



EAST COAST RAILWAY

# OPERATING MANUAL

**2015**

(First Edition)



# PREFACE

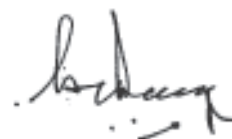
*East Coast Railway - the highest freight loading zone of Indian Railways spreads over three states i.e most of Odisha with parts of Srikakulam, Vizianagaram and Vishakhapatnam areas of Andhra Pradesh, DanteWada & Bastar areas of Chhattisgarh state. With the increase in demand for transportation due to surge in the industrial activities in these states, various developmental projects related to rail infrastructure are under execution. Due to commitment, dedication and involvement of the officers and staff, this railway is touching high heights with regard to handling of traffic.*

*This is the first issue of Operating Manual of East Coast Railway. The object to bring out this book is to get the staff acquainted with latest and revised guidelines of operating principles and practices. This book is having updated information regarding various operating instructions which are helpful in day to day train working. Previously, Railway Board has published the Operating Manual in the year 2008 applicable for Indian Railways in general. Hence, it was felt necessary to include the operating practices and rules with a special reference to this railway in a single volume for ready reference. As such, this manual is brought out with broad framework of guidelines which cover various aspects of train operation.*

*The important feature of this manual is that some basic information related to other concerned departments which are useful in daily working at field level are also included for the information of staff. Chapters like Derailment Investigations, Inspections, NI-Working, Train Examination, etc., are very helpful for supervisory staff. This manual does not in any way supersede or replace the General and Subsidiary Rule book or other instructions at zonal and divisional levels.*

*I am extremely thankful to all the officers and staff associated in the preparation of this manual for their untiring efforts. This book is to be studied carefully by all concerned staff and kept ready for use with latest amendments whenever issued. This book is the property of the administration and shall be given up by the holder on leaving service by him/her. I hope all the officials involved with train operations will find this manual useful in day to day working.*

Chandrasekharpur,  
Bhubaneswar



**G.C. RAY**  
Chief Operations Manager



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## CHAPTER-1

# GENERAL INTRODUCTION TO TRANSPORTATION AND RAILWAY OPERATIONS

### 1.01 Scope of Railway Operations:

The main objective of the railway operations is to provide (1) safe (2) efficient (3) speedy & economic transport. In general, the word 'OPERATION' brings together all the activities required to be undertaken for the working of the railways. Operations in the stricter sense used on the Indian Railways means (a) Planning, Organizing, Co-ordinating, Directing, Monitoring, Controlling, and Supervising the activities connected with the movement and usage of all the rolling stock, viz. the engines, coaches, wagons and other vehicles, that can be placed on the track and (b) handling the problems which arise in the course of the movement of the stock and utilization thereof as per the objectives, goals and priorities laid down from time to time.

Railway operations, therefore calls for utmost devotion to duty, management skills and efficiency. Various assets viz. P.Way, S&T facilities, locomotives, Traction and Rolling stock etc. are planned and maintained and replaced by the technical departments in co-ordination with the operating department.

### 1.02 Functions of Operating Department:

Operating department has an important role to play in railway operations through various other departments to provide infrastructure to a great extent in railway transportation. Various assets of the railway are available to operating department for optimum utilization. Operating department, thus, harnesses the efforts of all departments and optimizes the usage of operational assets. The function of operating department can be categorized as under:

- (a) Planning of Transport service on short term and long term basis.
- (b) Running of Trains.
- (c) Safety in Train Operations.
- (d) Economy and Efficiency.

### 1.03 General Principles of Railway Operations:

Operations & Transportation in railways are based upon certain principles by which existing resources are efficiently utilized to get the optimum result. The principles are :

- (a) Continuity
- (b) Unity of control
- (c) Full & efficient utilization of existing resources.
- (d) Planned provision of adequate capacity.

### 1.04 Scope of the Operating Manual:

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

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## CHAPTER-2

# WORKING OF STATIONS

### 2.01 Introduction :

Railway stations, worldwide, are located in prime city centers, as railways were started at a time when expansion of cities was yet to start. Railway station continues to be focal point of central business district in all cities in the world.

All description of rail business is transacted at the station, passengers start journey or complete it, outward parcels are booked and inward parcel consignments received and kept ready for delivery. At stations having attached goods shed, outward and inward freight cargo is handled there.

In their historic evolution, the stations now have catering establishments, resting facilities in retiring rooms or a budget hotel. A world-class station may look or in fact be more like a mall with shops and catering establishments with attendant information, ticketing and reservation counters.

Station Master is in overall charge of the station and includes station manager.

### 2.02 Duty list of staff:

The duties to be performed by the different categories of staff in connection with movement of trains are detailed below. These duties must be read in conjunction with the Station Working Rules of the station, General and Subsidiary Rule Book and Block Working Manual as amended from time to time.

#### (a) Responsibility of Station Incharge (Station Manager/Station Superintendent) :

- i. Station incharge is responsible for the efficient discharge of duties by different members of staff at his station. (General Rules 5.01)
- ii. Ensuring that the general working of the Station is being carried out in strict accordance with the current rules, procedures and instructions.
- iii. Providing prompt and courteous service with utmost safety and security of passengers and employees.
- iv. Availability, helpfulness and good conduct of station porters.
- v. He shall be responsible for general up-keep of the station.
- vi. He shall be responsible for keeping the safety and operating literature including circulars, pamphlets, gazette etc. up to date and these must be explained to the staff working under him and got noted by them.
- vii. He shall maintain complete and up to date record of Engg/S&T/TRD restrictions. He shall be responsible for bringing forward the caution order register every Monday.
- viii. He shall be responsible for maintaining Accident Register and Accident Charts and keeping these up to date.
- ix. He shall maintain figures in respect of the stock and get them relayed to the control in time.
- x. He shall investigate all public complaints and send the extracts of the complaint with explanation of the staff and his own remarks to Divisional Office in time. In case of complaints concerning the other department, intimation may be given to the subordinate In-Charge of that department immediately so that action may be taken to avoid recurrence.
- xi. Being the In-Charge of the station, he shall promptly attend all accidents, assume charge of the site and assist in relief measures ensuring prompt evacuation of injured and stranded passengers.

He shall take note of all the information available and protect the clues/evidence, which may be helpful in the enquiry. He shall intimate the control office at regular interval for current information and ask for the required assistance i.e., Relief Train, Medical van etc. He shall investigate yard accidents, obtain statements of the staff responsible and submit his report with conclusions and joint note to the Divisional office. In case of controlling station, he shall do the same in his beat. (The list of controlling stations of each division in E.Co. Railway is appended in Accident Manual).

- xii. He shall ensure that fire fighting equipments at the station such as fire extinguisher, fire buckets etc. are in good fettle and ready for use.
- xiii. The Station Incharge should regularly test and record in the charge book, the working of Points, Signals and Track circuit to ensure that:
  - \* The Signals are back to 'ON' position when the relevant slide/button/lever is put back or intended train movement has been completed.
  - \* It is not possible to take 'OFF' conflicting Signals at the same time.
  - \* Signals are not taken 'OFF' until all points are correctly set and facing points locked (Both facing and trailing points in case of motor operated points).
  - \* Any other manner of testing prescribed by the Authorised Officer.
  - \* Panel testing: Normal/Abnormal by Station Incharge.
  - \* At station provided with continuous track circuits or at stations having solid state interlocking the method of testing shall be prescribed jointly by Signaling and Operating Branch which shall be described in the Station Working Rules to be followed by Station Masters.
- xiv. He must ensure that the essential Safety equipments at his station are the same complete and in good condition. If there is any deficiency it should be made good without delay.
- xv. He shall conduct night and surprise inspections to check the alertness of staff and working of signals, points and visibility of the signals.
- xvi. The Station in charge at a station shall inspect his station daily with a view to ensure efficient working of-
  - \* All public facilities including , fans, lights, lifts, escalators,
  - \* All equipments being in efficient working order. Deficiencies must be promptly rectified or recorded in Petty Repairs Book.
  - \* Safe and efficient working of trains.
  - \* Cabins, ASM/SM/SS's office, yards, goods sheds and level crossing gates under his charge.
  - \* Reservation Enquiry, Public Address system, Public Information Display System, booking offices, Ticket Checking, catering and vending stalls etc.
  - \* Drinking water availability.
- xvii. He shall see that Train Signal Register, Station Diary, Inspection Note Book, Reference Books and other station record is properly maintained and preserved for a minimum period as prescribed in this chapter.
- xviii. At the bigger stations, Health Inspector is incharge of sanitation, the Station Manager shall conduct daily inspections and bring out deficiencies. He shall conduct daily inspection of waiting rooms, bath rooms, lavatories, refreshment rooms and catering trollies, platforms, tracks and other station premises from sanitation point of view and ensure that arrangements in this regard are adequate and effective. Availability of safe drinking water to passengers & employees is joint responsibility of JE/SE (works) and health department, he should check that same is available.



- xix. He shall ensure that sufficient stock is available for the requirement of the day. He shall keep in touch with the running of trains so that, in case of late running of connecting train, scratch rake can be turned out, if necessary. He shall also keep a check, on reserved stock available/ allotted to his station.
- xx. He shall take personal interest in arranging quick clearance of reserved carriages of troops, public, prisoners, treasuries etc.
- xxi. Whenever special trains are arranged to run from his station, he shall ensure that stock for the same is secured and certified, placed on the proper line in time.
- xxii. He shall fix up responsibility in case of detention to trains outside or at the station & submit full report to DRM office/Sr.DOM office.
- xxiii. He shall be responsible to ensure that all the operating staff working under him are relieved in time for their Periodical Medical Examination/Refresher Courses/Competency/Safety camp and special competency programmes. No one, overdue PME/Refresher Course/Competency shall be allowed to perform his normal duties.
- xxiv. He shall ensure that all staff working at station are acquainted with the instructions mentioned in Disaster Management Manual.
- xxv. He shall ensure that all correction slips of Train Working Manuals & SWR are posted & changes are made in respective pages.
- xxvi. He shall keep rule books up to date, posted with latest correction slips and shall keep himself fully conversant with the extant rules. He shall keep his books readily available for inspection when asked to do so.

**(b) Assistant Station Master/Station Master :**

- i. He shall come on duty after taking complete rest and shall not perform his duty under the influence of drugs or intoxicants.
- ii. While coming on duty, he shall ensure that all points and signals are in good working order and all the registers, records, pertaining to train passage are completed in all respect before taking over the charge.
- iii. He shall ensure that proper indications of points, signals, track circuits, crank handle, level crossing gate etc., are displayed at their proper places.
- iv. He shall be responsible for obtaining and granting line clear to trains or for shunting movements as per SWR & G & SR.
- v. He shall handle the control panel himself (wherever provided) when on duty and shall not permit any unauthorized person to manipulate the panel.
- vi. He shall handle the block instrument himself (wherever provided) when on duty and shall not permit any unauthorized person to manipulate or handle the block panel/ block instrument & block telephone.
- vii. He shall keep the Station Master's control keys of block instruments/Control Panel in his personal custody whenever, he is required to leave his office even for a short duration.
- viii. He shall attend the control and give arrival departure of trains promptly and shall carry out instruction given by superiors provided these do not violate safety rules & procedures.
- ix. He shall be responsible for correct issuance of caution order, whenever required.
- x. He shall inform the Technician/JE/SE(Sig) through a written message, any failure of signal or block working etc. and invariably enter these failures in Signal Failure Register.



- xi. In case of any accident, he shall inform the Section Controller & Station Manager/Station Superintendent immediately. He shall give all the information available with him in regard to the nature, places, cause and assistance etc. in respect of the accident.
- xii. He shall communicate reasons for late start of outgoing trains and late arrival of incoming trains to control.
- xiii. He shall keep his rule books up to date, posted with latest correction slips and shall keep himself fully conversant with the extant rules. He shall keep his books, readily available for inspection when asked to do so.
- xiv. He shall not absent himself from duty without prior permission of his superiors. He shall not leave his duty unless properly relieved by his reliever and shall not exchange his duty without prior permission of his superiors.
- xv. He shall not consider himself relieved of duty unless he has completed transactions of trains for which he has given/obtained line clear till the complete arrival of such trains.
- xvi. He shall always obey the lawful orders of his superiors so long as they do not contravene any of the extant rules in force.
- xvii. He shall issue shunting order for shunting operations as per extant rules and keep a watch on the working of shunting staff.
- xviii. In case of abnormal working he shall be responsible for correct setting, pad locking of points and piloting of trains.
- xix. In absence of Station Incharge his duty is devolved upon him.

**(c) Station Superintendent (Outdoor), (Wherever provided):**

- i. The Station Superintendent (outdoor) shall be responsible for general up-keep and proper working of the station.
- ii. He shall maintain safety literature, Rule Books, safety record. He shall counsel staff regarding rules and safety systems.
- iii. He shall deal with public complaints and counsel commercial staff for courteous behavior.
- iv. He shall ensure right time placement and dispatch of terminating/originating trains and keep records in this regard and also keep a watch on shunting operations.
- v. At Notice/Originating stations he shall be responsible for correct issuance of Divisional caution orders to Crew & Guard of all trains.
- vi. He shall maintain close contact and co-ordination with Panel ASM/SM and Log ASM/SM for smooth running of trains and for better planning of operational work and will assist in case of any abnormal working.
- vii. He shall promptly attend to any incident or accident and assist in relief measures during his duty. He shall collect all information and inform the Control office for required assistance, i.e., Relief Train, Medical Van etc. He shall also inform the local civil authorities as required and safeguard the clues or evidences which may be helpful in enquiry.
- viii. In case of abnormal working, he shall be responsible for manual operation (Hand Cranking) of Points and piloting of trains.

- ix. He shall ensure that all coaching trains scheduled to stop at the station, start within their allowed time.
- x. Whenever Special trains are arranged to run from his station, during his duty, he shall ensure that stock for the same is secured and placed on the proper line in time.
- xi. He shall keep close watch on passenger amenities provided at station and their up keep.
- xii. He shall look after any other work assigned to him by Station Manager/Station Superintendent (Supervising), from time to time.
- xiii. In case of emergency he shall also perform duty on Panel/Log.
- xiv. All instructions received from superiors shall be recorded in an Order Book. Senior officers should confirm these through a control order to avoid ambiguity. All such instructions shall be implemented, provided these do not violate safety rules and procedures.
- xv. He will perform all the duties of Station Incharge( Station Manager) in his absence.
- xvi. He shall keep his rule books up to date, posted with latest correction slips and shall keep himself fully conversant with the extant rules. He shall keep his books readily available for inspection when asked to do so.

**(d) Log ASM/SM and Block ASM/SM (Wherever provided):**

- i. He shall come on duty after taking complete rest and shall not perform his duty under the influence of liquor, drugs or intoxicants.
- ii. He shall handle the block instrument himself when on duty and shall not permit any unauthorized person to manipulate or handle the block panel/ block instrument and block telephone.
- iii. He shall keep the Station Master's control keys of block instruments in his personal custody whenever, he is required to leave his office even for a short duration.
- iv. He shall maintain TSR and other connected record/documents in good shape and ensure that all entries are completed and are up to date.
- v. He shall attend the control and give arrival departure of trains promptly and shall carry out instruction given by superiors provided these do not violate safety rules & procedures.
- vi. He shall inform the Technician/JE/SE(Sig) through a written message, any failure of signal or block working etc. and invariably enter these failures in Signal Failure Register.
- vii. In case of any accident, he shall inform the Section Controller & Station Manager/Station Superintendent immediately. He shall give all the information available with him in regard to the nature, places, cause and assistance etc. in respect of the accident.
- viii. He shall communicate reasons for late start of outgoing trains and late arrival of incoming trains to control.
- ix. He shall keep his reference books(trains working manuals) up to date, posted with latest correction slips and shall keep himself fully conversant with the extant rules. He shall keep his books readily available for inspection when asked to do so.
- x. He shall not absent himself from duty without prior permission of his superiors. He shall not leave his duty unless properly relieved by his reliever and shall not exchange his duty without prior permission of his superiors.

- xi. He shall not consider himself relieved of duty unless, he has completed transactions of trains for which he has given/obtained line clear till the complete arrival of such trains.
- xii. He shall always obey the lawful orders of his superiors so long as they do not contravene any of the extant rules in force.
- xiii. In case of any abnormal working, he shall also perform the duties assigned to Panel ASM/SM.
- xiv. He shall advise the descriptions of the train to which he had granted line clear or obtained line clear to panel ASM/SM.
- xv. In absence of SS(Outdoor) the responsibility of issuance of correct caution order lies on Log/Block ASM/SM.

**(e) Panel ASM/SM (Wherever provided):**

- i. He shall come on duty after taking complete rest and shall not perform his duty under the influence of drugs or intoxicants.
- ii. When on duty or when called upon to do so, in case of emergency, he shall be responsible for obtaining and granting line clear to trains as per SWR & GR.
- iii. He shall handle the control panel himself when on duty and shall not permit any unauthorized person to manipulate panel.
- iv. He shall keep the SM's control keys of control panel in his personal custody whenever, he is required to leave his office even for a short duration.
- v. While coming on duty, he shall ensure that all points and signals are in good working order and all the registers, records, pertaining to train passage are completed in all respect before taking over the charge.
- vi. He shall personally ensure that conditions for taking 'off' the reception signals are fulfilled and the clearance of line is verified as per SWR before actually pressing the relevant button for taking off the signals.
- vii. He shall ensure from indications available in the panel that the signals are burning brightly and are giving correct indications.
- viii. He shall ensure that proper indications of points, signals, track circuits, crank handle, level crossing gate etc., are displayed at their proper places.
- ix. He shall ensure that all Shunting operations are carried out as per extant orders and GR 5.19 and SRs thereof.
- x. He shall inform the Technician/JE/SE(sig) in writing or through a written message, any failure of track/signals/points/keys or panels etc. and shall invariably enter these failures in Signals Failure Register.
- xi. He shall keep his reference books up to date, posted with latest correction slips and shall keep himself conversant with the extant rules. He shall keep his books, readily available for inspection when asked to do so.
- xii. He shall not absent himself from duty without prior permission of his superiors. He shall not leave his duty unless properly relieved by his reliever and shall not exchange his duty without prior permission of his superiors.
- xiii. He shall not consider himself relieved of duty unless he has completed transactions of trains for which he has given/obtained line clear till the complete arrival of such trains.

- xiv. He shall always obey the lawful orders of his superiors so long as they do not contravene any of the extant rules in force.
- xv. He shall be responsible for issuing required papers to trains entering/leaving the yard under the instructions of log/block ASM/SM.
- xvi. He shall issue shunting order for shunting operations as per extant rules and keep a watch on the working of shunting staff.
- xvii. He shall ensure clearance of running lines in case of failure of their track circuits.
- xviii. He shall be responsible for giving complete arrival of all trains to log/block ASM/SM.
- xix. In case of abnormal working he shall be responsible for cranking pad locking of points and piloting of trains in absence of Outdoor Station Superintendent.

**(f) Pointsman/Shuntman/Token Porter:**

- i. He shall obey all lawful orders of the ASM/SM/SS on duty or official in-charge supervising the shunting during the course of shunting operations including coupling or uncoupling of vehicles, wagons, fixing rubber washers, closing wagon doors, displaying hand signals etc.
- ii. He shall exhibit danger signal to the official supervising the shunting if vehicles are fouled during the shunting operation.
- iii. He shall pilot the trains in case of abnormal working and when ordered by the SS on duty.
- iv. He shall be in proper neat and clean uniform while on duty.
- v. He shall come on duty after taking complete rest and shall not perform duty under the influence of liquor, drugs, or intoxicants.
- vi. Neither shall he absent himself from duty nor shall he exchange his duty without prior permission of his superiors.
- vii. He shall not leave his duty unless properly relieved or authorized by his superiors.
- viii. He shall set the points properly in non-interlocked yard and man them for all shunting movements and shall not interfere with the points while the vehicles are standing and or passing over them.
- ix. He shall be responsible to see that fouling marks are kept clear after completion of shunting.
- x. He shall always commence his duty equipped with hand signal lamps during night and flags during day.
- xi. He shall verify the correct setting of route before delivering required papers to the Loco Pilot either though taking 'OFF' the relevant shunt signal or by personal observation.
- xii. In case of track failure he shall assist the SM to ascertain the clearance of line.
- xiii. He shall be responsible for lighting up of the indicators in the evening and putting out in the morning time fixed by DRM office and ensure that these are burning brightly at night.

**(g) Gateman:**

- i. He shall be responsible for proper operation of the gate as per GWRs for the passage of trains.
- ii. He shall ensure that no train suffers any detention on account of late closing of the gate.
- iii. He shall keep the channels of check rails clean and shall clean the road within the railway limits and water the area regularly.
- iv. He shall clean the gate lamps and hand signal lamps daily if provided. He shall ensure that the wicks of the burners are trimmed so that these are lighted properly and kept burning continuously from sun set to sunrise.

- v. He shall keep the surroundings of his gate lodge clean tidy and neatly planted with shrubs, plants etc.
- vi. He shall remain alert on duty till properly relieved. If he is required to leave the gate in emergency he shall close and lock the gate booms against the road traffic before leaving the gate.
- vii. He shall ensure that equipment at LC gate are complete and in working orders.
- viii. He shall produce the public complaint book when required by public for lodging complaint and to the railway officials for inspection.
- ix. He shall ensure that road traffic is not unnecessarily held up at the gate.
- x. He shall stand in attention near the gate lodge facing the track and be prepared to repeat any signal which the guard may intend to convey to the loco pilot or show caution or danger signal should anything appear to be wrong with the train itself as it passes.
- xi. He shall be polite and courteous in his behavior towards the public.
- xii. He shall report any defect in the gate to the station master on duty without delay
- xiii. He shall close the gate on sighting a train if not informed earlier or when ordered by the Station Master on duty.
- xiv. He shall attract the attention of the loco pilots and guards by shouting and gesticulating instead of showing danger signal in case of train parting.
- xv. He shall obey all lawful orders of the SM on duty.
- xvi. In case of any obstruction, accident or damage to the gates, he shall protect the gate/obstruction as per instructions and rules in force.

### **2.03: Duty list and hours of duty:**

- (a) Sr.DPO/DPO shall fix the duty hours for the staff at stations in accordance with the hours of work and period of rest rules in consultation with Sr. DOM/DOM/Sr.DCM/DCM. Copies of these duty hours (rosters) must be displayed at each station.
- (b) Station staff shall handover charge at the end of their hours of duty as prescribed at the station only when properly relieved. Such duty hours shall not be exchanged without the permission of the Station in charge.

### **2.04: SM/SS's responsibility for Assurance:**

- (a) Station Master must not allow any employee to take independent charge of a post connected with train working without satisfying himself after detailed oral examination about the knowledge of concerned staff. He must satisfy that the employee –
  - i. possesses the requisite Certificate of Competency.
  - ii. has understood the working rules of the Station and is fully conversant with the duties he has to perform.
- (b) Before an employee takes independent charge of a post connected with train working for the first time, the pickup period is generally laid down by the DRM (Optns). However, following guidelines can be observed on first posting or when there is change of system/means of working of trains -
  - i. Junction stations with marshalling yard and lobby - 10 days
  - ii. Terminal stations with marshalling yard and lobby - 08 days
  - iii. Large stations or junction stations - 05 days

iv. Medium stations & Road side stations - 03 days

(c) If an employee fails to give declaration in fixed period, he must be directed for Refresher Training at his expense. Pick up should be covered in all the shifts for acquaintance.

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

(e) If an employee is out of Headquarters for more than 15 days or there is any changes in the SWR, fresh assurance should be taken in token of going through & understanding the same.

### **2.05: Home Address Register:**

(a) Every Station Master must maintain a Register containing the name and up-to-date address including telephone/mobile phone no. of each member of the staff employed at his station.

(b) A separate Register containing list of all shopkeepers, licensed vendors, licensed coolies, contractors coolies or any other persons working at station other than railway employees must be maintained along with their up to date address and telephone numbers, blood group if available and office copy of their Photo Identity cards. Entry of such persons into station area will be permitted only after checking the identity card.

### **2.06: Public and Staff Notices for Exhibition:**

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

- (i) Notice Board showing current running of trains in the waiting hall or at the entrance.
- (ii) Notices regarding hours of business of goods, luggage and parcels - outside the respective offices.
- (iii) Notices regarding restrictions in Goods Booking.
- (iv) Notices regarding allotment of wagons.
- (v) Rules regarding occupation/use of Waiting Rooms - inside the waiting rooms.
- (vi) Notice regarding date of payment of staff.
- (vii) Duty Rosters and classification lists of staff employed at stations.
- (viii) Extract of Railways Act (24 of 1989) and payment of wages act.
- (ix) A list of nearest Doctors and Hospitals, with telephone nos.
- (x) Rules for the occupation of Rest Houses and Rest Rooms.
- (xi) A list of home addresses with telephone nos. of staff in Station Master's office.
- (xii) List of persons with telephone nos. from whom conveyance can be requisitioned in emergency: list of tent houses.
- (xiii) List of nearest Fire stations, Bus depots, Airports, OIL companies etc. with telephone numbers.
- (xiv) List of telephone numbers of Civil, Police, Military and Railway officials.
- (xv) Other prescribed notices.
- (xvi) The list of staff qualified in First Aid.
- (xvii) Blood groups of staff.

(b) The Station Manager must be careful to see that out dated timetables and notices are removed and replaced with current ones. He should also ensure that the telephone nos. are updated from time to time.

### **2.07: Exhibition of Public Advertisements:**

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

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

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

(a) The Station Master is personally responsible to see that rules books are kept up-to-date and are available to staff for reference. (G&SR 2.01, 5.02 & 5.03)

(b) Station Master is also responsible to ensure that all registers, forms and charts are properly and neatly maintained and that they are not used for purposes other than those for which they are printed and supplied.

(c) Station Masters are responsible to ensure general accuracy of all periodical returns and their submission in time.

### **2.09: Station Records:**

(a) Before use of each Book/Register, all the pages in the book/register should be serially numbered.

(b) Each book/Register, when completed must be stocked in a bundle with a cover showing date of commencement & completion.

(c) Records must be placed on shelves and almirahs in dry and secure places, where they shall be safe from irregular handling or removal by any unauthorized person.

(d) Periods for which Station records must be kept at Stations are given at the end of this chapter. Any records pertaining to court cases/enquiries must not be destroyed until the DRM's permission is obtained.

(e) Destructions of obsolete records shall be recorded in a register.

### **2.10: Operating Registers Maintained at Stations are as Follows:**

- (1) Station working rules
- (2) Assurance register
- (3) Master transportation register
- (4) Train signal register
- (5) SM's diary
- (6) Counseling register
- (7) Officers' inspection register
- (8) DTI's inspection register
- (9) Weather warnings register



- (10) S&T failure register (Supplied by S&T deptt)
- (11) Caution order register
- (12) Failure memo book (Supplied by S&T deptt)
- (13) Fog signal register
- (14) Accident register
- (15) Safety meeting register
- (16) Disconnection & Reconnection register
- (17) Emergency crossover testing register
- (18) Relay Room / Basement key register
- (19) Joint points & crossing register (Supplied by engg. deptt)
- (20) Stable load register
- (21) Sick vehicle register
- (22) Veeder counter register(Supplied by S&T deptt)
- (23) PN Books & ID cover register
- (24) Control order book register
- (25) SM's inspection register
- (26) Staff categorization register
- (27) Crank handle register
- (28) Safety circular register
- (29) Essential equipment register

### **2.11: Books and Registers at Level Crossing Gates:**

- (1) A board showing list of registers & boards available.
- (2) A board showing the list of equipment.
- (3) Duty roster.
- (4) Gate working rules in Hindi, English & vernacular language.
- (5) Public complaint book
- (6) PME, Refresher and Competency Certificate of the Gateman.
- (7) Results of last traffic census.
- (8) Inspection register
- (9) Accident register
- (10) S&T failure register in case of interlocked engineering gate.

### **2.12: Filing of Operating Circulars:**

- i. Every Station must maintain subject wise files on circulars, Gazette, notifications etc.
- ii. Each circular must be got noted by members of the staff concerned. In case of Group 'D' illiterate staff, SM must record that circulars etc. have been correctly explained.

### **2.13: Instruction for Guards:**

Instructions issued for Guards from time to time must be kept in one file/register (Guards Standing Order Book) at Guards Headquarter stations. Guards must make themselves thoroughly acquainted with these instructions and should sign in the circulars and assurance register of safety literature file, prior to "signing on" for duty.



**2.14: Correspondence:**

- i. All official correspondence must be attended to by the Station Master, who must open all covers and see that all letters are replied without delay.
- ii. All inwards letters must be registered in the inward letters register showing the dates & letter no. of reply with a copy placed in a file.
- iii. Station Masters are responsible for the accuracy of the information contained in all outgoing letters, which they must sign personally.
- iv. The Station's name must be stamped on all returns and letters and on envelope in which they are dispatched.
- v. Every outward letter must be numbered, dated and must also bear reference no. of the subject. This must be adhered to in all subsequent correspondence when replying to correspondence; reference must be made to the letter number under reply.
- vi. Letters from the public asking for information must be replied to as promptly as possible. If there is any difficulty in supplying the required information, the receipt of the letter must be acknowledged and matter referred to the DRM/Sr.DOM.
- vii. The language used for reply should be polite, respectful and courteous. It should be written legibly at stations not having computers.
- viii. When forwarding letters or complaints from staff working under them, Station Masters must submit their own remarks, while forwarding such letters complaints.
- ix. Letters received by the Station master, pertaining to departments under him e.g. Goods Shed, Booking Parcel offices etc. may be marked by the Station Master for the In-Charge concerned, but the Station Master shall be personally responsible to ensure the early compliance of such letters.
- x. SM is responsible for correspondence pertaining to the station working, staff matters and other subjects with the division/HQ office. He is also responsible to maintain necessary files department wise for inward/outward correspondence.
- xi. He is responsible to arrange to send the Traffic and Commercial returns to the office concerned within the stipulated period which is decided by the Competent Authority.

**2.15: Playing of Bands and Presentation of Guards of Honour etc. on Station Platform:**

The playing of bands and presentation of Guard of honour etc., on the station platform is prohibited, except with the prior permission of the DRM.

**2.16: Prohibition Against Photography/film Shooting on Railway Premises:**

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

**2.17: Religious Edifices Within the Railway Limits:**

Employees are forbidden to occupy any place in station area for praying holding religious functions, speeches, discourses etc. to erect religious structures, either permanent or temporary, or to add or alter any existing religious structures on railway land, without the sanction of the General Manager. Station Masters will keep close watch and promptly report any violation of this instruction.

**2.18: Testing of Crank Handle by SM/ASMs:**

In order to ensure that the Crank Handle operation of electrical point machine can be resorted to in case of emergency, periodic drill of extraction of the crank handle from the interlocked key box and its operation should be undertaken regularly. The instructions mentioned below shall be followed.

- (i) The station staff should be fully conversant with station working rule regarding the method of extraction of the crank handle from the interlocked key box.
- (ii) Crank handle testing must be carried out by each and every SM/ASM once a month along with TP/ Pointsman and S&T staff during day shift regularly, so that they are used to operate the same in case of emergency.
- (iii) Surprise checks by supervisors of Operating and Signaling departments should be carried out to ensure that the testing of crank handle is done regularly.

**2.19: Use of Crank Handle for Motor Operated points:**

At stations where points are operated by electric motors, the following procedure shall be observed in case of failure of such point(s). These procedures should be incorporated in Appendix 'B' of the 'Station Working Rules' at stations where motor-operated points are provided.

- (a) At stations where points are worked by means of electrical points motors as in the case of Panel Solid State/Route Relay Interlocking, in the event of their failure the point can be operated locally by using crank handle(s). For this purpose, separate crank handle for each point or a common handle for group of points will be provided according to the design of interlocking at the stations. These crank handles are interlocked with the signals and are housed in the appropriate interlocking box(s) or electrical apparatus. In the event of failure of point/motor, to set the point(s) manually, Emergency Crank Handle may be taken out from the interlocking box(s) or electrical apparatus.
- (b) In the event of failure/defect of electrically operated point(s) trains may be received/despatched on signals after manual operation of points by the emergency crank handle(s), which is/are interlocked with the signals, provided-
  - (i) The Station Master deposes a responsible operating official with the crank handle to operate the defective motor operated point manually. The emergency crank handle can either be personally handed over or electrically transmitted to him by the Station Master Cabin Master/Lever man on duty with instructions to set the defective point(s) to the desired position (viz. normal or reverse) and clamp and padlocked the same. Both the ends of a crossover must be set in correspondence (viz. normal or reverse), the facing and trailing points must be clamped and padlocked. The operating official so deputed, after complying with such instructions should return the emergency crank handle either personally or transmit electrically to the Station Master/Cabin Master/Leverman on duty, in charge of operation.
  - (c) The Station Master/Cabin Master/Leverman on duty should verify from the visual indication available on the panel/other means that the points are set to the desired position as instructed by him (normal or reverse) and thereafter return the crank handle received by him to the appropriate interlocking box.
  - (d) He should also verify from the operating official deputed to set the defective point(s) that the same is also clamped and padlocked, supported by a Private Number in case of electrical transmission of the crank handles or by obtaining the signature of the operating official in the crank handle register.

(e) The Station Master/Cabin Master/Leverman on duty after ensuring the correct setting of defective point(s) as required in paras (b),(c),(d) above can take off the concerned signals for movement of the trains over the said point(s).

(f) If even after complying with the instructions contained in paras(b) to (e) by Station Master/Cabin Master/Leverman on duty, the correct setting of the defective points to the desired position is not indicated in the visual indication provided, the train will be piloted in and out in terms of SRs.3.69.01, 3.69.02,3.69.03,3.70.01 and 3.70.02.

(g) The cases of failures of motor-operated point(s) should be promptly reported to the SE/JE(Signal)concerned for immediate rectification of the same.

(h) Whenever, an emergency crank handle is required to be used by a Signal official for maintenance work or in the event of failures, the signal officials will give a disconnection memo to the Station Master on duty and after making necessary entries in the Emergency Crank Handle Register, the Station Master on duty will obtain the acknowledgement of the Signal official in the Emergency Crank Handle Register and then hand over to him the Emergency Crank Handle(s) for the points concerned. The concerned points will be treated as defective till the Emergency Crank Handle(s) is/are returned to the Station Master on duty.

(i) Whenever, Emergency Crank Handle(s) is/are handed over to a Signal official for maintenance work or for rectification of failure, the points for the affected lines should be treated as non-interlocked and the Station Master on duty is responsible for introduction of non-interlocked working and trains will be piloted 'in' and 'out' after clamping and padlocking the points over which the train is to pass as per SRs 3.69.01, 3.69.02,3.69.03,3.70.01 and 3.70.02.

(j) An Emergency Crank Handle Register should be maintained in the following proforma by the Station Master on duty wherein the particulars of the usage of Emergency Crank Handle must be recorded:-

- (1) Date.
- (2) Point No. which failed or is required to be tested.
- (3) Time of failure.
- (4) Disconnection Memo No.received from S&T staff.
- (5) Signature of Operating official/Signal official to whom the Emergency Crank Handle is handed over Transmitted.
- (6) Time Emergency Crank Handle is sent out/Transmitted.
- (7) Signature/PN of the Operating official to ensure correct setting,clamping and padlocking of the points.
- (8) Date and time fault rectified.
- (9) Time Emergency Crank Handle received back by the Station Master on duty.
- (10) Signature and designation of the Signal official who rectified the fault.
- (11) Remarks.

**2.20: Normal Period for which Station Operating Registers and Records are required to be preserved:**

S.No.of the Book/Form	Description of the Book/Form	Period of preservation from the date of completion
1	Muster Roll	Permanent Record
2	Uniform Register	Permanent Record
3	Leave Register(LAP)	Permanent Record
4	Railway Medical Sick Certificates	Permanent Record
5	Record of Station Equipment sent for repairs	Permanent Record
6	Station Order Book	Permanent Record
7	Station Inspection Register	Permanent Record
8	Transportation Bio-data Register & Home Addresses of staff etc	Permanent Record
9	Diary of Yard Supervisor	Permanent Record
10	Register of important Circulars	Permanent Record
11	Register of Inward & Outward letters	3 years
12	Wagon Exchange Book/Wagon Exchange Register	3 years
13	Sick wagon and Transhipment Register	3 years
14	Guard's signature Book	3 years
15	Wagon Demand /Priority Register	3 years
16	Indent and Loading Register	3 years
17	Wagon Transfer Register	3 years
18	Damaged Stock Register/Sick Wagon Register	3 years
19	Siding Voucher Book/Record of Time Wagon Handing over	3 years
20	Control Order Book/Conference Book	3 years
21	Unconnected Wagon Register	3 years
22	Load Report Register	3 years
23	Register showing Analysis of Late starts to Goods trains at important yards	3 years
24	Watering Register	3 years
25	Register of occupation of reception lines	3 years
26	Detention to trains outside signals and at adjacent stations	3 years
27	Guards' Arrival Register	3 years
28	Register showing Detention to wagons at Break of Gauge Transhipment point	3 years
29	Number Taker Book	3 years
30	Guards' Duty Register	3 years
31	Guards' Rough Journal	3 years
32	Register showing load of Goods Trains and Goods trains run under load	3 years
33	Statement of running of Passenger Trains	3 years

S.No.of the Book/Form	Description of the Book/Form	Period of preservation from the date of completion
34	Train passing registers/Books/Forms	1 year
35	Caution order register and Caution order books	1 year
36	Yard Wagon Balance Register	1 year
37	Form of Train Examination Advice	1 year
38	HQ Leaving Permission Register	1 year
39	Spectacles Register	1 year
40	Station Diary and Charge Book	1 Year
41	Casual leave register	1 year
42	Special casual leave	1 year
43	Leave other than LAP/CL/Special CL	1 year
44	Register of Train Advices	6 months
45	Summary of Daily receipt and dispatch of wagons and Work Done	Local orders to be issued by DRM
46	Special stock Register	Local orders to be issued by DRM
47	Detention to wagon at Train Marshalling stations	Local orders to be issued by DRM
48	Marshalling Register for Inward and Outward trains	Local orders to be issued by DRM
49	Register showing detailed Arrival, Placement, Dispatch and Detention Local orders to be issued by DRM particulars of PU, Repack wagons, etc.	Local orders to be issued by DRM
50	Register of Long Distance Goods Train run	Local orders to be issued by DRM
51	Unusual Register, other registers and Records maintained in Control offices and at specified stations.	Local orders to be issued by DRM

While deciding the periodicity the calculation should be made as under:

- In calculating the one year or the three years period, the year to which the books & documents relate and the year in which they are to be destroyed should be excluded.
- Record pertaining to court cases, departmental enquiries should not be destroyed till three years from the date the cases is decided.
- Record pertaining to public claims, etc. or those under reference from home or other railways, should not be destroyed without permission from DRM concerned.
- Records preserved more than stipulated period as prescribed above and devoid of any case as mentioned in item No. ii should be destroyed in presence of Sectional DTI, duly recording the list of Registers destroyed.

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## CHAPTER-3

# WORKING OF TRAINS GENERALLY

### 3.01: Prerequisite Conditions for Driving a Train:

- (a) No person shall drive a train, unless he is in possession of a valid Certificate of Competency issued by an authorized officer.
- (b) No Loco pilot, Assistant Loco Pilot or Loco Pilot of any self propelled vehicle shall be booked to work a train or to drive a vehicle until he has learnt road & shall give a declaration that he is fully acquainted with it. For this purpose, he will be booked to work 03(three) round trips on each section including one during night before being put to work the train/vehicle independently.

### 3.02: Examination of Trains:

Each train shall be examined by competent person from the rolling stock/electrical maintenance department before being offered for passenger/goods or any other service. The purpose of the examination is to ensure that all functions of the train and its constituent carriages/wagons etc. are working correctly, particularly safety devices including brake systems, passenger alarm etc. to be listed by competent authority. The competent staff shall issue a brake power certificate indicating brake power & duration of its validity.

### 3.03: Classifications of Trains:

Trains are either scheduled as shown in the Working Time Table or non scheduled trains & are run on the following account.

#### (a) Traffic Account:

- (i) Mail/Express/Passenger Trains
- (ii) Commuter trains EMU/DMU/for suburban, regional passengers.
- (iii) Military special including troop trains.
- (iv) Parcel trains of carriage of coaching traffic only.
- (v) Goods trains for movement of conventional freight cargo.
- (vi) Container Trains.
- (vii) Mixed trains carrying both passengers & freight.
- (viii) Other trains to include Exhibition Trains, Bharat Darsan, Mobile hospital on wheels etc.
- (ix) Special trains run on special demands from Central/State Govt, General public or other bodies.

#### (b) Engineering Account:

- (i) Ultrasonic & other track testing trains:
- (ii) Material trains.
- (iii) Track Maintenance trains like- Tie Tamping Machines; Rail grinding trains PQRS, BCM, and DGS etc.

#### (c) Electrical Account:

- (i) Wiring special/Tower Wagons.

#### (d) Miscellaneous Account:

- (i) Inspection specials.
- (ii) Staff shuttles.
- (iii) Water specials.

- (iv) Workmen's specials.
- (v) Accident relief trains (ARTs/SPART).
- (vi) Accident Relief Medical Equipments (ARMEs/SPARME).
- (vii) Crane Specials.

### 3.04: Train Ordering:

Scheduled passenger trains do not require train ordering. Train Advice is necessary only when these are required to be cancelled, put back or there is any change in the schedule shown in Public/Working Time Table. In case of unscheduled trains, Train Advice should be issued. On controlled sections, trains are ordered by SCR/Dy. CHC (Mov) in conjunction with the Power Control and/or Lobby Supervisor. On non controlled sections, trains are ordered by the Station Master of the originating station in accordance with the special instructions laid down by the Sr. DOM/DOM in this respect.

### 3.05: Train Preparation:

The time at which train is required to be in readiness in all respects for departure from the starting station will be laid down by the Divisional Railway Manager/Sr. DOM. In case of passenger trains, the rake duly examined and fit in all respects with full complement of coaches should be placed on the platform well in time to allow all pre departure functions to be completed.

These include-

- Loading of mails, booked luggage, and parcels
- Loading of linen
- Pantry car provisions
- Watering
- Cooling of AC coaches
- Display of reservation charts
- Deployment of train staff
- Attaching of locomotive

To facilitate passengers boarding, generally an important long distance passenger train should be placed on the platform 30 minutes/15 minutes before its scheduled departure, depending upon the terminal layout.

Every loco pilot of a train while starting from the starting station must verify adequacy of brake power as certified in train examination document. In addition, he must conduct a "brake feel test" to ensure that train brakes respond to brake application. In case any problem encountered, he will bring it to the notice of SCR as well as carriage controller. However, he should start the train only after rectification of the problem or getting suitable orders. Likewise, every Guard while taking over charge of a train carrying passengers must ensure that the brake-van equipment are duly provided in the brake-van. In case of non supply/short supply, he will report to the control on the issue. The train shall move only after the equipment supplied or suitable control order received to move without the same.

### 3.06: Wearing of Uniform:

- (a) Every railway servant who is provided with uniform must appear in full uniform when on duty or attending any enquiry or Training school or appearing before Selection Board. Those who have not been supplied with uniform must come on duty properly and neatly dressed.
- (b) Guards of all trains before coming on the platform/yard for taking charge of trains shall wear their uniforms as prescribed by the administration.



(c) It is the duty and responsibility of each Railway servant to get their uniform properly cleaned and ironed before use.

### **3.07: Booking of Running Staff:**

Scale of rest at headquarters and outstations to running staff are given as under.

#### **(a) Rest at headquarters:**

- i) For duty of less than 8 hours - 12 hours of rest.
- ii) For duty of 8 hours or more - 16 hours of rest.

#### **(b) Rest at outstation when working other than short trips**

- i) For duty of less than 8 hours - 06 hours of rest.
- ii) For duty of 8 hours or more - 08 hours of rest.

(c) **Rest at headquarters and outstations when working short trips:-** The interval between trips shall be treated as 'duty', if it is equal to or less than 01 hour plus time allowed for train or engine attendance after the last trip, plus time allowed for train or engine attendance before next trip. This period being increased at discretion of the railway administration where local conditions such as distance of running room from the traffic yard etc. warrant such an increase.

### **3.08: Taking and making over time:**

Taking and making over time should count as duty as under.

#### **(a) Loco Running staff-**

i) Where charge of engine is taken over and made over in a shed:-

**Diesel:** 30 minutes before departure of the locomotive(Multiple/Single unit) from shed and 15 minutes after arrival of locomotive in shed.

**Electric:** 45 minutes for multiple unit and 30 minutes for single unit locomotive before departure of the engine from the shed and 30 minutes for multiple unit and 15 minutes for single unit after arrival of locomotive in shed.

**EMU/MEMU/DMU :** 30 minutes for examining & taking over charge at starting station.

ii) Where charge of engine is taken over and made over outside a shed i.e., station yard : For Diesel Electric, it is 15 minutes before the schedule departure of the train and 15 minutes after arrival of the locomotive at the place where it is handed over.

**Note:** Where locomotive is taken over/made over in shed, the time taken for movement of engine from shed to the Bahar line/ yard and vice versa will be laid down for each shed by DRM concerned taking in to account the local conditions and layout of the shed.

#### **(b) Traffic Running staff -**

##### **i) Passenger trains:**

At train originating and train terminating stations 30 minutes for taking over and 30 minutes for handing over charge.



At other than train originating and train terminating stations 15 minutes for taking over and 15 minutes for handing over charge.

**ii) Goods trains:**

At train originating and train examination stations 45 minutes for taking over and 30 minutes for making over charge at destination/train examination station.

At other than train originating and train examination stations 15 minutes for taking over and 15 minutes for handing over charge.

**3.09: Counting of Hours of Duty, Periodical Rest & General Instructions:**

(a) Time for taking or making over charge are specified in para 3.08 (a) & (b) above shall be counted as time on duty.

(b) “Running duty” in the case of running staff should not ordinarily exceed 12 hours at a stretch and will claim relief after giving 2 hrs prior notice to the section controller.

(c) Calculation of duty hours for running staff travelling as passenger on duty by coaching/freight trains before or after working the train:-

(i) Actual journey time by coaching/freight train should be treated as duty hours.

(ii) If pilot crew & guard are detrained to work a train at road side station or having no running room facilities, they are not entitled for any rest and their duty hour will commence from actual time of departure of the train by which they travel as pilot.

(d) Waiting at the place of duty and not resting will count as duty during which an employee can be given other suitable work, before he actually starts on running duty.

(e) For Crew & Guard coming pilot by Coaching/Goods train up to crew changing point/running room, no rest should be allowed if the journey as spare does not exceed 4 hrs. The scale of rest to be allowed at outstation and headquarters are as under:

**(i) At outstations :**

- ➔ 01 hour rest if the journey as pilot exceeds 04 hrs.
- ➔ 02 hours rest if the journey as pilot exceeds 07hrs.
- ➔ 03 hours rest if the journey as pilot exceeds 10 hrs.

**(ii) At headquarters station :**

- ➔ Minimum 12 hours of rest irrespective of hours of journey.

(iii) Coaching crew & Guard, those who are in schedule links will pick up their links as scheduled.

**(f) Train ordered but subsequently cancelled :**

In case a train already ordered is cancelled subsequently due to unavoidable reasons i.e due to abnormally delayed for unforeseen causes, engine failure and so on, then crew and guard are relieved and given rest as under.

**(i) For headquarters Crew and Guard:**

- |   |                     |
|---|---------------------|
| ➔ Train cancelled within 08 hours:      | ➔ 12 hours of rest. |
| ➔ Train cancelled on 08 hours or above: | ➔ 16 hours of rest. |

**(ii) For outstation crew and guard:**

- |  |                     |
|--|---------------------|
| ➔ Train cancelled within 08 hours:     | ➔ 06 hours of rest. |
| ➔ Train cancelled on 08 hours or above | ➔ 08 hours of rest. |

(g) **Periodic Rest** – Running staff shall get the following periodical rest at HQ.

Four periods of rest not less than 30 consecutive hours each or 5(five) periods of rest not less than 22 consecutive hours each in a month. Periodic rest given at Hqrs. should always include full night in bed. (Night implies from 22hrs to 06 hours of next day).

(h) **General Instructions-**

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

(ii) Running staff should not normally be kept away from Hqrs. for more than 3 or 4 days at a stretch. (Note: It is for the Lobby Supervisor or/and Crew controller and Station Master on duty to see that running staff booked on ballast train away from Hqrs return to Hqrs. within the time shown in parah (ii) above.)

(iii) Running staff as far as practicable should be advised of their periodical rest at or before its commencement.

(i) **Accidents & Emergencies:** - In an emergency, like accidents, flood, agitation, equipment failures and other unexpected situations, which could not have been forced or prevented, staff must remain at their post as long as required, even if it is beyond their normal hours of work under these instructions. However, in such cases controller must advise the staff suitably. If there is a possibility for relief of crew and guard by any means, Controller/TPC/DPC should arrange for their relief.

### 3.10 Attendance of Running Staff:

(a) Generally, crew and guard must not be called for duty short of rest, However, they may be called for duty in case of emergency before completion of their rest. In such case, the names of Guards in the station Roster/CMS (if provided) and that of engine crew in the crew lobby /CMS (if provided) will be considered sufficient intimation that their services are required at short notice.

(b) The Guard and the engine crew, though scheduled to work a certain train should be available in CUG network round the clock so as to call them for duty before scheduled time in case of emergency. In case, he is out of the network or head quarters, CHC/SS/YM and SSE/SE (Loco)/Crew Controller/SSE/SE (Elect.) respectively of the lobby should be informed before leaving the official residence.

(c) When unable to go out with a train for which they may be in turn owing to sickness, etc., the Guard and the Engine Crew must give timely notice i.e. at least four hours before the scheduled departure of their train/train ordering, of the fact to the SM/YM/CHC and to the crew controller respectively, in order that arrangements may be made to fill their places. Reporting sick on the call book when sent to warn them for duty will not be considered timely notice.

(d) Guard or Engine crew absent from duty without proper leave or Medical Certificate from a Railway Medical officer will render themselves liable to punishment.

### 3.11: Road Learning for Running Staff:

(a) **Initial sectional road learning:-**

Category	By Day	By Night
LP/Motorman/ALP	02 trips	01 trip
Guard	02trips	01 trip

(b) **Not operated for specific period:**

Category	Below 03 months	03 to 06 months	Above 06 months to 02 years	Above 02 years
LP/Motorman/ALP	Not required	01 Trip	02 Trips	03 Trips
Guard	Not required	Not required	01 Trip	01 Trip

**(c) For working in sidings:-**

- (i) LP/ALP/Guard whenever, not worked in a siding for 06 months and above, can ask for learning road of 01(one) trip.
- (ii) If the pilot is worked in the siding accompanied by traffic pointsman/TP as per SR 5.13.03, then need of road learning is not required.

**3.12: Guard's Responsibility Regarding Equipment:**

Proper arrangement in the form of closed cup board should be provided in the SLR by Mechanical department for keeping the brake van equipment in locked condition. Brakevan equipment should be loaded in SLR by SSE(C&W) of the depot, after being provided by concerned departments. It will run on end to end basis and will be kept in the cupboard provided in the brake van with one time lock(OTL). However, in case of use/missing it should be made good by SSE(C&W), collecting the same from concerned department.

- (a) Every Guard before taking over a train either at originating station or enroute shall ensure that his personal equipment are complete and in good condition. In case of passenger carrying trains, he should further ensure that the equipment cabin is secured with OTL or the seal is intact.
- (b) He shall record all the particulars of brakevan equipment in rough journal and T-34(HF).
- (c) The Brakevan equipment cabinet seal can be broken only during accident, emergency or inspection by officers. After use of the equipment, the Guard shall give a written control message to all concerned indicating the train number, date & time of use of equipment and place of use for resealing the cabinet. If equipment are used enroute the coaching controller getting the message will inform next junction, station for recouping and resealing without OTL.
- (d) In case the seal of cupboard is found broken the same is to be informed through control message to the next station capable of arranging for replacement of deficient materials.
- (e) At originating station if it is found that OTL is missing, Brakevan cabinet is in open condition and deficiency of Brakevan equipment, the Guard will inform the matter to on duty SM through written memo indicating the brakevan no, particular of equipment missing and train no. The SM will lodge an FIR and inform SE(C&W) for further action.
- (f) If the missing of OTL and deficiency of equipment is noticed enroute during change of guard, then acknowledgement of outgoing guard should be taken in rough journal in token of the same and action to be taken for recouping of missing equipment and resealing. Such cases should be reported to on duty SM of the primary maintenance station by incoming Guard for taking necessary action.
- (g) No coaching train shall start without full complement of brakevan equipment. However, in case of emergency or non-availability of equipment, he shall start the train only after getting suitable orders from control.
- (h) Following are the complement of brake van equipment for coaching trains:

Sl.	Item	Quantity	Maintained/supplied by
1	Portable control telephone	01	JE/SE(Tele)
2	Portable train lighting equipment	01	JE/SE(Elec.G)
3	Portable fire extinguisher	02	JE/SE(C&W)
4	Wooden wedges/skids	02	JE/SE(C&W)
5	Stretcher	01	SS/SM

**3.13: Additional duties of Guard While Working a Train:**

Besides observing the provisions of the GR 4.34, 4.35, 4.42, 4.43, 4.44, 4.45, 4.47, and 4.48, the Guard while working a train should take the following actions.

- (a) He should always be vigilant during the run of his train as well as train controlled at station or between Stations.
- (b) He should observe and exchange signal with train/trains passing on the adjacent line/lines in all conditions whether, his train is in the block section or stationary at a station.
- (c) At curvatures, the guard of train should watch his train passing in safe manner and exchange signal with LP/ALP of his train and inform LP/ALP in case any abnormality is noticed.
- (d) Guard must be very much attentive towards the caution order and apprise the LP/ALP immediately on walkie-talkie as soon as the last vehicle clears the restricted zone.
- (e) Whenever, the train is dispatched from/via loop line, he must apprise LP/ALP as soon as the last vehicle clears the cross over.

**3.14: Duties of Guard When Taking Over Charge of a Train Where Train is Formed :**

All Guards while taking over charge of trains in addition to the stipulation in GR-4.34 &SR thereto shall ensure that -

- (a) The vehicle guidance /Wagon way bill of the train is collected and personally satisfy by actual check that the Vehicles/Wagons as per Vehicle guidance/Wagon way bill are correct on train and labels of wagons, seals and rivets of sealed wagons are intact.
- (b) The doors of all goods wagons are properly closed/secured and fastened.
- (c) The brake van is fitted with vacuum gauge/air pressure indicator and pressure available as stipulated.
- (d) The train is provided with prescribed brake power as stipulated.
- (e) The train is not wrongly marshalled. In case of any defect/deficiencies with the train or wagon/vehicle, it must at once be brought to the notice of the Station Master/Yard Master as the case may be and the defect/deficiency made good. If the defect/deficiency is such as would interfere with the safe running/working of the train, the train shall not be allowed to leave the station/yard until the defect/deficiency has been removed or the wagon/vehicle concerned has been detached.

**3.15: Guard's Duties in Respect of Vehicles/Wagons Attached/Detached:**

Guard in charge of train shall enter the number, owning railway and description of all vehicles/wagons attached to their trains and the name of the stations to and from which booked, in the rough journal and on the reverse of their train report in this space for remarks. Those particulars must be taken by Guards directly from the labels affixed to the vehicles/wagons on their trains and not merely copied from the way bills prepared by the trains clerks. Guards shall further carefully check the entries in the wagon way bills with the particulars shown in the labels and see their labels contain necessary particulars and that there is labels on each side that the door seals and revets on both sides of sealed wagons are intact. Should any mistake or deficiency be discovered the station Master or the train's clerk shall be asked to rectify the same and until this is done the train must not be started. Similarly, the Guard must record in the wagon way bills the particulars of wagons detached and also record the same on the reverse of the train report.

**3.16: Guard's Responsibility in Respect of Train Papers:**

- (a) The Guard in charge of the train, will be responsible to maintain the Guard's rough journal book and keep it up to date during the journey of the train. At Guard changing station, the wagon way bill/vehicle consists, DRS cards, way bills, summaries etc. must be carefully examined by the Guards when handing

over and taking over charge, and discrepancy or remarks recorded should be jointly signed by the Reliving and the Relived Guard. The Guards should make out their trains reports on the journey and complete it immediately on arrival of their train at destination. Three copies of train report (T34 HF) must be handed over by the Guard to the LP/ALP of the train at the Guard or crew changing stations or at terminal stations as the case may be. The LP should ensure to depute his ALP to collect the train report from the Guard. In case of no assistant to the LP, the Guard will be responsible to hand over the train report personally to the LP. Under no circumstances, such handing over be delayed involving detention to trains.

**(b) Reports at destination-**

**(i)** Guards shall prepare and hand over at the end of their journey (before they go off duty) to the control office/Station Master/ Train clerks/Roster clerk according to the local order in force, the following train paper and obtain signature in their rough journal books.

For goods trains.....	Wagon way bill/vehicle guidance consist, train report
For tranship trains.....	Wagon way bill/vehicle guidance consist, road van summarise and tranship guards journal.
For Coaching trains (Mail, Express, Passenger, Mixed & Local trains).	Wagon way bill/vehicle guidance consist, train report

**(ii)** In addition, the Guards of coaching trains shall hand over the summary of parcels and luggage etc., to the Station Master/Parcel Clerk at the destination station.

**(iii)** In case of local trains, such as those running between Khurda Road and Puri, any immediate station or any other trains tuned to make short trips, the trains reports may be made out for each round trips.

**(iv)** While preparing the train report the Guard must also indicate if any special loads on train as live stock, perishable, over size, inspection carriage or reserved carriage etc., or any unusual occurrence or any deficiency in rolling stock, weather condition, shunting by train engine etc.

**(v)** The train report of material train should be prepared after a day's work is finished and handed over to the Station Master/Train Clerk/Roster Clerk as the case may be at stabling station.

**(vi)** At the close of each day, these documents must be submitted duly entered in transmit memo to the official concerned. All concerned must take special care in preparing and submission of these documents.

### **3.17: Time Allowed for the Engines Between Shed and Yard:**

**(a)** DRM of the division having loco shed will prescribe the time allowed for outgoing engine to travel from "Bahar" line to the train and incoming engine to travel from the train to the "Bahar" line. Likewise the transit time from 'Bahar' line to shed & shed to 'Bahar' line should be fixed depending upon the shed layout. The LP must ensure that the time is not exceeded.

**(b)** It will be the responsibility of the Station Master/Yard Master on duty to ensure that an outgoing locomotive is taken out of the "Bahar" line immediately it comes and an incoming train engine due to go to shed is released for shed and reach the "Bahar" line without undue delay.

**(c)** Arrangements for recording the time of arrival at the "Bahar" line or the time of returning to loco limits have been made at the junction of traffic and loco limits. The LP must record their on the time of arrival and also detention, if any, for being taken out of "Bahar" line or release for shed.

(d) The time ahead of the scheduled departures of trains by which the outgoing engine is to be placed on “Bahar” line is prescribed for each shed. The LP must ensure that the outgoing engines are placed in the “Bahar” line within the time prescribed. Any failure to turn up at the “Bahar” line with the engine in time must be recorded in “Bahar” line register with the reasons there of.

(e) The movement of engines in big yards, to & from the loco shed will be controlled by shunt signals and other signals. The LP must make themselves conversant with the same and move their engines accordingly.

### **3.18: Attaching Engine on Train:**

Whenever any engine with or without vehicle/vehicles is to be attached on to a train en route or during shunting at road side station, care must be taken to come on to the train/vehicle with great caution and to avoid bump. Refer SR 4.32.01 & SR 5.13.04.

### **3.19: Additional Duties and Precautions to be Followed by the Loco Pilot While Working Trains:**

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

(a) LP & others travelling on engine cab must exercise great care in looking out of the engine cab when travelling, on account of the danger from proximity of signals and other fixed structures.

(b) When any of the engine crew is working under the engine or attending to motion parts, all the available brake power must be kept in on-position.

(c) Either LP or ALP should always be in the loco cab so as to avoid rolling down on gradient while one of them proceeding to check the rake.

(d) The LP must scrutinize the engine pass of any person desiring to travel on his engine and if the pass is not in order he must not allow.

(e) LPs/ALPs are not permitted to use goggles having tinted glass while working train.

(f) LP/ALP while passing on curvatures should look back and observe their train and exchange signal with guard of the train.

(g) LP/ALP should exchange signal with trains crew and guard of the train passing on the adjacent line/lines whenever in motion or in stationary condition at station/section.

### **3.20: Warning Bell and Instructions for Staff :**

At all block stations having stoppage of Exp/Passenger trains for passengers, S&T department will provide Public Announcement System (P.A.System) for announcement, on the arrival/departure of trains. Wherever, P.A system is not available the following action should be taken.

(a) **Incoming train** – As soon as “Line clear” has been given for an incoming stopping passenger carrying train, the station Master on duty must get the warning bell rung. Warning bell as per schedule codes should also be given when the train leaves the station in rear.

(b) Continuous warning bell will be sounded for the guidance of the public as soon as the incoming train is in sight.

(c) **Outgoing train** – in the case of outgoing trains having halts of less than 10 minutes the starting bell shall be rung just before the departure to warn the passenger. At originating station or stations having halt of 10 minutes or more, warning bell (quick continuous beat for 2 seconds) will be sounded five minutes before the departure of the train.

(d) No bell required for non-stopping passenger carrying trains.



**3.21: Station Bell Signal for Incoming and Outgoing Trains:**

At stations not provided with P.A. system the following bell Code should be followed.

The following signals are to be given on the station bell for trains carrying passengers:

Activity UP Train	DN Train	
Line clear given for a train to the station in rear	Sharp, continuous beats for 03 seconds followed by two strokes (***** **)	Sharp continuous beats for 03 Seconds followed by one stroke. (***** *)
Train left last station in rear	Two stroke pause two strokes (** **)	Three strokes (***)
Train approaching	Sharp continuous beat for a second (*****)	Sharp continuous beat for a second (*****)
Before starting	Two stroke pause two stroke pause two strokes (** ** **)	Three stroke pause three stroke pause three strokes. (*** ***)

**3.22: Working of Trains on Lines not Opened for Traffic:**

Whenever new lines are opened for traffic or any existing line has to undergo for major changes viz. yard remodelling in connection with engineering or /and S&T works etc. the said works are being put up to CRS for his approval and opened for traffic only when it is approved by CRS after his inspection if he desires so or otherwise.

All the train operations on the open line are subject to the provisions laid down in G & SR, BWM and other instructions issued by the Competent Authority.

It is obvious that during change over period or during the progress of construction work of new lines, doubling work, change of train working system etc. the engineering, S&T and even electrical departments have to enter into the section under construction by train or by means of locomotive, Track Machines, Material trains, PQRS machines, Motor trolleys etc. for their day to day activities. It is also of much importance that the CRS special and other inspection carriages are also required to run in these sections prior to its opening for the public carriage.

As the G&SR is not specifically explaining the train working procedure in such cases and is for “all open lines of Railways”, the following guide lines are issued to staff at ground level to ensure the safe working of trains during the movement of trains/vehicles/machines/trolleys from & to the station opened for traffic to the line under construction.

**(A) General Instructions:**

- (a) No train/vehicle/machine/motor trolley will enter into that block section/section without the prior permission of the Station Master concerned.
- (b) Official in charge of the work will give a request well in advance to the SM on duty to accord permission to work/enter into the section. The requisition will include the following:
  - i) Place, date and time the request put up.
  - ii) Place, date and time the request accepted.
  - iii) Place, date and time the request permitted.
  - iv) Expected time of return to the station.

- v) Private No. exchange between SM/SMs, SCR, SE(P.Way), SE(Signal) etc.
  - vi) Points coming en-route in the train movement.
  - vii) Location of the level crossing gate in the section.
  - viii) Location of the tunnels, cuttings, bridges, ROBs, RUBs, etc. in the section.
  - ix) Location of the flag stations, block stations, IBH/IBS etc. in the section.
  - x) Location where mass labour work is in progress which require cautious driving.
  - xi) Location where road vehicles are plying nearer to the track.
  - xii) Any other information which is required to be brought into the notice of the station staff as well as train crew.
- (c) Official in charge shall also issue the following along with the requisition :
- i) Track fit certificate for the section from/to kilometers with speed restrictions if any.
  - ii) Clearance certificate for the section for the confirmation that no vehicles/obstruction is occurring in the section.
  - iii) Maximum permissible speed of the section.
  - iv) Confirmation to the proper setting of points in the required position with clamps and padlocks.
  - v) Details of cautious driving required.
  - vi) Any other information if found necessary.

**(B) Dispatch of Train:**

On compliance of the above, SM on duty will:

- a) Obtain the permission of SCR on duty.
- b) Arrange to set the points in the required position, clamp and padlock the same, if required.
- c) Issue the following to the driver of the train-
  - i) Manually prepared authority to pass the departure signal (s) if any at 'ON' position with reference to official in-charge's message number, SCR's order No., Private number received from the SM at the other end of the section with place, date and time of issue.
  - ii) Caution order in detail including the MPS.
  - iii) Assurance for the setting of points in the section (if any).
  - iv) Location of L.C. gates (manned& unmanned).
  - v) Other locations which require special attention.
  - vi) Expected time of return.

All the above information shall be issued to the LP under receipt of acknowledgement. Proper record of train movements will be maintained in the Train Signal Register for record purposes.

- d) SM on duty should ensure that:

- i) Block working will not be adhered to.

Last Stop Signal will not be taken off, however, starter signals, calling-on signals can be taken off (if operative).

- ii) No train passing authorities will be issued to train crew.



**(C) Reception of the Train:**

- (a) After completion of the work, when the train returns to the station, LP of the train will bring his train to a stop at the foot of the Stop signal if any or at the outermost point whichever comes first and will whistle continuously to alert the SM on duty.
- (b) After ensuring that the train has come to a stop at the stop signal/outer most point, SM on duty will:-
  - i) Advise the SCR on duty and with his permission, arrange to receive the train by issuing manuscript authority by deputing a points man after ensuring correct setting and locking of points on the nominated line.
  - ii) On observing the proceed hand signal from the Points man at the foot of the stop signal if any or near the points, LP of the train will proceed to the station at a speed not exceeding 15 KMPH.
  - iii) All the authorities issued to the LP of the train will be handed over to the SM on duty and will be kept in a separate register maintained for the purpose.
  - iv) Arrival of the train will be recorded in the Train Signal Register for record purposes.

(Note: If the work is to be continued for a prolonged period or if the movements are to be carried out for a number of trains, necessary action should be taken to issue “Temporary Working Instructions” or ‘Special Instructions’ approved by COM).

**3.23: Stoppage of Trains for Railway Officials/Government Telecom Staff :**

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

**3.24: Inspection of Guard’s & Loco Pilot’s Equipment by SS/CYM and SSE/SE (Loco):**

- (a) The articles of personal equipment in the possession of Guards must be carefully inspected at least once in three months by the SS/CYM/Station Master/Yard Master of their headquarters station and a report submitted to the Sr. Divisional Operations Manager/Divisional Operations Manager within 07 days of inspection. Similarly, the equipment of the LPs must be inspected once in three months by the SSE/SE(loco)/LI/SSE/SE(Elec) and a report submitted to the Sr.DME/DME or Sr.DEE(OP) DEE(OP) within 07 days of inspection. Any deficiency must be made good immediately, raising debit against the staff at fault in case of loss or damage.
- (b) Officers and inspectors must check up the equipment of Guards/LPs as frequently as possible and take up cases of deficiencies.

**3.25: Care of Passenger Carriages:**

- (a) Station Manager must ensure that carriages detached at stations are swept and cleaned at once and the doors and windows are closed and locked immediately after they are vacated. The coaches detached or attached at a station shall not be allowed to be occupied by the passengers beyond the periods prescribed in local orders to be issued by the Divisional Railway Manager.
- (b) The cleaning of all coaching vehicles at stations where Train Examining staff are posted must be done by the Train Examiner staff, but the Station Master must see that the work has been duly and efficiently performed, and must bring any case of neglect to the notice of the Divisional Mechanical Engineer and the Divisional Commercial Manager.
- (c) Carriage cleaners and fitters are deputed to travel by a few important trains. It is the duty of the Guard & Conductors to ensure that they attend to the cleaning of carriages and minor repairs to carriages and electric fittings in coaches on the run and at stopping stations, as required.

(d) The C&W staff will be responsible for closing and locking of the doors and windows and for switching off the electric lights and fans (Where no train lighting staff are available) of empty coaching stock to be stabled at stations or before allowing the empty stock to run. In case the Passenger coach is detached or rake is stabled at a station not provided with C&W staff, the Station Master is responsible to ensure this. No person shall be allowed to stay in empty coaching stock or travel therein.

(e) Whenever any upper class carriage is not occupied, the conductor and Travelling Ticket Examiner shall arrange to close the doors and windows and switch off the electric fans, and shall also see that no unauthorized person travels therein.

(f) RPF staffs have been specially deputed on certain sections to guard the coaches and fittings on run and in stations yards.

### **3.26: Closing and Securing of Doors of Goods Stock :**

The main responsibility to ensure the closing and securing of doors of goods stock before any wagon is attached to train or shunted lies with the Station Master or Yard Master as the case may be. At a station or in a siding where goods Clerk or Goods Supervisor is posted, he will be responsible for ensuring that the doors of wagons are properly closed and secured immediately on completion of loading/unloading. The Train Examiner will also be responsible to see before issuing the certificate at the examination point of the train that the doors are properly closed and secured. Guards before starting the train from the originating station must ensure that the doors of all the wagons are properly closed and secured. Guards of all pilots, work trains etc. before drawing out wagons from the siding shall also ensure that the doors are closed and secured. If any wagon(s) is/are observed by the Guard in door-open condition after starting from a Station/Yard/Siding and likely to cause unsafe condition, the train should be stopped immediately and door(s) should be closed/secured. In case, closing/securing of door(s) is /are not possible, the train may be taken carefully with such restricted speed as considered necessary by the LP and Guard to the next station where steps should be taken to have the door(s) closed /secured properly.

### **3.27: Obstruction on Running Line :**

(a) Station Masters will not allow any packages or material to be so unloaded as to interfere with any signal rodding or wires or running line. Any consignment unloaded should be well away from the platform copying running line and signal rodding or wire so that there is no chance of its infringing the moving dimensions either where unloaded or by shifting due to vibration. They will make the staff understand the importance of this precaution and ensure it. In Goods sheds and Parcels sidings the Goods clerk/Parcel clerk will be responsible to ensure this.

(b) In a private siding where the Goods clerk/Goods supervisor is provided, he will be responsible to see all the packages/materials are kept well away from the line so that there is no chance of infringement of moving dimensions. The siding authority will be responsible to ensure this aspect where no railway staff is posted.

### **3.28: Safety of Passengers :**

(a) The Station Master must impress upon their subordinate staff as far as possible, the urgency of advising the passengers not to entrain or detrain when the train is in motion.

(b) Passengers must be prohibited from crossing the line in the face of an approaching train. At stations having over-bridges or subways, crossing of the lines must not be allowed. At stations not having over-bridges or sub-ways, only the “authorized crossing place” at the end of the platform ramps where sleeper-paths are provided shall be used.

(c) Announcement through Loud speaker for the purpose of item (a) and (b) above should be done wherever such facility is available.

(d) A Railway employee must not, under any circumstances, assist in or connive at, any infringement. But all Railway employees must exercise discretion in interference with persons who may appear to be about to place themselves in danger by breaking the rules laid down for the public safety. When any interference is likely to increase the risk to which they have exposed themselves, the action on behalf of the Railway servant must be confined to such precautions as will minimize the risk. But after the danger is over, steps should be taken, as far as possible, for the punishment of the offender.

For example, if a passenger about to enter a vehicle in motion has approach so near to it, that interference with him seems to be dangerous, he must be left alone, but if he succeeds in entering the train unhurt, such particulars must be sent forward as will facilitate his detention and punishment.

If it is noticed that a passenger, while attempting to enter the train misses his footing or is otherwise in imminent peril, the train must be stopped immediately, and the passenger assisted, if possible, to a position of safety; but nothing must be done to confuse him or in any other way add to his risk.

Similarly, when prompt action will stop a passenger alighting from a vehicle in motion, without adding to the danger of his position, such action may be taken; otherwise he must not be interfered with till he has alighted, after which steps must be taken for his prosecution.

(e) Whenever platforms, buildings, approach roads, etc. are under repairs, and there is any possibility of passengers or others falling into openings or against temporary obstruction, red lamps should be placed around those parts by the staff employed on the work. The openings should be fenced around. The area should be adequately lighted. Under no circumstances should trolleys, ladders or other things likely to interfere with or injure the passengers moving on the platforms be kept collected at a corner away from the place where the passengers entrain or detrain. The Station Master/CGS/CPS will remove the parcels/goods unloaded from trains promptly to the shed or else keep them stacked in one corner away from the portion of the platforms used by the passengers for entraining or detraining.

(f) The Conductor and Travelling Ticket Examiners of the trains must keep a vigilant look-out at all halting station on upper class carriages, especially at night, and any suspicious characters found loitering on the platform or off the platform should be tactfully and politely questioned, their tickets checked, etc. to find out their bona fide. In addition, the Conductor should also occasionally peep out on the side opposite to the platform through any of the compartments of the train and satisfy himself that there is no doubtful character loitering about.

(g) The Station staff, Assistant Station Masters, Trains Examining Staff and other staff of the station should also be on the lookout and detect doubtful characters loitering either on or off the platforms. No persons other than the Railway staff on duty should be permitted at night time to be on the off side of the train.

(h) The Guard, Loco pilot and other Railway staff working the train should also keep a vigilant look out in this respect as far as possible and without any detriment to their normal duties.

(i) At stations having GRP out posts, it is the duty of the GRP in-charge to post constables to guard the off-side of stopping Passenger trains. The Station Master should follow up with the officer-in-charge if this is not being done.

(j) Attendants have been provided in Air-conditioned and corridor coaches. The Conductor, Guard, Station Master and other supervisory staff, Inspectors, and officers must ensure by frequent checks that they are vigilant and do not allow any unauthorized person to travel in the compartments.

(k) All supervisors should emphasize upon the station staff at stations and upon the running staff of the trains concerned that it is the duty of every Railway staff to do everything possible to ensure the safe journey of the passengers.

### **3.29: Safety of Female Passenger:**

(a) Guards of originating Passenger carrying trains will examine fastenings of windows and doors of “LADIES” compartments when taking over their trains and will ensure that any defects observed are brought to the notice of the C & W Staff, and put right or secured in a manner to ensure safety before the train starts.

(b) Whenever time permits, Guards of trains are required to pay special attention, to all ‘LADIES’ compartments, and at the request of the occupants, to lock the doors of such compartments at night, and be on the alert to open the same when required. The Conductors by Mail and Express trains must pay particular attention to the ladies compartments at stopping stations.

(c) Guards shall inform the Travelling Beat Constable if any, in the train by making an entry in his beat book, about the train number, date and the number or numbers of carriages in which accommodation is reserved for ladies, and initial the entry so that the constable can keep special watch over the same. The Guard must similarly advise the RPF staff, if any escort the train of the ladies compartments on the train and advise them to keep a special watch. The Guard should also advise the constable or RPF staff to keep particular watch on the ladies compartments, if any safety fitting of any such compartment is defective or not working properly.

(d) The Travelling Ticket Examining staff will be particularly vigilant to ensure that no male person enters or travels in the ladies’ compartment.

### **3.30: Passengers to be Courteously Treated:**

(a) All passengers shall be treated with utmost courtesy and every assistance and protection afforded to them while on Railway premises. Every supervisory staff must impress upon his subordinates the importance of this and take stern action against any staff failing to comply with the same.

(b) Public complaint books have been provided at stations and also with the Conductors/ Guards. The same should be made available to the public as required. The complaints recorded should be attended to at once and causes of complaints removed. It must be the endeavour of every Railway employee to avoid public complaint, but should an occasion arise for any passenger to record a complaint, he must be given all facilities to records the same and the complaints recorded dealt with as per extant orders issued by the Chief Commercial Manager.

(c) Railway employee shall give their names and designation when asked to do so. The staff scheduled to wear badges or scrolls must have them on without fail when on duty. The staff dealing with the public must be in prescribed uniform.

(d) Station Masters shall see that each member of the staff under their control having dealings with passengers is acquainted with times of arrival at and departure from their stations of all Passenger trains and also stoppages en-route and instruct them that they should answer any query on the subject by the public in a prompt and civil manner. All supervisory staff, Inspectors and officers must pay particular attention to ensure that the staff performs the duties enumerated above creditably.

(e) Station Masters shall ensure that the Railway staff vendors or licensed porters do not make any unnecessary noise on platforms, particularly at night.

(f) The Station Master on duty and the Guards of the Passenger carrying trains shall see that specified stopping time is allowed at the stations to enable Passengers to alight and entrain safely. In case the specified time is considered insufficient, they should submit a special report in this regard to the Senior Divisional Operations Manager of the Division.

### **3.31: Carriage of Passenger and Others in Brake Van:**

(1) The following instructions should be observed for permitting travel of persons other than those authorized to do so, in brakevans of goods train-

- (a) Requests for permission to travel in the brakevan of a goods train should be obtained in writing by the Station Master from the person concerned indicating the special emergent circumstances warranting this facility.
- (b)
  - (i) On controlled sections the SM shall obtain the prior sanction of the Deputy Chief Controller on duty before giving permission to any person to travel in the brakevan of goods train.
  - (ii) On non controlled section, the SM on duty may himself grant such permission.
- (c)
  - (i) Permission to travel in the brakevan of a goods train should be granted only in exceptional emergent circumstances and not as matter of routine.
  - (ii) Such permission may, in the said circumstances, be given only if no suitable passenger train is available.
- (d) No lady will be permitted to travel in the brakevan of a goods train.
- (e)
  - (i) As a rule, permission shall not be given for travelling in the brakevan of through goods train, except for journeys between stations where these trains normally stop for operational reasons.
  - (ii) If it is necessary to stop a goods train out of course for this purpose, an “out of course” stoppage memo will be given to the LP of the goods train indicating where it is required to be stopped for the purpose of entrainment and/or detrainment.
- (f)
  - (i) The person should purchase a first class ticket or should be in possession of a first class season ticket to cover the journey involved.
  - (ii) He should also execute an indemnity Bond.
- (g) The SM on duty should give him a certificate of emergency in the form given below at para 3.31.1(k) at the station from which he wishes to entrain. Such certificate together with the first class ticket/season ticket will constitute the authority to travel in the brakevan of the specified goods train between the stations specified.
- h) The certificate of emergency should be shown to the Guard of the goods train by which the passenger desires to travel & should be surrendered to the SM of the destination station along with the ticket. The guard shall also make a proper entry in the ticket (T-34 HF) whenever such passenger travels in his brakevan.
- (i) In the case of Members of Parliament, the same procedure will apply except that instead of the ticket, the first class pass cum identity card issued to the Member will be sufficient. The Member of Parliament will give the usual journey voucher at the destination.
- (j) The number of persons permitted to travel in a brakevan in addition to the Guard, should not exceed five. An exception to this rule may, however be made, in emergent circumstances. Staff of the security services, police, repair gang of S&T department, staff of medical department & other railway departments when required to travel on duty under exceptional circumstances, the supervisor concerned should represent to SM in writing to allow beyond stipulations. In such cases, it should be ensured that the Guard of the train is not handicapped in performing his duties.
- (k) The SM of the stations between which a person is allowed to travel in the brakevan of goods train will keep a record of the journeys in a suitable register.

**CERTIFICATE OF EMERGENCY**

\_\_\_\_\_ is authorized to travel in the brakevan of goods train  
 No \_\_\_\_\_ from \_\_\_\_\_ to \_\_\_\_\_  
 on \_\_\_\_\_. He holds first class ticket/first class pass No \_\_\_\_\_  
 Station \_\_\_\_\_  
 Date \_\_\_\_\_ **Station Master**

- (2) The following instructions shall be observed for permitting travel of persons other than the guard of the train, in brake van of passenger carrying trains-
- In exceptional circumstances crew/guard, maintenance or security staff may be permitted to travel in the guard's brakevan.
  - On controlled sections the SM shall obtain the permission of the Chief Controller/Dy.CHC on duty. On non controlled section such permission shall be given by the SM himself.
  - The entraining and detraining of staff should be completed within the scheduled stoppage of the train.
  - In case the train is to be stopped out of course, the prior permission of Sr.DOM of the concerned division shall be obtained.
  - SM on duty from which the person(s) may be entrained, shall issue a certificate of emergency, authorizing the staff to travel in the brakevan.
  - In addition to the working guard, maximum 3 persons may be permitted to travel in the brakevan,

**3.32: Ghat Section and Working of Trains in Ghat Section:**

- Class (I) Category:** Sections with a ruling gradient of 1 in 40 or steeper will be classified as class-I category of Ghat section.
- Class-(II) Category:** Sections with a ruling gradient of 1 in 80 or steeper and flatter than 1 in 40 will be classified as class-II category of Ghat section.
- The distance between two adjacent block stations will be treated as a Ghat section, if the total length of the stretches in such section having the gradient specified above is at least one third of the total length of the section concerned.
- The following sections of Waltair Division of ECoR are considered as class-II category of Ghat sections. The details are as under:-

SI No	Block section	Inter distance between the block section in kms	Stretch of Class-I/II gradients in kms
1	SUP-BDVR	7.3	3.108
2	BDVR-SLPM	12.1	10.785
3	SLPM-TXD	6.6	4.965
4	TXD-CMDP	12.0	10.593
5	CMDP-BGHU	9.0	7.225
6	BGHU-KVLS	11.2	9.881
7	KVLS-SMLG	9.1	6.517
8	BDXX-DMK	11.7	9.889
9	DMK-SZY	11.2	4.112
10	KMLR-BHNS	10.3	4.812
11	BHNS-BCHL	9.4	6.979



- (e) The detailed instructions on train operation are incorporated in the SWR of the concerned stations.
- (f) The following precautions are to be taken while working trains in Ghat section.
  - i) The marshalling of the trains running in the Ghat section must be as per rules.
  - ii) On goods train the loaded wagon should be attached next to engine & empty in rear.
  - iii) Trains running on Ghat section should not exceed the authorized load.
  - iv) Only Ghat trained LPs should work in Ghat section.
  - v) LPs should test the efficiency of brake power before entering into the Ghat section.
  - vi) Trains should be fully on automatic (vacuum/Air pressure) system.
  - vii) Trains should not exceed the prescribed speed mentioned in the working time table as permanent speed.
  - viii) In the event of stopping of train in Ghat section for more than 10 minutes or failure of automatic brake, the train must be brought to stop and secured applying hand brakes and wooden wedges.
  - ix) On the Ghat section, locomotives must not be detached from trains between stations.
  - x) Lorries are not permitted to work in Ghat sections.
- g) Wherever steep gradients in the immediate neighbourhood of a station is available, it becomes mandatory to provide Catch siding or Slip siding at suitable position, to protect station yard or block section respectively.
  - i) **Catch siding:** If any station is situated in the immediate neighbourhood of an incline steeper than 1 in 80 falling towards the station, a catch siding should be provided, if necessary, in suitable position to protect the station from the vehicles which may roll down from the block section or station in rear. The take off point to a catch siding should normally be set & locked for the siding. The point is set & locked for main line only when a train is to be received or dispatched.
  - ii) **Slip siding:** If any station is situated in the immediate neighbourhood of an incline steeper than 1 in 100 falling away from the station or when a station yard itself on a grade steeper than 1 in 260, a slipsiding, should be provided, if necessary, in suitable position to protect the block section from the vehicles which may escape from the yards & cause severe accident. The take off point to a slip siding will be the farthest and next to the outermost facing point in that direction and normally set for the siding. The point is only operated just before the home signal is lowered for reception of a train or just before the starter signal is lowered to dispatch a train.
  - iii) No station yard should be constructed nor should any siding join a passenger line on a grade steeper than 1 in 260, except where it is unavoidable and then only with the previous sanction of the Railway Board obtained through the Commissioner of Railway Safety when a slip siding or other arrangement is made sufficient to prevent accident. The power of condonation of gradient steeper than 1 in 400 and up to 1 in 260 shall vest with the Commissioner of Railway Safety.

### 3.33: Weather Warning:

- (1) Arrangements exist with offices of the Meteorological department of the Government of India for issuing telegram of warning, when ever storms, gales or heavy rainfall are expected. The conditions under which warnings issued are furnished below:-
  - (i) Amount of rain fall considered dangerous → 50 Millimetres and above in 24 hours.

- (ii) Wind velocity considered dangerous → 72 Kilometers per hour and over.
- (iii) Period during which such warnings are issued throughout the year.
- (2) A list indicating Railway officials to whom weather warning telegrams addressed by offices of the Meteorological department is appended below.

Designation	DOT	Mobile	Fax
Chief Controller/Coaching/HQ/Bhubaneswar	0674-2303564	08455885926	0674-2301893
Chief Controller/Goods/HQ/Bhubaneswar	0674-2300373	08455885924	0674-2301893
Chief Controller/Coaching/Khurda	0674-2372362	08455887939	0674-2372347
Chief Controller/Goods/Khurda	0674-2492374	08455887938	0674-2372347
Chief Controller/Coaching/Sambalpur	0663-2401908	08455886939	0663-2533169
Chief Controller/Goods/Sambalpur	0663-2401908	08455886938	0663-2533169
Chief Controller/Coaching/Visakhapatnam	0891-2796708	08978080939	0891-2728832
Chief Controller/Goods /Visakhapatnam	0891-2746266	08978280881	0891-2728832

Telegraphic address and E-mail ID of officers at Headquarter, Bhubaneswar

Designation	Telephone& E –mail ID	Address
Chief PassengerTransportation Manager/HQ/Bhubaneswar	0674-2303054 Mob-08455885903 cptm@eastcoastrailway.gov.in	Office of the COM, East Coast Railway, Rail-Sadan,Ground-floor, South Block Chandrasekharpur, Bhubaneswar-751017.
PrincipalChiefEngineer/HQ/ Bhubaneswar	0674-2385071 Mob-08455885200 pce@eastcoastrailway.gov.in	Office of the PCE, East Coast Railway, Rail-Sadan, 1st Floor, NorthBlock,Chandrasekharpur, Bhubaneswar-751017.
ChiefElectricalEngineer/HQ/ Bhubaneswar	0674-2303515 Mob-08455885300 cee@eastcoastrailway.gov.in	Office of the CEE, East Coast Railway, Rail-Sadan,3rd Floor, South Block, Chandrasekharpur, Bhubaneswar-751017.

Telegraphic address and E-mail ID of officers at Divisional Headquarters

Designation	Telephone & E-mail ID	Address
Sr.Divisional Operations Manager/Khurda	0674-2490671 Mob-08455887900 srdom_kur@eastcoastrailway.gov.in	Office of the Divisional Railway Manager/Khurda road division, Dist-Khurda, Odisha
Sr.Divisional Operations Manager/Sambalpur	0663-2533169 Mob-08455886900 srdom_sbp@eastcoastrailway.gov.in	Office of the Divisional Railway Manager/Sambalpur division, Sambalpur, Odisha
Sr.Divisional Operations Manager/Waltair	0891-2746260 Mob-08978080900 srdom_wat@eastcoastrailway.gov.in	Office of the Divisional Railway Manager/Waltair division, Visakhapatnam, Andhra Pradesh.



(3) The following offices may be contacted to get information regarding weather warning.

Organisation & Designation	Office	Residence
Director, Cyclone Warning Centre Visakhapatnam.	0891-2543033 Fax-0891-2543033 cwc vsk@im dm ail.gov.in	0891-2543041
Duty officer, Cyclone Warning Centre Visakhapatnam.	0891-2543031/2543032/2543034 Fax-0891-2543036 cwc vsk@im dm ail.gov.in	_____
Director, Doppler Weather Radar Station, Kailasagiri. Visakhapatnam	0891-2543037/2543038 dwrvsk@sancharnet.in	0891-2543039
Director, Doppler Weather Radar Station, Machilipatnam.	08672-222800 Fax-08672-231291 edrmpt@im dm ail.in	08672-222318

Weather warning message will be classified as “XXW” (Weather warning) or “OOO” (Weather immediate). These messages will be normally delivered by P&T office directly to the Railway control office. If they are delivered to a railway station, that also must be dispatched and conveyed immediately on telephone also to the control office.

**(4) Action to be taken on receipt of weather warning message:**

**(A) By the central control office:**

- (i) The Chief Controller or in his absence the Dy.CHC must immediately repeat the weather warning message verbatim on the telephone or by a written message to the PCE & COM for information and then circulate the content of the message to the officers concerned in the headquarters office.
- (ii) He should also verify with the divisional control that such message received by him, have also been received by the Chief Controller of the concerned division, so that lapses can be remedied then & there.

**(B) By the divisional control office:**

- (i) The Chief Controller or in his absence Dy.CHC should immediately convey the weather warning message verbatim over telephone or in writing to the DRM, Sr.DOM, DOM and Engineering control.
- (ii) Simultaneously the CHC/Dy.CHC must immediately arrange for the transmission of the message verbatim on the control phone to the concerned SS/In charge/SM on duty. The controller repeating the message should record the initials to the SM to whom the message has been repeated.

(iii) In case of non controlled sections or when control telephone is interrupted, an “XXR” message should be issued by CHC/Dy.CHC to the SM on duty of the station through official mobile.

(iv) The text of weather warning message received from Metrological department should be reproduce verbatim in the text of “XXR” message as,

Regional Metrological Centre \_\_\_\_\_XXW/OOO Coded(insert which class the metrological department used) \_\_\_\_\_date(Date of original message) reads \_\_\_\_\_.

(v) A register should be maintained in each control office showing full particulars of the message receipt, action taken showing the date & time, initials of the SMs to whom the message has been repeated.

(vi) The Chief Traction Power Controller (CTPC) or TPC should ensure that the contents of message of weather warning are conveyed to all concerned including the depots.

**(C) Action by the SM on duty/official in charge of the station:**

(i) Wherever AEN/JE/SE/SSE(Engg) are head quartered, SM on duty should immediately hand over the message received from the controller to them & must obtain the acknowledgement. In case of non availability of the concerned officials, the SM should advise the controller on duty, who will then be responsible to convey the message to the Engineering control for further action. In case P.W. Supervisor/Gang Mate are head quartered only, then the message should be explained and acknowledgement obtained.

(ii) A register in this regard should be maintained in each station & acknowledgement obtained on the office copy should be pasted in the register. The proforma is as under:-

Date and time of receipt of message	Text of the message In full	Name and designation of officials to whom message was repeated.	Date and time of repeating of the message.	Signature of the Station Master/ official-in-charge of the station.
1	2	3	4	5

**(D) Precautions to be taken by the SM/LP/Guard- regarding controlling of trains:**

(i) When weather warning message has been received forecasting heavy cyclonic storm/ high winds/floods or heavy rains with reasonable doubt of breakout which may endanger the safety of passengers, then the SM in consultation with the Guard & LP shall detain the train until it is considered safe for the train to proceed ahead.

(ii) If a LP on run caught in the adverse situations mentioned in (i) which in his opinion may endanger the safety of passengers, he should bring his train with least delay to a halt avoiding sharp curves/high embankments, cuttings & bridges. The train may be started by the LP thereafter in consultation with the Guard after abate, if it is considered for the train to proceed ahead safely.

**(E) The JE(OHE)- in charge of the Depot:**

The JE(OHE) on receipt of the weather warning message should immediately mobilize their resources & alert their staff/gang, so that they will be in readiness for any eventualities.

**(F) Action to be taken by SSE(P.Way)/SE(P.Way) and JE(P.Way) on receipt of the weather warning message.**

**(i) During the Non-Monsoon Season:**

They shall advise the gangmates to be extra vigilant & to undertake gang patrol as per para 514 of the Indian Railways Way & works manual(IRPWM) & should be out on trolley during the period of warning & for 48 hours thereafter.

**(ii) During Monsoon Season:**

a) On Sections where monsoon patrolling is not in force, action should be taken on the same as specified for non monsoon season as above.

b) On sections where monsoon patrolling is in force they should advise the monsoon patrollers, watchmen at vulnerable locations & bridges to be extra vigilant & to undertake gang patrol as per para 514(IRPWM) & should out on trolley during the period of warning & for 48 hours thereafter to ensure carrying out of the prescribed duties by staff.

**(G) Action by P.W.Supervisor/ Gang Mates:**

- i) During both the monsoon & non monsoon seasons:
- a) On receipt of weather/cyclone/abnormal rainfall/floods warning message from SM/ASM, SSE/SE/JE(P.Way)/P.W.Supervisor/Gang Mate (as the case may be) should be extra vigilant for gang patrol as per para 514 of IRPWM. The patrolling shall extend for 48 hours beyond the duration specified in such message.

**(H) Exception:-** In the monsoon season in sections where regular monsoon patrolling is in force, this patrolling will commence with the occurrence of rainfall/cyclone and extended for 48 hours beyond the duration of such rainfall/cyclone/storm.

Should there be a sudden severe storm or hurricane or cyclone or abnormal rainfall or floods, in the day or night, whether or not he has received any advice of weather/cyclone warning from the SM/ASM, the SSE/SE/JE(P.Way) and whether or not monsoon patrolmen/Stationary watchman at vulnerable locations and bridges are on duty, he should, on his own initiative, organize, patrolling of his ganglength, as per para 514 of the Indian Railways Permanent Way Manual. Such patrolling should be extended for 48 hours beyond the duration of such severe storm/hurricane/cyclone/abnormal rainfall/flood.

**(I)** Action taken on every weather warning message must be reviewed periodically by DRM/Sr.DSO/DSO/Sr.DEN/DEN of the divisions. Inspecting officials to ensure that the register maintained at stations as per prescribed procedures.

### **3.34: Attaching and Working of Banking Engine, Assisting Engine, Dead Engine and Relief Engine over ECoR.**

As per East Coast Railway Joint Procedure Order No.12/2012( No-EcoR/Optg/SC/66/JPO/Banker Dated: 09.01.2013) the following guidelines are issued to ensure safe running of trains.

#### **1) Attachment and Working of Banking Engine:**

Banking engine is provided to a goods train over a part of the section if the train engine fails to haul the load due to raising gradient, wet rail, under powering etc. Following guidelines shall be followed for attaching and working of Banking Engine.

- i) Banking engine should be attached in rear of the last vehicle of the train.
- ii) In Ghat sections trains running with banker should have air pressure continuity up to the banking engine. But air pressure of the banking engine should be isolated from the train pipe in order to prevent brake binding on train.
- iii) In other sections due to operational requirement, brake pipe of the banking engine need not be connected to the train pipe.
- iv) Co-ordination between the train LP & banker pilot should be maintained by using prescribed whistle code as specified in SR-4.50.1, instructions contained in SR to GR3.84 & through walkie-talkie.
- v) Section & type of trains for which banking is required may be notified by the divisions or may be decided on case to case basis by the section controller.

#### **2) Attachment and Working of Assisting Engine:**

Sometimes it may not be possible to attach the banking engine in rear of the train. In such a case banking may be given from the front. Such engine attached in front of the working train engine shall be called assisting engine. Following guidelines shall be followed for attaching & working of this assisting engine:-

- i) Continuity of air pressure is to be ensured from the fore –most engine(i.e. assisting engine) to the rear –most vehicle of the train.
- ii) Air pressure of the train engine should be isolated from the train pipe in order to prevent brake binding on train. So, only the leading LP (of assisting engine) will have control over the train brakes. Loco Pilot of the train engine will have no control over the train brakes and he will only assist in hauling the train.
- iii) Co-ordination between LP of the train engine & the assisting engine should be maintained by using prescribed whistle code as specified in SR 4.50.1, instructions contained in SR to GR 3.84 & through walkie-talkie.

### **3) Attachment of Dead Locomotive to a Train:**

Sometimes it may be required to attach locomotives in shut-down condition (i.e. dead engine) to a train for the purpose of balancing, saving crew or for dispatching an incapacitated engine to loco shed. Following guidelines shall be followed in such case:-

- i) Such engines shall be attached next to the working engine(s), i.e. between the working engine(s) & the train.
- ii) Continuity of air pressure is to be ensured from the working engine to the last vehicle of the train.
- iii) Such dead engine (s) need not be manned.
- iv) Maximum 4 locomotives (1 working+1 dead or 2 working+1 dead or 2 working + 2 dead or 3 working +1 dead) can be coupled together & moved in a goods train.
- v) If brakes of the dead engine are functional then MR & BC equalizing pipes of the coupled engines shall be connected so that brake power of the dead engine can be utilized.
- vi) If brakes of the dead engine are not functional or if it is not possible to connect MR & BC equalizing pipes of the engines then the dead engine will be hauled as piped vehicle only.
- vii) In case it is not possible to attach the dead engine as a piped vehicle due to reasons like breakage of brake pipe, damage of angle cocks etc then the dead engine may be attached in rear of the brake van/SLR. In such a case following guidelines shall be followed:-
  - a) Only one dead locomotive is permitted to be hauled.
  - b) The dead locomotive shall be manned by an ALP/LP/LI/Loco maintenance supervisor.
  - c) The staff manning the dead locomotive should have walkie-talkie for communication in case of uncoupling /train parting & subsequent run-away /roll-down of his engine. He should be ready to apply hand brakes in such a situation.
  - d) Such movement shall not be permitted on gradients steeper than 1 in 100.
- viii) In case a dead locomotive is to be attached to a Mail/Express/Passenger/Mixed train following restrictions shall be imposed in conjunction with the above guidelines:-
  - a) Only one dead locomotive can be attached to the train.
  - b) Brake power of the train after attachment of the dead locomotive should not be less than 90%.
  - c) Dead locomotive shall not be attached to Rajdhani/Shatabdi Exp.
- ix) For detailed guidelines regarding attachment & movement of dead locomotives, ECoR's JPO No-8 issued vide letter No.ECoR/Optg/JPO/66 Dead Loco, dated:12.09.2006 may be referred to.

**4) Attachment and Working of Relief Engine:**

In case of failure of the train engine the train will require a “Relief Engine” for its onward journey. Following guidelines shall be followed for attachment & working of a Relief engine:-

- i) The Relief engine shall be attached in front of the failed engine.
- ii) Guidelines for ‘Attachment of Dead Locomotive to a train’ described in para (3) above shall be followed. The failed train engine will be the dead engine in this case.
- iii) In case it is not possible to attach in front, the Relief engine may be attached in rear of the brake van/ SLR. The train will then be driven from the rear engine(i.e. Relief engine) with the ‘train and the failed(dead)engine’ in front. In such a case following guidelines may be followed:-
  - a) This type of movement shall be permitted only to clear the block section.
  - b) The failed engine & the Relief engine should be manned.
  - c) Brake pipe of the Relief engine shall be connected to the train pipe.
  - d) Continuity of air pressure is to be ensured from the rear–most engine (i.e. Relief engine) to the fore-most engine (i.e. failed engine).
  - e) LP/ALP of the failed engine should be ready to apply emergency brakes when required.
  - f) Co-ordination between LP of the failed engine & the relief engine will be through walkie-talkie.
  - g) Precautions as prescribed in GR4.12 (Engine pushing) along with its SR shall be followed.

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## CHAPTER-4

# CONTROL ORGANISATION

### 4.01: Introduction:

The control organization of Indian railway is the nerve centre of train operation. It controls the asset management of the railways in a dynamic situation, round the clock incessantly moving trains on its entire network. It has come a long way from being an exclusively telephone based system emerging in the form of an Information Technology enabled organization. The basic structure of operating control on Indian railway exists at the divisional level, which has also been extended to Area control levels. In addition central control office is situated in the Zonal headquarters office and one at Railway Board.

### 4.02: Objectives of Control Organization:

- (i) Safe running of all trains.
- (ii) To ensure punctuality of the Mail/Express & passenger trains.
- (iii) To ensure maximum utilization of the rolling stock.
- (iv) To ensure maximum utilization of the section capacity.
- (vi) To increase the speed of goods trains.
- (vii) Optimize utilization of the train crew.

### 4.03: Control Organization at Zonal Level: Central Control

#### COM

CFTM	CPTM
Dy.COM (Freight)	Dy.COM(Chg)
Dy.COM (FOIS)	STM(Chg), STM(Sfy)
STM (FOIS)	
ATM (Goods)	ATM/Chg
CHC/Dy.CHC/Freight	CHC/Dy.CHC/Chg

Responsibilities of traffic operation throughout the zonal railway lie with COM assisted by CFTM and CPTM. COM advises all divisions regarding traffic and ensure that the objectives are fulfilled as per policy guidelines and planning.

**(a) Central Control:** Chief Controller is the head of the central control. All the functions are done on his direct supervision and he is responsible to the COM. For freight operation and coaching operation CHC(Goods) & CHC(Chg) work independently for smooth functioning of the Control. Dy.CHC(Coaching/ Goods) work in shift and assist the Chief Controller.

The following are the functions performed by the central control:

- (i) Maintain punctuality of all passengers, M/E trains run in ECoR.

- (ii) Inform the running position of trains to foreign Railway along with late running and also the description of late running trains and departure time of trains.
- (iii) Observe loss of punctuality percentage, its causes and position of coaching stock, current situation of wagons, parcel vans etc and collection of data.
- (iv) Wagons available in divisions, received and forwarding wagons, yard balance at ZERO hour and figures of wagons at 24.00hours i.e clearance.
- (v) Collection of figures of received tank wagons in excess, and for transshipment.
- (vi) Collection of figures of stabled wagons with description of vehicle/train.
- (vii) Analysis of detention to trains.
- (viii) Running of goods trains to their best possible paths.
- (ix) Elimination of avoidable detention to goods stock at loading and unloading points.
- (x) Allotment and distribution of goods stock to the stations.
- (xi) Arrangement of line blocks and to provide maximum time possible for the working of material trains.
- (xii) Ensure optimum utilization of the locomotives.
- (xiii) Issue proper instructions for train working during abnormal working.
- (xiv) Arrange speedy relief in case of accident.
- (xv) Help connecting the unconnected wagons.
- (xvi) Assist in the preparation of timetable in coordination with neighboring divisions, and railways..
- (xvii) Advise stations and permanent way staff regarding weather warning to take necessary precautions.

#### 4.04: Control Organization at the Divisional Level:

Sr.DOM			
DOM(M)	DOM(Chg)	DOM(P)	DOM(G)
AOM(Control)	AOM(Coaching)	AOM(P)	AOM(G)
CHC			
Dy.CHC			
SCR			

The control organization is one of the principal means by which the essential co-ordination is obtained in railways operation. It is from where, the planning activities of day to day working are done and the orders are issued to the stations and yard for execution.

Normally the divisional control office is located in the divisional head quarters and connected to the station & yard through various communication systems. If the size of the division is large and controlling becomes difficult a sub control office may be provided at a convenient location called Area Control. The area spread of a division is divided into control sections having a given number of stations. A section is generally of the range of 100 to 200 km stretch and the trains are controlled in the section by the section controller. The two way telephone system also called an omnibus circuit which permits all stations to have direct communication with the section controller, who is responsible for train regulation in his area. The section controller can speak to all stations at the same time or to the station selectively, using individual numbers/button. Sr.DOM has the administrative control of the divisional control office. CHC is the head of the control organization. For easy and effective controlling the entire division is divided into various sections and a well unit communication is provided for monitoring minute to minute activities at stations and



yards. CHC(In-Charge) is assisted by Dy. CHC (Chg), Dy.CHC (Minearls), SCRs, Hd. TNC, TNC. To guide and assist the SCRs there are shift Dy. Chief Controllers. All technical disciplines involved in train movement have a representative in the control office to provide the required support from his department. These include:

- Diesel power controller (DPC)
- Traction loco controller (TLC)
- Traction power controller (TPC)
- TXR controller
- Commercial controller
- Engineering controller
- S&T controller
- Fois incharge
- Electrical controller (Gen)
- Security controller

The entire organization works round the clock, all days of the year without any interruption, to monitor movement of trains on the entire rail network.

Each divisional control office is divided into one or more sections and each section is provided with a separate self-contained control circuit with a separate control Board. Each section or 'Board' as it is commonly called, is manned round the clock by the section controllers on shift duty. The work of Section Controllers is supervised by Deputy Chief Controllers also rostered on shift duty.

#### **4.05: Basic Functions of Different Control:**

**1. Traffic control** is the general and over-riding control for supervision of the movement of goods and coaching traffic on the section. It is exercised by:-

- (a) Collecting information from the various stations on the section in respect of –
  - (i) Registration of wagons outstanding at stations and arrangements for supply of wagons.
  - (ii) Number of wagons loaded and empty wagons/rakes awaiting dispatch.
- (b) Arranging running, regulation, putting back and cancellation of trains.(both freight & coaching)
- (c) Securing maximum loads for trains.
- (d) Collecting stock position from the different stations, marshalling and terminal yards.
- (e) Arrangement of crew & Guard for freight trains.
- (f) To keep liaison with adjoining Railways and Divisions for interchanging commitments.
- (g) Monitoring and co-ordinating working of yards, goods shed sidings, loco-shed, TXR depots etc.
- (h) Supervising of stock control.
- (i) Arranging supply of wagons against pending registration.
- (j) Securing optimum utilization of stock, with minimum detention.
- (k) To ensure optimum utilization of loco & staff.
- (l) To arrange ART & Crane from adjoining Railway/Division in case of accidents and other co-ordination.



**2. Train control:** Supervising & regulating movement of trains from station to station on the section to avoid delay to trains and to maximize utilization of the capacity of the section by:-

- (a) Monitoring movement of trains from station to station and recording paths and detention charts
- (b) Arranging crossing and precedence of trains judiciously.
- (c) Arranging working of departmental and material trains.
- (d) Giving time signal to all stations on the section daily at appropriate time.
- (e) Fulfilling interchange commitment.
- (f) Arranging proper movement of assisting / banking / relief / light engines.
- (g) Clearance of sick wagons from Roadside stations.
- (h) Arrangement of relief for 10 hours duty running staff.
- (i) Incident management on rail network & at stations.
- (j) Arranging Engineering and/ or Power blocks in such a way as to involve minimum disturbance to train running.
- (k) Maintaining fluidity of yards by controlling the flow of stock in and out of yard.
- (l) Arranging speedy relief in case of accidents.

**3. Power Control** is responsible for provision of motive power to all trains by maintaining position of locomotives and for :

- (a) Requisition engines from loco sheds for all operating requirements, i.e Train working, Shunting and Banking.
- (b) Ensuring most economical use of engines by close supervision both in Traffic Yards and sheds.
- (c) Ensuring the return of engines to “Home sheds” at regular intervals for servicing and maintenance.
- (d) Ensuring and even balance of engines and crews between running sheds for meeting demands of traffic.
- (e) Ensuring that light engine kilometers is kept to the minimum.
- (f) Providing guidance to running staff for trouble shooting.

**4. Carriage and Wagon Control** is responsible to assist the train and traffic control and to-

- (a) Ensure timely examination and fitness of all trains.
- (b) Keep a watch over the detachment of sick wagons/ coaches and to arrange for their early repair and fitness.
- (c) Keep a watch over availability of vital C&W components, like Air Hoses, washers, clamps etc. and efficient working of equipments & machines in C&W depot to avoid detention to trains.
- (d) Keep a watch over placement of wagons/coaches in sick line and their release.
- (e) Keep account of detention to trains on C&W account and take remedial action.
- (f) Provide guidance to running staff for trouble shooting.
- (g) For Electrical Multiple units, this function is performed by EMU controller.
- (h) Monitor the movement of POH due stock to workshops.

**5. Commercial control** assists in the Traffic and Train control.

- (a) To expeditiously dispose off unclaimed and unconnected wagons, parcel consignments.

- (b) To keep a watch on detention to trains on Commercial account like Alarm Chain Pulling. Carriage watering, parcel working etc., and take remedial measures.
- (c) To ensure quick transshipment of sick wagons by arranging matching stock and labour.
- (d) To keep a watch over submission of station returns.
- (e) Monitoring of public complaints lodged at the stations.
- (f) To ensure proper maintenance of public amenities available at stations.
- (g) Any other job entrusted by Sr.DCM/DCM.

**6. Traction power control** is provided to assist in Traffic and Train control for-

- (a) Arranging maintenance blocks for OHE.
- (b) Arranging alternative power supply in case of tripping etc. through remote control.
- (c) Monitoring OHE failures and taking remedial action.
- (d) Monitoring detention of trains on OHE accounts.
- (e) Guiding running/station staff in trouble shooting.

**7. Engineering control** monitors: -

- (a) Imposition & cancellation of engineering restrictions.
- (b) Working of track machines.
- (c) Integrated maintainable blocks & to coordinate works during maintenance blocks.
- (d) Running of material trains.

**8. Signal control** assists traffic and train control and is responsible :-

- (a) To keep a watch over the S&T failures and take remedial action.
- (b) To ensure efficient working of communication channels.

**9. Security control** is responsible for prevention of theft of property and assists passenger in trains/stations.

**10. Electrical control(G):** He issues instructions to electrical staff if complain regarding fan, light , batteries, failure of AC and dynamo in train as well as at stations.

**4.06: Main Functions of Traffic Control:**

- (a) Continuous supervision of the movement of all traffic in the controlled area with a view to achieve the maximum possible operating efficiency.
- (b) Correct ordering of trains and use of locomotives so as to reduce to a minimum the productive time of power and personnel, and losses on account of wasted haulage capacity on trains and thus to keep the “ turn round” as low as possible.
- (c) Systematic maintenance of accurate charts of train movement and the arrangement of crossing and precedence to the greatest advantage.
- (d) Analysis of detentions to trains.
- (e) Planning, ordering and running of goods trains to the best possible paths.
- (f) Maintaining the fluidity of marshalling yards/freight terminals.
- (g) Taking remedial action in the event of yard/terminal congestion.

