Traction Rolling Stock : OPERATION.

भारत सरकार / GOVT. OF INDIA
रेल मंत्रालय / MINISTRY OF RAILWAYS

TRACTION ROLLING STOCK
OPERATION

भारतीय रेल
विद्युत इंजीनियरिंग संस्थान
INDIAN RAILWAYS
INSTITUTE OF ELECTRICAL ENGINEERING
नासिक रोड NASIK ROAD - 422 101
TRACTION ROLLING STOCK

OPERATION

INDIAN RAILWAYS
INSTITUTE OF ELECTRICAL ENGINEERING,
NASIK ROAD - 422 101
PREFACE

The book of “Traction Rolling Stock: Operation” was brought out by Institute of Railway Electrical Engineers (IREE) long back. Since, lot of changes and developments have taken place in the field of Operations of Traction Rolling Stock, it has become necessary to incorporate the changes in this volume. Few additions and modifications in the field of “Traction Rolling Stock: Operation” has been included in this book.

For bringing out this book Shri N. D. Turkar, Lecturer and Shri M. A. Suryawanshi, Raj Bhasha Supdtt. have made substantial efforts, under the guidance of Shri A. A. Phadke, Senior Professor (Administration).

I am very glad to note that lot of efforts have been made in bringing out this book of “Traction Rolling Stock: Operation” in the present form. I am sure that this book will serve the needs of Electrical Engineers working in the field of Electrical Traction.

Nasik Road                A. K. RAWAL
18th Augutst 2010            DIRECTOR
### Traction Rolling Stock Operation

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</tbody>
</table>
1. CREW MANAGEMENT AND TRAINING

1.0 VARIOUS TYPES OF TRAINING GIVEN TO RUNNING STAFF

Running staff after the recruitment as Asstt. Drivers, have to undergo various types of training. These training are having oral and written examinations. The brief detail of the training is given in this chapter.

Training of Running staff (for A/Dr. and Goods Dr.) As per RB Letter No. E(MPP) 2009/3/36 dt. 16.10.2009 for Goods Dr. and E(MPP)2009/3/14 dt. 26.10.2009 for A/DR training duration is revised as under:

<table>
<thead>
<tr>
<th>TYPE OF TRAINING</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A/DR. (Elec.) with Traffic</td>
<td>103 days (79 days at ZRTI + 4 days at Control room + 20 days line training)</td>
</tr>
<tr>
<td>2. A/Dr. (Dsl.) with Traffic</td>
<td>103 days (79 days at ZRTI + 4 days at Control room + 20 days line training)</td>
</tr>
<tr>
<td>3. A/DR (Ele.+Dsl.)</td>
<td>151 Days</td>
</tr>
<tr>
<td>4. A/Dr. Conversion (Elec. or Dsl.)</td>
<td>48 Days.</td>
</tr>
<tr>
<td>5. Refresher Course for A/Dr.(Elec./Dsl.)</td>
<td>21 Days (18 days including 3 days simulator + 3 days safety camp).</td>
</tr>
<tr>
<td>6. Goods Driver single Traction (E or D)</td>
<td>60 Days at ZRTI including 6 days Simulator + 18 days Handling in respective division.</td>
</tr>
<tr>
<td>7. Dr. Conversion (E to D, D to E)</td>
<td>35 days including 6 days simulator + 18 days handling in respective division.</td>
</tr>
<tr>
<td>8. Refresher course for A/Dr (Elec/Dsl)</td>
<td>21 Days (18 days including 3 days simulator + 3 days safety camp)</td>
</tr>
<tr>
<td>9. Refresher Course for Dr.(Elec+Dsl)</td>
<td>31 Days (28 days including 6 days simulator + 3 days safety camp)</td>
</tr>
<tr>
<td>10. Loco Pilot (G) to LP (P)</td>
<td>48 working days.</td>
</tr>
</tbody>
</table>

Note: In conversion course only Loco is covered No Traffic.

1.0.1 Training course for Assistant Drivers: This training is conducted by Zonal Railways Training Institute (ZRTI) of the Railways. The candidate must pass the examination which is conducted at the end of this training. Unsuccessful candidate is required to repeat the course and reappear for examination. The candidates can be booked as assistant drivers, only after passing the training course in respective traction.
1.0.2 Training course for shunters: This course is conducted by DTC/BTC of the Division. However, many Railways have stopped the conduction of this course. Earlier passing of this course was essential for promotion as shunter from assistant drivers. Nowadays some Railways are promoting the senior most assistant drivers as shunters where the course for shunters are not being conducted. Since shunter handles the loco independently, minimum 2 weeks course including handling is recommended.

1.0.3 Training course for drivers: This is a very important training course for the running staff. This is conducted by ZRTI of Zonal Railways. This training course is given to shunters and senior assistant drivers. After successful completion of this training course, the shunters and assistant drivers become eligible for promotion as driver as per the selection procedure.

The driver who has passed diesel training course will work on diesel traction only. Similarly, if driver has passed the training course in both the traction (i.e., diesel and electric), then he can work the train on both the traction.

1.0.4 Refresher training course: This training is given to drivers and A/Dr. once in three years. In this training course, traffic rules and technical input of respective traction is given to refresh the knowledge of driver. Efforts should be made by division that no driver remains overdue for refresher course. For this purpose a register can also be maintained by depot incharge to keep a watch on the due date of refresher course for each driver.

In addition to above, following short term courses are conducted by Basic Training Centres (BTC) of the division.

(i) Crash training in Air brake stock operation:

Though training in air brake stock operation is given in regular training course, meant for drivers, however, a two day course is conducted by BTC to stress on the important aspects of Air brake stock operation. During this training course, first day is devoted to class room training for providing theoretical input whereas the 2\textsuperscript{nd} day is devoted to practical demonstration in yard and model room.

(ii) Training in Automatic Block signaling (ABS):-

Two days training is given to all running staff who are required to work in ABS territory. Details of training method is explained in chapter 1.4.1.

(iii) Special training to ‘C’ category and weak drivers:

There are some drivers in division who are lacking in one or other field of train operation and driving techniques. Such drivers are identified and their weak area like traffic rule knowledge, trouble shooting technique etc. are identified with the help of their loco inspector and suitable training of one or two weeks are planned to upgrade their knowledge and driving skill. This training is conducted by loco
inspector of Basic Training Center of the division. At the end of this training the driver is interviewed by AEE (OP) or Sr. DEE(OP).

iv) Training on simulator

1.0.5 Road Learning Training:

Road learning training is given to running staff to make themselves conversant with signal locations and other operating conditions. Methods and rules for providing road learning training is explained as under.

Road learning training is very important for the running staff. This training is essential before a driver or assistant driver is booked to work the train independently in section. During the road learning period, driver/assistant drivers travel in the section on engine and make themselves aware with the following aspects of train working.

1. Locations of signal at each station of the section.
2. Idea of visibility of signals of each station.
3. Intermediate block signaling in section.
5. Location of spring points in section.
6. Approximate idea of gradient of the section and ruling gradient.
7. Siding at various places in section where goods train are placed or removed.
8. Locations of Permanent speed restriction in section.
9. Maximum load allowed in section with single and multiple locomotives.
10. Banking section where backer is provided to avoid stalling of the train.
11. Maximum permissible and booked speed of the train in section.
12. Idea of capacity of loop lines at various stations.
14. Restriction of not stopping the good trains at certain stations or signals.

**PRESCRIBED ROAD LEARNING PERIOD:**

1. Every new driver should be given three trips for familiarizing himself with the section(s) on which he is rostered for duty.

2. If the driver has not operated on a section for over three months, he should be given road learning trips as per schedule given below :-

<table>
<thead>
<tr>
<th>Duration of absence</th>
<th>Nos. of trips for road learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) 3 to 6 months</td>
<td>One trip</td>
</tr>
<tr>
<td>(B) 6 months to two years</td>
<td>Two trips</td>
</tr>
<tr>
<td>(C) Over of absence</td>
<td>Three trips (as given to new entrants)</td>
</tr>
</tbody>
</table>

Note: As per RSRC recommendation one trip to be given in night i.e. between 20.00 hrs. to 06.00 hrs.

1.0.7 The scale of trips provided at (A) above would apply to all systems of working, including sections having one train only system of working.

A register should be maintained at crew booking point indicating the road learning validity of driver/assistant drivers.

Before a driver is allowed to work the train, a declaration should be obtained that he has taken the road learning of the section and he is fully familiar to work the train in section.

Before a driver takes over the driving work, he should certify that his previous trips on the sections was performed within last three months. More over the depot should keep watch on the trips performed by a particular crew so that if any crew has not operated in a particular section for about two or two and half months, such crew is identified immediately and booked to such section. This will avoid expiry of road learning of the crew.

After completion of road learning, driver/assistant driver should submit the diary indicating the road learning taken by them. During the road learning training, they should obtain the signature of the driver of the train by which they traveled during their road learning training.

In addition to above, the depot incharge should also interview the crew of his depot to judge the performance of road learning. If the performance is unsatisfactory, the road learning period can be extended suitably.

1.1.1 System of monitoring and counseling of running staff:-

The working of running staff is continuously monitored to ensure safe train operation. Procedure of monitoring the drivers, assistant drivers and shunters etc, on a division has been explained in this chapter.

The running staff i.e., drivers, assistant drivers belong to a category of staff who are not available at a time on a given work place. In other types of working, like workshops and sheds, the work place of the staff is definite and therefore, any instruction can be given to the staff in a planned manner. On the contrary, the
running staff, moves from one place to other and working is round the clock with no fixed period of duty and rest. Therefore, giving instructions, counseling and taking the feedback for their working becomes very difficult and cumbersome. Running staff either remains on line or takes rest in running room at their HQrs station. Therefore, they can be counseled / monitored only when they come for duty at the time of sign on and also during their journey by way of foot plate inspection.

The system of counseling by Loco Inspector:

1.1.2 Monitoring and counseling by Loco Inspector:

Division has certain number of loco inspectors. Each loco inspector is generally allotted 25 drivers. These nominated drivers are monitored and counseled by loco inspector during their foot plate inspection, their visit of lobbies or running rooms. The periodicity of monitoring the driver as per their safety category is given as under:-

Driver having A safety category: Drivers classified as ‘A’ are monitored once in 2 months by their nominated loco inspector.

Driver having B safety category: Drivers with ‘B’ safety category are monitored once in one month by their nominated loco inspector.

Driver having C safety category: Drivers classified as ‘C’ are monitored once in a fortnight by their nominated loco inspector.

Monitoring should include both up and down directions, all sections and in nights also, for all types of stock.

NOTE:

The system of classification of safety categories of drivers is explained in Chapter 1.1.8.

After monitoring and counseling the driver as per the programme given above, loco inspector submits reports to Sr. DEE (OP) once in a fortnight. This report includes the performance of their nominated driver in respect of technical knowledge, driving techniques, safety awareness and traffic rules. The driver found lacking in knowledge during such inspection are given special training in his / her area(s) of weaknesses so that their performance can be made upto the mark. Such training is imparted in Basic Training Center (BTC) of division which is generally headed by a Sr. Loco Inspector (Training). All new Goods Drivers should be treated as ‘C’ category, for first 3 months.

On receipt of the report from loco inspector, the frequency of monitoring done by these inspectors are compiled and it is found out whether any driver is overdue for monitoring by loco inspector or not. If any driver is found overdue for monitoring, the nominated inspector is questioned. The review of Drivers category by Sr.DEE (Op) should be done once in a year.
1.1.3 **Regular issue of safety circular and general instructions:**

The safety branch regularly issues the safety circulars indicating the salient features of train operation. This safety circular also highlight the recent unusual/accidents which has taken place due to human failures. Running staff is supposed to go through the safety circulars and note the contents of the safety circulars for strict compliance.

Similarly, executive branch i.e. mechanical or TRO branch issues the instructions which are mainly technical in nature to running staff. This is done to upgrade the knowledge of running staff also make them aware of the recent developments taking place in technical upgradation of locomotive and rolling stock. These safety circulars and general instructions are displayed at crew booking point where the drivers sign on and sign off. At the time of signing on, the running staff goes through these important instructions and make themselves aware.

1.1.4 **Issue of Monthly Bulletin:**

Certain divisions are issuing monthly bulletins to the drivers. These monthly bulletins highlight the important points of train operation to be followed by running staff. At the same time, case studies of recent failures are also written in simple language with the advice to running staff to follow the correct procedure to avoid reoccurrence of such mistakes. These monthly bulletins are circulated to all running staff and even individual copies are also given to all.

1.1.5 **Safety Camps:**

Safety camps are held at various places in division at the interval of a week time. These safety camps are organized by safety branch and experienced safety cancellers are associated with this. In these safety camps, the running staff assemble at a given station and they are counseled on important aspects of train working. These ideas of train working are explained in simple and interesting manner by having man to man contact. Any doubt during such safety camps is clarified and even practical demonstrations are arranged.

1.1.6 **Safety Meetings:**

This is held by depot incharge at least twice a month. In these safety meetings, safety circulairs, general instructions, issued during the month are read and the same is explained to each and every staff of the depot.

1.1.7 **Visit of running staff to Trip Shed / Elect. Loco Shed:**

Loco inspectors are supposed to take their nominated drivers for training in loco shed or trip shed for practical demonstration of trouble shooting. Practical demonstration of trouble shooting at least once a month is necessary to keep them versed with the equipment location and trouble shooting techniques.
Watch on the performance of C category Driver :

A special watch is required to be kept on the driver classified as ‘C’ category driver. As this category of drivers are weak, the watch on their working and training will help in improving overall performance of running staff.

Watch on the accident prone and alcoholic drivers :

List of drivers are maintained which is known (1) list of alcoholic drivers and (2) list of accident prone drivers. The drivers are included in this list based on the monitoring reports received from loco inspectors. Accident prone drivers will require frequent monitoring and counseling regarding safety rules and correct method of working in some risky situations. Similarly more ambush checks are required to be done on alcoholic drivers to find out whether the condition of driver is sober.

1.1.8 Method of classification of safety category of running staff :

There are certain guidelines which are followed for deciding the safety category of the driver. These guidelines are explained in this chapter.

Total Marks for deciding A, B and C category to Drivers is given as under:

<table>
<thead>
<tr>
<th>Category</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘A’ category</td>
<td>80 and above</td>
</tr>
<tr>
<td>‘B’ category</td>
<td>60 to 79</td>
</tr>
<tr>
<td>‘C’ category</td>
<td>below 60</td>
</tr>
</tbody>
</table>
### Performance Assessment Parameters for grading of Drivers into 'A', 'B' & 'C' category:

**Name of Loco Pilot:**

<table>
<thead>
<tr>
<th>Existing Category</th>
<th>Gradation No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5</td>
</tr>
</tbody>
</table>

**Date of Gradation**

<table>
<thead>
<tr>
<th>Name of the Inspector</th>
<th>2 Performance Parameters</th>
<th>3 Marks obtained in exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Driving Technique</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Performance before starting</td>
<td>6</td>
</tr>
<tr>
<td>b</td>
<td>Performance after starting</td>
<td>4</td>
</tr>
<tr>
<td>c</td>
<td>Engineermanship</td>
<td>11</td>
</tr>
<tr>
<td>d</td>
<td>Whistles under different conditions</td>
<td>4</td>
</tr>
<tr>
<td><strong>Marks on Driving Techniques.</strong></td>
<td></td>
<td><strong>25</strong></td>
</tr>
<tr>
<td>2</td>
<td>Knowledge of safety &amp; Operating Rules</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Road learning Knowledge &amp; location of following</td>
<td>5</td>
</tr>
<tr>
<td>b</td>
<td>Location of signals &amp; their signaling points</td>
<td>4</td>
</tr>
<tr>
<td>c</td>
<td>Knowledge of safety Rules &amp; Regulations</td>
<td>8</td>
</tr>
<tr>
<td>d</td>
<td>Knowledge of Rules Books &amp; latest correction slips</td>
<td>7</td>
</tr>
<tr>
<td>e</td>
<td>Knowledge of working under abnormal conditions</td>
<td>6</td>
</tr>
<tr>
<td><strong>Marks on Safety &amp; Operating Performance</strong></td>
<td></td>
<td><strong>30</strong></td>
</tr>
<tr>
<td>3</td>
<td>Technical Knowledge &amp; Trouble shooting</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Technical Knowledge</td>
<td>5</td>
</tr>
<tr>
<td>b</td>
<td>Knowledge with regard to C &amp; W fitments</td>
<td>6</td>
</tr>
<tr>
<td>c</td>
<td>Trouble Shooting capabilities</td>
<td>4</td>
</tr>
<tr>
<td><strong>Marks on Technical Knowledge &amp; Trouble shooting</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td>4</td>
<td>Personal Habits</td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Discipline</td>
<td>2</td>
</tr>
<tr>
<td>b</td>
<td>General attributes</td>
<td>5</td>
</tr>
<tr>
<td>c</td>
<td>Record keeping &amp; paper work</td>
<td>2</td>
</tr>
<tr>
<td>d</td>
<td>Hygiene</td>
<td>1</td>
</tr>
<tr>
<td><strong>Marks on Personal habits</strong></td>
<td></td>
<td><strong>10</strong></td>
</tr>
<tr>
<td>5</td>
<td>Accident record</td>
<td>20</td>
</tr>
<tr>
<td>6</td>
<td>Negative marks for Alcoholism</td>
<td>(-)</td>
</tr>
<tr>
<td>7</td>
<td>Grand Total</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>Signature of the Loco pilot</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Signature of the Loco Inspector</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Final Category</td>
<td></td>
</tr>
</tbody>
</table>
Gradation No. | 1 | 2 | 3 | 4 | 5
---|---|---|---|---|---
**Date of Grading**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Performance Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Max</strong> Marks obtained in e: Max Marks 1 2 3 4 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Marks</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Driving Technique</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>a Performance before starting</strong></td>
<td>1. Personally checks loco before starting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Personally checks his train at roadside station</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check brake power certificate after guard signs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Personally checks caution order before signing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Personally checks authority to proceed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Exchanges signals with guard</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>b Performance after starting</strong></td>
<td>1. Does not start with a jerk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Conducts brake feel test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Accelerates smoothly for attaining booked speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Whisles / Exchange signals with guard after leaving station</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>c Engineeringmanship</strong></td>
<td>1. Driving &amp; Coasting Techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Use of Dynamic / rheostatic brake</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Starting / stopping of train on up-gradient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Keeps control over train on down gradient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Stopping a train in down gradient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Working of double headed &amp; multiple locos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7. Observing all speed restrictions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8. No over shooting of platform during stopping</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9. Calling out signal-aspects, line nominations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. Exchanges all right signal on run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11. Enters loop lines at nominated speeds</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>d Whisles under different conditions</strong></td>
<td>1. Whisles before starting, after leaving</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the station and while running through a stations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. At all &quot;W/L&quot; boards, at cattle roaming on track</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Tress-passers crossing the track</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. While approaching a bridge, tunnel, cutting and blind cure</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Marks on driving Technique**

25
3 Technical Knowledge & Trouble Shooting

a Technical Knowledge
1. Examination of locomotive
2. Normal rating of current & voltage, limits of major equipments w.r.t. current & voltage.
3. Use of safety appliance & relays
4. Knowledge about circuit, traction motors, pneumatic circuits, axle boxes, underframe etc.
5. Recent modifications on locos.

Total 5

B Knowledge with regard to C&W fitment
1. Required amount of vacuum / air pressure, procedure for brake continuity test, BPC & continuity certificate
2. Conducting of leakage test and location of leakage in vacuum / air pressure.
3. Brake binding in vacuum/air braked train.
4. Knowledge of brake gear & other underframe gear fitment
5. Hanging parts, flat tyre, Hot axle, detachments
6. By passing of coach

Total 6

C Trouble Shooting capabilities
1. Noticing correct abnormal sign & logical stage-wise trouble shooting.
2. Action to be taken in case of fire in loco
3. Isolation of Traction Motors, auxiliaries, wedging of relays/contacts
4. Panto trouble/SMGR manual control in Electric locos and transition not working or picking up in case of diesel locos

Total 4

Marks of Technical Knowledge & trouble shooting 15

2 Knowledge of safety & Operating Rules

a Road learning knowledge & location of following
1. Manned level crossing, blind curves, steep gradient etc.
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Permanent speed restrictions, spring points etc.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Yard layout, sidings etc.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Neutral section with its type.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Station approaches on gradients, loop lengths, yards</td>
<td>layouts, sidings.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>B Location of signals &amp; their sighting points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Type of signaling system in different sections.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Meaning of each aspect of signal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Signals on RHS of track, on curves etc.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Calling on signals, signalling arrangement at junction</td>
<td>stations etc.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>C Knowledge of safety rules &amp; regulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. different authorities and documents given</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. rules &amp; Ghat section Banking section</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Speed restriction indications &amp; boards</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Knowledge of working the train in foggy weather</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. reception/ Departure from non-signalled the</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. Departure from common departure signalled line</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7. Flasher light observed on opposition train, Fusee observed</td>
<td>on track.</td>
<td>1</td>
</tr>
<tr>
<td>8. Failure of IBH, Automatic &amp; Semi-automatic signals.</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>D Knowledge of rule books &amp; latest correction slips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. system of working in different section</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. whistle codes between Driver &amp; Guard</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Latest correction slip of G &amp; SR</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. Latest correction slip of Operating Manual</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. Latest safety circular</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. Knowledge of rules for TSL working</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7. Knowledge of working under different conditions like poor</td>
<td>brake power, train parting.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>E Knowledge or working under abnormal condition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Piloting in case of signal/point failure</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. Action to be taken in case of extinguished colour light</td>
<td>signal, extinguished gate signal, Red signal in automatic territory etc.</td>
<td>1</td>
</tr>
<tr>
<td>3. Action to be taken in case of signal going blank to</td>
<td>Danger on approach, conflicting signal, etc.</td>
<td>1</td>
</tr>
<tr>
<td>4. Action to be taken in case of OHE hanging, headlight</td>
<td>failure, whistle failure, FLS etc.</td>
<td>1</td>
</tr>
<tr>
<td>5. Action to be taken in case engine failure in block section.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>
6. working in case of wheel slipping, cattle runover, when lurch is experienced etc. 1

Total 6

Marks on safety & Operating rules 30

4. Personal Habits
   a. Discipline
   1. Not carrying unauthorised person/materials in cab/loco, leaving loco unmanned etc. 1
   2. Punctuality Attitude toward work 1

Total 2

b. General abilities
   1. Duty consciousness, sincerity & hard working 1
   2. Takes proper rest before coming on duty, ability to concentrate. 1
   3. Exercising proper control over working of assistant driver 1
   4. Reports irregularities on line 1
   5. Performance during training course 1

Total 5

c. Record keeping & paper work
   1. Perusal of shed notices, Reads all Memos carefully 1
   2. Maintenance of memo book, filling up of CTR forms etc. 1

Total 2

d. Hygiene
   1. Overall health and alertness 1

Total 1

Marks of Personal Habits 10
5 Accident Record (during the last five year)

A First a lump sum of 20 marks be awarded to the driver under the head accident record for his performance during the last 5 Years.

B There after, certain negative marks (rounded off to the nearest whole number) will also be given based on the following criteria.

1. For primary responsibility in accidents, negative marks will be given as under:
   a- Collision 20/n marks
   b- Passenger train derailment 15/n marks
   c- Goods train derailment 10/n marks
   d- Manned level crossing 10/n marks

2. For secondary responsibility in accidents, negative marks will be given as under:
   a- Collision 10/n marks
   b- Passenger train derailment 10/n marks
   c- Goods train derailment 5/n marks

3. For each indicative accident in which driver was involved 5/n marks

Note: (1) n is the year starting from the assessment year, when the Driver was involved in the accident.

(2) If a driver gets involved in an accident, he should be regraded and in such a case n = 1.3 The total negative marks for accident cannot exceed 20.
These items as explained above may be gone through by Loco Inspectors thoroughly and LIs should submit the report giving the marks against each items after thoroughly understanding the working of driver. For newly promoted (drivers, kept in ‘C’ category) Loco inspectors may take about three months time to watch the working before giving marks and classifying them as A, B or C category.

1.2.1 Working procedure at a crew booking point:

The crew change point is provided in division keeping in view the duty hours of the drivers. There are stations where only goods drivers are changed where as at some stations mail/express as well as goods drivers are also changed. Each crew booking lobby is manned by a Engine Turner who is a member of running staff in the grade of shunter. In addition to engine turner, crew booking lobby may have a indoor and out shunters depending on the workload.

The busy crew booking points may have a crew controller in the lobby who is in the grade of (Rs. 9300 - 34800 GP – Rs. 4600/-). The incharge of the crew booking points is known as Loco Foreman or Assistant Traction Foreman (ATFR) or Chief Crew controller. In this chapter various functions at crew booking points are explained.

Facilities/Record available at a crew booking point:

The following registers are maintained at a crew book

1) Periodical Medical Exam (PME) Register:- Running staff have to undergo medical examination periodically. Therefore, a register is maintained where the last date of PME is noted and the date of PME is displayed each month on the board. The staff due for PME are sent for medical examination generally one week in advance. The staff overdue for medical examination cannot be booked to work the train. The periodicity of medical examination is explained in Chapter 1.3.5.

2) Road Learning Register:- Road learning particulars of all the drivers are recorded in this register.

3) Progressive hours of working register:- Working hours of the drivers for each fortnight is recorded. This helps controlling the working hours of the drivers in 2nd week of FN to achieve target of 104 hrs. in a FN.

4) Periodical rest register:- Periodical rest given is recorded for each driver. It is also ensured that no driver remains without availing proper due periodical rest.

5) Safety camp/safety meeting register:- Record for attending or relieving drivers for safety camp is entered in the register.

6) Personal stores of drivers register:- Personal stores issued to driver is recorded with the acknowledgement of the concerned driver.
7) Sign on register:- This register is available at crew booking point where
driver enters the detail at the end of the journey.

8) Sign off register:- This register is available at crew booking point where
driver enters the detail at the end of the journey.

9) Track defect register:– In these registers the defects noticed during the train working is
written by driver in respective register
for getting urgently attended.

10) Signal defect register:–

11) Caution order display register:–

12) Drivers detail book register:– Availability of driver in HQ and in running
room is maintained in this register. Drivers are booked with the help of
this register.

All these registers are maintained by LF/ ATFR/Chief Crew Controller who is
incharge of the depot. During the inspection of crew booking lobbies, these registers
should be inspected to judge its working.

**Information Displayed in the lobby:**

Each crew booking point should be very up-to-date in display of the
information/instructions issued from time to time by the administration. Following
information are displayed.

1. Safety circulars issued by safety branch.
2. General Instruction – issued by Sr.DEE/TRO or Sr.DME in ‘G’ Book.
3. Monthly bulletin issued by Sr.DEE/TRO/Sr.DME or DSO.
4. Safety slogans.

These information should be got noted by the running staff at the time of
sign on in lobby.

5. Drivers passed medical with spectacles – The list of such drivers are
displayed in the lobby. Whenever, these drivers sign on, the presence of 2
Nos. of spectacles with them should be ensured.


**1.2.2 Working of system at crew booking point:**

The engine turner gets the Train Notice Nos. containing the information of
expected arrival of train, loco number, and train number. As per the availability of
crew, engine turner sends the call book to the driver and assistant driver indicating
the time about Two Hours in advance of the time of expected arrival of the train.
Whenever, the driver comes for sign ON or sign OFF, engine turner ensures the same is being done properly. The brief description of duties of a engine turner/crew controller is given as under :-

1. To maintain the sign ON/OFF register properly.
2. To ensure B.A. (Breath Analyser) test of crew at the time of signing ON / Signing OFF
3. To call the crew for the train as per train Notice given by traffic department.
4. To maintain the book of availability of driver up to date.
5. To have close liason with the crew controller in control officer for balancing the drivers form one depot to other depot.
6. To ensure timely loading/uploading of drivers’ line boxes containing their personal stores.
7. Strive to achieve 104 hrs. of progressive duty in a FN for each Driver, without causing any Breach of his Rest and still providing all necessary Periodical Long Rest prescribed every month.
8. Strive for reducing both Pre-Departure Detention and Post Arrival Detention for Drivers.

1.2.3 Personal Stores of a Driver :

In this chapter, the tools issued to driver is given. The knowledge of these items given to drivers is required for timely and correct issue of tools to driver.

Driver is the only person available on a train who is technically more competent than the other Railway staff like T.T.E, conductor, guard etc, present on the train. Therefore, driver of the train is provided with certain important tools so that the minor trouble of engine, coaches or wagons can be attended and section can be cleared without undue detention to the train. Important items of the driver’s tool box is given below. This is given to each driver as personal store.

1) Tool Box - 1 No.
2) Hand hammer - 1 No.
3) Plier - 1 No.
4) Adjustable wrench spanner - 1 No.
5) Pin punch - 1 No.
6) Chisel - 1 No.
7) 30/32 spanner - 1 No.
8) Red flag - 2 Nos.
9) Green flag       - 1 No.
10) Detonator box      - 10 Nos.
11) EM Contactor wedge clamp    - 2 Nos.
12) H.S. Lamp Tri colour torch     - 1 No.
13) Memo Book (T215-B)     - 1 No.
14) Trouble shooting guide    - 1 No.
16) Accident manual       - 1 No.
17) Glass fuse 5 amp.      - 1 No.
18) Cotton Rope – 2.5 mtrs.     - 1 No.
19) Wedges for Relays     - 1 No.
20) Screw driver 6” (150 mm)     - 1 No.

1.2.4 Method of issue of personal stores to drivers:–

As soon as the staff is promoted as driver, he is given required training and issued with personal store as given above by the depot incharge. The concerned depot incharge maintains a register wherein details for issue of personal store to driver along with his signature is recorded. Whenever a driver is transferred or retired, the personal stores is taken back and kept in store for issue to other drivers.

Whenever a driver is on duty, the personal stores are to be kept by the driver. This personal store is kept in a box as line box or tool box.

1.2.5 Items to be checked while carrying out Foot Plate Inspection:–

All the railway officers and supervisors carry out foot plate inspection to review/judge their system of maintenance, organization discipline, level of alertness etc. from time to time. Foot plate inspection indicate the performance of all the department involved in train running. Therefore, the officials who are carrying out Foot Plate inspection should keep watch on the relevant aspect of train working particularly the areas connected with their branch. As a TRO officials the main attention is given to punctual train running and performance of the crew and loco. While there cannot be fixed number of items to be checked while carrying out foot plate inspection, even though, guide line can be provided so that foot plate inspection can be more meaningful and productive.

1.2.6 Some points to be kept in mind during foot plate inspection by Traction Rolling Stock operating officials is given below:–

While starting the foot plate inspection, the name of the crew and train detail like load, brake power certificate (BPC) etc should be noted down.
A) Observation of loco:- Performance of loco should be judged during foot plate inspection. For this purpose the loco log book should be gone through and observation of driver recorded in log book may be noted for remedial action. Observation of loco to be taken can be summarized as under:

1) Inspection of loco log book and observing the nature of defect booked by driver and action taken by trip shed/homing shed.
2) Type of speedometer and its working condition.
3) Condition of head light, flasher light and marker light.
4) Condition of horns/wipers.
5) Condition of safety fittings of locomotive as observed visually.
6) Condition of fire extinguishers and its date of filling.

B) Observations of the crew:-

1) General working and trouble shooting knowledge of driver/asst. driver. This can be ascertained to some extent by asking some questions regarding loco, traffic rules, safety rules etc.

C) Driving technique:- This can be observed by keeping watch on the following activity of driver.

1. The method of starting/ stopping the train:- whether driver is keeping watch on the current, voltage given to traction motor at the time of start. Is he keeping watch on Pressure level in loco? Is the starting is without or with wheel slip during start? Similarly, whether the driver is able to stop the train with minimum destructive of vac./air pressure. Whether train is stopping at proper place or not etc.

2. Coasting of driver:- This can be observed by the technique of driver for coasting the train to the maximum extent without loosing time in section at the down gradient.

3. Negotiating the gradient:- There are cases where the train stalled in UP gradient due to bad driving by a driver. Such case can be avoided if driver takes necessary precautions like keeping the brakes released, keeping the train in good momentum as per the speed restriction etc.

4. Negotiating the caution order:- Ability to negotiate the caution order at exact speed without over speeding or without being too slow.

5. Calling out the signal aspect and road knowledge:- Whether calling out of signals by driver/assistant driver is correct and loud. Road knowledge of the driver can be assessed by asking questions regarding gradient, signals location etc.
6. **Whistling at LC gates and curves:**- Whether driver/asst. drivers are whistling properly at specified locations.

7. **Exchanging the signal with station staff:**- The crew of the train is supposed to exchange signals with the station staff through which the train is passing. During foot plate inspection this aspect is to be observed.

8. **Testing of brake power of train at first opportunity:**- The driver is supposed to test the brake power of the train at the first opportunity after starting the train. This is very important for safety of the train operation because it gives the feel of brake power available on train which will help the driver for controlling the train during its course of journey whether driver is doing the test? This should be checked during foot plate inspection.

D) **Personal particulars of the driver:**

   Following particulars should be checked.

   1. Date for refresher course done – whether overdue for refresher training.
   2. Date of last periodical medical examination
   3. Date of competency certificate issued for working in ABS territory (if applicable)
   4. Section where he is due for road learning.
   5. Availability of personal store with driver.

E) **General Working:**

   1. Signal exchange by points-man and station master while train is running through.
   2. Alertness of gateman at level crossing gate.
   3. Whether caution order boards are correctly displayed as per caution order issued.
   4. Whether any jerk or lurch noticed – the Km/location of such position of track to be noted.

F) **Visibility / irregularity of signals:**

   1. If any of the signal is not visible properly the same are to be taken a note of. If any signal irregularity like a blank signal, bobbing signal etc are noticed, the same should also be noted down.
2. Whether drivers of the trains crossing on double line section for the train coming from opposite direction are using the dimmer of the head light to enable better visibility of signals for the train coming in opposite direction.

These are some of the important items which should be kept in mind while carrying foot plate inspection by a official of traction rolling stock operation branch. However, it is the discretion of the official to check any items of train working during his/her foot plate inspection like time taken in loading/unloading the parcel, passenger reservation on train, general condition of coaches from the point of view of passenger amenities, the relevant observation for remedial action should be informed to concerned branch officials immediately after foot plate inspection is over.

1.3.1 Duty Hours and Running Allowances to Running Staff:

It is very essential to know the duty hours of running staff for their efficient management. Similarly, the allowance paid to running staff are different than that of other category of staff. Therefore, it is necessary to understand the type of allowances paid to running staff for better management. In this chapter, following has been discussed:

1. Duty hours of running staff.
2. Various types of allowances paid to running staff.
   (1) As we know, there are four category of Railway staff as given under:
      1. Continuous
      2. Intensive
      3. Essentially intermittent
      4. Excluded.

The duty hours for running staff is counted from sign ON to sign OFF. The running staff are classified as continuous. The duty hours for the running staff is as under:-

i) Max. Hrs to be utilized in a fortnight. = 104 hours

ii) No. of periodical rest in a month = 4 rests of 30 hrs each or 5 rests of 22 hrs each including a night in bed.

2. Normally, running staff are not put on duty for more than 10 hrs at stretch. They can claim rest after performing 12 hours duty provided they have given 2 hours notice.

3. Running staff should not perform night duty for more than 6 consecutive nights. They should not be out of headquarters for more than 3 or 4 days continuously.
4. Periodical rest should include the full night rest. This rest should normally be given in a week.

HQ rest to running staff:

1. The Headquarter rest is given as under:
   i) For duty less than 8 hours = 12 hours rest
   ii) For duty more than 8 hours = 16 hours rest

Outstation rest for Running staff:

1. Outstation rest is given as under:
   i) For duty hrs of 8 hrs or more = 8 hrs rest
   ii) For duty hrs less than 8 hrs = half an hour rest for each hour of duty (Normally Min. 6 hrs. outstation rest is given).

2. While giving the HQ or outstanding rest as above, 2 hrs call time is also added.

3. Running staff accompanying dead/trial engine:
   When accompanying such engines, they may be allowed 2/3rd of the time spent in journey, but if they travel in engine while on trial they will be entitled to full credit of whole time spent on journey.

1.3.2 Running allowances for running staff:

Running staff are paid running allowance instead of TA. Certain percentage of the running allowance is taken into account as pay for fixation of pension, leave salary etc. The following allowances are paid to Running Staff:

I) Mileage (Kilometerage) Allowance:

This is paid when staff is engaged in running of train as per actual Kms of driving performed.

II) Allowance in lieu of mileage:

If the running staff is utilized for stationary duty in crew booking lobbies or inspectorial duties, the mileage in lieu of working at stationary duty is paid.

III) Waiting Duty Allowance:

When running staff are called for duty and keeps on waiting for duty due to administrative reasons, in such case, running staff gets the mileage at the rate of 15 Kms per hour of waiting duty.
IV) Allowance for Ghat Section:

a) Class I Ghat Section :- If the section is having a ruling gradient of 1 in 40 or steeper.

b) Class II Ghat Section :- If the section is having a ruling gradient of 1 in 80 or steeper but less than 1 in 40.

The running staff working in Ghat section, gets the mileage computation 5 times the actual distance traveled in case of Class I ghat section and 3 times the actual distance traveled in case of Class-II ghat section.

V) Out/stn. Detention allowance:

When the staff is detained at o/stn. For more than 16 hrs from the time they sign off duty they shall be credited 70 km for every 24 hrs or apart there of after the expiry of 16 hrs from the time of signing off.

VI) Breach of Rest Allowance (BOR):

If the running staff is called for duty at his HQRs without completion of the HQ rest the staff has to be paid Breach of Rest (BOR) allowance. BOR is paid for booking the driver under rest at his HQ station. This will not be paid for outstation driver. The rate of BOR will be at the rate of 2 Hrs. for every hour, by which rest falls short the prescribed hours of rest.

As per RB L.N.-E(LL)2008/HER/8 dated 16.09.08 With ref To L.N. HPB/460/LE/HER dated 22.08.08 ofGM(P) CR CSTM on the subject BREACH OF REST of drivers, the matter has been examined by RB and taken stand that serving of call book cannot be treated as Breach Of Rest as it is only a facility for the staff is in order.

Advance call of register facilitates the employees to be in readiness and after completing his personal work he can "sign on " in time. Moreover, providing ofCUG phones to running staff can also be leveraged to. Reduce the interaction further to ward off any apprehensions on this score. By-Director Estt. (LLJ/RB/NDLS.

VII) Accident Allowance:

R/staff who held up at any stn. other than their HQ due to an accident for a period exceeding 8 hrs shall be paid an accident allowance @ 70 km for every 24 hrs or a part there of from the time of commencement of the accident.

VIII) Out/stn. Relieving Allowance:

To work temporarily at stn. Other than HQ either running or stationary duties to a R/staff., o/stn. Relieving allowance is granted

(a) When R/staff are sent to an o/stn. to officiate in higher post, the allowance shall be paid for 14 days only.
(b) And for same capacity/grade, for a max. Period of 2 months.-

IX) **Minimum Guaranteed Km Allowance : -**

Each railway should identify the area, sections & circumstances which do not have the potential for enabling the R/staff to earn adequate km within the stipulated duty hrs. Rate is @ 120 km/day.

X) **TRIP ALLOWANCE :- (RBE 18/2009, 01.10.09)**

A trip allowance at the following rate shall be paid to the running staff wkg. on high speed train & RAJDHANI express for completion of trip.

<table>
<thead>
<tr>
<th>Category</th>
<th>Rate w. e. f. (01.10.2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Mail Dr.</td>
<td>Rs. 24.00</td>
</tr>
<tr>
<td>2) Co-Dr.</td>
<td>Rs. 18.00</td>
</tr>
<tr>
<td>3) Mail Guard</td>
<td>Rs. 18.00</td>
</tr>
<tr>
<td>4) Assist. Guard</td>
<td>Rs. 9.00</td>
</tr>
</tbody>
</table>

(XI) **SHUNTING DUTY ALLOWANCE :**

(1) R/Staff working through Goods trains & shunting vans, goods train, shall be paid shunting duty allowance at the following rates-

(a) For through goods trains, for shunting from third station/point in one trip.
(b) For shunting/van goods trains for shunting from fourth station/point in one continuous spell of duty. The rate of the allowance for shunting duty are as follow w. e. f. 01.10.09 (RBE No. 18/2009 dt. 01.10.2009)

<table>
<thead>
<tr>
<th>Category</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers</td>
<td>Rs. 33.50</td>
</tr>
<tr>
<td>Guard</td>
<td>Rs. 26.50</td>
</tr>
<tr>
<td>A/Dr.</td>
<td>Rs. 23.50</td>
</tr>
</tbody>
</table>

(2) When the main line crew is utilized for shunting duty at the terminals, which is preceded by or followed by train working, such duty shall be paid for at the rate of 1 5 KM par hour.

**The ALK is admissible in the following cases :**

(1) Journey on transfer
(2) Joining time
(3) Attending enquiries
(4) Attending law courts
(5) Attending defense counsel for witness
(6) Ambulance classes
(7) Territorial army
(8) Staff loan societies
(9) Railway institutes
(10) Welfare & debt committee
(11) Railway Co-op societies
(12) Medical examination
(13) Sport duties
(14) Lok Sahayak Sena
(15) Union meeting
(16) First aid classes
(17) Training in carriage sheds
(18) Workers educational schemes
(19) Railway training school for refresher & promotion course
(20) Sterilization operation
(21) Hindi exam.
(22) Guard booked on escort duty
(23) Dr. kept spare for examination/cleaning engine of SPL train for VIP
(24) Any other duty declared in emergency as qualifying for ALK.
(25) Also ALK of 120 km to Dr. working as power controller/crew controller.

