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# IRISET

## S 8

# SIGNALLING GENERAL



Indian Railways Institute of  
Signal Engineering and Telecommunications  
SECUNDERABAD - 500 017

# **S - 8**

## **SIGNALLING GENERAL**

**VISION :**

TO MAKE IRISSET AN INSTITUTE OF INTERNATIONAL REPUTE, SETTING ITS OWN STANDARDS AND BENCHMARKS

**MISSION :**

TO ENHANCE QUALITY AND INCREASE PRODUCTIVITY OF SIGNALLING & TELECOMMUNICATION PERSONNEL THROUGH TRAINING

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**INDIAN RAILWAYS INSTITUTE OF  
SIGNAL ENGINEERING & TELECOMMUNICATIONS  
SECUNDERABAD - 500 017**

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## **S-8: SIGNALLING GENERAL**

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## **CHAPTER- 1: RULES APPLYING TO RAILWAY SERVANTS GENERALLY**

- General duties of railway staff concerning rules, safeguarding railway assets, obedience, attendance, conduct and securing safety

### **1.1 Upkeep of the Copy of Rules/Manuals/Books(GR 2.02)**

Every railway servant who has been supplied with a copy of General Rules (GR) and other manuals/books of reference shall

- (a) Have his copies readily available when on duty,
- (b) Keep them posted with all corrections,
- (c) Produce the same on demand by any of his superiors,
- (d) Obtain new copies from his superior in case old one is lost or defaced, and
- (e) Ensure that the staffs working under him are supplied with all corrections and that they also comply with the provisions of various rules.

### **1.2 Knowledge of Rules (GR 2.03)**

**Every railway servant shall**

- (a) Be conversant with the rules relating to his duties whether supplied or not with a copy or translation of rules relating to his duties and the Railway Administration shall ensure that they do so,
- (b) Pass the prescribed examination, if any,
- (c) Satisfy himself that the staff working under him have complied with above clauses, and
- (d) If necessary, explain to the staff working under him, the rules as applicable to them.

### **1.3 Assistance in Observance of Rules(GR 2.04)**

Every railway servant shall render assistance in carrying out various rules/regulations (as per GR, manuals and other relevant books) and report promptly any breach thereof, which may come to his notice, to his superior officer and other authority concerned.

### **1.4 Prevention of Trespass, Damage or Loss(GR 2.04)**

- (a) Every railway person is responsible for the security and protection of the property of the Railway Administration under his charge.
- (b) Every Railway servant shall endeavor (attempt) to prevent
  - (i) Trespass on railway premises,
  - (ii) Theft, damage or loss of railway property,
  - (iii) Injury to himself and others, and
  - (iv) Fire in railway premises.

**1.5 Obedience to Rules and Orders(GR 2.06)**

**Every railway servant shall promptly observe and obey**

- (a) All rules and special instruction, and
- (b) All lawful orders given by his superiors.

**1.6 Attendance for Duty(GR 2.07)**

Every railway servant shall be in attendance for duty at such times and places for such periods as may be fixed in this behalf of Railway Administration and shall also attend at any other time and place at which his services may be required.

**1.7 Absence from duty (GR 2.08)**

- (a) No railway servant shall, without the permission of his superior, absent himself from duty or alter his appointed hours of attendance or exchange duty with any other railway servant or leave his charge of duty unless properly relieved.
- (b) If any railway servant on duty desires to absent himself from duty on the ground of illness, he shall immediately report the matter to the superior and shall not leave his duty until a competent railway servant has been placed in-charge thereof.

**1.8 Taking Alcoholic Drink, Sedative, Narcotic, Stimulant Drug or Preparation (GR-2.09)**

- (a) While on duty, no railway servant shall, whether he is directly connected with the working of train or not, be in a state of intoxication or in the state in which, by reason of his having taken or used any alcoholic drink, sedative, narcotic or stimulant drug or preparation, his capacity to perform his duties is impaired.
- (b) No railway servant, directly connected with the working of trains shall take or use any alcoholic drink, sedative, narcotic or stimulant drug or preparation within eight hours before the commencement of his duty or take or use any such drink, drug or preparation when on duty.

**1.9 Conduct of Railway Servants(GR 2.10.)**

**A railway servant shall**

- (a) Wear the badge & uniform, if prescribed, and be neat and tidy in appearance on duty,
- (b) Be prompt, civil and courteous,
- (c) Not solicit or accept illegal gratification,
- (d) Give all reasonable help and be careful to give correct information to the public, and when asked, give his name and designation without hesitation.

**1.10 Duty for securing safety (GR 2.11)**

**(a) Every railway servant shall**

- (i) See that every exertion is made for ensuring the safety of the public,
- (ii) Promptly report to his superior any occurrence affecting the safe or proper working of the railway which may come to his notice, and
- (iii) Render on demand all possible assistance in the case of an accident or obstruction.

**(b) Every railway servant who observes**

- (i) That any signal is defective,
- (ii) Any obstruction, failure or threatened failure of any part of the way or works,
- (iii) Anything wrong with a train, or..
- (iv) Any unusual circumstances likely to interfere with the safe running of the train, or the safety of the public, shall take immediate steps, such as the circumstances of the case may demand, to prevent accident; and where necessary, advice the nearest SM by the quickest possible means;

*Provided that in the case of a train having parted, he shall not show a stop hand signal but endeavor to attract the attention of the Loco Pilot or guard by shouting, gesticulating or other means.*

## **CHAPTER-2: DUTIES OF SIGNAL TECHNICIANS, SUPERVISORS AND OFFICERS**

### **CONTENTS**

- Duties of Signal Technicians
- Duties of Sectional SSE/JE (Signal)
- Duties of In-charge SSE (Signal)
- Duties of SSE/JE (construction)
- Duties of S&T Officers (Maintenance & Construction)

### **2.1 Duties of Signal Technicians (General)(SEM Pt.II Ch.11.1)**

- (a) Efficient maintenance of all signalling and block equipments under his charge.
- (b) To attend failures promptly and to rectify the defects expeditiously.
- (c) To ascertain the causes of failures and to take suitable action to prevent their recurrence.
- (d) To carry out new works or alterations to existing works under the instructions of the Senior Section Engineer/Junior Engineer (SSE/JE) (Signal)
- (e) To bring to the notice of the SSE/JE(Signal) any emergency that may be beyond his competence or control.

The competency certificate issued under Signal Engineering Manual part II (SEM II) 11.4 does not authorise them to attend to locking failures. Locking boxes are not to be opened by them. A Signal Maintainer shall, however, attend to the locking failures promptly to permit safe passage of trains till the arrival of the SSE/JE (Signal). If the locking is jamming, efforts shall be made to release the jam, as far as possible, by external means, such as, by tapping and oiling, without opening the covers or making any locking disconnection. If the jam cannot be released in this manner, he shall suspend all the signals operated or controlled from the interlocking frame before opening the covers or disconnecting any locking.

Signal Maintainer shall also ensure that, once the signals have been suspended, normal working shall not be restored until the locking has been attended to, tested and certified by the SSE/JE (Signal) and the locking trays have been closed, pad locked and sealed.

#### **Signal Technician will also carry out the following works**

- (a) Testing of signals fitted with Electrical Signal Reversers by pulling the wire by hand and to report to the concerned Signal Technician (Electrical) in case Signal gets lowered without slot and without feed to the signal.
- (b) Cleaning of roundels and lamp lenses during their maintenance.
- (c) Checking the condition of Signal Lamps.
- (d) Checking the visibility of signal lamps periodically.

The duties of Signal Technicians (Electrical) who are put in-charge of the maintenance of the token instrument will include the work of balancing of tokens. This work must be carried out strictly as per instructions given in the SEM and Block working manual (BWM). Signal Technicians (Electrical) will also carry out the following works.

- (a) Testing and maintenance of batteries.
- (b) Testing of slotted signals.

**DUTIES OF SSE/JE(S) IN-CHARGE OF A SECTION**

- (c) Obstruction test on points provided with Electrical Point Detectors or Point Machines.
- (d) Testing the functioning of Electric Signal Machines.
- (e) Checking the visibility of colour light signals periodically.

Technicians must be conversant with rules, regulations and instructions concerning their work. They must possess a copy of the following books

- (i) General & Subsidiary Rules (G&SR).
- (ii) Signal Engineering Manual (SEM).
- (iii) Block Working Manual and (BWM),
- (iv) Working Time Table (WTT).
- (v) Safety First book.

It is the responsibility of the Technicians to keep the books updated by posting them with latest correction slips. They must adhere to the laid down programme of maintenance rounds and must intimate to the SM before leaving headquarters station. Tools must be maintained properly and should be kept fit for immediate use. They should submit weekly diary/fortnightly report as laid down by the administration. They must also maintain a record of failures and should submit failure reports as per laid down procedure. They should not allow other artisan staff or class IV staff to do any adjustment on signalling gears except under their personal supervision. Technicians must observe the rules regarding disconnection and reconnection of gears. They will mark their own attendance and that of other staff working under them every morning before starting for the work.

Materials for repair and maintenance must be obtained from the SSE/JE(S) through requisitions. Released materials should be returned to the stores of SSE/JE(S) without delay.

## **2.2 General Duties of SSE/JE(S)**

**Brief duties of SSE/JE(S) are as follows**

- (a) Inspection and efficient maintenance of all signalling equipments.
- (b) Execution of works incidental to the maintenance of equipments.
- (c) Execution of works in connection with additions and alterations to existing installations and new installations as per approved plans under open line working conditions.
- (d) Testing overhauling and carrying out alterations to locking.
- (e) Carrying out works in an emergency on their own initiative and responsibility.
- (f) SSE(S) has also to maintain Stores, Establishment matters of staff wherever required.

The detailed duties of In-charge SSE/JE(S) as set out in the SEM are given below for ready reference.

### **2.2.1 Inspection and Testing Certificates (SEM Pt.I Ch-3.11)**

- (a) Each SSE/JE(S) shall submit an Inspection and Testing Certificate in prescribed format every month regarding station / installation inspected by him during the month to the Divisional Signal and Telecom. Engineer (DSTE), indicating the condition of gears inspected. Brief remarks shall be given in regard to any assistance required in regard to labour and stores or any other important matter.

**DUTIES OF SIGNAL TECHNICIANS,  
SUPERVISORS AND OFFICERS**

- (b) The certificate of inspection and testing is an important document and it forms a record of the nature of inspection carried out and the condition of the gear reported upon from time to time.
- (c) The certificate of inspection and testing should be used to carefully record all inspections carried out, repairs required on the section.
- (d) The report of each foot-plate inspection must be properly submitted to the DSTE in prescribed format every month.
- (e) At the end of each quarter the in-charge SSE(S) shall certify that all signals in his section have been inspected both by day and by night. He shall also highlight defects and deficiencies noticed during these inspections, which could not be rectified and should indicate assistance required. This certificate shall be kept on record in the office of DSTE.
- (f) The inspection, testing (including testing of cables) and overhauling certificates shall be filled in at the stations immediately after an inspection or testing or overhauling has been done and should not be left to be completed at the headquarters station.
- (g) Each SSE/JE(S) shall send a separate certificate that all the stations under his charge have been inspected as required. If all the stations have not been inspected, the names of stations left out and the reasons why these could not be inspected shall be furnished.

**2.2.2 Foot-plate Inspection(SEM Pt.I Ch-3.3)**

In order to check visibility of signals from Loco Pilot's view, Signal Supervisors have to travel by Locomotive. This is known as Foot-plate Inspection. All SSE/JE(S) shall carry out Foot-Plate Inspection of all signals by day and by night in both Up and Down directions once in a month or once in 3 months as applicable over their entire jurisdiction and submit record of observations in the prescribed format. During the inspection they shall take special notice of the following.

- (a) Signals should be correctly focused and should be burning brightly
- (b) All cabins should be provided with sufficient lighting arrangements
- (c) No fixed light should be interfering with the sighting of signals
- (d) The speed of the train should not exceed the maximum permissible speed
- (e) In case of a single line section provided with token instruments
  - (i) Oil torch or any other suitable light should be displayed at the token delivery net and token pick up apparatus to facilitate the Loco Pilot to clearly spot them
  - (ii) The incoming token should be delivered promptly at right place.
  - (iii) The Loco Pilot is personally checking the token given to him
  - (iv) The pouch in which the token is handed over is in good condition for single line token sections
- (f) Examine the visibility of signals from the Loco Pilot side. If a signal is seen obstructed by tree branches or other obstructions the detail should be noted for remedial action.
- (g) Note down the signals found drooping or improperly taken off or incorrectly replaced to "ON" position and bring it to the notice of the SM concerned for necessary action from the next station where the train stops. Cases requiring special attention, such as, trees in private lands shall be referred through the DSTE to DEN with full particulars of the topography of the areas for his information, necessary action and instructions. In other cases the In-charge SSE(S) shall arrange to remove the obstruction as early as possible through P-Way staff. If, for reasons of safety immediate action is necessary, the train may be stopped at the station for giving necessary information to the SM.

**DUTIES OF SSE/JE(S) IN-CHARGE OF A SECTION**

- (h) All signals should have adequate visibility as specified preferably from the Loco Pilot side of the foot-plate.
- (i) Anything that may endanger safety or may interfere with signalling gears shall be brought to the notice of the concerned department. If immediate action is necessary, the train may be stopped at the next station for giving necessary information to the SM.
- (j) All warning boards should be in proper fettle. Signal that are to be replaced to "ON" by the passage of trains are being so replaced.
- (k) Fireman/Asst Loco pilot's should be calling out signals clearly and loudly Speed Restrictions & Caution Orders should be observed precisely by the crew

*Note: Day Foot-Plate Inspection should be done during broad day light hours preferably at noon and night foot-plate Inspection should be done between odd hours (midnight) to 0400 Hrs (4AM)*

### **2.2.3 Possession and Upkeep of Books of Reference (SEM Pt.I Ch-3.15)**

- (a) All SSE/JE(S) shall possess following books while on duty and shall maintain them up to date by posting the correction slips issued from time to time for special equipments under his charge

|                              |                         |
|------------------------------|-------------------------|
| 1.General & Subsidiary Rules | 6. Accident Manual      |
| 2.Signal Engineering Manual  | 7. Block Working Manual |
| 3.Schedule of dimensions     | 8. A.C. Traction Manual |
| 4.Working Time Table         | 9. Maintenance Manuals  |
| 5.Telecommunication manual   |                         |

- (b) Each in-charge SSE(S) shall be well acquainted with all the rules in these publications, circulars issued from time to time that concern their work and duties. These books shall be kept updated with all the addendum and corrigendum slips issued from time to time. They shall ensure that all staff under their charge are well acquainted with these rules and regulations to the extent applicable to them.

### **2.2.4 Accidents (SEM Pt.I Ch-3.12)**

In-charge SSE(S), Sectional SSE/JE(S) and Technicians shall take all precautions to prevent accidents and damage to apparatus and shall see that

- (a) Instructions contained in IRCA (Indian railways Conference Association), Safety First Pamphlet as well as those issued from time to time are observed
- (b) Safety appliances provided such as belts, Pulley Blocks, etc., are used.
- (c) All ropes, lifting tackles and staging used for erection of signals etc. are adequate and are in good condition
- (d) Staff working on the line are vigilant and shall deploy 'look-out' men wherever necessary
- (e) All accidents are promptly reported.

## **2.2.5 Accompanying Important Inspections (SEM Pt.ICh-3.16)**

Every SSE/JE(S) while accompanying an inspection such as that of General Manager (GM) or Commissioner of Railways Safety (CRS) or Divisional Railway Manager (DRM) or the Chief Signal and Telecom Engineer (CSTE) or any other Signal and Telecommunication Engineer or any Officer of the Railway Board, shall have the following in his possession.

|  |  |
|--|--|
| 1.General and Subsidiary Rules                               | 8. Block Working Manual  |
| 2.Signal Engineering Manual                                  | 9. Accident Manual   |
| 3.Schedule of Dimensions                                     | 10. AC Traction Manual (in A. C. Electrified territory)  |
| 4.Current Working Time Table                                 | 11.Interlocking Yard Diagrams  |
| 5.Maintenance Manuals for special equipment under his charge | 12.Plans of sanctioned and proposed works  |
| 6.Telecommunication Manual                                   | 13. Point test gauges, millimeter, insulation test equipment, track circuit test equipment, portable control telephone to suit the section being inspected |
| 7.Telegraph Code (wherever applicable)                       | 14.Other tools such as measuring tape, foot rule, sealing pliers etc.  |

They shall also carry any other items as specified by DSTE /CSTE.

## **2.3 Duties of SSE/JE(S) in-charge of a section (i.e., sectional SSE/JE)**

### **2.3.1 Technical duties (SEM Pt.I. Ch-3.1)**

Efficient and proper maintenance of all Signalling and Interlocking Equipments under his charge in accordance with the provisions of various Manuals, Rules and Regulation in force and extant instructions.

To assist the in-charge SSE(S) in execution of works incidental to the maintenance of equipment in his charge, additions and alterations to existing installations and new works in accordance with approved plans and circuit diagrams under open line working conditions.

To assist the in-charge SSE(S) in overhauling and carrying out alterations to the existing interlocking of lever frame in accordance with approved interlocking table and interlocking chart and also carrying out alterations to electrical signalling and interlocking system in accordance with approved interlocking and selection tables and circuit diagrams when authorised to do so in writing by DSTE.

*Note: The term interlocking frame includes SM slide control and interlocking key boxes.*

Carrying out works in an emergency on their own initiative and responsibility. In such cases intimation must be given to their In-charge SSE(S) by suitable means.

### **2.3.2 Equipment Inspection (SEM Pt.I. Ch-3.2)**

The Sectional SSE/JE(S) shall carry out inspection and testing of all equipments under his charge at intervals not exceeding one month in accordance with detailed instructions contained in SEM. Telecom equipment entrusted to his maintenance shall be inspected in accordance with instructions contained in the Telecom manual. While carrying out his inspection, he shall take the Technician of the section with him wherever possible.

Special attention should be paid during inspection to the work of each Technician in respect of adjustments, cleaning and lubrication of moving parts of all points and signal equipment to ensure that they work smoothly. Any fault detected shall be rectified at the earliest.

Each Sectional SSE/JE(S) shall, at the end of every month, summarise and classify the failure reports and submit monthly failure report in prescribed format with his remarks to the DSTE. Failures may be classified as per extant format/instructions. Failures of other departments shall be promptly brought to the notice of the concerned departments.

### **2.3.3 Knowledge of Rules and Competency in Technical Work (SEM Pt.I. Ch-3.5)**

Sectional SSE/JE(S) must be fully conversant with the rules and regulations, instructions, procedures and practices of installations. He should be fully conversant with operation and maintenance of all installations under charge. He should be competent to carry out the following under open line working conditions

- (a) Additions and alterations to the existing installations and circuits
- (b) New installations
- (c) Testing, overhauling and carrying out alterations to the existing locking of lever frames and works related with electrical interlocking system
- (d) Installation, adjustment and testing of Electronic Signal and Interlocking Equipments.

The Sectional SSE/JE(S), while on inspection shall ensure that only competent staff are permitted to work and make adjustments to any of the signalling gears which are connected with the safety. The inspections shall be thorough with reference to the schedule of maintenance and to ensure that equipments function satisfactorily, safely and with minimum liability to failures. The interlocking plans, cabin diagrams, working rules etc. shall be inspected to see that they are up to date. Discrepancies noticed shall be brought to the notice of In-charge SSE(S). A record of monthly inspections shall be made in the Signal Failure and Inspection Book at each station.

### **2.3.4 Foot-plate Inspections (SEM Pt.I. Ch-3.3)**

The sectional SSE/JE(S) shall carry out foot-plate inspection of all the signals by day and by night in both up as well as down directions once a month over his entire jurisdiction and a report to this effect shall be submitted in prescribed proforma.

### **2.3.5 Failures (SEM Pt.I. Ch-3.4)**

Everyday, sectional SSE/JE(S) shall keep track of failures on his section. During his periodical inspection, he shall check up the causes indicated as well as the repairs carried out to ensure that similar faults do not recur. In cases of failures of serious nature and in cases of repeated failures, investigations shall be carried out immediately.

### **2.3.6 Reports of Technicians (SEM Pt.I. Ch-3.7)**

The sectional SSE/JE(S) shall ensure that the Technicians are regular in their maintenance programme and submit their reports in duly prescribed format. The maintenance programme of the Technicians shall be prepared so that it is convenient to the Technicians and provides for maximum time at every station with due regard to the rostered hours of duty. As far as practicable, the programme shall include allowance for picking up programmes missed during the previous week/weeks on account of failures and/or other exigencies.

## **2.4 Duties of the in-charge SSE/(S)**

### **2.4.1 Technical Duties (SEM Pt.I. Ch-3.8)**

The duties of in-charge SSE/JE(S), assisted by one or more sectional SSE/JE(S) are detailed in various chapters with the most essential being

- (a) Exercising supervision over the work done by the staff to see that the work is carried out in accordance with the instructions contained in the relevant codes/manuals.
- (b) Testing, overhauling and carrying out alterations to the existing Signal and Interlocking installations in accordance with approved plans and instructions.
- (c) Testing Telecommunication equipment specially entrusted to his maintenance, if any, in accordance with approved plans and instructions
- (d) Carrying out works on his own initiative and responsibility in an emergency. In such an emergency, intimation shall be given to his controlling officer by suitable means
- (e) The in-charge SSE/JE(S) shall see that the firefighting appliances at various locations under his charge are kept in a condition fit for immediate use and that the staffs under him are conversant with their operation. He shall arrange actual trials periodically for the purpose and also to test appliances for fitness. The appliances shall be recharged immediately after they have been used
- (f) The in-charge SSE/JE(S) shall be responsible to the DSTE.
- (g) Each in-charge SSE/JE(S) shall submit an Annual Report in duplicate of all apparatus on his section to the DSTE in prescribed forms.

### **2.4.2 Inspections (SEM Pt.I. Ch-3.9)**

The in-charge SSE/JE(S) shall carry out all the prescribed inspections over his entire jurisdiction at intervals not exceeding three months. He shall carry out the quarterly foot-plate inspection (preferable jointly with Loco Inspector and Traffic Inspector) by day and night and in both Up and Down directions.

Joint certificate of foot-plate inspection shall be submitted to the DSTE/ADSTE at the end of every quarter. A copy of the relevant portion of the joint report shall be sent to the station concerned for the reference of inspecting officers and for necessary action, if any, by the SM.

### **2.4.3 Sectional Gang and Maintenance Work (SEM Pt.I. Ch-3.10)**

Each in-charge SSE/JE(S) shall maintain a register in which all works that are beyond the capacity of the Technician shall be entered. Execution of such works in the order of their importance shall be entrusted to the Section Gang. The in-charge SSE/JE(S) shall prepare a programme of work for the sectional gang. The programme shall be so prepared as to reduce traveling time to the minimum and to allow the gang to return to headquarters on rest days.

#### 2.4.4 Tools and Plants (SEM Pt.I. Ch-3.14)

Every in-charge SSE/JE(S) shall be responsible for the issue of proper tools and equipments to the Technicians and Artisans under him and for ensuring that these are kept by them in proper working order. Unserviceable and defective tools shall be replaced promptly.

#### 2.4.5 Establishment matters(SEM Pt.I. Ch-3.17)

- (a) The in-charge SSE/JE(S) shall ensure that the rules laid down in Establishment Code, Acts and Regulations and local circulars issued from time to time are strictly complied. He should have the knowledge of Payment of Wages Act, Workmen's Compensation Act and Hours of Employment Regulations and a reference to the Act and Rules should be made while deciding cases.
- (b) The in-charge SSE/JE(S) shall arrange to have the blank muster sheets of staff top initialed by the Signal and Telecom. Engineer under whom he works and issue them to the staff in time. At the end of each wage period, the muster sheet shall be collected and fresh one will be issued.
- (c) In-charge SSE/JE(S) shall check and initial the muster sheets of staff whenever he inspects their section. The presence or absence of staff shall be noted on the spot and shall be recorded in the muster sheet in ink.
- (d) The In-charge SSE/JE(S) shall keep his correspondence up to date. He is responsible to see that his office records, registers, stores, ledger and accounts are maintained correctly and stores ledgers are posted up to date. Periodical reports shall be submitted within dates as per the standing instructions.

#### 2.4.6 Stores Matters

The in-charge SSE/JE(S) shall maintain the signalling stores & their accounts as per the guidelines laid down in SEM Part-1 chapter VI. Some important notes are mentioned below

##### 2.4.6.1 DMTR (Daily Material Transactions Register)

- (a) A Daily Material Transaction Register shall be maintained by each supervisor. This register shall be written daily.
- (b) All receipts and issue of stores (pending their posting in the concerned ledgers) shall be first entered in this register. There shall be no direct posting of materials in ledgers from challan.
- (c) A line shall be drawn across both pages under the last entry of each date to prevent subsequent entries being made.
- (d) The dates shall be the same in both ledger and the register.
- (e) Issues of materials from outstation stocks will be recorded by the supervisors in their line notebooks first. These entries will then be transferred to the DMTR. The date of entry, in the DMTR shall be recorded on the notebook.
- (f) Supervisors are personally responsible for all stores in their custody and shall ensure that the DMTR and the ledgers are correctly posted /Updated. They shall initial the DMTR at least once a week as a token of having verified the entries.

##### 2.4.6.2 Returned Stores

- (a) **Instructions regarding returned stores** are contained in Chapter XVI of the Indian Railway Code for Stores Department (relevant extracts in annexure-31 of SEM Part I) VI of the SEM Part-I Section 'J'.

**(b) Dispatch of spare, second hand and scrap materials**

- (i) Spare and second hand materials sent to Stores Depot shall be carefully loaded to avoid loss or breakage.
- (ii) Material complete but having pins badly worn and not sufficiently good to be considered second hand shall be entered as unserviceable scrap and their approximate weight shall be stated. If parts are missing, full details shall be given.
- (iii) In the case of signals - height, type and condition of post and fittings shall be stated.
- (iv) All cast iron, steel, brass, zinc, copper and lead scrap shall be collected from sections regularly and sent to Stores Depot, with description and approximate weight.
- (v) Empties such as tins, drums, kegs, barrels, and cement bags shall be accounted for along with the materials contained in them and shown in the returns. They shall not be held longer than necessary and shall be returned to Stores Depot for disposal.