- (h) To allot and distribute coaching and goods stock and direct its loading, dispatch and movement, particularly through intermediate marshalling yards, and to so direct its placement and quick release so as to attain the quickest possible “turn round” and ensure elimination of avoidable detentions to goods stock at loading and unloading points and at transshipment stations.
- (i) To keep in the closet touch with the operation of continuous sections and divisions so as to avoid congestion and lack of fluidity.
- (j) Supply of information to adjoining controls, terminals and engine changing stations regarding the movement of trains to enable adequate timely arrangements for timely reception and onward dispatch.
- (k) Arranging of engineering and other department blocks with minimum detention to traffic.
- (l) Running of material trains and other track machines, tower wagons etc.
- (m) Arranging relief for engine crew and Guard.
- (n) Ensuring maximum utilization of locomotive.
- (o) Issuing instructions for train working in case of equipments failures and whenever abnormal method for working has to be resorted to.
- (p) Speedy arrangement for relief, rescue and restoration in the event of the accident.
- (q) To assist in the realistic planning of time tables and punctual running of passenger trains in coordination with various departments, other divisions and railways.
- (r) To keep a watch over damaged stocks at road side stations, yards and sick lines and to ensure that they are promptly attended to.
- (s) To rectify immediately the irregularities on the part of the line staff and provide them necessary guidance.
- (t) To provide operations management information.
- (u) To ensure smooth functioning of FOIS and other IT applications.

#### **4.07: Telecommunication Facilities in Control:**

Extensive, efficient and realistic communication network is necessary for the efficient functioning of the control organization. The following telecommunication network is available in control offices.

1. FOIS network
2. (a) Railway Auto phone with facility.  
(b) BSNL Phone  
(c) Intercom facility to various officers and other functionaries concerned with the control
3. Section control Board: The section controller of each section is provided with control board with telecommunication facilities for coaching stations, certain important cabins, big freight terminals, loco shed etc. over a section. For the guidance of section controller, the lay out of all the stations and sidings is painted on a large board.
4. The station lay out diagram is also provided with details of holding capacity of each of the running & non-running lines, gradients and signals. In electrified area OHE sectioning diagram is provided. This depicts elementary section in different colours & other details of sectioning post(SP) and sub sectioning post(SSP).

5. Traction Power control circuit: This additional circuit is available on the electrified sections; this is connected to T.P.C in OHE remote control centre, all stations, control offices and selected work places. The section controller or TPC can also be connected from the emergency socket provide over the sections of line by means of portable telephone of the control point with indication on the electric mast, direction wise, to the nearest circuit.

#### 4.08: Train Control Chart:

(a) Trains are plotted on control graphs which consist of horizontal and vertical lines representing distance and time respectively. Alongside the vertical lines stations are spaced to a uniform scale. Each one hour is first divided into 6 units of 10 minutes each and each unit is further sub-divided into 5 smaller units of 2 minutes each.

(b) Each control graph at the end of the shift may have the following information on it:

- (i) Name and total distance of the section in Kilometers.
- ii) Distance in Kms. between each station on the section.
- (iii) State of weather in each shift.
- (iv) Engineering restrictions on the section.
- (v) Code names of each station of the section.
- (vi) Time lost by each train on loco, traffic or engineering account at or between stations.
- (vii) Section Controller's remarks against item (iv).
- (viii) Time made up by each train on loco, traffic or engineering account.
- (ix) Guard's record of time lost on loco, traffic or engineering account at or between stations and remarks.
- (x) General remarks.
- (xi) Signal failures

(c) In plotting various types of trains the coloured pencils shall be used as per extant convention. All up trains are plotted from the bottom of the chart upwards and from the left diagonally towards the right; and all down trains are plotted from the top of the chart downwards and also diagonally from the left towards the right.

(d) For judicious crossing and precedence, it is necessary to have plotting of passenger trains at least one hour in advance depending on traffic density in easily erasable lines. Now through computerized charting this is automated in all three divisions of ECoR.

**4.09 Master Charts:** For every section, Master Charts indicating trains run in 24 hours are prepared which show the running of each Mail, Express or passenger trains over the sections according to its scheduled running. In between the running of trains carrying passengers, paths for goods trains are worked out and plotted. They are helpful in revision of time tables and planning the running of any extra train and guidance of section controllers and should be displayed on the boards to which they refer.

**4.10: Preparation of Master Charts:** Paths of Passenger/Mail/Express trains are plotted keeping in mind the timings necessary at divisional and zonal level interchange points. Rest available path are utilized for ordering of goods trains. The following points are to be kept in mind while preparing Master charts:

- (a) The capacity of originating yard in forming trains and starting them.
- (b) The capacity at the terminals to receive the trains (Availability of platform lines, Pit line, sick lines etc.)

- (c) Facilities at enroute for crossing or precedence
- (d) Spreading out evenly occupation of Block section to avoid bottlenecks, if trains run late.
- (e) On Double line grouping of trains of uniform speed, so that detention and precedence becomes minimum.
- (f) On single line sections, if the paths of UP & DN direction trains can be traced at different periods the number of crossings can be reduced.
- (g) Running time of Trains suiting to 10hours duty of running staff i.e total running time (Yard departure to yard arrival) should not be exceeding to 8 hours of Goods trains (as minimum 1 hour has been provided for signing 'ON & 'OFF' duty and average 1 hour pre-departure detention.)
- (h) Keeping in mind the time for crew changing, fueling, and watering the coaches, passenger lunch/dinner.

**4.11: Forecast:** It is the information conveyed in advance by adjoining control offices, adjoining railways and MIL rail about the availability of stock indicating train, direction, commodities and type of stock. It includes –

- (a) Forecast of interchange
- (b) Forecast of trains to be run section wise.
- (c) Forecast of supply of empties for such loading transshipment etc.
- (d) Forecast of unloading.
- (e) Planning of engineering blocks & special moves. Information required for this purpose includes-
  - (i) Power availabilities
  - (ii) Availability of loads.
  - (iii) Disposal of empties & planning for loading
  - (iv) Analysis of midnight division wagon balance.

#### **4.12: Declaration:**

- (a) Before staffs are allowed to work independently as Controllers, they shall be required to pick up duties on the boards they would be required to work. This learning must be under the guidance of the section controller on duty. The period of learning would depend on the aptitude for control work which the staff possesses but in any case, it must not exceed 5 days in each shift for each board.
- (b) In case the Chief Controller observes that an employee would require more than 5 days for each shift on the board, he must bring the fact to the notice of the Assistant/Divisional Operations Manager and take his special sanction for extension of the learning period.
- (c) After the employee has taken learning, he shall write and sign the following declaration in a register specially maintained for the purposes; "I hereby declare that I have taken learning on Board/Boards to my entire satisfaction and can, now work independently as a section controller on this/these board/boards." The chief controller shall write the following remarks below the above declaration and sign it:" "Shri..... was given learning on .....board/boards from ..... to.....I have watched progress and consider him fit to work independently on the board(s)."The chief controller may also test the employee before allowing them to work independently.

- (d) Deputy chief controller shall also be required to give similar declarations, but in their case the period of learning in each shift should not exceed 3 days. If this period is likely to exceed, the chief controller shall take action as mentioned in sub-para(b) above.
- (e) The chief controller shall also append a certificate similar to one mentioned in sub para (c) , below deputy chief controller's declaration.
- (f) In case of sub-control offices where the Chief Controller is not posted, the duties herein assigned to the chief controller shall devolve on the senior most Deputy Chief Controller.

**4.13: Duties and Responsibilities of Controllers:**The main duties of control staff are detailed below:  
These are only guidelines to their day to day working and are not exhaustive.

- (a) **Chief Controller (In charge):**The chief controller is in overall charge of control office and is responsible for the total transportation of the division on day to day basis. His duties includes –
  - (i) A review of previous day's performance to confirm that all forecasts made have been fully met. For short falls cogent reasons have to be pinpointed to prevent recurrence.
  - (ii) Prepare current forecast indicating assistance needed from headquarters, adjoining divisions, railways.
  - (iii) These will generally relate to interchange, loading and locomotive utilization.
  - (iv) Checking control charts and bringing to the notice of the senior divisional operations manager/ divisional operations manager all avoidable detention to trains.
  - (v) Punctuality performance with particulars reference to trains which lost punctuality.
  - (vi) Maintaining statistics regarding the punctuality of passenger trains.
  - (vii) scrutiny of stock papers, monitoring interchange obligations,
  - (viii) watching detention to stock at stations and terminals.
  - (ix) watching the work of marshalling yard / freight terminals.
  - (x) Maintaining liaison with neighboring divisions.
  - (xi) Watching utilization of loco and their terminal detention.
  - (xii) Checking duty hours of running staff and balancing of crews.
  - (xiii) Granting engineering blocks , power blocks etc.
  - (xiv) Attending control office in cases of accident
  - (xv) Establishment work of control office
- (b) **Chief Controller (Coaching)/Dy.Chief Controller:**
  - (i) Ensuring punctuality of passenger trains in system
  - (ii) Ensuring punctuality at the start of all outgoing passenger train
  - (iii) Maintaining Detention Reports of Coaching trains
  - (iv) Ensure that late running trains make up time
  - (v) Maintaining coaching stock of division and balance stock to/from shop as per requirement.
  - (vi) Attending control office during accident.

**(c) Chief Controller (Movement)/Dy. CHC (Shift duty)**

He is responsible for:

- (i) Running of goods trains, preparing interchange forecast, and monitoring the same, loco utilization and passenger and goods train operations in general.
- (ii) Allotting empty stock/rakes to loading stations in accordance with current priority regulations along with Dy. Chief Controller (Stock) maintaining constant touch with adjacent divisions through regular conference to facilitate the smooth flow of traffic.
- (iii) Dealing immediately with significant detentions or transport bottlenecks and other unusual.
- (iv) Keeping constant touch with the working of major terminals & Marshalling yards and taking timely action to deal with congestion.
- (v) Giving advice of serious accidents to all concerned, and taking, charge of the affected sections.
- (vi) Supervising the running of oversized consignments.
- (vii) Maintaining liaison with the Power Controller.
- (viii) Co-ordinate the work of various Section Controllers.
- (ix) Maintain discipline among control staff in the absence of Chief Controller.
- (x) Maintain co-ordination and liaison with various functionaries involved in train running.

**(d) Chief Controller (stock) / Dy. Chief Controller:** He is responsible for:

- (i) Scrutinizing the indent register in details with regard to the oldest date of registration, nature of goods and type of stock required for lifting goods as per the oldest date of registration.
- (ii) Checking Divisional stock report and position of empties.
- (iii) Checking of different stock reports received from the various points and planning in advance the supply of stock, loading and clearance keeping in view interchange obligation and orders received
- (iv) Checking transshipment activity.
- (v) Chasing movements of stock as per supply order issued on the previous day.
- (vi) Keeping a close watch over hot axle, special type and unconnected wagons.
- (vii) Cross checking the daily Restriction Bulletin with Restriction Messages received from HQ office and issuing the same.
- (viii) Assisting the Sr. DOM/DOM in allotments.
- (ix) Keeping a close watch over the movements of seasonal perishable traffic and supply of suitable stock for its clearance.
- (x) Watching movements of damaged loaded stock in sick line and yards on their division and its clearance.
- (xi) Informing all major customers about their inward trains' expected arrival based on FOIS pipe line, Optimizing loading, unloading, transshipment etc.
- (xii) Monitoring loading and movement of POL rakes.



(e) **Section Controller:** The Section Controller shall be responsible for:

- (i) Reporting for duty 30 minutes before start of his duty and ascertaining the position of the section from his reliever. He shall also acquaint himself with the instructions to be observed and other special instructions to be followed.
- (ii) Recording the movement of trains on the 'Control' graph including crossing, connections and shunting reasons for detentions etc.
- (iii) Arranging for the supply and clearance of stock as ordered by Dy. Chief Controller.
- (iv) Advising stations in advance of the work to be done on trains on move
- (v) Informing sheds and stations about the late running of trains to avoid the calling of Crew and Guards earlier than necessary or to put back trains wherever advisable.
- (vi) Informing major stations and concerned Section Controller about the current running of trains on the section and their anticipated arrivals well in time
- (vii) Keeping in close touch with Engineering-blocks and working of material trains so as to give the maximum possible time with least detention to other traffic.
- (viii) Incident management to include adjusting movements of trains in view of the likely impact of the incident, informing all concerned
- (ix) Keeping a watch over damaged vehicles detached at road side stations and arranging repairs or transshipment of their contents and proper attention on the part of the train examining staff.
- (x) Arrangement of ART & ARME in case of accident.
- (xi) Eliminating all possible detention to train and stock.
- (xii) Watching the working of marshalling yards & major terminals.
- (xiii) Making timely arrangements for the relief of Guards /loco pilots whose duty hours are likely to exceed enroute.
- (xiv) Recording stock report (where stock clerks are not posted)
- (xv) Maintaining caution orders imposed/cancelled over sections in relevant register.

(f) **Power Controller/Traction Loco Controller:**

- (i) Planning and directing engine movements so as to ensure efficient engine utilization and maintaining the prescribed charts, and regular statistics.
- (ii) Co-ordination with sheds and Dy. Chief Controllers (movement) for sending overdue engines and obtaining time of engines coming out of shed.
- (iii) Making timely arrangement for the relief of crew whose duty hours are likely to be exceeded enroute
- (iv) Taking timely action to balance crew so as to prevent cancellation or putting back of trains on account of shortage of crew.
- (v) Arranging relief in case of accidents.
- (vi) Maintaining charts indicating engine position/utilisation.
- (vii) Rendering advice and assistance to locomotive running staff regarding trouble shooting.
- (viii) Carrying out any other duties allotted to him by the Sr.DME/DME or Sr.DEE(op)/DEE(op) from time to time.



- (ix) Monitoring day-to-day stock position of diesel fuel at depot and watching movement of diesel fuel tank wagons (for power controllers only)
- (g) **Traction Power Controller:** Traction Power Controller shall be responsible for-
  - i) While taking over shift duty acquaint himself with the prevailing position of the entire section, including the working of the Remote Control equipment position of all transformers, current breaker's interrupters and isolators, sections under power block, position of tower wagons and break down vehicle etc.
  - ii) Maintaining continuous contact with the Traffic Section Controllers in regard to power supply affecting train movements, imposing power blocks etc.
  - iii) Taking prompt action for restoration of supply in the event of power supply interruptions or other failures.
  - iv) Imposing and removing power blocks in consultation with Traffic Section Controller.
  - v) Advising promptly the concerned officials in case of accidents, OHE breakdown, failure of power supply and keeping them posted with all important developments.

#### 4.14: Records and Registers:

In addition to the records and registers which a control office may maintain suiting local conditions and in accordance with local orders, the following shall also be maintained in each control office:-

##### (a) By a Section Controller:-

- (i) **Section controller's diary-** A record shall be kept by the section controller of all important items affecting the running of trains and the movement of traffic, which requires bringing to the notice of his reliever for guidance. He shall note down the action he has taken in regard to these items and indicate items left unattended. In this register the section controller enters the orders he issues to the station masters. The orders shall be numbered consecutively and shall commence with No.1 after midnight each day.
- (ii) **Inward message book:-** All important communications from station masters and messages given by Guards & Loco pilot on the section shall be recorded in this book and necessary action taken.
- (iii) **Yard state register:** In this register, the state of important station yards on the section shall be recorded at the appointed time.
- (iv) **Caution order register:** The section controller shall take the messages from the stations about imposition and cancellation of engineering restrictions on his section and record them in the caution order register.
- (v) **Private number book:** This book contains printed numbers of two digits in a series, whenever any private number is issued, the section controller shall record the reasons and the section/shed etc. to which issued.

##### (b) By the Deputy Chief Controller:-

The deputy chief controller shall maintain the following records either personally or with assistance of a control clerk:-

- (i) **Yard running balance register:** All the important yards shall repeat to the control every eight hours i.e at 00.00hrs, 8.00hrs and 16.00hrs, daily the stock position of the yard indicating also the stock arriving by incoming trains and dispatched by outgoing trains.
  - (ii) **Deputy Chief Controller's diary:** The Dy. Chief controller shall maintain a running diary of all events affecting the working of trains and traffic.
  - (iii) **Order number book:** The book shall be used for orders emanating from chief controller and shall be maintained in the same manner as described in para 4.14(a)(i).
  - (iv) **Forecast and acceptance book:-** Once every eight hours or as frequently as necessary, the Dy.Chief Controller shall give under a serial number , a forecast of goods trains he proposes to run contiguous divisions. The forecast messages and the acceptance to the messages received in reply shall be recorded in this book.
  - (v) **Train ordering book:-** The deputy chief controller shall enter in this book, train ordering messages for all outgoing trains or light engines he prepares to order from his division. These messages shall be serially numbered and shall be repeated to the originating loco sheds, marshalling yards and stations well in advance so that the necessary power and crew can be arranged by Loco Sheds and the trains can be formed in time with nominated load. Private Numbers shall be exchanged for each messages.
  - (vi) **Unsatisfactory features register:-** A running record of all unsatisfactory features will be recorded in this register for transmission to the Central Control office every morning. The report of unsatisfactory feature should be impartial & fair and without any touch of 'Departmental' bias.
  - (vii) **Night order book:-** In this book the chief controller will enter the instructions that the deputy chief controller and the control staff are to carry out during his absence.
  - (viii) **Accident register:-**As soon as an accident message is received the Dy.chief controller shall make an entry in this register and shall start a chronological log, as per instructions laid down in the Accident Manual.
  - (ix) **State of Marshalling Yard:-** A record of the state of marshalling yards will be maintained at intervals of every eight hours, showing the nature of occupation or otherwise of each line in the reception, sorting and dispatch yards.
  - (x) **O.D. register:-** When there is any Over Dimensional Consignment or out-of –gauge load over the Division, the load full particulars will be entered in the register giving the particulars of the sanction granted for its movement by the Divisional Railway Manager or the Chief Operations Manager, as the case may be, and the precautions or restrictions to be observed on the run enroute.
  - (xi) HQ's conference register
- (c) By the power controller:-**
- (i) **Power position book:-**This book shall be maintained by the power controller every 8 hours showing the disposition of every locomotive in the Divisions.
  - (ii) **Out-station Loco Pilot register:** A roster of all the Home shed Loco Pilot who are at out-stations shall be maintained separately for each out-station shed.

- (iii) **Power Controller's diary:** The power controller shall maintain a running diary of all important events in regard to his sphere of duties. In this diary he shall also make a note of matters requiring his reliever's attention.
- (iv) **Engine Link Cards:** A link card will be maintained for each engine separately so as to show the day –to –day position and the turn-round time of every engine.
- (v) **Engine failure register:** This register will be maintained to show all the unsatisfactory features in train operation due to engine failures or failures of rolling stock equipment.
- (vi) **Washout and schedule register:** This register will indicate the engines undergoing washout or schedule examination and the engines due or becoming due washout and schedule examination. The disposition of the engine will also be indicated.  
  
(Note: Similar register will also be maintained by the Traction power controller showing the engines due for undergoing repair in the shed and their disposition.)
- (vii) **Q.T register:** This will indicate particulars of movement of wheels and other materials from workshop to shed to shed.
- (viii) Crew position register.
- (ix) Register of movement and diversion of Diesel fuel tank wagons.
- (x) Register showing undue and abnormal detention for engine changing at engine changing stations and for carriage and wagon examination at examination stations.

#### **4.15: Books and Documents and Basic Records to be Kept in Control Office.**

A copy of each of the following books of reference, corrected update , must always be available in the operating room and the control staff must be fully conversant with the rules and orders contained therein, so far as they concern the area they control :

1. General and Subsidiary Rule Book
2. Block Working Manual
3. Operating Manual
4. Accident Manual
5. Manual of A.C traction operation and maintenance(For electrified section)
6. Station Working Rules of all stations.
7. Working facilities available on the transshipment sheds.
8. Schedule of shunting engines in the various yards.
9. Link diagrams of rakes and engines working the passenger services and also of goods trains where laid down.
10. Crew link diagram of the various services, for the running staff.
11. Details of maximum moving dimensions permitted on the various section of the railway.
12. Map showing the maximum permissible axle load on all the railways with which traffic is interchanged.
13. Charts showing line capacity of the various sections.

14. Index sections and plans of the various sections of the jurisdiction and details of train watering. Engine fuelling etc.
15. Master charts depicting all trains indicated in the working time table in force.
16. Charts showing jurisdiction of the various officials details of:
  - (a) The maintenance branch of the post and Telegraph department responsible for maintaining control circuit wires in good condition.
  - (b) The various departments of the railways,
  - (c) Zone and telephone numbers of Civil, Police, Military authorities.
  - (d) List of various hospitals with Telephone Numbers.
  - (e) List of stations Civil, district-wise.
  - (f) OHE Sectioning diagram.
17. Diagrams showing the layout of line wires of the Control Circuit.
18. Line patrol chart
19. A calendar of returns
20. Cranes and Wagon weigh bridges.
21. Turntables and Triangles.
22. List of spare coaches based in the division as well as slip coaches running on and across the division.
23. List of coaching Rakes allotted to the division and those passing over the division.

#### **4.16: Operating Discipline:**

- i) Line Staff to obey orders of control: Station staff, Shed staff, Crew and Guards etc must obey orders issued by the Control as long as these orders are consistent with the General and Subsidiary Rules, extant instructions and the instructions contained in this Manual.
- ii) Control order register': Important instructions from control will first be recorded in a register maintained in the control office and serially numbered, commencing with number 1 after midnight each day. These will be issued as messages indicating the time of issue. All such orders received by the Station Masters or Running staff and Guards' lobby from Control should be entered in the control order register by the staff. Each entry must be initialed with time. At the end of each turn of duty the relieved as well as the relieving Station Master or Crew Controller must sign their name in full below the last entry in the register. On days when no orders are received from control, "Nil" entry must be recorded and signed as prescribed above. When a station Master or Crew Controller has received an order from the control and entered it in his register, he may repeat it to the control in order to satisfy himself and the control that he has understood it correctly.
- (iii) No Terminal Station should start a goods or unscheduled train or block the section without the permission of the Controller.
- (iv) Every Station on the section must report the movement of every train- passenger, goods, special, departmental, light engines, TTMs, Tower Wagons, trollies etc. to the controller.
- (v) When the control is in function, Line Clear must be asked from the station ahead for every train unless orders to stop it are given by the Controller.

- (vi) The Controller's permission must be obtained before stopping a train that should run through except to avert an accident or dangerous condition.
- (vii) No station should allow a train, which has been stopped out of course, to proceed, without first informing the controller that the train has been so stopped and receiving his further orders.
- (viii) Station Master must advise the controller of any unauthorised or undue detention to trains at their stations with full explanation.
- (ix) Whenever a train, either passenger or goods is detained at a station for longer than the booked halt without the orders of the Controller, on its departure, the Station Master must immediately inform the brief cause of the detention to the Controller.
- (x) Whenever any damaged wagon is detached out of course at a station, the Station Master on duty should inform the Controller.
- (xi) Station Master must promptly advise the Controller of any defects of signals, points, interlocking apparatus and line clear instruments at their stations. Information should also be given of any defects in any other station machinery such as cranes, wagon weigh bridges, turn tables, water columns, hydrants etc.
- (xii) Starting stations to report particulars of outgoing train: As soon as a train leaves a train starting station, the Station Master must intimate the following particulars to the control office:

Number and description of train, Engine number and class, Loco pilot's name, Guard's name, load of the train (in tones and vehicles) particulars of shunting to be done on the journey, time of departure, brief reasons of late start, time of S/O of crew fuel balance etc.
- (xiii) Intermediate stations to report arrival and departure time of trains: Station Master of intermediate station must communicate to the Control as early as possible, the following information in regard to every train dealt with:
  - (a) In case the train has run through, the time it passed the station.
  - (b) If it is a stopping train, the time of arrival and departure along with the explanation for every detention beyond the scheduled stoppage.
  - (c) If any shunting has been performed, the number of vehicles attached and detached.
  - (d) If any extra time has been taken in loading and unloading of packages, the number of such packages and name of the loading station.
- (xiv) Terminating stations to report the particulars of incoming trains: Station Masters of terminal and engine changing station must as soon as possible, after the arrival of a train, communicate to the control the time of arrival and the load of the train, particulars of loco detached/attached.
- (xv) Engine Movements to and from sheds to be reported :

SE/SSE (Loco) must communicate to control the time at which train engine leave from or returns to the shed 'Bahar line'.

This in no way, relieves the Station Master of the responsibility for issuing necessary all concerned messages regarding engine failures and engine trouble enroute. The Controller, shall record the duration of such defects in his chart, diary and registers.

## xvi) Time to be checked with control:

Station Master, Crew Controller and Lobbies must check their time with control at appointed hours every day when control gives a general ring for setting their watches/clocks at 16:00 hrs.

## xvii) Mode of using the control phone:

The Control telephone is to be used for operational purposes. The field staff wanting to talk to control will give their identity and wait for their turn to communicate. As this network is intensively used, the conversation should be brief, meaningful and polite. Discussions, disputes and arguments must be avoided.

a) Station Master and others must not start to speak to control unless they have ascertained by lifting the receiver and listening in, that the line is free. They must then announce the name of the station, shed, lobby or site from where they are speaking and wait for its being repeated by the controller before beginning the conversation.

b) When, however an urgent message has to be conveyed and the line happens to be engaged, the station name must be called indicating Emergency. The Controller will immediately attend to the Station having an emergency. Station Masters must attend 'Control Call' promptly.

c) Guard, Loco Pilots and other staff on duty can, with the permission of Station Master, use the section control telephone when they have any report to make to the section controller.

**4.17: Co-ordination Between Control and Stations:**

i) **Asking line clear:** In order to avoid the detention to passenger trains for crossing a less important train, line clear enquiry for the less important train must not be asked until the train is ready to leave and until the Section Controller's permission has been obtained. The Station Master receiving the line clear enquiry must immediately ask the Controller's permission to give line clear before giving the reply. The Station Master on duty is entirely responsible for seeing that the necessary General and Subsidiary rules and Station Working Rules are observed before giving Line Clear.

ii) When a Station Master for any reason finds it difficult to carry out Controller's arrangement to receive the train in yard/station due to yard/ station constraints, he must explain his reasons clearly and fully to the Controller.

iii) **Work at stations:** The permission of the Controller must be obtained before the performance of any shunting, Controller must be informed of the likely duration of shunting to enable him to arrange crossing and precedence of trains. In the event of Station Master being unable to start a train on receipt of line clear, he must at once report the circumstances to the Controller.

**4.18: General Order of Precedence of Trains:**

Unless specific orders to the contrary are issued by the COM or by those acting on his behalf, the following general orders of precedence shall be observed by control and stations.

1. ARME, ART proceeding to the site of accident.
2. President's and VVIP's specials (Unless otherwise specified in the Time Table).
3. Suburban train in peak rush direction.
4. Super fast trains like Shatabdi, Rajdhani etc.
5. Mail / Express trains.

6. Military personnel special, if instructed by emergency control/DOM.
7. Fast Passenger trains
8. Special engaged by the public. (Precedence order may be revised)
9. Passenger trains.
10. Mixed trains.
11. Military stores special.
12. Express or special goods train.
13. Through goods train.
14. Accident relief train returning from the site of accident (unless otherwise ordered).
15. Shunting and van goods train.
16. Departmental trains.

Note: - The following general principles are mentioned for the guidance of Controllers but it must be distinctly understood that nothing in these instructions modifies the safety precautions laid down in the rules (General and Subsidiary Rules, Station Working Rules etc.).

- (i) A Passenger train nearing the end of its run should not normally be detained in preference to a train which has a longer run before it, as the latter train is more likely to make up time and reach its destination punctually than the former.
- (ii) A train running to time should not be detained more than 30 minutes to effect crossing on single line. (This should be decided by the Division based on actual condition.)
- (iii) A train running late due to defective engine, or defect in rolling stock or any other cause which is likely to continue to operate against it and prevent it from making up time, should generally give way to a train running properly.

#### **4.19: Accident or Abnormal Occurrence to be Reported:**

In the event of accidents or any untoward incidents involving obstructions of running line or lines, or in any way affecting the safety of train working, full details shall be furnished by the Station Master to Control indicating the nature of assistance required.

#### **4.20: Accidents**

Controllers and other staff should thoroughly understand and act on the guidelines contained in G & SR and Accident Manual. Saving of lives and rescue of injured and mitigating hardship to passengers must be given the topmost priority.

#### **4.21: Working of Trains When Control is Interrupted:**

When the control is interrupted and no communication with the Controller is possible. Station Masters will be responsible for the working and regulating of trains, keeping in view the instructions issued by the railway administration.

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## CHAPTER-5

### SECTION CAPACITY AND THROUGH PUT

#### 5.01: Definition:

Section capacity is defined as the 'number of trains which can be run each way over a given section of the railway in 24 hours. It is also known as **line capacity**.

For a single line section, this is calculated as the number of trains that can be run each way during 24 hours, whereas on double line section, this capacity is worked out separately for both the directions. Section capacity could be expressed in three different ways viz:-

(a) **Maximum line capacity:** This is represented by the maximum number of trains that can be entered in the Master Chart so that it is impossible to introduce even a single more train on the section concerned.

(b) **Practical line capacity:** Practical line capacity is represented by the number of trains per day which is derived from the above mentioned maximum line capacity making allowance for such factors as time required for maintenance of permanent way, time margin for scheduling and other operational irregularities. In actual practice, the train scheduling is based on this capacity. When we speak of line capacity in general, we mean practical line capacity which is also known as effective line capacity.

(c) **Economic line capacity:** When line capacity is underutilized, increase in train services follow the pattern of law of increasing returns due to more intensive utilization of fixed assets. However, as the number of trains to be operated on a section grows larger and larger and the section starts getting saturated, it becomes more and more difficult to increase the train services without increasing the time loss in train operation. As a result, the utilization efficiency of the rolling stock and the train crew decreases and maintenance cost of the track increases. This leads to gradual increase of the transportation cost per train kilometer. The optimum number of trains which can be run on the section economically is the economic line capacity.

#### 5.02: Calculation of Line Capacity: (Theoretical Formula)

East Coast Railway follows the Scott's formula for section capacity which is as under:

$$N = \frac{24 \times 60}{R+5} \times \frac{7}{10} \quad \text{for Double line section}$$

$$N = \frac{24 \times 60}{R+5} \times \frac{7}{10} \times \frac{1}{2} \quad \text{for Single line section}$$

Where →

'N' represents the number of trains each way in 24 hours, 24x60 represents the number of minutes in a day.

'R' represents the running time of a goods train in minutes over the critical section (i.e the section over which the running time is maximum).

'5' represents the time in minutes allowed for "block working".

$\frac{7}{10}$  'represent the efficiency factor.

**5.03: Calculation of Line Capacity (Charting Method):**

The most reliable and practical way of assessing the line capacity of a section correctly, which is adopted by most of the railways, is the charting method- indicating train paths on time-distance graph for 24 hours. It is therefore, best to determine the section capacity by actually plotting trains in a master chart. In this process the scheduled coaching train paths are first plotted and then as many goods train paths are inserted as possible so that, it becomes impossible to accommodate even one more train. This gives us maximum section capacity. While doing so, the facilities provided at different block sections, block stations, as well as the terminal facilities & limitations are taken into consideration.

**5.04: Guidelines for Calculation of Line Capacity on Indian Railways:**

- (a) Charting method should be the basis for assessing line capacity for planning purposes.
- (b) Capacity assessed by charting method should not be less than as calculated by Scott's formula.
- (c) A section will be considered saturated if the number of trains run daily is 90% or more than the charted capacity. Planning for additional line capacity on such sections should be done.

**5.05: Various methods of Improving the Line Capacity:****(a) By incurring expenditure:**

- (i) To reduce the running time on critical block section
- (ii) To improve the speed of trains
- (iii) To provide automatic signals
- (iv) On increased use of modern signaling system
- (v) On provision of CTC on double line
- (vi) On provision of train describer
- (vii) To use EMU & DMU for stopping train.
- (viii) On provision of AWS
- (ix) On provision of ACD
- (x) On provision of PI/RRI/EI
- (xi) To increase CSL of running lines
- (xii) On interlocking of LC gates/Elimination of LC gates.
- (xiii) On improving facilities at terminal yard commensurating with the work load.
- (xiv) On provision of longer turnouts at stations to increase the speed of the train.
- (xv) On independent shunting facility at important stations to avoid constraints of reception & dispatch.
- (xvi) On easing of ruling gradient.

**(b) Without incurring expenditure:**

- (i) Proper planning.
- (ii) Proper controlling.
- (iii) Proper efficiency by motivation & training.
- (iv) Proper Time tabling.
- (v) Proper maintenance of instruments

- (vi) Minimizing block operation time
- (vii) By reducing crossing & precedence
- (viii) By implementing Management Information System (MIS).
- (ix) Uniform traction
- (x) By running heavy haul/longer goods trains.
- (xi) Keeping a watch on engineering restrictions, which should be imposed for minimum possible period.
- (xii) Simplification of rules.

#### **5.06: Order of Priority for Increasing Line Capacity Works:**

As line capacity works involve huge investments and long gestation periods, planning for such works has to be done with meticulous care to avoid traffic bottlenecks on one hand and uncalled for expenditure on the other hand. Therefore, it is necessary to follow the sequence below for considering increase in section capacity.

##### **a) Organizational and operating measures to ensure optimum utilization of the existing operating assets as follows:-**

- (i) Improvement in Time table.
- (ii) Reducing disparity in inter-sectional running times.
- (iii) Review of sectional running times.
- (iv) Improving efficiency of staff.
- (v) Efficient operations of yards, stations and terminals.
- (vi) Improved maintenance of equipment.
- (vii) Monitoring of trains by officers and inspectors.

##### **b) Technical measures:**

- (i) Improvement in Signalling & interlocking.
- (ii) Motive power improvements
- (iii) Civil engineering improvements will include the following:
  - Opening additional crossing stations.
  - Strengthening the permanent ways and bridges.
  - Improvements in alignment, eliminating surface road crossing, removing speed restrictions, providing 1 in 16 turnouts to permit higher speeds on loop lines.
  - Easing of gradients.
  - Patch doubling (Doubling of section is not undertaken in one stage but in phased manner)
  - Double/Triple/Quadruple line.

#### **5.07: Throughput:**

The throughput of a section is the total quantum of traffic which can be transported over a section in a period of 24 hours. The quantum of traffic moved includes passenger traffic & freight traffic. The passenger throughput could be measured in terms of number of passengers or passenger kms which are carried over the section in 24 hours.

**Passenger Throughput** = Number of passengers travelled x Distance they travelled in Kms.

The goods throughput may be expressed in terms of :

- a) Number of wagon, or
- b) Gross Tonne kms or
- c) Net Tonne kms (carried over the section in 24hours)

Generally 'Throughput' in Railways refers to goods throughput for day to day operation and is expressed in terms of number of wagons. But for commercial transactions, it is expressed in terms of 'Net Tonne kilometres' because NTKM indicates the ultimate productive work done by railways. Keen observation and effort is required to improve NTKM.

#### **5.08: Measures to Increase 'Throughput':**

Throughput of a given section can be increased by increasing section capacity. However, independent of section capacity, throughput can be increased by increasing the trailing load as under:-

- a) Inducting High capacity Diesel & Electrical locomotives & Multiple Operations of Locomotives.
- b) Improved Rolling Stock with CBC coupling & draw bar capacity of 80 tonnes or more.
- c) Improved roller bearing on Rolling stock.
- d) Increasing carrying capacity of rolling stock without much increase in length or tare weight.
- e) Improved Braking system (Air Brake & Disc Brake system) to maintain desirable "Braking Distance".
- f) Increasing Permissible Axle load & permissible moving dimensions by Civil Engineering works.
- g) Increasing loop capacity & strengthening the loop lines.
- h) Improved system of communication between Engine crew, Train staff, Station Master & Controller.
- i) Adequate Terminal capacity & facility to deal with Heavy Haul Operations.
- j) Re-Scheduling & curtailing running of slow stopping passenger train on heavy haul routes or on dedicated tracks.
- k) Integrated "Mega Blocks" to prevent frequent departmental maintenance block.
- l) Upgradation & modernisation of techniques & methods of attending to trouble shooting & break down.
- m) Upgradation in the skill & knowledge of "Train Running " & Train Passing" staff.

#### **5.09: Advantage of Higher 'Through Put':**

- a) Wagon Utilisation Increases.
- b) Increase in Railway Revenue.
- c) Yard/Sectional Congestions Eased.
- d) Reliability Increases.
- e) Customer is satisfied & reposes confidence on Railways.
- f) Cost of Transport of Freight Reduces.
- g) Interchange commitments with adjoining railways fulfilled.

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## CHAPTER-6

# COACHING TRAIN OPERATION

### 6.01: Introduction:

Railways train operation work is divided into two main branches, viz. Passenger Train operation and Goods Train Operation. With sharp growth in population along with industrialization & socio-economic development of the country, there is growing need for passenger transport in the country. Rail transport is the life line of the nation & it is therefore essential to understand & appreciate the various aspects of passenger train operations & to strive for excellence in this field. Public judge the efficiency of a Railway by the punctual and safe running of passenger services. Late running of trains is not only a cause of irritation and inconvenience to passengers but also involves wasteful expenditure. As a commercial enterprise and public utility service, the Railway should ensure that the passenger services are comfortable, convenient, safe and punctual.

### 6.02: Characteristics of Passenger Train Operation:

The passenger trains are run in a reasonably predictable, systematic & regular pattern. Train schedules are therefore made known to the public & efforts are made to run trains punctually despite unusual occurrences & constraints. Passenger train operation involves regular scheduled train examination, sick detaching, marshalling, placement of rake on the platform, booking of staff, right time start and punctual running, etc. Staffs at field level have to keep a hawk like vigil and take remedial measures in case of lapses and problems. Any serious dislocation of passenger train also affects goods train running. Passenger train operation is thus not only important from the point of view of the public and railways image but also to have significant bearing on the freight operations and the efficiency indices of operations.

### 6.03: Classification of Passenger Services:

As a public utility service the Railways have to serve the various needs of the public. The following types of coaching trains are run:

- a) **Superfast trains:** These are high speed long distance train services having limited stoppages at important stations. Average speed of these trains is normally more than 55 kmph.
- b) **Mail and Express trains:** These are high speed services which carry passengers and postal mail over long distances stopping only at important stations. Average speed of these trains is normally 45 to 55 kmph.
- c) **Local Passenger trains:** These trains cover relatively short distances and generally stop at every station. Average speed of these trains is normally less than 45 kmph.
- d) **Mixed trains:** On unimportant Branch Line sections where enough passenger or goods traffic does not offer for the running of separate Passenger and Goods trains, mixed trains are provided to reduce the cost of operation. Such trains stop at all stations and are essentially slow.
- e) **Suburban trains:** These are light trains of greater frequency serving the suburban area of metropolitan cities. Eg., MEMU/EMU/DMU/DEMU services.

### 6.04: Passenger Train Time Table:

Time Table is a “schedule” in a tabular form, showing details of arrivals and departures at stations of

trains carrying passengers. It is meant for different purposes hence are of different types. The Time Tables are changed once on 1st July every year. The following types of Time Tables are published on this Railway once in every year and come into force on the above mentioned dates.

### 6.05: Types of Time Tables:

**Time table can be divided in to two categories viz. (i)Public Time Table and (ii) Staff copy Time Table.**

(i) **Public Time Table:** Railway publishes different types of Time Table for use of public:

**a) Trains at a Glance(TAG):** These are handy volumes for use by the public and are printed in English by Railway Board with effect from 1<sup>st</sup> July of every year. Information regarding all Mail/Exp trains running in Indian Railway like halt at stations, arrivals, departures, class of accommodation provided in the train & availability of pantry car is printed in this book. In addition to the time schedules, they contain useful information for passengers like fare tables, catering facilities, reservation rules, refund rules, travelling concessions, Indian Railway map, etc. Some of the copies of TAG are marked as staff copy for use of staff connected with time tables.

**b) Zonal Railway Time Tables:** These are handy volumes for use by the public and are printed in English & are issued once a year in July only. Railway Board has divided all the zones of Indian Railway in to five regions by clubbing two to three zones in a group. ECoR comes under South Eastern Zone along with SER, SECR. Information regarding all Mail/Exp and Passengers, EMU, MEMU, DMU, originating, terminating and through running trains in Zonal Railway is mentioned in this time table. Abstract of some important Mail/Exp trains running over IR is also given in this time table. Details like halt at stations within zonal railway, arrivals, departures, class of accommodation provided in the train, availability of pantry car is printed in this book. In addition to the time schedules, they contain useful information for passengers like fare tables, catering facilities, reservation rules, refund rules, travelling concessions, amenities at stations & trains, compensation & claims & particulars of Railway Vigilance Organisation etc. Some of these time tables are printed as staff copies for use of staff connected with time tables.

**c) Suburban Time Tables:** These are printed in English and are of pocket size. They contain in details the timings of all suburban services as well as of other passenger services running over the suburban section and also abstract timings of other main line passenger trains. Since suburban trains are not running over ECoR, such time tables are not prepared.

(ii) **Staff Copy Time Tables:** Time table specifically meant for use of Railway staff & officers are called as staff copy time table. They are as under,

**a) Working Time Table:** These time tables are prepared exclusively for use of Railway staff & officers connected with train working. These are prepared by Zonal Railway separately for each Division with effect from 1<sup>st</sup> July of every year for the information and guidance of all Railway staff, especially the running staff, station and control staff. These Time Tables contain the schedules of all coaching trains including maximum permissible speed of the section, class of station, standard and type of interlocking, signaling system at all stations in the division. Other valuable information like load tables of Goods trains, maximum permissible speed of the section of various coaching and freight stock and locomotives, speed on turn outs at stations, list of emergency sockets, detailed list of level crossings, scheduled timings of various types of blocks, Headquarters of Divisional staff, permanent and semi-permanent speed restrictions, composition of coaching trains, list of early departures (Public Departures), CUG numbers of stations, supervisors and officers, etc.

- b) **Staff Copy:** Apart from working time table, TAG and Zonal Railway time table are used by staff & officers for day to day running of trains. The map and advertisement portions do not feature in the TAG & Zonal Railway time table meant for staff.
- c) **Graphic Time Table:** These time tables are in the graph form and are prepared for the guidance of the control staff. These are otherwise known as “**Master Charts**”. These time tables are prepared section wise & represent graphically, not only Mail/Exp/Passenger trains, but also goods trains that can be run in a section during 24 hours. These are generally displayed in front of the section controllers in their cabins, so that they can constantly relate actual running of trains to the fixed schedules laid down in the time table.

#### 6.06: Objectives of Passenger Time Table are as under:

- a) Provide information for intending passengers regarding.
  - (i) Schedule of arrivals and departures.
  - (ii) Through sectional and suburban trains.
  - (iii) Connections at various stations .
  - (iv) The amenities and facilities available to the passengers at the stations.
- b) A guide to the railway staff.
  - (i) In arranging crossings and precedence of trains.
  - (ii) Receipt and dispatch at terminals
  - (iii) Provision of motive power, crew, maintenance and other facilities.
- c) A guide to postal services for transmission of mail
- d) A data base for calculating the requirement of rolling stock, locomotives and running staff.
- e) To satisfy statutory requirements i.e., Railway must exhibit time tables for the guidance of the public as laid down in section 49 of IR Act 1989.

#### 6.07: Committees Associated with the Make-up or Revision of the Public Time Table:

Suggestions are invited from M.Ps, M.L.As, Chambers of Commerce and Members of Zonal/ Divisional/Suburban Railway users’ Consultative Committee, Members of Time Table Committee, Individual suggestions from public are entertained before framing the Time Table.

- (a) **Zonal Railway Users’ Consultative Committee (Z.R.U.C.C.):** This Committee functions at the Railway Headquarters office at Chandrasekharapur, Bhubaneswar, consisting of members recommended by zone & appointed by the Railway Ministry to represent railway users in the territory served by the Railway and includes elected non-official members of the Divisional Railway Users’ Consultative Committees. The General Manager is the Chairman of the Committee and the Dy. General Manager functions as the Secretary to the Committee.
- (b) **Divisional Railway Users’ Consultative Committee (D.R.U.C.C.):** This Committee functions on each Division and consists of members recommended by division & appointed by GM representing the railway users of the area. The Divisional Railway Manager is the Chairman of the Committee and the Sr. Divisional Commercial Manager functions as the Secretary. The Committee holds a meeting in advance of the meeting of the Time Table Committee (T. T. C) as per para (d).



(c) **Suburban Railway Users' Consultative Committee:** This is a committee formed by representatives of the various recognised Suburban Passenger Associations to advise the Railway regarding the requirements of suburban Passengers. One or two members of the Committee are also associated in the deliberations of the Time Table Committee. The Chief Operations Manager is the Chairman of the Committee and the Dy. General Manager is the Secretary.

(d) **Time Table Committee (T.T.C.):** This committee advises the Railway Administration on matters connected with the Time Table and meets about 3 months before the Time Table becomes due for revision. The constitution of the committee is as follows:

- (i) **Chairman:** Chief Operations Manager.
- (ii) **Secretary:** Chief Passenger Transportation Manager/ Deputy Chief Operations Manager (Chg).
- (iii) **Official Members:** Chief Commercial Manager, Chief Mechanical Engineer, and Chief Electrical Engineer.
- (iv) **Non-official Members:** Chief Representatives of the Zonal Railway Users' Consultative Committee, the Divisional Railway Users' Consultative Committees, Passenger Associations including the suburban passenger Associations & Members of the parliament.
- (v) **Postal Deptt. Members:** Representatives of the Postal Department also attend the meeting so that their requirements are presented.

Before the Time Table Committee meeting is held, the Divisional Officers meet at Headquarters and discuss various suggestions and difficulties relating to their Divisions for the Time Table. Before the Time Table is revised, Inter-Railway Time Table co-ordination meeting is held by Chief Passenger Transportation Manager/Deputy Chief Operations Manager (Coaching) of all the Railways to discuss the paths of new trains, reschedule trains, etc., and arrive at an agreement to hand over the inter-railway trains at junctions. The feasibility of introducing any new trains or extending a train is also gone into in consultation with the Railway Board's representatives.

#### 6.08: Inter Railway Time Table Meetings:

CHC (Chg) of all Divisions and CHC(TT) of Zonal HQ having good knowledge of local conditions and Time Tabling shall be deputed for revision of Time Table. CPTM at the Headquarter Office holds meeting with all master charts, Divisional recommendations, staff suggestions, suggestions from individuals, members of public, Divisional Rail User Consultative Committee, Passenger Association, etc. The co-ordinating meetings with various departments viz. Mechanical, Electrical, Engineering, S&T and Commercial are also held by CPTM/COM. Suggestions from postal department, ZRUCC, MPs, MLAs are also kept in view. Before the time table is finalised, Inter Railway Time Table co-ordination Committee Meeting is held by Executive Director (Chg) of Railway Board and the CPTMs of all the Railways. In this meeting, they discuss the timings and arrive at agreement in handing over the Inter Railway Trains at junctions. The feasibility of introducing new trains, extending a train is also deliberated with the Railway Board's representative and decisions are taken. After finalization, the new proposals are submitted to Minister of Railways to decide on their inclusion in the budget.

#### 6.09: Considerations governing the preparation of Passenger Time Table:

##### 1) User's requirement:

- a) The departure and arrival timings of passenger trains are decided taking into account the requirements of travelling public such as -
  - i) Businessmen going to big commercial centers and returning after business hours.

- ii) Litigants attending courts and returning in the evenings.
- iii) Employees going to attend offices, students attending colleges and schools and workmen going to place of work and returning to homes.
- iv) Postal mail require reaching important trading centers in morning and leaving in evenings.
- v) Long distance passengers desirous of having a full night's sleep during journey.
- vi) Although all types of passengers, generally want the trains to originate and terminate at the convenient hours, it is not possible to accommodate the demand though this can be attempted to the extent possible.

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

**c) Halts for Meals, etc:** Halts for enabling the passengers to get tea, snacks, drinking water, meals, etc., have to be provided at suitable stations. Though, some catering arrangements are available in the train, halts have to be provided for the convenience of passengers.

**d) Overall Commercial Speed:** The long distance passengers desire to complete the journey within the least possible time. Therefore, while deciding about the halts at roadside stations; the effect on the journey time for the train is also kept in view. The overall speed or the commercial speed is particularly important in case of peak time traffic in the suburban section and trains like Rajdhani/Shatabdi.

**e) Requirement of Public with Different Travel Range:** Passenger train halts and timings have to be taken into account for the convenience of various categories of passengers viz.

- (i) Short Distance Passengers travelling between major commercial centers or capitals/districts, cities or towns or villages around such major cities commute to city centers, industrial centers and return to their hometown in the evening. The travel distances generally ranges between 60 to 150 Kms. Such passengers travel together regularly in groups from a few places and hence some long distance trains are provided halts for them.
- (ii) Medium Distance Passengers: This category consists of the passengers whose travel range falls between 150 to 500 Kms. Some of these passengers travel between important cities and prefer to have overnight trains. A large number of passengers in this group work in major cities and visit their native places frequently for various reasons.
- (iii) Long Distance Passengers: Long distance passengers prefer fast trains with increased level of comforts and having least stoppages.

## 2) Railway's Requirement:

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

- a) Availability of suitable coaches, locomotives, crew and guard

- b) The terminal facilities like stabling lines, Carriage & Wagon examination and repair facilities, reception and berthing facilities at the junctions etc.
- c) Primary and Secondary Maintenance facilities of rakes
- d) Rake links, Engine Links, change of Locos for the maintenance schedules or their fuelling, change of traction, etc.
- e) Cleaning and watering of trains.
- f) Line capacity and availability of path.
- g) Need for precedence to faster trains and crossings.
- h) Maintenance Blocks and Engineering speed restrictions.
- i) Connecting trains, attaching/detaching of slip coaches and through service coaches, etc.
- j) Loading/unloading of parcels, luggage, etc.
- k) Provision of recovery time for recovery of late running trains caused due to unforeseen circumstances.

#### **6.10: Important Factors to be kept in view while preparing Time Tables:**

**(a) Maximum Permissible Speed:** The maximum permissible speed over different sections is approved by the Commissioner of Railway Safety taking into consideration the condition of track, bridges, curvature and gradient. This speed limit shall not be exceeded by LP under any circumstances. Maximum permissible speed for each type of stock and locomotive is also fixed for different sections and notified in the Working Time Table.

**(b) Minimum Permissible Running Time:** The minimum permissible running time between stations is fixed on the basis of maximum permissible speed. However, permanent speed restrictions are taken in to consideration for the concerned section. A Loco Pilot should not cover the run between two stations in less than the minimum running time published in the Working Time Table. While fixing the minimum running time, due consideration is given to the permissible track speed, load of the train, type of locomotive, acceleration, deceleration, restriction over facing points and turn-outs and Engineering restrictions, stoppages en-route, etc.

**(c) Time Allowance for Stop and Start:** The time allowances for stop and start at stopping stations shall be taken into consideration while preparing time table.

**(d) Time allowance to cover Permanent and Temporary Engineering Speed Restrictions:** Time allowance to cover permanent and temporary engineering speed restrictions is provided on each section, based on the track structure and work proposed to be carried out by the Engineering department.

**(i) Permanent Speed Restrictions:** These speed restrictions are the ones which are supposed to be for sufficiently long duration and are mentioned in the Working Time Table. Since copies of the WTT are available with the train crew and also caution indication boards are available at site, no other intimation is required to be given to them through caution orders on day to day basis. The time lost by the trains in observing these restrictions shall be considered for calculating the running time over a section and is time tabled accordingly. The restrictions which are expected to be imposed more than the currency of the time table are to be included as PSR which should be reviewed at the time of revision of the time table.

**(ii) Temporary Speed Restrictions:** A number of speed restrictions may have to be imposed for a short duration either on account of defects in track and related equipment or to facilitate repairs

to the track and OHE and signaling installations. Requirement of time for such repairs is assessed well in time before a new time table is introduced and this time is separately provided in the time table and is called 'Engineering Allowance'. This time is also provided in the time table short of junction stations or at the divisional/zonal interchange points. If there are repair works elsewhere on the section, trains would run late and this would be adjusted before the junction interchange points.

**(e) Recovery Time:** This time allowance is provided to compensate for time lost by a train due to unforeseen reasons such as alarm chain pulling, points and signal failures, fog, storms etc. Generally recovery time is provided ahead of major stations so that the loosing train can pick up its own path in the remaining portion of the journey from that major station. Some cushion of recovery time shall also be provided in the last lap of the journey for right time arrival at the destination station for scheduled pit occupation.

**(f) Time allowance of Junction station:** Time allowance at junction stations for maintaining connection with other trains and for other public requirements should be judiciously fixed and tedious halts avoided. The authorised permissible detentions to trains at junction stations are to be shown in the Working Time Table.

**(g) Platform Facilities at Terminal and Junction Stations:** When working out the timings for passenger services, it is essential to keep in view the facilities like platform availability, platform length, etc., at terminal and junction stations.

**(h) Sectional Coaches:** Sectional coaches are coaches which are run on selected trains between two important stations on the direct route of a train. These coaches shall be detached en-route at intermediate station.

**(i) Through Service Coaches:** Through Service Coaches are coaches which are transferred from one train to another at a junction station to reach a destination not served by the originating train. These coaches are run on certain passenger/Mail/Exp. train services for the convenience of passengers. It is not always feasible to arrange direct train service to all destinations. In such case, some through coach(es) shall be attached to run between two important stations on the direct route of a train which shall be detached en-route to connect with another train to reach the destination. Such through coaches shall also be attached for return trip. Sufficient time gap between two connecting trains should be given to avoid excess detention either to slip coaches or to connecting train.

**(j) Link Trains:** Passengers may need changing from one train to another while going from main line to branch line and vice versa. Scheduling of trains has to be so adjusted that the passengers are not required to wait for unduly long time at junction stations for connecting trains.

### 6.11: Factors Necessitating Review of Time Table:

Broadly, the timetable for a section generally remains static. But due to following factors, it is necessary to review the time table every year with minor changes.

- i) Introduction of new trains on the section or cancellation of some trains.
- ii) Introduction/elimination of some halts or changes in duration of halts.
- iii) Change in traction or type of loco.
- iv) Change in load of the train, particularly for introduction/ elimination of slip coaches.
- v) Change in speed restrictions or the maximum permissible speed.
- vi) New rake links or engine links,
- vii) New connections or elimination of connections.
- vii) Improvements in line capacity of the section and commissioning of new lines
- ix) Improvement in terminal facilities or maintenance facilities.

**6.12: Rake Links:**

For running a particular train, specified type of coaches in the prescribed marshalling order are required. Since trains have long runs and the rakes are required to be examined and maintained generally at both the terminals, it is not possible to maintain a particular train service with one rake only. Therefore, more than one rake is necessary for most of the trains. At some locations, there may also be constraints for stabling of idling rakes. Therefore, in order to avoid blockage of lines/ sidings and to achieve economic use of rakes, Zonal Railways draw schedule of the train so as to run to earn maximum kilometers from a rake before it is offered for regular maintenance.

Rake link is drawn up keeping in mind asset utilization and maintenance scheduled of the stock. Thus, one rake link may cater to only particular train or the rake may run for different trains in a link. The rake link also helps in ascertaining the actual requirement of stock for running the passenger services. Number of rakes required for a link is equal to the turn round of the link in days.

Rake link helps to keep intact the different coaches earmarked to run on set of rakes operating on Mail, Express and Passenger trains. If it is absolutely necessary to detach a coach from a set of rake due to sick marking or any other valid operational reason, it has to be ensured that the same is replaced on the relevant set of rake on the next trip. All concerned have to ensure that the authorised composition of trains is constantly watched and any deviation should be rectified at the earliest opportunity. Supervisory officials also to concentrate on proper upkeep of coaches by checking up fittings, equipments, etc., frequently. An example of rake link is given below.

**1. Example of a rake link for train no.12841/12842 is given as under.**

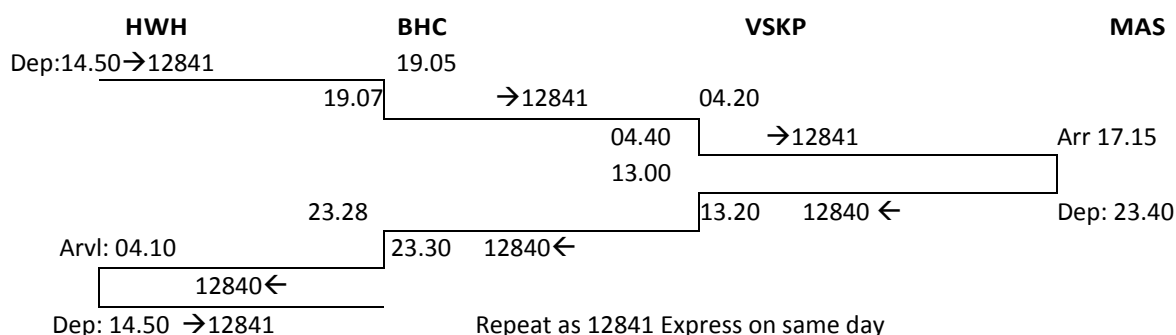
12841/12842 HWH- MAS COROMANDAL S/FAST EXPRESS.					
TOTAL KM	12841=1662 12842=1662	RUNNING TIME	12841 : 26.25 12842:27.05	AVERAGE SPEED	12841 : 62.91 12842 : 61.37
NORMAL COMPOSITION	GSLR=01 GSLRD=01	GS=03	WGSCN=12	WFACCW=01 WACCW=02 WACCN=03 WCB=01	(CBC STOCK) =24

**2. MARSHALLING ORDER:**

12841 EX HOWRAH: ENGINE			12842 EX MAS: ENGINE		
GSLR	01	HWH-MAS	GSLRD	01	MAS-HWH
GS	01	HWH-MAS	GS	02	MAS-HWH
WGSCN	12	HWH-MAS	WFACCW	01	MAS-HWH
WCB	01	HWH-MAS	WACCW	02	MAS-HWH
WACCN	03	HWH-MAS	WACCN	03	MAS-HWH
WACCW	02	HWH-MAS	WCB	01	MAS-HWH
WFACCW	01	HWH-MAS	WGSCN	12	MAS-HWH
GS	02	HWH-MAS	GS	01	MAS-HWH
GSLRD	01	HWH-MAS	GSLR	01	MAS-HWH
TOTAL	24		TOTAL	24	

Station	Time	Direction	Train Name
Dep: 23.45	→	12839	12839
04.07	→	12839	12839
13.50	→	12839	12839
14.10	→	12839	12839
21.50	→	12839	12839
07.15	→	12842	12842
07.17	→	12842	12842
22.10	→	12842	12842
11.50	←	12842	12842
08.45	←	12842	12842

Repeat as 12839 Express on same day



4. LOAD			5. TRACTION		
Section	Normal	Maximum	Section	Traction	MPS
HWH-MAS	24	24	BHC-VSKP	WAP-4	110Kmph
			VSKP-MAS	WAP-4	110Kmph

- |     |                            |  |
|-----|----------------------------|--|
| 6.  | THROUGH SECTIONAL COACHES: | NIL  |
| 7.  | CONTRIBUTION: Total Rakes: | Six (6) rakes  |
| 8.  | MAINTENANCE:               | Primary: SRC with RBPC, Turn Round Attention : MAS     |
| 9.  | DAYS OF RUN:               | DAILY  |
| 10. | SAFE TO RUN EXAMINATION:   | VSKP, BZA  |
| 11. | CARRIAGE WATERING :        | KUR, VSKP, BZA, MAS                                    |
| 12. | TRIP KMS :                 | 3324 KMs   |
| 13. | LINK KMS :                 | 6648 KMs   |
| 14. | INTEGRATED WITH:           | Integrated rake of 12839/12840 Mail. & 12841/12842 Exp |

**NB: The rake formation will be reversed at VSKP.**

The over-all plan for rake movements is described in a rake link booklet issued for official use by CPTM and COM of respective Zonal railway, which has details of the planned rake links, composition, marshalling order, permissible loads and accommodation in Mail/Exp and Passenger trains handled by the Zone. It provides the information like Composition of a train, Marshalling order, Permissible load, Watering stations, Postal accommodation, Locomotive allotment, Maintenance stations, Lie over periods, Distance in KM earned in a round trip, etc.



**Advantages of rake links:**

- i) More services can be provided to the required/needy area through review of rake links.
- ii) Reduce idling hours of coaches before or after the maintenance schedule.
- iii) Reduce coaching yard congestion
- iv) Increase utilisation of coaches.
- v) More passenger throughput thereby more revenue to railways.
- vi) More availability of platforms, pit lines and maintenance lines.

**6.13: Engine Links:**

Selected locomotives of prescribed classes of different traction are used for the coaching services. Engine link is the schedule of an engine to work one or more coaching trains between nominated stations before proceeding to shed. Objective of engine link is to ensure optimum utilisation. These links should be drawn in such a way that locos should not be kept idle for long time. Following stipulations should be kept in view while preparing engine links.

- i) Loco/Power links are prepared by HQ.'s office and circulated to the divisions.
- ii) Train timings should be checked from latest time table.
- iii) Links to be prepared before commencement of new time table.
- iv) Efforts should be made to send the loco to home shed for servicing within the stipulated schedule time
- v) Minimum possible out station halt should be provided.
- vi) Ensure that loco is permitted to run on the sections at the max. Permissible speed of the train.

**6.14: Duplication, Diversion, Cancellation and Short Termination of Trains:**

- (a) A duplicate Passenger train may be run if the original train is running abnormally late to the extent of causing serious inconvenience to passengers and up-setting connection with other important trains. CPTM of the zone is authorized on behalf of COM to order duplicate train with intimation to Railway Board.
- (b) A passenger train may be diverted by another route or short terminated due to serious accidents or floods or breaches causing dislocation of traffic and blocking of normal route. CPTM on behalf of the COM is authorized to order the same with due intimation to Railway Board.
- (c) Keeping in view abnormal working like serious accident, floods, breaches, agitation, when there is interruption of through communication for a considerably longer period or when the incoming rake is running inordinately delay, Zonal Railway can cancel or short terminate Mail/Exp trains, in consultation with Railway Board. Chief Operations Manager may authorize the divisions for cancellation of local Passenger trains.

**6.15: Punctuality:****Punctuality of Passenger Trains :**

Millions of passengers travel by trains on the Indian Railways every day. Efficiency of passenger train operation is judged by the punctuality of passenger services. Late running of trains not only spoil the public image of railways but also cause huge revenue loss to railways. It is monitored at various levels of railway operations and management. Due to inherent problems and unforeseen circumstances in day to day railway working, trains may get delayed and it may not be possible to run trains to time. In case of regular delay, detailed cause wise analysis of bad runners and bad sections are to be made and necessary remedial measures should be taken.



Station and Running staff and Control must understand clearly their duty to ensure punctuality in train running. Efforts must be made by all concerned to make up time at stations when a train is running late. Loco Pilots must be on the alert and ready to start their trains immediately on taking off signal and receipt of the Guard's signal and should run their train at maximum permissible speed. If a train arrives late at long halt stations, such trains may be dispatched before the allowed halt time to minimize the late running time.

Some of the important factors that affect the punctual running of trains is given below which are indicative but not exhaustive:

**(i) Operating Department:**

- a) Running of more number of trains on already saturated sections.
- b) Faulty time tabling
- c) Bad controlling
- d) Late placement of rakes on platform
- e) Extra time taken for shunting,
- f) Inadequate terminal facilities
- g) Frequent changing of berthing platforms and marshalling of trains

**(ii) Signaling Department:**

- a) Failures of block instruments, points, signal or interlocking
- b) Improper maintenance of S&T equipment.

**(iii) Mechanical Department:**

- a) Loco and coach defects
- b) Hot axle/flat tyres
- c) Late turning out of train engine from shed.
- d) Insufficient air pressure
- e) Failure in water filling at notified locations.

**(iv) Electrical Department:**

- a) Defective lights, fans and AC resulting into ACP by passengers
- b) Tripping/OHE failure
- c) Electrical Loco defects

**(v) Engineering Department :**

- a) Excessive engineering speed restrictions more than allowed
- b) Bursting of engineering blocks.
- c) Improper maintenance of track.

**(vi) Commercial Department:**

- a) Delay in loading and unloading and sealing of parcel compartments,
- b) ACP by passengers

**6.16: Not Loosing Time Concept:**

A late running of a train in one railway/division due to any reason cannot be accounted in another ones performance. If a train is taken over by a railway/division from another railway/division with a late arrival of say 15 minutes and if it continues to run with the same late and handed over to another railway/division with same 15 minutes or may be earlier also, then as far as this railway/division is concerned, the train has not lost any time further and said to be punctual. This concept is known as NOT LOOSING TIME (NLT). In case, if the train is handed over by 20 minutes late, then the train has lost punctuality only by 5 minutes.

**6.17: Calculation of Punctuality:**

Punctuality is calculated train wise (Mail, Express, Passenger, Suburban). It is expressed in percentage. Targets are fixed for zonal railways for punctual running of trains.

$$\text{Punctuality} = \frac{(A+B+C)}{D} \times 100$$

A= Number of trains arrived destination right time.

B= Number of Inter Railway trains not loosing time in the system.

C= Terminating trains not loosing time.

D= Total number of trains run on the system.

**6.18: Punctuality Meetings:**

A punctuality register must be maintained at all divisional control offices. CHC (Chg) should show the breakup of detention particulars along with reasons in the division and specify the department responsible for delay, if any. This information of previous day shall be transmitted to CHC(Chg)/Zonal HQ daily through COIS at 04.00 AM positively. This shall be put up to GM and all PHODs in their morning position. CPTM shall undertake analysis of cause-wise and train-wise detentions to mail and express trains. Causes contributing repeated detentions should be brought to the notice of PHODs concerned. Respective department must take a note of the delay and take immediate remedial measures to avoid recurrence. Inordinate delays of selected Mail/Exp trains and late running of premium trains must be transmitted to Railway Board along with reasons.

Daily punctuality conference is held by CPTM/DY.COM (Chg)/STM (Chg) with the Sr.DOM (Chg)/DOM (Chg) of divisions to analyze the performance of trains on the same day as well as failures of previous day. Divisions should present the detention particulars in an analytical manner taking in to consideration of recovery particulars section wise, for each train. Instructions of Zonal Head Quarter should be recorded in conference order register by both CHC (Chg)/HQ as well as CHC (Chg)/Divisions. Punctuality meetings are held at regular intervals at divisions and zonal HQs which are presided by DRM/GM in which a detailed analysis of cause-wise and train-wise detentions are discussed and remedial measures are taken.

**6.19: Remedial Measures to Improve Passenger Punctuality:**

- (i) To maintain punctual running of passenger carrying trains the Loco Pilot must run the train at maximum permissible speed.
- (ii) Guards of coaching trains must clearly maintain time loss if any, in the T-34(HF) for each block section.
- (iii) Detention particulars must be scrutinized by CHC (Chg) for each train & cross check the same with stations concerned.

- (iv) Strong action should be initiated against errant staff & in case it is detected that LPs are not running to MPS then allotted LI should be directed to monitor the LP for 07 days by foot plating the train.
- (v) To ensure punctual running of coaching trains, frequent punctuality drives should be conducted by nominating officers. If possible, the scheme of own your own train should be adopted & orders to be issued by DRM of divisions.
- (vi) For trains running late, the allotted halt at big stations should be curtailed only on the consideration of basic requirement & so also for the trains having earlier public departure timings.
- (vii) Detention of coaching trains for loading/unloading of parcel in the SLR as well as leased SLR is a common phenomenon. To ensure proper monitoring & improved punctuality performance of coaching trains, a commercial officer of Zonal Head Quarter of Dy.CCM level should be nominated by CCM to monitor on daily basis & answerable for all queries.
- (viii) Delogging of punctuality loss against a particular department should be mooted through Sr.DOM/ DOM (Chg) of the division & should be scrutinized by Dy.COM (Chg) at Head Quarter. However, CPTM is the final authority and his decision is binding on the punctuality loss determination.

#### **6.20: Stoppage of Mail/Express and Other Passenger Trains Out of Course:**

- (i) Premium service trains can be stopped out of course with prior approval of CPTM only.
- (ii) Mail/Express trains other than premium service trains can be stopped out of course with prior approval of Sr.DOM only.
- (iii) Rest all other passenger trains can be stopped out of course with prior approval of DOM (Chg)/ AOM(Chg).
- (iv) Any train may be stopped out of course by the SM on written request from a magistrate or a police officer not below the rank of Dy.Superintendent proceeding on duty to attend very serious case of crime or for maintenance of law & order. However, SCR should ensure prior permission of concerned authority related to the train before giving permission for stoppage.

#### **6.21: Restricted & Prohibited Trains:**

Restricted trains are those trains, in spite of availability of extra room on the train, in view of the risk of punctuality loss, attaching of coaches is restricted. However, extra carriage can be attached to these trains only with the sanction of CPTM.

Prohibited trains are those trains to which no extra coach can be attached. This prohibition may be for a portion of journey or particular type of coach only. However, for attaching permission of Railway Board is required. List of restricted & prohibited trains are circulated by Railway Board from time to time.

#### **6.22: Rules for Booking Special Coaches and Special Train on FTR (Full Tariff Rate):**

- (a) Application for reservation of carriage must be made through the SM of originating station to the CPTM, giving details of the journey such as destination, route to be followed, halts en-route & specific train to which the coach is to be attached at least 30 days in advance & not more than 6 months prior to the commencement of journey.
- (b) In case any party wishes to requisition a special coach at the short notice of less than 30 days, specific permission must be obtained from CPTM.

(c) It will be the sole discretion of the Railway Administration to allot coach/train & programme its movement depending on the availability of coaches, path and other operational constraints.

**(d) Security Deposit cum Registration Charges:**

(i) An amount as prescribed from time to time which at present is Rs50,000/- per coach as Registration charges-cum security deposit for a journey period of 7 days. An additional charge of Rs10,000/- for each extra day will be payable at the station from where the proposed journey will commence, of which half will be retained as security deposit & the balance amount would be adjusted against the fare payable at the time of booking. The security deposit will be refunded by the SM of the originating station on completion of the tour adjusting any other amount of extra detention etc.

(ii) The deposit charges for allotment of reserved coaches for journeys performed by railway employees and their families on privilege pass & passes/PTOs would be an amount as prescribed from time to time, which at present is Rs15000/- per coach.

**Note:** Tourists are exempted from paying the Deposit for reserved carriage, provided:

(i) They apply through recognised Tourist Agents who should give a guarantee to the Railways.

(ii) Their journeys are sponsored or recommended by Indian Embassies abroad.

(e) Reserved coaches are not guaranteed – Railway administration do not guarantee reserved carriages/coaches by any particular train and will admit no claim for compensation for inconvenience, loss or extra expenses due to such accommodation not being provided or attached to trains by which asked for.

(f) Parties requiring such accommodation need not be members of the same family.

(g) The reservation of coach/special train will be on priority of date of registration i.e application along with security deposit receipt duly forwarded by SMR/SM of originating station endorsing the Money receipt number and date of the security deposit.

(h) Charges for special coaches/special trains will be computed point to point on the basis of full adult Mail/Express fare of the concerned class for the actual number of passengers travelling or the marked carrying capacity of the coach whichever is more + Safety surcharges + Service charges + Empty haulage charges + Detention charges @ prescribed from time to time.

(i) The charges must be paid in full, 48 hours in advance of the departure of the train to which special coach are to be attached failing which it will be deemed that the running of special coach has been countermanded by the organisers. The entire registration cum security deposit will be forfeited in this case. Same rule is also applicable in the case of special train.

(j) As prescribed from time to time the minimum composition of special train at present is 18 coaches and minimum chargeable distance is 500kms for Mail/Express train both for coach as well as special train.

(k) No concession will be allowed for booking of special coaches. Charges will be recovered in full for children, students, Sr.Citizens etc.

**6.23: VEHICLE CODES FOR COACHING STOCK:**

For easy reference and identification, each and every type of coaching stock is provided with a code. Following codes are given for various types of coaching stock.

**DIFFERENT TYPE OF B.G. COACHING VEHICLES OWNED BY INDIAN RAILWAYS**

SN	Group Description	Alpha Type Coaches	Type and Description
1	Fully Air Conditioned coaches	WAC	Fully Air Conditioned (Vestibuled)
		WGFAC	Fully Air Conditioned (Vestibuled) self generating
2	Partially Air Conditioned coaches	FAC	Air -conditioned coach with First Class.
		FACC	Air -conditioned coach with First Class with Coupe
		WFACCW	First AC cum Second AC.
3	Second AC Sleeper.	WGACCW	Air-conditioned Two tier sleeper (Vestibuled).
4	Second AC 3-tier sleeper	WGACCN	Air-conditioned Three tier sleeper (Vestibuled).
	Second AC Chair Car	WSCZAC	Air-conditioned II-Class chair car.
5	II AC Chair Car. (EOG)	WGSCZACEN	Air-conditioned II-Class chair car with end on generation
6	First Class Coaches	FC	First Class coaches (With Coupe)
7	First class composite coaches	WFCS	First and Second class coach with coupe (Vestibuled)
		EWFRCP	First Class with brake & observation
		WGFSCN	First & Second class coach with Coupe
8	Second class coaches and second class composite coaches	GS	Second class (self generating)
9	AC Executive chair car	WGFCZACEN	Air-conditioned I- Class Executive Chair Car with end on generation
		WGSCZ	II-Class Chair Car (Self generating vestibuled)
		WGSD	II-Class Double Decker (Self generating vestibule)
		SRN	II-Class with power Car.
		SPPT	II-Class Coach with 3/4 postal.
		SP	II -Class Coach with 1/6 postal
		SPPC	II-Class Coach with full postal.
		SPPH	II-Class Coach with 1/2 postal.
		SPPQ	II-Class coach with 1/4 postal.
		SYPPC	II-Class Coach with ladies and postal.
10	Parcel luggage van	VP	Bogie Parcel Van.
		EVP	Four Wheeler Parcel Van.
		VVN	Bogie Milk Van.
		VPH	High Capacity Parcel Luggage Van.

11	Motor & parcel van	VPR	Refrigerated parcel van
12	II class sleeper coaches	WGSCN	II class 3 tier sleeper (self generating) vestibule
13	SLR Group/II Class composite coaches	SLR	II Class with brake & Luggage
		GSR	II-class with brake Van
		DSLRL	Disabled Second Class With brake & Luggage.
14	LR group	LR	Luggage Brake Cum Van
		WLRRMEN	Luggage & Brake with generator (vestibule) EOG
15	Upper Class	CTAC	Air Conditioned Tourist Car.
	Tourist Car	CT	First Class Tourist Car.
16	Lower Class	CTS	Second Class Tourist Car
17	Dining/Kitchen/Buffer car	WCD	Dining Car vestibule
		WCB	Buffer car vestibule (Pantry cars)
		WSCBZAC	Dining Cars (Vestibuled) – AC with chair car
18	Inspection carriages, saloons, staff and Misc.Departmental vans	ER	Inspection carriages
		RA	Officers Saloon.
		RH	Bogie Medical Van.
		RHV	Auxiliary Medical Van with Brake relief.
		BLRZ	Ostilograph Car.
		DKRD	Dynamo meter stores Cum Staff Car.
		DKDS	Dynamo meter stores Cum Staff Car.
		ERS	Stores Delivery Van. (four Wheeler)
		ERU	4- Wheeler Tower Wagons.
		RD	Bogie Staff Car for Research Directorate.
		RM	Charging Van.
		RS	Stores Delivery Van
		RE	Mobile Training Car.
19	Postal Van	PPS	Full postal vans
20	Military coaches	M	II – class Military Coach of own(Military) base
		MA	II – Class Military Coach provided by Rly
		MF	I-Class Military Coach
		MK	Military Kitchen Car
		MRA	Ambulance Ward Car.
		MS	Bogie Military Special Car.
		WACMRA	AC Ward Car (Military)
		WACMRD	Ward Cum Dinning Car ( Military)
		WM	II-Class Military Coach (Vestibule)

		WMF	I-Class Military Coach (vestibule)
		MGSCNR	II-Class 3-tier with Brake (Military)
21	Treasury Van	VPT	Treasury Van with security staff
22	Brake Van	SRJ	Second Class Brake Van
23.	Second Class	GSCZJ	Second Class Jan Chair Car.
24	Second Class AC Chair Car	CZACJ	Second Class Air- condition Jan Chair Car.
<b>LHB Coaches</b>			
25	LGS		Second class self-generating
26	LSCN		Second class 3-tier sleeper
27	LWACCW		AC2 Air-conditioned 2-tier sleeping-car
28	LWACCN		AC3 Air-conditioned 3-tier sleeping-car
29	LWCBAC		Air-conditioned pantry/kitchen/buffet car
30	LWFAC		AC 1 Air-conditioned first class sleeping-car
31	LWFCZAC		Air-conditioned executive chair car
32	LWLRRM		Luggage/generator/brake van
33	LWSCZAC		Air-conditioned chair car
34	LWSCZ		Chair car

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## CHAPTER-7

# FREIGHT TRAIN OPERATION

### 7.01: Importance of Freight Train Operation:

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

### 7.02: Broad Classification of Goods Trains:

Goods trains are classified as follows:-

- a) **End to End Trains or Through Goods:** Through goods train means those trains, which generally run from one yard or terminal to another yard or a terminal without attaching/ detaching en-route. Such train does not require any stoppage en-route except for crew change. To be more specific, in case of loaded rakes from loading point to unloading point & in case of empty rakes from unloading point to loading point or examination point. Through trains may have two or more destinations on the same or adjacent section. These trains include container trains & air braked block rakes.
- b) **Work Trains, Shunting Trains, Pilots, etc:** These train movements are for short distance for clearance of road side wagons, damaged wagons made fit or for supply/removal of wagons to and from the sidings or important terminals served by a yard. e.g. Juggler
- c) **Departmental Trains:** Trains such as material trains, track maintenance trains, ballast trains, relief trains, OHE car, crane specials, etc. required for departmental use come under this category.

### 7.03: Complexity of Freight Operation:

Freight operation is generally more complex than passenger train operation for the following reasons:

- (a) The changing pattern & fluctuations in demand for rakes/wagons due to change in the level of production, changes in the pattern of distribution & changed consumption centres.
- (b) The variety of commodities to be moved, with different characteristics & type of wagons required.
- (c) Preferential traffic schedules, rationalisation schemes & other public policy regulations.
  - (i) Seasonal variations in demand.
  - (ii) Time taken in loading/unloading, whether manual or mechanical.
  - (iii) Train examination system.
    - End to end/Intensive Examination
    - Premium end to end.
    - Close Circuit Rakes

This in turn results in sick wagon detachments & attachment of fit wagons for completing the rake composition.

- (d) Following are the series of operations for empty rakes being offered for loading.
- Examination
  - Supply/placement
  - Loading
  - Despatch
- (e) For inward loaded trains which after placement & release have to be back loaded at the same terminal or at other location, withdrawal from loading points may require an outward examination unless the rake is fit for round trip or for a prescribed distance.

Once the train is fit in all respects & commercial formalities have been complete a set of activities are initiated, these include:

- Preparation of train documents.
- Train ordering
- Arranging train crew & locomotives
- Monitoring of train movement
- Arrival at the destination

This cyclic operation requires constant monitoring & co-ordination.

#### **7.04: Ordering of Goods Train:**

- (a) Each freight train is required to be ordered to run under a unique number/name or train ID for monitoring its movement through intermediate divisions, zones etc as also to facilitate all processes at control offices, yards, C&W depots, station & Crew/Guard booking lobby/Power control/Traction loco control.
- (b) The message from Divisional control that a train is scheduled to leave from a station or yard at a certain time, is known as the Train Notice. The message is, in turn further conveyed to all concerned. The availability of suitable (i) load (ii) Locomotive (iii) Crew/Guard & (iv) Path has to be kept in view for ordering of goods trains.
- (c) Co-ordination between the Traffic Controller & the Power controller, the shed if fresh power is required, the Yard/Station, C&W staff & the crew/Guard booking lobby is thus required.
- (d) Regular conference with yards, terminals & the adjoining division is held by the Control & for exchange of information regarding forecast of trains in yards; completion of loading/unloading at sidings etc. & interchange with adjoining divisions. This monitoring should be enforced through FOIS so that time of staff spent on phone is reduced & more productive work is done by better planning.
- (e) Constant monitoring for expediting loading/unloading at major siding/goods shed is also done by control & station staff for ensuring the availability of load.
- (f) The train notice should be given to Crew & Guard at least 02 hours in advance, except emergency.

#### **7.05: Planning of Locomotives:**

##### **(a) Power Plan:**

The power plan indicates the daily average number of locos required and planned for various services on the railway, including goods, mixed, shunting and departmental purposes. It also takes into consideration the Locos that are required to remain in Loco Sheds for maintenance schedule. The bare requirement of

Locos for Traffic use is calculated on the basis of the traffic turn round and average number of trains run on each section, i.e. on the basis of the average time taken to work trains in each direction for each section, (including the yard detention) multiplied by the average daily number of trains required to be run on the section. This represents the average bare number of locos that have to be out on line on a Division for the use at any time.

**(b) Loco Outage and Loco Utilisation :**

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

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

Loco outage can be prepared service-wise/shed-wise/railway-wise, traction wise etc. The actual Loco outage should generally be around the target fixed for each Division. However, it should be appreciated that while the target is based on average, the actual requirement of Locos may fluctuate due to bunching of trains, increase in traffic or due to bottlenecks on account of operational reasons, equipment failure or after effect of interruption to traffic.

**(c) Control of Operating department on Loco running:**

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

While operating department has to optimise the work done by each Loco i.e. moving maximum traffic with the minimum number of Locos by adoption of operational strategies and improving the efficiency, the Shed and the Loco organisation should provide optimum number of Locos in good fettle, keeping in view the traffic needs as, shortage of Locos can lead to transport bottlenecks and inability to move the existing and potential traffic. Along with the availability, reliability, safety and predictability have to be aimed. Loco failures, Loco troubles en-route and ineffective locos should be kept to the bare minimum. Balancing of locos is also required to be done i.e., locos without loads may be sent to other divisions where they are required. Reduction in terminal detentions and increase in average speed of goods trains would substantially improve engine utilization.

**(d) Availability of Engine Crew and Guard:**

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

**(e) Availability of Path:**

Theoretically, a Goods Train can always be run when load, power and crew are available and the next block section is clear but, despatching a train is of little use, if it is going to suffer excessive detention on account of non-availability of suitable path on the section due to peak coaching block or bunching of freight trains. Out of path train running would adversely affect the speed of goods trains, engine utilisation and crew duty hours apart from occupying lines at roadside stations. In fact, it may be difficult to despatch a train from a yard or junction in case of bunching of trains. Therefore the scenario of train running on a section has to be kept in view while ordering and running the goods trains. Generally, Mail/Express Blocks, Peak timings of Suburban or Commuter traffic and running behind slow stopping Passenger Trains are to be avoided. Readiness of the interchange point or the terminal to accept the trains are to be kept in view before pushing a goods train ahead. In case of single line section, directional flow in convoy is preferred. However, crew long hours of duty is required to be taken into consideration while arranging crossing & precedence.

**(f) Master Charts:**

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

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

**(g) Lobby System:-**

A lobby is like a control office in the field. It is established with the twin aim of reducing engine detention & crew detention in a yard or a crew or engine changing station by realistic ordering of trains & Crew/Guard booking.

It is advantageous to have a combined Crew and Guard booking lobby so that both are available simultaneously. The lobby supervisor/staff can take forecast of a train running from the Deputy Chief Controller/Section Controller along with details regarding the names of Crew, Guard and their signing on time, loco particulars, last C&W examination etc.

They can verify the dates of loco schedules from the chart available with them and keep liaison with the Power Controller/TLC. They also keep watch on “expect” of train formation, examination, readiness etc. and by constant chasing, planning and updating information, trains are ordered on realistic except, trains may be put back or cancelled, if required and crew booking and engine allocation changed promptly.

Some overlapping Crew/Guard may also be kept in the lobby to take care of the last minute absenteeism. Shunters may also be kept in lobby of big yards /junctions to attach, detach and run round locos or to pull the Train from yards up to the Crew changing points, so as to avoid wastage of main line loco pilots.

The pre departure detention of the Crew, Crew hours balancing, rescheduling of locos and yard detentions of locos can be thoroughly monitored by the lobby and remedial measures taken.

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

Large number of agencies play important role in freight operations and almost all the branches of Division have direct or indirect role. In view of involvement of different departments in train operation, representatives of different departments work round the clock in control to co-ordinate among each other from one place. Marshalling Yards, Train Examination, Locomotives and Lobbies have been discussed elsewhere in this Manual. Role of a few agencies are discussed below with special reference to freight operations.

**Control Office:** The main function of the Control Office is planning, execution and review though in practice, all the three activities would be going on simultaneously.

**(a) Planning:** Planning is aimed at forecasting and optimizing the following :-

- (i) Interchange
- (ii) Trains to be run section-wise
- (iii) Supply of rakes for bulk loading, and empties for transshipment etc.
- (iv) Release of inward loaded rakes placed for unloading.
- (v) Engineering blocks and special moves

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

- (i) Analysis of divisional wagon holding
- (ii) Power availability
- (iii) Availability of loads
- (iv) Demands for loading
- (v) Disposal of empty rakes.

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

**(b) Execution:** The goods operation plan are executed on the basis of the actual materialization of the forecast with suitable adjustments made for short falls/excesses. Control conveys necessary instructions from time to time throughout the day. To execute the plan, it has to control, direct, co-ordinate and motivate various agencies for optimum output as per the plan and priorities for the day. Yards, Loco Sheds, Stations, Terminals, Lobbies and C&W depots are actively involved in execution of the plan.

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

- (i) Analysing shortfalls of previous day to take remedial measures and pin-point weak spots.
- (ii) Provide basic data for planing for the current day.

The main features of prformance, which can be reviewed, include :

- Interchange failures
- Divisional Wagon Balance (Wagons on Division)
- Train Running
- Disposal of empties
- Loading at important terminals and in case of shortfall, reason for the same.
- Review of unusual occurrences.
- Examination of control charts.
- Particulars of stabled loads.
- Yard performance.
- Unloading on division.
- Registration & loading.
- Power position.
- Utilisation of locos & terminal detention.
- Sick line working.
- Special type of stock.
- Clearance of piecemeal wagon (sick or otherwise) from road side stations.

### **7.07: Headquarter's Role in Freight Operations:**

The division's freight operations generally require close co-ordination and assistance from other Divisions and Railways. While direct contact is also maintained by the Control and Operating Officers of various Divisions, the Zonal Head Quarters play a pivotal role in this respect. Some of the functions performed by the Head Quarters are summarised below.

#### **Management Information System:**

(a) Important information concerning the position of Freight Operations on various Divisions of Railways is obtained through line and stock report daily telephonically or through FOIS or Teleprinter or FAX to the Head Quarters (Central Control) from Divisional Control. Now more & more zones & Railway Board are shifting to FOIS generated reports. This includes, loading and stock position, particulars of old outstanding and fresh registration of indents, category wise position of unloading, transshipment, Yard balances, important yards and wagons on Divisions, train Running on each section, average speed, interchange position, Locomotive position and Locomotive utilisation etc.

The position is reviewed and analysed by the COM/CFTM/ Dy. COM(Goods), STM(Goods), ATM (goods) CMPE and CELE. The important position pertaining to various departments is conveyed to the



departments concerned as well as the General Manager. The Head Quarter Office also obtains the Statements at the end of each month or whenever required and the performance is compared with

- (i) The Targets
- (ii) The figures of the previous month
- (iii) The figures of the corresponding month of the previous year and
- (iv) The best ever record etc.

In addition, the Statistical Branch also provides data to the General Manager and the Departments concerned with Operations for detailed analysis and review.

(b) Head Quarters plays important part in planning and co-ordinating freight operations. After detailed conference with the divisional Operating Officers, Head Quarters issues directions and instructions for providing assistance regarding the following items:

- i) Interchange transactions (category wise)
- ii) Loading and Unloading
- iii) Advising traffic insight from other Railways/Divisions. This information is now available on FOIS terminal where a pipe line can be seen from end to end & expected arrival of train at destination is also estimated by FOIS system.
- iv) Conveying priorities for the day and setting quantified objectives to be achieved.
- v) Reviewing the work done at the important activity centers like Yards, Transshipment Points, Terminals etc.
- vi) Train and Traffic regulation in case of accidents etc.
- vii) Certain items of Goods Operation are directly controlled by Head Quarters e.g. Co-ordination and directions regarding rake Loading of programmed and committed traffic, movement of special type of stock, movement of over dimensioned consignments, out of turn allotments and allotment despite restrictions etc.
- viii) Clearance of Bottlenecks, Yard and Terminal Congestion, Hold ups, Excessive Wagon Balance on the Division etc. Assistance may be provided by Head Quarters by providing extra Locos, Wagons or by regulating particular stream of traffic or by imposing quotas or restrictions on the congested areas.

(c) In view of operational constraints experienced during day to day operation, the Planning for the important traffic facility works and augmentation of capacity is another important function of the Operating Department of the Head Quarters.

### **7.08: Railway Board's Control on Freight Operations:**

The Railway Board provides unity of control and direction for the train operations. It also has the important role of supervision and coordination, which is very much essential for a big network like Indian Railways. The Railway Board's control office also remains in contact with the HQ (Central Controls) of the Zonal HQs and watches loading and movement of important streams of traffic, like coal, raw material for steel plants (iron ore), cement, food grains, fertilizers, POL, sugar, export ores, etc. It also watches loading, interchange, power position, goods trains running on important sections etc., to ensure that each railway fulfils its obligation and optimises the use of various assets. The items watched are more or less the same as those watched by the Zonal HQs in respect of the divisions, but the perspective is wider. Railway Board plays an important coordinating role between various railways and other central government departments and vital sectors of economy connected with railways. Policy formulation and planning, which have important bearing on freight operations is also the major function of the Railway Board.



**7.09: Role of some other Departments:**

The commercial Department plays an important role in canvassing for traffic, improving marketing customer relations in general, booking of traffic, expediting loading/unloading of wagons, quick disposal of unconnected wagons & transshipment of wagon detached out of course for Hot Axles etc. The various other departments like Mechanical, Electrical, Civil Engineering & S&T provide & maintain various assets & infrastructure (track, wagons, engines, S&T Network etc.). These departments also ensure sufficient availability, reliability, predictability, safety & reduction in equipment failures; promptness in restoration in case of breakdowns & accidents should also be ensured. They also endeavor for the achievements in technology upgradation along with the operating strategies and determine the level of excellence in Railway operations to a great extent. In nutshell, all the functionaries have to work as a dedicated team.

**7.10: Some Indices of Freight Operation and Efficiency:**

The important Operating Statistics, most of which are indices of Operating efficiency, have been discussed in detail in the Chapter-15 of this Manual (Operating Statistics). Some Indices of Freight Operations and efficiency are highlighted below:

**(a) Wagon Holding:**

For a given amount of originating loading and receipts of loaded wagons from other Railways and making an allowance for percentage of stock out of commission for repairs, etc., there are an optimum number of wagons that a Railway, and separately its constituent divisions, should hold to maintain the fluidity of transport system. More wagons than the optimum number might lead to increase in the repairs and maintenance percentage, heavier detentions to wagons and trains and transport bottlenecks, i.e. more congestion in sidings, yards and sections without a proportionate increase in the tonnes lifted, or in the efficiency of operations. Similarly, excessive shortage of Wagons may lead to loss of traffic. Proper estimation and projection of requirement, proper planning and working at various stages of freight operations is necessary for keeping wagon holding low. “Ineffective Stock” percentage should also be kept minimum.

**(b) Interchange Balance:**

Maintenance of the interchange target is an indication of a Railway’s overall operating performance and its efforts to meet inter railway obligations, hence, interchange balance should not be very high, even when maximum trains are interchanged. However, attempts should be made to see that on busy sections, interchange is not only confined to few hours of the day but uniformly distributed.

**(c) Load of Trains:**

A train is a unit of transport. Depending upon the load, suitable loco is provided for its haulage. In order to get the optimum use of motive power and to increase the capacity utilisation and throughput, each Locomotive is given a load approximately to the maximum hauling capacity, unless operating necessity requires utilisation of a loco for lesser load. The stations should also ensure that wagons are loaded to the carrying capacity or the minimum weight prescribed for some commodities.

**(d) Loading and Unloading:**

Loading is one of the most important items in freight operations because, it is through loading that Railway earns the maximum revenue. Similarly, unloading is necessary so that wagon becomes available

for next loading. Hence, to optimize the loading, reduction of the time taken for loading/unloading by technology up-gradation and other strategies in co-ordination with the customers has to be endeavored.

**(e) Empty Running:**

Ideally, it is waste of transport capacity to run a wagon empty or with light load. But much of empty running is inescapable on account of the unbalanced nature and quantity of outward and inward traffic at terminals and necessity of supplying empty wagons. Certain special type of wagons for POL, Steel, Coal, Natural Gas, Ammonia, LPG etc. have to be generally run empty to the loading points. Operating skill lies in avoiding or reducing the extent of empty haulage and cross movements of similar type of empty stock.

**(f) Despatch in Block Rakes :**

Despatching of wagons in small numbers always means transit delay while a block load can go direct to the farthest destination skipping many yards, thereby eliminating detention that the wagons might have suffered in the intermediate yards. Piecemeal wagons passing through a number of marshalling yards, where they have to be combined with other wagons to form train loads, cause huge amount of work for the staff and result in loss of efficiency, avoidable delay, anxiety and uncertainty regarding their arrival at destination. Unit train movement, i.e. a train load consigned by single consignee to single consignor, is ideal. Consignees can also be motivated to club their Indents to get train load and block rakes. Also two point loading on same engine run can improve wagon usage. Close circuit rake movement can also be resorted to between selected pair of stations or rakes. Maintaining the purity of freight rakes has also to be ensured.

**(g) Long Distance Trains:**

It is an age old principle of operations that full train loads should be formed at the earliest point for the longest possible distance. Long distance trains should have least stoppages like long distance passenger trains. Trains can also be run as “crack trains”. A “**crack train**” is a train when the same crew (and engine if possible) instead of “Signing off” at the intermediate crew changing point works a train to farther junction. Thus, a train running from Palasa to Talcher or vice versa without Crew/Guard change at Khurda Road can be run as X ‘CRACK’. The Crew can also be utilised on ‘CRACK’ basis when the same Crew perform a round trip without “Signing off at the outstation and is promptly provided a load so that Crew returns to its Head Quarters within normal duty hours.

**(h) Wagon Turn Round:**

The interval between two successive loadings calculated from the time a wagon is placed for loading till the time it again becomes available for reloading is the actual turn round. As the calculations for individual wagons in the manner stated above are not practicable, the following statistical formula is generally used:

$$\text{Wagon Turn Round (T)} = \frac{S}{L+R}$$

Where ‘S’ stands for the effective daily wagon holding or midnight wagon balance of a day (excluding ineffective wagons viz- sick, POH wagons in or waiting for shops, like departmental wagons, wagons lent for departmental use, and the wagons used for coaching traffic). ‘L’ stands for the total number of wagons loaded on the Division/Railways plus the wagons loaded at transshipment Point. ‘R’ stands for the total number of loaded wagons received from other Railway/Divisions. Thus, for example, if a Division loads

350 Wagons on BG (including 50 BG Wagons loaded through transshipment of MG Wagons), 150 inward loaded wagons are received from other Divisions and its effective wagon holding at the end of the day (midnight) is 2250 wagons, the Divisional Wagon turn round will be 4.5 days.

$$\text{i.e., } \frac{2250}{350+150} = \frac{2250}{500} = 4.5 \text{ days WTR (Wagon Turn Round)}$$

**(i) Detention to Trains and Wagons:**

**(a) Detention to trains:** A check on the detention to trains (1) outside signals or at stations adjacent to Goods Terminals, (2) in shunting operations at road side stations and (3) en-route detentions for various reasons should be exercised regularly.

**(b) Detention to wagons:** Close watch should be kept on the areas, e.g. Marshalling Yards, Goods Terminals, and Stabling Points etc., where wagons are likely to suffer avoidable detention during various phases. Although, this is watched through periodical data, special attention should be paid to pockets, where piecemeal wagons suffer prolonged detention and often remain out of sight.

**(j) Engine utilisation :** Engines being a critical, scarce and costly asset in Railways, their utilisation have to be carefully monitored. For improving the Engine utilisation, watch has to be kept on terminal detention, speed of goods trains, under load running, ineffective Locos and proper utilisation of spare Locos if any, running of Goods Trains on proper paths, etc. Some of the measures for improving Engine Utilisation are as under:

- i) Running of the Goods Trains on proper path. For this, the Master Charts have to be properly framed and consolidated.
- ii) Proper co-ordination between Control and Line Staff.
- iii) Reduction in Terminal detention of Locos by proper monitoring co-ordination and working of Yard Staff, C&W Staff etc.
- iv) Judicious ordering of Trains and Right time starts of Goods Trains.
- v) Proper Marshalling to avoid extra time in shunting en-route.
- vi) Proper controlling, judicious crossings and precedences.
- vii) Avoiding detentions outside Signals, at the Junctions, at the Stations adjacent to Junctions/ Terminals by keeping lines at the junctions/ terminals clear and giving correct expect of running to the Stations/Yards and Interchange Points.
- viii) Loop Lines on critical block sections should not be generally blocked.
- ix) Stabling and picking up of load should be judicious and properly planned.
- x) Loco Pilot should run at maximum permissible speed subject to restrictions.
- xi) Light Engines can be coupled or attached to trains in order to save path and energy.
- xii) Light Engines (Single or Couple) should run at maximum permissible speed, for which they are fit, subject to speed restrictions instead of running to the speeds of normal Goods Trains.
- xiii) Signals must be taken off promptly at Stations. Distant/Warner Signals must always be taken off promptly.
- xiv) Tangible authority to proceed should be handed over at the appointed place instead of getting the train slowed down in front of the Station for handing over the Authority from the Platform.

- xv) Trains should be run through Main Line (as far as possible) since looping results in extra time on run.
- xvi) Locomotives should be in good working order and staff should be well versed in Loco operations and trouble shooting.
- xvii) Hauling capacity of the Locomotives should be properly utilised.
- xviii) Engineering speed restrictions should be regularly reviewed and reduced by maximising the output of the Engineering staff and machines. Due care and foresight in offering blocks for track maintenance should be exercised.
- xix) Line capacity of the Sections should be properly utilised without causing congestion and steps for augmenting line capacity should be taken in time.
- xx) The movement of the Engines to & from Sheds should be monitored.
- xxi) Lie over period of Passenger Link Power may be utilised in short distance shuttling etc.
- xxii) Effective control over traffic yards to reduce other engine hours, detention to locos at important loading/unloading points and industrial sidings.
- xxiii) The factors adversely affecting the Locomotive utilisation of speed of goods train, terminal detention etc. should be got analysed by suitable multi departmental teams and remedial measures taken.
- xxiv) Prompt attention to equipment failure and Loco troubles.
- xxv) Prompt restoration of traffic after accidents and judicious diversion of Locomotives in case a line is blocked.
- xxvi) Incentive schemes for motivation of staff connected with Goods Operation, so as to improve Engine utilisation Special watch on Loco Pilots losing time on run and not running on maximum permissible speed.
- xxvii) Regular foot plating by officers & staff involved in operations motivates train crew & alerts the line staff.

**(k) Average Speed of Goods Trains:**

To determine the average speed of various goods trains running over a section during a particular period, there are two methods of calculating the speed of goods trains. For day to day review of the speed of goods train, it is calculated from control charts. It is generally calculated section wise and for up and down directions separately. It may be calculated for each train. Further, the total number of trains run in a particular section is multiplied by distance of the section divided by the total time taken by all the trains in the section, will give the average speed for all the trains on the section.

$$\text{Average Speed} = \frac{\text{No. of Goods Trains} \times \text{Distance travelled by each train in 24 hrs.}}{\text{Total time taken by all the Goods Trains run.}}$$

The detentions to goods trains en-route on account of traffic, loco, engineering, signaling, carriage and wagons or any other cause are calculated and has the effect of bringing down the average speed. Almost all the factors affecting engine utilisation play part in the average speed of goods trains. The difference being that in the calculation of average speed of goods trains, the detention at originating point and terminating point as well as the Light Engine Running are not taken into consideration.

Calculation of Average Speed using statistical formula:

$$\text{Average speed of goods train} = \frac{\text{Total Train Kilometres}}{\text{Total Train Engine Hours}}$$

**(l) Staff and Supervision:**

Excellence in freight operations requires that the staff offer their willing co-operation and turn out a high standard of work. To achieve this, effective management and team spirit at the supervisory as well as at the senior officers' level is required. Proper training for constantly developing the knowledge, skills and the desirable attitudes is essential. Inspections, information system and preparedness to deal with accidents, breakdowns and unusual occurrences have also to be effective.

**(m) Targets and Statistics:**

One of the important means to utilize fully & efficiently the existing carrying capacity of a railway is to set measurable & specific targets for the various performances after taking into consideration all the local conditions. Once, the targets are laid down, all possible efforts must be made to attain them.

The targets should be set sufficiently high & reviewed constantly with a view to improving the performance further. Details regarding statistics pertaining to Railway Operations are given in chapter on operating statistics. Where targets are not attained within a reasonable period, the causes must be traced & effective remedial action taken. If necessary, revised targets should be laid down.

**7.11: Carrying Capacity and Axle Load of Wagons:****(a) Carrying Capacity:**

Weight of an empty wagon is tare weight of the wagon. Gross weight of a wagon is the sum of carrying capacity and tare weight. The gross weight of every wagon bearing on the axle when the wagon is loaded to its maximum carrying capacity shall not exceed such limit as fixed by the central government. Maximum carrying capacity of a wagon is fixed on the basis of the class of axle under the wagon and it varies from wagon to wagon & depends upon its class of axle. Tare weight, Permissible Carrying Capacity and gross weight of wagons change from time to time after modification of wagons.

Subject to limit fixed as explained in the above para, railway shall determine the normal carrying capacity for every wagon and exhibit figures in a conspicuous manner on the outside of every such wagon. Carrying capacity of a wagon is always less than the maximum carrying capacity of the wagon. If the wagons are loaded as per the carrying capacity, charges will be collected as per the CC of the wagon.

**(b) Permissible Carrying Capacity:**

It is the varied carrying capacity determined by railway from time to time depending upon type of wagon or class of goods which may be specified through notification. It is the increased carrying capacity than the CC stenciled on the wagon but not more than the maximum carrying capacity of the wagon. If the CC of a wagon is increased to fix as PCC, the charges will be collected as per the revised PCC which shall be issued from Board from time to time as per rate circular.

Indian Railways are under pressure to meet the transportation demand due to enhanced economic growth in the country, constraint of funds for augmentation of line capacity and long gestation period obstructing the implementation of such works. Therefore we have no other immediate option except to increase the throughput by better utilization of existing assets. Increase in axle load is one of such steps taken by Indian Railways.

The increase in axle load would increase in carrying capacity. By introducing higher axle load wagons, we can increase the weight of the loadable commodity marginally. CC of a wagon is fixed on the basis of the axle load. As such, tare weight and CC varies for specific wagons. As explained above, CC for the wagon would be the loadable commodity weight, i.e., the permitted gross weight, less the tare weight. e.g., Axle load of BOYEL wagon (having 4 axles) is 25 Tons. That means, each axle can carry a gross weight of 25 T. As such, that BOYEL wagon can carry a gross weight (Tare weight of wagon + CC) of  $25 \text{ T} \times 4 \text{ axles} = 100 \text{ T}$ . Therefore CC of BOYEL is  $(100 \text{ T} - 20.71(\text{TW})) = 79.29 \text{ T}$  (Tolerance).

Up to the year 2004, railway was carrying the goods with a weight equal to normal carrying capacity of the wagon. The maximum axle load on IR had traditionally been 20.3 tons. In order to increase the throughput, IR had initially increased the axle load from 20.3 T to 22.9T by making some modifications in the wagons. An increase in axle load from 20.3 Tons to 22.9 Tons allowed a four-axle wagon to increase its gross weight from 81.2 Tons to 91.6 Tons. The increase in axle load would enable an additional loading of up to 10.4 Tons, i.e., up to  $\text{CC} + 8 + 2$ , two tons being the tolerance because of inaccuracies in loading and weighing. This initiative had made a significant impact on the performance of IR over the past years. A BOXN coal load having axle load of 20.3 T which was used to haul 4729 T is now hauling 5427 T trailing load after increase in axle load from 20.3 T to 22.9 T. Now IR is looking for the concept of multi-axle vehicles which was popular on roads and increase in the axle load to 25 tons and then to 30 tons. While loadability would go up, strength and safety of bridges would need to be examined afresh. These would require adoption of new technologies, apart from planning for future rail construction and wagon procurement activity to meet the required parameters.

As stated above, by making some modifications in the wagons, now we are running trains with increased carrying capacity like  $\text{CC} + 2 + 2$ ,  $\text{CC} + 4 + 2$ ,  $\text{CC} + 6 + 2$  and  $\text{CC} + 8 + 2$  for certain commodities in most of the routes in IR. Since the tolerance is only 2 T or 1 T, it would be a serious safety hazard if the loading exceeds more than its tolerance. In order to avoid excess loading, imposition of strict penalty charges for excess loading has been introduced which is revised from time to time. The penalties would be applicable for weights above the tolerance of 2 tons. In order to deal with such excess loaded wagons, keeping in view of limit of excess loading, railway has imposed some restrictions like.

- i) Get the load adjusted/unloaded or excess load wagon detached or run the rake at a restricted speed not exceeding 50 kmph or 30 kmph.
- ii) Overloaded wagon to be detached at the station or the excess load transferred into another wagon brought at the site or the material off loaded and then train is allowed to run.
- iii) Commercial actions for overloading and resulting detention are to be taken as per extant rules.

After successful implementation of heavy haul trains by increasing in CC of wagons, now IR is looking for increasing loadability for a given axle load by improving the net to tare ratio from the current 2.7 (to possibly around 4) which could be a possible technological solution. For a 92-ton gross weight, if the wagon weight could be brought down to 18 tons, the load ability would go up to 74 tons.

## 7.12: Operating Instructions for Movement of Higher Pay Load Rakes:

- i) A memo should be served to the guard and LP by the originating SM to be tagged to BPC and VG. At each crew change point, a memo should also be given to the outgoing guard and LP by the SM about higher



payload, so that the crew can be vigilant about special precautions including speed restrictions to be observed en-route in view of higher payload.

- ii) Caution boards shall be displayed at crew lobbies as well as notified stations prominently depicting caution orders based on track structure.
- iii) Sectional speeds shall be notified in consultation with Engineering department, to all concerned through Working Time Table as permanent caution. Notified station shall issue caution order accordingly.
- iv) Based on higher carrying capacity, special colour (preferably green) code will be followed in FOIS for such trains.
- v) Power shall be provided in accordance with higher trailing load to avoid stalling.
- vi) Restriction/limitation of tractive/ braking efforts in view of condition of bridges etc., any shall be imposed as per requirement.
- vii) Weigh bridges should be provided as per requirement en route for these rakes.

### **7.13: Long Haul Train Operation:**

Composition of more than one standard train formation is known as Long Haul Train operation. With the increase in demand of freight traffic and emphasis to reduce cost of operation, Indian Railways have been concentrating for increasing through put. This can be achieved by improving and designing wagons having better pay to tare weight ratio, increasing number of wagons per train, increase in axle load, etc. Though, through put is achieved to some extent, congestion on various important routes is still a constraint to meet traffic demands. In order to ease the congestion, railways have introduced running of long haul trains to improve the through put and reduce congestion at the same time.

For running of long haul trains, railways have already initiated steps for provision of longer loops at different stations to accommodate these trains for various operational reasons. Due to absence of longer loops, it is not possible to arrange precedence and crossing of trains at stations.

Formation and instructions to run these trains is given as under:

- a) Zonal Railway shall identify sections for running of long haul trains and notify the section and formation points of long haul trains.
- b) These long haul trains shall only be formed at notified stations in the presence of SE(C&W). If it is not a C&W point, SE(C&W) should be arranged at this point for issue of 'Cover BPC' after ensuring validity of BPC of constituent rakes. Cover BPC is a BPC issued by C&W staff after checking brake power continuity of amalgamated train. This Cover BPC contains the BPC particulars and originating brake power of the individual rakes and also the brake pressure of the leading loco and last vehicle. This cover BPC shall be handed over to the Loco Pilot of the leading train. However, BPCs of two constituent rake trains shall remain with respective Loco Pilots and in case of absence of rear rake loco pilot, with the guards of the respective constituent train. Air pressure in the leading locomotive shall be 5 Kg/Cm<sup>2</sup> and minimum pressure in the trailing brake van is 4.7 kg/cm<sup>2</sup>.



- c) Following combination of constituent trains are permitted in forming a long haul train :

**Front Rake****Rear Rake**

Empty train

Empty train

Loaded train

Empty train

Loaded train

Loaded train

The constituent empty/loaded trains can be of any type as decided and notified by Chief Operations Manager from time to time.

