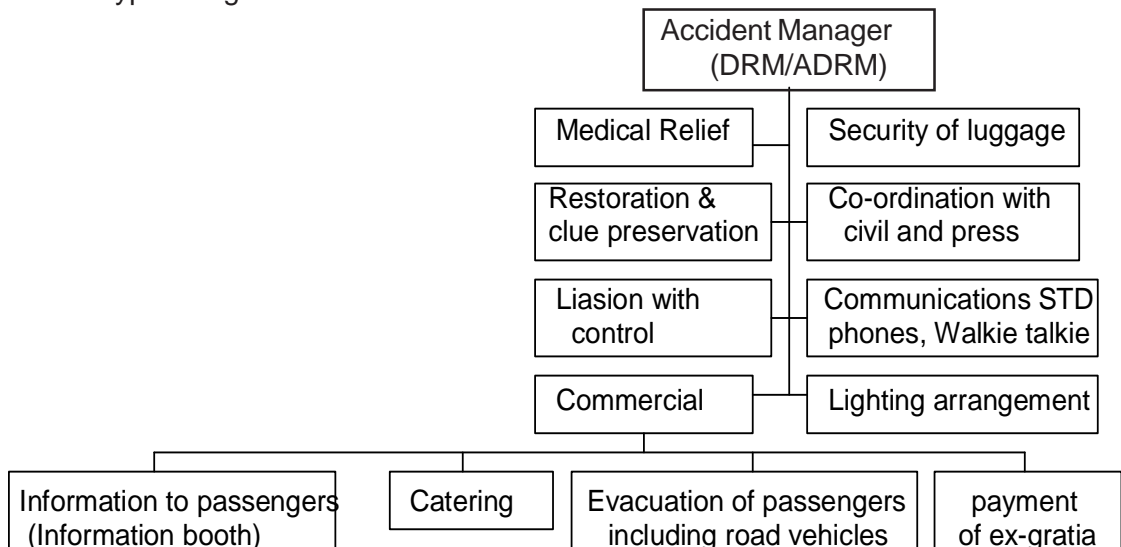
In the period immediately after an accident, the following action has to be taken by Railway officials/officers.

- i) Guard, Loco Pilot, Conductor and TTE’s etc. must pass on the information to the nearest station or to Control, about the accident. They are trained in First-Aid and therefore, must render, whatever possible, medical aid to injured passengers.
- ii) Senior most officer travelling by the affected train, whether on duty or on leave, shall take charge.
- iii) All Railway officers and staff available on train must report to the Guard and work as per the directions of senior most officers.
- iv) SMs of the adjoining stations must inform Control about the happening.

**Phase-II:**

Phase-II begins with the arrival of relief train. The senior most officer who reached the site, becomes the ‘Accident Manager’. All staff and officers work as per the directions of the Accident Manager.

The typical organisation at site is as under:



The medical team reaching the spot must comprise of adequate number of doctors and staff.

The senior most Doctor & Officer at site should have all data about dead and injured and hospitals where they have been sent.

## MANAGING DISASTERS

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The following teams are generally set-up for the specific task shown against each:

- i) **Medical** - Medical Relief and transportation to hospital
- ii) **Commercial** - 1. Catering – food and drinking water  
2. Liaison with Civil Administration and Press
- iii) **Commercial & RPF** - Security of luggage, Liaison with Police & Defence.
- iv) **Operating** - Liaison with Control and arranging logistics.
- v) **S&T** - Establishment of communication and free telephone booths.
- vi) **Mechanical** - Relief operations including rescue and rerailment, and preservation of clues.
- vii) **Electrical** - Lighting arrangements.

**Rescue team** members must wear **arm-bands & luminous jackets**. Doctors and other para-medical staff should put on an armband with a cross.

Extreme care must be exercised while tackling damaged coaches. Cold cutting equipment must be used on coaches with passengers.

Following are some of the guidelines for dealing with the injured passengers and dead bodies:

- i) Dead bodies should be handled with care and respect
- ii) Cover dead bodies with white sheets preferably under cover/shed.
- iii) Expeditious issue of death certificates
- iv) List of dead and injured must be passed on from time to time
- v) A photographer should take coloured photographs of dead and injured.
- vi) Press and other Media should be given correct pictures in time
- vii) Food and drinking water must be rushed from the nearest source
- viii) Free food and beverages must be supplied.

### **ACTION TO BE TAKEN AT DIVISIONAL HEADQUARTER LEVEL**

- Opening up of special enquiry booths at originating, terminating and enroute stations.
- Furnishing updated position of dead, injured and evacuated passengers.
- Phone numbers should be given through TV, Radio and Press.
- Arrangement for free railway passes for relatives.
- Make arrangements for evacuated passengers to be sent to destinations..
- In case of a major disaster, DRM can requisition helicopter/aeroplane.
- Press should be briefed properly and quickly.
- HQ's/Railway Board should be advised quickly.

### **Phase – III**

Phase-III mainly refers to dealing with injured passengers. Following actions must be planned.

- i) Relief trains, clearing injured or stranded passengers, must get over-riding priority.
- ii) Road vehicles can also be arranged for stranded passengers.
- iii) List of injured, hospital-wise, should be conveyed to all concerned.
- iv) Ex-gratia payment should be arranged.

### **Phase-IV**

Without affecting the relief operations, restoration of normal traffic should be planned and acted upon. Restoration of passenger services gives a sense of normalcy, besides, providing means to relatives of victims to visit and attend to them.

## **3306 CONCEPT OF CONTROLLING STATION**

Every division should have a system of nominating 'Controlling Stations' for each section. The Station Master of such nominated 'Controlling Station' should immediately, on receiving advice of an accident, reach the site with sufficient staff drawn from all departments at his

station and take all the necessary steps for rescue and relief. It should be made clear to everybody that staff of all departments must follow the directions of the controlling Station Masters and render all help & assistance necessary for tackling the disaster. The list of controlling stations is kept at each Divisional Control office.

**3307 CHECK LIST OF ACTIONS TO BE TAKEN BY TTE/TRAIN SUPERINTENDENT**

1. Ascertaining if any Doctor is travelling by either seeing the reservation chart or making verbal enquiries, and arranging for First-Aid to the passengers.
2. Preparing lists of dead and injured. If Doctor is available the list should be classified as under:-
  - i) Dead .....
  - ii) Grievous injury .....
  - iii) Simple injury .....
3. Details of the dead and injured should be obtained from reservation chart, tickets held, (to and from) or co-passengers. Assistance of the Police travelling in the trains to be also obtained for identification.
4. The following details should be collected:
  - (a) Tickets of the passengers travelling (to and from)
  - (b) Ticket Numbers – Class
  - (c) Coach Number and its position from the engine
  - (d) Address of the passengers
  - (e) Nature of injury (Simple, Grievous)
  - (f) Custody of luggage and other belongings – In case of injury, this should be kept by the TTE; in case of death, it should be handed over to the GRP with full details and acknowledgement obtained.
5. He should record evidence of passengers with full particulars – If some passengers are willing to give evidence later on, their names and addresses should be recorded.
6. He should keep record of the number of dead and injured (simple, grievous), if they are already transported by local people to the nearest hospital before the Railway Doctor had arrived.

**3308 CHECK LIST OF ACTIONS TO BE TAKEN BY COMMERCIAL STAFF**

- 1. Proceed to the site.**
- 2. Assistance to passengers**
  - (a) Drinking water, catering, etc.
  - (b) Issue of free telegrams
  - (c) Issue of complementary passes
  - (d) Information regarding alternative means of transport to destination
  - (e) Assistance in protection of their luggage, valuables
  - (f) Assistance to ladies, children and the injured.
- 3. Parcels, Mail, Goods, etc.**
  - (a) Arrange stacking, protection
  - (b) Preserve documents, cash, etc.
  - (c) Arrange tarpaulins, if necessary.
- 4. Ex-Gratia Payment**
  - (a) Arrange ex-Gratia payment on the spot to the injured and next of kin of dead as per extant rules.
  - (b) As per rules, money can be drawn from station earnings, for which proper records need to be kept.

### **5. Information to the General Public**

- a) Open information counters/booths at the site itself for giving information to the Public regarding the names of the injured, dead, etc.
- b) Display of list of injured and dead at a prominent place at the station/stations. Also pass on information to the Control.
- c) Announcements through Public Address System regarding arrangements for diversion of trains, regulation, probable time of arrival of the relief train with stranded passengers, etc.
- d) If your station is an important one enroute, open information booth even if accident has occurred elsewhere. Depute TCs etc. on special duty.

### **3309 CHECK LIST OF ACTIONS TO BE TAKEN BY ENGINEERING STAFF**

1. All Engineering officials shall report to the senior most officer at site or take charge if he happens to be the senior most. It is primary duty of all Railway officials to assist even though they are not on duty but are travelling by the ill-fated train.
2. Render assistance to give medical relief/treatment to injured passengers. Make available all transport to the injured passengers. Assist in rescue of trapped passengers.
3. Arrange divers with proper equipment for under-water rescue, if necessary.
4. Guarding and preservation of clues till Police or RPF personnel arrive at site and take charge.
5. Arrange for water supply at accident site by drawing from adjoining stations, if required.
6. (a) Cutting equipment available with the SE (P.way), BRIs and in workshops to be moved to the site for supplementing the ones available in the Break-down special.  
(b) Utilisation of Bridge gangs for rescue work wherever the need arises.
7. Assistance to other departments in establishing communications and power supply at site. Hiring of Diesel generator sets for augmenting the power supply arrangements.
8. Assisting in transshipment of passengers and their luggage.
9. Provision of tents and other temporary shelter at the site for protection against elements of weather.

### **3310 CHECK LIST OF ACTIONS TO BE TAKEN BY MECHANICAL / BREAKDOWN STAFF**

1. Proceed to the site of accident. Assist in evacuating passenger, if any, trapped under coaches involved in accident.
2. Record the details regarding brake power and other aspects of the Rolling Stock as per prescribed proforma.
3. Should have the measurements of the Rolling stock taken as per the prescribed proforma/procedure.
4. Should check the fitness of the stock which are supposed to move from the accident site.
5. Should ensure that locos/coaches/wagons railed are in a fit condition to be taken from the accident site.
6. Plan for efficient movement of ART, engine, tower wagon, etc. between site and station for quicker restoration.
7. Ensure that the log/diary regarding restoration at the accident site is maintained properly.

### **3311 CHECK LIST OF ACTIONS TO BE TAKEN BY S&T STAFF**

1. To proceed to site by quickest means available.
2. Ensure that portable/emergency telephone sets are provided at site.
3. Wherever feasible, wireless/satellite sets to be installed at accident site for communication with Divisional Headquarters and if possible, with Railway Headquarters. Walkie Talkie sets, Megaphones/Loud speakers to be deployed as necessary.
4. DOT Telephone with STD facility to be arranged at the temporary enquiry offices opened at site and nearest location wherever possible.

## MANAGING DISASTERS

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5. Render such assistance, as required by Guard, in attending to the victims and stranded passengers.
6. Seal Block instruments, Relay rooms and note positions of levers, knobs, slides, indicators etc. as the case may be.
7. Arrange for early restoration of signalling and telecom equipment as soon as such restoration is permitted.

### **3312 CHECK LIST OF ACTIONS TO BE TAKEN BY ELECTRICAL DEPARTMENT STAFF**

1. Power
  - (a) Adequate lighting arrangements, if required, to be provided at the site.
  - (b) In case of Fire in coaches, he should arrange to immediately collect/record evidence of passengers with full particulars. If some passengers are willing to give evidence later on, their names and addresses should also be recorded.
2. OHE
  - (a) In case of an accident, where OHE or Switching Stations are involved, arrange for adequate number of breakdown staff/tower wagon and nominated OHE staff should proceed to the site of accident by the quickest available means.
  - (b) Ensure that OHE is de-energized and slewed as required for ground/crane operations.
  - (c) Arrange and supervise restoration of OHE expeditiously.
3. TRO
  - (a) Proceed to site in case Electrical Loco or EMU is involved.
  - (b) Supervise restoration operations.
  - (c) Ensure that speedographs, Engine/EMU log book are seized, sealed and kept in safe custody.
  - (d) Note down his observations regarding the Electric Loco/EMU and record measurements as per the prescribed proforma.
  - (e) Ensure that measurements of the Loco/EMU are taken on the spot. If it is not possible for all types of measurements to be taken on the spot, then these should be taken in the shed.

### **3313 CHECK LIST OF ACTIONS TO BE TAKEN BY PERSONNEL BRANCH STAFF**

1. Welfare Inspector should be posted round the clock in shift duty to look after the welfare of the injured persons in the Hospital.
2. He should ensure that passes are issued to the relatives and escorts of injured for visiting them in the hospitals and taking them back home.
3. He should depute Welfare Inspectors to assist the ADMO in taking down the name and addresses of the dead/injured and in shifting them to the hospitals. Welfare Inspectors should be also deputed to the hospitals where the dead bodies/injured have been transferred. Such information should be passed on to Sr.DCM by quickest possible means.