**(c) Credit for " Returned Stores "**

- (i) The credit value allowed in the estimate for the returned stores which are not likely to be required again shall be kept within the figure likely to be realised for it as scrap.
- (ii) For materials likely to be used again, after return credit value proportionate to its further life may, however, be provided in the estimate. The normal life of some of the signalling equipments as laid down in Para 219 of the Indian Railway Financial Code is given at the end of this notes page No. 180

#### **2.4.6.3 Requisitions**

**(a) Preparation of Requisitions** - the following instructions shall be observed in the preparation of requisitions

- (i) Separate requisitions shall be prepared for each item of material. Requisition for stock items [Form No.S1313] and for non-stock items [Form No.S1302]
- (ii) Nomenclature, Price list nos. and other references shall be correctly reproduced. In case of special and non-standard items, description with complete specifications and drawings shall be given.
- (iii) Blank space, if any, below the last item shall be crossed.
- (iv) The designation of the consignee shall be written in full. No code abbreviations shall be given.
- (v) The head chargeable shall be entered on all the requisitions.
- (vi) The requisition for materials for different sanctioned works and revenue maintenance shall be distinguished by a mark or a code, as laid down by the Stores Department.
- (vii) In case of sanctioned works, the number of estimate and the reference of the sanctioning authority shall be given clearly.
- (viii) The quantity of each material shall be given in correct units in words and figures.
- (ix) Corrections, if any, shall be initialed.
- (x) Availability of funds shall be certified by the DSTE.

### (b) Requisitioning of Materials

- (i) All materials and equipment shall normally be indented in accordance with Indian Railways Standard Drawings and Specification. Where such drawing or specification number is quoted, the latest alteration number as on the date of purchase will automatically apply. For items where an IRS specification does not exist, an appropriate specification shall be quoted.
- (ii) No alteration or modification or divergence from IRS drawings shall be permitted without the specific sanction in writing, of the CSTE. In the case of deviations having been decided upon before the placing of an order, whether direct or through the Director General, Supplies and Disposals, the indenting authority concerned shall quote such sanction in the order. When deviations are decided upon or desired after placing of an order, the necessary sanction shall be obtained, in writing, by the Inspectorate concerned in consultation with the indenting authority.

#### 2.4.6.4 General Instructions

- (a) Stores supplied by firms** Receipt of Stores received direct from firms shall be promptly acknowledged. Discrepancy or defect, if any, shall be brought to the notice of the DSTE immediately.
- (b) Custody and Maintenance** - The supervisors shall be responsible for the maintenance of all Stores and Tools and Plant in their charge in proper condition. Where Watchmen are necessary, the supervisor shall approach the DSTE giving full justification.
- (c) Materials-at-Site (MAS) Account** - The material received for works, if not used up immediately, shall be kept at debit of a numerical account of Materials-at-site of the particular work. Detailed instructions in regard to maintenance of accounts for Works are contained in Chapter XIV of engineering Code(extract at Annexure 29 of SEM Part I)

#### 2.4.7 Relinquishing of Charge(SEM Pt.I Ch-3.21)

When relinquishing the charge of a section, the In-charge SSE(S) shall prepare a charge handing over statement in duplicate, which shall briefly contain the following:

- (a) The section particulars with staff, their service and leave records.
- (b) Details of sanctioned and proposed works and their progress.
- (c) General notes regarding painting, renewals and replacements etc.
- (d) Details of overhauling & testing of interlocking frames, block instruments, point machines, signal machines, relays etc.
- (e) Notes regarding materials, stores and documents.
- (f) Position of Stock Sheets, Accounts Notes, Audit and Accounts Inspection Reports, Completion Reports.
- (g) Any other important matters.
- (h) The In-charge SSE(S) taking over and handing over shall inspect important works in progress; check the staff and their tools and plants and materials at site.
- (i) The relieving In-charge SSE(S) shall examine all office records and ledgers and initial them with date.
- (j) Handing over charge statement shall be jointly signed by the In-charge SSE(S) taking over and handing over and a copy of the same shall be submitted to the Sr.DSTE. Errors and discrepancies noted during handing over and taking over, shall be recorded on the statement for the information of the officials.

## **2.5 Additional Instructions for SSE/JE(S) in-charge of Construction (SEM Pt.1 Ch-3.Sec.F)**

The rules for the execution of works are contained in Chapter III, Section 'F' of SEM Part-I.

- (a) The instructions for SSE/JE(S) in-charge of construction will also apply to SSE(S)/JE(S)/Maintenance when entrusted with the execution of certain specific works.
- (b) Similarly, the instructions for SSE/JE(S) in-charge of maintenance will apply to SSE/JE(S) in-charge of construction when entrusted with the maintenance of the equipment at a station or in a section.
- (c) In addition to above the instructions contained in para no.9.5 of SEM part-I also to be followed.

When an estimate for a new work is sanctioned, the SSE/JE(S) shall submit requisitions for the materials without delay and shall ensure that all the required materials are made available.

No work affecting an existing signalling and interlocking system shall be commenced until such portions of the work as can be carried out without affecting the working of the existing installation have been completed so that the period of disconnection will be as short as possible.

All new signals/modified signals and warning boards etc. shall be inspected and passed by "Signal Sighting Committee" (SSC) consisting of

- (i) SSE/JE(S)
- (ii) SSE/LOCO and
- (iii) Traffic Inspector.

SSC should be promptly submitted on prescribed format to DSTE.

Introduction of a new Signal or alteration to an existing signal, which would be required to be passed by a SSC, shall not be taken on hand without the publication of the Traffic Notice, which shall not be operative for a period longer than three months.

### **2.5.1 Execution of Works(SEM Pt.I. Ch-3.24)**

#### **Following instructions shall be followed during execution of works**

- (a) All necessary steps to be taken for the safe movement of trains during the execution of the work.
- (b) There is no avoidable detention to trains and in case any detention takes, the particulars are advised promptly to the Engineer-in-charge.
- (c) He should test the work before requesting the Engineer-in-charge to test and commission the work.
- (d) All precautions are to be taken to prevent accidents to trains, passengers and staff and to prevent damage to the equipment and
- (e) All accidents are to be promptly reported.

### **2.5.2 Measurement Book (MB)**

While executing the works, the guide lines for execution of S&T contractual works given in IRISSET notes on tenders and contracts may be followed.

### **Recording of MB.**

- (a) SEM Part-I, Chapter X, Section 'C' may be referred for details.
- (b) Separate measurement book for each work should be adopted.
- (c) If an agreement covers more than one station, station-wise break up shall be mentioned in M.B (Engg. Code. Para 1326).
- (d) While recording the measurements, proper chainage/kilometerage are to be mentioned in the MB to facilitate checks at a later stage.
- (e) While recording measurements for each item of work & each item of supply, 100% check shall be done by In-charge SSE(S) and 20% check shall be done by ASTE/DSTE.
- (f) From the MB all quantities should be clearly traceable into the documents on which payment are made and a reference to the voucher in which the quantities are entered for payment, as well as the date of entry, should be given by an endorsement up on the original entries in the M.B.
- (g) DMTR entries must precede M.B. entries for measurement related to supply. It is desirable to note details along side the measurements.
- (h) All signatures of officer and supervisors in the M.B. & bill must contain date. When any measurements are cancelled, initials of the officer ordering cancellation and reason for cancellations shall be recorded.

### **2.5.3 Progress Reports of Works (SEM Pt.I. Ch-3.25)**

The SSE/JE(S) in-charge of work shall submit a periodical progress report every month of all the works in his charge to the DSTE in prescribed format, which shall include

- (a) The progress of work and probable date of completion
- (b) Reference to requisitions of work orders against which supply has not been made
- (c) Details of items, which are particularly required, and on account of which works are being delayed.
- (d) Delays arising from other causes.

### **2.5.4 Opening of Works (SEM Pt.I. Ch-3.26)**

- (a) The SSE/JE(S) in-charge of works shall advise the DSTE when a work will be ready for opening in order that the latter may arrange for fixing of a date and for the issue of the necessary notice.
- (b) When a new work or alteration to an existing work is about to be brought into service the in-charge SSE/JE(S) shall see that he obtains new or corrected Interlocking and Yard Diagrams, circuit diagrams etc. before the date of opening. If there are minor alterations the existing diagrams shall be corrected and endorsement shall be made by the in-charge SSE/JE(S).

### **2.5.5 Completion Certificate and Completion Report (SEM Pt.I. Ch-3.27)**

- (a) The SSE/JE(S) shall submit a completion certificate to the DSTE in prescribed format immediately after new work/alterations to an existing work has been brought into service.

**DUTIES OF SIGNAL TECHNICIANS,  
SUPERVISORS AND OFFICERS**

- (b) The SSE/JE(S) in-charge of the work shall submit a completion report to the officer in-charge immediately after the completion of a work, which shall contain the following.
- (i) List of all materials received from the stores and other sources with all particulars
  - (ii) List of materials used for the work
  - (iii) List of materials returned to stores with particulars
  - (iv) Special problems or difficulties experienced during the execution of the work, if any.

**2.6 Duties of Signal and Telecommunication Engineers(SEM Pt.1. Ch-2.)**

The Signal and Telecommunication Engineers in-charge of maintenance and construction are generally responsible for

- (a) The installation and maintenance of all Signalling and Telecommunication equipment under their charge in a satisfactory and safe condition.
- (b) Observance of the rules and procedures laid down in the G&SR, Rules for opening of a Railway the SEM and orders and circulars issued by the CSTE from time to time and ensuring that all staff under their charge are acquainted with relevant rules and working method and efficiently perform their allotted duties.
- (c) Preparation of plans and estimates and safe execution of works in their charge.
- (d) Ensuring that all important inspection notes of higher authorities receive prompt action.
- (e) Coordination with Engineering and other branches in case of combined works, obtaining sanction of CRS for new signalling works or alterations and additions to the existing signalling installations either separately for purely signalling works or jointly with other departmental officers in the case of combined works.
- (f) Coordination with concerned branches in case of accidents for speedy restoration of traffic and for investigation into the causes of accidents.
- (g) Coordination with officers and staff of other branches in all other matters to ensure smooth functioning of signalling and telecommunication systems.
- (h) Ensuring supply of approved materials and tools for the installation and maintenance of the equipment.
- (i) Control over expenditure in relation to budget allotment and sanctioned estimate.
- (j) Submission of proposals for Revenue and Works Budget and for periodic reviews.
- (k) Exercise of such powers as may be delegated to them in establishment and other matters.
- (l) Ensuring strict discipline amongst their staff within the framework of the rules.
- (m) Dealing promptly with appeals and representations from the staff and looking after the welfare of their staff.
- (n) Issue of special and specific maintenance schedule for SSE/JE(S) and Technicians as and when necessary.

- (o) **Transfer of Charge:** Instructions on Transfer of Charge are contained in Chapter I of Indian Railways Code for Engineering Department. The Sr.DSTE handing over and taking over charge of a Divisional or of a work shall carry out joint inspection of important sections as necessary. The 'Transfer of Charge' statement shall be prepared in adequate number of copies signed by both and one copy shall be sent to the CSTE

### 2.6.1 Commencement of Works

A work is not to be started unless authorised by the concerned competent officer. The following instructions shall be followed while taking up works

- (a) Proper men and materials should be available for execution.
- (b) Approved signalling Plans, Locking Tables and Diagrams, Selection Tables and Circuits, Standard Drawings and Specifications should be available.
- (c) Sanction of CRS Safety in case of works on lines opened already for passenger traffic should have been obtained.
- (d) Station Working Rules and temporary working instructions should have been issued and that the station staff has received the necessary notice and Station Working Rules.
- (e) Sanction to the detailed estimate for the work with necessary allotment of funds (this does not apply to works started on urgency certificate) should have been obtained.

### 2.6.2 Additional Duties of S&T Engineers in-charge of construction

These instructions with suitable modifications will also apply to the S&T Engineers posted to a Division. The S&T Engineers in-charge of construction are responsible for

- (a) The accuracy, quality and progress of the works entrusted to them and for ensuring that each work is efficiently organised and so programmed that it progresses speedily and is completed within the time specified.
- (b) Ensuring that all works are carried out strictly in accordance with the approved plans, standard drawings and specifications and conform to the provisions of the manuals. Deviations, if any, shall have the prior approval of the CSTE
- (c) Ensuring that traffic notices are issued in consultation with other divisional. Officers before any existing installations are altered or before any new installations is introduced which affect the safe working of any interlocking.

Ensuring issue of temporary working instructions for working of traffic, where necessary.

- (d) Furnishing relevant information to the Operating Department to help in the preparation of working rules and temporary working instructions.
- (e) Arranging for obtaining the sanction of CRS where required
- (f) Advising CRS by a message after bringing a new installation into use or before bringing modification to the existing installations into use and submission of a Safety Certificate as per extant instructions.
- (g) Submitting progress reports on prescribed format to the headquarters every month.
- (h) Periodical verification of materials at site.

### **2.6.3 Additional Duties of S&T Engineers in-charge of Maintenance**

These instructions with suitable modifications will also apply to other S&T Engineers posted to a Division or for execution of works. The Sr. DSTE is generally responsible for

- (a) Ensuring that no alteration to an installation is made, which deviates from the original approved plan, diagram or specification without the authority of the CSTE.
- (b) Periodical inspection of all signalling and Telecommunication installations under his charge by a Signal Engineer at least once in 12 months. The inspection shall be intensive with reference to the prescribed schedule of maintenance. A monthly report of inspections so made shall be submitted to the headquarters office.
- (c) Inspection of signals within his jurisdiction from foot-plate of a locomotive or a driving cab both by day and by night in both Up as well as Down direction once in a year, preferably jointly with officers of Mechanical/Electrical/Traffic department.
- (d) Possessing the under mentioned drawings and registers as required when called upon to accompany the inspection of superior officers like DRM, CSTE, GM, CRS or an officer of the Railway Board etc.
  - (i) Interlocking plans of the Section
  - (ii) Foot-Plate Inspection Reports
  - (iii) Previous inspection reports of the section by the CSTE, GM, and CRS etc.
  - (iv) Any other books/papers/documents as per instructions issued by the headquarters office
- (e) Inspection of office and stores of SSE/JE(S) once in a year. During the inspection, a percentage check of some of the stores items, particularly those that are costly shall be made
- (f) Keeping watch on Inspections by the SSE/JE(S) under his control
- (g) Analysing the failures from the reports submitted by the SSE/JE(S) and taking remedial measures to eliminate recurrence of failures. The reports may be examined in a meeting preferably jointly with all In-charge SSE/JE(S) of the division to improve the standard of maintenance. Each Sr.DSTE must maintain a record showing the number of failures and number of trains detained every month over the jurisdiction of each In-charge SSE/JE(S).
- (h) Drawing out a programme of overhauling and/or testing of interlocking frames, interlocking key boxes, station master's slide control frames, block instruments, relays, cables, point and signal machines etc. as per instructions contained in SEM Part II chapter XIII.
  - (i) Reviewing the position in regard to supply of stores on the division periodically.
  - (ii) Planning replacements of worn out installation and additional signalling inputs necessary to improve the working and for submission of proposals for the same.
- (i) Reviewing the staff position periodically to ensure that strength is neither in excess nor short of requirements.

Arranging to obtain timely sanction for additional maintenance staff before new works or additions/alterations to existing installations involving increased workload are commissioned

Ensuring that periodical reports are sent to headquarters office and that letters from headquarters are replied within the time limit specified.

*Note: These rules will also apply to a SSTE/ Dy.CSTE normally In-charge of construction who is entrusted with the maintenance of an installation for the time being.*

## CHAPTER -3: SIGNAL FAILURES AND DUTIES OF STAFF

### CONTENTS

- Action Required with regard to Signal Failures
- Classification of Signal Failures
- Signal Failure and Inspection Book, Signal History Book
- Duties of SM in the event of a Defective Signal
- Duties of Loco Pilots and Train Crew in the event of a Defective Signal
- Passing Various Signals at "ON"
  - Issue of Disconnection & Reconnection Notices and Competency
  - Disconnection of apparatus and working of trains
  - Works that can be carried out without issue of Disconnection Notice

### **3.1 Preventive Maintenance**

It is of the utmost importance that maintenance work is carried out in an efficient manner. Signalling equipments are designed in such a way that they normally fail on the safe side. However, poor maintenance of the equipments and gears coupled with carelessness on the part of the operating / signalling staff may create unsafe conditions, e.g. drooping of signals etc. Further, failures of signalling gears tend to create unsafe working because all of a sudden dependence on human element increases which is susceptible to errors and mistakes. Large numbers of accidents on Indian Railway are attributable to failures on the part of the staff to observe necessary rules and regulations prescribed for train working in the event of point/signal failures. In fact, signalling and interlocking should aim to eliminate/reduce the dependence on human element in train working.

Hence, the importance of maintaining the gears in such a way that failures are controlled cannot be overemphasized. Equally importance is to ensure that the failures, once they take place, are attended & rectified promptly and action is taken to prevent recurrence. It is the duty of JE/SE/SSE(S) to investigate every failure thoroughly and to satisfy himself that all possible measures have been taken to prevent recurrence.

Aim should be to carry out effective preventive maintenance to see that the gears are maintained in good working condition all the time. Whenever a JE/SSE(S) visits a station, he must carefully go through all the failures entered in the Signal Failure and Inspection History Book. He must ensure that all the failures are entered in the failure register. This can be done by cross checking with the Disconnection Memos and also with reference to the authority forms written out for passing trains without signals. The time when the technician was informed of the failure, the time when the technician attended and the time of rectification should be seen carefully to satisfy himself that there was no slackness on anybody's part.

### **3.2 Actions Required in CASE OF FAILURE(SEM part-II ch-11.5)**

- (a) A technician shall proceed by the first available means.
- (b) Before taking up work, he shall issue a disconnection notice on receipt of written report/message for each failure recorded in signal failure register. He shall make all efforts to rectify the failure expeditiously and shall take steps to prevent recurrence.
- (c) If a gear has failed on the unsafe side, the maintainer shall keep the signal at "ON".
- (d) Failures beyond his competence shall be brought to the notice of the supervisor.

#### **SIGNAL FAILURES AND DUTIES OF STAFF**

- (e) Date and time of rectification and other details shall be entered in the Signal Failure and Inspection Book (see Para 3.4 below).
- (f) Sectional supervisor shall daily monitor all failures on his section. In case of a serious failure immediate investigation shall be carried out.
- (g) He will go through details of causes and repairs carried out during periodical inspection to ensure that similar faults do not recur.
- (h) Data Logger may be utilized both as tool for preventive maintenance & to analyse failures. (For Ex. Timing sequence of various relay operations may be studied for clues.)
- (i) At the end of every month, all supervisors are required to summarize and classify the failure reports received from technicians in a prescribed format and to send the classified failure report (refer Para 3.3 below) to the DSTE/ Sr.DSTE along with their remarks.
- (j) Failures pertaining to other departments shall be brought to the notice of concerned officials.
- (k) Officer concerned shall analyze the failures from the reports submitted by supervisors and take remedial measures to prevent recurrence. The reports should preferably be examined in a joint meeting with in-charge supervisors of division to improve standard of maintenance. He shall also maintain details of failures, trains detained throughout the jurisdiction of each supervisor.

### **3.3 Classification of Signal Failures**

**A method to classify failures is suggested below**

| <b>S – Signal Deptt</b>  | <b>O–Operating Deptt</b>  | <b>E – Engg Deptt</b>   | <b>M- Miscreants</b>                                    |
|--|---|---|---|
| SM—signal maintenance inefficient<br>SE – signal equipment<br>SI—signal installation incorrect<br>SO—signal-other failures | OW—wrong manipulation<br>OT—token exhausted<br>OP—points obstructed<br>OH—hanging coupling etc<br>ON— no fault found<br>OL – lighting improper<br>OO – operating-others | EC— creep<br>ED—drainage inadequate<br>ES – staff working<br>EP – packing<br>ET—trolley un-insulated<br>EO - others | MT – theft<br>MD— damages<br>MI- interference           |
| <b>R – Running Deptt</b>   | <b>L - Electrical Deptt</b>   | <b>P–Telecom Deptt</b>  | <b>X–Others</b>   |
| RC – cinder dropped at wrong place<br>RM – missed token<br>RO – running-others   | LP – power supply failure<br>LF – voltage fluctuation<br>LO – others  | PT – theft of line wire<br>PC– contact on line<br>PB – break on line<br>PE – earth on line<br>PO – others           | XW – extreme weather<br>XX – unknown cause<br>XF – fire |

*Note: The practice in vogue in some Railways.*

### 3.4 Signal Failure and Inspection Book

- (a) Signal Failure and Inspection Book must be provided at every interlocked station. The signal failure and Inspection Book should be such that separate pages are provided for recording failures and inspections. The book should be retained at a station even after the old one is replaced by a new one to ensure that details of inspections and signal failures are available with the Station for a period of at least one year at any time.
- (b) Every Station Master must record promptly, correctly and neatly all signal and block failures in the relevant columns provided for the purpose.
- (c) Each technician must record the time of rectification and his remarks as to the cause of failure and repairs carried out by him after attending a failure.
- (d) Every SSE/JE, while inspecting a station, shall check the failure entries made by the Station Master and technician.
- (e) It shall be checked that
  - (i) The Station Master has recorded all the failures correctly and has issued a failure message to the technician in proper time in each case,
  - (ii) The duration of failures is reasonable; the technician has attended promptly in each case and has taken appropriate action for each failure. He should also record the result of his investigation at site against failures that concern to him.
- (f) Each S&T officer and Supervisor must make a record of the inspections made by him in the book. Any defect in gear, repairs to be carried out and any instructions to be left for compliance by the SSE/JE, technician must also be recorded.

### 3.5 Signal History Book

A Signal History Book must also be provided at every interlocked station. The Signal History Book should contain a record of the following items

- (a) Type of Interlocking, reference to interlocking and yard diagram number, date of commissioning of existing interlocking and details of any special features.
- (b) Type of Block Instruments, their date of installation and date of last overhauling.
- (c) Details of subsequent modifications with dates, giving reference to plans and CRS sanction etc.
- (d) Details of major renewals of ground gear, overhead lines, underground cables, internal wiring etc.
- (e) Date of last overhauling and test of interlocking frames, interlocking key boxes and SM slide control frames.
- (f) Number of tokens in use in Block Sections on either side of the station with particulars of lost and removed tokens and details of replacement.
- (g) Batteries in use and dates of their subsequent renewals.
- (h) Last date of painting and details of Telecommunication equipments at station with the date of installation and type of equipment.

### 3.6 Duties of SM Generally when a Signal is Defective

- (a) As soon as a SM becomes aware that any signal has become defective or has ceased to work properly, he shall
  - (i) Immediately arrange to replace the signal at "ON" if it is not already in that position.
  - (ii) Depute competent railway servants with such hand signals and detonators as may be required to give signals at the foot of the defective signal until he is satisfied that such signal has been put into proper working order.
  - (iii) Take action in accordance with **GR 3.68** as may be required for movement of trains past the defective signals, and
  - (iv) Report the occurrence to the railway servant responsible for the upkeep of the signals and the controller.
- (b) When the SM receives information of any defect in a signal not pertaining to his station from the Loco pilot's or guard or any other railway servant, he shall immediately inform the SM concerned of the fact and keep the controller advised.
- (c) In case of signals becoming defective at stations situated on Centralised Traffic Control (CTC) territories, the Centralised Traffic Control Operator on becoming aware of such defects shall take action in accordance with special instructions.

### 3.7 Duties of SM when an Approach Stop Signal is Defective(GR3.69)

- (a) In the event of an Outer or a Home or a Routing Signal becoming defective, the SM shall advise the station in rear and the nominated station in rear, save in a case where a signal post telephone or a Calling-on signal is provided on the defective signal, in order that the Loco pilot's of approaching trains may be warned of the defective signal and issued a written authority to pass such signal on receipt of proceed hand signal at the foot of the defective signal.
- (b) The SM in rear as referred to in sub-rule (a) above on receiving the advice of the defective signal, shall immediately acknowledge it and advise the SM of the station where the signal has become defective, of the number of the first train which will be notified of the defective signal and again on receipt of the advice that the defective signal has been put into proper working order, shall advise the number of the train so notified last.
- (c) The SM of the station where the signal has become defective shall before authorizing a train to pass the defective signal ensure that the conditions for taking off that signal have been fulfilled. He shall then authorize the Loco pilot's to pass the defective signal at "ON" in one of the following manners,

#### **DUTIES OF SM WHEN A DEPARTURE STOP SIGNAL IS DEFECTIVE**

- (i) When the Loco pilot of an approaching train has been advised of the defective signal at a station in rear - by deputing a competent railway servant in uniform under of sub-rule (a) of Para GR 3.69, to exhibit proceed hand signal at the foot of the defective signal to the approaching train. In such cases, the SM shall not give Line Clear to the station in rear unless the conditions for taking "OFF" the signal which has become defective, have been complied with
  - (ii) When the Loco pilot of an approaching train has not been advised of the defective signal at a station in rear - by having a written authority, authorizing the Loco pilot to pass the defective signal at "ON", delivered at the foot of the defective signal through a competent railway servant.
  - (iii) By taking "OFF" the Calling-on signal where provided; or
  - (iv) By authorizing the Loco pilot to pass the defective signal at "ON" over the signal post telephone where provided.
- (d) When the Home Signal becomes defective, the Outer shall also be deemed to be out of order and the procedure prescribed in sub-rules (i), (ii) and (iii) shall be followed.

### **3.8 Duties of SM when a Departure Stop Signal is Defective (GR3.70)**

- (a) In the event of a Starter becoming defective, the SM may authorize the Loco pilot to pass such signal by a written authority which shall be handed over to the Loco pilot at the station where the defective signal is located and in addition thereto, a competent railway servant shall show hand signals to the departing train in accordance with the instructions of SM or by taking "OFF" the Calling-on signal, if provided, after the train has been brought to a stand at the defective signal.
- (b) In the event of an Advanced Starter becoming defective, hand signals may be dispensed with and the SM may authorize the Loco pilot to pass such signal by a written authority, which shall be handed over to the Loco Pilot at the station, where the defective signal is located:

*Provided that in exceptional circumstances where, an Advanced Starter protects any points, hand signals shall not be dispensed with.*

- (d) For the purpose of handing over the written authority mentioned in sub-rules above, the train shall be stopped at the station where the defective signal is located. The written authority to pass a defective departure Stop Signal shall not be handed over to the Loco Pilot unless all the conditions for taking "OFF" such signal have been fulfilled.
- (e) Where a Calling-on signal has been provided below a departure Stop Signal, other than the Last Stop Signal, the Calling-on signal shall not be taken "OFF" unless the conditions for taking "OFF" the departure Stop Signal above it have been fulfilled.