NO TA/DA OR SPL PAY ADMISSIBLE

COMPUTATION OF KM FOR PASSENGER SERVICES:

KM shall be calculated as follow for drivers working in pass, service.

Hrs. of duty from SOSO ------ KM to be paid for

(a) Less than 04 hrs. - Actual km subject to a min. of 120 km
(b) 04 hrs. & above but less than 05 hrs. - min. of 130 km.
(c) 05 hrs. & above - min. of 150 km.

INCENTIVE SCHEME FOR THROUGH GOODS TRAINS:-(w.e.f. 01.08.81)

Total km actually performed by = KM to be paid for the Running staff.

0-125 - min. 125km
126-175 - Actual km + 20 % thereof.
176-200 - Actual km + 30 % thereof.
201 & above - Actual km + 40 % thereof.
COMPUTATION OF KM FOR SLOW MOVING TRAINS:

R/staff working on slow moving trains will be paid as under:-

(i) Shunting & van goods trains will be paid as under. For the first 60 kms — to be paid at double the km. Beyond 60 kms — to be paid at 3 times the km.

(ii) In case of Ballast & material trains, crane spl. & L/Engine, on mech. account, the computation of kms shall be at the following rates. 20 kms per hour subject to maximum of 200 kms, for prescribed hour of duty from SOSO.

(iii) In case of Breakdown SPL, & Medical Relief trains - 25 kms per hour from sign on to sign off.

ALLOWANCE in lieu of R/Room facilities- (RBE 18/2009 w.e.f. 01.10.09)

1) Dr. & Guards — Rs. 32.00
2) Shunter — , Rs. 26.00
3) A/Dr & A/Guard — Rs. 22.40

LOCO RUNNING SUPERVISORS:-

CTLC, CLF, SLI, CCRC. - Rs. 7450-Rs.11500  Rs. 9300 – 34800,
GP Rs. 4600/-
LF, LI, - Rs. 6500-Rs. 10500

Note:- TLC’s are selected from Goods Dr. or Pass. DR. No change in pay scale, but eligible for mileage i.e. 120 km/day (for selected) & 1% of basic for temporarily appointment as TLC.

Tower wagon driver’s also classified as running staff for all purposes w.e.f. 10.04.91 vide Railway Board's L.N. E(P&A)ii/78/RS-II dated 10.04.91 & 29.04.91.

1.3.3 Periodical medical examination (PME) of running staff:-

Medical examination of running staff is very important for ensuring the safety of train operation. Railway Board vide letter No. 88/H/5/12 dated 24.1.1993 have given the guidelines for medical examination.

In this chapter the rules of medical examination as prescribed in the Indian Railway Medical manual is explained in brief. The knowledge of the rules of medical examination will help in better management of crew.

A thorough and stringent Medical Examination, including X-ray (Chest), ECG, Urine Examination. Blood sugar Estimation, or any other investigation/observation as deemed fit by the medical examiner is to be done keeping in mind the following conditions:
1. Hypertension
2. Diabetes
3. Ischemic Heart disease
4. Hearing
5. Mental condition/ Reactions of the candidates.

Visual Ability – 6/6  6/6 – no glasses permitted including night vision.

1.3.4 Examination at the time of induction as drivers/promotion to goods driver:-

1) Employees inducted as driver at an age less than 45 years age.
   i) A thorough physical examination with special emphasis in eye check up and any other examination investigation as deemed fir by medical examiner is done.

2) Employees inducted as driver at an age more than 45 years age.
   i) A thorough medical examination as applicable at the time of entrance to A-I category and defined in para (i) above.
   ii) Visual ascquity standards in these cases will be the same as prescribed for periodical medical examination (PME).
       If however, an employee below the age of 45 years being inducted as driver, has not earlier undergone the above tests, he/she will have to be examined with visual standards as at PME.
   iii) The eye examination is to be done by a doctor of the rank of DMO or above, specifically nominated by CMO.

1.3.5 Periodicity of Medical Examination :

1) Periodical medical examination would be done at the termination of every period of four years calculated from the date of appointment till the date of attainment of age of 45 years. Every two years upto 55 years and thereafter annual till retirement.

   Employee who has been periodically examined at any time within 2 years prior to his attaining the age of 45 years would be examined after two years form the date of the last medical examination and his subsequent medical examination will be held as mentioned above.

2) The running staff must give the following written undertaking to his superior while reporting back to duty after leave or absence of 45 days or more upto 90 days.
i) That he has not suffered any eye disease or undergone any eye operation.

ii) Regarding presence/absence of contact lenses.

iii) Regarding any history of fits/epilepsy attacks of giddiness or vertigo, chest pain, mental abnormality.

iv) Regarding any history having undergone any surgical operation

v) That he is not taking any drugs or treatment for Ischemic-heart disease, hypertension, diabetes or some other disease.

3) Any employee returning to duty after an absence of 90 days or more or with a history of having undergone any treatment or operation as mentioned in para (2) above irrespective of the duration of absence would have to undergo P.M.E.

1.3.6 Running staff are examined as per the following guidelines:

1) Blood pressure :- The peripheral blood pressure with medication should not be above 140:90 upto the age of 50, 150:90 upto 55 years and 150:95 upto 58 years of age. Ganglion blocking drug not permissible for control of hypertension.

2) Diabetes:- If controlled by diet alone – to be considered fit for all categories. If controlled by drugs, not fit as a driver except for shunting duty in the yard.

3) Ischemic Heart Disease:- Candidates/employees suffering from Ischemic Heart disease will not be passed fit. Relevant investigation in this context should be done where necessary.

4) Ear Examination :- Hearing should be normal. Hearing aids are not allowed. There should be no chronic ear discharge.

5) Driver should be mentally agile with normal reactions,

6) Examination is to be by a doctor of the rank of DMO or above specifically nominated by CMO.

A special training of 7 days is imparted to all the doctors undertaking the medical examinations of drivers to familiarise them with the provisions of the circular and other relevant rules circulated from time to time.

1.4.1 Periodical training in Automatic Block Signalling:

In this chapter the rules for automatic block signalling has been explained which is very important for safe train operation.

Wherever, the drivers of a division are required to work the train in automatic block signalling territory, the training in ABS working is given. On a division the following method of the training in ABS is followed.
(1) Initial training is organized by DSO of the division. This training is for two days period. After successful completion of training the running staff is given a competency certificate by DSO for working the train in ABS territory.

The staff who have not undergone this training cannot work the train in ABS territory.

(2) After initial training by safety branch, every six months, the knowledge of drivers/assistant drivers are tested in ABS working. This test is performed by nominated LIs for their allotted drivers. If the staff is found up to date in working in ABS section, the competency is extended for next 6 months. This way the competency of the running staff is renewed every six months.

During ABS training following rules are explained:

**ABS RULES**

(1) Driver’s duty when automatic stop signal is ‘ON’:-

When a driver finds an Automatic Stop Signal with an ‘A’ Marker at ‘ON’ he must bring his train to a stop in the rear of that signal. After bringing his train to a stop in the rear of the signal, the driver shall wait there for one minute by day and two minutes by night. If after waiting for this period, the signal continues to remain on ‘ON’, he shall give one long whistle and exchange signals with the guard and then proceed ahead, as far as the line is clear, towards the next stop signal in advance, exercising great caution, so as to stop short of any obstruction.

(2) Precautions after passing automatic stop signals at ‘ON’

When an Automatic stop signal has been passed at ‘ON’ the driver shall proceed with great caution until the next stop signal is reached. Even if this signal displays ‘Caution’ or ‘Attention’ or ‘Clear’ aspect, the driver must continue to look out for any possible obstruction. He shall proceed cautiously up to the signal and shall act upon its indication only after he has reached it.

(3) Type of Automatic signal:-

i) Automatic signal:- This signal post is provided with white colour “A” marker on a round black colour board. This signal can be passed in on position subject to following the rules explained above in para (1) and (2).

ii) Semi automatic signal:- This signal is provided with white colour “A” marker light. When this light is glowing, this acts as automatic signal and when NOT glowing this acts as ordinary non automatic signal.

**1.4.2 Protection of a Train stopped in an Automatic Signalling Section**:

When a train is topped in an Automatic Signalling Section on account of accident, failure, obstruction or other exceptional causes, and the train cannot proceed, the guard shall immediately check up that the tail board/light is correctly exhibited and also exhibit a ‘Danger’ hand signal towards the rear. If the detention exceeds or is
likely to exceed five minutes, it must be protected in accordance with rule except that on the occupied line the detonators shall be placed as under:

i) one detonator 90 meters from the train on the way out; and
ii) three detonators, 10 meters apart, not less than 180 meters from the train or at such distance as has been fixed by special instructions.

Ambush Checks: In order to get the feedback of actual compliance of the rule, the ambush check is conducted by making a ABS signal red and observing the action taken by the driver. The driver who is found in not observing the signal aspect are counseled and DAR action is also initiated for violating the ABS rules.

1.4.3 Training in Air Brake Stock Operation:

Indian Railways have planned to induct more air brake stock for goods trains. Similarly more and more passenger carrying trains are also running with air brake stock. Therefore, a special training is to be given to running staff to make them conversant with the operation and trouble shooting of air brake stock. In this chapter following items of air brake stock is discussed and explained.

i) Various parts of Air brake wagon and its working.
ii) Difference between Air brake and vacuum brake stock.
iii) Minor trouble with air brake stock and its remedy.

1.4.4 Description: A schematic diagram of a air brake wagon is given below in Fig (1).

A) Brief description of the important parts of Air brake stock as indicated in the circuit diagram is given as under:-

(1) Distributed Valve:- Distributor valve is most important part of an air brake system. Any drop of brake pipe pressure below 5.0 Kg/cm² at the rate of 0.3 kg/cm²/min. or more, results in applicable of brake due to difference of pressure which actuates the distributor valve. Main function of a distributor valve is given as under:
(i) It charges the control reservoir to a pressure of 5 Kg/cm².
(ii) It also charges Auxiliary reservoir.
(iii) It connects brake cylinder with Aux. Reservoir and supplies 3.8 Kg/cm² air pressure. But it stops charging the auxiliary reservoir as soon as the brake starts applying due to drop in brake pipe pressure.
(iv) It exhausts the brake cylinder air pressure to atmosphere at the time of recharging / release the brakes.
(v) It has got a handle to enable the manual release of brakes whenever required.

(2) Control reservoir :- As the name indicates, it controls the function of brake application with the help of distributor valve. The control reservoir has the capacity of 6 liters for goods wagons and 9 liters for coaching stock. It is charged by brake pipe through distributor valve. Once it is charged, it maintains a pressure of 5 Kg/cm² i.e. air pressure equal to brake pipe pressure. The air pressure inside the control chamber remains constant. Only during manual releasing, the air of control chamber escapes to atmosphere through release valve of distributor valve reducing the air pressure of control reservoir depending upon the extent of pulling of lever of release valve. During manual releasing, the lever of release valve of distributor valve is pulled, brake cylinder air pressure is connected to exhaust port of Distributor valve.

During charging operation, the air pressure of control reservoir on being charged to 5 Kg/cm² air pressure, opens the port of D.V. which allows the air pressure of brake pipe to charge the Auxiliary reservoir upto maximum of 5 kg/cm². During brake application, when the air pressure falls, the air pressure control reservoir actuates the distributor valve and connect the auxiliary reservoir with brake cylinder. Thus the reservoir keeps the full control over brake applications and releasing operation of distributor valve.
Auxiliary Reservoir :- It has been provided in Air Brake system to feed compressed air to brake cylinder at the time of brake application. One Auxiliary reservoir it provided per BOXN/BCN Wagon. The capacity of auxiliary reservoir is 100 Ltr. for wagons and coaches but for brake van, its capacity is 75 liters. The auxiliary reservoir has been provided with a drain hole in the bottom which is plugged by means of a drain plug. This drain plug has been provided in order to drain bout the water accumulated in the Auxiliary reservoir due to moisture in air.

1.4.5 Working Principle of Air Brake :

1) (i) Whenever air pressure in brake pipe is reduced either by driver through SA9/A9 valve or by any means, the distributor valve gets actuated and port No.1 and 2 and indicated in schematic diagram is connected. This allows the air to flow from auxiliary reservoir to brake cylinder and consequently the brake gets applied on the rolling stock. The rate of flow of air is proportional to the fall in air pressure of brake pipe.

(ii) When the distribution of brake pipe pressure is stopped loco charged the brake pope and pressure increases in brake pipe. At the time brake cylinder gets connected with the exhaust port (6) resulting in exhaust of brake cylinder pressure to atmosphere and release of brake. This release of brake is gradual and proportional to the rate at which B.P. increases to 5 kg/cm². at the same time brake pipe also shares the auxiliary reservoir as the distributor valve connects the part (2) and (3) during the process of releasing the brake and hence auxiliary reservoir is available with air supply for further application of brake.

(iii) Quick release handled is used when the brake becomes jammed and does not release even after building up a pressure of 5 Kg/cm² in B.P. due to some problem. In that case, quick release handled is pulled, this helps in proper connection of port No. (5) and (6) resulting in exhaust of brake cylinder pressure to atmosphere and releasing of brakes.

2) Difference between Air brake and Vacuum brake stock:-

It is necessary to understand the difference between two types of stocks so that proper action can be taken on those items requiring special attention during train operation.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>VACUUM BRAKE SYSTEM</th>
<th>AIR BRAKE SYSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No provision to isolate the train pipe on wagon/coach</td>
<td>Every air pipe is fitted with two cut off angle cocks which are sued to isolate the rear portion.</td>
</tr>
<tr>
<td>2</td>
<td>One box wagon, two cylinders jointly operate the brakes on both bogies through one shaft.</td>
<td>On BOXN &amp; BCN wagons only one cylinder operates brake on both bogies.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>After application of brake piston rolls down due to internal leaks weakening the brake power.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Piston remains in application position for hours together till it is released either manually or by recharging air pressure in B.P.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>After application of brakes on creation of vacuum the air below the piston goes to atmosphere through engine.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Air below the piston vanishes in atmosphere through the exhaust port of distributor valve fitted on each coach / wagon.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Brake power is drawn from normal atmospheric pressure which is 76 Kg/cm² on 50 cm of vacuum.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Compressed air at a pressure of 3.8 kg/cm² operates the piston inside the brake cylinder which is about 5 times high than in case of vacuum brake system. Total weight is 3085 Kg. As such rate weight reduces.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Total weight of vacuum brake system is 683.5 Kgs</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Maintenance is difficult and costly.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Maintenance is easy and cost of maintenance is 2.5 times less than the vacuum stock.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>The rate of prorogation is slower and hence more braking distance.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Fast prorogation rate and hence less braking distance.</td>
<td></td>
</tr>
</tbody>
</table>

3) Minor trouble shooting of Air Brake stock operation.

i) Bursting of brake pipe or leakage from the Angle cock of a brake pipe.

During train operation, it has been observed that some of the brake pipe angle cock starts leaking which results in drop in Brake pipe pressure and jamming of the of brakes. On the other hand, the brake pipe also bursts some time leading to full drop of brake pipe pressure. In both the cases, if it happens in section (in between two stations), the train stops due to application of brake. In order to move the train from section, the following method may be used for bypassing the defective B.P. or angle cock.

For bypassing the defective wagon, the brake pipe of the adjacent wagons on both the sides are to be replaced by feed pipe and then this feed pipe can be connected to the feed pipe of defective wagon as shown in figure above.

This will ensure the continuity of air pressure on both the sides of defective wagon and B.P. pressure may be created in train. After creation of full B.P pressure in trains, the brake of the defective wagon has to be released manually since brake pipe of this wagon is disconnected and hence brake will into get released automatically. After doing this, the crew must inform SCOR/PCOR about the attention given after clearing the section so that remedial action can be taken by TXR staff.
(ii) Leakage of Air from Distributor Valve:- Sometimes due to defects developed in Distributor valve, the air leaks from the distributor valve resulting in drop in B.P. pressure. In that case, the leaky distributor valve can be isolated by operating the D.V. isolating operating handle suitably. In such wagons the brake will become ineffective. Such trouble attended in section or station should be informed to SCOR/PCOR.

(iii) Brake pipe Pressure not building up in loco after attaching on air brake load:- Whenever such trouble arises, the engine should be tested for leak test jointly by driver, TXR and guard/ASM/AYM as under:

a) Brake pipe of loco is detached from the load and all the angle cock of BP and FP of the loco is closed.

b) Air pressure in Main Reservoir (MR) of the loco should be made upto 8.5 Kg/cm².

c) BP pressure should be made 5 Kg/cm² though SA9/A9 handle. Master gauge and the gauge provided in engine should indicate the same air pressure reading. If master gauge is showing less pressure, it indicates the leakage in brake pipe.

d) Drop the brake pipe air pressure by 1 Kg/cm². The two gauges should be compared and there should not be any pressure difference between master gauge and loco gauge. About 30 sec. time is allowed for stabilizing the BP gauge needle.

e) After this, there should not be any pressure drop in one minute time in Brake pipe. If there is a drop in BP pressure, the leakage in loco is excessive and the same should be attended. If during the test loco is found alright, the leakage of air pressure in load should be examined.

Above training regarding air brake stock is given to driver. All the points mentioned about the air brake stock is also demonstrated in yard or TXR examination point by Loco Inspectors. Some divisions have also started the practice of giving refresher training every year particularly in air brake train operation. The knowledge of the running staff is also tested periodically once in a year and fitness for working air brake train is recorded by nominated loco inspectors for his driver/asst. driver.

**TYPES OF BRAKING SYSTEM IN AC LOCO :**

1) Vacuum brake system (WAM4):-
2) Dual brake (IRA VB-2) system (WAM4.6P. WAG5. WAP1)
3) Air Brake system (WAM4.6P, WAP4, WAP5, WAP7, WAG7, WAG9)
Necessity of Air Brake system:

1. In vacuum brake system, it is very difficult to maintain the same amount of vacuum levels in loco & brake van throughout the run. The droppage of vacuum level adversely affect the brake power.

2. It is not possible to maintain the desired level of vacuum on higher altitude.

3. To run heavier & lengthy trains at higher speed irrespective of the altitude of the section, load & length of the train.

ADVANTAGE OF AIR BRAKE OVER VACUUM BRAKE:-

1. The air brake train can carry more load with higher speed as compared to VB system.
2. There is no detonation of brake power after repeated application & release in AB system.
3. The weight of the VB equipments is more as compared to AB system.
4. The time application of AB system is less than that of VB system.
5. AB system gives lower braking distance than that of VB system.
6. AB system requires less routine maintenance (2.5 times lesser than VB system.)
7. Isolating cocks are provided in AB system.

1.5.1 Issue of competency certificate to running staff:

In this chapter, the types of competency certificates issued to the running staff is explained. This knowledge is essential for correct issue of competency certificates.

Types of competency certificates:- Whenever the running staff passes the training course along with necessary handling and road learning training, a competency certificate is issued to authorize to carry out the work for which he/she is trained and found fit after examination.

Following types of competency certificates are issued (Ref. Manual of AC traction, maintenance and operation, Vol. III p.207)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Category of staff to Competency certificate</th>
<th>Format of the certificate</th>
<th>Issuing Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assistant Driver</td>
<td>TR-10</td>
<td>DEE(RS)DEE(TRO)Sr.DEE/TRO after written, oral and practical tests as prescribed.</td>
</tr>
<tr>
<td>2</td>
<td>Shunter</td>
<td>TR-13</td>
<td>-do-</td>
</tr>
<tr>
<td>3</td>
<td>Driver</td>
<td>TR-11</td>
<td>-do-</td>
</tr>
</tbody>
</table>
The format of the competency certificate is given below for ready reference.

No..........................

CERTIFICATE OF COMPETENCE No. TR-10
(For Asstt. Drivers of Elect. Locos)

Shri............................................... is authorized to work as an Assistant Driver in the section between .......................... and on the following types of Electric Locomotives:-

His written declaration dated ........................ that he is fully familiar with the signals in the above section has been noted in issuing this certificate.

He is NOT authorized to operate a locomotive independently.

DEE (RS) DEE (OP) SR DEE (OP) Date .................

No..........................

CERTIFICATE OF COMPETENCE No. TR-11
(For Drivers of Elect. Locos)

Shri............................................... is authorized to work as a Driver of Electric Locomotives of the following types..................in the section between ..........................

His written declaration dated ........................ that he is fully familiar with the signals in the above section has been noted in issuing this certificate.

Date .................

DEE(RS)DEE(OP)SRDEE(OP)
No……………………

CERTIFICATE OF COMPETENCE No. TR-13
(For Shunters/Engineer Turners of Elect. Locos and EMUs)

Shri…………………………………… is authorized to work as a
Shunter/Engine Turner of Electric Locomotives/EMU trains in the electrified
yards and sidings of the section between ................................. and

.............................

His written declaration dated ...................... that he is fully
familiar with the signals in the above section has been noted in issuing this
certificate.

He is NOT authorized to operate a Electric Locos/EMUs outside the
limits of the above yards and sidings.

Dated ................
DEE(RS)DEE(OP)SRDEE(OP)

This declaration must be countersigned by Driving Inspector and personally
scrutinised by the officer before issuing this certificate. Before countersigning the
declaration, the Driving Inspector shall orally examine the employee for his
knowledge of road.

Before issuing any of the above certificate the nominated loco inspector
should countersign the declaration given by the candidate to whom such
competency certificate is to be issued. Before counter-signing the declaration,
nominated loco inspector should orally examine the employee for his knowledge of
road.

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2. MAN POWER AND MOTIVE POWER PLANNING

2.0 POWER PLAN AND ORDERING OF GOODS TRAIN

Power plan provides the information for planning the goods train on a division for each section. This chapter will explain the followings:

i) How to understand the divisional power plan.
ii) To calculate the requirement of running staff.
iii) To understand the goods train ordering on division.

2.0.1 Procedure for issue of a power plan:

(1) Every six months, the running of goods traffic on a Railway is reviewed for each division. Actual number of goods trains run are observed. Moreover, the goods train to be run during next six months is assessed. While planning the goods train, availability of goods locomotives on railway is taken into account. Zonal railway power plan is issued by the office of Chief Operating Manager (COM) of the Railway.

Information available in a power plan,

Following information are available in a power plan:

a) Number of trains to be run on division section-wise in UP and DN direction.

b) Requirement of power for inferior services i.e., shunting work, railway material train, PQRS work of engineering department etc.

c) Outage of the locomotive on a division. Outage is the average number of locos available for a calendar day of 24 hours.

d) Target utilization of the locomotives. It may vary from one division to other depending on the operating conditions.

e) Requirement of power to be moved LELA or dead due to various reasons.
Shape of a typical power plan:

The information available in a power plan can be illustrated as under:-

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Section</th>
<th>Kms</th>
<th>No. of SH</th>
<th>Train DH</th>
<th>Total Engine Kms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BHUSAWAL – NANDGAON</td>
<td>159</td>
<td>15</td>
<td>1</td>
<td>5406</td>
</tr>
<tr>
<td>2</td>
<td>NANDGAON – IGATPURI</td>
<td>149</td>
<td>13</td>
<td>2</td>
<td>5066</td>
</tr>
<tr>
<td>3</td>
<td>BHUSAWAL – BADNERA</td>
<td>216</td>
<td>8</td>
<td>13</td>
<td>14892</td>
</tr>
<tr>
<td>4</td>
<td>BHUSAWAL – KHANDWA</td>
<td>123</td>
<td>9</td>
<td>-</td>
<td>2214</td>
</tr>
<tr>
<td>5</td>
<td>BHUSAWAL - ODHA</td>
<td>256</td>
<td>-</td>
<td>6</td>
<td>6144</td>
</tr>
<tr>
<td></td>
<td>TOTAL ENGINE KM</td>
<td></td>
<td></td>
<td></td>
<td>33722</td>
</tr>
</tbody>
</table>

In the above table, we can see that each section-wise, number of goods trains to be run are indicated. These trains gives the number of UP and DN both sides of the train. For example in BSL-NGN section number of trains is indicated as 15 Nos. single head and 1 No. as double head. This means there will be 15 Nos. of single head and 1 No. of double head trains running between BSL and NGN (UP direction) and same Nos. of goods trains between NGN and BSL which is DN direction. This table gives the idea of number of goods trains to be run on a division. This is the basic data from which necessary planning of requirement of running staff is calculated.

2.0.2 Procedure for calculation of requirement of running staff as per Power Plan:

(1) Before going ahead with the actual calculation, the following information are to be collected.

i) Average sectional running time:

Based on the traffic movement on division, the average running time for the last six months is to be found out. This average running time may be different for various section. For example, the average running time for BSL-NGN section will be different than BSL-BD section. This is basically due to difference in section length and traffic pattern. This data is generally available with the movement section of SR.DOM Office of the division. However, TRO office should also maintain this information.
ii) Pre-departure detention of the crew:

The time period from the sign on of crew to actual departure of the train is known as pre-departure detention of the crew. To illustrate this, let us assume that crew of the train has signed on at 8.00 hrs and the actual departure of the train could take place at 10.30 hrs due to line clear etc. therefore in this case pre-departure detention of the crew will be 10.30 – 8.00 = 2'30". PDD should not increase more than 30 mins. by proper coordination between TRO and Optg. Dept.

As we have already mentioned above for calculation of running time section wise, in the same, average pre-departure detention of the crew in each section has to be calculated. This data is also required for the last six months for calculation purpose.

It is essential to mention that higher the pre-departure detention more will be the bursting of ten hours duty cases and requirement of running staff. Therefore, division should make an all out effort to minimize the pre-departure detention of crew.

2.0.3 POST ARRIVAL DETENTION

This is the time which the crew takes after arrival of train to sign off at destination/crew change point station. This time is generally 30". However, if the arrival point of goods train is far away from the crew booking lobby, the crew may take more time to come to lobby to sign off. In that case, post departure detention will increase. However, in the most of the yard, booking lobbies are located in such a way that crew can sign off within half an hour after arrival of the train. Shunters may take over charge of loco from incoming driver to reduce this detention.

Actual post departure detention of the train for last six months should be calculated and average figure is taken into account for calculation purpose.

2.0.4 Goods Crew Requirement

Different railways are following different criteria, as given below:-

a) Average no. of Drivers to work one pair of up & down number of anticipated trains as per Power Plan.

b) Average of actual fortnightly performing crew-hours with a target of 104 hr.

c) Standard no. of crew required to man a loco as per average loco outage.

1. Based on anticipated No. of trains in Power Plan:

Power Plan of a Railway gives the anticipated no. of section-wise, up & dn. Goods trains (SH, DH/MU). Then Standard Driver Hours required to work one pair of train, including LR & TR, gives the total requirement of drivers to work goods trains.
a) Standard driver-hours to work a pair of up & dn. Train is calculated as:

<table>
<thead>
<tr>
<th>Description</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Departure Detention (PDD)</td>
<td>2 hr.</td>
</tr>
<tr>
<td>Running time outward</td>
<td>8 hr.</td>
</tr>
<tr>
<td>Outstation Rest</td>
<td>10 hr.</td>
</tr>
<tr>
<td>PDD towards HQ</td>
<td>2 hr.</td>
</tr>
<tr>
<td>Running Time to HQ</td>
<td>8 hr.</td>
</tr>
<tr>
<td>HQ Rest</td>
<td>24 hr.</td>
</tr>
</tbody>
</table>

Total turn-round hours = 54 hr.

b) Requirement of driver to work one pair of train per day, is computed as:

\[ \frac{54}{24} = 2.25 \text{ drivers.} \]

c) Add 30% LR (as per Rly. Bd's. Lr. No. E(G)73LR1(1) dt.03-12-73 & 30-06-78)

\[ 2.25 + 0.3 \times 2.25 = 2.925 \]

d) Add 3% minimum Trainee Reserve (TR), since for doing 3 weeks of Refresher Course once in 3 years, or average Refresher training of one week per year:

\[ \frac{7 \times 3.01}{250} = 3.01 \% \text{ TR} = 0.03 \]

Trainee Reserve crew per pair of train = 2.925 \times 0.03 = 0.0875

e) Thus total requirement of drivers per pair of train = 2.925 + 0.0875 = 3.01 = 3 \text{ drivers per pair of working Up & Dn train.}

f) The drivers required to man stationary jobs in shifts, like CCOR, PCOR, TLC, Out coming Loco-Checking in Sheds, etc. are calculated separately and added in above.

g) Drivers required for moving BT, MT, BD Train, LELA engine, or locos on trial are added separately, based on general trend.

2. Crew Requirement based on actual average performing hours

The requirement is calculated as following:

a) Average Fortnightly performing hours of

<table>
<thead>
<tr>
<th>Description</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last 6 months (used only for working goods trains)</td>
<td>A</td>
</tr>
<tr>
<td>Required Fortnightly working hours per goods driver (104)</td>
<td>B</td>
</tr>
<tr>
<td>Bare requirement of goods drivers</td>
<td>(A / B) = C</td>
</tr>
<tr>
<td>Additional req. due to traffic fluctuation @ 10% = 0.1xC</td>
<td>D</td>
</tr>
<tr>
<td>Revised Bare requirement</td>
<td>C+D   = E</td>
</tr>
<tr>
<td>Leave Reserve @ 30% on bare req.</td>
<td>0.3xC= F</td>
</tr>
<tr>
<td>Revised bare req. + Leave Reserve</td>
<td>E+F   = G</td>
</tr>
<tr>
<td>Trainee Reserve (TR) @ T% on G</td>
<td>O.OTxG=H</td>
</tr>
<tr>
<td>Total Crew requirement</td>
<td>G+H   = I</td>
</tr>
</tbody>
</table>

Traction Rolling Stock : OPERATION. 44
3. Crew Requirement based on driver reqd. to man a loco

(a) Available hours per fortnight = 104 hrs.
(b) Available average duty hours = 7 hrs 25 min.

• per crew per day (104/14)
(c) Available loco crew hours per crew per day for loco operation = 7 hrs 25 min - 1 hrs 45 min

[30 min prior to sign ON + 15 min after sign OFF + 1 hr. PDD ] = 5 hrs. 40 min

(d) Bare min. requirement of Crew to man loco for 24 hrs. = (24hrs / 5 hrs 40 min.)
= 4.24 crew

(e) Various allowance to be added, other than Leave Reserve
(I) Allowance for Traffic Fluctuation = 10%
(to meet peak requirement, spare running, growth in traffic volume over gestation period of crew requirement)
(II) Trainee Reserve = 5%
(Refresher course, Promotional course, conversion course, Air Brake training, 3-phase loco training, Safety camp/ seminar etc.)

(III) Total = 15%

(f) Total requirement of crew per single Power outage without leave reserve = 4.24 + 15% of 4.24
= 4.24 + 0.64
= 4.88

(g) Leave reserve @ 30% for leave (LAP, LHAP etc.)
Sparing staff for Misc duties viz. Selection suitability test etc.
Attending inquiries, joining time, court attendance, attending PNM) = 0.3 x 4.88
= 1.46

(h) Total Crew Requirement = 4.88 + 1.46 = 6.34 crew per loco

= at least 6 crew per loco

Note: The above yardstick does not provide for supervisory posts like TLC, CCOR, PCOR, LIs etc.
2.0.5 TRAINEE RESERVE POSTS:

Drivers and Assistant Drivers have to go undergo various types of trainings regularly. The details of the training is explained in Chapter No. 1.0. About 10% of the sanctioned strength of the crew always remains under various training which is conducted by division as well as Zonal Railways Training Institute. Therefore, 10% of sanctioned strength as trainee reserve is considered quite reasonable. But, there is no yardstick set for this. Divisions should justify the requirement of trainee reserve post as per the condition existing on division.

2.0.6 CALCULATION OF REQUIREMENT OF SHUNTERS:

(1) In addition to the requirement of drivers and assistant drovers, shunters are also required for movement of engine and rake in the rake in the yard from one place to other. These shunters also perform various types of the shunting work in the yard as under:

i) Attachment/detachment of coach or wagon from Mail/Express or Goods trains.

ii) Load formation in marshalling yard.

iii) Placement and removal of train rake from one point in yard/station to other point.

iv) Taking over the charge of engine in yard in case incoming driver is detained in the yard.

v) Indoor shunters also perform the work of booking a driver as per the requirement.

2) Each division will be having above type of the work to be performed. Therefore, requirement of shunters are to be worked out as per the operating condition of division. However, some guideline is given below:

i) Requirement of shunters for shunting engine:

In case shunting engine is operating in the yard round the clock, the provision of shunters should be made at the rate of 4 Nos. per shunting engine.

ii) Requirement in trip shed/loco shed :-

Trip shed and loco shed may be provided with adequate number of shunters after studying the work load of movement of loco from trip shed to yard or yard to trip shed. Based on the work-load, shunters should be deputed in trip shed/loco shed.

iii) Requirement of shunters in yard :

As per the lay out of the yard, the shunters may be required to take charge of the train in the yard from incoming drivers. In such case, shunter moves the train in
the yard from one point to other point. Such arrangement avoids extra post departure detention of drivers. In similar way, shunters also takes the engine on load for yard formed load or where change of engine is involved. Such work are generally done by shunters to avoid the detention of the drivers in the yard. Therefore, as per the operating condition, the requirement of shunters should be calculated for this purpose also.

iv) Requirement of shunters at stations

Slip coaches are required to be attached or detached from the train. If such a coach is next or near to engine, the necessary work of shunting is performed by train engine driver. However, if this attachment or detachment is required to be done is in the rear of the train, shunter along with engine will be required. Therefore, such requirement should also be studied based on the train working on a division.

v) Requirement of shunters for sidings:

There are number of private or railways sidings on a division like siding for electricity board, Food Corporation of India etc. In these sidings, the rake is required to be placed and after unloading, the load is to be formed and empty rake is to be dispatched. Such type of work is performed by shunters with the help of a shunting engine. In some cases, the private siding owners may have their own shunting engine and shunters. But for the sidings where railways have to carry out shunting work, the provision of shunter should be made.

2.1.1 Ordering of Goods train:

(1) In order to understand the working of goods trains, it is essential to know the system of ordering of goods trains in division. Chief Controller (Goods) or Area controller office gives a train notice number indicating following information.

i) Train Notice number – Any number selected serially.

ii) Train number of Goods train.

iii) Loco number of the Goods train.

iv) Expected arrival ready time of the goods train at crew change point or in yard.

The train notice is generally given about 2’.30" in advance of expected arrival of the goods train. This is essential to facilitate the driver booking lobby to send call book to driver and bring driver in time for the train. On receipt of train notice number by the drivers booking lobby, the crew controller/ATFR on duty sends call book to driver who may be available in the running room in case of outstation driver and at residence in case of headquarter driver. While calling the driver, general practice is to call the outstation driver first if out outstation and headquarters drivers are available at the same time.
(2) There are various factors, which are considered for giving ordering time of goods train. Ordering time depends on the train operating condition as explained below:

2.1.2. (i) Power through staff change (PTSC) trains:

Ordering of the goods train is generally done by Chief Controller (CHC) (Goods) or Area Controller. CHC (Goods)/Area Controller watches the running of train in section and make a forecast of expected arrival of train at crew change point or in yard. The goods train which is arriving at crew change point or yard may be dispatched as it is without any power change or TXR examination. Such goods train arriving at yard or crew change points are know as power through staff change (PTSC) trains. Therefore, for PTSC trains, the expected arrival of the trains at crew change point or yard may be the time for booking the crew or ordering time.

In such case, new set of crew will take charge from the incoming crew and train will depart within 15 minutes time after the crew change.

(ii) Yard Formed Trains:

There may be train which is formed in yard after the following works:

a) After marshalling in the yard.
b) After TXR examination in the yard.

For above types of trains, the power has to be made available. CHC (Goods) plan the power and make as assessment of expected arrival of power on the ready load in the yard. After arrival of power on load, the time will be taken for air pressure/vacuum creation in the goods train. Average time which a goods train takes for full vacuum/air pressure creation is about 45 minutes. Therefore, CHC (Goods) while ordering the goods trains takes into account following conditions:

a) Arrival time of Power.
b) Time taken for movement of power from arrival point to load.
c) The time taken for vacuum/air pressure cration.

After taking into the above factors, ordering time of the train should be given to that when crew arrives on the train, the train is ready in all respect for departure. The internal movement of the engine in the yard for taking the engine on load are generally performed by the shunter deputed in the yard. However, some time incoming driver can also do this work.

(iii) Ordering of the train when traction changes:

The goods train which arrives in the yard or crew change point may be required to go from a electrified territory to non-electrified territory or vice-versa. Moreover, engine may be required to be changed for the purpose of attending the locomotive for schedule/un-scheduled repair. In such case, the incoming engine has to be changed and other suitable engine to be provided. Therefore, whenever
engine is changed, TXR staff will provide a continuity certificate in the yard (if TXR staff exist, otherwise driver and guard of the train have to check the continuity themselves). Therefore, while ordering such a train TLC/CHC (Goods) takes into account the time taken for taking engine on load and ensuring continuity. As a thumb rule generally one hour time to be given after engine is taken on load in such cases.

From the above, we see that ordering of the goods train is very important for optimum utilization of running staff. Therefore, TLC and CHC (Goods) should have close liaison for giving realistic ordering time for goods train.

(iv) Availability of line clear:

The situation also arises when the train is ready in all respect, however, the path for movement of goods train is not available due to Mail/Express/Passenger trains running one after the other. Such a time period when number of Mail/Express trains runs one after the other at a very close time margin which does not allow a goods to move in between, is called the period for mail express block. Each division will be having mail block at some time. The CHC (Goods) orders the goods train taking this factor into account. In the Main/Express block period of no goods train is generally ordered to avoid pre-departure detention of the crew. If the train is ready, shunters are deputed on train engine to man it and driver only arrives at the ordering time after the mail block period is over.

From the above, we see that ordering of the goods train is very important for optimum utilization of running staff. Therefore, TLC and CHC (Goods) should have close liaison for giving realistic ordering time for goods train.

2.2.1 CREW AND LOCO LINKS

Crew link is prepared for ensuring proper utilization of running staff and for calculating the requirement of drivers/assistant drivers for running mail/express/passenger trains on a division. The factors which are to be taken into account for preparation of crew link will be discussed in this chapter.

FACTORS TO BE CONSIDERED WHILE PREPARING CREW LINK

1) Headquarter rest of driver

Whenever driver signs off at headquarter station, driver must be given a minimum of 16 hours of rest. This includes 2 hours call time. In addition to this, driver must get two numbers of periodical rest in a fortnight. Periodical rest is home-station rest including one night in bed. In whole months working there should be either four periodical rest of 30 hours or five periodical rest of 22 hours each. Therefore, the crew link should be prepared in such a way that this condition of headquarter and periodical rest is fulfilled. Any crew link violating this rule will not be valid and acceptable.
2) **Outstation rest of driver**

Driver signs off after working the train from his headquarter at the destination or at next crew change point. After signing off at outstation driver takes the rest in running room is called outstation rest. Generally outstation rest is of 6 hours (Min.) including 2 hours of call time to driver. While preparing the crew link, adequate outstation rest to the driver should be available. At the same time, excessive detention of driver in running room should also be avoided.

3) **Running time between two crew change points**

While deciding the crew change point for Mail/Express/Passenger train, it is planned that the running time between two crew change point should not exceed 8 hours. Therefore, while making the crew link, this point should be taken into account and crew change point should be decided accordingly.

Provision of running room at crew change point is essential so that drivers signing off at crew change point may take rest properly.

4) **Duty hours in a fortnight**

Duty hours of the driver is taken from the time of signing on to the time of signing off. In the period of a fortnight, total duty hours of the driver should not exceed 104 hours. Therefore, crew link should be made in such a way that driver is utilized for not more than 104 hours in a fortnight. Moreover, link should not be slack so that driver remains under-utilised. Therefore, based on the time table timings, efforts should be made to optimize the use of driver.

### 2.2.2 PROCEDURE FOR MAKING A CREW LINK

Working time table (WTT):

First of all, the arrival and departure timing of all the Mail/Express and Passenger trains at crew change points should be noted down for which crew link is to be made. To illustrate this, an example is given as under:-

There are three pairs of passenger trains to be run between BSL-BD and two pairs of passenger trains between BSL-KNW. Their timings for crew availability have been noted down in the table given below:

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>TRAINE NO.</th>
<th>BD A</th>
<th>D</th>
<th>BSL A</th>
<th>D</th>
<th>KNW A</th>
<th>D</th>
<th>HQ REST</th>
<th>O/ST N REST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1387</td>
<td>NR</td>
<td>NR</td>
<td>X</td>
<td>08.40</td>
<td>12.25</td>
<td>X</td>
<td>38 (Periodical rest)</td>
<td>12’40”</td>
</tr>
<tr>
<td>2</td>
<td>1388</td>
<td>NR</td>
<td>NR</td>
<td>17.40</td>
<td>X</td>
<td>X</td>
<td>14.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1357</td>
<td>NR</td>
<td>NR</td>
<td>X</td>
<td>19.50</td>
<td>00.25</td>
<td>X</td>
<td>22'10”</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1358</td>
<td>NR</td>
<td>NR</td>
<td>08.00</td>
<td>X</td>
<td>X</td>
<td>00.50</td>
<td>11’20”</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>1383</td>
<td>13.15</td>
<td>X</td>
<td>X</td>
<td>06.40</td>
<td>NR</td>
<td>NR</td>
<td>21’50”</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1384</td>
<td>X</td>
<td>10.00</td>
<td>16.15</td>
<td>X</td>
<td>NR</td>
<td>NR</td>
<td>15’05”</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>1385</td>
<td>00.30</td>
<td>X</td>
<td>X</td>
<td>18.30</td>
<td>NR</td>
<td>NR</td>
<td>25’15”</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1386</td>
<td>X</td>
<td>12.00</td>
<td>19.00</td>
<td>X</td>
<td>NR</td>
<td>NR</td>
<td>10’30”</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>1397</td>
<td>18.05</td>
<td>X</td>
<td>X</td>
<td>12.10</td>
<td>NR</td>
<td>NR</td>
<td>26’10”</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1398</td>
<td>X</td>
<td>03.00</td>
<td>09.00</td>
<td>X</td>
<td>NR</td>
<td>NR</td>
<td>12’40”</td>
<td></td>
</tr>
</tbody>
</table>

Average HQ Rest ------ 26’40”
Average O/Stn Rest ------ 14’25”

Note:

1. Driver generally take about 30” to sign off arrival of the train for completing the work of Handling over the loco and repeating the punctuality position of train to PCOR.