### **3314 CHECK LIST OF ACTIONS TO BE TAKEN BY SECURITY BRANCH STAFF**

1. Liaison with the Local Police at site.
2. Ensuring security of passengers' belongings.
3. Security of parcels, damaged goods and parcel vans.
4. To follow any instructions, as given by the officer in charge at the accident spot in connection with Items 1 to 3 above.

### **3315 CHECK LIST OF ACTIONS TO BE TAKEN BY MEDICAL DEPARTMENT STAFF**

1. Note the time of receiving/giving message.
2. Inform CMS and other Doctors and medical staff.
3. Alert Blood Donors Clubs, SJAB & Local Hospitals, about arrival of the injured.

## MANAGING DISASTERS

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4. One doctor should stay back in Railway Hospital to look after the in-patients.
5. The emergency boxes from Health Units and POMKA to be moved to the spot.
6. Reach the site by road – using any available vehicle or hire taxi.
7. All doctors & staff shall move to Medical Relief Van (MRV) and inform Station Master that medical team is ready to move.
8. Inform CMD about moving of MRV
9. Check all equipments in MRV
10. Get Operation theatre ready.
11. Suture of wounds, application of Plaster of Paris and minor surgery can be done in MRV operation theater.
12. Make out a list of the injured.

Trivial  
Simple  
Grievous

13. List out the dead.
14. Inform the Accident Manager & Control.
15. Dressings, splints can be applied at the site or in the First Aid post.
16. Details to be recorded of the injured

Conscious .....

Name .....

Sex .....

Age .....

Identification Marks .....

Address .....

Ticket No. ....

Originating Station .....

Destination .....

### 3316 ESSENTIAL TENETS OF SUCCESSFUL ACCIDENT MANAGEMENT

1. All Railwaymen, whether on duty or otherwise, should involve themselves in rescue and relief operations.
2. There should be utmost speed in rushing medical and other relief to the site of accident.
3. Utmost care, consideration and courtesy should be extended to the passengers involved in the accident.
4. Adequate and swift arrangements should be made for food, drinking water, etc. to the affected passengers.
5. The responsibilities of various employees at the site should be clearly defined. This helps to prevent confusion.
6. Quick transmission of information, particularly details of dead and injured, should be ensured.
7. Ensure proper preservation and care of the dead.
8. Ensure security of passengers' luggage.
9. Timely dissemination of information to passengers about evacuation arrangements made to avoid panic and create re-assurance.
10. Ensure proper liaison with Civil Administration and Press.
11. Ensure that clues are preserved and restoration operations are well planned and swiftly executed.

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CHAPTER - 34

MISCELLANEOUS

**3401 EMERGENCY COMMUNICATION**

1. 5/10 watt VHF sets have been provided to communicate between Guard & Loco Pilot of Mail, Express, Passenger & Goods train over the Western Railway.

Following infrastructure have been provided-

- (i) 25 watt base station on trunk route (all multiple line sections).
  - (ii) 5/10 watt sets for each Guard.
  - (iii) 1 set of spare battery of 5 watt set for each Guard if 5 watt set is used.
- 2 The system provides following communication –
    - (i) Guard of the train to the nearest station for a distance of 1 to 1.5 km. on either side if station has base station VHF set i.e. 25 watt.
    - (ii) Loco Pilot with the Guard & vice-versa.
    - (iii) Loco Pilot / Guard of a train to Loco Pilot /Guard of other train in the vicinity of 1 to 1.5 km.
  3. Both the communication system works on simplex mode i.e normally the set is in receive mode & for transmitting, press to talk switch is to be kept pressed. As such all users after completion of their sentence/message should say “OVER”, so that the person corresponding the message can reply.
  4. Handing over / taking over of VHF set to the Guard of Passenger, Mail, Express & Goods train
    - (i) VHF set (alongwith 1 spare battery for 5 watt set) is to be handed over to Guards of all trains operating over Western Railway.
    - (ii) The set will be handed over to the Guard while signing ‘ON’ at the Starting station by SM(P) / Dy SS / Guards lobby Supervisor. They will hand over the issue slip to the Guard after testing the set.
    - (iii) The Guard will carry the set to the train and test it with the Loco Pilot and keep the set On during the journey.
    - (iv) All the Lobbies/SM(P)/DY SS from where the set is handed over to the Guards will be provided with charging facilities. The Supervisor in-charge will be explained the procedure of charging the sets and he will be responsible for ensuring the proper charging, before the set is handed over to the Guard.
    - (v) All the sets and batteries other than those kept on charger shall be kept in personal custody in a Almirah under lock and key with the Lobby Supervisor / Station Master. All set including sets kept on charger and in Almirah shall be accounted and properly handed over / taken over at the change of each shift of Lobby Supervisor / Station Master.
    - (vi) The record of sets issued to the Loco Pilots /Guards and received back from them shall be maintained in a separate register.
  5. **Charging of the VHF sets**
    - (i) The S&T department will provide adequate number of chargers for charging the sets for the use of Guards.
    - (ii) As soon as, the set is handed over by the Guard, the Lobby supervisors/ SM(P) /Dy SS will put the set on the charger. On noticing the indication provided for the complete charge of the set, he will remove the set and keep it in safe custody for handing over to the Guard and record the same in the register.

## MISCELLANEOUS

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6. Normally full charge battery is adequate for operation of the set for 8 to 10 hours journey. If battery discharges during the run the Guard will replace the battery with the spare charged battery given to him at the time of signing 'ON' .
7. If any set goes defective during the journey, the Guard will get it replaced from nearest station.
8. No train will start without VHF communication.
9. Operation on Emergency communication shall be strictly as per Joint Procedure order issued either by HQ or divisions from time to time.
10. **Instructions for communication on Walkie-Talkie sets –**
  - a) SMs will clearly mention his identity to Guards/Loco Pilots they are communicating to and also confirm the identity of the user on the other end.
  - b) SMs should communicate only for those abnormalities requiring immediate attention by the Loco Pilots/Guards of trains for controlling /stopping trains.
  - c) These sets shall never be used for communicating the aspect /position of any signal to the Loco Pilots.
  - d) Use of walkie-talkie sets should in no way contravenes the conditions to be satisfied for reception/dispatch of trains as per General Rules.
  - e) Walkie-talkie sets should not be used as an alternative to or replace physical exchange of signal, written authority to proceed, authority to pass a defective signal at danger etc under any circumstances.

### 3402 **Portable Control Telephone Communication**

1. (a) Western Railway needs to provide PCT Telephone on end to end basis on all trains for which primary maintenance is being carried out by Western Railway.
- (b) Responsibility of providing PCT Telephones will be of S&T staff the Division where primary maintenance of the rake is being carried out.
- (c) Portable Control Telephone forms a part of Brake van equipment & must be supplied to every Mail, express & passenger train except for EMU suburban locals running between Churchgate- Virar.
- (d) PCT is to be used by the Guard of passenger train to relay information to control in case of any accident to train, obstruction or other case occurring in the mid-section, to arrange prompt relief message by the control & other concerned.
- (e) Proper arrangement in the form of closed cupboard shall provide in the SLR by Mechanical department for keeping brake van equipment in locked condition.
- (f) Portable control telephone would be loaded and run on end to end basis & will be kept in the cupboard provided in the brake van in locked condition by universal key.
- (g) No coaching train shall start without Portable Control Telephone Communication.
- (h) In order to ensure safety of equipment & proper handing over & taking over the Brake van equipments shall be loaded and shown to the Guard at originating station & acknowledgement taken from him as per instructions in Working Time Table issued from time to time.
- (i) Each Guard while taking charge on route, will sign for the intactness or otherwise of portable control telephone in the relieved Guard rough journal book.
- (j) At the terminating stations, equipment shall be handed over to Guards by the staff or respective deptt. At Stations where staff of S&T dept. are not available, the equipment will be handed over to authorized representative of SS/SM who will also be responsible for its loading in return direction, after taking acknowledgement from Guard.

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- (k) In case of any consumption en-routes or any defect noticed during journey, it will be advised in writing to relieving Guard by the relieved Guard. At the terminating station, it shall be advised in writing to SS/SM. Representative of concerned deptt. will recoup the shortage. However, responsibility of working of portable control telephone will be with primary maintenance depot. In case of any defect-noticed en-route, responsibility will be fixed up on supervisor, who has supplied the telephone.

- (l) S&T dept. will arrange the L-14 diagram for the entire run of the train.

### 2. **Maintenance of PCT**

Maintenance of Portable Control Telephone shall be carried out as per the instructions contained in joint circular No.SG 241 / 4 / 6 dt.4.5.76

### 3. **Action when Portable Control Telephone loaded by the terminating end ( i.e Western Railway) is not received.**

- (a) On being reported by the person responsible for loading / unloading of PCT, the Dy.SS shall send a message by quickest means to all concerned including Terminating station giving the details of Portable Control Telephone and also advise the Sr.DOM/DOM/ Sr.DOM(G)/DOM(G) and Sr. DSTE / DSTE
- (b) Spare Telephone shall be loaded to ensure that train does not leave without Control Telephone
- (c) Sr.DSTE/DSTE shall ensure adequate number of Portable Control Telephones with 'stand by' painted on them at all loading points.

### 4. **Action when PCT does not come in Foreign Railway Train.**

- (a) Dy.SS of the originating stations may be advised through message by the quickest means regarding PCT not being available , endorsing copy to Sr DSTE / DSTE and Sr.DOM of the concerned division of the Railway.
- (b) Stand by Telephone may be loaded up to the last point on the Western Railway and next Railway may be advised to send the Standby Telephone back to Western Railway by next available train.
5. Whenever any new train is started or rake link are changed , the notification issued by CPTM should include the responsibility of supplying of PCT Telephone also.

6. Portable Control Telephone handed over must be suitable to entire section of train run.

### 7. **Description of Portable Control Telephone ( PCT )**

A sealed metallic box containing a portable Control Telephone is of three types.

- (a) Non RE type — It is used for non electrified area. A folding pole along with connection and flexible wire is supplied along with the Telephone.
- (b) RE type —It is used for electrified section. It has 6 pin, plug to connect with the socket provided on the post in the mid section.
- (c) Combine RE / Non RE type-These types of Portable Control Telephone have the feature of Non RE type and RE type as given above, to work in both the sections. A folding pole along with connections and flexible wire is supplied along with the Telephone.

### 8 **Training.**

Each guard shall be trained and examined every 3 years at Zonal Training Centre regarding the use of PCT in details. On being satisfied as the proficiency of the guard in the use of Telephone, the Principle shall issue a Certificate to guard. In addition to this examination made by the Principle, Zonal Training Centre-Udaipur, The DTI, Telecommunication Inspector, Safety Counsellor should check the proficiency of the guard for the use of PCT as frequently as position and report deficiency, if any to Sr.DOM / DOM(G) for suitable action.

**3403 First Aid Boxes.**

(1) **Description/Supply**

- (a) First Aid Box is standard size Aluminium box, fitted with felt lined dust proof lid. The size and design should be as approved by the Chief Medical Director.
- (b) Obsolete and sub-standard First Aid Boxes should be gradually withdrawn and replaced with approved ones through the usual manner of procurement from Stores Department.
- (c) Initial supply of First Aid Boxes for all departments is to be made by the Sr.DMO/DMO in his jurisdiction. The Sr.DMO/DMO should keep a 10% reserve of the total number of First Aid Boxes required on the division.
- (d) On these boxes shall be painted the serial number of the First Aid Box, name of the Guard's HQ station, and the Division to which it belongs. A printed list containing the description, number of articles and quantities it contains will be pasted on the inner side of the lid of the box. This box will also contain an "Injury Card" which will contain particulars such as date and time the accident or injury occurred, name of the persons to whom first aid was rendered, the nature of the injury sustained, the actual number of dressings and other First Aid articles utilized.
- (e) Replacement of complete First Aid Boxes, after the initial supply will be arranged by the Station Master of Guard's HQ stations from the Stores Department in the usual manner of procurement.

(2) **Use :**

- (a) Every Guard of train intended to work passengers carrying trains and every Guard of material or ballast train which may be with or without labourers must carry the First Aid Box during the journey. Sealed First Aid Boxes will be supplied to Passenger Guards as part of their personal equipment and will be issued by the Guard's Headquarter station.

In case of Guards working material or Ballast trains, the First Aid Box will be supplied by the Station Master nominated and the same will be returned to the Station Master concerned on completion of the trip. The seal should be checked by the Station Master and the contents if the box has been used.

- (b) First Aid Box should remain available round the clock at every station.

(3) **Maintenance & Replenishment :**

- (a) The responsibility for maintaining the box and its contents, in a clean condition and fully up to scale will be entirely that of the Guard to whom the box has been issued as a part of his personal equipment.
- (b) Station Master will recoup his reserve stock once every month from the Sr.DMO/DMO at his headquarter stations. DMO will indent these items and recoup their stock as usual.
- (c) When the contents of the First Aid Box are used by the Guard for whatever reason, an entry will be made in the injury card and the same will be intimated to the Station Master who will arrange to replace the same from the Medical Department, by sending the box to the Sr.DMO/DMO concerned.
- (d) It will be the responsibility of the Sr.DMO/DMO in-charge, to check the contents of the First Aid Box and arrange immediate replenishment of the articles used or articles found unserviceable or damaged. The First Aid Box duly checked will be sealed by the Medical Department and returned to the Station Master concerned. Surprise inspections of First Aid Boxes in running trains should be made by Officers and Inspectorial staff of the Medical and Operating Departments.