- d) The combining rakes shall be with single pipe air brake system
- e) Each train should have valid BPC.
- f) Maximum speed of long haul train will be restricted to lower of the maximum speed of the constituent trains in the section.
- g) Special T/G boards are to be provided in notified sections to enable the LP to pick up the speed after restrictions.
- h) Pre tested walkie-talkie sets of adequate power will be supplied to LP and Guard for reliable communication during run and to the C&W staff during the course of formation.
- i) During the running, if the walkie-talkie communication fails, the long haul movement will be terminated at the next station. Long haul train shall not be operated during communication failure.
- j) In case of loaded - loaded or loaded – empty combinations hauled by electric locomotives, at least 5 compressors of the leading MV unit will be in ON condition. Locomotives in the middle of the long haul rake are not permitted to change the brake pipe. Leading locomotive will work the train and trailing locomotive will be just a piped vehicle that can provide additional power when required.
- k) Before restarting train after brake application, it shall be ensured that the brake pipe pressure in the leading loco is 5 kg/cm<sup>2</sup> and the last brake van is 4.7 kg/cm<sup>2</sup>. The guard in the trailing brake van shall confirm to the LP in the leading locomotive on the walkie talkie set about the pressure in the last van before starting the train.
- l) Crew, guard and station staff should be imparted familiarisation training by supervisors/officers from operation and traction in regard to long haul train operation.
- m) Guard of leading train will travel in its brake van or the middle locomotive cab and guard of trailing train will travel in the trailing brake van.

#### **7.14: Registration of Indents, Allotment, Supply and Loading of Wagons:**

##### **(a) Registration of Indents:**

- i) Detailed instructions regarding registration of indents & booking of goods traffic are contained in the IRCA, Goods Tariff/Part-I.
- ii) Movement of goods traffic in wagon loads is regulated by the “**preferential traffic schedule**” notified by the Railway Board every year, commencing, from the 1<sup>st</sup> April under section 71 of the Indian Railway Act 1989 & circulated by the COM. The “**preferential traffic schedule**” is otherwise known as “**priority schedule**” or “**preferential traffic order**” & is designed to ensure movement of certain essential commodities & urgent movement are accorded necessary preference when transport facilities available are not adequate to meet all the demands in full.

Under the preferential traffic schedule, traffic is classified under four heads viz “A”, “B”, “C” & “D” Commodities, registered on upper head always get preference over lower head items in spite of early registration. However, special preference to any particular consignment or commodity can be given over looking PTS under orders from Railway Board only. The priority schedule is decided by Traffic Transportation Directorate of Railway Board. It lists the sponsoring Authority & accepting authority for programmed traffic.

**iii)** Section 71 of the Railways act, 1989 the central Government hereby directs that all Railway Administration shall give special facilities for or preferences to the transport of goods/class of goods at station /siding as per priority/preference in the following order:

Priority “A”- Military traffic, when sponsored by MILRAIL & approved by Railway Board.

Priority “B”- a) Goods for emergency work for victims of natural calamities, like floods, drought, earthquake etc,  
b) Programmed traffic like food grains & levy sugar for public distribution system.

Priority “C”- All programmed traffic, commodities when sponsored & accepted by authority.

Priority “D”- All traffic not included in priority “A” to “C”.

**iv) General Instructions:**

1. Traffic will have preference over other traffic within the same class of priority in the following order;
  - a) Traffic covered by contractual obligations and/or guaranteed under specific schemes like Wagon Investment Scheme, Freight Forwarder Scheme, Terminal Incentive-cum- Engine-on-load scheme (TILES) etc.
  - b) Traffic in rakes loaded from a siding/Good shed having round the clock working.
  - c) Traffic in rakes a full rake handling siding having mechanized system of loading.
2. Traffic offered for distance of more than 800kms will have preference over other traffic within the same classification & priority.
3. Traffic offered in block rakes, including clubbed indents constituting a block rake will be given preference over traffic in piecemeal irrespective of the class of priority & date of registration.
4. Traffic offered in single point block rakes will be given preference over two point/multi-points block rakes & mini rakes within the same class of priority.
5. Any traffic can be accorded preferential loading & movement under a higher priority under special orders issued by the Ministry of Railways, Railway Board/Zonal Railways.
6. Two days in a week shall be reserved & notified for allotment of rakes as per the date of registration irrespective of the class of priority.

**v) Rationalisation Order:**

Under section 71 of Indian Railways Act-1989, Railway Board has been empowered to charge freight over route, which may not be the shortest between alighting point and destination. The rationalization order indicating the route through which the freight is to be charged is issued by Traffic Transportation Branch, Railway Board.

Revised rule 125 of IRCA Goods tariff part -1(Volume-1) vide Board's letter No.ECR 11255/94/3 dated 06.10.94 through which it has been directed that unless there is specific instruction in writing from the center or his authorized agent to the contrary, goods will be dispatched by the route optionally feasible & freight charges will be levied by the shortest route. However, charging of freight by shortest route is subject to any instructions issued under rationalization order issued from time to time.

**vi)** Station Master or his representative shall accept indents from indentors. All requests for wagons should be made on form T-193 & entered in a register on form T-191.

**vii)** Registration of indent shall not be accepted if it contravenes rationalisation scheme, civil or any other bans.

**b) Allotment:**

- i) All the registered indents are separated in free destinations, quota limitations & restricted destination wise.
- ii) The indents are repeated to SCR/Dy CHC(wagon) on daily basis. Further, it is sent to Sr.DOM/DOM on form T-570(OP/T-419 "A" foil).
- iii) Allotment is made by Sr.DOM/DOM/AOM & communicated to stations.

**(c) Supply and loading of wagons:**

- i) Supply of rake is intimated to consigner & necessary entries are made in the register.
- ii) The daily loading statement on form T-570 "C" are sent on the next day of loading to Divisional office. Likewise 10 days loading statement are sent to Divisional office in form T-267.

**7.15: Cancellation of Indents:**

If a consignor fails to commence loading of a wagon or wagons placed in position for loading, within the free time permissible for the wagon or wagons in accordance with the rules contained in the Goods Tariff and /or other extant rules, the indents should be cancelled by the Station Master unless the consignor requests the Station Master in writing to detain the wagon beyond the free time as may be admissible in accordance with the rules. The Station Master in such cases, i.e. when the indent is cancelled, will allot such wagon or wagons against the next indent in turn of priority at his station as advised by DOM/AOM. The free time permissible on different types of wagons is notified from time to time through special circulars.

**7.16: Checking of Goods Loading:**

Regular systematic checks are to be exercised by the Divisional Office on the loading at station with a view to detecting irregularities mentioned below.

- (i) Loading without allotment orders.
- (ii) Not loading in accordance with allotment orders.
- (iii) Loading a commodity other than that allotted.
- (iv) Change of destination or commodity.
- (v) Loading of wagon(s) in excess of allotment.
- (vi) Loading in contravention of the restriction orders.
- (vii) Supply of wagons in violation of seniority in registration under respective items of priority in accordance with the preference schedule.
- (viii) Splitting up of consignments to circumvent class and other restrictions.

**7.17: Precautions While Loading of Wagons:**

The following instructions should be strictly followed for loading wagons:—

- (i) The permissible moving dimensions must not be exceeded.
- (ii) Wagon should be evenly loaded so that the load bears equally on all springs. No overloading beyond permissible limits laid down being allowed under any circumstances.
- (iii) Bulky articles like furniture, machinery parts, etc. that are likely to shift in transit should be properly secured to avoid such shifting.
- (iv) Goods in bulk such as coal, ores, etc. should be evenly loaded up to the prescribed load lines so that there is no hazard due to overloading.
- (v) Rails and other long articles must not be loaded on trucks without sides unless they are fitted with the bolsters and stanchions and the rails, etc. securely lashed with chains in the prescribed fashion.
- (vi) Steel plates longer than the distance between two stanchions should always be placed above small sheets so that the weight of the longer sheets will prevent smaller sheets moving and falling off the wagons.
- (vii) “BFR”, “BRN” bogie wagon (including BRH type wagons) without stanchions should not be used for loading steel plates.

**7.18: Operating Restrictions:**

- (i) There are certain terminals at which the facilities available permit handling of a limited number of wagons only. If the potential of traffic handled at such location/areas exceeds the capacity and if the loading/unloading is not controlled, there will be heavy accumulation of wagons for such areas leading to congestions and wastage of wagon fleet. In such case, restrictions are to be imposed. Such restrictions are called ‘Operating Restrictions’.
- (ii) Restriction orders are issued from HQ timely when congestions are likely to take place and there are no other means of getting the congestions resolved. Such orders are also issued due to accidents, floods, etc., breach of railway communications or due to festivals or melas to run extra coaching trains for passengers. Such restrictions are known as operating restrictions. All concerned must observe these restrictions without fail.
- (iii) Divisions are not authorized to impose restrictions in booking and movement of traffic from and to other divisions. If imposition of restrictions is necessary, the Zonal HQ must be approached to impose restrictions on booking and movement of traffic.

**7.19: Interchange of Rolling Stock:**

**‘Interchange’ means the junction at which the stock between two or more Railway is interchanged. This may be between two divisions or between two zonal railways. All goods stock without exception shall be considered and interchanged on arrival at the junction from the using Railway and on departure from the junction to the using Railway. This junction is called point of interchange. The detailed rules in this regard are laid down in Part II and III of the I.R.C.A. Conference Rules. For the purpose of interchange each coaching vehicle & goods wagon are counted as 2 & 1 units respectively.**

**(A) Definitions:**

Some important terms which are frequently used in the rules are described in the definitions listed below.

- i) "Owning railway" means a railway to which a vehicle or wagon belongs.
- ii) "Forwarding Railway" means & includes each railway sending a vehicle or wagon to another railway, whether on the outward or home ward journey.
- iii) "Receiving railway" means and includes each railway receiving a vehicle or wagon from another railway, whether on the outward or home ward journey.
- iv) "Booking Railway" means the railway on which traffic originates.
- v) "Destination Railway" means the railway on which traffic terminates.
- vi) "Intermediate railway" means any railway between the booking railway and the destination railway.
- vii) "Working railway" means a railway working a junction.
- viii) "Using railway" means a railway using a junction worked by another railway.
- ix) "Rolling stock" includes both coaching & goods stock.
- x) (a) "Coaching stock" means all coaching vehicles such as Postal, Motor and Coaching traffic vans, Horse boxes, and military cars in addition to passenger carrying vehicles. Coaching vehicles belonging to different railways and of different kinds are identified by a code signifying what type of vehicle it is and on each vehicle is also painted the initial of the owing railway and a number. Thus E.Co.R FS-423 indicates passenger coaching vehicle belongs to East Coast Railway with accommodation for first & second classes bearing number 423.  
(b) Goods wagons intended for coaching traffic should be marked as such and used for coaching traffic only. They will be treated as coaching stock for interchange purposes but damages and deficiencies will be charged for at scheduled rates for goods stock.
- xi) "Goods stock" means rolling stock, other than coaching stock, irrespective of contents, whether attached to passenger or goods trains & includes tanks, flats, vans & such vehicles. Each type of wagon carries a code indication, the initial of the owing railway and the wagon number. For instance, ECoR/C/12576 implies East Coast Railway four wheeler covered wagon bearing number 12576.
- xii) "Vehicle" applies only to coaching stock.
- xiii) "Wagon" applies only to goods stock.
- xiv) "Director" means the director of wagon interchange.
- xv) "Interchange junction" means the junction at which the stock between two or more railway is interchanged.

**(B) Directorate of Wagon Interchange (DWI)** under the IRCA, DWI is responsible for coordinating all wagon interchanges across IR. Officers in charge of wagon interchange are assigned to each nodal point where interchange occurs. The DWI computes the **Pool Target** for each zonal railway which is the number of pooled wagon it can have at any time in order to run its expected goods operations smoothly. These are often denoted relative to the number of wagons the railway owns. A pool target of (+) 2000 implies that the zonal railway must do with 2000 fewer wagons than it owns, and therefore must be a creditor railway. Similarly, a pool target of (-) 2000 implies the railway is a debtor railway and will use 2000 more wagons than the number it owns. As excessive holdings of wagons by a particular zonal railway lead to inefficiency, the DWI is empowered to instruct railways to reduce their holdings, and impose fines when pool targets are not maintained.

At each **Interchange Point**, or junction where interchange occurs between railways, goods traffic needs to be regulated to maintain traffic flow, as well as to maintain divisional and zonal wagon holding. For this purpose, **Junction Quotas** are determined, which specify the number of wagons/rakes to be interchanged each day between individual railways at the interchange point, in each direction. Junction quotas in the case of highly asymmetric traffic routes may specify a particular number of empties to be returned in the reverse direction. The railway that works the junction or interchange point is known as the **Working Railway**, and the other railways interchanging their wagons at that junction are called the **Using Railways**. A wagon is interchanged between the working railway and the using railway when it enters or leaves the junction respectively. **Equalization** is the process of ensuring that the flow of wagons between two interchanging railways is equal in both directions at the interchange point. This is not always the case, when traffic flows are not symmetric. **Over equalization** refers to a railway handing over more wagons than it receives in return; the opposite situation is **Under equalization**.

The DWI issues instructions regarding junction quotas and equalization. As the working railway is placed at a disadvantage since it holds wagons at its junction even though it is not utilizing them, a **Junction Allowance** used to be specified to compensate for the extra wagon hours at the junction; this has since been dispensed with.

In addition to the aggregate information about numbers of interchanged wagons, individual wagon movement records are also maintained, so that overdue or missing wagons can be identified easily. The divisional/zonal wagon balance is calculated as of midnight each day.

### **7.20: Hire Charges:**

Each railway's wagons are enumerated and kept track of. Based on the goods traffic needs of a particular railway, it may require more or fewer wagons than it actually owns. A creditor railway is one which needs fewer wagons than it needs, so that its surplus wagons are, in effect, 'loaned' out to other railways. A debtor railway, similarly, is one which needs more wagons than it has, so that it has to 'borrow' wagons from the wagon pool for its operations. For the privilege of using wagons over the number that a railway owns, it has to pay rental charges. These rental charges are called **hire charges** which vary by type of wagon. Computer Cell of Railway Board, IRCA prepares the monthly BG Hire and Penalty charges for each Zonal Railway.

Similarly, hire charges are also collected from major sidings or Ports as per the agreement for detaining wagons more than prescribed free time. After the expiry of free time, hire charges shall be levied and realised at the rates in force from time to time as prescribed by Railway Board. These hire charges from non-railway users will be calculated on monthly basis for the total number of wagons handled during the month for the average detention during the month beyond the free time for each type of operations and wagons. The demurrage charges collected on behalf of Railways in any month by the Port Trust Railway from the public/Traders on wagons belonging to Railways shall be paid within one month from the expiry of the month concerned. If the demurrage collected from the traders by the Port Trust is less than the Wagon Hire charges payable to Railways, the difference of Hire charges will be paid to Railways by Port for proper monthly accounted once in three months.



Rates of hire charges which is revised from time to time are as under:

1) Hire charges of Inter-Railway Financial Adjustment:	
i) Workshop repairs	Rs. 56.00 x 2.45 per 8 wheeler wagon per day
ii) Depreciation charges	Rs. 102.00 x 2.45 per 8 wheeler wagon per day
Total :	Rs. 158.00 x 2.45 per 8 wheeler wagon per day
2) Hire charges of Non-Railway Users:	
i) Workshop repairs	Rs. 56.00 x 2.45 per 8 wheeler wagon per day
ii) Depreciation charges	Rs. 102.00 x 2.45 per 8 wheeler wagon per day
iii) Interest charges	Rs. 266.00 x 2.45 per 8 wheeler wagon per day
Total :	Rs. 424.00 x 2.45 per 8 wheeler wagon per day

### 7.21: Electronic In-motion Weigh Bridge:

Electronic In-motion Weigh Bridge is a machine for weighment of loaded rakes while in motion. Weighment of loaded wagons is a necessary pre condition to arrive at the correct pay load being carried by the railways for which freight is to be recovered at the tariff fixed by the Central Government. Over loading beyond certain limit causes excess stress on the rail and wagons leading to its eventual breakage which is a safety hazard. So, railway has decided to provide electronic in-motion weighbridge at all originating full rake mineral loading points. In addition to the above, in-motion electronic weigh bridges shall also to be provided at intermediate weighing points wherever necessary.

Chief Goods Supervisor or any other official of the commercial department nominated by the division will be the custodian and the in-charge of the weigh bridge including weigh bridge house and weighing operations. The weigh bridges shall be switched off when not required for weighment for more than 30 minutes. The weighbridge equipment shall be switched on at least 15 minutes before the weighment starts. The weighment in-charge shall ensure that the weighment readings are recorded at a speed less than 15 kmph, which can be checked from TC, monitor and visual display provided. Readings taken at more than 15 kmph are not valid. "Weighbridge Ahead" boards shall be provided on both sides of the weigh bridges about 300 mtrs in advance of the weighbridge with special marking to indicate the loco pilot that they shall pass over the weighbridge. The LP shall be suitably instructed regarding weighment of the train. The SE (P.Way) shall maintain level gradient not exceeding 1 in 300 for 100 mtrs. on either side of way rails. The approach rails shall be 52 kg/mtrs on ST sleeper. Creep anchors will be provided to avoid creep.

As soon as the rake is placed for weighment, the commercial staff posted at weighbridges shall complete all formalities of enlisting wagon numbers, its tare weights, CC and type of wagon with permissible carrying capacity of the loaded commodity, etc. If the wagons are found overloaded beyond permissible quantity of a particular commodity, he will initiate action for levy of panel freight demurrage and handling charges as prescribed in commercial rules. Intimation about overloading will also be sent to all concerned including originating, destinations & station ahead either to impose speed restriction, adjustment of load, detachment of wagon or for recovery of charges levied.

The staff concerned at weighbridges will exhibit the certificate about satisfactory function of weighbridges issued by weight & measure department. The electronic weighbridge shall be tested with duly calibrated test wagon every month as per procedure prescribed by the manufacturer and a certificate given to the commercial department jointly signed by the weighbridge in-charge and official of the mechanical department. In addition to the testing with the test wagon, repeatability test of the electronic in-motion weighbridge shall be carried out every three months along with the service engineer of the manufacturer. In



case of non functioning of weighbridge, necessary advice shall be sent to mechanical and operating department for necessary action.

Function of all weighbridges in the Division should be reported in the daily position. If a weighbridge gets out of order then loading shall be permitted up to 7 days by DRMs, up to 30 days by COM and up to 6 months by GMs with their personal approval. If the weighbridge remains out of order for more than six months, it should be brought to the notice of the Board (ME, MM and MT).

### 7.22: Transportation Options:

These are various transportation options differentiated primarily by the volume of traffic & include following services.

**a) Block Rakes:** It is a train carrying wagons for a single destination. Composition of block rake composed of different types of wagons are notified by Railway Board will be booked at Train Load Rate (TLR).

**b) Mini Rakes:** This is a short rake with a composition shorter than the specified number of wagons required for a block rake. Mini rake can be loaded at TLR under the following conditions

- i) It will have a minimum composition of 20 wagons.
- ii) It can be booked to or from any notified full rake or half rake terminal.
- iii) Free time for loading /unloading will be 5 hours.
- iv) It can be loaded only up to 400kms.
- v) Permitted only in covered wagons.

**c) Two Point Rake:** it is a train carrying wagons for two terminals. Two point rake can be loaded at train load rate under the following conditions.

- i) Originating terminal should be notified full or half rake terminal.
- ii) Destination terminal should not be more than 200km apart in busy season ,400kms apart in lean season.
- iii) Minimum 10 wagons should be loaded for each destination.

**d) Multi Point Rake:** This is a train carrying wagons for more than two destinations multi point rake can be booked at TLR under the following conditions.

- i) Originating terminal and each destination terminal should be notified full rake or half rake terminal.
- ii) No two destination terminals can be more than 200kms apart.
- iii) Minimum 10 wagons should be loaded for each destination.

**(e) Two and Multi Point Rake: (Other than covered wagons):-**

Such type of rake can be loaded at TLR under the following conditions.

- i) Both the station should be notified full rake /half rake terminals.
- ii) Minimum 10 wagons should be loaded for each station.

**(f) Rakes from two origination terminals (Covered wagons):-** Rakes from two originating terminals covered wagons can be loaded at TLR under the following conditions.

- i) Two point combinations from which loading is permitted, will be notified by the zonal Railway.
- ii) Each notified terminal should be notified full/half rake terminals.
- iii) Destination terminal should be notified full/half rake terminals.

iv) Two loading terminals must be less than 200kms Apart.

v) Minimum 10 wagons should be loaded from each terminal.

**(g) Rakes from two originating terminals (other than covered wagons):** Booking at TLR will be allowed under the following conditions:

i) Each terminal should be notified full/half rake terminal.

ii) Destination terminal should also be open for full/half rake.

iii) Minimum 10 wagons should be loaded from each terminal.

iv) Indent should be for complete Block rake.

**(h) Multi Commodity Block Rake:** Block rake of multi commodity will be booked according to following conditions:

i) Both the originating & destination should be notified full rake/half rake points.

ii) The total number of wagons indented and loaded should be according to the number of Block rake.

iii) Each wagon will contain one commodity. But different wagons can contain different commodities.

iv) The customer will have to pay seasonal surcharge or congestion surcharge also.

### 7.23 Particulars of different types of wagons : (These are subject to revision)

Sl No	Types of wagons description	Length over Hd stock	Length over buffer couplers	Length inside	Width inside/ over fall	Height inside/ from fall	Nominal max axle load	Tare	Pay load	Ratio pay load/tare	Gross load	Cubic capacity	Speed	Types of coupler
1	BOXN/BOXNHS	9784	10713	9784	2950/3200	1950/3233	20.320	23.200	58.080	2.503	81.280	56.300	75/100	CBC
2	BOXNHA	9784	10713	9784	2950/3200	2175/3450	22.100	23.170	65.230	2.810	88.400	62.800	100	CBC
3	BOXN(LW)	9784	10713	9784	3022/3250	1990/3263	20.320	20.410	60.870	2.980	81.280	58.840	65	CBC
4	BOXNAL	9784	10713	9784	3022/3250	2066/3341	20.320	18.260	63.020	3.450	81.280	61.090	-	CBC
5	BOXNHL	10034	10963	10034	3022/3250	2028/3301	20.320	20.800	70.800	3.400	91.600	61.050	80	CBC
6	BOXN25	9784	10713	9784	2957/3135	2333/3606	22.900	23.000	77.000	3.350	100.000	67.500	75/100	CBC
7	BOY/IR BOY/IRON ORE/SPL	11000	11929	10990	2924/3134	1175/2450	22.900	20.710	70.890	3.422	91.600	37.800	65	CBC
8	BOY25	9784	10713	9784	2907/3135	1334/2607	25.000	21.000	79.000	3.760	100.000	37.940	75/100	CBC
9	BCN/COVERED BOGIE	14500	15429	14494	2944/3100	2446/3787	22.900	27.200	54.080	1.988	81.280	104.000	80/85	CBC
10	BCNA/BCNAHS	13251	14450	13515	2944/3200	2677/4014	25.000	24.550	56.730	2.310	81.280	103.400	75/100	CBC
11	BCNHL	10034	10963	10034	3345/3450	2980/4305	20.320	20.800	70.800	3.400	91.600	92.540	80	CBC
12	BOBY/BOBYN	10718	1200	9000	2863/3189	1781/3050	22.900	27.040	54.240	2.005	81.280	40.300	75	CBC(T)
13	BOBSN25	9784	10713	9784	2925/3199	1941/3213	20.320	28.000	72.000	2.570	100.000	34.630	75/100	CBC
14	BOBR	10671	11600	8732	3340/3500	2461/3735	25.000	26.000	55.280	2.126	81.280	57.200	80	CBC
15	BOBRN	9671	10600	9327	3340/3500	2466/3735	20.320	25.600	55.680	2.175	81.280	56.780	65	CBC
16	BOBRNAL	9671	10600	9327	3316/3500	2466/3735	20.320	22.400	58.880	2.620	81.280	56.600	-	CBC
17	BOBRN25	9784	10713	9422	3460/3500	2756/4205	20.320	24.400	75.600	3.100	100.000	66.680	75/100	CBC
18	BTALN/AMMONIA	16600	17529	16325	2200	-/4265	25.000	49.130	32.130	0.650	81.260	60.660	65	CBC
19	BTPN	11491	12420	11434	2850	-/4265	20.320	27.000	54.280	2.010	81.280	70.400	75	CBC
20	BTPGLN	18000	18929	17994	2400	2400/4285	20.320	41.600	37.600	0.900	79.200	79.480	75	CBC
21	BVZC/BRAKEVANGOODS	8540	9469	-	-/3200	2448/3894	20.320	13.803	-	-	13.803	1.480	75	CBC
22	BVZI	13540	14469	-	-/3200	-/3894	20.320	23.500	-	-	23.500	-	100	CBC
23	BOST	12800	13529	12800	2850/3100	1805/3080	5.875	25.500	55.780	2.180	81.280	65.840	80/75	CBC
24	BFNS	13716	14645	13716	2845/3045	-/2785	20.320	23.629	57.651	2.430	81.280	-	100	CBC
25	BRNA/BRNAHS	13716	14645	13716	2845	-	20.320	23.543	57.740	2.450	81.280	-	75/100	CBC
26	BRN25	13716	10713	13716	2930/3130	1274	25.000	23.500	76.500	3.250	100.000	-	75/100	CBC
27	BLCA	13625	14566	-	2200max	1009	20.320	19.100	61.000	3.190	80.100	-	100	CBC/SDB
28	BLCB	12212	13165	-	2200max	1009	20.320	18.000	61.000	3.390	79.000	-	100	CBC

## 7.24 Description of Freight Stocks :

1	BOX	High - sided vogie open wagon. side discharge arrangement.
2	BOXN	High - sided vogie open wagon. with pneumatic brakes,high tensile CBC couplers
3	BOXN-HA	The BOXNHA type is a BOXN variant with imprived bogies and higher capacity ,fit for 100km/h. (Suffix 'HA' =high axle lode'.)
4	BOXN-HS	BOXNHS wagons are covered BOXN wagons fitted with CASNUB HS high-speed bogies raising the max.speed to 100km/h.
5	BOXN-HL	BOXNHL wagons are like BOXNHS wahons but about 250mm longer, and made of stainless steel and cold rolled sections. Air-braked, CBC couplers, roller bearings.
6	BOXN-CR	BOXNCR wagons are corrosion-resistant BOXN wagons built with 3CR12 stainless steel (a proprietary version of grade 409 stainless steel)
7	BOXN-LW	The BOXNLW wagons are low-tare-weight BOXN wagons ('LW'='low weight') The tare weight is reduced by 1.8t compared to BOXN wagons, and the payload correspondingly increased by the same amount.
8	BOXN-AL	BOXNALwagons are BOXN wagons with an aluminum body on top of a steel underframe, The aluminium allyi is 'RDE-40' , also used in the BOBR-AL wagons. These wagons are naturally lighter and allow a higher payload to be carried for the same axle load
9	BOXN-EL	The BOXNEL wagons ares BOXN wagons with 'enhanced loading' features,designed for transporting coal, ores, etc. CASMUB 22NLC boges, CCBC couplers, single-pipe air brakes.
10	BCN	Bogie covered 8-eeeler wagon, CASNUB bogies,air-braked,CBC.Originally developed in 1984 for carrying bagged commodities.
11	BCNA	The BCNA wagon, also known as 'BCN/A', is a variant of the BCN design was developed to be less long but increased geight to keep the capacity the same.
12	BCNA-HS	BCNAHS wagons are a modified design of the BCNA wagongs with CASNUB HS high-speed bogies raising the max.speed to 100km/h. These wagons are characterised by a patch of red /ehite horizontal stripes on the top left.n
13	BCCN	BCN variants for carrying bulk cement .Loading is throughn ports at the top; unloading chutes at the bottom
14	BCCN/ BCCNA/ BCCNB	Automobile Carriers :A few wagons also marked BCCN like the cement carrier class noted above are actually single-or double-decker wagons intended for carrying automobiles;these have a liw platform with 840mm wheel diameter and are fitted wigh air brakes,,
15	BCCNR	These are usually single-decker automobile carriers constructed out of old CF and BEML passenger stock.
16	NMG	High - sided vogie open wagon. with pneumatic brakes,high tensile CBCcouplers
17	BCX	Water- tight covered high -sided bogie wago with cast steel bogies. Cartridge tapearings on newer ones. Snubbers and nested coil springs under bolster, eastomeric pads, with secondary suspension system.
18	BOY	Low-sided bogie open wagon, CBC 91.4 tonne load. Used for iron ore transport, etc.
19	BOY-EL	BOYEL wagons are low-sided bogie open wagons - a BOY variant for 'enganced loasing'.
20	BOBS	Open hopper car with bottom/side discharge (often used for ballast and ores) Similas to the BOBR/BOBRN wagons, except that the discharge is to the side (clear of the gtacks). Underside doors on the wagons are operated pneumatically,and can be controlledby a lineside triggrrting mechanism.
21	BOBYN	Open hopper car with side-bottom discharge, for carrying stone, track ballast,etc.These are air -braked.
22	BOBR	Open hopper car with rapid (pneumatic)bottom discharge doors.Same as BOBRN (see Below) except that they have vacuumbrakes and are rated for lower speeds (80km / h?).

23	BOBRN	Open hopper car with rapid (pneumatic) bottom discharge doors, air- braked. BOBRN and BOBR (see above ) are most often used for carrying coal to thermal power plants, and also for ore, stone, track ballast, etc.
24	BOST	An open bogie wagon, for carrying finished steel products, but also used for coal, stone, etc.BOST-HS is the high-speed version .
25	BFK	Early version container flat car.
26	BKFX	Container flat car for domestic 5-ton containers. Improved BFK with CASNUB bogies (not much used now with the move to standard containers).
27	BFKI	Container flat car for ISO containers, with retractable anchir loks. Originally fitted with vacuum brakes. CONCOR bought about 1300 of these from IR in 1997-1998 and retrofitted them with air-brakes and put them to use on its domestic container traffic routes ('Contrack'). The pmes fotted with air-brakes were generally reclassified 'BFKN' (see below).
28	BFKN	Converted BFKI flat cars with air brakes and CASNUB bogies.See 'BFKI' above .
29	BFNS	Special flat wagons for transport of steel (colls, sheets,etc.) and also used for transporting rails, Air-braked. CANUB 22 NLB bogies Max. speed 100km/h.
30	BFR	Bogie flat rail-carrying wagon (64 tonne load)
31	BFU	Bogie flat type wagon: transporting move vehicles.
32	BRH	Bogie rail-carrying flat car with roller bearings. This has end-plates that can be removed.
33	BRHT	Bogie rail wagon , heavy load (80 tone load), with UIC bogies, transition coupler
34	BRN	Developed in 1994 as an improvement on the older BRH wagon. Air-braked wagon with CASNUB bogies,for rails and steel products and similar heavy loads.
35	BRNA	A variant of the BRN wagon developed on 1992. Air-braked, CBC couplers, roller bearings.
36	BRST	Bogie rail-carrying wagon, eith transtion coupler.
37	BTO	Bogie tanker wagon for heavy oil,furnace oil,etc
38	BTORX, MBTORX	Bogie tanker wagon for vegetable oil, and its MG variant
39	BTP, BTPN	The most common bogie tanker wagon seen today.Used prinaryly for liquid petroleum products (petrol,naphtha,kersene,disesl, furnace oil , etc.),and also for molasses, vegetable oil, etc. An enhanced version, the BTFLN.
40	BTFLN	Improved frameless bogie tanker wagon, successor to the venerable BTPN (see above) [2004].Used primarily for liwued petroleum product (petrol, naphtha,kerosene,diesel, furnace oil,etc.), and also for vegetable oil and other liquid cargo. The BTFLN wagon was developed by RITESin collaboration with Azovmash of Ukraine.
41	BTCS	Bogie tanker car for caustic soda.
42	B T AP	Bogie tanker car for aluminapowder. Leakproof wagon with a special air fluidizing system for discharging alumina powder from the bottom through pipes like a fluid.
43	BTAL	Bogie tanker car foranhydrous ammonia
44	BTPGLN	Bogie tanker, for liquified petroleum gas
45	BVZC	Four- wheeled braken van for block rakes,with CBC
46	BVZI	Improved braken van with max. speed of 100km/h, and some improved comfort features compared to the BVZC. it uses frication snubbers instead of hydraulic dashpots for damping, and has a bogi-mounted brake system in place of the conventional arrangement.
47	BVG,BVGT, MBVG, NBVG	Brake van for non-block rakes.BGVT is the same with a transtion coupler. MBVG is the MG version and NBVGis the NGversion. 4-wheeled.
48	BLAN/BLBN	Bogoe low-platform container flats, in mating plirs 'A' and 'B'. These have largely been superseded by the newer desingns used by CONCOR (BLCA/BLCA, BELIW).
49	BLC/BLCA/BLCB	BLCwagons are CONCOR's new [1995] container flats. (Also known as 'CCF' Coaching Container Flats.) Low platform container flat wagons.
50	BLLA/BLLB	These are variants of the BLLA/BLLB container flats, with an extra-long 45'(13.7m) platform.
51	TCT	BGLong Covered Wagon, for defence use.Screw couplers and side Buffers, fabricated 4-axle bogie, manual brakes.
52	BKH	Bogie open hooper wagon with side and centre discharge (Balast Transport)

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## CHAPTER-8

# MOVEMENT OF OVER DIMENSIONAL AND OTHER BULKY CONSIGNMENTS

### 8.01: Definition:

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

### 8.02: Acceptance of Forwarding Note:

Before a forwarding note is accepted for a bulky consignment it must be ensured that the full dimensions of the consignments are given therein, so that it may be determined whether, the consignment falls in the category of ODC. Therefore, any consignment exceeding the dimension quoted below shall not be registered for booking unless prior sanction for its acceptance has been obtained from the zonal headquarters.

### 8.03: Identifying the Restricted Sections in the Division/zone for Movement of ODC:

Engineering department of HQ should identify and issue the restricted sections/special restrictions to be followed to run different classes of ODC within the divisions/zone for information of respective controllers, escorting staff and field staff. A list of structures, where the clearances are restricted on the electric traction area, tunnels, gradients, curves, over bridges should also be circulated to all concerned.

### 8.04: Maximum Moving Dimensions from Rail Level (At any point):

Description	Broad Gauge (MM)
Height at centre	4115
Height at sides	3505
Maximum width	3050

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

(ii) When a dummy wagon is used, the maximum weight that may be loaded, in any wagon is distinctly marked on each vehicle and must not be exceeded.

### 8.05: Measurements of Over Dimensional Consignments:

If any package before loading exceeds the following dimensions, it is treated to be as ODC or out of gauge load.

Dimension	Size in Broad Gauge
Length	13716 mm (45'-0")
Height at centre	2743 mm (9'-0")
Height at corner	2133 mm (7'-0")
Width	2997 mm (9'-10")
Top width	610 mm (2'-0")

NOTE : These dimensions include lashing and packing.

### 8.06: Classification of ODC consignment:

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

**Class 'A':** Those ODC loads, which have a gross clearance of 22.86 cm (9 inches) and above and a net clearance of not less than 15.24 cm (6 inches) from the fixed structure.

**Class 'B':** Those ODC loads, which have a gross clearance of 15.24 cm (6 inches) and above, but less than 22.86 cm (9 inches) and a net clearance of 7.62cm(3 inches)and more but less than 15.24 cm(6 inches) from fixed structures.

**Class 'C':** Those ODC loads, which has a gross clearance of less than 15.24 cm (6 inches) but not less than 10.16 cm (4 inches) and a net clearance of less than 7.62 cm (3 inches) but not less than 2.54 cm (1 inch) from fixed structures.

NOTE: (i) Gross clearance means the extent of clearance when the consignment is stationary.  
(ii) Net clearance means the extent of clearance after allowing for horizontal lurching and vertical bouncing during run.

### 8.07: ODC Clearances:

#### a) Net clearance:

The net clearance shall be worked out as under:

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

#### b) Horizontal Clearance:

(i) Horizontal clearance is required as allowance for lean due to super-elevation and overhang due to curvature. The lean should be calculated for that point on the profile of the load which is likely to have the smallest clearance from fixed structure. Allowance for lean is represented as  $\rightarrow \frac{HC}{G}$

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

C = Super elevation

G =gauge.

(ii) The central overhang due to curvature, is represented as  $\rightarrow \frac{B^2}{8R}$

Where B = distance between bogie centre

R = Radius of curve.

(iii) In cases, the overhang at the end of a vehicle is to be calculated, it is represented as  $\rightarrow \frac{L^2-B^2}{8R}$

Where L= length of the vehicle.

B= distance between bogie centre

R= Radius of curve.

NOTE: Additional lurch on curves may be taken as 38 mm.



**c) Vertical clearance:**

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

**8.08: Sanctioning Authority for Different Class of ODC:**

Class	Sanctioning Authority	Max Permissible Sanctioned Speed	Movement During Day or Night	Required to be escorted by
A	Within Division: <b>DRM</b> Inter Divisions (ECoR) : <b>COM</b> Inter Railway: <b>COM</b> of the Zone and <b>COM</b> of concerned Railway(S).	Sectional speed	Day & Night	Not required
B	Within division : <b>DRM</b> Inter Divisions(ECoR): <b>COM</b> Inter Railway: <b>COM</b> of ECoR and <b>COM</b> of concerned Railway(S).	BG-40 KMPH	Day & Night	SE(C&W)
C	Sanction of <b>Commissioner of Railway Safety</b> to be obtained processed by <b>PCE</b>	BG-25 KMPH	Day	SE(C&W), SE(P.Way) & TI,SE (TRD) (As per 8.12(e), (f))

**8.09: Procedure for Sanction of Movement of ODC:**

- a) When ODC consignment is offered at a station for booking, SS/SM will verify whether the consignment exceeds the standard moving dimension from originating station to destination station including via. and break of gauge, if involved.
- b) The application to SS/SM must show the length, width, height in mm and weight of the load, received from the consigner along with a drawing of the consignment in duplicate by keeping a copy with SS/SM.
- c) SS/SM should forward the same to Sr.DOM, who in turn will advise Sr.DME to depute SE(C&W) to take the actual measurement.
- d) After scrutiny at divisional level if it is ascertained that it is within the purview of DRM, then it should be dealt at division or else sent to COM for further action.
- e) COM office will process the case along with actual measurement through Engineering, Mechanical & Electrical departments for necessary clearance at their end. Engineering, Mechanical and Electrical departments decide the class of ODC depending upon the track profile of the consignment .
- f) Depending upon the route over which the ODC will move all concerned Zonal Railways will be intimated in writing to communicate their provisional sanction.
- g) TI(ODC) will co-ordinate with different departments of same Railway as well as with COM office of all concerned Railways. In case of any inordinate delay, Dy.COM (Freight) will intervene for early clearance from other Railways as well as from other departments of originating Railway.



- h)** After getting clearance from all concerned departments of originating Railway as well as from all concerned foreign Railway(s), provisional sanction will be issued.
- i)** While, communicating sanction for the movement of ODC, specific route, through which the particular consignment will move, the restriction i.e speed restrictions, night running restrictions, platform restrictions & other restrictions if any are indicated. No relaxation in this regard is permitted. It is the responsibility of the SS/SM of the station from which the load originates to book on the approved route.
- j)** After getting the provisional sanction order, SS/SM shall advise the party for booking as per the classifications of ODC certified by the competent authority.
- k)** Under no circumstance, provisional sanction is to be treated as final sanction and final sanction must invariably be obtained before consignment is despatched.

**8.10: Loading of ODC Consignment:** (Refer GR 4.28 and SRs thereto)

- a)** On receipt of the provisional sanction, the consignment should be loaded carefully, lashed and packed properly, so as to avoid any chance of shifting en-route.
- b)** While examining the wagon loaded, the SE(C&W) must pay attention on the following:
  - i) Load is well secured.
  - ii) Load is within the C.C. of the specified wagon.
  - iii) Weight on any pair of wheels does not exceed the stipulations.
  - iv) Axle load restriction, if any.
  - v) Under gear of the wagon.
- c)** When a load is so long that it cannot be accommodated in two wagons (i.e. two 8 wheelers), it must be loaded in three wagons so that the entire weight is carried on the central vehicle and the end wagons are idlers. The load must be placed upon packing in the central wagon, so that it is clear of the floor of the end wagons by not less 152 mm and there must not be less than 304 mm up side clearance in the end wagons between each of load and side of wagon.
- d)** If the weight of the load is such that it cannot be carried on the centre wagon, then the load must be carried as equally as possible on the end wagons and the centre vehicle must be an idler.
- e)** After loading the consignment, SSE(C&W) will register the measurement and advise the SS/SM concerned of the various overall dimensions, including the packing and lashing etc., as loaded in wagon. SSE(C&W) must issue “fit to run” certificate to the effect that the loaded wagon concerned is safe to run via the particular route specified.
- f)** SS/SM will inform to Sr.DOM who will further informs to the office of the COM that the load is ready to move.
- g)** In case of movement of ODC over other railway(s), the operating ODC cell at HQ will arrange to advise the COM of the concerned railway(s) for sanction, with full dimensions of the consignment, as loaded in the wagon for issue of necessary final sanction for movement.
- h)** After receiving the details of the load from the division/railway for ODC movement, operating ODC cell of COM will process the case further by sending it to the concerned technical branch of HQ i.e., PCE, CME and CEE. The HQ technical branch will scrutiny the case thoroughly and certify the class of ODC and issue temporary restrictions for movement, if any.

- i) After getting clearance from all the technical branches as well as from other Railway(s), operating ODC cell of COM will issue a final movement sanction memorandum to the division/other railway certifying the class of ODC and speed restrictions including any other special restrictions.
- j) After obtaining final sanction from the division, SS/SM/YM concerned must furnish full particulars of the wagon to the control, such as wagon no., owning rly, type of wagon, station from and to, route over which it is required to move etc. After receiving the message, Divisional Wagon Control will give necessary permission to the concerned station to despatch the wagon by a particular train and date and obtain their acknowledgement.

### **8.11: Despatch of ODCs :**

- a) At the originating station, the ODC wagon will be moved only when final approval has been obtained from the competent authority.
- b) ODC loads should move by through trains and not by work trains or shunting trains. ODC vehicle should be attached next to engine as far as possible.
- c) A caution order mentioning all special restrictions, if any to be followed during run should be issued to the LP and guard of train along with escorting staff.
- d) At the originating point, the number of wagon/wagons carrying ODC should be entered by the Train Clerk/SM in the vehicle guidance in red ink which to be handed over to the Guard of the train.
- e) On the card label of ODC load, following particulars should be mentioned:
  - i) Sanction number for dispatch and by whom sanctioned.
  - ii) Route and via junctions
  - iii) Actual overall dimensions
  - iv) Weight of consignment loaded
  - v) Class of ODC
- f) The section controller has to ensure that the particular ODC consignment takes the specific route and the line for which movement sanction is issued. It will be the duty of the Divisional wagon controller/Dy.CHC to keep adjoining control office informed about the movement of such ODC, till such time, it is handed over to the adjoining Division/Railway by specified train.
- g) Section controller should arrange stoppages en-route for entraining and detraining of supervisors at the end/beginning of their beats. Dy.CHC should inform respective supervisors en-route well in advance for escorting.
- h) In addition to strictly adhering to the specific route, the restrictions (eg. speed restrictions, night running restrictions, platform restrictions etc.) notified for conveyance of the consignment over the route, must be adhered to, and no relaxation in this regard is permitted.
- i) SS/SM before starting the train and while asking line clear, describe the train number with letter 'X' suffixed on it.
- j) A Caution Order will be given to the Guard and Loco pilot of the train carrying ODC to restrict the speed and observe any other speed restriction at any other point or other precautions as laid down.

- k)** Shunting of train with an ODC should be avoided. Loose and rough shunting of ODC wagon and against such wagon is prohibited.
- l)** When any ODC wagon is detached from the train at any Station Yard, SM/YM and Guard are responsible to ensure safe placement and securing of wagon/load.
- m)** Extra wagon/brake van facility for accompanying staff should be provided adjacent to the ODC vehicle, if required.

### **8.12: Movement of ODC on Electrified Sections:**

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

- a)** In all cases, where oversize consignment is moving, it should be remembered by all staff accompanying the ODC, that the overhead electrical equipment is always 'LIVE', except when a particular power block has been obtained from the Traction Power Controller. Even when a power block has been obtained, it should be remembered that all the lines, other than those for which the power block has been granted, are 'LIVE' at 25000 Volts.
  - b)** No person should climb on the roof of the carriages or wagons, when those vehicles are located beneath the overhead equipment, except when the equipment is made 'DEAD' and earthed.
  - c)** The following are the prescribed clearance from contact wires for the passage of over-dimensional loads through electrified traction areas and the special restrictions required:
    - i)** Special speed restriction is not required when the gross clearance is at least 390 mm.
    - ii)** Speed must be restricted to 15 kmph, when the gross clearance is in between 390 mm to 340 mm.
    - iii)** Speed must be restricted to 15 kmph and over head power must be switched off when the gross clearance is less than 340 mm.
  - d)** No consignment with less than 100 mm gross clearance from the over head contact wire will be permitted over electrified section.
  - e)** A representative of the Traction Department should also accompany all ODC having clearance as specified in item 8.12(c) (ii) and (iii) above, over electrified section.
  - f)** A representative of the Traction Department should accompany all ODC loads having width of more than 1981 mm for BG and 1910 mm for MG from the centre line of the track.
  - g)** Section Controllers and Traction Power Controller must co-ordinate, while an ODC moves on electrified area.
  - h)** A list of structures, where the clearances are restricted on the electric traction area and also the clearance available under over bridges should be with the Section Controllers and Traction Power Controllers.
- ### **8.13: Responsibilities of Escorting Supervisors Accompanying ODC :**
- a)** Staff to be escorted during ODC movements as mentioned at para 8.08. They should travel in adjacent vehicle of the ODC vehicles, if provided.
  - b)** Walkie talkie sets should be provided to all escorting staff and it should be tested with LP and Guard before the train starts.

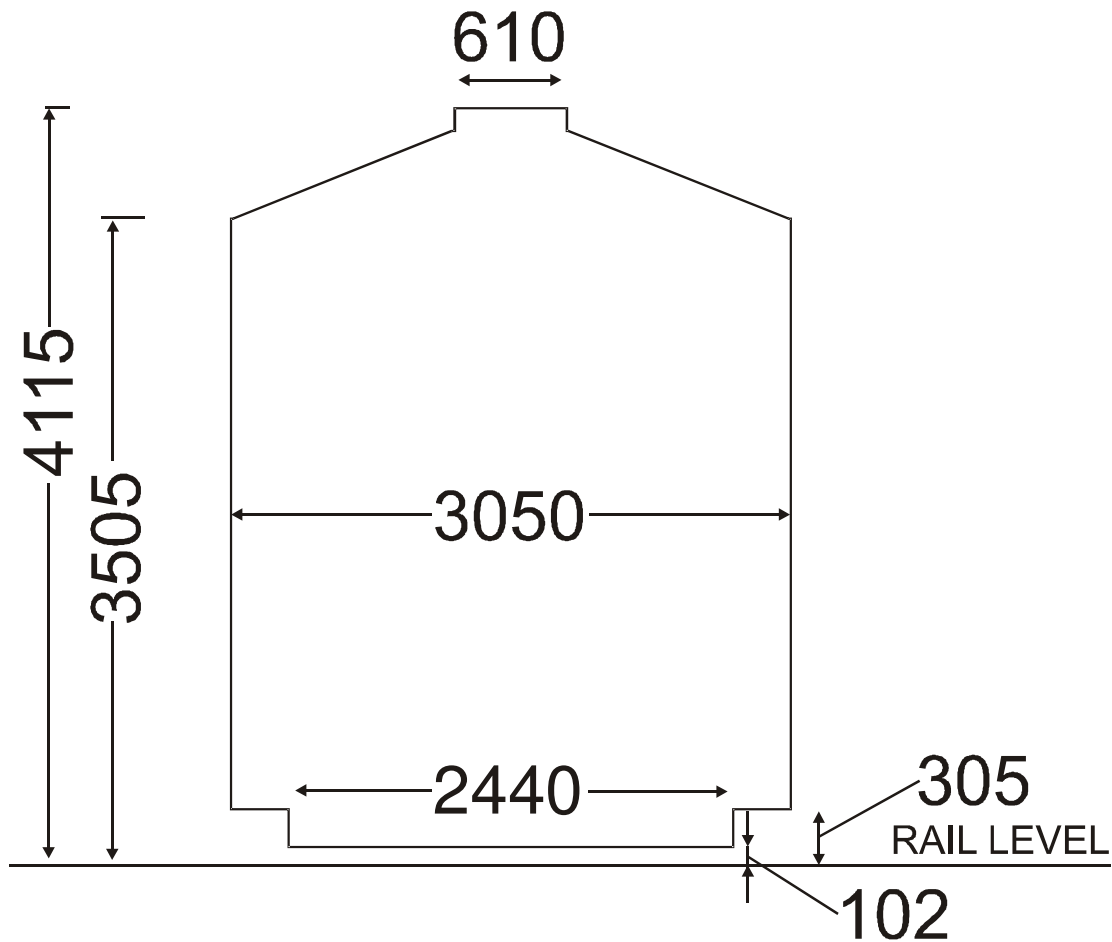
- c) These supervisors will travel over their respective sections/divisions and they should not travel beyond their beats, except in an emergency. Section controller should arrange stoppages enroute for entraining and detraining of supervisors at the end/beginning of their beats. DWC/Dy.CHC should inform respective supervisors en-route well in advance for escorting.
- d) SSE(C&W) to check frequently that the consignment does not shift/tilt from its position or packing is not loose. If it is found loose or consignment is shifted/tilted, train can be moved up to the nearest station, if it is safe and arrange for proper packing. During night, while approaching each structure where the net clearance is less than 6 inches, the train would be stopped and the consignment checked to see that there has been no shifting.
- e) In case any special restriction is issued to take precautions to pass a particular structure, train should be allowed to move very cautiously over that structure with walking speed.
- f) Escorting staff to ensure that the train is running with permitted speed and the ODC is not infringing any fixed structure. In case of any unusual occurrence, it should be immediately protected as per extant rules along with adjacent line, if necessary.
- g) These inspectors will also keep themselves in close touch with the crew of train and assist each other in safe running of train.

#### **8.14: Precautions for movement of ODC loads:**

- a) **“A” Class ODC:** No restriction
- b) **“B” Class ODC:**
  - i) It may be allowed to run at speed of 40 kmph during day as well as night.
  - ii) SE(C&W) should escort the load.
  - iii) During night while approaching each structure where the net clearance is less than 6 inches, the train would be stopped and the consignment checked to see that there has been no shifting.
  - iv) A further speed restriction of 15 kmph should be observed while passing stations, yards, curves and turnouts throughout the run in general and subject to observance of such special restrictions as may be stipulated by the sanctioning authority.
  - v) The train will be required to pass such tight structures having net clearance of less than 15.24cm(6 inch) or gross clearance of less than 22.86 cm(9 inch) excluding curve allowance (if the structure is situated on curve) with speed restriction of 8 kmph.
- c) **“C” Class ODC:**
  - i) It should be run during day light only.
  - ii) SSE(C&W), SSE(P.Way), SSE(TRD) & TI should escort the load. If the section is not electrified, TRD staff is exempted.
  - iii) Platform line should be avoided for reception/through passing.
  - iv) Speed of the train carrying the load must be restricted to 25 kmph which must further be restricted to 8 kmph while passing through stations, yards, curves, gradients and turnouts.

- v) A speed restriction of 8 kmph should also be observed for all structures having net clearance of less than 15.24 cm (6 inch) but more than 7.62 cm (3 inch).
- vi) For structures having net clearance less than 7.62 cm (3 inch) but not less than 2.54 cm (1 inch), the load should be stopped short of the structures, the dimension should be checked and adjusted, if necessary and then the load should be piloted through the structure at walking speed by SE(P.Way).

**8.15: Maximum Moving Dimension:**



ALL DIMENSIONS ARE IN MM.

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## CHAPTER-9

**MARSHALLING YARDS AND FREIGHT TERMINALS**

This chapter deals with many things which are not in vogue, yet they have been purposefully included for their historical importance and to understand the purpose behind certain activities which are now a days done by application of software.

**9.01: Introduction and Definition:**

A Yard can be defined as an activity centre on a Railway system, where trains received, reformed into trains or loads after marshalling or giving prescribed attention and are dispatched to their destinations. A Marshalling Yard is having facilities for receiving, sorting and despatching the wagons to their various destinations after prescribed attention. This involves detention to trains and wagons. But it is inherent in railway working to have Marshalling Yards. Some marshalling yards also work as freight terminals. A Marshalling Yard is laid out with a network of tracks divided into several grids for receiving, sorting, forming and dispatching of trains.

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

Sometimes it is not possible to get trains in such a manner that they are just ready for dispatch to their destination from a yard without any attaching or detaching of wagons. It is not always possible that the freight trains come back to their base depots intact and then resume the cycle. This is possible to some extent in case of CC/Premium rakes. Even in those cases, wagons have to be attached/detached/replaced for various reasons, particularly for sick detaching and maintenance, etc.

Though Yards perform very important functions, yet the work done in a Marshalling Yard is only indirectly productive. Yards are operational necessities and are even considered necessary evils. The ingenuity of the operating person consists of putting the minimum number of the wagons to the minimum possible number of Marshalling Yards by forming trains to the farthest common points subject to rules and regulations. The Control is the brain of the operating system and a large Marshalling Yard is the heart. Its working is to be planned and monitored with considerable care. Constant vigilance, intelligent and efficient work in day-to-day functions is required as it is one of the important factors governing the capacity and the output of a division. A Marshalling Yard affects not only the traffic it deals with, but also the entire train running in the division in particular and the working of Railway system in general. The Yard gets easily congested choking the entire system if treated as a holding yard and if more trains are put in, than taken out.

**9.03: Classification of Yards:**

Yards can be classified as:

- (i) **Terminal Yard:** Terminal Yard means the Yard attached to terminal goods sheds where large number of wagons are loaded and/or unloaded. This term is also used for every goods Yard, where a goods train terminates.
- (ii) **Marshalling Yard:** Yards are nominated as Marshalling Yards on the basis of the work done and wagons dealt with. The Yard which receive and despatch trains without any shunting on them are classified as Transit Yard. In such Yard generally change of Crew, Engine or C&W examination, etc., only take place in addition to formation of a few loads. In a complete marshalling yard in addition to transit services, trains are formed in a large scale. During the last 50 years with the introduction of block rake concept, such yards have become outdated and have given way to modern freight terminals.

#### 9.04: Objectives of Marshalling Yards:

**(a) Quick Transit viz.**

- (i) Accepting trains without detention at adjacent station outside the Yard.
- (ii) Minimising the detention to wagons in the Yard.
- (iii) Timely supply and placement/removal of wagons to the goods shed, transhipment shed, repacking shed, sidings, carriage and wagons depots etc. served by the Yards.
- (iv) Forming block rakes for farthest destination.
- (v) Ensuring convenient Marshalling of wagons from the operational efficiency point of view.
- (vi) Ensuring right time start to outgoing trains.

**(b) Economy:**

- (i) Maximizing productivity of resources and minimising the detention to Train Engine/Light Engine, Shunting Engine, crew and other connected staff.
- (ii) Optimizing the Trailing load of the trains.
- (iii) Optimising shunting engine utility.

**(c) Safety:**

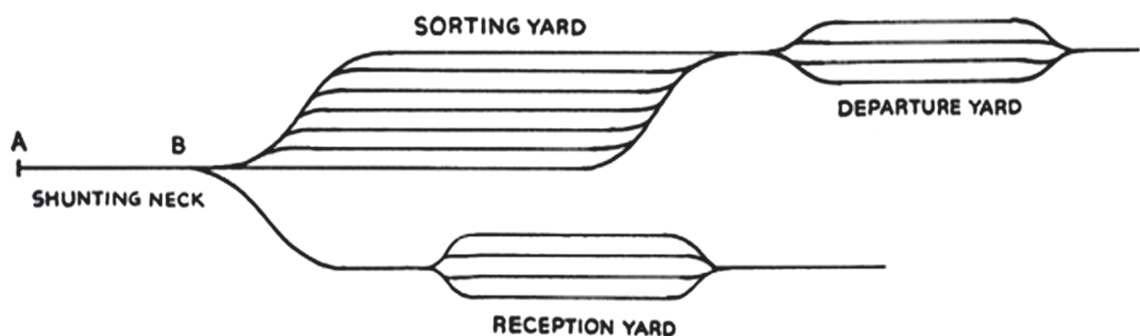
- (i) Ensuring minimum damage to wagons and consignments loaded on the wagons during the shunting operations.
- (ii) Ensuring safe Marshalling
- (iii) Ensuring right pattern of C&W examination.
- (iv) Elimination of Yard accidents.

#### 9.05: Kinds of Marshalling Yards:

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

**(a) Flat Yard:** Flat Yards are generally laid on flat or level land where shunting operations are carried out with the help of engine by push and pull method. Such Yard is economical in space but slow in working and wasteful in shunting engine hours. In East Coast Railway, Marshalling Yards are of this type.

**Fig.1 FLAT YARD**





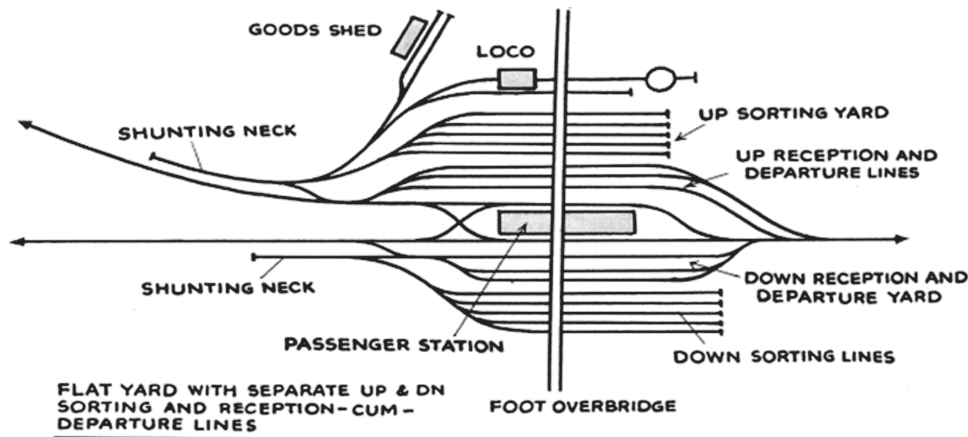


Fig. 2

(b) **Hump Yard:** Hump Yards are constructed by providing gradients between reception and the sorting and despatch lines and the grids. The gradients are created by constructing an artificial hump suitable for the purpose. The gradient of the hump is constructed in such a manner that the wagons roll down of their own to specified sorting lines from the summit(apex) of the hump after having been pushed up by the shunting engine. The load is pushed up by engine towards the hump from one side of the hump so that the uncoupled portion of the load rolls away towards another side of the hump in sorting/despatch line. There are generally two humps one for 'Down' and one for 'Up' Yard. These Yards are economical in shunting engine hours as compared to flat Yards.

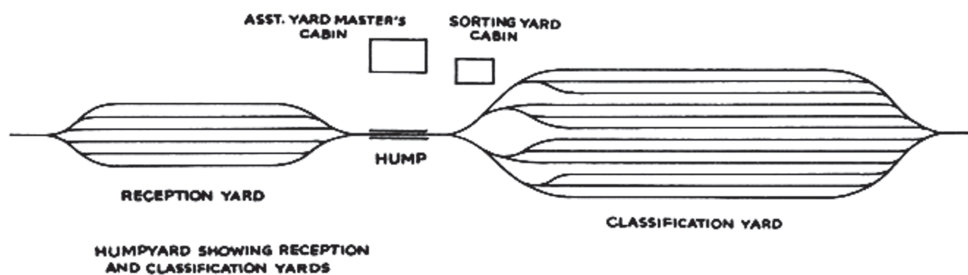


Fig. 3

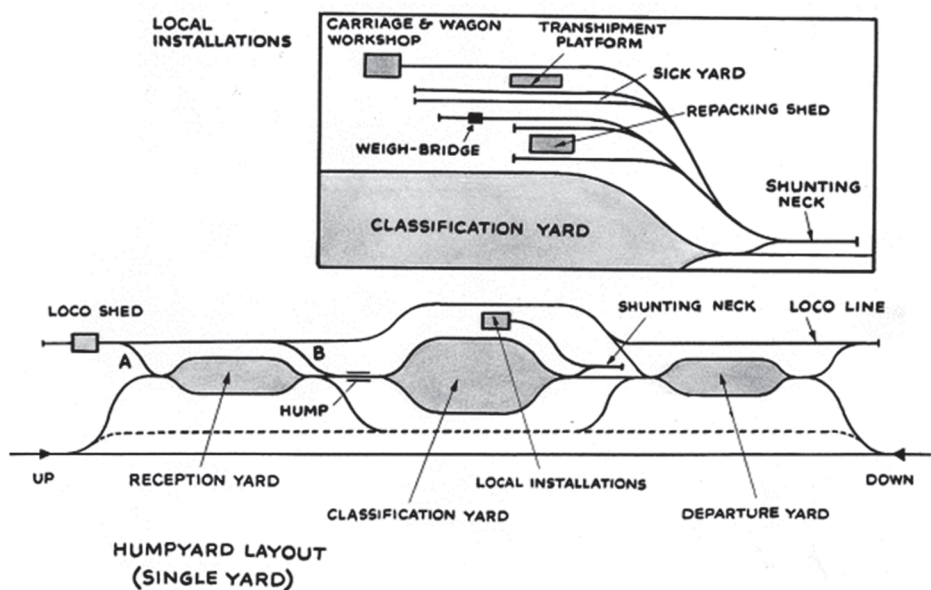


Fig. 4

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

#### **9.06: Terms Associated with Marshalling Yards :**

(a) **Reception Yard:** Reception Yard comprises of the lines on which the incoming trains are received and stand clear of other running lines while waiting their turn to be dealt with. Incoming trains may be composed of wagons which are to go through after changing of power, Crew and Guard or of wagons requiring sorting and marshalling. Separate grids may be provided in the reception yard, one for through trains and another for terminating trains. Separate reception Yards may be provided for trains coming from different directions. The grids for through trains by pass the hump.

(b) **Sorting Yard:** It is a yard in which the trains are broken up on the different sorting lines for various directions or specified destinations as per marshalling order so as to form them into trains.

(c) **Marshalling Lines:** The lines in which wagons are sorted according to commodity, type of vehicle, marshalling order, direction and reformed into trains to meet specific transportation requirements.

(d) **Departure Yard:** It is a yard in which ready loads are kept for despatch. Separate departure yards for trains of different directions are provided in large Marshalling Yards.

(e) **Shunting Neck:** It is a line in a Yard leading to sorting lines on which the actual shunting of the trains may be done clear of any running lines.

(f) **Gathering Lines:** It is a line on which the turn outs to other lines are arranged.

(g) **Transfer Lines:** These lines are meant for transferring wagons, generally from Up Yard to Down Yard or vice versa, in case of two separate Marshalling or hump Yards.

(h) **By-pass or Avoiding Lines:** It is a line, which avoids the hump and its object is to avoid engine going over the hump. It joins the shunting neck at one end and the main hump line short of the king point at the other. It is also used for vehicles, which cannot be passed over the hump into the sorting Yard due to various reasons.

(i) **Engine Run Round Line:** It is the line reserved for movements of incoming and outgoing train engines to and from the Yard or the loco shed, or for independent movement of shunting engines.

(j) **Engine Escape Line:** It is the line meant for engine movements to and from the loco shed from and to yard so that engine returning to loco sheds do not interfere with engines, going out of the loco shed, or with any other movements in the Yard.

(k) **King Points:** The first pair of points a wagon meets with after passing over the hump are called 'King Points'. They divide the sorting Yard into two portions.

(l) **Queen Points:** The second pair of points a wagon meets with on its way downwards are called Queen Points, which further divide the sorting yards into four portions.

(m) **Jack Points:** The third pair of points a wagon meets are called the jack points and these serve to divert the rolling wagons into the different grids of the sorting yard. Points beyond jack points are called 'Ten points'.

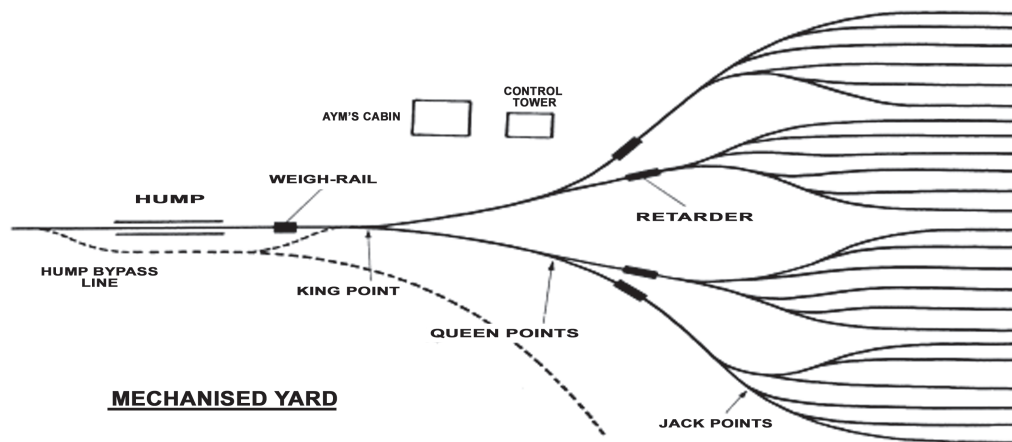


Fig. 5 King, Queen and Jack Points

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

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

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

(o) **Skids:** At Yards, where mechanical retarders are not provided, skids are placed on the sorting lines to control the speed of the humped wagons. These skids are placed by skid porters and the skids automatically come out of runways, where provided, or/and are removed after the wagon has come to stop.

(p) **Brake van siding:** In this siding, brake vans of incoming terminating trains may be detached for subsequent attachment to originating trains.

(q) **Special stock siding:** These are provided for keeping special type stock, cattle wagons, wagons containing commodities like explosives which cannot be humped.

(r) **Stabling Lines:** In a large yard, ballast, material or POH special, empty military special trains are sometimes required to be stabled. Moreover there are heavy accumulations of certain classes of stock for various reasons. The stabling accommodation in the yard should, therefore be ample so that the yard may retain its mobility inspite of any accumulation of wagons or other setbacks.

(s) **Sick lines:** Normally sick wagons are sorted out in the sorting yard, then sent to the sick line. As the time taken in placing wagons into and withdrawing them from a sick line is usually several times more than the time spent in actual repairs, provisions should be made to carry out whatever repairs are possible in the sorting yard itself by providing sick lines/examination facilities.

**9.07: Communication Facilities in Marshalling Yards:**

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

(a) **Telecommunication Arrangement:** Since a Marshalling Yard covers a considerably big area, the distance between its different points and portions becomes naturally long. Therefore, extensive telecom network through an electronic exchange and intercoms between all-important points in the yard is imperative so that instructions to the supervisory staff can be conveyed quickly. The yard should also have direct dialing trunk facilities and control telephones so that instructions to the supervisory staff can be communicated properly and promptly.

(b) **Paging and Talk-back Arrangement:** Major Marshalling Yards are provided with Paging and talk-back sets, through which orders and instructions are issued to the staff concerned, working in different spheres in the Yard, from one central point. Similarly, the staff can also convey any information to the central points. This helps co-ordination between different spheres of the Yard.

(c) **Loud Speakers** are also provided at convenient points so that instructions can be conveyed to different staff working in the same area. For example, loudspeakers are provided in the Sorting Yard, so that the in charge of the hump can convey instructions relating to Hump cabin and the skid porters regarding the line on to which wagons are being shunted. Similarly, arrival and despatch of trains can be monitored.

(d) Extensive use of good walkie-talkies will also go a long way in improving the efficiency of the yards.

**9.08: Yard Organisation:**

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

(a) **Field Staff:** It includes the Chief Yard Master, who is overall in charge of the yard and Yard Masters/AYM in each shift are responsible for operational work. In dual yard system, there may be more than one Yard Masters, eg., one for Down Yard and another for Up Yard. On the other hand, where the traffic is comparatively less, Yard Masters may be replaced by Assistant Yard Masters. The next level of supervision is generally related to the shunting engines. Each shunting engine may have a Shunting Master, attached to it, who controls the movements of the shunting engine. Where the shunting work is not heavy or comparatively unimportant, the Shunting Master may be dispensed & TPM-A may be entrusted with the job. Each shunting engine generally has a batch of three or four Points men, whose duties are usually as under:

- (i) For uncoupling the wagons
- (ii) For Braking of wagons
- (iii) For Relaying of signals
- (iv) For operating the points.

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

(b) **Trains Branch:** CTNC or Head TNC, has overall responsibility for the efficient working of the trains branch. Below them, there are Head TNCs/ Sr. TNCs/TNCs, who may be on shift duties or during

day duty only, depending on the work load of the yard. These Train Clerks are entrusted with comparatively important work in the train's branch like preparation of Marshaling Yard statistics, maintenance of the Yard Balance Register, Daily Stock Taking etc. The TNCs in shift duties take stock of trains in Reception and Despatching Yard. They also maintain Wagon Exchange Registers, Phase-wise Detention Register and stock on line position. The number of TNCs in a yard will depend on the number of wagons, trains dealt within a Yard.

#### **9.09: Yard Working Instructions:**

For proper and efficient working of each yard, general directions for working of each shift should be laid down in the Yard Working instructions. The instructions should deal with all important aspects of working in detail including the procedure for reception and despatch of trains, clearance of lines, restricted movements, etc. The Yard Working Instructions should be prepared generally under the following heads:-

- a) Full description of the Yard including no. of lines with their holding capacity etc.
- b) Strength of the Yard Staff in each shift.
- c) Quantum of inward, outward and internal traffic required to be dealt with by the Yard and their timings.
- d) Marshalling Orders in force.
- e) Shunting engines available in each shift and their utilisation.
- f) Procedure of work to be carried out in each shift.
- g) Directions to Shunting Masters and Yard Masters with regard to advanced planning of work during their shift.
- h) Directions to Shunting Masters and Yard Masters with regard to position of the Yard at the time of handing over the charge.
- i) Conditions for reception and dispatch of trains.
- j) Precautions during shunting operations
- k) Ensuring clearance of lines/yards
- l) Protections of lines
- m) Restrictions in shunting and other movements
- n) Important Safety Precautions, etc.

#### **9.10: Functions of Marshalling Yards:**

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

- a) To pass through trains after change of engine and carriage examination and detaching sick wagons, if any, and adjusting load of the train if necessary.
- b) To break up and sort out terminating trains and loads and the local loads originating in the Yard.
- c) To form originating through trains for the farthest point possible in accordance with long distance marshalling orders laid down by the HQ office.
- d) To form shunting and van trains for the different sections served by the yard.
- e) To hold back trains and wagons until they are able to go out.
- f) Attachment/detachment of locos and brake vans.

- g) To keep wagon detention to the minimum.
- h) To move train engines and pilots between the Yard/Loco Shed and sidings.
- i) Placement and removal of inward loaded wagons for the goods depots loco shed, private sidings etc. served by the Marshalling Yard.
- j) Placement and removal of wagons from the repacking shed to the Yard.
- k) Placement and removal of Sick/Fit wagons from the sick lines.
- l) Assessment of room by the nominated shunting trains for roadside stations.
- m) Arrangements for supply of stock as per Indent Register and ODR required by the road side station in accordance with the orders received from the CHC(Stock).
- n) Weighment of wagons in certain nominated yards as and when required.
- o) Maintenance of the correct tally of the daily output of the Yard.
- p) Maintenance of record of detentions to other kinds of stock such as local loaded, sick wagons, empties and special stock etc.

**9.11: Some Factors Affecting Working of the Yards :**

- (a) Lack of proper advanced planning and co-ordination between the Control and the Yards, and want of proper co-operation between the Yard staff, loco shed staff and carriage and wagon staff, affects Yard working adversely. For efficient Yard working it is necessary that the Yard staff plan their work in advance in consultation with control and adjacent Yards.
- (b) Sometimes, while breaking up the terminating trains, local wagons are not properly collected in specified lines and they remain scattered in the sorting and Marshalling lines or other parts of the Yards thereby causing undue delay in the Yard operations. Endeavour should always be made to collect these wagons in lines specified for the purpose.
- (c) Late or irregular removal of loads from local areas affecting timely placement of wagons in their appropriate sidings is often a chronic cause of trouble in the working of the Yard. Therefore endeavour must always be made to adhere to the schedules for placement and removal of wagons in the different areas of the Yard in accordance with Yard working instruction.
- (d) Empty stock should not be allowed to lie scattered all over the yard. As far as possible empty should be sorted out in the groups in which they are generally required to be worked out, keeping as far as possible special type of stock separately from general wagons. All empties so grouped preferably be kept separate in specified lines.
- (e) Sick wagons and wagons for adjustment of loads and transhipment of contents often lie scattered throughout the Yard thus hampering the Yard operations. Even if the number of sick wagons exceeds the repair capacity, these must invariably be kept collected in the specified lines and sick lines placement and removal should be done strictly according to the schedule. Wagons required adjustments of loads and transhipment of contents must always be placed in the appropriate line and attended to with the least possible delay. Where adjustment of loads can possibly be done in the Yard itself, this must be resorted to.
- (f) Any tendency on the part of shunting engine Loco pilots to waste time on giving attention to loco should be curbed. Shunting engine must not be allowed more than the specified time for loco requirements at fixed intervals.



(g) Higher wagon balance in a Yard affects its mobility. It is therefore very necessary that proper analysis of the highest wagon balance beyond which mobility of the Yard is seriously affected, should be worked out and proper co-ordination between the Yard Master, Station Master, Control and adjacent Yard should be maintained all the time. To prevent excessive inflow of wagons, which seriously affects mobility of the Yard, an eternal watch should be kept on the Yard Balance and steps taken to keep it within the working capacity of the Yard.

(h) Efficiency of the Yard shunting engine is one of the most important factors on which the working of the yard depends. Requirement of a better shunting engine or an additional shunting engine during the busy periods, may therefore be necessary for better working of a yard. In big Yards, efficiency and sufficiency of the yard shunting engines should be periodically examined and if frequent engine trouble is reported, supervisors of loco should be posted temporarily with them until the cause of the trouble is removed.

(i) **Yard layout:** The shunting Master and the Yard Master should carefully watch if any particular feature of the layout, such as wrongly placed cross over, a short shunting neck or isolation of two busy groups of lines is a restrictive factor in the efficient working of the Yard, and if any minor additions and alterations, such as providing an additional crossovers, positioning an existing cross-over correctly, lengthening of a particular line, etc. are likely to improve the working of a Yard, necessary proposals should be forwarded to the Sr.DOM.

(j) Sometimes delay in the release of the wagons by public and departmental consignees cause heavy accumulation of local wagons thus affecting the working of the Yard. Advance intimation given to rake handling parties on the telephone and the departmental supervisors in the local area about the number of wagons awaiting unloading would enable them to make necessary arrangements in time for releasing the wagons.

(k) Sometimes identification of any particular traffic, which affects the mobility of the Yard, is required so as to advice to control to restrict the inflow.

(l) In case of heavy congestions requiring block back on the neighbouring sections, neighbouring Yard should be called upon or directed by Sr. DOM/DOM by taking upon them some of the sorting and Marshalling work, the congested Yard would normally have done. If necessary a Competent Officer or Inspector should sit in the Yard and direct operation until the congestions is cleared.

(m) In the event of an accident temporarily reducing working capacity, steps should be taken to regulate the inflow of trains into the Yard for a day or two, or such a long period as may be absolutely necessary until the emergency is over and the Yard has regained its normal working capacity. The work load on the yard must be suitably reduced to avoid serious repercussions on the Yard itself and on the neighbouring sections. Accidents should preferably be attended to personally by officers as far as possible so that rerailling/ restoration and clearance work may be done in the best possible manner.

(n) **Late start of trains from the Yard:** Whatever may be the cause of late start of trains from a Yard, this apart from reducing available capacity of the section, in turn, affects the working of the yard itself by delaying subsequent formations of trains.

(o) **Yard facilities:** Ordinarily a Yard should be adequate enough for its requirements of sorting, handling of local traffic, formation of trains and for holding back stock until it can go out on the sections or to various installations in the local area. If shunting or train movements in one part interferes with similar movement in the other parts, or if simultaneous reception of trains from and despatch to different directions is not possible,



or the Yard starting a train from or carrying on shunting in one group of lines while a train is being received in the other group, if prevented, it requires careful attention of Supervisors, Inspectors and Divisional Officers for necessary remodeling. If frequent congestion takes place in a Yard or a Yard shows poor performance, the entire working should be thoroughly examined to determine the root cause of congestion. The causes of strained working may be a general increase in traffic, large scale increase of traffic from one or two sections or stations, bad working of some installations served by the Yard, small or obsolete shunting engines or their inadequacy etc. all of which call for suitable action.

**(p)** Sometimes want of proper working facilities, such as adequate lighting, communication between the different key-points in the Yard and the Yard Master and the Station Master requiring a number of messenger to run about in the Yard for this purpose, affects the working of the Yard adversely.

**(q)** Some of the other factors affecting the Yard working:

- (i) Non-rectification of hump gradients
- (ii) Hump shunting not useful enough for the loads which require pushing of loads.
- (iii) Under load running of outward trains.
- (iv) Trains received mis-marshalled.
- (v) Congestion/interruption on the section or in the intermediate or terminal yard.
- (vi) Heavy receipts of local wagons.
- (vii) Shortage of engines and train crew.
- (viii) Heavy shortage of Yard working staff including C&W staff.
- (ix) Mixing of loads with CBC and ordinary couplings

#### **9.12: Operating Considerations Governing Design of a Yard:**

**(a)** The layout of the Yard should be such that as far as possible movements of wagons in their several Marshalling operations would be continuous and progressive in the direction of the destination of the wagons because reverse or zig-zag movements reduce efficiency. The reception lines, sorting lines, shunting necks, Marshalling lines, departure lines, should wherever possible, be arranged with this object in view.

**(b)** The layout should also satisfy the basic principles of maximum flexibility in movements consistent with safety so that as many as possible of the different types of movements which are required to be performed may be carried out. At one and the same time it should be possible to perform all the different movements which are to take place.

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

- (i) Simultaneous reception of trains from different directions.
- (ii) Simultaneous despatch of the trains to different directions.
- (iii) Two or more shunting engines working, not to interference with one another, by provision of separate shunting necks.
- (iv) Reception of one train not to interfere with the departure of another train and vice-versa.
- (v) Reception of trains in one part of the Yard should not interfere with shunting in another part.
- (vi) In large Yards, there should be separate lines for Reception, Marshalling and Despatch. Bye-Pass Running lines may be provided if possible, when only crew change is required.

- (vii) There must be adequate facility of light and communication in the different part of Yard. Yard should be so designed as to permit future extensions in each important section, like reception lines, sorting lines/ Marshalling group etc. in the next 25 years.

### **9.13: Marshalling Yard Statistics:** (Manual of Statistical Instructions Volume-1)

(All the statistics are to be maintained in terms of 8-wheeler units)

#### **(I) General Instructions:**

- (a) The Marshalling Yard statistics should be prepared for selected Yards generally dealing with 8000 eight-wheeler wagons and over per month in respect of BG Yards and 5000 eight wheeler wagons and over per month in respect of MG Yards. Prior approval of the Railway Board should however, be obtained for addition or deletion of any Yard.
- (b) Brake vans are to be included.
- (c) The area of each Marshalling Yard is to be carefully defined and no extra allowance is to be made for any work done within that area. A diagram showing the Marshalling Yard area clearly demarcated should be prepared for the Yards for which statistics are required to be compiled by the Railway for the Board. This diagram should be readily available at the stations to enable any inspecting officer to obtain a clear indication of the extent of the Marshalling Yard.
- (d) Sick lines and repacking sheds, transshipment points, goods sheds, departmental sidings and the industrial sidings etc., may as a general rule, be treated as lying outside Marshalling Yards for purpose of calculation of Marshalling Yard statistics.
- (e) At places, where there are points like the Goods terminal station and/or Break-of- gauge transshipment point etc., adjacent to the Marshalling Yard, the detention statistics for each of these Yards are to be compiled separately either for submission to the Railway Board or for inclusion in the Railway's own Domestic Statistics. The sum total of detention in each Yard should account for the total detention from arrival of a wagon till its final dispatch from that station. To ensure this, the supervisory staff in-charge should exercise a check, at least once in a month, on a random sampling basis. This check should be broad based covering not only the important categories of wagons e.g. BOX wagons, oil tanks etc. but also the main stream of movement of wagons to and from different directions. This exercise should cover at least 10% of the total number of local wagons dealt within the Marshalling Yard during the previous month and the records of such checks should be properly maintained to be available for scrutiny by inspecting personnel.
- (f) In the case of wagons whose arrival or despatch particulars are not available, their detention should not be omitted but reckoned on the basis of the average detention during the month for similar type of stock while working out the average detention per wagon. The number of such wagons should be indicated separately under through loaded and all wagons for each Yard in a foot-note to the statement.
- (g) Yards provided with humps are to be denoted by a star and terminal Yards should be specified by a note to that effect.
- (h) Except where otherwise stated, all results, are to be worked out correct to one place of decimal, but those which are less than 10 should be worked out correct to two places of decimal.

(II) Marshalling Yard statistics (Statement No. 14) for the month of \_\_\_\_\_

Item	Name of Marshalling Yards stating BG or MG	Remarks
	<b>Wagons despatched-</b>	
1	1.01	<b>Number of wagons de spatched by trains during the month</b>
	1.02	<b>Number of wagons placed from Marshalling Y ard outside the Y ard by pilots in goods sheds, transshipment/ repacking sheds,departm ental sidings or Y ards, military sidings, assisted sidings, etc</b>
	1.03	<b>No. of total wagons dealt with during the month</b>
2	<b>Daily average number of wagons despatched-</b>	
	<b>Number of trains received</b>	
	3.01	a) Number of by passing trains b) Number of terminating trains
3	3.02	c) Total (a+b ) Average detenion to bypassing trains : Total - Actual -
	3.03	Number of wagons carried by bypassing trains included in item s 3.01 (a)
4	<b>Number of trains despatched</b>	
	4.01	a) No. of bypassing trains
	4.02	b) No. of originating trains
	4.03	c) Total (a+b)
5	<b>No. of wagons dealt with per shunting engine hour-</b>	
	5.01	No. of pilots working in the station (a) Number of Pilots (b) Number of shifts per day
	5.02	Total shunting engine hours outside Marshlling Y ards
	5.03	Total shunting engine hours of regular shunting engines employed for work inside Marshalling Yard
	5.04	Total shunting hours by train engine employed for work in Marshalling Yard.
	5.05	Total time taken for locom otive duties and minor repairs
	5.06	No. of wagons dealt with per shunting engine hour
6	<b>Average detention per wagon (Hours)</b>	
	6.01	All Wagons : Target - Actual -
	6.02	Thorough loaded wagons : Target - Actual -
	6.03	Through empties
	6.04	Outward Local
	6.05	Inward Local
	6.06	Sick wagons

**(III) Procedure for working out Marshalling Yard statistics:****Item 1 - Wagons despatched:**

Item 1.01 and 1.02 are self explanatory. A wagon should be included under item 1.02 as many times as it leaves the Marshalling Yard. Wagons on 'by passing' trains (i.e. through goods trains, as defined in note under item (1) of statement will not be included under item 1.01).

$$\text{Item No. 1.03} = \text{Item 1.01} + 1.02$$

**Item 2 - Daily average number of wagons despatched:**

$$\text{Item 2} = \frac{\text{Item 1.03}}{\text{No. of days in the month}}$$

**Item 3 and 4 - Number of trains received and despatched :**

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

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

$$\text{Item 5.06} = \frac{\text{Item 1.03}}{\text{Items 5.03} + 5.04}$$

**Note:** While compiling shunting engine hours under item 5.03 and 5.04 the following instructions should be kept in view.

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

in the Marshalling Yard in shunting goods vehicles will be available. Time taken by shunting engine in placing wagons in such lines is to be included in shunting hours when such lines form the part of the Marshalling Yard area.

(e) Time spent for locomotive duties recorded separately under item 5.05 will include under 5.03 also. Item 5.05 will include the time taken by shunting locomotive for locomotives duties and minor repairs upto 30 minutes per shift as per Note (b) above.

**Item 6 - Average detention per wagon:**

(a) The detention time should have reference only to the detention within the Marshalling Yard territory as defined in para (d) of General Instructions and the incoming and outgoing wagons from and to the local outlying sheds, sidings, etc. should be counted as many times as they enter the Yard. This will include detention to sick wagons in the Marshalling Yard although their detention is separately shown against item 6.06.

(b) The average detention is to be obtained by recording in the wagon exchange register or similar record, the hours of detention to each wagon, that is the interval between its arrival and departure. At the end of the month under different types must be totalled, and both detentions and number of wagons for each type must be multiplied by the factor of equivalence to eight wheeler and then consolidated to work out the average detention per wagon. The following example will illustrate the method of calculation of the average detention per wagon :-

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

$$\frac{400 \times \frac{1}{2} + 200 \times 1 + 150 \times \frac{5}{4}}{100 \times \frac{1}{2} + 20 \times 1 + 10 \times \frac{5}{4}} = 7.12 \text{ hours}$$

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

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

**Item 6.1 - All wagons** - The term 'all wagons' includes through loaded, through empty, local loaded, local empty and departmental wagons, wagons on 'through trains' (as defined in item 1.01 & 1.02). Sick and damage wagons will be excluded but these wagons will be included wherever the sick lines form part of the Marshalling Yard area.

The empties in the holding yard/depots should not be included for the purpose of this item. These Yards should, however, be denoted by a suitable footnote specifying therein the average daily holding of the depot.

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

**Item 6.2 - Through loaded wagons -**

The term “loaded wagons” means loaded wagons which neither originate nor terminate at the station, but which are dealt within the Yard and are not on “bypassing” trains (as defined in item 1.01. and 1.02).

**Item 6.3 - Through empty wagons -**

The term “empty wagons” means empty wagons which neither originate nor terminate at the stations, but which are dealt in the Yard and are not on “bypassing” trains (as defined in items 1.01 and 1.02).

**Item 6.4 - Outward Local -**

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

**Item 6.5 - Inward Local -**

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

**Item 6.6 - Sick Wagons -**

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

**9.14: Records to be maintained in Marshalling Yards:**

Records, charts and graphs will be maintained in each yard in accordance with the local orders in force. The following are the principal records which shall be maintained in each yard.

**(a) Running balance register:** This will be maintained by the Train Clerk I/C(Ch.TNC) personally. All stock entering into the yard i.e., received by incoming trains or from the shed, transhipment shed, sidings including departmental sidings should be posted with blue/black pencil showing date, train number, time, loads or empties against different columns direction wise as directed by the Divisional Operations Manager or the Chief Controller of the Division. This will be done by the red pencil for the out-going trains or when stock will be leaving the traffic yard for placement in shed, sidings departmental siding and tranship shed etc.

The posting will be done from time to time commencing from 00-00 hours and every 4 hours. The balance will be closed after adding the incoming stock while the departing stock is subtracted and the balance repeated to the control for the purpose of train ordering and controlling of incoming trains as necessary. This register forms the basic record to show at any time the condition of the yard controlling the loads and empties offering for ordering out trains, the trend of traffic and loads held up as well as to prepare certain statements and statistical figures.

**(b) Trains Clerks's Hand Book:—**Particulars of all wagons entering or leaving the marshalling yard area must be recorded in the Trains Clerk's hand Book directly from the trains by which they are received or despatched. Wagons works into or out of the yard and to outlying shed and sidings by pilots are to be treated in the same way as wagons arriving or leaving by trains. Separate Trains Clerk's Hand Books must be maintained for incoming and outgoing trains, each book being earmarked for a particular direction. These Hand Books form the basic record from which the Running Balance Register is posted.



(c) **Register Showing Receipt and Despatch of Wagons:** — A register is maintained in form OP/T442 to show the phase-wise detention at different stages i.e. from arrival to placement, placement to release and release to despatch of all wagons dealt with at a yard. From this register, details of detention to goods stock in goods sheds, sidings, transshipment sheds, sick lines and departmental sidings can be checked.

(d) **Work Trains Register:** Trains arrived in the yard after collecting loaded/empty wagons from various stations of the division are maintained in this register showing details of wagons received and further disposal particulars.

(e) **Yard Detention Register:** Detention of all wagons in the yard for various reasons are maintained in this register separately for empty and load. Daily and monthly average detention is to be calculated from this register.

(f) **Sick Line Register:** Details of sick vehicles attached/detached, detention in sick line on different accounts are to be maintained in the register. Monthly average detention of sick vehicles is to be calculated from this register.

(g) **Pre-departure Detention Register:** Though a block rake is ready, its despatch will be delayed on various accounts like non availability of power, not turn up of crew/guard, box loading, crossing/precedence of trains, etc. All these detentions of block rakes are to be mentioned in this register and average pre-departure detention is to be calculated daily and monthly basis.

(h) **Turn Round Register:** This is maintained separately for each siding attached to marshalling yard. Timings from 'dispatch of a block rake to siding' to 'arrival from siding' are to be maintained to calculate the turn round time of rakes.

(i) **Train Ordering Book**

(j) **Transshipment/Load Adjustment Register**

(k) **Unconnected Wagon Register**

(l) **Power Detention Register**

(m) **Loaded Wagons Detention Register:-** This register is maintained direction-wise to watch the detention to through loaded wagons. The register is provided with the following columns:—

Date	Direction	Standard Detention	Total No of loads dispatched	Total detention in hrs	Average detention	Excess	Remarks
				Hrs-Mins	Hrs-Mins	Hrs-Mins	

From this register the Y.D. (Yard detention) return is submitted to the Divisional Operations Manager at the end of each ten day period ending viz., periods ending on the 10th, 20th and the last day of the month.

(n) **Shunting Engine Log Book:**— A Log book for each shunting engine should be maintained by the Yard Master or the Shunting Master in charge of each engine. In this book the daily performance of the shunting engine should be recorded with timings from the time it arrives into the traffic yard till the time it leaves the traffic yard for the Loco Shed with the detentions in the yard on Loco account e.g. temporary repairs, defective brakes etc.



(o) **Yard Performances Register:-** Yard Performance Registers must be maintained at all marshalling yards. The columns of the this register are shown below:-

Date	No of wagons at 0-0 hr	No of wagons detached from train	No of wagons worked into yard by pilots from outlying sheds & sidings.	No of wagons dispatched by train	No of wagons placed from yards in outlying sheds & sidings etc.	Total No of wagons dispatched	No of wagon remaining at 24hrs	No of wagons dealt with	No of trains received	No of wagons dispatched	No of shunting engine hours of regular shunting engines	No of shunting hours of train engines	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14

In addition to the above, any other registers as required by the division shall also be maintained. If the Marshalling Yard deals with the activities of freight terminals, the registers required for freight train working shall also be maintained.

(p) **Graphs:-** A graphical record of the following items should be maintained:-

- (i) Daily average wagon holding at 0-0 hour.
- (ii) Average number of wagons dealt with monthly.
- (iii) Average number of wagons dealt with per shunting engine hour.
- (iv) Daily average number of wagons received and average number of wagons despatched.
- (v) Daily percentage of right time starts to trains originating from the yard.
- (vi) Average number of wagons marked sick daily.
- (vii) Daily average detention to through loaded wagons.
- (viii) Average detention to all wagons.

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## CHAPTER-10

# CONTAINER TRAIN OPERATION

### 10.01: Introduction:

Since the day human beings could learn to think and innovate, they have been constantly developing new and better ways to accomplish their tasks. The ancient mariner must have spent many sleepless nights exploring how to sail his log-boat faster. When he came up with larger ancient ships he faced the single greatest problem i.e., his ship stuck to the berth for longer time than it was on high seas. The reason was the excessive time consumed to fill the ship and again unfill the same.

As necessity was the mother of all inventions, during Second World War, US navy struck upon a noble idea of containers to load and unload the ship quicker than before. These containers were conical by dimension. However, the innovation paid dramatically, when Malcolm Maclean, creator of Sea Land Corporation revolutionized the concept and developed internationally standardized containers and its mechanized handling. This was in the year 1956.

The ship berthing time reduced & sailing time increased drastically & ship owners saved a lot of time. Now by spending the saved time on high seas, he earned almost the double of what he was earning prior to containerization. The cargo owner thrilled to see his cargo as if “as is where is” even after moving hundreds and thousands kilometer. No loss, no pilferage & even no smell when the container was having cooling system.

When this revolution was taking place, it did not escape the alert eyes of the Indian Railway Managers. They built some 5 ton square size containers to move them fast without any pilferage en-route to the door of the consignee. This was in the year 1966.

But, soon the onslaught of internationally standardized containers began. The first I.S.O containers were handled in Cochin port during the year 1973. The first Inland Container Depot (ICD) was commissioned in Bangalore during the year 1981 & by 1988, there were seven ICDs in India.

At this point, it was felt that a separate entity should shoulder the movement and marketing initiative of containerized cargo. Here took birth the today’s leader i.e “Container Corporation of India”, a PSU under Ministry of Railways. Since, then there is no looking back.

Later, it was felt in an era of globalization, CONCOR may not alone be able to cope up with the huge container logistics requirement in the country. Some private investments were needed for excellence and exploitation of the hitherto unexploited arena of the multimodal logistics. Some 13 container operators got license to run container trains which helped domestic container movement to attain a higher level.

The agreement those Container Train Operators (CTO’s) signed with Indian Railways is called “**Model concessioners agreement**”. CONCOR also came under the purview of the same agreement to ensure a level playing field.

### 10.02: The Salient Features of the Agreement:

The salient features of this Agreement as well as of related instructions with respect to train operations are given below. The salient features of the Concession Agreement with Container Train Operators and of other related instructions are indicative in nature and for guidance only. For actual provisions, the Concession Agreement and the Circulars and Railway Board’s letters should be referred to.

1. Concessionaires have a non-exclusive right to require the Railway Administration to haul the Concessionaire's Trains subject to the Concessionaire establishing/ensuring access to Rail Terminals and acquiring a minimum number of Wagons including brake vans to form a Block Rake for the commencement of operations and for transportation of containers.
2. The term of this Agreement shall be for a period of 20 years starting from the Commercial Operations Date.
3. In the event the Concessionaire fails to operate its Container Trains in accordance with the requirements of this Agreement within three (3) years from the date of award of the In Principle Approval, Railway Administration shall have the right to terminate the Agreement.
4. The rights of the Concessionaire shall include the following:
  - i) The right to undertake the business of collecting, storing and loading onto Wagons, consignments of goods from any third party;
  - ii) The right to determine, charge, collect, retain and appropriate all the fees that it charges from the consigners;
  - iii) The right to obtain access to Rail Terminals and develop, own, operate and maintain Rail Terminals, including inland container depots;
  - iv) The right to procure and own/lease Wagons and containers.
5. The concessionaire will be responsible for loading and unloading operations at both the origin and destination Rail Terminals
6. The Railway Administration shall haul the Concessionaire Trains on the payment of prevalent haulage charges as notified from time to time.
7. The Central Government (Ministry of Railways) shall have the right to specify certain commodities, which ordinarily move in railway wagons in trainload as notified commodities, which may be subjected to different tariff and conditions for haulage.
8. The existing incentives/schemes extended to rail customers or that may be introduced in future shall not ipso facto apply to the Concessionaires. Upon request of the Concessionaire(s), Railway administration may consider extending such schemes to the Concessionaire to the extent possible in a non-discriminatory manner.
9. All commercial rules like that contained in Commercial Manual, as amended from time to time and as applicable to other freight traffic moving on Indian Railways shall apply to the Container traffic, except rules specially covered in this Agreement in a non-discriminatory manner amongst similarly placed entities.
10. It shall be the Concessionaire's sole responsibility to procure the requisite approval/authority for the Concessionaire's Train and/or a Railway Administration locomotive to enter into and utilize the origin and destination Rail Terminal(s).
11. Each concessionaire is required to set up two rail linked inland container terminals within three years of obtaining the license to operate or have access to inland container terminals.
12. Use of Railway freight terminals (Goods sheds) as Container Rail Terminals (CRT) has been permitted by the Railways in terms of Rates Circular 10 of 2008.

**13.** Each Rail Terminal, other than a Railway owned Terminal, that is used by the Concessionaire shall conform to the following:

- (i) Each Rail Terminal shall have rail facilities for handling Concessionaire Trains along with locomotive in conformity with siding rules prescribed by Railway Administration from time to time.
- (ii) Be equipped with a RDSO approved in-motion weigh bridge of prescribed standards for weighing of Wagons with and without containers of the Concessionaire's Train.
- (iii) Be equipped with TMS and such other facilities as may be required to interface with, and ensure transfer of data online to FOIS of Railway Administration.

**14.** The Concessionaire shall declare the weight of each Wagon/container prior to departure of the Concessionaire's Train.

**15.** The Concessionaire shall procure by way of purchase, lease or hire. wagons including Brake Vans and Containers required for the purposes of operating the Concessionaire's Trains. However, till such time as the Concessionaire procures the required Brake Vans, Railway Administration may provide its own Brake Vans (provided they are available), on non-discriminatory basis, at a reasonable charge, notified by the Railway Administration from time to time.

**16.** In the event any of the Wagons of the Concessionaire are lying idle ("Idle Wagons"), the Concessionaire may offer to the Railway Administration or other Concessionaires, use of any such Idle Wagons. However, Railway Administration shall be under no obligation to accept such an offer of the Concessionaire for use of any idle Wagons and may levy a Stabling Charge as specified.

**17.** In the event of an Emergency, Railway Administration shall have the right, to temporarily assume control and make use of the Wagons of the Concessionaire. For any such Emergency Use, Railway Administration shall pay to the Concessionaire, a reasonable rent/charge to cover the cost of provisions, maintenance and operation of the Wagon.

**18.** The Concessionaire shall at all times conform to the maintenance standards specified by the Railway Administration in accordance with Good Industry Practice for the Concessionaire's Containers, rail related equipment and tracks.

**19.** The Concessionaire's Wagons shall be maintained by the Railway Administration in accordance with the maintenance schedule notified by the Railway Administration. Such maintenance shall, *inter alia*, include intensive examination, routine overhaul ("ROH") and periodic overhaul ("POH"). The Concessionaire will provide and maintain the requisite Wagon examination facilities(as specified by railway Administration) inside the Rail Terminal and bear a one time capital cost for tools and plants as specified by Railway Administration and approved by RDSO.

**20.** Wagon maintenance charges for maintenance by Railway administration of the Concessionaire's Wagons shall be included in the Haulage Charges. The present Haulage Charges include 5% thereof by way of maintenance charges.

**21.** Railway Administration shall normally complete the intensive train examination within a period of 6 hours from the time the Concessionaire's Wagons (in empty Rake formation) are handed over by the Concessionaire for such examination. Provided however, that the minimum interval between two successive Rakes offered for intensive train examination shall be at least 6 hours. Alternatively, the Railway Administration may examine the Concessionaire's Wagons at suitable point en-route its destination where the facilities for such examination exists. The time stipulated for maintenance shall not be applicable vis-a-

vis such Concessionaire's Wagons that are declared sick during the course of examination and are required to be detached from the Concessionaire's Train for sick line/ workshop attention.

**22.** In the event of the Railway Administration's inability to conform to the time schedule specified for intensive train examination, it shall pay to the Concessionaire for every 24 hours of delay (inclusive of initial 6 hours) so caused, an amount equal to the Stabling Charges payable for such period of delay.

**23.** The Concessionaire may undertake maintenance of the Concessionaire's Wagons through any other entity including the Concessionaire on such terms and conditions as specified by the Railway Administration from time to time provided however, that the maintenance is carried out as per maintenance schedules and various stages of inspection as may be notified by Railway Administration and pre-departure certification of such Wagons shall be issued by the Railway Administration for which the prescribed charges shall be paid by the Concessionaire.

**24.** The Concessionaire shall hand over empty Concessionaire's Wagons, in rake formation, to Railway Administration for carrying out maintenance as per the schedule specified by the Railway Administration.

**25.** The haulage charges for moving the Wagons, in rake formation, from a Rail Terminal to the workshop/ maintenance depot/train examination point of the Railway Administration and back shall be borne by the Railway Administration, provided however, that the scheduled haulage charges shall be payable by the Concessionaire in the event maintenance is carried out by an entity other than the Railway Administration and inspection is carried out by the Railway Administration at the location of maintenance.

**26.** In the event wagon maintenance is undertaken by the Concessionaire, or any other party (other than Railway Administration in accordance with the provisions of this Agreement) a proportionate rebate in haulage charges (equivalent to the built in maintenance charges) shall be given to the Concessionaire.

**27.** Subject to any operational constraints, Railway administration will provide locomotives to haul the Concessionaire's Trains on a non-discriminatory and non exclusive basis vis-a-vis other Concessionaires only.

**28.** At least four (4) hours prior to the planned departure of Concessionaire's Train, the Concessionaire shall submit an indent ("Indent for Locomotive") for supply of locomotive. The existing incentive schemes if any or incentive schemes that may be introduced in future for supply of locomotives may be extended to the Concessionaire's Trains with suitable modifications such that it is applied in a non discriminatory manner among different concessionaires.

**29.** The Concessionaire may, anytime prior to arrival of a locomotive cancel its Indent provided however, the Concessionaire shall be liable to pay to Railway Administration indent cancellation charges equivalent to one (1) hour Locomotive Detention Charges. In the event, indent for cancellation of locomotive is received by Railway Administration after the loco is dispatched for the Rail Terminal, the Concessionaire in addition to indent cancellation charges, shall also be liable to pay to Railway Administration such charges as may be prescribed by Railway Administration for the infructuous movement of locomotive both ways. Such charges, however, shall not exceed the charges levied for the movement of the locomotive for the distance from the nearest locomotive shed.

**30.** If after arrival of the locomotive at the Rail Terminal from where the train is required to depart, or the Rail Terminal where the train is required to terminate, as the case may be, the Concessionaire's Train, for whatsoever reason not attributable to Railway Administration, is not attached or detached and released (as the case may be), prior to expiry of the Free Waiting Time of two hours (entry to exit), the Concessionaire shall be liable to pay to Railway Administration, Locomotive Detention Charges for every hour (or part thereof) for which the locomotive is detained beyond the Free Waiting Time. Provided however, if a locomotive is detained for a period of more than eight (8) hours at any Rail Terminal (either the Rail Terminal of origin or

of termination, as the case may be), then, without prejudice to the Concessionaire's liability to pay to Railway Administration the Locomotive Detention Charges. Railway Administration shall have the right, but not the obligation, to withdraw and/or remove the locomotive from such Rail Terminal. In case Railway Administration withdraws and/or removes the locomotive from the Rail Terminal after detention of 8 hours, the detention along with movement charges shall be levied without granting any free time. In the event Railway Administration withdraws the locomotive then, the Indent for locomotive shall be deemed to have lapsed, with no further effect. These provisions shall also apply to the situation where the locomotive arrives at a Rail Terminal where the train is scheduled to terminate, but is denied entry into such Rail Terminal for reasons attributable to the Concessionaire and /or the Rail Terminal operator.

**31.** Locomotive Detention Charges payable by the Concessionaire for detention of a locomotive beyond the Free Waiting Time shall be at the rates as prescribed for Diesel/Electric Train Engines by the Railway Administration from time to time.

**32.** Railway Administration shall, in the event of delayed supply of locomotive beyond 12 hours from the indented schedule time of departure of the Concessionaire's Train, be liable to give to the Concessionaire a onetime rebate equal to two (2) percent of the haulage charges payable by the Concessionaire for the Booked Route. This rebate shall, however, not be admissible in contingencies such as interruption of traffic due to accidents or any other similar unavoidable reasons beyond the control of Railway Administration.

**33.** Transportation of the Concessionaire's trains shall be in Block Rakes. In the event a Concessionaire's Train operates with lesser number of Wagons/Containers than those prescribed in the Block Rakes ("Non-Block Rake Trains"), the haulage charges for such Non-Block Rake Trains shall be recovered on the basis of the minimum composition of Block Rake as specified by Railway Administration. Provided, however, in the event a Concessionaire's Train has less than half the Wagons required to constitute a Block Rake, the Railway Administration shall have the right to refuse to haul the Concessionaire's train comprising less than half a Block Rake. The Railway Administration may however, at its sole discretion extend the facility of two point rakes for Container Trains during specified periods and on specified routes.

**34.** The Concessionaire's Trains to be hauled by Railway Administration pursuant to this Agreement shall be booked by the shortest route possible (the "Booked Route") and the haulage charges shall be determined with reference to such Booked Route. Provided however, in case of any accident or other operational exigencies on, or affecting, the Booked Routes, Railway Administration shall, in its sole discretion, be entitled to transport the Concessionaire's Train by an alternative route ("Alternate Route"). The Concessionaire shall be liable to pay haulage charges only for the Booked Route even when Concessionaire's Train is transported by an Alternate Route. Provided that in case the Concessionaire's Trains are carried by a longer route in pursuance of the Rationalisation Scheme of MOR (under section 71 of the Railway Act 1989), the Concessionaire shall be liable to pay charges accordingly.

**35.** The Concessionaire shall, at least 7 (seven) days prior to any calendar week in which it proposes to operate any Concessionaire's Train, inform ("Weekly Advance Scheduling Notice") Railway Administration of the number of Concessionaire's Trains, it requires to be moved, the proposed routes and the likely departure dates ("Weekly Advance Schedule").

**36.** Notwithstanding anything to the contrary, the Concessionaire shall, at least twenty four (24) hours prior to the day of programmed loading (excluding the day of loading itself) of a Concessionaire's Train, confirm to Railway Administration the departure schedule of such Concessionaire's Train, provided that such notices shall not in any way be binding and shall be only indicative of the Concessionaire's operations schedule for the following week/ day.



37. Railway Administration shall maintain a level playing field among all Concessionaires and shall devise and implement a transparent and non-discriminatory system for dispatch of Concessionaire's Trains on a first come first served basis.

38. Notwithstanding anything to the contrary contained in the Agreement, dispatch of locomotives and Concessionaire's Train(s) shall be subject to any operational exigencies and/or system restrictions.

39. Railway Administration shall make all efforts to ensure minimum en-route detention of the Concessionaire's Trains.

40. Subject to any operational and capacity restrictions of Railway Administration, there shall be no restriction on the number and frequency of Concessionaire's Trains that the Concessionaire may require Railway Administration to haul pursuant to this Agreement.

41. The Concessionaire may request the Railway Administration to accept, at any time after the departure of a Concessionaire's Train, the diversion/re-diversion of such Concessionaire's Train to any other Rail Terminal, in accordance with the various terms and conditions (including but not limited to payment of haulage charges and other charges) and procedures specified by Railway Administration from time to time subject to its operational exigencies and/or for system restrictions. It is clarified that the Railway Administration shall not be under a legal obligation to comply with such request

42. The Concessionaire shall be liable to pay to Railway Administration Stabling Charges, in the following events:

- (i) In case the Concessionaire's Train suffers detention at the serving station for reasons attributable to the Concessionaire or when the Concessionaire either declines to accept Wagons inside the Rail Terminal, scheduled to be the terminating Rail Terminal or is not in a position to receive placement of subsequent Wagons; or
- (ii) In case of non acceptance of trains inside any port by the port authority concerned; or
- (iii) At any of the stations enroute due to any reason attributable to the Concessionaire.
- (iv) Provided however that Stabling Charges shall be levied only where the detention of the Concessionaire's Train is for a period in excess of 4 hours. Stabling Charges shall be payable at the rates notified by Railway Administration from time to time and the Railway Administration shall have the right to revise the Stabling Charges on an annual basis; provided that any increase in charges in any Financial Year during the term of this Agreement, shall not exceed 10% (ten percent) of the charges payable in the preceding year.

#### **10.03:Importance of Container Traffic:**

a) Various modes of transport include railways, roadways, inland waterways, airways and sea routes. Multimodal transport is the carriage of cargos in containers by more than one mode of transportation. Containerisation is a prerequisite for efficient multimodal transportation. Containerisation could be defined as a means by which goods are transported within large uniform containers or boxes that could be conveniently carried by and transferred between different modes of transportation. Containerisation involves consolidating mixed general cargo packages into standardised units accommodated in standard size containers.

b) Multimodal transport, especially of high value general goods has helped in reducing overall physical distribution costs as well as in providing better quality of service which includes—



- (i) Speedy transport,
- (ii) Door to door service,
- (iii) Safe and secure transit,
- (iv) Easy packaging,
- (v) Less documentation.

c) Containerisation has now become essential in respect of international trade in general goods involving transportation by sea. Prior to containerisation, the utilisation of the loading space in sea vessels was poor and vessels suffered heavy detentions at ports in loading/unloading operations in respect of general goods traffic. Containerisation has brought great economic benefits to both ship-owners and shippers by better use of vessels, shorter time in ports, reduced transit times for goods and all round greater reliability. International container trade which started in mid-sixties has picked up and now spread to various major routes in India.

d) Indian Railways introduced door-to-door service in 5-tonne domestic containers in early sixties, but this was not popularised. However, International traffic in containers has shown a rapid increase during the last decade. International containers (ISO) are standardised boxes of 8.5 or 9.5 feet in height, 8 feet in width and 20 to 40 or 45 feet in length. The capacity of a ship or terminal or the quantum of container traffic handled is generally measured in terms of 20 feet- equivalent units (TEUs) of containers. In Indian Railways, containers are carried on BLC/BLL/BLLA/BLCA/BLCN wagons in which two TEUs (Twenty feet Equivalent Units) can be accommodated in each wagon.