2. Similarly, driver also signs on about 30” before the arrival of the train. Therefore, this 1 hour time should be taken into account while calculating the rest of driver.

From the above table, the drivers reaching at KNW and BD can be linked, e.g. driver reaches KNW by working Train No. 1387 DN at 12.25 hours after availing the rest of 8 hours in running room, this driver is available to work the train again from KNW from (12.25 + 08.00) = 20.00 hours. However, the first train available for this driver from KNW is 1358 UP which departs from KNW at 00.50 hour. Therefore, this driver will have to work train No. 1358 UP after availing the outstation rest of 12 hours. Thus, depending on the time table of train, the HQ and outstation rest may be more than prescribed.

In a similar fashion, the drivers at BD, KNW and BSL can be connected considering the rest hour requirement. If we draw the crew link, the same will be as given in fig. 3.041.
From the above the Fig. 3.041, we observe that if one driver is required to work on the link, it will take 11 days to work all the trains. This means total 11 drivers will be required to work these passenger services daily.
2.2.3 Calculation of sanctioned strength

1) After working out the requirement of bare minimum number of drivers, the sanctioned strength will be as under:

If \( R \) is the bare minimum requirement, sanctioned strength ‘\( S \)’ = \( R + 0.3R = 1.3R \).

30% is added to the bare minimum requirement to take care of leave reserve and rest/training.

Note: Number of Assistant Drivers required will be same as Drivers.

2) CONCLUSION

In this subject, the method for preparation of crew link has been explained. This is essential to find out the requirement of staff for running a set of Mail/Express/Passenger services. From the Railway working time table, practice should be made to draw the crew link as per the method explained above.

2.3.1 LOCO LINK:

Loco link is an arrangement of locomotive for working a set of trains from one station to other station for Mail/Express/Passenger trains. Loco link gives the requirement of locomotive required to run the given number of trains. Loco link is prepared by HQ office in consultation with COM.

Factors to be considered while preparing a loco link:

1) Availability of the Loco.
2) Trip Inspection:

Mail/Express or Passenger locomotives are required to be given trip inspection as under as per AC traction manual:

After running of 3000 kms or at completion of a trip whichever is later.

Therefore, loco link has to be prepared in such a way that the trip inspection is done as per the yardstick and no loco runs overdue trip inspection in the link. Loco link should have the provision of the trip inspection at suitable interval.

3) Lie over period at destination station:

When a loco completes its journey after working a train, this loco is sent to yard, trip shed etc. This loco is again attached to the train as per the link. The period for which it remains idle at destination station (i.e. the time period when loco is detached and again attached to train) is known as lie over period of the locomotive. This time should be adequate to take care of the types of attention required to be
given to locomotive. Therefore, lie over period of locomotive is a loco link will depend on the following:-

A) Lay out of yard and location of trip shed:

If the locomotive is to be given trip inspection during the lie over period, the time (T) to be available during the lie over period should be as under:-

\[ T = T_{t} + T_{m} \]

- Time taken for trip inspection (T_t)
- Time required for movement of loco from station to trip shed and back (T_m)

Generally, the time required for trip inspection is 2 hours to 2 hour 30 minutes. However, time is also taken to attend the drivers booking regarding loco defects. On an average, it is seen that one hour time will be required to attend to various types of defects booked by drivers. Therefore, for trip inspection, time to be given is about 3'30" to hours considering the practical working in trip shed. Sometime, when loco arrives in trip shed, staff may be busy in dealing with the problem of other loco. In that case, loco has to wait. Therefore, allotting a time of 4 hours for trip shed in case of trip inspection to be done is quite reasonable and practical.

Similarly, some time will be taken for movement of electric locomotive from station to trip shed. Again this time will vary from one destination to other. Generally, trip sheds are located in the yard in such a way that loco can be moved from station to trip shed within 30" time. However, due to variation in yard lay out and other operating condition trip sheds are to be located far away from station where engine is detached. In such situation, the time taken to move the loco from station to trip shed may be as high as two hours.

B) Whether destination in a terminus:

Moreover, if the destination of the train is CSTM or HWH or Madras etc. where the railway track terminates, the locomotive at such station cannot be immediately detached and sent to trip shed. Therefore, loco has to remain on station platform till the rake is backed to washing siding in the yard after about 45" from the arrival of the train. This aspect should also be taken into account while planning the loco link.

Practical example

Central Railway locomotives are reaching HWH after working the train like 2151 Samrasta Exp. As HWH is a terminus station and also the trip shed is located away from station at Santaragachi S.E. Railway requires a lie over period of 10 to 12 hours for trip inspection for the reason explained in above paras.

4) Consultation with other Railways/Divisions:

While planning the loco link, other Railway or division (where the loco will be detached and attention will be given) should be consulted for requirement of time for lie over period. Similarly, trip inspection schedule should also be planned and place should be nominated in the link.
5) **Provision of Schedule Inspection (IA, IB or IC of loco):**

Loco link should include the withdrawal of loco for monthly schedule after it has worked for 35 to 40 days in the link. Withdrawal of the loco at Homing Shed station should be planned in such a way that it suits the homing shed by way of working hours for carrying out the schedule.

In electric loco sheds, normally locos are placed for schedule inspection at about 2 to 3 hours in (0-8) shift of working. This helps the homing shed in carrying out complete testing of locomotives by 8 hours. The staff in (0-8) shift will give complete detail of unscheduled work to be carried out along with schedule work.

This will enable the staff in day shift to carry out the work properly. Therefore, withdrawal of loco to be planned by such trains which reaches homing station at about 0 to 1 hour so that loco reaches the homing shed just in time. Therefore, withdrawal of loco to be planned while considering following points:

i. **When to withdraw the loco –** By suitable train so that it reached homing shed station at about 0 to 2 hours.

ii. **From which train to withdraw the loco -**

This should also be decided judiciously after studying the working time table. there are some trains where time allowance and running time is sufficient, such trains can make up the loss of time which takes place while changing the engine for withdrawing the same for such inspection. Generally, for changing the engine 10” extra is taken for loco movement and vacuum creation.

From this link in fig. (shown Next page), we find that for running trains between Igatpuri-Nasik, Igatpuri-

**Calculation of the requirement of engines:**

The loco link gives the bare minimum requirement of engines. Therefore, the actual engine requirement will be as under:

\[
\text{The requirement of loco} = \text{Bare minimum requirement} + \text{repair allowance.}
\]

The repair allowance for Mail/Express locomotives is 9.2 statistical. Therefore, requirements of locomotive will be:

\[
\text{Bare minimum requirement as per loco link} = 0.92
\]

**CONCLUSION**

In this subject, we have learned to draw loco link and also factors to be considered for drawing a loco link. More practical should be done to draw loco links from the Railway time table for better understanding.
AC LOCO LINK OF C.RLY – CR-3 LINK NO. BSL-3
Air–brake loco link (WAM4)

<table>
<thead>
<tr>
<th>IGP</th>
<th>BSL</th>
<th>HWH</th>
<th>EKM</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.30</td>
<td>8029</td>
<td>14.30</td>
<td>1525</td>
</tr>
<tr>
<td>01.50</td>
<td>8030</td>
<td>12.30</td>
<td>1831</td>
</tr>
<tr>
<td>00.50</td>
<td>8029</td>
<td>6.10</td>
<td>308</td>
</tr>
</tbody>
</table>

Total – 3664 km

Link No- BSL-3
No. on of loco Reqd .for link = 6
No, on holding Basis = 7
(Since power detached at BSL for schedule Insp.)
Total link engine Km /day = 3664 km
Utilization (KM/LOCO/Day) = 3664/6 = 611 km

AC LOCO LINK OF C.RLY – CR-5
LINK NO. BSL-5, Air–brake loco link (WAM4)
w-e-f- 01. 09. 2004 (Weekly Train)

<table>
<thead>
<tr>
<th>MMR</th>
<th>BSL</th>
<th>NZM</th>
<th>EKM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAT. 23.20</td>
<td>6217 (Swarnjayanti)</td>
<td>TI</td>
<td>21.20-SUN 1281</td>
</tr>
<tr>
<td>TUE. 03.05</td>
<td>6218</td>
<td></td>
<td>05.50-MON 1281</td>
</tr>
<tr>
<td>TUE. 23.20</td>
<td>1053(KOP-NZM EXP)</td>
<td></td>
<td>21.20-WED 1281</td>
</tr>
<tr>
<td>FRI. 03.05</td>
<td>1054</td>
<td></td>
<td>05.50-THU 1281</td>
</tr>
</tbody>
</table>

Total – 5124 km

Link No- BSL-5
No. on of loco Reqd .for link = 01
No, on holding Basis = 01
Total link engine Km /day = 5124/7 = 732 km
Utilization (KM/LOCO/Day) = 732 km
AC LOCO LINK OF C.RLY – CR-4

LINK NO. BSL-4, Air brake (WAM4)

<table>
<thead>
<tr>
<th>Time</th>
<th>BSL</th>
<th>MMR</th>
<th>IGP</th>
<th>NGP</th>
<th>G</th>
<th>HWH</th>
<th>EKM</th>
</tr>
</thead>
<tbody>
<tr>
<td>07.15</td>
<td>1354</td>
<td>1323</td>
<td></td>
<td></td>
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<td></td>
<td>15.40</td>
</tr>
<tr>
<td>21.10</td>
<td></td>
<td>2129</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18.15</td>
</tr>
<tr>
<td>00.45</td>
<td>2130 Azad Hind. Exp.</td>
<td>TI</td>
<td></td>
<td></td>
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<td>04.50</td>
</tr>
<tr>
<td>00.35</td>
<td>TI</td>
<td>1039</td>
<td></td>
<td></td>
<td></td>
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<td>17.07</td>
</tr>
<tr>
<td>06.30</td>
<td>1040 Mah. Exp.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>21.10</td>
</tr>
<tr>
<td>21.10</td>
<td></td>
<td>1324</td>
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<td></td>
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<td>19.10</td>
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<tr>
<td>14.50</td>
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<td>1353</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>08.20</td>
</tr>
<tr>
<td>18.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17.30</td>
</tr>
</tbody>
</table>

Link No- BSL-4
No. of loco Reqd. on link basis = 08
No. on holding Basis(for sch.,cc) = 09
Total Km/day = 5704
Utilization (EKM/LOCO/Day) = \( \frac{5704}{8} \) = 713 Km
2.4.1 POLICY OF RECRUITMENT OF RUNNING STAFF

In this chapter, the guidelines issued by Railway Board for filling up the vacancy of assistant driver is explained. This will help in taking proper action in filling up the vacancy in consultation with personnel branch.

Methods for recruitment

Running staff recruitment is done as Assistant Driver. There are guidelines which have been issued from time to time for filling up the vacancies through various sources of man power. This is given as under:

1) 50% of the vacancies are filled by lateral induction from amongst the first firemen who are atleast 8th class pass and are below 45 years of age. The shortfall in first firemen if any, is made up by way of usual selection procedure from amongst II firemen. The firemen are available only on those divisions where steam traction is existing. The divisions where steam traction is eliminated, the I and II firemen will not be available.

2) Balance 50% of the vacancies shall be filled by lateral induction of matriculate 1st firemen with minimum 3 years of continuous serve. Shortfall if any by promotion from amongst II firemen – through Departmental Examination.

3) Shortfall if any, after following the procedure for filling up the vacancy as given above, is to be made good by conducting departmental examination from amongst matriculate class IV staff of loco sheds with 5 years of continuous service. Class IV staff in shed as cleaner, Khalasi etc are eligible.

4) Even after following the above procedure, the vacancies in the running staff category exists, the remaining posts can be filled in by the lateral induction of skilled artisan staff of electrical/diesel loco sheds. But this way maximum 20% of the total vacancy can be filled in.

5) If vacancy of assistant driver still exists even after filling up the post as per method given at Sr. No. (1), (2), (3) & (4) above, these vacancies can be filled in by direct recruitment through Railway Recruitment Board with minimum qualification of matriculate with ITI.

Above guide line for recruitment has been given in Railway Board’s letter NO.E(NG)I/90/PM-7/34 dated 16.7.1991.

Qualification for Asstt. Drivers:

* Assistant Loco Pilot (1N. E(EN)II/86/RC-2/24, 20.08.1992 and 02.09.1998, Matric + ITI or Act app. 1961 (50% dept+ 50% RRB)

As per Railway Board’s letter No. E(NG) I-2006/PM7/6 dt. 22.09.2006 (RB/EST/No.138/2006) Qualification for Departmental selection of ALP is Matric & ITI will be additional qualification.
2.4.2 Assessment of vacancies:-

For filling up the post, the vacancy is to be assessed. This assessment is done as under:

1) Existing vacancy in Asstt. Driver = a
2) Vacancies to be created due to promotion to shunter or driver in next one year. = b
3) Vacancies to be created due to retirement/vol. retirement. = c

Therefore total vacancy to be filled in = a + b + c

2.4.3 Policy of promotion of running staff:

In earlier chapter No. 3.09, the method of recruitment and training of running staff has been explained in detail. The running staff when recruited as assistant driver, gets promotion as per the order given as under:

i) Assistant Driver/Firemen (In case of Steam Engine only)
ii) Shunter
iii) Goods Driver
iv) Passenger Drivers.
v) Mail/Express or Special ‘A’ drivers.

The running staff recruited as assistant driver gets the promotion after following the selection procedure at each stages. These procedures may slightly vary from division to division of railway to railway. However, the basic idea of selection procedure at each stages is to judge suitability and ensure competency in grade where he has to work. The procedure followed for promotion at various stages is as under:

(i) Promotion from assistant driver to shunter:

Senior most trained assistant driver are considered for promotion as shunter. There used to be a promotional training course for assistant drivers to shunter. However at present almost in all the divisions this training has been stopped. For selecting the shunter out of assistant driver, a screening test is conducted by a committee of assistant officer from Power, Safety and Personnel branch. Those considered suitable in the screening test are promoted to work as shunters. It is a
general practice to give 2 weeks of handling training in the traction where the
candidate has to work under the supervision of loco inspector. After judging the
suitability in handling training, a competency certificate is issued by
SR.DEE(OP)DEE(OP) and candidate is allowed to work as a shunter.

(ii) **Promotion of shunter/assistant driver to Goods Driver**

The suitable candidate from shunter category as well as the trained assistant
drivers are considered for promotion as a goods driver. In the division, where
vacancies of goods drivers were in large number, and shunters were not suitable (for
promotion as driver because of low literacy level and not passing the examination
during training course), the assistant drivers were considered for direct promotion to
driver. The assistant drivers and shunters are called 3 times the numbers of actual
vacancy of drivers to be filled in. The committee for selection consists of the
following officers.

1) DEE (OP)
2) DPO/APO
3) DME

**NOTE :-** All candidates must pass the Driver promotion course in Diesel or AC
both for consideration of selection as driver.

The above selection committee conducts viva-voce test of the candidates and
suitability of the candidates is judged as under:

1) Marks for seniority = 15
2) Marks for confidential = 15
report for last 3 years
3) Personality Test = 20
4) Technical ability = 50

From the above, the candidate must get 60% marks for passing the test. For
SC/ST candidates, marks for seniority is not counted. After the selection is over, the
result sheet is prepared and signed by all the committee members and put up to
ADRM/DRM for approval.

After getting the competent authority’s approval, the pane of goods driver is
formed and declared for taking out further promotion order.
2.4.4 Procedure for training of Assistant Driver/Shunter to driver before allowing them to work independently:

They are given following training.

1) Handling training of locomotives:

This is given for one month period. This training is generally given by nominated loco inspector to whom the driver has been allotted. During handling training, the driver works under the supervision of loco inspector and makes himself conversant with the operation of various cocks, handles, location of equipment etc for day to day working.

2) Road learning training

   i) The road learning training is given to each driver for the sections where he has to work. The duration of road learning is mentioned in Chapter 2.0.2. After the road learning training, the candidates give declaration as per the format given as under:-

      FORMAT
      “I hereby declare that I have taken road learning in following section.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Section</th>
<th>Date of learning</th>
<th>No. of trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I am fully aware of the sections.

Signature:_______________________
Name:__________________________
Design:_________________________
Date:____________________________

   ii) If the candidate is not confident of road learning, in the prescribed period, he may ask for an extension of road learning period to his depot incharge. On getting such request, road learning period is suitably extended. But, the declaration of having learned the road has to be taken from each candidate.

   iii) Training as co-driver:- It is normally a practice to allow the newly promoted driver to work as co-driver for a month along with the experienced goods driver. This helps to get the feel of driving and absorbing the driving technique by newly promoted candidate and clarify his doubts. During this period of working as a co-driver, nominated loco inspection keeps a watch on the performance of the driver and guides and counsels suitably.
2.5.1 Competency Certificate

After completing their training as above, nominated loco inspector gives a certificate for the driver that the handling, road learning and co-driver training has been done satisfactorily and fitness to work train independently.

After getting certification by loco inspector, the candidate is once again interviewed by AEE(OP)/SR.DEE(OP) and Safety Officer and if candidate is found suitable during such interview the competency certificate is issued authorizing the candidate to work the train independently.

The format for issue of competency certificate is given in Chapter 1.5.1.

For filling up the vacancies of goods driver, due to non-availability of shunters suitable for promotion as driver, Railway Board has given relaxation from time to time for promotion of assistant driver to goods driver with the following conditions:

1. Assistant driver should have 60,000 kms of foot plate inspection as assistant driver.
2. Assistant driver has completed 2 years of service on line.

With the above condition, Assistant Drivers are promoted only on ad-hoc basis. They have to be regularized as a goods driver after following the proper procedure of selection as explained above.

Promotion of Goods Driver to Passenger Driver:

The promotion of goods driver to passenger driver is done with the help of a viva-voce test. Selection of goods driver to passenger driver.

1. The list of goods drivers having 5 years or more service as a driver is prepared. Number of driver in this list will not exceed 3 times the number of vacancies of passenger driver to be filled in.
2. A selection committee is formed at the level of JA grade officers consisting of following:
   a) Sr.DEE (OP)      b) Sr.DPO      c) Sr.DME

This selection committee gives them the marks during the viva-voce test as under:

1) Marks for seniority = 15
2) Marks for confidential reports of last 3 years = 15
3) Personality Test = 20
4) Technical ability = 50

The candidates must secure 60% marks for passing viva-voce examination. For SC/ST candidates, marks for seniority are not counted.
2.5.3 Promotion of passenger driver to Mail/Express Driver:-

This promotion is done purely on the basis of seniority. No formal viva voce test is taken. However, before promoting the passenger driver to Mail/Express Driver, following item is looked into.

The candidate is suitable to work Mail/Express trains and is not involved in accident case and no D & AR action is contemplated against him.

NOTE:

While considering the promotion at various levels, the common points which are to be considered in each promotion are as under:

1. No Vigilance / D&AR case is pending against the candidate.
2. The Confidential reports for last 3 years are examined and the candidate is not graded ‘Below Average’ or no adverse remarks written in CR viz. ‘Not Fit for promotion’ during the last 3 years in the Confidential reports.
3. Generally the candidate should not be C category (safety) driver for promotion to passenger driver. In such cases, the driver should be given intensive training to upgrade the category and then he should be considered for promotion as passenger driver.

2.5.4 Opportunity of promotion for running staff as Loco Operating Supervisor:-

(1) Railway Board has specified that loco operating supervisor, who works as a loco foreman/ATFR/PCOR/TLC, Crew Controller and Loco Inspector are to be selected from the drivers only.

For considering the running staff for selection, the staff should meet the following conditions:

i) The candidate should have 5 years experience of working as a driver.

(2) Procedure for selection

For conducting the selection, a notification has to be issued by Sr.DPO well in advance. Generally, one months notice is to be given. In this notification, the date and venue of selection is to be specified and application should be invited. During the selection, written test and viva-voce is conducted by selection committee at JAG level.
The selection committee consists of:

1) Sr.DEE (OP)  
2) Sr.DPO and  
3) Sr.DME

Written test:-

During the written test, candidates are tested in the followed order:-

1) General and subsidiary rule and train operation.
2) Electric Loco operation and
3) Diesel loco operation.

Viva-voce test:-

Candidates who qualify for written test are called for viva-voce test. The same selection committee interviews these candidates and their suitability is judged.

The above policies of promotion are given for guidelines. There may be slight variation in selection procedure on different railways or there may be latest alteration. In that case, those are to be taken into account.
3. STATISTICS OF LOCOMOTIVE

3.0 DEFINITION AND EXPLANATION OF TERMS USED IN LOCO STATISTICS

Every month each railway compiles the information of loco utilization and its accountal as per the format known as statement 4A for steam/diesel/electric locomotive.

In this chapter various terminologies used in 4 A statement and method for preparing the 4A statement has been explained.

3.0.1 Description of the terms used in 4A statement

1. Average authorized stock: This indicates the average number of engines for the month. This can be illustrated by the following example.

Let us assume that the holding of a electric loco shed for the month of July has the following addition.

1. Holding of the electric loco shed on 1st July, 1994 = 109
2. 10 locos arrived on 16th July and taken in holding. Therefore, holding from 16th July = 109 + 10 = 119
3. 15 locos arrived on 26th July, 1994

Therefore holding from 26th July = 119 + 15 = 134
Therefore average authorized stock for the month of July 1994

= \(109 + \frac{(16 \times 10 \times 6 \times 15)}{31}\) = 120.6

In this way average authorized stock of a loco shed/Railway is calculated every month. This is the total number of engines authorized for the line by the Railway Board.

3.0.2 Average total number of line: This figure indicates the average number of engines actually on line. This takes following into account.

a) Engine replaced but still running on line is included.

b) Engines lent to other department, engines condemned but awaiting formal sanction are not to be included.

c) Engine hired from other Railways/department to be included.

3.0.3 Average number under or awaiting repairs:- Ineffective figure of electric locomotive is calculated on hourly basis. An engine remaining under or awaiting
repair for full day is equivalent to one engine day. An engine handed over to traffic after remaining ineffective for part of the day shall be reckoned as ineffective for the total hours it was under or awaiting repair. The ineffective day being reckoned by dividing the actual ineffective hours by 24.

The ineffective of the locomotive is further categorized in two parts.

(i) Statistical ineffective: If the loco remains under or awaiting repair in shed for full calendar day i.e. from 0 to 0 hours this is known as statistical ineffective. This will always be in whole number.

If 2 locos remain under repair from 00 hours to 00 hours, the statistical under repair = 2.

(ii) Minor ineffective: If the loco remains under or awaiting repair for the part of the day, the same is known as minor ineffective. Method of calculation is illustrated as under:

Loco No. 23026 remains under repair from 16 hrs to 23 hrs.

Loco No. 23275 remains under repair from 8 hrs to 22 hrs.

Therefore,

\[
\text{minor ineffective} = \frac{(7 + 14)}{24} = \frac{21}{24} = 0.88
\]

Therefore,

\[
\text{minor ineffective of locos.} = \frac{\text{Total sum of engine hours for a calendar day}}{24}
\]

Average No. effective: This is the availability of the loco for traffic use.

Therefore, average No. effective = \[\frac{\text{Average total No. on line} - \text{Average No. under repair or awaiting repair}}{24}\]

Average No. in use: The locomotive which are used by traffic or any other department are to be accounted as per the use on different services. The type of services which has been classified for the locomotive use is given as under:-

(i) Passenger service:- The locomotive used for passenger/mail/express services are accounted as loco used on passenger services. This is calculated as under:

\[
\text{Loco used on passenger services} = \frac{\text{Total engine hrs on mail/express/passenger services in a calendar day}}{24}
\]
(ii) Mixed services: There are certain types of trains like parcel trains, plantain special etc. These are counted as mixed services and they are calculated as under:-

\[ \text{Total locos on mixed service} = \frac{\text{Total engine hrs on mixed services in a calendar day}}{24} \]

(iii) Goods services: Engines utilised for running goods service are accounted as engine used on goods service and it is calculated as under:-

\[ \text{Total locos on goods service} = \frac{\text{Total engine hrs on goods services}}{24} \]

(iv) Shunting services: There are certain engines in the yard or sidings earmarked for shunting works only. Such engines are counted under shunting services. However, if the train engine is utilised for carrying out shunting work for that train, the shunting engine hours are to be counted in pass/mixed for goods services for which the train engine has been used for carrying out shunting work.

For example, if a engine working on a goods train is utilised at any station by station master for carrying shunting work for goods train, the engine hours spent for such shunting work will be counted as goods service engine hours.

(v) Departmental services: There are number of usage of engine for departmental work of division. Such engines are counted as departmental service. Following types of services are counted as departmental services.

a) Engine used for moving ballast trains and rails for engineering department.
b) Engines used for carrying out track maintenance work such as PQRS etc.
c) Engines used as pilot engines which run for protection of trains.

(vi) Banking services: Engines are required to bank the heavier load on a steep gradient to avoid stalling of the train. There are certain grade section in division where all the goods train above certain load requires the help of a banking engine. At such places a full time (round the clock) banking engine is provided. Engine hours used for banking a train is counted in the type of train it has been used. If a banking engine has been used for banking a goods train, the same is counted as engine hours on goods services.

NOTE: If an engine is used for two or more services during the day, from midnight to midnight, it is to be allocated to the different services on the basis of the time spent on each service.

**3.0.4 ENGINE KM PER DAY PER ENGINE IN USE:**

This is calculated service wise. The engine KM earned is divided by the engine used for earning the Kms in a calendar day. This is calculated as under:

\[ \text{Engine Km per day per engine in use} = \frac{\text{Engine Km earned in a calendar day}}{\text{(engine hrs in use)}} \]

\[ = \frac{\text{Engine Km earned in a calendar day}}{24} \]
3.0.5 ENGINE KM PER DAY PER ENGINE ON LINE:-

This is also calculated service wise i.e. separately for goods, passenger, departmental etc services. This is calculated as under:

\[
= \frac{\text{Engine Km earned in calendar day}}{\text{(engine hrs on line)}} \times 24
\]

(Engine Km per day per engine on line)

(The difference between in use and on line figure may be due to some engines remaining idle for repair to be moved to shed/shop etc)

3.0.6 ENGINE KM PER DAY PER ENGINE ON LINE ON ALL SERVICES:

This is the average figure calculated as under:

Engine Km/day/engine on line on all service

\[
\frac{\text{Eng.Km/day/engine on line for (Pass.services + Mixed Service + Goods services)}}{3}
\]

Engine Km per day per engine in use on all services

This is the average figure and calculated as under:

Engine Km/day/engine on line on all services

\[
= \frac{\text{Eng.Km/day/engine on line for (Pass.services + Mixed service + Goods services)}}{3}
\]

3.0.6 CLASSIFICATION OF ENGINE FAILURES:

Engine Failure: Engine is considered to have failed if the engine is not able to complete its journey with the specified engine in specified time. Engine failure is classified as under:

(1) Statistical engine failure: If the engine fails to work its booked train to destination or causes a delay in arrival at destination of 30 minutes or more for mail/express/passenger train and 60 minutes or more for freight trains due to the problems related with locomotive or enginemanship of crew is categorized as statistical engine failure.
(2) **Non statistical engine failure**: Wherever the loco developed some problem during its course of journey but the loss of time is less than 30 minutes in case of mail/express/passenger trains and less than 60 minutes in case of goods train, the engine failures are termed as non-statistical engine failure.

(3) **Calculation of time loss**: In case of passenger carrying train, the loss of time should be calculated as net. Mail/Express/Passenger train are also gaining time due to its running with maximum permissible speed. Therefore, net time loss = time lost – time gained. For example, if an express train has lost 25 minutes due to loco problem but further during the run, it has gained 15 minutes time, the net time loss will be $25-15 = 10$ minutes only.

In case of goods train only loss of time will be equal to the time lost by the train as the time gained by goods train is not maintained.

(4) **Reason for engine failure**: The reason for engine failure is classified as under by the homing shed.

i. Defective design.
ii. Defective material.
iii. Bad workmanship in shop.
iv. Bad workmanship in shed.
v. Mismanagement by engine crew.
vi. Miscellaneous – the engine failure due to cattle run over etc.

There are certain cases where failure of an engine is not counted as statistical engine failure. These conditions are as under:

i. Failure of departmental service engine.
ii. Failure of shunting service engine.
iii. Failure of trial engine (After heavy repair schedule, like AOH, IOH, POH Traction motor, transformer replacement).
iv. Failure of locomotive overdue for schedule for more than 24 hours.

The above failure will be accounted as non-statistical engine failure.

3.1 **METHOD FOR PREPARATION OF 4 A STATEMENT**:

3.1.1 The various terms used for preparation of 4A statement has already been explained in the previous chapter 3.0.1. Now it is possible to prepare the 4A statement. This statement is prepared every month and sent to Railway Board as per format given below:
<table>
<thead>
<tr>
<th>S.No</th>
<th>ITEM</th>
<th>TYPE OF LOCOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WAG5</td>
</tr>
<tr>
<td>1</td>
<td>Average authorized stock</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Average total number on line</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Average number under or awaiting repairs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.01 In workshop</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.02 Stabled in sheds awaiting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>workshop repairs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.03 Under repair in sheds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.04 Engines in transit to and from</td>
<td></td>
</tr>
<tr>
<td></td>
<td>shed/workshops and also when moved dead</td>
<td></td>
</tr>
<tr>
<td></td>
<td>to and from shed or workshop on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mechanical and elect. Account.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.05 Total (item 3.01 to 3.04)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Average number effective (fit for use)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(item 2-3.05)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Actual number in good repair stored</td>
<td></td>
</tr>
<tr>
<td>5A</td>
<td>Average number available for use (item 4-5)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Average number in use</td>
<td></td>
</tr>
<tr>
<td>6.01</td>
<td>Passenger service</td>
<td></td>
</tr>
<tr>
<td>6.02</td>
<td>Mixed service</td>
<td></td>
</tr>
<tr>
<td>6.03</td>
<td>Goods service</td>
<td></td>
</tr>
<tr>
<td>6.04</td>
<td>Shunting including siding</td>
<td></td>
</tr>
<tr>
<td>6.05</td>
<td>Departmental service</td>
<td></td>
</tr>
<tr>
<td>6.06</td>
<td>Departmental service excluding engine in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>transit to and from</td>
<td></td>
</tr>
</tbody>
</table>
### Traction Rolling Stock: Operation

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.05(ii)</td>
<td>Engine in transit to and from shed/workshop for and after repairs, included under item 6.05(ii)</td>
</tr>
<tr>
<td>ii)</td>
<td>Engines in transit to and from shed/shops for and after repairs when moved in steam under their own power</td>
</tr>
<tr>
<td>iii)</td>
<td>Total (i) &amp; (ii)</td>
</tr>
<tr>
<td>6.06</td>
<td>Total (6.01 to 6.05)</td>
</tr>
<tr>
<td>6.07</td>
<td>Average number spare in sheds (available but not used on a calendar day)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>ITEM</th>
<th>TYPE OF LOCOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>WAG5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Engine kilometers per day per engine in use on:</td>
<td></td>
</tr>
<tr>
<td>9.01</td>
<td>Passenger service</td>
<td></td>
</tr>
<tr>
<td>9.02</td>
<td>Mixed service</td>
<td></td>
</tr>
<tr>
<td>9.03</td>
<td>Goods service</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Engine kilometers per day per engine on line on</td>
<td></td>
</tr>
<tr>
<td>10.01</td>
<td>Passenger service</td>
<td></td>
</tr>
<tr>
<td>10.02</td>
<td>Mixed service</td>
<td></td>
</tr>
<tr>
<td>10.03</td>
<td>Goods service</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Engine kilometers per day per engine in use on all services (item 6.06)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Engine kilometers per day per engine on line on all services (item 2)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Engine failures:</td>
<td></td>
</tr>
<tr>
<td>13.01</td>
<td>Number -</td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>On passenger trains</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>On mixed trains</td>
<td></td>
</tr>
</tbody>
</table>
c) On goods trains

d) Total \((a + b + c)\)

<table>
<thead>
<tr>
<th>13.02</th>
<th>Engine kilometers per engine failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Passenger trains</td>
</tr>
<tr>
<td>b)</td>
<td>Mixed trains</td>
</tr>
<tr>
<td>c)</td>
<td>Goods trains</td>
</tr>
<tr>
<td>d)</td>
<td>Average</td>
</tr>
</tbody>
</table>

The statement item No. 7 & 8 is applicable to steam traction both and hence the same has not been given.

The calculation of various items from Sr. No. 1 to 6 and Sr. No. 9 to 13 should be made based on the explanation given in chapter 3.0.1.

3.1.2 Under each row, two columns have been provided, the first column indicated the figure for the particular month for which loco statistics are being sent and the other column indicate the aggregate figure from 1st April to that particular month. For example, if the 4A statement is prepared for the month of August 1994 the two columns will indicate the figure as under:

1st column will indicate the figure of Aug 1994.

2nd column will indicate the average figure from April to Aug, 1994.

The PCOR/TLC maintains the hourly record of the movement and use of the engines. The record is also maintained for ineffectiveness in shed, on line or in workshops. Based on the hourly records maintained each engine wise the calculation of various items, various types of calculation could be made at the end of the month. It is advisable to maintain daily record of each item for each type of locomotive so that the same can be added and average figure can be calculated at the end of the month. This should be done by the recorder on line round the clock in TLC office.

3.1.3 Target for under repair of locomotive:

Railway Board prescribes the target for locomotive under repair. Target for statistical and minor under repair is given separately. The method for calculation of statistical and minor under repair has already been explained in para 3.0.3. The existing target of under repair is fixed as under:

i) Target for statistical under repair = 9.2%

ii) Target for minor under repair = 10%

a) Statistical under repair: This repair allowance is available for the locomotive of all services.
b) Minor under repair: The repair allowance is available for all services except mail/express/passenger services. This allowance has not been given to passenger services as the provision for minor repair is provided during their lie over period at destination station. This lie over period is treated in use and minor servicing and repairs are done in trip shed/homing shed during this period. As far as the IA, IB or IC schedule are concerned, the provision of withdrawal of loco is made in the loco link and the loco withdrawn for IA, IB or IC schedule and again given ready as per loco link is not taken as under repair and remains in use.

That is why, the minor repair allowance for the coaching services are not provided. However, for freight and other services, no lie over period or link is available where the minor repairs can be done. Therefore a repair allowance of 10% is provided for such services.

3.1.4 Example of calculation of a target outage of shed:

Each shed is having a number of locos which are utilised for various types of services as per the requirement. At present WAM4, WAM4A and WAP1 series of locomotives are utilised for coaching services. Whereas WAG5 series of locos are utilised for freight and services other than coaching on regular basis. While deciding the outage service wise of a shed following should be kept into mind.

1) Coaching outage: The coaching outage of the shed is decided by the loco link for which the engines are to be provided by the shed. The loco link has already been explained in chapter 3.07 and 3.08. The requirement of the loco is found out from the loco link and target for the shed for coaching outage is fixed accordingly.

Therefore, the target for coaching services = Requirement of loco as per link.

Holding of coaching locos in shed = Coaching target x 100
                                  (100% age of statistical repair allowance)

= Coaching target x 100
     (100-9.2) = Coaching target x 100
              (90.8)

(Assuming 9.2% repair allowance for statistical ineffective)

2) Outage for Inferior services While calculating the outage for inferior services, the following types of services are considered:

i) Departmental services

ii) Shunting services
Calculation of target and holding of inferior service locomotive can be illustrated as under. Let us assume the requirement of loco for departmental service and shunting services are \(L_d\) and \(L_s\) respectively.

If \(L_i\) is the number of loco required on holding basis for inferior service, the target for the inferior services will be as under (Assuming 9.2% statistical and 10% minor repair allowance).

\[
\text{Target for inferior outage} = 0.908 L_i - (L_i - 0.092 L_i) \times \frac{10}{100} \\
= L_i (0.908 - 0.908 \times 0.10) \\
= L_i (0.908 - 0.0908) \\
= L_i \times 0.817 \\
= 0.817 L_i
\]

Therefore, \(L_d + L_s = 0.817 L_i\)

Or

\[
L_i = \frac{(L_d + L_s)}{0.817}
\]

In calculating the target outage the statistical repair allowance is taken into account first and then minor allowance has been taken into account.

3. Outage for goods service :- Generally the requirement of coaching and inferior services remain more or less fixed. Therefore, the target of outage for goods services is fixed after deducting the requirement of coaching and inferior services. If the target for good outage is \(L_g\). The holding of the shed for goods loco should be

\[
= \frac{L_g}{0.817}
\]

Therefore holding of the shed can be given as under:

\[
\text{Lh} = \frac{L_c}{0.908} + \frac{L_g + L_d + L_s}{0.817}
\]

Where \(\text{Lh}\) = Loco holding of the shed

\(L_c\) = Target outage for coaching services

\(L_g\) = target outage for freight services

\(L_d\) = target outage for departmental services

\(L_s\) = target outage for shunting services.

Therefore, from the equation No. (1), the holding of the shed can be calculated if the target outage of various types of the services are known. For example, holding of a shed is 100 and its coaching outage and inferior services outage has been fixed as 45 and 5 respectively. The target goods outage can be found out from equation (1) as under:
Lh = Lc + Lg + Ld + Ls \ [1] \ 
\frac{0.908}{0.817}

Given in example

Lh = 100
Ld + Ls = Inferior service outage = 5
and Lc = 45

therefore, substituting the value in eq (1)

100 = \frac{45}{0.908} + \frac{Lg + 5}{0.817}

or \ Lg + 5 = 0.817 (100 – 45 ) = 0.817(100-49)

0.908

= 0.817 x 51 = 41.67

dependent target goods outage = 41.67

In this way, the target outage and holding of the loco can be calculated.

3.2 HIRE CHARGES OF LOCOMOTIVE

Whenever the locomotive is given for use to other agency or other zonal railway, the engine hire charges are levied. These hire charges with private/public sector undertaking and with other zonal railways are different. In this chapter, the method of raising the debit to Zonal Railway an other agencies for hire charges is explained.

3.2.1. Accountal of loco given on hire: Earlier practice of raising the debit or calculating the hire charges of the basis of engine kms earned by engine has been discontinued. Railway Board vide their letter No. F(X)1-92/12-1 dated 12.1.93 have decided that engine hire charges shall be calculated as per the engine hours used by the concerned organization. Engine hire charges fall in two category as under;

i) Engine given on hire to other public/private sector for their use in sidings:-

In such case the accountal of engine hours used is maintained by the traffic department. The information regarding engine hours for raising the hire charges is given to commercial branch who in turn sends the bills to concerned public/private sector. Engine hire charges to private/public sector are revised by Railway Board from time to time.
ii) Engine hire charges to other Zonal Railway:

A locomotive while working Mail/Express/Passenger of freight trains travels from one zonal railway to other zonal railway. The accountal of the number of hours/days of a loco is maintained by the PCOR/TLC recorder in hourly chart of loco movement. This chart gives the engine wise position for its utilization on its owning railways as well as foreign railways. For keeping hourly chart of the locomotive up to day, TLC/PCORS remains constantly in touch with neighbouring division/railway TLC/PCOR and records the time of handing over of engine to other railway and also notes down the time/date of taking over the loco in its own railway.

Division/Railway may maintain the record month wise for their locos utilised by other railway as under:-

<table>
<thead>
<tr>
<th>SL NO</th>
<th>NAME OF RAILWAY</th>
<th>NO.OF FREIGHT LOCO</th>
<th>ENGINE HOURS COACHING LOCO</th>
<th>TOTAL ENGINE HOURS</th>
<th>HIRE CHARGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>South Eastern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Western</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Eastern</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After calculating the hire charges, railway wise the same are sent to respective railway for accepting the debit. Similarly locomotive of other Railways works on own railway and accountal of engine hours used of foreign railway locomotives are also maintained in same fashion month wise. This helps in verifying the debit of engine hire charges set by foreign railways.

3.2.2 Budget for engine hire charges: Adequate funds should be planned for debit/credit of hire charges. This division which has no loco shed will have to cater for the full debit of hire charges for the foreign railway locomotive which will be running in their divisions. Similarly, for the divisions which have got loco shed, should plan the budget by anticipating engine hire charges of the locos of foreign railways and also the hire charges of its own loco earning in foreign railways.

Therefore while planning the budget following should be taken into account.

i) Anticipated hire charges of the own railway/division of foreign railway on an average basis (credit).

ii) Anticipated hire charges for foreign railway/locomotive used (debit).

Traffic pattern for the coaching services are known and hence the engine hire charges can be estimated for coaching locomotive more accurately. However, the same is not true for freight locomotives which does not run to any time table or link. Therefore, hire charges for goods engines are estimated as per the traffic pattern for the last three to six months.
The funds asked for the hire charges should be revised estimate stage based on the traffic pattern and availability of engine of foreign railway and owning railway/division engine in foreign railway.