**3404 Schedule of Standard Dimension**

Instructions of schedule of Standard Dimension as referred in GR 4.07 (3) are given in Appendix -A at the end of this Chapter.

3405

**Use of Walkie -Talkie sets-**

1. In case a train has come to an out of course halt in Automatic Signaling Territory between two stations and is not in a position to move ahead and requires a relief engine, the Guard of that train shall guide the crew of a relief engine when it is to come to pick-up the train, except in suburban sections.
2. Station Master may communicate on Walkie-Talkie for advising abnormalities that require immediate attention by Loco Pilot/Guard for controlling / stopping their train.
3. Use of Walkie -Talkie sets should in no way contravene conditions required to be satisfied for reception/dispatch of train as per G&SRs.
4. Walkie-Talkie sets should not be used as an alternative to written authority to proceed, authority to pass a defective signal at danger etc.
5. These sets shall not be used for communicating the aspect /position of any signal by Station Master to Loco Pilot /Guard. The Loco Pilot/Guard may advise if the aspect of any signal is 'ON'.
6. Walkie-Talkie sets should not used be an alternative to or replace physical exchange of signals. However in case of full length trains, in following circumstances, walkie - talkie sets may be used for exchange of signals between Loco Pilot and Guard when it is not possible to exchange signals physically and the conditions for exchange of signal have been fulfilled:-
  - (a) To dispatch/start the train from a station;
  - (b) To start a train stopped in curvatures / tunnels in block section and
  - (c) On run, when it is not possible due to curvatures or due to geographical lay outs.
7. In all the above cases where the Station Master or Loco Pilot or Guard uses the Walkie - Talkie he will clearly mention his identity along with station name/train number while communicating and also confirm the identity of the speaker at the other end.

Supervisors/Officers should periodically conduct surprise checks as a part of their routine inspection regarding use of walkie - talkie sets by Station Master and running staff. Cases of violation of above instructions and short-cut methods adopted should be dealt with firmly.
8. Walkie-Talkie can be used during shunting operations by the shunting staff, by using specific frequency which is different from that of Loco Pilots and Guards and station staff.

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**STANDARD DIMENSIONS (1676mm GAUGE (BG))**

**CHAPTER I- GENERAL**

The DIMENSIONS given in this Schedule-I have been classified under two heads namely for 'Existing works' and for 'New works', Existing works means the works which were existing before issue of this Schedule of Dimensions (2004) and would help the field engineers to provide the information about previous dimensions followed at one place.

New works would include altogether new constructions, additions of new lines/ structure, gauge conversion and doubling. However, it is not intended to include the works of alteration such as shifting of points and crossings of siding, building etc.

The dimensions, except for existing works, are to be observed on all 1676 mm gauge on Indian Railways unless prior sanction has been obtained from the Railway Board through the Commissioner/Chief Commissioner of Railway Safety to execute the new works which would infringe this Schedule of dimensions.

(See Diagram Nos. IA, IA (Modified), 1B, 1C and 1D)

**Note:-**

(1) Items 8 and 10 are applicable only to structures outside station yards. All other items are of general applicability.

(2) For running EMU and other 3660 mm Stock on existing works, clearances prescribed in items 13 of Chapter 1 "Tunnels, Through and Semi Through, Girder Bridges" shall also be required for all structures governed by items 1, 7, 8 and 12 of this chapter and not only for tunnels, through and semi through girder bridges.

**Spacing of tracks:-**

1. Minimum distance centre to centre of tracks.

- |                                                |         |
|------------------------------------------------|---------|
| (i) For existing works                         | 4265 mm |
| (ii) For new works/additions to existing works | 5300 mm |

**Note:**

(a) See Appendix for extra clearance required on curves.

(i) Extra clearance up to 5 degree has been accounted for the track spacing given in item (ii) above.

(ii) For curves more than 5 degree, extra clearance is to be calculated and accounted for.

(b) For spacing of tracks in tunnels, through and semi through girder bridges, see item 13 (i).

(c) New/Additional works cover laying of new line and new running loops. Extension of existing line or replacement of points & crossings will not be treated as new work. ]

**Curves :-**

2. Minimum radius of curves 175m(10 degrees)

**Bridges :-**

3. Bridges must conform to the requirements of chapter IV of the Railways opening for the Public carriage of Passengers, Rule 2000.



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On existing bridges where there is nothing solid between sleepers to prevent a derailed wheel dropping, the clear distance between two consecutive sleepers shall not exceed 510 mm. The clear distance between the joint sleepers shall not, however, exceed 200mm and that between the two consecutive sleepers 450mm in all new constructions and in existing bridges when regirding or carrying out through sleeper renewal.

Bridge sleepers resting directly on longitudinal girders should not be less than 152mm deep exclusive of any notching which may be required to allow for cover plates, camber, etc. and not less than 305mm greater in length than the distance outside to outside of girder flanges subject to a minimum of 2440mm. The minimum length of steel trough sleepers should be the distance outside to outside of girder flanges subject to a minimum of 2440mm.

### Rails :-

4. Minimum clearance of check rails for a curve 44mm

### Note:

- (a) This clearance must be increased by not less than half the amount of any difference between 1676mm and the gauge to which the curve is actually laid.
- (b) Check rails to be provided in curves where the radius is 218metres or less i.e. curvature is 8 degree or more. They may be necessary also in the case of flatter curves, if high speed is contemplated.

5. (i) Minimum clearance of check rail at a level crossing 51mm  
(ii) Maximum clearance of check rail at a level crossing 57mm
6. Minimum depth of space for wheel flange from rail level 38mm

### Buildings and structures :-

7. Minimum horizontal distance from centre of track to any structure from rail level to 305mm above rail level
- (i) For existing works 1675mm  
(ii) For new works or alterations to existing works 1905mm
8. Minimum horizontal distance from centre of track to any structure except a platform
- (i) For existing works  
From 305mm above rail level to 4420mm above rail level 2135mm
- (ii) For new works or alterations to existing works
- (a) From 305mm above rail level to 1065mm 1905mm increasing to 2360mm
- (b) From 1065mm above rail level to 3355mm 2360mm
- (c) From 3355mm above rail level to 4420mm 2360mm decreasing to 2135mm
- (d) From 4420mm above rail level to 5870mm 2135mm decreasing to 915mm

### Note:-

- (a) Under item 7 and 8, any material stacked by the side of line is to be considered a structure in the sense in which the word is under here. These items also apply to projections of rock etc. from the side of cutting.

## MISCELLANEOUS

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- (b) See appendix for extra clearance required on curves.
- (c) Light structures such as ladders, thin posts etc. erected along side the track at a distance of less than 2360mm from centre of adjacent track should be blanked off to a height of 300mm between 2060mm and 2360mm above rail level.
- (iii) (a) Below the rail level up to the formation level of the track on straight and curves up to radius of 875 m. 2575mm
- (b) Below the rail level up to the formation level up to the formation level of the track on curves with radius less than 875m. 2725mm

**Note:-**

- (a) The required clearances as mentioned under item 8(iii)(a) and (b) above will be applicable in case of new lines/doubling/electrification.
- (b) The various fixture which are attached to the track like traction bonds etc. and are required to be filed with the rail can be provided and the clearance as mentioned in item 8(iii)(a) & (b) above will not be applicable to the fixtures.
9. Minimum horizontal distance of any telegraph post measured from the centre of and at right angles to the nearest track.
- (i) For existing works The height of the post plus 2135mm
- (ii) For new works or alterations to existing works. The height of the Post plus 2360mm

**Note:-** When the line is in cutting a telegraph post erected outside the cutting, must be at a distance from the edge of the cutting not less than the total height of the post.

10. (i) Minimum height above rail level for distance of 915mm on either side of the centre of track for overhead structures. 4875mm
- (ii) Where D.C. electric traction is in use or is likely to be used this dimension shall be 5410mm
- (iii) Where 25 KV A.C. traction is likely to be used, the minimum height above rail level for a distance of 1600mm on either side of the centre of track shall be:
- (a) Light overhead structure such as foot over bridges 6250mm
- (b) Heavy overhead structure such as road over or flyover bridges. 5870mm

**Note:-**

- (a) See appendix for extra clearance required on curves.
- (b) In case of existing structures a special study shall be made as indicated in Appendix-A to Chapter V-A before 25 KV A.C. traction is introduced.
- (c) In areas where 25 KV A.C. traction is used or likely to be used, if any turnout or crossover is location under a heavy overhead structure or within 40m from its nearest face irrespective of the position of level crossing gate, the minimum height of such overhead structure shall be 6250mm. Also, in case the turnout is beyond 40m but the level crossing gate is within 520m from the nearest face of the bridge, the height of such overhead structure shall be 6250mm.

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- (d) The height mentioned against items 10(i), 10(ii) & 10 (iii) shall be measured from the higher of super elevated rail.
- (e) Extra vertical clearance under overhead structure and overhead equipment in electrified sections an allowance of 275 mm to be made for raising of track to permit modern track structure to be introduced.

**Note:-**On lines proposed to be electrified on 25 KV A.C. system, necessary provision should be made in over head structure and overhead equipment if necessary by using longer traction overhead equipment masts to permit possible raising of the track by 275mm in future to cater for increased ballast cushion, larger sleeper thickness and deeper rail sections.

11. (i) Minimum height above rail level of the lowest portion of any conductor crossing a railway, including guard wire, other than telegraph, telephone and other such low tension wires or a traction trolley wire, under conditions of maximum sag shall be:

| Voltage                                     | Clearance                     |
|---------------------------------------------|-------------------------------|
| (a) Up to and including 11 KV               | Normally by underground cable |
| (b) Above 11 KV upto and including 66 KV    | 14.10m                        |
| (c) Above 66 KV up to and including 132 KV  | 14.60m                        |
| (d) Above 132 KV up to and including 220 KV | 15.40m                        |
| (e) Above 220 KV up to and including 400 KV | 17.90m                        |
| (f) Above 400 KV up to and including 500KV  | 19.30m                        |
| (g) Above 500 KV up to and including 800 KV | 23.40m                        |

- (ii) Minimum clearance between any conductor not adequately insulated and any railway structure under most adverse conditions.

| Voltage                                       | Clearance |
|-----------------------------------------------|-----------|
| (a) Up to and including 650 volts             | 2500mm    |
| (b) Above 650 volts up to and including 33 KV | 3700mm    |
| (c) Above 33 KV up to and including 66 KV     | 4000mm    |
| (d) Above 66 KV up to and including 132 KV    | 4600mm    |
| (e) Above 132KV up to and including 165 KV    | 4900mm    |
| (f) Above 165 KV up to and including 220 KV   | 5500mm    |
| (g) Above 220 KV up to and including 400 KV   | 7300mm    |
| (h) Above 400 KV up to and including 500 KV   | 8200mm    |
| (i) Above 500 KV up to and including 800 KV   | 10900mm   |

- (iii) Minimum height above rail level for telegraph, telephone and other such low tension wires crossing a railway. 610mm
- (iv) the minimum horizontal distance measured at right angles from the centre of nearest track to structure carrying electrical conductors crossing a railway shall be equal to height of structure in metre above ground level plus 6 m.