### **3.9 Warner or Distant Signals Defective in the "OFF" Position(GR 3.71)**

- (a) (i) If a Warner Signal on a post by itself or a Distant Signal is out of order and cannot be kept in "ON" position; a stop hand signal shall be shown at the foot of the signal. At night, the light/lights of the signal shall be extinguished and the train, after being brought to a stand, may then be hand-signalled past the signal. Advice of the defective signal shall be given to the Loco pilot's of trains at the station in rear warning them to stop at such signal.
- (ii) If a Warner Signal placed below a Stop Signal becomes defective and cannot be kept in the "ON" position, the Stop Signal above it shall be treated as defective and by night the light of the Warner Signal shall be extinguished.

- (b) If the Warner or Distant Signal of an Intermediate Block Post is defective and cannot be kept in the "ON" position, the Intermediate Block Stop Signal shall also be kept at "ON" and treated as defective and action taken as per G.R 3.75.

### 3.10 Warner not to be used when a Stop Signal is Defective(GR 3.72)

Whenever a Stop Signal is defective or ceases to work properly at a station provided with Warners, the Warner applying to the line to which the defective Stop Signal applies shall be kept at "ON" until the defective Stop Signal is rectified.

### 3.11 Passing of a Gate Stop Signal at "ON"(GR 3.73)

- (a) When a Loco pilot finds a Gate Stop Signal at "ON", he shall sound the prescribed code of whistle and bring his train to a stop in rear of the signal.
- (b) (i) If the Gate Stop Signal is provided with a 'G' marker, the Loco Pilot shall wait at the signal for one minute by day and two minutes by night, and if the signal is not taken "OFF" within this period, he may draw his train ahead cautiously up to the level crossing, and
- (ii) If the Gateman is available and exhibiting hand signals, proceed further past the gate cautiously,
- (iii) Or if the Gateman is not available, or, is available but not exhibiting hand signals, he shall stop short of the level crossing, where he shall then be hand-signalled past the gate by the gateman, if there is one or in the absence of Gateman, by one of the members of the engine crew of the train after ascertaining that gates are closed against road traffic.
- (c) If the Loco pilot finds, after stopping at signal that there is no 'G' marker, he shall proceed further only in accordance with the procedure laid down under special instructions.

### 3.12 Absence of a Fixed Signal or a Signal Without a Light (GR 3.74)

- (a) If there is no fixed signal at a place where a fixed signal is ordinarily shown, or
- If the light of a signal is not burning when it should, or
  - If a white light is shown in place of a color light, or
  - If the aspect of a signal is misleading or imperfectly shown, or
  - If more than one aspect is displayed,

The Loco pilot shall act as if the signal was showing its most restrictive aspect: Provided that during night, if in the case of a semaphore Stop Signal for approaching trains only, the Loco pilot finds the signal light extinguished, he shall bring his train to a stop at such signal. If he finds that the day aspect of such signal is clearly visible and is satisfied that the signal is in the "OFF" position, he shall proceed past it up to the station cautiously at a restricted speed obeying all intermediate Stop Signals, if any, relating to him, and report the matter to the SM for necessary action.

- (b) At stations equipped with a color light signal provided with a 'P' marker, the Loco Pilot shall bring his train to a stand if it does not show any light or shows an imperfect aspect and having satisfied himself that the signal is provided with a 'P' marker, shall proceed preparing to stop at the next Stop Signal and shall be guided further by its aspect.

### 3.13 Passing an Intermediate Block Stop Signal at "ON"(GR 3.75)

- (a) When a Loco pilot finds an Intermediate Block Stop Signal at "ON", he shall stop his train in rear of the signal and contact the SM of the block station in rear on the telephone, if provided on the signal post.

- (b) The SM shall authorize the Loco pilot to pass the IB Stop Signal, if defective.
- (c) If the telephone is not provided or is out of order, the Loco pilot after waiting for 5 minutes at the signal shall pass it at "ON" and proceed cautiously and be prepared to stop short of any obstruction, at a speed not exceeding 15 Kmph if he has a good view of the line ahead, otherwise at a speed not exceeding 8 Kmph and report the failure to the SM at the block station ahead.
- (d) The SM of the block station working the IB Stop Signal on becoming aware that such a signal is defective shall, before dispatching a train, treat the entire section up to the block station immediately ahead of the Intermediate Block Post as one block section and issue a written authority to the Loco pilot to pass defective IB Stop Signal at "ON", without stopping at the signal.

**3.14 Duties of Loco Pilot and Guard when an Automatic Stop signal on double line is to be passed at 'on'— (GR 9.02).**

- (a) when a Loco Pilot finds an Automatic Stop signal with an 'A' maker at 'on', he shall bring his train to a stop in the rear of the signal. After bringing his train to a stop in the rear of the signal, the Loco Pilot shall wait there for one minute by day and two minutes by night. If after waiting for this period, the signal continues to remain at 'on', he shall give the prescribed code of whistle and exchange signals with the Guard and then proceed ahead, as far as the line is clear, towards the next Stop signal in advance exercising great caution so as to stop short of any obstruction.
- (b) The Guard shall show a Stop hand signal towards the rear when the train has been so stopped at an Automatic Stop signal, except as provided for in sub-rule (4)
- (c) Where owing to the curvature of the line, fog, rain or dust storm, engine working the train pushing it or other causes, the line ahead cannot be seen clearly, the Loco Pilot shall proceed at a very slow speed, which shall under no circumstances exceed 8 kilometers an hour. Under these circumstances, the Loco Pilot, when not accompanied by an Assistant Loco Pilot and if he considers necessary, may seek the assistance of the Guard by giving the prescribed code of whistle
- (d) When so sent for by the Loco Pilot, the Guard shall accompany him on the engine cab, before he moves forward, to assist the Loco Pilot in keeping a sharp look-out.
- (e) When an Automatic Stop signal has been passed at 'on', the Loco Pilot shall proceed with great caution until the next Stop signal is reached. Even if this signal is 'off', the Loco Pilot shall continue to look out for any possible obstruction short of the same. He shall proceed cautiously up to that signal and shall act upon its indication only after he has reached it.

**3.15 Duties of Loco Pilot and Guard when an Automatic Stop signal on single line is to be passed at 'on'— (GR 9.07)**

- (a) When a Loco Pilot finds an Automatic Stop signal with an 'A' marker at 'on', he shall bring his train to a stop in rear of that signal and wait there for one minute by day and two minutes by night.
- (b) If after waiting for this period, the signal continues to remain at 'on' and if telephone communication is provided near the signal, the Loco Pilot shall contact the Station Master of the next block station or the Centralised Traffic Control Operator of the section where Centralised Traffic Control is provided, and obtain his instructions. The Station Master or the Centralised Traffic Control Operator, as the case may be, shall, after ascertaining that there is no train ahead up to the next signal and that it is otherwise safe for the Loco Pilot to proceed so far as is known, give permission to the Loco Pilot to pass the signal in the 'on' position and proceed up to the next signal, as may be provided under special instructions.

#### **SIGNAL FAILURES AND DUTIES OF STAFF**

- (c) If no telephone communication is provided near the signal or if the telephone communication provided near the signal is out of order and cannot be made use of, the Loco Pilot shall give the prescribed code of whistle and exchange signals with the Guard and then proceed past the signal as far as the line is clear, up to the next Stop signal in advance, exercising great caution, so as to stop short of any obstruction.
- (d) The Guard shall show a Stop hand signal towards the rear when the train has been so stopped at an Automatic Stop signal, except as provided for under sub-rule (6).
- (e) Where owing to the curvature of the line, fog, rain or dust storm, engine working the train pushing it, or other causes, the line ahead cannot be seen clearly, the Loco Pilot shall proceed at a very slow speed, which shall under no circumstances exceed 8 KMPH. Under these circumstances, the Loco Pilot when not accompanied by the Assistant Loco Pilot and if he considers it necessary, may seek the assistance of the Guard by giving the prescribed code of whistle.
- (f) When so sent for by the Loco Pilot, the Guard shall accompany him on the engine cab, before he moves forward, to assist the Loco Pilot in keeping a sharp look-out.
- (g) When an Automatic Stop signal has been passed at 'on', the Loco Pilot shall proceed with great caution until the next Stop signal is reached. Even if this signal is 'off', the Loco Pilot shall continue to look out for any possible obstruction short of the same. He shall proceed cautiously up to that signal and shall act upon its indication only after he has reached it.

#### **3.16 Intimation to Officials when Defects Remedied(GR 3.76)**

As soon as a defective signal has been put into good working order, the SM shall intimate the fact to the officials who were advised of its being defective.

#### **3.17 Defective or Damaged Points etc.(GR 3.77)**

- (a) Whenever points, crossings or guardrails are damaged, the railway servant in-charge of operation of points shall protect them and immediately arrange to report the circumstances to the SM.
- (b) The SM, on becoming aware of such defective or damaged points etc., shall
  - (i) Immediately arrange to have the defect rectified by the railway servant responsible for their maintenance.
  - (ii) Arrange to ensure the safe passage of trains over such points, and
  - (iii) Keep the signal or signals concerned at "ON" until the defect is rectified.

#### **3.18 Duties of Engine Crew in Respect of Signals (GR 3.78)**

- (a) The Loco pilot shall pay immediate attention to and obey every signal whether the cause of the signal being shown is known to him or not, he shall not, however, trust entirely to signals, but always be vigilant and cautious.

- (b) When his engine explodes a detonator or when he notices a flare signal burning, he shall immediately bring his train to a stop and be guided by the signals that he may receive or if no hand signal or other signals are at once visible to him
- (i) if it is day and he has a clear view of the line ahead, proceed very cautiously at such speed as will enable him to stop short of any obstruction.
  - (ii) if it is day and the view of the line is not clear or if it is night, or if the visibility is impaired on any account, proceed very cautiously on hand signals given by a member of the engine crew or the guard who shall walk ahead of the train for this purpose.
  - (iii) after proceeding 1.5 km from the place where the explosion occurred or where flare signal was burning, if he does not explode any more detonators or sees no other signals, he may then resume authorized speed, and
  - (iv) report the incident to the next station or cabin.
- (c) If due to fog or storm or for any other reason, the view of the signals is obstructed, the Loco Pilot shall take every possible precaution, so as to have the train well under control.
- (d) A Loco Pilot shall acquaint himself with the system of working, location of signals and other local conditions affecting the running of trains on sections of railway over which he is to work and if he is not so acquainted with any portion of railway over which he is to work, obtain the services of a qualified railway servant who is conversant with it.

### **3.19 Duties of Loco pilot in Respect of Calling-on Signal (GR3.79)**

The Loco pilot of a train shall be guided always by the indication of the Stop Signal below which the Calling-on signal is fixed. If this Stop Signal is at "ON", he shall bring his train to a stop. If he finds that the Calling-on signal is taken "OFF", he shall, after bringing his train to a stop, draw ahead with caution and be prepared to stop short of any obstruction.

### **3.20 Duties of Loco Pilot when an Approach Stop Signal is "ON" or Defective (GR3.80)**

- (a) The Loco pilot of a train shall not pass an Outer, a Home or a Routing Signal that refers to him, when it is "ON" or defective, unless
- (i) He has, at a previous station, received notice in writing specifying that the signal is out of order and unless he also receives a proceed hand signal from a railway servant in uniform at the foot of such signal; or
  - (ii) After coming to a stand, he is either given a written authority by the SM to proceed past such signal or is authorised by a Calling-on signal in the "OFF" position or is authorised by the SM over the signal post telephone.
- (b) The Loco pilot of a train while passing an Outer, a Home or a Routing signal, when it is "ON" or defective shall ensure that the speed of his train does not exceed 15 Kmph.

### **3.21 Duties of Loco pilot when a Departure Stop Signal is "ON" or Defective (GR3.81)**

- (a) The Loco pilot of a train shall not pass a departure Stop Signal that refers to him, when it is "ON" or defective, unless his train has been brought to a stop at the station where the defective signal is situated and he is authorised to do so
- (i) He shall communicate with SM using VHF Walkie-Talkie set / Mobile phone.

#### **SIGNAL FAILURES AND DUTIES OF STAFF**

- (ii) By a written permission from the SM, in addition, in the case of a Starter or Advanced Starter protecting points, he shall not pass such signals, when "ON" or defective, unless he also receives a "Proceed" hand signal from a duly authorised member of the station staff posted at the signal, or;
  - (iii) By taking "OFF" the Calling-on signal, if provided.
- (b) In case of a Last Stop Signal, he shall not pass it, when "ON" or defective, unless he is also in possession of a proper authority to proceed under the system of working.

### **3.22 Permission Before Entering on or Crossing a Running Line(GR3.82)**

No Loco pilot shall take his engine on or across any running line until he has obtained the permission of SM and has satisfied himself that all the relevant signals have been taken off / Hand signals shown as applicable.

### **3.23 Assistance of the Engine Crew Regarding Signals (GR3.83)**

- (a) The Loco pilot and the first fireman or the assistant Loco pilot, as the case may be, shall identify each signal affecting the movement of the train as soon as it becomes visible. They shall call out the aspects of the signals to each other.
- (b) The assistant Loco pilot or the fireman shall, when not otherwise engaged, assist the Loco pilot in exchanging signals as required.
- (c) The provisions of sub-rules above shall, in no way, absolve the Loco pilot of his responsibility in respect of observance of and compliance with the signals.

### **3.22 Duties of Loco pilot when two or more Engines are attached to Train (GR3.84)**

When two or more engines are attached to a train, the Loco pilot of the leading engine shall be responsible for the observance of and compliance with the signals and the Loco pilot or Loco pilot's of other engine or engines shall watch for and take signals from the Loco pilot of the leading engine, except in cases where special instructions are issued to the contrary.

### **3.23 Reporting of defects in signals(GR 3.85)**

- (a) Should a Loco pilot or a guard observe that a signal is rendered imperfectly visible by branches of trees or any other cause, or that a signal light is obscured or not burning brightly to give a clear aspect, he shall report the matter to the SM at the next station at which the train stops.
- (b) When such report is made by a Loco pilot or a guard, the SM shall take immediate steps to advise the SM concerned who shall get it rectified.

## **DISCONNECTION AND RECONNECTION OF APPARATUS(GR 3.51(3))**

### **3.24 Advice of Disconnection**

As per GR 3.51, no railway servant is allowed to interfere with any points, signals or their fittings, signal wires or any interlocking or block gear for the purpose of effecting repairs, or for any other purpose, except with the previous permission of the SM. When it is necessary to disconnect any switches, signals, locking or any other gear, the SM and/or cabinmaster on duty must be advised in writing on the prescribed form which may be filled up either in English or Hindi or the regional language and his/their signature must be obtained before the work is started and also once the work is completed.

### 3.25 Persons competent to give Disconnection/Reconnection Notices

**AS PER SEM 11.4.1** A Maintainer who is in possession of a Competency Certificate cum Training History book only shall independently undertake works necessitating issues of Disconnection. (Each Maintainer shall have in his possession a book of Disconnection Notices- Form S&T/DN Notices.)

### 3.26 Knowledge of Rules

As the jurisdiction of SSE/JE (Signal) extends over a number of stations spread over long stretches of sections, their personal supervision of works requiring issue of Disconnection/Reconnection Notices may not always be possible. Therefore, Signal Technicians are allowed to undertake independently work of repairs or other works necessitating disconnection of points, lock bars, detectors and signals etc. They have to ensure that provision of **GR 3.51** invariably observed during the period of the work. In view of the importance of knowledge of rules, particular attention has to be paid to ensure that signal technicians are conversant with the rules to be followed while attending the work necessitating disconnection of points, lock bars, detectors, signals etc.

The Railway Board has, therefore, stipulated that

- (a) All artisan staff particularly Signal Technicians should be given refresher training once in every 4 years.
- (b) During the refresher course the knowledge of the Signal Technicians with reference to rules should be refreshed and the examination at the end of the course should include questions to test his knowledge pertaining to relevant rules contained in GR and SEM before issue of certificate of competency.
- (c) When staff are trade tested for the job of a signal Technicians, their knowledge of rules should also be tested before the staff are certified fit as Technicians.
- (d) For compliance of (a) and (b) above, action should be taken by the Railways to augment the training facilities in railways artisan training schools.

### 3.27 Disconnection of Apparatus

- (a) Each signal technician shall have in his possession a book of Disconnection Notices (Annexure-2 SEM Pt-II). A signal technician who is in possession of a Competency Certificate cum Training History book (Annexure-4 SEM Pt-II) only shall independently undertake works necessitating issue of Disconnection Notices.
- (b) Disconnection Notices need not be issued in situations as listed in annexure 2 of SEM Pt-II given in page No 31 provided suitable precautions are taken. In other situations, when it is necessary to disconnect any equipment in his charge for repairs, replacement or adjustment, the Maintainer shall advise the SM on duty in writing on prescribed form (Annexure-2 SEM Pt-I) and obtain the SM's signature before work is started and after it has been completed.
- (c) When it is necessary to disconnect point equipment, switches or signals for repairs, replacement or alteration, Warner/Distant and Stop Signals governing the lines in question shall be kept in the "ON" position and made inoperative until the work is completed.

#### **SIGNAL FAILURES AND DUTIES OF STAFF**

- (d) The signal technician must seal the equipment opened by him under his competence.

### **3.28 Working of Trains During Disconnection**

In the interval between disconnection and reconnection, if it is necessary to pass trains or to perform any shunting movement, the SM on duty must advise the SSE/JE(S) or the person in-charge of the work, by a memo stating in which position the points are to be set. The SM or other authorised staff on his behalf, shall, with the permission of the SSE/JE(S), or the person in-charge of the work, then arrange to set, clamp and padlock the points in the desired position making it safe for the passage of the trains.

It shall be the duty of the SM or any authorised person on his behalf to see that the points are set and clamped for the correct route and then put his pad lock on the clamp so as to prevent any interference therewith subsequently until the completion of the train shunting movement, as the case may be. The pad lock and clamp should be removed by the SM or the authorised person after the completion of the train or shunting movement, and then the SSE/JE(S) or the person in-charge of the work can resume work on the gear.

## (Annexure 2 Para11.41 SEM Pt-II)

|   |  |   |
|---|--|---|
| <p><b>FORM NO.S&amp;T/DN</b><br/><b>RAILWAY</b></p> <p><b>Signal &amp; Telecommunication Department</b><br/><i>Acknowledgement of Disconnect/ Reconm. Notice</i></p> <p>No. <b>^ - - &lt; ^&gt; DR</b></p> <p>To The Station Master or Cabinman on duty at ..... Station/Cabin</p> <p>For disconnecting the following gear :</p> <p>* ..... on ..... at ..... hrs. <b>MSM/ESM/JESE (Sig)</b></p> <p>Notice about disconnection received at ..... hrs. on ..... 20</p> <p>Disconnection allowed/not allowed** at ..... hrs. on ..... 20</p> <p>Disconnection will be allowed at ..... hrs. on ..... 20</p> <p>Reconnected at ..... hrs. on ..... 20 <b>MSM/ESM/JESE (Sig)</b></p> <p>Notice about reconnecting received at ..... hrs. on ..... 20 <b>SM/Cabinman</b></p> |  | <p><b>FORM NO S&amp;T/DN</b><br/><b>RAILWAY</b></p> <p><b>Signal &amp; Telecommunication Department</b><br/><i>Reconnection Notice</i></p> <p>No. <b>^ - - &lt; ^&gt; R</b></p> <p>Notice for reconnecting Signalling Gear already disconnected</p> <p>Division/District ..... To The Station Master or Cabinman on duty at ..... Station/Cabin</p> <p>Please note that the disconnected gear referred to in Notice No. .... has since been reconnected on ..... at ..... hrs.</p> <p>Please note that the following gear will be disconnected on ..... at ..... hrs.</p> <p>*</p> <p>Signature <b>Date</b></p> <p>Signature <b>Date</b></p> <p>Designation</p> |
|   |  | <p><b>FORM NO.S&amp;T/DN, Annexure 2</b><br/>Para No. II.4.1<br/><b>FORM NO S&amp;T/DN</b><br/><b>RAILWAY</b></p> <p><b>Signal &amp; Telecommunication Department</b><br/><i>Disconnect Notice</i></p> <p>No. <b>^ - - &lt; ^&gt; D</b></p> <p>Notice to Transformation Staff for disconnecting signalling gear</p> <p>Division/District ..... To The Station Master or Cabinman on duty at ..... Station/Cabin</p> <p>Please note that the following gear will be disconnected on ..... at ..... hrs.</p> <p>*</p> <p>Signature <b>Date</b></p> <p>Signature <b>Date</b></p> <p>Designation</p>  |

\* Fill in details of Gear to be disconnected. \*\* Reasons for not allowing disconnection to be recorded.

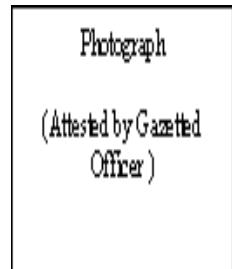
^ Station Code to be filled by Maintainer

~ Printed serial number of S&amp;T/DN

(x) number to be same as complete number in DR form and D form

**Railway  
SIGNAL AND TELECOMMUNICATION DEPARTMENT**

**Competency Certificate cum training History book**



Certificate number.....

This is to certify that

|             |   |
|-------------|---|
| Shri        | . |
| S/o Shri    | . |
| Designation | . |
| Staff No.   | . |
| Station     | . |
| Division    | . |

who has undergone training in.....has been examined in the relevant rules and instructions pertaining to his duties stipulated in the SEM & G&SR and he is competent to undertake independently such work which may necessitates disconnection of signalling and interlocking gear in service under open line conditions.

This certificate is valid up to.....  
He is also qualified to work on the following block instruments and is competent to disconnect and restore working (Tick the appropriate)

|   |  |   |
|---|--|---|
| 1 | Double line block instrument             | . |
| 2 | Single line token block instrument       | . |
| 3 | Single line push button block instrument | . |
| 4 | Single line handle type block instrument | . |
| 5 | .  | . |
| 6 | .  | . |

Date : .....

Place:.....

Principal  
S& T Training center

.....Railway

**RENEWALS OF COMPETENCY CERTIFICATE**

| Date | Renewed up to | Block Instruments |         | Signature |
|------|---------------|-------------------|---------|-----------|
|      |               | Added             | Deleted |           |
| .    | .             | .                 | .       | .         |
| .    | .             | .                 | .       | .         |
| .    | .             | .                 | .       | .         |
| .    | .             | .                 | .       | .         |
| .    | .             | .                 | .       | .         |
| .    | .             | .                 | .       | .         |

**REFRESHER COURSE**

| S. No. | Course No. | Last attended |    | Next Due | Signature and Date |
|--------|------------|---------------|----|----------|--------------------|
|        |            | From          | To |          |                    |
| .      | .          | .             | .  | .        | .                  |
| .      | .          | .             | .  | .        | .                  |
| .      | .          | .             | .  | .        | .                  |
| .      | .          | .             | .  | .        | .                  |
| .      | .          | .             | .  | .        | .                  |
| .      | .          | .             | .  | .        | .                  |

**EQUIPMENT AND OTHER COURSES ATTENDED**

| Sl.No. | Date | Name of course | From | To | Signature |
|--------|------|----------------|------|----|-----------|
| .      | .    | .              | .    | .  | .         |
| .      | .    | .              | .    | .  | .         |
| .      | .    | .              | .    | .  | .         |
| .      | .    | .              | .    | .  | .         |
| .      | .    | .              | .    | .  | .         |

**S&T MAINTENANCE WORKS – TESTING OF POINTS, SIGNALS  
AND OTHER EQUIPMENT – DISCONNECTION NOTICE**

**I. Disconnection and testing of S&T gears:**

1. There are certain works such as replacement of fuses, bulbs etc., which can be carried out without any hindrance to the normal working of trains. These works may be attended to by the S&T staff without the consent of the Station Master on duty.
2. The testing of points / signals / interlocking of the lever frame etc., may not require Disconnection Notice but definitely requires the consent of on duty Station Master as it is likely to interfere with the train movements and safety of operation. It has accordingly, to be done with the consent of the operating staff only. The written consent shall be obtained in the Proforma enclosed (annexure – A).

Annexure A

**SOUTH CENTRAL RAILWAY**

S & T department — memo of consent

Memo to operating staff seeking permission for attending to signalling gears

No.....

To

SM on duty / .....

Please note that the following gears will be attended without interference

-----  
-----

Signature of ESM/MSM/SI

Date ..... Time .....

**Acknowledgement**

Signature of Station Master

Date ..... Time .....

3. It is essential in the interest of safety that whenever any work is to be executed necessitating interference with any points or its fittings, signals or its fittings, signal wires, point rodding or any interlocking gear or locking of switches or any other signalling gears for carrying out repairs or for making alterations to the circuitry or for any other purpose, which is likely to affect safe running of trains, the Station Master on duty must be given Disconnection Notice in the form S&T/DN(T/351) (SEM Part-II, Annexure-2 11.4.2) and his permission obtained before the work is started.

4. To summarize for this purpose, the situations are grouped under three sets and the details under each group are shown below:-

**Group (A)** - Situations not requiring the consent of on duty Station Master

**Group (B)** - Situations definitely requiring the consent of on duty Station Master

**Group (C)** - Situations in which issue of Disconnection Notice is definitely required.

While undertaking the items of work listed in Group (B), it is essential that the Station Master concerned be kept informed by the official of S&T department undertaking the work so that Station Master on duty is aware that the S&T staff is working on signalling gears at his station.