**Note**: Engine hire charges are accounted against Demand No. in the budget.

### 3.2.3 10 HOURS DUTY IMPLEMENTATION OF DRIVERS

Drivers are running the trains round the clock. As the mail/express/passenger trains may run, late or goods trains do not run as per the time table, duty hours of the drivers are likely to exceed the specified period of duty hours at a stretch. As the over hours may result in drop in efficiency and alertness of drivers which may ultimately affect the safety of train operation. Therefore, watch on the duty hours of drivers are kept. In this chapter, the system of keeping watch on this factor is explained.

Factors affecting the duty hours of drivers: The driver’s duty hours for goods train varies on number of operating factors. These can be summarized as under:

i) Distance between crew change point
ii) Pre-departure detention of the crew
iii) Gradient and banking of the train in section
iv) Traffic density of mail/express/passenger trains
v) Unusual occurrence of the train in section or station
vi) Vacancies of the running staff

The duty hours of the mail/express and passenger trains are generally well within the specified time limit because they run as per time table. However, in rare case where trains are diverted or trains are detained in section due to accidents etc the drivers are provided with suitable reliever.

Therefore, main task remains to watch the duty hours of the drivers of freight services. The duty hours may exceed the specified duty hours if watch is not kept due to the reasons already given above. In such cases, the driver’s efficiency may drop drastically and may commit some or other mistakes which will lead to unusual/accidents. For keeping watch on the working hours of the drivers, crew controller on duty maintains a log books where drivers name and sign on time is recorded / any driver which is approaching a duty hours of 10, a relief driver is arranged by the crew controller. Section controller (SCOR) may be advised to run the goods train of such drivers without stopping for precedence in section so that the driver may reach the destination within 10 hours. However, if this is not possible the relief should be arranged at the convenient station.

Driver may also demand for relief after completing the 10 hours duty period, therefore crew controller should be alert in arranging the relief well in advance to avoid the detention to the train.
3.2.4 Maintenance of record of duty hours of drivers:-

The data from the daily log book of the crew controller is collected and the monthly summary of duty hours of the drivers section wise is prepared with the following criteria.

i) Time taken from wheel move to wheel stop (WMWS): This figure indicate the time the train has taken from its departure from the crew change point to arrival at the next crew change point. This time is generally denoted as Tms.

ii) Time taken from sign On to sign Off (SOSO):-

This time gives the total duty hours of the driver from the time of sign on to sign off. This can be expressed as under:

\[ T_{soso} = T_{ms} + \text{Pre departure detention} + \text{Post dept. detention}. \]

Where in \( T_{soso} \) indicates the time from sign on to sign off.

\[ T_{ms} \] – indicate the time from wheel move to wheel stop.

From the above we can see the time for wheel move to wheel stop depends on the sectional run time and detention of train in section. The time from sign on to sign off is the sum of pre-departure detention and \( T_{ms} \) (time of wheel move to wheel stop).

The record for the same is maintained as per proforma given as under:

<table>
<thead>
<tr>
<th>SN No.</th>
<th>SECTION</th>
<th>TRACTION</th>
<th>TOTAL NO. OF TRAINS RUNS</th>
<th>CASES FOR WHEEL MOVED TO WHEEL STOP</th>
<th>REASONS CASES OF SIGN ON TO SIGN OFF</th>
<th>REASONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td>Less than 10 hrs</td>
<td>10 to 12 hrs</td>
<td>12 to 14 hrs</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The number of cases as per the above proforma are prepared based on the details of the log book of crew controller in the crew control office wherein for each drivers (who has worked the train) the duty hours are recorded.

The above statement is prepared generally every 10 days and one statement for the month. This statement is sent to COD and headquarter office every month. After preparation of the statement and detailing the reasons for bursting of duty hours of drivers, a detailed analysis is made. Based on the analysis, the remedial actions are planned for reducing the cases of bursting of 10 hours duty of the drivers.
3.2.5 Periodical meeting with recognized unions:

As the duty hours affect the working condition and the welfare of the staff, a regular meeting with recognized union is held in the division for discussing the duty hours of the running staff. This meeting is known as 10 hours meeting of the running staff. This meeting is held by DRM/ADRM once in three months in divisions. This meeting is attended by the following:

1) DRM/ADRM
2) SR.DME
3) SR.DEE/TRO
4) SR.DOM
5) SR.DPO

In this meeting, section wise case of bursting of duty hours (more than 10 hours) of drivers are discussed and action to be taken for reducing the case of drivers working more than 10 hours are discussed. The decision taken is recorded as minutes of the meeting and the same is sent to all concerned for implementing the decision taken during the meeting. The decision taken during such meeting and its implementation are once again reviewed in the next meeting.

Similar meeting to review the bursting of the duty hours beyond 10 hours are also discussed at zonal headquarters level by GM with the recognized unions.

While discussing the duty hours, the other facilities given to drivers like condition of running room etc are also reviewed. The duty hours can be controlled by regular monitoring of drivers working hours as suggested in this chapter. This is very important for the safe and efficient train operation. The following factors may be considered while reviewing the case of duty hours of drivers.

1. Whether distance between two crew change point is adequate:
The distance between two crew change point should be such that the driver completes the journey within 10 hours in the traffic pattern which is existing on the division. This would be kept into mind. The distance should be neither too long nor too short.

2. Whether pre-departure detention of the crew is more.

   This factor can be controlled and kept to about 30/40 minutes by judicious order of the train. This has been explained in detail in chapter 2.0.2.

3. Gradient and banking of the train:- If the section is having gradient and requires banking. This causes detention of the train and likely to increase the duty hours. In such case adequate number of banking engines should be arranged and if possible crew change point should be adjusted suitably.
4. Traffic density of Mail/Express train: If the traffic density of mail/express passenger trains are more, the goods trains should be ordered suitably to avoid detention of goods train enroute for precedence of mail and express trains. This has been explained in chapter 2.1.1.

5. Vacancies of Running Staff:

Sometime the administration is forced to utilise the drivers without giving proper relief or rest in the interest of running the train due to vacancies in the category of drivers. An immediate action should be taken to fill up the vacancies of running staff to avoid such a situation. Moreover regular review of the power plan as explained in chapter 2.0.1 should be made and if the traffic has increased the staff strength in driver/assistant driver category should be increased suitably so as to take care of increased requirement.

3.3 ACCOUNTAL OF LE AND DEAD MOVEMENT OF LOCOMOTIVE

PREAMBLE:

Due to various reasons, the locomotive is sent light without a load or sometime it is sent dead with goods or passenger trains. In this chapter, the circumstances under which some movement takes place and the method of its accountal for loco statistics have been explained.

3.3.1 Reasons for Light Engine / Dead movement of loco:

During the course of train operation, such movement becomes inevitable. The conditions which lead to such movement is given below:

i) Light engine is sent from one station to other station where the load is ready for clearance.

ii) If the holding of the engines are more on a division at the same time some other division is having shortage of engines for the traffic, the engines from one division to other division is sent light or dead for balancing purpose. The engine movement for item (i) and (ii) is called light engine traffic account (LE.TA).

Defects of Aux equipments:

a) Both PVs of a loco are not working in case of vac. Brake loco and no air brake load is available. Such locos are moved light without any speed restriction for the attention of defect. Any other defect which only allows the locos to be moved light and not with load.

b) Breakage of helical spring of loco:- In such case suitable speed restriction is imposed ranging from 30 KMPH to 50 KMPH depending on the extent of breakage. This speed restriction is decided by the supervisor who inspects the loco and inform the TLC/PCOR accordingly.
c) Suspension bearing metal out:- In such case in WAM4 and WAG5 locos, the wheel set on which suspension bearing metal out has been noticed are lifted with the help of suitable steel packing to avoid any further damage to axle of the wheel set. However, if the suspension bearing metal out is minor, ALF, trip shed, examines the condition of suspension bearing by removing the wicks pad and decides whether the loco can go to homing shed without wheel lifting. If the suspension bearing oil is topped up by removing the small chips of white metal, ALF, trip shed, advised the TLC/PCOR accordingly. Such locomotives are allowed LE/LA generally with a speed of 30 KMPH.

d) Traction Motor defects : Following traction motor defects leads to LELA movement to homing shed.

i) Traction motor bearing seized.

ii) Traction motor commutator mica out or resiglass/steel bending worked out.
In the above two cases generally traction motor pinion of defective TM is removed and loco is given ready for traffic with 5 TMs.
However, in case the same is not possible, the wheel set (for which TM has gone defective due to above reasons) is lifted and loco moves towards homing shed LELA.

iii) End shield or gear case crack or loose:- In such cases, ALF/trip shed tries to attend the defect to the extent possible in trip shed and then allows it. If it is not possible to attend these defects properly, the loco is allowed LELA with suitable speed restriction to homing shed.

e) Bogies crack of locomotive:- ALF trip shed or supervisor examines the loco for bogie crack and decide the speed at which it can move LELA towards homing shed.

Other defects of the locomotive due to which it is not possible the loco to work, such locomotives are sent dead with goods or passenger train as per the operating feasibility.

Accountal for the LELA or dead movement:- Whenever the loco which is fit for traffic use is moved dead or light by traffic department or balancing of power or clearing the loco from other station is accounted as loco used for freight or passenger service for which the loco is being moved.

Whenever the loco which is not fit for traffic use is moved light engine loco account (LELA) the engine hours used for such movement is counted as departmental service.
3.3.2 Calculation of Kms per Engine failures:

Preamble:

The performance and reliability of locomotive is judged from its value of Kms per engine failure. In this chapter, the procedure for calculating this figure will be explained.

i) Method of calculation:

The engine failures categorized as statistical failures are only taken into account for calculation of the value of engine Kms/failures as under:

\[ \text{Eng. Kms per failure} = \frac{\text{Kms earned by engine}}{\text{Statistical failure of engine}} \]

The failures categorized as non-statistical failures for category II are not taken into account. The types of failures has already been explained in para 3.0.7. The computation of Kms earned by the engine is obtained from the hourly chart maintained for loco movement by TLC/PCOR.

\[ \frac{\text{Total engine Kms earned by all the locos}}{\text{Total Nos. of statistical failure during the month of locos of the shed}} \]

For getting the details of Kms earned by the loco the details of its running is obtained from the following.

i) Hourly chart of loco movement gives the running of engine in the division and outside.

ii) The speedo-meter record also gives the reading of Kms traveled by it. Difference of the reading at the end of the month with the beginning of the month can be obtained. For the purpose, record of the speedo-meter reading should be maintained. However, this method is not dependable in case speedometer becomes defective during the run.

Therefore, calculation of engine Kms are done with the help of hourly chart maintained by PCOR/TLC.

3.3.2 Engine Kms per failure on Division (territorial basis):

Locomotives of various sheds and railways work on a division. They develop some loco trouble during the course of working and some time fails also. On a division, accountal of all the unusual are maintained and the failures are classified
and statistic or non-statistic in consultation with Sr. DOM of the division. Territorial figure of Kms/failures is calculated as under:-

\[
\text{Kms per failure} = \frac{\text{Total engine kms earned by all the Locomotive in division for a period}}{\text{No. of statistical failure for the period}}
\]

The period for which this is calculated is generally 10 days or one month.

3.3.4 Specific electricity consumption of electric traction:-

Specific Electricity consumption of electric traction is an index for the efficiency of traction. In this chapter the method of calculation and factors affecting the specific electricity consumption are explained.

Specific electricity consumption: The amount of electricity used by moving a load of 1000 tons for one Km is known as specific electricity consumption (SEC) of electric traction.

Therefore, SEC = \(\frac{\text{Total electricity consumed}}{\text{tonnage of train} \times \text{kms. Travelled}}\)

This is the method of calculation of SEC. However, on a division the calculation is done once in a month. For this purpose following procedure is followed.

a) GTKM for freight operation:-

Total number of goods trains moved in UP and DN direction is recorded daily along with their train load. The tonnage of the load and distance travelled gives the total GTKM of goods train.

\[
\text{Kg} = \text{Tg} \times \text{Dg}
\]

Where Kg = GTKM of goods train (total)

Tg = Total tonnage of goods services

Dg = Total distance in Km of goods services.

b) GTKM of pass/mail/express operation:

The trials have been conducted and it is found that specified energy consumption is about 18 KWH/1000 GT Km for passenger and mail express services. Therefore, for mail/express/passenger services are recorded.

\[
\text{Kp} = \text{Tp} \times \text{Dp} \quad \text{where Kp} = \text{Total GTKM of pass./mail/express services.}
\]

\[
\text{Tp} = \text{Total tonnage of pass./mail/express services}
\]
Dp = Total distance travelled of Pass./mail/express services.

The train load of these mail express trains are known and therefore calculated of GTKM for passenger/mail/express train is relatively easy.

c) **Accountal of electricity consumed during shunting operation**:

Number of shunting works are performed with the help of shunting engines. This engine may not be hauling the load from one station to other station. However, the electricity is consumed during carrying out shunting works. The electricity consumed by such shunting work is taken as 3% of the total electricity consumption.

Therefore, SEC for goods services are only calculated every month. The other consumption are taken as per the guide line fixed.

**3.3.5 Factors affecting the specific energy consumption:-**

Specific energy consumption depends on the following important factors.

a) **Distance between stops** – More stops and start of train will result in wastage of energy and hence the consumption of electricity will be more. For mail/express/passenger trains stops are fixed, but for goods trains if run on a proper path may avoid unnecessary halts and save the energy.

b) **Gradient**: On a upgraded section, the energy taken by the train will be more where as on a down gradient, the train will move with its momentum. Therefore, coasting of the train on down gradient will result in saving of electricity to a great extent.

c) **Speed of the train** – As the speed increases, the train resistance also increases. The relation between speed and train resistance can be given as under:-

\[
R = A + BV + CV^2
\]

Where R is the train resistance
V is the speed of the train
A,B & C are the constant.

Therefore, for more speed train resistance increases proportional to the square of speed of the train. Therefore, more energy is required to run the train at a higher speed.

**3.3.6 For economical use of energy to get better figure of SEC, following steps are initiated by the divisions.**

1) Switching off the MVMT’s for mail/express/passenger trains if the halt of the train is for 5 minutes or more.

2) Coasting boards have been provided to guide the driver for bringing the master controller (MP) and to coast the train to the extent possible.
3) Switching off the DJ of the locomotive in the yard if the loco is waiting for the load or crew.

4) Ordering of the goods train if clear path is available so that frequent stop/start of the goods train is avoided.

Typical values of specific electricity consumption:

The SEC value for electric traction is achieved as given below:

a) SEC for mail/express/passenger services = 18 KWH per 1000 GTKM
b) SEC for goods services = 9 to 12 KWH for 1000 GTKM.

The SEC figure given as above are generally achieved. However, the same may vary from one division to other division depending on the operating condition of the division.

3.4 DAILY POSITION OF TRO OFFICERS:

3.4.1 A daily position giving the complete accountal of incidence and loco statistics are prepared by TLC/PCOR and crew controller for the calendar day and sent to TRO officials in the morning. In this chapter important information of daily position is discussed.

Need for the daily position:- During the train operation, number of unusals related to loco and crew take place. In order to have proper record and control over these factors for deciding suitable managerial action, the daily position is prepared.

3.4.2 Information contained in daily position:- Following information is contained in daily position.

1) Unusual occurrence of Loco :- This position is prepared covering all the unusual which has taken place in a calendar day. This position contains following information.

   (i) Loco No. with base/shed to which it belong.
   (ii) Last schedule date and trip inspection date.
   (iii) Name of driver and nominated LI (some division gives the name of the driver only).
   (iv) Train No. and load of the train.
   (v) Section i.e. name of the station or name of two stations between which loco trouble took place.
(vi) Description of loco trouble and action taken by crew and TLC or loco inspector.

(vii) If the loco has failed on mail/express/passenger train, its record of time lost and gained as indicated. The taking over and handing over time of train in division is also indicated.

2) Crew unusual: Some time the trains detain in division on crew account. The train may be detained for crew as under:

(i) The crew may not be available for the train ordered by traffic department.

(ii) The crew may arrive late on duty.

(iii) The crew may ask for relief due to over hours, sickness or any other reasons.

Therefore, all the trains detained on crew account is recorded and sent in daily position consisting of following information.

a) Name of crew.

b) Train No. and load.

c) Station.

d) Detention to train.

e) Brief description on the unusual.

f) Reason for the detention and responsibility.

3) Loco statistics: Loco statistics is prepared for the loco as per the 4A statement (already explained in chapter 3.1.1.) is prepared for 0 hours to 0 hours period. This loco statistics include the following, in addition to the information contained in 4A statement.

(i) 4A statement of the loco utilization for a calendar day.

(ii) Loco numbers which are under repair with brief reasons in trip shed or homing shed.

(iii) Forecast of the loco for giving it ready from trip shed / loco shed.

(iv) Engine utilization for goods, passenger, mail/express and all services.

(v) Freight locos used on coaching services.

(vi) Average holding of goods engine for the calendar day and mid-night position of engines for goods services.

(vii) Total in-effective locos of freight and passenger services.

(viii) Locos under movement LELA or dead.

(ix) Actual outage of freight and coaching locos as compared with target outage.

(x) Details of freight services: Following information is indicated:
a) No. of goods trains ordered (section wise) and actual number of goods train run indicating the reasons for short fall if any (This position is taken from traffic branch by TLC and incorporated in daily position).

b) Forecast for ordering of goods train in next 24 hours i.e. upto 00 hours for each section of division.

c) Location and name of the stabled goods train waiting for power for clearance.

d) Cases of bursting of 10 hours duty limit of driver, section wise, with brief reason for exceeding the duty hours beyond 10.

4) Punctuality position of mail/express/passenger trains:

This position indicates the time lost by passenger carrying trains on division. It has following information as per the format given below:

<table>
<thead>
<tr>
<th>SN</th>
<th>TRAIN NO.</th>
<th>TAKEN OVER IN DIVISION</th>
<th>HANDED OVER IN DIVISION</th>
<th>DETAILS OF THE TIME LOSS OR GAIN BY DIVISION WITH REASONS</th>
</tr>
</thead>
</table>

The trains losing time on loco account are analysed in detail and remedial action is initiated to avoid its recurrence.

5) Late start summary of the major yards of division:

Freight trains are ordered from the yard suffers late start due to various reasons. These are recorded train wise and summary is prepared as per the following table:

<table>
<thead>
<tr>
<th>SN</th>
<th>LOC NO.</th>
<th>TRAIN NO.</th>
<th>ARR. OF TRAIN IN YARD</th>
<th>OUT GOING DRIVERS TIME</th>
<th>ORDERING TIME</th>
<th>EOL</th>
<th>LOAD READY WITH</th>
<th>DEPART TO YARD</th>
<th>REASONS FOR DETENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

This table indicate delay for each train and reasons also. This helps in taking action for avoiding detention to train in the yard. Regular meetings are also held in yard by senior supervisor and divisional officers of the divisions where in delay in the yard is discussed to find out the solution.

6) Loco link of coaching services:

Based on the current running of mail/express/passenger trains, the loco number to be given to various trains for mail/express/passenger services as per the loco link is decided. The detail is also given in daily position. The loco changing required for scheduled/unscheduled repair is decided in consultation with the...
homing shed or the shed of neighbouring division. This position indicates train No. nominated for this train.

7) Overdue schedule position:

The record of locos overdue for schedule belonging to the homing shed of the division as well as the loco of other division/railway running overdue for schedule is maintained. This helps in close monitoring of such loco and directing such locos to homing shed for schedule in time. The position is given as per the following format:

**OVERDUE LOCOS OF SHED OF OWN DIVISION**

<table>
<thead>
<tr>
<th>SN</th>
<th>LAST SCHEDULE INSPECTION</th>
<th>THE DIVN.RLY WHERE THE LOCO IS WORKING</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OVERDUE LOCOS OF SHED OF OTHER DIVISION**

<table>
<thead>
<tr>
<th>SN</th>
<th>LAST SCHEDULE INSPECTION</th>
<th>TRAIN NO. AND SECTION WHERE IT IS WORKING</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For each loco, the action taken by TLC / COR is indicated in Remark column.

8) Locos running with defect:

This position indicates the loco number with the nature of defects so that watch can be kept on such locos for timely withdrawal of the loco for its attention before it fails to work the train. The position is maintained as under:

<table>
<thead>
<tr>
<th>SN</th>
<th>LOCO</th>
<th>TYPE OF DEFECT</th>
<th>ACTION TAKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The typical of defects with which loco is allowed to run before withdrawing the same at suitable station is given below:

1. Isolated TM’s.
2. Speedometer defective.
3. Q118 or other air flow relays like QVMT, QPH etc isolated.
4. DJ tripping without apparent cause.
5. Sometime MP and EEC are not responding.
6. HQQP in OFF position.
7. HOBA in OFF condition.
8. One of the pantograph isolated.

There may be several other types of defect in loco which may be working. The same are to be recorded and action to be taken to withdraw from the services as soon as possible for attention to defect.

9) **Crew position** :

Crew position is to be watched regularly to avoid the shortage of crew for running the trains. Depot wise crew position is given in daily position as under:

a) Name of the depot.
b) Sanctioned strength of Driver/Asst. driver/shunter.
c) Men on roll.
d) Absence of staff from duty due to:
   i) Leave
   ii) Medical examination
   iii) Sickness
   iv) Under training
   v) Under road learning
   vi) Under suspension
   vii) Unauthorised absence
e) The staff on line at 00 hours.
f) The staff available at 00 hours.
g) The staff under Rest at 00 hours.
h) Average Head Quarter Rest of Driver.
i) Average outstation Rest of Driver.
j) Driver used on special duty.

These are ten items of the daily position. However based on the peculiar working condition and train operation requirement, more details can be added.
3.5.0 SOME IMPORTANT OPERATING STATISTICS

3.5.1 Preamble :

As a loco operating officials, many operating statistic / terminology is used in day to day working. The basic knowledge is essential to deal with the working effectively.

The following terminology are used.

1. Line capacity:- It is defined as the maximum number of trains that can be moved through a section in 24 hours. The working capacity of a section can be calculated by means of the following formula:

\[
\text{Line capacity} = \frac{24 \times 60}{t + 5}\%
\]

   i) Where \( t \) = Running time of slowest train in the block section in which it is maximum.

   ii) Efficiency of operation is generally taken as 70% to 80%.

   iii) 5" time allowance has been given to take into account the time taken for granting line clear etc. during crossing or precedence of the train.

The line capacity of the track depends on the following main points.

   a) The condition of the track.
   b) Gradient and curves on the track.
   c) Level crossing in the section.
   d) Length of block section.
   e) Length of running loops.
   f) Speed of the train.
   g) System of signalling and interlocking.

2) Wagon turn round: Wagon turn round means the time interval between the time wagon picks up a load and the time it is next available for loading. It depends on the following factors:

   i) Time spent in placement for loading.
   ii) Time taken to move to destination or loaded transit time to destination.
   iii) Time spent in placement for unloading at destination.
   iv) Empty transit time to next loading point.
Therefore, wagon turn round (Wt) can be written as under:

\[
Wt = T_1 + T_{1tt} + T_u + T_{ett}
\]

Where
- \( T_1 \) = Loading time
- \( T_{1tt} \) = Loaded transit time
- \( T_u \) = Unloading time
- \( T_{ett} \) = Empty transit time
- \( Wt \) = Wagon Turn round time

This figure is an index of wagon utilization and operating efficiency. The lower the wagon turn round time the better will be the operating efficiency.

The calculation of wagon turn round is done by the following formula:

\[
\text{Effective average daily wagon holding} = \frac{\text{Wagon turn round (in days)} \times \text{Average No. of Wagons loaded daily} + \text{Average No. of load wagons received daily from other Divns/Rlys.}}{\text{Average No. of load wagons received daily from other Divns/Rlys.}}
\]

3) Isolation: Isolation is a valuable safety device in railway operation. A line is said to be isolated from the adjacent line or lines when no movement on the adjoining lines must be isolated from sidings and other non-running lines.

3.5.2 Following means are adopted to isolated the line.

i) Trap point or derailing switch: These are single switch rail points provided on a line to isolate it from another line. It is an efficient and economical method of ensuring isolation but it also traps the vehicle by derailing it.

ii) Snag dead end: The running line i.e. loop is extended into a dead end. Isolation is provided by means of the dead end and cross over. If the wagon slips from the loop line, it will go into dead end and get trapped there instead of rolling on to the main line.

iii) Sand hump: It is a short siding of approved design terminating into a sanded hump generally 50 meter in length connected to a running line to provide isolation in conjunction with the cross over as well as to provide the adequate distance required for lowering approach signal.
4. OPERATION AND TROUBLE SHOOTING OF LOCOMOTIVES.

4.0 PREAMBLE:

Whenever the loco is not required for the use, the loco is switched off and pantograph is lowered and stabled on a suitable line in dead condition. While energising such dead or stabled loco, certain precautions are to be followed. In this chapter these precautions are explained.

4.0.1: Following should be followed before energising the locomotive.

1) Loco log book inspection:

This should be gone through minutely and information if any regarding defect or any special working instruction for the loco to be found out. If the loco has been made dead for attention of some defects etc. the loco must not be energized before attention of such defects. After getting satisfied with the log book that there in nothing wrong in energising the loco the following procedure may be followed.

2) Checking of the safety fittings of the locomotive:

All the safety fittings of the loco should be checked. If the loco is stabled on the pit, the under frame safety fittings must be checked and it should be ensured that all the safety fittings are intact. The details of safety fittings of the locomotives which must be checked is given in chapter 4.8.

3) Building up the emergency reservoir pressure and raising the pantograph:

After checking the safety fittings, the battery should be switched ‘ON” with HBA switch and baby compressor (MCPA) should be started. During this process RAL cock which connects the emergency reservoir to the air circuit of the loco should be closed. When the emergency reservoir pressure builds up to 7 to 8 kg.cm². The RAL cock should be opened. After building up the pressure, it must be ensured that loco is under the OHE. After this panto should be raised with the help of ZPT key. A sound “chu” will be heard when pantograph touches the OHE which gives indication that OHE is alive. BL key and MPJ should be fitted in its position.

4) Putting the isolating cocks of brakes in proper position:

The isolated cocks of the loco brake and train brake in the working cab should be in open position and in rear cab it should be in closed position. This should be ensured before closing DJ.

5) Inspection of switch board / relay boards:

   i) Programme switches: This board is provided behind cab no. 2. All the programme switches should be at ‘1’ position the reason for the
isolation of respective relay or equipment should be ascertained and action should be taken accordingly.

ii) Relay condition: Condition of the relays targets should be seen. No relay target should be in dropped condition. If target of any relay is dropped, the same should be found out for any defects and action to be taken accordingly.

iii) H.T. Compartment: A round of the loco corridor should be taken to check the visual condition of the H.T. compartment. There should not be abnormality like leakage of TFP/GR oil etc.

6) Closing of DJ:

Now the DJ of the locomotive can be closed after raising the panto with the help of ZPT key by pressing BLDJ and then pressing BLRDJ, the DJ will close and it will give indication in voltmeter by showing a reading approximately 25KV. The BLCP switch should be made ON immediately to start compressor to build up main reservoir pressure of 8 to 9.5 kg/cm².

7) Testing of loco brake:

After building up the MR pressure and releasing the hand brake the loco (if it is in applied condition), the loco brake must be tested and it should be ensured that the same is adequate. The detailed method of testing the brake power is explained in chapter 4.19.1 which may please be referred. If the skids have been put under the wheels of the loco, the same should also be removed.

8) Traction testing of the loco:

After moving the MPJ in forward and reverse position, the pilot lamp LSB should extinguish. If it is not extinguishing even with MPJ in forward or reverse position, the necessary trouble shooting like seeing the position of reverser and Q50 relay should be done.

After this the MPJ should be kept forward and with the help of MP, two or three notches are taken by keeping loco brakes applied so that loco does not move. As soon as, one notch is taken the LSGR lamp should extinguish. The same testing should be done by keeping the MPJ in reverse position.

9) Checking of emergency brake:

After taking two or three notches above, the vacuum or air pressure should be destroyed by applying emergency brake. The brake should get applied on loco and at the same time notch should come to zero automatically.

10) Checking the work of EEC:

The ZSMS switch should be kept on D position and MP on ‘N’ position and push button switch for operation of EEC should be pressed. Notch should come one by one with each push of EEC push button.
11) Checking of Headlight, marker light, flasher light:

Working of headlight, marker light, flasher light should be checked from both the cabs. After carrying out these checks and inspection loco is ready to be worked.

4.1.1. Procedure for stabling a loco in dead condition:

Preamble:

Locomotive is required to be made dead and stabled due to any of the following reasons.

i. Loco trouble/failure.

ii. Loco waiting for its next train/load.

iii. Crew for the loco is not available.

In this chapter, the method/procedure to be followed for making the locomotive dead and stabling is explained.

4.1.2: Procedure to be followed by the person/crew making the loco dead:

Following should be followed step by step-

1. Loco is to be stabled in a loop line or siding, it must be ensured that fouling mark is clear where loco is to be stabled.

2. Increase air pressure by MCP upto 7.5 kg/cm²

3. Apply loco brakes and also the hand brakes of loco.

4. Use skids or wooden wedges for securing loco.

5. Put reversor in neutral position and remove MPJ.

6. Lower PT and remove ZPT.

7. Switch off ALL BL switches on drivers desk and remove BL key.

8. Put HBA on ‘0’ position and see that battery voltage is ‘0’.

9. Keep ZPT, MPJ and BL key at secured place in locomotive locker.

10. Lock the door from outside.

11. Hand over keys to Engine turner/ASM on duty informing the location of stabling the loco.
4.2.1. Vacuum brake train operation:

**Preamble**

Preliminary knowledge of vacuum brake stock is essential to deal with the problems related with train operation of vacuum brake stock. In this chapter brief description of vacuum brake stock is given.

**Amount of vacuum prescribed:**

The amount of vacuum on engine and last vehicle or guards brake is give as under for BG AC electric engines.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Type of Train</th>
<th>Vac. In engine</th>
<th>Vac. In Last vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mail/Express/Pass. trains</td>
<td>50 cm</td>
<td>40 cm</td>
</tr>
<tr>
<td>2</td>
<td>Superfast trains</td>
<td>56 cm</td>
<td>53 cm</td>
</tr>
<tr>
<td>3</td>
<td>Goods trains</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>upto 70 vehicle unit</td>
<td>50 cm</td>
<td>40 cm</td>
</tr>
<tr>
<td></td>
<td>upto 71 to 90 vehicle units</td>
<td>45 cm</td>
<td>36 cm</td>
</tr>
</tbody>
</table>

Above level of vacuum in engine and guards brake should be ensured for adequate amount of brake power available on train.

4.2.2. Description of parts of vac. Brake stock: Description of important parts of a vacuum brake stock will help in understanding the working principle of vacuum brake stock. The description of various parts are under:

1. **Train pipe:** This is fitted on the under frame of all the vacuum brake stock. Both the ends of this pipe is fitted with a swan neck. This facilitate the figment hose pipe on either side of the wagon / coach. The size of the train pipe is 51 cm in diameter. This is connected with vacuum cylinder with the help of siphon pipe by providing a tee connection.

2. **Hose pipe:** This is 51 cm dia size pipe made of thick rubber protected with canvas. Inside of the pipe is provided with M.S. wire through out the length. The hose pipe is fitted on the train pipe swan neck portion after providing a cage made of M.S. wire to arrest the entry of foreign matters like waste cotton, plastics, rags etc.

3. **Dummy plug:** Every vacuum brake stock is fitted with a dummy ply on either side near the train pipe. When the hose pipes are not in use or train is to be shunted, the hose pipe is uncoupled and placed on the respective dummy plug.

The dummy plug has a horn to engage with of universal coupling on the hose pipe.
4. **Universal coupling**: 

5. **Release valve**: This valve is fitted on the base of vacuum cylinder at their seat. The release valve is fitted with operating lever having a wire connection. By pulling this wire, the release valve operates and open the door between upper and lower chamber space in vacuum cylinder leading to equalizing the atmospheric pressure in both the chamber. This results in falling down of piston on its own weight and brakes are released. Therefore, the functions of this valve is to release the brake after detachment of engine or from source of vacuum.

6. **Direct admission valve (DAV)**: This is fitted between release valve and train pipe on ICF, BEML and some IRS(BG) coaches and in BOX and BCX mark II wagon. This valve helps to admit air directly from atmosphere into release valve at the time of application of brakes. Therefore, air admitted into the train pipe from engine is utilized to actuate the direct admission valves (DAV) only. The air for application of brake is admitted in the piston through individual DAVs fitted on coaches/wagons. Therefore, it ensures simultaneous and uniform application of brakes in all vehicles on the train.

7. **Auxiliary vacuum chamber/reservoir**: This is fitted as an accessories of ‘F’ type vacuum cylinders on coaching stock and chamber space above the piston when piston goes up and ensures efficient brake power of vacuum cylinders.

8. **Vacuum cylinders**: It holds the piston in position and provides a passage for the piston to move upward/downward for application or releasing of brakes and at the same time maintains vacuum whenever desired. There are E type vacuum cylinders. E type vacuum cylinder does not have auxiliary reservoir where as F type vacuum cylinder is fitted with the auxiliary reservoir.

9. **Vacuum piston**: The piston functions as under :-

   a. Air above and air below the piston remain at bottom.
   b. Vacuum above and vacuum below the piston – piston remain at bottom. In both the above condition brake remains released.
   c. Vacuum above and air below the piston – piston moves to top. In this condition brake gets applied.

10. **Stuffing box**: It is a cast iron box fitted in the center of the base of vacuum cylinder over the piston rods. It provides air tight joint piston rod with bush of the vacuum cylinder.

11. **Clappet valve**: This is fitted on top of the coaches and connected with the main train pipe by means of extension pipe on swan neck. Pulling of ACP (alarm chain pull) results in lifting the clappet valve from its seat admitting air through the valve into extension pipe and destroying the vacuum.
12. **Hand brake:** Hand brake have been provided on all rolling stock to apply this brake to stop or stable the rolling stock, whenever the need arises. These are of two type (i) straight hand brake lever type (ii) Screw rod and wheel type.

### 4.2.3 Working principle of vacuum brake stock:

Vacuum derives its braking power from atmospheric pressure which acts against the bottom of piston when form inside of the piston air is withdrawn. Whenever the vacuum is destroyed the air is admitted in vacuum cylinder in movement of piston due to pressure of air and application of brake. Similarly when the vacuum is created, the piston moves down due to gravity and brakes get released.

### 4.3. USE OF DYNAMIC BRAKE OF LOCO:

#### 4.3.1. Preamble:

Dynamic/Rheostatic braking is applied by crew to control the train without any application of brake by train or loco brakes. Important guide lines for using the dynamic brake of loco is given in this chapter.

For applying dynamic brake the master controller (MP) is brought to ‘0’ from the traction mode. Then MP is turned towards braking. Before taking the notch for applying dynamic braking following is required to be done for smooth braking in the train.

1. Before using dynamic brakes load should be bunched on buffers by applying A9 slightly and then releasing.
2. The current limit should not go beyond 750 Amps per traction motor.
3. While applying dynamic brake, loco brake should be released.
4. Loco brake should not be applied while applying dynamic brakes. It may cause wheel skidding.
5. Watch on the high tension compartment should be kept frequently to see any sign of overheating.

As a practice the dynamic brakes are applied at a higher speed to reduce the speed of train and avoid the wear of brakes and wheels of rolling stock.

#### 4.3.2. Method of testing loco brake power:

**Preamble:**

Whenever the charge of a locomotive is taken by driver, the loco brakes are tested to ensure its effectiveness. The method for testing the loco brake power has been explained in this chapter.
1. Ensuring proper position of the cocks: The isolating cocks of the locomotive should be put in proper position. Moreover the checking of the locomotive should be done as explained in chapter 4.4.6.

2. Traction test: After closing the DJ, all auxiliaries should be started with the help of BL switches. Loco brake should be applied by moving the loco brake handle in application position. It should be ensured that brake cylinder pressure is about 3 to 3.5 kg/cm² and brake blocks are applied on the loco wheels.

After this following should be done to ensure the adequacy of brake power.

(i) Notches should be taken in such a way that traction motor current becomes about 650 amps. This much current is generally obtained by taking three to four notches. The loco should not move with the current of about 650 amps. This will indicate that brake power is sufficient.

(ii) At the same time, the brake blocks should not exert too much pressure on the wheels so that it may result in skidding of the wheels. Therefore, to assess the maximum braking effort, the current is increased to a value of 850 to 900 amps. At this amount of current, the loco should move slowly in brake applied condition. This test gives the indication that the braking effort is adequate i.e. neither low nor too high.

If the brake power is found to be inadequate, this should be informed to TLC/PCOR for further action in this regard.

4.4. PRECAUTIONS TO BE TAKEN TO AVOID WHEEL SKIDDING:

Preamble:

Wheel skidding is caused when the part of the circular surface of the wheel freed becomes flat. This reduces the life of wheels and causes the loco to be out of use for considerable amount of time. In this chapter, the precautions which should be taken to avoid the wheel skidding has been given.

4.4.1: Precautions:

Following precautions should be taken.

1. The brake cylinder pressure should not be high. standard setting of brake cylinder pressure is 3.5 kg/cm². However, some of the sheds, have reduced it to 3.0 kg/cm² to have less pressure of brake blocks on wheels to reduce the chances of wheel skidding.

2. The hardness of the brake block should be tested regularly if the same is found to be more than 180-200 BHN, such brake blocks should not be used.
3. In WAG5 locomotive the handle of the C3W distributor valve should be kept in freight position while working the goods train.

4. A choke has been provided on the additional C2 relay valve to have delayed application of brake on loco and quick release of loco brake.

5. The loco should be tested for its brake power, if the loco does not move at a current of 850 to 900 amp, it only indicate that braking after is more and the same is required to be adjusted.

6. Driving technique: While working the train, as per the brake power of the train, the efforts should be made to apply train brake and control the train. Many experienced drivers apply the train brake only at the same time press the PVEF to ensure that loco brake does not come in service. In this way, the train is controlled on train brake power upto a speed of 30 kmph. After the brakes and loco and train is put as per conjunction working by keeping PVEF in normal position. This process of working the train, ensures very less application of loco brake and avoids the wheel skidding. However, such a practice can be only adopted by experienced drivers. Moreover, this cannot be done for all cases as a rule. The train has to be controlled as per the available brake power with help of train brake and loco brake. But this idea can be kept in mind and should be applied to the extent possible.

4.4.2. Working the train with loco having isolation of one RSI block or traction motor:

Preamble:

Several times due to trouble in RSI block or traction motors, the defective RSI block/traction motor(TM's) are isolated. The correct method of working the train with such condition of isolation of equipment in loco is explained in this chapter.

RSI Block isolated: The RSI block may have to be isolated due to earth fault or puncturing of diodes of RSI block. The working procedures in such cases for WAM4 and WAG5 loco shall be as under:-

WAM4:- In case of isolation of one RSI block and working of all the six traction motors, the current by one RSI block will be supplied through SL to traction motors. Therefore, the total current which should flow should not be more than 2000 Amps i.e. continuous current capacity of the smoothing reaction (SL). Therefore the current per traction motor should not exceed –

\[
\frac{2000}{6} = 330 \text{ amps}
\]

The train should be worked in such condition if load is light so that section can be cleared. While working the train in such condition frequent watch should be kept by assistant driver in observing the condition of HT compartment about any sign of overheating etc.
WAG5: In WAG5 loco when the RSI block is isolated, the group of 3 traction motors also gets isolated and therefore, one RSI block feeds the power for one RSI block only and therefore, current can be given to TMs as per their current rating.

Traction Motor isolation: While working the train, traction motors are isolated if QOP relay drops due to earth fault in any group of the traction motor. The traction motors can be isolated with the help of HMCS switch. Various position of HMCS switches and isolation of traction motor is given in the table given below.

4.4.3 Precaution to be taken while changing the cab:

Preamble:

Proper procedure, while changing the cab of the locomotive should be followed to avoid any unusual / accident. In this chapter, main precautions in this regard have been explained.

It has been seen that some mistakes are done in changing the cab of a locomotive which results in problem like brake failure, pressure not building up etc. therefore, important items which are to be given attention during changing the cab of a locomotive with single loco or multiple loco is given as under:

4.4.3. Cab changing in single loco:

Following should be done step by step.

1. Application of loco brake with SA9 or loco brake.
2. Switching off the DJ and lowering the pantograph.
3. Removing the ZPT key, BL key and MPJ from the cab.
4. Closing the isolating cock of loco and train brake in the cab and putting the handle of loco brake and train brake in released position.
5. Going to the next cab and putting the BL key, ZPT key and MPJ key in position. ZPT key should be put at appropriate position to raise the pantograph.
6. DJ should be closed and MPJ handle should be moved to forward position.
7. The isolating cock of SA9 and A9 i.e. loco brake and train brake should be opened and the brake should be released by moving the handle of the loco brake in released position.
4.4.5: Cab changing in multiple loco:

Following additional points are to be checked/done in case of multiple loco when the cab is changed from one loco to other loco. (The items 1 to 7 as explained above are followed in case of cab changing in multiple loco also).

1. The position of the MU2B valve in the loco which will work as trailing should be kept in trail position. Similarly, lead and trail cock should be open in leading loco and closed in trailing loco.

2. The position of the MU2B valve in leading loco should be kept in lead position.

3. In trailing loco, loco brakes handle and train brakes handle bolt should be kept in isolated condition. The loco brake and train brake of rear cab of leading loco should also be in isolated condition.

The loco brakes and train brakes isolating cock should be open in working cab (leading cab) of the locomotive.