### Interlocking and signal gear :-

12. Maximum height above rail level of any part of Interlocking or signal gear for a width of 1600 mm or 1830 mm in the case of tunnels, through and semi-through girder bridges on either side of centre of track subject to the restriction embodied in the note(a) below. 64mm

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### Note:-

- (a) For a distance of 229 mm outside and 140 mm inside the gauge faces of the rail, no gear or track fittings must project above rail level except such parts as are required to be actuated by the wheels or wing rails and point rails of special crossings leading to snag dead ends or elevated check rails of crossing or check rails/check flats of diamond crossings.
- (b) Signal wires or supports for signal wires may be allowed at not less than 1600 mm or 1830 mm in the case of tunnels or through or semi-through girder bridges {see note at item 33 of Chapter IV (A)} on either side of the centre of track provided that they are not more than 203 mm above rail level.
- (c) Metal covers with ramps on both sides must be provided over all interlocking gear projecting above rail level between the rails of a track to prevent hanging couplings from damaging the gear

### Tunnels, through and semi-through girder bridges:-

{(See diagram No.1A; 1-A (Modified))}

13. (i) Minimum distance centre to centre of track
  - (a) For existing lines 4495 mm
  - (b) For new works and alterations to existing works 4725 mm
- (ii) Minimum horizontal distance from centre of track to any structure shall be as follows :

| Height above rail level     | Horizontal distance from centre of track |
|-----------------------------|------------------------------------------|
| (a) From 0.0 mm to 305 mm   | 1905 mm                                  |
| (b) From 305 mm to 1065 mm  | 1905 mm increasing to 2360 mm            |
| (c) From 1065 mm to 3355 mm | 2360 mm                                  |
| (d) From 3355 mm to 4420 mm | 2360 mm decreasing to 2135 mm            |
| (e) From 4420 mm to 5870 mm | 2135 mm decreasing to 915 mm             |

### Note:-

- (i) Where electric traction is not likely to be used, over head bracing of bridges may be 5030 mm above rail level for a distance of 1370 mm on either side of the centre of track
- (ii) In case of existing structures, a special clearance study shall be made as indicated in Appendix –A to Chapter V-A before electric traction is introduced.
- (iii) See Appendix for extra clearances required on curves.
- (iv) Where D.C. traction is in use item 13(ii)(e) above may be allowed to remain as under :
 

|                         |                              |
|-------------------------|------------------------------|
| From 4420 mm to 5410 mm | 2135 mm decreasing to 915 mm |
|-------------------------|------------------------------|

### Safety Refuges :-

14. Maximum distance apart of refuges in tunnels 100m
15. Maximum distance apart of trolley refuges:
  - (i) On bridges with main spans of less than 100m 100m
  - (ii) On bridges with main spans of 100m or more A refuge over each pier

### Formation width :-

16. Formation width for single line straight track
  - (a) Minimum width in embankment 6850 mm
  - (b) Minimum width in cutting (excluding side drains) 6250 mm

## MISCELLANEOUS

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17. Formation width for double line straight track
- |                                                      |         |
|------------------------------------------------------|---------|
| (a) Minimum width in embankment                      | 12150mm |
| (b) Minimum width in cutting (excluding side drains) | 11550mm |

**Note:-**

- (a) The minimum formation width is based on :
- (i) Ballast section having 1:5:1 side slope
  - (ii) Cross slope on top of formation of 1 in 30
  - (iii) Track centre in case of double line section is 5300mm

**18. Formation width on curves :**

- (a) Increase due to extra ballast on outside of curves :

On curves, the actual width to be provided should take into account 150mm extra widening of ballast shoulder (500mm in place of 350mm) required on the outer side of curves. Thus, additions in the width on this account will be 150mm for single line and 300 mm for double line.

- (b) Increase on double line due to effect of super-elevation :

Due to requirement of extra clearances on double line on curves, increase in track centres with corresponding increase information width would be necessary to take into account the effect of super elevation.

Increase information width on curves will be decided after taking into account the increase mentioned in (a) & (b) above.

19. **Gauge on straight and curves :** The gauge shall be as follows :

- |                                                |                                    |
|------------------------------------------------|------------------------------------|
| (i) Straight including curves of 400 m, radius | Up to 3 mm tight i.e. up to 1673mm |
| (ii) Curves less than 400 m radius             | Up to 5mm i.e. up to 1681mm        |

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**CHAPTER II – STATION YARDS**

**(See Diagram No.2)**

**Note:**

- (1) The expressions “in station” and “out of station” are to be interpreted in accordance with the definition of “station limits” given in Chapter I, Part I, of the General Rules for open lines, viz. “station limits” means the portion of a railway which is under the control of a station master and is situated between the outermost signals of the station.
- (2) For running EMU and other 3660 nm Stock clearances prescribed in items 13 of Chapter I “Tunnels, through and semi-through girder bridges” shall also be required for all structures governed by items I and II of this chapter and not only for tunnels and through and semi-through girder bridges. However a platform shelter may infringe item 13(ii)(e) of chapter I and edge of the platform shelter may be kept at a minimum horizontal distance of 1600mm from centre line of track and at a minimum height of 4610mm above rail level.

**Spacing of tracks :-**

1. Minimum distance centre to centre of tracks.
  - (i) For existing works 4265 mm
  - (ii) For new works or alterations to existing works 5300 mm

**Note:-**

- (a) See Appendix for extra clearance required on curves. For spacing of 5300mm, extra clearance up to 5 degree has been accounted for. Extra clearance for curves more than 5 degree are to be calculated and accounted for.
- (b) New/Additional works cover laying of a new line. Extension of existing line for replacement of points & crossings will not be treated as new work.
2. Maximum gradient in station yards unless special safety devices are adopted and/or special rules enforced to prevent accidents in accordance with approved special instructions.
  - (i) For existing works 1 in 400
  - (ii) For new works 1 in 1200

**Note:-**

- (a) It may not be possible to provide yard gradients of 1 in 1200 while executing works in connection with gauge conversion, doublings and new crossing station etc. Railways should, however, make efforts to provide grades as flat as possible in the station yards but not steeper than 1 in 400. In case of gradient steeper than 1 in 400 are required to be provided in exceptional cases, condonation for the same should be obtained from Railway Board.
- (b) For the purpose of the above rule, a station yard will be taken to extend :
  - (i) On single line to a distance of 50 metres beyond outermost points at either ends of the station.
  - (ii) On double line where 2 aspect signalling is provided, from home signal to a distance of 50 metres beyond outermost points at the trailing end, or where there are no loops, to last stop signal of each line.

## MISCELLANEOUS

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- (iii) On double line where multiple aspect signalling is provided to a distance of 50 metres beyond outermost points at either end of the station or where there are no loops, from Block Section Limit Board to last stop signal of each line.
- (c) No siding should join a passenger line on a steeper grade than 1 in 260, except where it is unavoidable and then only with the previous sanction of the Railway Board obtained through the commissioner of Railway Safety when a slip siding or other arrangement is made sufficient to prevent accidents.
- (d) Except in Hump or Gravity yards or as provided for in item 22 of this Chapter, there must be no change of grades within 30 metres of any points or crossings.
- (e) At station with grades steeper than 1 in 400 beyond 50 metres of outermost points, trains should not be drawn up to the last stop signal and held up on the steep gradient in order to clear the reception line for giving permission to approach to the following train.

No shunting beyond outermost points on the steep gradient side should be allowed unless a locomotive is attached at the lower end of the load from the point of view of gradient.

- (f) Item 2 does not apply to Flag or Halt stations.

### Platforms :

- 3. (i) Horizontal distance from centre of track to face of passenger platform coping
  - Maximum 1680mm
  - Minimum 1670mm

### Note:-

- (l) The coping of passenger platform must be so constructed that when necessary, to allow for introduction of wider stock, it can be easily and expeditiously set back to 1905mm. From centre of track (see diagram no.2)
- (ii) Horizontal distance from centre of track to face of goods platform coping.
  - Maximum 1680mm
  - Minimum 1670mm
- (iii) Horizontal distance from centre of track to face of any platform wall.
  - Maximum 1905mm
  - Minimum 675mm

### Note:-

- (a) New platform walls should be built to maximum dimensions and the coping corbelled out to 1675mm unless provision is made to allow for the introduction of wider rolling stock either by slewing the platform track out of 230mm or by moving the platform wall 230mm further from the track.
- (b) See Appendix for extra clearance required on curves.
- 4. Height above rail level for high passenger platforms 840mm maximum  
760mm minimum
- 5. Maximum height above rail level for low passenger platform. 455 mm
- 6. Maximum height above rail level for goods platform 1065mm  
(except horse and end loading platforms)

### Note:-For items 4,5 and 6

- (a) Platform may be flush with rail level.



## MISCELLANEOUS

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- (b) The ends of all platforms (except end loading platforms) must be ramped to a slope of 1 in 6 for a width of not less than 1 metre from the face of the platform wall, the rest can either be ramped to the same slope or fenced.
- (c) The height of platforms serving super-elevated track should be measured vertically from the face to a plane passing through the top of both the rails.
- (d) End loading platform and platforms on sidings used exclusively for horse loading may be raised to a height of 1295mm above rail level
- (e) Signal wires or supports for signal wires may be allowed underneath the platform coping.
- (f) The length of a passenger platform should be not be less than the length of the longest passenger train excluding the engine, booked to stop at the platform.
- (g) No passenger platform in case of new line, would be constructed on a curve having radius less than 875 metres.
- (h) In case of construction of a new platform on the existing line addition/alteration to existing platforms or in gauge conversion/doubling works, where either the new platform(s) are to be constructed or the old being dismantled and reconstructed, efforts should be made to ease out the existing curves having radius less than less 875 metres. However, for these works, having platform located/to be located on curves with radius less than 875 metres, no condonation of CRS/Board would be necessary.

### **Buildings and structures :**

- 7.(a) Minimum horizontal distance of any building on a passenger platform from centre line of track :
- |       |                                                                                     |                                             |
|-------|-------------------------------------------------------------------------------------|---------------------------------------------|
| (i)   | From platform level to 305mm above platform level<br>increasing uniformly to 5330mm | 5180mm                                      |
| (ii)  | From 305mm above platform level to 3430mm<br>above rail level.                      | 5330mm                                      |
| (iii) | From 3430mm above rail level to                                                     |                                             |
| (a)   | 4115mm above rail level in case of existing works.                                  | 5330mm<br>decreasing uniformly<br>to 3810mm |
| (b)   | 4610mm above rail level in case of<br>new works or alterations to existing works    | 5330mm<br>decreasing uniformly<br>to 3810mm |

**Note:-** For the return end of platform fencing this dimension may be reduced to 2740mm.

- 7.(b) Minimum horizontal distance of any building or longitudinal boundary fence from the face of the platform coping of passenger platform which is not on island platform (for new works or alterations to existing works).
- |      |             |         |
|------|-------------|---------|
| (i)  | Minimum     | 5485mm  |
| (ii) | Recommended | 10210mm |

### **Note:-**

- (a) Item 7(b)(ii) allows for setting back the platform to make room for an additional track in future, without infringing item 7(b)(i).
- (b) Item 7(b) should also apply to buildings and isolated structures not readily removable, erected on ground over which it is anticipated that a platform may be extended in future.

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8. Minimum horizontal distance from centre line from track to a pillar, column, lamp or similar isolated structure on a passenger platform or any building on a goods platform.
- |       |                                                                                |                                        |
|-------|--------------------------------------------------------------------------------|----------------------------------------|
| (i)   | From platform level to 305mm above platform level                              | 4570mm increasing uniformly to 4720mm. |
| (ii)  | From 305mm above platform level to 3705mm Above rail level                     | 4720mm                                 |
| (iii) | From 3705mm above rail level to                                                |                                        |
| (a)   | 4115mm above rail level in case of existing works.                             | 4720mm decreasing uniformly to 3810mm  |
| (b)   | 4610mm above rail level in case of new works or alterations to existing works. | 4720mm decreasing uniformly to 3810mm  |
- 8.(A) Minimum horizontal distance from centre line of track to a pillar, column, lamp or similar isolated structure on a goods platform.
- |       |                                                                                                           |                                        |
|-------|-----------------------------------------------------------------------------------------------------------|----------------------------------------|
| (i)   | From platform level to 305mm above Platform level.                                                        | 3960mm increasing uniformly to 4110mm, |
| (ii)  | From 305mm above platform level to above rail level.                                                      | 4110mm 4310mm                          |
| (iii) | From 3980mm above rail level to                                                                           |                                        |
| (a)   | 4115mm above rail level in case of existing works.                                                        | 4110mm decreasing Uniformly to 3810mm  |
| (b)   | 4310mm above rail level to 4610mm above rail level in case of new works or alterations to existing works. | 4110mm decreasing Uniformly to 3810mm  |

**Note:-**A pillar or column (vide items 8 and 8A) which covers more than 3716 sq.cm. in plan, must be classed as “building” and not as “isolated structure”.

9. Minimum height above rail level for a width of 1600mm on either side of the centre of track, of tie rods or any continuous covering in a passenger station. 6250mm

**Note:**

- (1) On lines other than main lines where 25KV AC electric traction is not likely to be used, the dimensions given above may be modified as under :
- |                                                         |        |
|---------------------------------------------------------|--------|
| For a width of 1370mm on either side of centre of track | 6100mm |
|---------------------------------------------------------|--------|
- (2) On existing primary lines, not likely to be electrified, dimension as in Note 1 may be allowed to continue.
- (3) Item 9 does not apply to overhead piping parallel to the track.
- |      |                                                                                                                                                                                                                                     |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (i)  | A low roof that infringes item 9 is permissible in the case of goods or transshipment shed on a siding, provided it does not infringe the out line of the figures for the minimum fixed structure out of stations (See diagram 1B). |
| (ii) | Extra vertical clearance of 275mm under overhead structures and overhead equipment in electrified section be ,provided to allow for any raising of track to permit modern track structure to be introduced.                         |

**Note:**On lines proposed to be electrified on 25 KV AC system, necessary provision should be made in over line structures and overhead equipment if necessary by using longer traction overhead equipment masts to permit ;possible raising of the track by 275mm

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in future to cater for increased ballast cushion, larger sleeper thickness and deeper rail sections.

10. Minimum height above rail level for a width of 1600mm on either side 6250mm of centre of a track, of a signal gantry or a foot over bridge in a passenger station.

**Note:**

- (a) Where D.C. traction is in use or likely to be used, this minimum height should be 5410mm.
- (b) On secondary lines where electric traction is not likely to be introduced, this minimum height may be 4875mm. This also applies to overhead piping arrangements parallel to track wherever provided, which shall necessarily be changed over to the ground hydrants when the section is electrified.