#### **10.04: Advantages of Containerization:**

- a) Containerisation facilitates ‘door-to-door’ service for domestic as well as international traffic. The traders who are located inland can export or import their goods from the nearby ICDs (Inland container Depot) or CFSs (Container Freight Stations) without the necessity of going to the sea ports for clearing such traffic.
- b) Through mechanised handling of standard size (ISO) containers, time required for loading/unloading of such traffic into/ from ships at the ports is greatly reduced thereby effecting considerable saving of time for such ships and reducing overall cost of transportation.
- c) The space in the cellular ships in which the containers are transported is much better utilised.
- d) Containerisation ensures faster transit of goods since detentions at terminals and inter-modal points are minimised due to mechanised handling of containers.
- e) The goods are less liable to thefts and damages when transported in containers.
- f) Containerisation reduces cost of packaging, insurance and documentation.
- g) Merchants can keep better track of their cargoes when the same move in containers, as on line information is available.
- h) The main emphasis is to subject itself to strict bench marked standards and design service packages with a view to offer a range of value added services to its customers to enhance delight and loyalty.
- i) Faster transit of goods due to movement by “CONTRACK TRAINS” & “CONRAJ TRAINS” maintaining higher speed.

**10.05: Setting up of Container Corporation of India Ltd (CONCOR):**

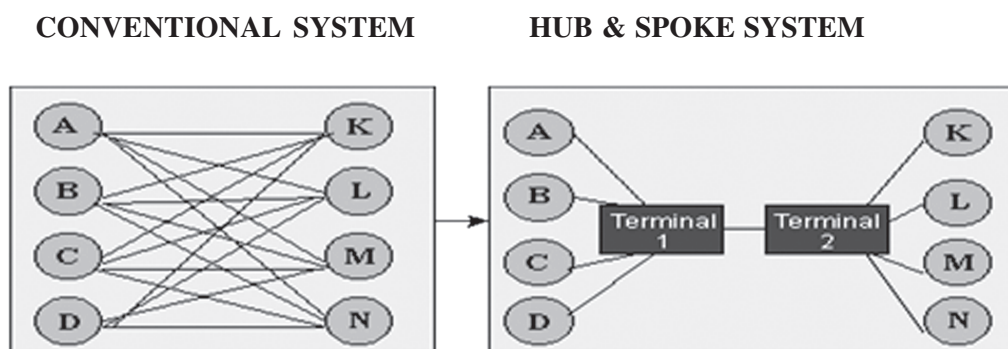
Container Corporation of India (CONCOR), a mini Ratna (category) company, was setup in March 1988 as a subsidiary to the Indian Railways for the operation and management of Intermodal terminal facilities. The objective of the division is to bring back the goods to rail which are now being transported by road. The division aims to do this by containerising piecemeal cargo and offering a comprehensive door to door intermodal service. A number of Inland Container Depots (ICDs) have already been setup and additional ICDs have been planned to set up in near future. It operates 43 EXIM (Export and Import Cargo) terminals at present. These ICDs are supported and fed by 71 container freight stations (CFSs) located within a radius of 350 kms. from each ICD. The shippers can directly export/import their cargoes from these Inland Depots (Dry Ports) without the need to go to the sea ports for their international trade.

Presently, CONCOR has a nationwide Network of container terminals. It is today, the most dominant provider of logistics service and support for both international and domestic cargo industry in India. The company has also extended its operations abroad by managing the only rail based Inland Container Depot in 'Birganj' in Nepal.

**10.06: Hub and Spoke System:**

In order to take full advantage of the rail linkages offered, while at the same time offering the reach and dependability of road services, the concept of "hub and spoke" operations are introduced as the long term development in CONCOR. The hub-and-spoke distribution network is a system of connections arranged like a chariot wheel, in which all traffic moves along 'spokes' connected to the 'hub' at the center.

Private Container Operator can operate Hub and Spoke system for transportation of containers in certain regions. Hub is a container loading facility/depot, which will be used by an operator to collect/distribute traffic. For this purpose the operator may make a request to railway indicating the pairs of station between which he will run his container trains via this hub.

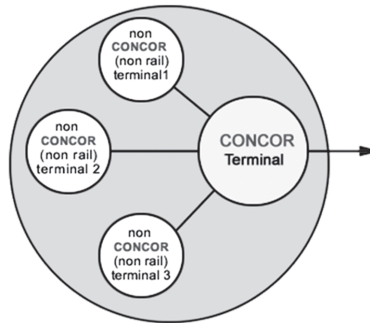


Hub and Spoke operations are feasible for both the international and domestic business segments. Such operations involve the linking of road or short lead rail shuttle services within defined catchment areas, to long lead point to point train services.

In the international domain, some hubs like Tughlakabad are fed by several satellite locations like Panipat and Gwalior, until traffic justifies running a scheduled service from the satellite itself, as was done in the case of Ludhiana and Moradabad, both of which started out as remote locations linked to the hub terminal at Tughlakabad, but now function as stand alone terminals.

### 10.07: Competition from Other Container Operators:

Competition in the field of container handling is increasing, especially in the metropolitan ports. Several companies have started operations in ports. In the deep hinterland, other operators have entered the market in the sense that new terminals have been set up. However, as CONCOR concentrates on its hub-spoke strategy, these developments can become complementary to **CONCOR's** operations, as our competitors in the Container Freight Stations business often become customers for transport of containers from and to gateway ports.



In the domestic arena as well, hub and spoke movements allow for a better utilization of transport potential and allow for long lead services to be generated on the basis of short lead traffic collections using road and rail shuttle services. This service can be especially useful for big corporates for whom production centers are concentrated in a single location, but distribution needs are national in scale. **CONCOR** has already successfully moved white cement as a commodity using this experiment, whereby the product has been distributed over various locations after being picked up from a single production center.

### 10.08: Double Stack Container:

The present rail share in container transport is around 30% and is not increasing because of several reasons. Some of the reasons are the comparative benefits offered by road transport: faster, door to door service, aggregation of smaller volumes, lesser waiting time at ports and terminals, avoidance of additional handling of cargo at rail terminals. All these help reduce costs in comparison to rail.

There are also chances of increase in container traffic to manifolds in near future. This magnitude cannot be handled with current bottlenecks and line capacity constraints. Such line capacity constraints cannot be eased overnight. Therefore running Double Stack Container trains is one such feasible strategy and as such First double stack container was moved on Indian Railway track on 23.3.2006 from Jaipur to Pipavav Port on BLC/BLCM wagons.

### 10.09: Advantages of Double Stack Container Operations:

- (a) Number of trains can be reduced by 48% for the same throughput.
- (b) The payload capacity of the container train has been increased from 1500 MT to 2500 MT to match the carrying capacity of the locomotives.
- (c) The terminal congestion can be minimized. Dwell time of containers at terminals and ports shall reduce.
- (d) Matching of throughput for larger ships can be fulfilled in lesser time.
- (e) Cost of unit transportation will be reduced.
- (f) Rolling stock requirement of locos and rail flats will reduce substantially.
- (g) Rail share will increase with the same rolling stock.
- (h) It encourages direct service of bigger ships to Indian Ports.
- (i) Overall transit time of containers will reduce.

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## CHAPTER-11

# STATION WORKING RULES

**11.01:Introduction:** Station Working Rules are the rules for working of trains at a particular station to which it is applicable and printed in the form of a booklet. Station Working Rules contain the instructions and are issued for the knowledge of staff involved in train operations directly or indirectly during normal as well as abnormal working.

**11.02:Objectives:** The object of issuing SWR is to inform all staff concerned with working of trains about the special features of the station to ensure safe train operations at & between stations including level crossings, depending on local conditions and special features, such as, the layout of the station yard, signaling and interlocking, gradients, catch sidings, slip sidings, etc.

**11.03: Provision of GR 5.06:-** SWRs are issued in conformity with the G&SR & cannot, in any way supercede them. In case of any conflict, the provision of G& SR will prevail.

- (a) In addition to General Rules for Indian Railways and Subsidiary Rules of a Railway, each station shall be provided with Station Working Rules, applicable to the station, issued under special instructions.
- (b) A copy of the Station Working Rules or relevant extract thereof shall be kept at stations, cabins and level crossings concerned. SWRs shall be issued in Bi-lingual i.e. in English and Hindi language.

### **11.04: Authority to Issue SWRs:**

Under the provisions of GR 5.06, the authority to issue SWRs rests with the Authorised Officer of the Railway. The power to issue SWRs has further been delegated to the Sr.DOM/Sr DOM(G)/DOM/DOM(G) and Sr.DSTE/DSTE jointly for all stations within the Division.

### **11.05: SWRs Requiring Sanction of Commissioner of Railway Safety (CRS) :**

Approval of CRS is to be obtained before SWR is issued & brought into force & observations made should also be incorporated in relevant para of SWR. CRS approval is also to be obtained if modifications in station working are required in following cases:

- (a) If relaxation is to be obtained from provisions of General Rules under approved special instructions,
- (b) If the SWRs are to be revised as a result of any work listed in para 1302 of the Indian Railway's P.Way Manual.
- (c) Works requiring the sanction of Commissioner of Railway Safety

### **11.06: Procedure for Preparation of SWR:**

- (a) While framing the working rules, approved Engineering Drawing and Signal Interlocking Plan should be taken into consideration. To avoid errors, a copy of approved EP and SIP should be available with Engineering, Signalling and Operating departments of division while checking the draft rules.
- (b) Sr.DSTE/DSTE,Dy.CSTE (Con/Proj) shall prepare/amend the working rule diagram for open line/Construction/projects works on the basis of EP and signaling plan in case interlocked station and forward to Sr.DOM/Sr.DOM(G)/DOM(G)/DOM for framing of SWR.
- (c) Sr.DOM/Sr.DOM(G)/DOM(G)/DOM will arrange to scrutinize & prepare the Station Working Rules by the Transportation Inspectors (SWR) in the Standard Format and after which it shall be checked and

approved by the Sr.DOM/Sr.DOM(G)/DOM(G)/DOM personally. In case of interlocked stations the draft working rule shall be checked & approved by Sr.DSTE/DSTE jointly with Sr.DOM/DOM (G)/DOM. For electrified section Sr.DEE/DEE (TRD) should also be associated.

(d) Appendix 'B' and Appendix 'C' (ACD) shall be prepared by SSE(Signal) of Project/Construction/ Open line/RVNL. Similarly, Appendix 'G' shall be prepared by TRD department.

(e) Since the Working Rule Diagram has a vital bearing on the preparation of the SWRs, Sr.DOM (G)/DOM (G) will scrutinize the Rule Diagram and the Signaling Appendices, if any, and have these checked at the site to avoid differences between field & SWR.

(f) If there is a 'D' class (Flag Station) and 'DK' (station with siding) between two Block Stations, the SWRs of the Block Stations on either side shall contain a reference to such D/DK class Station (in Appendix 'F' of the SWR). In the case of a DK class Station, the special instructions for working the siding shall also be incorporated in the SWRs of the Block Stations situated on either side of the 'DK' class Station. A copy of these special instructions along with the Rule Diagram shall be made available at such DK class Stations.

(g) In case of Ghat section, it should be prepared with utmost care taking into consideration of gradient of adjacent sections on either side and station yard. In such cases, conditions for granting/taking line clear, taking off reception and dispatch signals, shunting precautions should be clearly mentioned instead of mentioning the rule numbers.

(h) Once SWR is finalized, it shall be again examined by concerned departments before signing the respective appendix. SWR shall be signed as under:

Item	To be signed by
(i) Main body of SWR (ii) Appendix → B, C, E & F	Sr.DOM/Sr.DOM(G)/DOM/DOM(G) & Sr.DSTE/DSTE/Dy.CSTE(Con/Proj)
Appendix-A	Sr.DOM/Sr.DOM(G)/DOM/DOM(G) & Sr.DSTE/DSTE/Dy.CSTE(Con/Proj) & Sr.DEN/DEN(Section)
Appendix-D	Sr.DOM/Sr.DOM(G)/DOM/DOM(G)
Appendix-G	Sr.DOM/Sr.DOM(G)/DOM/DOM(G) & Sr.DEE(TRD)/DEE(TRD)

(i) In electrified sections, Appendix-G should be prepared, signed and issued along with SWR. In case electrification works are commissioned after issuing SWR, Appendix-G should be issued which is signed not older than 15 days from the date of commissioning. Simultaneously, revised kilometer masts of level crossings should also be amended in SWR.

(j) Each SWR should have latest working rule diagram at the end of the book.

(k) Three copies of SWRs should be prepared in original out of which, one each shall be retained with Operating and S&T and another shall be sent to CRS. SWR books should have provision of easy replacement of pages when corrections are made. After obtaining CRS's sanction required number of copies of SWRs

shall be printed by executive agency of S&T department and submitted to Sr.DOM(G)/DOM(G) for further circulation to the following officials :

- |      |                                     |   |   |
|------|-------------------------------------|---|---|
| (1)  | Station                             | : | Two copies at station and one copy at each cabin (if any)*                          |
| (2)  | LP and Guards booking lobby         | : | One copy at each crew booking lobby concerned                                       |
| (3)  | Transportation Inspector (Section)  | : | One copy of each station of his jurisdiction  |
| (4)  | SSE/SE(Signal)                      | : | One copy of each station of his jurisdiction  |
| (5)  | SSE/SE(P.Way)                       | : | One copy of each station of his jurisdiction  |
| (6)  | Sr. DOM                             | : | Two copies (One copy to be kept with Chief Controller and another with SWR section) |
| (7)  | Sr.DEN (Co)                         | : | One copy of each station to be kept in Engineering Control                          |
| (8)  | Sr. DSTE (Open line)                | : | One copy of each station to be kept in S&T Control                                  |
| (9)  | Sr.DME                              | : | One copy of each station to be kept in DP Control                                   |
| (10) | Sr.DEE(OP)                          | : | One copy of each station to be kept in Traction Loco Control                        |
| (11) | Sr.DSO                              | : | One copy of each station to be kept in safety cell of Sr.DSO                        |
| (12) | Divisional Disaster Management Cell | : | One copy of all stations of the division  |
| (13) | HQ Disaster Management Cell         | : | One copy of each station of all divisions.  |
| (14) | COM                                 | : | One copy to be kept in planning cell  |
| (15) | CSTE                                | : | One copy  |
| (16) | CME                                 | : | One copy  |
| (17) | CEE                                 | : | One copy  |
| (18) | CSO                                 | : | One copy  |
| (19) | PCE                                 | : | One copy  |
| (20) | CRS                                 | : | One copy  |

\* Portion of working rules pertaining to the cabin may be kept at concerned cabin instead of full SWR.

#### **11.07: Points to be Observed While Preparing SWRs:**

- a) This should be self contained, brief, to the point and in an unambiguous language.
- b) The portion(s) which is/are not related to the station should be shown as NIL. Words like 'if any' or 'if available' should not be used.
- c) To avoid the repetition, rule numbers may be quoted which is/are specifically applicable to that station. In case, any part of the rule is not applicable, the same may be reiterated after deleting the portion which is not applicable.
- d) Conditions for granting line clear, taking off reception signals and dispatch signals should be described briefly and clearly as applicable to the station. Specific points on the track up to which the line is required to be kept clear must be indicated instead of quoting rules.
- e) Special restrictions imposed by CRS should be mentioned clearly. These are issued on the basis of yard layout and gradients. Restrictions like stabling on main line, shunting towards approaching train, detaining train outside signals due to gradient, dispatch of train from common loop when line clear is granted to another train in opposite direction on double line sections, etc. come under special restrictions.



- f) Approved Special instructions issued by CRS or Special instructions issued by COM relating to any special or additional precautions that are to be taken for movement of trains are to be mentioned in the SWR.

**11.08: Responsibility of the Officers Signing the SWRs :**

- a) SWRs are the functional rules governing the working of stations. These need to be prepared with care and attention as any deficiency in these rules can endanger safety, in which case, the officers signing the SWRs shall also be held responsible along with other staff for breach of safety rules.
- b) It is obligatory that the rule diagram of the ground conditions is compared at site to confirm accuracy of Rule Diagram. In absence of officials signing the SWR having verified it personally, the Transportation Inspector and the SE (Signal) will, after having jointly inspected the site shall certify in writing that the actual layout conforms to what is shown in the Rule Diagram and the number of points and signals quoted therein are correct.
- c) At least 7 days time should be given to SWR section of operating department to go through and compare with WRD before approval.
- d) Each page of the SWR should be signed by concerned officials.

**11.09: Review of SWRs :**

- a) The SWRs should be reviewed once in every five years. Same SWR can be revalidated if no corrections are required unless it is mutilated or torn. Revalidating certificate should be signed jointly by DOM(G) and DSTE.
- b) In case the review brings out the necessity of carrying out changes, SWR should be re-issued after incorporating necessary corrections at relevant paras with modified EP and SIP. It should not be revalidated or its period extended, if it is already having correction slips.
- c) In the event of more than five correction slips having been issued, SWR should be re-issued without waiting for the periodical review to be conducted every five years as mentioned above.
- d) There should not be any corrections, alterations, erasers at the time of re-issue of SWR.

**11.10: Method of correcting SWRs :**

- a) Any work requiring amendment to SWR should be carried out only when amended SWR and Working Diagram have been made available to concerned station. It is the responsibility of the executing agency (Sr.DSTE or Dy.CSTE(Con/Pro) or Sr.DEN) to amend the Working Rule Diagram and propose for corrections in SWR before commissioning of the work at the station. Modified work should not be commissioned unless revised SWR and diagram is provided to the station.
- b) Whenever any addition/amendment is required to be made in the said rules, the entire page/pages duly signed by concerned officers on which the provisions requiring addition/amendment appears should be replaced.
- c) A certificate with the signature of Sr.DOM (G )/DOM(G) is to be issued for each correction slip bearing the rule numbers and page numbers corrected & pasted in the 1<sup>st</sup> page of SWR. Each page of correction slip should contain the number of correction slip & date of issue at the bottom of the page.



d) The method of pasting correction slips by hand in the SWRs or correction on SWR by pen is not permitted.

#### **11.11: Responsibility of Transportation Inspectors (TI):**

a) The Transportation Inspector is responsible to see that SWRs of stations on his section are correct and up to date. He will also be responsible to ensure that the station staff viz. Station Supdt., Station Master, Cabinmaster, Cabinman, Pointsman, Gateman and any other staff who are in any way connected with train passing duties, possess correct knowledge of the Rule Diagram and the SWRs and observe them strictly.

b) Transportation Inspector will also check the SWRs and Rule Diagram and point out irregularities, if any, detected by him. If he finds that certain rules are impracticable thereby forcing the staff to infringe them, he shall immediately bring this matter to the notice of the Sr.DOM/DOM. If he detects any error or omissions which, in any way, affect safe running of trains, he shall take immediate steps at the spot as necessary for safe working of trains and report the matter to the Sr.DOM/DOM concerned for necessary amendment/ modification in the SWRs. Reports on any amendment or discrepancies to SWR should come to SR.DOM/Sr.DOM(G)/DOM(G)/DOM from sectional TI within 15 days from the date, SWR was brought into force.

c) TI (SWR) should maintain a register in the divisional office in which all the data regarding SWRs and corrections slips issued and its validity are to be mentioned. The SWRs should be periodically revised according to the time schedule.

#### **11.12: Responsibilities of Station Manger/Station Master in charge:**

**(a) Station Manager/SS In-charge/SM on duty should not allow commissioning of any alterations or modifications either in the yard or interlocking that affects train working at his station until and unless revised SWR is received.**

(b) The Station Superintendent/Station Master on receipt of the SWR must immediately check to ensure that these conform to the local conditions at their stations. If he finds any discrepancy in the said rules, he shall immediately bring such discrepancies and difficulties to the notice of the Sr.DOM/Sr.DOM(G)/DOM/DOM(G) and Transportation Inspector of the section i.e. within 7 days of SWR being brought into force

(c) The Station Manager in charge shall see that all staff having definite responsibilities in train passing at their stations correctly understand and follow the SWR.

#### **11.13: Assurance of Staff:**

(a) All the staff who are in any way associated with train passing duties, must sign a declaration in the Assurance Register in token of having studied the SWRs, Rule Diagram and other instructions pertaining to their duties and understood the same and that they are in a position to take up duties independently at the Station. In case, they cannot understand, the Station Manager in charge/Yard Master/Assistant Station Master shall personally explain the SWRs, Rule Diagram and their duties and obtain their acknowledgements in the Assurance Register as a token of their having understood the instructions. The SS/YM/SM/ASM shall also certify that the staff concerned has understood the instructions pertaining to their duties.

(b) Fresh assurance shall be obtained in the Assurance Register from the staff concerned when -

- (i) He joins at the station as a new member
- (ii) There is any change in the Station Working Rules
- (iii) He resumes duty at the station after an absence of 15 consecutive days or more.

(c) It is the responsibility of staff concerned to give the assurance, on the provision of SWR before taking over independent charge. However, prior to handing over charge in case of SM/YM category the relieving SM/YM has to ensure the same.

(d) The SM/YM on duty before putting staffs in to duty working under them viz-CM/Cabin man/TPM/TP/GK, should ensure that these staffs are fully acquainted with the rules of station working and given assurance in respect of the same.

(e) Station Master/Yard Master/CM/Cabin Man/TPM 'A' shall sign declaration in Part-A and all other staffs shall sign in Part-B of Assurance Register.

#### **11.14: Inspection of SWRs:**

Checking of SWR should be a part of inspection at all levels including safety audits. Sr.DSTE/DSTE and Sr.DOM (G)/DOM(G) should conduct joint inspections of some large, medium and small stations on each section of the division and also at stations where there are changes in signaling systems.

#### **11.15: Essential Equipment:**

It is the equipment required to be kept at station in good working order for use during securing of vehicles, exchange of signals, fire accidents, blocking of lines, point failures etc. A list of essential equipment should be displayed at the station and Appendix - E of SWR. Sr.DOM(G)/DOM(G) shall fix the scale of equipment to be made available at each station and supply accordingly. Once it is supplied, it is the responsibility of SS/SM in charge to keep it in good fettle as per the scale. If the equipment is kept at more than one location, it should be shown clearly in Appendix-E. Once the equipment fall short of the requirement, immediate action shall be taken to recoup the same. TP/TPM who ever comes in day shift either at cabin or at station should clean them daily and oil them at least twice in a month. Following equipment shall be included in the list:

- i) Detonators.
- ii) LED based Tri Colour flashing torch.
- iii) Hand Signal Flags.
- iv) Safety Chains with pad locks.
- v) Clamps with padlocks.
- vi) Skids.
- vii) Wedges
- viii) Fire and Sand buckets.
- ix) Fire extinguishers.
- x) Line blocking collars.
- xi) Motor trolley on line board
- xii) Block suspension board

#### **11.16: Standardisation of SWRs :**

To maintain uniformity in the SWRs, the following format shall be used while framing/revising the Station Working Rules for stations. Care may, however, be taken to ensure that -

- a) The SWRs framed as per the format are self-contained, brief, precise to the point and written in simple spoken language.

- b) General and Subsidiary Rules need not be reproduced in the SWRs. Relevant GR/SR number, may be mentioned in bracket against each para when required.
- c) Sr.DOM/DOM and Sr.DSTE/DSTE and Sr.DEE/DEE (TRD) are required to add those special items or features having a bearing on safety in operation at the concerned Station, which is not covered by the format given below (This format has been fixed by Railway Board) :

**EAST COAST RAILWAY**

No.....

.....Railway

.....DIVISION

STATION WORKING RULES OF \_\_\_\_\_ (Name of the station)

.....(BG)

Date of issue: \_\_\_\_\_

Date brought in force \_\_\_\_\_

**NOTE:**

- (i) The Station working rules (SWR) must be read in conjunction with General & subsidiary Rules and Block Working Manual. These rules do not in any way supersede any rule in the above books. The language of SWR should be simple, brief and unambiguous applying provision of rules to the specific conditions at the relevant station. These rules must be in simple language intelligible to ordinary railway men. However, relevant GR/SR Numbers may be mentioned in the brackets.
- (ii) The SWR must be page numbered with the station name code written on each page and signed by the Sr. Divisional Operations Manager(G)/DOM(G) and Sr. Divisional Signal & Telecom Engineer/DSTE at interlocked stations and at non-interlocked stations by Divisional Operations Manager and Divisional Engineer should sign each page.
- (iii) The SWR should be issued afresh after every five years or after issue of five amendment slips and reviewed as and when required.
- (iv) Any new innovations introduced to facilitate train operation should be incorporated in SWR after approval of competent authority.

**(1) Station working rule diagram:**

SWR Diagram No. \_\_\_\_\_ based on CSTE/— Railway and Signal Inter locking Plan No. \_\_\_\_\_ should show the complete layout of the yard. Points, Signals, gradients and interlocking arrangements of the station including the non-interlocked sidings, exact and actual holding capacity of all the individual lines in meters, actual inter signal (demarcation point) distances, names of adjacent stations and IBH signals, where provided, on either side of the station with their respective distances from the centre line of the station building to the central line of the adjacent stations and any other information necessary in the day to day operation of trains. The particulars of date up to which it is corrected should also be mentioned. SWR diagram should show actual distances and not the minimum prescribed. It should

be signed by the Sr.Divisional Operations Manager (G)/DOM (G). Sr. Divisional Signal & Telecom Engineer/DSTE and Sr.Divisional Engineer/DEN. The detection table, Lever Collar Chart and Pull Sheet may be provided in Appendix 'B. Pull Sheet should be reproduced on a board brightly painted in the cabins to be placed above the Lever Frames.

## **(2) Description of station:**

### **2.1: General (Location):**

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

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

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

In case of IBS signal being provided in the adjacent section the mention of the same need to be made as follows: The section between ———— (name of the section on which the IBS is provided) has been split into two Block sections by providing Track Circuit/Axle Counters and Intermediate Block Stop Signal at Km. ————and Km. ————on Up and Dn lines respectively, which are controlled by Track Circuit/ Electronic Axle Counter and Double Line Block Instrument.

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

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

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

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

Between Stations	The point from which the "Block Section" commences	The point at which the "Block Section" ends

### **2.4: GRADIENTS, IF ANY:**

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

### **2.5: LAYOUT:**

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

**2.5.1: RUNNING LINES, DIRECTION OF MOVEMENT AND HOLDING CAPACITY IN CSL.**

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

**2.5.2: NON RUNNING LINES AND THEIR CAPACITY IN CSL:****2.5.3: ANY SPECIAL FEATURE IN THE LAYOUT.**

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

**2.6: LEVEL CROSSINGS:**

Detailed working of the gate along with the particulars regarding LC gate No., location, class, normal position, whether interlocked or non-interlocked, whether communication provided or not and whether Train Actuated Warning Device (TAWD) provided or not, how the gate is operated etc, need to be mentioned in Appendix 'A'.

**(3) SYSTEM AND MEANS OF WORKING:**

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

**(4) SYSTEM OF SIGNALLING AND INTERLOCKING:**

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

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

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

(JPO Issued by COM and CSTE/ECOR vide No.JPO/02/2012, Dt.29.8.2012 should be followed)

**4.3: POWER SUPPLY:**

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

**5: TELECOMMUNICATION:**

The availability of the telecommunication facilities at the station and their operational aspects should be clearly defined:

- i) Section Control/Dy. Control/Traction Power Control Telephone, etc.
- ii) Auto/DOT Telephones,
- iii) Magneto Telephone with the cabins/gates,
- iv) IBS Telephone with IBS at Km———,
- v) Telephone with Axle Counter reset boxes,
- vi) Telephone for yard communication,
- vii) VHF Sets, and
- viii) Mobile Train Radio Communication (MTRC)

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

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

**(6) SYSTEM OF TRAIN WORKING:****6.1: DUTIES OF TRAIN WORKING STAFF:**

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

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

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

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

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

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

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

**6.2 CONDITIONS FOR GRANTING LINE CLEAR :**

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

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

- 6.2.1.1: Setting of points against block line.
- 6.2.1.2: Reception of train on blocked line.
- 6.2.1.3: Reception of train on non-signalled line.
- 6.2.1.4: Despatch of train from non-signalled line.
- 6.2.1.5: Despatch of train from line provided with common starter signal.
- 6.2.1.6: Any other special conditions should be mentioned giving reference to the G&SR.

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

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

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

Station master should ensure that signal is put back to 'ON' after passage of the train as per GR 3.36.2(b).

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

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

- a) All possible simultaneous reception & dispatch should be mentioned in conformity with CRS approval.
- b) All possible ways of crossing & precedence should be described taking into consideration the availability of the lines, PF availability/Freight/Coaching trains & topography of the station.
- c) Any specific deviation permitted on consideration of the topography of the station.

**6.5: COMPLETE ARRIVAL OF TRAINS:**

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

**6.6 : DESPATCH OF TRAINS:**

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

**6.7: TRAINS RUNNING THROUGH:**

The provisions given in G&SR should be mentioned.

**6.8: WORKING IN CASE OF FAILURE:**

Working in case of failure of track circuits, points, signals, block instruments, axle counters, axle Counter Block, procedure for working over damaged points, reception of trains on obstructed lines, non-signalled line including failure to read the occupation of line by trolley or light engine etc. should be mentioned in detail here. Procedure to be followed in regard to point indication available/not available in cabins when signals are defective.



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

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

- (i) The section where axle counters are provided in lieu of track circuits, Trolleys, Motor Trolleys, Lorries etc., which are not insulated, shall not be allowed to run except on line clear.
- (ii) Motor trolleys/Tower Wagon/Material Lorries are not likely to actuate the Axle counter correctly. When they are to run over the section split by Axle counters, the whole section to be treated as one and next train to be started after the last train has arrived complete.
- (iii) In all other respects the working of a light Motor trolley shall conform to the rules laid down for motor trolleys while running under block protection or following another light motor trolley or a motor trolley.
- (iv) Any other restriction on movement of trolleys/motor trolleys/material lorries/tower wagons etc.

**(7) BLOCKING OF LINE:**

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

**(8) SHUNTING:**

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

**(9) ABNORMAL CONDITIONS:****(a) The rules to be observed in the event of abnormal conditions:**

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

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

**(b) Procedure For Emergency Operation Of Points By Crank Handle:**

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

**(c) Certification Of Clearance Of Track Before Calling On Signal Operation is initiated:**

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

**(d) Reporting Failure Of Points, Track Circuit/Axle Counter and interlocking:**

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

**9.1 : TOTAL FAILURE OF COMMUNICATION:**

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

**9.2: TEMPORARY SINGLE LINE WORKING ON DOUBLE LINE SECTION:****9.3: DESPATCH OF TRAIN UNDER AUTHORITY TO PROCEED WITHOUT LINE CLEAR OR TO ASSIST THE CRIPPLED TRAIN:****(10) VISIBILITY TEST OBJECT:**

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

**(11) ESSENTIAL EQUIPMENT AT THE STATION:**

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

**(12) FOG SIGNAL MEN NOMINATED TO BE CALLED IN CASE OF FOG:**

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

**LIST OF APPENDICES**

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

**11.17: Gate Working Instructions:**

- (a) Gate working instructions are to be prepared in Hindi, English and vernacular language and in conjunction with G&SR, Operating Manual and SWR of the station.
- (b) Gate working instructions are issued and kept at the manned level crossings which contain the information like detailed description of level crossing, gate equipment, procedure for closing of barriers against movement of trains, duties of gateman, protection of gate in case of accident, etc. Working of trains during various abnormal conditions like breakage of barriers, failure to close barriers, blocking of crossing by road vehicles, etc. are also mentioned in detail.
- (c) For new level crossings or while proposing any modification or upgradation of the level crossings, the Gate Working Instructions shall be prepared by the Sr.DEN/DEN mentioning the detailed description of level crossing, equipment to be made available, visibility, road signs and indication boards, etc. except the portion of procedure of train operations and submit to Sr.DOM(G)/DOM(G). Procedure for train working during normal and abnormal condition shall be prepared by Sr.DOM(G)/DOM(G) for all engineering and traffic level crossings keeping in view its location, communication, visibility, etc. on the basis of data submitted by Sr.DEN/DEN and submitted to them for preparation of Gate Working Instruction.
- (d) After adding procedure of train working, Sr.DEN/DEN shall scrutinize carefully and ensure that they are correct in every respect before getting it signed by himself, DOM(G) and Sr.DSTE/DSTE.
- (e) Gate Working Instructions are to be signed by DOM(G) and Sr.DEN/DEN for non interlocked level crossings. In case of interlocked level crossings, it should also be signed by Sr.DSTE/DSTE.
- (f) In case of traffic level crossings, gate working instructions are to be prepared and issued by Sr.DOM(G)/DOM(G). However, required information of the gate like visibility, road signs, indicators, etc., shall be given by Sr.DEN/DEN.
- (g) Any modification or alteration which effects the change in gate working and train operations, should be commissioned only after necessary changes in GWR and also after ensuring that the changes are understood by the gatemen working at the gate. This should be ensured by the SE/JE(P.Way) or SS as the case may be.

**11.18: Temporary Working Instructions: (Details of N.I. Working are given in a later chapter)**

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

**(a) Circumstances under which 'TWI' is to be issued:**

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

**(b) Procedure for preparation of Temporary Working Instructions:**

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

Draft TWI is submitted by the SE(P.Way)/SE(Signal)/SE(Elec.) to their Divisional Officers i.e Sr.DEN/ Sr.DSTE/Sr.DEE. After the draft TWI is checked and justified by the divisional officer of department concerned, Sr.DEN/ Sr.DSTE/Sr.DEE will send the draft TWI to the Sr.DOM/DOM who will include instructions for regulation of Traffic during the execution of work and will issue the TWI to the concerned station with detailed instructions including the safety precautions to be observed during execution of work. As the TWI differs with the SWR, all station staff deployed during the temporary working, should give an assurance of these temporary working instructions in the assurance register.

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## CHAPTER-12

# INSPECTIONS

### 12.01: Objects of Inspections:

The railway network is spread over a vast area. It is estimated that for running a train over a section, co-operation and co-ordination of thousands of Railway staff is essential. A vast organization, such as the Indian Railway system function on the basis of a carefully arranged system of selective autonomy accountability and responsibility. Rules and instructions lay down the procedure of work and the staff are properly trained and the officials at various levels monitor, supervise and direct the staff from time to time by different means. Inspection is an important function of management, particularly in the field of Railway operations to ensure efficient working with utmost safety at all levels.

### 12.02: Following Objects shall be Borne in mind while Conducting Inspections:

- (a) Verify whether every Railway employee is fully conversant with rules, instructions and procedures relating to his duties.
- (b) Ascertain that the staff is performing their duties according to rules, instructions and procedure in force.
- (c) Detect undesirable shortcuts, irregularities or unsafe practices being resorted to by the staff taking remedial action which may be:-
  - i) Educative, in case these are resorted to out of ignorance.
  - ii) Corrective, if there is something wrong in the working conditions, or there are system deficiencies.
  - iii) Punitive, if resorted to wilfully or negligently and persisting even after repeated guidance and counselling.
- (d) Observe the conditions actually prevailing at the work spots to understand the difficulties experienced by staff including their personal grievances and seeking on the spot redressal.
- (e) Ensure that full complement of staff and equipment is available and staffs have knowledge of its operation.
- (f) Ascertain that registers, documents and other records are being maintained and preserved according to instructions.
- (g) Monitor the behaviour of staff towards customers, particularly promptness of response and willingness to help.
- (h) Assess as far as possible that the interest of the public and the Railway are kept in view and safeguarded.
- (i) Inculcate discipline and build up the morale of the workers.
- (j) Check the compliance of previous inspection reports.
- (k) Analyse efficiency targets vis-à-vis performance.

Inspections thus provide the means to achieve efficiency and effectiveness through spot checks and personal contact with the staff on line. In order to accomplish these objectives, inspections have to be carried out at Officer's and Supervisor's level. The inspecting official has to command the respect and obedience of staff, for his inspection to be effective and beneficial and as such his conduct should be exemplary.

### 12.03: Types of Inspections:

The following inspections have to be carried out by operating and safety officials.

#### (a) **Regular Inspections(Detailed Inspection):**

Each station on the division must be inspected in details at least once in every six months i.e. January to June and July to December covering the various aspects of safety, operations and allied matters including staff matters by Operating Officers and must be inspected once in every three months by the sectional TIs.

Regular inspections have to be comprehensive in nature. The inspecting officials concern shall also spend the night at the station. In order to inspect in detail all the stations in the division minimum twice in a year, Sr.DOM will distribute all the stations among all the operating officers and monitor on monthly basis.

**(b) Safety Inspection:**

Such inspections are basically meant to be preventive by detecting short cut methods and unsafe practices resorted to by train passing, running and maintenance staff. The irregularities noticed pertaining to train passing staff are to be brought to the notice of the SM (In charge) and remedial measures initiated promptly. In case of any serious irregularity, the inspecting official must at once inform Sr.DOM/Sr.DOM (G)/DOM/DOM (G) concerned telephonically besides making a written report. However, any irregularity pertaining to other departments, concerned officer should be intimated over phone as well as through written report.

**(c) Surprise Inspection:**

Such inspections must have an element of surprise. Officers and inspectors may inspect a station either while passing through it or during the short time at their disposal or when they want to check some aspect at the station without prior notice. Apart from any special aspect, they intend to check; they must also observe and take note of the irregularities/deficiencies/good work done which may come to their notice. They may check as many items as possible as time permits.

In the automatic signalling territory, besides surprise inspections, ambush checks should also be conducted to check whether the LP/Motorman are observing the rules regarding passing of automatic signals at "ON" position. Similarly, Loco Pilots whistling at Whistle Boards on approach of LC gates also needs to be checked.

**(d) Night Inspection:**

Night inspections must be carried out by the officers and supervisors frequently to appreciate the working conditions as well as to detect the irregularities. Surprise night inspection may be carried out between 00hrs to 04 hrs, because in this period the staff is likely to be lethargic and negligent in duties. Similarly, instances of staff sleeping on duty, dim signal lamps and indicators, unauthorised absence from duty and many other irregularities, unsafe and undesirable practices may come to notice between 00hrs to 04hrs. Frequent night inspections are a must and SS/SM(In charge) must conduct surprise night inspections of their station between 00hrs to 04 hrs & take remedial measures to rectify the irregularities and deficiencies noticed. Supervising SS/SM should conduct 04 night inspections whereas, SS/SM (I/C) working in shift duty should conduct 02 night inspections per month. At stations having traffic level crossing gates, these should also be covered during night inspections. After conducting night inspection Sectional TI & SS/SM (I/C) should exchange private number with section controller without fail & record it in the night inspection register. For this purpose TI/SS/SM(I/C) should use their own P.N.Book specifically used for this purpose only. Apart from this SS/SM incharge should note down on the Station diary and repeat the same to the SCR on duty.

**(e) Level Crossing Inspection:**

Level crossing gates should be inspected in detail with a view to ensure safety of rail and road traffic, availability of safety equipments, knowledge of gateman regarding rules pertaining to his duties and Loco Pilot's whistling while passing the LC gates.

**(f) Surprise Inspection by Road:**

These inspections have an element of surprise in them. To create a sense of alertness amongst the staff the road inspection should be carried out without informing anybody.

**(g) Foot plate Inspection:**

These inspections are carried out by travelling on the engine of running trains. These afford an opportunity to the inspecting official to observe & check certain aspect of working on the engine, along the track and at the stations which cannot be checked otherwise. To achieve the purpose for which foot plate inspections are carried out, it is essential that these are done by day and by night, in clear weather and when the visibility is poor due to thick, foggy & tempestuous weather.

**(h) Joint Foot plate Inspection:**

These are carried out jointly with officials of Mechanical, Electrical(Running),Permanent Way and Signalling branches i.e checking the visibility of the signals, their locations, operations, lighting up, speed restrictions and caution boards, rail wheel interaction and Loco Pilots' and Asst. Loco Pilots' operating behaviour.

**(i) Surprise speed checks:**

In order to ensure the maximum permissible speed are not exceeded, permanent and temporary speed restrictions are correctly observed and limits of speed over turnouts and facing points are observed. Surprise speed checks should be conducted as per schedules.

**(j) Running Room Inspection and Crew Lobby Inspection:**

During regular, safety, surprise and night inspections opportunity should also be taken to inspect running rooms to ensure that running staff are able to get proper food and resting facilities. Running rooms should also be jointly inspected by the team of officers as nominated and prescribed. Similarly, crew lobbies inspections should be carried out to ensure that extant rules and instructions/policies are being scrupulously followed in respect of running staff booking, on duty, off duty and other aspects.

**(k) Ambush checks:**

It is essential to ensure rigid observation of rules when automatic stop signals are passed at "ON" position. The inspecting officials should carry out ambush checks with the help of signaling officials who will arrange to put an automatic stop signal to "ON" position. Such checks should be arranged in consultation with Sr.DOM/DOM.

**(i) Running Train Inspections:**

Whenever an operating officer or an inspector is travelling by a train on duty, he must pay special attention in observing the performance of duties by Guards, LP/ALP, Station Staff, Gateman and others.

**(m) Loco shed Inspections:**

Each loco shed shall be inspected once in 3 months individually as well as jointly.

**(n) C&W depot Inspection:**

Each C&W depot shall be inspected once in 3 months individually as well as jointly.

**(o) Accident Relief Medical Equipment (ARME)/SPARME & Accident Relief Train (ART)/SPART inspection:**

Inspection of ART/ARME should be as per the provision of ECoR Accident Manual vide para 4.07 & 4.10.

**12.04: Inspection Quotas:**

The minimum number of regular, surprise, safety and night inspections will be carried out by officers and inspectors as per quota fixed from time to time. The monthly and yearly inspection quota of operating Officers and Inspectors in ECoR are given in the next page:



### Monthly Quota of Inspection

Type of inspections	SAG	SG/JA/SS	JS	Sr.DOM (G)/DOM (G)/AOM (G)	TI
Regular	1(Major or Terminal Stn. or a Train or a LC in day)	02	04		04 (All stations once in a quarter)
Safety	0	0	0	01	03
Surprise	0	0	0	0	0
Night	2(way side Stn or LC or FP)	01(Stn)	01(Stn)	03(1 stn, 1LC & 1FP By goods train)	03(1 stn, 1LC, 1FP By goods train)
Level crossing gate	0	01	02	02	02
Surprise road	0	0	0	0	0
Individual Foot Plate	0	01	02	02(1 Chg & 1by goods train)	04 (1 by chg & 3 by goodstrain)
Joint Foot Plate	0	0		02(onesection both UP & Down)	0
Surprise speed check	0	0	0	0	0
Running room regular	1*	1***	1***	1****(Joint inspcion of all running room once a year) With Sr. DEN/Sr.DEN/SR.DEE/DEN/DEE	01
Ambush check in auto signal territory in auto signalling	0	0	0	02(1 day & 1 ight)	0
Running train	0	0	0	As often as Possible	0
Loco shed	0	0	0	0	0
Depots	0	0	0	0	0
ARME	0	0	0	1***	0
ARTs	0	0	0	1***	0
Brake van	0	01	01	0	04
Crew lobby	1*	1***	1***	1***	01
Total Per Month	04	6+2***	10+2***	16+3***+1****	22

**NB:** 1\* (Crew lobby or running room)

1\*\*\* (Once in a quarter)

1\*\*\*\* (Once in a year)

**12.05: General Guidelines for Inspecting Officer:**

- (a) Before commencing the inspection all inspection books should be called for and the notes made by other inspecting officials should be carefully perused to check, whether the staff have complied with their instructions. If any of these instructions have not been carried out written explanation of the Station Master should be obtained.
- (b) It shall not be enough merely to point out the irregularity of the staff; matters must be put right personally while at the station to the extent possible.
- (c) All books and registers inspected must be initialled and dated.

**12.06: Techniques of Inspection:**

It requires both expertise and experience to carry out intelligent inspections. To evolve a sound technique of inspections, an inspecting official should:

- (a) Have a clear understanding of the station lay out, its signalling, special features of working and the instructions in regard to reception, dispatch, crossing, shunting and running through of trains. For this he should have a good knowledge of not only General & Subsidiary rules but also of SWR.
- (b) Select the features of working which he intends to check during his inspection and should have a clear conception about them in his mind. For instance he may like to emphasise on the correct reception and dispatch of trains and observance of safety rules by the staff or on utilisation of stock, detention to passenger or goods train, knowledge of staff etc.
- (c) Inspect the aspect of working by thorough inspection of books, registers, forms and equipments used for operations and secondly by means of personal observation of actual operations.
- (d) Be selective in choosing:
  - i) The time and operations of personal observation.
  - ii) The documents, registers and forms for checks and cross checks.
  - iii) The equipments for checking, its availability, adequacy, maintenance and its use.
- (e) Select specific periods for checking registers, books, forms keeping in view the purpose of inspection and time of inspection and time of disposal, should be subjected to concentrated, minute and probing checks and cross checks. It may be worthwhile to select two or more separate periods. One of these being that immediately preceding the day of inspection. This will help him in not only detecting the irregularities being committed but also whether these have been continuing for the past some time.
- (f) Discuss the irregularities or lapses noticed during inspection with the staff actually doing the work as well as those supervising their work. Such a discussion will prove to be educative and produce useful results.
- (g) Discuss, as far as possible, the points common to two or more branches, like the Signaling Interlocking branch or Loco Train Examining, Civil Engineering and Commercial Branches jointly for objectivity and acceptable solutions. This will help in not only arriving at correct conclusions and forming sound views but also in avoiding unnecessary correspondence.

- (h) Ensure that all previous inspection reports are pasted complied & signed by all SS/SM working at the station in token of going through the same.
- (i) Regular (detailed) inspection of sectional TI should contain one para on “Irregularities noticed”. Where in, all the irregularities should be consolidated. This will help the other inspecting officials to get the brief irregularities in nutshell.

**12.07: Monitoring of Operating Safety:**

Operating safety is monitored in divisions under Sr.DOM (G)/DOM (G)/AOM (G). It is the prime responsibility of divisional operating safety cell that all the operating officers/Sectional TIs/SS (I/C) should conduct the inspections as per schedule. Further, irregularities pertaining to operating department pointed out by operating officers and supervisors/officers of other departments should be complied by the operating safety cell in time & compliance report sent to concerned authorities. Particulars of monthly inspections conducted by individual operating officer should be sent to zonal head quarters vis-a-vis quota of inspections every month. Major irregularities pointed out by sectional TIs should be summerised every month and sent to concerned department in the division and copy of which should be sent to HQ to take up with concerned authorities.

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## CHAPTER-13

# SIGNALLING AND INTERLOCKING

**13.01:** A signal is a visible or audible indication, which controls the movement of trains. As mentioned in GR 3.02, the signals used for controlling the movement of trains are:

- (i) Fixed Signals
- (ii) Hand Signals
- (iii) Detonating signals
- (iv) Warning signals

**13.02:** The following types of fixed signals are in use on this Railway:

- (1) Semaphore Arm Signals :-
  - (i) Two Aspect Lower Quadrant Signals
- (2) Colour Light Signals:-
  - (i) Manually Operated Multiple Aspect Signals.
  - (ii) Multiple Aspect Automatic Signals
  - (iii) Multi Aspect Semi-Automatic Signals
- (3) Subsidiary Signals:-
  - (i) Supplementary Signals:-
    - (a) Calling-On Signals
    - (b) Repeating Signals
  - (ii) Shunt Signals:-
    - (a) Position Lights

### **13.03: Commissioning of Signals :**

- (a) For commissioning or re-erection of signals, the instructions contained in GR.3.26 and SR there to shall be followed.
- (b) The divisional signal and telecom engineer or assistant signal and telecom engineer will, wherever necessary, requisition the services of a sighting committee comprising of Sectional DTI, LI & SSE/SE/JE(Sig) .
- (c) The sighting committee having decided on the site and the height of the proposed signal or signals, all the members will sign the certificate in the prescribed form and the same will be forwarded to Sr.DSTE/Dy.CSTE for onward submission & approval of Competent Authority.
- (d) While deciding the site and determining the height of a signal the minimum visibility distance as indicated in SR.3.16.01, infringement to schedule of dimensions and visibility of signals not being obstructed by OHE masts in electrified section should be taken into consideration by the sighting committee.
- (e) On the date that the new signals are first brought into use, the DTI, the LI and SSE/SE/JE(Signal) will attend and jointly send message to the DEN, DME/DEE, DOM and DSTE stating whether the signals are satisfactory or otherwise, both by day and night. On receipt of this message, the DSTE shall endorse on the sighting certificate.

(f) Location of signal on right hand side of track should be mentioned in divisional working time table viz., station name, name of signal, COM's dispensation and kilometre of signal.

#### **13.04: Relocation of Signals :**

When minor alteration to signals are required in order to provide better sighting such as increasing the height or moving the post across the track, DRM may approve the work. Sr.DSTE/DSTE shall advise Sr.DOM, the time and date on which the alteration shall be made and the manner in which it will be carried out. Once it is commissioned, SR.DSTE shall arrange to issue a memorandum detailing the work done as an information to all concerned staff.

In case of a new signal to be commissioned on the right side of the track, approval of GM is to be obtained. Once a signal is newly commissioned or relocated, a caution order is to be issued to all trains for a period of 15 days from the date of commissioning. Whenever the obstruction, which necessitated shifting of signal to right hand side is removed, immediate action has to be taken for shifting of signal to left side of the track.

Whenever any inspecting official mentions about poor visibility of a signal, Sr.DSTE shall process for inspection of signal by signal sighting committee who shall submit a report to Sr.DSTE after conducting joint foot plate inspection by them.

#### **13.05: Responsibility for Repairing, Maintenance and Replacement of Signals and Signal Lamps:**

The signal and telecommunication department is responsible for repair, maintenance and replacement of signals, signal lamps and their fittings. In case of any damage to the signal, signal lamps and their fittings, the station master must intimate the SSE/SE/JE(Sig) and signal maintainer concerned for necessary action through a memo. Before handling the signalling equipment, Para 13.16 of this chapter shall be followed.

#### **13.06: Interlocking:**

Interlocking means an arrangement of signals, points and other appliances, operated from a panel or lever frame, so interconnected by mechanical locking or electrical locking or both that their operation must take place in proper sequence to ensure safety.

Points, signals and other units are usually, operated by means of levers and panels. Interlocking between these levers is accomplished either by mechanical or by electrical or electromechanical or electronic means. In the mechanical method, mechanical contrivance variously designed, controls the relation between one lever and other.

#### **13.07: Basic Principles of Interlocking:**

- (a) It shall not be possible to take 'off' conflicting signals at one and the same time.
- (b) Once the signals are taken off, it shall not be possible to alter the points on the route unless the signals are put back to 'ON'.
- (c) The points and signals can be operated only in a sequence to ensure safety.
- (d) Last stop signal cannot be taken off unless the conditions to take off the signal are fulfilled.
- (e) When all signals are in the 'On' position, all points which would be locked by taking 'off' such signals must be free for shunting purposes/ testing etc.
- (f) It must be impossible to take 'off' a Warner Signal, until all the relevant stop signals in advance have first been taken 'off' and when 'off' it must back lock all such signals.

- (g) It shall not be possible to take 'off' signals for a running line unless -
  - (i) All points on the running line are correctly set and facing points locked.
  - (ii) All points, giving access to the running lines from sidings and goods lines, are set against the running line.
  - (iii) Level Crossing gates controlled by interlocking are closed and locked against the road traffic.

### 13.08 Indirect and Direct Interlocking : -

- (a) Indirect interlocking means that the points are set and locked from one place and the signals are operated from another place and another lever frame; the interlocking is effected by means of keys carried from one place to the other.
- (b) Direct interlocking means that all levers, viz. the point, the point locks and the signal levers are concentrated in one lever frame and worked there from. The interlocking is effected by means of rigid connections between levers without the use of keys. This is effected by mechanical and/or electrical means.

### 13.09 Types of Interlocking:

#### a) Mechanical Interlocking:

The era of interlocking started with mechanical frames. In mechanical signaling, the functions are operated by levers. To ensure that the signal can be taken 'OFF' only after the point is correctly set, we can arrange the interlocking between the signal lever and point lever in such a manner that the signal lever can be reversed only after the point lever is in the correct position, viz. 'Normal' or 'Reverse', as the case may be. The levers are interlocked by means of tappets inside a box of the lever frame, which is normally kept covered and sealed.

As the size of yards & train movements increases, size of lever frames also increases. These lever frames not only increase in size occupying more space but also require intensive maintenance.

#### b) Panel Interlocking:

With the advent of Electro-mechanical relays, lever frames gave way to relay interlocking based installations. This development resulted in relatively faster operation, fail-safe operation and reduced size of buildings required for housing of interlocking installations.

Panel interlocking is a system of centralized operation of points and signals provided normally at a small station. Generally, it is provided in colour light signals, electrically operated point machines and track circuit or axle counters. In this system, all the functional operations for a train movement relating to track are controlled by knobs or pushbuttons through a network of electrical circuits with relays and automatically checked by inter-related control circuits to suit safety requirements.

#### This system requires that :

- (i) All points in the route overlap and isolation are set individually to the required position or automatically in case of route setting type panel by pressing signal and route button.
- (ii) The route is set to the required line and signal cleared afterwards.
- (iii) As the train passes and clears the route and operating switches are restored to the normal position, the route clears and gets released.

The panel depicts schematic reproduction of the entire track layout of the station with different track circuits being painted in different colours. The points, signals as well as train routes are controlled by means of push button, located within the track layout diagram of the panel at their respective geographical position.

Indications regarding setting and locking of the points, setting and locking of route and signal aspects are given on the panel. All the points and signals are operated from a combined indication diagram cum control panel.

The panel is also equipped with SM's lock up key to enable the SM on duty to lock the panel. The SM on duty must not permit unauthorized persons to operate the control panel and must lock the panel whenever he leaves his seat. No operation can take place without inserting the SM's key.

**c) Route Relay Interlocking :**

Route Relay interlocking is same as Panel Interlocking with Electro Mechanical Relays, generally adopted for big yards and junction stations having large number of points and signals and frequent yard movements. In this system, points in the route overlap and isolation get set automatically to the required position when a route setting is initiated from a signal to a required route. Setting of route and signals can be taken off by pressing Signal button and Route Button (entry-exit system). In this system, two panels one for operation and other for indication are provided separately.

The normal indications available are points by means of straight slit for normal and diagonal slit for reverse and the signal indications by a small red light; independent shunt signals by a small white straight slit, etc. Every track circuit on the panels is represented by prime colour except black colour indication for a non track circuited portion.

**d) Solid State Interlocking (SSI):**

This is also called Electronic Interlocking. It is a modern system of interlocking where the interlocking is effected through customized hardware and software. The SSI system occupies considerably less space, consumes less power, is more reliable and is easy to install and maintain. This enables operation through push buttons on the panel board or by giving necessary commands on the key board/mouse by viewing the yard layout displayed on the Visual Display Unit (VDU).

PI/RRI systems require considerable time in installation, require space and a large number of relays which makes the system considerable complicated. With the advancement of computer and communication technology, it has become possible to incorporate the logic in Electronic Interlocking System which is more compact and easy to adopt frequent changes.

In this system, a single or dual Visual Display Unit (VDU) shows the yard diagram with various operational features. This system will have a standby system with conventional panel or a VDUs for standby use in case of failure.

**Working of VDU system:** Visual Display Unit(VDU) consists of a CPU with a high resolution colour monitor, key board and pointing device(mouse). Both the serial ports(Com1 and Com2) in the CPU are connected to the EI system and CPU board for exchange of control and indication messages. The software is installed to display the Station Yard Mimic panel diagram on the VDU and that it allows access to all functions through pop-up menus. When a particular function is selected, an appropriate menu will appear on the screen. By selecting a required operation by clicking the left button of the pointing device(mouse), a function(Signal clear and cancellation, route release, point operation, etc.) can be executed.



**Advantages of SSI:**

- Faster operation.
- User friendly operation.
- Fail safe technique
- Multiple mode operation.

**13.10 Standards of Interlocking : -**

There are three standards of interlocking viz., Standard I, II and III which are existing in many stations over this railway. These standards of interlocking are further revised into 4 categories as Standard – IR, IIR, IIIR and IVR and commissioned at some stations in this railway. The system of working of standard I, II and III shall continue till such stations are modified into revised standards of interlocking.

Features of existing interlocking system are as follows :

**(1) In Two aspect signaling system :**

**(a) Standard I interlocking :**

- (i) **Speed** - 50 kms. Per hour.
- (ii) **Isolation** - Isolation of the main line is recommended, but is not essential.
- (iii) **Points** - The facing points should be provided with key locks, locking both switches independently and the switches detected independently by relative signals.
- (iv) **Interlocking** - Interlocking between points and signals may be carried out indirectly by means of key locks.
- (v) **Signals** - Outers and Bracketted Home signals shall be provided. The provision of Starter signals is optional. All signals shall be operated from the interlocked frame so placed as to be under the control of station master on duty and provided with a key to enable the station master to lock the signal frame.

**(b) Standard-II interlocking :**

- (i) **Speed** - 75 kms. Per hour.
- (ii) **Isolation** - Isolation of the main line is essential.
- (iii) **Points** - The facing points should be provided with plunger types locks, locking both switches independently and the switches and the bolt should be detected independently by relative signals.
- (iv) **Interlocking** - Interlocking between points and signals may be direct or indirect. Where indirect interlocking is used, signals shall be worked from a position under the control of the Station Master and key must be provided to enable the Station Master to lock up signal frame.
- (v) **Signals** – Outer, Warner and Bracketted Home signals must be provided and starters where considered necessary. Where starters are not provided, the ‘off’ position of the Warner signal shall be dependent upon the receipt of ‘Line Clear’ on the block instrument.

**(c) Standard-III interlocking :**

- (i) **Speed** – Maximum permissible speed of the section as mentioned in the Working Time Table.
- (ii) **Isolation** – Isolation of the main line is essential.

- (iii) **Points** – The facing points should be provided with plunger types locks, locking both switches independently and the switches and the bolt should be detected independently by relative signals.
- (iv) **Interlocking** - Interlocking between points and signals must be direct.
- (v) **Signals** – Outer, Warner, bracketed Home signal and starter must be provided and Advanced starter as may be necessary.

**(2) In Multiple Aspect Signaling System :**

The standard, their speed, requirement of isolation, equipment of points and requirement of interlocking between points and signals are the same as in the case of two Aspect signaling., However, the signaling arrangement shall be as under :—

- (i) **Standard-I:** A Distant and a Home signal in each direction.
- (ii) **Standard-II:** A Distant, a Home and a Starter signal in each direction.
- (iii) **Standard -III:** A Distant, a Home and a Starter signal in each direction.

**13.11 Revised Signaling and Interlocking :**

It will only apply to future signaling and interlocking installations. Wherever existing installations do not fulfill these requirements, existing speed of operation shall continue. Revised Interlocking at stations is standardized into four different classes viz. I(R), II(R), III(R) and IV(R). The standards are as follows: -

**(1) In Two Aspect Signaling system :**

**(a) Standard I(R) :**

- (i) **Speed** - 50 kms. Per hour.
- (ii) **Isolation** - Isolation of the main line is recommended, but is not essential.
- (iii) **Points** - The facing points should be provided with key locks, locking both switches independently and the switches detected independently by relative signals,
- (iv) **Interlocking** - Interlocking between points and signals may be carried out indirectly by means of key locks.
- (v) **Signals** - Outers and Bracketted Home signals shall be provided. The provision of Starter signals is optional. Working Warners may be provided for meter gauge stations where trains run through, if considered necessary, but are not required for other stations signaled to standard I.

**(b) Standard II(R) :**

- (i) **Speed** - 110 kms. per hour.
- (ii) **Isolation** - Isolation of the main line is essential.
- (iii) **Points** - The facing points should be provided with plunger type locks, locking both switches independently and the switches and the bolt being detected independently by relative signals,
- (iv) **Interlocking** - The interlocking between points and signals may be direct or indirect. Where indirect interlocking is used, signals shall be worked from a position under the control of the Station Master and key must be provided to enable the Station Master to lock up the signal frame,
- (v) **Signal** - Outers, Warner and bracketed Home signals must be provided, and Starters where considered necessary: Where Starters are not provided the “off” position of the Warner signal shall be dependent upon the receipt of ‘Line Clear’ on the block instrument.

(c) **Standard III(R) :**

- (i) **Speed** -140 km/h Unrestricted speed.
- (ii) **Isolation** - Isolation of the main line is essential.
- (iii) **Interlocking** - The interlocking between points and signals must be direct.
- (iv) **Signals** - Outers, Warners, Bracketed Home Signals and Starters must be provided and Advanced Starters as may be necessary.

(d) **Standard-IV(R) :**

- (i) **Speed** - Speed upto 160km/h
- (ii) **Isolation** - Isolation of the main line is essential

(2) **In Multiple Aspect Signaling system :**

The Standards, their speeds, requirements of isolation equipments of points and requirements of interlocking between points and signals are the same as in the case of two aspect signalling. The Signalling, however, should be as under: -

- (i) **Standard I R**- A Distant and a Home Signal in each direction.
- (ii) **Standard II R, III R and IV R** - A Distant, a Home and a Starter Signal in each direction.

Sl.No	Item	Std.I ®	Std.II®	Std.III®	Std.IV®
1.	Allowable speed (kmph)	Upto 50	Upto 110	Upto 140	Upto 160
2.	Isolation	Y*	Y	Y	Y
3.	2Aspect (2A) Semaphore/Multi Aspect (MA) Signalling	2A/MA	2A/MA	MA	MA
4.	Double distant	N	Y**	Y	Y
5.	Point Operation	Mech	Mech/Elect	Mech/Elect	Elect
6.	Point locking	Key/Facing point lock/ Hand Plunger lock	Facing point lock with point machine	Facing point lock with point machine	Clamp type direct (desirable)
7.	Point Detection	Mech/Elect	Mech/Elect	Mech/Elect	Elect
8.	Lock Detection	N	Y	Y	Y
9.	Interlocking	Key/Mech	Mech/Elect/ Electronic	Mech/Elect/ Electronic	Electrical/ Electronic
10.	Track Circuiting	N	Mech Interlocking: Run Through lines (Main), Elec/Electronic: All Running lines	All Running lines	All Running lines
11.	Block Working	Token	Token/ SGE	#SGE /Track circuit	#SGE/Track circuit
12.	Preventing signal passing at danger	N	N	N	Y (Desirable)

**NB :-**

- \* Isolation is not compulsory provided that the conditions laid down in the second paragraph of the GR 4.11 are complied with.
- \*\* Double distant on sections where goods trains have a braking distance of more than 1 km.
- # At station provided with CPI or high density routes

### **13.12 Training on Panel Interlocking System and Electronic Interlocking System with conventional panel or VDU panel :**

- a) At newly commissioned/modified stations, 3 days on the job training shall be organized for SMs by the supervisors of S&T construction/Project Unit, where the supervisors of S&T (Open line) and traffic shall also be present.
- b) All the Station Masters who are to operate the conventional panel or VDU panel for the first time shall undergo three days practical learning/training of PI/EI at that station. Such staff should take learning atleast one shift each in both day and night. If any SM has experience only either in panel operation or VDU operation, he shall have to undergo one day practical training in the system which he has not operated earlier.
- c) The above training/learning shall cover all relevant clauses of SWR with respect to the Panel Interlocking System/Electronic Interlocking System including emergency operations.
- d) Sectional DTI and Signal Supervisor (Open Line) will ensure proper training of staff before they are permitted to work independently on Panels/VDUs.
- e) At the end of above training/learning, sectional DTI and Signal Supervisor incharge (Open Line) shall issue a joint competency certificate on prescribed format (OPT-1C) only after satisfying that SM is competent having taken his oral examination.
- f) The competency certificate shall be kept at the station for record, which is valid for three years. This shall be inspected by inspecting officials. It is the responsibility of the SS I/C of the station to ensure that the competency certificates of his staff are within valid date and available on record.

**13.13 (a) Description of panel operating keys :**

Sl No	Button	Description	Colour	Location
1	SMKEY	SMKEY		Top Centre of the panel.
2	PANEL/PC SWITCH	Used during the process of transferring control PANEL to PC and VICE VERSA.		Nearby SM Key.
3	GN	(Main) Signal Button	RED	Close to signal and on the line representing track
4	SH-GN	Shunt signal button	YELLOW	Close to Signal and on the line representing track.
5	UN	Route Button	WHITE	Centre of the berthing line of last control track circuit
6	WN	point Button (for regular operation)	BLUE	Close to the point demarcation
7	WWN (Normal / Reverse)	Point Button (used for point operation and also for route section release)	BLUE OR BLUE WITH WHITE DOT ON TOP	Top of the panel
8	LXN	Level crossing control release button.	BROWN OR CHOCOLATE	Closed to the level crossing demarcation
9	KLYN	Siding key lock Release Button	BLACK	Closed to slotted point demarcation
10	COGGN	Calling on Signal control Button (common)	RED	Top of the panel and below COGGN COUNTER
11	EGGN	Common Button to replace a cleared Signal at 'ON'	RED	Top of the panel below EGGN counter
12	GBN	Common Slot Release Button (For Gate, Crank Button)	GREEN	Top of the panel
13	GBRN	Common Slot Return Acknowledgement Button	BLACK	Top of the panel
14	EWN	Common point button (for emergency operation )	BLUE	Top of the panel and below EWN COUNTER
15	AGGN	Common Button to introduce Auto working of a Main Signal.	GREEN	Top of the panel

16	AGGRN	Common Button to cancel Auto working of a Main Signal	BLACK	Top of the panel
17	EUYN	Common Emergenncy Route section release button	GREY	Top of the panel and below EUYN counter.
18	EUUYN	Common Emergency Full Route Release button	GREY	Top of the panel and below EUUYN counter.
19	OYN	Common Emergency Overlap Release Button	WHITE	Top of the panel and below OYN COUNTER
20	HL /SL MECR FAILED	MECR ( Signal filament failure ) along with the buzzer and indication	WHITE	Top of the panel
21	HL/SL MECR RECTIFIED	Signal filament rectified	WHITE	Top of the panel
22	E/WHLME FAIL/ WSLME FAIL	Signal lamp Failure Alorm acknowl edgement button	WHITE	Top of the panel below FILAMENT FAIL INDICATIONS
23	E/WHLME RECT/ WSLME RECT	Signal lamp Failure Rectified Alarm acknowldgenent button	WHITE	Top of the panel below FILAMENT FAIL INDICATIONS
24	POWER FAIL ACK	POWER Failure Alarm A cknowledgement Button	RED	Top of left side of the panel
25	SYS FAIL ACK	SSI system failure acknowledgedenent	WHITE	Top of the panel system on indications.
26	G/U/W/GRN ACK	Button hold alarm Acknowledgement	WHITE	Top of the panel
27	FCORPB	False feed alarm Acknowledgement	RED	Top of the panel
28	AXT RESPB	Loop line axle counter reset button	GREY	Below AXLE counter. RESET counter.
29	TRAIN ENTRY ACK	Train entering next block section alarm acknowledgement button	BLACK	Top of the ADVANCE STARTER SIGNAL DOMINO.

**b) PANEL BUZZERS :**

1. Button hold buzzer
2. Signal filament failure buzzer
3. Power failure buzzer
4. System failure buzzer
5. Block release buzzer,
6. Train entry buzzer
7. False feed buzzer

**c) PANEL COUNTERS :**

1. Emergency signal replacement counter (EGGN)
2. Emergency route release counter (EUUYN)
3. Calling on signal counter (COGGN)
4. Emergency route section release counter (EUYN)
5. Emergency point operation counter (EWN)
8. Emergency overlap release counter (OYN)



**d) Panel Button Description and Panel Operation Chart**

SL. No	Gear Type	Buttons to operate	Required Conditions	For Route Release		
				Signal Cancel	Emerg. full Rout Release	Emerg. route section release
1	Home Signal	GN+UN	Route Track and overlap track to pick up, require point detection including overlap/isolation point detections, gate is locked and concerned CH locked plus concerned MCB is switched on	GN+EGGN	GN+EUUYN	GN+EUYN
2	Calling On signal	GN+COGGN Release only COGGN keeping GN pressed and press UN	Calling On Track in front of Signal must be occupied and rear / replacement track must be clear.	GN+EGGN	GN+EUUYN	GN+EUYN
3	Main line Starters	GN+Ad.St.UN GN+St.UN	Route Track is to pick up, require point detections including isolation point (s) and concerned CH locked plus concerned MCB is switched on	GN+EGGN	GN+EUUYN	GN+EUYN
4	Loop line Starters	GN+Ad.St.UN GN+St.UN	Route Track is to pick up, require point detections including isolation point (s) and concerned CH locked plus concerned MCB is switched on, Approach clear, Clears after berthing track is occupied for 48 seconds	GN+EGGN	GN+EUUYN	GN+EUYN
5	Shunt Signal	SHGN+UN	Route Track is to pick up, require point detections including isolation point (s) and concerned CH locked plus concerned MCB is switched on	SHGN+EGGN	GN+EUUYN	GN+EUYN
6	Auto signal Set	GN+AGGN	The Signal should be lowered first	'A' Marker will lit		
7	AutoSignal Cancel	GN+AGGRN	Introduce Semi Auto signal working	A' Marker will not lit		
8	Loop line Axle Counter Reset	AXTRES PB+A/C RES KEY	Loop line AxleCounter Track failed	Station Master will ensure personally for clearance of line before resetting		
9	Power Fail ACK	POWFR FAIL ACK	Power failure indication and buzzer should sound	Buzzer will stop on pressing the BUTTON, the RED indication remains till the problem is rectified		
10	System Fail ACK	SYS.FAILACK	System Failure and buzzer should sound	Buzzer will stop immediately on pressing the button.		
11	HL/SL MECR Failed	HL/SL MECR FAILED	MECR (Signal filament failure ) along with the buzzer and indication	Buzzer will stop immediately but RED indication remains till the problem is rectified		
12	HL/SL MECR	HL/SL MECR RFCTIFIED	Signal filament rectified	RED indication stop immediately		

### 13.14 Non-Interlocked Points and its Securing :

Non interlocked points are those points which have no locking mechanism and so they can be operated at any time if it is not locked manually using cotter bolt or by any other means. Non-interlocked points are common in marshalling yards and sidings. Non-interlocked points must be inspected before a facing movement to make sure that the tongue rail is tight against the stock rail. If there is any gap between the points, such points must be secured before allowing movement. For locking of non interlocked points refer SR 3.39.03, 5.14.03 & 5.14.06.

(a) **Locks and bolts for points:** At stations where the points are not interlocked with the signals, each sets of points must be provided with a safety lock or a clamp of approved types or screw locking bolts with nut and cotters and a padlock so as to secure the switch or tongue rail to the stock rail. In this position the switch is set to be closed. This should be ensured before allowing any movement over the point(s).

(b) **Keys of points lock:-** The keys of points locks must not be kept in bunches, as when a bunch of keys is sent out to unlock points there may be other keys in the bunch which should be with the station master, and in such cases it might be in the power of the pointsman or porter to unlock points that should be kept locked.

(c) **Padlocking of points:-** The clamp must be properly tightened to hold the tongue and stock rails together before being padlocked. Where bolts, nuts and cotters are provided the bolt should be passed through the tongue and stock rails near the nose of the closed switch, then the nut should be screwed tightly, cotted and padlocked. If the nut cannot be screwed sufficiently tight so as to hold the tongue and stock rails together without a gap, the bolts etc, should be renewed at once.

When keys are removed from locks, care must be taken to place the key hole shields over the keyholes so as to prevent rain and dust getting in to the locks.

**13.15 Isolation:** - It means an arrangement, secured by the setting of points or by other means, to protect the line so isolated from the danger of obstruction from other connected line or lines. A line is said to be isolated from the adjacent line or lines when no movement on the adjoining lines can foul it. Isolation can be achieved by any of the following methods.

(a) Snag dead end, (b) sand hump, (c) trap points, (d) setting of points (e) permanently locked points, (f) Scotch Block and (g) Hay's Derail, (h) Derailing Switch.

Note:-Scotch block and Hay's derail may also be used to isolate movement on same line.

#### (a) **Snag Dead End**

- (i) This is an extended portion of track with an erected obstruction with buffers at the end.
- (ii) The length is at least 120 metres.
- (iii) This is used to isolate main line from loop line.
- (iv) This is an efficient substitute for signal overlap.

**(b) Sand Hump**

Sand hump is an extended portion of rail embedded in sand. It is total 60 m in length, with increasing gradient of 1 in 60, of which the first 30 m is laid with normal track embedded in sand and remaining 30 m is an earthen lump of uniform 4 m width.

**(c) Trap Points**

- (i) This is a single rail cut.
- (ii) This rail cut will be away from the adjacent line,
- (iii) To provide isolation, the trap point will be open,
- (iv) When it is open and if a vehicle moves, the vehicle will derail.
- (v) This is provided to isolate running line from non-running line and main line from loop line.

**(d) By Setting of Points:**

At interlocked stations, isolation can also be obtained by setting of points.

**(e) Permanently Locked Points**

- (i) Certain points, including traps are kept permanently locked.
- (ii) The keys for these points are kept with the on duty Station Master.
- (iii) These points have to remain set and locked in normal position,
- (iv) These keys are handed over, when these points are required to be worked.

**(f) Scotch Block**

- (i) A lump of log covered with iron sheets and coloured red.
- (ii) This will be connected with a chain tied up on the earth.
- (iii) This is placed across the rail and locked to prevent vehicles moving away.
- (iv) If the vehicle moves, the vehicle will derail.
- (v) This is used normally to isolate running line from non-running line.

**(g) Hay's Derail**

It is a device designed to limit the movement of free rolling, uncontrolled wagons/ vehicles. This is accomplished by grinding the flange of a wheel up and over the railhead, dropping the wheel clear of the rail on outside of the rails. The wheels lodging in the tie cribbing and ballast halt movement of wagons /vehicles.

**(h) Derailing Switch**

This is an extended portion of track ending with some sand.

- (i) The distance from the points is about 15 feet.
- (ii) This is used to isolate main line from loop line.
- (iii) This is an efficient substitute for signal overlap under approved special instructions.
- (iv) The normal setting of points is for derailing switch.
- (v) If the vehicle moves, the vehicle will derail on the sand at the end of the derailing switch.
- (vi) Simultaneous reception is possible with CRS permission.

- (vii) This should not be obstructed.

### **13.16: Custody of Relay Room Key and procedure for its handing over and taking over between Station Master and S&T maintenance staff :**

The following procedure shall be adopted for opening of Relay Room/Cabin basements at stations:

#### **(a) Locking of Relay Rooms:**

- (i) The Relay Room/Cabin basement of station shall have double locking system of operating & S&T locks.
- (ii) **Operating Lock-** One Godrej lock shall be provided on the door of Relay Room/ cabin basement by SM. This lock is named as operating lock. The key shall be kept in the safe custody in key-box with the Dy.SS/SM on duty.
- (iii) **S&T Lock-** Likewise one Godrej lock shall be provided on the door of Relay room/cabin basement by signal maintainer/signal supervisor. This lock is named as S&T lock. The key shall be kept in the safe custody of the concerned signal maintainer/signal supervisor of the station/section.

#### **(b) Opening of Relay Room/Cabin Basement:**

- (i) Names of the S&T staff authorized for opening of relay room/cabin basement of a station is to be entered in the first page of relay room key register & jointly certified by SSE/Signal in charge & TI in charge of the section.
- (ii) In emergency, if any S&T staff other than authorized, wants to open the relay room, he must inform DSTE through signal fault control. Signal fault control conveys the permission of DSTE to Dy.SS/SM on duty by giving signal fault control order number.

#### **Duties of S&T Staff:**

Whenever relay room is to be opened either for scheduled maintenance or during failures or for other maintenance activities/construction works, the concerned maintainer/signal supervisor will inform Dy.SS/SM on duty for opening of relay room with reason.

#### **Duties of operating staff:**

When Dy.SS/SM on duty is requested for the key by S&T staff:

- (i) Dy.SS/SM on duty shall verify his identity from the list of authorized S&T staff recorded in the first page of relay room key register or as advised by signal fault control in emergency.
- (ii) Then Dy.SS/SM shall give the key of operating lock to S&T staff, after the entry is made in the relay room key register and also in TSR in red ink.
- (iii) Relay Room/Cabin basement key shall not be handed over by Dyss/SM on duty to any group 'D' staff of S&T department.

#### **(c) Closing of Relay Rooms:**

#### **Duties of S&T staff:**

On completion of work, the concerned signal maintainer/signal supervisor shall:

- (i) First Properly close the relay room/cabin basement door and lock it with both the locks.
- (ii) Then return the key of operating lock to Dy.SS/SM on duty and make entry in the relay room key register.

**Duties of operating staff:**

When the key of operating lock is returned by S&T staff to Dy.SS/SM on duty, he shall:

- (i) Verify the relay room/Cabin basement for proper locking.
  - (ii) Then keep the key in safe custody and acknowledge it in the relay room key register.
- (d) The procedure, frequency and authority for opening of relay room in 4 categories are appended below.**
- (i) For attending failures of S&T gears within relay room the following steps shall be taken:**

Entry to be made in S&T failure register by Dy.SS/SM on duty and failure memo has to be issued to S&T staff. S&T staff shall not take the relay room key for attending failures and open the relay room unless failure is recorded in signal failure register.

If disconnection is required, disconnection memo has to be given by S&T staff to Dy.SS/SM on duty. Failure memo should be acknowledged and entry in relay room key register to be made by S&T staff before obtaining SM's key.

**(ii) For Periodical Maintenance of Relay Room:**

Relay room key for scheduled maintenance shall be taken once in a calendar month during monthly inspection by sectional supervisor.

**(iii) Opening for Special Activities and Works:**

The relay room can also be opened by following the procedure as given in para (b) and (c) respectively to carry out the activities as and when required.

- (a) Special maintenance activities like cable insulation testing, selection/locking table testing, maintenance work inside relay room by electrical and engineering staff, data loggers resetting and inspection by divisional and headquarter officials.
- (b) Track circuit adjustments & voltage monitoring during monsoon and whenever required during rains.
- (c) Works required by S&T construction & open line staff for preparatory works and during commissioning. In each such case, the construction staff shall follow the detailed guidelines issued regarding working on signaling gears under the charge of open line.

**(iv) Emergency Cases:**

In case of emergencies such as fire, flood, earthquakes etc., open line Section Engineer(Signal)/Signal Maintainer and Dy.SS/SM shall jointly decide the need for opening the relay room. Section Engineer (Signal)/HQ at divisional control office and section controller shall be advised respectively.

In case of communication failure during such emergencies, open line Signal Maintainer /supervisor and Dy.SS/SM on duty shall jointly decide the need for opening the relay room and communicate later on to respective controls.

**(e) In case key is lost/misplaced:**

It shall be reported to S&T control as well as section control. In normal course the spare key with the respective custodians shall be used. In emergency situations lock may be broken under advice to section control as well as S&T control. New lock shall be procured and provided.

**(f) Unauthorized Opening:**

In case Dy.SS/SM on duty comes to know about relay room/cabin basement opening by unauthorized person or by Group-"D" staff, the signaling system shall be suspended by him and matter immediately reported to section controller for necessary action.

**(g) Reporting and Recording of Opening of Relay Rooms:**

Senior Section Engineer (Sig) and TI of the respective section will check the station records of relay room opening during their inspections and cross check with data logger/ counter reading if provided. Discrepancy, if any, shall be immediately inquired into and advised to Sr.DSTE & Sr.DOM by numbered control message from the station immediately for further action.

**13.17: Situation in which disconnection notice need not be issued provided suitable precautions are taken by S&T staff by not interfering with safe working of trains :**

**(a) Cleaning and/or lubricating/graphiting without affecting any physical/electrical disconnection.**

- (i) Lever frame basement
- (ii) Relay room and battery room.
- (iii) Apparatus case/battery box/goomty
- (iv) Lifting barrier mechanism including winch.
- (v) Lever lock and circuit controller without opening cover.
- (vi) Inspection and cleaning of inside equipment by opening the covers of point machines, signal motors, reversers, apparatus cases and detectors.
- (vii) Point , facing point lock and lock bar.
- (viii) Cranks, compensators, pullies, wheels, roller stands, counter weights and levers.
- (ix) Power supply equipments
- (x) Insulation joints
- (xi) Lens/roundels of signals, point indicator/trap indicator and shunting permit indicator provided phantom indication to a loco pilot of an incoming train is prevented by covering lenses.

**(b) Testing of:**

- (i) Track locking, approach locking, back locking, indication locking, route release.
- (ii) Checking various parameters of axle counter without disconnecting the equipment.
- (iii) Power supply equipment
- (iv) Lever frame, SM's control slide, signal operation, Point operation, level crossing gate and slot circuits.
- (v) Point by obstruction test for lock only.
- (vi) Checking and testing of track circuits parameters when track is unoccupied.
- (vii) Focussing of colour light signal provided phantom indication to Loco Pilot of incoming train is prevented by covering lenses.

**(c) Adjustment of :**

- (i) Wire transmission, except double wire operated point transmission.
- (ii) Tightening of terminals using insulated tools without causing any shorts on adjacent terminals.

**(d) Replacement of:**

- (i) Electric signal lamp by covering lenses to prevent phantom indication to Loco Pilot of incoming trains.
- (ii) Bond wire, one at a time.
- (iii) Plug in relay in case traffic condition permits.
- (iv) Indicator lamps
- (v) Push buttons/switch/key of panels.
- (vi) Lock bar clips/bar stops, one at a time.
- (vii) G.D Tubes
- (viii) Fuse, one at a time.
- (ix) Pulley, bottom roller/top roller in wire and rod transmission one at a time and in split pins.
- (x) Batteries/cells without affecting disconnection of supply to main equipment.

**13.18 Rectification of Signal Failures :**

(a) The SM will advise signal maintainer concerned through a written memo or by telephonic communication about the failure. The signal maintainer only after receiving the failure memo should attend the failure. SM shall also advise the controller about the failure of the signal at the station.

(b) SM shall take necessary steps for movement of trains in terms of GR 3.68, 3.69, 3.70 and SRs thereto and procedure contained in the Station Working Rules for running of trains during failure of signals. He will also make necessary entries in the signal failure register, train signal register, SM diary and caution order register.

(c) On receipt of the written memo about the failure from the SM, the concerned signal maintainer shall attend the defective signal and issue a disconnection memo in form no. T-351 for the concerned signalling equipment(s), if necessary and obtain acknowledgement from SM.

(d) The signal maintainer must specify clearly in the disconnection memo whether reception & dispatch of any train is restricted on any route.

(e) In case the maintainer requires working in the relay room for rectification of the failure, he shall take the key of the relay room from the SM after making necessary entries in the relay room key register giving details of works to be done in the relay room and a certificate in the appropriate column that the interlocking gears will not be interfered with.

(f) When a defect is rectified, the signal maintainer shall issue a reconnection memo on the relevant portion of form T-351 to the SM as a certificate for rectification of the defect and safe working of the signal and obtain signature from the SM. He shall also make necessary entry in the rectification column in the failure register.

(g) Before acknowledging the reconnection memo, SM shall test the signal personally and satisfy himself that the signal (s) is in safe working order.

(h) Thereafter, SM shall make necessary entries in the signal failure register, train signal register, SM diary and caution order register and advise the controller about rectification of the defective signal.

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## CHAPTER-14

# NON – INTERLOCKED WORKING OF STATION

### 14.01: Non Interlocking:

- (a) Non-Interlocking (NI) Working means temporary disconnection of points, signals, track circuits, axle counters and other signalling gadgets for any designated works. This kind of working is normally resorted to at the time of overhauling of lever frames, yard remodelling, introduction of Panel Interlocking/ RRI/SSI, meggering of cable etc.
- (b) Sometimes, at an interlocked station when points and signals become defective, station becomes non-interlocked for the purpose of working.
- (c) In both the cases the safeguards built into the system for normal functioning of various signalling equipment are missing and as such responsibility to ensure safety on the part of staff increases manifold. Non-Interlocking working puts staff under severe strain and hence, prone to lapses. Undivided attention from every quarter is the need of the hour so that safety is ensured.
- (d) Non-Interlocked working leads not only to slowing down of train operations; it is also a less safe system as compared to interlocked working. Since it is desirable to avoid NI altogether, both from safety as well as customer convenience point of view, attempt must be made at the project proposal stage itself to dispense with NI altogether and undertake the work by means of traffic blocks with minimum possible disconnection.
- (e) Instructions given below are in addition to existing rules for Non-Interlocked working such as issue of Green Notice etc. They must be read together with existing provisions in G&SR, Block Working Manual etc.

### 14.02: Requirement of Non-Interlocked Working:

The following guidelines are laid down for a correct assessment of whether NI working is required in the first place or whether it can be dispensed with altogether.

- (a) NI working should not be resorted to as far as possible, in case of installation of new S&T gears. NI is unavoidable only if, modifications are to be made to existing S&T gears.
- (b) For new S&T gears, there is no need of NI and the work can be managed through well planned pre-change over works (insertions of point & crossing etc). The final change over to new gears can be carried out under partial or complete traffic block.
- (c) At the project proposal stage itself, S&T department should make it clear whether the project requires NI or not; and if it does, the duration of such NI. This fact must be mentioned in the check list on the original tracing itself.
- (d) Sr. DOM & Sr. DCM must quantify the actual impact of such NI, and deduce it to monetary terms, by calculating anticipated losses both on account of passenger and freight traffic. These should include losses on account of cancellation, short termination, diversion, rescheduling, detention to trains and imposition of restriction on booking/movement of Freight traffic.
- (e) Expenses likely to be incurred on account of TA/DA of temporary NI staff, and other administrative costs should also be added to arrive at the traffic cost of proposed NI working.
- (f) This traffic cost of NI should be communicated to S&T, who will evaluate if new gears can be installed without resorting to NI for less than the expected cost of proposed NI, if necessary by constructing a new building etc. as the case may be.

(g) If new gears can be installed in a new building and commissioned under traffic block at a cost that is comparatively less than the overall traffic cost of proposed NI, then the project should be recorded as one to be taken up without NI.

(h) This entire exercise must be carried out under the personal supervision of DRM, who will ensure that all estimates are reasonable and no figures are unrealistic both with regard to duration of NI or the anticipated traffic cost.

(i) Thus, NI will be undertaken only if found to be unavoidable, and this fact will be recorded on the original tracing, to be signed by branch officers concerned, and the DRM.

#### **14.03: Works with Traffic Block or NI Working:**

Guidelines given below should be followed for deciding whether NI working is required or not.

**(a) NI working is not required and the work can be managed by traffic block in following cases :**

- (i) Replacement of Mechanical lever frame by another Mechanical lever frame.
- (ii) Replacement of Mechanical lever frame by panel.
- (iii) Replacement of Panel by RRI.
- (iv) Replacement of RRI by RRI.
- (v) Commissioning of new SSI/RRI.
- (vi) Amalgamation of newly constructed double line portion into existing double line.

**(b) NI working is required only for following cases:**

- (i) Overhauling of cabins.
- (ii) Replacement of Panel by Panel at road side stations.
- (iii) Meggering of cables.
- (iv) Changes in yard layouts

#### **14.04: Minor and Major Works:**

NI working can be divided into 2 distinct categories, namely minor and major works.

- (i) **Minor works** – Overhauling of cabins at road side stations.
- (ii) **Major works** – Changes in yard layouts, overhauling of cabins, etc. at comparatively bigger terminals and junction stations.

#### **MINOR WORKS**

##### **Procedure to be followed for Non – Interlocked Working for Minor Works :**

Road side stations on double line having up to 2 lines in each direction, and on single line having up to one main line and 2 loop lines are covered under the heading of Minor Works.

**(a) Duration of NI working for Minor Works :**

1. A road side station would normally have about 21 levers in each end cabin (including spare levers).
2. S&T department must suitably augment the strength of their NI gang so that each cabin can be completed in one day.
3. NI working at the 1st cabin should start at 8/- hrs. in the morning and by 18/- hrs. the same must be interlocked and handed back to traffic.

4. The same procedure should be repeated the next day for the 2nd cabin.

**(b) General Instructions for Train Operation :**

1. Speed restriction of 15 kmph. shall be imposed over all facing points.
2. No train/wagon should be stabled on any running line of the NI station.
3. The common line should not be used for reception of trains coming from opposite directions.
4. Emergency and other crossovers including sidings taking off from the station should be set for normal position and clamped and padlocked. The keys of all padlocked points must be kept in the personal custody of the overall in-charge of NI working to prevent their being used even by mistake.

**(c) Train Running on double line section during NI working :**

1. Twin single line should be suspended during the duration of NI working and section worked as conventional double line only.
2. No temporary single line working should be introduced during NI period, except in case of an accident or blockade of through communication.
3. At road side stations on double line, route must be set for platform line in each direction and clamped and padlocked.
4. In case there is more than one platform in each direction, route must be set for one nominated platform.
5. At all such stations no precedence should be arranged.
6. During the NI period station should basically function as a halt station.

**(d) Train Running on single line section during NI working:**

1. Ideally, if possible, only one platform line should be nominated for train running.
2. The route must be set for this platform line in each direction and clamped and padlocked.
3. No precedence or crossing should be arranged at this station.
4. In case it is not possible to nominate only one line, then 2 specific lines should be nominated for Up and Down movement.
5. In that case, while crossings would have to take place, no precedence should be arranged at this station.

**(e) Staff requirement:**

1. Sectional TI and SI will be overall in-charge of NI working at the station.
2. Additional staff if required should be managed locally .

**MAJOR WORKS :**

For major RRI work and yard remodelling, CSTE (Open Line) shall be the overall in-charge for pre-NI and NI works and he shall work in close co-ordination with COM. It must be ensured that the project does not get delayed and the targets for construction organisation be assigned the required priority and yard remodelling work shall be closely monitored by CSTE(OL). CSTE (Con) shall work under the guidance of CSTE(OL). However, planning and execution of major RRI works should be reviewed at the level of General Manager.

**Procedure to be followed for Non – Interlocked Working for Major Works :**

Changes in yard layouts, overhauling of cabins etc. at comparatively bigger terminals and junction stations are covered under this heading of Major Works.

**(a) Duration of Non Interlocked Working :**

1. NI working must not be simultaneously introduced at more than one station in a Division.
2. NI must be planned during temperate weather, to avoid wrong actions on account of harsh and inclement weather.
3. Period of Non – interlocked working must be kept to the bare minimum as it is a potential safety hazard.
4. Staff of all departments must work round the clock in three shifts so that the work can be completed at the earliest.
5. For NI working of up to 3 days, plans will be finalized in consultation with DRM, Branch Officers and concerned HOD of Construction/RE Organization.
6. For NI working of more than 3 days and upto 07 days plans will be finalized in consultation with CTPM, CPTM and HOD of RE/Construction Organization at Zonal level to assess the duration and arrangements of NI working.
7. For more than 3 days NI, plans should be worked out for cancellation, diversion, rescheduling, short termination or even extension of trains as the case may be.
8. For NI working of more than 7 days personal approval of the General Manager must be obtained.
9. No NI working should last for more than 14 days.

**(b) Sanctions, clearances and preparatory works :**

1. Signal Plan must be finalised in Hd Qrts. at least 45 days in advance.
2. All plans and clearances including CRS sanctions that are required for NI working must be available at least 1 month before commencement of NI working.
3. Under no circumstances should this period of 1 month be relaxed.
4. NI working must be postponed in order to provide for 1 clear month before start of NI either in case of :
  - (i) Delay in receipt of above clearances/sanctions etc.
  - (ii) Last minute modifications to Signal Plan.
5. All pre – NI work that can be carried out without non – interlocking must be completed before actual NI working begins. These include changes in yard layout, insertion /removal of points & crossings etc. Changing/installation of new point machines must be done in advance.
6. Preparatory work in connection with OHE work must also be done in advance, including shifting of neutral section, if required.
7. Lessons learnt during previous NIs must be gone through in detail so that shortcomings of earlier occasions are avoided.

**(c) Level of Supervision/Responsibility:**

1. Responsibility to ensure availability of proper arrangement for NI working shall be of Construction/ RE organization.
2. Though the responsibility to provide necessary arrangement will be of Construction/RE organization, concerned branch officers from open line shall be responsible to ensure its availability and functioning during train operation. For this, he shall be the coordinating officer for the department concerned.
3. PERT chart should be made out detailing various activities to be completed on a day-to-day basis.

4. For round the clock working PERT chart should be made out detailing various activities to be completed on a shift to shift basis.
5. Dy. CSTE/Dy. CE/Dy. CEE as applicable shall make themselves available in non-interlocked area where, the work is being undertaken.
6. The concerned Project in – charge (XEN, DSTE/Con. etc) shall camp near the non-interlocked area till completion of non-interlocked working.
7. Overall in charge for NI working will be SR.DOM(G)/DOM(G)/AOM(G) as the case may be for both Safety and Operations.

**(d) Green Notice :**

1. Construction officials responsible for carrying out the work should send a ‘circular notice’ to the Sr. DOM at least two months in advance.
2. They will advise as to when the work will be undertaken with a request to issue special instructions. A copy of the notice shall also to be sent to SM/SS/SMR of the station concerned.
3. Sr. DOM on receiving such ‘circular notice’ get special instructions prepared for that station. These are then issued to all concerned.
4. Green notice is to be issued by Sr. DOM. It should incorporate the following :
  - (i) Details of existing yard layout and its various provisions.
  - (ii) List of all works to be completed by Civil Engg./S&T/Elec. before start of NI.
  - (iii) List of all works to be undertaken by Civil Engg./S&T/Elec. during NI period.
  - (iv) Additional facilities to be made available after commissioning of new works.
  - (v) Existing facilities that are to be dismantled.
  - (vi) Details of yard layout to be made available after completion of NI.
5. Signalling Plan must indicate permissible routings and simultaneous movement facilities to be made available.
6. Signalling Plan must invariably indicate whether any of existing facilities for train movement are to be
  - (i) either curtailed, (ii) modified or (iii) restricted.

**(e) Time Tabling changes :**

For assessing the impact of NI working at a bigger terminal or at a Junction station, a detailed exercise has to be undertaken as indicated below.

1. During the course of NI working changing of points manually after passage of a train and after completing all formalities takes about 10 minutes time.
2. The capacity of the junction station to handle maximum number of trains during a particular time period has to be worked out keeping in mind the above constraints.
3. Every possible train movement for reception and despatch must be clearly documented,
  - (i) Along with time of movement.
  - (ii) With exact sequence of points, whether in normal or reverse.
4. For time-tabled moves, trains demanding same point either at the same time or within 10 minutes must be identified since this is the time required before an existing setting of points can be changed. In case of conflicting moves, the less important moves have to be cancelled, rescheduled or diverted.

5. Crossing and precedence must be restricted to the bare minimum with few specific routes being selected for most movements.
6. As a thumb rule, only 80% of the reduced capacity as worked out should be utilized since unforeseen failures such as ACP, equipment failures etc. are likely to take up the remaining 20% of the available capacity.
7. In all such planning it is better to keep adequate cushion in train operations and initially cancel, reschedule or divert more number of trains than what may be required. In case NI working progresses smoothly without major detentions and it is felt that some of the cancelled trains can be restored, the same may be done after a week or so.
8. Clear corridor for freight must be charted out, with exact number of moves possible, and extra freight trains that cannot be handled should be planned to be diverted to other routes. In case diversion is not possible then operating restrictions must be imposed.
9. More time must be spent in precise planning of each move during NI period, such that the station is not brought under pressure at any time.
10. Changes in PRS reservation system for cancellation, diversion, rescheduling etc. must be done in advance as per advance period of reservation.

**(f) Advance preparation for train running and stoppages on platform:**

1. Duration of stoppages of Mail/Express trains must be reduced to the extent feasible.
2. Loading/unloading of parcels should be reduced to the bare minimum. If possible handling of parcels should be suspended giving due publicity in the Press and other media.
3. Running of trains with single SLR must be prohibited.
4. Shunting operations must be restricted to the bare minimum and preferably avoided altogether as far as possible.
5. Booking of through carriages, inspection carriages, etc. to the NI station must be restricted.
6. Quick watering of coaches must be ensured by deputing additional staff as required.
7. Nominated stations for watering of coaches may also be changed if alternate stations are available.
8. Extra TXR staff must be deputed on platforms for attending to defects in rolling stock and promptly attending to complaints.
9. Extra train lighting staff must also be deputed on platform duty for promptly attending to complaints.
10. Special squads of commercial and RPF staff must be deputed on platform duty for checking ACP etc.
11. All efforts must be made to minimize detentions.

**14.05: Crew Changing :**

1. Loco Supervisor must be kept on round the clock duty on the platform for quick change over of crews.
2. If possible crew changing for through passing trains may be planned at adjoining stations.
3. If necessary, LIs may be deputed to accompany the loco pilot from one station before NI station till one station after NI station.
4. Traffic Supervisor must be kept on round the clock duty on the platform for quick change over of guards.
5. Extra porters should be deputed for delivering the caution orders to loco pilot and guard.

**14.06: Locomotives :**

1. Engine changing for through trains must be curtailed.
2. Locomotives must be freely extendable beyond territorial jurisdiction.
3. If it is unavoidable, then changing of locos may be done at either side of NI station.
4. For avoiding changing of locos from Diesel to Electric and vice versa, train routings may be changed during the duration of NI working.
5. For traction changing, half shunt of locos may be freely resorted to.
6. Attaching of locos in rear should be resorted to in case of stations where trains reverse.
7. Sending of light engines to sheds must be restricted. For this purpose, an out pit may be opened, if necessary.

**14.07: Controlling of Trains :**

1. In case of major terminal stations, a mini control office may be opened at the station. This mini control will liaison with divisional control office for purposes of train running. The jurisdiction of this mini control office would be the NI station itself, and 2 – 3 stations on either side in each direction.
2. Station undergoing NI must not be permitted to be brought under any pressure whatsoever at any time during NI working.
3. All relevant notices must be issued in advance.

**14.08: Goomty Arrangements :**

Location and number of goomtys is an extremely important aspect of advanced planning for NI. Sr. DOM/DOM should personally approve final arrangements regarding goomtys.

1. Cabins should not be used as goomtys.
2. For a group of maximum of three sets of points operated from the ground, one goomty should be made.
3. Ideally, only 2 sets of points should be controlled from a single goomty.
4. Each goomty should be provided close to the group of points that it controls. This will ensure that physical movement of staff is reduced to the bare minimum.
5. Under no circumstances should 2 ends of the same points/crossings be with different goomtys. This must be specially ensured for diamonds with single slips and also with double slips. Each such diamond must be under the same zone in-charge.
6. Location of each goomty as also number of points that are controlled from it should be tentatively marked out in yard diagram. This should then be physically cross checked at site by visiting the station yard.
7. At site it must be ensured that staff are not required to walk long distances for setting of points.
8. Both ends of each point must be clearly visible from the goomty itself.
9. A goomty must be provided near the first stop signal for prompt issue of written authorities for reception of a train etc. as required. Another goomty must be provided at the last stop signal to ensure correct dispatch of trains.



**14.09: Staff Arrangements:**

1. Each goomty should have one ASM and two Pointsman in each shift. These extra ASMs posted in goomtys shall be called goomty ASMs. ASM posted with indoor ASM will be termed as co-ordinating ASM.
2. For cabin operated points, to commensurate with extra work load extra staff (ASM/cabinman/pointsmen) should be provided. However, cabins should not be used as goomtys as far as possible. Cabin ASM will co-ordinate with goomtys for reception and dispatch of trains.
3. Goomty ASMs during their duty hours shall be fully in-charge of working of points/levers under their charge. They shall discharge all obligations of the cabinman/pointsmen working at the station/cabin. They shall work under the direct supervision and instructions of the coordinating ASM on duty.
4. A group of goomtys at each end of the station should be put in one zone. Each zone should be under the charge of a TI in each shift. TI will periodically keep moving about amongst the goomtys within his zone. He will check up and monitor the working of group of goomtys under his charge.
5. For non-interlocking work at major terminal stations, necessary arrangement for additional staff should be made, if necessary, from adjoining divisions/Zones, before undertaking NI working.
6. Under no circumstances should NI working be started unless full complement of staff is available at the station as per above norm and adequate training has been imparted to them.
7. Preferably those staff should be drawn from outstation who have
  - (i) Adequate knowledge of NI working.
  - (ii) Previous experience of the same.
8. Boarding and lodging of outstation staff is an important aspect of NI preparation. Dormitory type arrangement would be ideal, if these can be arranged. At major junctions these can be taken care of by stabling a few coaches at sidings. However, facilities will have to be arranged for electrical charging, watering, cleaning of bathrooms, sanitation etc.
9. On divisions where separate non – interlocking gangs are already in existence their strength may be adjusted accordingly. However, composition of such NI gangs should be periodically changed by inducting fresh faces and withdrawing earlier ones.
10. Round the clock engineering gangs with crow-bars and handles should be available to move points in emergency. One gangman should be available with each goomty in each shift for this purpose.
11. At each non-interlocked station one Asst. Scale officer or above of operating department will be nominated for over all supervision.

**14.10: HOER :**

1. Under no circumstances HOER violation should be permitted during NI working. As far as possible duty hours of staff should be restricted to 8 hrs duty per shift in continuous roster.
2. For catering to unexpected casualties such as leave, sickness etc. during the NI period, RG and LR staff must invariably be provided for.
3. RG and LR must be made available shift wise. The standard of RG and LR should be the same as that of regular duty cadre staff for that shift as stipulated.

**14.11: Duty Rosters Shift Wise :**

Meticulous detailed planning must be carried out for drawing up roster of staff to be deputed for NI working. While drawing up roster of staff for various shift duties, following guidelines must be followed :

1. These should be drawn up for the entire duration of NI period.
2. Duty rosters drawn up should be openly displayed and given wide publicity.
3. No staff shall be permitted to mutually exchange his duty roster with any other staff, without prior permission of his departmental officer at site.

**(a) Last Night Shift Duty :**

1. Best and most competent staffs should be deployed for last night shift duty.
2. As far as practicable, second preference be for regular staff permanently working at the NI station.
3. Last preference should be for staff who have previously worked at that station.

**(b) First Night Shift Duty :**

1. Regular staff permanently posted at the NI station, if still available for deployment after covering last night shift, should be rostered for first night shift duty.
2. Second preference should be for staff who have previously worked at that station.
3. Amongst outstation staff preference should be as follows :
  - (i) Senior staff having previous experience of NI working.
  - (ii) Staff who are presently posted at major junctions.

**(c) Day Shift Duty :**

1. Comparatively junior inexperienced staff from outstation should be deputed for day shift working.
2. Teams for different goomties should be so formed as to include at least one staff having previous experience of NI working.
3. For day shift working, more number of staff may be deputed per goomty, if required, to cater for comparatively inexperienced staff.

**14.12: Execution of Field Works :**

1. Railways should prepare plan for executing such works carefully and execute NI taking adequate precautions ensuring full preparedness for handling train operations immediately after completion of NI work.
2. As the work progresses, 60 days before proposed NI, regular weekly reviews at SAG level should be done for final planning of all the activities during pre-NI, NI and post-NI periods. During these reviews, progress of these activities should be closely monitored and all hurdles should be resolved in close coordination with concerned departments and agencies.
3. NI for all RRI works at major station/junction stations shall commence only after approval of CSTE, COM and GM.
4. Phased commissioning should be adopted to reduce NI period.

5. Executing unit should give certificates for compliance of instructions as per format given in Adviser(Signal) letter No. 2012/Sig/SF/2(Policy), dated 09.04.2012 and should be submitted through Divisional officers before permitting NI by CSTE and COM.
6. 10 days before NI, all major activities/works which can be completed prior to NI, should be completed in all respects.
7. Most of the works should be completed in advance, leaving the bare minimum work for completion during pre-NI periods with final changing over, testing/commissioning to be completed during NI period.
8. The preparatory works should be closely monitored and reviewed jointly by Construction organisation with Open Line officers and outdoor works should be re-confirmed and re-tested before taking up NI.

#### **14.13 Temporary Working Instructions (TWI) :**

1. When NI is undertaken, inter – locking provisions stipulated in SWR are no longer available. So the SWR in its existing form becomes invalid.
2. TWI is basically meant to replace some portion of Station Working Rules of the station during the period of NI working. While they need not be as detailed as the original SWR of the station, nevertheless, they must cover all aspects of train operation that are included in the existing SWR.
3. Static information of SWR will continue to be valid. These include :
  - (i) Inter – station distances.
  - (ii) Description of yard layout.
  - (iii) Level crossing gates.
4. TWI is to be read in conjunction with G&SR, Operating Manual, Block Working Manual. It must also be read along with existing SWR of the station.
5. Portions of SWR that will get replaced pertain to :
  - (i) Ensuring clearance of running lines.
  - (ii) Granting of line clear.
  - (iii) Reception/despatch of trains.
  - (iv) Working of level crossing gates.
  - (v) All checks that are done by means of :
    - (a) Slots.
    - (b) Lock bars.
    - (c) Point locks.
    - (d) Signals.

All these checks have to be taken care of manually.
6. TWI should list out :
  - (i) Number of goomtys.
  - (ii) Portions of yard that each goomty would control.
  - (iii) Which goomtys are to be involved for reception/departure of a train on/from different lines.

7. TWI should list out different conditions required to be fulfilled for reception and despatch of train :
  - (i) How line clear is to be granted/obtained.
  - (ii) How clearance of nominated line is to be ensured.
  - (iii) How complete arrival of a train is to be ensured.
  - (iv) Procedure for closure of level crossing gates, if any.
  - (v) How the route is to be set.
  - (vi) What are the series of points involved.
  - (vii) Which one of them are to be in normal position and which ones in reverse.
  - (viii) How signals are to be lowered.
  - (ix) Which staff would do what.

**14.14:Field level Advance Preparation :**

1. Detailed working instructions clearly specifying the zone of responsibility of each and every staff and supervisor along with temporary working instructions must be issued well in advance of the NI working. In any case these should be ready at least 15 days in advance of NI working.
2. Station Superintendent/Transportation Inspector who is overall in-charge should be fully aware of their responsibilities/duties. Temporary working instructions should clearly stipulate these unambiguously.
3. Each Station Masters/Assistant Station Master, Cabin Master, Cabin Man and Point man deployed on shift duty should be supplied with copies of temporary working instructions. In addition SM/ASM and Cabin Man shall be supplied with yard layout diagrams and pull charts for their guidance.
4. The temporary working instruction shall be supplied to SS/ASM/Cabinman and Pointsman in advance for study by them and for explaining to illiterate staff.
5. The instruction should be prepared in English and Vernacular language and assurance to the fact that they have understood shall be obtained.
6. Ready made pull charts indicating normal and reverse position of points for specific routes must be prepared goomty wise. All such pull charts should be prepared at least 15 days in advance.
7. TI should be entrusted with the job of personally checking each and every pull chart. Compliance report must be submitted by TI at least 10 days in advance.
8. These pull charts must be printed, laminated and displayed in goomtias as also given to each staff concerned.
9. Draft instructions and pull sheets must be computerized and prepared in advance. Thereafter these should be revised on a day to day basis. Actual revision should take into account the progress of work as per the original time schedule.
10. A checklist of items to be inspected jointly by Traffic, Signal and Permanent Way Inspector should be drawn and controlling officers should monitor that instructions in the checklist are complied with.
11. The exact location on the stock rail where clamps are to be fixed must be marked with white paint and clamps should actually be fitted to check that there are no obstructions.
12. It may not be possible to fix clamps on motor operated points provided with second leading stretcher bar. In all such cases provision must be made for cotter bolting of points.

13. In any case, cotter bolting of points must always be preferred as compared to clamping and padlocking since it is a much faster method.

14. Normal/reverse position of points should be painted on tongue rail to indicate position of the road.

#### **14.15: Mock Drill and Staff Assurance :**

1. Before the SM/ASM/Cabinman/Pointsman and other staff connected with train passing work are allowed independent duty, the Station Superintendent shall obtain their verbal assurance that they have understood the same.

2. With regard to semi – literate and illiterate staff :

- (i) SS/TI should explain detailed working.
- (ii) Test their knowledge.
- (iii) Satisfy himself that they can work independently.

3. Before starting actual non-interlocked working, a “mock drill” or “hands-on” demonstration/training should be given to all staff for at least 1 day in advance to familiarize them thoroughly with the type of work they have to handle.

4. This should be carried out in all the 3 shifts to ascertain difficulties, if any, which may be encountered during NI working.

5. Teams already formed for different shifts should be deputed as per roster.

6. “Mock drills” should be carried out without actually disconnecting signal gears, points etc.

7. Whatever deficiencies are noticed during this period should be rectified before introduction of actual NI. This experience should also be used to accurately estimate capacity to be available during N.I. and the number of trains planned to handled should be accordingly revised.

8. Written assurances are required to be obtained before staff connected with train passing duties are allowed to work independently.

9. This written assurance should be taken from the staff only after :

- (i) They have participated in the “mock drill”.
- (ii) Worked independently as per their laid down roster.
- (iii) Successfully carried out all responsibilities entrusted to them during the “mock drill”.

10. No staff should be deployed unless proper entries are made in the “Assurance Register” and relevant signatures obtained.

#### **14.16: Dissemination of Information:**

1. All changes of post-NI should be clearly documented and explained at all Loco pilot/Guard lobbies of bases of whose staff pass through that yard.

2. For this purpose loco/traffic inspectors, senior subordinates should visit these lobbies, and apprise the running staff on changes.

3. Assurance of each and every running staff regarding these changes should be recorded in respective lobby assurance registers, and complete report submitted to Sr. DOM/Sr. DSO/Sr. DME/Sr. DEE.
4. Adjoining divisions/railways including notice stations and inter-change points should also be intimated of the detailed programme pertaining to NI working.
5. All control staff including CHC, Dy. CHC, Section controllers, Power controllers, TLCs, C&W control etc. should be appropriately briefed.
6. The section controllers working on control boards must be fully conversant with the proposed changes pre-NI, restricted movement during the course of NI working and post-NI facilities to be made available.
7. Adequate publicity must be given through newspaper advertisements, electronic media, announcements at stations etc. informing the public of the likely repercussions on train running.