4.4.6: The position of various cocks in leading and trailing loco is given as under:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of valve</th>
<th>Position in leading loco</th>
<th>Position in trailing loco</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MU2B</td>
<td>Lead position</td>
<td>Trail or dead position</td>
</tr>
<tr>
<td>2</td>
<td>A9 brake valve handle (the handle should be removed from the cab in which not working)</td>
<td>Release</td>
<td>Release</td>
</tr>
<tr>
<td>3</td>
<td>SA9 brake valve handle (handle should be available in driving cab only)</td>
<td>Release</td>
<td>Release</td>
</tr>
<tr>
<td>4</td>
<td>A9 brake valve cut out cock</td>
<td>The cut out cock of driving cab will be open and rear cab will be closed</td>
<td>Cut out cocks in both cabs will be closed</td>
</tr>
<tr>
<td>5</td>
<td>SA9 brake valve cut out cock</td>
<td>The cut out cock of driving cab will be open and rear cab will be closed</td>
<td>Cut out cocks in both cabs will be closed</td>
</tr>
<tr>
<td>6</td>
<td>A9 differential valve cut out cock</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>7</td>
<td>H5 relay cut out cock</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>8</td>
<td>HB5 relay cut out cock</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>(i)</td>
<td>On air brake train</td>
<td>Close</td>
<td>Close</td>
</tr>
<tr>
<td>(ii)</td>
<td>Vacuum brake train open</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>S.No.</td>
<td>Name of valve</td>
<td>Position in leading loco</td>
<td>Position in trailing loco</td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Distributor valve isolating cock</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>10</td>
<td>Lead and trail cock</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>11</td>
<td>2&quot; size cut out cock (MTP cock)</td>
<td>Open (This main train pipe cut out cock is provided near PVI in corridor no. 1)</td>
<td>Open (Note: This valve remains open in 6.0’ clock position &amp; close in 9.0’ clock position)</td>
</tr>
<tr>
<td>12</td>
<td>Feed pipe isolating cock</td>
<td>Open (This valve is closed as only single pipe system is working. In case twin pipe system working this cock will be open).</td>
<td>Open</td>
</tr>
<tr>
<td>13</td>
<td>Auto drain valve isolating cock on MR1 &amp; MR2.</td>
<td>Open</td>
<td>Open</td>
</tr>
<tr>
<td>14</td>
<td>MR equalizing pipe angle cut out cock (White colour)</td>
<td>It will be open after coupling the loco.</td>
<td>It will be open after coupling the loco.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of valve</th>
<th>Position in leading loco</th>
<th>Position in trailing loco</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Brake cylinder equalizing pipe angle cut out cock (Green colour)</td>
<td>-do-</td>
<td>-do-</td>
</tr>
<tr>
<td>16</td>
<td>Brake pipe angle cut out cock (Green colour)</td>
<td>-do-</td>
<td>-do-</td>
</tr>
</tbody>
</table>

4.5: IMPORTANT RULES FOR SHUNTING OPERATION:

4.5.1: Preamble:

Shunting operation at station or yard are to be performed. Coaching as well as good stock are shunted with the help of engine as per the requirement of train operation. In this chapter, important rules for carrying out shunting work has been explained from the point of view of loco operation.

1) Important rules for shunting:

1) While attaching the engine with the position of the coach or wagons for which shunting is to be performed, the following precautions should be taken. This is also applicable for engine being taken on load.

i) While approaching the wagon or coach for shunting purpose, driver must work the engine with leading cab only. This will provide better visibility of the location of coach/wagon to which the engine is to be attached for controlling the engine properly.
ii) The engine should be stopped about 20M in advance of the coach/wagon to which engine is to be attached. After this engine should be moved dead slow towards the coach/wagon as per the signal of the pointsman or guard so that engine is attached with the coach/wagon smoothly without any jerk.

2) At stations where there is a gradient steeper than 1 in 400 falling away from the station within the station sections towards the approaching train, shunting should be performed with the engine lending towards the falling gradient at a class B station.

3) **Loose shunting:** Loose shunting means vehicles being pushed by an engine and being allowed to run forward unattached. It include hump shunting. Cranes vehicle carrying passengers, workers, explosives, dangerous goods or live stock or any vehicle should not be loose shunted and no loose shunting should be made against them.

4) **Speed during shunting operation:** The speed during shunting operation should not exceed 15 kmph unless otherwise specified.

4.5.2: **Supervision of shunting operation:**

At stations other than road side where separate shunting staff is provided, the shunting operation must be supervised by the competent person as specified in station working rules. At road side stations, the guard-in-charge of the train must personally supervise all shunting connected with his train under instructions of Station Master.

4.6 **PRECAUTION TO BE TAKEN WHILE RECLOSING THE DJ:**

**Preamble:**

There are certain checks which have to be carried out at the time of re-closing the DJ after it trips. If these elementary checks/precaution is not made, there may be serious trouble with loco. In this chapter, these checks/precautions have been explained.

Precautions /action which are taken while reclosing the DJ in case of single loco and multiple loco are slightly different.

4.6.1: **Precautions / action in case of single loco:**

When the DJ of the locomotive is open and gives the indication with the glowing of LSDJ bulb, the following must be done before again closing the DJ.

(i) **Relay Board** must be examined and it must be checked whether the target of any relay has dropped. If it is so, the action should be taken accordingly.

(ii) **HT compartment from the corridor** should be visually examined to ensure that there is no sign of overheating or smoke emission.
After checking the loco as per Sl. No. 1 & 2 and the condition of loco is found satisfactory, the DJ can be again closed.

4.6.2: Precautions / action in case of multiple loco:

In case of MU loco, the train load on which the MU loco is working may less. Therefore, line of action will be slightly different in case the loco is working with light load as compared with the capacity of full load.

1. Condition no. 1 when road and load permits the load to be hauled by single loco.

   Relay target of leading loco to be checked as explained above, if no relay target is dropped action to be taken-
   
i) Pantograph of the trailing loco can be lowered with BLSN and section should be cleared while working with one loco (leading loco).
   ii) On the next stoppage station, the relay board & HT compartment of other trailing should be checked for any abnormality. If nothing is found wrong, the DJ of trailing loco can be also closed after raising the pantograph of trailing loco with BLSN switch.

2. Condition no. 2 when road and load do not permit to haul the load with single loco:

   i) After DJ tripping, train should be stopped.
   ii) Relay board and HT compartment as explained above should be examined for leading and trailing loco.
   iii) If both the loco is normal, the DJ can be closed and train can be worked. If either of the locomotive is defective and load cannot be worked with single loco, assisting engine should be demanded.

(Note – If the target of QLM relay has dropped it should not be reset).

There had been number of cases where crew of the train did not take above precaution while reclosing DJ which resulted in fire in locomotive. Therefore, the above precautions are essential.

4.7 DEFECTIVE AUXILIARY EQUIPMENT AND ITS RELAYS AND ITS EFFECT ON TRAIN OPERATION:

Preamble: There are following air flow relays which gives tripping QVMT1 & 2, QVSL QVSI 1 & 2, QVRH, QPH. Whenever these relays malfunction, it gives tripping. It is essential to identify the tripping by particular relay so that it can be isolated quickly. In this chapter the problems of DJ tripping with the malfunctioning of air flow relay and its remedy have been explained.
4.7.1: Problems of defective air flow relay in single loco:

For the loco control circuit, it can be seen that the DJ trips in loco through Q118 relay. From the DJ tripping due to air flow relay, it can be observed that the DJ trips with some time lag. If DJ trips through Q118 without drop of the target of any relay, it may be due to the following relays.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name of defective relay</th>
<th>Time delay in tripping of DJ after closing the DJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QVSL and QPH</td>
<td>DJ closes but trips after 5.6 sec.</td>
</tr>
<tr>
<td>2</td>
<td>QVMT1</td>
<td>DJ closes but trips after 10.6 sec.</td>
</tr>
<tr>
<td>3</td>
<td>QVMT2</td>
<td>DJ closes but trips after 15.6 sec.</td>
</tr>
<tr>
<td>4</td>
<td>QVRH</td>
<td>DJ closes but trips after 15.6 sec.</td>
</tr>
<tr>
<td>5</td>
<td>QVSI1 &amp; QVSI2</td>
<td>DJ closes but as soon as one notch is taken it trips.</td>
</tr>
</tbody>
</table>

After observing the nature of the tripping, the concerned relay can be isolated by keeping concerned program switch for relay on III position. From the above table we can see that DJ tripping with a time delay of 5.6 sec. will take place due to the defect of following relay.

1. QVSL
2. QPH
3. QVMT1

Therefore, in such case, the program switch for all these three relays should be put on III position and DJ should be closed. Thereafter, the program switch of the relays should be brought to ‘I’ position one by one. The programmed switch which will give the tripping when it is kept at position ‘I’ will indicate that its relay is defective.

Therefore, this program switch should be kept at III position and other program switch can be put at ‘I’ position and loco can be worked further.

4.7.2: Problems of defective air flow relays in multiple locos:

In case of multiple loco, working, the problems of DJ tripping in the leading loco should be dealt with as given for single loco. However, the problem of trailing loco giving DJ tripping will be reflected in leading loco as per the following:
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Defect in trailing loco</th>
<th>Indication in leading loco</th>
<th>Indication in trailing loco</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>QVSL or QPH or QVMT1.</td>
<td>DJ remains closed</td>
<td>DJ closes but trips after 5.6 sec.</td>
</tr>
<tr>
<td>2</td>
<td>QVMT1</td>
<td>-do-</td>
<td>DJ closes but trips after 10.6 sec.</td>
</tr>
<tr>
<td>3</td>
<td>QVRH</td>
<td>-do-</td>
<td>DJ closes but trips after 15.6 sec.</td>
</tr>
</tbody>
</table>

**Note:** Whenever the DJ in trailing loco trips and leading loco DJ remains closed.

The following indication will be availed on pilot lamp indication board of the loco.

a) **LSOL will glow.**

b) **LSDF, LSCHBA, LSGR and LSB will glow.**

c) **VA reading will indicate the voltage.** After identifying the defective air flow relay, it can be isolated and train can be worked.

**4.7.3: Precautions to be taken while taking manual notches:**

**Preamble:** Whenever MP and EEC of a loco fails while working a train, manual notches are taken to clear from section. In this chapter, certain precautions which are to be taken are explained.

When the MP and EEC fails it is not possible to take traction notches. While taking manual control of tap changer following precautions to be taken.

1. GR manual operating handle should be removed by rotating the GR handle by 90°. By doing so, the air supply to GR operating mechanism is cut off. This is necessary so that manual operation of GR can be taken easily. If air supply remains in GR, it will be difficult to take manual notches.

2. **Q44 relay should not be in wedged condition.** Not to be wedged during manual operation of GR.

3. GR manual operation handle should be operated quickly so that one rotation is completed within 0.6 sec. If time taken in rotating the GR manual operation handle for one rotation is more than 0.6 sec. it will read to DJ tripping.

4. Watch on the equipment of HT compartment particularly on RGR should be made.

5. Notches should be increased or decreased as per the advice of the drivers. In such case a train should be run with restricted speed so that train can be stopped at any point as per the requirement.
6. The manual control of GR is recommended only to clear the section. Once the section is cleared, the information of MP and EEC failure should be given to TLC/PCOR for necessary action.

4.8: SAFETY FITTINGS OF THE ELECTRIC LOCOMOTIVES:

4.8.1: Preamble

Safety fittings of the locomotive must be checked by shed staff as well as crew at regular interval. The safety fittings which are to be checked by crew at the time of taking over the charge of locomotives is given in this chapter.

(1). Safety items of the under frame of locomotives:
(i). Rail guard and cattle guard should be proper with no sign of damage or deformation.
(ii). Equalizing beams, equalizers safety bracket and tie bolt should be without any crack. The bolts of the safety bracket should not be loose or deficient.
(iii). Helical springs of the locomotive should be without crack.
(iv). Safety ‘J’ clamp and safety slings of brake rigging in proper condition.
(v). Availability of axle box liners in position.
(vi). Brake block condition – it should not be tilted/broken.
(vii). Traction motor suspension lock pin should be intact.
(viii). Traction motor gear case fixing bolt should not be loose or deficient.

(2) Safety items of loco body:

1. Effectiveness on hand brake.
2. Condition of screw coupling.
3. Lock pin of CBC and clavis condition.
4. Proper securing and fitting of Buffer.
5. Availability of foot steps.
6. Effectiveness of horns.
7. Speedometer recording-cum-indicator unit: Indicator unit in Cab-1 and Cab-2 are in working condition.
8. Availability of fire extinguisher.
10. Battery box bracket.
11. Flasher are working in both cabs.
12. Marker lights at both cabs are working.
13. Both headlight with proper focus.
15. Panto pan and leveling rod condition.
(3) **Availability of lubricants:**

1. Center pivot
2. Side bearers
3. Gear cases
4. Suspension bearings

Above checks are essential to ensure safe train operation. Therefore, any shortfall or defects noticed in above items should be told to TLC/PCOR for necessary action for getting these defects attended.

### 4.9 AIR PRESSURE AND VACUUM TEST OF LOCOMOTIVE:

**Preamble:** In order to ensure that the locomotive is creating the vacuum or air pressure as per the standard, the leak test is carried out. In this chapter the procedure and method for carrying out leak test has been explained.

#### 4.9.1 Vacuum creation test:

This test is carried out whenever the loco is turned out from homing shed, trip shed or in case of doubt in yard when trouble of vacuum not creating properly is noticed in the train.

1. Hose pipe of both the ends of locomotive is kept on the dummy and one of the exhauster is run.
2. Loco brake of the engine remains in applied condition.
3. One of the hose pipe is removed from the dummy and the standard test plate having a hole of 8 mm in center is put on the opening of the hose pipe.
4. Vacuum creation is checked by master gauge as well as loco gauge. The vacuum creation should be obtained as under:

   “Vacuum of 53 cm should be created in 45 seconds”.
5. The same type of test should also be carried out with second PV also.

#### 4.9.2 Vacuum leakage test of loco:

This test is carried out to ensure that vacuum leakage in the locomotive is within the permissible limit. This test is carried out as under:

1) Vacuum is created by running any one exhauster.
2) After creation of full vacuum, the exhauster is switched off.
3) The fall in vacuum is noted for three minutes. The fall in vacuum level should not be more than 18 cm in 3 minutes. If the fall is more than 18 cm. In 3 minutes, it indicates excess leakage and the source of leakage to be found out.
Vacuum leakage test is carried by the homing shed only at the time of giving the loco ready.

4.9.3. Air pressure creation/leak test:

This procured of carrying out leak test on WAG5 air brake loco is given as under:

1) First of all, the angle cocks of the feed pipe and brake pipe should be opened and compressor should be run to ensure the clearance of passage in brake pipe and feed pipe.

2) All the angle cocks of feed pipe and brake pipe should be closed and MR pressure of 8.0 to 9.5 kg. cm2 should be built up.

3) One of the brake hose pipe should be connected with the master gauge.

4) Brake pipe should be charged to 5 kg/cm2 by keeping the handle of A9 valve in release position. Gauge in the loco and master gauge should show the same reading.

5) B.P. pressure should be dropped by 1 kg/cm2 through A9 and lead & cock should be isolated by closing the isolating cock.

6) B.P. gauge needle will take about 30 seconds to stabilize. Thereafter for one minute, no pressure drop should be noticed.

If the above test indicates pressure drop in BP within a minute as given in item No. (6), the source of leakage in loco should be identified and attended.

4.10 CALCULATION OF TIME LOSS WHILE OBSERVING CUATION ORDER:

Preamble:

Whenever the train observes the speed restriction for a particular distance in section, it loses time as compared with the inter sectional running time provided in the working time table. In this calculation of time loss while negotiating the caution driving has been explained.

4.10.1 Time loss due to observance of the speed restriction is calculated for mail/express/passenger trains only. The time loss have been calculated for various condition and given as under:
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Time loss allowed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Time loss in deacceleration for out of course of main line</td>
<td>1 minute</td>
</tr>
<tr>
<td>2</td>
<td>Time loss in acceleration to booked speed after out of course stoppage on main line.</td>
<td>2 minutes</td>
</tr>
<tr>
<td>3</td>
<td>For stop dead &amp; proceed with 8 kmph over on T.P. (i) additional 30 sec. for each T.P.</td>
<td>6 minutes</td>
</tr>
<tr>
<td>4</td>
<td>For 8 to 10 KMPH speed over one T.P. (i) additional 25 sec. per T.P.</td>
<td>5 minutes</td>
</tr>
<tr>
<td>5</td>
<td>For 15 KMPH speed restriction over one T.P. (i) additional 15 seconds per T.P.</td>
<td>4 minutes</td>
</tr>
<tr>
<td>6</td>
<td>For 30 KMPH speed restriction over one T.P. (i) additional 8 seconds per T.P.</td>
<td>3 minutes</td>
</tr>
<tr>
<td>7</td>
<td>For 50 kmph speed restriction over one T.P. (i) additional 5 seconds per T.P.</td>
<td>1 minute</td>
</tr>
<tr>
<td>8</td>
<td>Deacceleration for out of course hault in loop line</td>
<td>3.5 minutes</td>
</tr>
<tr>
<td>9</td>
<td>Time loss in acceleration from loop line</td>
<td>3.5 minutes</td>
</tr>
<tr>
<td>10</td>
<td>Passing through loop line with 15 kmph speed</td>
<td>7 minutes</td>
</tr>
<tr>
<td>11</td>
<td>Passing through loop line with 8 kmph speed</td>
<td>12 minutes</td>
</tr>
</tbody>
</table>

If the speed restriction is imposed for 30 KMPH for the distance equal to 5 span of OHE mast. The time loss can be calculated from the above table as under:

a) Time loss for 30 KMPH speed restriction over first one OHE span length = 3 minutes.

b) Time loss for remaining 4 spans of OHE at = 15 SEC.X4 span length at the rate of 15 sec. per OHE span length = 60 SEC = 1 MIN.

Therefore, total time loss will be 3 + 1 = 4 minutes.

(Note: Over on T.P mean length of one OHE span)
4.11 ITEMS TO BE CHECKED WHILE TAKING OVER MU LOCO / SINGLE LOCO IN TRIP SHED

Preamble:

There are certain essential items which are required to be checked while taking over the charge of locomotives whether in multiple or in single. This is essential to avoid any trouble later on while working the train. In this chapter, these essential checks have been explained:

4.11.1 Checks to be carried out with multiple loco

1. The position of the various cocks to be checked in leading as well trailing loco. While taking over the same has to be ensured. If the position of cocks are not as it should be, the same should be corrected.

2. Application & release of brakes with A9 and SA9 to be checked. The brake should function properly without any leakages from C2 relay valves.

3. The proper fixing of multiple jumper electrical connection should be checked so that it doesn’t get uncoupled during run.

4. The creation of air pressure in main reservoir and brake pipe pressure should be checked and the same should show about 8.0 kg/cm² to 9.5 kg/cm². Similarly brake pipe pressure should be achieved 5 kg/cm² without any difficulty. The vacuum should also be created with both the PVs.

5. The BLSN switch operation should be done and it should be ensured that the pantograph of rear locomotive is getting lowered and raised with the help of operation of BLSN switch.

6. The DJ of trailing loco should be tripped and all the pilot lamp indication should be available as under:

   LSOL, LSDJ, LSCHBA, LSGR AND LSB SHOULD GLOW

7. Similarly the DJ of the leading loco should be opened and ensured that DJ of both the locomotives are tripping without any difficulty.

8. Traction test: This should be done by taking two or three notches in leading loco while keeping the loc brakes in applied condition. The position of notch in trailing loco should be seen. The notch position in leading & trailing loco should be the same. Similarly after notching down to O notch, the position of notch in trailing loco should be verified.

9. Brake power test: The brake power of multiple loco should be tested in the same way, as it has to be one for single loco which has already been explained in chapter 4.19.1.
10. All the safety fittings of the locomotives to be checked has already been explained in chapter 4.20.1

After carrying out the above checks the loco is fit to be moved for working the train.

4.11.2 Items to be checked for single loco

The items to be checked while taking over single loco is identical to the items to be checked with multiple loco. The only difference is that, the checking of the BLSN operation and verifying the notch position in trailing loco are not applicable.

4.12 DEFECTS IN TRAILING LOCO AND ITS EFFECT ON LEADING LOCO IN MU OPERATION OF LOCOMOTIVE.

4.12.1. Preamble

In multiple loco operation, crew remain s in the leading loco. Any trouble in trailing loco is to be identified with the pilot lamp indication in the leading loco. In this chapter, the indication in leading loco if any trouble occurs in trailing loco has been explained. This will help in identifying the loco problem in trailing loco quickly.

Any trouble which causes the DJ tripping in rear loco will cause the LSOL pilot lamp to glow in leading loco. The indication in leading loco due to DJ tripping and faults in trailing loco is given in tabular form as under:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>TYPE OF DEFECT (In Trailing)</th>
<th>INDICATIONS ON LEADING LOCO</th>
<th>TRAILING LOCO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DJ tripped</td>
<td>1. DJ remains maintained.</td>
<td>1. DJ Tripped</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LSOL will glow</td>
<td>2. LSCRT will glow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. LSOL will glow</td>
<td>3. LSDJ, LSCHBA, LSGR,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. LSDJ, LSCHBA, LSGR,</td>
<td>LSB will glow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LSB will glow</td>
<td>4. UA Reading will be OK</td>
</tr>
<tr>
<td>2</td>
<td>CCPT Fuse blown off</td>
<td>1. No effect</td>
<td>1. No effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. No effect even after</td>
<td>2. No effect even after Neutral section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neutral section</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CCPT Fuse blown off</td>
<td>1. DJ will be maintained.</td>
<td>1. DJ will be tripped but panto will not be lowered.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. LSDJ, LSCHBA, LSGR,</td>
<td>2. LSDJ, LSCHBA, LSGR,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LSB will glow</td>
<td>LSB will glow</td>
</tr>
<tr>
<td>4</td>
<td>CCLS Fuse blown off</td>
<td>No effect</td>
<td>No effect</td>
</tr>
<tr>
<td>5</td>
<td>CCBA Fuse blown off</td>
<td>1. No effect. Note:- When trailing loco DJ will not reset - LSDJ, LSCHBA, LSGR, LSB will glow</td>
<td>1. No effect</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. When DJ will trip, it will not reset again &amp; LSDJ, LSCHBA, LSGR, LSB will glow</td>
<td>2. No effect</td>
</tr>
</tbody>
</table>

Note:- When trailing loco DJ will not reset - LSDJ, LSCHBA, LSGR, LSB will glow
<p>| | | | |</p>
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</table>
| 6 | CCA Fuse blown off | 1. No effect  
2. Auxiliary remains working. | 1. No effect  
2. Auxiliary remains working. |

If the above points are understood clearly, it will help in quick trouble shooting.

<p>| | | | |</p>
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</table>
| 7 | Pressure Relay Defective  
QVSL-1, QVSL – 2 & QPH  
QVSI-1&QVSI-2  
QVMR-1,QVMR-2 & QVRH | DJ remains maintained  
DJ remains maintained  
DJ remains maintained | DJ closes but trips immediately (5.6 sec)  
DJ trips on first notch  
DJ trips after 5.6 to 15.6 sec. |

8. Pressure Relay Defective  
QVSL-1, QVSL – 2 & QPH  
QVSI-1&QVSI-2  
QVMR-1,QVMR-2 & QVRH

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</table>
| 8 | Reverser/CTF/Q50 defect | 1. LSB will glow  
2. LSOL will glow | 1. LSB will glow  
2. LSGRT will glow |

9. Reverser/CTF/Q50 defect

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</table>
| 9 | RSI Tale Tell fuse blown off | 1. LSRSI will glow  
2. LSOL will glow | 1. LSRST will glow  
2. LSGRT will glow |

10. RSI Tale Tell fuse blown off

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</table>
| 10 | QD Energised | 1. LSP will glow  
2. Auto Regression  
3. Q48 will not be picked | 1. LSP will glow  
2. Auto Regression  
3. Q48 will pick up |

11. QD Energised

<p>| | | | |</p>
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</table>
| 11 | No progression  
(Notches Not coming) in trailing loco only | 1. LSGR will not extinguish  
2. Notch Repeater deviates  
3. Ammeter will deviate. | 1. LSGR will not extinguish  
2. Notch Repeater will not deviate  
3. Ammeter will not deviate. |

### 4.13 PRECAUTIONS FOR AVOID STALLING

#### 4.13.1. Preamble:

If some precautions are observed, the stalling of the train on the gradient can be avoided. Some important points are explained in this chapter.

Following points should be followed for avoiding stalling.

1. Conditions of Load: While taking over the charge, Brake Power Certificate should be examined and it should be ensured that BPC is valid. Moreover continuity of the air pressure / vacuum from the engine to load should be ascertained. While starting the train two or three notches should be taken, the train should start rolling with a traction motor current of about 400 amps. If the train is not moving it gives a clear indication of load being jammed. In such a case crew of the train should examine the load and find out the jammed vehicle and release the brake with distributor valve or release valve by manual operation. After fully satisfying about the released condition of load, the train should be started and it will move by taking 400 Amps or less amount of current.

   If this check is not carried out, the train may be started in jammed condition of the load. This will result in stalling of the train on the gradient ahead because the actual load of the train increases due to increase in train resistance resulting from brake block jamming. Therefore, it is very important to check the condition of load and ensure full release of brake blocks and continuity in the train.
2. Watch on traction motor current: It is always a good practice while driving to take notches gradually while keeping constant watch on voltmeter & ammeter reading of the traction motor. In no case, the current limit for short time during starting and continuous current rating should be exceeded. Progression should be done notch by notch gradually so that tractive effort develop in the train smoothly without causing any wheel slipping. Very quick notch for accelerating the train may result in wheel slipping causing regression of the notches automatically by wheel slip relay. This will result in loss of tractive effort and this may become the cause of stalling on a gradient.

3. Picking up speed before gradient: A good road knowledge helps in taking proper action in driving. Therefore, while working a fully loaded train, it is necessary to maintain a good momentum in the train before approaching the up gradient. Therefore, speed should be picked to the extent possible subject to the speed restriction in force. This is possible with a good road knowledge of the gradient. This will help in anticipating the problems to be encountered ahead and help in initiating proper action in advance to tackle with those problems. Therefore, speed should be picked before the approach of up gradient so as to overcome the more requirement of tractive effort. This will avoid the stalling on up gradient. That is why in working time table stopping of goods train on certain stations / signals situated on gradient is prohibited to avoid stalling due to loss of momentum of the train.

4. Use of sanders and ZQWC: With a fully loaded train, it is very essential that sanders are working. The sanders must be used judiciously to the extent required. Excess use of sanders may lead to drop in main reservoir pressure causing DJ tripping of loco. In addition to this, the sand may exhaust early which may result in a situation where the sand box is empty while negotiating the up gradient section. Therefore, while approaching gradient sanders should be operated from time to time to avoid any wheel slip of the locomotive. Moreover ZQWC if function should be switch on. This will help in adjusting the traction motor current and avoiding the wheel slip of the locomotive.

5. Negotiating caution order: If a caution order is existing for a speed of 30 KMPH or less on the up gradient or on the spot approaching up gradient, the chances for stalling increases. Therefore, such caution order should be negotiated with great care. In such cases, it is very good driving practice to control the train well in advance of the spot of caution order by destroying the vacuum or air pressure in small amount say 10 cm for vac. or 0.2 to 0.5 kg/cm2 for air brake trains as per the brake power of the train. This cause gradual application of train brake when the speed reduces to the desired level, the train brake handle should be kept in released position. This will ensure the release of brake. This activity should be done in such a way that the train passes through the spot of caution order in brake of the train in released condition. At this time the vacuum / air pressure level will be proper. In this way, the advantage of taking notches will be available as and when required. This will help in picking up the speed just after the end of caution order without any delay for release of brake.

6. Shunting notches: Whenever gradient is negotiated by a fully loaded train, the maximum possible current is fed to traction motor to achieve higher amount of tractive effort. It is a good practice to increase the current by taking notches or in
other words by increasing the voltage. This will cause the increase in traction motor current in elation to speed of the train. If the shunt notches are taken suddenly, it causes sudden increase of the tractive effort. This increase may cause wheel slipping and regression of notches. Therefore, as far as possible the use of shunt notches while approaching or negotiating the gradient should be avoided.

Therefore, if above precautions are taken, stalling of the train can be avoided.

4.14 ADVANCE TROUBLE SHOOTING AND CHECK LIST FOR INSPECTORS / SUPERVISORS FOR SOME COMMON TYPE OF LOCO TROUBLES

4.14.1 Preamble

When locomotive gives some problem and crew of the train is not able to attend the problem, the loco inspector or trip shed supervisor is deputed to go to loco and help in quick trouble shooting. In this chapter, some common type of loco trouble have been taken with guide lines to carry out certain checks before failing the locomotive and directing the loco to homing shed for proper attention. In this chapter, these checks have been elaborated.

Six most common type of loco trouble along with the check list is given as under:

4.14.2 MP and EEC not responding:

Following checks should be done before failing the loco.

1) Check Q51, it should not be in energized condition.
2) Check the ZSMGR handle in 6 O’ Clock position and RS cock limit switch.
3) Check QRS, Q20, if stuck up in energized condition make it normal.
4) Check QRS, it should be in energized condition (In WAG-5 loco).
5) Check Q50, it should be in energized condition.
6) Check the SMGR pressure, it should be 3.6 Kg/cm2 to 3.8 kg/cm2. Check pressure drops and its rebuilding during SMGR operation.
7) Check the ZSMS switch for proper operation.
8) Check MP interlocks and BD, MP cocks for proper connections & fitting.
9) Check the each interlock tension of QRS, Q50, Q51 & Q52.
10) Check the fitment of Q52, Q50, Q46, QRS & their base connections for tightness.
11) Check the Aux. Cam contacts of SMGR in UP & DOWN valve circuit for its proper operation. The switch should be free from cam when contacts are closed.
12) Check the milli volt drop between wire no. 700 to O52 in UP valve circuit. It should not be more than 40 MV and wire No. 700 to O62 in Down valve circuit not be more than 40 MV.

13) SMGR strainer to be checked & cleaned.

14) SMGR air pipe line to be blown.

15) VS diodes of Q52 relay for notch by notch operation to be checked.

16) Check whether SMGR is over shoted beyond zero or not.

4.14.3 DJ tripping without apparent cause:

Following checks should be made

1) CCDJ fuse holder to be checked.

2) BP1DJ operation along with connections to be checked.

3) BLDJ contacts & connections to be checked.

4) ZPT interlocks to be checked.

5) Check tightness of wires on Q11B, Q44 & MTDJ circuit at SB’s/BD’s TB’s panel and all switches wires Nos. 717, 718, 719, 720, 721, Q30 normally closed.

6) Check crushing of interlocks of EMC, Q44 and Q118 normally open and normally closed. Check tightness of base connections of Q118 and Q44 and all protection relays.

7) Check SMGR pressure reducing valve, pressure drop (5 kg/cm2) timings & Q44 branch contact operation (wire 720-721 & 717-719)

8) Check setting of QPDJ by test lamp method and operation of HQPDJ.

9) Calibrate Q44 and Q118 relays from Test Room.

10) Clean DJ air filter and provide ceramic filter replacing strainer by micro filter.

11) Clean SMGR pressure reducing valve & SMGR cock.

12) Function of blower relay & connections to be checked.

13) If nothing is found, then relay panel to be tapped gently for any loose contacts.

14) Check milli volt drop for Q44, MTDJ, Q118 branches as given in the final testing proforma.

4.14.4 DJ not closing after passing neutral section or DJ not holding, or DJ not maintaining:

1) Check QPDJ setting.
2) CCDJ fuse to be checked for any looseness or blowing condition.
3) BP1DJ interlock along with connections to be checked.
4) Check Q44 normally closed interlock crush & pressure (for Q118 branch)
5) Check C118 normally closed interlock crush & pressure (for Q118 branch)
6) Check SMGR interlock in the branch of Q44.
7) Check Q45 & QCVAR contacts for C118 (Pressure & cap).
8) Blowing DJ air pipe / DJ NR valve cleaning is to be done.
9) Clean DJ strainer.
10) Check whether SMGR over shoted beyond zero notch, check LSGR not glows unless SMGR (o) interlock (717-719) is closed.
11) Milli volt drop test for MTDJ, C118, Q44, Q118 in battery ‘ON’ condition, is to be done.

4.14.5 Half notch tripping:

Following checks should be done before failing the loco.

1) Check the Q44 timing.
2) Check the SMGR timing in progression as well as in regression. It should be between 9 to 13 sec.
3) Check the pressure drop during continuous progression & regression. It should not be more than 0.5 kg/xm2.
4) Check the cam & cam interlocks operation of SMGR in Q44 branch.
5) Check SMGR valves for proper lifts & leakages during operation.

4.14.6 QRSI drop:

Following checks should be done before failing the loco

A) QRSI DROP

1) Check the operation of line contactor L1 & L2 in LT test.
2) Check the flexible shunts of L1 & L2 for any flashing or parting.
3) Check all power cables connections and its lug for flashing or parting etc.
4) Power circuit to be meggered.
5) RSI 1 + 2 blocking diodes and power fuses to be checked by micro ohm resistance meter.
6) Check and megger RC damping circuit’s ETTFP 1 +2,
B) If all items given above found normal then

1) All TMs inspection covers to be opened & checked visually for any flashing or parting inside. Afterward all TM connection cable condition in junction box and terminal box to be checked along with its PG clamps. All TMs to be megerred individually.

2) SL coils & cables to be checked for its over heating, burning, flashing or parting etc and to be megerred.

C) If all the above items A & B found normal then

1) QRSI 1 + 2 relay setting to be checked from test room.

2) After calibration, relay to be re-fitted in loco and QRSI 1 + 2 setting to be checked.

3) For checking the function of QRS12 relay, first line contactor L1 coil connection to be removed and brake to be applied on loco and notches to be taken. QRS12 should be dropped: about 600 Amps which is indicated in AM ½, AM 2/1, AM 1/1, AM 2/2 ammeters in driver’s desk.

4) Similar check to be carried out for QRSI – 1 relay dropping by removing coil connection of L-2.

4.14.7 QOP drop (WAM 4 LOCO with 2 S, 3 P combination):

A) Following checks should be done before failing the loco.

1) Megger the power circuit from top side connections of line contactors (L1,L2,L3,L4,L5), after putting J1,J2 in neutral position and HQOP in neutral position.

2) If top side circuit showing ‘Q’ (earth) then SL cable & coil to be megerred, if it is found good then

3) Cable of Q20 relay, RQ20 to be checked & megerred, if it is good than

4) RSI 1 – 2 block cover to be opened and to be checked thoroughly for any abnormality and to be megerred if it is good then

5) All concerning cables of SL, RSI to be checked and megerred.

6) RC damping to be checked and megerred.

B) 1) Megger the power circuit from bottom side of the contactor L3, L4, L5.

2) If L3 showing ‘O’ (earth) then TM 1 + 4 cable connections to be removed and TM’s to be megerred individually and its cable also to be megerred.
3) If L4 showing ‘O’ (earth) then TM 3 and 6 cables to be uncoupled and TM’s to be meggered individually and its cable also to be meggered.

4) If L5 showing ‘O’ (earth) then TM 2 and 5 cables to be uncoupled and TM’s to be meggered individually and its cable also to be meggered.

C) **If item No. A & B showing good then**

1) Megger the circuit from reverser – 1 (J1) and reverser –2 (J2) finger (after putting in neutral position).

2) If J1 finger No. 1 & 2, 5 & 6 showing earth then RPS and shunting resistance, SJ TM 1&4 and its connection cables to be checked and meggered.

3) If J1 finger 3,4,7,8 showing earth, same procedure (C-2) to be adopted for TM2.

4) If J2 finger No. 1,2,5,6 showing earth, same procedure (C-2) to be adopted for TM5.

5) If J2 finger 3,4,7,8 showing earth, same procedure (C-2) to be adopted for TM3 and 6.

D) **If item No. A, B & C showing good then**

1) QD relay and its connection cables, ammeters and its connections and ammeter’s shunts to be checked and meggered.

2) Copper links, line contactors insulating bars to be checked and meggered.

These check lest is given for loco inspector and trip shed supervisor only. Driver of the loco may not in a position to do.

E) **If every thing found normal in item No. A, B, C & D then**

1) Relay QOP to be checked, RPQOP, RQOP and mid point resistance and connection cables to be checked and meggered.

2) All TMs cables underneath to be checked visually for any insulation failure or rubbing with TM/Bogie etc flashing or tracking in cable or in junction box and terminal box to be examined thoroughly.

F) **If every thing found normal in item No. A, B, C, D & E then**

1) Loco to be energized, movement to be taken and isolate the TM groups one by one, if found no QOP drop then

2) Loco to be moved with only two traction motor group, in service one by one.
3) All TMs inspection covers to be opened and checked thoroughly inside for any flashing, tracking or burning marks etc. If there is any doubt then rocker of all TMs to be rotated for thorough checking.

4) RPS and SL covers to be opened and to be checked. For any flashing tracking or burning marks.

5) HT compartment to be checked thoroughly for any flashing, tracking or burning marks etc or any foreign material.

4.15 COMBINED TRAIN REPORT (CTR)

4.15.1 Preamble:

Combined train report (CTR) form is filled in by driver and guard of the train after completion of the trip. In this chapter important information available in CTR form and its method of filling up and submission have been explained. Earlier, this report was called as guard’s journal. Now this guard’s journal format has been revised. It has got two parts:

Part I – This is to be filled by driver of the train.
Part II – This is to be filled by guard of the train.

Information available in CTR form: CTR form gives complete detail of train working. Important information available is as under:

1. Train Name and No. with the name of crew.
2. Load of the train.
3. Engine No.
4. Intersectional running time of the train in between two crew change point.
5. Time loss or gain on various account.
6. Lub. oil and fuel oil consumption (in case of diesel traction)
7. Utilisation of engine hours.
8. Duty hours of the crew i.e. time of sign on/sign off.
9. Signal and track defects noticed by crew in brief.

This CTR form is signed by driver and guard of the train.

4.15.2 Procedure for filling up the CTR form:

CTR forms are issued and filled in the following manner.

1. 4 nos. of CTR forms are collected by guard of the train at the time of signing on.
2. These forms (Part II) are filled in by guard of train in quadruplicate.

3. At the end of journey, guard and driver meet with each other at the time of signing off and the guard of the train hand over the three copies of CTR forms to driver after verifying the various timing recorded in the CTR forms.

4. Driver, in turn, fills up his position of the entries in the guard journal in all the four copies.

5. Driver submits the three copies of the CTR form to his headquarter depot. These three copies of CTR forms are disposed of as under:
   i) One copy is sent to statistical branch.
   ii) One copy is retained by the depot incharge for his record.
   iii) One copy is sent to loco running bill section.

If CTR forms are very important for maintaining the data related with train operation. Therefore, crew should be trained to fill it up properly and submit the same to their headquarter depot. This CTR form is also the basic record for payment of mileage allowance to crew of the train.

4.16 MAINTENANCE OF PORTABLE FIELD TELEPHONE

4.16.1 Preamble:

The portable field telephone is provided in locomotive to ensure quick communication of information in case of train is stopped in section due to any unusual / accidents. The system of management of field telephone in locomotives is explained in this chapter. There are two types of portable telephone which are provided with driver/guard of the train.

1. Portable telephone to be used on field telephone sockets

This portable field telephone operated by dry cells is provided with flexible wire with pin. In case of unusual in the section, the crew of the train can use this portable field telephone to convey / to talk with TPC by going to the nearest field telephone socket and inserting the pin of portable telephone in socket. Field telephone socket is provided by the side of the OHE mast every half KMs in the section. This is indicated by the arrow mark on the OHE mast indicating the direction in which the field telephone socket is nearest.

2. Portable mobile telephone: This type of telephone, it does not require any field telephone socket and pin arrangement. This telephone has to be recharged periodically to keep the battery provided in field telephone in working order. This field telephone can be used from anywhere in section to talk to section controller or traction power controller. In this case time is saved as there is no wastage of time in movement to nearest field telephone socket. However this mobile
telephone set is very costly as compared with the portable field telephone with socket and pin arrangement.

4.16.2 Issue of portable field telephones: There are various types of system of issue of field telephone set, exists on railways. These systems are as under:

1. Field telephone as loco item: In this case homing shed provides a portable field telephone in each loco. This field telephone is taken over / handed over from driver to driver who work the engine. The drivers also record the handing over/taking over details in the loco log book. In this type of working, the advantages are as under:

   (i) Requirement of field telephone is minimum.

   (ii) No loading / unloading of field telephone is involved at crew. Change point and hence manpower requirement reduces.

   However, it has been experience that the field telephones were lost when the loco went working in foreign railways where a different type of working is existing or the field telephones were not taken / handed over at crew change point properly becomes very difficult to trace back the missing telephones. Therefore, this system of providing field telephone is useful when the loco is working on a field route / link. Therefore this type of working may be useful for mail/express/passenger locomotives.

2. Field telephone to be issued to drivers at the time of sign on.

   In order to have better accountability and maintenance of field telephone, these phones are issued to drivers at the time of sign on and again returned back by driver to the same depot while signing off. in this system following procedure of issue of field telephone is followed:

   “Columns in field telephone register”

<table>
<thead>
<tr>
<th>SN</th>
<th>DRIVER’S NAME</th>
<th>FIELD TELEPHONE NUMBER</th>
<th>TRAIN NO. FOR WHICH ISSUED</th>
<th>DATE &amp; TIME OF ISSUE</th>
<th>DRIVER’S SIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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   DATE & TIME OF RETURN | TRAIN BY WHICH A DRIVER ARRIVED | DRIVER’S SIGN AT THE TIME OF RETURN | SIGNATURE OF LOBBY INCHARGE |
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</table>

   When the drivers signs on the field telephone is issued to him and relevant columns in the registers in ab is filled in and drivers signature is taken. When this driver signs off at outstation, he deposits his field telephone at outstation lobby where the same is kept in safe custody of engine turner / lobby incharge.