11. Minimum, horizontal distance from centre of track to any structure:

(A) For existing works :

- |                                                                                                              |                             |
|--------------------------------------------------------------------------------------------------------------|-----------------------------|
| (i) From rail level to 305mm above rail level                                                                | 1675mm                      |
| (ii) From 305mm above rail level to 3355mm above rail level.                                                 | 2135mm                      |
| (iii) From 3355mm above rail level to 4115mm above rail level                                                | 2135mm decreasing to 1980mm |
| (iv) From 4115mm to 6250mm above rail level on main line.                                                    | 1600mm                      |
| (v) Below the rail level up to the formation level of the track on straight and curves up to radius of 875m. | 2575mm                      |
| (vi) Below the rail level up to the formation level of the track on curves with radius less 875m.            | 2725mm                      |

**Note:**

- (a) See appendix for extra clearances required on curves.
- (b) On lines other than main lines or existing main lines where electric traction is not likely to be introduced, the horizontal distance of 1375mm from 4115mm to 6100mm above rail level may be allowed to continue.
- (c) The clearance mentioned above in item (v) and (vi) will be applicable only in new yards/ electrification works. The various fixtures which are attached to the track like lock bar, point machine, traction bonds, point and signal rodding etc. and are required to be fitted with the rail can be provided and the clearance as mentioned in item 11(v) and 11(vi) above will not be applicable to these items.
- (B) +In case of new works or alteration to existing works
- |                                               |                             |
|-----------------------------------------------|-----------------------------|
| (i) From rail level to 305mm above rail level | 1905mm                      |
| (ii) From 305mm above rail level to 1065mm    | 1905mm increasing to 2360mm |
| (iii) From 1065mm above rail level to 3355mm  | 2360mm                      |
| (iv) From 3355mm above rail level to 4420mm   | 2360mm decreasing to 2135mm |
| (v) From 4420mm above rail level to 4610mm    | 2135mm decreasing to 1980mm |
| (vi) From 4610mm above rail level to 6250mm   | 1600mm                      |

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**Note:** See appendix for extra clearances on curves

**Points and crossings :**

12. Maximum clearance of check rail opposite nose of crossing. 48mm

**Note:**

- (a) In case of turnouts laid with 1673mm gauge, the clearance shall be 45mm instead of 48mm  
(b) In the obtuse crossing of diamond crossings, the clearance at the throat of the obtuse crossing shall be 41mm.

13. Maximum clearance of wing rail at nose of crossing 44mm

**Note:**

- (a) In case of turn outs laid with 1673mm gauge, the clearance shall be 41mm instead of 44mm.  
(b) In the obtuse crossing of diamond crossing, the clearance at the throat of the obtuse crossing shall be 41mm.

14. Maximum clearance of wing rail at nose of crossing 48mm.

**Note:**

In case of turn outs laid with 1673mm gauge, the clearance shall be 45mm instead of 48mm.

15. Minimum clearance of wing rail at nose of crossing 44mm

**Note:**

In case of turn outs laid with 1673mm gauge, the clearance shall be 41mm instead of 44mm.

16. Minimum clearance between toe of open switch and stock rail

- (i) For existing works 95mm  
(ii) For new works or alteration to existing works 115mm

**Note;**

The clearance can be increased up to 160mm in curved switches in order to obtain adequate clearance between gauge face of stock rail and back face of tongue rail.

17. Minimum radius of curvature for slip points, turn outs or crossover roads. 218mm(8 degree)

**Note:**

In special cases mentioned below this may be reduced to not less than the minimum of

- (j) 213m radius in case of 1 in 8.5 BG turnouts with 6.4m over riding switch, and  
(ii) 175m radius in case of 1 in 8.5 scissors crossing to allow for sufficient straight over the diamond crossing between crossovers.

18. Minimum angle of crossing (ordinary) 1 in 16

**Note:**

Crossing as flat as 1 in 20 will usually be sanctioned if recommended by the Commissioner of Railway Safety.

19. Diamond crossings not to be flatter than 1 in 8.5

**Note:**

Diamond crossings as flat as 1 in 10 will usually be sanctioned if recommended by the Commissioner of Railway Safety.

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- |     |                                                                           |         |
|-----|---------------------------------------------------------------------------|---------|
| 20. | Minimum length of tongue rail                                             | 3660mm  |
| 21. | Minimum length of train protection, point locking or fouling treadle bar. | 12800mm |

**Note:**

This must be no change of super elevation (of outer over inner rail) between points 18m out side toe of switch rail and nose of crossing respectively, except in the case of special crossings leading to snag dead ends or under circumstances as provided for in item –22.

22. Super elevation and speed in stations on curves with turnouts of contrary and similar flexure:

Main line : Subject to the permissible run through speed, based on the standard of interlocking, the equilibrium super-elevation, calculated for the speed of the fastest train, may be reduced by a maximum amount of 75mm without reducing the speed on the main line

Turnouts:

- (i) Curves of contrary flexure :-

The equilibrium super-elevation in millimeters should be calculated by the formula

$$C = \frac{11860}{R}$$

Where R = Radius of turnout in metres

The permissible negative super-elevation on the turn out (which is also the actual super-elevation of the main line) may then be made as (75-C)mm.

- (ii) Curves of similar flexure :-

The question of reduction or otherwise of super-elevation on the main line must necessarily be determined by the administration concerned. In the case of a reverse curve close behind the crossing of the turnouts, the super-elevation may be run out at the maximum of 1mm in 360mm.

**Length of siding :**

23. Minimum clear available length of one siding at any station where it is intended to cross trains:

- (i) At a non-watering station- 7 percent longer than the longest train permitted to run on the section.
- (ii) At a watering station such that when the train engine is standing (and taking water), at the water column the rear of the longest train permitted to run on the section shall be at least 15 metres clear of the fouling mark in rear and such that when a second assisting engine is standing (and taking water) at a water column the leading engine is clear of the fouling mark in front.
- (iii) Although it may not be necessary till traffic develops to provide sidings for the largest possible train loads, land should be acquired for them and no building, level crossings or other obstructions should be permitted that will interfere with one crossing siding being lengthened to the following dimensions:

| On sections of the railway where the ruling gradients is | Minimum clear available length of one siding. |
|----------------------------------------------------------|-----------------------------------------------|
| 1 in 500 or flatter                                      | 770 metres                                    |
| Between 1 in 500 and 1 in 300                            | 610 metres                                    |
| Between 1 in 300 and 1 in 100                            | 550 metres                                    |
| Between 1 in 100 and 1 in 50                             | 490 metres                                    |
| Steeper than 1 in 50                                     | 370 metres                                    |

**CHAPTER IV (A) – ROLLING STOCK (Carriage & Wagon)**

**Wheels & Axles**

|    |                                                                                                             |                                   |
|----|-------------------------------------------------------------------------------------------------------------|-----------------------------------|
| 1. | Wheel gauge, or distance apart, for all wheel flanges                                                       | Maximum 1602mm<br>Minimum 1599 mm |
| 2. | (i) Maximum diameter on the tread of new carriage or wagon wheel, measured at 63.5mm from wheel gauge face. | 1092 mm                           |
|    | (ii) Minimum diameter on the tread of new carriage of wagon wheel, measured 63.5mm from wheel gauge face    | 914mm                             |
| 3. | Minimum projection for flange of new tyre, measured from tread at 63.5mm from wheel gauge face.             | 28.5mm                            |
| 4. | Minimum projection for flange of worn tyre, measured from tread at 63.5mm from wheel gauge face.            | 35.0mm                            |
| 5. | Maximum thickness of flange of tyre, measure from wheel gauge face at 13mm from outer edge of flange.       | 28.5mm                            |
| 6. | Minimum thickness of flange of tyre, measured from wheel gauge face at 13mm from outer edge of flange       | 16mm                              |
| 7. | Minimum width of tyre                                                                                       | 127mm                             |
| 8. | Incline of tread                                                                                            | 1 in 20                           |

**Height of Floors.**

|     |                                                                              |        |
|-----|------------------------------------------------------------------------------|--------|
| 9.  | Maximum height above rail level for floor of any unloaded vehicle.           | 1345mm |
| 10. | Minimum height above rail level for floor of fully loaded passenger vehicle. | 1200mm |
| 11. | Minimum height above rail level for floor of fully loaded goods vehicle.     | 1145mm |

**Note:** This does not apply to crocodile wagons.

**Buffers & Couplings.**

|     |                                                                                   |        |
|-----|-----------------------------------------------------------------------------------|--------|
| 12. | Distance apart for Centres of buffers.                                            | 1955mm |
| 13. | Maximum height above rail level for centres of buffers for unloaded vehicles.     | 1105mm |
| 14. | Minimum height above rail level for centres of buffers for fully loaded vehicles. | 1030mm |

**Wheel Base & Length of Vehicles.**

|     |                                                                     |         |
|-----|---------------------------------------------------------------------|---------|
| 15. | Maximum rigid wheel base for four wheeled vehicles                  | 6100mm  |
| 16. | Minimum distance apart of bogie centres for bogie vehicles          | 5400mm  |
| 17. | Maximum distance apart of bogie centres for bogie vehicles          | 15241mm |
| 18. | (i) Minimum rigid wheel base for bogie truck of any vehicle         | 1830mm  |
|     | (ii) Minimum rigid wheel base for bogie truck of passenger vehicle. | 2440mm  |

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- |     |                                      |         |
|-----|--------------------------------------|---------|
| 19. | Maximum length of body or roof for : |         |
|     | (a) 4-wheeled vehicle                | 8540mm  |
|     | (b) Bogie vehicles                   | 21340mm |

**Note:**

- (i) A cornice may project beyond the maximum permissible length of the roof up to 51mm in the case of (a) above, beyond each end of the vehicle.
- (ii) Fittings on the end of a vehicle, such as step iron, vacuum brake piping, electrical connections, vestibule etc., need not be kept within the prescribed maximum permissible lengths for bodies of vehicles, but may project beyond the end of the body to a reasonable extent.
- (iii) Maximum length of bogie wagons can be up to 23550mm subject to tapering of the ends in a manner that the end throw when calculated as per Appendix is same as that for a coach of 21340mm length and within this Schedule of Dimensions.

- |     |                                    |         |
|-----|------------------------------------|---------|
| 20. | Maximum length over side buffers : |         |
|     | (a) 4-wheeled vehicle              | 9810mm  |
|     | (b) Bogie vehicles                 | 22300mm |

**Note:**The maximum length over the side buffers for longer coaches as per item 20 above shall be so arranged that the difference between the length over side buffers and the length of body or roof is not less than 460mm.

- |     |                                                        |         |
|-----|--------------------------------------------------------|---------|
| 21. | Maximum distance apart between any two adjacent axles. | 12345mm |
|-----|--------------------------------------------------------|---------|

**Maximum Moving Dimensions (See diagram 1D)**

- |     |                                                                                                              |                                                |
|-----|--------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| 22. | Maximum width over all projections at 102mm above rail level, when fully loaded                              | 2440mm                                         |
| 23. | Maximum width over all projections, at 305mm above rail level when fully loaded.                             | 3135mm                                         |
| 24. | Maximum width over all projections, at 305mm above rail level to 1082mm above rail level, when fully loaded. | 3135mm                                         |
| 25. | Maximum width over all projections, at 1082mm above rail level to 1170mm above rail level when fully loaded. | 3135mm<br>increasing<br>gradually to<br>3250mm |

- |     |                                                                                                                      |        |
|-----|----------------------------------------------------------------------------------------------------------------------|--------|
| 26. | Maximum width over all projections, from 1082mm above rail level when fully loaded to a height of 3380mm when empty. | 3250mm |
|-----|----------------------------------------------------------------------------------------------------------------------|--------|

- (i) Guttering, side lamps and destination boards may project 76mm on each side beyond the dimensions given above from a height of 2895mm to 3355mm above rail level, up to a maximum over all width of 3402mm.
- (ii) Coach number plates may project 25mm on each side beyond the dimension given above from a height of 2590mm to 2895mm above rail level, up to a maximum over all width of 3300mm.
- (iii) Reservation card holders may project 25mm on each side beyond the dimensions given above from a height of 1750mm to 1980mm above rail level up to a maximum over all width of 3300mm.
- (iv) The doors are to be either sliding or opening inwards. Hand bolts, door locks, handles and window bars shall not, however, project beyond the dimensions given against item above.



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27. Maximum width over open doors, including all projections for passenger vehicle. 4040mm
28. Maximum width over open doors, including all projections for goods vehicle. 4265mm

**Note:** Doors of horse boxes, brake vans luggage vans and rising and falling flap doors of goods wagons are exempted from this rule.

29. Maximum height above rail level for a width of 760mm on either side of the centre of unloaded vehicles. 4265mm
30. Maximum height above rail level at side of unloaded vehicles. 3735mm

**Note:**

- (i) Destination boards for passenger vehicles may project 76mm above the dimensions up to maximum height above rail level at sides of vehicles when empty.
- (ii) (Applicable for clauses 26,27 & 30).