**14.17: Telecommunication, Lighting and Medical :**

1. Absolutely foolproof arrangements must be made regarding communication between the station and two adjoining stations on either side so that under no circumstances should there be a situation of total failure of communication between these stations.
2. Satisfactory arrangements for telephonic communication between station (indoor), Cabins, Goomty and Level Crossings Gates should be made to ensure efficient functioning of telephones provided at various locations.
3. Additional fail safe communication between control office and the NI station must be provided as a backup to existing section control channels.
4. Arrangements for public address system should also be made so that the same can be used for warning the public etc.
5. Loud speakers must be provided on each goomty for making announcements regarding train movement.
6. Walkie – Talkie sets must be provided to all on duty Station Masters at goomtys and supervisors working at site.
7. Gangmen, Keymen and Patrolmen in 2 block sections on either side of the NI station must be provided with walkie – talkie sets, electronic hand signal lamps etc.
8. Arrangements of staff and recharging facilities should be available for charging of batteries of telecom equipment including walkie – talkies.
9. General lighting in yard should be adequate.
10. Separate lighting should be provided in each point zone. Lighting should be adequate so as to ensure that each point controlled from a goomty is clearly visible to the ASM/Cabinman in charge of that goomty.
11. Adequate generator backup should be provided. Spare bulbs should also be provided at each location.
12. Round-the-clock medical post with doctor and para-medical staff must be provided. They should be equipped for handling first aid and crush injuries. Anti-snake venom (Covalent) should be available. Road ambulance should be permanently stationed for quick transportation if needed.
13. Sufficient stock of ORS(Oral Rehydration Salt) should be procured to arrest dehydration of staff in sunny weather.

**14.18: Safety Equipment:**

1. Safety equipment required for each location such as goomty, cabin, level crossing gate etc. must be spelt out in detail and full complement arranged by executing agency.
2. Adequate spares must be arranged for safety equipment such as of hand signal flags, clamps, pad locks, torch light and walkie-talkie etc.
3. LED based flashing Hand Signal Lamp must be provided to each such location for better visibility.
4. Cotter bolts, cotter pins and clamps & padlocks must be thoroughly tested to be in proper working condition.
5. Spare numbered crank handles must be provided in goomtys where point machines are predominantly working.
6. Each goomty must be provided with the following safety equipment and should be kept in view while preparing estimate of works :
  - (i) Clamps, padlocks.
  - (ii) Flags, hand signal lamps etc.
  - (iii) Relevant pull sheets, yard diagrams etc. duly laminated.
  - (iv) Torches, emergency light, in addition to normal lighting, fan, cooler.
  - (v) Umbrellas, caps, raincoats as required.
  - (vi) Cotton Gloves for staff handling points etc.
  - (vii) Table, chairs in tent or covered area.
  - (viii) Containers and glasses for drinking water.
  - (ix) Thermos for tea/coffee and provision of snacks and meals for staff deployed from other station or /headquarters. This should be provided by agency executing works.
  - (x) Mosquito/insect repellent creams.
  - (xi) Magnetto, and VHF walkie talkies, Public Address Equipment.
  - (xii) Private number books, diary, paper, pens, caution order, T/369(3b), PLCT wherever necessary.

**14.19: Security Arrangements :**

1. Adequate RPF security staff round the clock must be arranged at following locations :
  - (i) ASM's office.
  - (ii) Central place at the station.
  - (iii) Level crossing gates.
  - (iv) Outer most goomtys on either end.

**14.20: Introduction of NI working :**

1. Before permitting introduction of NI working DRM/ADRM will satisfy himself regarding arrangement of staff, safety equipment, lighting, telecommunication and ground position.
2. After completion of Pre-NI works the concerned Dy.CSTE/Dy.CE/Dy.CEE will give in writing the readiness for commencement of NI. Basing on this, Officers from Operating, S&T, Engineering and Electrical department should visit and verify physically the progress of works and arrangements made for NI and report to DRM on the deficiency. Basing on the compliances on deficiency permission for commencement of NI working should be accorded.



3. On the notified day, for introduction of NI working, Signal Inspector concerned shall give a general disconnection memo for gears proposed for NI working.
4. Disconnection memo should be accepted from JE/SE(Signal) by SS/TI. However, permission of disconnection should be accorded only after getting control orders after due consultation with Sr.DOM.
5. Efforts should be made that there is no train in the block section. If the density is more, NI work should be introduced only after clearance of coaching train, if any in the block section.

**14.21: Train Operation During NI Period :****Working of Signals :**

1. Speed restriction of 15 kmph. must be in force over all points and crossings. Speed restriction Board of 15 kmph. must be exhibited at the foot of the first stop signal.
2. The following signals should be provided with caution aspect :
  - (i) In case of colour light signals, a common NI home signal without route indicator.
  - (ii) In case of MLQ/TALQ, single arm NI home signal.
  - (iii) Warner signals, if any are to be put out of commission by putting 2 cross bars.
3. NI Home/Starter signal can be taken off only after ensuring that :
  - (i) All points on the route are correctly set, both facing and trailing points clamped and padlocked.
  - (ii) In addition to correct setting, clamping and padlocking of facing points, they must also be manned.
  - (iii) Level crossing gates on the route have been closed against road traffic.
4. Last stop signal should not be disconnected throughout NI working except at the fag end of commissioning.
5. Movement of trains to and from the block sections should be controlled by taking off the last stop signal.
6. Normally, no Paper Line Clear or T/369(3b) should be issued to the loco pilots as authority to proceed in the block section.
7. If required, a traffic block of 2 – 3 hrs. should be taken for disconnecting the last stop signal and block instrument and reconnecting the new last stop signal and new block instrument.

**14.22: Train Running :**

1. Each train movement must be announced well in advance on the loudspeaker:
  - (i) Along with the number of the goomty involved.
  - (ii) Sequence of points required to be set and locked in normal or reverse condition.
2. Trains must be allowed to enter cautiously at 15 kmph.
3. Loco pilot of an incoming train must not under any circumstances pass the outermost facing points even though signals have been taken off:
  - (i) Unless he also sees that the points are manned.
  - (ii) A proceed hand signal is exhibited towards him from the points.

**14.23: Failures :**

1. All indicative accidents during the period of NI working must be immediately reported to the site in charge in order to ensure prompt corrective action and avoidance in future.
2. Details regarding such cases must be promptly intimated to DRM and Sr. DSO.

3. A register must be opened at each goomty in which before handing over charge, staff will enter details of whatever difficulties they have faced during their shift. The person in charge of NI working at that station must scrutinize this register daily.
4. Cases of bursting of NI target should be appropriately dealt with and individual responsibility should be fixed up.

#### **14.24: Revised Station Working Rules :**

1. After completion of NI working, new works are to be commissioned.
2. Since the yard layout, facilities etc. have changed, the previous SWR is no longer valid.
3. A new SWR duly approved by CRS is to be brought into effect after completion of NI.
4. Staff assurances for the revised SWR must be taken afresh.

#### **14.25: Completion of NI Working:**

1. NI working must not be terminated unless and until each and every item originally scheduled for completion has been successfully complied verify the following:
  - (i) Completion of work as per program.
  - (ii) Correspondence of yard layout as per SWR.
  - (iii) Correspondence of movements permitted as per SWR.
3. The installation shall jointly be tested by Traffic, S&T and Engg. officials and for their correct functioning.
  - (i) The lever/knobs, signals, points and connections work freely and properly and that the installation fulfils its objective.
  - (ii) Signals are properly focussed, the indications on the panel correspond with the signal aspect and point position at site.
  - iii) Engineering officials shall check the proper housing of points gauge level etc.
4. Before issue of Safety certificate and taking over of stations, the Transportation/Safety Officer shall instruct the station staff responsible or working the interlocking installation and test them in their knowledge of the signalling arrangement.
5. Engineering and S&T officers shall give a certificate stating that all works as per the approved plan are completed.
6. Staff concerned shall be notified through Station Order Book, Control Order Book and their acknowledgement obtained. All inspectors and other supervisors shall ensure strict compliance and report any deviation or violation with prompt to notify then and there.
7. On the day of completion of work, branch officers concerned shall visit the work site to ensure completion of work as per programme.

#### **14.26: Handing over of the Relay Room Key after commissioning of Panel Interlocking / Route Relay /Electronic Interlocking works at station:**

1. After completion of the NI working and issuance of safety certificate, station shall be treated as commissioned only after the SM has received the relay room key in duplicate from SSE (Signal)/Const. Before resuming normal working, SM on duty should ensure the double locking of relay room personally.

2. SM key of the relay room must be handed over in duplicate to the on duty SM under necessary entry in the relay room register, which should be witnessed by the SS I/C of the station and SSE/SE (Signal) I/C of the station. This shall be primary responsibility of the open line signal supervisor, to take over the responsibility of the relay room as soon as the station is commissioned.
3. Similarly, handing over of S&T key in duplicate to the Signal Technician of the station shall also be witnessed by SSE/SE(Signal) I/C of the station. While handing over the key to Signal Technician, handing over of a set of hand corrected “as wired” diagram and OEM’s technical manual on the systems and sub-systems installed at that station shall also be ensured by construction department. Detailed customised documents and spares may be handed over subsequently under MOU for handing over of the station.
4. Any leftover residual work or release of old equipments or attention to failures may be attended by construction staff or contractual agency, in presence of Technician or JE/SE/SSE(Sig) of the station after making necessary entry and signatures in the relay room registers. Nature of the work carried out need to be indicated in the relay room register. If any work requires disconnection or reconnection memo, it should be issued by competent signal staff.

**14.27: Post NI Analysis:**

1. Within 7 days of completion of NI, a brain storming session should be held with all the senior supervisors involved for taking stock of lessons learnt.
2. These lessons learnt should be compiled at one place for successive NIs, so that they are available for future reference.
3. A copy of the same may also be sent to other divisions for reference purpose.

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## CHAPTER-15

# OPERATING STATISTICS

### 15.01: Definition:

Statistics is a science which deals with the collection, presentation, analysis and interpretation of quantitative information. Statistics is an important managerial tool in a vast organization like Indian Railways with huge capital investment which cannot be over emphasized. Railway Managers must therefore be fully conversant with this valuable tool so as to work more effectively to fulfill the objectives of the organization. Proper and correct interpretation of statistics will not only help to pinpoint areas of weaknesses but also to avoid unnecessary scare in respect of really insignificant events. Statistics is essential for planning, prioritizing and exceeding activities connected with operation. All monthly and annual statistical statements are to be generated on line.

### 15.02: Railway Statistics :

The railway statistics are based on four factors: Quantity, Distance, Duration and Service. In Railway environment these relate to –

(a) **Primary Units:** These are basic units to measure time, distance, weight, etc.

- (i) Quantity - Expressed as tonnes and number of passenger carried and earnings derived.
- (ii) Distance - Expressed in kilometres.
- (iii) Duration - Expressed in minutes, hours & days
- (iv) Service performed - Expressed in terms of trains, vehicles, wagons, Engines.

(b) **Fundamental Units:** Multiplication of two related primary units gives rise to a Fundamental Unit. It gives quantum of input or output. These units express relationship between primary units and expressed in composite terms is called as 'Fundamental units', viz.

- (i) Tonne-kms.
- (ii) Passenger - kilometres.
- (iii) Train-kilometres,
- (iv) Wagon-kilometres,
- (v) Engine - hours.
- (vi) Wagon - days etc.

(c) **Derived Units:** A derived unit is a ratio between two primary or a primary and fundamental or between two fundamental units. This gives an indication regarding the efficiency of utilization of resources. These 'Derived Units' highlight special features of transportation output and are useful in evolving suitable management strategies. Eg.,

- (i) Passenger earning (Primary) divided by Passenger carried (Primary)= Earning per passenger
- (ii) Passenger earning (Primary) divided by Passenger kilometres (fundamental) = Earning per passenger kilometre.

- (iii) Passenger kilometer (fundamental) divided by Number of passenger (Primary) = Average distance travelled by a passenger (Lead of passenger traffic).
- (iv) Wagon kilometres (fundamental) divided by Wagon days (fundamental) = Wagon kilometres per wagon day.

**15.03: Classification of Railway Statistics :** The principal heads under which the railway statistics is generally grouped are indicated below:

- a) Economic and Financial Statistics:** Under this head, detailed statistics relating to the advance statement of gross earning and traffic handled are to be included i.e. the number of passenger booked and tonnage lifted and wagons loaded for current information and the statistics of revenue and expenditure as booked in monthly and yearly accounts.
- b) Operating Statistics:** Operating statistics are broadly divided into (i) Traffic (ii) Power. (iii) Rolling Stock.
  - (i) Traffic Statistics :** The traffic statistics include statistics of wagons loaded, wagon mobility, wagon usage, train loads, train mobility, productive and unproductive services, wagon detention, marshalling yard, terminal goods station and punctuality
  - (ii) Power Statistics :** The power statistics include engine usage, fuel and energy consumption, and engine failure statistics etc.
  - (iii) Rolling Stock Statistics :** Rolling stock statistics include Rolling stock holding, availability, repairs, maintenance percentage
- c) Rolling Stock and Workshop Repair Statistics:** Under this head, grouped statistics dealing with POH of coaches, wagons, locomotives and other information relating to workshop activity are included.
- d) Commercial Statistics:** Coaching and freight revenue and volumes and earnings by class of passengers, for different commodities, claims paid for compensation of goods and parcels lost or damaged.
- e) Administrative Statistics:** These statistics relate to the staff matters, numbers by categories and classes of staff, cost of pay by class and category.
- (f) Engineering Statistics:** Engineering statistics give details of track and bridges requiring attention - ultra sonic tests done or overdue, track renewals, distress bridges, gradients, curvature of P.way etc..
- (g) Medical Statistics :** Medical statistics relate to sickness of staff etc.
- (h) Other Statistics:** Number of stations by Class, halt stations, Standard of interlocking.

#### **15.04: Compilation of Railway Statistics:**

- (a)** Compilation of statistics of Indian Railways falls broadly under two categories, namely –
  - (i)** the statistics required to be compiled by the Railways for submission to the Railway Board in order to keep the Board informed about the different activities, progress, etc., on the Indian Railways and
  - (ii)** Further detailed Railway statistics which individual Railways may undertake for their own respective domestic requirements.

(b) The statistical compilation work on the zonal Railways is in the charge of a Statistical Officer working under Finance deptt. The format and the methods of compilation of the monthly Statistical statements and the Annual Statistics required to be submitted to the Board are detailed in the Manual of Statistical Instructions, Volumes I and II respectively.

#### 15.05: Operating Statistics:

Operating Statistics for the Indian Railways are issued in the form of various pamphlets published periodically by the Railway Board. Detailed Statistics relating to each division and gauge are contained in various parts of the 'Domestic' statistics issued yearly. (Part- I, II A and II-B&C).

#### Common Terms Used in Operating Statistics:

(a) **Route Kilometre** : Distance of each gauge owned by a railway including its worked lines, treated as single line. Kilometres of double, triple, etc, tracks crossings at stations and sidings as also the track from the centre of terminal station to the end of the mainline buffer stop are to be excluded. If any section of the line is worked entirely by another railway or by electric power, or is opened for goods traffic, but not for passenger traffic or vice versa the kilometreage of that section is included.

(b) **Running TrackKilometres** : In addition to the route kilometreage, the extra distance of multiple tracks i.e., double, triple, etc., tracks shall be treated as two or three or more tracks but shall exclude the tracks in sidings, yard and crossings at stations.

(c) **Track kilometres** : Distance of each gauge owned by a railway including its worked lines treated as single line and extra distance due to double, triple, etc., tracks, as also the length of sidings, crossings at stations, etc.

(d) **Mean Route Kilometre**: The length of railway calculated according to the definition of route kilometreage allowing for changes in the kilometerage during the period covered. Thus, the mean kilometerage worked during the year, which has had an addition/closing during the year will be as follows :

Route kilometreage at commencement of a year plus/minus number of days the new section/closed section was in use during the year multiplied by the length of the new section/section closed divided by the number of days in a year.

#### 15.06: Passenger Train Performance:

##### (a) Passenger Train Punctuality :

Punctuality is the main criterion for judging passenger train performance. Some of the statistics compiled separately for 'Mail/Express trains', 'Other Passenger Trains', and 'Mixed' trains are:

$$\text{Punctuality} = \frac{\text{RT} + \text{NLT}}{\text{Total no. of Mail/Express trains}} \times 100$$

RT = Trains arriving Destination at Right Time

NLT = Trains not loosing time in a railway for inter-railway trains.

**(b) Vehicle kilometres per Vehicles Day:**

Vehicle kilometer per vehicle day is calculated by dividing the coaching vehicles kilometres by the vehicles days. Vehicle days is the product of average number of coaching vehicles on line/in use and the number of days in the period under reference. This derivative unit is worked out on allotment basis.

This figure indicates the extent to which coaching vehicles are kept 'on the move'. Since train composition is not susceptible to change, it is only by increasing the speeds of trains and tightening up rake links, an improved performance can be achieved. This can be represented as –

$$\text{Vehicle km. Per Vehicle day} = \frac{\text{Coaching Vehicle Km}}{\text{Vehicle day}}$$

The main factors affecting its value are :

- (i) The average speed of trains
- (ii) The average length of train run (average load)
- (iii) The idle periods provided in rake links.

**(c) Average Speed of Passenger Trains:**

This figure represents the average speed shown in the Time Table of passenger trains. The higher this figure, the better the service to the passengers.

$$\text{Average Speed of a train} = \frac{\text{Total distance travelled by the train}}{\text{Total time taken to cover the distance including enroute detention.}}$$

**(d) Shunting Kilometres per 100 Train Kilometres (Passenger including proportion of Mixed):**

This figure indicates the amount of unproductive service that has to be performed per 100 train kilometres (Passenger including proportion of mixed). Since the amount of shunting to be done on a passenger train depends upon various local factors, the figure will vary from Division to Division and from Railway to Railway. This is an indicative of wasteful shunting. The figure is arrived at by multiplying by 100 the quotient of shunting kilometres divided by train kilometres (passenger including proportion of mixed).

$$\text{Shunting Kilometres per 100 Train Kilometres} = \frac{\text{Shunting Kms} \times 100}{\text{Train kms.}}$$

**15.07: Wagon Usage:****(a) Average Starting Wagon Load :**

This figure is compiled separately for coal and coke, heavy merchandise and light-merchandise, thus affording an indication of the extent to which wagon space is utilised by stations from which traffic originates. It is extremely important that wagons be given as full a load as possible because this means economy, in wagon usage and hence engine power and less strain on line and yard capacity. Even a slight improvement in the starting wagon load can mean a tremendous saving to the Railway.

The result is calculated by dividing the number of tonnes loaded by the number of wagons loaded (in terms of 8 wheelers). However, wagons used for live stock and departmental purposes are excluded.

$$\text{Average Starting Wagon Load} = \frac{\text{Tonnes Loaded}}{\text{No. of Wagons Loaded}}$$



**(b) Wagon Kilometres per Wagon Day:**

This figure is a measure of wagon mobility and indicates the average number of kilometres moved by a wagon, on the average, per day, both loaded and empty journeys being included. Delays in marshalling yards, delays at stations when loading or unloading, delays in clearance from roadside stations, decrease in average speed of goods trains, increase in the number of wagons awaiting repairs, and shorter loads of trains are some of the factors normally responsible for poor mobility.

This result is obtained by dividing wagon kilometres by wagon days which is the product of daily average number of wagons on line and number of days in period.

$$\text{Wagon Km. Per Wagon day} = \frac{\text{Wagon Kms.}}{\text{Wagon Days}}$$

**(c) Net Tonne Kilometres per Wagon Day :**

This unit is a measure of the revenue earning work done by the wagons and reflects both mobility and loading. A decrease in this figure may be due inter alia to any of the causes which affect the figure of wagon kilometres per wagon day. The proportion of loaded to total wagon kilometerage, the average loaded wagon and the relative amount of heavy and light merchandise carried, are some of the other factors which may affect this figure.

Net Tonne Km. Per Wagon Day can be obtained by dividing the net tone kilometers (excluding departmental) by the wagon days.

$$\text{Net Tonne km. Per wagon day} = \frac{\text{Net Tonne kms.}}{\text{Wagon days}}$$

**(d) Wagon Turn Round :**

This figure expresses the ratio between the total number of serviceable wagons on a Railway and the number of wagons required daily for effective use on the railway for its outward, inward and transshipment traffic. It can be stated in a different way i.e., wagon turn round represents the average period of time in which a particular wagon completes its average loaded trip and after which it again becomes available for loading. The time interval (in days) between two successive loadings calculated from the time a wagon is placed for loading till the time it again becomes available for reloading is the actual turn round.

$$T = \frac{B}{L+R}$$

Where T = Wagon Turn Round in days

B = Number of effective wagons holding

L = Average Daily loading in wagons

R = Average daily loaded wagons received

**Note :** Effective wagon balance 'B' does not include wagons marked sick, used for departmental and coaching purposes.

**Measures for improving Wagon Turn Round :**

- (i) Reducing Average lead of traffic : As railway operation is more economical for longer leads it is not desirable to think of reducing average lead of traffic though longer lead may result in increasing in turn round of wagons.
- (ii) Increasing average speed of goods train.
- (iii) Increasing distance between consecutive yards: This may not be always possible but forming block loads by-passing intermediate yards will have the same effect and will reduce overall WTR. This is already being achieved by running more and more traffic in train loads.
- (iv) Reducing average detention to wagon in yards : As has been described earlier, a wagon spends considerable time in yards and as such WTR can be appreciably improved by cutting down detention in yards.
- (v) Reducing time taken in terminal handlings and clearance : More than 1/4<sup>th</sup> of the time of wagons is spent in this. Follow up with traders for expeditious release of wagons, timely placements and removals, regular and punctual running of pilots and shunting, goods trains will go a long way to reduce detentions under this account.

**(e) Average Wagon Load during the Run :**

This unit is a good index of wagon utilisation as it refers to the average load of all loaded wagons carried. It suffers from the drawback that it does not directly reflect the performance of the division, gauge or railway to which it applies, as only a proportion of the loaded wagons carried is loaded locally and the balance consists of both received traffic and cross traffic.

For obtaining this figure net tonne kilometres are divided by loaded wagon kilometers. While deriving, the figures relate to departmental trains are excluded.

$$\text{Average Wagon Load during the run} = \frac{\text{Net Tonnes Kms.}}{\text{Loaded Wagon kms.}}$$

**15.08: Goods Train Performance:****(a) Average Speed of Goods Trains :**

This result is calculated separately for 'through goods trains' and all goods trains and is arrived at by dividing the total train kilometres by total train engine hours of the concerned service. Detentions to goods trains at roadside stations enter into the calculations and have therefore the effect of bringing down average speeds.

$$\text{Average Speed of Goods Trains} = \frac{\text{Train kms.}}{\text{Train Engine hours including enroute shunting engine hours by train engine.}}$$

**Factors affecting the average speed of goods trains:**

- (i) The proportion of the density of trains to the sectional capacity. The nearer a section is worked to its sectional capacity, the proper the speeds obtained.
- (ii) Hauling power of the engines used, standard of maintenance of engines and time taken by loco pilots for loco requirements.

- (iii) Loads of trains.
- (iv) Condition of rolling stock, particularly the brake power available.
- (v) Standards and maintenance of signalling and interlocking.
- (vi) Facilities at roadside stations to complete shunting in the minimum time and shorter block sections which will increase the sectional capacity.
- (vii) Engineering restrictions - permanent and temporary, gradients and curves.

**(b) Average Net Train Loads (in tonnes):**

This figure refers to the average freight load carried in tonnes, i.e., to that portion of load which earns revenue for the railway.

$$\text{Average Net Train Loads} = \frac{\text{Net Tonne kms.}}{\text{Train kms.}}$$

**(c) Average Gross Train Loads (in tonnes):**

This figure represents the average overall load of goods trains i.e. the freight load plus the weight of the rolling stock.

$$\text{Average Gross Train Loads} = \frac{\text{Gross Tonne kms.}}{\text{Train kms.}}$$

**The principal factors affecting this figure are:**

- (i) The tractive capacity of engines on goods train services.
- (ii) The gradients on various sections of the line.
- (iii) The nature of goods carried.

**(d) Shunting Engine Kilometres per 100 Train Kilometres :**

This figure indicates the amount of non-revenue earning work done per 100 train kilometres (Goods and proportion of mixed). Its value is affected mainly by the load of goods trains and the amount of terminal work involved. However, for the same division or/railway, the pattern of traffic remaining the same, rise in this figure is indicative of wasteful shunting.

$$\text{Shunting Engine kms. per 100 Train kms.} = \frac{\text{Shunting kms.} \times 100}{\text{Train kms.}}$$

**(e) Net Tonne Kilometres per Engine Hour:**

The figure of net tonne kilometres per Engine hour is a very useful index of the efficiency of freight working on a division. Net tonne kilometres indicate the amount of revenue earning work done while engine hour measure the cost of doing it.

$$\text{Net Tonne Kilometers per Engine Hours} = \frac{\text{Net Tonne kms.}}{\text{Engine hours}}$$

**A decrease in net tonne Kilometres per engine hour may be due to factors such as:**

- (i) Shunting engine hours not being cut down in proportion to the decrease in traffic offering.
- (ii) Increase in departmental, assistance required, assisting not required and light engine running.
- (iii) Decreasing in the average train load and or the average speed of goods train.

- (iv) Decrease in the average starting wagon load or in the wagon loads of wagons received from other divisions.
- (v) Increase in the proportion of unbalanced traffic.
- (vi) The type of traffic carried heavy or light.

### 15.09 Marshalling Yard Statistics :

#### (a) Average Detention per Wagon :

It is calculated in two ways. (1) All wagons (2) Through loaded wagons. Detention suffered by stock in a yard depends, inter alia, on the layout of the yard and on the number of trains per day that can be despatched in various directions. Target figures have been laid down for each yard for detentions to all wagons and through loaded wagons. Such targets take into consideration the condition of work and facilities available in the yard concerned. Detentions in excess of this figure indicate inefficient yard work. Lesser detentions mean lesser cost of handling wagons in yards. The number and detention of Brakevans will be excluded for the purpose of this item.

$$\text{Average Detention per Wagon} = \frac{\text{Total Detention Hours}}{\text{No. of Wagons despatched}}$$

#### (b) Number of Wagons Dealt with per Shunting Engine Hour:

The number of wagons that a given yard can deal with per shunting hour depends, inter alia, on its lay-out. Accordingly, a target figure has been prescribed for each yard to enable the efficiency of yard work to be gauged. As shunting involves cost, the higher this result, greater the efficiency of the yard.

$$\text{No. of wagons dealt with per shunting engine hour} = \frac{\text{No. of Wagons dealt with}}{\text{Shunting Engine hours}}$$

### 15.10: Locomotive Performance:

#### (a) Engine Kilometres per Day per Engine in Use:

This figure is compiled separately for passenger, mixed and goods train services as well as for all services refers to 'engines in use'. This clause is applicable for steam locomotives. However, for Diesel and Electric locomotives, utilization is based on hourly position of locos followed for compilation of statistical statements. Locomotives in the sheds and sick lines are excluded while calculating these statistics. This is affected by such factors as:

- (i) The average run of trains.
- (ii) The average speed of trains.
- (iii) The engine links
- (iv) The location of engine shed with respects to the stations which they serve.

$$\text{Engine kms. per day per engine in use} = \frac{\text{Engine kms.}}{\text{Engine days in use}}$$

#### (b) Engine Kilometres per Day per Engine on Line :

This figure is also compiled by services and for all services put together. The proportion that this figure bears to the corresponding figure of 'engine kilometres per engine day per engine in use indicates the proportion of available engines 'on line' that were put to effective use during the period in question. The locos in the sheds and sick lines are included while calculating these statistics.

$$\text{Engine kms. per day per engine on line} = \frac{\text{Engine kms.}}{\text{Engine days on line}}$$

**(c) Quantity of Fuel Consumed per Engine Kilometre by Service :**

This figure indicates the fuel consumption in relation to engine kilometres only and does not reflect the tonnes hauled. This unit has limitations as it does not take into account of either the speed or load of the train. It is represented as under :

$$\text{Quantity of fuel consumed per engine km by service} = \frac{\text{Quantity of Fuel Consumed}}{\text{Engine kms.}}$$

**(d) Quantity of Fuel Consumed per 1000 Gross Tonne Kilometres by Services:**

This figure indicates the fuel consumption in relation to the work done and is, therefore, a better index of fuel consumption than the quantity of fuel consumed per engine kilometer figure though this unit does not take into account the effect of speed of the train on consumption. The main factor that influences this result is the gross load of the train. It is derived by the formula given below:

$$\text{Fuel Consumption per 1000 gross tonne Kms.} = \frac{\text{Quantity of Fuel Consumed} \times 1000}{\text{Gross Tonne kms.}}$$

**(e) Traction Energy consumption :** Traction energy consumed per engine km and per 1000 gross tonne kms is worked out exactly in the same way, replacing 1000 litres of diesel by kwhs.

**15.11: Financial Statistics :**

**(a) Operating ratio :** The ratio of total workings expense excluding suspense but including appropriation to Depreciation Reserve Fund and Pension Fund to Gross Earnings. Working expenses include, expenditure incurred in connection with Administration, Operation, Maintenance and repairs of line, opened for traffic. In other words, it represents the percentage of working expenses to total earnings.

$$\text{Operating Ratio} = \frac{\text{Working Expenses excluding suspense but including appropriation to DRF and PF}}{\text{Gross apportioned earnings}} \times 100$$

**15.12: Statistical Forms (Monthly Statistical Statements) :** Compiled by Zonal Railways for Railway Board.

Statement	1-A	:	Passenger Train Performance (Punctuality Statistics)
Statement	1-B	:	Passenger Train Performance
Statement	2	:	Goods Train Performance
Statement	3-A	:	Passenger and Goods Train Performance
Statement	3-B	:	Goods Train Performance
Statement	4-A	:	Rolling Stock Performance (Locomotive)
Statement	4-B	:	Rolling Stock Performance (C&W)
Statement	5-A	:	Fuel and power Statistics

Statement	5-B	:	Lubricating Oil Statistics
Statement	6-A	:	Passenger Revenue Statistics
Statement	6-B	:	Parcel Traffic Statistics
Statement	7-A	:	Goods Revenue Statistics (Advance Information)
Statement	7-B	:	Goods Revenue Statistics (On Originating basis)
Statement	7-C	:	Commodity Statistics
Statement	8	:	EMU,DMU,MEMU,DEMU Train performance
Statement	9(I&II)	:	Narrow gauge Govt, Railways train performance
Statement	10	:	Locomotive workshop repairs statistics.
Statement	11	:	Carriage and wagon workshop repair statistics.
Statement	12	:	Cost of Repair and maintenance of rolling stock.
Statement	14	:	Marshalling Yard statistics
Statement	15	:	Detention to wagons in goods terminal stations
Statement	16	:	Detention to wagons at Break-of-gauge Transshipment point.
Statement	18	:	Accident statistics
Statement	19	:	Supplementary information to statements 1B to 4B.
Statement	13	:	Claims Statistics
Statement	17	:	Detention to damaged wagons

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## CHAPTER-16

**FOIS, ICMS, COA AND CMS****(A) FREIGHT OPERATIONS INFORMATION SYSTEM (FOIS)****16.01: Introduction:**

In keeping with global trend, there has been a long outstanding demand of the industry & trade for transparency in sharing of information to give the customers an up-to date business like environment. Railways in this millennium have decided not only to perform the traditional tasks of carrying passengers and goods efficiently, but also to change the mindset of working as a closed system. The great concern to improve on its market share has prompted Railways to have a multi pronged approach to its freight policy.

Continuous Cargo Visibility has always been a critical component of the Supply Chain Distribution Management System.

To achieve this, out of the stated multi pronged new freight policy, a lot of emphasis has been laid on establishing a computerized FREIGHT OPERATIONS INFORMATION SYSTEMS (FOIS). The system indigenously developed is fully functional in the B.G. system of Indian Railways being the first of its kind in South East Asia.

**16.02: Freight Operations Information Systems Mission- FOIS:**

To give a total transparent system with continuous Cargo visibility and an up-to date business environment to the customers with instant access to information regarding their consignments in transit for just in time inventory’.

FOIS is an On-line Real-Time system based on absolute current State of Art Technology and efficient Communication system

A management tool to optimize utilization of costly assets and resources by improving the distribution of Rakes/Wagons & Locos, and also scheduling and Routing Traffic in an optimized cost effective manner.

Provides Continuous Cargo Visibility and enables the Freight customers to have instant access to information regarding the current status of their consignments in transit for just in time inventory.

**16.03: Strategic Advantages Derived From the FOIS System:**

- Extension of the current business practice from bulk movement of freight traffic in train load formations to *piecemeal traffic* by clubbing and moving together similar type of stock in ‘Hub & Spoke’ arrangement to increase its market share by re diverting high profit yielding piecemeal cargo from road to rail.
- Global tracking of consignments in real time Rakes or individual wagons.
- The insight and pipeline of consignments thus captured on the entire BG network is made available for timely planning and just in time inventory management on a time span cargo movement which may extend to 2 to 5 days from origin to destination.
- Facilitate acceptance (customer’s Orders), billing and cash accountal of freight traffic from identified nodal customer centers which may not necessarily be the handling terminals.
- Extension of such facilities to customer’s premises and introduction of e-commerce, benefitting both IR and the trade & industry, by eliminating manual transactions which necessarily add to the burden of logistics management.



- Providing requisite Foundation for a total logistics system furnishing real time information of the chain of physical distribution, an essential element in reducing inventory costs.

#### **16.04: Scope Of FOIS Systems:**

Presently two subsystems of FOIS are already in use after extensive field trials and validation, RMS and TMS.

##### **a) Rake Management Systems (RMS)**

- Rake based consignment tracking and pipeline.
- Train/Rake operation.
- Stock Holding in terms of summary of wagon types.
- Train and stock Interchange.
- Terminal Handling performance.
- Loco holding, outage and power on-line.
- Reporting to take care of Train/Load on summary basis.
- Invoice based consignment tracking.
- Wagon wise Stock Holding.
- Reporting of consist Wagon wise.
- Invoice based loading originating tonnage and revenues.
- Wagon wise Interchange.
- Statement of missing Wagons/wrongly delivered.

##### **b) Terminal Management Systems (TMS)**

- Computerized booking and delivery of consignment.
- Station Accounting.
- RR generation/Transmission.
- Improved Customer Interface.
- E-Payment of Freight.

At present 100% RRs are generated in TMS. Around 80% of freight is collected through e-payment. Nodal concept has been introduced to cover those terminals where loading/unloading is rarely done. The reporting of these non-device locations are done through a convenient nearby TMS location.

At present a freight calculator has been provided in the CRIS webpage [www.fois.indianrail.gov.in](http://www.fois.indianrail.gov.in). The expected freight can be ascertained through it. Certain basic data like originating station, destination, wagon type, and commodity is required to be given & system will calculate the details of freight indicating different charges applicable, including service tax.

Crew Management System (CMS) has been developed and has been implemented. Control charting of train (Control Office Application) has been integrated with FOIS.

The above two sub systems have been fully developed and tested.

**16.05: FOIS Design Architecture:**

FOIS is designed and developed in conformity with the state of art technology which is scalable, maintainable, with open systems architecture and is based on the Indian Railways organizational hierarchy, its present and future requirements. Based on the business processes that are being adopted, the business model developed in the FOIS - IT architecture is based on the assumptions: -

The current business practice of bulk movement in rake formation is the accepted norm for future also. Around 80 to 85% of traffic already moves in Rake, majority of which comprises similar type of rolling stock.

Global perception is more important, with respect to tracking of consignment and Rakes rather than of individual wagon, locomotive and train. The insight and pipeline of consignment and rakes should be seamlessly available. Railways would like to share information on booking and movement of consignments with individual customers also.

The operations and data capturing, will remain control centric for train, rake locomotive and stock management and terminal centric for booking, loading, unloading, and delivery. Taking into account the spatial distribution of activities, which need to be captured.

Integrity of Operation and Commercial data is an absolute necessity. RMS and TMS application are conceptualized, to provide the integration with the other subsystems as and when these are developed.

FOIS ultimately expects an event driven integrated reporting in real time, beginning with the tendering of Forwarding note to loading and generation of invoice, followed by load consists, train ordering and departure/arrival of load destination, unloading and delivery. The data thus captured is used for generating associated managerial reports of on-line information (MIS). The data will also be used for expanding the scope to cover other functional areas of the remaining modules and can easily integrate with RMS/TMS using appropriate middle ware Technology for sharing information locally. Therefore, a strategic approach has been adopted to computerize IR operations by implementing RMS/TMS systems in a phased manner using modular approach.

**16.06: FOIS System Architecture :**

Key components of the System Architecture.

Intelligent terminals will be placed at the field locations to capture the data from the place of activity namely control offices, yards, goods sheds, C & W depot, Loco sheds etc., and connected to the identified Application Server through reliable communication links for transaction processing.

Application servers are centrally placed at CRIS office. These servers are connected to the Zonal Hd. Qrs., Divisional Control Offices, yards, interchange points and goods sheds etc., with a reliable and integrated network. The servers are networked amongst themselves and to the central server for global level transactions.

The central Server provides management Reports at board level and acts as repository of all the global data and also provides global services to maintain referential integrity of the databases including master files.

**16.07: Network Topology :**

In view of the Centralized application architecture, a star based network topology has been designed. However, in order to provide alternate paths (to meet the up time requirement of 99.9%) from reporting locations, a mesh has been created within each zone so that every location has at least two paths to reach CRIS. Each zonal HQ has been connected to central location (CRIS) on high bandwidth pipes.

In addition to this, another zonal location has been connected to CRIS using high capacity link. Hence these two high bandwidth links shall cater to the entire transaction load generated by a zone. Railway telecommunication network, leased lines, DOT, VSAT Technology as communication media has been provided for reliable and fast means of data transfer.

#### **16.08: Phased Implementation - Approach:**

i) In case implementation is attempted for events of all the functions to be reported in real time, concurrently from day one, then the reporting sites to be readied, the associated communication requirements and the number of staff to be trained assume enormous proportions. To ensure that the implementation effort is within manageable limits, one way is to take up, one by one, only limited portions of geographical territory for computerization at any given time. On the other hand, if the territory is small, instances of repetitive data entry increase; resulting in redundant expenditure on reporting infrastructure that will have no use as the territory expands. At the same time, if the MIS requirements are to be met in totality, the territorial expansion must ensure that a function is implemented on end to end basis as quickly as possible, otherwise only a truncated picture will be available to various levels of users and the benefits of computerization remain postponed till the entire Indian Railways have been covered.

ii) The FOIS comprises several subsets of functions each meeting a distinct set of objectives. Certain FOIS subsets presuppose others to be operational before they can be implemented. Loco and wagon based functions presuppose load/train/rake functions to be operational. Goods shed functions expect wagon-based functions to be in place before they can be implemented. With these assumptions the FOIS / RMS systems have been designed in a modular structure which could be taken up for implementation in a phased manner.

For example:-

Phase I (PI module)

Provides facility for reporting load summary with only wagon type and number of units.

Phase II (PII module)

Provides facility for reporting the consists with details of wagon numbers.

Phase III (P3 module)

At present all loading terminals of ECoR are covered by TMS.

TMS provides facility for goods shed functions and generation of RR.

#### **16.09: Implementation Strategy:**

Realizing that functional phasing is the only way to keep the implementation effort within manageable limit and yet remain meaningful at every stage, FOIS software has been developed as above in three modules such that functions of global utility are implemented faster from fewer sites. It also takes into account that the beginning is made from the control offices where computer awareness is of a high order. The implementation can grow on need basis driven by the Railways themselves.

For timely completion of field implementation, the total involvement and commitment of Railways is very essential from day one. Therefore, COMs of Railways have been given the total responsibility and charge of implementation of FOIS, to provide for the following:-

- Railways to get staff identified and train them to work on PCs

- Railways to prepare the sites for installation of hardware including provision of electrical and civil facilities.
- Maintenance of channels & data com equipment has been given to CSR of the zones.
- CRIS would provide specifications for the same.

For facilitating this process the organization of CAO/FOIS has been strengthened and made responsible for coordination, implementation on All - India-basis.

The software implementation and maintenance shall remain the responsibility of CRIS. Pre implementation training of the required number of staff (consisting of Core Implementers and Telecom Inspectors from each of the divisions), in RMS - phase 1 has been completed by CRIS for all the zonal railways and their divisions. However, Railways will be required to make arrangements through the Zonal Training Schools to train the remaining staff of the concerned categories.

#### **16.10: Benefits:**

##### **i) Continuous Cargo Visibility**

- Rake based consignment tracking and pipeline
- Invoice based loading -Originating Tonnage & Revenue
- Information on trains on the run, the ETA at next point and the work to be performed.
- Vehicle guidance of all trains on run.
- Daily report describing the performance of all through trains operated in a controlled territory for the day.
- Actual/Estimated arrival and departure particulars for a particular train at any or all the reporting points
- Yard or on the run delay information.
- Train & stock Interchange
- Wagon wise Interchange

##### **ii) Optimised Asset Utilisation**

- Improved Locomotive Utilization by reduction in Light Engine running and reduced in effectives
- Statement of missing or wrongly delivered wagons and finally its elimination.
- Elimination of unconnected wagons
- Increased Availability of Repair Capacity
- Stock Holding
- Loco Holding

##### **iii) Increased Revenue**

Savings in wagon fleet would result in corresponding saving in the recurring cost of maintenance of wagons.

- Reduced Locomotive power and Rolling Stock Maintenance Cost
- Savings in Time & Cost of handling in yards, cost of empty haulage
- Ensures optimal crew management and monitors statutory limits for running duty and overtime payments
- Reduction in staff cost per unit of transportation due to improved productivity of the available manpower

**iv) Improved Productivity per/man Year**

Accuracy of reporting - The Head & Hand system of collecting data on telephones results in sizeable error levels, which need to be reconciled and corrected periodically .FOIS data with built in validation systems has Zero errors .

- Drudgery of manual processes like maintenance of registers etc.
- Particulars of crew on train with hours spent on duty.
- Re-deployment of major portion of staff involved in wagon tracing and accounts checking activities.
- Improved Customer service and satisfaction
- Facilitation of acceptance (customer's Orders), billing and cash accountal from identified nodal customer services centers and not necessarily at the handling terminals.
- E-Commerce will facilitate the customers to operate from their premises for the above requirements of billing and cash accountal and thus reduce the burden of logistics management, and in addition drastically bring down the inventory costs, in the entire chain of physical distribution system.
- Quick settlement of Claims
- Just in Time Inventory

**v) Goods shed Operations**

- Arrival particulars of Wagons
- Placement and Release Particulars
- Information on demands registered and pending indents
- Preparation of Railway Receipts
- Information on Demurrage and Wharfage
- Loading Particulars
- Goods Shed Earning
- Information on delayed wagons and Wagons awaiting Placement/Release

**vi) FNR No :**

At present 'FNR' no is printed on each RR generated through TMS. The customer can track & trace the status of the Rake by referring the 'FNR' no in the FNR enquiry option available in CRIS webpage at <http://www.fois.indianrail.gov.in/>. Similarly by sending the 11 digit FNR no through SMS to '57886' the position of the rake can be ascertained by the consignor/consignee.

**16.11: Application/Software:**

RMS module has been developed with GUI interface which is highly interactive, very user friendly. The software is totally menu driven and navigation is through logically linked tasks. The application and front end forms for reporting events has been developed in Visual Basic and resides in the client machine located at the reporting location. Data is stored in the central server located at CRIS.

**16.12: General Concepts:**

A Rake is a rather generalized term, which refers to any set of wagons moving together and has been identified in the system as rake. Wagons can be attached/detached to a Rake. A Rake is identified by

a uniquely defined ID number, which remains unchanged through various Load/Empty cycles & movements. A Rake, when given a destination, is known as a Load. A Load, when given a loco, is known as a Train. Thus, there can be no Train without a Load & no Load without a Rake (except where a load is mixed and is not identified in the system as a rake). With a clear understanding of these terms, you enter data through clearly defined “tasks”.

The RMS software has two identifiable cycles-

**a) Train cycle:** It starts the moment a load is identified as a train and the following tasks are used for online reporting: -

Train Ordering: TO/Call between two crew-changing points.

Train Departure: reports departure.

Train Arrival: Reports arrival.

Train Run-through: Reports through runs

Train rerouting

**b) Yard Cycle:** It starts as soon as a terminating load arrives at its destination or a train is cancelled, (i.e. the load is sent to load planning) and the following tasks are used for various online reporting:-

i) Load Related Tasks

Inward Number Taking: Destination validates consist.

Load Planning: Initial activity, following rake assignment.

Load Stabling: Run/ordering termination is reported through this.

Load Diversion/Termination/Extension: Reports changes in planned load destinations

Load Yarding: Takes a load-to-load planning screen, but will not reflect in stabled position.

ii) Vehicle Guidance Related Tasks

Consist Reporting: originating station reports summary details. (Guidance is also called as Consist).

iii) Rake Related Tasks

Rake Formation Details: form/modify rake consist.

Movement order: facility to give advance assignments to rake

Rake Placement/Release: reporting Load/Empty cycle.

Rake Dissipation: for generating piecemeal out of rake or for doing away with a rake which has no wagons left. After a load is made ready, loco attached and train ordered Again the train cycle begins.

iv) Loco Related Tasks (Attachment/Detachment of Locos).

Loco Reporting: reporting shed activities of loco.

Light Engine: reports light engine movements

Given above is the list of tasks that are to be performed on real-time basis i.e. as soon as the event takes place.

**c) Demand:-** This function is to be reported at station where the party/consignor registers his Demand for supply of Rake/Piecemeal wagon for loading of goods. The following tasks are used for reporting this activity:-

New demand  
 Modify demand  
 Add/delete demand  
 Fulfilling demand  
 Forfeiture / Withdrawal of demand

### **16.13: Interchange Forecast:**

In the system as the trains are planned, a pipeline is generated from Originating Station to destination and the position can be viewed at any point in its route. Forecast can be reported by selecting trains from the pipeline shown at the interchange point. The task used is interchange forecast reporting task.

Given below is a summarized list of entity related tasks :-

#### **i) Rake Related Tasks**

Rake Formation Details: form/modify rake consist.  
 Movement order: facility to give advance assignments to rake  
 Rake Placement/Release: reporting Load/Empty cycle.  
 Rake Merging: moving wagons from one to another rake.  
 Rake Dissipation: for generating piecemeal out of rake or for doing away with a rake which has no wagons left.

#### **ii) Load Related Tasks**

Load Planning: initial activity, following rake assignment.  
 Load Stabling: run/ordering termination is reported through this.  
 Inward Number Taking: destination validates consist.  
 Load Diversion/Termination/Extension: reports changes in planned load destinations  
 Load Yarding: similar to stabling, but will not reflect in stabled position.  
 Cut-in by Arrival/Departure: was useful when there were non-computerized territories also.

#### **iii) Train Related Tasks**

Train Ordering: TO/Call between two crew-changing points.  
 Train Departure: reports departure.  
 Train Arrival: reports arrival.  
 Train Run-through: reports through runs.

#### **iv) Loco Related Tasks**

Attachment/Detachment of Loco: reporting loco failure on run.  
 Loco Reporting: reporting shed activities of loco.  
 Light Engine: reports light engine movements.  
 Roadside/Piecemeal Wagons Related Tasks  
 Attachment/Detachment of Wagons en route: load & consist are automatically modified in this task.  
 Piecemeal Placement/Release: reports piecemeal activities.



Piecemeal Sick/Fit Reporting: reports sick/fit.

Clearance of Detached Wagons: clears detached wagons.

- v) **Demand:** reports indents for a good shed type of loading.

Vehicle Guidance Related Tasks

Consist Reporting: originating station reports summary details. (Guidance is also called as Consist)

- vi) **Detentions Related Tasks**

Train Detention en route: reports unscheduled stoppages.

Pre departure Detentions: reports detentions suffered by loads/trains at yards/stations.

- vii) **Other Tasks**

Interchange Forecast: reports daily targets, which should be frozen by noon.

BPC & Crew Details: reports these details.

Modify ETA: changes ETA for a train.

Re-routing: changes path of a train while on run.

As you realize, these are all routine tasks. Besides this the divisions have to carry out some systemic tasks which help in generating MIS reports (name for reports which are not generated on online data) and some time specific reports.

#### **16.14: Terminal Sub-Systems(TSS):**

TSS (Terminal Sub-Systems) is a generic word used in FOIS to refer to PCs, Printers & UPS. This PC is used for entering (and retrieving) data. Following are the important guidelines for users.

##### **i) Power Connection:**

Please make sure that a data entry PC or a “Reporting Terminal” is always kept in the “ON” condition. The power feed required is met through a 5A dedicated socket. Please make sure that all the different PCs & Printers have a separate 5A socket. Don’t use multi-plug adapters.

Also check up with the Electrical personnel as to whether your sockets have Earthing arrangement. In absence of the same, your PC may get damaged. The earthing to neutral voltage must not be more than 2-3V.

It is also better to have a MCB attached to main power supply point/board. Your AC connection & PC supply must be on different phases. This saves from fluctuations. Your PC is not connected to the mains directly. Instead, the Power supply is routed through a UPS (Uninterrupted Power Supply). Please ensure that this is always done. This saves your PC from power fluctuations as well as gives a power from batteries for about 20 minutes, in case of power failure. There should be a power back up, either through AT (OHE) or through Diesel Generator. The change over switch should be close to you.(care to be taken that earthing is proper). It is a healthy practice to ensure that various power chords feeding your PC, Printer etc are neatly tied together, rather than strewn all over.

If you locate your UPS very close to your monitor, the display will wobble. Please ensure that UPS & Monitor are separated by at least 24 inches. When the PC is ON, don't try to change any connection. This applies equally to not only power connectors, but also to various chords connecting different equipments, LAN Cables etc.

When turning the PC ON, (if need arises) follow this sequence Mains -> UPS -> Monitor -> Printer -> CPU. The reverse is followed when switching off.

## ii) **Environment:**

If an AC is provided, make sure that it is working properly. AC should be on a phase different from the one feeding your PC. The room should be kept as clean as possible. Dust, smoke particles & moisture cause maximum damage to your PC. So, don't allow any smoking, eating or drinking at the workstation. Never clean your PC using an organic solvent (such as Colin). Always use a soft, damp, dirt-free cloth. When the PC is not in use, keep it covered with "Dust Covers". Make sure that the Keyboard has been supplied with a "Skin" - a tight-fitting plastic covering for Keyboard, which does not stop usage. Your PC should not face direct sunlight. Nor should it be placed so close to window where rains can affect it. CPU (Central Processing Unit) & Monitor should not be placed in such a way that the fans/outlets at the rear of these equipment get blocked by walls/other objects.

## iii) **Virus Protection:**

Viruses come to you PC through pirated software of games & utilities that you load. Yet another source is downloading of files from Internet. Once a virus is on a single PC of a network, it spreads on its own to the entire network. Therefore, you must not load pirated software or download wallpapers etc from Internet. Make sure that Virus protection files are loaded on your PC. Please enable virus scans on data transfers, floppy drive files & CD files. Please schedule your Virus software to run every day at a fixed time. To do this, open "My Computer". Double Click on "Scheduled Tasks" Folder. Double Click on "Add Scheduled Task". This will activate "Schedule Task Wizard". Click next & select the name of the Anti-Virus program given to you.

Keep following the simple steps to schedule your Anti-Virus to run daily. Once scheduling is done, your PC will automatically run the program everyday at a given time, as specified by you. There is an arrangement whereby we get updated Anti-Virus files every 3 months. These CDs are available at your Divisional HQ through OCC. You must update your anti-virus programs to enable it to take care of new viruses. There are tell tale signs of virus on your PC. Please be on lookout for these signs, which are listed below:

- Unexplained disk drive activity light or floppy drive light
- Reduction in RAM Availability
- "File Copied" message appears without copying anything
- Failure of a memory resident program to operate properly
- System behaves slowly or in a chaotic manner
- Bad clusters on the disk
- Increased number of files on disk
- Increase in size of executable programs
- Change in file's date and time, without modification

- Program running slower; taking more time
- Program/Data file corruption/disappearance

**iv) Internet Connections :**

There should be no Internet connection on your PC. This restriction is applicable to everything related with Internet - email, chat, surfing etc.

Further, your PC should not have access to another network - such as Railnet. This makes the network prone to hackers & Viruses. Since the information available on FOIS is confidential, therefore hackers have to be prevented from entering our network. This is the reason for having separate LAN and Routers for FOIS.

**v) Important Files (Software):**

You work with Windows XP. A quick restore CD is also available with you, along with Anti-Virus software & current version of TMS & RMS. Also windows back up files are normally available in the cab folder. Please ensure that none of the following files are tampered.

COMMAND.COM

IO.SYS

MSDOS.SYS

Similarly, ensure that RMS file - which resides in Program Folder of your Hard Disk - is never tampered.

**vi) Datacom Equipment and Connectivity**

In this chapter, we shall deal with some pertinent issues regarding Connectivity. Your PC is connected not only to adjacent PC but also to each & every PC on FOIS. (Each PC on the network, therefore, has a unique identification or Address - known as IP address). This has been achieved by using leased lines, ISDN connections & VSATs for data transfer. This data transfer rate is higher than PRS system. Also, unlike PRS terminal, your terminal is a full-fledged independent machine. The interface is Windows, unlike text type processing in PRS.

Your PC is connected to FOIS through a Router, which is a junction between LAN (Local Area Network - connecting all PCs in your premises) & WAN (Wide Area Network - a bigger network which connects all PCs on the system). A Router does this mostly through Channels - which are connected to it using Modems. (A channel has two ends. One end is connected to Router through a Modem in your premises. The other end is again connected through a Modem to the equipment of Channel Provider, at his premises. This can be S&T or BSNL or any other telephone company). Finally, a Router will have connections with your LAN (through Hub/Switch), Modems (one for each channel), ISDN Connections (directly to Router) & VSAT (directly to Router). All this equipment is collectively referred to as Datacom Equipment.

**vii) Routers:**

A Router routes the data that you want to send/receive. It is an intelligent device, unlike Hubs & Modems. The data is sent & received in data packets. A LAN works below a Router. Data sharing between various PCs connected on a LAN is automatic & Router has no role. It is only when the data requires being sent/accessed from a remote PC/Server - i.e. accessing WAN terminals - that Router's role assumes significance. Its IP Number specifies each Router - like all intelligent devices on a network -. This IP Number actually identifies its Ethernet port. A Router may have WAN, LAN. & VOICE port. A port is actually a point where a channel (through Modem) or LAN or ISDN or VSAT connection can connect to Router. On Railways, we have two makes of Routers supplied - Cisco & Motorola.

Router has to remain “ON” at all times.

Also ensure that the power feed is having a proper earthing arrangement. The earthing norm of 2-3V is to be maintained.

Power supply to Router should be routed through a UPS. Never operate a Router without a UPS. Also, wide fluctuations in input voltage can damage the Router.

There should be a power back up, in addition to Normal Power Supply. This could be through Auxiliary Transformers (AT) in OHE area or through a Diesel Generator Set (DG Set). The change over switch should be accessible easily.

The Router should be kept in a dust, smoke & moisture free environment. Please use Racks provided to house the Router. Since Router is expensive & sensitive equipment - which does not require daily maintenance - therefore, it is better to leave the equipment undisturbed.

Essentially provide Air-conditioning for routers.

A Router, along with Modems should be placed at a location where it is always accessible to the user. You actually don't have to do anything with Router, but just by looking at various displays & reporting the same, you will be participating in troubleshooting. For this reason, you must have Router under your control and not locate it in Test Room.

Some of the Routers have a specialized Port for ISDN. (Not all Routers have it). Unlike all other terminating leads on a Router, ISDN connection gives a higher voltage (— 100 V). Therefore, if ISDN lead is connected to any other port that port will burn down. Be careful.

Firm connections of all chords to Router are to be ensured. Nothing should be placed on Router. Router should not be dragged.

#### **viii) Modems:**

Modem (Modulator/Demodulator) is the device through which a channel connects to your Router (& through it, to your PCs on LAN). It is a very sturdy & maintenance free device. It also requires a dust & smoke free environment. It is normally housed in a Rack along with Router. A lot of information is available on its front display. We have two types of Modems on Railway - G703 (at service provider's premises) & V35 (at our premises, with Router).

When the channel connected to a Modem is working properly, you will find both “RD” & “TD” glowing & blinking. If it is not so, then there is some problem with channel.

As always, you have to ensure that Modem is always kept “ON”. Also ensure that the power feed is having a proper earthing arrangement. Never use a metallic brush to clean the surface. Organic solvents are also not permitted.

Since one end of a channel always resides at the channel provider's premises, therefore you must also know some simple checks to analyse the channel position. Some of these steps you take in tandem with the operator at other end, who is observing his Modem. These steps, which are invoked when the channel is down (i.e. “line protocol” is down), are

- Make “LL” (Local Loop) switch “ON”. This gives the status of the Modem & Router. If “TD”, “RD” blinks, then local equipment is OK. If it doesn't, then the problem is with Modem/Router.

- In the next step, we make “RL” (Remote Loop) switch “ON”. This checks the local lead condition between Modems. However, to get the response of this action, there should be an observer at the other end. If everything is OK. then at the remote end, “RD” & “TD” will blink. Similarly, remote end can also give a “RL”, in which you will get blinking “RD” & “TD” on your Modem, if everything is OK between two Modems.
- If both “RL” & “LL” give OK results, then the problem is beyond the Modem at service provider’s end. You have to take a docket number after registering the fault with service provider (i.e. S&T or BSNL). If Modem at the other end is not able to execute “LL” successfully then Modem at that end is defective/improperly connected.
- If all loops show positive result & line protocol is still down, try initialising Modem by switching it off & then on.
- If everything gives OK & data is still not able to pass through then there may be problem with Router. Inform Divisional Control.
- Always ensure that all leads are firmly connected. However, no lead should be checked with power at “ON” position.

#### ix) Channels:

A Channel refers to a leased line dedicated channel for data transmission. You have two types of channels - Railway & BSNL. However, as a user you don’t see a difference. Though technically a Channel refers to a leased line channel, in this section we will also cover ISDN & VSAT in it. A channel connects your system through Modems & Routers. In addition to leased channels, you also have ISDN connections & VSAT (Very Small Aperture Terminal) connections to enhance your Connectivity. Connectivity refers to the immediate links that your PCs on LAN (at a Node) has with neighbouring nodes. It has been planned that ideally each node has a minimum of two links, each giving a different route to your data - so that data transmission can continue even if one link is down. This is technically known as Route Diversity.

Unless a Channel is available, data will not transmit. If your node is connected through two channels & one of them is down, you will not know the difference. However, with one channel down, you are in a very precarious position as data entry will stop as soon as the second channel even flickers. It is therefore important for you to take active interest in knowing the state of a channel. This can be done through “pinging”. Pinging is the name given to sending & receiving a test data packet from one computer to another remote PC/Router or to any intelligent device. However, you can ping only if you know the (IP) address of remote PC or Router. These are listed in Annexure I. You can ping by following command

Start -> Run -> Ping [IP Address of Remote Router] -> OK

Only an entry like “Request Timed Out” or “ttl expired in transit” indicates failure.

VSAT connections can also be pinged. Some other important points for VSATs are as follows

The data is transferred directly to CRIS SERVER. This is a sturdy system, which once stabilized, works trouble-freely.

The earthing resistance should be less than 1 ohm. Neutral to earth leakage should be 2V. It should never work without UPS&CVT Air-conditioning is a must.

The antennae base structure should be firmly fixed and clamped. At the time of installation it should be ensured that ODU is having its protective laminated cover (to protect it from water and dust) OR at least the rubber cap of Radio Frequency (RF) unit is in place.

There should be one ladder for antennae access.

There should be a routine of checking the equipments. It should be ensured that rubber cap of RF unit is in place and the cord going to indoor unit is firmly in place.

Similarly, ISDN connections can directly pass the data, bypassing Router (or more accurately, bypassing Router at that node but connecting to a remote Router). Only in such ISDN connections where Routers are not provided, you will not know the status of channel through pinging.

Please ensure that ISDN connections are always with power “ON”. Also ensure that ISDN connections are not STD barred.

Though it is not possible for you to know as through which particular channel your PC is transferring data, the same is always very accurately known to Router. Depending on the channel availability, it keeps on defining the route dynamically. Thus, if ISDN is available & all other channels are down. Router shall use ISDN to transmit data. (ISDN connection can also be assigned a higher priority by configuring the Router). As soon as any of the other channels becomes stable for a predefined time interval, it again resumes data transfer through that channel, shutting off ISDN. This is what is known as programming of Router.

ISDN is a secondary channel and since its usage is very expensive so it should be used very judiciously.

#### **x) LAN:**

LAN connects all your PCs available at a location. However, it need not be confined to a building. It can be extended to a few kilometers (up to 6 km) also. Such extension is normally through a LAN Extender. Even if PCs are connected through LAN Extender, there is no role of Router in sharing of data among these PCs.

LAN is achieved by using the network card available on your PC. An identical work group is to be defined on each PC on the LAN so that they are “visible” to all other PCs.

While defining Network Properties on your PC, make sure that only one Gateway (i.e. IP address of your Router) is defined. Disable DNS.

A PC may be visible on a LAN. However, other PCs can use only those files, folders, drives etc of that PC which the owner of that PC has decided to “Share”. To share a file, single click on the file name, followed by right click. Select “Properties”, followed by “Sharing” tab. Share to the extent you desire.

You can decide to allow other users to even write on your Hard disk. However, you cannot differentiate between your co-users on LAN & other users on WAN!

You can also share some scarce resources - such as Printers - through this scheme.

LAN wiring consists of two parts - first, a CAT5 structured cabling from Router/Hub to I/O box (a 3" x 3" x 2" white box) & second a flexible cable from I/O box to your PC. Please ensure that all PCs at a location are connected on LAN.

Ensure that CAT5 cable is mounted on wall properly & is not hanging loosely. Ensure that flexible chord is not stretched. Also ensure that I/O box is located close to your PC.

Hubs/Switches are devices for connecting additional PCs to Router’s LAN port. Please ensure that these are properly mounted on wall.



**xi) Uptime:**

It refers to the time when a node or a channel remains available for data entry. As explained earlier, it is of utmost importance to know the status of availability of equipment for user. You should keep records both of Channel Uptime & Node Uptime. It is easier to maintain record of Node uptime. Simply record in a register the daily position of availability of a node. (Along with the reasons of failure for doing analysis.) It is very essential to keep check on the health of secondary channel when primary channel is up.

Give summary position of the entire day to your Zonal OCC at odd hours.

For finding the channel uptime, you have to schedule task of ping, even if your Node is up. Ideally, every 4 hours, you should ping to adjacent Routers & note the result. This, compiled over entire day, will give channel availability of each channel at your Node. This is to be recorded in a register, duly giving message to Zonal OCC through Messaging Feature of RMS.

There should be a fixed regime of reporting of failure to be in place so that in case of a failure trouble shooting is fast.

A list of phone numbers of service provider should be readily available both at div headquarters and zonal headquarters.

You also have to keep tab on the time taken by various service providers to attend to your reports of breakdowns of Routers, Modems, UPS, Printers, PCs etc. This should be in a separate register, which is to be reported daily to your headquarters.

**xii) Other Applications:**

Do not use your FOIS network for any other regular data transfer programs. This can cause virus threats, slowing down of application, vitiate OCC tasks & mis-programming of Routers.

Within LAN, you can share information occasionally. However, running regular & heavy program may reduce the availability of system for data entry to FOIS. Please don't run any heavy or regular programs on your LAN.

Unless you procure genuine copies of software that you intend to use on a single PC, please don't load it. In any case, this should never be done on a "Reporting Terminal".

**xiii) Other Networks:**

Your PC should not have access to another network - such as Rail net. This makes the network prone to hackers & Viruses. Since the information available on FOIS is confidential, therefore hackers have to be prevented from entering our network. This is the reason for having separate LAN and Routers for FOIS.

Do not allow any Internet connectivity.

**16.15: System Administration:****i) Operational Control Center (OCC)**

For successful implementation of FOIS over Indian Railways each zone shall have to undertake following responsibilities towards FOIS. Real time updating of system data Management of Network, Maintenance of equipment - PCs, Printers, UPS, LAN extender. Routers, Switches, Hubs and associated accessories, Replacement of manual information system.



**ii) In service training:**

To achieve this each zone should deploy personnel to set up an Operational Control Centre (sufficient work charged posts have been provided and adequate staff has been trained by CRIS). OCC will be the empowered body for prescribing and enforcing working procedures. It will also monitor performance and take appropriate (pre-emptive and remedial) measures to ensure cent percent availability of system.

OCC shall be manned round the clock to operate NMS and to provide proactive support to field reporting units (help desk) in every respect. It will have additional functionaries during day shift for management support for maintenance, analysis of system efficacy, up gradation of procedures, and escalation as may be required.

**iii) Real time updating of system data:**

Procedures, roles and responsibilities should be prescribed to ensure that data is entered into the system as soon as the physical event has occurred but definitely before the next event takes place these delays can be monitored with help of Transaction log

(Query → Operation Control → Exception task → Transaction log)

Procedures should be location specific and further device specific i.e. functionary specific. Specific office orders to be issued covering every possible eventuality on a given territory with the sole objective of not allowing any data element to escape.

Participation of train staff to deliver data through train documents for both normal and abnormal working will be prescribed as local procedures. In case, when abnormal working has been introduced on account of failures. OCC to co-ordinate for proxy reporting and restoration of normal working.

Each division should nominate a Sr. supervisor who shall be responsible for timely update over his division and accountable to OCC. Reporting terminals have been provided at divisional and sub control offices, in yard locations, (terminals are provided at the place where all the information required to be input is available). Control Office will report for non-device locations. The entire gamut of reporting to the system is to be engineered around these terminals, which must be manned round the clock.

Procedures should also be prescribed for reporting in case any failure affects data entry from the nominated device beyond two hours.

Each division shall have a predetermined reporting regime in case of failure. In such cases data should be entered from a pre-defined alternative device at that location/site or from the reporting devices at another location by following the mechanism of proxy reporting. Proxy reporting will be possible through the permission of zonal OCC who will enable the nominated device to report for the failed location/site.

Proxy reporting regime can be devised on the following lines:

- a) If at LOCATION TERMINALS have failed reporting will be done through remaining terminals at that location/site.
- b) At a location there may be several sites. If a particular site has failed, proxy reporting will be done through a nominated site.
- c) In case of failure at yard - Divisional Control or sub control office will report
- d) In case of failure at Division - Zonal OCC will report
- e) In case of failure of complete Zone - Disaster management will come in use.

**iv) Management of Network:**

Having route/media diversity and adequate spare equipment has provided sufficient redundancy. It should always be ensured that redundancies are always in working order. Monitoring the functioning of Network with the help of NMS software installed is also the function of zonal OCC that has to be manned round the clock on a continuous basis. It will include -

Ensuring that primary and secondary data and voice channels are in working condition.

If your node is connected through two channels & one of them is down, you will not know the difference. However, with one channel down, you are in a very precarious position, as data entry will stop as soon as the second channel even flickers. It is therefore important for you to take active interest in knowing the state of a channel. This can be done through “pinging”. Pinging is the name given to sending & receiving a test data packet from one computer to another remote PC/Router or to any intelligent device. However, you can ping only if you know the (IP) address of remote PC or Router. List of IP addresses of your zone should be available with OCC. You can ping by following command

Start -> Run -> Ping [IP Address of Device] -> OK

For finding the channel uptime, you have to schedule task of pinging, even if your Node is up. Ideally, every 4 hours, you should ping to adjacent Routers & note the result. This, compiled over entire day, will give channel availability of each channel at your Node.

Registering complaints for channels that are not working and following up for rectification. Liaison with both BSNL and railways for the above.

Routers have been configured to route data on a predetermined priority. Rerouting and load balancing will have to be done through OSPF (Open Shortest Pathfinder) on the NMS and need basis. Analysis of network failures for identifying problematic links for up gradation. Monitoring payment processes of rentals of communication channels.

Trouble shooting for other equipment failures in association with central OCC and ordering its replacement from the spares.

**v) Maintenance of equipment :**

Regarding maintenance of equipments, OCC shall keep a record of hardware components provided at each locations/sites and their failures at zonal headquarters and its division. Repairs will be through maintenance contracts.

A PC breakdown (either Monitor or CPU or UPS) is crucial as it affects data entry. However, you must first make sure that there is no such problem, which cannot be fixed locally. Please check for power chord, operating system & RMS program. If all of these are there & still your PC does not respond, bring it to the knowledge of Divisional HQ. At each site you have one extra PC, complete in all respects, to take care of such eventuality. Replace the defective PC with this stand-by. Finally, report the failure to concerned vendor or as prescribed by the maintenance practice of that div/zone . Addresses of vendors should be readily available.

OCC should prescribe spare maintenance practices on their respective zones.

The following points should be kept in mind before prescribing any spare maintenance practice: -

- Uptime requirement of location
- Accessibility of vendor from a location

Sourcing of spares may be done from a central point ideally a big city where vendor services are available readily.

In house skills would be confined to troubleshooting and to replacement of equipment out of spares. NMS software also helps in troubleshooting. Vendors with whom AMC has been drawn and entered can then repair defective pieces.

**vi) Replacement of Manual Information System:**

Suspension of parallel manual system will be the biggest challenge. It has to be gradual. First of all it will have to be explained to operations managers that value lies in using application in an interactive mode. Dependence on fixed time reports should be minimized. Fixed time reports should be more in the nature of exception reports to reflect failures.

It would be prudent to prioritize this effort in the following order.

Interchange

Stock and Demand

Loco inventory

OCC will in consultation with COM prescribe a schedule for identified manual reports and bring systems stability in terms of data capturing in those areas first.

OCC will also evolve a mechanism to analyze systems usage at every step and match it with expected returns. Returns can be in terms of savings in efforts, accuracy of information, avoidance of disputes, less correspondences and cross references, more time for planning operations, resultant customers satisfaction, enhancement in business achievements and productivity (redployment achieved, overtime curtailed), reduction in work pressure amongst staff, less diversions etc.

From the analysis of application by OCC, it is expected that items for up gradation of application further will get identified. However before undertaking development OCC will weigh every new requirement for its return justifies it and then only forwards it to agencies responsible for application development.

**vii) In Service Training:**

It is very essential that concurrently a programme be made by each railway to disseminate the learning to rest of the cadre. The training should be institutionalized taking the help of zonal training schools. The components of training will comprise exposure to revised ground procedures for data collection and maintenance, reporting tasks of the application and OCC functions.

The participation of all those in the field who are associated with operations, taken together will only ensure sustained upkeep and usage of the system. The FOIS training should be made a part of the induction and refresher courses of TNC, GC, SM, TXR, Trains, Power, C&W and Commercial Controllers, Guards, and Loco pilots.

There will also be an element. This training is essentially for understanding of procedures and application tasks.

In case of those who have to man OCC and perform its functions an extended module will be prescribed in addition to training in procedures and application tasks.

OCC of each railway will nominate trainers from their existing cadre strength who in turn will be trained by CRIS to establish training processes on their railways and train others. OCC will thereafter monitor progress of training on their railways and ensure that regularity is maintained.

**viii) Miscellaneous Issues:**

**a) Printing Reports:**

All reports, which are available on display, can also be printed. You should decide as to which reports are most useful & which require printing.

You can print either the view shown (through F7) or you can choose which columns & rows you want (by clicking them) & then print your selection by pressing F11.

For printing, you should have a Dot Matrix Printer attached either to Network or attached to a PC & “Shared”.

You must plan in advance for your requirement of paper & ribbons.

**b) Messaging Feature:**

This is a very powerful communication tool that should be used for meaningful works only. Don't allow it to become a general-purpose e-mail feature. Since the addressee is not a filter, the entire list of messages for a station increases exponentially. However, use it freely & liberally for communicating messages related to freight operations, FOIS messages & emergent non-personal messages.

**c) Passwords:**

The RMS package has a concept of passwords. For each user, who enters data, such passwords can be defined. Once a password is given by CRIS, you can change your password on your own by going to Access > Password. As a supervisor, you must also ensure that anyone who is going away from FOIS work (on transfer etc) should be struck off from user list & his password is disabled by CRIS. Assigning passwords gives responsibility to user. This password helps in keeping the security trail i.e. the reporting done carry the id of the user.

Password management task is being passed on the zones so that they can manage password on their own without getting CRIS involved. Besides RMS password there is Windows password, which you use at the time of logging in your PC, if you are using this password then all the users of that device should know it.

**16.16 Reports available in RMS module:**

**(I) Conference set:**

- a) Interchange forecast summary:** Gives desktop summarized view of forecast & interchange of current date. It is updated by I/C forecast and arr. /dep reporting task.
- b) Running interchange:** Gives detailed view of forecast & interchange and also gives running position of trains forecasted. It is updated by I/C forecast and arr. /dep.reporting task.
- c) Current interchange:** Gives summary information of interchange with break-up of empties and loaded stock, stock (8w) interchanged. It also provides summary of jumbo and box rakes interchange. It is updated by I/C forecast and arr. /dep. reporting task.

- d) **Likely shortfall :** Gives summarized view of interchange along with trains likely to shortfall along with the reasons of their shortfall. It is updated by I/C forecast and arr. /dep. reporting and I/C shortfall reporting task.
- e) **Train interchange: shortfall:** Gives shortfall /excess of yesterday interchange along with reason of shortfall in despatch. It is updated by I/C forecast and arr. /dep. report task.
- f) **Stream wise pipe line:** Provides pipeline between two nominated stations and also pipeline for a via. It is updated by Load planning. Train ordering, arrival / departure reporting tasks.
- g) **Loads on run :** This is an unstructured query for all loads on run in the system. There are different filters available for viewing loads according to user's requirements. It is updated by Load planning. Train ordering, arrival / departure reporting tasks.
- h) **Traffic flow :** Gives information regarding likely traffic flow interchange points up to 3 days in advance. It is updated by Load planning. Train ordering, arrival / departure reporting tasks.
- i) **Outward train railway wise:** Gives division wise destination railway wise view of all outward trains on a zone. Filters for rake types, commodities are also available. It is updated by Load planning, arrival / departure reporting tasks.
- j) **Terminal position:** Displays total rakes at the terminals as well as the insight for those terminals. On selecting a cell relevant details rake wise are displayed. It is updated by arrival/departure reporting, l/w no. taking. Rake placement/rel tasks.
- k) **Terminal performance:** Gives terminal performance for a selected period, It is updated by arrival /departure reporting, l/W no. taking. Rake placement/rel tasks.
- l) **Terminal history:** Gives details of individual rakes handled at the terminal for a selected period . It is updated by arrival / departure reporting, l/W no. taking. Rake placement/rel tasks. Terminal performance and running position: gives status of load at terminal along with its insight. It is updated by arrival /departure reporting, l/W no. asking, rake placement/release tasks.
- m) **ODR wise rake outstanding (details):** Gives ODR wise outstanding demand details it is updated by demand reporting task.
- n) **Rake performance:** Gives performance of rakes for the period they were in the division /zone along with total kms ran in the division. It is updated by arrival / departure reporting, rake Formation/dissipation, l/W no taking. Rake placement/rel tasks
- o) **Rake position:** Gives break up of rakes over a division/zone Under following heads:U/R,U/L,O/W,l/W and Empty. It is updated by arrival / departure reporting, l/W no. taking. Rake placement /release tasks.
- p) **Rake integrity:** Gives details of all attachment/detachment/sick reporting on a individual rake on the selected zone. The examination & dissipation if done) is also shown. Further details can be seen after selecting a cell and pressing enter. It is updated by all rake reporting, consist reporting, and TXR examination.
- q) **Current traffic flow:** Holding of each railway is shown in terms of l/W.O/W and empties, the flows between the railways are shown by arrows for both loaded & empty rakes. Details of individual rakes can be seen on selecting the desired cell and pressing enter. It is updated by all rake & load reporting

r) **Terminal management planning:** For a selected group rake type, division wise, outstanding rake demands, rakes on hand and pipeline of terminating loads are displayed. On selection of cell & pressing enter, details relevant to that cell are displayed. It is updated by Demand, rake placement/rel and arrival/departure task.

s) **All stock:** current rake holding of zone is shown division wise, specifying loaded empties, at terminal, cross traffic (through), originating for foreign railway, local and terminating received from other Railways.

Facility to see details of individual rakes on selecting any cell is also available, other stock icon in the conference set run on the same query (BCN.BCX, CRT.BOXN.BOX.SHERPA SHERPA-N.CONTAINER.TANKS).It is updated by load planning, consist reporting. Placement /release tasks.

t) **Loco position:** This query displays all the locos for the selected Division, location wise. A type wise summary is also displayed. It is updated by loco reporting, arrival/departure, loco attachment/detachment task.

## (II) Managerial Report

### a) Interchange:

#### Yesterday

Yesterday Interchange: This query displays the information of the trains actually interchanged in terms of the Loads and Light Engines at the divisional interchange point. The shortfall and excess columns display direction wise summary of loads that were short or excess vis a vis the forecast for the previous day. Receipts and dispatches are shown separately for each of the I/C point. It is updated by the Interchange forecast and Arrival/Departure Reporting tasks.

#### Current

Interchange monitoring this query gives view of current I/C, giving the Status of forecasted trains and also the trains, which are not forecasted, but are likely to go in the I/C. It is updated by train forecast, arrival/departure tasks.

### b) Rake & Terminal Position:

#### Yesterday

24:00 Hrs Terminal Position: Gives status of load at terminal along with its insight at 24 hrs. It is updated by arrival/dep reporting. I/W no.taking. Rake placement /rel tasks

#### Current

**Optimised movement of rakes:** This query displays movement of rakes originating from the logged in zone and available in the database till the queried date. It shows empty and loaded runs of the rakes and the kms clocked by them and time taken for a run. It has the facility for displaying the detention details of the rake .Filters are provided to view details of specific commodities and stock types This information is updated by the arrival/departure, rake formation /dissipation, placements/release-reporting tasks.

**CC rakes BPC Position:** this query gives running details of close circuit rakes which are running in the system on the logged in date for the logged in Zone/div.or selected BPC station of that zone. Option is available for selecting a rake type also if the rakes of a specific rake type are to be seen.

It is updated by BPC details, train arrival/departure/formation/dissipation tasks.



**Movement of a rake:** It shows empty and loaded runs of the rake on entering the ID of the rake the kms clocked by them and time taken for a run. It has the facility for displaying the detention details of the rake. Filters are provided to view details of specific commodities and stock types.

This information is updated by the arrival/departure, rake formation/dissipation, placements/release-reporting tasks

**c) Demand & Loading:**

**Yesterday**

**Commodity wise loading and outstanding:** This query displays loading information for a Division/zone against particular station in terms of the no. of rakes 8w, piece meal, 8w, and the total tonnage and freight. The user can use options for (a specific consignee or all consignees or excluding a consignee) and for a (specific commodity, or all commodities, or excluding a commodity). These options are mutually exclusive and can be used in any combination.

**d) Load Planning, Consist Reporting, Loading tasks, updates this query:**

**Yesterday Loading**

Terminal wise loading of rake demand: This query gives the terminal wise rake loading performance of a zone/div. along with demand details and handling activity details, views of commodity wise and destination rly wise summary are also available Option is also available for viewing terminal wise unloading details in term of balances.

**e) Arrival/departure, rake formation /dissipation, placements/release-reporting tasks update this query:**

**Loading performance:** This query displays loading information for a Division/zone against particular station in terms of the no. of rakes 8w, piece meal, 8w, and the total tonnage and freight. The user can use options for (a specific consignee or all consignees or excluding a consignee) and for a (specific commodity, or all commodities, or excluding a commodity). These options are mutually exclusive and can be used in any combination.

In this query there is submenu for O/S loading division wise and commodity wise loading and o/s.

**f) Demand reporting and placement/release tasks, update this query:**

**Current**

**Type wise stock position:** This query gives break up of all rake types or selected rake type over the zone (in terms of rake/pm).on selecting a row and pressing enter

Details of the highlighted wagon type are shown.

This query is updated by arrival/departure, rake formation, dissipation, and consist reporting tasks.

**Piecemeal outstanding summary:** gives destination wise details of piecemeal o/s over a zone with ODR Demand reporting and Piecemeal placement /release tasks update this query.

**g) Loco**

Power interchange gives summary of Zonal loco l/C and also a summary of holding of locos type wise over a zone.

Arrival/departure and loco reporting tasks update this query.



**16.17 Operations Control:****(a) Interchange:****Yesterday**

**(i) Train wise interchange:** This query displays I/C load wise of a division, I/C point wise for specified date. View is available for specified I/C point and direction. The details of loads, like load name, L/E, type, loco, unit, I/C date/time for handed over and taken over is listed separately. This information is updated by load planning, arrival/ departure tasks.

**(ii) Load interchange analysis:** This query displays I/C load wise of a division I/C point wise for specified period. View is available for specified I/C point and direction. The details of loads, like load name, L/E, type, loco, unit, I/C date/time for handed over and taken over is listed separately. There are filters provided for originating zone/div/station and terminating zone/div/ station so that various analysis can be done on I/C data. This information is updated by the arrival/departure and I/C reporting tasks.

**(iii) Stock interchange load wise:** This query displays summarized information of receipts and dispatches of stock at divisional level for a specific type of stock. Loaded stock classified in terms of through and terminating. Empty stock is shown separately. This query displays and distribute output fields like No./units for each classification with total(No./Unit), for both receipts and for every I/C point. This information is updated by the arrival/departure and I/C reporting tasks.

**Current**

**(i) Stock forecast:** The query displays summarized information of receipts and dispatches of stock at Divisional level for a specific type of stock. Loaded stock classified in terms of through and terminating. Empty stock is shown separately. This query displays output fields like No./Unit, for both receipts and dispatches for every I/C point. The train I/C forecast reporting task updates this information.

**(ii) Stock interchange (summary):** An online query which gives forecast and actual trains ran till the time of viewing the report, along with stock interchanged in terms of L/E in 8-w units I/C point wise. Summary of I/C is also given rly wise. I/C forecast and arrival /dep update this query.

**(b) Load & Pipeline:****Yesterday**

**(i) Change in load destination:** The query gives information on the loads for loaded/empty/mixed/ AII within Zone/Division with revised change of destination and the station where the change was effected with the message No. and the functionary who authorized the change of destination. The reports can be obtained selectively for a specific commodity, for consignee or for a specific destination. This information is updated by the change in Load destination tasks.

**(ii) Stabled loads at 24.00 hrs:** This query gives information on the loads for both loaded/empty stabled with date and time, reason as at odd hrs. This information is updated by load planning arr/dep and train stabling tasks.

**Current:**

**(i) Type wise Terminating load in sight:** The query gives information of terminating loads for a station/division. The loads details along with the current location and status with the expected arr/dep time and date at the I/C station and destination are displayed. This query is updated from Load Planning, train ordering. Train Arrival/Departure tasks.

(ii) **Outgoing loads:** It gives details of loads which have originated from the logged zone/div /station. It also gives the I/C time of that load and also its expected time at its destination. Load planning, placement /release, arrival /dep, tasks update this query.

(iii) **Running position optimized destination wise:** This query displays rakes loaded from a zone and are running on that date. It gives loading details and I/C date and time, its current status, filters are provided for stock type commodity and unloading zone. Load planning, placement /release, arrival /dep, tasks update this query.

(c) **Stock:**

**Yesterday**

(i) **Rake performance:** Gives performance of rakes for the period they were in the division /zone along with total kms ran in the division.(query picks rake from their date of exit from zone/div) It is updated by arrival / dep reporting, rake Formation/dissipation/W no. taking, Rake placement /release tasks.

(ii) **Stock holding:** The query displays yesterday position of the total holding for the zone for all Wagon types, loaded and empty, separately for piecemeal. rakes and DVS Stock. Details of a stock can be seen by selecting that stock type by clicking and pressing enter. This query is updated by Inward No. taking, departure, consist reporting, rake formation/dissipation, and attachment/ detachment of wagons en-route reporting tasks.

(iii) **Rakes at 24 hours:** The query displays information of rakes at 24 hrs on yesterday. Rakes group type wise or rake type wise for a specific commodity included, or commodity excluded, or all types and for a specific consignee included, or a specific consignee excluded or all consignees for a zone. This query is updated by Inward No. taking. Arrival/departure, consist reporting, rake formation/dissipation and placement/release tasks

**Current**

(i) **Rake Position:** The query displays information of rakes on real-time basis. Rakes group type wise or rake type wise for a specific commodity included, or commodity excluded, or all types and for a specific consignee included, or a specific consignee excluded or all consignees for a zone. Inward No. taking. Arrival/departure, consist reporting, rake formation/dissipation and placement/release tasks

(ii) **Destination:** Rly Wise Outstanding displays demand details of a zone, division wise, clubbed on destination railway basis. Gives details of commodity and no. of units indented .filters are provided for viewing rake/piecemeal wise demands, commodity and consignor can be selected.

This query is updated by demand and placement /release tasks.

I/W traffic shows handling details of inward loads of a specified terminal on current date basis.

Arrival/departure and placement/release tasks update this query.

O/W traffic shows handling details of outward loads of a specified terminal on current date basis.

Arrival/departure and placement/release tasks update this query.

(d) **Miscellaneous:**

(i) **Load Wise Route:** This query gives the complete route details for the selected load (selection is made by entering the load name ) like load from-to, load direction, load type, units, stn, Arri/Dep. Date/Time, Inward Dren, Outward Direction of the selected load. This information is updated by the load planning Train ordering, arrival/departure tasks.

(ii) **Load Wise Train Details:** This query gives the details of all the trains ordered for a particular load's journey(selection is made by entering the load name ). The load is recalled by giving departure time from the originating station details of each train leg are also available including the Loco details. The train details show all the stations en route and the reporting, if any, made during that run.

This information is updated by the Train ordering and arrival/departure tasks.

(iii) **Train Schedule:** This query shows all train schedules in the system between any pair of stations. The details show all the stations in the train schedule, including indicators for zonal, divisional and sectional interchange. This information is updated by static database in the system.

(iv) **Route display:** This query shows the default load route between any pair of stations. The inward and outward details are shown against each interchange station on the route. This information is updated by static database in the system.

(v) **Invoice details:** It gives details of invoices made generated in a division/station for a period. This query gives RR details and freight and weight of loading done.

This information is updated by demand registration, placement/release and RR reporting tasks.

(vi) **Station Help:** This Query provides help regarding station code or name. In case only part of either station name or station code are known, the system shows all stations in the database having the input name as a part. This information is updated by static database in the system.

Booking profile this query gives the booking profile of the selected station as given in the Alphabetical List of IRCA This information is updated by static database in the system.

(e) **Exception Tasks:**

Transaction log this task is provided to monitor the delay in reporting taking place. This can be viewed for a date and for a division/station. There are filters to view train and rake reporting tasks separately

Train and rake reporting tasks update this.

Statistical Report (Reports)

(f) **Interchange:**

I/C Summary gives I/C summary in terms of no. of loads Interchanged vis a vis forecast and shortfall Forecast and arrival /dep tasks update this query

(g) **Load & Pipeline:**

Reason wise stabling gives details of load stabled during a specified period along with load details, reasons of stabling and the time when that load was lifted Stabling, load planning and arrival/dep tasks updates this query.

Diversion register gives diversion details for a specified period Filters available for originating station commodity, i/e Diversion task updates this query

**16.18 Maintenance Procedures for FOIS:****(a) Check list for daily maintenance of hvnetvsat prerequisites:**

- (i) Minimum 1KVA On line UPS - dedicated to VSAT
- (ii) Dedicated Electronic earth less than 1 ohm
- (iii) Earth to neutral Voltage should be less than 2 volts
- (iv) Air -conditioned dust free environment with clearance of at least 8" in front and rear of indoor unit. This provides airflow and prevents overheating.
- (v) AC input requirements-230v+10%v VAC 47-63 Hz for PES
- (vi) Grounding of VSATs antenna and unit is a must resistance should be less than 02 ohms.
- (vii) AC input voltage to PES must be derived from UPS output only (Live to neutral 230 VAC Live to Earth 230 V Neutral to Earth OV)
- (viii) Do not allow moisture to enter in the RF unit. Plastic tape should be put on all the Connectors at the ODU. A properly designed rain protection over can also be used to prevent the same.

**(b) On-off Procedure:**

- i) → Do not put off the power supply. Keep it continuously “on” because Hub is always polling each location for status and control signals must be received at any time from the Hub.
- If PES is switched off and subscriber switches it on, in this case PES will take nearly 40 minutes to get ready for normal working provided it is ON continuously for that period.
- Observation of the LEDs should be recorded during this period and it may be conveyed to HUB if PES does not come to normal position i.e. dots do not flash on all cards of PES.
- ii) Single phase 230 ohms 50Hz with input circuit breaker of 3amps for protection.

**(c) Precautions:**

- i) Do not disconnect the IFL cable from DIU without switching power supply off. This may damage equipment.
- ii) Protect your antenna/FL cable/ODU from tampering by unauthorized person.
- iii) To prevent damage to the DIU turn power off before connecting/disconnecting any telephone failure to remove power may damage the VDPC card.
- iv) Do not use rotary telephones with VSATs. Use only Touch tone (DTMF) telephones.
- v) Do not place equipment, which produce dust near the DIU (Certain copier of computer primers produce carbon dust, which can cause malfunction.
- vi) Prevent moisture from getting inside DIU
- vii) Limit the distance between VSATs DIU to telephone instrument 15 meter for proper operation.
- viii) For normal operation the VSATs should be displaying, flashing dots in all the cards i.e. IFM, VDPC and MPC. Any other display is an abnormal condition
  - In case of difficulty contact HUB numbers: (To be taken from CRIS)
  - Specify the display of all the three PES cards
  - PES= Power Earth Station

- ODU= Outdoor unit DIU= Digital Indoor Unit
- IFM= Intermediate Frequency Module
- VDPC=Voice Data Port Card
- MPC=Multiport Port Control

#### 16.19 Additional FOIS-related Activities in ECoR:

(i) **RAS (Rake Allotment System)-** In order to ensure transparency in allotment of Iron Ore Rakes, RAS was introduced in 01.05.2011. in KUR division of ECoR. Earlier it was implemented in SERly on 01.01.2011. Subsequently, Coal Rakes of Dhanbad division is being allotted through RAS. Rake supply to a consignor/consignee having programmed/committed traffic will be a three step process on Non-ODR (Oldest Date of Registration) days, namely Allocation, Allotment and supply of rake. On ODR-day's allocation list is ignored and allotment is done on the basis of seniority of Indents. A maximum of 02 days can be declared as ODR days for a division by COM.

(ii) **Terminal Pipeline Management System (TPMS):** Trial run of TPMS was undertaken in Indian Railway on dt.01.11.2011. This is a FOIS- based decision support system which facilitates the loading Division/Zone to plan the loading to a particular terminal on the basis of number of rakes available at the destination terminal and number of rakes arriving the terminal on a given date. The ultimate objective is to ensure that there should not be any overlapping rake waiting for unloading at a terminal and simultaneously the terminal capacity is not wasted for want of load.

At present, the congestion level of a destination terminal will be 'loading division' based and not on loading terminal based. Thus the Divisional congestion level for any unloading terminal 'X' will be applicable to all loading stations in the Division 'D'. In short, the division is taken as a unit to assess the congestion level vis-à-vis a particular destination terminal. Everyday at 08.00 hrs the congestion report is generated in FOIS which can be accessed at Zonal, Divisional and Terminal level and load planning is made accordingly.

(iii) **Weighbridge Integration with TMS:** In Motion Weigh Bridge are being integrated with TMS to facilitate generation of RRs without undue delay. TMS has been commissioned at 09 weighbridges of ECoR. CRIS is in process of developing the requisite software in consultation with RDSO and Mechanical Directorate. The integration of weighbridge with TMS has been planned over Indian Railway.

(iv) **Radio Frequency Identification (RFID):-** A pilot project has been successfully conducted on the suitability of monitoring the movement of RFID-tagged wagons. The trial run was done on 500 BOBRN wagons in OEC-TLHR-PRDP circuit. Its field level application will result in generation of correct RRS, vehicle guidance summary and retrieval of wagon maintenance history etc.

(v) **Rates Branch system (RBS):** Rates Branch system is an all India application available in CRIS webpage [WWW.fois.indianrail.gov.in](http://WWW.fois.indianrail.gov.in). The chargeable distance whether shortest or Rationalized between a pair of station/siding can be known through this. There is option to ascertain both the coaching and goods distance. The Zonal Railway (Commercial Branch) updates the changes whenever it is notified.

**(B) INTEGRATED COACHING MANAGEMENT SYSTEMS(ICMS)****16.20 (a) Modules in ICMS:**

- i) Punctuality Module (PAM):** Punctuality Analysis Module captures the delays involved in train running at interchange points and detention causes for the delays at the Divisional level. Zonal client does the responsibility fixing for detention. Status: Implemented
- ii) Coaching Operations Information System(COIS):** Captures events on Coaches/Rakes, Generates Reports for Management of Coaching Stock. Data input predominantly at Station/Coaching Yard level. Status: Implemented.
- iii) COIS Data Entry Module:** Support module of ICMS, to maintain database pertaining to the information of Rake Links, Yard Infrastructure, Coach Master, Train Schedules etc. Data input at Zonal HQ level. Status: Implemented.
- iv) Coaching Maintenance Module:** To capture depot activities related to coaching maintenance operations, Utility tool for managers looking after mechanical and electrical maintenance, Includes module for Material Management and Manpower data (gang strength per shifts etc), Data input at CDO level. Status: Under system study
- v) Time-tabling Module:** For simulating the suitable timings for running of all kinds of trains, simulating the best available path for planning a train keeping in view all variables, simulating optimum utilization of rake link, generating all time-tabling documents. Data input at Zonal HQ level. Status : Under system study.

**(b) ICMS-System Architecture:**

- User connects through browser interface (like Internet Explorer)
- Separate URL for PAM, COIS and DATA modules ( for ex: <http://..7cois> , <http://.../pam> , <http://.Jdata> and so on)
- Users have Thin clients at location
- Back-end: RDBMS (Oracle based)

**(c) ICMS-Data Feeding:**

**Master Data:** Common Master database for PAMs and COIS, includes Infrastructure data: (of more permanent nature like List of Stations, Platforms, washing lines) and Other Master Data: (of less permanent nature like Rake Link Data, Time Table data, Coach Master etc)

**PAM :-**

- Feeding mostly at divisional level. Interchange owning division controls the data feeding for handing over through COA database. Zonal client does the responsibility fixing deciding the trains “lost in punctuality”.
- Activities include:
  - Originating terminating, interchange timings
  - Detention Reports,
  - Cause wise logging,
  - Fixing Responsibility
- PAM is integrated with COA.

**COIS :-**

Unlike PAM - no concept of data “feeding” in COIS at division. However, in case of non-device location or failure of COIS at terminals, proxy feeding is done at divisional control office. Instead working on the system at station/yard level leads to generation of required data (and memos for the operator). This works as input for MIS.

All station/yard activities from arrival to departure of rake are captured in COIS. Arrival time is captured through control charting. But the consist verification/new rake operation will be done by the station/yard at the time of despatch of the rake. These activities are .....

Main function	Sub functions
1) Rake Operation	1) Washing line examination 2) Loco 3) Vehicle Guidance 4) Consist to PRS 5) Move Rake 6) Rake form 7) Sick mark
2) Coach operation	1) Stock Entry 2) Movement 3) Movement to Yard 4) Sick mark 5) Sick Operation 6) Shop Mark 7) Shop operations 8) VP load/unload
3) Rake	1) Rake form 2) Rake movement to Yard 3) Pilot Rake form 4) Rake move to Yard 5) Get Rake
4) Train	1) Arrival 2) Enroute attaching and detaching
5) Loco	1) Loco cut in 2) Loco attaching and detaching 3) Multi Unit formation
6) Utilities	1) Dispute Resolve 2) Rake detach all.

**(iii) ICMS-MIS-Reports**

**PAM :** Reports for Management at Divisional Level, HQ level, Board level like:

- Railway Punctuality Performance for a date for a Division
- Movement of Trains (Division wise) in a Zone
- Punctuality percentage of Mail/Express
- Cause wise/Gauge Wise breakup of Lost Trains between dates



- Division wise analysis of Cause of Lost Trains on Date in a Zone
- Railway Punctuality performance for a date in a Zone
- Cause wise breakup of Trains lost in a period
- Summary of Monitored trains daily Run and Lost
- Section wise/Cause wise analysis for all trains on a date
- Zone wise/Cause wise analysis for all trains on a date, etc
- Bad runners
- Comparative cause-wise summary
- Train delay over division

**COIS:-** Reports for Management at Station Level, Divisional Level, HQ, RB level like:

- Yard Stock Position (Line position)
- Vehicle Guidance
- Coach utilization
- Zonal Stock Balance sheet (type wise details of Bare Requirement, allotment, running in service, ineffective etc)
- Coaches on way from/to shop
- Foreign Railway Coaches
- Ineffective Coaches
- Coach History
- Rake Link Information Zonal/Divisional Coaching Stock allotment/availability, etc.

**At present COIS data-entry is being done at the following locations. At Zonal HQ and Division, proxy-data entry is done for non device location and fixing of responsibility is done.**

Locations	Mode of Connectivity	Online Data Feeding.
KUR	OFC	Yes
BBS	OFC	Yes
PURI	V-SAT & OFC	Yes
SBP	OFC	Yes
WAT	OFC	Yes
RGDA	OFC	Yes
VSKP	OFC	Yes
MCS Work Shop	VSAT	Yes

System Generated Vehicle Guidance is being issued to originating Coaching trains at all COIS locations.

One V-SAT has been installed inside Mancheswar Workshop for updating POH particulars.

## (C) CONTROL OFFICE APPLICATION (COA)

### 16.21 (a) Introduction - General Information:

#### What is Control Office Application?

Control Office Application (COA) is a comprehensive software for the automation of Control Charting at a railway divisional control office. COA is intended to replace the tedious manual plotting of running trains on a chart. The core functionality of the control charting with ergonomics is intended to provide the Traffic Controllers a good look-and-feel and user-friendly work environment. The benefits of COA would include- better planning and decision-making in train operations and thus contribute to increased operational efficiency.

COA is designed to form the core application to drive the existing allied systems like FOIS, NTES and COIS, CMS. The integration with allied systems will be facilitated through a Central Application Server at CRIS.

The flow of data on real time basis to adjoining divisions will mark a significant breakthrough in the train operations without dependency on human interference.

#### (b) Scope of COA:

COA covers the following core functionalities Control Office Operations. They include: -

- Train Ordering
- Maintain Train Information
- Manage Train Movement (Abnormal Working, Stabling, Banker Movement)
- Report Unusual Occurrences.
- Management of Maintenance Blocks
- Caution Orders Plot Graphs
- Advance Plotting \_ System / Manual
- Maintain referential data MIS Reports
- Yard Management Siding
- Miscellaneous Functions
- View Station Layout

The application will have interfacing capability with Data Logger to capture data pertaining to train movements in the final version of the product.

#### (c) Intended Audience:

- Operations Managers
- Train Controllers
- Key functionaries of sister departments.

#### (d) Benefits:

- Fully Automated work environment
- As an aid to the controller in terms of efficiency, precision & time management.

- Leverage to Controller's Experience in decision making through manual forecast
- Real time information on train operation without human dependence
- To serve as a backbone system for sharing of data between allied systems

**(e) Features:**

- System provides automatic train ordering for coaching trains, display of all possible routes, facility of diversion, re-routing etc.
- Availability of details regarding Consist, Crew, BPC, Loco etc.
- Reporting of unusual events.
- Chart shows line occupancy, caution orders, abnormal working. Zoom facility, Horizontal scrolling, Expanding of sections on chart are also provided.
- Facility for saving chart as an image, printing of chart and saving file at pre-determined interval available. Facility of capturing detention at station/block section.
- Capturing abnormal working and depiction of the same on the chart.
- MIS reports related to Punctuality, Hours on run, Interchange, Speed restriction, Maintenance of blocks, Unusual occurrence and Equipment failure.
- Facility for controller to add remark by using electronic pen.
- Facility for SMS alerts to concerned users for specific events.
- Integration for transferring COA data from one division to the adjoining division and with other systems such as FOIS, NTES etc.
- Advanced plotting parameters are-Caution order, Blocks, Speed restrictions, Deduction of allowances (engg./ traffic) line occupation of stations, priority of trains, Absolute block check, Delays on account of unusual occurrence, Scheduled halts etc.

At present COA has been implemented at all the control boards of KUR, SBP & WAT Divisions.

**(D) CREW MANAGEMENT SYSTEM (CMS)**

**16.22** Crew management system is aimed at providing information regarding the crew at all times. It provides information regarding the presence of crew at home station or out station, maintain their status wise records and assign crew to the trains. It shall also maintain information regarding the periodic and other rests, Road Learning, Traction Knowledge, Training Scheduling, PME, DAR actions, etc.

**(a) Scope of the system:**

- i) The scope of the proposed Crew Management module is to cover crew booking lobbies for both Loco Pilots and guards. The system is sanctioned for 302 major crew lobbies across the Railways.
- ii) The benefits of the Crew Management module will be:-
  - Better balancing of Crew.

- Regulation of crew working hrs.
  - Higher crew efficiency.
  - Better planning of crew deployment.
- iii) The system will be a browser based application with central server architecture. The application will be deployed on a centralized server at CRIS on FOIS network. It will have connectivity to FOIS and train charting applications through a server level messaging service. The CMS application shall be supported on browser based thin clients as well as desktops having browsers at the following activity centers:
- Lobby
  - Chief Crew Controller
  - Divisional office (office of Sr. DME, Sr. DEE(OP) & Sr. DOM)
  - Divisional control office.
  - Zonal office (office of CME,CEE & COM).
- Access to the reports shall be available through rail-net on the existing PC available.
- iv) The application will be interface through a message broker type of application to exchange information between CMS & FOIS, Like:-
- Train departure and arrival times at crew booking point available on FOIS shall be updated to CMS.
  - Particulars of crew like name, designation, Sign ON, Sign OFF time available with CMS shall be updated to FOIS.

**(b) Objectives:**

- i) Optimum and effective utilization of crew by maintaining inventory of all crews at home stations and at out stations.
- ii) Effective scheduling and assignment of train crew by receiving information of train call and depending upon the type of traction and sections to be covered, assign the most suitable crew.
- iii) Monitoring road learning and training of crew to operate the locomotive of different traction and gauges.
- iv) To serve as a tool for controlling payment of the over time and kilometer allowance.
- v) Monitoring of training of staff due for refresher courses and also the staff whose competency certificate is due for renewal.
- vi) Monitor 10 Hrs duty and HOER rules.
- vii) Schedule periodic rests.
- viii) Monitoring of the crew productivity by calculating total hours of duty worked, total kilometers earned by each staff.
- ix) Catering for cases of acts of malingering like late turning up and Leave > 30 days.
- x) Serve as a tool for giving calls to crew in a most effective manner.
- xi) Assist in monitoring by the LI /TI of the drivers and appropriately grading of the crew.
- xii) Serve as a tool for upgrading knowledge of the Crew and continuously evaluating their performance.
- xiii) Act as a tool for making the crew lobbies more or less paperless.

**(c) Modules of CMS :**

- i) Freight
- ii) Shunting (including special pilot)
- iii) Coaching (including DEMU & MEMU on main line)
- iv) SMS
- v) Biometric
- vi) Quiz for running staff to improve knowledge
- vii) Others (abnormality reporting, MIS reporting, off line solution etc) All these modules cover allowance, booking & Circulars.

**At present CMS is functioning at the following 11 Lobbies.**

Sr.No	Division	Lobby	Status of Lobby
1	KUR	TLHR	<b>Booking done through CMS</b>
2		KUR	
3		PRDP	
4		PSA	
5		BHC	
6	WAT	VSKP	
7		BCHL	
8		RGDA	
9		VSKP(CHG)	
10	SBP	SBP	
11		TIG	

- Coal Pilot Module has been activated in TLHR & PRDP CMS lobbies.
- Round trip System has been activated for TLHR, MIPM & TIG lobbies.

**16.23 Software Aided Train Scheduling and Network Governance ( SATSANG)**

The Software Aided Train Scheduling and Network Governance (SATSaNG) is a planning software tool that plays a vital role in train scheduling in Indian Railways (IR). It would be a comprehensive system to aid scheduling of passenger trains, identifying path for freight train and scheduling where necessary, creating a master chart, providing a tool for path management, improving capacity management through simulation tool and enhancing resource utilization through optimization methods. It is therefore conceived as a tool that would be used as a time tabling tool for passenger carrying trains and in the subsequent phase become a tool that would be used for improving utilization of the network, rolling assets and human resources. It is going to be of immense assistance in preparation of Time Table.

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## CHAPTER-17

**DERAILMENT INVESTIGATIONS**

**17.01: “Accident Investigations – a tool to prevent recurrence”:** The derailments are a scientific phenomenon and causes can be scientifically established provided relevant evidence is available and necessary expertise is developed to analyse that evidence. In most of the cases on Indian Railways, cause of the accident is not clearly established. This results in repetitive failures. Pinpointing the causes of accidents, therefore, is of paramount importance.

**17.02: Site Investigation:**

- 1) Condition of track with special reference to gauge cross level and super elevation:- Gauge of the track is to be checked under the load for a distance of 45 meters on either side of point of mount, if cause is indisputably established. Otherwise it should be checked for a distance of 90 meters ahead of the point of mount. In case of sabotage or suspected sabotage nothing to be disturbed except to rescue life till clearance is received from police.
- 2) Adequate photograph and videograph is to be taken from different angles to assist in reconstructing the scene of the accident and for depicting site condition before disturbing the site and also after pulling back of load etc., to clearly show the track, rolling stock and their disturbances.
- 3) A rough sketch showing the position of derailed vehicles and marks on sleepers should be made. Point of drop/mount to be indicated.
- 4) Locomotive speed records/graph to be checked.
- 5) Condition of rolling stock with special reference to brake power, marshalling of trains and engine details as also breakage of components like brake blocks under frame assemblies having caused obstructions are to be looked into.
- 6) The position of block instruments, signals, points indicators are to be noted.
- 7) At stations with panel interlocking position of switches & indicators to be recorded preferably by two officers or two Sr. Subordinates of different branches and relay room to be sealed.
- 8) Position of important relays are to be checked.
- 9) Seize & freeze all records as laid down in accident manual
- 10) The statement of the concerned staff available at site should be recorded for finding the cause of accident.
- 11) To give the prima-facie cause of the accident with expected time of restoration
- 12) The dates as given in the accident reporting form must be recorded for locomotives to produce before the Accident Enquiry Committee. The track and coach/wagon is to be examined jointly and the data and information collected are to be recorded jointly signed by the Sr. Subordinates available at the site.

**17.03: Features to be checked for investigating into a derailment (not exhaustive) :**

- Total load in the wagon
- Condition of load – Uneven load/shifted load. Load in all the vehicles must be checked to get an idea of loading and lashing/securing of loads.

- Speed of the train just before the accident
- Application of brakes
- Brake power of the train and location of vehicles without brake power
- Whether all hand brakes are in released condition.
- How was the train received or dispatched by the station master. Whether station staff adopted any abnormal method of working
- Sudden reversal of points
- S&T failure reported before the accident – how and when was it set right.
- Condition and measurement of the track, its fittings and readings
- Condition and measurement of wagon and wagon readings, etc.

It is always useful to look into all aspects connected with the derailment. Sometimes important clues get neglected due to preconceived ideas and it becomes very difficult to properly arrive at the cause of derailment.

**17.04:** Accidents involving collision, passing signal at danger, rolling back of a train, etc., are generally caused by violation of train operation rules and it is not very difficult to trace the irregularities committed. There are two broad categories of derailments :

- a) Sudden Derailment, by wheel sets jumping the rails. Such a derailment indicates that the derailing forces were high enough to suddenly force the wheel off the rail.
- b) Derailment by flange climbing i.e., by wheel mounting the rail in a relatively gradual manner. It indicates that the derailing forces were powerful enough to overcome the normal stabilizing forces, yet not sufficient to cause a sudden derailment.

The most difficult accidents, from investigation point of view, are the ones where wheel leaves the rail as mentioned in category (b) above. Such accidents can be categorized in four types:

- (i) When one or both wheels of the same wheel-set fall inside the track.
  - (ii) When the wheel derail without any mark on the rail table.
  - (iii) When the wheel derails with single flange mark on the rail table
  - (iv) When a number of wheels derail with multiple flange marks on the rail table.
- (i) **Type 1: (When one or both wheels of the same wheel set fall inside the track):** In such derailments the cause of accident is very clear, i.e., spread gauge or possibility of shifting of wheel disc on the axle or breakage of axle or journal or combination of factors. It is generally seen that in such cases of wheel/wheels falling inside the track, the affected rolling stock is lifted with the help of jacks and the rolling stock can be lowered and moved on the same track. In the case of spread gauge, special care has to be taken for recording the condition of track fittings. Loose keys, signs of rail-chairs shifting on the sleeper, condition of elastic clamps, tie rod cotters etc. must be carefully examined and recorded. If a wheel starts mounting the rail, its tread lose contact with the rail and entire weight is shifted to the point of contact on the flange. At this particular moment, the arrangement of forces is as follows: -





â: Flange angle

The ratio  $Y/Q$  is called derailment coefficient.

For investigation of such derailments the accident site must be carefully inspected for foreign body, which might have caused obstruction to the derailed wheel. Examination of train brake power, position of zero brake power vehicles and heavily loaded vehicles must be critically done. Additionally, loco speedometer chart must be checked for last brake application.