   (ii) When the driver signs on at outstation lobby the phone is again taken back from the custody of outstation engine turner by the driver for working the train. On
return at his headquarter depot the driver signs off and return the field telephone to his depot. At this time entry is made in column no. (7) & (8) and driver and engine turner signs in column (9) and (10) respectively.

In this system of working close accountal is kept for each field telephone set. Moreover if there is any loss of field telephone, the same can be traced and responsibility can be fixed. Therefore, this system of working is well suited for goods as well as passenger service working. The requirement of field telephones at least twice the requirement of field telephone in it is a loco item. It also requires handling of field telephone at each crew change point.

3. **Field telephone as a driver’s personal**

In the issue of field telephone to driver at the time of sign on,

A register is required to be maintained and record of issue of field telephone to each driver at each occasion is to be maintained. This involves a lot of record / information keeping work for the drivers lobby where about 100 drivers sign off / on daily. Therefore, it was thought to make the field telephone as drivers personal store. In this cause field telephone is given to each driver as a personal store. This field telephone will be kept in the line box of the driver will work the train alongwith line box and field telephone and avoids the issue of field telephone each time and related record keeping.

The driver will return the phone only in case it has become defective or for regular checking. However, the requirement of field telephone becomes much more i.e. equal to the number of driver on a division. Moreover, some divisions have reduced the size of line box which will cause the problem of accommodating the field telephone in line box.

After evaluating all the above three options, the method of issue of field telephone to driver at the time of sign on appears to be more practical and workable. Now option of S.No. (2).

4.16.2.1 **Testing/Repair of field telephones:** All the repairing and testing work of the field telephone is carried out by S&T branch of the division. Each field telephone is tested periodically by test room and the date of next date due for testing of field telephone is painted on the field telephone. Therefore, each field telephone is sent for testing before this date. The lobby incharge maintains a register indicating the date of field telephone testing done and due.

Driver while taking the field telephone must test the working of field telephone from the testing socket provided in the lobby. If any defect is noticed the field telephone is replaced by the engine turner.
4.17 SALIENT FEATURES OF WORKING TIME TABLE FROM THE LOCO OPERATION POINT OF VIEW

4.17.1 Preamble: Working time table of a division gives many useful information. However, some informations are more relevant from loco operation point of view. These points are covered in this chapter.

Working time table (WTT):

Working time table is issued by COM by the zonal railway for each division at the periodicity of six months. Following points should be got noted by the officials involved in train operation.

4.17.2 Details of Goods Train working: Each working time table indicate the permissible load of the goods for each section of the division for various types of engines separately. The load table also prescribe the requirement of banking engines. In brief the following information is available about freight operation on the division.

1. Permissible load in tons for each section for various types of engines.
2. Requirement of banking engine.
3. Restriction of stopping, the train on particular station / signals for fully loaded goods train.
4. Reduction of train load for goods train during monsoon.
5. List of permanent speed restriction due to continuous falling gradient for goods train.
6. List of permanent speed restriction due to various operating condition for goods as well as main/express/passenger trains.
7. Inter sectional running time for goods trains.

4.17.3 Details of Rolling Stock: For each type of engines and rolling stock also the details are provided as under:

1. Maximum permissible speed at each type of engine.
2. Maximum permissible speed of roller bearing and ball bearing wagon / coaches etc.

4.17.4: Details of passenger train working: The working time table provides following details

1. Intersectional running timing of each train.
2. Booked and maximum permissible speed of each passenger carrying trains.
3. Normal and minimum running time of passenger trains indicating the engineering, loco and traffic gain available in the time given.
Some of the important information given as indicated above are used in day to day working of the train. This should be well known to the officials connected with loco operation work.

4.18: LOCO BRAKES NOT RELEASING PARTICULARLY IN WAM 4 LOCOMOTIVE

4.18.1 Preamble

Particularly at the time of loco changing, the brakes of loco some time doesn’t release leading to detention of the train. Some tips for tackling such problem is given in this chapter.

The problem of loco brakes not releasing may be due to the following defects in the pneumatic circuit.

i) Defect in driver automatic brake (DAB)

ii) B2 relay valve defective.

iii) Brake cylinder spring broken.

4.18.2 Method for dealing with the above defects during loco operation is given below:

1) Defect in driver automatic brake: Following indication will be obtained when the DAB is defective leading to non releasing of loco brakes.

a) Continuous air leakage through the exhaust port of brake valves. This may also make the pressure in brake cylinder equal to pressure in main reservoir. In this case, the poppet valve seat may be worn out or defective. The rubber part of DAB may be defective. In such case the DAB may require replacement. However, if the engine has already been taken on load, the train can be worked by isolating the DAB.

b) If there is no clear indication of air leakage, the defect can be confirmed by applying the brake from other cab. While doing so, the brake should be manually released and the DAB of the cab which is giving problem should be isolated. The functioning of loco brake from the other cab should be checked by operating the DAB in application and release position two or three times. If the operation of locomotives are satisfactory form the DAB of other cab, it indicates that defect lies in DAB and the same should be attended.

2) Defect in relay valve B2: If the loco brakes are not releasing/working from the DAB of both the cabs, the problem may be with relay valve B2. In such case relay valve will leak continuously. This will also lead to dropping of main reservoir pressure. Such type of defect causes the loco brakes not releasing because when the DAB is placed in release position, the control air pressure is released but there is no release of pressure from exhaust port of B2 relay valve due to sticking of piston packing and keeping exhaust valve in closed position. In such case, the relay valve B2 has to be replaced or repaired.
3) Brake cylinder spring broken: This defect can be identified by observing the particular brake cylinder which is not releasing. If the spring of a brake cylinder is broken, the brake of such cylinder will not release whereas the brakes operated by other cylinder will function properly.

After identifying such brake cylinders, the same can be dummied by blocking the air supply with wooden plug. However, the brake cylinder has to be isolated replaced for proper repairs.

**4.19.1 Method of testing loco brake power**

Whenever the charge of a locomotive is taken by driver, the loco brakes are tested to ensure its effectiveness. The method for testing the loco brake power has been explained in this chapter.

**4.19.2 Ensuring proper position of the cocks:**

The isolating cocks of the locomotive should be put in proper position. Moreover the checking of the locomotive should be done as explained in chapter 4.20.1.

**4.19.3 Traction test:** After closing the DJ, all the auxiliaries should be started with the help of BL switch. Loco brake should be applied by moving the loco brake handle in application position. It should be ensured that brake cylinder pressure is about 3 to 3.5 kg/cm² and brake blocks are applied on the loco wheels.

After this, following should be done to ensure the adequacy of brake power.

1. Notches should be taken in such a way that traction motor current becomes about 650 amps. This much current is generally obtained by taking three to four notches. The loco should not move with the current of about 650 amps. This will indicate that brake power is sufficient.

2. At the same time, the brake blocks should not exert too much pressure on the wheels so that it may result in skidding of the wheels. Therefore, to assess the maximum braking effort, the current is increased to a value of 850 to 900 amps. At this amount of current, the loco effort is adequate i.e. neither low nor too high.

If the brake power is found to be inadequate, this should be informed to TLC/PCOR for further action in this regard.

**4.20.1 Safety fittings of the electric locomotives**

Safety fittings of the locomotives must be checked by shed staff as well as crew at regular interval. The safety fittings which are to be checked by crew at the time of taking over the charge of locomotives is given in this chapter.
4.20.2 **Safety items of the under frame of locomotives**

i) Rail guard and cattle guard should be proper with no sign of damage or deformation.

ii) Equalising beams, equiliser safety bracket and tie bolt should be without any crack. The bolts of the safety bracket should not be loose or deficient.

iii) Helical springs of the locomotive should be without crack.

iv) Safety ‘J’ clamp and safety slings of brake rigging should be in proper condition.

v) Availability of axle box liners in position.

vi) Brake block condition – it should not be tilted or broken.

vii) Traction motor suspension lock pin should be intact.

viii) Traction motor gear case fixing bolt should not be loose or deficient.

4.20.3 **Safety items of loco body**

1) Effectiveness of hand brake.

2) Condition of screw coupling.

3) Lock pin of CBC and clavis condition

4) Proper securing and fittings of Buffer

5) Availability of foot steps

6) Effectiveness of horns

7) Speedometer recording-cum-indicator unit in Cab-1 and Cab-2 are in working condition.

8) Availability of fire extinguisher

9) Portable telephone in working condition

10) Battery box bracket

11) Flasher are working in both cabs

12) Marker lights at both cabs are working

13) Both head light with proper focus

14) Availability of earthing poles and cables

15) Panto pan and leveling rod condition.
4.20.4 Availability of lubricants in

1) Centre pivot
2) Side bearers
3) Gear cases
4) Suspension bearings

Above checks are essential to ensure safe train operation. Therefore, any shortfall or defects noticed in above items should be told to TLC/PCOR for necessary action for getting these defects attended.
5. ADHESION

It can be described in following ways :-

1. Adhesion is the grip or force of attachment, produced by friction between the wheels and rails. Adhesion is required to keep the wheels from slipping. It depends on various factors and applies a limit on useful TE for a given axle-load.

\[ \mu = \frac{T_{\text{max}}}{W} \]

Fig. 1 Coefficient of Adhesion

Coefficient of Adhesion (\(\mu\)) is the ratio of “maximum value of Tractive Effort (\(T_{\text{max}}\)) which can be transmitted to the wheel” divided by the “effective value of load (\(W\)) on the driving axle”

\[ T_{\text{max}} \propto W \quad \text{or} \quad T_{\text{max}} \mu W \]

\[ \frac{T_{\text{max}}}{\mu} \]

\[ \frac{W}{w} \]

Max. Value of for steel on steel =0.44 = 44% in most ideal case,. Therefore, if \(T_{\text{max}}\) is to be increased, Weight on driving-wheel has to be increased, but track has the limitation of Max. Axle-load, therefore number of ales has to be increased, but for curvature.
The Wheel Slip Phenomenon

\[ \text{Slip} = \left( \frac{\delta V}{V} \right) \times 100\% \]

Bad effects of wheel Slip

- Damaged Gears
  - Damaged gear profiles lead to other modes of oscillations.
- Damaged bearings
- Cracks in bogie frames, supports and fixtures.
- Excessive wheel wear and rail-burns.

Fig - Rail burn
Fig. Rail burn

Damaged Wheel
Damaged Rail Head

Damaged Rail Head
FACTORS AFFECTING ADHESION

1. Effect of speed on adhesion:– As friction is maximum at start and then reduces with speed, similarly adhesion is maximum at start and then reduces with speed.

If \( \mu_{as} = \text{Coefficient of adhesion at start} \) & \( \mu_{ar} = \text{its value at speed V} \), then as per SNCF:

\[
\frac{8 + 0.1 V}{8 + 0.2 V} \mu_{as} = \mu_{ar} \\
\]

and as per Curtius & Kniffler:

\[
7.5 = \frac{\mu_{ar}}{V + 44} + 0.16
\]

2. Rail condition and weather condition:– Wet rails reduce adhesion. Oily rails drastically reduce adhesion. A thin film of dust etc. gets stuck to wheel-rim and reduces adhesion-value of steel on steel. Dry leaves and coal dust also reduces adhesion. Moderate to heavy rain is better than drizzle for adhesion. Sanding helps, but the sand should be fine, dry and should fall on rail-head.

Unevenness of rail-wheel contact, due to worn-out rail or wheel, loose track packing, warp in wheel-rim, difference in wheel-dia, irregular wheel tread profile, variations in track-levels, less contact area between rail and wheel at points and crossings, and curves causes the reduction in adhesion.
Reduction of Adhesion on curves

- The angle subtended between the wheel flange and the gauge face of the rail is called “angle of attack”.

- Increase in this angle by 1 deg. As on curves, reduces the adhesion by half.
Final weight distribution due to weight transfer between bogies and between axles of the bogie is as follows:

\[
\begin{align*}
M &= \text{Mass of locomotive at the centre of gravity.} \\
T &= \text{Ttractive effort exerted by the motor at each driving axle.} \\
L &= \text{Bogie centre distance.} \\
I &= \text{Bogie wheel centre distance.} \\
H &= \text{Height of drawbar coupling above rail level.} \\
H' &= \text{Height at which TE is exerted by the bogie on the locomotive body.}
\end{align*}
\]

The weight transfer effect is reduced with the increase in the bogie wheel centre distance. Due to safety considerations of negotiating curves, points and crossings, wheel centre distance of bogie, can be adjusted only to a limited extent. In the bogie employing nose suspended motors, wheel centre distance is fixed by the diameter of driving wheels and traction motor dimensions.

While reducing the value of ‘h’ will have desirable effect on the weight transfer between the two axle of the bogie, it will on the other hand increase the weight transfer effect between the bogies. Weight transfer between the axles of the bogie of conventional design is of the order of 15 to 20% of the adhesive weight of
locomotive and weight transfer effect between the bogies is only 1 to 3%. Thus the overall effect due to the reduction in the value of ‘h’ is to decrease the weight transfer considerably.

**Methods of Reducing The Weight Transfer**

The weight transfer in the case of trailing axle of leading bogie and leading axle of trailing bogie are just opposite to each other. Thus by effecting vertical coupling between bogies by resilient component vertical reactions due to weight transfer are made to cancel each other.

By means of low traction bar the point of application of tractive effort by bogie on the locomotive body is virtually brought down i.e. the value of ‘h’ is reduced. This design feature is incorporated in the manufacture of bodies of WAM1, WAG and WAG4 locomotives of Indian Railways.

3. Mechanical Factors :

1. Effect of weight transfer : When the loco is standstill on level gradient, its weight is equally shared by all axles, but this condition is disturbed when the loco or train is in a condition of run or start/brake, due to turning moments.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Component</th>
<th>Important factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Body Reaction</td>
<td>1. Height or Drawbar &amp; Centre – pivot.</td>
</tr>
<tr>
<td>2.</td>
<td>Bogie Reaction</td>
<td>1. Direction of TM Noses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Height of centre pivot.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Primary suspension.</td>
</tr>
<tr>
<td>3.</td>
<td>TM Nose Reaction</td>
<td>1. Diameter of wheel.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Gap bet. TM Nose and axle-centre.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Direction of Noses.</td>
</tr>
</tbody>
</table>

3.1 (a) Effect of Truck Draw Bar Pull :- This results in reduction of load on leading bogie, and corresponding increase in load for trailing bogie :-

(b) Effect of Traction Motor Nose :- If the direction of nose is towards the direction of motion of loco, the nose presses upward on bogie and equal pressure acts downwards on axle bearing, increasing pressure on axle. If the nose points opposite the loco-motion, the load on the axle decreases.

\[
\text{TM Nose Force} = N = \left(\frac{1092}{2}\right) \times \left(\frac{6}{800}\right) = 4.1 \text{ t}
\]
WEIGHT TRANSFER DUE TO TORQUE EXERTED BY TRACTION MOTOR

If the direction of motion is from left to right and

\[ D = \text{Diameter of driving wheel.} \]
\[ d = \text{diameter of the gear wheel.} \]
\[ S = \text{distance between the axle and the nose.} \]
\[ T = \text{Tractive effort at the rails.} \]
The force at the gear teeth = \( \frac{TD}{d} \) and its direction is downwards on the gear wheel and its reaction on the pinion of the motor is upwards. As a result of this, motor nose exerts an upward force \( F \) on the bogie truck.

When the vehicle is moving in the direction towards which the nose is pointing, the motor nose presses upwards on the bogie truck and axle bearing presses downwards on the axle, thus increasing effective axle-load.

These forces are reversed when the vehicle is moving in opposite direction to that in which the nose is pointing.

In WAM-4 and WAG-5, both Nose-Reaction and Truck-Reaction are subtractive from the weight on leading axle, hence there will be tendency of lifting or wheel slipping.

**Motion for WAG – 5**

In high-adhesion bogies of WAG-7, Nose-Reaction is adding to the weight of leading axle, so better adhesion and less chances of slipping occurs.
Motion for WAG – 7

COMPARISON BETWEEN WAG – 5 & WAG-7

<table>
<thead>
<tr>
<th>Axle No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAG 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Load</td>
<td>-3.29</td>
<td>-2.12</td>
<td>+5.26</td>
<td>-5.26</td>
<td>+2.12</td>
<td>+3.29</td>
</tr>
<tr>
<td>WAG 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Static Load</td>
<td>20.5</td>
<td>20.5</td>
<td>20.5</td>
<td>20.5</td>
<td>20.5</td>
<td>20.5</td>
</tr>
<tr>
<td>Dynamic Load</td>
<td>-1.34</td>
<td>-1.34</td>
<td>-1.34</td>
<td>+1.34</td>
<td>+1.34</td>
<td>+1.34</td>
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<tr>
<td>Net Load</td>
<td>19.16</td>
<td>19.16</td>
<td>19.16</td>
<td>21.84</td>
<td>21.84</td>
<td>21.84</td>
</tr>
</tbody>
</table>

Max. T.E. (without wheel-slip) = No. of axles x Min. Net load on axle x μ
For WAG-5, 6x14.41x0.37 = 32 t, & For WAG-7 - 6x19.16x0.37 = 42.5 t

Max. T.E. (without wheel-slip) = No. of axles x Min. Net load on axle
For WAG-5, 6x14.41x0.37 = 32 t, and For WAG-7 – 6 x 19.16 x 0.37 = 42.5 t
3.2 Effect of vertical shocks:-- The contact between rail and wheel gets detached, under the effect of instantaneous vertical shocks. Provision of better elastic suspension and damping arrangement in a bogie, reduces the chances and duration of such a loss of rail-wheel contact, thus giving better adhesion.

Primary suspension of WAG-7, has sets of equalizers hung directly on end axle boxes, and supported on middle axle box though a link and compensating beam arrangement. This ensures equal distribution of vertical load on all 3 axles. WAG-5 has two different sets of equalizer beams, one each between either end-axles and middle axle.

Secondary Suspension of WAG-7 has 4 side beares on each bogie, and share full vertical load leaving nil for centre pivot. In WAG-5, centre pivot takes 60% of vertical load, and 40% is shared by 2 side bearers.

**Suspension System of Locos**

- **CO-CO TIRMount Bogies**
  - WAM - 4, WAG - 5 Locos
- **High Adhesion Bogies**
  - WAG - 7 Locos
- **Bogies with Bolster**
  - WAP - 1, WAP - 4
- **Bogies of Three Phase Locos**
  - WAP - 5
  - WAG - 7

**CO-CO TIRMount Bogies of WAM - 4, WAG - 5**

- Side bearers - 40% load
- Centre pivot - 60 % load
- Snubbers - 4 per bogie
- Equalizing bear
- Motor axle hung nose suspended
- Only primary suspension
- Unequal Wheel Base
**Bogie Arrangement of WAM-4 or WAG-5**

- Side bearers - 4 Nos per bogie: Carries 100% load equally divided.
- Centre pivot: Carries only TE/BE and no vertical load.
- Equal wheel base: 3800 mm (1900+1900)
  (Unlike 1702+2108 for trimount bogie)
- Primary and Secondary suspension
- T.M.axle hung nose suspended
- Lateral Dampers between Body and Bogie
- Leading and trailing axle box bearings are provided with rubber thrust pad.
FLEXI-COIL BOGIES OF WAP - 1 / 4

- Primary and Secondary both suspension.
- Provision of bolster.
- Secondary suspension has got lateral friction dampers.
- Primary suspension with helical springs.
- Bolster is supported on springs provided on Bogie frame.
- Low traction - Bar
BOGIES OF WAP 5 / WAG 9

- Primary and Secondary suspension.
- Primary suspension - Springs and damper
- Secondary suspension - Springs and damper
- Lateral dampers
- Yaw dampers
- WAP - 5 : Motors are fully suspended.
- WAG - 9 : Motors are Axle hung nose suspended.

4. **Electrical factors**

4.1 **Effect of performance characteristics of TMs**:

The steepness of the TE vs Speed characteristics of TM, decides the time taken for arresting the wheel-slip and better adhesion. Normally TE at any speed should be lower than the maximum adhesive limit, but if the maximum adhesive limit decreases due to factors like dew or oil on rails, the wheels start slipping, and speed increases, causing TE to fall. If this instantaneous fall in TE is too rapid, it may become lower than the new adhesive limit and slipping may be arrested, otherwise for a less steep curve the slipping will continue a longer.
4.2 Effect of TM combination in series or in parallel:

Wheel-slipping of one axle causes the speed of that TM to increase, in turn increasing the back-emf, thus reducing the current. Now if TM groups are in series, the current-reduction in slipping TM will also cause current-reduction in other TM in series with it, so developing slipping in additional TM. Whereas TMs in parallel will not be affected by slipping of one TM. Hence 6 - P combination of TMs give better adhesion than 2 S - 3 P combination.

4.3 Method of traction control:

Method of control of TM by rheostatic method as in DC locos, or by tapchanger method as in AC locos, causes sudden large variation in TE in discrete seps. Then, the average value of TE becomes much less than the maximum permitted by adhesive limit. Increased number of steps reduce the variation in TE and hence the average value of TE rises and becomes closer to maximum. Continuous step-less control, as provided in 3-phase locos achieve better adhesion.

4.4 Use of Switch ZQWC in Loco, by Driver:

The torque developed by traction motor (TM) is proportional to the product of field flux and armature current. By use of ZQWC a part of the TM’s field is diverted through a shunting resistor.

Therefore torque produced by motor and consequently TE at the corresponding wheels will be lower. In this way, fields of TMs on off-loaded axles are weakened, while those of TMs on overloaded axles are working to
their full strength. Thereby total TE of locomotive is so distributed among axles that ratio of TE to weight is more or less equal for all axles. This provides relief to offloaded axles that would otherwise have this ratio unduly strained - heightening the probability of wheel-slip. For same level of limiting adhesion - utilization - factor ( ), higher TE can be obtained from the locomotive.

Circuit for Weight Transfer Compensation Switch

A spring-loaded switch named ‘ZQWC’ is provided on the Driver’s desk. The Driver is expected to use it by pressing it until the train starts rolling while starting the train on up gradients. This switch operates a relay ‘QWC’, which in turn operates the shunting contractors to achieve shunting of fields of desired TMs depending upon the direction of motion.

It may be noted that the Driver is supposed to leave the switch, the moment locomotive has begun to roll. Therefore this circuit is relevant only before the moment in which back emf gets established.

4.5 Enginemanship :

The Driver’s skill or enginemanship also affects the adhesion while in motion. Sudden increase in TE may result in a value higher than permitted by Kinematic Coefficient of Adhesion and may result in slipping and auto-regression, finally causing temporary reduction in TE. Negotiating a gradient with necessary attacking speed and timely use of sanders, helps in maintaining proper adhesion.

Methods to improve Adhesion

1. Bogie Design
2. Selection of TM Characteristic
3. Arrangement of TMs in series or parallel
4. Field weakening of slipping TMs
5. Enginemanship
6. Stepless Control
7. Sanding
8. Creep Control

SLIP- SLIDE CONTROL OR CREEP - CONTROL

Maximum tractive or braking effort is obtained if each powered wheel of the vehicle is rotting at such an angular velocity that its actual peripheral speed is slightly higher (motoring) or slightly lower (braking) than the true vehicle speed (i.e. the linear speed at which the vehicle is traveling, usually referred
to as “ground speed” or “track speed”. The difference between wheel speed and track (or “ground”) speed is referred to as “slip speed” or Creep.

This system and method maximizes the available rail adhesion between the rails of a track and the wheels of a rail vehicle so that the vehicle is better able to accelerate up to operating speed and to decelerate to a stop condition under poor rail conditions.

**Doppler radar based control:**

- Measure Vehicle speed independently.
- Measure individual axle speed.
- Control slip by permitting wheel to slip at fixed rate above vehicle speed.
- Examples: WAG - 6 A, WDG - 4.

**Delta-N Control**

- Estimate reference speed.
- Obtain TE feedback.
- Permit slip till TE is maximum.
- Examples: WAG- 6 B and C, WAG - 9 , WAP- 5

**SLIP- SLIDE CONTROL OR CREEP - CONTROL**

There is a relatively low limit value of slip speed at which peak tractive or braking effort is realized. This value, commonly known as maximum “creep speed,” is a variable that depends on track speed and rail conditions. So long as the maximum creep speed is not exceeded, slip speed is normal and the vehicle will operate in a stable microslip or creep mode.
If wheel-to-rail adhesion tends to be reduced or lost, some or all of the vehicle wheels may slip excessively, i.e. the actual slip speed may be greater than the maximum creep speed. Such a wheel slip condition, which is characterized in the motoring mode by one or more spinning axle-wheel sets and in the braking mode by one or more sliding or skidding axle-wheel sets, is continuously monitored, detected and corrected immediately.

**STEPS IN SLIP / SLIDE CONTROL**

1. Measuring actual vehicle velocity and computing therefrom values of wheel rotational velocity and wheel acceleration for the actual vehicle velocity;

2. Measuring actual wheel velocity and deriving therefrom actual wheel acceleration;

3. Determining if actual wheel velocity varies from the computed wheel velocity by more than a selected first minimum value and, if so, generating a wheel slip/slide signal.

4. Computing, in response to the slip/slide signal, a difference between actual wheel acceleration and computed wheel acceleration; and

5. Summing a value representative of the computed difference with the torque request signal so as to adjust motor torque in a manner to correct the wheel slip / slide condition.

6. Determining if the actual wheel velocity varies from computed wheel velocity by more than a second minimum value greater than the first minimum value and, if so, substantially reducing the torque request signal until the variation between actual and computed wheel velocity is less than the 2nd min. value.

7. Inhibiting modification of the torque request signal until vehicle velocity exceeds a minimum threshold value.

8. The first minimum value includes a slip value and a slide value and the method of determining includes comparing actual wheel velocity to each of the slip and slide values for generating respective wheel slip and wheel slide signals.

9. Determining if the vehicle is in a propulsion or in a braking mode and enabling a corresponding one of the slip and slide signals.

---------------

**Traction Rolling Stock : OPERATION.**
6. Traction Effort and Train Resistance

6.0 General Concepts about Force (Traction Effort), Power & Speed:

6.0.1 Force: The application of force to a mass will cause it to accelerate as governed by one of Newton's laws of motion. The relationship is that the force necessary, is the product of the mass and acceleration.

\[ \text{Force} = \text{Mass} \times \text{Acceleration} \]

(Tractive Effort is a type of Force, causing a loco or train to move)

6.0.2 Energy: The energy consumed in moving an object over a distance is the product of the force required and the distance.

\[ \text{Energy} = \text{Force} \times \text{Distance} \]

6.0.3 Power: Power is the rate of energy usage, or energy per unit time.

\[ \text{Power} = \frac{\text{Energy}}{\text{Time}} = \frac{\text{Force} \times \text{Distance}}{\text{Time}} = \text{Force} \times \frac{\text{Distance}}{\text{Time}} = \text{Force} \times \text{Speed} \]

or \[ HP = \text{TE} \times \text{Speed} \]

6.1 TRACTIVE EFFORT

Tractive Effort (TE) is the force applied to the rail by the wheel of the train to cause movement. The size of this force is determined by the characteristic of the power equipment installed on the train, and how the driver uses it. TE is a function of speed for a particular setting of control.

A typical TE-vs.-Speed Curve for a locomotive is shown on Fig.1 next page. The starting TE is shown constant up to 20 mph, therefore in this speed range, from relationship of \( F = m \times a \), as TE (or Force) is constant, the acceleration will be constant. As a result of this, speed will build up uniformly with time as shown in Fig.2. This is the region of Maximum Tractive Effort, limited by adhesion. Above this speed, TE falls, and in consequence, the acceleration will start to fall and speed will not build up so quickly. The plot of speed with time, now starts to take shape of a curve as shown in Fig 3.

![Fig.1 – Tractive Effort versus Speed Curve](image-url)
6.2 Maximum Power at Rail:

In the example given, the maximum TE of the unit is 100kN, and hence the maximum power may be calculated as follows:

Speed in m/s = \(\frac{\text{speed in mph}}{2.2}\) = \(\frac{20}{2.2}\) = 9.1 m/s

Power = Force x Speed = 100kN x 9.1 m/s = 910KW upto 20mph.

As this is the power needed to actually move the train it is strictly referred to as the **Maximum Power at Rail** as shown below in Fig.4.
In reality, the total power drawn from the supply will be greater than 910kW, due to the need for additional auxiliary loads and due to losses in the conversion process.

It highly unlikely that the equipment is capable of running at this power level continuously, and for all types of services. Again, for reasons of rating, the characteristic of the equipment will not follow the curve of maximum power at top speed, as indicated by the dip from 70mph onwards in Figs 1 & 4. Consequently a continuous power rating will often also be quoted. Continuous Power rating may be derived from a number of factors based around the equipment characteristic and will include assumptions of proportion of time; coasting is done at a lower tractive effort demand by driver.

6.3 Types of tractive effort: As, $\text{TE} = \text{loco weight} \times \text{adhesion}$. It may be noted that horsepower isn’t a part of the calculation for TE.

6.3.1 Starting Tractive Effort - is the amount of tractive effort that must be produced by the motive power to start moving a train from a dead stop without slipping the wheels.

6.3.2 Continuous Tractive Effort - is the amount of tractive effort required to keep a train in motion continuously for long term without slipping the wheels or overheating the traction motors & transmission.

6.3.3 Short Term Tractive Effort for X minutes - is the amount of tractive effort required, for short term (for prescribed X minutes), say to climb a grade. This will generally not exceed 120% of the Continuous TE for the prescribed short period of time. It is limited by overheating of the traction motors, of other power & transmission equipments on the locomotive.

6.4 Increase of Speed and Balancing Speed:-
As the DC motor starts to turn, the interaction of the magnetic fields inside it causes it to generate a voltage internally. This "back emf" opposes the applied voltage and the current that flows is governed by the difference between the two.
So, as the motor speeds up, and the internally generated voltage rises, the effective voltage falls, less current is forced through the motor and thus the torque falls. In order to continue accelerating the train, notches are further increased, each notch increases the effective voltage and thus increasing the current and torque for a little bit longer until the motor again catches up. This can be felt by a jerk of acceleration as the torque suddenly increases in response to the new surge of current.

Fig.5-Intersection of TE-vs-Speed Curve, with Train Resistance Curve
The motor naturally stops accelerating at any notch-position, when the drag or Resistance of the train (increasing with speed) matches the torque produced by the motors. This is called the “Balancing Condition”. Balancing Speed is the maximum speed for the given load, on that gradient & curvature, and is the speed at the intersection-point of TE-Speed curve & Train Resistance-Speed curve. Force available to accelerate the train is the difference between TE and train resistance.

6.5 TRAIN RESISTANCE:
It is the resistance offered to start or run a train of given load at a given speed and on a given gradient.
Train Resistance during run is normally given by:-
\[ R = a + bv + cv^2, \] where \( v \) = speed
The factors \( a, b \) and \( c \) characterise the particular train, with \( "a" \) being the static friction, \( "b" \) is due to mechanical considerations, and \( "c" \) is air resistance.
It is normally expressed as the Specific Resistance in kg/ton, which is the force or TE required for starting or running a loco or train, per ton weight of loco or train.
Types of train-resistances are:-
1. Resistance to start (a loco or loco+train) on straight level track.
2. Resistance to run at a given speed on straight level track.
3. Resistance due to gradient.
4. Resistance due to track-curvature.

6.5.1 Calculation of Train Resistance & Tractive Effort:
(RDSO's Technical Circular TC 27 vide Lr.No.EL/3.1.39/1 dt.27.7.98)
(A) Starting Resistance of Train or TE required to start a Train is given by :-
\[ TE = T_1 x (Load Wt.) + T_2 x (Loco Wt.) + T_3 x (Train Wt.) + T_4 x (Train Wt.) \]
Where, \( T_1 \) = Starting Resistance of load in kg/ton.
= 4 kg/ton for BOXN wagon & 6 kg/ton for BOX wagon.

T_2 = Starting Resistance of loco = 6 kg /ton
T_3 = Grade Resistance in kg/ton
T_4 = Curve Resistance in kg/ton

(B) Running Resistance of train or TE required to run a train at a given speed "V" in kmph , is given by :-

Here, T_3 \& T_4 remain the same as for starting the train, while T_1 \& T_2 on run are given by :-

T_1 = 0.6438797 + 0.01047218 V + 0.00007323 V^2 \quad \text{(for BOXN load)}
T_2 = 0.647 + (13.17 / A) + 0.00933 V + (0.057 / AN) V^2 \quad \text{(for loco)}

Where A = Axle-Load of Loco in ton

and \quad N = \text{No. of Axles in Loco}

6.5.2 Effect of gradient on train-resistance :

If the train was travelling vertically upwards or on Grade 1 in 1 (G=1), it would incur the full effect of gravity. The acceleration due to gravity is constant. Mathematically, it is known as "g" and its value is 9.81 m/s^2.

For example, for a 150 tonne (150 x 1000 kg) train, the gravitational force acting on it is:

\[
\text{Force} = \text{Mass} \times \text{Acceleration} \\
= 150 \times 1000 \times 9.81 = 1471500 \text{ N} \\
= 1471.5 \text{ kN} \,. \text{(This is also weight of train given by mg)}
\]

Such a high TE is required to lift the train vertically upwards on 1:1 (G=1) gradient.

Now, since luckily no gradient is that steep, so the gravitational resistance practically encountered isn't nearly so great. While it's not completely accurate, for the gradients encountered by trains, it suffices to divide the weight by the gradient to obtain the value for this resistance.

For example, if the above train were to climb a 1 in 200 gradient or G=200, the resistance due to gravity would be :-

\[
T_G = \frac{1471.5}{200} = 7.3575 \text{ kN}
\]

Therefore TE required for a train of weight "W", to overcome a gradient of "1 in G"is given by:-

\[
T_G = \left[ \frac{W}{G} \right] \\
\text{Or, Specific Grade Resistance} = \left(\frac{1}{G}\right) \text{..in kg/ton}
\]

The train's speed remains constant at the point where the torque of the motor, governed by the effective voltage, equals the drag or train-resistance at the balancing speed. If the train starts to climb a grade, the speed reduces because drag is greater than torque. But the reduction in speed causes the back voltage to decline and thus the effective voltage rises - until the current forced through the motor produces enough torque to match the new drag. As long as the train produces Tractive Effort, greater than the overall train resistance, the train will accelerate. In the example shown in Fig.5 above, the balancing speed is 95 mph on the level, but it is 75 mph on a 1 in 100 gradient, as it will reduce on increasing up-gradient.

6.5.3 Effect of curvature on train-resistance :

Tractive Effort required to overcome curve-resistance of S^0 curve is given by :-

\[
T_C = 0.4 \times S \times W, \\
\text{where } W= \text{Weight of train in tons}
\]
If instead of degree of curve, the radius of curvature (R) is given in m.,
then :- \( S_0 = \frac{1746}{R} \)

So, Specific Curve Resistance = \( T_4 = 0.4 \times S \) \( \text{in kg/ton} \)

**6.5.4 Effect of Gear Ratio on Tractive Effort:**

A gearbox links the traction motor shaft to the train axle, in order to step down the high rotational speed of motors to the required speed of axles!

Since power = force \( \times \) speed; as the speed at axle is reduced, the force or torque at the axle is increased. Consequently, re-gearing is often used as a means of obtaining a revised traction characteristic to suit alternative service patterns. The effect of changing gear-ratio is to change the train speed at which full load can be applied. Therefore:

1. Increasing the gear ratio reduces the minimum speed (hence increases torque) at which a given locomotive can operate safely, e.g. gear ratio of about 4 (16:65, 18:64 or 17:77) is used in Goods
2. Reducing the gear ratio, increases the maximum speed at which a given locomotive can operate without mechanical damage to the motors, e.g. a gear-ratio of about 3 or (21:58) is used on Coaching Locos.

**6.5.5 Effect of Wheel Diameter on Tractive Effort:**

As the wheels wear down, the tractive effort characteristic will change! A change in the wheel diameter is effectively a change of gear ratio, and consequently as the wheels get smaller the starting TE will increase. However, as this also means that the axle speed becomes higher for any given train speed, the TE at higher speeds will fall off more rapidly. When train performance is being predicted, it is normal to assume the average half-worn wheel diameter.

**6.5.6 Effect of Field Shunt on TE & Speed:**

The DC motor can be made to run faster than the basic "balancing speed" achieved whilst in the full parallel configuration with full voltage applied. This is done by "field shunting". An additional circuit is provided in the motor field to weaken the current flowing through the field. The weakening is achieved by placing a resistance in
parallel with the field. This has the effect of forcing the armature to speed up to restore the balance between its magnetic field and that being produced in the field coils. It makes the train go faster but at less power.
7. TRAIN PARTING

7.1 TYPES OF COUPLER FORCES:

1. **Draft Force** :- It is the force on coupler required for pulling other attached coupler / wagon. Pulling of attached wagon starts only after complete extension of the couplers attached together.

![Coupler Extension](image1.png)

**DRAFT-FORCE & KNUCKLE-SLACK ON COUPLER (DRAW-GEAR) IN RUN-OUT**

2. **Buff Force** :- It is the force on coupler required for pushing other attached coupler / wagon. Pushing of other wagon starts only after complete compression of couplers attached together.

![Coupler Compression](image2.png)

**BUFF-FORCE ON COUPLER DURING RUN-IN**
7.2 DEFINITION OF SOME TERMS:

1. **Draw Gear**: The actual coupling between loco & wagon or between wagons.

2. **Draft Gear**: The impact absorbing apparatus, whereby the draw-gear is attached to a its loco or wagon.

3. **Slack**: It is the free play provided in draw-gear and in some draft-gear. It is required for movement around curves & grades.

4. **Free Slack or loose slack**: It is the clearance within the draw-gear, which can run-in or run-out, without compressing / stretching the draft-gear. Its value is upto 1 inch for a wagon.

5. **Spring Slack**: It is the additional longitudinal movement that can occur after “free slack” movement is finished, and when draft-gear is compressed or rebounds directing all slack in opposite direction. Its value is upto 5 inches, when draft-gear is fully pressed. **Total slack** for 40 vehicles is about 20 feet.

6. **Run-In**: It is the rapid change of the train’s coupler-slack to buff (compressed). It may happen when rear section of a train travelling at faster speed bumps against the front portion of the train travelling at slower speed, due to sudden braking.

7. **Run-Out**: It is the rapid change of a train’s coupler-slack to draft (stretched). It may happen when rear section of a train travelling at slower speed stretches against the front portion of the train travelling at faster speed, due to sudden acceleration.

8. **Slack Action**: It is the movement of one part of a coupled train at a speed different from another part of the train, causing run-in or run-out. Impact Force due to bump on couplers varies as square of the difference of these speeds. Such repeated impacts cause wear and fatigue and finally coupler-breakage.
Run-In Mechanism at Km. 167 due to undulating graded section is described on next page, with respect to the sketch of tension / compression forces shown above.

As the locomotive start to climb the grade(B) the group of wagons near the bottom of the grade slow down after being in tension and begin to compress as the rear portion on the downhill grade runs into them. When the couplers in this region finally become compressed (C), the rear of the train runs in rapidly (D, E) until the wave reaches the rear of the train at which point the entire train begins to oscillate at its natural frequency.
7.4 CAUSES OF TRAIN PARTING:

7.4.1 DRIVING STRATEGIES:

One of the key factors in limiting longitudinal coupler forces is the ability to control the slack action within the train. Relatively low forces will result if the coupler slack is taken-up one wagon at a time; however it is not possible with longer trains on undulating grades.

It is important to prevent the relative movement of large groups of wagons that behave as single mass. High impact forces result when two blocks of bunched (or stretched) wagons separated by a number of stretched (or bunched) wagons move together (or apart) due to differences in speed along the train. When all slack between the two separate blocks of wagons is used up, the resultant run-in (or run-out) can easily cause longitudinal coupler forces in excess of the permissible limit.

Maximum chances of train parting arise while negotiating undulating graded section. Following precautions may help in avoiding excessive coupler-forces & parting:

1. Try to maintain constant speed by MP manipulation and coasting by utilizing gradient rather than brakes.

2. Reduce power slightly just before approaching top of the hump, to avoid subsequent excess speed and use of severe braking.

3. Similarly increase power slightly just before approaching dip.

7.4.2 TRAIN BRAKE APPLICATION:

The application and release of train brakes has been found to be a key factor in many of the recorded train partings and knuckle failures. A train brake application usually results in compressive coupler forces. However, much of the severity of the resultant run-in depends on the force and slack distribution within the train prior to the brake application. The wagons may or may not be uniformly loaded, so wagons may brake differently to each other accordingly.

A good train handling practice for freight trains usually consists of keeping the consist stretched. This is achieved by keeping the consist in power while a brake application is made and by bleeding the air off the locomotives brakes before they apply. It is not possible to do this with the use of dynamic brake, which presents its own train handling challenges. The use of dynamic brake can result in a severe slack action, when applied; run-in is highly possible if brought-in at an inappropriate time (with respect to track geometry and train speed) and if released at an inappropriate time, can result in a run-out. Both can potentially snap train draw-gear, causing the train-parting.

7.4.3 Coupler Maintenance:

It is observed from majority of C&M’s investigation reports of broken couplers that, the failure is often due to poor tensile strength (UTS) of coupler, caused by:

1. Excessive & uneven wear on knuckle and plates.
2. Improper heat treatment of knuckle.
4. Improper material composition.
5. Fatigue or old cracks.

The CBC coupler is designed to withstand 295 T of UTS, whereas the maximum force found to be exerted on coupling due to worst driving of full load on a heavily graded section, as simulated on AC Loco Simulator at Bhusaval, is only 190 T, which can not cause parting, unless an old flaw in knuckle is existing.