In case of stocks exceeding the 1929 profile and within the maximum moving dimensions shown in diagram 1D, clearance of the following Railway is required to be obtained for the following locations before permitting the stock for the general adoption:

| Sr.No. | Railway      | Section                  | Location           |
|--------|--------------|--------------------------|--------------------|
| 1      | 2            | 3                        | 4                  |
| 1.     | E. Railway   | (i) Andal-Sainthia Chord | Br.No.66           |
|        |              | (ii) Sahibganj Loop      | ROB No.53          |
| 2.     | N.F. Railway | Old Malda-Singhabad      | Tangon Br.         |
| 3.     | S.E. Railway | Tata-Rourkela            | Up Saranda Tunnel  |
| 4.     | S.E.C.R.     | Bilaspur-Katni           | Dn Bhortonk Tunnel |

31. Minimum height above rail level when fully loaded for a width of 1220mm on either side of centre of track with the exception of wheels and attachments there to (vide note below) 102mm

**Note:** A tyre or an attachment of a wheel may project below the minimum height of 102mm from a distance of 51mm inside to 216mm outside of the gauge face of the wheel.

32. Minimum height above rail level, when fully loaded at 1567.5mm from centre of track. 305mm

**Loading Gauge for Goods.**

33. Maximum width 3250mm
34. Maximum height above rail level at centre 4265mm
35. Maximum height above rail level at sides 3735mm

**Note:** The loading gauge is for testing loaded and empty vehicles; the maximum moving dimensions are given in items 26,27,29 and 30 above.

CHAPTER IV(B)

Rolling Stock, 3660mm wide stock

**Note:**

These dimensions shall not be adopted in designs for rolling stock without the special sanction of the Railway Board in each case.

**Maximum Future Moving Dimensions :** (See diagram No.1A)

1. Maximum width over all projections:
  - (i) At 102mm above rail level, when fully loaded 2895mm
  - (ii) At 305mm above rail level, when fully loaded 3505mm
  - (iii) From 305mm above rail level to 1145mm above rail level when fully, loaded 3505mm
  - (iv) From 1145mm above rail level, when fully loaded to a height of 3355mm when empty. 3660mm
  - (v) At 4265mm above rail level, when empty 3505mm
2. Maximum width over open doors, including all projections, for passenger vehicles. 4495mm
3. Maximum width over open doors, including all projections, for goods vehicles. 4725mm

**Note:** Doors of horseboxes, brake vans, luggage vans and rising and failing flap doors of goods wagons are exempted from this rule.

4. Maximum height above rail level for a width of 915mm on either side of the centre of unloaded vehicles. 4725mm
5. Maximum height above rail level at sides of unloaded vehicles 4265mm
6. Minimum height above rail level, when fully loaded for a width of 1450mm on either side of centre of track, with the exception of wheels and attachments thereto (vide note below) 102mm

**Note:** A tyre or an attachment to a wheel may project below the minimum height of 102mm from a distance of 51mm inside to 216mm outside of the gauge face of the wheel.

7. Minimum height above rail level, when fully loaded at 1755mm from centre of track. 305mm

**Loading gauge for goods :**

8. (i) Maximum width at a height of 3380mm above rail level 3710mm
- (ii) Maximum width at a height of 4295mm above rail level 3555mm
9. Maximum height above rail level for a width of 915mm on either side of the centre of track. 4750mm
10. Maximum height above rail level at sides 4295mm

**Note:** The loading gauge is for testing loaded and empty vehicles, the maximum moving dimensions are given in items 1(iv), 4 and 5 above.

**CHAPTER IV (C) Rolling Stock (Locomotive)**

**Wheels and axles :**

|    |                                                                                                                |      |        |
|----|----------------------------------------------------------------------------------------------------------------|------|--------|
| 1. | Wheel gauge or distance apart for wheel flanges:                                                               |      |        |
|    | (a) Wheels with thick flanges/wear adopted wheel profile                                                       |      | 1596mm |
|    | (b) Wheels with standard flanges                                                                               |      | 1600mm |
|    | (c) Wheels with thin flanges                                                                                   |      | 1600mm |
|    | (d) Wheels without flanges                                                                                     |      | 1600mm |
|    | (See item 5 for identification of thick/wear adopted, standard & thin flanges)                                 |      |        |
| 2. | (i) Maximum diameter on the tread of new locomotive carrying wheels measured at 63.5mm from wheel gauge face   |      | 1092mm |
|    | (ii) Minimum diameter on the tread of new locomotive carrying wheels measured at 63.5mm from wheel gauge face. |      | 914mm  |
| 3. | Minimum projection for flange of new tyre measured from tread at 63.5mm from wheel gauge face.                 |      | 28.5mm |
| 4. | Maximum projection for flange of worn tyre measured from tread at 63.5mm from wheel gauge face.                |      | 35mm   |
| 5. | Maximum & Minimum thicknesses of tyre flanges measured at 13mm from outer edge of flange :                     | Max. | Min.   |
|    | (a) Thick flanges/wear adopted wheel profile                                                                   | 32mm | —      |
|    | (b) Standard flanges                                                                                           | 28mm | —      |
|    | (c) Thin flanges                                                                                               | 18mm | —      |

**Note:**

- (i) The above values of flange thicknesses are measured from the back face of the tyre.
  - (ii) Minimum size of flange of locomotive tyres shall be determined by condemning profile gauge which specifies the minimum thickness and the limits of angularity of the flange on the gauge face.
- |    |                                          |       |
|----|------------------------------------------|-------|
| 6. | Minimum width of tyres:                  |       |
|    | (a) Locomotive coupled wheels            | 133mm |
|    | (b) Locomotive wheels other than coupled | 127mm |
7. Incline of tread. 1 in 20 for all profiles except wear adopted profile for which the tread inclination of 1 in 20 will merge with radii of the wear adopted profile.

**Buffers & Couplings :**

|     |                                                                              |        |
|-----|------------------------------------------------------------------------------|--------|
| 8.  | Distance apart for centres of buffers                                        | 1955mm |
| 9.  | Maximum height above rail level for centres of buffers for empty locomotive. | 1105mm |
| 10. | Minimum height above rail level for centres of buffers when fully loaded.    | 1030mm |

**Maximum Moving Dimensions :**

(See diagrams 1D- the new diagrams introduced by RDSO)

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- |                                                                                                                                                                                                                      |  |                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------|
| 11. Maximum width over all Projection :                                                                                                                                                                              |  |                                |
| (i) At 102mm (Min) above rail level, when fully loaded                                                                                                                                                               |  | 2440mm                         |
| (ii) From 305mm (Min.) above rail level to 1082mm above rail level, when fully loaded.                                                                                                                               |  | 3135mm                         |
| (iii) From 1082mm above rail level to 1170mm above rail level, when fully loaded.                                                                                                                                    |  | 3135mm                         |
|                                                                                                                                                                                                                      |  | Increasing gradually to 3250mm |
| (iv) From 1170mm above rail level, when fully loaded to a height of 3735mm when empty.                                                                                                                               |  | 3250mm                         |
| 12. Maximum height above rail level for a width of 760mm on either side of centre of empty locomotives.                                                                                                              |  | 4265mm                         |
| 13. Maximum height above rail level at sides of empty locomotives.                                                                                                                                                   |  | 3735mm                         |
| <b>Maximum Moving Dimensions for X-Class locomotives :</b>                                                                                                                                                           |  |                                |
| 14. Maximum width over all projections:                                                                                                                                                                              |  |                                |
| (i) At 102mm above rail level, when fully loaded                                                                                                                                                                     |  | 2440mm                         |
| (ii) From 305mm above rail level to 1110mm above rail level, when fully loaded.                                                                                                                                      |  | 3135mm                         |
| (iii) From 1110mm above rail level to a height of 1145mm above rail level when fully loaded.                                                                                                                         |  | 3135mm                         |
|                                                                                                                                                                                                                      |  | Increasing gradually to 3200mm |
| (iv) From 1145mm above rail level when fully loaded to a height of 3735mm above rail level, when empty.                                                                                                              |  | 3200mm                         |
| 15. Maximum height above rail level for a width of 305mm on either side of centre of empty locomotives.                                                                                                              |  | 4470mm                         |
| 16. Maximum height above rail level at sides of empty locomotives                                                                                                                                                    |  | 3735mm                         |
| 17. Minimum height above rail level when fully loaded for a width of 1220mm on either side of centre of track with the exception of wheels and attachments thereto (vide note below)                                 |  | 102mm                          |
| <b>Note:</b> A tyre or an attachment to a wheel or sand ;pipes in line with the wheel may project below the minimum weight of 102mm from a distance of 51mm insides to 216mm outside of the gauge face of the wheel. |  |                                |
| 18. Minimum height above rail level when fully loaded at 1525mm from centre of track.                                                                                                                                |  | 305mm                          |

## CHAPTER V – ELECTRIC TRACTION (Direct Current)

**Note:** Wherever electric traction, employing overhead conductor wires, is in use strict orders must be issued prohibiting any one from getting on the roofs of vehicles until the current in the overhead conductors has been switched off and the conductors themselves have been earthed.

1. Minimum height from rail level to the underside of live conductor wire :

|                                     |        |
|-------------------------------------|--------|
| (i) Under bridges and tunnels       | 5030mm |
| (ii) In the open                    | 5335mm |
| (iii) In running and carriage sheds | 5790mm |
| (iv) At level crossing              | 5485mm |

**Note:** The height prescribed in item 1(iv) applies also to tramway trolley wires crossing the railway.

2. Maximum height from rail level to the underside of live contact wire except in running and carriage sheds. 5790mm

**Note :** In the case of running and carriage sheds, the maximum height of the contact wire will be determined in each case based on the operating range of the pantograph and the permissible electrical clearances required inside the sheds.

3. Maximum variation of live conductor wire on either side of the central line of track:

|                                             |       |
|---------------------------------------------|-------|
| (i) On straight track                       | 230mm |
| (ii) On curves (on the inside of the curve) | 380mm |

4. Minimum distance between live conductor wire and any structure 130mm

5. Maximum width of pantograph collector 2030mm

**CHAPTER V-A Electric Traction**

**25 KV A.C. 50 Cycles**

**Note:**

Wherever electric traction is in use, special precaution shall be taken in accordance with provisions made in Chapter XIX, General Rules for all Open lines of Railways.

**Electrical clearances :**

1. Minimum vertical distance between any live bare conductor (overhead equipment or pantograph) and any earthed structure or other bodies (rolling stock, over bridges, signal gantries etc.).

- |                                        |       |
|----------------------------------------|-------|
| (i) When the conductor is at rest      | 320mm |
| (ii) When the conductor is not at rest | 270mm |

**Note:**

(i) A minimum vertical distance of 340mm shall normally be provided between rolling stock other than steam locomotives and contact wire to allow for a 20mm temporary raising of the tracks during maintenance. Wherever the allowance required for track maintenance exceed 20mm the vertical distance between rolling stock and contact wire shall correspondingly be increased. For steam locomotives, the figure of 340mm shall be increased to 380mm.

(ii) Where adoption of above clearance is either not feasible or involves abnormally high cost, reduced clearances as follows may be adopted with prior approval of the Chief Electrical Engineer of the Railway concerned and provision of permanent bench mark to indicate the level of the track to be maintained.

- |                                   |       |
|-----------------------------------|-------|
| When the conductor is at rest     | 250mm |
| When the conductor is not at rest | 200mm |

If however, the over line structures are required to be rebuilt, normal clearances should be adopted.

2. Minimum lateral distance between any live bare conductor (overhead equipment or pantograph) and any earthed structure or other bodies (rolling stocks, over bridges, signal gantries etc.)

- |                                        |       |
|----------------------------------------|-------|
| (i) When the conductor is at rest      | 320mm |
| (ii) When the conductor is not at rest | 220mm |

**Note:**

When adoption of the above clearances is either not feasible or involves abnormally high cost, reduced clearances as follows may be adopted with prior approval of the Chief Electrical Engineer of the Railway concerned.