(iii) **Type-3: (When the wheel derails with single flange mark on the rail table)** - This is the most interesting category of derailment and requires detailed examination of track, vehicles, loading condition and train operating conditions. First, the wheel mount mark itself has to be properly ascertained. The length of flange mark gives a clue to reasons for derailment. The following factors must be considered after seeing the flange mark:

- Long flange mark suggests that the wheel load reduced considerably for a long period.
- Short flange mark suggests that the lateral thrust increased to a considerably high value.
- The weight of the vehicle and speed of the train at the time of accident affect the impression of flange mark on the rail.

In a number of cases an empty derailed wagon had been pulled to a very long distance and the wheel mount mark was found but disputed due to ignorance of the investigating officials. In all the cases, one must ascertain the first wheel drop mark and then trace back the mount mark. After locating the mount mark, next step is to match it with the wheel that derailed first. For this matching of damages on sleepers and position of vehicles after derailment will have to be done. After identifying the point of mount and drop, detailed examination and recording of track geometry rolling stock parameters, condition of loads in derailed as well as non-derailed vehicles and operating conditions has to be done. This record reveals reasons for the accident. The analysis has to be done with a view to find out reasons for increase in thrust and reduction in instantaneous wheel load (off loading of wheel).

(iv) **Type-4: (When a number of wheels derail with several flange marks on the rail table):** - In this category of derailment the probable reasons for derailment can be as follows:

- Obstructions in the path of wheels.
- Derailment due to vehicle/loco defects causing many vehicles to derail as after effect.
- Disturbed track (work being done on the track or sabotage)
- Rail failure
- Serious track defect-twist misalignment or formation failure
- Buckling of track

In such cases, if there is no obvious reason like obstructions or rail failure, track parameters are of particular relevance and sufficient care has to be taken in recording them. Readings of track geometry and observations of vehicle defects are of great importance in establishing the behavior of vehicle just before the derailment. In addition to the readings taken after derailments, records of previous maintenance (rail renewal, de-stressing etc.) must be perused to assess the amount of work done in the last few days.

#### **17.05: Derailments at Points and Crossings:**

Points and crossings are meant for changing the road of a train and they have some discontinuities thereby making them weak links in track structure. In a point there are two tongue rails connected together by stretcher bars and this assembly is called switch. A pull rod from some distance operates this switch. Today, most of the points are operated by motors and they have some interlocking arrangement. The interlocking for motor operated points is done with a lock bar and it has detection device also to detect proper housing of points.

Tongue rails forming the switch are hinged onto the heel blocks in the rear. The bolts, provided for hinging the tongue rails, are kept loose for easy operation of switch. After the switch arrangement, another important part is the nose of crossing. Here all the wheels traverse the path shown by the switch. Most of the derailments at points and crossings either initiate at the toe of the tongue rail or near the nose of the crossing. The wheel gauge of the vehicle and offloading of wheel is also important contributory or solely responsible factor. Whenever a derailment takes place on a point the following checks must be done:-

**Track:**

- Gauge and cross level in switch and lead portion.
  - a) At 450mm ahead of toe of switch.
  - b) At ATS between the two stock rails:
  - c) At 150 mm behind toe of switch (only gauge) :
    - i) For straight road:
    - ii) For turnout:
  - d) At heel of switch.
    - i) For straight road:
    - ii) For turnout:
  - e) At 3m interval in lead portion

The Gauge must be within tolerance at all places except at the toe where it may be 6 mm slack for housing the tongue rail. It can be appreciated that conditions created by 'slack gauge' are not permitted near the switch. IRPWM-2004, Para 237 (8) (a) and (b) is reproduced below:

*“(8) Gauge and Super-elevation in turnouts-*

*(a) It is a good practice to maintain uniform gauge over turnouts.*

*(b) If gauge of track adjoining the points and crossings is maintained wider/tighter than the gauge on the points and crossings, the gauge on the adjoining track must be brought to the same gauge as in the points and crossings and run out at the rate of 1 mm in 3 meters to the requisite extent.”*

**(i) In case of derailment suspected to have started near the switch of the turnout the following points need to be carefully examined:**

- The condition of tongue rail-whether broken, chipped or bent.
- Whether the damage is old or new.
- Height of the tip of the switch from top of stock rail.
- Any gap between the tongue rail and stock rail
- Any damage to stretcher bar
- In case of interlocked points, the slackness between the locking bar slot and slide should be recorded
- The condition of brackets holding the stock rail
- Whether the switch jumps up when a wheel passes on its heel.

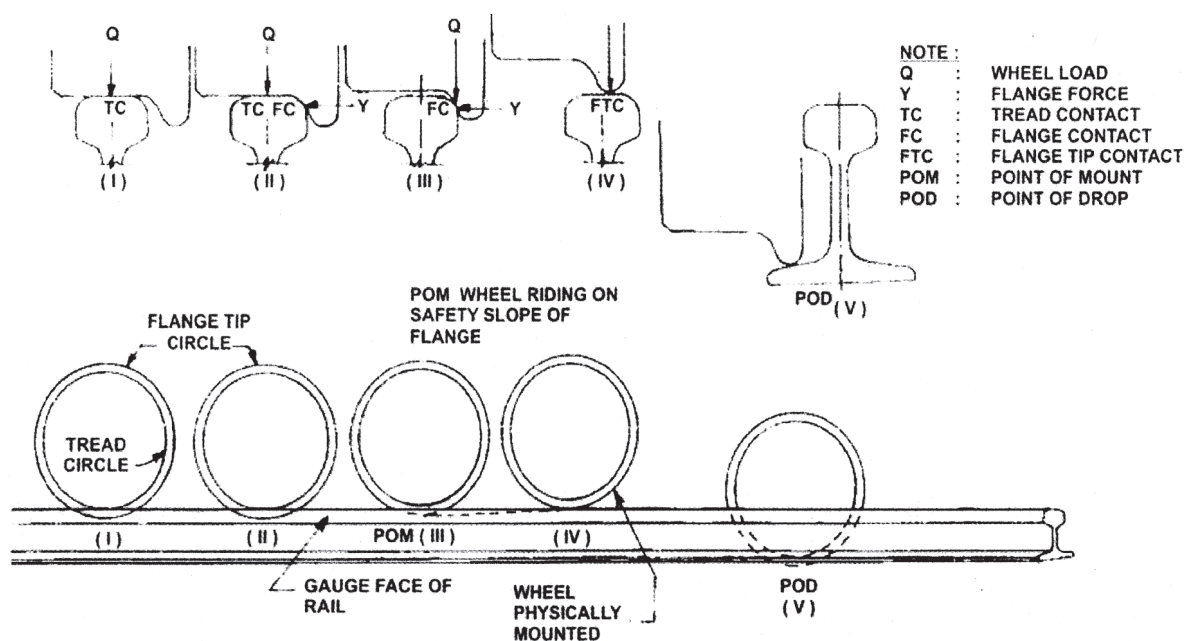
**(ii) If, the derailment is suspected to have started near the crossing, the following points must be carefully checked:-**

- Condition of nose-wear, breakage, chipped, bent
- Reduction in the level of nose as compared with wing rails.
- Clearance between wing rail and stock rail (near the nose) on both sides.
- Clearance between guard rail and stock rail

Alignment of turnout to be measured for checking smoothness (with 6 metre chord at 1.5 metre intervals)

IRPWM has specified a check-list for complete examination of points and crossings.

There is one potentially dangerous structure called diamond crossing, which is generally not provided on the main line. A simple diamond crossing has four noses (two acute angle and two obtuse angle), which require a critical watch. Even a slight damage to these noses or disturbance to the clearance between stock rails and guardrails make this diamond crossing unsafe. The problem is further compounded if a diamond crossing has one or two slips also. The curvature of the slip is generally so high that these structure are not fit for speeds above 8 to 10 kmph. It is advisable to avoid use of these structures.



**Fig. 1.1 Rail-wheel interface.** (i) during normal movement of vehicle, (ii) when the wheel flange starts sliding up the rail during the process of flange-climbing derailment.

#### 17.06: Some Important Defects:

##### (a) Permanent Way:

- Spread gauge
- Gaping in points
- Tipping of the toe of switch
- Worn out & broken tongue Rail
- Excessive clearances of check rail opposite to the nose of the crossing
- Loose or slack points connections
- Sharp curves with kinking alignments
- Worn out Rails
- Abrupt introduction of super elevation
- Super elevation not corresponding to speed of the train

- Buckling of track
- Shearing of fish plate bolts
- Subsidence of track
- Uneven Cross level
- Condition of Ballast
- Security fastening deficient/loose

Track defects, solely or in combination with vehicle defects, can cause accident and therefore it is very essential to check the various parameters of the track and vehicle defects. The following parameters of track must be checked thoroughly to pin point the defects in the track. However, the mechanism of derailment should be in conformity with the type of defects in the track. The Maximum limits of the following factors are good riding quality for passenger comfort and not safety limit. Any track defects should be in conformity with the mechanism of derailment (para-607 (2) and (3) of IRPWM).

**(i) Gauge:**

The standard gauge is 1676 mm.

**(ii) Permissible Variations:**

- Straight line—6 mm tight to 6 mm slack ( $\pm 6$  mm)
- On curve with radius 350 Mtrs or more---6 mm tight to +15 mm slack (-6 to +15 mm)
- On curve with radius less than 350 Mtrs---Slack up to +20 mm (correction slip No. 10 Rly Bd. L.No. 94/CE/II/TSG/I Dt. 20/24-6-96 of P. Way, manual)
- Gauge sleeper to sleeper Variation—2 mm

Cross-level of the track is relative level difference between the two rail tables measured perpendicular to the track at the same point. It includes the variation in the super elevation in case of curve cross level to be recorded on every fourth sleeper or 3 mts apart. The cross level reading helps in calculating the TWIST available in the track. TWIST is calculated in mm/meters by using the formula.

$$\text{Twist} = \frac{(\text{Cross level at point A} - \text{Cross level at point B}) \text{ in mm}}{\text{Distance between A \& B in meters.}}$$

**IRPWM Para 607(2) :**

The following limits of track tolerances are prescribed for the guidance of the Engineering officials on the suitability\* of standard of maintenance of track for sanctioned speeds above 100 Km/hr. and upto 140 km/hr on BG track.

- (i) Alignment defects:** (Versine measured on a chord of 7.5 metres under floating conditions)
- a) **On Straight Track:** 5mm; values upto 10mm could be tolerated at few isolated locations\*\*.
  - b) **On Curves** \_\_\_\_\_ + 5mm over the average Versine, Values up to + 7mm could be tolerated at few isolated locations\*\*.

Total change of Versine from chord to chord should not exceed 10mm.

(ii) **Cross Level Defects** — No special tolerance limits. As regards cross levels, the track should be maintained, to standards generally superior to that at present available on main line track on which unrestricted speeds upto 100 Km/hr. are permitted.

(iii) **Twist** — (to be measured on a base of 3.5 m)

(a) **On straight and curve track, other than on transitions** — 2mm/metre except that at isolated locations\*\*, this may go upto 3.5mm/metre.

(b) **On transitions of curves** — Local defects should not exceed 1mm/metres, except that at isolated locations\*\* this may go upto 2.1 mm per metre.

(iv) **Unevenness rail joint depressions (Versine measured on a chord of 3.5m)** — 10mm in general and 15mm for isolated locations\*\*.

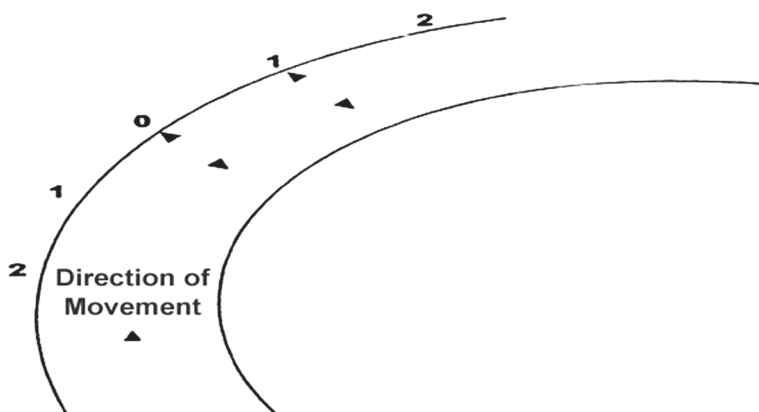
(v) **Gauge variations** — No special specifications. The maximum limits for tight and slack gauge should be as indicated in Para 224(2) (e) of IRPWM.

(\*) **Suitability** - Suitability refers to good riding quality for passenger comfort and not from stability point of view.

(\*\*) In above 'few isolated locations' has been taken as not exceeding 10 per km.

(iii) **Unevenness:** - This defect of the track is not reflected in the gauge and cross level reading. Low joints, high joints, loose packing, sleepers and lifting of sleepers cause this defect. Long sags are not taken as unevenness. It is recorded for left and right rail separately. It is measured in terms of difference in longitudinal levels over a fixed base. Unevenness gives rise to forced oscillations in a vehicle and can cause variations in the values of instantaneous Wheel load and lateral thrust. (Para 607(1) of IRPWM classifies unevenness (measured on 3.6 Mts cord) above 15mm as category D).

(iv) **Versine and super elevation:** Versine and super elevation are measured for checking correctness of a curve. At the beginning and at the end of the curve, details of the curve are mentioned on the board. Radius of any curve is obtained by dividing 1750 mtrs, by its degree.



Versine is calculated as:

$$V_s = 125.C^2/R$$

R - Radius in meters

C - Cord length in meters

V<sub>s</sub> - Versine in mm

**As per Para 421(2) of IRPWM,** The running over a curve depends not only on the difference between the actual versine and the designed versine but also on the station-to-station variation of the actual versine values. This is because it is the station to station variation of versine which determines the rate of change of lateral acceleration, on which depends the riding comfort. Service limit for station to station versine variation for 3 speed group viz. 120 Km/h and above, below 120 Km/h and upto 80 Km/h and below 80 Km/h and upto 50 Km/h, should be considered as tabulated below:

Speed Range	Limits of station to station Variation (mm)
120 Km/h and above	10 mm or 25% of the average versine on circular curve whichever is more
Below 120 Km/h and upto 80 Km/h	15 mm or 25% of the average versine on circular curve whichever is more
Below 80 Km/h and upto 50 Km/h	40 mm or 25% of the average versine on circular curve whichever is more

In case exceedence of the above limit is observed during an inspection, local adjustments may be resorted to in cases where the variation of versines between adjacent stations is only at few isolated locations, at the earliest possible. If more than 20% of the stations are having versine variation above the limits prescribed, complete realignment of the curve should be planned within a month.

**The super elevation is calculated as:**

$$C = GV^2 / 127R$$

C = Cant/Super elevation in mm.

G = Dynamic gauge in mm (gauge of track + width of rail head in mm)

V= Speed in Km/h

R= Radius of the curve in meters.

#### **Para 406 ( d) of IRPWM**

Maximum cant on curved track shall be as under –

- (1)(i) **Broad Gauge** – Group ‘A’, ‘B’ and ‘C’ routes-165 mm.

Note :– Maximum cant of 185 mm. may be assumed for the purpose of locating all permanent structures etc., by the side of the curves on new constructions and doubling on group ‘A’ routes having potential for increasing the speed in future. The transition length should also be provided on the basis of 185 mm. cant for the purpose of planning and layout of the curve.

- (ii) **Broad gauge** – Group ‘D’ and ‘E’ routes-140mm.

IRPWM specifies a maximum cant of 165 mm. on group A, B and C routes and 140 mm on group D and E routes. The maximum amount of cant deficiency is also specified in para 406(2) as given below :

- (2) **Cant Deficiency** – Maximum value of cant deficiency –

(a) For speeds in excess of 100. km.p.h. on Groups ‘A’ and ‘B’ routes for nominated rolling stocks and routes with permission of the Chief Engineer. .... 100 mm.

(b) For Broad Gauge routes not covered by above .....75 mm.



(V) **Ballast:** - It is a very important member in the track structure. It provides resilience of damage on the track. It also helps in maintaining track Geometry. The ballast resistance is affected by following factors -

Ballast – Size, Material, Shape, State of consolidation, Type of sleeper, Cushion at Formation.

Para 263(2) I RPWM recommends the Minimum depth of ballast below the bottom of the sleeper at rail seat as under:

Minimum depths of Ballast Cushion – (a) The recommended minimum depth of the ballast below the bottom of the sleepers at the rail seat should be as under –

**Groups Recommended depth:**

B.G. – Group- ‘A’ - 300 mm

B.G. –Group- ‘B’ and ‘C ‘ - 250 mm

B.G. –Group- ‘D’ -200 mm

B.G. - Group ‘E’ - 150 mm

**Note:-** (i). In case of SWR the recommended depth is 200mm

(ii) Whenever primary renewals are carried out even on ‘E’ routes, the minimum depth of ballast of 200mm shall be provided.

(iii) Minimum depth of ballast under the rail seat of the sleepers shall be 150mm except under PRC sleepers where it shall be 250mm.

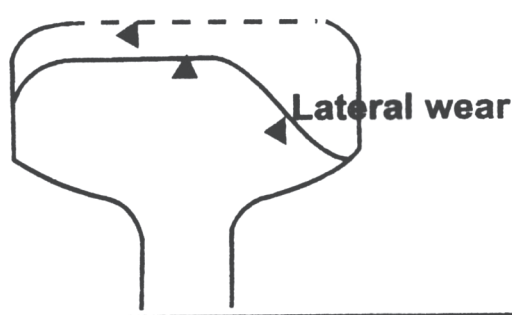
(iv) Wherever 22.1 t Axle load rolling stock is nominated to run the minimum depth of ballast shall be 350mm.

However, reduced ballast may not directly cause derailment unless the track geometry is substantially disturbed.

(vi) **Rail:** Rail/Weld fracture takes place when its strength is exhausted due to long service, corrosion, fatigue and sudden impact like oblong/wheel flat, impact of derailment, etc. Overloading will accelerate reduction of fatigue life of rail and may lead to premature failure suddenly under normal/ lesser axle load.

The accident caused by rail fracture does not leave much room for investigation. It is often not clear whether rail/weld fracture is an after effect of derailment or is the cause of derailment. The fractured rail is to be tested to find out the nature of the failure. The visual inspection can reveal whether the fracture was new or there was some old flow in the rail. For other derailments, the rail is measured for its wear. The rail wears out, mostly on the top surface and gauge face. Rail wear can be vertical, lateral or angular.

- Angular wear
- Profile of new rail
- Vertical Wear



## Worn profile

The limits of wear of rail have been laid down in IRPWM Para 302 (b) for proposing for sanction of renewal work.

Gauge	Rail section	Vertical wear
B.G.	60 kg/meter	13mm
	52kg/meter	8mm
	90R	5mm

Lateral wear limits have been given in para 302 (b)

Section	Gauge	Category of track	Lateral wear
Curves	B.G.	Group A & B routes	8 mm
		Group C & D routes	10 mm
Straight	B.G.	Group A & B routes	6 mm
		Group C & D route	8 mm

The above limits are laid for planning track renewal and are not the safety limit.

**(vii) Sleepers:** If sleeper suffer any damage or loss in property, it can cause derailment. While recording the gauge and level readings, the condition of each sleeper near point of mount must be carefully checked and recorded.

**(viii) Rail Fasteners:** For different - type of sleepers, the rail fasteners are different. For Wooden sleepers - Dog spikes, Round head spikes, Steel keys Steel trough sleeper - steel keys

Prestressed concrete sleepers(PSC)— elastic clips with liners between the foot of rail and clip.

Condition of all fasteners should be recorded while taking track reading

**(ix) Creep:** - This is a silent but very dangerous phenomenon of the track. Creep is a longitudinal displacement of track and is caused by

- Temperature variation causing expansion and contraction of the rail.
- The tractive forces of locomotive to push the rail backward.
- Braking forces of train trying to push the rail forward. The effect of the above forces is accelerated if the rail fasteners are not able to hold the rails properly to the sleepers or rail seat on the sleepers is a damaged or bad joint in the track with out proper expansion gap.

As per IRPWM para no.242 (2), following are some of the causes to which creep is attributed:

- Inadequate toe loads of the rail to sleeper fastening and rails not secured properly to sleeper.
- Inadequate ballast resistance to the movement of sleepers due to poor or insufficient ballast or other causes.
- Inefficient or badly maintained rail joints.
- Rails too light for the traffic they carry.
- Improper expansion gaps.
- Decaying sleepers, uneven spacing of sleepers.
- Lack of proper drainage.
- Yielding formation resulting in uneven cross levels.
- Loose/uneven packing.
- Rail seat wear in metal sleeper road.

Para 242 (6) of IRPWM specifies maximum creep permitted is 150mm. In LWR and CWR creep is measured at SEJ (Switch Expansion Joint) on either end of LWR/CWR.

(x) **Buckling:** When a section of track buckles, the track leaves its place and moves side way. This also happens due to the rise in temperature and other reasons similar to the creep. The buckling may be horizontal or vertical. Buckling normally happens in the 2nd half of the day mostly, when the track has absorbed maximum heat and also near the bridges, level crossings etc. where the track is firmly held in ground. In case of straight track buckling may take shape of 'S' curve or simple curve. However, in case of curved track buckling will cause the track to move out side of the original curve.

(b) **Defects of Rolling Stock**

- Defects in wheel and Axle Broken & Hanging fittings
- Defects in Bolster and Assemblies
- Defects in spring gear, axle guard and trolley
- Defects in Brake gear
- Excessive Clearance in side bearer, pivot etc and restraining pivot surface.
- Hot box/Roller bearing failure
- Under frame and under frame members out of alignment
- Defective Draw gear, CBC gear and Buffing gear, Train parting & subsequent-collision – 'alliance 2' – couplets opening automatically.
- Hot axle, brake binding
- Dimensional variation of wheels, spring dashpot, oil level.
- Sudden shifting of load
- Improperly loaded vehicle.
- Resonant rolling, nosing or hunting
- Speed in excess of maximum permissible speed around a curve or turnout.
- Sudden variation in draw bar forces induced by a possible improper train operation: braking or acceleration.

Defects of Locomotives are very similar to defects of Rolling Stock

(c) **Para 607 (3) of IRPWM:** The stability of trains against derailment depends upon several factors such as track geometry, vehicle characteristics and state of their maintenance and speed of the particular vehicle at relevant point of time etc. Rail wheel interaction is thus, a complex phenomenon and therefore, safety tolerances for track alone cannot be prescribed in isolation. With this in view, safety tolerances for maintenance of track have not been prescribed on Indian Railways. Each derailment case, therefore, needs careful examination of all available evidence, in respect of Track, Rolling Stock, speed and other factors considered relevant, to arrive at the cause.

The provision and tolerances mentioned in para 607(2) and elsewhere in IRPWM are with a view to maintain track geometry for good riding comfort.

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## CHAPTER-18

## LOCO LINK, POWER PLAN, CREW LINK, ELECTRIC ROLLING STOCK AND LOCO MAINTENANCE SCHEDULE

**18.01: LocoLink:**

Locomotives are our precious assets and hence proper and intensive utilization of the same is very vital for the overall efficiency in operation. As per the availability of traction, a division may utilize diesel and electrical locos. Locos are utilized for carrying passenger and goods trains as well as for shunting purposes. Keeping in view the pattern of traffic, the Railway Board lays down average number of such locos each zonal railway may hold at a time. The zonal headquarters prescribe similar targets for each division. Deputy Chief Controllers and Power Controllers keep a close watch of the holding of locos on their divisions and ensure making and taking over of goods trains and light engines to maintain proper average balance of locos as per the targets and requirement of traffic.

Power controller keep a record of loco motives which are required to be sent to their home sheds for various maintenance schedules and when the same locos would be available after the scheduled repairs. They also maintain close liaison with the adjoining divisions to forecast the availability of locos during the next 8 to 24 hours. This forecast helps the Deputy Chief Controllers in ordering goods trains in the division.

The locomotives for mail, express and passenger trains mostly work on link basis. Loco links are required to be worked out in such a way that there is least detention at a terminal between two consecutive links and ample time is available on completion of a link for maintenance of locomotive at shed. The Power Controllers have to keep close liaison with the sheds and stations that such locos are available in time for working these trains punctually. In case of defect in a link engine, either the defect should be rectified in time or another loco should be arranged to ensure that the corresponding passenger carrying train is not delayed.

**18.02 General Basis of Working out of Loco Link:**

- (a) 10 % of the holding of locos in any shed will be for heavy repair spare.
- (b) Passenger carrying trains links are made in such a manner that the idle time of locos is very minimum.
- (c) Locos will touch a satellite depot or home depot for trip schedule once a week.
- (d) Links are to be prepared before commencement of new time table.
- (e) Links are so drafted that enough time is allowed for completion of trip schedule and pick up the link.
- (f) Out of the balance number of locos after providing for link service, 10% of this balance will be for minor repairs.  
The other locos are offered for goods service. The outage for goods trains is monitored on hourly basis.
- (g) The important terminal yards for the goods trains are identified and turn round for carrying goods is provided as less as Possible so that idling of engines are minimized and only fueling and crew checking is done.
- (h) In some major yards trouble shooting gangs attend any minor repairs during turn round.
- (i) Locomotives working Express trains on links will be utilized for goods services at terminal points during the lie over time.

- (j) Normally, monthly schedules are only done apart from heavy repairs in the home depot. Fortnightly trips schedules are done at satellite depots.
- (k) Ensure loco is permitted to run on the sections at the maximum permissible speed of the train.
- (l) Minimum possible outstation halt should be provided.
- (m) Loco links are prepared by HQ's office and circulated to the divisions. The objective of power links is to ensure optimum utilization of power.

**18.03 Power Requirement (Power Plan):**

- (a) Power plan is to be prepared once in a year.
- (b) Average number of trains run on each section per day and average hours on road for last one year duly signed by Sr. DME(P) and Sr. DOM are to be prepared.
- (c) **Formula:** section wise average freight Power on Line (POL) for the last one year is to be calculated as under.  
  
Bare POL= PDD + HOR + PAD , where  
  
PDD = Pre departure detention  
  
HOR = Hours on load  
  
PAD = Post arrival detention
- (d) 3.5% further growth and 10% bunching allowance are to be demanded on bare POL.
- (e) Loco's requirement for DMT, ART & other locos which remain in outage but not added in POL for the purpose of calculation of average kilometers to be added in the bare requirement.
- (f) To arrive total POL, last one year's average POL of shunting loco link WDS-4, WDS-5 pilots and mail lie over to be added in the POL calculated above.
- (g) Mail/express/passenger loco requirement is to be worked out on the basis of loco link and add 10% for major repair allowance.
- (h) For shunting services work out number of points for 8 hours shunting, demand 0.33 POL. Add one loco as overlap against six locos. Add 10% for major repairs.
- (i) **Kilometer formula:** Total kilometers earned on the average per day during last one year divided by average loco utilization.

**18.04: Procedures for Calculating Crew Requirement of a Division:**

- (a) Running staff review should be carried out after every year i.e. on 1<sup>st</sup> July by the division.
- (b) Before preparing review, loco pilot's links of all the shed should be got prepared and vetted by personnel branch.
- (c) Statement of avg. hours on road and no. of goods.
- (d) Trains run during last one year for each section should be ready duly approved by Sr. DOM/DOM. A list of shunting points and DMTs running to be prepared and signed by Sr. DOM/DOM.
- (e) Mail/Express/Passenger loco pilots requirement to be worked on the basis of loco pilots/crew links.

## **254** *Loco Link, Power Plan, Crew Link, Electric Rolling Stock & Loco Maintenance Schedule*

- (f) For goods crew the requirement should be worked out as per power plan signed by Sr DME(P) and Sr. DOM. 7.67 Crews are to be demanded for one freight POL. Separate crews to be demanded for the activities which cannot be covered in power plan e.g., Light Engine and Empty coaching rakes running etc.
- (g) 30% leave reserve and 10% trainee reserve should be demanded for this additional requirement.
- (h) Shunters should be demanded @ 1 against 8 hrs. Point. Also rest giver @ 1 for 6 Shunter to be demanded. Leave reserve and trainee post to be demanded separately.
- (i) Requirement of ALPs should be same as that of loco pilots (Excluding motormen where no assistant loco pilot is required).
- (j) Running staff review duly signed by Sr. DME/Sr. DEE should be put up to Sr. DFM for vetting.
- (k) After accounts vetting sanction of DRM may be taken and Sr. DFM will issue circulars of revised sanction.
- (l) Running supervisors review should also be made with staff review @ 1 loco Inspector against 25 loco pilots or 50 shunters. No rest giver is allowed for supervising category. However, leave reserve @ 12.5% should be considered.

### **18.05: Points to be kept in view while preparing loco pilot's links:**

- (a) Loco pilot/Crew links are prepared by Chief Power Controller/Chief Traction Loco Controller and got verified from Personnel Branch. Objective of crew links is to ensure optimum utilization of crews.
- (b) Train timings to be checked from the latest time table.
- (c) Links to be prepared before promulgation of new time table.
- (d) Max. duty hours in any one trip should not exceed 10 hours.
- (e) Avg. duty hours in a fortnight should not exceed 104 hours.
- (f) Minimum number of rests in a month should be 5 of 22 hrs. or 4 of 30 hours, including night in bed from 22 hrs. to 6 hrs. from sign off to sign on.
- (g) Efforts should be made to include all the sections in the link to avoid giving learning road again and again.
- (h) Minimum out station rest in case less than 8 hrs. duty in the previous trip should be 6 hrs from sign off to sign on. In case duty is 8 hrs or more than 8 hrs, then 8 hrs rest to be given. In case of short trips of less than or equal to 5 hours then duty performed plus 1 hr will be sufficient.
- (i) Minimum home station rest should be:
  - 1. If duty performed in the last trip is less than 8 hrs., then 12 hours rest.
  - 2. If duty is 8 hrs. or more, then 16 hours rest.
  - 3. If staff is required to work train after getting less then stipulated rest then breach of rest allowance is payable to running staff.
- (j) Separate links should be prepared for superfast trains such as Rajdhani/Shatabdi Exp.
- (k) Chronic late running trains should be kept in view to avoid link failures.
- (l) Link having the maximum earning kilometerage should be worked by senior most loco pilots and so on.

## **GENERAL DESCRIPTION OF ELECTRIC ROLLING STOCK**

### **18.06 Classification of Electric Rolling Stock**

Locomotives and Multiple Unit stocks are classified by means of a three/four letter code followed by a number to indicate the individual class and a series of the same. The code letters used for AC locos and EMUs are given below:

- a) The first letter denotes the Gauge: 'W' for BG and 'T' for MG.
- b) The second (middle) letters 'A' denotes the system of power supply for which it is suitable - A for AC & C for DC, CA for DC & AC.
- c) The third letter for locos indicates the class of service.
- d) 'M' for mixed traffic locos suitable for both passenger and freight services, 'G' for Freight (Goods) service locos, 'P' for Passenger services locos, and 'S' for Shunting locos.
- e) Multiple Unit Stock is denoted by the letter 'U'.

### **18.07 The various classes of AC locos and EMUs at present in service on Indian Railway are as under:-**

- a) AC Locos- WAG1, WAG2, WAG3, WAG4, WAG5, WAG6, WAG7, WAG9, WAG9M
- b) WAP1, WAP2, WAP3, WAM1, WAM2, WAM3, WAM4, WAP4, WAP 5, YAM1
- c) AC/DC Locos- WCAM1,
- d) AC EMUs- WAU1, WAU2, WAU3, WAU4, YAU.

In addition two types of BG DC EMUs converted for AC working are in use on the Eastern Railway.

### **18.08 Important Equipment of Electric Loco/EMU**

#### **a) Pantograph :**

For collecting power from 25 kV ac contact wire pantographs are mounted on the roof of the traction vehicles. AM 12 pantograph of Faively design has been adopted by Indian Railways for 25 kV ac electric locomotives and EMUs. These pantographs are provided with steel strips for current collection. The raising and lowering of the pantograph is by means of a pneumatically operated servo motor. This pantograph is a single pan design having two o-springs mounted on it. For keeping the pantograph in the lowered condition, main springs have been used. The suspension of pan is on plungers.

This pantograph is suitable for operation upto 140 km/h. For increasing the speed potential, improved pantograph with lower dynamic mass and independent pan heads have been used. Further, in order to improve the life of the contact wire, use of carbon strips has also been tried. Use of carbon strips for current collection has already been adopted in European countries.

#### **b) Circuit Breaker :**

- i) Air Blast Circuit breaker
- ii) Vacuum Circuit breaker

These breakers are designed for isolation of power to the traction vehicle in the event of faults.

Vacuum Circuit Breakers were introduced on electric locomotives on Indian Railways. in the year 1985. The VCB is a simplified design with fewer number of parts (260 Nos.), have a simplified control block and self - contained interrupting medium that is vacuum. Due to these features, the life of the main



contact achievable is as high as 1 lakh electrical operations as against 20,000 operations for air blast circuit breakers. As a result, the periodicity of replacement of main contact is second POH for VCB and IOH for Air Blast Circuit Breakers. Besides, these factors, VCB also offers the advantages of reduced size, reduced weight and reduced maintenance cost as compared to these for air blast circuit breakers. The total trip-time for VCB is less than 60 milli-seconds while the same is of the order of 100 milli-seconds for air blast circuit breakers. The air blast circuit breaker is only capable of breaking the fault current with breaking capacity of 250 MVA. The VCB, besides having breaking capacity is also designed for making capacity of the same rating, i.e. 250 MVA and can handle the same level of fault current during closing also.

**c) Transformer :**

Power to the traction vehicles is available at 25 kV ac single phase from the contact wire. In order to step down the voltage as well as to control the same for feeding to the traction motors, the traction power transformers are provided on the traction vehicles.

These transformers generally have a primary winding, a regulating winding, traction secondary windings and auxiliary windings. The regulating winding is designed for choosing appropriate voltage for the traction motors. The auxiliary winding is required for feeding the auxiliary motors on the locomotive.

In order to increase the h.p. of the locomotives, the traction transformers have been uprated from time to time keeping the overall dimensions unchanged on account of space constraint. The upratings have been achieved by using increased copper section of the conductor used, improved insulation scheme and in certain cases adoption of aluminium foil wound construction for minimizing the losses.

With the introduction of thyristorised converters, the design of the traction transformer has undergone simplification with the deletion of regulating winding. The transformer for thyristorised converter becomes a two limb construction and traction secondary winding split into 4 windings for two step sequence control.

The traction transformer necessarily has to have forced oil circulation and forced air cooling. For this purpose oil pump, oil cooler and blower form an integral part of the traction transformer.

**d) Tap Changer :**

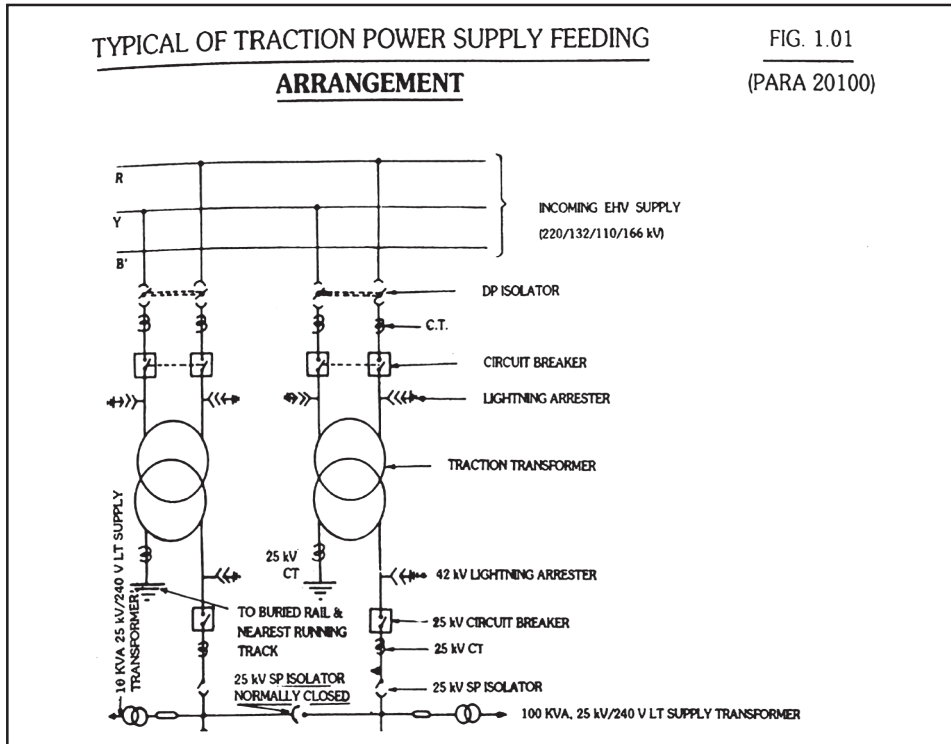
Tap changer is provided on 25 kV (HT) regulating winding of locomotive transformer for controlling the voltage input to main transformer.

**e) Traction Motor :**

In case of traction motor great emphasis is being given on improving power to weight ratio, keeping in view the limited space available on locomotive for mounting the same. There is continuous effort to improve the performance of traction motor by making them lighter/compact, at the same time more reliable. Indian Railways have been adopting the latest technology available for design and manufacture of traction motor. Over a period of years the traction motors have become now 2.5 times lighter specially for EMU application.

**f) Arno Converter :**

Arno Converter is a special duty machine for conversion of single phase in-coming supply into 3 phase out- put supply. 3 phase supply is essentially required on most of the electrical locomotives for driving certain auxiliary equipment like blowers and compressors. The function of Arno Converter is to supply 3 phase power required for these auxiliaries.



#### 18.09: Loco Maintenance Schedule

##### (a) Conventional Locos:

##### (i) Coaching Locos-( WAP-1/WAM-4/WCAM-1,2,3/WCAG-1/WCG-2/WCM-6)

Railway Board letter No. 92/Elect (TRS)/138/5 Pt. I, dated 18.10.2001

Railway Board letter No. 92/Elect (TRS)/138/5 Pt. II, dated 21.12.2001

Railway Board letter No. 2006/Elect(TRS)/138/1, dated 13.11.2006

Maintenance schedule	Periodicity	Duration
Trip inspection (TI)	After 3000 kms or one trip, whichever is later	02 hrs
IA	40 $\pm$ 3 days	04 hrs
IB	80 $\pm$ 3 days	06 hrs
IC	120 $\pm$ 3 days	08 hrs
AOH	12 month $\pm$ 15 days	06 working days
IOH	36 month $\pm$ 1month or 4 lakh kms (6 Lakhs for WAP - loco ),whichever is earlier.	09 working days
POH	6 years $\pm$ 3months or 8 lakh kms.(12 lakh for WAP -1 loco) whic hever is earlier	24 working days

**ii) Coaching Locos- WAP-4**

Railway Board letter No. 92/Elect (TRS)/138/5 Pt. I, dated 18.10.2001

Railway Board letter No. 92/Elect (TRS)/138/5 Pt. II, dated 21.12.2001

Railway Board letter No. 2006/Elect(TRS)/138/1, dated 13.11.2006

Railway Board letter No. 2007/Elect(TRS)/138/1 Pt., dated 20.03.2012

Maintenance schedule	Periodicity	Duration
Trip inspection (TI)	After 3000 kms or one trip, whichever is later	02 hrs
IA	40± 3 days	04 hrs
IB	80±3 days	06 hrs
IC	120±3 days	08 hrs
AOH	12 month ±15 days	06 working days
IOH	36 month ± 1 month or 6 lakh kms whichever is earlier.	09 working days
POH	6 years ±3months of 12 lakh kms.whichever is earlier	24 working days

**(iii) Freight Locos-WAG-5 Locos (Fitted with TAO TMS)**

Railway Board letter No. 92/Elect (TRS) 138/5 Pt. I, dt.18.01.2001.

Maintenance schedule	Periodicity	Duration
Trip inspection (TI)	15 days (fitted with TAO TMs) 120 days (fitted with Hitachi TMs)	02 hrs
IA	45± 3 days	04 hrs
IB	90±3 daus	06 hrs
IC	135±3 days	08 hrs
AOH	18 month ±15 days	06 working days
IOH	54 month ± 1 month or 6 lakh kms. Whichever is earlier	09 working days
POH	9 years ± 3months or 12 lakh kms. whichever is earlier	28 working days

**(iv) Freight Locos WAG-5 TAOchi, WAG-5H & WAG-7 Iocos**

Railway Board latter No.92/Elect (TRS) /138/5 Pt, I, dt 18.01.2001

Railway Board latter No.92/Elect (TRS) /138/5 Pt, III, dt 19.04.2011

Railway Board latter No.92/Elect (TRS) /138/5 Pt, III, dt 16.08.2012

Railway Board latter No.2009/Elect (TRS) /720/2 Pt, I, dt 19.12.2012

Maintenance schedule	Periodicity	Duration
Trip inspection (TI)	20 days	02 hrs
IA	$60 \pm 3$ days	04 hrs
IB	$120 \pm 3$ days	06 hrs
IC	$180 \pm 3$ days	08 hrs
AOH	18 month $\pm$ 10 days	06 working days
IOH	54 month $\pm$ 1month Or lakh kms, Whichever is earlier	09 working days
POH	9 years $\pm$ 3months or 12lakh kms. whichever is earlier	28 working days

**260 Loco Link, Power Plan, Crew Link, Electric Rolling Stock & Loco Maintenance Schedule****(b) 3-Phase (ABB) Locomotives****(i) Coaching Locos-WAP5/WAP7 locos**

Rly. Board Letter No. 97/Elect (TRS)/440/18/44(3-Phase), Date:23.02.2007

Maintenance schedule	Periodicity	Duration
Trip inspection (TI)	300 kms or one Trip which ever is Later	02 hrs
IA	90 days	04 hrs
IB	180 days	06 hrs
IC	270 days	08 hrs
MOH	18 months	6 working days
IOH	4.5 years $\pm$ 6 months Or 12 lakh kms. Whichever is earlier	WAP-7 (11 working days) WAP-5(20 working days)
POH	9 years $\pm$ 6 months or 24 lakh kms. whichever is earlier	28 working days

**(ii) Freight Locos WAG9/WAG9H Iocos**

Rly Bd.Letter No97/Elect (TRS)/1844 (3-Phase),dt.23.02.2007

Maintenance schedule	Periodicity	Duration
Trip inspection (TI)	15 days , 45 days 120 days	04 hrs
IA	90 days	04 hrs
IB	180 days	06 hrs
IC	270 days	08 hrs
MOH	18 months	6 working days/ 08 working days for 2 <sup>nd</sup> MOH.
IOH	6 years $\pm$ 6 months or 12 lakh kms. Whichever is earlier	11 working days.
POH	12 years $\pm$ 6 months or 24 lakh kms. whichever is earlier	28 working days

(c) Diesel loco schedule & duration

[illegible]

## 18.10: ELETRIC LOCOMOTIVE FEATURES

S. NO.	Description	WAM4	WAP1	WAP4	WAP5	WAP7	WAG5	WAG5H	WAG6	WAG7	WAG9	WAG9H
1	Supply System-AC{kV}	25	25	25	25	25	25	25	25	25	25	25
2	Continuous HP	3850	3800	5000	5440	6120	3850	3850	6000	5000	6120	6120
3	Max. Speed (kmph)	110	130	140	160	130	105	80	120	100	100	90
4	Starting Tractive Effort (Tonnes)	33.5	22.4	32.4	26.29	32.88	33.5	33.5	46	44	46.89	52
5	Continuous Tractive Effort {Tonnes}	20.6	13.8	18.8	22.42	23.23	20.6	20.6	32	27	33.12	46
6	Total Weight	118.8	108.3	112.8	78	123	118.8	123	123	123	123	123
7	Braking	Air	Air	Air	Air Regen	Air Regen	Air Rheo	Air Rheo	Air Rheo	Air Rheo	Air Regen	Air Regen
8	Bogies Arrangement	Co-Co	Co-Co	Co-Co	Bo-Bo	Co-Co	Co-Co	Co-Co	Bo-Bo-Bo	Co-Co	Co-Co	Co-Co
9	Bogies Type	Cast	Cast	Flexicoil	Fab	Cast	Cast	Cast	Fab	Fab.	Fab.	Fab.
10	Gear Ratio	21:58	21:58	23:59	17:35:67	20:72	17:77/15:62	18.64	16:63/20:75	16:65	15:77/21:107	21:107
11	No. of Traction Motors	6	6	6	4	6	6	6	6	6	6	6
12	Traction Motor	TAO 659	TAO 659	TAO 659	6FXA-7059	6FXA-6068	TAO 659	HS-15250A	ASEA-L3M450-2	HS-15250A	6FRA-6068	6FRA-6068 HT
13	Axle Load	19.8	18.05	18.8	19.5	20.5	19.8	20.5	20.5	20.5	20.5	20.5
14	Max Regen braking Effort (KN)	-	-	-	160	182	-	-	-	-	260	-
15	Max Dynamic braking Force (Tonnes)	-	-	-	-	-	21.0	21.0	25.0/20.0	22.0	-	-



## CHAPTER-19

### TRAIN EXAMINATION

#### A. FREIGHT TRAIN EXAMINATION

**19.01: Introduction:** An essential ingredient in the successful running of a railway is a well maintained system. Train maintenance is very important and this chapter outlines the methods and systems used for train maintenance.

Rolling stock is the most maintenance intensive part of the railway system and is most vulnerable if maintenance is neglected. A stalled train will block railway working immediately and will reduce a timetable on an intensively used system to an unmanageable shambles for the remainder of the day. Reliability is the key to successful railway operation and maintenance should be the number one priority to ensure reliability.

**19.02: C&W Examination Points in ECoR:**

The examination points in ECoR and different types of examinations that are carried out at these examination points are listed below:

Division	Stock	Depot	Type of examination	CCcircuit	Validity of CC rake BPC
KUR	BOBRN	PRDP	CC/Premium	ECoR & SER	7500 km or 35 days
	BOYEL	PRDP	CC/Premium	ECoR Only	6000km or 30 days
	BOXN	PRDP	Premium	—	—
	All other stock	PRDP	Intensive	—	—
	BCN	CTC	Premium	—	—
	All Stock	CTC	Intensive	—	—
	Steel Rakes	MRDL	Round Trip	Steel Plant Destinations	Round Trip
WAT	BOXN,BOXNHL & BOBRN	OEC,RYD & RMUY/VSPS	CC/Premium	ECoR,SECR,SER, SCR & ER	7500 km or 35 days
	BOYEL & BOXNEL	OEC & RYD	CC/Premium	ECoR only	6000km or 30 days
	BTPN	RYD	CC/Premium	ECoR,SECR,SCR & upto NKJ/WCR	6000km or 30 days
	BOST,BRN, Concord	RYD/OEC	Premium	—	—
	BOST,BRN, Concord	RMUY & FPY/VSPS	Round Trip	Steel Plants Destinations	—
	Only BOXN & BCN	RGDA	Intensive	All other stock to bypass	
SBP	Only BOXN & BCN	KBJ	Premium/Intensive	All other stock to bypass	

Trains moving with invalid BPC will be offered for C&W examination at first examination point in the direction of movement.

**19.03: Characteristics of Premium and CC Rakes:**

SN	Characters	Premium Rakes	CC Rakes
1	Loading Cycle	Multiple	Multiple
2	Validity for loading	12 days	30/35 days
3	Grace period for movement over and above validity period for loading	03 days	—
4	Colour of the BPC	Green	Yellow
5	Formation(Wagon Selection)	Good Condition	Off POH/ROH and New Wagons
6	KM logging/Monitoring of KM and validity	Monitoring on basis of days	Loco Pilot to log kilometers, monitoring through control (Division/HQ) and through FOIS
7	Post Loading/Unloading Check		
	TXR Point	TXR Staff	TXR Staff
	Non-TXR Point	Crew and Guard	Crew and Guard
	BOBRN Rakes	Refer Para 19.04.03 of this Chapter	
8	On becoming overdue /Invalid BPC		
	Empty condition	To be moved to nearest TXR point for C&W examination	Intensive examination with 07 days/one trip validity of BPC in the direction of base depot.
	Loaded Condition	Fresh C&W examination if more than 12+3 days	To be moved to nearest TXR point in the direction of movement for C&W examination to allow it tobase depot after unloading.
9	BPC becomes invalid in different cases		
	Expiry of period/KMs	12+ 3 days	30/35 days or 6000/7500 Km.
	Loss of integrity of rake	Disturbed by more than 04 wagons	Disturbed by more than 04 wagons
	Circuit Limitation	—	Out of circuit movement
	Overdue rakes	—	Runnindg towards direction other than base depot.

Both Mechanical and Traffic control of the division and headquarter shall record the movement particulars of every CC rake of ECoR origin and CC rakes earning more than 6000kms should normally be kept within ECoR jurisdiction.

**19.04: Special Conditions:****19.04.01: Clearing of Rakes with Invalid/Missing BPC:**

When back loading is done at a station where freight train examination facilities exist, the rake must be examined there and fresh BPC issued. In case of rake is back loaded, detected with invalid /missing BPC and in the absence of C&W examination facilities the rake can be cleared by any of the following means.

- (a) Checked by a flying squad and fresh BPC issued , if operationally feasible.
- (b) If it is not possible then the rake is permitted to run upto the next C&W examination point in the direction of movement by GDR check as per Para 19.04.02 of this chapter.

**19.04.02: GDR Check:(Guard and Loco Pilot joint check)**

GDR check is not required when the rake has a valid BPC or in case of invalid BPC, when the next C&W examination point is less than 250 km(RB's letter No.2000/Safety(A&R)/19/35 of 28.7.2009). However, GDR check shall be done before clearance of a stabled load at a Non-C&W point for more than 24 hours and GDR checking time should be restricted to 45 minutes. Rakes detained at terminals on account of any of the handling activities must not be considered as stabling.

GDR check shall be carried out by Guard and Loco Pilot as detailed in RB's letter No.M (N)/2005/Train Examination dated 25.05.2005 and SR 4.31.03 which is produced below :

- i) The LP will do checking from the main station building side and the Guard from the off side.
- ii) Rake integrity is not disturbed by more than 4 Bogie wagons and only intensively examined wagons given fitness by C&W staff have been attached in the rake.
- iii) All CBC and Air hoses are properly coupled and locked.
- iv) All angle cocks except the last one are in open condition.
- v) Hand brakes are released and Empty Load device handles are in appropriate position.
- vi) Doors of wagons are closed and in locked/secured condition.
- vii) There is no loose fittings, hanging parts like push rod, Beam, Safety brackets, Brake blocks etc., which may endanger safety.
- viii) Any other abnormality noticed which may endanger safety and action taken to be recorded in the joint memo.
- ix) Joint memo in triplicate shall be prepared. SM/YM's endorsement shall be obtained in two copies and retained with Guard & LP respectively while the third copy is to be handed over to the SM/YM.
- x) Air pressure or Vacuum continuity shall be done and confirmed through VHF/ prescribed whistle code.

**19.04.03: Special features for BOBR/BOBRN rakes:**

Whether CC or Non-CC BOBR/BOBRN rakes, each rake shall be offered for C&W examination for attention of proper door closing mechanism before next loading.

**19.04.04: BTPN and Other Tank Rakes:**

- (a) Both CC and Non-CC BTPN and other tank wagon rakes will be based at VSKP and will be examined at VSKP R/Yard, where facility for same exists and sent for loading to nearest loading point at VSKP and PRDP.
- (b) After examination in empty condition, CC/Premium/Round trip BPC will be issued to facilitate return of rake to VSKP on the same BPC.
- (c) In-order to facilitate this, BPC shall have following endorsement “For rake unloaded within ECoR, SER, SECR, SCR and upto NKJ/WCR only, the rake can be returned to VSKP/EcoR on same BPC.”
- (d) In case of invalid BTPN rake intended for loading runs via Cuttack, only undergear examination and validation of BPC can be done at Cuttack.

**19.04.05: Trains Received from Other Railways:**

- (a) Trains originating from other Railways shall not be accepted in ECoR unless the same is with a valid BPC. However, if it is not operationally feasible, this may be allowed in exceptional cases, but must be offered for C&W examination at first available nominated C&W point in the direction of movement and a fresh BPC shall be issued. From the point of detection of invalid BPC the rake shall be cleared as detailed in Para 19.04.02.
- (b) Guard & Loco Pilot of incoming train at ECoR will be personally responsible to check, while taking over from other railway's crew, that the BPC is available and valid for the train. If not, Guard must report to the Section Controller through Station Master for C&W examination at the next examination point in the direction of traffic.
- (c) BCN/BOXN rake door closing to be ensured by the Guard before taking over the rake.

**19.04.06: Rakes for Steel Plant:**

- (a) Incoming rake for loading at Steel Plant shall be examined in regard to mechanical examination only and completeness and securing of brake-gear and air brake components/items to issue loading fit certificate.
- (b) The examined rake may be supplied to the Steel Plant for loading. After loading, the wagons shall be checked by the C&W staff in regard to securing of steel consignment and RR shall be issued only after certification of all the wagons by the C&W staff.
- (c) The loaded rake on receipt from Steel Plant shall be offered for C&W examination in the outward Yard/Exchange Yard and fresh round trip BPC shall be issued.
- (d) Clearance of steel consignments in Non-TXR points shall be carried out by GDR check. Everybody to follow the loading pattern for steel consignment as approved from office of the CME to ensure that consignments are loaded uniformly and strapped and secured adequately to prevent shifting of load during movement.

**19.04.07: Private owned rakes:**

Name of the Party/Firm	Type of stock	N o m i n a t e d Examination Point	Circuit of Operation	Validity of BPC
<b>NALCO</b>	BTAP & BTCS	RYD/VSKP and NLOD/DMNJ	D M N J - B D P K - VSKP	<b>NALCO maintained rake:</b> Round trip. <b>Railway maintained rake:</b> 7500km or 35 days whichever is earlier.
<b>VAL</b>	BTAP & BTCS	RYD/VSKP	VSKP-LJR-KRBA	7500km or 35 days whichever is earlier.
<b>ARSHIYA, CONCOR AND KRIBHCO</b>	BLC/BLCA	RYD/VSKP	IR	6000km or 30 days whichever is earlier.

**19.05: Conditions for Validity of the BPC:**

- (a) Integrity of the rake is maintained as per Railway Board circulars. The integrity and continuity of the rake is clearly certified by Crew & Guard.
- (b) Kilometer earned is logged properly without fail by crew & Guard after each run. In case distance is not recorded, BPC will be deemed valid for only 20 days.
- (c) In case of invalid BPC, the trains shall move on Guard & Loco Pilot's memo as per extant rules.

**19.06: Instructions for Crew, Station Staff and Control:**

- (a) It is primarily responsibility of the Guard (Being in-charge of the train) as well as of Loco Pilot and station staff for not allowing train running on invalid BPC in violation of the existing instructions.
- (b) In case of Crew/Guard notice that, BPC is invalid, it should be brought to the notice of station staff, who will advise the Control about the same. Thereafter, the Controller will instruct the Crew of the action to be taken on the basis of instructions laid down in this chapter.
- (c) If any unusual situation is not mentioned in this chapter, the train will be started after GDR check and will run to the next C&W point in the direction of movement.

**NOTE :**

- i) Provision of these instructions shall be reviewed whenever further instructions are received from Railway Board.
- ii) It shall be the responsibility of the Operating and Mechanical Departments to ensure that rules are not violated in any manner and no train shall run without proper and valid BPC.
- iii) These instructions shall be effective from the date of issue and will be reviewed for amendment if required, jointly by CME & COM based on the suggestion from the Divisions/Board's further instructions.

## **B. COACHING TRAIN EXAMINATION**

### **19.07 Examination of Coaching Trains :**

#### **i) BPC for Shuttle/Passenger/Inter-connected Mail/Express Trains :**

The undergear examination should be specified after running 3500 kms or 96 hours, whichever is earlier.

#### **ii) Issue and revalidation of BPC for Military/Election Specials :**

The BPC will indicate the validity as 3500 kms or 96 hours, whichever is earlier, as also the first destination. At the first destination, if such a train is to re-originate without fresh examination, the Station Master will endorse the next destination on the BPC available with the Guard and the LP provided the total distance/time limit from the point of primary maintenance till the final destination is not going to exceed 3500 kms or 96 hours, whichever is earlier.

#### **iii) Amalgamation of two Mail/Express/Passenger trains on one rake link :**

Validity of BPC for integrated rakes in a round trip is upto a distance of 3500 Kms or 96 hours whichever is earlier. For such rakes, it is also to be ensured that the integrated train rakes have a standard composition. The original BPC issued by the primary end should however be revalidated at every terminal station in the link or whenever the train engine is changed.

Amalgamation of two trains in one rake link could be permitted within the overall stipulation of “kilometers” and “time”. A minimum of 1 hour 15 minutes time should be provided for terminal attention like inside coach cleaning, watering, etc., at intermediate stations after creating such facilities as necessary. Nomenclature of such rakes may change from one train to another. It should be ensured that the quality of internal cleaning, etc., is not compromised. This may be done either contractually or by deputing adequate number of staff with suitable equipment. Division/HQ to arrange proper water pressure, provision of high pressure jets, washable apron, wherever necessary.

#### **iv) Running of more than one trips of Mail/Express trains touching Primary Maintenance Depot:**

It Should be permitted within the overall stipulation of “kms” and “time”. The rake should be given terminal attention (inside cleaning of coach, watering, etc.) within 1 hour 15 minutes, as prescribed in paragraph (iii) above. If the rake is to remain at the originating point for more than 4 hours, the rake should be placed in the pit line for watering, cleaning, etc.

**v)** When two trains starting from different stations and amalgamating into one train at an enroute station, the BPC for individual trains shall be clubbed at the intermediate amalgamating point, revalidated and the train worked upto the destination.

**vi)** When train originating from one station and disintegrating into two/more trains at an enroute station, the originating station shall issue separate BPCs for all the trains which are to be formed after disintegration at an intermediate station. AT the intermediate station, the respective BPCs shall move along with the trains after revalidation.

**vii)** Whenever revalidation of the BPC is to be carried out at non SE/JE(C&W) stations, the exercise be carried out jointly by Guard and LP as is prevalent for GDR check of freight stock.

#### **viii) BPC for OCVs (VPs/VPU/VPHs) :**

So long as the OCVs are part of a Mail/Express/Passenger train, they should have examination schedule as applicable for that train. The BPC for Parcel Express train should be valid for 3500 kms or 10 days, whichever is earlier. However, isolated OCVs lying in a yard, when attached to the rake or to a

Mail/Express/Passenger train, should be examined before attachment and suitable endorsement to that effect should be recorded in the BPC of the train.

ix) Whenever an empty coaching rake is moved for shorter distance from one station to other for the purpose of stabling or otherwise for which issuance of BPC is required, the rake is to be examined at par with freight train and for which placement on pit line should not be insisted upon. However, it should be ensured that all the doors are locked to prohibit passengers to entrain.

**NOTE :** For the purpose of checking brake continuity and revalidation of BPC, wherever required, it must be ensured that the values of BP, FP in the locomotive and the rearmost brakevan are recorded afresh each time whenever the train engine is changed or the rake composition is altered.

#### **19.08 Mandatory conditions to be fulfilled prior to introduction of Round Trip Primary pattern of maintenance on coaching trains :**

The following mandatory conditions should be fulfilled prior to introduction of round trip/ Kilometers based PRIMARY maintenance pattern on any passenger carrying train on Indian railways.

##### **PRIMARY END :**

- (a) The attention during primary maintenance should be made more intensive with special emphasis on the following aspects:
  - i) The brake gearing should be properly adjusted including the slack adjuster 'A' dimension and the brake cylinder stroke to ensure 100% brake power.
  - ii) Brake blocks should be changed in only as bogie sets.
  - iii) All missing passenger amenity fittings must be replaced and the rake must be turned out as 'Zero-Missing-Fitting' rake.
  - iv) Intensive cleaning of coach toilets
- (b) Clear maintenance time of 6 hours should be ensured at Primary end to enable intensive attention.
- (c) Provision of proper washing cum maintenance pit line facility with adequate testing equipment and high pressure jet cleaning plant at primary end.
- (d) Adequate gang strength with proper supervision to ensure intensive attention.

##### **THE OTHER END :**

- (a) Fresh BPC should be issued wherever the brake power check is provided in the Revised Coaching Maintenance pattern.
- (b) Whenever the lie-over is more than 2 hours at the platform or the rake is stabled in the yard, the rake should be locked and positive security should be provided.
- (c) The minimum infrastructure to be provided at the platforms from where trains are returned without secondary maintenance should consist of :
  - i) One storage room for essential safety and passenger amenity item.
  - ii) Road transportation facility for ferrying materials from the main depot.
  - iii) Mobile high pressure cleaning machines in adequate numbers.
  - iv) 2 inch water connection at both the ends of the platform for quick filling of high pressure jet cleaning machines.



- v) Washable apron on the platform lines with covered drains to facilitate movement of maintenance staff.
  - vi) Walkie-Talkie/Radio trunking sets for quick and easy communication
  - vii) Standard watering hydrants
  - viii) Flood light at the platform ends for rolling-in examination at night and 110 V inspection lights along the side of the track for night examination to the under gear.
- (d) A joint safety certificate covering each clause of the mandatory conditions will be issued by the mechanical and operating branches at divisional level prior to changing over any train to the revised coaching maintenance pattern. No relaxation will be permissible except approval of the Board on case to case basis.

#### **19.09 Maintenance of Pantry Car in Coaching Depots :**

- (a) Pantry cars may be fully vacated before the train is taken for pit line maintenance at the primary end.
- (b) Fire extinguishers must be checked for refilling status and general condition and it must be ensured that no fire extinguisher available in the pantry cars is overdue filling/checking.
- (c) Only authorized personnel undertaking maintenance of pantry equipment & coach maintenance staff be permitted access to the pantry cars during maintenance in the pit lines.
- (d) A list of prescribed standard fittings, gadgets/equipments, duly signed by Mechanical/ Electrical/ Commercial Departments, must be maintained in the pantry cars.
- (e) Zonal Railways may ensure uninterrupted comprehensive maintenance/ certification contracts through certified bodies of IOC/BPC/HPC, etc., to ensure safe and proper functioning of the LPG installation in the pantry cars.
- (f) Detailed records of monthly inspection/certification by the authorized agencies for LPG installation and appliances, jointly signed by the concerned maintenance supervisors, must be maintained in the coaching depot. A certificate to this effect must be jointly issued for each non-AC pantry car after each such monthly attention in the following proforma and a copy of the same must also be displayed in the pantry cars.

Train No./Pantry Car No.	_____
Date of inspection/servicing	_____
Name of agency undertaking	_____
Maintenance of LPG installation	_____
Address:	_____
Telephone No.:	_____

This is to certify that Gas Pipe Lines, Burners, connectors and associated accessories in the above noted Pantry Car have been thoroughly inspected, repaired, serviced and cleaned. It is also certified that it is safe to use LPG inside the pantry car and there is no leakage in the pipe lines.

Signature of authorized representative of the contractor

Signature of Pantry Car Manager

Signature of Railway Authority with Designation.

**19.10 MAINTENANCE PATTERN OF COACHING TRAINS****Annexure to letter No.95/M(Ct/14i/I dated 31.1.07**

SL	Category of train	Preventive maintenance schedules at pitline	Under gear examination and brake system maintenance at pitline	Internal cleaning passenger amenity attention and watering	External cleaning on nominated line with proper facilities	Enroute/ Terminating Examination	Brake system check prior to start at platform at the other end.
1	Mail/Exp : One-way run>3500 Kms.	At primary end	At both the ends	At both the ends	At both the ends	Enroute : After every 250 to 350 Kms of run at locations to be decided by railway for each train. Terminating Exam: At terminating station.	Complete alr brake testing with issue of fresh BPC
2	Mail/Exp : One way run <3500Kms but round trip run>3500 Kms.	At primary end	At both the ends	At both the ends	At both the ends	-do-	-do-
3(a)	Mail/Exp : Round trip run Upto 3500 Kms	At primary end	Only at Primary end	At both ends	At Primary end	-do-	Only continuity check, if stabled at platform, otherwise, brake power check with end orsement on original BPC.
3(b)	Interconnected Mail/Exp : Round trip run upto 3500 kms	At primary end	To be done after 3500 kms or 96 hrs after the issue of original BPC whichever is earlier, only at primary end	At primary end and each terminal	At primary end	Enroute : After every 250 to 350 Kms of run at locations to be decided by railway for each train. Terminating Exam : At terminating station.	Only continuity check, if stabled at platform, otherwise, brake power check with endorsement on original BPC.
4	Passenger trains with toilets including interconnected passenger trains/ shuttles	At primary end	-do-	-do-	At primary end	-do-	-do-
5	Passenger trains without toilets	At primary end	To be done after 3500kms or 7 days whichever is earlier only at primary end	-do-	-do-	Once a day at primary end or at nominated terminal	-do-

- Internal cleaning, passenger amenity attention and watering may be done at platform line or nominated stabling line provided stipulated facilities are available at such line.
- In case, the rake is stabled in yard for more than 6 hours positive safety arrangement should be made for the rake and incase the security is considered inadequate, the rake should be taken to pit line for attention to under gear as given under column (4) above.

## CHAPTER-20

**HEAVY DUTY ON-TRACK MACHINES****20.01: Description and Features of Various Track Machines:**

Different types of heavy duty on-track machines have been specially designed for packing of ballast under the sleeper, alignment and levelling of track, deep screening, shallow screening of track, renewal of points and crossings, lifting of released materials during maintenance as well as track renewal. There are variety of heavy duty on-track machines like **BCM** for deep screening and lifting of track, **FRM** for shallow screening, **UNIMAT**, **MPT** for tamping of points and crossing, **DGS** for consolidation of track, **BRM** for regulating of ballast, **T-28** for renewal of points and crossings, **UTV** for picking of released materials and **PQRS** and **TRT** for complete renewal of track. These are 8 wheeled self propelled machines except **BRM** and **UTV**. These are fitted with powerful prescribed headlight, tail light, marker light and flasher light on either side and function as per GR 4.14, 4.15 and 4.16 and SRs there to. Each machine shall display LV board/tail lamp if moving alone. When two or more machines are coupled together and run on a section, the LV board/tail lamp shall be fixed to the last machine only in the direction of movement. Efficient push buttons are provided which will give warning with red light indication on the driving dash board if anything is wrong with the machine. The vehicles can run both forward and backward direction. The unit can run both by day and night at prescribed maximum speed on either direction.

**20.02:Supervision :**

The heavy duty on track machines will work under the direct supervision of an engineering official not below the rank of JE/SE(P.Way) (Person-incharge), who will be responsible for taking the traffic block and for protection of the line while the work is in progress. While the machine(s) will be in overall charge of SSE (TM) of the division, each machine will be in direct charge of an operator. The unit must not be normally attached to any train or light engine and always run independently. Before starting, the operator should ensure that the machine is in a sound condition to run with good break power, adequate fuel and also ensure that the working gears are in good condition. The operator of the unit must be a qualified person competent to hold charge of the machine on the main line and also certified to be qualified in rules and actual driving and working of the unit efficiently.

**20.03: Competency to work Heavy Duty on-Track Machine:-**

The operator must be conversant with rules for operation and section over which the unit has to work. Each machine will be under the control of an operator and he is responsible for the safe working of the machine and following of rules.

- (a) The operator shall undergo initial training at the IRTMTC/Allahabad. Result of the written examination held at the end of the course shall be communicated by the Principal/IRTMTC/Allahabad to the Departmental Officer of concerned Zonal Railway.
- (b) After successful training at IRTMTC, they are to undergo training on 'train working rules' at ZRTI, SINI. After successful completion, Dy.CE(TM) of Zonal Railway shall issue competency certificate to the operator after conducting requisite written and oral test of the operator on technical as well as train working rules.
- (c) This competency certificate shall be valid for 3 years and kept in the personal custody of the operator and shall be promptly produced when required. The operator has to undergo all above refresher courses once in three years. The operator shall apply to the Dy.CE(TM) well in advance before the date of expiry of competency certificate.
- (d) The operator should also possess a certificate of medical fitness in A-3 category issued by a Railway Medical Officer. Period of PME shall be as prescribed for SSE/JE(P.way).

**20.04 Equipment :**

The following equipment should be carried by the Operator-in-charge of the unit before the machine is put on a running line. Further, he should ensure that all the equipments are in working order.

- (a) One copy of General and Subsidiary Rules book.
- (b) One copy each of Operating Manual and Accident Manual.
- (c) One copy of Working Time Table of the division where the machine is working.
- (d) One portable field telephone (For electrified and non-electrified sections separately).
- (e) One green hand signal flag and Two red hand signal flags in a case.
- (f) One pair of red and green slides
- (g) Two LED based torch cum flasher tri-colour hand signal torch.
- (h) Last vehicle board and flashing tail lamp.
- (i) 10 detonators.
- (j) Two banner flags.
- (k) Walkie Talkie set.
- (l) One patromax/LPG lamp.
- (m) Two long chain with pad lock with key.
- (n) Two wooden skids.
- (o) One pair of spare spectacles of the operator, if using.
- (p) One First Aid Box.
- (q) Such other equipment and stores as may be prescribed by the Engineering Department.

**20.05: Rules for Working of Heavy Duty on-Track Machine:-****20.05.01: General instructions to work track machines**

- (a) The heavy duty on-track machine shall be treated as train as per G &SR 1.02(58) for all purposes and shall run under the system of working applicable.
- (b) To improve productivity of track maintenance, the maximum number of track machines required to be worked at a time in one block section shall be decided as per the MOU, jointly framed by COM and PCE and it shall be modified from time to time if required.
- (c) No Machine shall be brought on a running line from the siding/stabling line without the permission of the Station Master on duty in the form of shunt signal/shunting order (T/806).
- (d) When the track machine is required to move from one block station to another block station, the operator should run the machine only with proper authority to proceed as per the system of working in force.
- (e) Track Machines shall not be permitted to work during total interruption of communication, foggy and stormy weather.
- (f) Intime clearance of block is the responsibility of the person-in-charge of the machine(s). Hence, before availing the block and entering into the block section, he should match his timings with station watch.

**20.05.02: Working Procedure Between two Block Stations:**

- (a) The Person-in-charge of the track machine(s) shall give the requisition for block in duplicate to the station master on duty, indicating the following:
- (i) The number and types of machines to work and its sequence to proceed into the block section.
  - (ii) Name of the Block Section (Between stations and particular line, if intended to work in Double/Multiple line section)
  - (iii) Exact Location of work for each machine.
  - (iv) Duration of Work including transit time.
  - (v) Whether the machine will proceed to the next station or return to the starting station after completion of the work.
- (b) The SM shall then apprise the section controller the details of block and movement of the machine(s).
- (c) After recording the control order in token of permission granted for block and the exact duration of block granted, SM shall return the duplicate requisition to the person-in-charge of machines endorsing the duration of the block permitted and other instructions, if any.
- (d) Before allowing the block, the station master on duty shall exchange message with the station master of the other end of the block section with private number. Gatemen in the section shall also be informed about the detailed block particulars viz. location of work, number of machines and direction of movement by the respective controlling station master under exchange of private number. All necessary precautions shall be taken at both end stations to prevent entry of trains in to the concerned section during the working of the machines. Suitable entries in red ink in TSR and SM's diary should be made.
- (e) On both double and single line, when **only one machine** is allowed to work, the section shall be blocked back or blocked forward as the case may be as per GR 1.02(8) and (9). The authority to proceed for the machine shall be the caution order itself as mentioned in item no.(g) below. The signals can be taken off, if permitted.
- (f) When **more than one machine** are allowed to work, the following procedure should be followed :
- (i) The leading machine shall be despatched as mentioned at (e) above with a caution order.
  - (ii) The second and subsequent machines shall be allowed on authority of block ticket in the form of T/A-602 or T/C-912 as the case may be along with a caution order for each machine. The kilometre at which, the machine is to work is to be mentioned on each block ticket.
  - (iii) The person-in-charge of the machines will personally supervise the movement by travelling in the machine to keep the minimum safe distance margin of 180 meter in the same direction.
  - (iv) During night, fixed tail light of the machine shall be lit for each machine but the flashing tail lamp should be fixed only to the last machine.
  - (v) Operator of each machine is to be provided with walkie talkie.
- (g) SM shall issue caution order to person-in-charge and operator(s) of machine(s) indicating number and type of machine(s) to work and their sequence, duration of work, location of work, movement of machines via right or wrong direction and whether return to same station or proceed to next station after completion of work etc. Signature of person-in-charge of machines and each operator shall be obtained on the record foil of the caution order/block ticket as acknowledgement. The operator(s) should be extra vigilant while passing level crossing gates and personally ensure closure of level crossing gates before passing it.

- (h) The person in-charge of track machine(s) will be responsible to see that the adjacent line is not fouled at any point of time during the course of working. In case of fouling, he must immediately arrange to protect the adjacent track as per GR.6.03.
- (i) After completion of the work, the machine(s) will be received at the station either on taking off stop signals, calling on signal or issuing written authority as per system of working in force or by exhibiting green hand signal after ensuring correct setting and locking of relevant points. All the machines should be admitted on one line except in case where it is operationally not feasible.
- (j) On reaching the station, the person-in-charge of the track machine(s) will hand over the authority to proceed (if any) and sign the complete arrival register. He should also certify that the section is clear of all obstruction and the track is fit for movement of subsequent trains.
- (k) Before sending the block removal report/train out of section report, the station master/cabin master must satisfy himself that all machines have arrived complete and the track is certified fit. Block Ticket(s) if any should be collected and cancelled.

**20.06: Working procedure of Track Machines in Automatic signalling system:**

Automatic signalling system between the proposed stations of work shall be suspended by the SMs on duty under exchange of messages with private number ensuring the section concerned is clear of all trains in consultation with the section controller. Working procedures as mentioned at para 20.05 shall be followed.

**20.07: Run through movement of track machines in convoy without work:**

Under Absolute Block System of working only one machine is allowed to run without working within a block section. However, more than one machine may be allowed at a time provided they are coupled together with continuous pressure. This will be treated as one train and the last vehicle indicator should be fixed in rear of the rearmost machine and all other red lamps fixed at the end of other vehicle(s) must be extinguished. If the track machine operator is new to the section and not fully aware of the section/route, then one P.Way supervisor who is aware of that section/route may accompany the machine for guidance of the machine operator.

**20.08: Precautions while working of machines:**

- (a) Person-in-charge (JE/SE (P.Way)) is responsible for protection of the site of the work and also for protection of the adjoining tracks in case of infringement. He shall be conversant with the infringement conditions of the various machines. He shall also be responsible for safe condition of the track before clearing the block after the machine work.
- (b) Some machine like BRM, T-28 tends to foul the adjacent line. While working on the double line section or in the yard, if any part of the machine is likely to foul the adjacent line, the person-in-charge shall request SM in writing to block the lines. Such works shall only be undertaken if blocking of such adjoining lines has been permitted by the SM and such adjoining lines have been protected.
- (c) It is necessary that all trains passing on the adjoining line should be issued with a caution order. The loco pilot shall keep a sharp look out, whistle intermittently and be prepared to stop observing hand signals at site of the work. Such caution order on the adjoining track is necessary due to high noise caused by track machine and large concentration of staff working around it.
- (d) The vertical and lateral clearance for OHE, signal post and any other structure should be checked and adjusted before clearing the block. It shall be ensured by supervisor working with the track machine, that there is no infringement to signal post, OHE and any other structure as per schedule of dimensions.



- (e) The operator shall not relinquish charge until he has satisfied that the machines have been properly secured and protected as prescribed herein. During shunting on a line occupied by track machines, no machine shall be shunted without the presence of competent machine staff.
- (f) The SM on either side shall inform all the manned LC gates falling within the jurisdiction of work about the total number of track machines permitted in the block section under exchange of private number.
- (g) In course of working when it is required to pass a level crossing gate, it is the responsibility of the operator to ensure that the level crossing gate is closed in case of manned level crossing or there is no road traffic in case of unmanned level crossing gate.

**20.09: Stabling and securing of Heavy Duty on-Track Machine:**

- (a) The track machine shall normally be stabled on a non-running line.
- (b) Whenever Heavy Duty on-Track Machine is stabled on a running line at a station, the operator should ensure that it is clear of the fouling mark. The mechanical hand brake shall be applied and the machine shall be secured by application of skids and chain to the rails in accordance with GR 5.23 to prevent rolling down. The responsibility of securing lies with the operator.
- (c) Lever collars and reminder collars must be used as per SR 5.04.01.
- (d) In case of machine is stabled in the siding, in addition to securing of the same as mentioned above, the siding points should be set in their normal position, clamped and padlocked. Key of the padlock should be kept with the SM on duty. No shunt movement should be allowed over the line where machine is stabled.

**20.10: Accidents:**

Failure of Track Machine and other accidents shall be treated in the same manner as train accidents under appropriate class and action taken as described in Chapter-VI of General and subsidiary rules and in the Accident Manual.

**20.11: Failure of Track Machines:**

- (a) In the event of breakdown, the track machines shall be protected as per GR 6.03 by the machine staff as directed by machine-in-charge.
- (b) Failure of track machines in block sections will be treated as accident under class 'J'.
- (c) In case of failure of track machine in block section, the Junior engineer /Section engineer (P.Way) may decide to push the disabled unit to the nearest station provided the break power is in good condition. Otherwise, intimation shall be sent to the nearest SM through any means of communication available asking for a light engine to tow the unit. The speed of the locomotive when hauling the machine shall not exceed 15 kmph on straights and 10 kmph on curves.
- (d) In case of machine in charges feels clearance of section is going to take long time, assistance of Accident Relief Train shall be asked immediately. Mean while the machine in charge shall take necessary action to rectify the defects.
- (e) In ghat sections brake power, hand brake and emergency brakes shall be tested before starting and operator shall not leave driving/working cabin of machine(s) unmanned in such sections.



**20.12: Various machines used for track maintenance and its utility:**

Sl. No	Type of Track machines	Purpose of Deployment	Deliverables	Minimum stipulated block period				Maximum stipulated	
				To and fro Time (in *)	Setting and winding up time (in *)	Working time (Hours)	Total (Hrs)	Output/ Effective hour	Minimum Ty.speed Restriction if any (new machine)
1	09-3X	Plain track tamping	It corrects geometry i.e alignment, twist, cross level, longitudinal level and pack ballast under sleepers. This machine can pack three sleepers at a time.	15	10	3.35	4:00	1.6km	Nil, except in summer with 50 kmph, if not followed by DTS.
2	CSM	Plain track tamping	DO. But can pack two sleepers at a time.	15	10	3.35	4:00	1.2km	-do-
3	UNO	Plain track tamping	DO. Generally deployed at work site. But can pack one sleeper at a time.	15	10	3.35	4:00	0.5km	-do-
4	DUO(O)	Plain track tamping	DO. Generally deployed at work site. But can pack one sleeper at a time.	15	10	3.35	4:00	0.8km	-do-
5	WST	Plain track tamping	DO. Generally deployed at work site. But can pack one sleeper at a time.	15	10	3.35	4:00	0.8km	-do-
6	BCM	Ballast screening of plain and turnout track.	It screens track ballast by removing muck, thus, improve drainage and elasticity of track for safe and comfortable running.	30 as 3 m/c go in block	40	2.50	4.00	0.2km	20kmph or 40 kmph if DTS+TTM deployed behind in and stipulated safety instructions followed.
7	FRM	Shoulder Ballast cleaning	It is used to carry out cleaning of shoulder ballast by removing muck, drainage of track and elasticity improving of ballast bed.	30	30	3.00	4.00	0.4km	Nil, except in summer with 50kmph if not followed by DTS.
8	UNI	Turnout packing	It corrects turnout track geometry i.e alignment, twist, cross level, longitudinal level and pack ballast under sleepers.	15	10	3.35	4.00	1 T/out	Nil

Sl. No	Type of Track machines	Purpose of Deployment	Deliverables	Minimum stipulated block period				Maximum stipulated	
				To and fro Time (in *)	Setting and winding up time (in *)	Working time (Hours)	Total (Hrs)	Output/ Effective hour	Minimum Ty. speed Restriction if any (new machine)
9	DGS	Consolidation of newly tamped track	It build up lateral resistance and consolidation of track faster and helps to relax speed restriction early.	15	10	3.3	4.00	1km	Nil
10	TRT	Laying of track	It is a fully mechanised system of complete track renewal.	40	50	2.30	4.00	0.36km	30kmph or 40 kmph if DGS deployed and ballasting, rail joints are done as per IRPWM.
11	PQRS	Laying of track	It is a semi mechanised system of track renewal where in pre-fabricated rail panels are laid and existing panels removed with minimum labour.	25	20	3.15	4.00	0.24km	20kmph
12	T-28	Turnout replacement Machine	It is a fully mechanised system of complete turnout with minimum manual labour.	10	10	2.40	4.00	1 Turnout per 4 hour.	20kmph
13	UTV	Utility vehicle	It is a mechanised system of transporting heavy material like rail, sleepers, etc. from one station to another in traffic block.	15	10	2.45	4.00	50 rails per hour in one BFR.	Nil
14	BRM	Ballast regulating Machine	It is a mechanised system of track ballast equalisation, regulation and profiling.	20	20	3.20	4.00	2km.	Nil

\* As per Board's Joint Circular

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## CHAPTER-21

# MARSHALLING OF TRAINS

### 21.01:Marshalling and its Objectives:

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

### 21.02:Marshalling of Mail/Express/Passenger Trains:

The general principles to be kept in view while marshalling are:

- a) Position of upper class coaches, ladies compartment, dining car in respect of easy accessibility. Normally the dining cars or the catering compartments, air-conditioned and upper class coaches, shall be marshalled in the middle of the train or as near to it as possible and ladies compartment will be near Guard's SLR.
- b) Non-passenger carrying stock shall preferably be marshalled next to the engine or in the rear of the train, defining the area for stacking, loading and unloading of parcels packages and mails on platforms.

### 21.03:Marshalling of SLRs and Anti-Telescopic/Steel- Bodied Coaches on Passenger Carrying Trains:

#### (a) Marshalling of Mail and Express Trains :

- (i) In case of SLRs which have passenger portion on one side, luggage-cum-brake portion on the other, the SLR should be marshaled in such a way that the luggage and brake portion is trailing outermost or next to engine.
- (ii) In case of new design of SLRs with Passenger portion in the middle, these can be positioned in either way.
- (iii) In case, anti-telescopic/steel-bodied SLR is marshalled with passenger portion next to the engine or rear SLR with the passenger portion towards the end of the train, the passenger portion of SLR should be locked.
- (iv) In case of shortage of SLRs, any other suitable coaching vehicle or a VPU may be provided. In case a coaching vehicle is attached, its doors should be locked to ensure that passengers cannot occupy it.
- (v) Two anti-telescopic or steel-bodied coaches should be marshalled inside the anti-telescopic or steel-bodied SLRs at both ends.
- (vi) After providing anti-telescopic or steel bodied SLRs for Mail/Express trains, all the available anti-telescopic or steel-bodied SLRs should be used on main line passenger trains and after meeting this requirement, the rest should be used on Branch Line Passenger trains. Anti-telescopic or steel-bodied SLRs should be marshalled in the same way as in the case of Mail/Express trains.

#### (b) Marshalling of Short Service Trains:

Railway Board has permitted marshalling of three coaches in front and rear of the SLR on short passenger trains, provided they have working brakes and subject to two end coaches at either side are anti-telescopic. An Inspection Carriage may be attached as fourth trailer coach on such trains. However, 04(four) POH/ROH coaches can be attached in front and rear of the SLR for quick evacuation to and from workshop and movement within the Eco Railway jurisdiction provided, all such coaches are in locked condition to prevent entry of passengers.

**(c) Marshalling of Non-Passenger Coaches:**

VPs, LRs, WLRRMs and other coaching vehicles, which do not carry passengers may be marshalled as operationally convenient but preferably as outermost vehicles at either end to absorb the impact of collision energy. Inspection carriage, whether anti-telescopic/steel-bodied or not and occupied or being worked empty may be marshalled as operationally convenient.

**(d) Marshalling of Reserved Bogies and Saloons occupied by VIPs :**

Reserved bogies occupied by passengers and Inspection Carriages/ Saloons occupied by VIPs should be treated as a passenger coach and marshalled accordingly. If they are anti-telescopic or steel-bodied, they can be marshalled anywhere as operationally convenient.

**(e) Marshalling of Sectional/Through Service Coaches:**

Sectional/through service coaches, if they are anti- telescopic or steel-bodied, may be marshalled as operationally convenient.

**(f) Marshalling of POH/Sick Coaches Returning to Shops:**

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

**21.04:Marshalling of Block Rake Composition:**

For block rake composition and marshalling order, normal composition, marshalling order and rake link of passenger trains are issued by COMs of respective railways from time to time.

**21.05:Marshalling of Mixed Trains :**

Attachment of both goods/parcel vans and passenger coaches in the same train is classified as Mixed Train. COM authorizes to classify a passenger carrying train as a mixed train. On such a train, coaching and goods stock shall normally, remain in one block (except where a deviation is permitted) and their marshalling will also be laid down by the COM. Normally goods stock should be attached next to engine and coaching stock inside the rear brake van.

**21.06:Medical Relief Van :**

ARME Can be run without brake van.

**21.07: Inspection Carriages attached to Light Engine:**

Maximum three inspection carriages occupied by the officers can be attached. In case more than 3 Inspection carriages are to run with a light engine, rules regarding running of goods trains without brake van will apply.

**21.08 Attaching of Travelling Cranes:**

Provisions of G&SR 4.27 and Chapter 24 of this operating manual should be followed.

**21.09: Attaching of Four Wheeler brake-van on Goods and Mixed Trains:**

- (a) A four wheeler brakevan can be attached in rear of a goods train as a part of train composition. If any extra four wheeler brake van is to be attached, this should be attached in rear of the train/rear brakevan.
- (b) However, a four wheeler brakevan having CBC coupling can be attached in between two bogie wagons or between an engine and a bogie wagon.

**21.10: Attaching of vehicles outside the rear Brake van:**

Vehicles outside the rear Brakevan can be attached to Passenger, Mixed and Goods train in accordance with the provision of the SR 4.24.01.

**21.11: Marshalling Chart for Passenger/Mixed/Goods Trains :**

S.No	Type of Stock	Marshalling order
1	Empty coaching stock, covered motor trucks etc.	As operationally convenient but preferably marshalled as outermost vehicle at either end.
2	Motor car etc. loaded in open wagons covered with wagon sheets.	In the rear of the Train either as a last vehicle or inside the rear brake van
3	Banking Engine	(a) On ascending gradients in rear of train. (b) On descending grades in front. (c) In front, if both gradients are in quick succession.

**21.12: Marshalling of Goods Trains :****(a) Wagons containing combustible articles:**

If the train is worked by diesel or electric locomotive, the dummy wagon need not be provided in between the engine and wagon loaded with the commodities like Bamboo, Bidi leaves, Coir rope, Coir matting, Cotton, cotton waste, lac, paper, fire wood, tobacco and bamboo cuts.

**(b) Wagons containing explosives (IRCA Red Tariff Rule no. 132.1) :**

- i) The maximum number of carriages/wagons containing explosives which may at any time be attached to or be hauled by a train shall be 10 by a goods train and 3 by a mixed/parcel train. However, the above provision will not be applicable to military ammunitions specials.
- ii) Carriages or wagons containing explosives should be placed as far away as practicable from the train locomotive, grouping together those carriages/wagons which are permitted to be so grouped.
- iii) Carriages/wagons containing explosives shall be separated by at-least one carriage/wagon not containing explosives or other dangerous goods or articles of inflammable nature from the electric/diesel locomotive.
- iv) Carriages/wagons containing explosives shall be separated by not less than 3 carriages/wagons not containing explosives or other dangerous goods or articles of inflammable nature from the passenger carriages/brakevan or any other carriage/wagon containing other dangerous goods or articles of inflammable nature.

**(c) Wagons containing Petroleum and other inflammable liquids (IRCA Red Tariff Rule no. 325.1) :**

- i) There is no restriction on the number of wagons containing petroleum and other inflammable liquids which may at any one time be attached to or be transported by any one train.

ii) Wagons containing petroleum and other inflammable liquids which may be grouped together should be placed as far away as practicable from the train locomotive.

iii) (1) Wagons containing petroleum and other inflammable liquids (Class.A) shall be separated by atleast one carriage/wagon not containing explosive or other dangerous goods or articles of inflammable nature from the electric/diesel locomotive as well as brake-van.

(2) Wagons containing petroleum and other inflammable liquids (Class-A) shall be separated by at least three carriage/wagon not containing explosive or other dangerous goods or articles of inflammable nature from the passenger carriages or any other carriages/wagons containing explosives or other dangerous goods or articles of inflammable nature.

iv) Wagons containing petroleum and other inflammable liquids (Class-B) shall be separated by at least one carriage/wagon not containing explosive or other dangerous goods or articles of inflammable nature from the train locomotive/passenger carriages/brake van/any other carriages or wagons containing dangerous goods or articles of inflammable nature except that the number of such intervening carriages/wagons shall not be less than two when these contain compressed/liquified/ dissolved gases.

NOTE : See IRCA Red Tariff Rule No. 119, 213, 314, 414, 514, 614 and 714.

**(d) Wagons containing other dangerous or inflammable goods :**

For marshalling of wagons containing the following commodities, the relevant rules of IRCA Red Tariff No. 20 as indicated below must be observed :-

SN	Commodity	IRCA Red Tariff Rule No.
1	Gases	227.1
2	Inflammable solids	425.1
3	Oxidising substances	524.1
4	Poisonous (Toxic) substances	624.1
5	Acids and other corrosives	826.1

**21.13: Attachment of Dead Locomotives:**

JPO issued by ECoR, as per Railway Board's letter No:2000/M(L)/466/803/Pt dated 28.06.2006 based on instructions Bulletin No. MP. IB.BK- 01.05.05(Rev.0.02) May, 2006 by RDSO/Lucknow,

**(A) Conditions for attachment of dead locomotive:**

i) Maximum permissible length and maximum permissible load of the train should not be exceeded including attached dead locomotive(s).

ii) When maximum permissible speed of the dead locomotive is less than the maximum permissible speed of the train, then suitable speed restriction shall be imposed on the train, while attaching the dead locomotive.

iii) Dead locomotive(s) may be attached next to the working locomotive as a piped vehicle with connection of MR and BC equalizing pipes for application of brakes in synchronisation.

(OR)

As a piped vehicle in case of dead locomotive(s) brakes are not functional

(OR)

In case dead locomotive cannot be hauled as piped vehicle due to any reason, it will be attached in rear of the brakevan/SLR.

iv) While attaching dead locomotive on passenger or goods train, certificate for 'Fit to run is to be issued by Section Engineer/Loco Inspector/Power Controller.

v) When a dead electric locomotive has to be moved on a non-electrified section, special check shall be made regarding its infringement to the schedule of maximum moving dimensions. In the case of any infringement, the dead locomotive shall be treated as an ODC and this movement shall be permitted in accordance with the extant rules governing such ODC movement.

vi) As a final check, the coupled locos should be run for about 500 meters and the Loco-Pilot shall check for any abnormal rise in the temperature of the wheels of the dead locomotive(s) and shall also check it at subsequent stops during the journey.

vii) Running of double/triple headed is permissible on the section over which the dead locomotive is to be hauled.

viii) Locomotive with defects in undergear equipment can be attached only in freight trains.

(ix) The dead locomotive intended to be attached should have all circuit breakers and battery knife switched off. Reverser shall be kept in neutral position and handle shall be removed. MU-2B valve shall be placed in Trial/Dead position. All air pressure shall be fully discharged and locomotive brakes shall be fully released.

**(B) Attaching/Hauling of dead locomotives by goods trains:**

i) Maximum 4 locomotives (2 working and 2 dead or 3 working and 1 dead) can be attached provided over all train length does not exceed the loop line length from starter to fouling mark.

ii) Following combination of working and dead locomotives shall be permitted:

Type of section	No.of working locos	No. of dead locos
On all section	1	1
On sections where double heading is permitted	2	1
	2	2
On sections where triple heading is permitted	3	1

iii) Only one dead locomotive shall be hauled in case of –

a) Dead locomotives brakes are not functional and attached as a piped vehicle.

b) When dead loco cannot be attached as a piped vehicle and attached in rear of brakevan.

iv) In case of item (iii)(b) above, the movement shall be permitted on gradients not steeper than 1 in 100 and the dead locomotive shall be accompanied by a competent person not less than Assistant Loco Pilot. He shall be provided with suitable equipment including walkie talkie set, flags, detonators, etc. The guard of the train shall personally ensure that the dead locomotive is accompanied by such a competent person. It will be the duty and responsibility of the competent person to switch on the flasher light and apply hand brakes judiciously in case of run away.



v) In case of dead diesel/electric locomotive fitted with side coupling rods (CBC operating handle) it shall be ensured that all coupling rods are in position and properly secured.

**(C) Attaching/hauling of dead locomotives by Mail/Express/Super fast/Passenger trains: -**

i) Only one dead locomotive (diesel/electric) shall be attached except to Rajdhani/Shatabdi Express trains.

ii) Dead locomotive may be attached at originating station or at en-route station provided the brake power of the train excluding dead locomotive should be at least 90%.

iii) Dead locomotive shall be attached in following condition.

(a) Next to working locomotives where connection of MR and BC equalizing pipes for application of brakes in synchronization is possible.

(b) Next to working locomotives as a piped vehicle where brake application on dead locomotive is not possible.

(c) When dead loco cannot be attached as a piped vehicles, it shall be attached in rear of brake van SLR.

iv) In case dead loco cannot be attached as a piped vehicle and attached in rear of brake van/SLR, the following conditions shall be fulfilled.

a) A certificate shall be issued by the section engineer/loco inspector/Loco Pilot of the failed loco that the dead locomotive is fit to run by passenger train in all respects from safety point of view at the maximum permissible speed of the train.

b) Such type of dead loco movement shall not be permitted on gradients steeper than 1 in 100.

c) The dead locomotive shall be accompanied by a competent person not less than Assistant Loco Pilot. He shall be provided with suitable equipment including walkie talkie set, flags and detonators, etc. The guard of the train personally ensure that the dead locomotive is accompanied by a competent person. It will be the duty and responsibility of the competent person to switch on the flasher light and apply the hand brakes judiciously in case of run away.

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## CHAPTER – 22

# STABLING AND SECURING OF VEHICLES

### 22.01 Stabling of vehicles :

In this chapter, vehicle means wagon, coach, rake/load/train. In train operation, the vehicles may be stabled at a station for various operational reasons. These stabled vehicles tend to run away from line(s) and lead to accidents, if they are kept loose at stations and yards without proper protection. Whenever working power is detached from a train or power is shut down, the rake is to be secured properly irrespective of gradients in the yard as mentioned in para 22.03 below .

Station staff, Guard, Engine Crew and Section Controller should be aware of gradients at stations/ yards/sidings and block sections. As far as practicable, stabling on main line is to be avoided. If it is done in unavoidable circumstances, efforts should be made for its early clearance. As far possible, the vehicles should be stabled on a line which is isolated from other lines, particularly running lines.

Station Master incharge must ensure that adequate stock of safety chains, wedges, skids, padlocks are available. Procedure for stabling and securing of vehicles and precautions to be taken should be mentioned in SWR.

### 22.02 Responsibility of Station Master in Stabling of Vehicles :

Generally, securing of vehicles is not necessary till it is manned and coupled with live engine having brake power. As per GR 5.23 and SRs thereto, Station Masters are responsible for seeing that the stabled vehicles are secured in such a manner that they cannot be moved so as to obstruct any running line.

If for any reason, vehicles are allowed to remain on a running line for some time, the line should be blocked using collars and a clear remark in red ink should be made immediately in the train signal register indicating time and number of running line on which the vehicles are stabled. A record thereof shall be made in the station diary also. At stations where end cabin(s) exists, the in charge of the cabin shall ensure the same with the station master / in charge at centre/cabins under exchange of private numbers and record it in the TSR/log book in red ink and in addition comply with SR 5.04.01 (a) & (b). Points at the either end of the occupied line shall be immediately set against the occupied line complying GR 3.38(2) & SR 3.51.06.

### 22.03 Procedure for Securing of Stabled Vehicles :

- (a) Atleast four skids/wooden wedges to be used, two each below the outermost pair of wheels at either end.
- (b) In case of goods train, effective hand brakes of atleast 6 wagons from either end must be fully tightened. If the number of vehicles stabled are 12 or less, the hand brakes of all vehicles are to be applied whether side operated or end operated by incoming ALP and guard of the train from their respective end. In case of coaching train, the Guard should apply hand brakes of the SLR in addition to the application of loco brakes by the LP. The train crew and the guard shall personally ensure this and jointly sign in the stable load register before they leave the station.
- (c) The vehicles are to be chained and padlocked using atleast two chains, one at either end, under the supervision of SM/YM, if the load(s) is to be stabled for 3 hrs and above. The safety chains shall be passed twice round the axle and after tying the ends together they shall be locked, so that no strain falls on the padlocks.

- (d) The stabled vehicles should be coupled together. In case the stabled load has to be split for any reason, each such split part should be treated as a separate load for the purpose of securing. Before vehicles are uncoupled, the hand brakes should be applied, wedges/skids should also be used to prevent vehicles from rolling down.
- (e) The points must be set, clamped and padlocked against the blocked line and set towards dead end or trap point (if available). Scotch blocks must be used, if available.
- (f) Line Block collars/reminder button caps must be placed on relevant signal and point buttons/slides/levers, etc., by SM.
- (g) Remarks should be made in TSR and/or SM diary in red ink to the effect that 'Line No. \_\_\_\_ is blocked'. An entry in this regard should also be made in the stabled load register.
- (h) Safety chains, skids and wedges are to be removed before the stabled load are coupled/despatched.
- (i) When the train is to be stabled with unmanned live engine or in shut down condition, LP/ALP before leaving loco, shall -
  - (1) Apply both SA-9 and A-9 brakes
  - (2) Apply hand brake and parking brakes
  - (3) Secure the loco with wooden wedges provided on the loco
- (j) If the station yards or sidings are having a gradient of steeper than 1 in 400 and any special operating restrictions are imposed, these should be strictly adhered to.

#### **22.04 Exemptions in Securing of Stabled Vehicles :**

- (a) In case of nominated big yards, terminals as notified by Sr.DOM, when vehicles are to be stabled on non running lines, it is sufficient to apply effective hand brakes of atleast two end vehicles on either side. Skids shall also be used at either end of the vehicles of the concerned line.
- (b) At all stations having a gradient of steeper than 1 in 400, when a stabling is required to be done on both running and non running lines, irrespective of hours of stabling, the procedure mentioned at para 22.03 shall be applicable.

#### **22.05 Action to be taken by Loco Pilot/ALP and Guard to secure the load/train when the train is stalled in block section due to accident, failure, obstruction or any other reasons :-**

- (a) Loco Pilot/ALP and Guard should protect the train as per provision of G&SR 6.03.
- (b) The train should be secured by applying loco brakes (SA-9, A-9 and hand brake of loco) and hand brakes of atleast 6 wagons at either end of the train. The hand brake in engine should be operated by ALP and in brakevan/SLR by the guard. In case of coaching trains, the guard should apply hand brake of the SLR in addition to the application of loco brakes by the LP.

#### **22.06 Securing of vehicles on lines which are handed over to Engineering/RE Department for their exclusive use :**

- (a) Whenever any siding is nominated for Engineering or Rail Electrification department as specified in the SWR, the responsibility of stabling vehicles lies upon the concerned department.

- (b) Wagons are to be placed by pointsman in presence of not lower than P. Way/RE supervisor. The P. Way/RE incharge whoever available at the time of placement shall be personally responsible for stabling and securing of vehicles as mentioned in this chapter with their own equipment viz., safety chains, padlocks, skids, wedges, etc.
- (c) Station Master should isolate the engineering/RE siding from other lines, if provision is made.

**22.07 Securing of vehicles in industrial sidings, colliery sidings, etc.**

- (a) Users of assisted and private sidings and outlying railway sidings are responsible for proper securing and the safety of the vehicles placed at such sidings intended for them (for loading or unloading) and also for the damages caused due to derailment on account of their negligence.
- (b) The responsibility of the user begins from the time of placement of wagon(s)/rake in the siding. The user's representative will thereafter take necessary precautions.

## 22.08 Stabled Load Register:

[illegible][illegible]

## CHAPTER-23

# MATERIAL TRAIN

### 23.01: Application for Material Train:

(a) Applications for Material trains working on open line are to be made by Divisional Engineers or Divisional Electrical Engineers(Tr.D) to the Senior Divisional Operations Manager/Divisional Operations Manager. Such applications must contain the following information:-

- (i) Date, hour and station/section at which work is to commence.
- (ii) Number and class of wagons, exclusive of brake-van, required.
- (iii) Limits between which the train is required to work until further notice.
- (iv) Name and designation of the Engineering/Traction official under whose supervision the train will work.
- (v) The name of the SE/JE (P.Way) or the SE/JE (Trd) who will examine the train with the SE/ JE (C&W) before it commences work.

(b) For each Material train, a suitable programme should be drawn up by the Divisional Engineer/ Divisional Electrical Engineer (Tr. D) in consultation with the Divisional Mechanical Engineer and this should be supplied to the Senior Divisional Operations Manager at least a week before commencement of work.

### 23.02: Ordering and Cancellation of Material Trains:

(a) The Senior Divisional Operations Manager/ Divisional Operations Manager will issue orders for the working of the Material trains and will intimate the Divisional Engineer or the Divisional Electrical Engineer(Tr.D) and those named by him in his application for the train, with copies of these orders.

(b) The Senior Divisional Operations Manager/ Divisional Operations Manager will also issue orders for the final cancellation and disposal of Material trains on the requisition of the Divisional Engineer or the Divisional Electrical Engineer (Tr.D) only.

(c) The traffic department may utilise the engine, brake or vehicles of Material trains for emergent purpose, if the Senior Divisional Operations Manager/Divisional Operations Manager requires the wagons for public traffic. He must give the Divisional Engineer or the Divisional Electrical Engineer (Tr.D), 7 days notice of his intention to cancel the train.

(d) When it is necessary to cancel a Material train temporarily on request of Engineering / Electrical department, the Guard at the request of the Material train official-in-charge, will inform the Sr. Divisional Operations Manager, Train Ordering officials, Crew controller, Divisional Engineer or Divisional Electrical Engineer (Tr. D) and other officials concerned as follows—

“Material train No.....  
Temporarily cancelled on.....(date)  
and will probably resume work on  
.....(date).”

(e) ‘Guard’s report;—Guards of all Material trains must submit a Train Report to the Senior Divisional Operations Manager/ Divisional Operations Manager daily, giving the number of the wagons. Each trip must be shown separately.

(f) The Material train Guard must, at the close of the day's work, programme for the next day's work in consultation with control and the Engineering Controller where there is one such programme shall not be cancelled except in emergency, so that labour may not be wasted.

The working hours of the Material train shall be so arranged that the train can complete the work and return before night to the station at which it is to be stabled in accordance with Material train programme.

Statistics of the daily work done shall be maintained by the Engineering Controller, Divisional Wagon Controller (DWC) so that a watch can be kept on the utilisation of Material train.

(g) Material train— Content of vehicles.— Guards working Material trains should note in the remarks column of their reports the description of the materials carried in the train. The note should be made thus:—

1. Wagons sand.
2. Wagons wooden sleepers.
3. Wagons moorum ballast.
4. Wagon bricks.
5. Wagons bridge girders and so on.

(h) The Senior Divisional Operations Manager/ Divisional Operations Manager office while preparing the Material train bill should reproduce these particulars in the remarks column against each entry in the bills.

### **23.03: Loco Requirement and Carriage Examination:**

(a) Unless it becomes absolutely necessary, a Material train engine shall not be allowed to go to shed for loco requirement before completing a fortnights work. This interval however is not rigid and has to be fixed with other considerations in view also like the examination of rolling stock and the periodic rest of labour. The date should be, so fixed that all these items dovetail into each other thus preventing idling of the loco or wastage of labour.

(b) Holding of loco for working material train is fixed. Any additional requirement can be provided after approval of CFTM only. However, same can be regularised in ensuing power planning, so that holding of loco can be improved.

### **23.04: Working of Material Train:**

(a) A Material train shall have sufficient vehicles fitted with hand brakes to control the train, taking into consideration the ruling grade on the section it is working on. Each brake-van or hand braked vehicle shall be attended by a person competent to apply the hand brake in case of train parting. A brake-van shall always be attached to the rear of the train except in emergent circumstances and in such cases SR 4.62.06(d) shall be followed.

(b) The Material train Guard shall be responsible for seeing that the brakes of all vehicles on his train are applied as necessary. When working on sections of the line where the gradient is steeper than 1 in 150, the LP before moving his train, shall see that sufficient number of hand brakes have been applied to enable him to control his train.

(c) Material train working during foggy weather or night should be avoided. However, during accident or exigency of work, it may be permitted with adequate precautionary measures. From safety point of view of labourers and train movement on adjacent line, the provision of adequate lighting facility at the place of work is the responsibility of the department executing the work. The provisions of SR.4.62.03(c) should be adhered.



(d) Material train when stabled at engineering siding/other departmental sidings, it must be properly secured. Same should be ensured by concerned department's supervisor.

### **23.05: Joint Inspection of Vehicles:**

(a) Before a train commences work, and after completing work when finally cancelled, a joint examination of all wagons will be made by the SE/ JE(C&W) and the SE/JE(P.Way) or the SE/JE(Trd) concerned. Both of them will sign the report which is to be submitted to the Divisional Mechanical Engineer and Divisional Engineer or the Divisional Electrical Engineer(Trd) as the case may be.

(b) All material train will be worked to a train examining station once in every month, for thorough examination and repair. While the responsibility for this purpose will devolve on Sr DEN/DEN or Sr DEE/ DEE concerned, who will arrange to get it done regularly in conjunction with the Sr, DME/DME. It is the responsibility of the Sr. DOM/DOM to see that the train is moved within the quickest possible time and it is the responsibility of the Sr. DME/DME to see that the detention for train examination does not exceed 24 hours. The examination will be made by the SE/JE(C&W) in conjunction with the authorised representative of the Engineering branch or the Electrical branch and the SE/JE(C&W) will enter any damages discovered in the joint Register, the duplicate copy of which will be forwarded to the Sr.Divisional Engineer's office or the Sr.Divisional Electrical Engineer's office.

(c) Whenever, there is an interchange of a vehicle or vehicles between the Engineering or Electrical departments, the SE/JE(P.Way) or the SE/JE(Trd) shall advise the SE/JE(C&W) concerned to enable the latter to jointly survey the vehicles before the interchange takes place.

(d) After the usual joint examination by the Train Examiner and the SE/JE(P.Way) or the SE/ JE(Trd) of a Material Train, when the material train is no longer required, the SE/JE(C&W) will enter any damages discovered in the Joint Register and mark the wagons requiring repairs, giving intimation of the same to the Station Master concerned, who will then arrange to work the wagons into Carriage and Wagon Depots in groups as room on trains permit.

(e) The cost of repairs to Material wagons should be charged to Abstract 'D'—Carriage and Wagon expenses.

(f) The charges to be billed against the Engineering branch or the Electrical branch for a Material Train should include the cost of repairs based on sanctioned estimates.

### **23.06: Charge for Damages:**

The Engineering or Electrical branch will accept all charges raised by the Mechanical branch (carriage & wagon) for damages done to wagons which have been in commission on Material trains and will recover the cost of damages accepted from the Material train contractor concerned.

### **23.07: Charges for Supply of Rolling stock:**

The rate to be charged for supply of rolling stock will be as laid down in I.R.C.A. Goods Tariff.

### **23.08: Material Train Bills:**

The Guard's Train Report will be the sole authority for the preparation of Material train bills and the time for which it shows the train to have worked must be accepted as final. Guards of Material trains must submit the following documents to Divisional Wagon Controller(DWC) and to SSE(P.W)/SSE(Trd) on daily basis:

(a) Total hours of work done by the Material train.

- (b) Type and number of wagons loaded/unloaded.
- (c) Commodity.

### **23.09: Material Train Running Through:**

A Material train running from one station to another without stopping in the Block Section or at intermediate stations enroute shall be run in accordance with the rules for running goods train.

### **23.10: Material trains working on Ghat section and on other sections on which heavy gradient of 1 in 400 and steeper exist:**

Material trains when working on such sections are to have their engines towards the falling grade, i.e. at the end of the train in the direction in which grade falls.

### **23.11: Combining the Different Works by the Same Material Train:**

To get maximum use out of a Material train working on a section and to avoid movement of Multiple Material trains on the same section, the Senior Divisional Operations Manager/Divisional Operations Manager shall in consultation with the Divisional Engineer and the Divisional Electrical Engineer (Tr.D) plan out the different works to be undertaken in the same section by one Material train, to the extent possible. The Guard of the Material train shall in such case record specifically in their Train Report the particulars of work done on account of different department and the time spent on each. The Sr Divisional Operations Manager's office shall allocate to the different departments the Material train charges on the basis of the time spent on the different works, any residue being debited to the department at whose instance the Material train is commissioned.

### **23.12: Provision of First Aid Box on Material Train:**

Material train which is programmed to work with labour should be provided with First Aid Box with approved contents. JE/SE (P.W/TRD) will ensure that it carries the First Aid Box and the Guard of the train will also see that the First Aid Box is carried on Train.

**23.13:** In addition to the rules of this Chapter, the General Rules 4.62, 4.63, 4.64 and SR thereto shall also be observed for working and running of Material train.

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## CHAPTER-24

# CRANE WORKING

### 24.01: Introduction:

- (a) The following types of cranes are in use on this Railway:
- (i) Diesel (Rail) cranes
  - (ii) Diesel (Road) cranes
  - (iii) MFD equipment
- (b) The cranes are under the control of different departments as follows:
- (i) Cranes working in sick lines and carriage and wagon depots under the Mechanical Department.
  - (ii) Cranes working in Traffic Yards such as Transshipment points, Transit Sheds etc., under the Traffic Department.
  - (iii) Cranes working in Store Depots, scrap yard and Reclamation Yard under the Stores Department.