5. When the situation mentioned in Group (C) arises, the work shall commence only after traffic staff accepts Disconnection Notice. Such Disconnection Notice when presented by Signal Maintainer/Inspector to the Station Master, it will be accepted by him in consultation with section controller so that it does not interfere with the train movement. If the Station Master is not in a position to accept the Disconnection Notice immediately, he should try to accept the same at the earliest. The JE/SSE(S) should collect the details from Technicians, cases of non-acceptance of Disconnection Notices on same day and forward it to DSTE / Sr. DSTE on daily basis for taking corrective action at higher levels.
6. In the interval between Disconnection and Reconnection of gears, when it is necessary to pass trains or perform shunting in the affected portion of lines where points etc., have been disconnected, procedure laid down (Example S.R. 3.51.7.1 of SCR) should be strictly followed.
7. Attending to signal and point failures:

As soon as the Station Master on duty becomes aware of any failure of signalling equipments at his station governing the movements of trains, he should immediately report such failures in writing personally or through control phone to the Technician as the case may be and to the JE/SSE(S) apart from advising all other officials in accordance with rules laid down (S.R. 3.68.3 of SCR). It should be understood by S&T staff attending to the gears that a written or control message from the Station Master is only the intimation for the maintenance staff to attend the defect. Before attending to the defect involving interference with the interlocking gears, procedure laid down for Disconnection Notice as brought out in paras 3, 4 & 5 above will be followed. In all such cases the traffic staff must accept Disconnection Notice. After the failure is set right, the person-in-charge shall test and certify in writing the rectification of the defect and if necessary demonstrate to the traffic staff about the normal working. Technicians who attends such failures shall record the date and time of rectification and the nature of fault removed must be recorded in the Signal failure and inspection register provided at each interlocked station. These reports shall be forwarded weekly to the JE (Signal) for further scrutiny. It is reiterated that the signal maintainer must not permit any other artisan or Group D staff to do any adjustment for cleaning or repairs of signal equipment except under his personal supervision.

## GROUP (A)

### Situations not requiring the consent of on duty Station Master

1. Tightening of terminals without causing any short circuits
2. Replacement of fuses.
3. Replacement of bulbs.
4. Cleaning of color light signal lenses and roundels outside and focusing of signals including route indicators.
5. Cleaning and opening of top covers pertaining lever locks, circuit controllers, detectors, point and signal mechanisms.
6. Lubrication of pins of cranks and compensators, lock bar clips, down rods of signals, signal diversion wheels, signal & point mechanisms detectors and external cleaning and lubrication of points.
7. Renewal and re-fixing of pulleys.
8. Casual renewal and re-fixing of roller stands, top roller, bottom roller etc., one at a time.
9. Cleaning of roundels and lenses of point indicators and signal lamps etc.

**GROUP (B)**

**Situations definitely requiring the consent of on duty Station Master**

1. Work on track circuits without causing disconnection of leads, terminals etc.
2. Cleaning of terminals / contacts of circuit controllers without causing energisation of lever locks.
3. Maintenance of reversers and signal machines without changing any parts.
4. Opening of covers of block instruments for visual inspection of token balancing.
5. Testing of points.
6. Testing of signals.
7. Lubrication and cleaning of internal parts
8. Changing of batteries which cause disconnection of signalling circuits.
9. \*Cleaning of lenses inside color light signals, by opening the doors of CLS unit.
10. Changing of lenses of color light signals as well as the roundels of semaphore signals.
11. \*Adjustment of staggering of axle counter.
12. \*Testing and measurement of wheel dip of outdoor equipment of axle counter.  
(\*) These works apart from taking the consent of Station Master should be done in between train timings.

**GROUP (C)**

**Situations in which issue of Disconnection Notice is definitely required**

1. Disconnection of track leads, leading to disconnection of track circuits, other than taking current readings only and adjustment of track lead resistance and relay resistance.
2. Replacement of insulation parts of track circuits at block joint
3. Disconnection of pins of rodding run, cranks/compensators, interlocking frame or any other gear which will lead to unsafe conditions.
4. Repairs and replacement of rodding transmission and cranks compensator.
5. Disconnection of any rod from corresponding lever or lever frame or from point, lock or signal, including repairs and replacement of facing point lock along with rod.
6. Disconnection of wire transmission.
7. Removal of point or lock slides of a point detector, both Electrical or Mechanical including repairs and replacement of point.
8. Disconnection of a lock bar or a facing point lock plunger or switch extension piece or detector rods.
9. Any work on electrical point machine/signal machine/electrical detector involving disconnection and replacement of parts.
10. Replacement of reverser/reverser parts.
11. Alteration of Station Master's slide control, Station Master's key locking boxes.
12. Disconnection of link of a circuit controller or lever lock-cum-circuit controller.
13. Making any adjustment to the contact bands of circuit controller or lever lock and circuit controller.

14. Removal of key lock from the lever to which it is fixed.
15. Opening of key transmitter or local release of its key.
16. Changing of booms of lifting barriers within station limits.
17. Changing of diversion wheels of wire transmission
18. Change of signal arms.
19. Removal of any relay from the circuits.
20. Addtions/replacement/ Alteration to the existing wiring (circuit diagram).
21. Insulation test of cables involving disconnection of cable terminals and replacement of Cables.
22. Disconnection of any terminal carrying circuits of axle counters.
23. Disconnection of axle counters batteries either of oscillator and/or evaluator
24. Opening of covers of block instrument for maintenance or making adjustments, change of wiring etc.
25. Conducting broken wire tests.
26. Replacement/Repairing of any counting arrangements like veeder counter for cancellation of route or line clear etc.
27. Any other signalling gear or part requiring interference which is likely to lead to unsafe condition.
28. Changing of signal transformer in color light signalling.
29. Normally replacement of block joint insulations must be done on a programmed basis jointly by Engineering and S&T staff under special instructions. In emergency replacement of block joint insulations shall be done under Disconnection Notice only.
30. Changing of cable conductors for working functions.
31. Rectification of defective audio warning device
32. Overhauling of lever frame.

### **Locking of Relay Rooms — procedure for working**

1. The relay room or the cabin basement room where relays and interlocking / locking gears are housed shall invariably be kept locked with
  - (a) Two independent locks, keys of which shall be with Station Master on duty and Signal Maintainer respectively, or
  - (b) With single lock which works on double key operation; one key of the lock shall be kept with the Station Master and the other with the Signal Maintainer
2. The locks meant for locking the relay room / cabin basement, shall be provided by the S&T branch. These locks should have numerical counter like the one used for crank handle.
3. In the two independent lock arrangement the key of one lock will be under the custody of Signal Maintainer and the other in the custody of Station Master. Unless both the padlocks are opened, the relay room door cannot be opened.
4. In the case of single lock with double key, one key will be with the Signal Maintainer and the other key in the custody of Station Master. The locking is such that the lock cannot be opened unless both the keys are inserted and turned one after the other in succession.
5. This arrangement will mean that without the consent of either party (Station Master or Signal Maintainer) the relay room cannot be opened.

(a.) Locking of Relay Room:- First key SM and second key S&T

**SIGNAL FAILURES AND DUTIES OF STAFF**

(b). Opening of Relay Room:- First key S&T and Second key SM

6. A register will be kept in the Station Master's room in which the S&T staff intending to carry out the work requiring the opening of relay room should make suitable entries as per **Relay Room Key Register** given below. The Station Master will then handover the key to the S&T Maintainer after obtaining his signature in the register.
7. The register should be kept only in the Station Master's office at stations where end cabins are manned by Switchmen. However where cabins are manned by Assistant Station Masters, the register can be kept with the cabin Assistant Station Master.
8. After carrying out the work, the Signal Maintainer / Signal Inspector shall return the key to Station Master. Both shall sign the register indicating the date and time of returning the key.
9. The Assistant Station Master's key of the relay room shall be kept under the personal custody in a glass fronted box in Station Master's office.
10. The keys of the Signal Maintainer shall be kept in the personal custody of Technicians or in a box in the S&T equipment room or in case equipment room is not there, in the Assistant Station Master's room with a universal lock.
11. These instructions shall apply to all stations either panel interlocked including RRI or provided with mechanical lever frame and also where round the clock S&T Maintenance staff are available.

### Relay room key register

| S. No. | Date | Time | Key handed over to | Reason for taking key | Signature of ASM/SM Signal Technician /JE/SSE | Key taken over from S&T staff | date | Time | Signature of ASM/SM/ Signal Technician/ JE/SSE |
|--------|------|------|--------------------|-----------------------|---|-------------------------------|------|------|--|
| 1      | 2    | 3    | 4                  | 5                     | 6   | 7                             | 8    | 9    | 10   |

## CHAPTER - 4: SCHEDULE OF DIMENSIONS

### CONTENTS

- Schedule of Dimensions
  - Need, History and Developments
  - Schedule of Dimensions (Revised, 2004)

### 4.1 Need for Schedule of Dimensions

While the rolling stock moves from place to place over different railways it is necessary that both the rolling stock as well as the various structures like signal posts, cabins, etc. should be of uniform nature, so that a particular rolling stock can safely pass without any danger to the passengers traveling on the trains or without any likely damage to the goods that is likely to be carried in the trains throughout all the places of our country. This will also avoid the likelihood of damage to various permanent structures by the sides of the track. In fact, the schedule of dimensions is meant to safeguard the interests of both the rail users as well as the railways and must be rigidly followed by the railways. The need for formulation of schedule of dimensions was felt because various railway companies which were in existence in earlier days had their own different standards of construction, which were not conducive for interchange of traffic between different railways owned by different companies.

#### Additional Clearance

While vehicles pass over a track, they do not move absolutely in a straight line, but are subjected to three types of motions.

- (a) **Lurching motion:** Vehicle when moving, it oscillates from side to side because of the clearances available between the flanges and gauge faces of the rails.
- (b) **Bouncing motion:** Vehicle when moving, it oscillates vertically up and down on the track due to unevenness of springs, unevenness in track and unevenness of loading.
- (c) **Shuttling motion:** Vehicle when being started/stopped the movement is backward /forward in the direction of the movement of vehicle mainly generated from acceleration and retardation of the train.

The various motions of the vehicles require additional clearances, which must be allowed while constructing various structures by the side of track.

While a vehicle moves on a curve, even though the rails are curved, the vehicle being a straight body, a part of the vehicle projects towards the inner side of the curve. Also for the same reason, the tail of the vehicle would project more outside the track.

Further, while a vehicle is moving over a curve, due to super elevation of track, the top portion of the vehicle tilts towards the inner side of the curve. This tilting is further increased due to unevenness in the strength of the spring and unevenness of loading of the vehicles.

The clearances are therefore, required to be increased in the case of vehicles moving on curves.

*Note: This chapter deals with 1676 mm Gauge (BG).*

## **4.2 History and Development of Schedule of Dimensions**

The first set of schedule of dimensions was formulated in 1913. In 1922, the Railway Board issued a Schedule of Maximum, Minimum and Recommended Dimensions to be observed on all 1676 mm gauge Railways in India.

In 1929, it was found desirable further to amend the Schedule of 1922 in order to introduce certain improvements in the light of experience gained since it was issued, and also to provide the clearances required by electric traction equipments on lines which were likely to be electrified in the future.

In 1936, however, the financial stringency on Railways brought to the front the urgent necessity for restricting capital expenditure to a minimum. The reduction in Railway traffic and the increasing demand for light fast units to compete with motor bus transport made the introduction of heavier engines and 3660 mm wide rolling stock on Railways improbable. In these circumstances it was found desirable to alter the dimensions prescribed in Schedule I of the 1929 Dimensions and to revert to the maximum and minimum dimensions of the 1922 Schedule in several important respects.

The SOD, with metric and F.P.S dimensions of the year 1973 was based on the 1958 reprint of 1939 schedule. The dimension prescribed in Schedule I which were essential for safe working, were applicable to all new railways and to new works on existing railways, including alterations and renewals, and sanction was required to a departure from them.

The SOD of 1973 version was based on the requirements of 25KV A.C. traction and all future construction were to be carried out to these dimensions except in cases where it was considered that there was no chance of the line being subsequently converted to 25KV AC traction. A new chapter V (A) was added in respect of dimensions required for electric traction with 25KV A.C. (50 cycles).

## **4.3 Schedule of Dimensions (Revised, 2004)**

The present Schedule of Dimensions (Revised, 2004) is a revised version of the Schedule of Dimensions of 1939 reprinted in 1973. It consists of only metric units. All dimensions in FPS units are deleted.

## **4.4 Schedule-I (Schedule of Dimensions, Revised, 2004)**

The Dimensions given in Schedule-I have been classified under two heads namely for 'Existing works' and for 'New works'. Existing works means the works, which existed before issue of this Schedule of Dimensions (2004) and would help the field engineers to provide the information about previous dimensions followed at one place.

New works would include altogether new constructions, additions of new lines/structure, gauge conversion and doubling. However, it is not intended to include the works of alteration such as shifting of a points and crossings, extension of siding, building etc.

The dimensions, except for existing works, are to be observed on all 1676 mm gauge on Indian Railways unless prior sanction has been obtained from the Railway Board through the CRS/CCRS to execute the new works which would infringe this Schedule of Dimensions.

Schedule-I contains following chapters

|                |  |
|----------------|--|
| Chapter-I      | : General                                |
| Chapter-II     | : Station Yards                          |
| Chapter-III    | : Workshops and Station Machinery        |
| Chapter-IV (A) | : Rolling Stock (Carriage & Wagon)       |
| Chapter-IV (B) | : Rolling Stock, (3660 mm wide stock)    |
| Chapter-IV (C) | : Rolling Stock (Locomotive)             |
| Chapter-V      | : Electric Traction (Direct Current)     |
| Chapter-V-A    | : Electric Traction (25 KV AC 50 Cycles) |

## 4.5 General

### 4.5.1 Spacing of tracks

Minimum distance centre to centre of tracks

|   |           |
|---|-----------|
| (a) For existing works                        | - 4265 mm |
| (b) For new works/additions to existing works | - 5300mm  |

**Note:**

(a)

*Extra clearances are required on curves*

- *Extra clearance up to 5 degree has been accounted for the track spacing given in item (b) above.*
- *For curves more than 5 degree, extra clearance is to be calculated and accounted for.*

(b) *New/Additional works cover laying of new line and new running loops. Extension of existing line or replacement of points & crossings will not be treated as new work.*

(c) *OHE mast and signal post shall not be provided in between Tracks. However, under unavoidable circumstances, the clearance mentioned in 4.5.1(b) above para shall be increased by “equal to the width ” of such provisions/ structures /foundations, as such case may be.*

### 4.5.2 Curves

|                          |                      |
|--------------------------|----------------------|
| Minimum radius of curves | 175 Mts (10 degrees) |
|--------------------------|----------------------|

### 4.5.3 Rails

|  |       |
|--|-------|
| (a) Minimum clearance of check rails for a curve | 44 mm |
|--|-------|

Note: (i) This clearance must be increased by not less than half the amount of any difference between 1676mm and the gauge to which the curve is actually laid.

(ii) Check rails to be provided in curves where the radius is 218 meters or less i.e. where curvature is 8° or more. They may be necessary also in the case of flatter curves, if high speed is contemplated.

|     |   |       |
|-----|---|-------|
| (b) | (i) Minimum clearance of check rail at a level crossing | 51 mm |
|     | (ii) Maximum clearance of checkrail at a level crossing | 57 mm |

**SCHEDULE OF DIMENSIONS**

|   |      |
|---|------|
| (c) Minimum depth of space for wheel flange from rail level | 38mm |
|---|------|

**4.5.4 Buildings and structures**

- (a) Minimum horizontal distance from centre of track to any structure from rail level to 305 mm above rail level
  - (i) For existing works – 1675 mm
  - (ii) For new works or alterations to existing works – 1905 mm
- (b) Minimum horizontal distance from centre of track to any structure except a platform
  - (i) For existing works
    - From 305 mm above rail level to 4420 mm above rail level – 2135 mm
  - (ii) For new works or alterations to existing works
    - From 305 mm above rail level to 1065 mm – 1905 mm increasing to 2360 mm
    - From 1065 mm above rail level to 3355 mm – 2360 mm
    - From 3355 mm above rail level to 4420 mm – 2360 mm decreasing to 2135 mm
    - From 4420 mm above rail level to 5870 mm – 2135 mm decreasing to 915 mm

**Note:**

- Any material stacked by the side of line is to be considered as structure. These items also apply to projections of rock etc.
- Extra clearance is required on curves
- Light structures such as ladders, thin posts etc. erected along side the track at a distance of less than 2360 mm from centre of adjacent track should be blanked off to a height of 300 mm between 2060 mm and 2360 mm above rail level.
- (iii) Below the rail level up to the formation level of the track on straight and curves up to radius of 875 m – 2575 mm
- Below the rail level up to the formation level of the track on curves with radius less than 875 m – 2725 mm

**Note:**

- The required clearances as mentioned under item (iii) (a) and (b) above will be applicable in case of new lines/doubling/electrification.
- Various fixtures, which are attached to the track like traction bonds etc. and are required to be fixed with the rail can be provided and the clearance as mentioned in item (iii) above will not be applicable to these fixtures.

- (c) Minimum horizontal distance of any telegraph post measured from the centre of and at right angles to the nearest track
  - For existing works – The height of the post plus 2135 mm
  - New works or alterations to existing works – The height of the post plus 2360 mm

**Note:** When the line is in cutting a telegraph post erected outside the cutting, must be at a distance from the edge of the cutting not less than the total height of the post.

- (d) Minimum height above rail level for telegraph, telephone and other such low tension wires crossing a railway – 6100 mm

#### 4.5.5 Interlocking and signal gear

Maximum height above rail level of any part of interlocking or signal gear for a width of 1600 mm or 1830 mm in the case of tunnels, trough and semi-trough girder bridges on either side of centre of track  
– 64 mm

**Note:**

- (a) For a distance of 229 mm outside and 140 mm inside the gauge faces of the rail, no gear or track fittings must project above rail level except such parts as are required to be actuated by the wheels or wing rails
- (b) Signal wires or supports for signal wires may be allowed at not less than 1600 mm or 1830 mm in the case of tunnels or trough or semi-trough girder on either side of the centre of track provided that they are not more than 203 mm above rail level
- (c) Metal covers with ramps on both sides must be provided over all interlocking gear projecting above rail level between the rails of a track to prevent damaging the gear by hanging couplings

#### 4.5.6 Tunnels, trough and semi-trough girder bridges

- (a) Minimum distance centre to centre of track

- (i) For existing lines – 4495 mm
- (ii) For new works and alteration to existing works – 4725 mm

- (b) Minimum horizontal distance from centre of track to any structure shall be as follows

| Height above rail level  | Horizontal distance from centre of track |
|--|--|
| (a) From 0.0 mm to 305 mm  | 1905 mm                                  |
| (b) From 305 mm to 1065 mm   | 1905 mm increasing to 2360 mm            |
| (c) From 1065 mm to 3355 mm  | 2360 mm                                  |
| (d) From 3355 mm to 4420 mm  | 2360 mm decreasing to 2135 mm            |
| (e) From 4420 mm to 5870 mm (From 4420 mm to 5410 mm in case of DC traction) | 2135 mm decreasing to 915 mm             |

**Note:** (i) Where traction is not likely to be used, overhead bracing of bridges may be 5030 mm above rail level for a distance of 1370 mm on either side of the centre of track.

(iii) In case of existing structures, a special clearance study shall be made which will be accepted by Electrical Inspector of the Railways as indicated in Appendix-a to chapter V-A before electric traction is introduced.

(iv) Extra clearances are required on curves.

(v) Tunnels, through grider and semi through grider bridges out side yard should be treated as heavy overhead structures such as ROB for electrification works and the same dimensions as mentioned in note ( C) at para in page No 7 of SOD issued in 2004 shall be applicable and over head equipment (OHE) arrangements shall be as per RDSO diagrams.( s.c No.10 page No5)

#### 4.5.7 Safety Refuges

- (a) Maximum inter-distance between two adjacent refuges in tunnels - 100 Mts
- (b) Maximum inter-distance between two adjacent trolley refuges
  - (i) On bridges with main spans of less than 100 Mts - 100 Mts
  - (ii) On bridges with main spans of 100 Mts or more - A refuge over each pillar

#### 4.5.8 Gauge on straight and curves

The gauge shall be as follows

(i) Straight including curves of 350 Mts radius up to 5 mm tight and 3 mm loose  
i.e up to 1671 mm and 1679 mm

(ii) On curves with radius less than 350 Mts: up to +10 mm i.e. 1686 mm

### 4.6 Station Yards

#### 4.6.1 Track

Maximum gradient in station yards unless special safety devices are adopted and/or special rules enforced to prevent accidents in accordance with approved special instructions.

(a) For existing works - 1 in 400

(b) For new works - 1 in 1200 (desirable/recommended)

#### Note

(a) "No station yard should be constructed nor should any siding join a passenger line on a steeper grade than 1 in 260, except where it is unavoidable and then also only with the previous sanction of the Railway Board, obtained through the CRS when a slip siding or other arrangement is made sufficient to prevent accident."

The power of condonation of gradient steeper than 1 in 1200 in case of new works shall be as under

(i) Steeper than 1 in 1200 and up to 1 in 400 : Personal approval of GM through COM of the Zonal Railway after making efforts for providing grade as flatter as possible.

(ii) Steeper than 1 in 400 and up to 1 in 260 : CRS

(III) Steeper than 1 in 260 : Railway Board through CCRS

For the purpose of the above rule, a station yard will be taken to extend

- On single line to a distance of 45Mts (Recommended-50 Mts) beyond outermost points at either end of the station.

- On double line where 2 aspect signalling is provided, from Home signal to a distance of 45Mts (Recommended-50 Mts) beyond outermost points at the trailing end, or where there are no loops, to last stop signal of each line.

- On double line where multiple aspect signalling is provided to a distance of 45Mts(Recommended-50 Mts) beyond outermost points at either end of the station or where there are no loops, from Block Section Limit Board to last stop signal of each line.

(i) Except in Hump or Gravity yards there must be no change of grades within 30 meters of any points or crossings.

- (ii) At stations with grades steeper than 1 in 400 beyond 50 Mts of outermost points, trains should not be drawn up to the last stop signal and held up on the steep gradient in order to clear the reception line for giving permission to approach to the following train. No shunting beyond outermost points on the steep gradient side should be allowed unless a locomotive is attached at the lower end of the load from the point of view of gradient.
- (iii) Para 4.6.1 does not apply to Flag station, Halt Station and IBS

#### 4.6.2 Platforms

- (a) (i) Horizontal distance from centre of track to face of passenger platform coping

|         |         |
|---------|---------|
| Maximum | 1680 mm |
| Minimum | 1670 mm |

**Note:** The coping of passenger platform must be so constructed as to allow introduction of wider stock, when necessary it can be easily and expeditiously set back to 1905 mm. from centre of track

- (ii) Horizontal distance from centre of track to face of any platform wall.

|         |         |
|---------|---------|
| Maximum | 1905 mm |
| Minimum | 1675 mm |

- (b) Height above rail level for high passenger platforms - 840 mm maximum  
- 760 mm minimum

- (c) Maximum height above rail level for medium level passenger platform - 455 mm

- (d) Maximum height above rail level for goods platforms  
(Except horse and end loading platforms) -1065 mm

#### 4.6.3 Buildings and structures

- (a) Minimum height above rail level for a width of 1600mm on either side of centre of track, of a signal gantry or a foot over bridge in a passenger station - 6250 mm

- (b) Minimum, horizontal distance from centre of track to any structure:

- (i) For existing works

|   |                               |
|---|-------------------------------|
| (i) From rail level to 305 mm above rail level  | 1675 mm                       |
| (ii) From 305 mm above rail level to 3355 mm above rail level   | 2135 mm                       |
| (iii) From 3355 mm above rail level to 4115 mm above rail level   | 2135 mm decreasing to 1980 mm |
| (iv) From 4115 mm to 6250 mm above rail level on main line  | 1600 mm                       |
| (v) Below the rail level up to the formation level of the track on straight and curves up to radius of 875 Mts. | 2575 mm                       |
| (vi) Below the rail level up to the formation level of the track on curves with radius less than 875 Mts.       | 2725 mm                       |

**Note:**

- Extra clearances are required on curves

#### SCHEDULE OF DIMENSIONS

- On lines other than main lines or existing main lines where electric traction is not likely to be introduced, the horizontal distance of 1375 mm from 4115 mm to 6100 mm above rail level may be allowed to continue.
- The clearances mentioned above in item (v) and (vi) shall be applicable only in new yards. The various fixtures, which are attached to the track e.g lock bar, point machine, traction bonds, point and signal rodding etc. and are required to be fitted with the rail can be provided and the clearance as mentioned in item (v) and (vi) above shall not be applicable to these items and also to the OHE mast/uprights and signal post for electrification in the existing yards
- Item (v),(vi) in above table shall not be applicable in case bidges(SOD correction slip no 10)

(ii) In case of new works or alteration to existing works

|  |                               |
|--|-------------------------------|
| (i) From rail level to 305 mm above rail level   | 1905 mm                       |
| (ii) From 305 mm above rail level to 1065 mm   | 1905 mm increasing to 2360 mm |
| (iii) From 1065 mm above rail level to 3355 mm   | 2360 mm                       |
| (iv) From 3355 mm above rail level to 4420 mm  | 2360 mm decreasing to 2135 mm |
| (v) From 4420 mm above rail level to 4610 mm   | 2135 mm decreasing to 1980 mm |
| (vi) From 4610 mm above rail level to 6250 mm  | 1600 mm                       |
| (vi) Below the rail level up to the formation level of the track on straight and curves up to radius of 875 Mts. | 2575 mm                       |
| (vii) Below the rail level up to the formation level of the track on curves with radius less than 875 Mts.       | 2725 mm                       |

**Note:** Extra clearances are required on curves

#### 4.6.4 Points and Crossings

(a) Maximum clearance of checkrail opposite nose of crossing – 48 mm

**Note:** (i) In case of turnouts laid with 1673 mm gauge, the clearance shall be 45 mm

(b) Minimum clearance of check rail opposite nose of crossing – 44 mm

**Note:**

(i) In case of turnouts laid with 1673 mm gauge, the clearance shall be 41mm instead of 44 mm

(c) Maximum clearance of wing rail at nose of crossing – 48 mm

**Note:**

In case of turnouts laid with 1673 mm gauge, the clearance shall be 45 mm instead of 48 mm.

(d) Minimum clearance of wing rail at nose of crossing – 44 mm

(Note: In case of turnouts laid with 1673 mm gauge, the clearance shall be 41 mm instead of 44 mm.)