- |                                        |       |
|----------------------------------------|-------|
| (i) When the conductor is at rest      | 250mm |
| (ii) When the conductor is not at rest | 200mm |

3. Height of contact wire :

Minimum height from rail level to the underside of live conductor:

- |                                  |       |
|----------------------------------|-------|
| (i) Under bridges and in tunnels | 4.80m |
|----------------------------------|-------|

## MISCELLANEOUS

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**Note:** Para 4(a) Appendix A to Chapter V-A explains the basis of this dimension.

|                                    |       |
|------------------------------------|-------|
| (ii) In the open                   | 5.50m |
| (iii) At level crossings           | 5.50m |
| (iv) In running and carriage sheds | 5.80m |

**Note:**

- (a)(i) In cases where it is proposed to allow only locomotives or stocks not higher than 4.27m, the minimum height of contact wire specified under item 3(i) may be reduced to 4.65m. A board showing this restriction and specifying locomotives or stocks not permitted to ply normally on such sections should be exhibited at the entrance to the same.
- (ii) In case reduced clearances as indicated in Note (ii) under item 1 are adopted, the minimum height of contact wire as provided in Note (a)(i) above up to 4.65m may be further reduced to 4.58m. The board as adopted in note (a)(i) should also indicate clearly the special reduced clearances having been adopted at the location.
- (b) For movement of over dimensional consignments the height specified under 3(i) above, shall be increased by the difference between the height of the consignment contemplated and 4.41m. In case such an over dimensional consignment is moved at speeds not exceeding 15 KM/h and is also specially escorted by authorized railway staff, the desired height of contact wire may be reduced by 50 mm.
- (c) On curves, all vertical distance specified in item 3 above, shall be measured above the level of the inner rail, increased by half the super elevation.
4. Maximum variation of the live conductor wire on either side of the centre line of track under static conditions.
- |                       |        |
|-----------------------|--------|
| (i) On straight track | 200 mm |
| (ii) On curves        | 300 mm |

**Note:**

These limits would not apply to special locations like insulated overlaps and out of run wires.

5. Maximum width of pantograph collector 1800 mm

**Note:**

A tolerance of plus 10 mm on maximum width specified is permissible to accommodate variation in manufacture and mounting with respect to the centre line of vehicle.

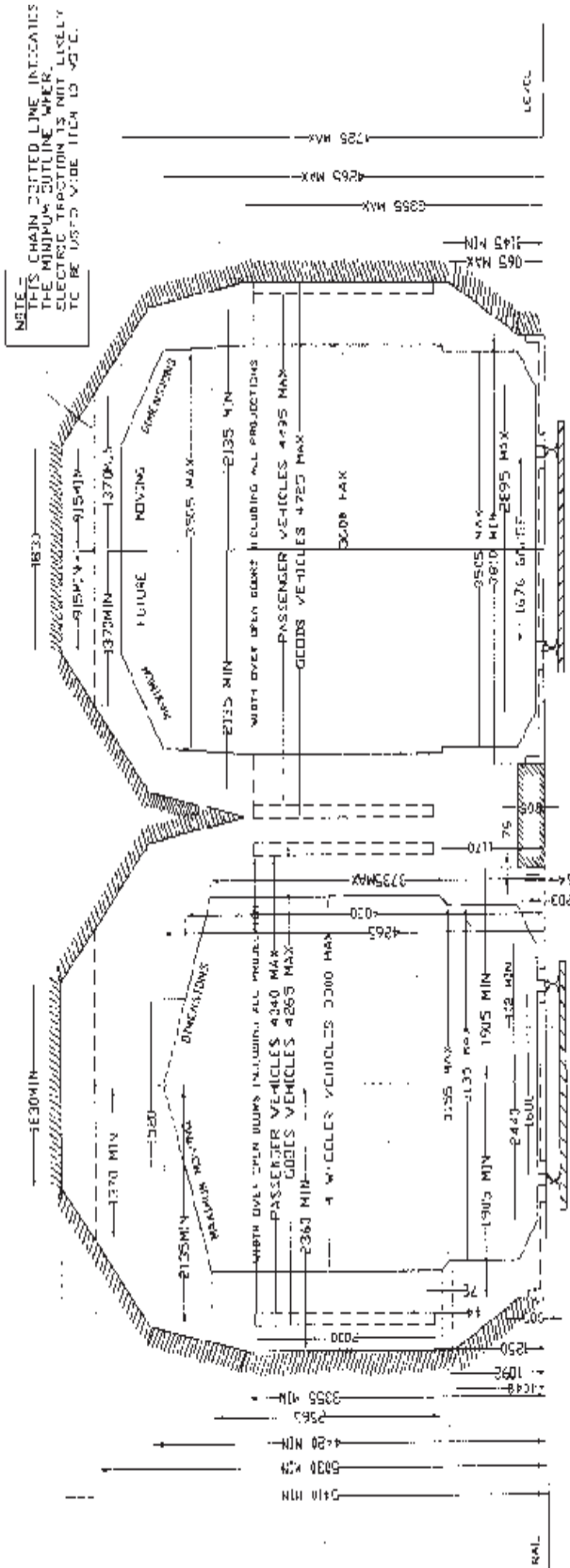


STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES

SCHEDULE I-CHAPTER I

DIAGRAM NO. 1A  
1:676 mm GAUGE  
(S.C.G.)

NOTE -  
1. WHERE THE GUE IS ENCLAVE THE HORIZONTAL DISTANCE BETWEEN ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE ABOVE TABLE.  
2. WHEN BE SPACING BETWEEN TRACKS IS MORE THAN 4.495 METRE FOR THE PURPOSE OF TRACKS MAY BE REDUCED FROM 4.725 TO NOT LESS THAN 4.495 FOR THE PURPOSE OF PROVIDING HEAVY ATTACHMENTS TO TUNNELS OR THROUGH GIRDER BRIDGES THE 4.725 DIMENSION IS TO BE ADAPTED FOR ALL NEW WORKS.



NOTE -  
ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT WHERE OTHERWISE SHOWN

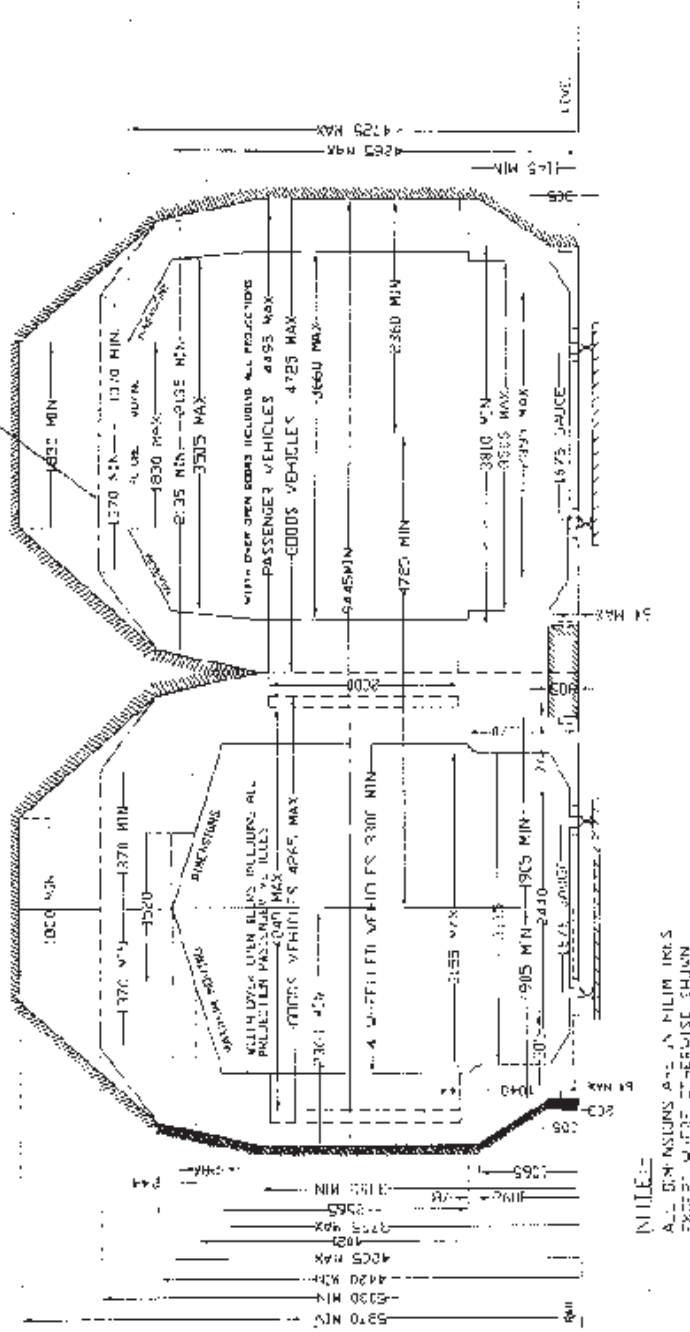
# STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES TO SUIT 25 k.V. A.C. TRACTION SCHEDULE I CHAPTER I

DIAGRAM No. 1A (MODIFIED)  
1575 mm GAUGE (B.G.)

**NOTE:-**

THE DISTANCE SPECIFIED APPLY ONLY IN CASE OF STRAIGHT TRACKS ON CURVES.  
THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW  
FOR THE LEAN DUE TO SUPER ELEVATION ON CURVES, CALCULATED BY THE FOLLOWING  
FORMULA WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE AND 'S' THE SLIPPER  
ELEVATION AND 'R' THE RADIUS OF THE TRACK, ALL DIMENSIONS BEING IN METRES  
D = H<sup>2</sup> / 2R

NOTE:- THIS CHAIN DIMENSION  
INDICATES THE MINIMUM CLEARANCE  
AT THE ELECTRIC TRACTION IS NOT  
APPLIED AT THE USUAL VEHICLE  
NOTE: (B) OF CHAPTER I SCHEDULE



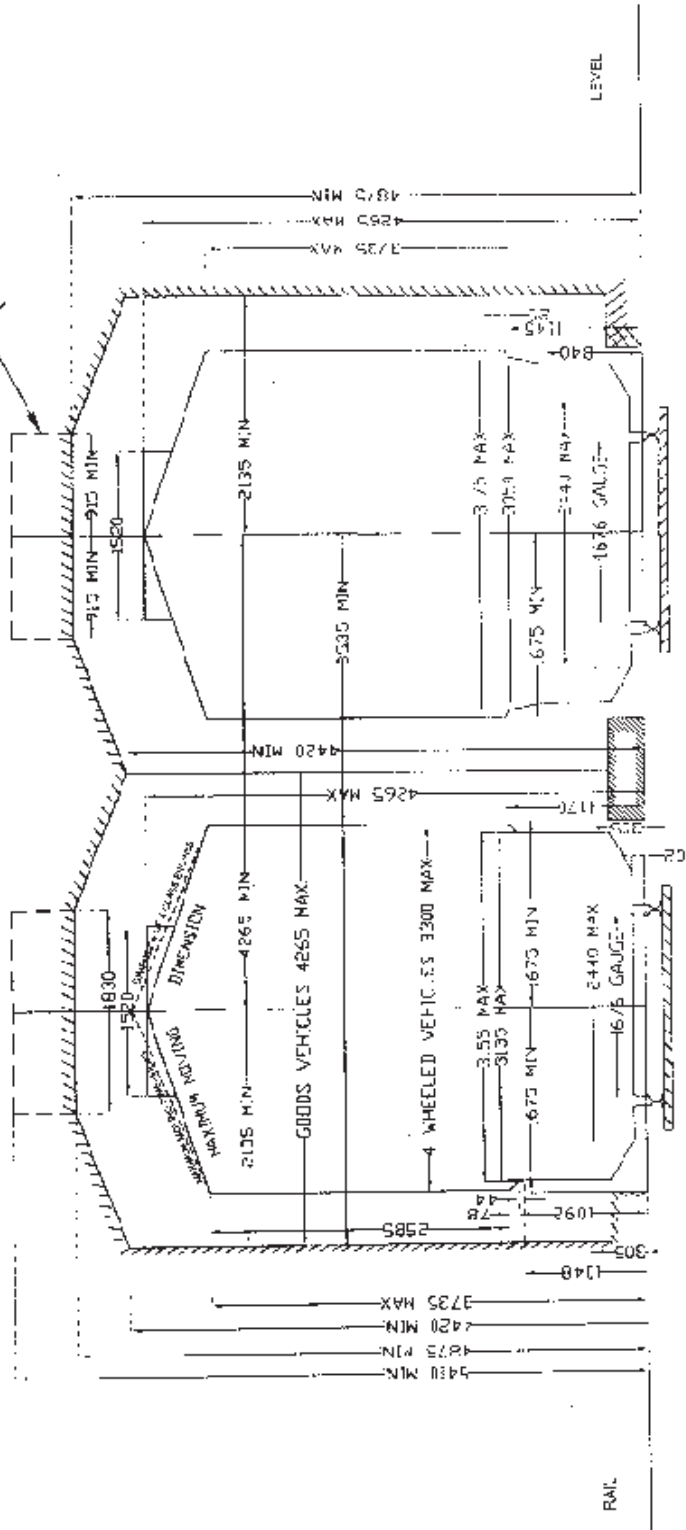
STANDARD DIMENSIONS OUT OF STATIONS  
SCHEDULE I-CHAPTER I

DIAGRAM No. 1B  
1676 mm GAUGE (B.G.)

NOTE:-

WHERE THE LINE IS ON A CURVE, THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.