7.5 Reasons of train-parting, due to uncoupling etc. :

- Lock not properly engaged
- Ineffective anti-creep device
- Uncoupling lever dropping on the run
- Unauthorized tampering with uncoupling lever
- Uncoupling due to vertical slipping out of knuckle

7.6 Precautions to reduce train parting:-

1. While starting from standstill, back the train a little. This will help in dropping of the locks where the lock has not fully dropped at the time of initial coupling.

2. Avoid sudden notching up.

3. Avoid sudden application of brakes from rear.

4. Allow time for brakes in rear wagons to get fully released before further notching up.

5. Try to keep the couplers in slack-stretched condition.

6. Ensure proper casting and maintenance of couplers. It is further explained as

6.1 Procurement of the coupler spares of proper quality needs to be placed on sound footing.

6.2 Purchase inspection by RDSO at coupler manufacture’s works is required to be stricter.

6.3 It is considered that some type of locking arrangement should be provided in the uncoupling gear to guard against unauthorized tampering with unlocking mechanism.

6.4 The wearing surfaces of the knuckle like the nose, lock face and hub may hardened by some suitable local hardening process like Plasma weld deposition process to reduce wear.

6.5 No coupler component should be lubricated at any stage.

6.6 Weld reclamation of pre and post heat treatment of the knuckle and lock to be carried out properly. It has been noticed during checks in certain
workshops that the heat treatment procedure particularly is not being done properly.

6.7 All reclaimable components of the coupler, like shank, knuckle, lock and draft gear should be sent to workshop for reclamation/rejection. The operating mechanism and rotary lifting gear should be examined for any bent rod, broken bracket and defective/missing components.

6.8 Repairs/replacement to be carried out and where not possible, Wagon to be marked sick.

6.9 Some defects like excessive dropping of the coupler, crack in the coupler head, crack in the knuckle itself, loose and inadequate fastening of yoke pin support plate should checked properly.

6.10 Checking of anti-creep feature to be done on all wagons leaving sick line according to the method prescribed and any malfunctioning should be corrected.

7. Ensure proper working of DV.

8. Ensure correct handle position in wagon to empty / loaded.


10. Arrest the air-leakages from BP pipe.
8. LINE HAUL COST

8.0 Line Haul Cost: It is the total all-inclusive unit-cost, incurred by Railways, to haul 1000 GTKMs of trailing load. It is calculated service-wise (for Coaching and Freight separately) and traction-wise (for Electric & Diesel traction separately). Only revenue portion of GTKM, (i.e. excluding weight of engine & departmental vehicles), is taken for calculation.

It consists of following four elements:-
1. Traction Cost
2. Track & Signalling Cost
3. Other Transportation Cost
4. Provision & Maintenance Cost of Coaches and wagons.

8.1 Line Haul Traction Cost = \[\frac{\{\text{Total Traction Expenses in Rs.}\}}{\{\text{GTKM in ‘000}\}}\]

It is given in Rs. per thousand GTKM, and is calculated every year, separately for Freight & Coaching Services, and separately for electric & diesel traction, for each Railway.

These figures are published by Rly.Bd. (Directorate of statistics & economics) in the booklets on “Summary of end-results – separate books on Freight Services Unit Costs & Coaching Services Profitability/Unit Costs.” For LHC (Goods), Figures for “Through Goods Train” is considered.

Figures extracted from these Booklets are given below for last four years:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>LHC (FREIGHT)</th>
<th>LHC (COACHING)</th>
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<tr>
<td></td>
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<tr>
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<td>89.98</td>
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The figures of LHC for different Railways for Elect. & Dsl. For last 2 years is given here:

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<td>CR</td>
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<td>ER</td>
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<tr>
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<td>197.44</td>
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<tr>
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<td></td>
<td>219.74</td>
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<td>114.98</td>
<td></td>
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<tr>
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<td>SCR</td>
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<td>162.64</td>
<td>312.72</td>
<td>82.53</td>
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</table>

8.2 Components of Line Haul Traction Cost:

It has following five components:-
A) Component of Repair & Maintenance Cost of Loco & OHE.
C) Component of Other Operating Expenses.
D) Component of Depreciation Cost of Loco & OHE.
E) Component of Interest Charges on Loco & OHE.

8.2.1 DEMAND HEADS FOR BOOKING EXPENDITURE, RELEVANT FOR LHC:

<table>
<thead>
<tr>
<th>SN</th>
<th>ABSTRACT</th>
<th>DEMAND NO.</th>
<th>DESCRIPTION OF EXPENDITURE</th>
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<td>1</td>
<td>A</td>
<td>3</td>
<td>General Supervision</td>
</tr>
<tr>
<td>2</td>
<td>C</td>
<td>5</td>
<td>Repair &amp; Maintenance of Motive Power</td>
</tr>
<tr>
<td>3</td>
<td>E</td>
<td>7</td>
<td>Repair &amp; Maintenance of Plant &amp; Equipment</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>8</td>
<td>Operating Expenses – Rolling Stock Equipments</td>
</tr>
<tr>
<td>5</td>
<td>G</td>
<td>9</td>
<td>Operating Expenses – Traffic</td>
</tr>
<tr>
<td>6</td>
<td>H</td>
<td>10</td>
<td>Operating Expenses – Fuel</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>14</td>
<td>Appropriation of Funds</td>
</tr>
</tbody>
</table>

8.2.2 Component of LHC - Repair & Maintenance Cost of Loco & OHE

It consists of following 10 parts:-

1. Electric Locomotives C-500, C-670
2. OHE for electric traction E-410
3. Power Supply Equip-electric traction E-420
4. Plant & Equip. in loco shed E-440 (443)
5. Other Plant & Equip-electric traction E-470
6. Service motor-car & trolleys E-483
7. Credit of material released from work charged to ord. rev. (elec. dept.) C-920, E-930
8. Credit of material released from works C-921+922
10. Direct supervision for electric management Abs.A

8.2.2.1 Sub-Heads of “R & M Cost of Electric Loco” component of LHC:

<table>
<thead>
<tr>
<th>SN</th>
<th>SUB HEAD</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>C 510</td>
<td>Running Repair in Shed</td>
</tr>
<tr>
<td>2</td>
<td>C 520</td>
<td>Running Repair in Shed / Workshop</td>
</tr>
<tr>
<td>3</td>
<td>C 530</td>
<td>POH in Workshop</td>
</tr>
<tr>
<td>4</td>
<td>C 540</td>
<td>IOH</td>
</tr>
<tr>
<td>5</td>
<td>C 550</td>
<td>Special Repairs / Overhauling</td>
</tr>
<tr>
<td>6</td>
<td>C 560</td>
<td>Other Repairs like Auxiliaries etc.</td>
</tr>
<tr>
<td>7</td>
<td>C 570</td>
<td>Misc. Charges</td>
</tr>
<tr>
<td>8</td>
<td>C 580</td>
<td>Other Repairs like Brake Equipments etc.</td>
</tr>
<tr>
<td>9</td>
<td>C 590</td>
<td>Misc. Charges – incl. Adjustments</td>
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8.2.2.2 Sub-Heads of “OHE Cost” component of LHC :

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<tr>
<td>2</td>
<td>E 411</td>
<td>Normal Maintenance &amp; Repair</td>
</tr>
<tr>
<td>3</td>
<td>E 412</td>
<td>Modification to OHE</td>
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<tr>
<td>4</td>
<td>E 420</td>
<td>PSI</td>
</tr>
<tr>
<td>5</td>
<td>E 470</td>
<td>Other Plants &amp; Equip. for traction</td>
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<tr>
<td>6</td>
<td>E 930</td>
<td>Credit for Released Material</td>
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</table>

8.2.3 Component of LHC - Operating Energy Cost –Fuel :

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<tr>
<td>1</td>
<td>H 300 (331 to 338)</td>
<td>Cost of electric energy consumed</td>
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<tr>
<td>2</td>
<td>H 930 (931 to 934)</td>
<td>Credit of energy supplied to other than traction</td>
</tr>
<tr>
<td>3</td>
<td>E 141- 144, 151-154 &amp; 160</td>
<td>Direct Supervision of OHE Plant &amp; Equip.</td>
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8.2.4 Component of LHC – Other Operating Expenses :

<table>
<thead>
<tr>
<th>SN</th>
<th>Sub Head</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>Direct Supervision of Running Staff</td>
</tr>
<tr>
<td>2</td>
<td>F 312</td>
<td>Loco Running Staff &amp; Crew</td>
</tr>
<tr>
<td>3</td>
<td>F 321</td>
<td>Shed &amp; Yard Staff</td>
</tr>
<tr>
<td>4</td>
<td>F 322</td>
<td>Examiner, Cleaner etc.</td>
</tr>
<tr>
<td>5</td>
<td>F 331</td>
<td>Lubricants</td>
</tr>
<tr>
<td>6</td>
<td>F 332</td>
<td>Operating Stores</td>
</tr>
<tr>
<td>7</td>
<td>F 333</td>
<td>Contingent Expenses</td>
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<tr>
<td>8</td>
<td>F 340</td>
<td>Misc. Expenses</td>
</tr>
<tr>
<td>9</td>
<td>G 750</td>
<td>Inter Railway Financial Adjustment (IRFA)</td>
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</tbody>
</table>

8.2.5 Component of LHC – Depreciation Cost of Loco & OHE :
It has following two components :-
1. Depreciation for locomotives - Abs. C
2. Depreciation for OHE - Abs. E

8.2.6 Component of LHC – Interest Charges of Loco & OHE :
It has following two components :-
1. Depreciation for locomotives - Abs. C
2. Depreciation for OHE - Abs. E
8.2.7 **Items to check for Depreciation Cost of Loco & OHE:**
- "Capital at charge" for the zone
- Codal life of Loco & OHE
- Allotment of DRF from Railway Board
- Distribution of DRF based on "capital at charge" of the zone
- Care should be taken to ensure that locos taken on lease from IRFC do not form part of the "capital at charge"
- Care should also be taken to ensure that IRFA debit is properly accounted for.

8.2.8 **Items to check for Interest Charges of Loco & OHE:**
- Capital at charge for loco & OHE
- Interest is calculated at rate (same for both loco & OHE), as advised by Rly. Bd. from time to time.
- Guidelines are required to calculate interest on loan taken from World Bank and IRFC.

8.3 **Calculation of Line Haul Cost:**

The monthly “expenditure” and “operating statistics” data of every Division is taken by the “Statistical Inspector” to his Zonal HQ. The basis for Division’s “operating data” is the summary of all “Combined Train Reports” (CTR) filled by Driver & Guard at the end of each trip. Monthly Statements 1B, 2, 3A, 3B & 4A are prepared by HQ’s Statistical Branch, and are submitted to EDP Centre/HQ, where the Statements 8, 16, 17 & 18 are generated. Statement 8 is “Kilometerage Statement”. Statement 16 is “GTKM Statement-traction-wise”, Statement 17 gives “Engine Km”, and Statement 18 gives “Engine Hours”. Further, using COBOL Programme, it bifurcates the expenditure in Goods & Coaching, and prepares the supporting details for Annual Statistical Statements (ASS)” and calculation of LHC is done using EXCEL Worksheets, in the form of “Goods Cost Study” and “Coaching Cost Study” and is submitted to Railway Board. LHC and ASS is published only by Rly.Bd. The basis for bifurcation of expenditure etc., among “Goods” and “Coaching” is given as following:
### Table, explaining the basis of distribution of expenditure in Goods & Coaching

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Head of Account</th>
<th>Basis of Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C-500</td>
<td>To be divided in the ratio of: -&lt;br&gt; (i) 50% of the expenses on the no of locos in use on respective services&lt;br&gt; (ii) 25% of expenses on the basis of total engine Km of respective services&lt;br&gt; (iii) 25% of expenses on the basis of total engine hours of respective services</td>
</tr>
<tr>
<td>2</td>
<td>C-670</td>
<td>To be divided in the ratio of expenses under C-500</td>
</tr>
<tr>
<td>3</td>
<td>C-920</td>
<td>- do -</td>
</tr>
<tr>
<td>4</td>
<td>E-400</td>
<td>In the ratio of GTKM (including weight of engine &amp; departmental) of electric service</td>
</tr>
<tr>
<td>5</td>
<td>F-312</td>
<td>The wages &amp; allowances of Drivers Grade 'A', 'B' &amp; 'C', Shunters &amp; Firemen according to sanctioned cadre on 1st oct for goods, passenger &amp; shunting services by working out for three respective group, on the base of mean of the revised scale &amp; the average</td>
</tr>
</tbody>
</table>

#### 8.4 Check Points for Line Haul Cost:

<table>
<thead>
<tr>
<th>Sr No</th>
<th>Head of Account</th>
<th>Basis of Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>F320</td>
<td>To be divided in the ratio of loco in use under coaching and goods</td>
</tr>
<tr>
<td>7</td>
<td>F311</td>
<td>In the ratio of expenses allotted under F312, F320</td>
</tr>
<tr>
<td>8</td>
<td>F331</td>
<td>In the ratio of average consumption per Km on the patterns available in domestic statistics multiplied by Engine Kms (Including Dept) of respective services</td>
</tr>
<tr>
<td>9</td>
<td>F332</td>
<td>Same as F331</td>
</tr>
<tr>
<td>10</td>
<td>F333</td>
<td>Same as F311</td>
</tr>
<tr>
<td>11</td>
<td>F340</td>
<td>In the ratio of total expenses under F300</td>
</tr>
<tr>
<td>12</td>
<td>G751</td>
<td>Credit/Debit will be deducted/added from/to the allocated repair &amp; maintenance expenses for coaching &amp; goods under C500(C572). The relative share of coaching/goods is worked out on the basis of Engine Km earned by interchanged locos.</td>
</tr>
<tr>
<td>13</td>
<td>G782</td>
<td>To be transferred to C500(C511)</td>
</tr>
<tr>
<td>14</td>
<td>H311,318,321,322,331,333,335,336,338,930</td>
<td>To be distributed in the ratio of GTKM (including wt of engine &amp; departmental) of electric traction of respective services, multiplied by 0.025 in case of passenger. Proportion of mixed (other than EMU) and 0.012 in case of goods proportion of mixed</td>
</tr>
</tbody>
</table>
• Monthly operating statistics as per statement 4A, 3A, 2 & 1B to be closely watched. Corresponding statements should also be verified for GTKM calculation.

• Expenditure to be booked on correct head.

• In case of combined crew, methodology to be developed to book expenses on diesel working. Proper booking of expenditure through TV to be ensured.

• Ensuring 5% booking of energy cost of CLS on H 333 through proper TV.

• Calculation of components of LHC for Diesel also to be checked.

• For arriving at traction-wise figure of NTKM, the total figure computed on the basis of the commercial document (RR), shall be applied to respective Diesel and electric services in the ratio of cumulative figures derived from train document for the respective traction as available in monthly statement 3A.

• A watch should be kept on traffic GTKM figure for diesel and electric to ensure proper bifurcation.

• Energy consumed for shunting, departmental trains, light engines should be deducted for LHC calculation.

• Credit for locos and energy should be realized from other Railways in time and accounted for.

**8.5 Items requiring attention & correction:**

Passenger GTKM is calculated on the basis of normal load and not maximum load, so extra coach/RA is not accounted for.

• The weight of AC coaches (Self Generated) is 1-1/2 times more than ordinary coaches, but is not accounted for in GTKM.

• Energy lost on account of transmission losses from SEB’s to Railway substations to be accounted in line of 0.1% pilferage allowed for diesel.

• Diesel LHC does not include cost on H-240 (Fuel Organization including inspection) and departmental transportation cost. Similar deductions should also be made for TRD establishments.

• Diesel LHC does not include transportation charges for carrying HSD for fuelling points, if transported in departmental tank wagons.

• Method/basis followed by Railway Board for IRFC lease charges calculation is not known.
• Period, for which lease charges and interest on lease charge will be paid, is not known.

• Trailing Load is not correctly mentioned by Guard in CTRs.

• Apportionment of energy between coaching and freight services should not be arbitrarily distributed in the ratio of GTKM, but the weightage of 25:12 or 2:1 should be reviewed periodically.

• Energy meter readings of loco should be recorded by driver in the CTR, just like diesel consumption card readings.

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9. RAILWAY ACCIDENTS & ENQUIRIES

9.1 Railway Accidents:-

Railway transport is considered to be among the safest modern modes of transports. Yet there are occurrences which do or may affect the safety. Each of such occurrences in the working of Indian Railways is thoroughly investigated and suitable measures are taken so that their recurrences are avoided.

Accident: Any occurrences which does 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 does or may cause delays to trains or loss to the Railways is termed as accident.

Definition and Re-classification of Accidents on Indian Railways as per Railway Board’s letter No. 2000/Safety (A&R)/19/20 dated 31.10.2000

In supersession of instruction contained in Board’s Letter No. 88/Safety(A&R)/29/8 dated 18.4.1980 and letters of even number dated 10.8.2000 and 17.10.2000 regarding classification of accidents, Board has reexamined the matter and has decided to re-defined, accidents as follows:

(1) Definition:

(i) **Train**: A train is a set of vehicles, empty or loaded, worked by locomotive, or any other self propelled unit including light engine/engines or rail-motor vehicles or a single rail-motor vehicles, empty or conveying passengers, livestock, parcels or goods, which cannot be readily lifted off the track and running under a particular number or a distinct name from fixed point of departure to a fixed destination. Part of a train shall also be treated as train for the purpose of these definition, classification and statistics. The train engine or any other vehicles once put on the train continues to be a part of the train until the station is reached beyond which it is not required to go on the same train. At such stations, the moment the train engine or any other vehicles is cut off the load, it ceases to be a part of the train.

(ii) **Passenger Train**: A train intended solely or partly for the carriage of passengers shall be treated as a passengers train. A workman’s train or a ballast train or a material or an Accident Relief Train or a Tower Wagon or such other train carrying workmen, or Cattle special/Military special carrying authorized escorts or similar such train shall be treated as a passenger train.

(iii) **Other Train**: All trains not covered under (i) and (ii) shall be termed as “Other Train”.

(2) Accident:

For the purpose of Railway working, accident is an occurrence in the course of working of Railway which does or may affect the safety of the Railway, its engine, rolling stock, permanent way and works, fixed installations, passengers or servant or which affect the safety of others or which does or may cause delay to train or loss to the Railway. For Statistical purpose accidents have been classified in categories from “A” to “R” excluding “I” and “O”.
(3) **Injuries:**

Injuries are classified as (a) Grievous (b) Simple

(a) *Grievous* injuries for purpose of these statistics should be taken an injuries as defined in Section 320 of Indian Penal Code reproduced below for ready reference. (Section 320, Indian Penal Code 45 of 1860)

Following kinds of hurt only are designated as ‘Grievous’:

(A) Emasculion
(B) Permanent privation of the sight of either eye.
(C) Permanent privation of hearing of either ear.
(D) Privation of any member or joint.
(E) Destruction of permanent impairing of the powers of any member or joint.
(F) Fracture or dislocation of a bone or tooth.
(G) Any hurt which endangers life, or which causes the sufferer to be, during the space of twenty days, or in severe bodily pain or unable to follow his ordinary pursuits.

(H) **Simple Injuries**:

(i) A person will be considered to have incurred simple injuries if these injuries incapacitate the injured person to follow his customary vocation during 48 hours after the occurrence of the accident.

(ii) A Railway servant is considered to have been injured if he/she is prevented from returning to work as a result of injuries for a period of 48 hours after the occurrence of the accident.

(4) **Threshold Value:**

For the purpose of accident, threshold value is the minimum value beyond which the accident will be treated as having serious repercussion on the basis of loss to railway property or interruption to communication. It shall constitute two portions:

(a) Threshold Value of Railway Property, loss of which is fixed at One Lakh Rupees:

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OR
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(b) Threshold Value of interruption to communication either partial or total where duration or interruption is equal to or more than Number of hours specified against each cell.
<table>
<thead>
<tr>
<th>Interruption</th>
<th>BG-A,B,C or D Spl. (in hours)</th>
<th>BG- D, E Spl or MG-Q. R (in hours)</th>
<th>BG – E, MG- S or Ng route (in hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>OR</td>
<td>OR</td>
<td>OR</td>
<td>OR</td>
</tr>
<tr>
<td>Total + Partial</td>
<td>6</td>
<td>8</td>
<td>12</td>
</tr>
</tbody>
</table>

Duration of interruption is defined as duration from the time of accident till starting of first train on line clear from adjacent station for movement over the affected line in that section.

(5) **Classification of Accidents**:

Accidents are classified under the following heads:

(i) Train Accidents,

(ii) Yard Accidents,

(iii) Indicative Accidents,

(iv) Equipment Failures,

(v) Unusual Incidents.

(i) **Train Accidents**:

Train accidents is an accident that involves a train. Train accidents are further divided into two:

(a) **Consequential train accidents**; and

(b) **Other train accidents**.

(a) **Consequential Train Accidents** includes train accidents having serious repercussion in terms of loss of human life, human injury, loss of Railway property or interruption to Rail traffic. Train accident under following classification will be termed as consequential train accidents:

- Collision: All Cases under categories A-1 to A-4
- Fire: All Cases under categories B-1 to B-4
- Level Crossing: All Cases under categories C-1 to C-4.
- Derailment: All Cases under categories D-1 to D-4
- Miscellaneous: All Cases under categories E-1

(b) **Other Train accidents**: All other accidents which are not covered under the definition of consequential train accident are to be treated as ‘Other train accidents”. These include accidents under categories B-5, B-6, C-5 to C-8, D-5 and E-2.
(ii) **Yard Accidents**:
All accidents that take place in a yard and do not involve a train are termed as Yard Accidents. These includes accidents falling under categories A-5, B-7 and D-6.

(iii) **Indicative Accidents**:
In real term they are not accidents but are serious potential hazards and include all cases of train passing signal at danger, averted collision, breach of block rule coming under classification F, g and H.

(iv) **Equipment Failures**:
These include all failure of railway equipment i.e. failure of locomotive rolling stock, permanent way, overhead wire, signaling and telecommunication equipment and include cases falling under classification J, K, L and M.

(v) **Unusual Incidents**:
These include cases related to law and order but not resulting in train accidents and other incidents under classification N, P, Q, and R.

(2) **Reportable Train Accidents**:
All accidents falling under the purview of Section 113 of the Railway Act 1989 are termed as reportable train accidents and include following:

(a) Any accident attended with loss of any human life or with grievous hurt.

(b) Any collision between trains of which one is a train carrying passengers; or

(c) The derailment of any train carrying passengers, or any part of such train; or

(d) Accidents which are attended with loss of human life in passenger train involving train wrecking, or attempted train wrecking, cases of running over obstructions placed on the line, of passengers falling out of train or of fires in trains, or grievous hurt as defined in the Indian Penal Code, or serious damage to railway property of the value exceeding rupees twenty five lacks which have not actually occurred but which by the nature of the accident might reasonably have been expected to occur and also cases of land slides or of breach by train or flood which cause interruption of any important through line of communication for at least 24 hours.

7. **Serious Accident**:
*Accident to a train carrying passengers which is attended with loss of life or with grievous hurt to a passenger or passengers in the train, or with serious damage to railway property of the value exceeding Rs. 25,00,000 and any other accident which in the opinion of the chief Commissioner of Railway Safety of Commissioner of Railway Safety requires the holding of an inquiry by the commissioner of Railway*
**Safety shall also be deemed to be a serious accident.** However, the following shall be excluded:

- (a) cases of trespassers run over and injured or killed through their own carelessness or of passengers injured or killed through their own carelessness;

- (b) cases involving person being Railway servant or holding valid passes/tickets or otherwise who are killed or grievously injured while traveling outside the rolling stock of a passenger train such as on foot board or roof or buffer but excluding the inside of vestibules between coaches, or run over at a Level Crossing or elsewhere on the Railway track by a train; and

- (c) Level crossing accident where no passengers or Railway Servant is killed or grievously hurt unless the Chief Commissioner of Railway Safety or Commissioner of Railway Safety is of the opinion that the accident requires the holding of an inquiry by the Commissioner of Railway Safety.

(8) **Reporting of Accident**:

(a) **To Railway Board**: A telephone advice should be relayed to nominated officer in Railway Board’s Office immediately after the accident in case of following categories of accidents:

- (i) All consequential train accidents.

- (ii) Any yard accident having serious repercussion on movement of traffic of through/main line resulting in dislocation of traffic more than the threshold value as indicated above.

- (iii) Land slides, breaches, OHE breakdown etc. which result in dislocation of traffic more than the threshold value as indicated above.

In addition to this, periodic (monthly) statement of Accidents in all categories shall be submitted to Railway Board in prescribed Performa.

(b) **To zonal Railway**: A telephone advice should be relayed to nominated officer in Zonal HQ immediately after the accident in case of the following categories of accidents:

- (i) All trains accidents,

- (ii) Any yard accidents having serious repercussion on movement of traffic pm through line resulting in dislocation of traffic more than the threshold value as indicated above.

- (iii) Land slides, breaches, OHE breakdown etc. which results in dislocation of traffic more than the threshold value as indicated above.

In addition to this, periodic (monthly) statement of Accidents in all categories shall be submitted to Zonal Headquarter in prescribed Performa.
(9) Level of Enquiry:

(i) All serious accident shall be inquired into by the Commissioner of Railway Safety.

(ii) In case Commissioner of Railway Safety or Chief Commissioner of Railway Safety is not in a position to inquire into serious accident cases the inquiry shall be done by JA Grade Inquiry Committee.

(iii) All other consequential train accidents except Unmanned Level Crossing Accidents shall be inquired into by a committee of JA grade officers and in its absence by Brach officers. Consequential Unmanned Level Crossing Accidents shall be inquired into by a Committee or Junior Scale Officers.

(iv) All other train accidents shall be inquired into by a committee of Senior Scale or Junior Scale Officers as decided by respective DRMs.

(v) All yard accidents shall be inquired into by a Committee of Senior Supervisors.

(vi) Safety Officers shall be one of the members of all Departmental Accident Inquiry Committee. In case Safety Officer in same grade as of the inquiry committee is not available in the Division, Safety Officer of one grade below may be nominated for the Inquiry Committee.

(vii) All cases of indicative Accidents shall be inquired into by a Committee of Junior Scale Officers.

(viii) All cases of equipment failure shall be inquired into by senior Supervisors/Supervisors of respective departments.

(10) Rules for the preparation of accident returns:

(i) Accidents to trains shall be accounted for by the Railway which exercises jurisdiction over the site of accident. Engine failures shall be accounted for by the Railway owing the engines.

(ii) A train intended solely or partly for the carriage of passengers shall be treated as a passenger train. All other trains will come under the category of other trains.

(iii) Statistical returns in the prescribed Performa showing cumulative data till the end of the month should be submitted so as to reach Board’s Office not later than 7th day of the next month.

(iv) Only those accidents which have occurred during the period to which the returns relate shall be included in the relevant returns. With regard to accidents where detailed are not available at the time of forwarding the returns for any reason, such accidents are to be included in the statement with a clear indication that further details would follow.

(v) Each accident must be shown only once and in the event of an accident falling in more than one category, it should be treated as an accident in the higher category.

(vi) Derailments or bumping during reversing or shunting operations etc. on an incoming, outgoing or any other load, including a sectional carriage, etc shall be deemed to be a ‘train accident’ only when the train engine
or a vehicle still forming part of the train derails or as result of bumping casualty (including injuries) or loss to Railway property takes place, irrespective of whether the shunting was being done by the train engine or by a shunting engine.

(viii) Interruption is defined as duration from the time of accident till staring of first train on line clear from adjacent station for movement over the affected line in that section.

(ix) Statistics of fire should included all cases of physical fire or smoke emission resulting in death or injury or damage to property amount to Rupees 5000 and above.

(x) Details and Statistics for accident cases falling under Unusual incident categories “N”, “P” and “Q” shall be maintained and provided by Security (RPF) Branch.

(xi) DRM at the Divisional level and the General Manager at the Zonal Headquarters level will ensure correct reporting of accidents to Zonal Headquarters and Railway Board respectively.

(11) Collection, Compilation and Monthly statement of Accident Statistics:

(a) Information about train accidents, yard accidents and indicative accidents falling under classification A, B, C, D, E, F, G, and H will be compiled by the Safety Branch at Divisional and Zonal railways.

(b) Equipment failures falling under classification J, K, L and M will be compiled by the Divisional control on daily basis and shall be handed over to Safety Branch. Every equipment failure shall be classified under the category of avoidable and unavoidable by the Branch Officers concerned and summary shall be handed over to Safety Branch. Every equipment failure shall be classified under the category of avoidable and unavoidable by the Branch Officers concerned and summary shall be handed over to the Safety Department of the Division. It is further clarified that all equipments failures should be taken into account irrespective of the date of last schedule or examination and shall be subsequently classified under avoidable or unavoidable category as the case may be. The Safety Branch shall forward the monthly summary to Chief Safety Officer of respective Zonal Railways. Chief Safety Officer after compilation of statement shall be forward monthly statement to the Safety Directorate of Railway Board.

(c) Unusual incidents falling under classification N, P and Q shall be collected and complied by the Security (RPF) Branch at Divisional level and they shall take subsequently follow up action. Daily position will be given to the Safety Branch of the Division who after compilation of statistics shall forward monthly statement to Chief Safety Officer of Zonal Railways concerned. Chief Safety Officers after compilation of statement shall forward monthly statement to the Safety Directorate of Railway Board.
(12) Following system will be followed for reporting of accident to Railway Board:

(a) Information regarding consequential train accident and any yard accident leading to serious repercussion shall be reported by Divisional Control to Headquarters Central Control of Zonal Railway Headquarters. Central Control shall in turn inform all concerned at Headquarters office including GM, PHODs etc.

(b) In case of accidents as in para (a) above, chief Safety Officer/Dy COM (safety) should thereafter inform nominated officer of Safety Directorate of Railway Board. At Board level Safety Directorate shall issue the message and take follow up action.

(c) In case of land slide, breaches, OHE break down etc which result in dislocation of more than threshold value and also case due to public agitation shall be reported by Headquarters Control Office to Punctuality Cell of Railway Board and dealt with by the Coaching Directorate.

(d) Cases falling under N, P and Q except Q-6 i.e. blockade of train service due to public agitation; shall be dealt with by security Directorate.

Above instruction are in super cession of all pervious instruction on the subject, and have the approval of the competent authority.

These may be incorporated in Accident Manual of respective Railways.

Detailed classification of Accidents:

Class ‘A’- collisions

A-1 Collision involving a train carrying passengers, resulting in (i) loss of human life and /or grievous hurt and/or (ii) damage to Railway property of the value exceeding Rs. 25,00,000 and/or (iii) interruption of any important through line of communication for at least 24 hours.

A-2 Collision involving a train NOT carrying passengers resulting in (i) loss of human life and /or grievous hurt and/or (ii) damage to Railway property of the value exceeding Rs. 25,00,000 and/or (iii) interruption of any important through line of communication for at least 24 hours.

A-3 Collision involving a train carrying passengers, not falling under A-1 above.

A-4 Collision involving a train NOT carrying passengers not falling under A-2 above.

A-5 Other collision, i.e. collision occurring in shunting, marshalling yards, loco yards and siding etc. but not involving a train.
Class ‘B’ – Fire or Explosion in trains

B-1 Fire or Explosion in train carrying passengers resulting in (i) loss of human life and / or grievous hurt and/or (ii) damage to Railway property of the value exceeding 25, 00, 000 and / or (iii) interruption of any important through line of communication for at least 24 hours.

B-2 Fire or Explosion in train NOT carrying passengers resulting in (i) loss of human life and / or grievous hurt and/or (ii) damage to Railway property of the value exceeding 25, 00, 000 and / or (iii) interruption of any important through line of communication for at least 24 hours.

B-3 Fire or Explosion in a train carrying passengers not falling under B-1 above but (i) loss to Railway property and/or (ii) interruption of traffic is more than the threshold value and/or (iii) resulting into derailment of rolling stock/stocks from the train and/or (iv) requiring relief engine/s.

B-4 Fire or Explosion in a train NOT carrying passengers not falling under B-2 above but (i) loss to Railway property and/or (ii) interruption to traffic is more than the threshold value and/or (iii) resulting into detachment of rolling / stock from the train and/or (iv) requiring relief engines.

B-5 Fire or Explosion in a train carrying passengers not falling under B-2 or B-4 above.

B-6 Fire or Explosion in a train NOT carrying passengers and not falling under B-2 or B-4 above.

B-7 Fire or Explosion occurring in shunting, marshalling yards, loco yards and siding etc. involving rolling stock but not involving a train.

Note : In case of an inquiry by a committee into a fire accident in Railway Premises or in a train leading to damage to Railway property and/or booked consignments, a representative of the Railway Protection Force should also be included as a member of the Committee.

Class ‘C’ – Train running into road traffic, and/or traffic running into train, at level crossing.

C-1 Train carrying passengers running into road traffic and/or road traffic running into such trains at manned level crossing resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage to Railway property and/or (iii) interruption to traffic in more than the threshold value.

C-2 Train NOT carrying passengers running into road traffic and/or road traffic running into such trains at manned level crossing resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage to Railway property and/or (iii) interruption to traffic in more than the threshold value.

C-3 Trains carrying passengers running into road traffic and/or road traffic running into such trains at unmanned level crossings resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage to Railway property and/or (iii) interruption to traffic is more than the threshold value.
C-4 Trains NOT carrying passengers running into road traffic and/or road traffic running into such trains at unmanned level crossings resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage to Railway property or/and (iii) interruption to traffic is more than the threshold value.

C-5 Trains carrying passengers running into road traffic and/or road traffic running into such trains at manned level crossings but not falling under C-1.

C-6 Trains NOT carrying passengers running into road traffic and/or road traffic running into such trains at manned level crossing but not falling under C-2.

C-7 Trains carrying passengers running into road traffic and/or road traffic running into such trains at unmanned level crossing but not falling under C-3.

C-8 Trains NOT carrying passengers running into road traffic and/or road traffic running into such trains at unmanned level crossings but not falling under C-4.

C-9 Shunting engine with or without vehicles running into road traffic and/or road traffic running into such shunting engine with or without, vehicles or loose vehicles, at level crossings.

NOTE: If a road vehicle is not capable of being physically cleared off the track promptly by single person operating it, it should be termed as road traffic for the purpose of classifying such an accident as a train accident, irrespective of its mode of traction.

Class ‘D’ – Derailments

D-1 Derailment of a train carrying passengers resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage of Railway property of the value exceeding Rs. 25,00,000 and/or (iii) interruption of any important through line of communication for at least 24 hours.

D-2 Derailment of a train NOT carrying passengers resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage of Railway property of the value exceeding Rs. 25,00,000 and/or (iii) interruption of any important through line of communication for at least 24 hours.

D-3 Derailment of a train carrying passengers, not falling under D-1 above.

D-4 Derailment of a train NOT carrying passengers not falling under D-2 above but loss to Railway property and/or interruption to traffic is more than the threshold value.

D-5 Derailment of a train NOT carrying passengers not falling either D-2 or D-4 above.

D-6 Other derailments, i.e. derailments occurring in shunting, marshalling yards, loco yards and siding etc. but not involving train.

Class ‘E’ – Other Train Accident

E-1 Train running over or against any obstruction including fixed structure other than included under class “C” resulting in (i) loss of human life and/or grievous hurt and/or (ii) damage to Railway property and/or (iii) interruption to traffic is more than the threshold value.
E-2 Trains running into any obstruction including fixed structure but not covered up under class ‘C’ or ‘E-1’.

INDICATIVE ACCIDENTS

Class ‘F’ – Averted Collisions
F-1 Averted collision between trains at least one of which is carrying passengers.
F-2 Averted collision between a train carrying passengers and an obstruction.
F-3 Averted collision between trains NOT carrying passengers.
F-4 Averted collision between trains NOT carrying passengers and an obstruction.

Class ‘G’ – Breach of Block Rules
G-1 Trains carrying passengers, entering a block section without any authority or without a proper “Authority to Proceed”.
G-2 Trains NOT carrying passengers, entering a block section without any authority or without a proper “Authority to Proceed”.
G-3 Train received on a blocked line, not constituting an averted collision.
G-4 Train received on or entering a wrong line at a station or Catch Siding or Slip Sliding or Sand Hump etc.

Class ‘H’ – Train passing signal at danger.
H-1 Train carrying passengers running past a “stop” signal at danger without proper authority.
H-2 Train NOT carrying passengers running past a “stop” signal at danger without proper authority.

EQUIPMENT FAILURES

Class ‘J’ – Failure of Engine and Rolling Stock
J-1 Failure of engine hauling a train carrying passengers.
J-2 Failure of engine hauling a train NOT carrying passengers or light engine.
J-3 Parting of train carrying passengers.
J-4 Parting of a train not carrying passengers.
J-5 Failure of Rolling Stock such as Failure of tyres, wheels, axels, or braking apparatus etc. on a passenger carrying train leading to detachment of rolling stock/stocks from the train.
J-6 Failure of Rolling Stock such as Failure of tyres, wheels, axels, or braking apparatus etc. on train NOT carrying passenger leading to detachment of rolling stock/stocks from the train.
J-7 Failure of Rolling Stock such as Failure of tyres, wheels, axels, or braking apparatus etc. on passenger carrying trains, not leading to detachment of rolling stock/stocks from the train.
J-8 Failure of Rolling Stock such as Failure of tyres, wheels, axels, or braking apparatus etc. on train not carrying passengers, not leading to detachment of rolling stock/stocks from the train.

J-9 A train or a portion of a train running away, out of control.

J-10 Poor brake power in a train but not covered in class J-9.

Class ‘K’ – Failure of Permanent Way.

K-1 Buckling of track

K-2 Weld failure.

K-3 Rail fracture.

K-4 An unusually slack or rough running or heavy lurch experienced by drivers of running trains while passing over any length of permanent way leading to blockage of communication.

K-5 Failure of Railway tunnel, bridge, viaduct/formation/cutting and culvert etc.

K-6 Damage to track of such a nature as to render it temporarily unsafe for the passage of trains or likely to cause delays to traffic for period above threshold value.

K-7 Damage to track of such a nature as to render it temporarily unsafe for the passage of trains or likely to cause delays to traffic not covered up under classes – ‘K-1’ to ‘K-6’

NOTE : In above classification those cases detected during regular maintenance and not affecting trains movement will not be counted.

Class L – Failure of Electric Equipment

L-1 Snapping off or any damage to OHE wire requiring switching off of OHE for more than three minutes.

L-2 Not tension in OHE for more than three minutes.

L-3 Pantograph entanglement not covered under J-1 and J-2.

L-4 Defect in AC or other electrical equipment leading to detachment of a rolling stock/stocks from a train.

Class ‘M’ – Failure of Signaling and Telecommunication

M-1 Failure of part or complete panel / RRI.

M-2 Failure of interlocking/track circuit of axel counter.

M-3 Failure of block Instrument.

M-4 Failure of point machine and equipment.

M-5 Failure of signal/point.

M-6 Failure of control/station communication for more than fifteen minutes.

M-7 Failure of station to station or station to level crossing gate for communication for more than fifteen minutes.

NOTE : Signal/Point and Tele Failure which were not informed to S&T department will not be taken into account for Failure.
UNUSUAL INCIDENTS

Class ‘N’ – Train Wrecking
N-1 Attempted wrecking of or sabotage to a train carrying passengers.
N-2 Attempted wrecking of or sabotage to train NOT carrying passengers.
N-3 Attempted sabotage or tampering with track not involving any train.

Class ‘P’ – Casualties
P-1 Person or persons falling out of a running train resulting in loss of human life or grievous hurt.
P-2 Person or persons run over or knocked down by a train resulting in loss of human life or grievous hurt.
P-3 Person or persons falling out of a running train or knocked down by a train or engine or railway vehicle, not resulting in loss of human life or grievous hurt.

Class ‘Q’ – Other Incidents
Q-1 Accidental or natural death or grievous hurt to any person whether passenger, railway employee or tress passer (or any other person), within railway premises (excluding railway quarters).
Q-2 Murder or Suicide in a train or within railway premises.
Q-3 Robbery, attempted robbery, theft or attempted theft in Railway premises, including trains.
Q-4 Fire or explosion within Railway premises but not involving trains.
Q-5 Fire or explosion resulting in damage to Railway bridge and viaduct etc.
Q-6 Blockade to train services due to agitation.

Class ‘R’ – Miscellaneous
R-1 Vehicle or vehicles running away.
R-2 Train running over cattle.
R-3 Flood, Breaches and land sliding etc. resulting in interruption of an important through line of communication more than the threshold value.
R-4 Other cases of Floods, Breaches, Land Sliding etc. resulting in interruption to traffic.
R-5 Any accident not included in the foregoing classifications.

NOTE:  
1. The term ‘cattle’ does not include sheep, goats, pigs, dogs, donkeys, rams, ewe and lambs.
2. A train includes a trolley, lorry, motor, motor trolley when worked under the rules for working trains.
Objectives to be achieved in dealing with the accident:

(1) Save life and alleviate suffering
(2) Protect property including mails
(3) Provide help to other passengers
(4) Ascertain the cause of accident
(5) Restore through communication

To achieve this objective:

(a) Resources of man and material of all departments should be promptly made available
(b) Each official receiving advice of an accident must do all that is within his power to render assistance.

Duty of Railway servants towards safety vides GR 2.11:

Every Railway servant shall:

(a) See that every exertion is made for ensuring the safety of the public
(b) Promptly report to his superior any occurrence affecting the safe and proper working of the railway which may come to his notice.
(c) Render on demand all possible assistance in the case of an accident or obstruction.