- (e) Minimum clearance between toe of open switch and stock rail
- |  |          |
|--|----------|
| (i) For existing works                             | - 95 mm  |
| (ii) For new works or alteration to existing works | - 115 mm |

*(Note: The clearance can be increased up to 160 mm in curved switches in order to obtain adequate clearance between gauge face of stock rail and back face of tongue rail. )*

- (e) Minimum radius of curvature for slip points, turnouts of crossover roads - 218 Mts. (8 degree)

**Note:** In special cases mentioned below this may be reduced to not less than the minimum of

- (i) 213 Mts. radius in case of 1 in 8 1/2 BG turnouts with 6.4 Mts. overriding switch, and
- (ii) 175 Mts. radius in case of 1 in 8 1/2 scissors crossing to allow for sufficient straight over the diamond crossing between crossovers.

- (g) Minimum angles of crossing (ordinary) - 1 in 16

**Note:** Crossings as flat as 1 in 20 will usually be sanctioned if recommended by the CRS.

- (h) Diamond crossings not to be flatter than 1 in 8.5

- (i) Minimum length of tongue rail – 3660 mm

- (j) Minimum length of train protection, point locking or fouling treadle bar - 12800 mm

#### 4.7 Rolling Stock (Carriage & Wagon)

|   |                                    |
|---|------------------------------------|
| Wheel gauge, or distance apart, for all wheel flanges   | Maximum 1602 mm<br>Minimum 1599 mm |
| Maximum diameter on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face | 1092 mm                            |
| Minimum diameter on the tread of new carriage of wagon wheel, measured at 63.5 mm from wheel gauge face | 914 mm                             |
| Maximum projection for flange of new tyre, measured from tread at 63.5 mm from wheel gauge face         | 28.5 mm                            |
| Minimum projection for flange of worn tyre, measured from tread at 63.5 mm from wheel gauge face        | 35.0 mm                            |
| Maximum thickness of flange of tyre, measured from wheel gauge face at 13 mm from outer edge of flange  | 28.5 mm                            |
| Minimum thickness of flange of tyre, measured from wheel gauge face at 13 mm from outer edge of flange  | 16 mm                              |
| Minimum width of tyre   | 127 mm                             |

#### 4.8 Rolling Stock (Locomotive)

- (a) Minimum projection for flange of new tyre measured from tread at 63.5 mm from wheel gauge face - 28.5 mm
- (b) Maximum projection for flange of worn tyre measured from tread at 63.5 mm from wheel gauge face.- 35 mm
- (c) Maximum & minimum thickness of tyre flanges measured at 13 mm from outer edge of flange

|  | <b>Max</b> | <b>Min</b> |
|--|------------|------------|
| (i) Thick flanges/wear adopted wheel profile | 32 mm      | --         |
| (ii) Standard flanges                        | 28 mm      | --         |
| (iii) Thin flanges                           | 18 mm      | --         |

#### 4.9 Electric Traction 25 KV AC 50 Cycles

Vertical and lateral distances between 25KV live parts and earthed parts of fixed structure or moving loads/rolling stocks shall be as large as possible. The minimum vertical and lateral electrical clearances to be maintained under most worst condition of temperature, wind etc. between any live part of the overhead equipment or pantograph and parts of any fixed structure (earthed or otherwise) or moving loads/rolling stocks shall be as under

- |                     |   |        |
|---------------------|---|--------|
| (i) long duration   | - | 250 mm |
| (ii) short duration |   | 200 mm |

**Note:**

- (a) Long duration means when conductor at rest and short duration means when conductor is not at rest
- (b) A minimum vertical distance of 270 mm shall normally be provided between rolling stock and contact wire to allow for a 20 mm temporary rising of the tracks during maintenance. Wherever the allowance required for track maintenance exceeds 20 mm the vertical distance between rolling stock and contact wire shall correspondingly be increased.
- (b) Where adoption of above clearances is either not feasible or involves abnormally high cost, reduced clearances as follows may be adopted with prior approval of the Chief Electrical Engineer(CEE) of the Railway concerned and provision of permanent bench mark to indicate the level of the track to be maintained.

| Minimum height from rail level to the underside of contact wire  |           |
|--|-----------|
| Under bridges and in tunnels   | 4.80 Mts. |
| In the open  | 5.50 Mts. |
| At level crossings   | 5.50 Mts. |
| In running and carriage sheds  | 5.80 Mts. |
| Maximum variation of the live conductor wire on either side of the centre line of track under static conditions. |           |
| On straight track  | 200 mm    |
| On curves  | 300 mm    |

#### **4.10 Schedule-II (Existing infringements of Schedule I which may be permitted to continue on existing 1676 mm gauge Railways)**

The following infringements of the dimensions prescribed in Schedule-I may, subject to such restrictions of speed as are considered necessary, be permitted on existing railways, it being understood that when structures are altered they will be rebuilt to comply with Schedule-I.

Dimensions marked (i) refer to the requirements for 3250 mm wide stock and those marked (ii) refer to the requirements for 3660 mm wide and 4725 mm high stock.

| <b>Clearance</b>   | <b>3250 mm wide stock</b> | <b>3660 mm wide and 4725 mm high stock.</b> |
|--|---------------------------|---|
| Minimum distance centre to centre of tracks  | 3660 mm                   | 4040 mm                                     |
| Minimum clear horizontal distance from centre of track to any fixed structure from rail level to 1065 mm above rail level  | 1675 mm                   | 1905 mm                                     |
| Minimum clear horizontal distance from centre of track to any fixed structure from 1065 mm above rail level to 3505 mm above rail level  | 1980 mm                   | 2135 mm                                     |
| Minimum clear horizontal distance from centre of track at 4265 mm above rail level   | 2055 mm                   | -   |
| Minimum clear height above rail level for a distance of 305 mm on either side of centre of track   | 4420 mm                   |   |
| <b>Station Yards:-</b><br>Minimum height above rail level for a distance of 1600 mm on either side of the centre of track, of a signal gantry or a foot over bridge in a passenger station | -                         | 5410 mm                                     |

**Note:** Extra clearance is required on curves.

**SCHEDULE OF DIMENSIONS**

**EXTRA CLEARANCES REQUIRED ON CURVES FOR HIGH SPEED ROUTES (160 KMPH)**

Note: For further details Indian Railways Schedule of Dimensions 1676 mm Gauge (BG) can be referred

| Degree of curvature | Radius of curve | Maximum permissible speed | Super-elevation | Extra clearance between structure and adjacent track |   |                             |                           | Extra clearance between adjacent track when there is no structure between track |  |
|---------------------|-----------------|---------------------------|-----------------|--|---|-----------------------------|---------------------------|---|--|
|                     |                 |                           |                 | Inside of curve                                      |   |                             | Out side of curve any ht. |   |  |
|                     |                 |                           |                 | Up to 840 mm above rail level                        | From 840 mm to 4420 mm above rail level | At 5410 mm above rail level |                           |   |  |
| 1                   | 2               | 3                         | 4               | 5  | 6                                       | 7                           | 8                         | 9   |  |
| Degree              | Meter           | Kmph                      | mm              | mm   | mm                                      | mm                          | mm                        | mm  |  |
| 1                   | 1750            | 158                       | 95              | 25   | 280                                     | 350                         | -                         | 130   |  |
| 1.5                 | 1167            | 145                       | 142             | 60   | 440                                     | 545                         | -                         | 190   |  |
| 2                   | 875             | 130                       | 164             | 85   | 520                                     | 640                         | 10                        | 230   |  |
| 3                   | 583             | 106                       | 165             | 100  | 540                                     | 665                         | 25                        | 265   |  |
| 4                   | 438             | 92                        | 165             | 115  | 555                                     | 680                         | 45                        | 295   |  |
| 5                   | 350             | 83                        | 165             | 130  | 570                                     | 695                         | 60                        | 300   |  |
| 6                   | 292             | 75                        | 165             | 145  | 590                                     | 710                         | 75                        | 360   |  |
| 7                   | 250             | 70                        | 165             | 165  | 605                                     | 725                         | 95                        | 395   |  |
| 8                   | 219             | 65                        | 165             | 180  | 620                                     | 740                         | 110                       | 425   |  |
| 9                   | 194             | 62                        | 165             | 195  | 635                                     | 755                         | 130                       | 460   |  |
| 10                  | 175             | 58                        | 165             | 210  | 650                                     | 770                         | 145                       | 490   |  |

DIAGRAM No. 1A (MODIFIED)  
1676 mm GAUGE

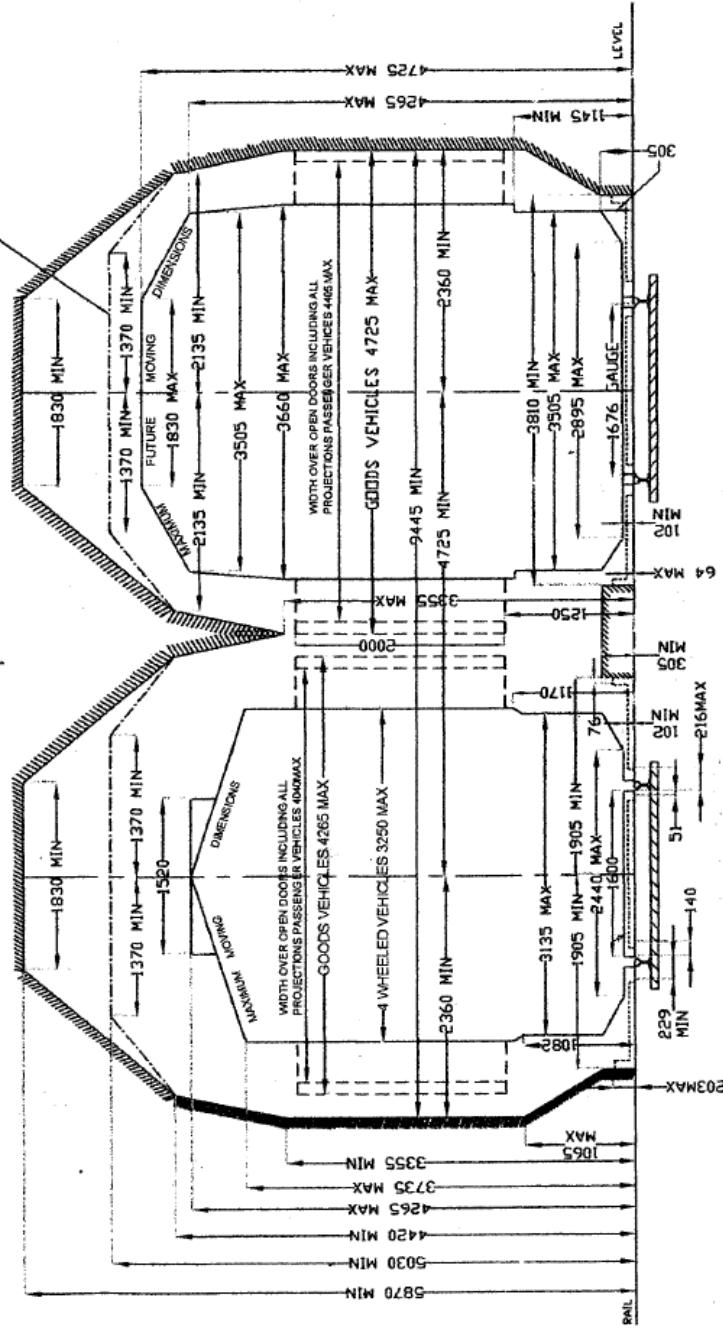
STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDERS BRIDGES

TO SUIT 25 k.V. A.C. TRACTION SCHEDULE I CHAPTER I

NOTE:-

THE DISTANCES SPECIFIED APPLY ONLY IN CASE OF STRAIGHT TRACKS ON CURVES,  
 THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW  
 FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING  
 FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPER-  
 ELEVATION AND 'G' THE GAUGE OF THE TRACK, ALL DIMENSIONS BEING IN METRES  
 $D = H \times S/G$

NOTE:- THIS CHAIN DOTTED LINE  
 INDICATES THE MINIMUM OUTLINE  
 WHERE ELECTRIC TRACTION IS NOT  
 LIKELY TO BE USED VIDE ITEM 13  
 NOTE (I) OF CHAPTER I SCHEDULE I

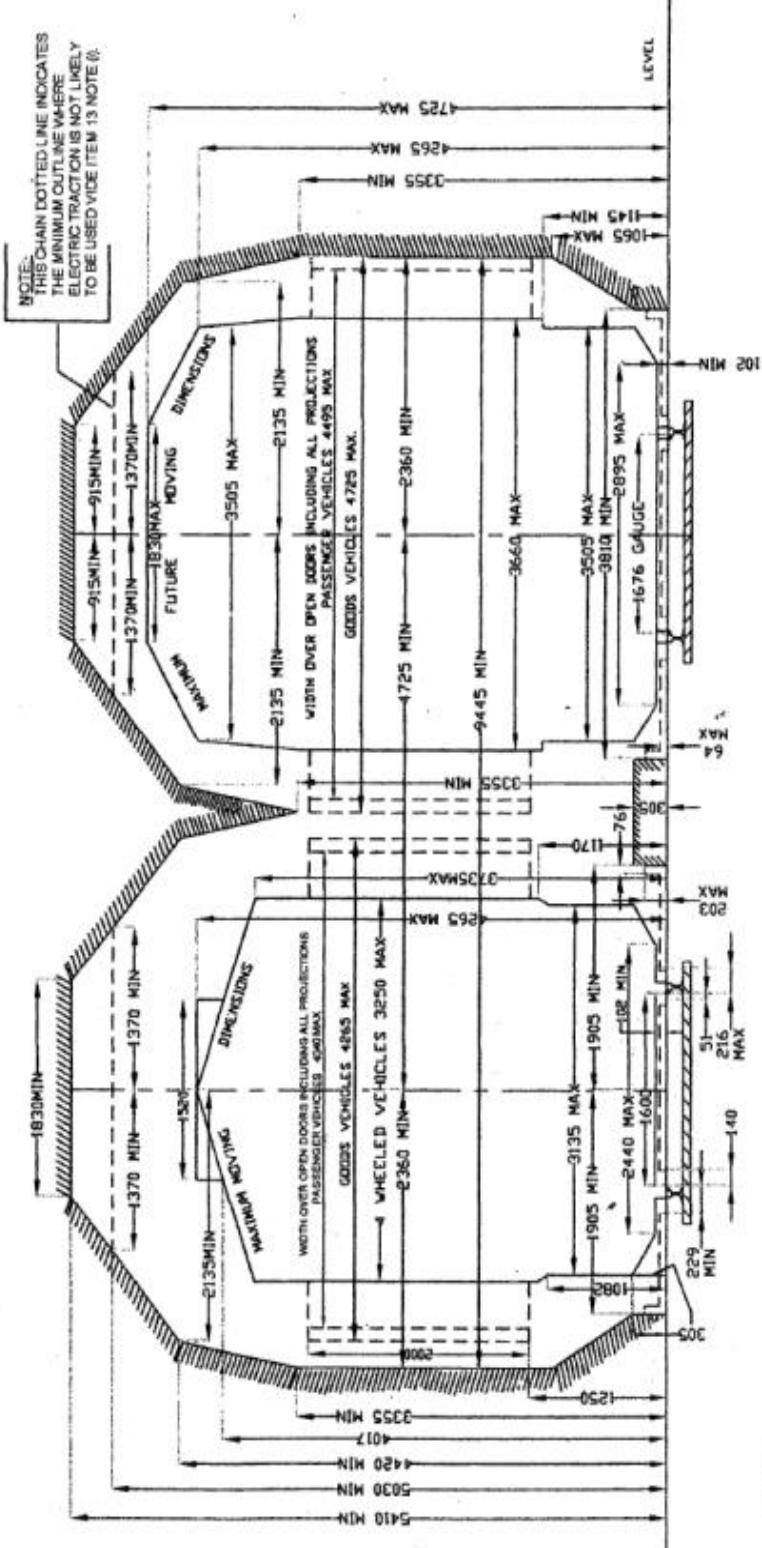


NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES

**STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES**  
**SCHEDULE I-CHAPTER I**

**NOTE:**  
 1. WHERE THE LINE IS ON A CURVE, THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.  
 2. WHEN RE-SPACING EXISTING LINES, THE MINIMUM DISTANCE CENTRE TO CENTRE OF TRACKS MAY BE REDUCED FROM 4725 TO NOT LESS THAN 4486 FOR THE PURPOSE OF AVOIDING HEAVY ALTERATIONS TO TUNNELS OR THROUGH GIRDER BRIDGES. THE 4725 DIMENSION IS TO BE ADOPTED FOR ALL NEW WORKS.

**DIAGRAM No. 1A**  
**1676mmGAUGE**



**DIAGRAM No. 1B  
1676 mm GAUGE**

**STANDARD DIMENSIONS OUT OF STATIONS  
SCHEDULE I - CHAPTER I**

**NOTE:-**

WHERE THE LINE IS ON A CURVE, THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX

NOTE-MINIMUM HEIGHT WHERE ELECTRIC TRACTION IS IN USE OR LIKELY TO BE INTRODUCED (ITEM 10 (i))

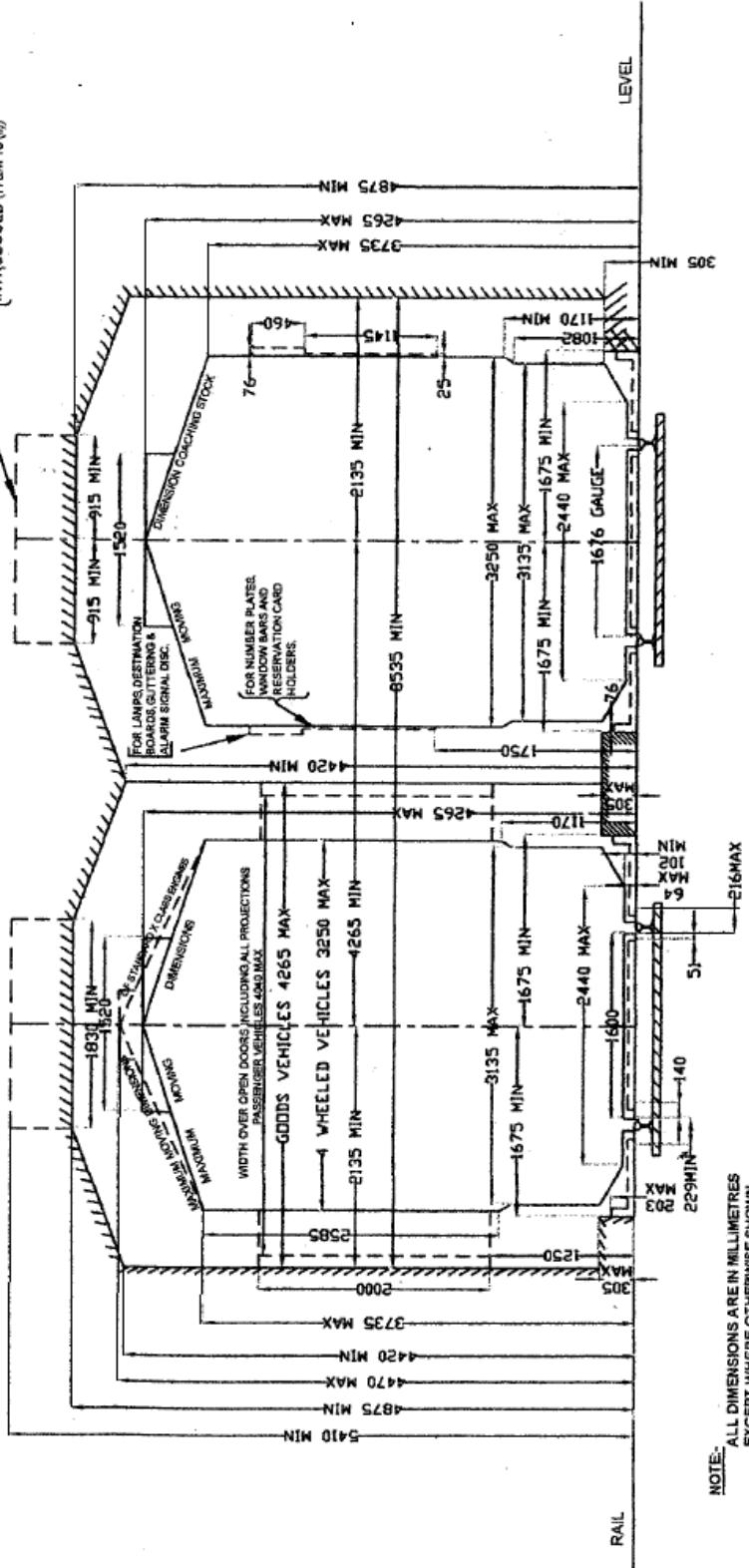


DIAGRAM No. 1C  
1676 mm GAUGE

STANDARD DIMENSIONS OUT OF STATIONS

TO SUIT 25 KV. A.C. TRACTION  
SCHEDULE I - CHAPTER I

NOTE:-  
THE DISTANCES SPECIFIED APPLY ONLY IN CASE  
OF STRAIGHT TRACK ON CURVES, THE HORIZONTAL  
DISTANCE SHOULD BE INCREASED BY AN AMOUNT  
'D' TO ALLOW FOR THE LEAN DUE TO SUPER-  
ELEVATION CALCULATED BY THE FOLLOWING  
FORMULA, WHERE 'H' IS THE HEIGHT OF THE  
CONTACT WIRE, 'S' THE SUPERELEVATION  
AND 'G' THE GAUGE OF THE TRACK, ALL  
DIMENSION BEING IN METRES

$$D = \frac{H \times S}{G}$$

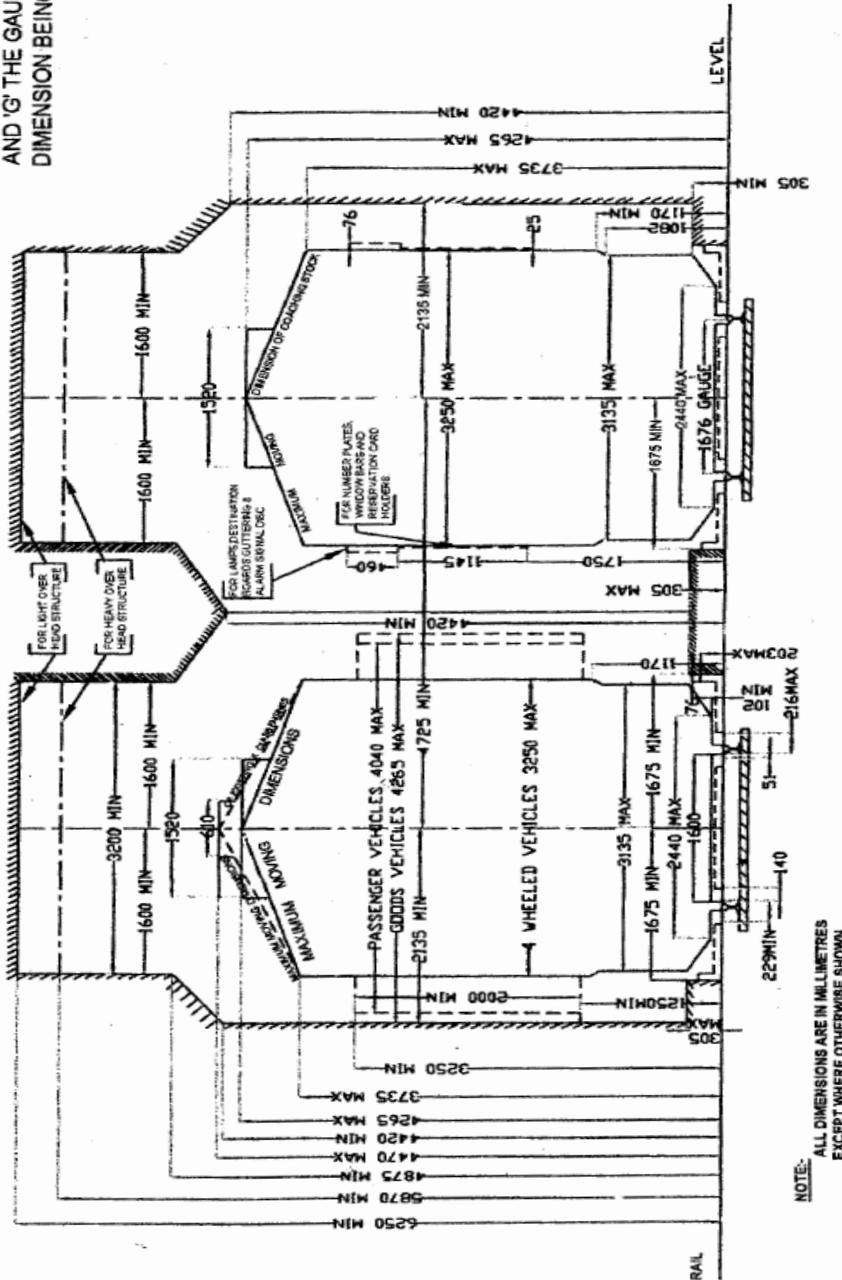
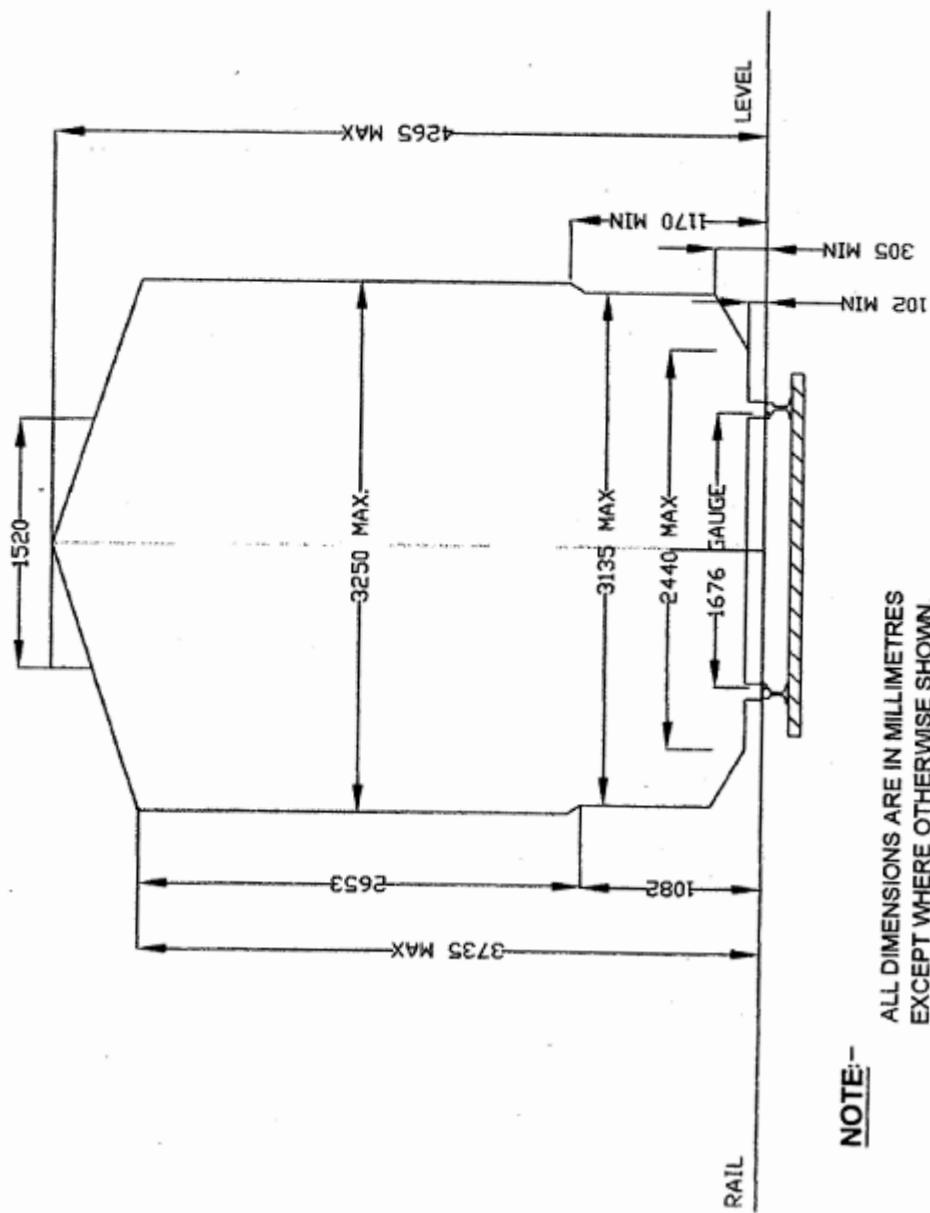