NOTE:-MINIMUM HEIGHT WHERE ELECTRIC TRACTION IS IN USE UP LIKELY TO BE INTRODUCED (ITEM 10 C 13)



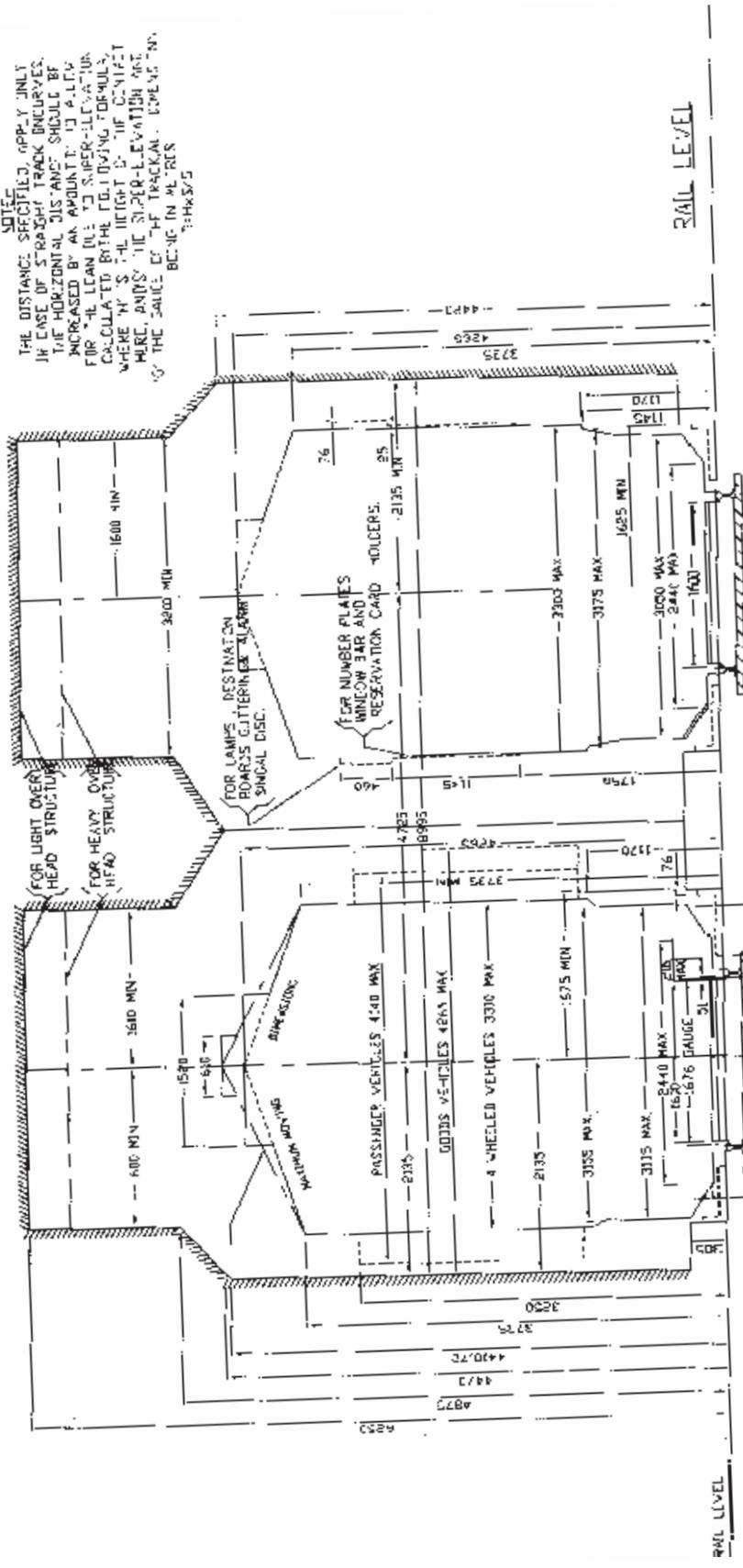
NOTE:-

ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN

STANDARD DIMENSIONS OF STATIONS  
 TO SUIT 25 KV A.C. TRACTION SCHEMULE-I-CHAPTER-I

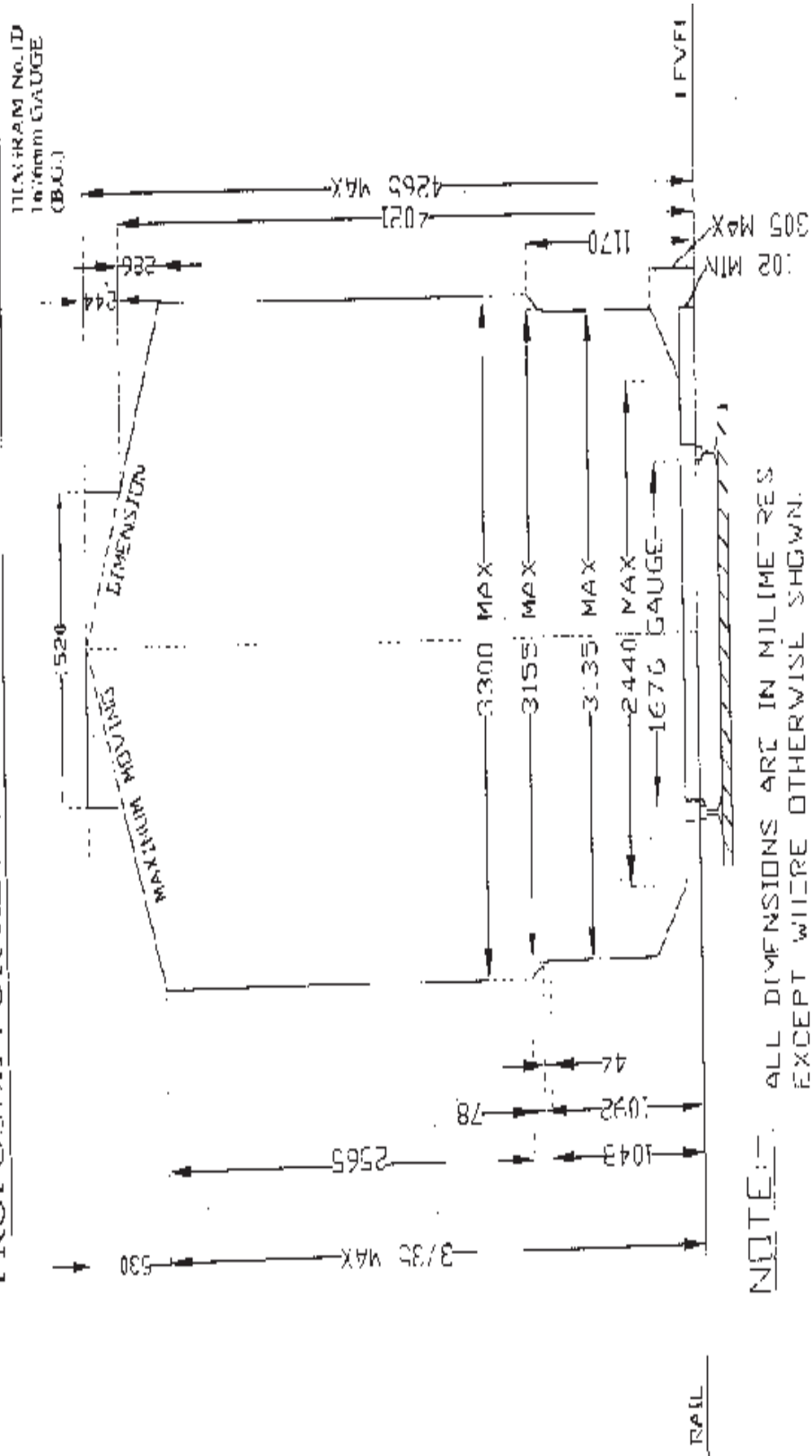
DIAGRAM NO. 1C  
 1576 OF GAUGE

NOTE:-  
 THE DISTANCE SPECIFIED, APP. V. ONLY  
 IN CASE OF STRAIGHT TRACK INCLUDES  
 THE HORIZONTAL DIS AND SHOULD BE  
 INCREASED BY AN AMOUNT TO ALLOW  
 FOR THE LEAN OF TO SUPER-ELEVATION  
 CALCULATED BY THE FOLLOWING FORMULA,  
 WHERE 'N' IS THE HEIGHT OF THE CENTER  
 HERE, AND 'S' IS THE SUPER-ELEVATION AT  
 THE SAUCE OF THE TRACKAL. USE 15% 'N'  
 BEING IN METRES  
 $\frac{1}{3} H \times \frac{S}{75}$



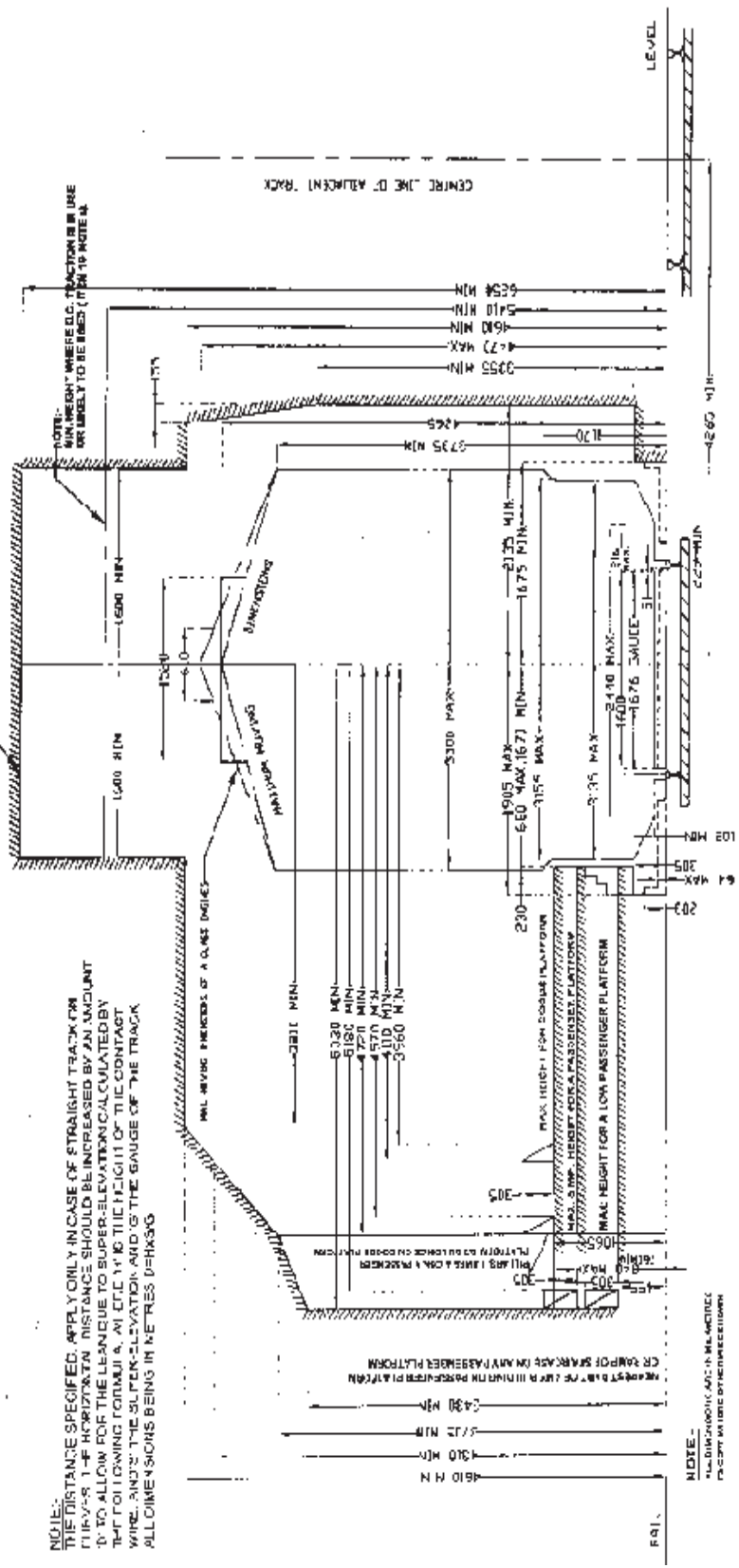
NOTE:-  
 ALL DIMENSIONS ARE IN MILLIMETRES  
 EXCEPT WHERE OTHERWISE SHOWN.

**MAXIMUM MOVING DIMENSIONS OF THE PROFILE  
PROPOSED FOR REVISED SCHEDULE OF DIMENSIONS.**



**STANDARD DIMENSIONS IN STATIONS  
TO SUIT 25 KV.A.C. TRACTION SCHEDULE-I-CHAPTER-I**

DIAGRAM NO. 2  
1878 TRUSS GAUGE  
1971



NOTE:-  
THE DISTANCE SPECIFIED, APPLY ONLY IN CASE OF STRAIGHT TRACK FROM  
TURN-OUT TO THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT  
TO ALLOW FOR THE CLEARANCE TO SUPER-ELEVATION CALCULATED BY  
THE FOLLOWING FORMULA:  $4.71 \times R \times \frac{H}{100}$  (H IS THE HEIGHT OF THE CONTACT  
WIRE, AND R IS THE SUPER-ELEVATION, AND G IS THE GAUGE OF THE TRACK  
ALL DIMENSIONS BEING IN METRES DEKES)

NOTE:-  
ALL DIMENSIONS ARE IN METRES  
EXCEPT WHERE OTHERWISE SPECIFIED