**Note:** The instructions contained in this Chapter do apply to Workshop Cranes under the Mechanical and Civil Engineering Departments working within the limits of Workshops and Cranes under the Stores Department when such cranes are in use on the open line. The Working of Cranes within the Workshops Of Stores Yards or depots etc., will be governed by local instructions issued by the head of Department concerned.

### 24.02. Competency Certificate:

- (a) Competency certificates are necessary both for supervising and conducting Operations for— (i) Crane Supervisors (ii) Crane Drivers and (iii) Crane Maccadums.
- (b) Normally the operation of diesel crane is entrusted to Crane Drivers. However, in case of heavy consignments or in course of break-down operations on running lines or for operations in sick lines, a Supervisor is also provided to look after crane- operations and observance of the different Safety rules.
- (c) Hand cranes are of lower lifting capacity and are operated manually. Overall charge of operating a hand crane is entrusted to a Maccadam who also directs and supervises the work of the gang attached to him for slinging and unslinging operations.
- (d) The competency certificates referred to hereunder relate to both road and rail cranes in use.
- (e) Competency certificates for supervising crane operation or for operating cranes should be granted in prescribed proforma appended below, after due testing by the Sr.DME/DME of division. The officials authorised to issue competency certificates are indicated below:

Deescription of Cranes	Authorised Official
For break-down cranes with working capacity of 40.0 tonnes and above	Sr.DME
For crane with working capacity of less than 40 T utilised in traffic yards, carriage and wagon depot, sick lines, loco sheds, goods sheds, stores depots, etc.	Sr.DME/DME/Dy.CME(C&W)
Road cranes	Sr.DME/DME/Dy.CME
Hand cranes	Sr.DME/DME

**Note :** If the Road crane is to go on the public road, for whatever short period/length it may be, the Crane Driver must be in possession of the license for driving the crane issued by Motor Vehicle Section of the state.

**(Proforma of competency certificate)**

Name.....Designation .....

The above mentioned has been tested by me and is certified competent to take charge of and be responsible for the correct and safe working operations of Diesel crane of.....tonnes capacity.

Date

Sr. DME/DME/Dy.CME

**(f)** Competency Certificates for supervising crane operation are granted to SSE(C&W), SE(C&W), JE(C&W), Transportation Inspectors and such other Supervisory staff of other than Mechanical Department as may be permitted to supervise crane operations. In all cases of crane operations on the Open line, SSE(C&W), SE/JE(C&W) possessing competency certificate will alone be competent to supervise crane operations on running lines. The operation of Traffic Crane on running lines or adjacent to the same in such a way as may foul the running line shall be under the supervision of a Transportation Inspector.

**(g)** Competency certificates for supervising crane operations are valid for a period of 3 years only and have to be renewed from time to time. The knowledge and proficiency of the staff concerned are to be tested before renewal of competency certificate.

**(h)** The Crane Drivers or Muccadums prior to the issue of Competency Certificates must undergo at least one week's training under the guidance of the SE/JE(C&W) of the nearest Loco Shed where such crane are available. In the matter of technical knowledge in operation, upkeep of the crane, rules to be observed and the precautions to be taken for such operations. On completion of this training, they must be examined by the authorised official concerned and competency certificate as per sub-para (e) above issued, if found fit.

**(i)** In addition to the Competency Certificate referred to in sub-para(e) above, the Divisional officers are responsible for seeing that Crane Drivers/ Muccadums working in their departments are annually examined, and are also in possession of a certificate of fitness from the SSE(C&W) of the Division to be deputed for the purpose by the Senior most Divisional Mechanical Engineer. For this purpose SSE(C&W) must annually test all Drivers/ Muccadums in charge of cranes and see that they have full knowledge of their work and responsibilities and are able to operate the crane correctly, before issuing a certificate of fitness.

**(j)** The department using a crane will ensure that the crane is worked by a Driver or Muccadam as the case may be, holding a valid competency certificate and a certificate of Fitness. For supervision on operation of crane, it is necessary that the supervisor also possesses a valid competency certificate. It will be the duty of the Supervisor/Driver/ Muccadam to satisfy himself as to the competency of the other men of the gang.

**24.03. Maintenance:**

**(a)** All Rail cranes are classified as rolling stock. For repairs and up-keep, they are under the charge of the Chief Mechanical Engineer, and no repairs or adjustments, must be made to them except in the manner laid down by him. Girder crane "Rhinoceros" belonging to the Bridge section of the Engineering Department will, however,, be maintained by the Engineering Department. Rail Cranes inside the Mancheswar work shop is under the works Manager of the Shop for maintenance. In the Divisions, the Senior most Divisional

Mechanical Engineer will be responsible for arranging maintenance of the cranes through the SSE/ JE(C&W) as mentioned in clause (b) below.

(b) SSE/SE(C&W) shall be responsible for the maintenance & proper working order of the Cranes under their charge and also the Diesel cranes belonging to or used by other departments. Attention to running/lifting gear of all Cranes including those in sick line, will be arranged by SSE/ SE(C&W) of the Shed concerned.

(c) SSE/SE/JE(C&W) should examine the chains of the Cranes under their charge every three months, and see that they are in safe working order. Chains used in accidents must be examined immediately afterwards and if any chain is found to be defective, it should be sent at once for repairs.

(d) SSE/SE/JE(C&W) must send the Crane chains to Kharagpur Workshop every 12 months for the purpose of examination and annealing and a certificate in form L. M. 36 must be obtained with each chain before it is brought back into use.

**Note:** In the case of Cranes belonging to other departments the duties and responsibilities in respect of the periodical inspection, the annual examination, testing and annealing of chain will also devolve upon the SSE/SE(C&W) concerned.

(e) The lifting capacity must be painted conspicuously on the jib of the each crane and the lifting capacity of the chain stamped on the hook.

(f) When a Travelling Hand Crane is required to run on open line, the Train Examining staff at the starting station will see that it is in a safe running condition and that the axle boxes are correctly packed and oiled.

#### **24.04. Periodical Overhauls:**

Periodical overhaul of all cranes will be undertaken by the Shops and the time interval between periodical overhauls will be as under:

- (i) 120 T ORTON Diesel cranes - 5 years
- (ii) 140 T GOTTWALD Diesel Crane – 8 years.

**Note:** Extension of 6 months at a time may be granted by the CMPE/Dy. Chief Mechanical Engineer (C&W), if the Crane is sparingly used and if its condition is certified by the SSE/SE-in-charge of the maintenance. Life extension for the boiler will be sanctioned only by the Chief Mechanical Engineer.

#### **24.05: Use of Cranes under Mechanical department by the other departments:**

(a) Break-down cranes must always be kept in readiness to be turned out at a moment's notice in the event of accidents, and stabled in such a position as to minimise the amount of shunting required to get them into the traffic yard. Breakdown Cranes should invariably be worked by their own trained gangs earmarked for them.

(b) Except in cases of accidents, demand for use of Breakdown Cranes for traffic or engineering purpose, prior approval of CME/CMPE should be taken for ordering the crane.

(c) In all cases except accidents, the date and time at which the Crane is required to be at work, the probable length of time for which the Crane will be required and the purpose for which the crane is required, must be stated.

(d) Requisitions for Cranes should be made by letters, and a week's notice being given except in cases of emergency, to enable the Dy. Chief Mechanical Engineer (C&W) or the Sr.Divisional Mechanical Engineer to decide the order of preference, in case more than one demand is pending. The Sr.Divisional

Operations Manager will make the necessary arrangements for despatch of the Crane to and from Headquarters on receipt of the sanction from Chief Mechanical Engineer/ Sr.Divisional Mechanical Engineer.

(e) Working away or Break-down Crane for other purposes is to be discouraged. Divisional Officers should see that the Break-down Crane is not requisitioned, unless it is absolutely necessary. If the Relief Van is also required, it should be mentioned in the indent.

(f) Diesel Cranes will be sent out in charge of the Drivers of the Crane and Hand Cranes in charge of a certified Crane Muccadam. The Divisional Mechanical Engineer will decide whether a Crane Supervisor will also be required depending on the job to be undertaken.

(g) The Diesel Cranes of 40-tonne capacity or above are not permitted to pass over weighbridges.

#### **24.06. Operation:**

(a) All instructions for the proper operation of Crane at the site of accidents and for its subsequent arrangements shall be given to the SSE/SE(C&W) by the Sr. DME/ DME/ AME. The SSE/SE(C&W) shall give the necessary order to the Driver who is incharge of the Crane and its staff. In the absence of the SSE/SE(C&W), the necessary orders shall be given to the Driver incharge by the Sr. DME/ DME/AME.

(b) No person other than the Sr. DME/ DME/AME/ SSE/SE(C&W) will issue any order to the Driver incharge of the Crane at site of accident.

(c) However, in case of Crane attached to OHE Relief train, necessary orders for working the same may be issued to the Driver in charge by the SSE(OHE) or SE(OHE), or Divisional Electrical Engineer (Traction- Distribution) or Assistant Electrical Engineer (Traction Distribution).

(d) The Driver-in-charge is responsible for the safety of the Crane and its staff and will himself decide whether out-eggars or dogs shall be used and what other precautions must be taken. He must be afforded every assistance in strictly carrying out the rules laid down for the use of Cranes, whether in actual work or being moved to the site of accident with the dummy truck removed.

(e) Relief vans and Cranes working at the site of accident should on no account be moved without the consent of the Senior Locomotive representative at the spot.

(f) No Diesel Crane shall be worked near or adjacent to traction overhead equipment, unless such overhead equipment is made dead and earthed. The movement of the crane jibs shall be done with care so as not to foul the traction overhead equipment. Wherever possible, the direct blast from the Crane funnel to the overhead lines or insulators, shall be avoided.

(g) When cranes are required to be worked adjacent to traction overhead equipment, the person-in-charge of the work shall give a prior intimation to the Traction Power Controller who will make arrangements for overhead line staff to stand by for the purpose of Power Block etc. whenever required.

(h) Provision of Para 24.15 and 24.16 must be rigidly observed for operation of Crane. Before lifting operations are started, the following instructions will be observed:—

(1) The spring relieving screws will be screwed down on the spring buckle and where these are not provided, packing pieces must be inserted between the spring buckle and the sole bar of the Crane.

(2) The rail clips should be securely fastened to the rail.



- (3) The out-rigger girders of Steam and Diesel Cranes should be placed in position and should project equally on both sides and packed at the outer ends with sleepers or wooden packing.
- (i) Before lifting any load, however light, the balance weight box should be kept in its position until the lift is completed. On no account should any of the weights in the balance weight box be reduced at any time.

**Note:** This does not, however, apply to the reduction that may be necessary to bring the weight down to the standard axle load when running on a train, but any weights that may have been removed for this purpose, should be restored to the balance weight box immediately the Crane arrives at its destination.

- (j) The weight of the fixed balance weight is to be less than sufficient to counterpoise a weight of half the lifting capacity of the Crane suspended from the jib when at its lowest position of elevation and at right angles to the rails and is not to be more than that will leave a safe margin of stability to enable the Crane to be shunted with the jib at right angles to the rails and no load on it.
- (k) The weight of balance weight should be conspicuously painted on it like:

Weight of balance weight:—

Tonnes.

Kgs.

#### **24.07: Precautions Before Lifting with Hand Crane:**

Precautions laid down in para 24.06 (h) (1), (2), (3) should be observed.

- (a) The blocking screws and wedges should be used.
- (b) The tail may then be released.
- (c) Handles should be secured to the winding shaft.
- (d) In order to prevent the jib of the Crane slewing out of control when carrying a load, a guy rope should be fixed to the jib in order that it may be pulled in the opposite direction to that in which it tends to slew to control the jib. The Crane Muccadam will be responsible for warning all staff working with him to stand clear during such operations.

#### **24.08. Precautions While Lifting with Hand Crane:**

- (a) Jib struts should be used when the Crane is handling a load up a bank or for warping a load which is beyond the sweep of the jib or in any other case when ordinary means do not appear adequate to ensure the equilibrium of the Crane. These struts cannot be used if the jib is to be slewed with the load suspended.
- (b) The Crane handles should not be left unmanned either in lifting or lowering condition. Lowering with the check of the brake only is strictly prohibited.
- (c) When lifting load above half the lifting capacity of a 10 tonne Hand Crane, the rising pulley block should invariably be used.

#### **24.09. Precautions when Cranes are not in use:**

The following instructions should be observed when Cranes are not in use:

- (a) The spring relieving screws are to be released and secured so that they cannot work down when running. The packing pieces are to be removed and hung on the hooks provided for the purpose.
- (b) The out-rigger girders of Diesel Cranes are to be stowed away and secured so that they cannot foul the running road.



- (c) The rail clips are to be released and secured on the hooks provided for the purpose.

#### 24.10. Precautions for Resting Jibs:

The Crane truck should be under the jib, the weight of which should be supported on the centre bearing slide. On the main line, crane trucks should not be removed until the jib of the Crane has been placed parallel to the line of rails; off the main line, Crane trucks may be moved without this precaution only if the Crane is so weighted that there is no danger of its canting over.

#### 24.11. Attaching Crane to a Train:

(A) Before attaching a crane to a train, the jib should be lowered on to the Crane truck and locked to prevent it from swinging while in motion, and it should be certified that it is in proper running order. In the absence of Train examiner, the Crane Muccadam will be the duly authorised person to issue certificate as required vide G.R.4.27. Except in unavoidable circumstances the jib must point towards the rear of the train.

(B) The Chimney must be lowered to the running position.

(C) The spring relieving screws to be released and secured so that they cannot work down.

(D) The crane should as a rule, be placed four vehicles from the engine, but when proceeding to a breakdown the rule may be relaxed.

(E) The Driver-in-charge must travel with the Crane and will be responsible for oiling and safety of the crane throughout its journey.

(F) The speed of the train carrying crane shall be restricted as indicated in S.R. 4.27.03. The speed of 10-tonnes Diesel "Orton" cranes is restricted to 25 KMPH.

(G) However, the following speed limits with trailing and marshalled as last vehicle of the Break-down or Relief Train for track laid in 75-R or higher poundage rails with N+3 sleeper density and above and 203 mm. (8' inches) ballast cushion subject to any lower speed restriction notified locally:

Capacity of Cranes.	Max Axle. load.	Max Speed in KMPH
76.0Tonnes (Breakdown)	19.81 tonnes	40
66.0Tonnes(Breakdown)	16.71 tonnes	55
40.0 Tonnes	16.55 tonnes	50
30.0 Tonnes	16.11 tonnes	50
20.0 Tonnes	16.31 tonnes	50
20.0 Tonnes	16.50 tonnes	50
20.0 Tonnes	14.53 tonnes	50
20.0 Tonnes	13.82 tonnes	50
15.0 Tonnes	14.99 tonnes	50
120 Tonnes(Orton)	22 tonnes	40
140T (Gottwald)	20 tonnes	100

The Divisional Railway Manager will notify locally the sections over which such higher speed for Cranes moving as last vehicles on Break-down or Relief Train will apply.

(H) 120 tonnes B.G. Diesel Crane manufactured by M/s. Orton Crane and Shovel Company, U.S.A. may be hauled in a train with the crane in running order and jib fully resting on the match truck, at speeds upto a maximum of 40 KMPH on Bhadrak - Waltair section on mainline and on all Broad gauge sections of this Railway, subject to the observance of the following:

- (i) The match truck for the crane should be suitable for being hauled at 40 KMPH.
- (ii) The crane should be marshalled as per para 24.11 (d) above.
- (iii) Sectional speeds, all local and other speed restrictions as existing or as imposed from time to time.
- (iv) All other precaution as contained in this chapter related to running and attaching of crane.

(I) It is safe to run 140 t Gottwald B.G. diesel, hydraulic break-down crane to RDSO Drawing No WD-92004-S-02(Alt-4) in A-Class ART formation of 4 GS coaches and 2 BRNAHS wagon with maximum axle load of 20 T for crane and 20.32 T for BRNAHS wagon at a maximum speed of:

- (i) When hauled in a train as a trailing load or by diesel or electric locomotive with its 'jib' resting on match-truck = 100 kmph.
- (ii) When travelling on its own power with or without loads = 5 kmph.
- (iii) **Bridges-** The maximum permissible speed of the crane on bridges of BGML & PBG standard designs/ drawings shall be as follows :

Condition applicable for permissible speed= Max. permissible speed.

(a) As trailing load hauled by single WDM2, WAM4 or any other diesel/ Electric Locomotive with jib resting on match-truck.

(b) Driven by own power, free on rail and moving with a previously lifted load as shown in SK 1. WDH 140 CR ALT-5 and having wheel loads as in sketch LD/SK-612.

- (i) Jib parallel to track and——
  - towards front bogie : BGML & RBG standard bridges ... 5 kmph
  - towards hind bogie BGML standard bridges ... 5 KMPH
  - RBG standard bridges ... prohibited
- (ii) Jib Inclined to track all bridges ... prohibited.

(c) Driven by own power, free on rail & lifting the loads Shown in sketch/WDH140CR ALT-5 & having wheel loads as in sketch LD/SK-612.

- (i) **Jib parallel to track & Towards front bogie:**  
 BGML Standard bridges .....5Kmph.  
 RBG Standard bridges .....Prohibited.  
**Towards hind bogie:**  
 BGML/RBG standard bridges.....Prohibited.
- (ii) **Jib inclined to track:**  
 All bridges.....Prohibited.

- (iii) For bridges of lower standard than that mentioned above, the chief engineer concerned shall be referred to:-For track of lower standard, the Chief Engineer concerned shall decide the lower maximum permissible speed. When the Chief Engineer considers that the road bed is not compact or there is improper drainage, he may suitably restrict the maximum permissible speed depending on the local condition.
- (iv) The maximum permissible speed on curves to be decided on the basis of existing provisions of the Indian railways Permanent Way Manual.
- (v) **Working of the crane:**
  - (a) The load shall be brought to the shortest possible radius. The jib should normally be brought parallel to the track.
  - (b) Based on the type and conditions of the formation, the crane driver/supervisor should take adequate pre-cautions to ensure that there is no settlement of the formation under the working crane.
  - (c) During crane working, a special watch shall be kept on the condition of fish plates. Any damaged fish plate should be replaced before allowing traffic on the restored track.
  - (d) The crane shall not be permitted to work on the girder bridges without the permission of Sr.DEN who will keep in view the provisions of para 3.2 (bridge) of RDSO.s speed certificate. Sr.DEN will obtain sanction of Chief Bridge Engineer, if necessary.
- (vii) The crane should as a rule be placed four vehicles from the engine, but when proceeding to a break down the rule may be relaxed.
- (viii) All the permanent and temporary speed restrictions in force and those imposed from time to time due to track, bridges, curves signalling and Interlocking etc. shall be observed.
- (J) When a Crane is attached to a train, the Guard will hand over a memo to the LP bringing the fact to his notice and giving him particulars as to the type of the Crane attached and the station to which it is booked. He will on no account start his train unless the Driver is in possession of this memo, and has received from the Driver a written acknowledgement for the same. A Caution Order indicating the speed restriction to be observed shall also be made over to the LP by the Station Master on duty. The LP will thereafter be personally responsible to observe the speed restrictions required.
- (K) Particular attention to these restrictions in speed must also be paid by Section Controllers and Deputy Chief Controllers so that suitable paths can be arranged for trains conveying Cranes and crossings decided upon in accordance with reduced speeds applicable in each case. Excess speed should be avoided.
- (L) On electrified sections the Crane supervisor/ Driver/ Muccadam will be personally responsible to secure the jib and other fitting in the Crane suitably to ensure that there is no infringement of electrical clearances and the Crane does not hit or damage any fixed structure or fittings.

#### **24.12. Movement of Cranes to the Site of Accident:**

- (a) It is usually necessary to approach a site of accident from the station nearest to it with the crane leading. The Official in charge of Relief Train will arrange for this marshalling in consultation with Control at the station short of the site of accident. Some Cranes have reversible dummy trucks which can be lifted bodily by the Crane itself and placed in rear. In case of Cranes which do not have reversible dummy truck these should be marshaled in rear of the Crane at the previous station and the site approached with jib trailing.

(b) It is possible in most cases, to avoid running with the jib hoisted but should an occasion arise necessitating the Crane to run with the jib unsupported on the dummy truck, the jib must be in the central position, and its swivelling movement prevented by a dependable locking arrangement such as is provided under swivelling base and the speed must not exceed 8 kilometres per hour. The Supervisor-in-charge of the Crane shall see that the jib is hoisted not more than 4115mm.(13'6") above the rail level so as to rule out the possibility of its fouling with any structure, overhead wires or any over-bridge, tunnel etc.

#### **24.13. Running of Hand Crane on Open Line:**

(a) The precautions laid down in para 24.11 for Diesel Cranes must also be observed for Hand Cranes, except sub-para - (H).

(b) Counter balance box, if provided should be moved inward to the fullest extent and securely fastened. The weight of the balance box shall be marked on it and no alteration in the weight shall be made except under written sanction of the Chief Mechanical Engineer.

(c) All the operating handles must be removed from the shafts.

(d) The gear for relieving the weight on the central pillar, where provided, must be locked in the travelling position.

**Note:** Any Hand Crane not fitted with buffing gear, spring gear, enclosed axle boxes or with a match truck, will not be considered as a travelling crane and must not be attached to any train without the specific orders of the Chief Mechanical Engineer.

#### **24.14. Lifting-10-tonne Hand Crane:**

(a) The precautions laid down in para 24.07 must be observed.

(b) The maximum load must not exceed 10 tonnes in any circumstances and must be limited to reduce tonnage when prescribed.

(c) Care must be taken to ensure that the track is in good condition.

#### **24.15. Crane Working within Station Limits:**

(a) Before commencing operations, the Supervisor/ Driver/Muccadam will clearly indicate by a written memo to the Station Master/Yard Master on duty the nature of the work, the siding/ line on which the Crane will work, the line or lines to be blocked or fouled during Crane operation and the time required for the work and only on obtaining the written permission from the Station Master/Yard Master as per specimen below, operation will be commenced. On controlled sections where running lines are fouled, the Station Master on duty will not give the permission except with the prior approval of the Controller on duty. Record of such approval and permission asked for and given, must be entered in red ink in the Train Signal Register and Station Diary, including the number of line/lines/siding which will be blocked/fouled.

##### **(Proforma of certificate from the SM/YM)**

The Crane is permitted to work on line No...../Siding from.....Hrs. to ..... hrs.  
The line / siding and adjacent line Nos..... have been protected by red banner flags and there will be no movement on the above lines/siding till the Crane working is completed and a written memo to this effect is received.

Date

Station Master/Yard Master

Time

Station Stamp

(b) Once permission is given to the Supervisor/ Driver/Muccadam of the Crane to commence operation as per proforma above, the Station Master/ Yard Master on duty will be responsible to see that no shunting or other movements are allowed which will interfere with the crane working and block the line/ lines on which the Crane will be working and the line likely to be fouled. The points giving access to the line (s) on which the crane will be working or which may be fouled shall be set against entry. The reception and departure signals for the lines concerned shall be kept at danger, and necessary lever collars/button collars shall be fixed on the respective points, slots and signal levers. The Station Master on duty shall be responsible for advising the Cabinmaster/Cabinman to this effect and get their acknowledgement under exchange of Private Number. Slide collars shall also be fixed on the respective signal slide of the Station Master's slide control apparatus where provided. In case of non-interlocked point (s), it/these shall be kept set and clamped with padlock at either end against any entry. The keys of the clamps shall be kept by the Station Master & yard Master on duty till the Crane working is completed. The Station Master shall make a suitable entry in the caution order register regarding working of crane with the line(s) occupied/fouled or likely to be fouled by the crane while working and the time from which the permission is given, and the outgoing Station Master on duty shall be responsible for getting the entry noted by his reliever before he goes off duty. The Station Master on duty shall advise the Station Master on duty at the adjacent Block station so that necessary caution order can be issued to the LP and Guard of the train concerned indicating the location of crane work, speed and other precaution if any. The speed of the train over adjacent line at the site of crane work shall be restricted to 15 KMPH, and LP should be advised to exercise extra caution.

(c) Protection of line:

In addition to the precautions mentioned in para (b) above, the station Master/Yard Master on duty will be responsible for the protection of line(s) over which the crane will be working as also the line(s) likely to be fouled by the working of Crane. For this purpose two look out men with red hand signal shall be posted near the entrance point on either side and two red banner flags be placed at suitable distance from the crane on either side. The posting of men and placing of banner flags shall be decided with due regard to the safety of Crane working and minimising interference with the normal working of trains movements.

(d) Crane operations within station limits will be deemed "obstructions" on the line or lines concerned for the purposes of lowering of signals.

(e) If during the course of Crane operations, train movements or other operations are required to be performed on the line blocked or on lines which may be fouled due to Crane working, all Crane working shall be stopped by the Supervisor/Driver/Muccadam on obtaining a written request from the Station Master/ Yard Master to suspend operation. After doing so, the Supervisor/Driver/Muccadam will give a written memo to the Station Master/ Yard Master in the form given below to the effect that Crane working is suspended, that the jib of the Crane is parallel to the track and the tail locked and no obstruction is fouling the line or lines where train movement or shunting movements are to take place. On receipt of this memo, the Station Master will authorise lowering of signals concerned for the train or perform other movement. The Station Master/Yard Master on duty will also be personally responsible to ensure that all obstructions have been removed from the nominated line before authorising lowering of signals. The certificate of the Crane Supervisor/Driver/Muccadam is to be kept pasted on the Station Diary.

**(Proforma of suspension memo from the Supervisor/Driver/ Muccadam of the Crane)**

To

The Station Master/ Yard Master.

Station :

Please note that the Crane working on the line No. .... /Siding No..... is suspended at ..... Hrs. and the line/siding and its adjacent lines are clear and nothing has been kept fouling the lines. Crane work will not be resumed till receipt of written permission from you. The crane is standing on line No...../Siding No.....

Date.....

Supervisor/Driver/Muccadam.

- (f) After the Crane work is over, the Supervisor will issue a memo to the Station Master on duty to the effect that the work is over and the lines blocked and/or fouled are clear of obstructions and are safe for the passage of trains in the proforma appended below. The Station Master/Yard Master will keep the memo attached on the Station Diary.

**(Proforma of completion memo from the Supervisor/Driver Muccadam of the Crane)**

To

The Station Master/Yard Master, .....Station.

Please note the Crane working on line No ...../siding .....is completed at h r s , and the adjacent lines are clear and nothing has been kept fouling the lines. The Crane is standing on line No ...../Siding No.....

Date..... Time.....

Supervisor/Driver/Muccadam.

Note: The certificate and the memo mentioned above may be in manuscript.

**24.16. Crane Operations in Block section:**

- (a) In the case of crane operation in Block section or any of the sidings in such a way as to affect the running line in the Block section, the Supervisor-in- charge of the Crane operation will clearly indicate by written memo to the Station Master on duty at the adjacent block station the nature of work, the line(s) of work or line(s) which will be fouled during the crane operation and the time required for the work, and on receipt of permission from the Station Master concerned in writing he will commence operations.
- (b) The section concerned shall be blocked before allowing the Crane in block section and the block shall be removed only after clearance of the section by Crane.
- (c) Cranes are not to be operated in the block section between sunset and sunrise except in case of accident and for the purpose of removal of obstruction.
- (d) When Crane is working on double/triple line section the supervisor in charge should see that the adjacent line is not infringed and if any infringement is involved, or even apprehended, the adjacent line must also be blocked.
- (e) On double/triple line section during the Crane operation on one line, the LP and Guard of Train on adjacent line(s) shall be issued with caution orders indicating the location of Crane work, speed and other precautions if any. The speed of the train passing over the adjacent line(s) at the site of work should be restricted to not more than 15 KMPH and LP should be advised to exercise extra caution.



(f) The Supervisor-in-charge of the Crane operation will be responsible for protection of Crane/ Track vide GR 15.09(1) (a), 15.09 (3) and SR 15.09.01. The same procedure of protection shall also be followed for adjacent line(s) when it/they is/are fouled. When the adjacent line(s) is /are not fouled and trains are permitted to run vide para(e) above, signals shall be shown vide GR 15.09 (1) (c); and in such case the Crane Supervisor will see that the jib of the crane is turned parallel to the track and tail locked before authorising the train to pass on the adjacent line(s). During night or when visibility is poor the banner flag/ red hand signal flag shall be replaced by red signal lamp. Hand signal lamp in place of banner flag shall be placed at the centre of the track on a stand.

#### **24.17: Working of Cranes in Sidings:**

Working of Cranes, specially heavier capacity Cranes of 40 tonnes capacity and above in private or assisted sidings or any outlying sidings of the Railway will be regulated by special instructions issued by the Sr.DME/Sr.DOM/Sr.DEN concerned, with the approval of the Divisional Railway Manager.

#### **24.18. Display of Rules:**

Mounted copies of the rules of this Chapter are to be conspicuously displayed on the walls of all engine and carriage sheds workshops and offices of the departments using travelling Cranes. A copy of these rules enclosed in a suitable waters-proof frame should be fixed on the back of the balance weight box of travelling Crane or at any other suitable place in it for the guidance of the Driver.

#### **24.19. MFD Equipment:**

- (a) To facilitate quicker re-railing operations in case of serious accident/derailment, specially in electrified sections where normal use of Break down Crane involves interference with OHE, this Railway has MFD vans containing re-railing equipment hydraulically operated with lifting straps, jacks, presses etc. for the purpose of rerailing rolling stock including diesel and Electric Locomotives as well as coaching and goods stock.
- (b) Such MFD equipment vans are provided at different locations on this railway.
- (c) The MFD van is under the charge of Seniormost Divisional Mechanical Engineer of the concerned Division. For operation of the MFD equipment as well as its supervision there are specially trained staff attached to the carriage Shed homing the MFD van and such special staff accompany the MFD van for its operation.
- (d) The staff working this MFD equipment must have competency certificate issued by the Senior Divisional Mechanical Engineer/Divisional Mechanical Engineer. This certificate will be valid for 3 years.
- (e) The safety rules regarding blocking of lines fouled or obstructed and protection by banner flags/ danger signals applicable to crane working will apply to the working of MFD equipment as well.

#### **24.20: Working Mobile Road Cranes:**

- (a) The Mobile Road Crane of various capacities ranging from 1 tonne to 12.5 tonnes are in use on this Railway.
- (b) Road Cranes have greater mobility as compared to Rail Cranes because they can be move in areas inaccessible by Rail Cranes and on steeper gradients, etc. The Road Cranes can move with a load after lifting over some distance with due care.
- (c) The power transmission from the prime mover to the hoisting mechanism or to the propelling mechanism of the Crane is generally electric with push button controls. All motions, travelling forward or backward, derricking, slewing, lifting or lowering are achieved by the operation of electric motors, the current being provided by a main generator under the control of the operator from a switch box near his



seat. There are other push buttons or lever type switches for the various operations as mentioned above. Usually, the Cranes are also provided with necessary safety devices against lifting of overloads, incorrect slewing, etc. as basic protection for the safety of the Cranes in operation. The method of working and the precautions to be observed have been notified in local instructions and should be rigidly observed.

**(d)** The operators manning the mobile Road Cranes under various departments are generally under the control of the officers of the using department. But it has to be ensured that such operator are trained in Kharagpur Shops where facilities exist for training of the operators. The operator must hold a Competency Certificate issued by the Senior Divisional Mechanical Engineers/ Divisional Mechanical Engineer concerned.

**(e)** The training given to a mobile Crane Driver does not permit him to interfere with any vital item in the Crane, and any defect, however small it may be, should be reported immediately to his superior who should get in touch with the Divisional Mechanical Engineer and also with the Works Manager(G) at Kharagpur. Any trouble shooting of electrical devices on the Cranes should be done by the operator who should report the matter to the Divisional Electrical Engineer of the Division and also the Works Manager(G) at Kharagpur.

**(f)** The Cranes have to be operated and maintained according to the instructions received from the manufactures, and in this regard necessary instructions are given to the mobile Crane Driver. It should be noted that as there are various makes of these Cranes, each Crane may have certain specialities and any Crane operator even though holding competency certificate should not be allowed to handle a Crane of a different maker unless he has received a course of instructions in handling the same from the SSE/SE(C&W) to be specified by the Divisional Mechanical Engineer for the purpose and holds an annual "Certificate of fitness" for handling that type of Crane from the SSE/SE(C&W) as per para 24.02 (i).

**(g)** The Cranes are given their maintenance schedules, change of oils and greases, etc. according to the Maker's instructions, or special instructions issued by the competent authority. At wayside points away from Loco Sheds the Crane Driver should be instructed to be careful to see that Cranes are not worked overdue schedules. He should inform his superior in advance when the Crane is due schedule giving the date so that prior intimation can be sent to the necessary unit responsible for the normal schedule of mobile Crane. The major schedules of such Cranes will be controlled by W.M. (G)/KGP. Any major break-down shall also be reported for attention to the Works Manager (G), KGP.

**(h)** For the guidance of the Crane Operator, the capacity at various radii for operation of the jib are indicated on the Crane itself. The operator is also made conversant during his training with the operating speed for traversing with load and without load and hoisting speeds etc. He should refrain from going against such instructions, as such actions may be dangerous.

**(i)** Instructions regarding the periodical attention to chains laid down in para 24.03 (c) and (d) must be followed for Road Cranes as well.

**(j)** The operation of these Cranes will be confined to the sidings alone. In case of working on running lines or working on a siding fouling or likely to foul the running line provisions of paras 24.15, 24.16 and 24.17 must be observed and the Crane operations controlled by a Supervisor as per para 24.02(f).

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## CHAPTER – 25

# FIRE FIGHTING

### 25.01 Object :

Safety against fire hazards of passengers and goods entrusted to the Railway is of the utmost importance and Railway staff should ensure that all precautions are taken to avoid losses caused by fire.

The instructions given below are issued for general guidance of all Traffic Staff. They must make themselves thoroughly familiar and act whenever necessary in accordance with those instructions. GR 6.10 and SRs thereto already have brief about 'Fire in railway premises and trains'.

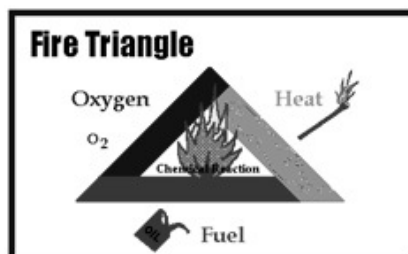
### 25.02 About Fire:

A fire requires three basic components

- Enough oxygen to sustain combustion,
- Enough heat to raise the material to its ignition temperature,
- Some sort of fuel or combustible material

Oxygen, heat, and fuel are referred to as the 'fire triangle'. To control the fire, at least one of them must be removed. Essentially, fire extinguishers put out fire by taking away one or more elements of the fire triangle. Fire safety, at its most basic, is based on the principle of keeping fuel sources and ignition sources separate.

**Fire Triangle**



1. **Air (Oxygen) :** If air is removed, the fire will suffocate because of lack of oxygen and put off. Water-based foam sprayed on to the fire will act as a blanket between the fire and the air. Similarly, a layer of dirt shovelled onto the fire will act as a blanket. The removal of air from a fire is a form of attack that is normally limited to small or easily accessible fires.
2. **Heat :** The removal of heat or the cooling of a fire is the most common form of suppression. In most cases water is used to essentially soak up the heat generated by the fire. This heat turns the water in to steam, thereby robbing the fire of the heat used. Without energy in the form of heat the fire cannot heat unburnt fuels to ignition temperature and the fire will eventually go out. In addition, the water can act to smother the flames and suffocate the fire. Chemicals can be added to water to improve the heat removal properties of water, or to improve the ability of the water to stick to unburnt fuel.
3. **Fuel :** If fuel is removed, the fire will starve and be extinguished. In railways, physical removal of combustible things away from fire will help to put off the fire.

### 25.03 Classification of Fire :

Not all fuels are the same, and if wrong type of fire extinguisher is used on the wrong type of fuel, it will worsen the situation. Different fuels create different fires and require different type of fire extinguishing agents. It is therefore very important to understand the four different classifications of fire.

(a) **CLASS A:** Class A fires involve common combustibles such as wood, paper, cloth, rubber, trash and plastics where cooling, blanketing, or wetting extinguishing agent is needed. They are common in typical commercial and home settings, but can occur anywhere these types of materials are found.

(b) **CLASS B:** Class B fires involve flammable liquids, gases, solvents, oil, gasoline, paint, lacquers, tars and other synthetic or oil-based products. Class B fires often spread rapidly and, unless properly secured, can reflash after the flames are extinguished. Extinguishers for this type of fire include **carbon dioxide, dry chemical and halogenated agent types**.

(c) **CLASS C:** Class C fires involve energized electrical equipment, such as wiring, controls, motors, data processing panels or appliances where a non conducting gaseous clean agent or smothering agent is needed to put off the fire. They can be caused by a spark, power surge or short circuit and typically occur in locations that are difficult to reach and see. The most common type of extinguisher for this class is a **carbon dioxide extinguisher**.

(d) **CLASS D:** Class D fires involve combustible metals such as Magnesium, sodium, Potassium, titanium, aluminum, etc. Combustible metal fires are unique industrial hazards which require special **dry powder** agents. Special dry powder extinguishing agents are required for this class of fire.

(e) **CLASS K:** Class K fires involve combustible cooking media such as oils, fats, grease, etc., commonly found in commercial kitchens. The new cooking media formulations used for commercial food preparation require a special wet chemical extinguishing agent that is specially suited for extinguishing and suppressing these extremely hot fires that have the ability to reflash. A wet potassium acetate, low pH-based agent is used to put off this class of fire.

### 25.04 Types of Fire Extinguishers:

It is important to use the correct fire extinguisher for the type of fuel. Using the incorrect agent can allow the fire to reignite after apparently being extinguished successfully. Some type of fire extinguishing agents can be used on more than one class of fire. Most fire extinguishers will have a pictograph label telling you which fuels the extinguisher is designed to fight.

(a) **FOAM (AFFF) : AFFF(Aqueous Film Forming Foam)** fire extinguishers extinguish the fire by taking away the heat element of the fire triangle. Foam agents also separate the oxygen element from the other elements. Foam extinguishers can be used on class A & B fires only. They are not for use on Class C fire due to the shock hazard.

(b) **CARBON DIOXIDE (CO<sub>2</sub>) :** CO<sub>2</sub> Fire Extinguishers extinguish the fire by taking away the oxygen element of the fire triangle and also by removing the heat with a very cold discharge. CO<sub>2</sub> can be used on Class B and C fires. They are usually ineffective on class A Fires.

(c) **DRY CHEMICAL POWDER (DCP) :** Dry chemical fire extinguisher extinguish the fire primarily by interrupting the chemical reaction of the fire triangle. Today's most widely used type of fire extinguisher is the multipurpose dry chemical that is effective on Class A, B and C Fires. This agent also works by creating a barrier between the oxygen element and the fuel element on Class A Fires.

**NOTE :** Please note that difference between the dry chemical extinguishers and dry powder extinguishers is that the Dry powder extinguishant will cake and form an exterior crust when heated by the fire. The crust formed will exclude air from the chemical reaction, resulting in extinguishment of the fire, and dissipating heat. A regular dry chemical extinguisher will simply blanket the burning material, interrupting the chemical reaction at the fuel's surface.

#### **25.05: How to use Dry Chemical Powder Type (DCP) Fire Extinguisher :**

These are commonly used extinguishers in railways. These types are suitable for tackling petroleum, gas, electrical fire and controlling fires of textile fibres. Sodium based chemical powder is used on a fire which undergoes chemical reaction.

##### **How To Use :**

- (i) Carry to the place of fire and keep it up right.
- (ii) Remove the safety clip.
- (iii) Strike/Press the knob located in the cap.
- (iv) Sealing disk of the gas cartridge gets broken and allows carbon dioxide gas to escape to the main shell and powder is pushed out.
- (v) Direct the stream of the powder at the base of the flame.
- (vi) For effective result, stand at about 1.5 to 2.5 m. away from the centre of the fire.
- (vii) Move forward while moving the nozzle rapidly from side to side in sweeping motion.
- (viii) When using on outdoor fires operate from the up wind side for effective spray.

#### **25.06: Provision of Fire Extinguishing Equipment :**

At places where mobile units are not provided but only simple firefighting equipments such as hydrants, fire extinguishers and fire buckets are provided, normally the following is the minimum quota of fire buckets, drums and fire extinguishers to be kept at stations :

SN	Description	Fire bucket 11 to 14 ltrs. round bottom	Minimum Fire Extinguishers
1	Small stations and RRI cabins	6	02
2	Central SS office	-	02
3	Flag Stations	-	02
4	Goods shed	6	02
5	Parcel Office	6	02
6	Electric/Diesel loco	-	04 (2 in each cab)
7	Brakevan	-	02
8	AC Coaches	-	02
9	Pantry Car	-	04
10	Motorman cabin of EMU/DMU/MEMU	-	02
11	RMS Van	-	02
12	Inspection Carriage	-	02
13	Each Generator Car	-	04

- (i) The ratio of water and sand buckets should be 1:1.
- (ii) The fire buckets should be secured by stand with chain and lock. The buckets should be covered to protect from sunlight and rain.
- (iii) Sand should be in dry condition and sand should be replaced as and when it becomes wet. Water should be replaced on every Monday.
- (iv) SSE(C&W) of the base depot of the rake is responsible for providing fire extinguisher and to ensure its timely maintenance in all cases except at station/RRI cabin/Central SS office/Goods shed/Parcel office where it is the responsibility of SS/SM in charge.

### **25.07 Fire Alarms :**

A proper fire alarm is the quickest means to warn staff about the outbreak of fire. Now-a-days, smoke detecting alarms are being provided in trains and offices to alert the staff. Where accident hooter/siren is provided, this may be used to sound continuously for 5 minutes to alert the staff. At stations where such alarms are not provided, on noticing a fire, the station bell to be rung or sounded at once continuously for 5 minutes.

### **25.08: Fire Prevention in Railway Premises :**

Most fires are caused primarily due to negligence in one form or the other. If not detected and extinguished in the initial stage, they may result in heavy loss of life and property. It shall therefore, be the responsibility of all Railway employees to observe such precautions against fire as may be necessary and to take immediate action to extinguish it in its early stage by making proper use of first aid fire fighting appliances provided.

Some important precautions against fire which should be kept in mind and observed, are given below :

- (i) Smoking or lighting a flame in railway premises and in trains is prohibited which should be strictly followed.
- (ii) Places of work should be kept clean and free from waste paper cuttings, scraps, rubbish etc.
- (iii) Dustbins must be provided for throwing scraps and combustible waste materials and these should be kept at a safe distance from the building.
- (iv) Over loading of electric circuit should be avoided and electrical installation should be checked periodically.
- (v) Petrol, paints, explosive materials and gases should not be kept in stores and godown which do not conform to the standard specification for such storage as specified in IRCA Red Tariff No. 20.
- (vi) Rules for marshalling and shunting of inflammable, explosives and other dangerous goods as laid down in Chapter-21 of this Manual and Red Tariff No. 20 should be strictly observed.
- (vii) Supervisory staff should ensure that staff working under them are conscious of fire hazards. Circulars and standing orders issued from time to time on this subject are got noted by all the staff and strictly followed.
- (viii) Updated telephone numbers of available fire brigades nearby should be displayed outside the SM office. Correctness of telephone numbers should be frequently checked.
- (ix) Smoke alarms/detectors should be provided in big offices.
- (x) Fire fighting appliances should be kept in places easily accessible and the staff must know the location where the fire appliances like hydrant hose-pipe, extinguishers, buckets, etc are installed. Further, fire fighting appliances should be periodically checked.

- (xi) The Station Master and Supervisors concerned shall see that adequate number of water buckets and sand buckets are properly kept filled with water and sand respectively. These buckets should be replaced immediately in case of any damage.
- (xii) Water supply points should be inspected twice in a month by the SSE/SE/JE(Works).
- (xiii) Fire drills are to be conducted with all staff once in a month.

#### **25.09: Action to be Taken in Case of Fire in Railway Premises:**

- (i) Any Staff whether on or off duty noticing fire shall —
  - (a) Raise the fire alarm immediately as prescribed in para no.25.07
  - (b) Take all possible action to extinguish the fire without any loss of time.
  - (c) Use the available fire extinguishing appliances properly and promptly.
  - (d) Inform the control of Railway Fire Brigade, City Fire Brigades, Civil Police, RPF Control/Post giving them in brief the correct location of fire and also the material involved, if possible.
- (ii) In addition to above, immediate information should also be given to concerned Railway officials of the department whose property is involved in the fire.
- (iii) The senior most railway official present at the site of fire, shall see that every action is being taken to extinguish fire to prevent theft and other miscreant activities. RPF/ Police official present at the site of fire will be responsible to guard the property during the occurrence and after. The senior most fire fighting official present at the site of fire, will ensure proper utilisation of the Fire fighting facilities.
- (iv) Rescue anyone in danger and send the injured immediately to the nearest hospital, save documents and property from being gutted.
- (v) As far as practicable, the documents and all moveable property adjacent to the fire should be removed to a safer place under the direction of the responsible staff of the department concerned. A list of the property/ documents so removed should be prepared in duplicate.
- (vi) In case of fire in a sealed wagon, the seals, locks/rivets should be immediately broken (in absence of key of the lock) and the door opened in presence of Station Master/Yard Master/Goods Supervisor/ Goods Clerk as the case may be or in presence of Guard when fire on a wagon is in mid-section.
- (vii) In case of fire in electrical installations, switch off the mains before using any fire extinguisher or water on it. In case this is not done, it may prove fatal as water is a good conductor of electricity.
- (viii) Keep the doors and windows of the room, coach wagon etc. closed till such time fire appliances are ready for use on fire or till the time of arrival of fire brigade. Keep the gates open and road free from obstructions for easy access of fire brigade engines.
- (ix) Push away coaches and wagons and remove other combustible materials, if any, from the vicinity of fire in order to check its spread and all shunting movement in the vicinity of the affected area should be stopped.
- (x) Water column or any other source of water supply can be used freely for fighting fires, if required. If fire breaks out in a wagon or coach the same should be placed immediately beneath nearest water or hydrant. In case of fire in locked goods shed and parcel shed, the lock should be opened after breaking it and action taken to extinguish the fire.



- (xi) On arrival of the fire brigade, the fire officer should immediately be apprised of the nearest source of water the risk involved and risk apprehended and be given any other co-operation that may be needed. The senior most official of the Fire Brigade will be responsible for efficient working of the unit on the fire.
- (xii) Cause of fire should be investigated and ascertained without delay and any material, clue found or detected must be preserved, if sabotage is suspected.

#### **25.10: Fire in Trains and Locomotives :**

Fire on a running train is more disastrous than on a stationary one, since wind helps spreading of the fire to other coaches/wagons. Moreover, passengers sometime jump out of a running train on fire resulting in increased casualties.

##### **(a) Main causes and sources of fire in trains :**

- (i) Carrying stoves, sigris, gas cylinders, kerosene oil, petrol, fireworks, acid, etc. in passenger compartments and booking of motor vehicles without completely decanting petrol/diesel.
- (ii) Making fire/using fire near paper, wood, petrol or such other inflammable articles.
- (iii) Lighted match sticks, cigarette ends carelessly thrown.
- (iv) Short circuit in electrical wirings.

##### **(b) How to prevent fire accidents in trains :**

- (i) Provision of highly-sophisticated VESDA (Very Early Smoke Detection Apparatus) fire and smoke detection system in all coaches will help to avoid fire accidents. It can sense carbon monoxide easily once a fire breaks out inside a bogie.
- (ii) Installation of fire-retardant cables and a multi-tier electrical protection system bogies will prevent sudden fire caused due to electrical snags.
- (iii) Installation of fire barrier and thermic lock in vestibuled doors of LHB(Linke Holfmann Busch) will help to prevent or check spread of fire.
- (iv) Installation of sprinklers in pantry and power cars will help to prevent fires.
- (v) Do not allow to carry inflammable/Combustible articles like petrol, kerosene oil, diesel, films, fireworks, gas cylinders etc., in train.
- (vi) Do not allow to light a cigarette in trains. Smoking is already prohibited in trains and stations.
- (vii) Do not allow to block the pathways in coaches with heavy luggage which restricts exit of passengers from coach in case of fire.
- (viii) Do not allow selling of food items using cigars/stoves by vendors. If detected stringent penalty to be imposed.
- (ix) A minimum gap of 6 inches in between roof of the SLR/VP and consignment is to be maintained to pre-empt the incidence of fire due to friction as mentioned in IRCM manual.
- (x) No motor vehicle should be booked without ensuring complete decanting of petrol/diesel.
- (xi) Adequate and proper maintenance of electrical devices in the coaches as per laid down norms.



(xii) All electrical points provided in the coaches for laptop/mobile charging should be thoroughly checked as these are continuously used in the train journey.

(xiii) Emergency feed of electric supply from adjoining coaches should be made only in unavoidable circumstances and that too for a short period. It must be ensured that the connections for such emergency feed are properly secured. It should also be ensured that the condition and fitment of emergency feed terminals are checked both during primary and secondary maintenance.

(xiv) Proper maintenance and upkeep of electrical devices, boilers, refrigerators, burners, gas cylinders, gas manifold, exhaust fans, chimneys and wiring system in pantry cars.

(xv) Use of overload, over voltage protection devices, standard size fuses, MCBs, Earthing, etc., in coaches, pantry cars and power cars.

**(c) Action to be taken in case of fire in train :**

(i) LP of the train should immediately switch on his flasher light. Crew of any train coming from the opposite direction seeing flasher light should immediately control speed and proceed with caution.

(ii) In case of fire in a running train, every railway staff available on the train including TTE shall immediately try to stop the train and plunge into action to save lives and property.

(iii) Pull the Alarm Chain and stop the train immediately.

(iv) All the railway staff at site should advise the passengers to remain calm and not panic and vacate the coach only if there is actual fire. In case of double line section, passengers should be advised not to detrain on the other line to avoid being run over by train coming from the opposite direction.

(v) Evacuate passengers from burning coaches. Open the emergency windows of the coach to escape after the train is stopped. In AC coaches, hammer can be used to break the window glasses to escape from the coach. In case of vestibule coaches, it will be advisable for passengers to go to adjoining coaches through vestibules rather than get down from the affected coach on to the adjoining track, which can be dangerous.

(vi) Try and put out the fire before it becomes a big blaze by using water, blankets, fire extinguishers or by any other means.

(vii) More people expire due to suffocation from smoke rather than due to actual burning. If you smell gas or vapour, or even in case of excessive smoke, hold a wet cloth loosely over your nose & mouth and breath through it in as normal a manner as possible.

(viii) Insist that passengers should save themselves first and not to bother about their luggage which can be retrieved later on.

(ix) Building up confidence of injured passengers by suitable advice is of great importance.

(x) Once the train is stopped, isolate the burning vehicle from other vehicle by uncoupling.

(xi) In case fire is discovered when the train is near a tank or watering station, the Guard and LP shall use their discretion to proceed there, but no such attempt shall be made until the portion of the train in rear of burning vehicle has been detached.

(xii) Inform all concerned to assist in extinguishing the fire.

- (xiii) In case of fire from electrical short circuit, switch off the source.
- (xiv) Once the incident is over and the train starts again the affected coach should invariably be checked at nearest C&W/Electrical maintenance point. The train should move only after proper certification about safety and if necessary competent maintenance staff should be deputed to escort the coach.

**d) In the event of fire on an Electric engine/EMU:**

Provision as laid down in SR.6.10.04 should be followed.

**e) In the event of a fire on a Diesel Engine/DMU :**

- (i) The LP/Motorman shall immediately pull the circuit breaker and shut down the engine. The train shall be brought to stop at once.
- (ii) The Guard shall give all possible assistance to the LP in putting out the fire.
- (iii) Fire extinguishers of approved type shall be provided on each diesel locomotive and motor coach of DMU when these are turned out from the home shed. The SSE(Loco) in charge of the shed shall inspect the fire extinguishers and ensure that these are in good working condition.

**f) Fire caused by Petrol or other inflammable liquids, acids or gas:**

- (i) Segregate the affected wagon, coach or area involved.
- (ii) On opening a wagon do not enter in to it immediately. One would thus, avoid fumes, which may be dangerous.
- (iii) Use foam type fire extinguishers and sand and not water or soda acid type fire extinguishers.
- (iv) Do not bring naked lights near the site of fire.
- (v) Warn the people living in the surrounding areas within one Km. radius.
- (vi) Stay away from ends of tanks, as tanks normally burst from the ends.
- (vii) Cool tanks that are exposed to flames with water from the sides only after the fire is put out.
- (viii) Withdraw immediately in case of rising sound from venting safety device or any discolouration of tank due to fire.
- (ix) Inform the nearest Fire Stations intimating that the fire has been caused by Petrol or any other inflammable liquids, acids or gases.

**g) In case of fire due to Explosives/Inflammables/Dangerous Goods :**

- (i) Extinguish by closing the valve or isolating LPG feed to fire by other suitable controls.
- (ii) Following steps may be taken if no undue risk is involved:
  - (a) Move cool cylinders to a safe place after ensuring closing of valves.
  - (b) Cool the hot cylinders by spraying water from a safe position. The person directing the spray should take up a position where he would be protected from possible explosion.
- (iii) If cylinder containing inflammable/toxic gas develops leak during transportation, remove it to an isolated open place away from any source of ignition and advise the filler or consigner as required.

- (iv) Inform the Chief Controller of Explosives by fax/telephone immediately.
- (v) Inform officer in charge of nearest fire/police station.
- (vi) Inform departmental officers concerned.
- (vii) Pending the visit of the Chief Controller of Explosives/his representative, the wreckage and debris shall be left undisturbed except to save lives.
- (viii) After getting information from the Chief Controller of Explosives that he does not wish any further investigation, the restoration work may be commenced.

#### **25.11 Inspection of Fire Appliances :**

Official-in-charge of offices, yards, sheds etc. where these appliances are provided will be responsible for the upkeep and safe custody of the fire appliances supplied to them. Following are to be ensured :

- (i) To see and ensure that Fire prevention instructions issued from time to time are strictly observed.
- (ii) That 'No-smoking' Notice Board are provided specially where smoking is considered dangerous.
- (iii) That Notice Boards indicating current telephone numbers of the nearest Railway and City Fire Brigade are to be provided and displayed at stations, Goods Shed, Parcel Offices, yards and at other important places.
- (iv) Where water tanks, barrels or buckets are provided, Station Master must see that they are always kept full of water and conveniently placed in suitable position. A little kerosene oil should also be dropped in the water to prevent breeding of mosquitoes. Water should be replaced one every Monday.
- (v) The ratio of water and sand buckets is 1:1 These should be topped or changed at least once every month. This sand should not be allowed to get wet.
- (vi) That any defects, noticed in the fire appliances are attended to with least possible delay by writing to the authorities concerned. Ensure that timely inspections and checks are conducted by the authorised agent as per schedule.
- (vii) The SSE/SE/JE(C&W) of the base depot of the rake is responsible for providing fire extinguishers in respective places like RMS Van, A.C. Coach, Inspection Carriage, Dining Car, etc., and to ensure its timely maintenance and filling of fire extinguishers as per schedule and their loading in brakevan of passenger carrying trains and other locations. A record should be maintained for this purpose.
- (viii) Guards of Passenger carrying trains LPs of all trains should ensure availability of fire extinguishers in Brakevans/locos. If not available, they shall report the matter in writing to the Station Master for necessary action.
- (ix) Frequent checks should be conducted to ensure the efficacy and availability of adequate number of fire extinguishers as prescribed.
- (x) Cases of loss or theft of the fire fighting appliances should promptly be reported to the RPF/ Inspector, Officer Incharge/RPF and GRP including the controlling authority of the respective department and the incharge will arrange to replace the same from his on hand stock or place indents to division for replacement.
- (xi) Chief Civil Defence Instructor of the division should also be entrusted with the job of inspection and training of staff.

**25.12 Responsibility of Maintenance of Fire Extinguishers :**

The designated agent should maintain the fire extinguishers quarterly and all the extinguisher shall also be subjected to a thorough inspection at least once in a year. The annual inspection should be combined with the operational test and hydraulic pressure test. The extinguishers after inspection should be refilled immediately and the date of inspection and refilling should be indelibly marked on the extinguisher and recorded in the register of the fire extinguishers.

Sr.DME/Sr.DEE of the division who are entrusted with the job of selection of the private agency for inspection and maintenance of fire extinguishers should circulate details and address of the authorised agent for upkeep of fire extinguishers, validity of the contract, telephone numbers and frequency of inspections to be conducted by the agent as per the agreement to all places where fire extinguishers are provided to enable them to call the agent whenever necessary.

**25.13 Training in Fire Fighting :**

Staff attending Zonal Railway Training Institute / Sini, System Training Centre/KGP and Electric Loco Centre/TATA should be imparted training on fire fighting through lectures and practical demonstrations. Principal/ZRTI/STC/ELTC shall co-ordinate with the Sr. DSO/DSO or Sr. DSC/DSC of division to requisition Civil Defence Instructors or qualified RPF staff, from the division to impart such training as per requirement. Training centres also nominate their instructors to undergo training on fire fighting in nominated Training Centres. These trained instructors shall conduct fire-fighting training for trainees. In some cases, special classes may be held at training centres to give fire fighting training for which field supervisors should be spared positively who give training to their field staff.

For the staff, those who do not attend the Training Centres/Schools, necessary programme should be organized by concerned departments in co-ordination with Sr.DSO/DSO/Sr.DSC/DSC from time to time.

In addition to the above training centres, all Divisional Training Centres should include 'Fire Fighting' as part of the curriculum to give lectures and practical demonstrations of fire fighting to all staff. Besides, necessary fire drills are to be conducted at stations, yards, sheds, offices, hospitals, etc., once in a month.

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## CHAPTER-26

# TRAIN LIGHTING AND AC COACHES

### 26.01. Electrical Equipment in Coaching Stock :

(a) Coaching stock is generally provided with lights and passenger coaches are provided with fans also. Power supplies in the coaches are either self generating type or EOG / MOG type. Coaches fitted with generator equipment such as Alternators and batteries are called equipped coaches whereas other coaches are unequipped. While each light or fan has its switch inside the coach, equipped coaches have a control switch also fixed at the end of the coach. Power supply in MOG/ EOG type of coach is from Generator cars placed at mid or both ends of the rake. Some of the coaches are provided with Air-conditioning for which power supply is made either from self generation or from EOG.

(b) All defects in the lighting of trains are attended to by Technician (Electrical) of the train lighting section posted at certain base stations and also at certain intermediate stations en-route.

(c) For AC coaches, accompanying AC mechanic (ACCI) and AC coach attendants (ACCA) are provided. Train Superintendent/TTE of the coach have to collect their names along with mobile numbers and record the same in their report.

(d) Following is the list of stations at which Train Examiners (Electrical) and Train lighting staff are posted over this Railway:-

WAT Division	KUR Division	SBP Division
Koraput	Puri	Sambalpur
Rayagada	Khurdha Road	Titlagarh
Kirandul	Bhubaneswar	Bhawanipatana
Jagadapur	Cuttack	
Visakhapatanam	Talcher	
Vijayanagaram	Paradeep	
	Palasa	
	Bhadrak	

### 26.02. Marshalling of coaches:

(a) Rakes should be marshaled in such a manner that equipped coaches and unequipped coaches are distributed evenly over the train so that two unequipped coaches are not marshaled side by side. On a rake not less than 80% of the total number of coaches should be equipped coaches. Non-electrified coaches should not be marshaled inside a block rake. Parcel Vans also should be marshaled outside the passenger coaches.

(b) If for any reason any coach is marked sick or booked for repairs, the coach after being repaired should go back to the same rake. When for any cause a coach is detached from a Mail, Express or a Passenger train, the Station detaching it should send a message to the concerned control advising the class and type of vehicle detached, so that steps may be taken to replace the vehicle on the rake at the earliest possible opportunity.

(c) When any coach working on 110 Volts is required to be marshaled, it should be so marshaled that continuity of original system is not disturbed. Further as far as possible all the 110 Volts coaches, on such trains should be marshaled together at one end, to make it easy to connect them together in the case of failure of generating equipments on these coaches.

### **26.03. Control of Lights and Fans:**

(a) With a view to prevent undue drain on batteries, lights and fans on train service coaches are to be switched on as follows:-

- (i) Local or branch line trains: - Half an hour before starting time.
- (ii) Mail, Express and Passenger trains: - As soon as the rake is backed on the platform line or one hour before the departure of the train whichever is later.

(b) On termination of a train, after the passengers alight, the Train lighting staff must switch off the fans and lights.

(c) Switching 'On' and 'OFF' of lights and fans circuits in a rake is effected by operating rotary switches or MCBs in the Junction box provided inside individual coaches. Operation of these circuits is the duty of train-lighting staff deputed at important stations. Individual switches regulators of lights and fans are to be operated by passengers themselves.

### **26.04. Guard and TTE Duties:**

(a) On taking over a train, the Guard must satisfy himself that the lights and fans in the SLR and the side and tail lamps are in working order. In Parcel Compartments, Guard should switch off the lights inside the parcel compartment after loading is completed to avoid fire accidents due to short circuit.

(b) Conductor or TTEs are responsible for ensuring that the electrical equipments and fittings of all coaches are functioning satisfactorily. Where any defect or deficiency is noticed, they should inform the electric staff on duty of AC coaches or advise through control to the next station where electrical staff is provided.

### **26.05. Failure of Lights and Fans on Coaches:**

Passenger carrying train shall not be dispatched from the originating station with defective lighting to avoid inconvenience to the passengers. In case the lighting system is defective while on run, Train Superintendent/TTE of the coach should ensure that electrical defects in their train are rectified. In case, on board staff are unable to rectify, TS/TTE should convey the message to the train lighting station to attend either through Commercial Control or Station Master. If TS/TTE are not available in the train, on knowing about the defective lights, guard of the train shall convey the message to the train lighting station through Station Master of the enroute station.

### **26.06. Action to be taken by Station Masters in case of Short Termination of Trains :**

Whenever coaching trains are to be terminated permanently at station having no train lighting staff, Sr.DEE(G) and SR.DME shall depute train lighting and C&W staff to take over the empty rake to switch off the lights/fans and close the doors. In case of any train is short terminated due to abnormal working or due to operational reasons, SS/SM of the station shall give a message to the above officials to take over the empty rake. Similar action should also be taken in case of detachment of coaching stock.

**26.07. Movement of Equipped Coaches, Generator Cars and A.C. Coaches:**

Coaches provided with costly equipments shall be moved by Passenger trains only. Movement by goods trains should not be allowed (i) to avoid thefts and pilferage of costly equipments (ii) for putting back these coaches into service after the earliest possible attention to avoid loss of Revenue. Controllers and other operating officials should ensure that such coaches move by passenger trains only. But the coaches with such equipment from and to work shops should be moved by “Shop special” or “Goods train” with RPF protections. In unavoidable circumstances when the coaches with costly equipments are dispatched by Mixed/Parcel train, they should be provided with escort. For this purpose, Electrical Department should provide the list of coaches along with coach numbers not to be attached in Goods/Mixed/Parcel train to the DOM.

**26.08. Fire on Electrically Fitted Carriage:**

(a) Fire in trains is discussed in detail in Chapter 25. In the event of electrical fittings in a coach caught fire, action to be taken as mentioned in para 25.10(C) of this manual. Guard/Loco Pilot/any other on duty staff on train shall take all possible actions to stop the train and the Guard shall:-

- (i) Remove the battery fuse;
- (ii) Remove the alternator belt;
- (iii) See that the fire is extinguished;
- (iv) Remove loosely hanging wires if any.

(b) If any Generator Car is marshaled in the rake, the Guard should ask the staff accompanying the Generator Car to shut down the Generator and cut off the supply.

(c) In case the wood work of a coach catches fire, all possible steps with available means shall be taken to prevent it from spreading and to extinguish it. In this connection the stipulation of G.R. 6.10 and SRs thereto should be followed.

(d) In case of fire on train in mid-section, the Guard/Loco Pilot of the train shall give immediate intimation to the controller and other concerned over portable Telephone or other means if the fire cannot be extinguished at the initial stage.

**26.09. Examination of Electrical Equipment by Train Examiners:**

Train Examiners in absence of Electric Train Lighting staff, should pay attention to the following points:-

- (a) Alternator should not be interfered except when an obvious defect has developed; the belt should then be removed and the alternator labeled ‘For repairs’.
- (b) When a missing belt is replaced, care should be taken to ensure that the tension on the belt is adjusted correctly.
- (c) A blown fuse should only be replaced with the correct HRC fuse supplied for the purpose. Care is necessary to be taken owing to risk of fire.
- (d) Lamps burnt out, broken or missing, should be replaced.
- (e) No major fan repairs should be attempted. Loose fan guards may be tightened or re-connected and fuses replaced.



**26.10. Special Equipment on Pantry Cars, Air conditioned Coaches and Inspection Carriage:**

- (a) Pantry cars are provided with special switches by which their own installations are fed from their own equipment not assisting the rest of the equipped coaches on the rake.
- (b) All Inspection Carriages are provided with special switches. If the Guard receives a complaint that the lights and fans have failed he should advise the electrical Train Examiner.
- (c) Air-conditioned coaches are normally accompanied by attendants who should attend to the defects and failures, if any.

**26.11. Breakage of Cells:**

- (a) In the event of any battery fitted coach being subjected to rough shunting or a bump or being derailed the staff present on the spot must see whether any liquid is dropping from the battery box. If any liquid is found dropping this matter must be reported at once to the Yard Master or the Station Master concerned who will arrange to have the electrical equipment examined by the Train Lighting staff and obtain full report. If there is no Train Lighting staff provided at the station, the nearest Train Lighting staff must be informed by the quickest possible means.
- (b) Whenever Air-conditioned Coaches and Inspection Carriages are sent to base station or Workshops for repairs to electrical equipment, the carriages are to be locked by train examining staff.

**26.12: Emergency Lighting Equipment in Brake-van of Passenger Carrying Trains:**

- (a) All trains carrying passengers except EMU shall carry Emergency lighting equipment in portable sealed box in the brake van.
- (b) The emergency Lighting Equipment consists of the following items:-
  - (i) Tripod Stand.
  - (ii) Platform with 2 Automobile Headlights and a 3-pin socket.
  - (iii) One hand lamp and Kent Coupler socket wired with 2 core TRS cable.
  - (iv) One Kent coupler socket and 3-pin plug with connecting TRS cable.
- (c) Procedure for assembling:-
  - (i) Tripod stand is to be fixed in position.
  - (ii) Automobile Head lights would be installed fixing them in the direction to be focused according to circumstances.
  - (iii) Plug is to be fixed in the socket provided at the Tripod stand and Kent coupler to the kent coupling socket of the coach.
  - (iv) The emergency light should be coupled up or connected to the coach which has its batteries in good condition. In case there is no coupler or no current in the coupler, the wire may be directly connected to the battery.
  - (v) The hand lamp may be used for illuminating any place where the projector light does not give adequate illumination or where close inspection is necessary.

- (d) **Training to the Guards:-**The Guards are to be trained at the Zonal Training Centre during their initial and refresher course of training in the use of emergency lighting equipment whenever necessary. It is the duty of every Guard to be fully acquainted with the procedure for using these lights.
- (e) **Custody of the Emergency Lighting Equipment:** - The emergency lighting equipment is to be kept in the onetime sealed cubicles of SLRs by the SSE/ JE (Electrical) of base station. It is the responsibility of SSE(Electrical) to check the equipment periodically as per the schedule and ensure its proper functioning. In case electrical lighting equipment is not available in SLR, SSE(C&W) of the base depot has to inform the same to the SSE(Elect) to take immediate action to provide the same.
- (f) **Breaking of Seal of Electrical Lighting Equipment :** Whenever, guard uses the electrical lighting equipment, an entry in this regard should be made in T-34 HF giving the reasons of use and it should also be informed to the base station for re-sealing. In case any E.L. Box is not received back or missed in SLR, SSE/JE(Elect) to report the same to DOM and DEE(G) for enquiry.
- (g) **Maintenance and Testing of the Equipment :** Electrical Lighting Equipment should be periodically tested atleast once in a quarter by electrical staff of base depot to which rake belongs and sign in the journal kept inside the box. Electrical and safety officers to spot check the emergency lighting equipment at base depots to ensure correct maintenance.

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## CHAPTER - 27

# ELECTRIC TRACTION AND OHE

### 27.01 Power Supply :

25 KV, AC, 50 Hz single phase power supply for electric traction is derived from the grid system of State Electricity Boards through traction sub-stations located along the route of the electrified sections at distances of 35 to 50 km apart. The distance between adjacent sub-stations may however even be less depending on intensity of traffic and load of trains.

### 27.02 Sectioning of OHE :

To ensure rapid isolation of faults and to facilitate maintenance work, the OHE is sectioned at intervals of 10 to 15 km along the route. At each such point a 'switching station interruptors' usually rated at 600A are provided. The shortest section of the OHE which can be isolated by opening interruptors alone is called a 'sub-sector'. Each sub-sector is further sub-divided into smaller 'elementary sections' by provision of off-load type manually operated isolator switches.

At some stations with large yards, alternative feeding arrangements are provided so that the power for feeding and yards may be drawn from alternative routes. Normally the switch is locked in one position, being changed to the other when required after taking necessary precautions.

To meet requirements at electric loco running sheds, isolator with an earthing device in the 'off' position is provided. At watering stations manually operated interrupters and isolator with earthing heels are provided to enable switching off of the power supply locally and earthing the OHE to enable working on roofs of rolling-stock. There are several types of switching stations as detailed in the following paras.

### 27.03 Feeding Post (FP): It is a supply control post, where the incoming feeder link from grid substation are terminated.

Each feeder supplies the OHE on one side of the feeding post through interrupters controlling supply to the individual lines. Thus, for a two track line, there will be four interrupters at each feeding post.

### 27.04 Sectioning and Paralleling Post (SP) :

These posts are situated approximately midway between feeding posts marking the demarcating point of two zones fed from different phases a '*paralleling Interrupter*' is provided at each 'SP' to parallel the OHE of the up and down tracks of a double track section, '*bridging interrupters*' are also provided to permit one feeding post to feed beyond the sectioning post upto the next FP if its 25 KV supply is interrupted for some reasons. These bridging interrupters are normally kept open and should only be closed after taking special precautions as detailed in these rules.

### 27.05 Sub-Sectioning and Paralleling Post (SSP) :

One or more SSPs are provided between each FP and adjacent SP depending upon the distance between them. In a double track section, normally three interrupters are provided at each SSP i.e. two connecting the adjacent sub-sectors of up and down tracks.

### 27.06 Sub-Sectioning Post (SS) :

These are provided only occasionally. They are similar to SSPs with provision for sectioning of the OHE but not paralleling.

**27.07 Neutral Section:**

It is a short section of insulated and dead overhead equipment which separates the area fed by adjacent substation or feeding post. A neutral section is provided to make it impossible for the pantograph of an electric locomotive or EMU train to bridge the different phases of 25 KV supply, while passing from the zone fed from one sub-station to the next one.

Since the neutral section remains 'dead', warning boards are provided in advance to warn and remind the Loco pilot of an approaching electric locomotive/EMU to open locomotive circuit breaker (DJ) before approaching the 'neutral section', to coast through it and then switch 'on' on the other side. Special care is taken in fixing the location of neutral sections, on level tangent tracks far away from signals, level crossing gates etc. to ensure that the train coasts through the neutral section at a sufficiently high speed, to obviate the possibility of its stopping and getting stuck within the neutral section.

**27.08 Other Important Equipment at Switching Stations :**

Certain equipments are installed at various points to protect the lines, to monitor the availability of power supply and provide other facilities. These are generally as under:

- (a) Lightning arresters are provided to protect every sub-sector against voltage surges.
- (b) Auxiliary transformers are provided at all the posts and also at certain intermediate points to supply AC at 240 V, 50 Hz required for signalling and operationally essential lighting installations. To ensure a fairly steady voltage, automatic voltage regulators are also provided where required.
- (c) Potential transformers are provided at the various switching stations for monitoring supply to each sub-sector.
- (d) A small masonry cubicle is provided to accommodate remote control equipment, control panel, telephone and batteries and battery chargers required for the control of interruptors and other similar equipments.

**27.09 Rule Books of Electric Traction :**

Rules applicable in electrified sections have been given in Chapter XVII of General Rules and in the Subsidiary Rules made there under for Electric Traction. The General Principles governing operation and maintenance of traction overhead equipment, electric locomotives and signal and telecommunication installations have been given in the A.C. Traction Manual. These Rule books shall be kept in each station and yard office and all the staff responsible for dealing with the movement and operation of trains shall make themselves thoroughly acquainted with these rules for safe working and shall be held responsible for knowledge and compliance with the same.

Brief references to important rules required to be followed by Loco Pilots, Guards, Station and Yard staff etc., in their day-to-day work have been given in this Chapter. These are, however, illustrative and not exhaustive. Loco Pilots should ensure that these instructions as well as those contained in Chapter XVII of the General Rules and Subsidiary Rules there to and also those contained in the A.C. Traction Manual are known to their crew as far as they are concerned.

**27.10 General Safety Precautions :**

- (a) All staff are warned that contact with or approach within 2 metres of any live portion of the 25 KV traction overhead equipment, unless protected by screen as per rules, is dangerous and should be strictly avoided (G.R.17.04 and Subsidiary Rules thereto). The zone within 2 metres of any live portion of equivalent is to be treated as dangerous.

(b) Notwithstanding the above, the Loco Pilot of an electric locomotive is permitted to change the head-light bulb of the locomotives while standing on the buffer beam projection at the floor level of the cab.

#### **27.11 Movement of Diesel locomotives on Electrified Sections :**

- (a) Fueling of the loco shall only be carried out in yards outside the electrified zone.
- (b) Watering of carriages :- Normally, all passenger carriages to move on the electrified sections, should be fitted with the side filling arrangement so that the water can be filled in the tanks from the ground level only.

#### **27.12 Unwired Tracks :**

No electric locomotives with pantograph raised shall under any circumstances be taken to an unwired section. All levers in cabins giving access to an unwired lines have a yellow point mark warning the cabinman/ASM against setting the unwired lines for electric locos.

#### **27.13 Power Block :**

- (a) The detailed procedure for obtaining power blocks has been given in G & SR 17.04 and Subsidiary Rules there to and this must be rigidly followed.
- (b) The sequence of switching operations for granting and cancelling the power block for particular sections is included as an Annexure to the appendix of Station Working Rules under 25 KV A.C. Traction. These should be strictly followed by all staff. Failure to follow the sequence indicated is likely to lead to dangerous consequences. When any isolator switch is changed from its normal position, for staff to work on overhead equipment, a danger Board shall be exhibited on the switch with the caption 'Danger, Men working'. An adequate number of such Danger boards are provided at each station.

#### **27.14 Section Insulators :**

In order to isolate Up and Down running lines and also sometimes Main and Loop lines or different grids in the yard, the cross-overs connecting Up and Down lines or cross-overs/turnouts connecting main and loop lines or different grids of the yard are provided with section insulators so that when one line or grid is made electrically dead or there be any fault on the same, the other line/grid is not affected.

When one of the two sections separated by a section insulator is dead, the pantograph of the electric locomotive on the live section shall not proceed closer to the section insulator to avoid bridging of live section and dead section.

#### **27.15 Fire :**

Regarding fire on or adjacent to any electrical equipment, refer GR 6.10 and Chapter 25 of this manual.

#### **27.16 Power supply to Colour Light Signaling:**

- (a) Power supply for colour light signalling on each station on the electrified stations is arranged from two independent sources as under:-
  - (i) One from Traction Overhead Equipment by means of step down auxiliary transformer for allowing the Voltage from 25,000 Volts to 230 Volts other from another Traction Overhead Equipment or from local supply.

(ii) Where the station is not electrified and there is no local electric supply available, both the sources (the primary as well as the duplicate) will be from the Traction Overhead Equipment by means of step down transformers. The two sources will, however, be tapped from the traction overhead equipment belonging to two different independent sections so that the outage of both the sources at the same time is reduced to the minimum.

(iii) The Change over from main supply to stand-by may be automatic or manual. In case of manual change over arrangement the SM on duty will operate the change over switch to the stand-by Power supply in the case of interruptions to the main power supply and vice-versa wherever such switch is provided to indicate the availability of both main as well as standby power supply.

(b) The Station Master shall be guided by the general procedures embodied in the Station Working Rules in restoring power supply to colour light signals at the respective stations. The Station Master shall ensure that power supply for the colour light signals will be switched over to the duplicate source in the case of power failure of the local supply or power block on their traction overhead equipment. Power blocks should be imposed after giving due consideration to the effect of the power blocks on power supply to the colour light signals, when the power is tapped from traction overhead equipment. While permitting Power blocks on either of the OHEs, it is to be ascertained that the alternative power supply is available so that the supply to the colour light signals is not interrupted thereby causing all signal light to go off.

#### **27.17 Loading and Unloading of Petroleum Products in Electrified Sections :**

Regarding loading and unloading of petroleum products in electrified sections, refer Para no. 10419, Chapter-IV, Volume-I of Indian Railways Manual of AC Traction Maintenance and Operation.

#### **27.18: Rules Applicable to Permanent Way Staff Working in Electrified Sections:**

Regarding rules applicable to Permanent Way staff working in electrified sections, refer Para no. 10420 to Para no. 10428, Chapter-IV, Volume-I of Indian Railways Manual of AC Traction Maintenance and Operation.

#### **27.19: Rules for S & T Installations in Electrified Sections:**

Regarding rules for S & T installations in electrified sections, refer Para no. 10429 to Para no. 10433, Chapter-IV, Volume-I of Indian Railways Manual of AC Traction Maintenance and Operation.

#### **27.20: Movement of Rubber Tyred Vehicles on Railway Wagons in Electrified Sections:**

All metallic parts of rubber tyred vehicles which are transported on Railway wagons through 25 KV electrified area shall be earthed to avoid the effect of induction. This is as per Para no. 10438, Chapter-IV, Volume-I of Indian Railways Manual of AC Traction Maintenance and Operation.

#### **27.21: Issue of Competency Certificate for Operation of Isolators during Emergency:**

Station Masters/Assistant Station Masters/Cabin Master/Pointsmen should be issued with Competency Certificates, after giving practical training, to enable them to operate specific isolator under instructions of Traction Power Controller (TPC). This is as per advance correction slip no. 24 dated 10.01.2013 to Para no. 20970-5, Volume-II, Part-I of Indian Railways Manual of AC Traction Maintenance and Operation and SR 17.04.14 (b). Similarly, vide SR 17.04.09 (c) (i), Guards shall be issued with such competency certificate jointly by SSE/SE(TRD) and TI of the section for operation of isolators.



**27.22 Safety Measures to be Observed in Case of Unusual Occurrences on Electrified Sections:**

Regarding safety measures to be observed in case of unusual occurrences on electrified sections, refer advance correction slip no. 11 dated 18.08.2003 to Para no. 5, Appendix-VIII, Volume-II, Part-II of Indian Railways Manual of AC Traction Maintenance and Operation.

**OVERHEAD EQUIPMENT****27.23 Catenary and Contact Wires :**

1. The overhead equipment above the tracks comprises of the following: -
  - a) A stranded cadmium copper wire of about 65 mm<sup>2</sup> section or stranded aluminium alloy wire of about 116 mm<sup>2</sup> section for catenary.
  - b) A grooved hard drawn copper contact wire of 107 mm<sup>2</sup> cross-section (when new) supported from the catenary by means of droppers of 5 mm diameter spaced not more than 9 m apart.
2. The catenary and contact wire together have an equivalent copper section of 157 mm<sup>2</sup>. The current normally permissible on a single track is 600 A approximately, because of equivalent cross-sectional area of OHE. This current limit is based on the temperature limit of 85° C in contact wire. Certain sections in Waltair-Kirandul section have the catenary and contact wires together having an equivalent copper section of 200 mm<sup>2</sup>.
3. For loop lines, sidings, yards and spur lines excluding the main running lines and first loop or lines taking off from main running line, tramway type OHE having only grooved hard drawn copper contact wire of 107 mm<sup>2</sup> section is provided.

**27.24 Height of Contact Wire :**

The normal height of contact wire for regulated OHE is 5.60 m (with 10 cm pre-sag for 72 m span) above rail level. For unregulated OHE in areas with a temperature range of 4°C to 65° C, this figure is 5.75 m and in areas with a temperature range of 15 °C to 65 °C, it is 5.65 m. In certain cases, such as under over-line structures, the height may be as low as 4.65 m on BG and 4.02 m on MG. For passing oversize consignments on such lines, special precautions have to be taken.

**27.25 Span of Supporting Mast/Structures :**

The span normally used for supporting the OHE from masts/structure using the cantilever type bracket assembly varies from maximum 72 m on straight track to 27 m on curved track, the spans depending upon the degree of curvature. The catenary system is normally supported on straight tracks at maximum intervals of 72 m (63 m on MG) by cantilever type arms fixed to galvanized broad flange or I section steel masts or fabricated steel structures. On curves the catenary is supported at closer intervals, the spans adopted depending upon the degree of curvature.

**27.26 Stagger :**

The contact wire is staggered so that as the pantograph glides along, the contact wire sweeps across the current collecting strips of the pantograph upto a distance of 200 mm on either side of the centre line on straight runs and 300 mm on one side on curves. This ensures a uniform wear of the current collecting strips of the pantographs.

**27.27 Overlaps:**

The OHE conductors are terminated at intervals of about 1.5 km with an overlap, the conductor height being so adjusted that the pantograph glides from one conductor to the other smoothly.

There are two types of overlap spans as under:-

- (a) Uninsulated overlap spans where the distance of separation between two contact wires is 200 mm and the two conductors are permanently connected together electrically by suitable jumpers.
- (b) Insulated overlaps, where the two OHE systems are kept apart at a distance of 500 mm.

Normally the electrical discontinuity at insulated overlaps is bridged by interrupters or isolator except at neutral sections.



### 27.28 Regulated and Unregulated OHE :

OHE with automatic tensioning called 'regulated OHE' is generally provided for all main lines, but for large isolated yard and unimportant lines, automatic tensioning is dispensed with in the interest of economy and only unregulated OHE is used.

### 27.29 Section Insulator Assembly:

Section insulators are provided to insulate the OHE of one elementary section from the OHE of the adjacent elementary section such as at cross-overs. When the pantograph of a locomotive passes from one track to another along a cross-over/turnout, current collection changes from one OHE to other and therefore the runners of the section insulators overlap with contact wire so that there is no arcing.

On double line sections with runners trailing, the section insulator assembly using porcelain insulators are fit for speeds upto 120 km/h provided it is installed between the first one-tenth and one - third of the span. In case the runners of the section insulator assembly are in the facing direction or it is not installed within the first one third of the span, the speed should be restricted to 80 km/h.

### SPECIAL WARNING SIGNALS

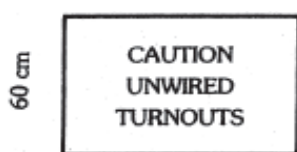


FIG. 2.03

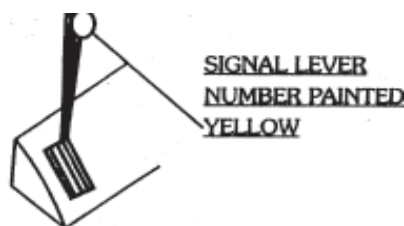


FIG. 2.04

<p>Trip Circuit Breaker</p> <p>FIG. 2.05</p>	<p>Close Circuit Breaker</p> <p>FIG. 2.06</p>	<p>Neutral Section Ahead</p> <p>FIG. 2.07</p>
<p>Neutral Section Ahead</p>	<p>Lower Panto</p>	<p>Raise Panto</p>

## CHAPTER - 28

# SIGNAL ENGINEERING

### 28.01 Signals :

These are used to ensure and enhance safety and efficiency in train operations. The use, placement, description and working of signals is detailed in chapter-III of G&SR.

### 28.02 Fixed Signal:

Fixed signal means a signal of fixed location indicating a condition affecting the movement of a train and includes a semaphore arm or disc or fixed light for use by day and fixed light for use by night.

### 28.03 Points :

Points are movable tapered pieces of rails by which either of two routes may be set. Each piece is usually known as tongue or blade or switch. It has a toe (the thin end) which fits against the stock rail, the other end being known as the 'Heel'.

**Points are further classified as :**

#### (i) Facing Points:

Points, the toe of which faces traffic approaching them and which can be directly diverted from the line upon which it is running are called facing points.

#### (ii) Trailing Points:

Points, the heel of which faces traffic approaching in the normal direction are called trailing points.

#### (iii) Coupled points:

When two or more points are worked by the same lever, they are called coupled points.

#### (iv) Cross Over:

It is a permanent way connection between two lines where they cross or join one another.

#### (v) Trap Points:

These are the points provided in a line to prevent unauthorized movements from that line to another line. These are having only one Tongue rail, which remains in normal position. After their proper settings, movements can be allowed. It is a derailing switch connected to a line for the purpose of isolation.

### 28.04 Locking of Points:

#### (i) Locking :

A lever is said to be locked when in the normal position it cannot be pulled over. A lever is said to be locking another lever when owing to the former's remaining in the normal or reverse position the latter cannot be pulled.

#### (ii) Positive Lock :

A plunger lock is attached to hand worked points for locking them. The lock is released by a key, whenever the points are to be operated.

#### (iii) Cotter and Bolt :

These are provided to lock the nose of the switch rail set with the stock rail. It can also be locked with the help of clamp and padlock to keep the point in the required position.

**(iv) Lock Bar :**

A metal bar mounted alongside the running rail and connected with a lever or an operative unit in such a manner that the lever or unit is prevented from being moved so long as the presence of vehicle prevents the bar from being raised. Minimum length of lock bar on BG is 1280 cm and on MG 1220 cm. An inside lock bar lies 38 mm below the top of the rail. Facing points lock must be fitted on the gauge tie plate.

**(v) Economical Point Lock or S.L.M. (Switch & Lock Movement):**

When the facing points and the facing point lock are worked by the same lever, it is called “Economical Point Lock” or “S.L.M.”

**(vi) Facing Point Lock :**

It is a plunger bolt provided at facing points, which ensures that the points are correctly set and locked to prevent them from being moved.

**(vii) Facing Point Lock Bar :**

It is a bar provided at facing points connected with a facing point lock, which prevents facing point from moving while a vehicle is passing or standing over it.

**(viii) Fouling Bar :**

It is a bar provided at the fouling points between two diverging roads which prevents points being set and locked and signal being taken ‘OFF’ for one road while a train is standing short of clearance on the other road.

**(ix) Detector :**

A detector is an appliance which when provided at facing points ensures the points being correctly set before the relevant signals can be taken off. It also prevents the points being worked until the signal has been put back to ‘ON’.

**(x) Clamp :**

It is an appliance (Made of iron) used to secure the switch rail hard against the stock rail in either normal or reverse position as required.

**28.05 Main Components of Points & Signals :****(i) Compensator:**

It is an appliance for compensating the expansion or contraction caused by change of temperature in a run of rodding or wire line connecting points/signals.

**(ii) Disengager :**

It is an appliance for breaking the continuity of control. When provided in the outer signal wire run, it prevents the outer signal from being lowered before the Home signal has been taken off.

**(iii) Mechanical Signal Replacer:**

When a semaphore signal is taken off for the train, the depression of rails caused by the weight of the train, while passing the signal actuates this device which is fixed to the rail and connected to the signal and puts the signal to the “ON” position.

**(iv) Electrical Signal Replacer:**

A device operated electrically is used to put the signal to the “ON” position. This works in conjunction with a mercury treadle or track circuit. The ESR is fitted on the signal post.

**(v) Electro Pneumatic:**

A system of power signaling where points or signals are worked by means of compressed air controlled electrically from the signal cabin.

**(vi) Gauge Tie Plate:**

A metal plate is fixed on the sleeper at the toe of points to maintain gauge.

**(vii) Slotting:**

This is a process by which signals are controlled by two or more persons. When signals are slotted, such signals can only be taken off by the combined efforts of all persons slotting the signal but can be put back to danger by anyone of the person. This may be mechanical or electrical arrangement.

**(viii) Crank:**

It is an appliance fitted with the rodding to change the direction of the motion given to lever.

**(ix) Clutch Resetting Lever:**

A lever used to re-set a double wire clutch lever which has trailed due to over haul wire breakage or obstruction between stock rail and tongue rail. This lever is kept in possession of the SS/SM and sealed on a bracket or box.

**(x) Tongue Rails :**

These are rails with tapered movable ends which controls the setting of the route.

**(xi) Treadle :**

It is a device by which the deflection of the rail due to the passage of an engine or vehicle or the impact of the wheels operates a contact to open or close an electric circuit.

**(xii) Point Indicator :**

Point indicator show 'white' on both sides towards the route when the line is set for the straight.(i.e the normal position) and 'green' when the line is set for 'take off'.(Ref. GR.1.02(46).

**(xiii) Trap Indicator :**

Trap indicator show 'red' on both sides towards the route when the switch is in open condition or the derail on the rail, and 'green' when the switch is closed or the derail off the rail. Ref GR.1.02(46)

**(xiv) Release :**

A lever releases another lever, when due to its operation, the later can be pulled. If lever No. 2 can only be pulled over when lever No. 1 is pulled, then lever No. 1 is said to be the releasing lever No. 2.

**28.06 Mode of Operation of Signals :**

**(i) Single Wire:** Single wire system was introduced to suit the operation of two aspects lower quadrant signals mechanically. Following major equipments are used for operating the signals by single wire.

**(a) Lever Frame:** A lever does the dual function for operating the signal and also actuating to ensure safety. Lever frames used on Indian Railways are of two types:

- (i) Direct locking lever frame
- (ii) Catch handle type lever frame.

**(b) Signal Transmission:** A steel galvanized wire is used for signal connections from lever frame to signal post.

**(c) Supports of Transmission:** Signal wires are carried on pulleys which are mounted on pulley stakes firmly driven into ground.

(d) **Cabin wire Adjuster:** A pull up type wire adjuster is provided in the cabin.

(e) **Signal post and fittings.**

**(ii) Double wire:**

Double wire signaling system employs two wires for the transmission of strokes from the lever to the operated functions viz. points, signals, locks, detectors etc. A double wire transmission consists of silico steel galvanized wire carried on pulleys which are mounted on pulley stakes firmly driven into ground. This is an arrangement on the safe side which also ensures that the signal takes up its position corresponding to the position of the lever in the cabin.

The operation of the signal lever from 'Normal' to 'Reverse' or from 'Reverse' to 'Normal' is positive and smooth. Double wire signaling has a number of advantages over single wire signaling in terms of ease of operation, display of definite aspect by MAUQ signals, no drooping, longer range of operations for points and signals and less operating staff requirements etc.

**(iii) Power Operated:**

Certain signals installed at a station are beyond the working range of mechanical signaling and electrical motors are being used to operate such signals. Moreover, colour light signals are generally electrically operated.

**28.07: Braking Distance:**

This is the distance required for a train to come to a stop when running at the maximum permissible speed of the section. This distance varies with the gradient, speed, brake power and weight of the train. Braking distance is also kept in view while fixing the location of reception signals.

**28.08 Sighting Distance :**

It is the distance between a signal and the place from where a Loco Pilot first sights the signal.

**28.09 Minimum Visibility Requirement for Signal:**

**(a) In Lower Quadrant Signaling and Modified Lower Quadrant Signalling system:**

- |  |   |              |
|--|---|--------------|
| (i) Home Signals   | - | 400 meters   |
| (ii) Main Line Starter signals   | - | 400 meters   |
| (iii) Loop Line Starter signals  | - | 200 meters   |
| (iv) Outer/Warner signals in Two aspect lower quadrant signaling territory | - | 1200 meters. |

**(b) In Multiple aspect signaling :**

- |                        |   |            |
|------------------------|---|------------|
| (i) Distant Signal     | - | 400 meters |
| (ii) Inner Distant     | - | 200 meters |
| (iii) All stop signals | - | 200 meters |

**28.10 Power Signaling Devices:**

An efficient signaling system not only provides mechanical methods of signaling but also uses electric energy devices like slotting etc. For more advanced methods of signaling, operation of points and signals is arranged through Electric power or Electro-pneumatic power. The common devices in power signaling are:

## 1. Relays :

A relay is an electrically operated device which has basically two conditions, either it is energized or de-energised. When it is energized the set of contacts made are called front contact, and when deenergised are termed back contact. These two conditions cannot be made at the same time as they are contradictory and this is made use in achieving the relay interlocking. Thus, if the locking relay is energized, its back contact is not available and hence, the other relay is locked as it cannot be energized. Based on this property a whole set of circuits is developed to set the points, clear the signal slotting etc. These sets of circuits interlock among each other to achieve essentials of interlocking.

## 2. Track circuits:

(a) A track circuit consists of portion of running rails insulated on both ends. It is fed electrically at one end and a track relay connected at other end. The track circuit is employed to indicate to the SS/ SM on duty the presence of a train vehicle at a portion of line which may be out of his sight and to control the signals or block instrument. Axle Counter Track circuits are used both in AC&DC traction areas as well as in non-electrified areas. In this track circuit rail is not a continuous part of track circuit.

**Track circuits can be of following types-**

- (i) AC Track circuits – used in DC traction area.
  - (ii) DC Track circuits- used in AC traction & Non-electrified area.
  - (iii) AFTC-Audio Frequency Track Circuits-used both in AC&DC traction areas as well as on non-electrified areas.
- (b) **Application of track circuit:**
- (i) Automatic signaling installation, on double and single line
  - (ii) Intermediate Block Signalling
  - (iii) Panel interlocking
  - (iv) Solid State Interlocking
  - (v) Route Relay Interlocking
  - (vi) Centralized Traffic Control
  - (vii) Power Signalling installations
  - (viii) Mechanized Hump yards
  - (ix) Track circuiting of run through and reception lines for giving indication in SM/In-charge cabin.
  - (x) For token less block instruments on single line sections.
  - (xi) To replace a signal to danger
  - (xii) To provide approach locking and lighting of signals and back locking of points.
  - (xiii) To provide automatic warnings of an approaching train to the Gateman of a level crossing.
- (c) **Failure of Track Circuits:** Track circuits should be considered to have failed in following cases when:
- (i) Track circuited section is occupied but does not give red illumination on the panel.
  - (ii) Track circuited section being unoccupied shows red illumination on the panel.
  - (iii) Track circuited section gives red illumination on the panel and signals can be taken off.

- (iv) Failure of track circuits, which control block instrument, should also be treated as failure of Block instrument.
- (v) In the event of failure of track circuit controlling the points, the panel ASM on duty should first verify that the concerned track is not occupied by any vehicle or train and then should reset the points.
- (vi) Failure of IBS track circuit will also result in failure of Advanced Starter and Home signal (IBS/IBP), and then procedure as detailed in G&SR 3.75 should be followed.

### 3. Axle Counter:

(a) It is a device for counting the number of axles of the vehicles comprising a train passing over a given point. The apparatus provided at two points proves whether the complete train has passed over the section of line between them. The main components of axle counting system are the detection points and the counting equipments. In axle counter counting actions are produced at two detection points which are compared to check whether the axles passing at one point is equal to the number of axles leaving at the other end. The condition of section whether 'Free' or 'Occupied' is indicated by means of counter. For every entering axle, the count is increased by one and for every exit it is decreased by one. Thus zero position indicates a clear section. It is a fully electronic system which counts the axles. It consists of –

- (i) Outdoor equipment (Detection Sets)
- (ii) Transmission Cables
- (iii) Indoor equipment (Counting Machine): The two detection sets are mounted on rail by means of clamps. Counting machine is provided in indoor equipment.

(b) Reset Button: A reset button is provided in the SM'S cabin to normalize the axle counter equipment in the event of any failure. Such resetting is done only after verifying from the station in advance that the preceding train has arrived there complete. Procedure given in SWR/Block Working Manual should be followed.

### 4. Block Proving by Axle Counters (BPAC) :

In conventional Block signaling last vehicle check is done by the ASM/cabin master/cabinman of receiving station to ensure complete arrival of train. Sometimes due to human error, a parted vehicle may be left behind in the block section leading to serious accident. This can be avoided if block is proved by the Axle counter.

Axle counter block working monitors the train movement to the block section, ensures automatic checking of the clearance of track upto block overlap and restoration of all signals to ON position after arrival of last train with locking of relevant points. Thus it ensures reduction in block operation time.

The SMs at both the stations get automatic display of status of the track (line closed and train on line) and direction of train movement (train going to /train coming from). The Axle counter block working is possible for both single line and double line section. In single line sections one axle counter is placed at either side of the station. The track devices are mounted on the advance track circuit of both ends of the



block section. In double line section both up and down lines have axle counter at the receiving station. Track device are mounted on the advanced starter and home signal track circuits of each line.

As count of axles at dispatching station is tallied with count of axles at receiving station for block proving, the possibility of leaving any stock in the block section is nullified. In case of failure of axle counter block resetting is possible with co-operation from the other end Station Master. Details of block working are given in Block Working Manual.

## 5. Data Logger :

This is a Micro Processor based equipment which logs the events occurring in the signaling functions of a yard chronologically with date and time. It is also known as event logger. Its main function is to store change in status of various field and panel functions (Relay contacts) along with exact time. It has battery backed memory. Stored data can be printed out at any time upon a request through the front panel key pad. Data can also be stored and printed through remote terminal (PC). It is compulsory for RRI and SSI. It is useful for failure analysis, repetitive discrepancies, to extract logic reports and accident investigation.

### 28.11 Tappet Locking :

To prevent conflicting routes from being set or conflicting signals being taken 'OFF' in the Mechanical Signalling Systems, it is necessary that levers operating various points are locked with each other on a certain pattern. The locking generally required is :

- (i) One lever locking another when pulled. This is known as "Normal locking".
- (ii) One lever releasing another when pulled is known as "Reverse or Release locking".
- (iii) One lever locking another in either position is known as "Both way locking".
- (iv) One lever locking or releasing another when third lever is either normal or reversed is known as "Special or conditional locking".

The 'TAPPET' is a flat bar of Mild steel attached to each lever which can move perpendicularly to a channel provided by 'Applet Ways' fixed in a locking tray, generally placed below the lever frame in the cabin. The tappets have notches cut in the sides whereas, in the channel there are wedge shaped blocks which can fit into the notches of the tappet and once these fit into the notches, the tappet cannot be moved and hence the lever is locked unless it is pushed by operation of the lever. There are two types of Tappet locking:

- (a) **Loose locking-** If the tappet notch is more than the locking dog, it is loose locking.
- (b) **Tight locking** – If size of the tappet notch is equal to the locking dog, tight locking is achieved. Tight locking achieves better safety where as loose locking gives better operational flexibility in the yard.

**28.12 Painting of Levers:**

1.	Warner signal (two aspect) lever	'Green'
2.	Distant signal (Multiple aspect) Lever 45° aspect	Yellow
3.	Distant Signal (Multiple aspect) lever 90° aspect	Green
4.	Other Stop Signal Levers	Red
5.	Slot Lever mechanical	Same colour of the lever slotted with 15.2cms/6" wide 'Blue' band in the middle
6.	Slot lever electrical	Same colour as of the lever slotted with 15.2cms/6" wide 'Yellow' band in the middle.
7.	Points lever	Black
8.	Facing point lock lever	Blue
9.	Economical facing point lock lever	Upper half 'Black' & Lower half 'Blue'
10.	Station Master's control lever	Upper half 'White' & Lower half 'Black'
11.	Level crossing gate control lever	Chocolate
12.	Release lock lever	'Black with a 15.2cms/6" wide "blue band" in the middle.
13.	Detector lever(DW)	'Red and Blue' bands 15.2 cms/6" wide alternatively
14.	Route lever	Upper half 'Red'; Lower half 'Black'
15.	Siding key control lever	Black
16.	King lever	'Red & White' bands 15.2cms/6" wide alternatively.
17.	Spare lever	White

**28.13 Numbering of Levers in Frames.**

All levers, including spares, are numbered consecutively through the frame from left to right. Each lever is provided with a name plate showing its function and the number of the other levers in the order of operation which must precede to release it. The levers are broadly classified into three groups :-

- (i) Up signal levers/slotting levers.
- (ii) Down signal levers/slotting levers.
- (iii) Point, lock, shunt signal and other levers.

**Arrangement and numbering of signal levers :**

1. Levers of reception and dispatch signals are grouped separately. While cabinman is facing the levers, the first lever on the left shall be for the first approach signal for trains coming from left. This shall be followed by other levers concerning the reception from that direction.

2. Similarly, levers correspond to the despatch signals towards left shall be grouped together with the last stop signal lever being the 1<sup>st</sup> lever from left side of the group which shall consist of levers meant for despatch to that direction.
3. All other levers such as point, lock, shunt signal, etc., shall be grouped together between the above two group of levers. All levers, including spares of each group are, then numbered consecutively starting from the first lever on the left.

#### **28.14: Centralized Traffic Control (CTC):**

It is the centralized operation of all points and signals at the various stations on a section of the Railway at one single location in the hands of a single controlling official. CTC consists of the following elements:

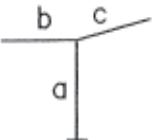

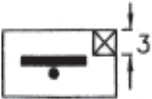




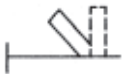
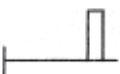



1. Provisions for electrical operations of points and signals with panel interlocking located in the Station Master's office .
2. Complete track circuiting/axle countering of the controlled section.
3. Remote control of points and signals at all stations on the controlled section and remote monitoring of the stations of points, signals, track circuit etc. from the control office.
4. Provision of intermediate block signaling for increasing line capacity.



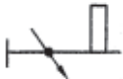
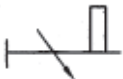

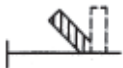
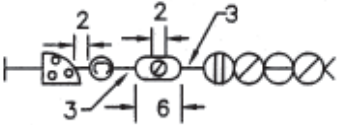
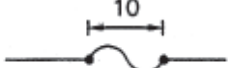
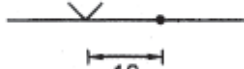
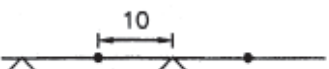
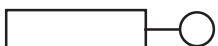

All the movements in the section are centrally directed and usual system of block operation dispensed with. In CTC system, operator not merely controls the train but also does train operation over a section.

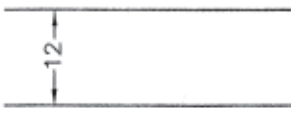


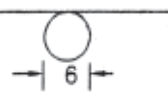
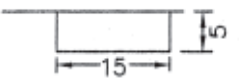
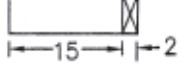
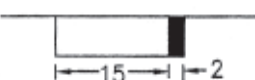


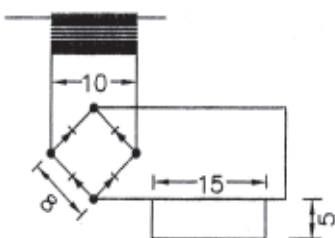
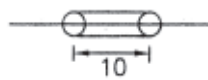
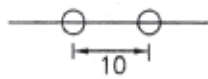
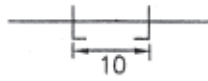
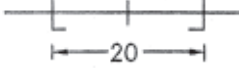


Generally, CTC is provided at a central place controlling stations on either side. The operator is provided with a control panel on which entire section under his control is depicted. Operating knobs for signals, route points, local control, remote control etc. are located at the relevant junction. The indication regarding the occupation or otherwise of the tracks is also depicted. The operator has a full view of the section and therefore, he is in a better position to formulate the movements. The control from the operator can also be transferred to SM if necessary for operation of equipment by satellite stations locally thus enabling the SM to control the field stations in case of emergencies. A modern CTC installation may have a television monitor wherein the required station details can be called for and projected in front of the operator.

**28.15: Description of Symbols:**

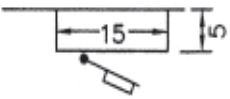
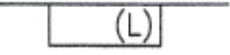
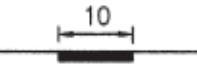
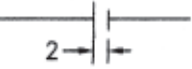
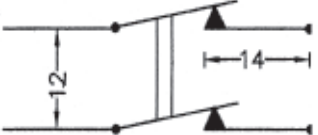

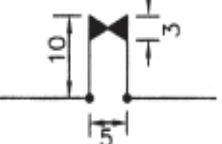




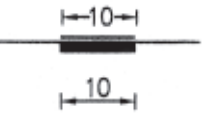

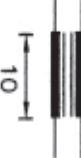
Sl. No.	DESCRIPTION	SYMBOL
1.	<b>WARNING BOARD.(GOODS)</b> It is provided at a distance of 1.4 km in rear of the first stop signal which is not prewarned by the provision of a Warner/Distant signal located at a distance of not less than 1.4 km from it.	
2.	<b>WARNING BOARD (PASSENGER)</b> It is provided at a distance of 1.0 km in rear of the first stop signal which is not prewarned by the provision of a Warner/Distant signal located at a distance of not less than 1.0 km from it.	
3.	<b>B.S.L.B / S.L.B</b>	
4.	<b>L-XING GATE, WITHOUT-WINCH LEAF BARRIER (SWING TYPE-NON INTERLOCKED)</b>	
5.	<b>COLOUR LIGHT SIGNAL</b>	
6.	<b>COLOUR LIGHT SIGNAL</b>	
7.	<b>POSITION LIGHT SHUNT SIGNAL</b>	
8.	<b>SHUNT SIGNAL ( DISC TYPE)</b>	
9.	<b>CALLING ON SIGNAL</b>	
10.	<b>LIFTING BARRIER, INTERLOCKED &amp; WORKED FROM GROUND</b>	

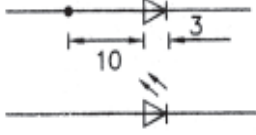
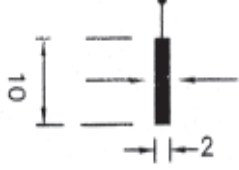
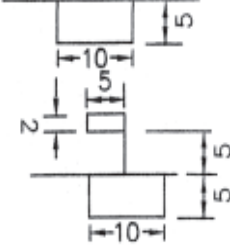

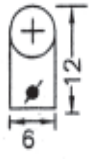
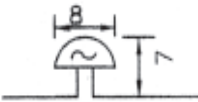



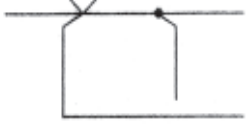
Sl. No.	DESCRIPTION	SYMBOL
11.	GRADIENT	
12.	LENGHT OF LOCK BAR, F.B, H.B	
13.	CABIN WITH WINCH	
14.	L-XING GATE, WITHOUT-WINCH LEAF BARRIER (SWING TYPE-NON INTEROCKED)	
15.	ARC LEVER	
16.	KEY LOCK	
17.	(POINT OR TRAP) INDICATOR	
18.	CABIN SLOT	
19.	SEMAPHORE SIGNAL	
20.	MOTOR OPERATED SIGNAL	
21.	REVERSER ARM TYPE	
22.	S.M	

Sl. No.	DESCRIPTION	SYMBOL
23.	INTERLOCKED L.C. GATE WINCH OPERATED	
24.	ADV. STARTER CONTROLLED BY DLBI	
25.	ADV. STARTER CONTROLLED BY SLBI (TOKEN)	
26.	ADV. STARTER CONTROLLED BY TLBI	
27.	'E' TYPE LOCK WITH KEY	
28.	SM'S SLOT	
29.	ORDER OF DIFFERENT KINDS OF SIGNAL PLACEMENT ON A SAME POST	
30.	SIZE OF FUSE	
31.	LENGTH OF CONTACT	
32.	GAP BETWEEN CONTACTS ETC	
33.	ELECTRICAL POINT MACHINE	
34.	MOTOR CRANK HANDLE	

Sl. No.	DESCRIPTION	SYMBOL
35.	GAP BETWEEN ADJACENT LINES	
36.	SIZE OF TERMINAL	
37.	LENGTH OF TERMINAL WITH LINK	
38.	LAYER BAND OR SM'S SLIDE BAND	
39.	SIZE OF RELAY	
40.	SIZE OF SLOW TO PICK UP RELAY	
41.	SIZE OF SLOW TO RELEASE RELAY	
42.	SM'S SLOT IN INTERLOCKING PLAN	
43.	RECTIFIER (FULL WAVE)	
44.	RELAY WITH TRANSFORMER & RECTIFIER	
45.	NORMAL DETECTOR CONTACT	
46.	REVERSE DETECTOR CONTACT	
47.	TRACK CIRCUIT ( 2 RL)	
48.	COMBINO TRACK CIRCUIT	
49.	ANALOG AXLE COUNTER	
50.	DIGITAL AXLE COUNTER	



Sl. No.	DESCRIPTION	DIMENSION	SYMBOL
51.	DOOR LOCK COIL		
52.	LEVER LOCK		
53.	TIME RELEASE CONTACT		
54.	BATTERY		
55.	SWITCH		
56.	NORMAL OR RECEIVING OR SENDING CONTACT		
57.	TOL CONTACT		
58.	KT LOCK COIL		
59.	INDICATION (1)		
60.	INDICATION (2)		
61.	SIGNAL LAMP		
62.	CHOKE COIL		
63.	RESISTANT		
64.	TRANSFORMER		

Sl. No.	DESCRIPTION	SYMBOL
65.	RECTIFIER (HALF WAVE)	
67.	3-POSITION RELAY CONTACT	
68.	ELECTRICAL REVERSER	
69.	INDICATOR (ARM TYPE)	
70.	HKT	
71.	A.C. BELL	
72.	D.C. BELL	
73.	CROSSING OF TWO WIRE (WITHOUT CONNECTION)	
74.	TWO WIRE CONNECTED TOGETHER	
75.	i) PARALLEL CONNECTION TO BE SHOWN FROM A DEFINITE POINT OF CONTACT ii) MAXIMUM TWO CONNECTION TO BE SHOWN AT A POINT	

## CHAPTER – 29

# PERMANENT WAY ENGINEERING

### 29.01: SOME IMPORTANT ENGINEERING TERMS :

1. **Abutment:** A masonry or concrete structure which is designed to support one end of the girders or arch or slab of the end span of a bridge. It also retains the earth of the Railway embankment. (In case of single span, both end supports are abutments.)
2. **Alignment:** The horizontal location of a Railway track with reference to straight lengths and curves.
3. **Axle load:** The weight of a vehicle and its contents on one pair of wheels including the weight of the axle and its pair of wheels.
4. **Ballast :** A layer of Selected material such as stone, sand, cinders, kunkar, gravel, moorum of any other gritty material etc., spread over the formation on which the sleepers are laid and which acts as an elastic bed for the permanent way. Any material spread over the formation but below the ballast proper is known as Sub-Ballast. Portion of the ballast between two adjacent sleepers is called Crib Ballast. The portion of the ballast between the ends of the sleepers and the toe of the ballast slope is referred to as Shoulder Ballast. To box the track means to neatly dress the ballast to the required profile of ballast section.
5. **Bearing Plates:** Cast iron or mild steel plates with or without cant, fixed on wooden sleepers upon which flat footed rails rest.
6. **Bridge:** A structure built across a river or a valley or a road for the passage of permanent way.
  - (a) **Minor Bridge:** Bridges having a linear water way less than 12 metres for single span and total linear water way less than 18 meters for multiple spans are termed as a Minor Bridges.
  - (b) **Major Bridge:** Bridge having linear water way of 12 meters or more for single span and total linear water way of 18 meters or more for multiple spans is termed as a Major Bridges.
  - (c) **Important Bridges:** Those bridges whose water way area is 1000 sq. mtr. or more or linear water way more than 300 meters.
  - (d) **Culvert:** Very small bridges are called culvert. Generally, bridges having water way less than 6.0 meters are called as Culverts.
7. **Check Rails:** These are rails attached to running rails at nominated locations to ensure safety. They are used:
  - (a) With points and crossings opposite to the crossing in order to guide the wheel flanges into the gap between the nose and the wing rail over the crossing and also to prevent the wheel hitting against the nose of crossing.
  - (b) On the sharp curves along the running edge of the inner rail to prevent the tendency of the outer wheels to ride over the outer rail particularly in case of less superelevation and high speed thereby avoiding any possibility of derailment.
  - (c) On level crossings to keep the way for wheel flanges clear as the space between the rails has to be filled for making up the road surface.