DIAGRAM No. 1D (EDOT-2202)  
1676mm GAUGE

### MAXIMUM MOVING DIMENSIONS

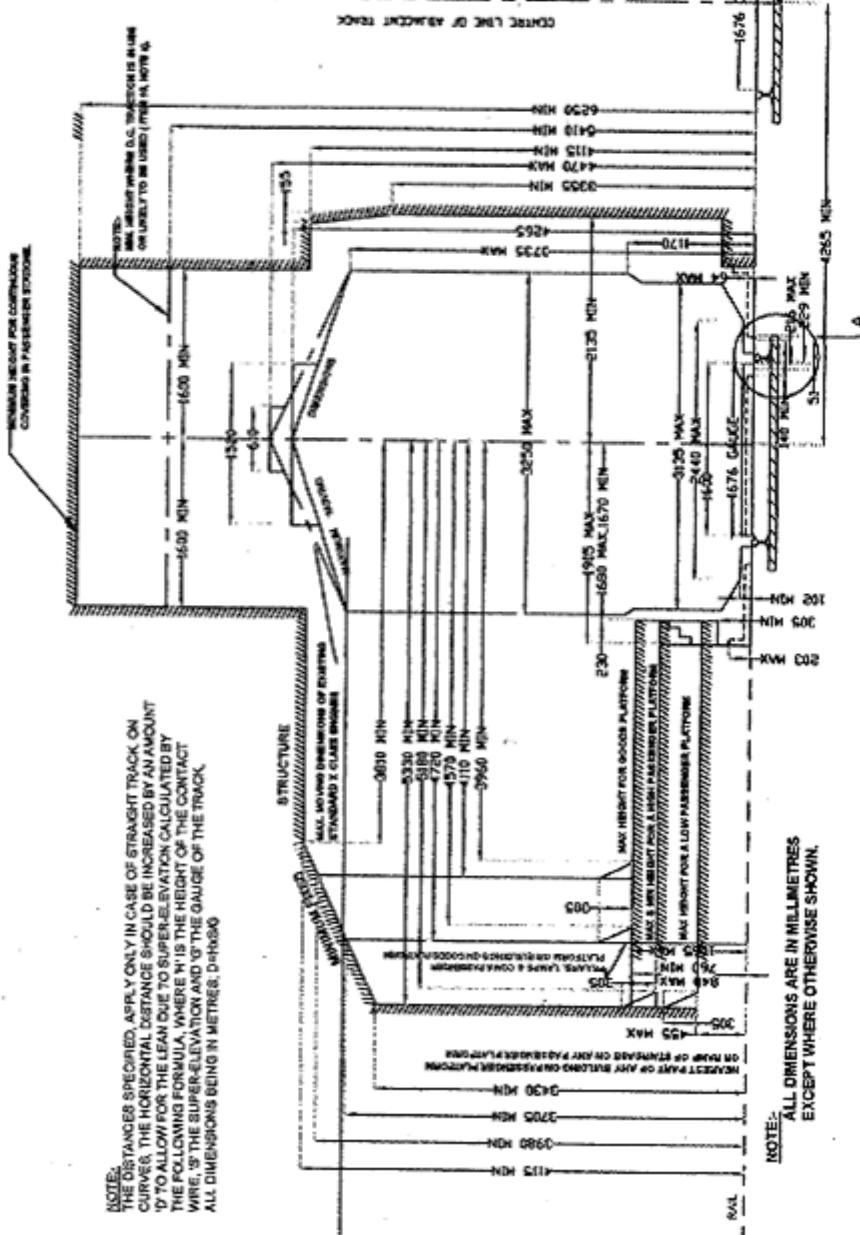


NOTE:-

ALL DIMENSIONS ARE IN MILLIMETRES  
EXCEPT WHERE OTHERWISE SHOWN.

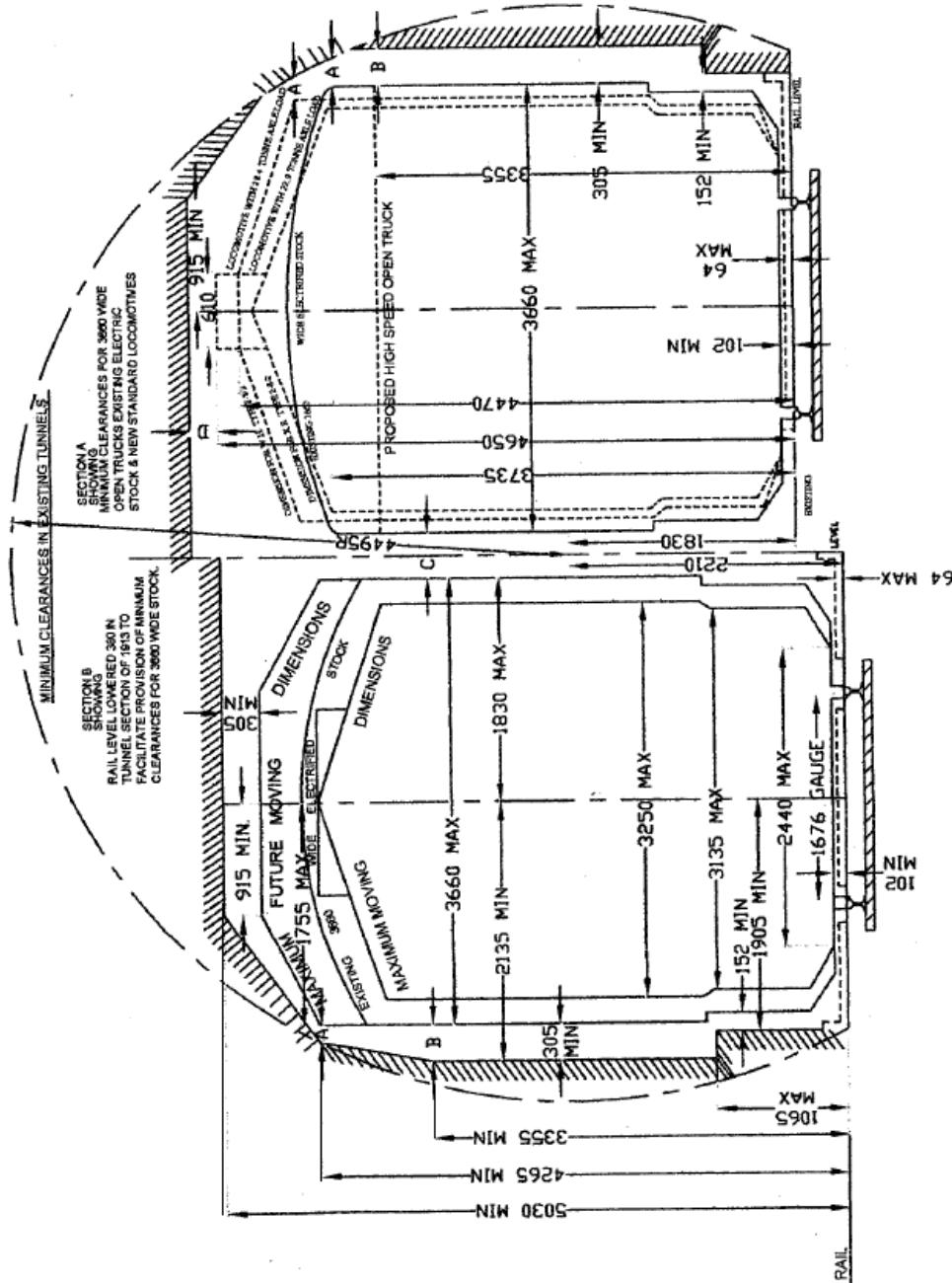
**DIAGRAM NO. 2**  
**1676 mm GAUGE**

**STANDARD DIMENSIONS IN STATIONS  
TO SUIT 25 KV.A.C. TRACTION SCHEDULE I-CHAPTER II**



FOR 3660 mm GOODS STOCK & NEW  
STANDARD LOCOMOTIVES IN EXISTING  
TUNNELS ONLY  
PERMITTED UNDER SCHEDULE-II

TUNNEL SECTION OF 1913



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES  
EXCEPT WHERE OTHERWISE SHOWN

## CHAPTER- 5: DRAWINGS, SPECIFICATIONS AND BOOKS OF REFERENCE

### CONTENTS

- Plan of New and working installations
- Standard Drawings
- Specifications
- Books of Reference
- Maintenance of Drawings, Specifications and Books of Reference

#### 5.1 Plan of New and working installations

##### 5.1.1 Preparation-General Procedure (SEM Part-I Ch. 8.1)

- (a) All plans shall be prepared in accordance with the instructions issued by the CSTE
- (b) The names of the junction or terminal stations should be noted on plans, that on the left hand side being the one from which the kilometer progressively increases. The names of the adjacent block stations and mid-section sidings should also be indicated on the plans as also their respective distances from the center line of the station for which the plan is prepared.
- (c) Standard drawings shall not be departed from without the specific permission of the CSTE
- (d) The S&T Engineer in-charge should ensure that drawings submitted with an estimate for a work are complete and include all information necessary
  - (i) For the proper understanding of the scheme, relevant notes being written on the drawings; and
  - (ii) For proper check of the design and estimate.

When part of the work has to be done to a standard plan or to an existing drawing, the fact should be stated. Such drawings need not be reproduced. If part of the information necessary has to be supplied by another department, the officer-in-charge should obtain and incorporate the details on the drawing.

- (e) The north point should be shown on every signalling plan.
- (f) All drawings should be quoted by number in their proper place in the estimate and in the covering letter accompanying the estimate.
- (g) Tentative signalling plans prepared for estimating purposes should bear the legend : "Tentative-For estimating purposes only". Tentative signalling plans issued for tender purposes should bear the legend : " Tentative-For tender purposes only". Tentative signalling plan sent to Divisions for comments should bear the legend : " Tentative-For comments only ". All tentative plans should be signed by at least a Senior Scale Officer.

### 5.1.2 Plans for other Departments (SEM Part-I Ch.8.2)

- (a) The DSTE/Sr.DSTE may at his discretion prepare sketches for officers of other Departments or for Deposit Works. No detailed plans for Deposit Works should be prepared except on receipt of orders from the CSTE
- (b) The DSTE/Sr.DSTE should obtain complete details from officers of other Departments when preparing plans that affect those departments and embody their requirements on the plans, if considered necessary. He should arrange for the plans, to be signed by the representative of the department concerned in token of approval.

### 5.1.3 General Practice and Sizes of Drawings (SEM Part-I Ch.8.3)

- (a) The code of practice for general engineering drawings and the standard sizes of drawings shall be followed as far as practicable.
- (b) In preparing plans or making Ferro prints, wastage of drawing paper, tracing paper and Ferro paper should be avoided.
- (c) The following considerations govern the size of a drawing
  - (i) Folding, approximately to foolscap size to accompany correspondence and reports.
  - (ii) The commercial size of drawings, tracing and Ferro paper rolls.
- (d) The following sizes may be adopted

| <b>Types of Drawings</b>   | <b>Size</b> | <b>Measurement Including Border</b> | <b>Border</b> |
|----------------------------|-------------|-------------------------------------|---------------|
| Sketches                   | A-4         | 210 mm X 297 mm                     | 10 mm         |
| Locking Table              | A-3         | 297 mm X 420 mm                     | 10 mm         |
| Selection Table            | A-3         | 297 mm X 420 mm                     | 10 mm         |
| Circuit Diagram            | A-3/<br>A-2 | 297 mm X 420 mm/<br>420 mm X 594 mm | 10 mm         |
| Power Supply Diagram       | A-3         | 297 mm X 420 mm                     | 10 mm         |
| Track Circuit Bonding Plan | A-3         | 297 mm X 420 mm                     | 10 mm         |
| Cable Termination Plan     | A-3         | 297 mm X 420 mm                     | 10 mm         |
| Operating Panel            | A-3         | 297 mm X 420 mm                     | 10 mm         |
| Signalling Plan            | U           | 297 mm X any length                 | 10 mm         |
| Locking Diagram            | U           | 297 mm X any length                 | 10 mm         |
| Cable Core Chart           | U           | 297 mm X any length                 | 10 mm         |
| Cable Route Plan           | U           | 297 mm X any length                 | 10 mm         |

On left hand side of each drawing, an extra margin of 30 mm should be allowed for binding. All the tracings shall be prepared on 85/90 g.s.m (grams per square meter) tracing paper.

- (e) Drawings for a large project should be bound together, each such drawing should be marked as sheet 1,2 and so on as also the total number of sheets (e.g., 1/3, 2/3, 3/3) and bear in the proper place, the separate numbers by which each is identified. These numbers should be entered in the Office Register of Drawings and should also be marked on the outside bindings.

#### 5.1.4 Titles and numbering of Drawings (SEM Part-I Ch.8.4)

- (a) The title and number may be placed at the bottom right hand corner of the plan, sufficient space being left for "Notes" to be entered as necessary.
- (b) Drawings pertaining to any station, viz., Signalling plans, Locking Tables/Selection Tables, Locking diagrams, wiring diagrams etc. shall bear the same number.,
- (c) If more than one sheet is used for a particular work, each must be distinguished by the sheet number as indicated in Para 5.1.3 (e) the title may be placed below the number. If the drawing cancels the previous one, a note to this effect and the number of the cancelled drawing should be recorded at the right hand top corner of the drawing.
- (d) Every plan should bear in small letters at the lower left hand corner, the name and initials of the Technical Assistant or Superintendent, Drawing Office, Head Draftsman/ Draftsman and Tracer who prepared and checked the plan.
- (e) All signatures in tracings should be in indelible ink. All signatures should be dated with date month and year.

##### 5.1.4.1 Scale of Drawings (SEM Part-I Ch.8.5)

It is desirable that signaling plans are prepared to the scales-

- 1) 10 m. to a Centimeter (1/1000) longitudinal ;
- 2) 5 m. to a centimeter (1/500) transfers.

#### 5.1.5 Details on Drawings (SEM Part-I Ch.8.6)

- (a) All dimensions and distances shall be written carefully upon that part of the drawing to which they refer. The distance to be embraced by the figures shall be indicated by arrowheads. Figuring and descriptive matter should be so printed that without moving the plan, it can be read with ease.
- (b) The information to be shown on signalling plans: - *Please refer Chapter 6 of the book*

#### 5.1.6 Check and issue of Drawings (SEM Part-I Ch.8.7)

- (a) Signalling Plans and Locking Tables/Selection Tables shall be checked in full by both Assistant Signal and Telecommunication Engineer (ASTE) and Sr.DSTE before they are approved and signed by an officer in Junior Administrative Grade (JAG) or above, as authorised by the CSTE.
- (b) Locking Diagram for lever frames having more than 50 levers shall checked in full by both ASTE as well as by SSTE and shall be approved by a JAG officer or above as authorised by CSTE. Locking Diagram for lever frames having up to 50 levers, cable plans and power supply distribution diagrams shall be checked in full by ASTE before they are approved and signed by DSTE/ Sr.DSTE.
- (c) Circuit Diagrams for inter-cabin control and automatic signalling shall be checked in full by ASTE and Sr.DSTE before they are approved and signed by Dy.CSTE. Detailed wiring diagrams for individual stations prepared on the basis of these typical circuit diagrams should be checked in full by ASTEand DSTE or Sr.DSTE who may approve and sign them.
- (d) For major signalling schemes, including power and electro-mechanical signalling

(i) Typical circuit diagrams for various circuit elements, such as route locking, approach locking, sectional route release, point control, interlocking relay control, signal proving and lighting, etc., will be checked in full by both DSTE/Sr.DSTE and Dy.CSTE before they are approved and signed by CSTE

(ii) The detailed circuit and wiring diagrams, including those submitted by the contractors or firms for individual schemes shall be checked in full by both ASTE and DSTE/Sr.DSTE before they are approved and signed by an Officer in JAG or above, authorised by the CSTE

#### **5.1.7 Completion Drawings(SEM Part-I Ch.8.8)**

(a) The Signal and Telecommunication Engineer in-charge of construction should submit signed Ferro copies to the CSTE for works completed. These should indicate the work as actually carried out including the dimensional details as actually measured at site, location of signals, details of cables laid, wiring diagram, locking diagram etc.

(b) On receipt of these drawings, the original tracings will be amended in the Office of CSTE and marked "Completion Drawing". Requested number of copies of the completion drawing will be sent to the office of DSTE

#### **5.1.8 Supply of Plans (SEM Part-I Ch.8.9)**

(a) Plans of working installations - In addition to the Standard Drawings, each DSTE/ASTE shall have copies of the following diagrams and charts of working installations:

- (i) Engineering Plan and Signalling Plan for each interlocked station including interlocked level crossings situated outside station limits and interlocked mid-section sidings.
- (ii) Working Rule diagram where issued for each station including interlocked level crossings outside station limits.
- (iii) Locking Tables and Locking Diagrams of each interlocking frame, Station Master's slide control frame, interlocking key box, and lever frame with mechanical locking.
- (iv) Selection Tables for each electro-mechanical / Relay interlocked station
- (v) Panel diagram
- (vi) Diagrams of track circuits for each yard showing complete layout and diagrams of individual track circuit showing location of insulation joints, jumpers, relay and feed ends, polarity, length, traction, bonds, etc.
- (vii) Diagrams of connections at track, line and other relays, as necessary for each track circuited yard.
- (viii) Diagram of electrical signalling and power signalling circuits for each yard.
- (ix) Diagrams of single and double line block instrument circuits
- (x) Diagrams of Location/Junction Boxes showing description of wires at terminals for each yard.
- (xi) Arrangement of relays in relay racks and contact analysis sheet for relay interlocked stations.
- (xii) Diagrams showing connections of power supply panels for each power supply installation.
- (xiii) Cable route plan showing disposition of underground cables for each yard

- (xiv) Disposition charts of overhead lines for control telephones block instruments, administrative trunks, telegraph and other railway circuits.
- (xv) Disposition charts of overhead lines for circuits such as electrical reverses, key transmitters and other circuits under the charge of each inspector.
- (b) JE(S) and SSE(S) shall be supplied with copies of the above mentioned drawings and charts.
- (c) At stations provided with electromechanical signalling or centralised operation of points and signals, a set of signalling plans, locking / selection tables, locking diagrams, wiring diagram, cable route plan etc. may be kept for reference of the maintenance staff.
- (d) While signalling plans, locking tables, selection tables and wiring diagrams shall be supplied by Headquarters Office, other plans mentioned in Para 5.1.8 (a) shall be prepared by DSTE (Construction) or (Maintenance) as the case may be. Signalling plans for non-interlocked stations shall be prepared by DSTE (Construction) or (Maintenance) as the case may be.

#### **5.1.9 Care and Filing of Tracings /Auto CAD files (SEM Part-I 8.Ch.10)**

- (a) Tracings should be guarded against by moths and white ants. Tracings shall not be used for reference, as they may get lost or damaged. Required number of Ferro-prints should be supplied to Officers and Inspectors. Each particular file should contain a Ferro print of the works relating to it.
- (b) Should it be necessary to send a tracing from one office to another, it shall be rolled and inserted in a cardboard cylinder.
- (c) Ferro should be folded carefully. The folding should be arranged so as to make visible the title of the plan without unfolding the plan. When prints are rolled for dispatch, they should be rolled with the working side outwards.
- (d) The records section of each Drawing Branch may file every tracing and original drawing on the basis of the subject classification and the index card filing system. Each drawer of the index card cabinet should be distinguished by a classification number. Each card should be complete as regards title of the drawing, other connected drawings, file reference and the drawer number in which the original is stored.
- (e) The storage drawers should have placards on the outside indicating the contents in each. The plans should be stored flat in shallow drawers of convenient dimensions. Probability of damage from nests.
- (f) Where drawing files are maintained on computer in Auto CAD or any other format, they shall be preserved folder wise and title name suitably named after stn to which they are related. Suitable backups be taken on CD/DVD to safeguard against loss of data.

## Standard Drawings

### 5.2.1 Indian Railway Standard Drawings (SEM Part-I 8.Ch.11)

(a) Indian Railway Standard Drawings, designated by the code word IRS have been issued by the Director-General, Research Designs and Standards Organization (RDSO), Ministry of Railways, Lucknow. The signal drawings are marked IRS (S) where "S" stands for "Signal". The particulars of the drawings and their reference numbers are detailed in an "Index of Indian Railway Standard Signalling and Interlocking Drawings-IRS.(S)". This index shows all the IRS.(S) drawings arranged alphabetically, as well as serially, in the order of their numbers. Each drawing number is either prefixed with letters 'SA' or letter 'S'. The letter 'SA' stands for a signal assembly and 'S' stands for a part of a signal assembly.

New designs and drawings which are accepted for adoption as standards have the word 'Advance' suffixed to their number e.g. S: 6085 (Advance), pending their final adoption as Indian Rly. Standard drawing. The drawings are prepared in the first instance by the RDSO and circulated to the Railways for offering their comments. The drawings together with the comments are put up for discussion before the Signal Standard Committee SSC who, if considered in order, will recommend that the particular drawing be issued as "Advance Standard". The Railway Board will order whether it is acceptable or not. When Railway Board orders, the drawing is issued as "Advance Standard".

The word Advance is deleted when no further comments are received and when the design is seized.

(b) New designs and drawings which are accepted for adoption as standards have the word "Advance" suffixed to their number e.g. S-8716 (Advance), pending their final adoption as Indian Railway Standard Drawings. For such drawings the manufacturers shall have a sample approved by the purchaser before undertaking the bulk manufacture.

### 5.2.2 Supply of Standard Drawings (SEM Part-I Ch.8.12)

(a) A set of all IRS(S) drawings shall be supplied to the office of each DSTE, ASTE and to each JE/SSE(S) as required.

(b) IRS drawings should not be traced by the Zonal Railway. Copies in reproduction tracings should be obtained from the Director General, Research, Designs and Standards Organization (Signal and Telecommunication), Ministry of Railways, Lucknow, whenever required.

#### (c) Colpur codes for making additions/alterations/proposals on the plans

- Red      additions/ proposals
- Yellow    removal
- Green     Work to be carried out in the next phase.

**Complete list of IRS Specifications of Signal Directorate can be accessed at  
[www.rdsd.gov.in/specification/index.html](http://www.rdsd.gov.in/specification/index.html)**

### **5.3 Specifications**

#### **5.3.1 Indian Railway Standard Specifications (SEM Part-I Ch.8.13)**

Specifications for materials used for signalling purposes have been drawn out by the Director General, Research, Designs and Standard Organisation (DG/RDSO), Ministry of Railways, Lucknow and are titled as "Indian Railways Standards Specifications". The procedure for issuing a new specification is the same as that of the new drawings. Tentative specifications are drawn out by RDSO and circulated to Railways for comments. Later on the same is discussed in SSC and the SSC will recommend to the Railway Board that the specifications be accepted as Tentative Standard. The same are issued as tentative standard specification by RDSO, when approved by Board. These specifications are issued under a fixed serial number e. g. S-12-54, the letter " S " denoting " Signals " the number " 12 " representing the serial number of the specifications and the final number " 54 " indicating the year of original adoption as standard, or in the case of revision, the year of last revision.

#### **5.3.2 Other Specifications (SEM Part-I Ch.8.14)**

Specifications issued by the British Standards Institution, the Indian Standards Institution and the British Railway have also been adopted for items of equipment used for signalling purposes for which no IRS specifications exist.

#### **5.3.3 Supply of Specifications (SEM Part-I Ch.8.15)**

Each DSTE and ASTE should have a copy of all Indian Railway Standard (Signal) specifications in his office. Copies of such British Standard and Indian Standard specifications that are generally required may also be kept. He should also have a copy of all specifications issued by CSTE.

#### **5.3.4 Availability (SEM Part-I Ch.8.16)**

- (a) Indian Railway Standard Specifications are obtainable from the Manager of Publications, Civil Lines/Delhi-6.
- (b) Indian Standard Specifications are obtainable from the Indian Standards Institution, Manak Bhavan, Bahadur Shah Zafar Marg, New Delhi, or its branch offices at Mumbai, Calcutta, Madras, Hyderabad, Kanpur and Bangalore.
- (c) British Standard Specifications may be purchased from Indian Standard Institution offices at New Delhi, Mumbai, Calcutta and Madras.