Action to be taken on getting information of an accident:

(1) The concerned AEN and inspector should rush to the site of accident by the quickest available means. On their way they should collect further information of damage and arrange for man and material and their movement as required for restoration.

(2) The DEN shall collect the information and check for the adequacy of the arrangement made by AEN. If necessary he will supplement the arrangement and proceed to the site.

(3) Some responsible officer will be deputed in control for monitoring the movement of man and material and to provide further assistance to the site as required. He will also coordinate between the accident site and higher officers at Hqs.

(4) As per the gravity of accident ART and ARME will be ordered to proceed to accident site. ARME should be dispatched within 30/15 minutes of ordering during night/day time. ART should be dispatch with 45/30 minutes of ordering during night/day time.

ALARM SIGNAL CODE:

(1) Two long hooters 45" -5"-45” – accident in loco/traffic yard at homing station
(2) Three long hooters 45" -5"-45" - 5"-45” – accident outside homing station
(3) Four long hooters 45" -5"-45" - 5"-45" -5" 45” ARME required
(4) One long hooter of 90” – cancellation of ART/ARME
**Action at site:**

The first official (which is mostly an engineering official) reaching site should take following actions:

1. Protect train if not done by guard/driver of train involved.
2. Arrange for rescue and medical relief to the passengers involved.
3. Carry out a rapid survey of site and inform to the control/nearest station master regarding the damage and assistance required.
4. Check for the line clear, caution order, train register, etc.
5. Preserve clues and take up the preliminary clearing operation. In case of suspected sabotage, clearance from police officials must be taken before commencing restoration. A factual note of the conditions obtaining at site should be prepared and signed jointly by senior most police and railway officials at the site. However, it should not be allowed to interfere with rendering of medical relief to passengers. In case CRS wants to inspect the site, commencement of restoration may be delayed accordingly.
6. The preliminary statements of staff concerned should be taken at the site itself as any delay in doing so might lead to some facts being suppressed or some evidence being fabricated in due course of time.
7. Continuous contact should be maintained with the higher officials through fields telephone. After through assessment of the situation, prima-facie cause and probable restoration time should be intimated to the control.
8. Photographs showing the details of damage to permanent way, rolling stock etc should be taken wherever necessary.
9. AEN should ensure above actions being taken and he should coordinate with control for providing assistance as required. He should also plan for expeditious restoration of through traffic.
10. DEN should examine the adequacy of measures taken for fast execution of work.
11. **A preliminary report should be prepared at site including the sketch and sent to the higher officials.** The report should contain:
   (a) Nature of accident
   (b) Prima facie cause
   (c) Loss of life, injuries etc.
   (d) Extent of damage
   (e) Tract reading---- X-level, gauge, versine, super elevation for a distance of 45 m on either side if cause of derailment is indisputable known, otherwise for 90 m on rear side and 45 m ahead of zero station (point of mount).
   (f) Particulars of rainfall, patrolling, if any
   (g) Plan of restoration
   (h) Assistance(Man and material) required and probable restoration time.
(i) Any special feature
(j) Sketch of accident, site showing the details of the position of permanent way, rolling stock, any marks on rails, drag etc.

(12) The senior most officer at site will take the overall charge and ensure expedition execution of the work by proper coordination among the various departments. He will monitor for all works at site and check for the adequacy of measure taken.

Procedure of dealing with cases of sabotage or train wrecking:
The guard along with Engine crew and other railway staff if traveling by the train involved, after reporting the accident, protecting the train and rendering first aid to the injured must:

(i) carefully examine the track jointly with responsible passengers, and record the results of the examination and have the record signed by them.

(ii) See that the track, rails, fish plates, bolts etc. appearing to have been tampered with are not disturbed by any persons, and that these are closely watched till arrival of the Civil and Police Authorities.

The Station Master adjacent to the site of the accident must inform the local Civil Police/RPF authorities by the quickest means available and give them all possible assistance to reach the site as early as possible.

Engineering officials going to the site should take following precautions:

(i) the gang should not carry any tools with them while going in the first instance

(ii) their tool boxes are not opened until they have been checked by the police

(iii) instruct them not to disturb the track etc. till the time inspected by police authority.

Other officials should take care to protect the clues and collect evidence that may throw light on the cause of accident. They should also make arrangement for photographing etc. On getting the information, RPF personnel will rush to the site after contacting the local GRP/Civil Police.

Whenever there is delay in arrival of police officials, the senior most railway officials at site may jack up and portion of a coach or shift any property to the minimum extent necessary, after noting its original position by sketch, to extricate human beings trapped under it in the shortest possible time to avoid unnecessary pain and suffering. Normal traffic should however not be permitted without consulting the police. A joint inspection by railway official and police officials should be carried out and jointly signed report should be prepared. After getting clearance from police officials only restoration work should be taken up.

Accident inquiries:
The objective of an accident inquiry is to:

(1) ascertain the cause of the accident.

(2) to formulate proposal for preventing its recurrence.
(3) to fix up responsibility and also to determine whether there was general laxity in working.

Classification

(1) CRS inquiry
(2) Major joint inquiry
(3) Minor joint inquiry
(4) Departmental inquiry

Central Government may also order a Commission of Inquiry to inquire into very serious accidents under the Commission of Inquiry Act, 1952.

(1) CRS Inquiry: CRS is appointed under Section 4 of Indian Railway Act as Inspector of Railways. He may order and personally conduct an inquiry into an accident, which he considered to be serious. He shall inform to the GM for the same and all assistance should be given to him for conducting inquiry.

(2) Major Joint Inquiry: Such inquiries will be held in case of all accidents falling within the purview of Section 83 of Indian Railway Act. The inquiry committee will consist of the officers of all the departments involved in the accident. Normally Engineering, Mechanical and Traffic Departments are associated in almost all the cases. Depending on the gravity of the accident, the officers of inquiry committee may be

(i) SAG Officers (to be ordered by GM)
(ii) Divisional Officers or (to be ordered by DRM)
(iii) Assistant Officers (to be ordered by DRM)

(3) Minor Joint Inquiry: Such inquiries are held in case of minor accidents. The inquiry committee consists of senior subordinates of all the departments involved in the accident. Such inquiries are ordered by DRM.

(4) Departmental Inquiry: Such inquiries are held by the officials of the particular department, which is indisputably responsible for the accident and accepts the same.

Proceedings of inquiry: It should consist of the following documents:

(4) a brief description of the accident
(5) detailed statement of the evidence taken
(6) findings of the committee together with dissent note, if any
(7) reasons for conclusion arrived at
(8) an appendix stating nature and extent of damage to railway property
(9) a list giving particulars of persons injured or killed
(10) recommendation and observations, if any

Findings: The findings should consists of:

(1) the cause of the accident mentioning the persons responsible, if any, and the rules violated
(2) dissent note, if any, with reasons
(3) reasons for arriving at the findings
(4) recommendations for avoiding the recurrence of such accidents

**Time schedule for inquiry proceedings:**

- **D+2** Preliminary report in serious accidents by DRM to GM
- **D+3** holding of inquiry
- **D+5** detailed report by DRM to GM for Rly. Bd.
- **D+10** inquiry proceedings to be forwarded by DRM to GM
- **D+27** finalization of inquiry report and submission to the accepting authority

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DISASTER MANAGEMENT

Some important points of disaster management:

Disaster Management involves:

1. Intelligent and meticulous planning
2. Prompt response to situation and adequate post disaster measures.

Planning and preparation:

3. Relief equipment should be made available at strategic point.
4. Information about nearby medical facility should be available in as much detail as possible.
5. Emergency equipment like ART/ARME should be kept ready with full essentials.

Prompt response and post disaster measures:

1. Accident details and assistance required from site to control should be given at the earliest.
2. Medical personnel and volunteers in train should be requested for help, if required
3. Quick redressal to injured should be ensured
4. Preserve clues at site
5. Railway staff on duty or off duty should rise to the occasion.
6. Log book to record all activity including passenger’s names should be maintained.
7. Civil authorities should be requested for help, if required
8. Information centers should be opened at site and other convenient places
9. Restoration time should be informed to the public.
10. Restoration should not start will clearance from police authorities in case of suspected sabotage.
11. Incorrect information should not be given in haste.
12. Rush to the site by the quickest possible means. First one hour is called “Golden Hour”, during which, if medical relief team arrives, many precious lives can be saved, in case of fatal accidents.
13. Arrange for restoration materials and manpower after proper assessment of damage
14. The restoration work should be executed in a planned manner.
9.2 ACCIDENT INQUIRIES

1.0 RULES

1.01 RULES FOR INQUIRY INTO RAILWAY ACCIDENTS

Rules for the guidance of the Commissioner of Railway Safety for holding inquiries into Railway accidents are contained in the ‘Statutory Investigation into Railway Accidents Rules, 1998’ notified by the then Ministry of Tourism & Civil Aviation in the Gazette vide G.S.R.587 dated 09.04.73 and amended vide notification No. GSR 20 dated 17.18.80 and GSR No. 704 dated 09.07.85

A uniform code for inquiry into Railway accidents on the State Railways was prescribed and issued in the year 1879. These rules were only administrative orders without any statutory backing. This lacuna was removed by the passage of the Indian Railways Act, 1890 which has since been replaced by the Railways Act, 1989. An inquiry is necessary if:

1. The accident is ‘Serious’ within the ambit of section 113 of Railways Act, 1989 or
2. A passenger train is involved or
3. There is a reason to believe that Railway staff are responsible either on prima facie evidence or on police report or
4. The system involved in the Railway working is suspected to be deficient or defective
5. The cause of the accident is not clear or
6. For any special reason an inquiry is considered necessary by the GM, CSO or DRM or
7. The Commissioner of Railway Safety asks the GM to obtain a comprehensive report on a particular accident, provided that such an inquiry can be dispensed with if.
   a) The inquiry is to be conducted by the Commissioner of Railway Safety under the Statutory investigation into Railway Accidents rules, 1998 or a Commission of Inquiry appointed under the Commission of Inquiry Act, 1952 (60 of 1952) or any other authority appointed by the Central Government to which all or
   b) There is no reasonable doubt as to the cause of the accident or
   c) Any department of the Railway Administration accepts responsibility for the accident.

Before considering various aspects of such inquiries, it is necessary to understand the meaning of the term ‘accident’ in this context. To facilitate this, the definition given to this term is reproduced below:

“For the purpose of Railway working, accident is an occurrence in the course of working of Railway which does or may affect the safety of the Railway, its engines, rolling stock, permanent way does or may cause delay to trains or loss to the railway. For statistical purposes accidents have been classified in categories ‘A’ to ‘R’ excluding ‘I’ and ‘O’.

Some of the objectives that are intended to be achieved by conducting accident related inquiries are as follows: OBJECTIVES


Traction Rolling Stock : OPERATION.
1. To establish the cause for the accident beyond reasonable doubt;
2. To fix up responsibility for failures / commissions / omissions / violation of extent rules or instructions based on "which the follow up punitive action can be taken against such officials;"
3. To assess availability or otherwise or proper system and their adequacy and practicability.
4. To assess exiting preventive measures, adequacy of the extent rules, regulations and instructions and their implementation in order to avoid recurrence of similar accident.
5. To ascertain skills, knowledge and effective functioning.
6. To examine the safety aspects involved in the installation, working and maintenance repairs to the equipment.
7. To review the response of the Railway’s system as a whole in rendering adequate and prompt relief and rescue;
8. To recommend alterations / modifications to the means, layouts, and signalling etc;
9. To be useful ‘as an effective tool to minimize accidents and
10. To help in the compilation of accident related statistics at various levels.

The primary objective in conducting and finalizing ‘accident enquiries’ everyone must realize should be to identify the efficiency or weakness in the system, bring about improvement in the system and achieve better safety performance. Awarding punishment to the staff considered responsible should take the next priority. There presently exists a system for ensuring adequate punishment to the staff considered responsible but none to pursue compliance of the accepted recommendations.

**LEVELS OF INQUIRY**

Depending upon the seriousness of an accident and the gravity of its percussions, inquiries are ordered and conducted at either of the following levels for in-depth investigation:

**1. NON-RAILWAY**

1.1 Commission of inquiry
1.2 Commission of Railway Safety (CRS)
1.3 Magisterial of inquiry
1.4 Police investigation.

**2. RAILWAY**

2.1 Major fault inquiry
2.2 Minor joint inquiry
2.3 Departmental inquiry
1. NON-RAILWAY

1.1 Commission of inquiry

1.1.1 A Commission of inquiry can be ordered by the Central Government if in its consideration; the situation so demands or justifies, under the Commission of inquiries Act, 1952’ either on the direction of the Government or a mandate from the parliament. The Commission is presided over by a sitting or retired judge of the Supreme Court or high Court, with the rank of union Cabinet Minister. He is assisted by one legislator and a retired senior Railway officer. A senior railway officer functions as the secretary to the Commission.

1.1.2 The terms of reference of a Commission of inquiry are normally to inquire into one or more serious accidents or review the accident inquiries conducted earlier at lower levels. In addition, the Commission can also be asked to study the prevailing safety scenario obtaining on the Indian Railway and propose suggestions for improvement.

1.1.3 The procedure adopted is like that of a court. The Commission exercises the power of a civil court, such as issuing summons to witnesses, taking evidence under oath, requisitioning records and inspection of sites and work units etc. Counsels are permitted to represent individuals before the Commission. Once a Commission of inquiry is ordered all other inquiries into that incident should cease. However, the findings of an Inquiry commission are only recommendatory and hence, subject to acceptance by the Government.

1.2 COMMISSION OF RAILWAY SAFETY

a) Brief history

i) To exercise effective control over the construction and operation of the first railways in Indian subcontinent, which were entrusted to private companies, Consulting Engineers were appointed under the then government of India. Later, when the Government undertook the expansion of the railway network, the Consulting Engineers were redesignated as Government Inspectors. In 1883 their position was statutorily recognized. Later the railway Inspectorate as placed under the Railway Board, which was established in 1905.

ii) Under the Indian Railway Board Act, 1905 and notification No. 801 dated 24th March 1905 of the Department of Commerce and Industry, the railway Board was vested with powers and functions of the Central Government under various sections of the Railway Act and was authorized to make General Rules for the operation of the Railways. The Railway Board is thus the Safety Controlling Authority for the working and operation of Government and Company managed railways.
iii) Section 181(3) of the Government of India Act, 1935 provide that functions for securing safety, both of the reveling public and of persons operating the railways, including the holding of inquiries into the causes of accidents, should be performed by an authority of the Federal enclosed in 1940 by the Central Legislature who recommended that Senior Government inspectors of Railways should be placed under the Administrative control of some authority of the Government of India other than the Railway Board”. Accordingly, the Inspectorate was placed under the administrative control of the Department of Posts and Air in May 1941 and continuously thereafter under whichever Ministry that the portfolio of Civil Aviation. The erstwhile Railway Inspectorate was re-designated as the Commissioners of Railway Safety on 01.11.1961.

b) **Organizational Structure:**

The Commission is headed by a Chief Commissioner of Railway Safety (CCRS) at Lucknow, who also acts as principal Technical Advisor to the Central Government in all matters pertaining to Railway Safety, working under the Administrative control of CCRS are 9 Commissioners of Railway Safety (CRSs), each one exercising jurisdiction is known as 'Circle'(Old Nine Zones of Railway). In addition, the jurisdiction of some of them covers Metro Railways, Port Trust Railways and Konkan Railway. There are 5 Deputy Commissioners of Railway Safety posted in the Headquarters at Lucknow to assist the CCRS. There are 2 Deputy Commissioners of Railway Safety in the field, one each at Mumbai and Kolkata, to assist, to those CRSs in matters concerning the Signaling and Telecommunication disciplines.

C ) Functions:-

i) The commission of Railways Safety, Working under the administrative control of the Ministry of Civil Aviation of the Government of India, deals with matters pertaining to safety of rail travel and train operation and is charged with certain statutory functions as laid down in the Railways Act, 1989 and executive instructions issued from time to time, which are of regulatory, inspectorial, investigatory and advisory nature.

ii) The principal functions of the Commission of Railways Safety, as spelt out in Chapter iii of the Railways Act, 1989 are:
- Inspection of new Railway lines prior to authorization for passenger traffic
- Periodical inspection of open lines.
- Approval of new works and renewals affecting passenger carrying lines
- Investigation into accidents, including inquiries into such accidents to passenger trains as are considered to be of serious nature, and
- General advice on matters concerning safety of the train operation.

iii) The important functions relating to investigation and inquiry into Railway accidents is government by
- Statutory investigation into Railway Accidents Rules, 1998 and
c) Inquiries

i) **When should a statutory inquiry be held.**
   A statutory inquiry by a Commissioner of Railway Safety is obligatory in every accident to a passenger-carrying train which is attended with loss of human life or grievous hurt as defined in section 320 of the Indian penal Code or with serious damages to Railway property of the value exceeding Rs. 25 Lakhs.

ii) As defined in Section 320 of the Indian Penal Code, following are the various injuries that should be considered as grievous.
   1) Emasculation / permanent privation of sight,
   2) Permanent privation of hearing,
   3) Privation of a member or joint,
   4) Permanent disfiguration of head or face,
   5) Fracture or dislocation of bone or tooth,
   6) Unable to follow ordinary pursuits for > 20 days (hospitalization).

iii) Commissioner of Railway safety may also inquire into any accident which, in the opinion of the Chief Commissioner of Railway Safety or the Commissioner of Railway Safety, requires the holding of an inquiry at that level. The Chief Commissioner of Railways safety to do so.

iv) The inquiry shall be obligatory only in those cases where the passengers killed or grievously hurt were traveling in the train. If a person traveling on the footboard / roof of passenger train is killed or grievously hurt or a person in run over at a level crossing or elsewhere on the railway rack, such an inquiry in not obligatory.

v) Workman’s train or ballast trains carrying workmen shall also be treated as passenger trains and in the event of a workmen getting killed or grievously injured as a result of an accident to the train. CRS’ inquiry shall be obligatory.

d) Procedure when CRS in unable to hold an inquiry:

When a CRS is unable to hold an inquiry, he may inform the CCRS of the reasons as to why the inquiry cannot be held by him. In such a case, the CCRS may himself hold the inquiry or may direct another CCRS to inquire into the accident. Or else the inquiry can be entrusted to the Railway itself, who will then appoint a committee of Railway officers to hold the inquiry. The Railway committee’s inquiry report will be submitted to the CRS who scrutinizes it and in case he agrees with the findings, forwards it to the CCRS along with his views on the finding and the recommendations made. If, on the other hand the CRS considers that the inquiry should be held by him, he may proceed to do so.
f) **Stoppage or discontinuance of CRS inquiry:**
Whenever the Central Government appoints a Commission of Inquiry under the Commission of Inquires Act, 1952 the CRS shall discontinue his inquiry.

g) **Scope:**

1) CRS hold inquiries into accidents with a view to ascertain the cause and fix responsibility there of on the individuals concerned.

2) Investigation are also carried out into the question whether prompt and adequate steps were taken by the Railway administration for relief measures such as provision of first and medical treatment and refreshments to passengers, evacuation of injured passengers and other facilities like arrangement for transshipment, completion of their journey to destination, running of duplicate trains etc.

3) As a result of the inquiry CRS may also make recommendations to prevent recurrence of similar accidents and may suggest laying down new rules or modifying existing rules and improved standard of signaling, installation and maintenance of track bridges etc. He also comments on matters observed by him during the inquiry, which may not have any direct bearing on the cause of the accident but which may, in some cases affect the safe working of the Railway and may lead to accidents.

h) **Powers:**

1) For the purpose of conducting an inquiry into the cause of any accident on the Railway, CRS has the power as are vested in civil court while trying a suit under the code of Civil Procedure 1908 (5 of 1908) in respect of the following matters.

   i) To summoning and enforcing the attendance of person and examining them on oath,
   
   ii) Requiring the discovery and production of documents.
   
   iii) Receiving evidence of affidavits.
   
   iv) Requisitioning any public record or copies there of from any court or office,
   
   v) Any other matter, which may be prescribed.

2) The Commissioner while conducting an inquiry shall be deemed to be a Civil Court for the purpose of Section 195 and Chapter XXVI of the Code of Criminal procedure, 1973 (2 of 1974).

i) **Procedure for conducting a statutory inquiry:**

1. Where the Commissioner of Railway Safety receives notice under section 113 of the Railways Act, 1989 (24 of 1989) of the occurrence of an accident which he considers of a sufficiently serious nature to justify such a course, he shall as soon as may be, notify the Chief Commissioner of Railway Safety, the Railway Board and the Head of the Railway Administration concerned of his intention to hold an inquiry and shall, at the same time, fix and communicate the date and place for the inquiry.
2. As soon as CRS receives intimation about the occurrence of a serious accident, he proceeds to the site, conducts inspection of the accident site and collects all particulars relevant to the accident. He then fix's date time and place for the injury, which is given publicity, in the medical Officers of the local Magistracy and police are separately advised of the inquiry. Members of public are invited to give evidence in the inquiry in person or to write to him.

3. The concerned DRM will make available necessary office accommodation, secretarial assistance etc, to facilitate the inquiry. ADRM and concerned branch officers, like Sr. DSO, SR. DSTE, SR. DEE, SR. DME will render suitable administrative and technical assistance to the CRS in conducting the inquiry including ensuring availability of subordinated with relevant records, examination of evidence etc.

4. After completing the recording of evidences and collecting the material and data, the CRS will return to his headquarters and compiles the preliminary report. The copies of the preliminary inquiry report will be furnished to the CCRS, Railway Board and the concerned GM. If the CRS finds that the accident was caused by sabotage or train wrecking, he shall submit this confidential report to the Director, intelligence Bureau, Ministry of Home Affairs, and Government of India.

5. CCRS, after considering the preliminary report, will convey his approval and comments. The concerned HODs will study the preliminary report and offer comments indicating whether the report is acceptable or any part thereof requires review. The chief Safety Officer will coordinate in getting the comments from different HODs and obtaining the approval of the GM before forwarding them to the CRS, CCRS and Railway Board.

   The Chief Safety Officer should also convey to the CRS the departmental action taken and the punishments awarded to the staff considered responsible. After receiving comments from the CCRS and the GM, the CRS will review the preliminary report and draw up his final report. In case the Railway Board has reservations on the recommendations of the Chief Commissioner of Railway Safety, the matter shall be finally decided by the Central Government (Ministry of Civil Aviation). The final report will then be tabled in the parliament, after which it will be published.

Through out this process, the document will be considered as confidential.

j) Follow up action

1. Disciplinary action against the staff considered responsible for the accident and other irregularities pointed out there in can be initiated on the CRs' preliminary inquiry report.

2. If the Head of the Railway administration concerned considers the prosecution of any person or person desirable, he shall immediately forward a copy of the report, together with statement/s, to the District Magistrate of the district in which the...
accident occurred or to such other officers as the State Government may appoint in this behalf and to the concerned police authorities.

3. On receipt of the finding of the CRS, the police authorities shall as soon as possible, intimate the head of the Railways Administration concerned about this decision regarding launching of any prosecutions.

k) Format of CRS’ accident inquiry report:

CRS accident inquiry report consists of the following information.

1. Summary giving details like date, time and place of the accident, brief description of the site, type of accident, cost of damages, adequacy of relief arrangements and medical attention, cause and persons responsible.

2. Abbreviations used.

3. Chapters -
   - Chapter – I: Preamble, inspection & inquiry, description of accident, casualties.
   - Chapter – II: Relief measures
   - Chapter – III: Composition of the train/s and damage
   - Chapter – IV: Local features
   - Chapter – V: Summary of evidence
   - Chapter – VI: Tests and observations
   - Chapter – VII: Discussion
   - Chapter – VIII: Conclusion
   - Chapter – IX: Remarks and recommendations

4. Appendices.

1.3 MAGISTERIAL INQUIRY

1.3.1 Whenever an accident, falling Section 113 of the Railway Act, 1989, has occurred in the course of working of a Railway, the District Magistrate who may be appointed in this behalf by the local Government, may either:

a) himself make an inquiry into the causes of the accident, or
b) depute a Subordinate Magistrate, who if possible, should be a Magistrate of the First Class, to make such an inquiry, or
c) direct an investigation into the causes of the accident to be made by the police.

1.3.2 The Direct Magistrate or the Magistrate as the case may be, will advise the GM of the Railway and the concerned CRS intimating the date, time and place of the inquiry so that the Railway administration can summon the required evidence and expert assistance. After examining the scene of the accident, he will conduct the inquiry.

1.3.3 Since law and order is the function of the State Government, District Magistrates have been given the powers to inquiry into Railway accidents which apparently impinge on law and order such as accidents at level
crossings, sabotage etc. These accidents are intended to establish whether it involves criminal offence.

1.3.4 The Magistrate can summon a Railway servant or any other person for the inquiry. After the inquiry he shall decide whether there are sufficient grounds for a judicial inquiry and then bring to trial any person whom he considers criminally responsible for the accident.

1.3.5 He shall furnish a copy of his inquiry findings to the concerned GM and CRS.

### 1.4 POLICE INVESTIGATION

Police inquiry is conducted into serious Railway accidents and is governed by the following.

1.4.1 Railway Police may investigate these causes of a Railway accident occurring the course of working of a Railway when.

   i) The accident is attended with loss of human life or grievous injury or serious damage to railway property or is prima facie caused due to criminal act of commission or

   ii) The District Magistrate or Magistrate directs to do so.

1.4.2 No Police investigation is made when a Magistrate inquiry has been ordered.

1.4.3 The Government Railway Police of the area shall primarily be responsible for carrying on the investigation within limit of the Railway premises. But if occasion arises, the GRP shall carry out the investigation beyond such limits.

1.4.4 The Police officer conducting the inquiry shall advise the concerned GM and DRM who may depute a Railway official to be present in the inquiry as an observer and to provide technical assistance. The investigation however, can continue even in the absence of the Railway official.

1.4.5 In place of the Railway Police, the State Police can conduct such an investigation.

### 2. Railways inquiries

i) In case of accidents in course of working a Railway, the Railway inquiries are conducted by inquiry committees at appropriate levels, which are known as Major Joint inquiry, Minor joint inquiry and Departmental inquiry. The joint inquiry committee normally consists of one official each from Operating, Civil engineering and Mechanical Engineering departments. If any other department, like S&T, Electrical Engineering etc, is also involved, then an official of such department will also be represented in the
joint inquiry committee. Non railway officials, like State Police, Defense etc, may be allowed to sit in the inquiry only as an observer.

ii) Among the various officials in a joint inquiry committee, the senior most will be the president of the committee and the remaining officials the members. The Safety Operating official will function as its secretary.

iii) The level at which accident have to be injured into is laid down in column No. 4 of the ‘Classification’ chapter of the Accident Manual. Otherwise, the Chief Safety Officer at the Zonal headquarters or the DRM of the Division, as the case may be, will decide and nominate the appropriate level of and the individual officers to constitute the joint inquiry committee.

2.1 The joint inquiry reports are made out in 6 copies including the evidences recorded.

**MAJOR JOINT INQUIRY (MJI)**

2.1.1 Major joint inquiries can be either at Senior Administrative Grade, Junior Administrative Grade, Senior Scale or junior scale depending on the nature of the accident and seriousness of the consequences.

2.1.2 GM orders an MJI at SAG level in cases of collisions involving train carrying passengers resulting in loss of human life and / or grievous injury and other serious consequences, which are not to be inquired into by CRS. These inquiry reports will be the Chief Safety Officer and accepted by the AGM.

2.1.3 The JA Grade, Senior Scale and Junior Scale joint inquiry committees are ordered by the DRM. The Sr. DSO / DSO process these inquiry reports, which are accepted by the DRM. Copies of the accepted inquiry reports will be submitted to CSO. After acceptance, extracts of the relevant portions of the inquiry report will be forwarded by the Sr. DSO/DSO to the concerned branch officers to take necessary administrative action as well as initiate disciplinary action again the staff considered responsible. The Chief Safety officer at HQ level and Sr. DSO/DSO at Divisional level are required to ensure adequacy of punishments awarded to the staff by various branch officers. In case they find the punishment to by inadequate or not in keeping with the extent instructions of the Railway Board laying down the minimum punishments for different accidents and failures, the case will be put up to AGM or DRM as the case may be, for review.

2.2 **MINOR JOINT INQUIRY**

Minor joint inquiries are ordered and conducted onto rest of the minor accident case on the same lines as for major joint inquiry. The Minor joint inquiry committees are formed by Senior Subordinates of various departments nominated by St. DOS/DOS or consolation with the concerned branch officer. Minor joint Injury reports will be accepted by Sr. DSO / DSO or AMO(G) according to the comparative gravity of the accident.
2.3 DEPARTMENTAL INQUIRY

a) Normally joint inquiries are ordered when the cause could not be ascertained beyond doubt and no individual department accepts the responsibility. This however, does not prevent the DRM from ordering a joint inquiry even if the responsibility is accepted by a department, particularly if it is felt that the accident involves irregularities on the part of departments other than the one which owns the responsibility for the occurrence.

b) The departmental inquiry will be at an appropriate level as decided by the concerned HOD or branch officer if it is conducted by a single official of that department and the report will be considered by that department’s HOD or branch officer, depending on the level at which the inquiry has been made.

3. CONDUCTING RAILWAY INQUIRIES:

3.1 The Safety / Operating official, in consultation with the president and various members of the joint inquiry committee, issues a message fixed the date, time and place of the first sitting of the inquiry. In this message the concerned senior subordinates will also be advised to make available the staff to be interrogated along other necessary records and data. As the secretary to the committee the Safety / Operating official will also ensure secretarial assistance and other logistics to facilitate the inquiry. If any members of the message will also be addressed to the GRP and RPF.

3.2 The first sitting of the inquiry must be held at a convenient place as near as possible to the site of accident, since inspection of the site to accident before commencing the inquiry is imperative. The site inspection provides better perception and appraisal of various aspects like the topography, alignment, view, curves, gradients, track and soil condition etc., which enable the officials to form a mental picture of the whole scene of the accident site.

3.3 At least two of the members of the joint inquiry committee should be present to conduct any sitting of the inquiry. But, in the last sitting when the findings will be drawn up, the president and all the members must be present.

3.4 To commence with, the inquiry committee must thoroughly go through the evidence collected, the joint observations recorded, the sketch of the site and the preliminary statements recorded at the site to the accident. On the basis of these documents, a list of all probable causes must be drawn up. Obtaining the statements from the witnesses should be with an aim to eliminate one probable cause after another and establish a cause beyond reasonable doubt.

3.5 Proving the most probable cause beyond reasonable doubt impartially should override the departmental interest / bias.

3.6 Before commencing recording the evidences of Railway employees, they must be duly warned that, in case of any deviation from their preliminary
statements which they cannot substantiate convincingly, they will be liable for disciplinary action.

3.7 In case of incompatibility of statements of different witnesses, a confronted examination will be done to ascertain the actual fact and rule out aberrations.

3.8 If a witness is hospitalized, the statement of such a person can be recorded in the hospital after duly obtaining necessary permission from the doctor under whose charge the person is being treated.

3.9 After completing the recording of evidences and perusal of relevant records, the president of the committee will discuss the detail with the members all the aspects of the proceedings, draw up his draft findings and hand over the same to the other members. All efforts should be made to make a consensus decision about the findings.

3.10 However, in case any of the member/s is/are in disagreement with the draft findings as a whole or part/s thereof, he/she shall submit a ‘Dissent note’ to the president. After due consideration of the dissent note the president will furnish his “Rejoinder” to the member/s. After further discussion, if the committee does not come to a single consensus decision, then majority findings will be finalized, which will be signed by the dissenting member/s with remarks to the effect ‘Dissent note submitted’. In such cases, the dissent note and the rejoinder would from part of the inquiry report and the accepting authority will consider the inquiry report as well as the dissent note and the rejoinder before giving his verdict.

According to the extent instructions, in such cases the dissenting official will be examined by the appropriate authority, like AGM or DRM. If the dissenting official cannot convincingly prove his point, he will be liable for necessary action.

3.11 The accepting authority should consider and accept the accident inquiry report, the recommendations and the report on the effectiveness of the relief and rescue measures separately.

3.12 If the accepting authority does not agree with the inquiry report either in full or in part, the committee will be asked to review the report. If necessary, the committee may assemble again to re-examine any to the witnesses.

3.13 In the ‘Findings’ the responsibility should be fixed in the three following stages:

Primary responsibility

Secondary responsibility

Blameworthy
'Blameworthy' includes any irregularity / commission / omission / violation of rules or regulations etc which may or may not be related to the cause of the accident.

3.14 A separate report should be prepared on the effectiveness and promptness of the relief and rescue measures undertaken following the accident, which should be enclosed with the accident inquiry report.

3.15 In order to ensure effectiveness as a tool to enhance safety and promptness, accident inquiries must be dealt with strictly as per the following time schedule.

<table>
<thead>
<tr>
<th>SAG LEVEL</th>
<th>JAG AND BELOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day of accident</td>
<td>D</td>
</tr>
<tr>
<td>Commencement of inquiry</td>
<td>D+4</td>
</tr>
<tr>
<td>Submission of inquiry report for acceptant</td>
<td>D+8</td>
</tr>
<tr>
<td>Submission of accepted findings to competent authority</td>
<td>D+10</td>
</tr>
</tbody>
</table>

3.16 The disciplinary action against the employees considered responsible should be completed within 60 days in case of minor penalty and 90 days in case of major penalty.

3.17 The safety cell both at the Division and at the Zonal HQ shall maintain necessary statistical record of all the accident inquiries and keep a regular watch on the timely completion and finalization of pending cases.

3.18 The Safety Directorate of the Railway Board compiles annually the accident statistics primarily based on the finalized accident inquiries. This compilation is done for each Zonal Railway and for each type of accident cause-wise, responsibility-wise, equipment-failure-wise etc. The number of casualties, injuries, loss towards damage to Railway property and detention / disruption to traffic are also compiled.

3.19 The details of each finalized inquiry must be conveyed to the concerned station / workplace which will be posted in the “Accidents Register”. This register should be perused by the inspecting officials to ascertain the trend of accidents and identify-prone employees for taking necessary remedial action.

3.20 A sample format of accident inquiry report is enclosed at annexure ‘A’.
OFFICER’S DUTY ON ACCIDENT SITE:

A. RESPONSIBILITIES OF FIRST OFFICIALS REACHING AT SITE:

DOs

1) Ensure proper protection of the adjacent track and preserving clue / evidence of accident.

2) Ensure that the load is protected against rolling down, by putting hand brakes and wedges.

3) Check whether Medical van and Break Down train are required and order accordingly.

4) Provide first aid to victims and transport injured passengers to nearest hospital.

5) Collect following particulars and inform the higher officials and controllers from the site of accident

a) Time and date of accident.

b) Train No. and description of train / Trains.

c) Block section / station location, Kilometer age of accident site.

d) Brief description of accident and site.

e) Casualty / injury particulars if any.

f) Condition of derailed coaches / wagons if any and speed restrictions to be imposed.

g) Damaged condition of Track, OHE, Rolling stocks, S&T fitting etc.

h) In case of level crossing accident – the type of road vehicle, casualty and obstruction on track.

i) Prima facie cause of the accident, if known.

j) In case of fire, the Coach / wagon No., material involved in fire, additional fire extinguishers required, if any.

k) Any other relevant information.

6) Collect Railway men and volunteers at the site.

7) Allot duties to each as best as possible under the prevailing circumstances.
8) Organize relief with the assistance of volunteers.

9) Help passengers in a cordial manner.

10) Maintain communication with control office.

11) Seize relevant records and seal conceded signal levers and equipments.

12) Record evidences and statements of staff and public.

13) Proper preservation of dead bodies.

14) Security of luggage and protection of Railway property.

**DON’Ts**

1) Don’t panic and get irritated.

2) Don’t disturb the debris in case of suspected sabotage until the Police give permission except to extricate human beings trapped under the debris. Record evidences and statements of staff and public.

3) Don’t allow anybody to interfere at the sport of accident, as there is a chance to alter the cause of accident due to ignorance’s or dot of curiosity.

4) Don’t report the cause of accident to public or press till the cause is investigated by an expert team and allowed by a Responsible Railway official.

5) Don’t leave the site until the charge is handed over to a responsible Railway official.

**B. DUTIES OF SENIOR MOST OFFICER / SITE MANAGER AT SITE.**

The DRM or ADRM and in their absence, the senior most Officer at the site of the accident shall be the Officer-in-charge at site (Site manager). On arrival at the site he shall immediately.

**DOs**

1) Make an immediate assessment of:-

   a) The number of passengers killed, grievously injured and simple injured.

   b) Catering requirement such as food, drinking water etc. to passengers, injured or otherwise.
c) Extent of damage & assistance required.

d) Prima-facie cause of accident and relay this information to the Officer-in-charge of the control office.

e) Probable detention to traffic.

2) Depute officers and / or staff for specific duties in :-

   a) Assisting in rescue operation.

   b) Noting down particulars of persons sent to hospitals / given first aid.

   c) Assisting in preservation of clues, materials, sealing of documents & equipments and preparing sketches.

   d) Arrange photographers for taking colored photos of dead / injured.

   e) Maintaining a log at site.

   f) Assisting in transshipment work.

   g) Assisting in Railway security work.

3) Arrange for ex-gratis payment, it warranted, as per instruction given.

4) Arrange to operate Mobile Control Office with all facilities at the accident site duly manned to log the events and progress of restoration in the register and also give the latest information to Division / HQ Control.

5) Ensure information centre / booths are opened at important stations enroute for giving up-to-date information to public.

6) Security of luggage of the involved passengers and protection of the area around.

7) Arrangement for clearing the stranded passengers and their luggage free of cost by road. Care shall be taking to see that the suitable accommodation is provided in the connected trains for the through passengers. A relief train can also be arranged if required.

8) Efficient communications including STD phones for passengers at adjoining stations, walkie-talkie sets at site etc.

9) Arrange information counters / booths and depute somebody to inform to public regarding the accident and train / passenger particulars.

10) Incase of suspected sabotage make arrangement for joint investigation by civil and railway police and coordinate the injury process.
**DON’Ts**

1) Don’t panic and get irritated.

2) Don’t disturb the debris in case of suspected sabotage until the Police give permission except to extricate human beings trapped under the debris.

3) Arrangement for clearing the stranded passengers and their luggage free of cost by road. Care shall be taking to see that the suitable accommodation is provided in the connected trains for the through passengers. A relief train can also be arranged if required.

4) Efficient communications including STD phones for passengers at adjoining stations, walkie-talkie sets at site etc.

5) Arrange information counters / booths and depute somebody to inform to public regarding the accident and train / passenger particulars.

6) Incase of suspected sabotage make arrangement for joint investigation by civil and railway police and coordinate the injury process.

**DON’Ts**

1) Don’t panic and get irritated.

2) Don’t disturb the debris in case of suspected sabotage until the Police give permission except to extricate human beings trapped under the debris.

3) Don’t allow any outsider to interfere in the rescue work.

4) Prevent theft and any antisocial acuity at accident site and make arrangement against such effort. Don’t allow any Outsider to interfere in the rescue work.

5) Don’t give press report till authorized to do so.

**B. DUTIES OF STATION MASTER / MANAGER:**

**DOs**

1) Note down the date & time and details of first information also note down the name of person giving the information.

2) Lock the operating handle of the block instrument controlling the affected section in Train on Line Position.

3) Report the accident to controllers, and in case of suspected sabotage, inform civil and Railway Police also. Advice the Controller about the nature of medical and other assistance required.

4) Take action to protect and safeguard Railway and public property.
5) Arrange medical aid, if required, locally from the nearest hospitals, dispensaries and doctors and transport injured passengers to nearest hospital.

6) Call all the off-duty staff and allot them specific duties for relief and rescue.

7) Arrange to provide all sort of assistance to the affected passengers such as catering, drinking water, issue of complimentary passes for onward journey free messages to relatives etc.

8) Open information counters and booths for giving information.

9) Be polite with stranded passengers.

10) Maintain communication with controller and report the situation and if any assistance required from Division / Head Quarter.

**DON’Ts**

1) Don’t panic.

2) Don’t allow any train to enter the affected section.

3) Don’t allow any passing run through train on opposite line without issuing a caution order.

4) Don’t LEAVE the place of duty till the accident is cleared or relieved by a competent railway servant.

5) Don’t allow anybody to interfere or damage the clues and cause of accident.

**C. DUTIES OF CONTROLLERS :**

**DOs**

1) Note the time of first information received and also the name of the person giving the information.

2) Information operating and mechanical officers and order ART / ARMV / ARME in consultation with Sr. DME.

3) Alert the adjoining station to stop entry of any train in the affected section.

4) Arrange civil and medical aid.

5) Advise the SM / TI of the nearest important station of the accident and instruct him to proceed by first means to the site of accident.

6) Inform Officers and officials in the priority as mentioned in the extent instructions as required also inform concerned railway officers as per existing instructions.
7) Regulate Mail/Express and Passenger trains at such stations where adequate and communication arrangements are available and cancel unimportant trains.

8) Divert the important trains through alternate routes if necessary and inform the changed timings at important stations and adjacent Division / Zones.

9) Maintain a chronological log of the information received and action taken and maintain a continuous communication with accident site and officers.

10) Ensured the list of injured and dead are obtained as quickly as possible from the site and relayed to the Zonal HQ / Railway Board, concerned station, officer-in-charge of publicity etc.

**DON’Ts**

1) Don’t panic

2) Don’t detain ART / ARME while proceeding to accident site.

3) Don’t permit the running of unimportant trains and avoid congestion of the section.

4) Don’t forget to inform civil and Railway Police in case of suspended sabotage.

5) Don’t leave duty till the charge handed over to a responsible competent railway servant.