8. **Cant:** The inward inclination of the rail in the track usually 1 in 20, is termed as cant.
9. **Chord:** A straight line joining any two points on a curve.
10. **Curved Switch:** A switch with curved tongue rail is termed as Curved Switch. These are provided for smooth movement of rolling stock over the switch portion diverting from one track to another.
11. **Classification of Routes:**  
**Broad Gauge:**

Group A route	-	Max. Permissible speed	-	160kmph
Group B route	-	Max. Permissible speed	-	130kmph
Group C route	-	Suburban section i.e. Mumbai, Kolkata, Delhi, Chennai		
Group D route	-	Max. Permissible speed	-	upto 100 kmph
Group D special	-	Max. Permissible speed	-	110 kmph

(Where the traffic density is very high or likely to grow substantially in future)

Group E route	-	Max. permissible speed	-	Below 100 kmph
Group E special	-	Max. Permissible speed	-	Less than 100kmph

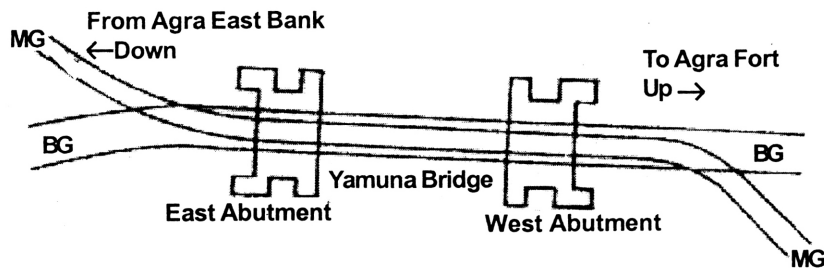
(Where the traffic density is very high or likely to grow substantially in future)
12. **Curve:** Alignment of track in circular form. A circular curve having only one radius is called simple curve. Compound curve is one which is made up of two or more simple curves of similar flexure. A curve consisting of two simple curves of opposite flexure is a Reverse Curve.
13. **Creep:** It is longitudinal sliding movement of rails on track.
14. **Cutting:** A cut or excavation made through a hill or high ground for laying the rail road to specified grades.
15. **Drainage:** Interception, collection and removal of surface, sub-surface water by means of pipes, drains etc.
16. **Embankment:** A bank of earth or other materials constructed above the natural ground surface to enable a Railway line to be laid to specified grades.
17. **Expansion Gap:** The space left between the rail ends at specific temperature to allow for their expansion due to variation in temperature is termed as expansion gap.
18. **Flange way clearance:** The distance between the running edge of the track rail and the check rail.
19. **Flange Way Depth:** The vertical distance from the top surface of rail to the top of the filler or distance block fitted between the running rail and check rail.
20. **Flare:** A tapered check rail of the flange way formed by bending or splaying the end of a guard rail/ check rail away from the gauge line.
21. **Flexure:** It is the curvature of the circular alignment of the line.
22. **Formation:** The formation is the top portion of the embankment and of the cutting where ballast is spread and track linked.
23. **Fouling Point :** It is a point where the distance between two converging tracks starts infringing the fixed standard dimensions.

**24. Gauge:** The minimum distance between the rails of a track, measured from inside edge to inside edge of the rail heads. This edge which is the running edge of a rail is known as the Gauge Face.

**25. Guard Rails:** These rails are attached to sleepers at specified distance with running rails and provided at following locations:

- (a) On the girder bridges with open floor in order to prevent derailing wheel from falling off the bridge. Here the check rails are known as guard rails.
- (b) Where the derailment will produce serious results.

**26. Gauntleted Track:** Where it is necessary for a double track to be narrowed down over a short distance to utilize the space occupied by a single track, the tracks are gauntleted as in sketch below. It is useful where one side of a double track bridge or tunnel is temporarily disabled or required for repairs or improvement. The two track simply run together on the same sleeper.



**27. Leveling the Track:** Bringing the top surface of rails, to correct level and grade as desired.

**28. Main Line:** The principal line of a Railway. Single Line is the one on which trains are operated in both the directions. Instead of operating the trains in both the directions on a single line, sometimes where the traffic is heavy two tracks are provided, one each for the movement in only one direction. Such a line is called Double Line.

When the traffic is still heavier as in the case of big cities, one more track may be provided for movement of trains which is known as triple line (or 3<sup>rd</sup> line). Normally 02 lines are dedicated for running trains in defined direction and one line in both directions.

When the traffic is still heavier as in the case of big cities, two tracks may be provided for movement of trains in each direction bringing the total number of tracks to four which is known as Quadruple Line.

**29. Normal Position:** The position to which the points, its levers and the corresponding signals are normally kept set.

**30. Pier :** The intermediate structures of bridges of multi-spans which support the girders or slabs or arches as the case may be.

**31. Rigid Wheel Base:** The distance between the extreme axles held in a rigid frame.

**32. Running Rail:** The rail on which the wheels of a vehicle run as distinguished from check rail.

**33. Span :** The horizontal distance between abutments or two adjacent piers of a bridge.

**34. Square Joints:** When rail joints of one side rails are exactly opposite to the joints on the other side in a track, they are said to be square joints or even joints.

**35. Staggered Joints:** When joints of the side rails are not exactly opposite the joints of the other side rails, they are said to be staggered.

**36. Supported Joints :** Those rail joints which are directly supported over a sleeper, i.e. the ends of the rails are directly resting over a sleeper.

**37. Suspended Joints:** The ends of the rails are midway between the two supporting sleepers.

**38. Cant/Super elevation:**

(1) Cant or super elevation is the amount by which one rail is raised above the other rail. It is positive when the outer rail on a curved track is raised above inner rail and is negative when the inner rail on a curved track is raised above the outer rail.

(2) Equilibrium speed is the speed at which the centrifugal force developed during the movement of the vehicle on a curved track is exactly balanced by the cant provided.

(3) Cant deficiency – Cant deficiency occurs when a train travels around a curve at a speed higher than the equilibrium speed. It is the difference between the theoretical cant required for such higher speed and actual cant provided.

(4) Cant excess – Cant excess occurs when a train travels around a curve at a speed lower than the equilibrium speed. It is the difference between the actual cant and the theoretical cant required for such a lower speed. (As per IRPWM Para No.404)

**39. Switch:** Switch is used to transfer a vehicle from one line to another line. Switch is a part of a point & crossing.

**40. Transition Curve:** Transition curve is an easement curve, in which the change of radius is progressive throughout its length and is usually provided in a shape of a cubic parabola at each end of the circular curve. It affords a gradual increase of curvature from zero at the tangent point to the specified radius of circular arc and permits a gradual increase of superelevation, so that the full superelevation is attained simultaneously with the curvature of the circular arc. (As per IRPWM Para No.404 (8) )

**41.** A circular curve which has been provided with transition curves at its both ends is a **TRANSITIONED CURVE**.

**42. Turn Table:** A circular revolving platform placed in circular pit on a central pivot supported by wheels at the circumference, running on circular rails and used for turning engines from one direction to another.

**43. Versine:** The perpendicular distance from the centre of the chord to its arc i.e. at gauge phase side of rails.

**44. Vertical Curve:** A vertical curve shall be provided only at the junction of the grade when the algebraic difference between the grades is equal to or more than 4 mm. per metre or 0.4 per cent.

The minimum radius of the vertical curve shall be kept as under –

<b>Broad Gauge</b>	
Group	Minimum Radius
A	4000 metres
B	3000 metres
C, D & E	2500 metres

(As per IRPWM Para No.419 )

**45. Catch siding:** It is a siding designed and provided to catch-up and absorb the momentum of any ineffectively controlled train or part of a train running down a grade without being wrecked. They are provided at stations where the gradient in the vicinity is so steep that danger is apprehended from vehicles running back and entering into collision with other vehicles or trains in those station yards.

**46. Derailing switch:** A safety device provided on the track to guide vehicles off the track at a selected spot for protection against collisions or other accidents.

**47. Gravity or Hump Yard:** A yard in which sorting of wagons on nominated lines is done by pushing the wagons over a summit or hump beyond which they run by gravity.

**48. Siding :** An auxiliary line in a station yard provided for crossing, receiving and stabling of rolling stock.

**49. Scotch Block:** A derailing arrangement in which a wedge block rest on the top of a rail to derail any vehicle and purposes are divided into 2 categories-

- (a) Those whose function is to protect “running line” i.e. those lines which are reserved for the reception and despatch of trains, whether passenger or goods. These will be painted in RED.
- (b) Those which are used anywhere else within a goods or stabling yard e.g. on a dead end siding to prevent wagons running into another stabling line. These will be painted WHITE to distinguish them from red ones.

**50. Trap Point:** One switch provided in a siding to derail and prevent vehicles from running into the running line.

**51. Trap siding:** This is to prevent vehicles or wagons from running out of stations and fouling the main line while being shunted or when blown by wind. Since it is required to trap only wagons, it will be of a smaller magnitude.

**52. Yard :** A system of tracks within defined limits provided for receiving, forming, dispatching or stabling trains.

## 29.02 TRACK STRUCTURE :

### 1. Typical Track Structure:

The combination of formation, Ballast, Sleepers, Rails and Fastenings forms the typical track structure.

### 2. Formation:

(a) **Definition:** It is a part of track structure consisting of series of cuttings, embankments on a prepared and dressed up ground of certain fixed dimensions on the surface to maintain the surface level within ruling gradient for easy haulage of specified train load.

(b) **Functions of Formation:**

- (i) To provide smooth and uniform bed to track structure.
- (ii) To bear the load transmitted through ballast.
- (iii) To provide stability to track
- (iv) To facilitate drainage

(c) **Type of Formation:** The formation above ground level is called embankment and below ground level is called cutting.



**3. Ballast:**

- (a) Definition: It is a part of track structure used in the form of a layer of broken stone or similar coarse material under and around the sleepers for distributing the load from sleepers to formation and for providing drainage as well as giving longitudinal and lateral stability to the track.
- (b) Functions of Ballast:
  - (i) To transfer and distribute load from sleeper to formation over wider area.
  - (ii) To provide lateral and longitudinal stability to track structure.
  - (iii) To absorb shocks, vibrations and noise.
  - (iv) To provide elasticity to the track.
  - (v) To facilitate drainage.
- (c) Ballast Profile:
  - (i) Cushion below sleeper
  - (ii) Shoulder ballast

**4. Sleepers:**

- (a) Sleepers are transverse ties on which rails are laid.
- (b) Functions:
  - (i) To hold the rails to correct gauge and alignment.
  - (ii) To give firm and even support to rails.
  - (iii) To transfer the load evenly.
  - (iv) To absorb shocks and vibrations of moving boards.
  - (v) To provide lateral and longitudinal stability to track.
- (c) Different type of sleepers:
  - (i) Wooden - Durable and non-durable
  - (ii) Cast iron - Plate & Pot.
  - (iii) Steel - Fixed lung, loose jaw & bolted.
  - (iv) Concrete - Mono block and twin block

**5. Rails:**

- (a) Definition: The rails are the longitudinal ties fastened to sleepers at a fixed distance apart to carry the moving loads.
- (b) Functions:
  - (i) To provide a continuous and level surface to the rolling stock.
  - (ii) To provide a lateral guide to the rolling stock.
- (c) Types of Rails:
  - (i) Double headed (No. more in use on I.R.)
  - (ii) Bull headed (No. more in use on I.R.)
  - (iii) Flat footed.

- (d) Parts of Flat footed rails:
  - (i) Head
  - (ii) Web
  - (iii) Foot
- (e) Length of rails:  
The standard lengths of rails are as under:
  - BG - 13 meters
  - MG - 12 meters
- (f) Weight of rails:  
Weight of rails is taken as weight/unit length; Lbs/yards in FPS system and KG/meter in metric system say 90 lbs/yard or 52 kg/m etc..
- (g) Axle Load: the load in MT transferred to rail by one axle of the rolling stock.
- (h) Standard rail sections prescribed on Indian Railways:  
The standard sections of rails prescribed on Indian Railways are 60 kg/m 52kg/m and 90 lbs/yard

## 6. Fastenings :

These are of two types:

- (a) Rail to Rail fastenings:
  - (i) Fish Plates: The function of a fish plate is to hold the two rails together both in horizontal and vertical planes.
  - (ii) Combination Fish Plates: Combination or Junction fish plates are used for connecting the rail lengths of two different rail sections.
  - (iii) The fish bolts are used for fixing the rail ends with the help of fish plates. For each joint 2 plates and four fish bolts are used. The distance between centers of two fish holes is known as pitch.
- (b) Rail to Sleeper Fastenings:
  - (i) Rigid Fastenings:  
Fastenings of wooden sleepers:
    1. Dog spikes:  
Dog spikes are used for fixing rail to the wooden sleepers.  
The number of dog spikes used is as under:
 

(a) On straight track	-	Two
(One on either side and duly staggered)		
(b) On curved track	-	Three
(Two outside and one inside)		
(c) Joint sleepers	-	Four
(d) Bridges sleepers	-	Four
(e) Turn out sleepers	-	Four
(f) Ash pit timbers	-	Four

## 2. Bearing Plates:

The bearing plates are used for fixing the rail on wooden sleepers.

The different types of the bearing plates being used on the Indian Railways are as under:

- (a) MS canted bearing plates.
- (b) MS flat bearing plates.
- (c) Cast iron anti-creep bearings plates.

Fastening of steel through sleepers

## 1. Two way keys

## 2. Loose jaws

Fastening of cast iron sleepers: two way keys

Note: No rigid fastenings are provided on concrete sleeper.

Fastenings of Concrete Sleepers:

(ii) **Elastic fastenings :** Elastic Rail Clip IRN 202 clip etc. and their attachments.

Note: Elastic Fastenings can also be used on wooden and metal sleepers as well.

**29.03 CURVES:****1. Definition:**

A curve is defined as a deviation of a straight in radial form.

**2. Necessity of a Curve:**

- (a) To bye pass obstacles.
- (b) To pass through desired location.
- (c) To have easier gradient.

**3. Degree of curve:**

The degree 'D' of a curve is the angle subtended at the centre by a chord of 30.5 m to in length.

**4. Versine of Curve:**

The versine of a curve is defined as an offset taken on a curve at the centre of chord of certain length.

**5. Types of Curve:**

- (a) Horizontal Curves: the horizontal curves are employed for effecting the deviation in the straight alignment of the track due to whatever reason it may be.
- (b) Vertical curves:

The vertical curves are employed for easing the junctions of two gradients meeting in opposite directions/same directions such as rising gradient followed by the falling gradient and vice-versa. It is provided only at the junction of the grade when the algebraic difference between the grades is equal to or more than 4mm per metre or 0.4%.

- (i) Simple curve
- (ii) Compound curve
- (iii) Reverse curve
- (iv) Transition Curve

Simple curve is the curve which is having same degree and radius throughout in length.

A compound curve is formed when simple curves of different degree and radius together having a common tangent. All the simple curves in the compound curve deviate from straight line in the same direction.

Transition curve is an easement curve between straight and circular curve in which the degree of curvature and gain of super elevation is uniform throughout its length starting from 0 at the tangent point to the specified value at the beginning of the circular curve.

## 6. Super elevation on Curve:

(a) Definition:

It is the amount by which the outer rail on a curve is raised above the inner rail.

(b) Super elevation (Ce<sub>q</sub>):

Super elevation in which both the rails bear equal load during motion of a vehicle, or centrifugal force is fully balanced, is called equilibrium S.E or Ce<sub>q</sub> for a particular speed.

## 29.04 TRACK GRADIENTS AND POINTS AND CROSSING:

### 1. Track gradients:

When a train 'moves along a rising gradient, the locomotive has to exert a greater pull and extra force is required to lift the train up the height through which it rises in every metre it traverses along the gradient.

If a track rises 1 meter in 100 metres the gradient is called as 1 in 100 or 1% grade.

If a track rises 1 meter in 200 metres the gradient is called as 1 in 200 or 1/2% grade.

If a track rises 1 meter in 50 metres the gradient is called as 1 in 50 or 2% grade.

If the weight of the train is 1000 tonnes and it has to climb a gradient of 1 in 100 then the locomotive requires an extra force of approx.  $1000/100=10$  tonnes to exert up the height, through which it traverses in every meter. It is therefore desirable to climb a slope as flatter as possible. Therefore, for each section of railway the steepest gradient at which a track is laid is defined and is known as 'Ruling Gradient'.

A ruling gradient is defined as the steepest gradient in a section for locomotive to haul a specified economical train load fixed for the section without any additional effort.

### 2. Horizontal Curve on Ruling Gradient:

If a curve lies on a Ruling gradient then the total resistance increases in that portion due to curvature which is beyond the maximum limit set for the Ruling Gradient. At such portions the gradient is reduced in order to keep the resistance within limits of Ruling Gradient. This reduction in grade is known as the grade compensation due to curvature on the Ruling Gradient.

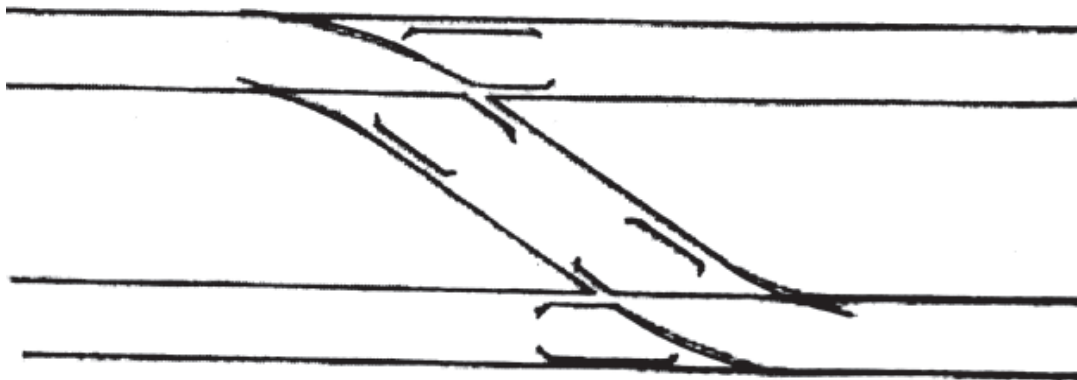
### 3. Point and crossing and nomenclature of their parts:

(a) Points and crossing is the name given to the whole set-up consisting of the switches and crossing with their connecting straight and curved rails, the points being the switches. The idea of laying points and crossing is to divert railway vehicles from one track to another. All switch and crossing works, however, complicated, are built up of two units termed:

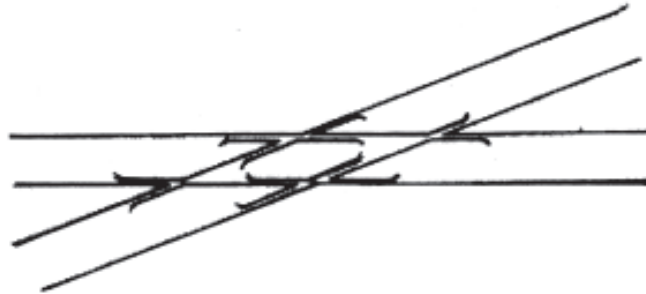
- (i) Switches
- (ii) Crossings (acute or obtuse)

- (b) A switch consists of one side stock rail and the other side tongue rail. Two switches, one on the left and the other on the right form a set of points. Switches are termed as 'right hand' or left hand' as viewed from a facing direction, i.e. looking from the points towards the crossing. A set consisting of a pair of tongue rail & corresponding stock rail is called switch.
- (c) A Tongue Rail is a movable rail fixed to a stock rail at its heel. It is tapered over a considerable part of its length. The tapered end is called 'Toe'. A tongue rail is also called switch rail and is termed as 'Right Hand' or 'Left hand'.
- (d) A Stock Rail is the rail against which the tongue rails operate and houses with it. It is termed 'Right Hand' or 'Left Hand'.
- (e) A crossing is a device at the intersection of two rails and is used to pass the wheels running upon one rail of one track across a rail of another track. It consists of a pair of wing rails and a pair of rails – one point rail and the other a splice rail both spliced together at the nose. This is called built up crossing. However, now the entire structure is made monolithic by casting in the particular shape to function as wing rail and point rails, known as CMS crossing. Its end towards the points is called the 'Nose' and the other end the 'Heel. It is termed 'Right Hand' or 'Left Hand', according to the position of its splice rail viewed from its nose to the heel. A crossing is acute or obtuse, as its angle is acute or obtuse. It is either cast or built up from rail pieces. CMS crossings are very commonly used these days.
- (f) Each of the outer rails of a built up crossing is called a Wing rail. Its one end forms the toe of the crossing and the other is flared or splayed. It is termed 'Right Hand' or 'Left hand' as viewed from the nose of the crossing to its heel.
- (g) Out of the two rails forming the 'V' of the crossing, the longer rail which extends right upto the blunt nose of the crossing is called the 'Point Rail'.
- (h) The rail other than the point rail forming the 'V' of the crossing is called the 'Splice Rail.
- (i) The number of a crossing is usually defined to be the cotangent of the angle formed by its gauge faces and if 'N' be this number, the crossing would be described as 1 in 'N' crossing.
- (j) How to measure the number of crossing: It is measured by the distance from the theoretical nose of the crossing on either of the point or splice rail when perpendicular distance of the other rail is unity.
- (k) Crossings are described as follows:
  - (i) Facing points or facing turn-outs are those where trains pass over the switches first and then over the crossing.
  - (ii) Trailing points or trailing turnouts are those where trains pass over the crossing first and then over the switches.
  - (iii) Lead of crossing is the distance from the heel of switch to the theoretical nose of crossing measured along the straight.
  - (iv) Throat of crossing is the closest gap between the wing rails.
  - (v) Theoretical nose of crossing is the imaginary point of inter-section of the gauge lines of a crossing.
  - (vi) Actual or Blunt Nose of crossing- The tapered end of the point rail which is (1.7 MM to 19.1MM) in thickness is called the actual or blunt nose of the crossing.

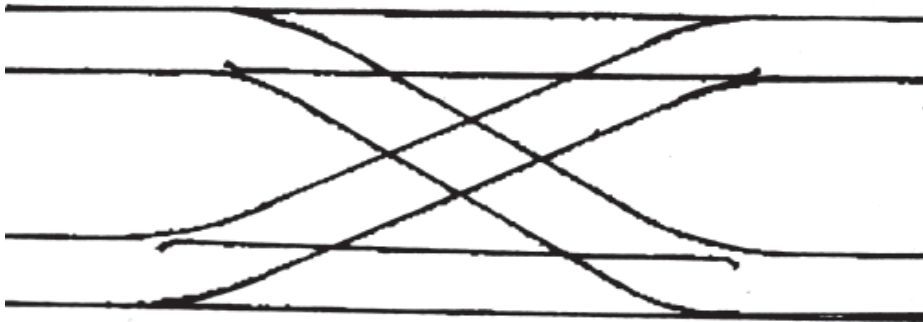
- (vii) Heel divergence is the distance from the gauge face of the stock-rail to the gauge face of the tongue rail at the heel of switch, measured perpendicular to stock rail.
- (viii) Throw of switch is the opening between the stock rail and the toe of the tongue rail when wide open.
- (ix) Switch box or tumbler lever or spring lever is a device for working points.
- (x) Stretcher Bar- There are two or more bars which keep the two tongue rails at a fixed distance. The one near the toe is called leading stretcher bar and the other following is called stretcher bar.
- (xi) Pull Rod is the bar with which the points are worked. it connects the points to the Tumbler lever.
- (xii) Slide chairs are the chairs interposed between the stock rail and the sleepers. Upon these chairs rest the tongue rails which slide over them.
- (xiii) Heel Block is a block of cast iron by means of which the tongue rail is connected to the stock rail.
- (xiv) Crossing chairs are cast iron or mild steel chairs used for fixing the crossing on wooden sleepers. Crossing bearing plates are mild steel flat plates used on wooden sleepers for fixing the crossing.
- (xv) Heel Bolts are the bolts with which the heel block is held between the tongue rail and the stock rail.
- (xvi) Crossing bolts are the bolts with which the blocks are held between wing rails and the V piece and also between the point, splice and check rails of the crossing.
- (xvii) Locking Bolts are the bolts meant for locking the tongue rail to the stock rail when both are in contact with each other.
- (xviii) Cotter Bolts are Bolts of special design which restrict bending of the tongue rail to the extent required, when a vehicle is passing over it.
- (xix) Stud Bolts are the cotter Bolts of special design which restrict bending of the tongue rail to the extent required, when a vehicle is passing over it.
- (xx) Gauge plate or Switch Tie Plate is a plate placed on the sleeper under the toes of the tongue rails to prevent the gauge from spreading at the points.
- (xxi) Crossing Tie Plate is a plate placed on the sleeper under the nose of the crossing to prevent the gauge from being disturbed at this point.
- (xxii) Cross-over is a road which connects two roads. It consists of two turnouts and a length of ordinary road between them.



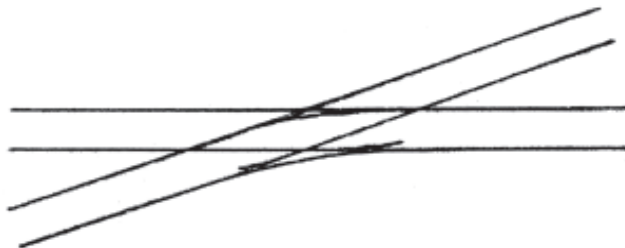
(xxiii) **Diamond crossing:** when one track crosses another at an angle less than a right angle, diamond is formed comprising of two acute and two obtuse crossings.



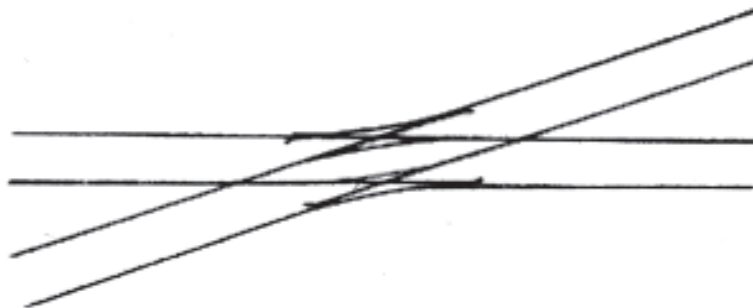
(xxiv) **Scissors or Double crossovers:** These consist of two crossovers usually between adjacent parallel track which cross each other and form a diamond between the tracks. This layout is used where space does not permit for two separate crossovers being used.



(xxv) **Single slip:** It is formed by the provisions of two pairs of switches being a flat diamond to enable vehicles to pass from one track to the other in one direction.

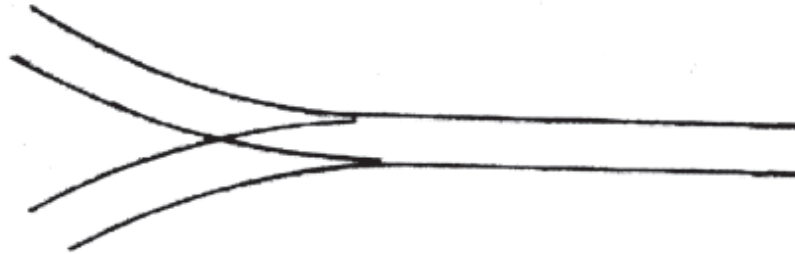


(xxvi) **Double slips:** These are formed by the provision of four pairs of switches within a flat diamond to enable vehicles to pass from one track to the other in both directions.





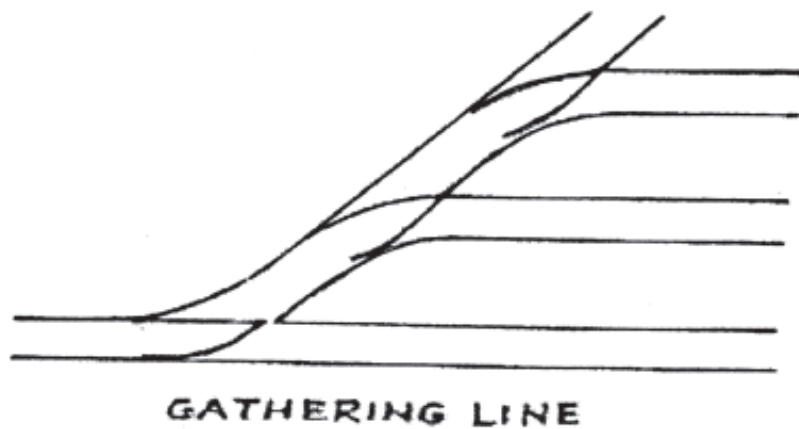
**(xxvii) Symmetrical Splits:** It is a turnout from a curved track curving in the opposite direction with the same radius as the main track. It is a very useful connection as by its use easy turnout radius is obtained.



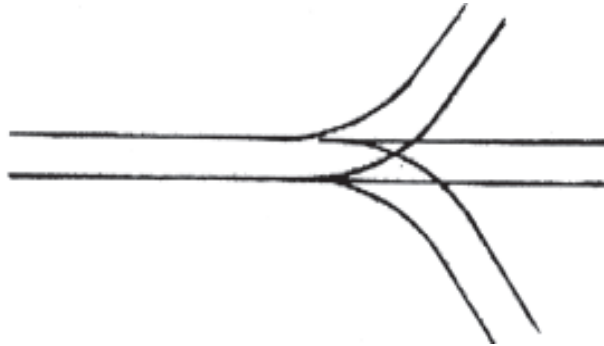
**(xxviii) Three Throw:** When a line divides into three, two sets of switches and three crossings are required forming what are called three throw points. A 'Three Throw' consists of two turnouts, the tongue rails of which are side by side and the heels of switches generally opposite to each other and there is only one stock rail on each side. It is an old fashioned connection used in congested areas in order to economise space.



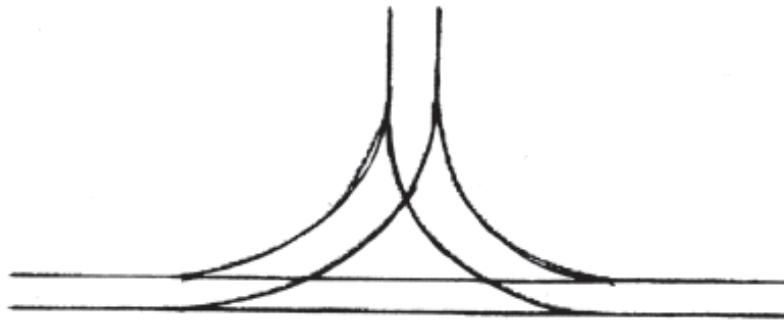
**(xxix) Gathering Line or Ladder Track:** A gathering line is a sloping line from which any number of parallel sidings take off and the angle which the sloping line makes with the sidings is the angle of the gathering lines.



(xxx)**Double or Tandem Turnouts:** The arrangement of two turnouts where the switches of one turnout come in the lead of the other is known as double or tandem turnout.



(xxxi)Triangle or Wye is used for turning engines where it is inexpedient to put down a Turn Table.



### 29.05 DEFECTS OF TRACK AND THEIR EFFECTS:

1. Following are some of the defects of track which may cause bad running or, if neglected, may get magnified and cause discomfort to passengers and may become unsafe.

- (a) Variation in gauge causes oscillation or swinging from side to side with lurches and transverse jolts.
- (b) Uneven Cross Levels: The level of the two rails at a section being different causes rolling (rocking).
- (c) Loose packing of sleepers causes up and down movement of the vehicles and rolling.
- (d) Kinks: They usually develop at rail joints and give unpleasant jerks to vehicles passing over them.
- (e) Perished sleepers
- (f) Defective fish plates and bolts.
- (g) Incorrect super-elevation on curves
- (h) Defective working of points, or gaping of points.
- (i) Improper housing of tongue rails with stock rails.
- (j) Tongue rails not resting evenly on slide chairs.
- (k) Incorrect clearances at heels of switches and at nose of crossings.

2. Following are the common causes which may result in derailments and accidents and which are to be detected and repaired promptly.

- (a) Buckling of Rails which causes distortion of the line.
- (b) Wash aways or Breaches of the line leaving the track unsupported.

- (c) Breakage and removal of fish-plate.
- (d) Obstructions placed or fallen on the line.

### **29.06 WELDED TRACK:**

1. Earlier two rails of the track used to be joined by using a Fish plate. Such type of track is not suitable for high speed traction. It is also comparatively more prone to sabotage. To avoid these short comings now a days, Fish plated track is being replaced by welded track. This type of track is not only suitable for higher speed, but also is less sabotage prone and results in the higher degree of comforts to the travelling public as the ride is smoother and noise is less. The welded track needs less attention than the conventional Fish Plated Track.

The welded track may however be sub-divided into 3 categories viz. Short Welded Rail Track (SWR), Long Welded Rail Track (LWR) and Continuous Welded Rail Track (CWR).

2. Definitions:

(a) Short Welded Rails(SWR) : It is a welded rail, which expands or contracts throughout its length due to temperature variations.

The three rail length SWR has been standardized on Indian Railways viz.

3 x 13 m = 39 m on BG

3 x 12 m = 36 m on MG

(b) Long Welded Rails (LWR): It is a welded rail, the central part of which does not undergo any movement due to temperature variations. A length of greater than 250 meters will normally function as LWR. The maximum length of LWR under Indian conditions shall normally be restricted to one block section.

(c) Continuous Welded Rails: The CWR is a long welded rail, the de-stressing of which is required to be carried out in parts.

(d) In the conventional type of Fish plate track any increase/decrease in the length of rail on account of increase/decrease in the temperature can be accommodated through special devices. A few of such devices are described below.

(i) Breathing length: It is that length at each end of LWR which is subjected to expansion or contraction on account of variation in temperature.

(ii) Switch Expansion Joint (SEJ): It is an expansion joint installed at each end of the LWR to permit expansion or contraction of the adjoining breathing lengths due to temperature variation.

(iii) Buffer rail joint: This is standard rail length track with fish plated joint to permit expansion or contraction of the adjoining breathing lengths due to temperature variation.

(e) Destressing of LWR:

Since the rail is not free to expand or contract, continuous variation i.e. increases or decrease in rail temperature results in building up of internal stresses in the LWR/CWR. An operation for distressing of such welded rails has to be undertaken as and when needed (para 6.4 of LWR manual) to avoid track failures, otherwise it may result in deformation of rails in the forms of buckling, etc.

During distressing operations, the rails freed from the track, pulled either manually or through a mechanical device (like Rail Tensor etc.) lengthwise, to release the stresses developed inside the Rails and then fixed on the track. This distressing operation is performed within a specified temperature range.

**29.07 INTEGRATED BLOCKS:**

In order to ensure safety and reliability of the system the maintenance and repairs to the track, points and crossings, Bridges, Signals and Overhead equipments etc. is inevitable. To make best use of available time integrated blocks are planned in co-ordination with different departments separately. Duration of the integrated blocks is determined on the basis of margins available in the Master charts and passenger operations. The details of integrated blocks are notified in the working time tables separately for each division indicating the section, up and down lines, duration of block period and their implications, if any. These blocks are subject to minor adjustments depending upon running of trains. However, all out efforts should be made to ensure that the blocks are permitted as prescribed in the working times tables. The running of trains, particularly goods trains, should be adjusted by the Sr. DOM and Chief Controllers of respective divisions to avoid detentions during the block on account of temporary single line working and precedence being given to passenger carrying strains. Except for the works given in the Temporary Working Instructions, no other maintenance block shall be given to any department. All works shall be allowed within the Engineering allowance provided to each division.

One of the Sr. DENs of the division is nominated by Principal Chief Engineer, to co-ordinate the operation of blocks and maintenance works by all other departments. This is to be executed shall be planned in advance in block meetings attended by officers concerned department with all preparatory arrangements made well in advance for the smooth and timely execution of blocks without causing undue detention of traffic and inconvenience to passengers. All concerned should ensure that blocks are not burst as to a void adverse effect on running of trains and inconvenience to travelling public. For further reference, see SR 4.62.11

**29.08 TRACK RECORDING:**

(1) Introduction- Inspection by foot, trolleys, locomotives and rear vehicles enable the Permanent Way staff to carry out assessment of the quality of track. These inspections, though important, are qualitative and enable assessment based on individual experience. Objective assessment of track is done by track recording cars, Oscillograph cars and portable accelerometers.

(2) Track Recording by Mechanical / Electronic Equipment –

The following track recording equipments are in use in Indian Railways at present:-

- (a) Track recording cars.
- (b) Oscillograph car.
- (c) Portable accelerometers.

(3) Track Recording Car-

There are two types of track recording cars currently in use on Indian Railways, one mechanical and the other electronic. With these track recording cars, it is possible to have a continuous record of the track geometry under loaded conditions, by running the cars at nominated intervals.

(4) Arrangements for running track recording car-

On receipt of track recording car programme from the RDSO, the Zonal Railways should arrange for suitable power and path for the special along with telecommunication arrangement between the track recording car and the locomotive. The Headquarters should advise the divisions concerned for making necessary arrangements to ensure that the Track Recording Car has an uninterrupted run.

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## CHAPTER - 30

## COMMAND, CONTROL AND COORDINATION OF EMERGENCY RESCUE OPERATIONS

**30.01:** Railway Board has prepared this SOP to deal with emergency rescue operations during serious accidents and disasters in railways. In Accident Manual of this railway, duties of various officials and activities involved in dealing with serious accidents are defined in Chapter – VI (Management of Serious Accident) in chronological order. However, this chapter elaborately defines the duties and responsibilities of commercial officials at the time of accidents. The instructions given in this chapter are to be read and followed in conjunction with the Accident Manual and Disaster Management Plan of this railway.

### Purpose

- a) The purpose of this Standard Operating Procedure (SOP) is to delineate responsibilities and procedures for the control and coordination of all responses to emergency situations on a railway
- b) To provide step by step guidance on how to deal with incidents should they happen.
- c) Particular note should be taken of the need to provide suitable training to keep staff aware of what needs to be done in the event of a serious incident.

### 30.02: Objectives of Incident Management Plan:

In Order of priority, these are:

- a) Save lives and alleviate suffering.
- b) Provide help to stranded passengers and arrange their prompt evacuation.
- c) Instill a sense of security amongst all concerned by providing accurate information.
- d) Protect Railway property.
- e) Ascertain the cause of accident, preserving clues by cordoning of incident site etc.
- f) Expedite restoration of train operation

There is a difference between a disaster and an accident. All disasters need not be the outcome of train accidents, neither all accidents are classified as disasters. Accidents are occurrences where safety has been affected. Disasters are those situations, which cause acute distress to passengers, employees and outsiders and may even be caused by external factors and unless promptly managed the distress levels are likely to increase with time.

### 30.03: List of serious incidents requiring use of this plan:

- a) Fire, smoke emission, explosion in railway premises including trains.
- b) Derailment of a passenger carrying train.
- c) Collision of a train/trains.
- d) Security threats/Terrorist attacks, widespread violence, bomb explosion.
- e) Release of Chemical or biological gas in trains, stations or tunnels.
- f) Natural calamities like cyclone, floods and earth quakes.

**30.04. Definitions:**

In the context of Indian Railways, unusual events are classified as under:

- a) **Incidents** - which cause delay to trains
- b) **Accidents** - which have the potential or do actually cause loss of life and or injury and damage to property
- c) **Emergency/Serious Accidents/Disasters** - These may or may not necessarily be the outcome of train accidents but have the potential to cause loss of life and or injury to human beings causing further death/injury and wide spread and prolonged distress to all those involved unless tackled in an effective manner.
- d) **Disaster Management Team** - A team of Railway officials earmarked to reach incident site by first available means and take over site management at Zonal, Divisional and area/major station levels.

**30.05: Scope:**

This SOP is applicable to all IR personnel working on the Open Line.

**30.06: Responsibility:**

- a) Sr.DOM/DOM shall function as Divisional Emergency Officer and responsible for the overall control and coordination of emergency situations by coordinating with other departments.
- b) The officer commanding at site (OCS) is responsible for overall control and coordination of all activities at the incident scene in coordination with Divisional Emergency Control.
- c) Traction, Track and Structure, Signalling, and Telecommunication, fire service & security personnel are responsible for providing technical assistance to Divisional Emergency Office and OC at site.
- d) Rolling Stock Department is responsible for providing technical assistance to Divisional Emergency Office and OCS, as required and managing site restoration work.
- e) Operations and Commercial personnel of the station are responsible for making appropriate station announcements, and providing information, rendering first aid, mobilizing medical & fire services & assistance from civil administration, including police and providing all other assistance in alleviating suffering and hardship to passengers and others.
- f) The Guard and Loco pilot at the site of incident shall follow the instructions of OCS for movement of locomotive or coaches or any other nominated duties assigned by OCS at site. Further, they will provide information to passengers on rescue operation if available with them.
- g) Government Railway Police and Railway Protection personnel are responsible for securing the incident scene and for performing/directing investigation activities in compliance with existing procedures, (in case of incidents caused by criminal acts).
- h) The senior Police official at the scene is responsible for controlling and coordinating all police activities at all times. In doing so, this official has final authority to determine when these activities are complete and shall coordinate these activities with the OCS and the senior Fire services official.
- i) Security personnel will assist local Police; Fire services personnel, medical services or station staff as directed by OCS.

**30.07: General:**

In case of no officer is available at the site of accident, the following personnel are authorised to act as Officer In-Charge (OCS) at site in order of preference till arrival of officers or rescue team.

- a) Traffic Inspector
- b) Station Manager/ Station Superintendent
- c) Guard of the affected train
- d) Train Superintendent
- e) Loco pilot

When none of the above mentioned personnel are present at the scene, Divisional Control Office shall appoint an OCS as directed by DRM from the personnel available.

The mere presence or arrival of an authorized senior official at the scene shall not indicate his/her assumption of command as OCS. Such senior official shall remain in an evaluating capacity unless he/she specifically assumes command.

The method of managing an emergency situation will be in compliance with the applicable Zonal Railway Rules and Procedures contained in Accident Manual, Disaster Management Manual or as directed by Divisional Emergency Officer during incidents not covered by Rules or Procedures. The OCS has the authority and the responsibility to command the presence of any personnel and equipment required at the scene and to command the removal of any unnecessary personnel or equipment from the scene. This does not apply to police or Fire Department personnel.

Entry into the incident area by the news media or other visitors must be authorized by the CPRO and shall be coordinated with DRM/ADRM/OCS at site.

**When it is necessary to call the Fire Services, and/or to seek medical assistance the following information shall be provided:**

- a. Identification of caller;
- b. Nature of problem (give in plain English/Hindi e.g., fire, flood, smoke, injuries);
- c. Type of assistance requested to be specific
- d. Specific location of the problem and the best access points;

**30.08: Procedure:**

The Divisional Emergency Officer shall :

- a) Appoint the initial OCS
- b) Ensure that ARME & ART is turned out on time
- c) Coordinate all field activities and requests through the OCS.
- d) Notify members of Disaster Management Team and all departments and personnel, as required.
- e) Coordinate and direct the safe movement of all trains, to include those trains which may be involved in the incident;
- f) Request Police /RPF assistance in critical stations for crowd control;



- g) Keep Loco pilots and Station Managers informed of system status and instruct them to make appropriate announcements to their passengers;
- h) Ensure that system-wide public address announcements are made frequently to provide patrons with up-to-date information concerning Rail System status;
- i) Coordinate and assist OCS with restoration activities;
- j) Provide and obtain, from OCS frequent updates on events
- k) Coordinate with Zonal Emergency Officer
- l) Inform local civil authorities as per procedures in vogue in the event of train accidents like, derailment, Collision fire, terrorist attack etc., of a passenger carrying train or any other accident relating to train operation resulting in death and/or grievous injury (as per provision of Railway Act).

**30.09 The OCS shall :**

- a) Ensure that the safety of passengers and personnel at the incident scene is maintained; ascertaining that all injured and stranded passengers have been safely evacuated. Till evacuation is complete necessary succor in the form of drinking water, tea & edibles are made available to stranded passengers.
- b) Ensure that all personnel involved, at the scene, work efficiently to restore rail service as quickly and safely as possible;
- c) Control and coordinate all field activities with personnel at the scene.
- d) Coordination with Divisional Emergency Officer
- e) Coordinate all police related activities and requirements with the senior police official at the scene.
- f) Coordinate activities with the senior Fire Department official at the scene.
- g) Ensure that all the rescue activities are intimated to divisional emergency control through available communication.
- h) Establish a command post, at the incident scene Direct all inquiries and/or requests made by jurisdictional police officials Appoint individual (s) to provide public address announcements, at five (5) minute intervals, to passengers of the incident train and/or inside the incident station;
- i) Direct all inquiries and/or request made by the news media to the CPRO Office;
- j) Maintain a chronological log of all events.

**30.10 Station Operations/Commercial personnel shall:**

- a) Make appropriate station announcements;
- b) Assist Police with crowd control; and
- c) Make every effort to identify and retain knowledgeable witnesses, or to obtain their testimony along with their address.

**30.11 Guards and Loco pilots shall:**

- a) Operate their trains as per the instructions of Officer Incharge or Senior Operating Official at Site.
- b) Keep their passengers informed by making frequent announcements regarding system and delay status.
- c) All Rail personnel at the incident scene shall honour the requests and obey the directions of the OCS.

**30.12 Emergency Control in the Zonal Office:**

- a) Zonal Emergency Cell shall be manned by designated officers as per procedure laid down in Accident Manual. It shall take prompt action to inform concerned zonal officers and plan all assistance to the Divisional Emergency Cell in mobilising resources and manpower.
- b) Seek GM/COM's approval to relay the information to Railway Board Regulate traffic on the affected line, on adjoining Divisions and Zonal railways, to include train cancellation, diversion rerouting, road bridging, and air lifting of stranded passengers.
- c) CPRO will continuously brief media to inform passengers of the current status of rail situation.

**30.13 Duties of Commercial staff in case of accident:**

**30.13.01** On receipt of information of accident from the Operating Emergency Control, following Officials of Commercial department at HQ will be informed by the Commercial Control of the headquarter.

- a. CCM
- b. CCM(FS)
- c. CCM(PS)
- d. CTM
- e. Dy.CCO
- f. Dy.CCM(FS)
- g. Dy.CCM(Catering)
- h. Dy.CCM(PS)

On getting information of accident, officers will proceed to the site of accident vide Para 6.07 of the Accident Manual.

**30.13.02 : Center of Activity:**

- A) Headquarter
- B) Divisional Commercial Control
- C) Site of Accident.

**A) Headquarter :**

i) Commercial Control will have DOT and railway Telephones, FAX, photocopier machine and a PC with an Internet. The Telephone Numbers are as under :

- P&T : 0674-2303110
- Railway : 51333
- Fax : 50731 (Rly)  
0674-2302272

ii) Commercial Control office in Headquarter would be manned by officers round the clock basis. In case of serious accident of passenger carrying trains, CTM will immediately come to Control office. In his absence, CCM(FS)/CCM(PS) as nominated by CCM will come to the Control office. Thereafter, Control duties will be assigned as per roster for manning the Control office round the clock. Besides regular staff manning commercial control at least one officer and one inspector will remain in the control round the clock. Officer deputed will be responsible for proper functioning of the control.

iii) Headquarter Commercial Control would collect following information:

- a) Time and place of accident from Divisional Emergency Cell.

- b) Details of dead/injured Passengers, rescue operations, helps/assistance being rendered at the site of accident, enroute etc. from the divisional Commercial control/control at the site of accident.
  - c) Details of specials being run to the accident site and officials accompanying from Divisional Emergency Cell.
  - d) CCM(PS) will get the reservation charts printed and supplied to control. In addition the addresses as per requisition slips shall also be get collected by CCM(PS) and supplied to Commercial control, and Divisional Control.
- iv) Commercial control at HQ will maintain: -
- a) Telephone and FAX numbers of the control at accident site manned by Commercial officer.
  - b) Names and phone numbers of hospitals where injured are admitted (i) with names of passengers and (ii) location of dead bodies identified (iii) digital photographs of all injured and dead transmitted through computer network to be displayed and at sites or telecast & all enquiry offices.
  - c) Telephone and FAX numbers of helpline booths (Appendix. 15 of Accident Manual) that would have been set up at various stations including at other Zonal Railway.
- v) Constantly monitor the information relayed from the divisions and other railways regarding the dead and injured persons and enquiry offices opened at important stations.
- vi) Coordinate with Zonal Emergency Officer regarding assistance required by the division from other divisions/other railways in terms of deployment of material, staff and officers.
- vii) In case of confirmation of death/injury, the Commercial control will inform the concerned division/railway (Commercial control) to convey the information to the family of affected passengers.
- viii) Maintain a log of events.

**B) Divisional Commercial Control.**

- i) Control Offices will have DOT/Rly. telephones, FAX, photocopier machine and a PC with an Internet connection. The details of telephones and faxes of all the divisions should also be kept
- ii) Commercial Control in Division would be manned by officers on round the clock basis. In case of serious accident of passenger carrying trains, DCM or in his absence, an officer nominated by Sr.DCM will immediately come to the Control. Thereafter, Control duties will be assigned as per roster for manning the Control office. Second senior most commercial officer of the division will work as incharge of the Commercial control.
- iii) Divisional Commercial Control would collect the following information from Divisional Emergency Control/accident site:-
  - a) Time and place of accident from Operating Emergency Control office.
  - b) Details of casualties - dead/injured and safe passengers from operating emergency control office.
  - c) Details of specials being run to accident site and officials accompanying, from Operating Emergency Control office and monitor their arrangements.
  - d) Details of rescue operations and assistance being rendered to the affected passengers.
- iv) Information collected should be relayed to all concerned including HQ Commercial Control, helpline booths opened at stations through phone, fax, etc. without delay.

- v) Commercial Control in Division will maintain:
- a) Telephone and FAX numbers of the accident site.
  - b) Names and phone numbers of hospitals where injured are admitted and dead bodies shifted,
  - c) Telephone and FAX numbers of helpline booths that would be set up at various stations including at other Zonal Railways.
  - d) Name of Commercial Officer(s) deployed in each hospital.
  - e) Divisional control will advise headquarters commercial control, details of assistance required from Headquarter or the adjoining divisions.
  - f) Maintain a log of events.
  - g) Opening of Enquiry offices (Helpline booths) at the important stations enroute : This function will be ensured by the incharge available in divisional control.
    - i) Emergency offices would be opened at important stations as per the route of the train. On the basis of need, enquiry offices would be opened at other important stations also. The list of stations in ECoR is mentioned at Appendix.15.
    - ii) All these enquiry offices should have DOT and Railway telephones with STD facility. Fax machine, photocopier and a PC with Internet connection. Identical telephone numbers will be preferred.
    - iii) These enquiry offices would be manned on round the clock basis by deputing additional staff. It will be supervised by a Commercial officer, where feasible/commercial inspector/CTI
    - iv) These control offices should constantly keep in touch with the divisional Commercial Control.
    - v) Emergency offices would display the list of dead and injured passengers at the notice board at stations.
    - vi) Officers attending these emergency offices would not interact with the press.
    - vii) Sr.DCMs will prepare their own contingency plan on similar lines.
    - viii) Withdrawal of Money from station earnings: Money withdrawn from station earnings will also be used for relief operations like purchase of items immediately required, hiring of vehicles and other equipments directly.

**C) Site of Accident:**

Sr. DCM in his absence, DCM will attend site of accident and work as site in charge of the Commercial department.

**I. Setting of Control Office at the site:**

- i) Division would set up a control office at the site with telephone, FAX and Public Announcement System (PAS) to be manned by Commercial, Security and Medical departments.
- ii) Announcement would be made for registering the names of injured passengers, and the list would be verified by Doctor to be relayed to the Emergency Control offices at the division and headquarters. The extent of injury viz. Trivial, simple & grievous should be separately indicated.
- iii) Control office at the site will be manned by Assistant Commercial Officers on round the clock basis.
- iv) The site control office would maintain a log book. Flow of information both incoming and outgoing would be recorded along with the time and names of the officers / staff who were given information to keep track of chronology of events.

- v) Commercial Officers/personnel at site will **NOT** interact with the press.
- vi) All necessary arrangements for refund as per rules should be made.
- vii) A manual/guide be made available with train crew like; TTEs, AC Coach Attendants. AC Pantr Car Staff, which will inter-alia to include DOs and DONTs for them in case of accidents.
- viii) Commercial Control will ensure that at stations where trains are
  - Delayed,
  - Diverted, or
  - Terminated.

Additional alphabetical list of passengers on board with their current status must be available and displayed at enquiry counters for quicker dissemination of information. It will be ensured by CCM/PS and Divisional Control and divisional Commercial Officers.

## **II. Rescue:**

Sr. DCM will ensure the following functions :

- a) Sufficient number of TTEs/TCs and licensed porters in uniform would be rushed to the site. The required personnel would be mobilized from the affected division and the neighboring divisions by the quickest available means. For this purpose TTEs from the divisional squad should be utilized. Requirement of staff could be continuously reviewed and augmented depending on the assessment of the officer in charge of site.
- b) Arrangements are to be made for speedy dispersal of stranded passengers of the train(s) involved in the accident, as well as of trains regulated or terminated as a result of the accident in association with operating Department. In case of non availability of rail services, adequate arrangements should be made to disperse them by arranging road vehicles etc. This would be done by site in charge.
- c) Depending upon the need, accommodation in hotels/Dharamshalas would be hired for accommodating passengers and providing resting facilities to officials working at the site
- d) Make arrangements to inform the next of kith & kin of the deceased/injured persons involved in accident. It will be done free of cost.
- e) TTEs of the affected train will not leave site of accident till ordered by the site in charge.
- f) Train Superintendent or Conductor or senior most Ticket Checking staff till a commercial officer from division reaches to the site of accident, will allot duties to each available ticket Checking/other Commercial staff/volunteers in a manner to ensure maximum help to passengers under the prevalent circumstances. This function will be taken over by a Commercial officer as soon as he reaches to the site of accident.
- g) Duties of ticket checking staff on board will be:
  - i) Collect Railway staff. Doctors and volunteers on the train or near the accident site for obtaining assistance.
  - ii) Provide assistance to Guard in making quick assessment of assistance required.
  - iii) To carry out the duties assigned to them by Guard/Senior official present at the site of the accident.
  - iv) Take action to save lives and render First Aid and organise relief operations with the available assistance.
- h) In case of involvement of Goods Train, following actions will be taken promptly:
  - i) Arrangements of adequate labour by mobilising resources available at other stations as well as from the market locally, for unloading of material from the wagons involved in accident.

- ii) Adequate tarpaulins to cover the contents so that these are saved from rains etc.
- iii) Arrangements of gunny bags etc. for retrieval of loose materials lying at the site of accident.
- iv) Consignor/consignee would be informed regarding involvement of their consignments in accident besides intimating forwarding/destination station. The information will be conveyed through the Commercial Control of the division/HQ as the case may be. Also to make arrangements for delivery of the consignments at the site of accident if they desire.
- v) Arrangements of road transport for evacuation of the contents from the site of accident.
- vi) To coordinate with the Operating branch for supply of adequate empty stock for transshipment disposal of the contents.
- vii) Till such time, the consignment involved in the accident is not removed/transported; the same shall be made over to RPF Incharge for security purposes.
- i) Staff using their personal mobile phones in connection with the accident will be eligible for a lump sum grant of Rs.200/- without any clerical work to be performed in accidents.
- j) In case of bodies, which remain unclaimed/unidentified, the division shall get such bodies photographed by hiring a photographer. Each body will be given a number, which can be displayed, on the body of the dead for subsequent identification.

### **III. Safety of Passengers/Passengers luggage:**

- a) Separate tent for packages/bags and belongings of the injured and dead should be arranged and guarded with the help of RPF at site.
- b) A list of each item with distinguishing marks should be made.
- c) Luggage claimed should be handed over on the satisfactory proof of ownership.
- d) Unclaimed items will be safely transferred to one of the stations and for this purpose, if need be, road vehicles will be utilized/hired. Their personal belongings are useful in establishing identify of deceased/missing.

### **IV. Catering arrangements:**

It will be ensured by the site incharge.

- a) Sr. DCM will ensure that adequate eatables, water etc. is available at the site of accident in case of involvement of a passenger carrying train in an accident. This arrangement will be made for the passengers free of charge at the site of accident and at roadside station where train involved in the accident is stabled temporarily.
- b) Gas stoves, Gas cylinders, drinking water, provisions for preparation of meals, etc., should be rushed to site for left over stranded passengers and officials involved in rescue operations. This will be augmented later, if necessary. Sufficient cooks and catering staff from departmental catering or catering contractor would be ensured at the site for arranging tea, biscuits, packed meals like *poories* and vegetables to the stranded passengers, and staff engaged in rescue and restoration.

- c) Sr. DCMs would prepare advance section-wise nomination of catering agencies both departmental and private for rushing to site.
- d) To supplement railways catering arrangements, nearby *Dhabas* and hotels should be contacted and arrangements made for opening up stalls at the site.

**V. Hospitals:**

- a) One assistant officer each in the hospitals will be deputed to look after where injured passengers are admitted or dead passengers are kept. In case of non-availability of assistant officer, one CMI/ Inspector/ Sr. supervisor will be deputed by Sr. DCM. All dead bodies must be photographed after wiping their faces to establish identify.
- b) The nominated officer will work in close coordination with doctors and render required help.
- c) Officer incharge of the hospital will assist kith and kin of the passengers involved, in disposal of dead bodies, release injured passengers.
- d) Deputed official will obtain details like name, address, etc. of hospitalized/dead passengers. He will also obtain the details of injured, nature of injuries with the help of doctors and convey it to the divisional Commercial control.

**VI. Payment of ex-gratia:**

- a) Payment of ex-gratia at the site as well as in the hospitals will be arranged on the basis of the identification of injuries by the doctors,
- b) Sr.DCM/DCM will ensure availability of sufficient cash for payment of ex.gratia.
- c) CCO/Dy.CCO will also depute claims officials at the site/hospitals to assist the relatives of the injured/dead passengers regarding filing of claims for compensation.
- d) If some injured passengers/kith & kin of deceased involved in accident have not been paid ex-gratia at the site of accident or in the hospital, arrangements should be made to pay at their residence by deputing officials of the division or seeking help of the other divisions/railway. Such payment will be witnessed by the Pardhan or Sarpanch or any other responsible official of the area.

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## CHAPTER-31

### CUSTOMER INTERFACE AND ROLE OF COMMERCIAL STAFF

**31.01: Introduction:** The physical movement of both passengers and freight cargo is handled by operating staff but it is the Commercial staff, who interacts with the customers. Hence, the front line staff those, who interact with public, their behavior should be polite and cordial as because that depicts the image of Indian Railways.

#### **31.02: Duty of Commercial Staff:**

(a) **Platform Ticket Checking staff:** - Their foremost duty is to enforce rigid access control in station area to prevent ticket less travel and entry of undesirable elements in station premises and to prevent unauthorized occupation of waiting rooms and waiting sheds.

(i) Except under special orders from the Div. Railway Manager, passengers must not be allowed to use the waiting rooms at stations as rest houses, but passengers arriving at Road side stations at night may be allowed to occupy the waiting rooms or waiting halls between trains or until the morning. At junction stations passengers may use waiting rooms and waiting halls when waiting for connecting trains.

(ii) To ensure that bonafide use of waiting rooms is being made, they shall be checked by a ticket checking staff every eight hours.

(b) **Booking staff:**

(i) To issue tickets, release and display reservation slips and charts in time to avoid detention of trains in boarding of passengers.

(ii) To advise all commercial figures and occupation report of trains to Divisional office by SM on duty as required.

(iii) Station Master or Parcel Clerk shall ensure that Parcel, luggage, goods and vendors' trays and barrows shall not be placed on passenger platforms within 3 meters of the edge of the platform. When parcels or luggage are loaded on platform, the barrows must be kept outside this distance at a point opposite where the vehicle, into which they are to be loaded is likely to stop. Packages unloaded from a train must be removed as quickly as possible to the usual place of stacking outside this distance, if they are not taken away immediately into luggage and parcel offices or the goods shed. Under no circumstances should drums and barrels be left on the platform in such a position that they may roll into the track.

#### **31.03: Precautions Before Starting a Train Carrying Passengers:**

(a) Control of electric lights and fans in coaches: -Switching 'On' and 'OFF' of lights and fans circuits in a rake is effected by operating rotary switches or MCBs in the Junction box provided inside individual coaches. Operation of these circuits is the duty of train-lighting staff deputed at important stations. Individual switches regulators of lights and fans are to be operated by passengers themselves.

(b) Conductor or TTEs are responsible for ensuring that the electrical equipments and fittings of all coaches are functioning satisfactorily. Where any defect or deficiency is noticed, they should inform the electric staff on duty of AC coaches or advise through control to the next station where electrical staff is provided.

(c) Conductor or TTE shall, before the train leaves the starting station, request the occupants of those compartments to test if the locking devices on doors and windows are in working order. In case of any

defect, they shall arrange to have the defects put right by the TXR staff under advice to SM either at the starting station or at the next train examining station.

(d) Travelling Ticket Examiners are to note that doors on both sides of carriages on a train carrying passengers shall never remain locked at the same time, except in the case of compartments reserved for ladies which may be locked at the request of the occupants.

(e) Conductor and TTEs must see that passengers are not getting in and out of carriage when trains are about to start and that no one is travelling on the roofs of carriage.

(f) Segregation of passengers suffering from infections or contagious diseases: - For greater safety of the travelling public, passengers suffering from infections or contagious diseases should be segregated from other passengers by TTE with the help of security forces.

(g) Passengers to be courteously treated.-All passengers, irrespective of the class of tickets they hold, shall be courteously treated and all possible assistance and protection afforded to them while on Railway Premises.

(h) Female passengers particularly when unaccompanied by males, friends or relatives shall be given special attention at all times.

(i) Each member of staff who has to deal with passengers must be acquainted with the time of arrival and departure from their stations of all trains carrying passengers to answer in prompt and civil manner any question put to them by the public.

#### **31.04: Precautions During Journey:**

(a) In cases of long distance through trains coming from or going to other railways, which have yet to journey through the following night, the guard or conductor or TTE shall, at a convenient station some time during the day, approach the occupants of upper class and second class ladies compartments, and request them to check up if the door latches and window catches are in good working order. When the train arrives at a station where the TXR staff is required to attend to the safety catches, the TXR staff should be ready with the necessary material and should themselves check up the locking devices and put right any deficiencies detected by them or reported to them by passengers.

(b) The Conductor or TTE should also make it a point to warn the passengers at convenient stations between 21 and 22 hrs to apply the locking devices, if not already done.

(c) Should it be found that the alarm chain has been pulled mischievously or for an unjustifiable cause or the hose pipe has been disconnected by some miscreants, the Conductor or TTE in charge must ascertain the name of the person who pulled the chain or disconnected the hose pipe. His name and address with those of other occupants must be obtained and the Conductor or TTE should make a report regarding the alarm chain pulling or the hose pipe disconnection incident and hand over the same to SM/ASM of the station at which the incident occurs, if time permits or at the next stopping station, who will take action in lodging the report with the GRP of the station in whose jurisdiction the incident has occurred.

(d) Calling out name of station - Travelling Ticket Examiners where employed and at Ticket Checking stations, the Ticket Examiners are required to give this information to passengers as they go from compartment to compartment checking tickets and at junction stations they shall advise passengers to change, if necessary.

**31.05: Waking up Passengers:**

- (a) Passenger of all classes occupying reserved accommodation shall not be roused for tickets, to be rechecked between the hours 22 and 6 except when there are reasons to believe that a certain passenger is travelling without a ticket or otherwise irregularly.
- (b) TTEs of Mail Express and passenger trains are to arouse Air Conditioned and First Class Passengers at night at any station when requested by the passengers to do so and will be assisted by the coach attendant. The Ticket Checking staff to whom such a request is made by a passenger shall enter in the "wake up memo" the name of the passengers the number and the class of the carriage occupied and the name of station at which the passenger is to be called.
- (c) The Ticket Checking staff when intimating the arrival of the train at a station where a passenger has been noted to alight shall take care of that other passengers are not unnecessarily disturbed.
- (d) Passengers shall not be placed in carriages of a higher class than that for which tickets are held except on payment of additional fares as per extant rules or on automatic up gradation.

**31.06: Ladies Travelling Alone at Night:-**

- (a) In no case, whatever, shall a male passenger (except a boy under twelve years of age) be allowed to travel in a compartment reserved for Ladies in any train.
- (b) A lady travelling alone or with children under 12 years of age at night in a first class compartment reserved for ladies may take with her in the same compartment in which she is travelling, one women attendant holding a second class ticket for that portion of the journey which is performed between the hours 8 p.m. and 6 a.m. This rule may also apply when two or more ladies are travelling in the same compartment without any objection and any inconvenience.
- (c) A lady travelling alone or with children under 12 years of age in a first class compartment may take with her compartment one dog on payment of the dog-box rate, provided that if another lady enters the compartment, the dog shall only be allowed to remain in the compartment with the permission of the other passenger.

**31.07: Medical Aid:**

- (a) It will be the duty of the train manning staff or station staff to render first aid to any injured person within Railway premises immediately.
- (b) If the case is serious one, the senior most official available on the spot must arrange to summon medical aid from the nearest available source, whether Railway, Civil, Military or private.

**31.08: Murder or Serious Assaults :**

- (a) If a crime of serious nature such as a murder or a serious assault be committed in a Railway carriage on a running train, the following action shall be taken by the staff with a view to helping the Police Officials in their investigation:
- (b) The Conductor or TTE of the train shall have the compartment emptied and locked up after all shutters have been closed immediately after the commission of such an Offence is known so that blood stains, marks of struggle, foot prints, finger impressions etc. may remain undisturbed.

**31.09: Passenger Trains Overshooting Platform:**

When any portion of a passenger train over shoots a platform, or when a platform is too short to accommodate a full train, at night, passengers who are obliged to alight on ballast should be told that they should alight carefully as there is no platform. If a carriage at the end of a train is off the platform, the Guard should also call out a similar caution to the passengers.

**31.10: Duties of Conductor:**

- (i) He shall report to the train guard for his appearance and the time of his appearance shall be noted down by the train guard in the Constitution Report. The Conductors shall sign this entry and the train guard shall countersign it.
- (ii) See that the window catches and other safety devices fitted in II Class compartments reserved for ladies are in perfect working order and get the deficiencies repaired.
- (iii) See that the passenger carriages are thoroughly cleaned and filled with water.
- (iv) Look after the safety and comfort of passengers of all classes and more particularly, of women and children, attend to complaints of passengers regarding cleanliness of carriages, water supply in lavatories, lights and fans and any other complaints and have them promptly attended to.
- (v) Make it a practice to walk along his train at stations to see if passengers want any assistance or information and keep a careful look out for irregularities of any kind, especially at night.
- (vi) Before a train begins a night journey, ensure that the safety bolts provided on the inside of windows and doors of Upper Class carriages and ladies compartment are in working order.
- (vii) Arrange for the meals of passengers when requested to
- (viii) Wake up upper class passengers alighting at night if requested;
- (ix) See, in so far as is possible that there is no irregular or unauthorized travel by trains in contravention of any rules in force. All infringement of rules by passengers should be brought to the notice of the station master on duty.
- (x) Note the Coach, which is to be detached short of the destination of the train. Must see that such carriages are not occupied by passengers who have tickets for beyond the station at which the coach is to be detached. He must ensure that, if some passengers are allowed to ride in such coaches they are warned before starting that they shall have to vacate the coaches on arrival at the station at which such coaches are to be detached.
- (xi) Conductor must see that passengers are not getting in and out of carriages when trains are about to start and that no one is travelling on the roof of carriages

**31.11: Duties and Responsibilities of TTEs:**

- (i) He shall see that all doors, bolts, windows and catches etc. of all the coaches particularly upper class and ladies compartments are in perfect working order and also that all through and sectional coaches are provided with proper destination boards.
- (ii) If there are defects in the working of any of the fans and lights, he shall get them rectified by the train lighting staff.

- (iii) He shall see that, where arrangements exist, the compartment are properly cleaned, dusted, and watered and shall make necessary enquiries from passengers in this connection.
- (iv) He shall see that lights, fans and other fittings, and water in the carriages are not misused.
- (v) He shall check Attendant compartments and ensures that only bonafide attendants of upper class passengers occupy them.
- (vi) He shall check Vendors and G.R.P/RPF compartments to ensure their correct use.
- (vii) He shall receive reservation charts well in time before the departure of the train, see that the same are completed in all respects and that the reservation labels are intact so that there is no hitch in providing berths to passengers.
- (viii) He shall look after the safety and comforts of passengers in general and of upper class and women passengers in particulars.
- (ix) He shall assist all classes of passengers in securing accommodation either reserved or available for them.
- (x) During the course of the journey, he shall keep special watch on compartments occupied by women passengers without causing any annoyance to occupants. He shall, where halt permits; walk on platforms, to see that in ladies compartment everything is well. While inspecting a train in this manner, he should be ready to answer queries and receive complaints from all classes of passengers and complaints of special nature and action taken by him should be recorded.
- (xi) During the night, he shall awake upper class passengers who express their desire to be called at a particular station and in the event of his change of duty en route, ask his reliever to do so.
- (xii) He shall ascertain from Passengers their meal requirements and arrange it either from the Dining Cars running with the train or the next Refreshment Room station.
- (xiii) He shall assist Refreshment Room bearers in finding out space for return of empty meals crockery, trays or thalies.
- (xiv) He shall see that no suspicious person attempt to enter upper class compartments and compartments reserved for women.
- (xv) He shall not interfere with or annoy passengers by talking, smoking or slamming doors while entering, or leaving compartments.
- (xvi) He shall keep an eye on vendors and licensed porters charging passengers excessively and promptly intervene where necessary. All such cases must be reported to the Divisional Commercial Manager concerned under intimation to the Station Master concerned.
- (xvii) He shall see that vendors do not shout their wares at station during night.
- (xviii) In the event of any passenger being found molested, a passenger's property being stolen or tampered with, he shall, promptly, take action in conjunction with the guard in-charge of the train, or the station master as the case may be and see that police is advised immediately. The passenger's name, address and ticket numbers of those who are allegedly responsible for the trouble and also the same particulars of some respectable witnesses, should be taken and full report submitted to the Divisional Commercial Manager concerned.

(xix) When alarm chain is pulled or hose pipe is disconnected, the disc at the end of the affected coach should be returned to normal position (thereby closing the Clappet Valve) and FIR to be lodged to GRP under advice to Guard/ Station Master.

(xx) Similarly air hosepipe disconnected should be reconnected by Asstt. Loco Pilot under the supervision of train guard.

### **31.12: Duty list of Train Superintendents:**

(i) The train Superintendents will report for duty one hour before the departure of the train. He must be in proper uniform with prescribed badges, scrolls and his name plate.

(ii) He will be the overall incharge of the Conductors, TTEs, Coach Attendants, amenities staff like safaiwallas, Electric, C&W, Air-conditioning and Catering Staff on duty by the same train and will be responsible for exercising effective supervision on the quality of their work.

(iii) All the staff on duty in the train excepting the crew and Guard would report to him well before the scheduled departure of the train at the train originating station. The staff en-route would also report to him at the point from where they are to board the train as per their scheduled link programme.

(iv) The Train Superintendent will record in a register the names and designations of the staff who report to him for duty on the train and mention the particulars of the absentees in his trip report at the end of the journey.

(v) After ascertaining the details of the staff who have turned up for duty he will allocate the work of manning of coaches to the Conductor, TTE, Coach Attendants, Safaiwallas, etc. to ensure that the coaches are properly manned.

(vi) The Train Superintendent should ensure that the staff are in proper uniforms with name badges and perform their duties properly.

(vii) The position regarding the details of the berths remaining vacant after allotment to passengers and the RAC passengers left over in each coach will be reported to him by Conductor and each TTE. He will have the vacant berths allotted to the RAC passengers still awaiting allotment of berths.

(viii) He will be responsible for giving the vacancy position of the berths/seats to the Commercial Controllers/S.M. of Road side station if the berths are available in train after adjusting all the RAC passengers.

(ix) He will also exercise necessary checks on the reservations given to passengers and Excess Fare Ticket books of the TTEs and Conductors to ensure correct realization of dues.

(x) Whenever the staff belonging to his railway do not cooperate with him, or do not attend their duties properly and promptly, he should send a report against such staff to Sr. DCM of the Division concerned and also to Chief Commercial Manager (Passenger Service) indicating the name and specific act of failure, impertinence, indifference or disobedience for which the person is held responsible.

(xi) In case of staff belonging to the other railway, if they do not report for duty or fail to perform their duty, he should immediately send a message reporting this matter to DRM concerned from the next halt station.

(xii) In his role as the Captain of the train, he will coordinate the work of all the team members and will always be vigilant in ensuring customer satisfaction.



(xiii) At the train starting station, the Train Superintendent will make a quick inspection of the train to ensure that the passenger amenity fittings are in proper working order. The defects and deficiencies should be reported to SM-in-charge and got rectified by the staff concerned and if necessary send advance information to the station ahead and get the defects attended to by the electrical and C&W staff at that station. He would also ensure that the coaches, bathrooms and toilets are intermittently swept and cleaned by the staff concerned.

(xiv) The Train Superintendent will ensure that proper pre-coiling is done in AC coaches before the train starts from the originating station.

(xv) The Train Superintendent will ensure that the Coach Attendants of AC 2-tier coaches are carrying the bed rolls for all passengers to ensure that the bed rolls are supplied as early as possible avoiding disturbance to passengers during the night.

(xvi) The Train Superintendent will also maintain a complaint book in his custody and make the same available to passengers on demand for recording complaints, if any. He should ensure that prompt action is taken to remove the cause of the complaint and render satisfactory service to the passengers.

(xvii) The Train Superintendent will exercise checks on the catering service on the train in respect of quality and quantity of food, cleanliness of uniform and utensils, behaviour of the Manager and bearers, issue of receipts by the bearers, timely service of meals, proper vending of tea, coffee, snacks and cold drinks.

(xviii) Pantry Car Managers are to maintain complaint books separately. The Train Superintendent shall ensure that the complaint books are readily available with him.

He will check the nature of complaints and their proper dispatch to Chief Commercial Manager (Passenger Service) for further action. He will also take steps to rectify the deficiencies leading to complaints.

(xix) He should try to effectively prevent unauthorized hawking and begging on his train, utilizing the TTE and other train staff for the purpose.

(xx) He should ensure that the sleeper coach TTEs, and Coach Attendants follow the standing instructions regarding the securing and latching of the doors on run and at stations and also closing and bolting the vestibule doors at night time are scrupulously observed by his staff.

(xxi) In case of any incident of theft during the run of the train, he would guide the passenger to the GRP escort party, if travelling by the train, otherwise, he will make a blank FIR form available to the passenger for lodging the complaint. Such forms duly filled in should be handed over to the first GRP Post available at the scheduled stoppage of the train for further action.

(xxii) At the end of each trip the Train Superintendent should make out a brief report indicating special occurrence, if any, commenting upon all aspects of passenger amenities namely Catering, supply of drinking water, filling up of water tanks, cleanliness of coaches, entry of unauthorized passengers in reserved coaches, working of lights, fans and other fittings, incidents of thefts of luggage, non-functioning of air-conditioning and other public complaints, etc. the report should be submitted to the Lobby Office/SM (Comml.) at the destination station who should take necessary action for getting the deficiency rectified. A copy of the same should also be sent to SM(Commercial), Senior Divisional Commercial Manager(Sr.DCM) / Divisional Commercial Manager(DCM) for initiating immediate necessary action.

(xxiii) Any other duty assigned to him from time to time.



**31.13: Duty list of Train Conductors in 1AC, 2AC, 3AC and First Class:**

- (i) He shall report for duty at least one hour before the scheduled departure of the train at the train originating station and at least half an hour before the schedule arrival of the train at the intermediate station.
- (ii) He shall wear neat and clean uniform along with number, badge, name plate, etc.
- (iii) He shall sign ON & OFF Register maintained at the station.
- (iv) He shall obtain complete position of the reservations, checks the same on train, maintain record (charts, etc.) and hand over the reliever complete and correct details showing the vacant berths/seats.
- (v) He shall check the tickets of the passengers in the coach and guide the passengers in the coach and guide the passengers in occupying their accommodation. He shall prevent illegal/unauthorized entry in the coach including the platform ticket holders.
- (vi) He shall ensure that the number of passengers do not exceed the carrying capacity of the coach.
- (vii) He shall collect dues such as reservation fares/supplementary charges and issue EFTs.
- (viii) He shall ensure that passengers in the coach do not carry heavy luggage in their compartments causing inconvenience to fellow passengers and assists such passengers to transfer the luggage to Luggage Van/Cabin.
- (ix) He assists the passengers in the coach in obtaining food/refreshments, etc. and also to issue message to proper station for this service in time.
- (x) He shall take care of the passenger amenities and cleanliness of the coaches.
- (xi) He shall ensure that the doors of the coaches are kept latched during run of the train and open them as and when required by the passengers.
- (xii) He shall keep the end doors of the vestibule coach locked during 22.00 hrs to 06.00 hrs to prevent unauthorized entry.
- (xiii) He shall remain vigilant particularly during the night time and prevent entry of unauthorized persons/beggars/intruders in the coach.
- (xiv) He shall always be polite, tactful and courteous in his dealings with the passengers leaving no room for any complaints.
- (xv) He shall allot berths seats which are vacant to passengers at intermediate stations on realization of fare/surcharge as per rules on first come-first serve basis or according to the priority on the waiting list if such a list is kept at the station.
- (xvi) He shall assist GRP/RPF if necessary for removal of unauthorized occupants and deal with them under provisions of Section 155(I) of Railway Act, 1989.
- (xvii) He shall be present in the allotted coach during duty hours and if more than one coach are to be manned, give frequent visits to all the coaches to be manned.
- (xviii) He shall issue Guard Certificate/Receipt to AC passengers in case of failure of AC equipment or when passenger is compelled to travel in lower class with a higher class ticket for want of room/accommodation.
- (xix) He shall attend to any complaint of theft/loss of passenger belongings and lodge the first information report with the GRP in the prescribed format to enable the passenger to continue the journey.

(xx) He shall carry blank FIR forms for making them available to the passengers in case of any incident of theft of luggage, etc. such forms duly filled in are to be handed over to the next GRP Post at the scheduled stoppage for further action in the matter.

(xxi) The conductors shall make out a report of the deficiencies, if any, of the whole train regarding passenger amenities and submit the same at the end of his duty to the Lobby Office set up at the station for terminating trains. If the Conductor is detraining at an intermediate station, he will give the deficiencies report to the incoming Conductor who will deposit the same at destination. The Lobby Office shall take necessary action for getting the deficiencies rectified and also report the matter to SM (Comml.) and Divisional Commercial Manager (DCM) or Sr. Divisional Commercial Manager (Sr.DCM) of the concerned Division.

(xxii) Such other activities as may be prescribed from time to time.

### **31.14: Duties of TTEs assigned to Second Class Sleeper Coaches:**

(i) The Sleeper Coach TTEs shall report for duty at least half an hour before the scheduled departure of the trains. In case he joins the train en route, and not at the train originating station he shall report for duty at least 15 minutes before the scheduled arrival of the train.

(ii) He shall wear neat and clean uniform along with the TTEs Badge to distinguish him while on duty. He shall also wear the name badge provided for the purpose.

(iii) He shall obtain, at the starting station, complete particulars of reservations made in the Coach and shall maintain complete entries in respect of occupation of berths/seats on the run and hand over to his reliever complete and correct details clearly indicating the berths/seats that are vacant and are available for allotment.

(iv) He shall check the tickets of passengers in the Coach, guide them to their berths/seats and prevent unauthorized persons from entering the coach. He shall in particular ensure that persons holding platform tickets, who come to see off or receive passengers, do not enter the coach.

(v) He shall regulate the entry and exit of passengers so that the number of passengers travelling in the coach does not at any stage exceed the marked carrying capacity.

(vi) He shall realize the fare/surcharge/reservation charges, etc. wherever required from passengers to whom berths are allotted and make over EFTs to passengers as a token of receipt.

(vii) He shall assist the passengers in depositing heavy pieces of luggage in the luggage booth where provided for the purpose and ensure that they are not taken inside the coach, causing inconvenience to other passengers.

(viii) He shall assist the passengers travelling coach in obtaining food, refreshment, etc.

(ix) He shall allot berths/seats, which are vacant to passengers at intermediate stations on realization of fare/surcharge as per rules on first come first served basis or according to the priority on the waiting list if such a list is kept at the station.

(x) He shall ensure that berths/seats exclusively earmarked for ladies are allotted to ladies only and shall prevent male persons from occupying such accommodation.

(xi) He shall arrange for the filling up of water containers, where provided, during the stoppage of the train.

- (xii) He shall pay prompt attention to all complaints from passengers with regard to non-working of fans, lights, laps, etc. and take necessary remedial action to get them rectified.
- (xiii) He shall ensure the cleanliness of the carriage and ensure that safaiwallas are deputed to clean the coach at intervals.
- (xiv) He shall ensure that the doors of the coach are kept latched when the train is on the move and open them up for passengers as and when required for entraining /detraining of authorized passengers.
- (xv) He shall ensure that the end doors of vestibule trains are kept locked between 22.00 hrs and 06.00 hrs to prevent outsiders from entraining the coach.
- (xvi) He shall be vigilant particularly during night time and ensure that intruders, beggars, hawkers, and unauthorized persons do not enter the coach.
- (xvii) TTEs assigned to sleeper coach shall ensure that unallotted vacant sleeper berths are kept folded up and hinged so that they are opened up only on allotment to passengers.
- (xviii) The TTEs shall carry blank FIR forms for making them available to the passengers in case of any incident of theft of luggage etc. Such duly filled in forms are to be handed over to the next GRP post, at the scheduled stoppage for further action in the matter.
- (xix) The TTEs shall make out a report of deficiencies, if any, in the coaches about passenger amenities and submit the same at the end of his duty to the lobby office set up at the station for terminating trains. If the TTE is detraining at an intermediate station, he shall give the deficiency report to incoming TTE who will deposit the same at the destination. The Lobby Office shall take necessary action for getting the deficiency rectified and also report the matter to SS on duty, Divisional Commercial Manager(DCM) or Sr. Divisional Commercial Manager(Sr. DCM) of the concerned Division.
- (xx) He shall be tactful and courteous in his dealings with passengers leaving no room for complaint.
- (xxi) Such other duties as may be prescribed from time to time.

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## CHAPTER-32

# AUTOMATIC AIR BRAKE SYSTEM

### 32.01: Principles:

In Automatic air brake system, the medium is compressed air pressure. It obtains its power from the pressure differential between control reservoir pressure and brake pipe pressure. The Brake pipe is originally charged to 5 Kg/Cm<sup>2</sup> of the compressed air.

### 32.02: Description:

(a) In a train composed of completely fitted or piped vehicles, the automatic air brake may be operated on every completely fitted vehicle, provided that the engine air hose pipe is coupled to the first vehicle of the train by means of air hose coupling, angle cocks opened, and that each vehicles is coupled to its neighbour in a similar manner, the rear angle cock of the last vehicle being closed and the air hose pipe placed on the air hose support.

(b) The gauges on the Engine and in the Guard's van when the train pipe is continuous indicate the air pressure available by reduction of which the train can be stopped. The gauges should show not less than the following:-

	<u>Engine Gauge</u>	<u>Guard's Van Gauge</u>
Passenger Train ...	5 Kg/cm <sup>2</sup>	4.9 g/Cm <sup>2</sup>
Goods Train....	5 Kg/Cm <sup>2</sup>	4.8 Kg/Cm <sup>2</sup>

(c) More than 5 Kg/Cm<sup>2</sup> is not necessary and the air brake combination in the engine(Ag.Valve) should be so set that the pressure charged in the brake pipe is not more than 5 Kg/Cm<sup>2</sup> as otherwise brake binding is likely to be experienced.

### 32.03: How Applied and Taken off:

(a) The Brake is applied by the engine driver or guard by reducing the brake pipe.

(b) The first application when made by the Loco Pilots should be made sharply by reducing not less than 0.4 kg/Cm<sup>2</sup> of air pressure initially and further reduction in steps of 0.2 Kg/cm<sup>2</sup>. The different sequence of Brake applications are minimum reduction 0.4 Kg/Cm<sup>2</sup>, service applications 0.8 to 1 Kg/Cm<sup>2</sup>, full service application 1.5 Kg./Cm<sup>2</sup> and emergency brake application, in which the maximum brake cylinder pressure attained in shortest period of time.

(c) In any emergency, the brake may be applied from the Guard's van or any other vehicle of the train, where an application valve is fitted (provided the brake pipe is continuous) by pressing down the valve lever, until the needle of the gauge falls to zero. The Brake is then fully applied on each fitted vehicle.

(d) Should be train on which the automatic air brake is in operation parts accidentally in the portion on which the brake is operated, the air hoses between the parted vehicles will get disconnected, and the brake will be applied, automatically on each of the fitted vehicles.

(e) The brake is released by the engine Loco Pilot by charging the air pressure by means of Loco Pilot's Brake Valve (Ag Valve) to the same conditions as existed before the application of the brake.

(f) The automatic air brake can be released on any vehicle by pulling the released lever of the distributor. The release rod need not be kept pulled till the Brake cylinder is exhausted.

(g) The Brake gear should be properly adjusted so that the brake blocks firmly grip the wheel treads in the brake applied condition, the test for which may be done by sounding the brake blocks with a hammer.

### 32.04: Specification:

(a) The air hose coupling between the Engine and the first vehicle and between each piped or fully braked vehicle and its neighbour must be properly connected. The rear air hose of the piped or fully Braked vehicle forming the last of the sequence from the engines must be engaged on air hose support and the angle cock closed carefully.

(b) When the air hose couplings have been connected, and the angle cocks are opened, the engine Loco Pilot must charge the required air pressure 5Kg./Cm<sup>2</sup> and maintain it through out the journey.

(c) Examination of trains before starting should be done as per general rule 4.30,4.31,4.32,4.33 and subsidiary rules thereto.

(d) Guard and Loco Pilots shall ensure at the time of taking over charge of a train, that their trains have the prescribed minimum brake power as laid down below.

#### (A) For Goods Trains:

(i) For the purpose of working out of the percentage of operative pistons on trains, piped vehicle should be deemed to have in-operative cylinder/cylinders. The percentage has not been expressed in terms of vehicles or four wheeler units but only in terms of brake cylinders, since bogie wagons have two cylinders and four wheelers have one cylinder.

(ii) An active brake cylinder is one in which the air pressure can be admitted through the auxiliary reservoir when the pressure in the brake pipe is reduced by control from the engine and which, moreover, satisfies the stipulation that its piston would remain in pushed-out position for not less than 30 minutes after the air pressure in the brake pipe is reduced.

(iii) On steep gradient sections 90% of the brake cylinders must be operative.

(iv) Brake power of freight trains:-

Description	-	Originating station
Freight trains		
a) C.C. Rakes	-	95%
b) Other goods train	-	85%

Not less than 95% of total number of cylinders in case of C.C. rakes and 85% in case of other goods trains shall be in working condition in case of train originating/examination point. There may be however, certain amount of deterioration in the brake power while the train is on run due to wear and tear. Taking into account the practical conditions, the goods trains including C.C. rakes may be worked with 75% active cylinders enroute. For the purpose of this rules 'piped vehicle' (i.e . fitted with trains pipes and having no vacuum cylinder or other brake fittings) should be deemed to have inoperative cylinder(s).In case, however, a driver feels that the brake power is not upto even this level (i.e 75%), he shall suitably control the speed of the train and work the train to the next station or next train examining station for necessary examination by train examination staff.

(v) No audible leak is permissible in the air brake system along the train.

(vi) There should be atleast 4 fully air braked vehicles including brake van, with operative cylinders at the rear end of the train.

(vii) The position of Empty/Load Box handle on wagon should be placed on the appropriate position either Empty/Load, according to the loaded condition of the wagon.

**(B) For Passenger Carrying Train :**

- (i) From an originating station the train must have all vehicles with active air brake cylinders.
- (ii) At intermediate stations not more than 10% of in-operative cylinders. (Subject to maximum of 2 cylinders only) can be permitted.
- (iii) When the engine is attached to the train, the Loco Pilot must see that the air hose coupling on the engine is properly connected to that on the train. Both angle cocks to be closed before detaching their hose couplings of the engine and front vehicles and air hoses are engaged on respective air hose supports.
- (iv) The Loco Pilot must test the engine automatic air brake apparatus before leaving the shed. Should there be any difficulty in charging and maintaining the required air pressure, after coupling to the train, steps should be taken to locate and remedy the fault, failing which the defective vehicle should be detached without infringing safety. Loco Pilots should ensure that the specified main reservoir Pressure is maintained.

**32.05: Recording and testing of air pressure indication by Guards :**

- (a) The Guard must record in the appropriate column in the Guard's rough journal book and Guard's train report (T 34 HF) what air pressure is indicated in the brakevan gauge every time the train starts after a halt. He will not give starting signal to the Loco Pilot unless the air pressure as indicated in rule 32.02(b) is registered in his gauge or unless he is authorized by a representative of Mechanical Department to start at lower air pressure than prescribed.
- (b) At the first starting station and at all stations where the engine or any vehicle(s) are detached from the train or any vehicle(s) are attached to the train, before starting when the Loco Pilot has charged the air pressure, the Guard must reduce 0.4 Kg./Cm<sup>2</sup> air pressure by operating his brake van valve observing the indication needle and then replace his valve to normal and allow the Loco Pilot to charge the remained air pressure. Without doing, the Guard must not give the starting signal to the Loco Pilot.
- (c) If the indicator is not registering correct air pressure as given in rule 32.02 (b) the fact must be brought to the notice of either the Train Examiner or the Loco Pilot.

**32.06: Air pressure tightness test for locomotives and trains by Loco Pilots :**

- (a) **Engine :** Engine should be tested for leakage test as follows :-
  - (i) Open the Loco angle cocks in front and in rear to allow the dirt or water to blow out and apply master gauge on rear air hose couplings. Close the front angle cock of the engine.
  - (ii) Charge the brake pipe pressure to 5 Kg./Cm<sup>2</sup> Ensure 5 Kg./Cm<sup>2</sup> pressure is registered in the Engine brake power pressure gauge as well as in master gauge.
  - (iii) Drop pressure 1 Kg./Cm<sup>2</sup> by keeping the Loco Pilot's brake valve handle in applicable position.
  - (iv) Keep the cut-out cock in 'OUT' position. Wait for 60 seconds.
  - (v) Note, there should not be any drop in the pressure gauge in the next 60 seconds.
  - (vi) Any drop in pressure indicates the leakage in the Engine.
  - (vii) Again charge the brake pipe pressure to 5 Kg./Cm<sup>2</sup> and ensure pressure is restored instantaneously.

**(b) On Trains :**

- (i) Couple up engine air hose to the train air hose.
- (ii) Open rear angle cock of the brake van to allow the dirt or water to blow out and apply master gauge.
- (iii) Charge the brake pipe pressure to 5 kg./Cm<sup>2</sup> Ensure the same amount of pressure is registered in the brake van pressure gauge and master gauge.
- (iv) Drop pressure by 1 Kg./Cm<sup>2</sup> by Loco pilots, brake valve.
- (v) Keep the cut-out cock in the loco brake valve in out position and wait for 60 seconds.
- (vi) A drop of 0.2 Kg./Cm<sup>2</sup> (0.3 Kg./Cm<sup>2</sup> on longer trains) is permissible.
- (vii) Any excess leakage noticed is to be attended to.
- (viii) Again re-charge the brake pipe pressure to 5 Kg./Cm<sup>2</sup> and ensure the pressure restores instantaneously in brake van.
- (ix) Close the rear angle cock of brake van and engage the respective air hose on support.

**32.07 :During Journey :**

- (a) Loco Pilots and Guards must unscrew their hand brakes fully off before starting.
- (b) Loco pilots will be guided in the use of their air brakes and hand brakes by the orders in force.
- (c) If during the journey the Guard of any train finds that the gauge in his Brakevan shows less than the required air pressure (unless he is satisfied that such is caused by an application of brakes) he must be prepared to apply his hand brake if required and advise the Loco Pilot of the defect at the next stopping station.
- (d) The Loco Pilot and the guard must report to the Train Examining staff at the next train examining station any irregularity or defect in connection with the working of the automatic air brake which may have occurred, and the Guard must in addition, note the particulars in his journal.
- (e) When fitted or piped vehicles on which the automatic air brakes are being operated have to be parted for any purpose, the angle cocks of the vehicles where they have to be uncoupled must be closed so that there may be no delay in coupling and the men put on the job are not injured.
- (f) In case of failure of the automatic air brake on any train during the journey, if the defect cannot at once be remedied, the train must proceed cautiously to the next convenient station, where the defective vehicle can be remarshalled, detached or otherwise dealt with, the speed of the train being so regulated as to enable the Loco Pilot to have full control of the train by the hand brakes. In all such cases the Guards must be on the alert and assist in stopping the train with the hand brakes.
- (g)
  - (i) When two engines are employed to draw a train, the Loco pilot of the leading engine will be held responsible for the working of automatic air brake. The Loco Pilot of the second engine must, however in case of emergency, assist in stopping or reducing the speed of the train by applying the automatic air brake, or hand brake, as may be required, but he must not maintain or recharge the air pressure.
  - (ii) When an additional engine or engines are employed to push a train, the Loco Pilots thereon must not interfere with the working of air brake which shall be under the control of the leading engine Loco Pilot as laid down in para (g)(i) above.
  - (iii) Loco Pilot of all additional engines will at all times keep the handles of the Loco Pilots brake Valve in the release position.



(iv) In the event, Loco Pilots of the engine in rear requiring in any emergency to attract the attention of the leading engine Loco Pilot, he shall give whistle code as laid down in G.R.4.50 and S.R.4.50.01.

**Note :** - These rules are laid down to avoid the serious danger which would arise if the Guard or the Loco Pilots of additional engines were to put the brake on, while the leading Loco Pilot was trying to recharge air pressure.

### **32.08: Stopping :**

(a) Before the train is brought to a stand, the Loco Pilot will release the brake slightly to prevent a rebound of the vehicles and an undue strain on the couplings.

(b) In case of a train becoming divided, the Guard in the rear van must put his hand brake hard on and secure it with the chain and skid, where provided. He must also take any other precaution that may be necessary to prevent the rear portion moving, before going back to protect his train.

(c) In controlling trains on descending long and heavy grades, Loco Pilots are cautioned against the exhaustibility of the air brake system. Loco Pilots should know what is called the sensitive brake application and should take extreme care in avoiding the fading of the brake power. After repeated brake applications care should be taken that auxiliary reservoirs where the brake cylinders are fed from, are recharged to the original capacity ( 5 Kg./ Cm<sup>2</sup>). Neglect of this rule may lead to the train going out of control.

(d) On long and heavily graded sections, when trains are braked only by compressed air pressure, it is essential that trains be stopped at suitable time intervals during the run for recoupling lost air pressure in auxiliary reservoir and to ensure that train be kept under control and hence, halts may be provided on such heavily graded sections either at station or in mid sections for recoupling air pressure in the auxiliary reservoir and these halts wherever provided are shown in the working Time Tables. Loco Pilots while working air brake trains must ensure that they strictly observe these halts regardless of whether they are given through signals or not.

(e) The fact that after the brake has been applied the air pressure in the control reservoir gradually decreases due to leakage and that in less than half an hour the brakes may leak off altogether must not be forgotten when a train is brought to a stand on a gradient steeper than 1 in 150. In all such cases measures must be taken to guard against the possibility of a run-away. For this purpose, precautions mentioned in SR.6.04.02 (d) must be observed strictly.

The Guard must always be vigilant and be prepared to assist the Loco Pilot by applying hand brakes, if called upon to do so by the Loco Pilot and if necessary in an emergency. If the Loco Pilot requires additional brake power, the Guard and Assistant Loco Pilot shall pin down hand brakes on as many vehicles as the Loco Pilot may consider necessary.

### **32.09: Passenger Train Stopping Apparatus :**

(a) Passenger carriages are fitted with an apparatus enabling passengers, in case of emergency, to partially apply the automatic air brakes and so to attract the attention of the Loco Pilot and the Guard of the train except such particular carriages/trains as may be exempted vide GR.4.18.

(b) On noticing the drop of pressure in the brake pipe pressure gauge, the Guard, Loco Pilot, Motorman and Asst. Loco Pilot will take necessary action as laid down in SR.4.18.01 and 4.18.02.

(c) To reset the apparatus to enable the train to proceed, it is only necessary for the Guard or Asstt. Loco Pilot to push one of the discs to its socket or to turn disc through 90° as the case may be, which will cause both disc to resume their normal position and the brake blocks to get released.

**32.10: General :**

- (a) Air Hose couplings must not be left hanging loose but must be properly secured on the air hose support provided for the purpose.
- (b) To couple the air hoses, they must be taken one in each hand and lifted sufficiently high to enable the palm ends of both air hoses to be coupled together and when lowered the coupling packing ring of one palm end will fall in the coupling case of the other end and hold in position with stop-pin.
- (c) To uncouple the air hoses, they must be lifted straight up, when the coupling packing ring of one palm end will come out of the coupling case of the other palm end and air hose palm ends will separate.
- (d) When connecting and dis-connecting Air hoses, staff must be extremely careful. When the Air brake system is under charging, there will be a pressure of 5kg/cm<sup>2</sup> in Air Hose and hence, before handling them respective angle cocks should be closed and after uncoupling /coupling angle cocks should be opened.
- (e) Care must be taken in un-coupling air hose Palm ends that the MU washers are not displaced or lost.
- (f) Shunting staff and other when passing between vehicles must not step on the air hose coupling interfering with or damaging them.
- (g) When automatic air brake vehicles are placed in siding or stabled within the station limits, the brakes must be released, and vehicles kept from moving by the application of the hand brakes if fitted, or by wedges or chains on the required number of vehicles if necessary.
- (h) Guards and other concerned staff must take care that articles are not placed in Guard's vans in such a position as to come in the way of the lever of the Guard emergency valve.

**32.11: Instructions to Loco Pilot and Guard on the use of Air Brakes :**

Loco Pilots and Guards are being instructed in the training centre during their initial and refresher training period regarding the air brake system and its use. They must be well acquainted with all the instructions of this chapter and ensure strict observance.

**32.12: Recording of Air Brake particulars by Guards :**

- (a) The Guards must be careful to show in their rough journals and on the T-34HF copy handed to the Loco Pilot the particulars of air pressure and number of vehicles with active/in-active cylinders on train.
- (b) In all cases where the active cylinder is made in-operative or vice-versa, during the journey, the change and stations where it took place must be noted by the Guard in his rough journal and on the T-34HF copy handed by him to the Loco Pilot.

**32.13: Locomotive Loco Pilot to blow through :**

In order to prevent the accumulation of moisture and dirt in the pipes of automatic air brake apparatus, Loco Pilots are instructed that before leaving shed with their engine to work a train, a good blow through should be given with the Loco Pilots brake valve by opening the front and rear angle cocks. A through blow should be given by opening the dummy plug of main reservoir also. The accumulated moisture and oil will be drained out. Likewise, before engine is attached to the train, the rear hose should be opened and blow-through given. After the engine is attached to the train and the rear air hose of the engine and the air hose of the first wagon of the train air hose coupled, the blow-through should be given by opening the rear angle cock of the last vehicle.

**32.14: Other Responsibility of Staff :**

- (a) The working of automatic air brake by the engine Loco Pilot will not relieve the Guard of any responsibility as to the braking of the train. Guards must therefore keep, a good look-out and be prepared to apply the automatic air brake or hand brake, should any necessity arise.
- (b) Engine Loco Pilot must satisfy themselves that the automatic air brake is in proper working order before starting and at each station where any vehicle is attached or detached. They must also test the brakes before descending steep inclines and while approaching any danger signal or terminal station; the speed of the train must be reduced if necessary so as to stop the train at the proper place, Guards must watch the speed of the train and assist the engine Loco Pilot by the use of their Air Brake and Hand brake when necessary.
- (c) Unless the automatic air brake is working properly while the train is on run, the engine Loco Pilot must whistle for the Guard's hand brakes, stop the train and inform the Guard that the automatic Air Brake is out of order and that the hand brakes must be relied upon for working the train to the next convenient station.
- (d) In the case of failure of the automatic air brake on any vehicle during the journey, and if the defect cannot at once be remedied, the train must proceed cautiously to the next convenient station where the defective vehicle can be remarshalled, detached or otherwise dealt with. The speed of the train should be so regulated as to enable the LP to have full control of the train. In all such cases the Guards must be alert, and assist in stopping the train.

**32.15.:How to Locate Leakage in Air Pressure :**

Normally, the leakages are at the joint of the Air Hoses couplings namely at the palm ends and at nipples, at angle cock spindles, at the grip seal joints on main brake pipe, branch pipe etc. The leakage is usually detected by hissing sound produced by the air blowing –off. For detection of minor leaks, soap solution can be applied at joints where bubbles will be formed if leakage exists.

**32.16.: Trains with Air Brakes :**

- (a) Normally, trains must run fully air braked.
- (b) In case of emergency when a passenger train, for any reason has to run non-air braked, the speed must not exceed 40 KMPH and for mixed and goods train must not exceed 30 kmph subject to any lower speed restriction which may have been imposed over a particular section for any reason. In any case, a passenger train must not run non-air braked over any portion of the line without the permission of the Chief Operations Manager. However, running of non-air braked goods train in emergency may be permitted by the DRM.
- (c) In such case, the load of the trains must be reduced and the Loco Pilot and Guard of the train shall be responsible to see that the train is under control to stop wherever required.

**32.17: Air Pressure for Ghat Section :**

- (a) In addition to the specification on air pressure requirements and all other instruction laid down for goods trains in the earlier paras, it should be further ensured that a minimum of 90% of total No. of cylinders are fully operative on train on ghat section.
- (b) If the required brake power, as defined above is not available or if the Loco Pilot doubts whether the brake power is sufficient or not, he has to stop and sufficient number of hand brakes have to be pinned down to ensure control on a down gradient.

**32.18: Attaching of Vehicles not Fitted with Automatic Air Brakes to Coaching Trains :**

- (a) Mail, Express and passenger trains fitted with automatic air brakes, brake piped vehicles (vehicles fitted with only brake pipe and not with distributor valve, brake cylinder, brake rigging etc.) may be attached not more than one. Such vehicle attached on a passenger train should be protected by one or more vehicles fitted with automatic air brakes attached in rear of it.
- (b) No goods vehicle fitted with brake pipe only is permitted to be attached to a coaching train. Vehicles, both coaching & goods, fitted with brake pipe only, may be attached to troop trains and special trains conveying military stores etc., but the specification of brake power laid down in para 32.04 must be followed except if any relaxation is permitted by CME/Sr.DME/DME in case of emergency.

**32.19: Dis-connection of Means of Communication :**

If disconnection of means of communication to prevent misuse is permitted vide GR.4.18, the procedure and precaution laid down in the said G.R & S.R thereto should be followed.

**32.20: Testing of Communications and Alarm Chains on Running Train :**

- (a) The communication provided in passenger carriages for stopping trains in case of emergency, must be tested by Divisional Operations Manager, and Divisional Mechanical Engineers, their Assistants and also by the Divisional Transportation Inspectors and C & W and Loco inspectors in running train at least once a month. The test must be made by pulling the chains in one of the passenger carriages on the train, while the train is on the move but the test should be avoided while a train is ascending an incline or when a train is running late. Divisional Safety Officer shall also make similar checks.
- (b) The result of the test must be recorded by the testing officials and reported to the Divisional Operations Manager or Divisional Safety Officer and the Divisional Mechanical Engineer at once. The following particulars are to be recorded:-
  - (i) Date, time, train Number and the number and class of the Carriage in which the chain was pulled.
  - (ii) Time that was taken to stop the train after the chain was pulled.
  - (iii) Whether signals were properly exchanged between the Guard and the Loco Pilot.
  - (iv) The time that elapsed before the Guard came to the carriage from which the chain was pulled.
  - (v) Total duration of the halt.
  - (vi) Approximate estimated speed of the train at the time of test.

**32.21: Application of Automatic Air Brake from the Brake Van:**

The Automatic air brake may be applied from the brakevan in an emergency only. The application of Automatic air brake must, in such cases, be gradual, as there is risk of the train parting owing to sudden application of the air brake from the rear.

**32.22: Blanking “off” Automatic Air Brake Distributor Valve:**

When an automatic air brake distributor valve or its brake cylinder on a vehicle is out of order, the distributor valve and brake cylinder must be put out of action. The brakes of the individual wagon can be isolated by shutting off the isolating cock. This isolating cock is either fitted on the distributor valve itself, or on the branch pipe connecting the brake pipe to the distributor valve.

**32.23: Empty/Load Handle on Special Type Bogie Fitted Wagons:-**

- (a) The special type bogie wagon with higher carrying capacity are provided with a mechanical device known as empty/load box, by the manipulation of which, the brake power of a wagon can be increased or decreased.
- (b) This equipment has been provided to ensure that the train has adequate brake power in the empty as well as loaded condition of the wagon to enable it to be kept under proper control at all times.
- (c) When the wagon is loaded, its brake power must be increased and this is done by operating a small Empty/load Box handle (Provided at the side of the wagon just below floor), from the 'Empty' position to the 'loaded position'. These two positions are clearly marked on the plate on which the handle is fixed, by legend also by colour.
- (d) When, the wagon is empty and as such increased brake power is not necessary, the Empty/Load box handle MUST BE set at the 'Empty' position.
- (e) If the Empty/Load Box handle is not set in the correct position, a serious accident can happen, as in the loaded condition the train will have inadequate brake power, on the other hand, when it is empty, severe application of brake will skid the wheels and cause them irreparable damage.
- (f) All station and yard staff both operating and commercial, also train examining and running staff should be fully acquainted with the operation of the Empty/Load Box device fitted on special type bogie fitted wagons. The following instructions should be strictly observed:-
  - (i) The handle of empty/load box should be at the "Empty" position when the wagon is empty or when it is loaded with light materials like bamboo etc. So that the gross weight of the wagon is not likely to exceed 50 tonnes. The handle should be set to "loaded" position when the wagon is fully loaded or if the gross weight is above 50 tonnes.
  - (ii) The Train Examiner will be responsible for the correct setting of the Empty/Load Box handle at all originating stations where the train is examined and certified fit by the Carriage & Wagon staff and at stations where the trains are passed by them. This should be recorded in the Air Pressure Brake certificate also.
  - (iii) The Guard will be responsible for the correct setting of Empty/Load Box handle at wayside stations where any shunting is done or when a stabled train is picked up. The guard must, however, be vigilant to see that when his train is detained at a station for any length of time, no unauthorised person interferes with the handle. This caution is to be exercised particularly when the train is running empty.
  - (iv) The staff responsible for loading or unloading of the wagons should also ensure that the handle of Empty/Load Box is correctly set after loading/unloading. Just before unloading commences, the Empty/Load Box handle should be changed to "Empty" position.

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### Register of Addenda and Corrigenda

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