### **5.4 Books of Reference (SEM Part-I Ch.8.17)**

#### **5.4.1 Books of Reference-Scale of**

Books of reference should be supplied to officers, inspectors and maintainers for their personal use, as well as for use in their offices. A statement showing the various books and their distribution is given in Annexure-36 SEM Pt-I

#### **5.4.2 Reports of Signal Standards Committee, Technical papers and Journals (SEM Part-I Ch.8.23)**

Each DSTE should arrange to have the under mentioned technical literature in the Divisional Library

- (a) Reports of the Signal Standards Committee.

- (b) Proceedings and Technical papers issued by the Institution of Railway Signal and Telecommunication Engineers, New Delhi.
- (c) Relevant IRS Specifications, British Standard Specifications, Indian Standards Specifications etc.
- (d) Quarterly Technical Bulletin and other technical papers on Signalling and Telecommunication matters published by the Research, Designs and Standards Organization / Lucknow.
- (e) Notes published by Indian Railways Institute of Signal Engineering and Telecommunications, Secunderabad.
- (f) Technical books and journals of interest on Signalling and Telecommunication.

## 5.5 Maintenance of Drawings, Specifications and Books of Reference

### 5.5.1 Folders

Standard drawings, plans of working installations and specifications should be maintained in a book form separately bound in suitable folders.

### 5.5.2 Addenda and Corrigenda (SEM Part-I Ch.8.20)

- (a) IRS Drawings and Specifications - A quarterly notification is issued by the Director General, Research, Designs and Standards Organization which gives the details of the new Indian Railway Standard Specifications and drawings issued. It also gives the details of those, which have either been modified or cancelled during the quarter covered by the notification.
- (b) British Standard Specifications - British Standard Year Book is published by the British Standards Institution, Victoria Street, London. It contains a list of up-to-date British Standards in numerical order and also gives a brief description of each.
- (c) Indian Standards Specifications - The ISI Hand Book of Publications contains up to date list of Indian Standards and is available from the Indian Standards Institution, Bahadur Shah Zafar Marg, New Delhi, or any of its branch offices at Bombay, Calcutta, Madras, Hyderabad, Kanpur and Bangalore.
- (d) Standard Drawings and Plans of working Installations - Railway should publish lists of standard drawing as also lists of plans of working installations for the information of the staff. Addenda and Corrigenda slips should be issued to these lists regularly once in six months incorporating particulars of drawings and plans issued / modified / cancelled.
- (e) Books of reference - Addenda and Corrigenda slips to the books of reference are issued from time to time by the Railway Board and the Railways, as the case may be.

### 5.5.3 Accountal(SEM Part-I Ch.8.21)

All Indian Railway Standard Drawings and Specifications, British Standard and Indian Standard Specifications as well as books of reference must be accounted for in the same way as tools and plant items.

#### 5.5.4 Responsibility(SEM Part-I 8.Ch.22)

- (a) All officials to whom books of reference have been supplied shall be responsible for
  - (i) Their safe custody and good order
  - (ii) Pasting all addenda and corrigenda slips promptly and seeing that these are up to date to the last slip as modified from time-to-time.
  - (iii) Returning all books issued to them for personal use prior to retirement.
- (b) Each supervisor shall be responsible to see that
  - (i) The standard drawings and plans of working installations are properly maintained and kept up to date in respect of new drawings issued and old ones cancelled.
  - (ii) The staff working under him understand and carry out work in accordance with standard drawings and plans of working installations. Any mistake in drawings and plans that may come to his notice should be promptly intimated to the DSTE for arranging correction.
  - (iii) The staff under them maintains their books of reference up to date and in good order.
- (c) Each DSTE shall be responsible to see that
  - (i) The standard drawings, plans and specifications in his custody are kept up-to-date and that the obsolete and cancelled ones are destroyed.
  - (ii) All supervisors keep their standard drawings and plans up to date
  - (iii) The staff properly understands and carries out work in accordance with the standard drawings and plans.
  - (iv) Any mistake in the standard drawings, working plans and specifications, which come to his notice, is promptly intimated to the CSTE for arranging necessary correction.
  - (v) Every DSTE shall make periodical check to see that JE/SSE(S) maintain their books of reference up-to-date and in good order. He should encourage his supervisors and other staff to study relevant reports, proceedings, papers and journals so as to enhance their knowledge and to keep them informed about the up to date developments, methods and techniques in Railway Signalling and Telecommunications.

### 5.6 Indian Railway Standard Equipment

#### 5.6.1 Indian Railway Standard Designs

Where Indian Railway Standard Designs exist, they should invariably be followed for all new works and no modification of such designs should be introduced without the previous approval of the Railway Board.

If any defect in standard designs is noticed under service conditions or if certain modifications to the design are considered desirable, the matter should be brought to the notice of the Director General, RDSO for examination in consultation with the Signal Standard Committee.

### SUMMARY

| <b>Sl.<br/>No</b> | <b>Description of work</b>  | <b>Checked and approved by</b>   |
|-------------------|---|--|
| 1.                | Signalling Plans (IP), Locking Tables (LT) and Selection Tables   | Approved by CSTE (OR) Dy. CSTE   |
| 2.                | Locking chart (Dog Chart) Prepared on the Basis of approved locking Table, cable plan, Power supply Distribution, etc.  | Above 50 levers: As item 1 above<br>up to 50 levers – checked in full by ASTE<br>Approved by: DSTE/SSTE  |
| 3.                | Typical wiring diagrams such as inter-cabin Slotting, Auto signalling, Track Circuit, Indication circuit etc.   | Checked in full by: ASTE and SSTE<br>Approved by: Dy CSTE  |
| 4.                | Detailed wiring diagrams for individual stations Prepared on the basis of approved Typical wiring diagrams.   | Checked in full by: ASTE Checked and approved by DSTE/SSTE   |
| 5.                | Typical circuit diagrams for various circuits Such as route locking, approach locking, Sectional route release, point and Signal control, lamp proving circuits, relay interlocking Circuits etc. | Checked in full by: DSTE/SSTE and Dy.CSTE Approved by : CSTE   |
| 6.                | Detailed circuit and wiring diagram based on Typical diagram including those submitted by contractors and Firms.  | Checked in full by: DSTE/SSTE and Approved by : Dy.CSTE/Sr.DSTE (Authorised by) CSTE   |
| 7.                | Signal Sighting committee report  | To be submitted after jointly inspected and signed by SSE(S), SSE(LOCO) and Traffic inspector (Optg.)And then only bring the signal(s) or installation into use. |
| 8.                | Type of Block Instruments   | Approved by CRS  |
| 9.                | IRS Drawings should not be traced by Zonal/Divl.Railways. copies in reproduction tracing should be obtained from DG/RDSO/LKO  |  |

## CHAPTER- 6: LAYOUTS OF YARDS AND PERMANENT WAY

### CONTENTS

- Permanent Way: Gauge tolerances, classification of routes on IR, rail sections, creep, gradient, curves and superelevation, point and crossing
- Engineering Plan
- Signalling Plan
- Station Working Rules (SWR)
- Essential Requirements Before Interlocking a Point

### 6.1 Permanent Way

Permanent way is the track or railroad on which rail vehicles i.e. rolling stock runs. The **permanent way** means the physical elements of the railway line itself: generally the pairs of rails typically laid on sleepers embedded in ballast, intended to carry the ordinary trains of a railway. It is described as permanent way because in the earlier days of railway construction, contractors often laid a temporary track to transport spoil and materials about the site; when this work was substantially completed, the temporary track was taken up and the permanent way installed.

The clear distance between the running faces of the rails is called "the gauge". The following gauges are in use over Indian Railways

|              |         |
|--------------|---------|
| Broad Gauge  | 1676 mm |
| Meter Gauge  | 1000 mm |
| Narrow Gauge | 762 mm  |

The two parallel rails forming a track have to be kept at an exact distance apart. This is done with the help of sleepers. The chief functions of sleepers are to support rails, distribute the load from the rails to the ballast and keep the two rails of a track to correct gauge. The sleeper density is the number of sleepers used per rail length and is described as M+1, M+2 etc., where M is the length of standard single rail in meters. In case of LWR (long welded rail) and CWR (continuous welded rail) this is expressed as the number of sleepers per Km of track. The sleeper density is fixed duly taking into consideration the maximum permissible speed and the traffic density of the section. It varies between 1660 to 1310 in nos. per KM for BG. In case of MG it varies from M+7 to M+3.

PSC sleepers, wooden sleepers, cast iron sleepers and steel trough sleepers are available on IR system. However, PSC sleepers only are being used these days on all important routes as they offer a number of distinct advantages over other types of sleepers.

#### 6.1.1 Gauge Tolerances Allowed

**Gauge on straight and curves:** The gauge shall be as follows: (as per SOD 2004)

##### **(a) Broad Gauge**

- (i) On straight line including curves of 350 m or more : -5 to +3mm (1671 to 1671mm)
- (ii) On curves with radius less than 350 m : up to +10 mm

**(b) Meter Gauge**

- |   |                   |
|---|-------------------|
| (i) On straight line:                       | - 3 mm to + 6 mm  |
| (ii) On curves with radius 290 m or more:   | - 3 mm to + 15 mm |
| (iii) On curve with radius less than 290 m: | up to +20 mm      |

**(c) Narrow Gauge**

- |   |                  |
|---|------------------|
| (i) On straight line:                       | -3 mm to 6 mm    |
| (ii) On curves with radius 175 m or more:   | -3 mm to + 15 mm |
| (iii) On curve with radius less than 175 m: | up to + 20 mm    |

| RADIUS IN METERS   | GUAGE          |
|--|----------------|
| <b>a) Broad Gauge (1676 mm.)</b>                           |                |
| i) Straight including curves of radius up to 350m.and more | -5mm. to +3mm. |
| ii) For curves of radius less than 350m                    | Up to +10mm.   |
| <b>b) Meter Gauge (1000mm.)</b>                            |                |
| i) On straight including curves with radius 290m. and more | -2mm. to +3mm. |
| ii) On curves with radius less than 290m.                  | Up to +10mm.   |
| <b>c) Narrow Gauge (762mm.)</b>                            |                |
| i) Straight including curve with radius up to 400m.        | -3mm. to +3mm. |
| ii) For curves with radius less than 400m. and up to 100m. | Up to +10mm.   |
| iii) Curves with radius less than 100m.                    | Up to +15mm.   |

**6.1.2 Classification of Routes**

The permanent way sections are classified by IR according to the maximum speed proposed for the immediate future that the tracks are capable of supporting. In most cases this classification is an indication of the priority of the route and IR's plans for it in the future, rather than an indication of the speeds allowed on it today. Also, some small stretches of a line may have much higher (or lower) allowed speeds than the classification of the line might indicate because of local conditions, ghat sections, curves, etc.

#### LAYOUTS OF YARDS AND PERMANENT WAY

(a) On Indian Railways Broad Gauge (BG) lines have been classified as follows

| Route           | Description  | Example   |
|-----------------|--|---|
| A               | BG sections for speeds up to 160 km/h  | Chennai-Vijayawada-Nagpur-NewDelhi                        |
| B               | BG sections speeds up to 130 km/h  | Vijayawada-Howrah   |
| C               | Suburban sections of metropolitan cities   | Suburban sections of Bombay, Sealdah, Howrah, Chennai etc |
| D-special class | BG lines rated up to 100 km/h, with high traffic density or high expected growth in traffic  | Moulali-Sanatnagar bypass                                 |
| D class         | BG lines rated up to 100 km/h  | Vikarabad-parli, Kakinada-Samalkot                        |
| E-special class | BG lines with sanctioned speeds below 100 km/h, with high traffic density or High-expected growth in traffic   |   |
| E class         | This class includes all other BG lines with sanctioned speeds below 100 kmph   | Bhimavaram-Narsapur Gudivada-machilipatnam                |
| Class 'Q'       | MG: These are MG lines rated for speeds above 75 km/h and traffic. Generally above 2.5 GMT. Some routes (such as Delhi - Jaipur) allowed speeds up to 105 km/h or so (Pink City Exp., etc.) and had concrete sleepers and welded rails |   |
| Class 'R'       | These are MG lines rated at up to 75 km/h. This category is further broken down into three classes based on traffic density: R-1 (traffic above 5 GMT/year), R-2 (traffic above 2.5 GMT/year) and R-3 (traffic above 1.5 GMT/year)     | Akola -Khandwa  |
| 'S' Routes      | These are all the remaining MG lines rated for below 75 km/h and/or with low traffic densities (below 1.5 GMT/year)  |   |

**Note: There are no classifications like the above for narrow gauge tracks.**

#### 6.1.3 Rail Sections

Rail sections are normally selected to suit the standard of loading and the speeds. In case of BG, 60 Kg rails (weighing 60 Kg per meter) are used on the routes where traffic density is more than 20 GMT (Gross Million Tones) whereas 60 Kg/52 Kg rails are used on other routes. 90 R rails (weighing 90 pounds per yard) are generally used for loop lines on all the routes. On MG routes, 90 R/75 R/ 60 R rails are used depending upon traffic density and speed.

Three types of rails are in use on the Indian Railways. They are (i) Double headed rails (ii) Bull headed rails and (iii) Flat footed rails. Of these, flat-footed rail is the most commonly used.

The two parallel rails forming a track have to be kept at an exact distance apart. This is done with the help of sleepers. The chief functions of sleepers are to support rails, distribute the load from the rails to the ballast and keep the two rails of a track to correct gauge.

#### 6.1.4 Creep

Creep is the longitudinal movement of rails in a track. It is caused by the tendency of the rails to move gradually in the direction of the dominant traffic. It is believed to be caused by the pushing out of the yielding track by the moving load, increased by braking loads, and by the impact of the wheels on the running-on ends of the rails, particularly at times when they are in a state of expansion or contraction. The following are some of the avoidable causes to which creep can be attributed (written by/said by).

- (a) Rails not secured properly to sleepers
- (b) Poor / Insufficient ballast
- (c) Inefficient / Badly maintained rail joints
- (d) Rails too light for the traffic they carry
- (e) Decaying or unevenly spaced sleepers
- (f) Improper drainage
- (g) Loose or uneven packing etc

Effects of creep are

- (a) Sleepers getting out of square
- (b) Distortion of gauge
- (c) Loosening of joints
- (d) Shearing and breaking of spikes, bolts and fish plates
- (e) Buckling (in extreme cases)

The above factors affect point fittings and track circuiting and are likely to cause signal failures also.

**Creep Indicator:** The amount of creep is recorded by measuring the movement of the rails. Creep indication posts are erected square to the track on either side of the track on the cess at intervals of about 1 Km. these are generally unserviceable rail posts with chisel marks square to the joints. The top of the post is kept about 25 mm above the rail level and the amount of creep in either direction is measured with a fishing cord stretched over the chisel marks. Creep in excess of 150 mm is not to be permitted.

#### 6.1.5 Gradient

Gradient or grade is the longitudinal slope of a track, which may be expressed as a rise or fall in a certain horizontal length. For example, if a track rises 1 foot in 100 feet the gradient is called 1 in 100 rising gradient. For a particular section, the steepest gradient to which a portion of track (in that particular section) is laid is known as the Ruling Gradient. A ruling gradient is so termed because it limits the maximum load, which can be hauled over the section by the locomotives. Ruling Gradient of 1 in 200 to 1 in 100 is common in broad gauge tracks. Much steeper grades are also provided in ghat sections. They become as steep as to necessitate the help of an extra engine. Such gradients are often referred as pusher grades. The gradients in station yards have to be sufficiently flat in order that (a) vehicles left standing on the tracks do not start moving automatically due to the effect of gravity combined with strong winds and/or a gentle push and (b) locomotives do not stall (c) shunting operations may be carried out safely and without affecting operational flexibility.

At any station situated in the immediate neighborhood of a gradient steeper than 1 in 80 falling towards the station a catch siding or a gradient of 1 in 100 falling away from the station a slip siding should be provided at suitable locations.

## 6.1.6 Curves and Super-elevation

Although it is desirable to lay a track as straight as possible, it is not always possible to do so because of the natural features of the country and due to the necessity of avoiding obstructions both natural as well as artificial. As the curves are unavoidable, it is desirable to lay them as flat as possible that is with as large a radius as practicable. Curves offer resistance to the haulage of trains, produce substantial wear in the track and vehicles, reduce the speed and increase the maintenance costs.

Curves can be designated by the radius in meters or by its degree. The angle subtended at the center by a chord of length of 30.5 meters is the degree of the curve. A 1 degree curve is thus of  $360 \times 30.5 / 2\pi = 1750$  meters radius. Similarly a  $2^{\circ}$  curve has a radius of  $1750/2 = 875$  meters and so on. In field, the radius of a curve is determined by measuring the versine of a chord of known length from the equation -  $R = (125 C^2)/V$ ; where R is radius in meters, C is chord length in meters and V is versine in millimeters.

**Cant or Super-elevation:** 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 curve is raised above the inner rail and is negative when the inner rail is raised above the outer rail. When a track is laid on a curve, it requires to be provided with super-elevation. It is required because; when a body moves in a circular path it has a tendency to move off the path due to centrifugal force. This force has to be countered if the body is to follow the circular path. The force necessary to keep a vehicle in a circular path is obtained by raising or super-elevating the outer rail of the curve. In absence of super-elevation the outer rail be rapidly worn away and the track could constantly be moved out of position due to the pressure exerted by the flange of the wheels traveling on the outer rail. Considerable possibilities of derailment due to flange of wheels mounting the rails would also exist. The amount of super elevation depends upon two principle factors (i) Speed and (ii) Radius of curvature.

**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. Equilibrium Speed, radius of curve and cant (super-elevation) are related to each other according to the following equation

$$C = GV^2/127R$$

Where, C is cant/super-elevation in mm,

G is the gauge of the track + width of rail in mm,

V is the speed in kmph and

R is the radius of the curve in meters

From the formula above, it can be seen that the super-elevation or the cant required is directly proportional to the square of the speed and is inversely proportional to the radius of the curve. In other words, for a curve of a given radius the cant required would be high for high speeds. Further, it also can be seen that as the radius of the curve decreases (sharper curve) the cant required would be more for a given speed. An inference can be drawn from the above that even for a very sharp curve (very low radius) the speeds can be kept very high by increasing the cant/super-elevation. However, this is not the case. If we increase the cant too much, it will affect the trains running at lower speed than the equilibrium speed and the situation will further worsen if a train comes to a stop at such curve. To take care of such situations (stationary trains/trains running at lower speeds than the equilibrium speed):

An upper limit on the permitted cant has been specified as under

|                       |          |
|-----------------------|----------|
| BG; A, B and C routes | : 165 mm |
| D and E routes        | : 140 mm |
| MG                    | : 90 mm  |
| NG                    | : 65 mm  |

### 6.1.7 Point and Crossings

Crossings, switches and turnouts are the essential part of track structure which are provided at the inter section of two running rails to permit the rolling stock to pass from one track to another. The smooth passage of the rolling stock from one track to another depends among other factors on the angle of the crossing, which is kept as small as possible for high-speed traffic on the running line. On Indian Railways, 2 sizes of crossings viz. 1 in 12 and 1 in 8 1/2 have been commonly used so far. To permit higher speeds, special layouts with 1 in 16 and 1 in 20 crossing have been designed. 1 in 16 crossings are being introduced on important routes.

There are different methods of denoting the angle of the crossing the most common being by a number. In the IRS designs this number is denoted by the cotangent of the angle. Thus when a crossing is stated to be 1 in 12, the cotangent of the angle of crossing will be 12. Similarly, curved switches or partly curved switches are being increasingly used to permit

**(a) Crossover:** A means of connection between two adjacent and continuous tracks, which are generally parallel, is called crossover. They comprise two turnouts, which are inter-connected. Their layouts depend upon the distance between two tracks.

**b) Diamond Crossing:** When one track crosses another track at an angle, a diamond is formed comprising two acute and two obtuse crossings. A diamond consists of two acute crossings and two obtuse crossings with four check rails and 2 special checkrails at the elbow. No diamond crossing should be flatter than 1 in 8 1/2 for all gauges. In all diamonds the gauge is kept 3.25 mm (1/8") tight for steady running of vehicles.

**(c) Single Slip and Double Slip:** In a diamond crossing two tracks cross (intersect) each other and a vehicle cannot be taken from one track to the other. If tracks are so arranged that a train on one track normally crosses another track but can also be diverted to that same track when required, such an arrangement is known as a diamond crossing with slips. This is made possible by the inclusion of two or four pairs of switches. When such diversion is permitted in one way, the arrangement is known as single slips and if it is permitted in both ways, it is known as double slips.

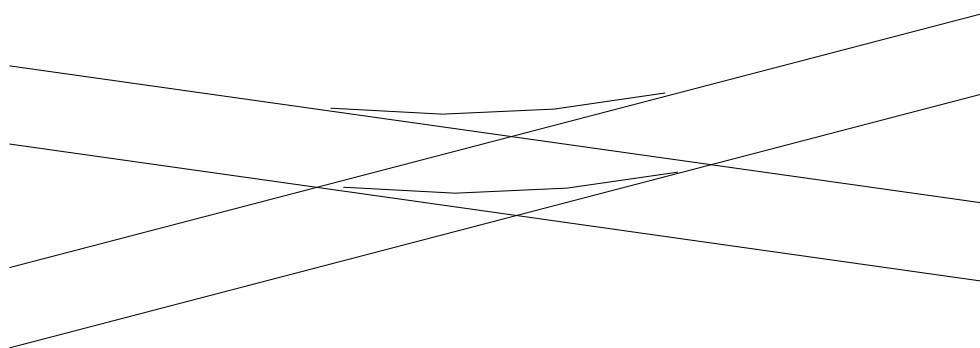


Fig: 6.2 SINGLE SLIP



**Fig: 6.3 Double Slip**

**(d) Movable diamond (Switch diamond):** When a vehicle passes over a diamond crossing there is an inherent risk of derailment owing to large gaps at the elbow of the obtuse crossing and due to the possibility of wheel, particularly of a small diameter being deflected to the wrong side of the nose. A method of eliminating this risk is to make the point rails of the obtuse crossings made in the same way as the tongue rails of switches; these point rails being suitably joined together by stretcher bars. Such an arrangement is known as movable diamond.

(e) **Scissors Crossover:** This consists of two crossovers usually between adjacent parallel tracks intersecting each other with a diamond crossing.



Fig: 6.4 Scissors Crossover

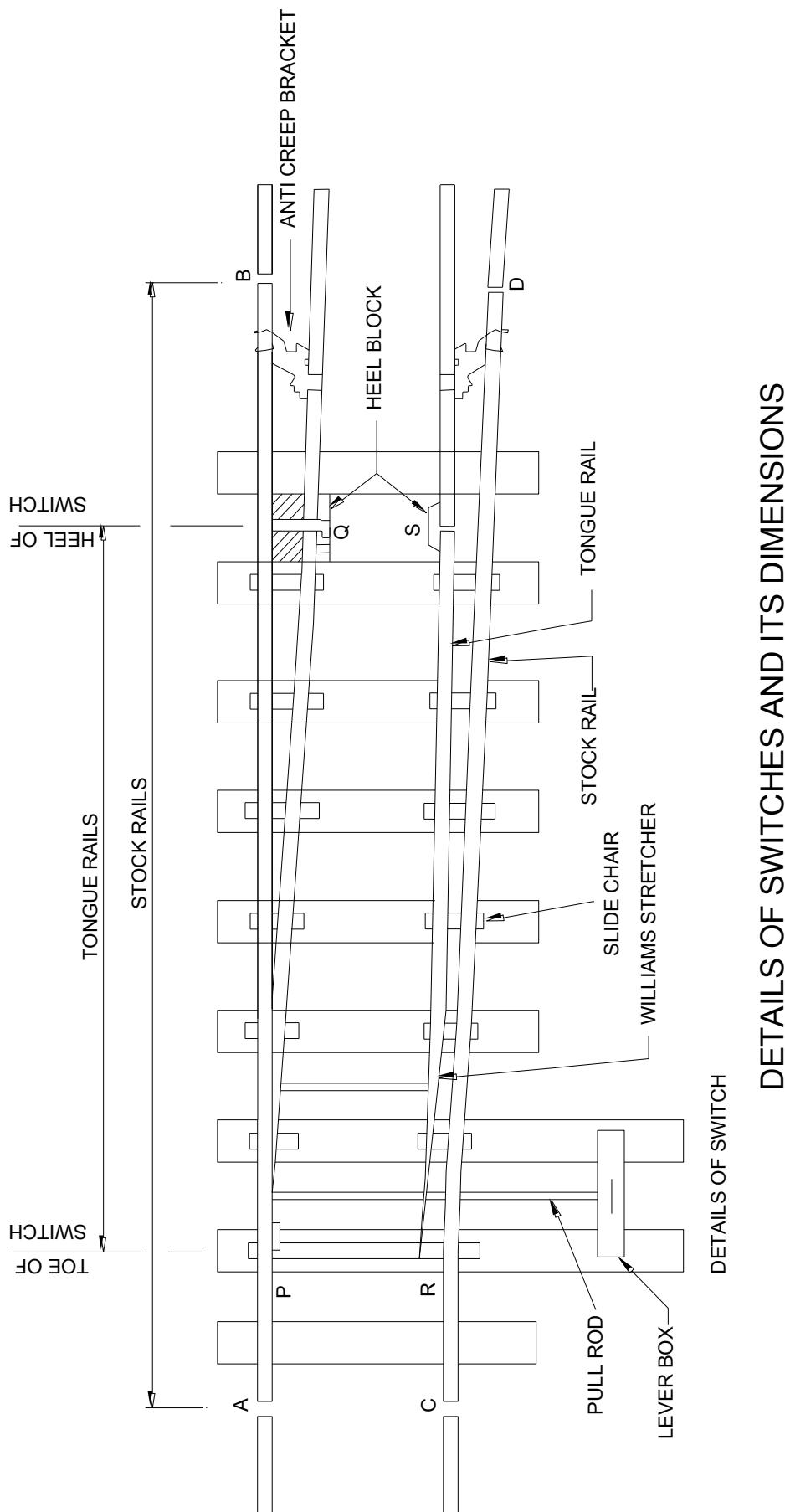


Fig: 6.5

**MAIN DIMENSIONS OF BG TURNOUTS ( mm) FOR STRAIGHT SWITCH.**

| S.No. | DESCRIPTION                   | 1 IN 8 1/2 |          | 1 IN 12  |          |
|-------|-------------------------------|------------|----------|----------|----------|
|       |                               | 90R        | 52 Kg.   | 90R      | 52 Kg.   |
| 1.    | STOCK JOINT AHEAD ( SJA)      | 840        | 840      | 1500     | 1500     |
| 2.    | ACTUAL LENGTH OF SWITCH       | 4725       | 4725     | 6400     | 6400     |
| 3.    | THEORITICAL LENGTH OF SWITCH  | 4950       | 4950     | 6724     | 6724     |
| 4.    | SWITCH ANGLE                  | 1°34'27"   | 1°34'27" | 1°8'0"   | 1°8'0"   |
| 5.    | HEEL DIVERGENCE               | 136        | 136      | 133      | 133      |
| 6.    | LEAD                          | 20730      | 20730    | 29200    | 29200    |
| 7.    | RADIUS                        | 222360     | 222360   | 442120   | 442120   |
| 8.    | CROSSING LENGTH               | 4800       | 4800     | 5970     | 5970     |
| 9.    | A. N. C. to T. N. C. DISTANCE | 118        | 132      | 167      | 186      |
| 10.   | CROSSING ANGLE                | 6°42'35"   | 6°42'35" | 4°45'49" | 4°45'49" |
| 11.   | OVERALL LENGTH                | 29502      | 29516    | 40985    | 41004    |
| 12.   | LENGTH OF TONGUE RAIL         | 4722       | 4722     | 7620     | 7620     |
| 13.   | LENGTH OF TONGUE RAIL         | 9000       | 9000     | 11000    | 11000    |

**MAIN DIMENSIONS OF BG TURNOUTS ( mm) FOR CURVED SWITCH.**

| S.No. | DESCRIPTION                   | 1 IN 8 1/2 |          | 1 IN 12  |          | 1 IN 16  |          | 1 IN 20  |          |
|-------|-------------------------------|------------|----------|----------|----------|----------|----------|----------|----------|
|       |                               | 90R        | 52Kg.    | 90R      | 52Kg.    | 90R      | 52Kg.    | 90R      | 52Kg.    |
| 1.    | STOCK JOINT AHEAD ( SJA)      | 1500       | 1500     | 1500     | 1500     | 844      | 844      | 844      | 844      |
| 2.    | ACTUAL LENGTH OF SWITCH       | 6400       | 6400     | 7730     | 7730     | 9750     | 9750     | 11150    | 11150    |
| 3.    | THEORITICAL LENGTH OF SWITCH  | 6835       | 6835     | 8478     | 8478     | 10594    | 10594    | 11994    | 11994    |
| 4.    | SWITCH ANGLE                  | 0°47'27"   | 0°47'27" | 0°27'35" | 0°27'35" | 0°24'27" | 0°24'27" | 0°24'27" | 0°24'27" |
| 5.    | HEAL DIVERGENCE               | 182.5      | 182.5    | 133      | 133      | 133      | 133      | 133      | 133      |
| 6.    | LEAD                          | 18395      | 18395    | 27870    | 27870    | 37170    | 37170    | 46210    | 46210    |
| 7.    | RADIUS                        | 232320     | 232320   | 458120   | 458120   | 824225   | 824225   | 1303810  | 1303810  |
| 8.    | CROSSING LENGTH               | 4800       | 4800     | 5970     | 5970     | 7000     | 7000     | 9310     | 9310     |
| 9.    | A. N. C. to T. N. C. DISTANCE | 118        | 132      | 167      | 186      | 222      | 248      | 272      | 272      |
| 10.   | CROSSING ANGLE                | 6°42'35"   | 6°42'35" | 4°45'49" | 4°45'49" | 3°34'35" | 3°34'35" | 2°51'45" | 2°51'45" |
| 11.   | OVERALL LENGTH                | 29502      | 29516    | 40985    | 41004    | 52398    | 52422    | 94176    | 94176    |
| 12.   | LENGTH OF TONGUE RAIL         | 7620       | 7620     | 9020     | 9020     | 11000    | 11000    | 12636    | 12636    |
| 13.   | LENGTH OF TONGUE RAIL         | 11000      | 11000    | 11000    | 11000    | 13000    | 13000    | 13000    | 13000    |

## 6.2 Engineering Plan

Engineering plan shows the geographical details of a yard. It shows various dimensions, gradients, points and crossings, cabin building, relay room, SM's office, passenger lines, goods lines, sidings, foot-over bridges, platforms, quarters near station, railway boundary etc. It is an important drawing issued by the office of the CE of the zonal railway. An approved Engineering Plan is required before issue of Signal Interlocking Plan / Interlocking Plan. No work within a yard can be taken up till such time the Engineering Plan and subsequently the SIP/IP (wherever required) are issued to the effect. An Engineering Plan should contain the following Information:

- (a) Station name with kilometrage (from a fixed station generally)
- (b) Name of adjacent stations on either side and on branch lines, if any
- (c) Distances of adjacent stations on either side and on branch lines, if any
- (d) Up and Down Directions
- (e) North line for the station
- (f) Chainages of various points, LC gates, fixed structures etc. from centre line of station building on either side
- (g) Gradients on either side of the yard
- (h) Type and length of bridges with chainages
- (i) Location of existing cabins and their distances from the centre line of the station and from the centre of the nearest track
- (j) Clear available length (CAL) of all running and non running lines, sidings etc
- (k) Description of work, pink book no. etc with date
- (l) Scale of plan
- (m) Type and lengths of turn-outs, sand humps, DS, traps used
- (n) L.C gates and their details, if any
- (o) Position of foot-over bridges, culverts or any other permanent structures
- (p) Distance and position of slip/catch sidings, if any
- (q) CE's Drg No. and approval.
- (r) List of infringements to schedule of dimensions, if any
- (s) Special restrictions/rules, if any
- (t) Details of platforms
- (u) Quarters details within railway boundary
- (v) Railway boundary

### Ensure the Following While Checking the Engg. Plan

- (a) 1 in 8 ½ turn-outs should not be laid on the inside of curves
- (b) Turn-outs / Crossovers should not be proposed on girder bridge and LC gates
- (c) Avoid diamond crossings, single slips and double slips
- (d) There should be adequate space between two points taking off in opposite direction (one lock bar length or 5 meter in case of electric operation of points)
- (e) Level Crossing to be avoided in the overlaps

#### LAYOUTS OF YARDS AND PERMANENT WAY

- (f) Specific zonal rules/practices as applicable (e.g. in some railways, provisions of trap is not accepted as means of isolation on passenger lines)
- (g) There should be no change of gradient within 30 meters in case of BG and within 15 meters in case of MG of the point.
- (h) Permissible station gradient should extend up to 45 meters beyond outer most point
- (i) If proposed lines are passing nearby existing electrical mast, flood light mast or any other permanent structure, clear distance from face of structure to the nearest track may be marked
- (j) For passenger lines, 1 in 12 turnouts or less steeper turnout should be used. However, 1 in 8 ½ turnouts with curved switches may be proposed.

### 6.3 Signalling Plan

Signalling Plan/SI Plan/IP is prepared on the basis of Engineering Plan. It contains the information regarding type of Signalling & Interlocking arrangements, method of operation of points, signals etc. Various Inter-signal distances, overlaps and line capacities are also detailed in it. It also gives information regarding the type of block working and telecommunication facilities provided at a station. Sig. Plans should be drawn to scale in metric dimensions. The Signalling Plan is approved by CSTE.

#### Information to be recorded in Signalling Plan

1. Standard of interlocking and class of station, Mileage of station building.
2. Name of the station in full
3. Names of Adjacent stations, their distances, Type of Block Working and location of block Instruments.
4. Holding capacity of all running lines and sidings. (CSL)
5. Direction of reception and dispatch on running lines and description of sidings,
6. Restriction on dead-end sidings (e.g. no stabling) if any.
7. All gradients within the station limits and up to 2.5 kilometers in rear of first stop signal,
8. Kilometer and class of level crossings within the station limits, whether interlocked or not,
9. Up and Down directions and names of important junctions on either side.
10. Reference to condonation of gradient infringements, CRS dispensation for deviations from GR / SEM, (if any.)
11. Reference to approved Engineering plan on which the Signalling plan is based.
12. In case of an interlocked level crossing gate within the station limits mention the KM No., distance, width, class, type of barrier, method of operation and control on signals, Telephone communication provided, showing the place to which it is connected. Bell / warning and road signals provided are to be indicated. Indicate whether it is operated electrically or mechanically and from where.
13. Actual inter signal distances and lengths of overlaps
14. Note regarding telephone communication provided between A.S.M./ Cabinman and level crossings within and outside station limits.
15. Aspect sequence chart for color light signals.
16. Whether turnout is 1 in 8-1/2 or 1 in 12 or 1 in 16 etc.
17. Details of Detection Table etc., which are not apparent in the plan.
18. Details of Track Circuits / Axle Counters. Relay end and Feed end of track circuits.
19. SM's slide control for individual signals & routes.
20. Type of signalling, standard of Interlocking and method of operation of various points, detection table of points for various signals to be given.

21. Gradient and level posts.
22. Inter-signal distances and distance between Warning Boards and Signals.
23. Details of open bridges.
24. Location of water column, ash pit/tray.
25. Signal overlap in big yards.
26. Custody of spare keys.
27. Details of dispensation, obtained from CRS with letter number & date Item No of Book of sanction (for Execution of Works)
28. Brief history of Previous versions & Date of their commissioning.
29. Present Version Number.

#### 6.4 Station Working Rules (SWR)

The objective of the SWR is to regulate safe working of trains at and in between stations. Local conditions, special features viz. yard layout, signalling & interlocking, gradients within and at approach of station limits, catch / slip / other siding are detailed in it. It aims to draw the attention of staff to rules governing granting of Line Clear, taking "off" signals, reception & dispatch of trains, berthing of trains, working of gates, shunting, stabling of vehicles etc. It is meant to draw the attention of staff to rules regarding working during failure of points, failure of signals, failure of interlocking, failure of block instruments, partial / total interruption of communication and in an emergency etc.

No station shall ever be commissioned before SWR is prepared and signed jointly by DSTE and DSO / DOM (and DEE in RE area) and is issued. Every page of SWR must be signed jointly at the bottom by DSTE and DSO / DOM (and DEE in RE area). SWR must be read in conjunction with G&SR and BWM. However, it shall not in any way supersede G&SR and BWM. It must be revised / revalidated once in every **5 years or 3 correction slips**.

All class III station staff, concerned with movement of trains must read & understand the SWR and sign in a register in form 'A'. For all class IV station staff, the SM of the station shall read and explain the contents of SWR to them and obtain their signatures as a proof of having understood the relevant provisions of the SWR. Whenever any alteration / modification is done in the station, which affects the working of trains, necessary correction slip must be obtained and it shall be pasted at the correct place immediately.

The following information should be available in SWR

- (a) SWRD and its description (SWRD or Station Working Rule Diagram is a miniature IP)
- (b) Description of station
  - (i) Location
  - (ii) Adjacent stations, halts, IBS
  - (iii) Block section limits on either side
  - (iv) Gradients within the yard and in the vicinity of yard on either side of the station/yard, Layout details (e.g. running and non-running lines with their capacities)
  - (vii) Details of level crossing gates in adjacent block section including the yard
- (c) System of working and means of communication
- (d) System of signalling and interlocking
- (e) Telecommunication

**LAYOUTS OF YARDS AND PERMANENT WAY**

- (f) Train working
  - (i) Train working staff
  - (ii) Clearance of line and zones of responsibility
  - (iii) Conditions for granting LC
  - (iv) Reception of trains
  - (v) Simultaneous reception/crossing of trains
  - (vi) Complete arrival of trains
  - (vii) Dispatch of trains
  - (viii) Through running of trains
- (g) Blocking of lines
- (h) Shunting limits and procedures and detailed procedure of working of sidings etc
- (i) Abnormal circumstances e.g. working of trains during total interruption of communication, during temporary single line working in a double line section,
- (j) Visibility test objects are clearly defined in either direction to help SM ascertain visibility conditions in an objective way
- (k) Essential equipments at station
- (l) Fog signalling
- (m) Special restrictions depending upon local geographical constraints (tunnels, gradients etc.)
- (n) Certificate

"NOTHING IN THESE RULES SHALL BE READ AS CANCELLING, AMENDING OR MODIFYING ANY G&SR and BWM AND OPERATING MANUAL. THESE RULES CANCEL ALL PREVIOUS STATION WORKING RULES."

**SWR contains the following appendices also**

**LIST OF APPENDICES**

|               |  |
|---------------|--|
| APPEN DIX 'A' | Working of Level Crossing Gates<br>(Interlocked LC gates – to be jointly signed by DSTE, DOM & DEN)<br>( Non-interlocked LC gates – to be jointly signed by DEN & DOM) |
| APPENDIX 'B'  | System of signalling and interlocking and communication arrangements at the station (To be signed by DSTE)   |
| APPENDIX 'C'  | Anti Collision Device (Raksha Kavach) (As and when brought into force)   |
| APPENDIX 'D'  | Duties of Train Passing Staff and Staff in each shift (To be signed by DOM)  |
| APPENDIX 'E'  | List of essential equipments provided at the Station. (To be signed by DOM)  |
| APPENDIX 'F'  | Rules for working of DK stations, Halts, IBH IBS and Outlying sidings (To be jointly signed by DOM & DSTE)   |
| APPENDIX 'G'  | Rules for working of trains in Electrified Sections. (To be jointly signed by DOM & DEE)   |

## 6.5 Points for Interlocking

Before any newly laid point is connected to the lever frame or a point machine and interlocked, it shall be ensured that the JE/SE/SSE (P-Way) has

- 1) Brought the track to correct level and alignment.
- 2) Eased off rail joints on either side of points to be interlocked and closed the stock Rail joints associated with lock bars.
- 3) Fully ballasted and packed all points which are to be interlocked and taken adequate measures to prevent lateral and longitudinal movement of points.
- 4) Provided creep and level pillars.
- 5) Arranged the sleepers on adjacent tracks in alignment, where rods and wires have to cross.
- 6) Seen that the gauge is correct.
- 7) Provided and fixed special timbers as required.
- 8) Provided means to prevent creep in the vicinity of points.
- 9) Fitted gauge tie plates correctly.
- 10) Made the stretchers of such a length so that the throw of switches is as per approved drawings.
- 11) Adjusted loose heel switches so that
  - (i) They can be thrown both ways with ease and can be housed against the stock rail by hand and remain there when the pressure is removed.
  - (ii) The planed surface of the switch rail fully houses against the stock rail as per approved drawings.
- 12) Adjusted fixed heel switches to that
  - (i) They normally lie in the mid-position and flex equally in the normal and reverse positions.
  - (ii) The planed surface of the switch rails fully houses against the stock rails as per approved drawings.
- 13) fitted flexible stretchers so that they flex equally in the normal and reverse positions
- 14) Provided a stop for the open position of a single switch layout.

## CHAPTER -7: OPENING OF WORKS

- **Organisation and objectives of Commission of Railway Safety**
- **Duties of Commissioner of Railway Safety**
- **Signalling works that require/do not require prior CRS Sanction**
- **Application for CRS Sanction, documents to be attached**
- **Safety Certificate**
- **Signal Sighting Committee Report and Green Notice**

### **7.1 Commission of Railway Safety**

The Commission of Railway Safety, working under the administrative control of the Ministry of Civil Aviation of the Government of India, deals with matters pertaining to safety of rail travel and train operation and is charged with certain statutory functions as laid down in the Railways Act (1989), which are of an inspectorial, investigatory & advisory nature. The Commission functions according to certain rules viz. Statutory Investigation into Accidents Rules framed under the Railways Act and executive instructions issued from time to time. The most important duties of the Commission is to ensure that any new Railway line to be opened for passenger traffic should conform to the standards and specifications prescribed by the Ministry of Railways and the new line is safe in all respects for carrying of passenger traffic. This is also applicable to other works such as gauge conversion, doubling of lines and electrification of existing lines. Commission also conducts statutory inquiry into serious train accidents occurring on the Indian Railways and makes recommendations for improving safety on the Railways in India.

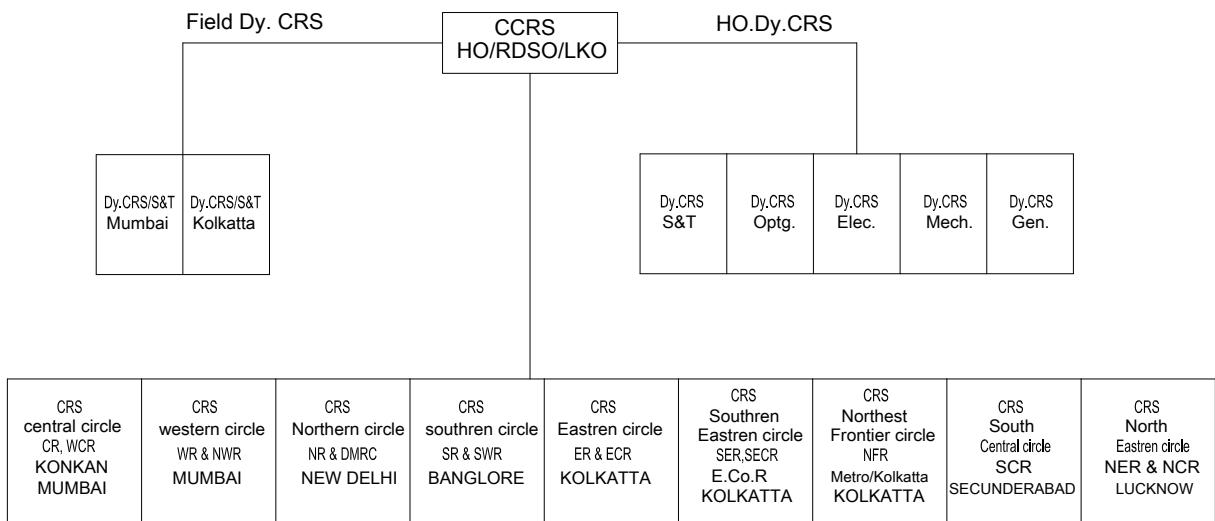
Senior officers of Engineering Department of Railways can opt for permanent absorption as CRS. However, once an officer joins the Commission as a CRS, he can not return back to the Railways. This provision ensures that CRSs are able to give their free opinions on matters concerning safety without any bias or prejudice.

### **7.2 Organisation of the Commission**

The Commission is headed by a Chief Commissioner of Railway Safety (CCRS), at Lucknow, who also acts as Principal Technical Advisor to the Central Government in all matters pertaining to railway safety. Working under the administrative control of CCRS are nine Commissioners of Railway Safety (CRS), each one exercising jurisdiction over one or more of the 17 Zonal Railways (new addition Metro Railway/Kolkata), DMRC/Delhi, MRTS/Chennai and Konkan Railway also fall under their jurisdiction. There are 5 Dy. Commissioners of Railway Safety posted in the Headquarters at Lucknow for assisting the CCRS as and when required. In addition, there are 2 field Dy.CRS(S&T) one each in Mumbai and Kolkata, to assist the CRS in matters concerning the Signalling and Telecommunication disciplines.

### 7.3 Jurisdiction of the Commissioners of Railway Safety (CRS)

#### ORGANISATIONAL STRUCTURE



### 7.4 Duties of the CRS

The duties of a CRS as spelt out in Railways Act 1989 are as under

- (a) To inspect new railways with a view to determine whether they are fit to be opened for the public carriage of passengers, and to report thereon to the Central Government
- (b) To make such periodical or other inspections of any railway or of any rolling stock used thereon as the Central Government may direct
- (c) To make inquiry into the cause of any accident on a Railway and to perform *such other duties* as are imposed on him by the Railways Act or any other enactment for the time being in force relating to Railways

The term "such other duties" has been detailed in the Railways Act and covers the following

- (d) Sanctioning the execution of all works, including new works, affecting the safety of running lines
- (e) When, after inspecting a line already in use or a rolling stock already authorised, the Commissioner is of the opinion that their continued use will be attended with danger to the traveling public, he may report his opinion to the Central government, who may then order the closure of the line or the discontinuance of the use of the rolling stock; and
- (f) To inspect such a closed line and sanction its reopening for carriage of passengers and also report to the Central Govt. on the fitness for use of discontinued rolling stock.

## 7.5 Opening of New Railway Lines

- (a) In terms of Railways Act, 1989, the CRS has to carry out his statutory inspection of the new railway line, its accessories, various sub-grade and accommodation works etc. and submit his report to the Central Govt. stating whether the railway line can be opened without any danger to the public using it. In case the railway line cannot be opened without danger to the public, he shall state the grounds thereof as also the requirements, which in his opinion are to be complied with before the sanction is given by the Central Govt.
- (b) Under the Railways (Opening for Public Carriage of Passengers) Rules, the CRS has been authorized to sanction the opening of new railway lines for the public carriage of passenger, after his inspection, subject to such conditions, as he may consider necessary to impose. On receipt of the report of the CRS, the Central Govt. may confirm, modify or cancel the sanction so given by the CRS, subject to such conditions, alterations or relaxation, as may be considered necessary, after giving due consideration to the suggestions or the conditions subject to which the CRS has opened the railway lines.
- (c) The term new railway or new lines of railway includes
- (i) Extension of existing railways, new double, treble or other running lines laid along side existing lines and conversion from one gauge to another.
  - (ii) The initiation of electric traction on the existing lines.
- (d) When the railway administration is prepared for opening of a new railway or section of a railway, it shall make a reference to the CRS and supply the required documents about the new lines, bridges, tunnels, stations, Signalling system, infringements, electrification details and various other certificates and the working orders to be enforced at the stations for operation of the trains. If the CRS is satisfied with the information, he will fix the date of inspection and the railway administration shall make such arrangements as are necessary to facilitate the inspection by the CRS, of the railway, which is to be opened. The GM or his representative, not below the level of Joint Secretary, shall accompany the CRS throughout the inspection along with other railway officers in-charge of the works and the DRM
- (e) The CRS will inspect the entire section including the bridges, the Signalling arrangements and the electrification work etc. and if he is satisfied, will issue the sanction for opening the railways for public carriage of passengers with such conditions as considered necessary, to be complied by the railway administration. He shall then submit the detailed report of his inspection to the Central Government as brought out in (b) above.

## 7.6 Works Programme Proposals

The system of getting the works sanctioned through Works Programme each year is a well-known and established procedure as laid down vide chapter IV of Engg.Code and SEM Part-I, Annex.22. Investment decisions relating to the creation, acquisition and replacement of assets on the Railways are processed through the annual "Works, Machinery and Rolling Stock Programme".

- (a) **Draft booklets:** CE co-ordinates with other departments and compiles Works Programme booklets. The overall priorities of works within the ceiling given by the Board will be decided by the GM in consultation with Heads of the Departments. Chief Mechanical Engineer (CME) is the Nodal Officer for Plan Head 41 – Plant and Machinery, CSTE is the Nodal Officer for Plan Head 33 – S&T works & Plan Head - 29 - Road Safety Works - Level Crossings interlocking and CPO is the Nodal Officer for staff quarters.

- (b) **Preparation of Preliminary Works Programme (PWP):** In June/July each year, the Railway Board conveys to each Railway, the total outlay in respect of each Plan Head, within which the Works Programme are to be prepared. Accordingly Zonal Railway reviews on going works and shortlists new works for inclusion in the Works Programme.
- (c) **Advance Planning:** The preparation of the Annual Works Programme is not an isolated exercise for the year, but is a part of a continuous planning process from the level of the Divisions and upward. Works Programme Proposals are submitted for the approval of the Board in 3 stages as under
- (i) Advance list of proposals costing Rs.5 crores and above each is normally required to be submitted to the Board during June/July for their prior approval for inclusion in PWP.
  - (ii) PWP consisting of works costing below Rs.5 crore each and lumpsum cost of works falling under GM's power for sanction are normally due in Board's Office during August.
  - (iii) FWP: Such of those works included in PWP and approved by Board are submitted after Works Programme meeting with Board, which are normally due during November/December.
- (d) **Target Date for Submission of Proposals:** The target dates for receipt of proposals from the Divisions, sponsoring PHODs and processing the same for Works Programme are circulated to all concerned in such a manner that the Preliminary Works Programme of the following year is submitted to the Railway Board by first week of September or such earlier date as may be laid down by the Board. Proper financial appraisal of each of the work is required to be given in the Preliminary Works Programme together with the comments of the FA & CAO.
- (e) **Sponsoring of Proposals:** The proposals from the Divisions for inclusion in the Works Programme should emanate from the sponsoring departments, which depending on the nature of proposal, inter-alia, will (a) arrange to obtain the estimated cost from Sr.DEN/ Sr.DSTE/ Sr.DME/Sr.DEE concerned, (b) have the proposals concurred in by Sr.DAO and obtain approval of DRM for inclusion in the PWP.
- (f) **Selection of the Proposal for Works Programme:** While selecting proposals, it is kept in view that the proposals are financially viable, provide adequate returns, remove operational bottlenecks and/or are essentially required for providing/upgrading rail users' amenities and provide staff satisfaction. For prioritising various proposals, requests from people's representatives (MPs and MLAs), various Rail Users' Committees such as ZRUCC, DRUCC etc. and Rail Users' Associations, Central and State Governments, Local Administrative Bodies, Gram Panchayats etc. are also considered. Instructions issued vide various Inspection Notes of Board's Officials, GM, PHODs and other Railway Officers are given adequate attention.
- (g) **Deficiencies/Shortcomings in the Works Programme Proposals:** A study of the Works Programme proposals of a particular Railway submitted by various sponsoring units has revealed that there are certain deficiencies / shortcomings in framing the proposals by the sponsoring units, resulting in back references, delay in finalisation of the works programme and sometimes acceptance of underestimated/ immature/ incomplete/ technically unsound proposals. A few of such deficiencies which are noticed generally are indicated below

#### **OPENING OF WORKS**

- (i) Inordinate delay in preparation/ submission of the proposals resulting in some important ones not being included in the Works Programme/ or sometimes some proposals get included without proper examination/ checking due to lack of time.
- (ii) The proposals for works when initiated are not well thought of.
- (iii) Preliminary survey not done in adequate detail as per provisions of the Engineering Code resulting in inaccurate estimation of cost.
- (iv) Lack of serious technical planning and application of mind in project formulation leading to heavy cost over runs even before the commencement of the work.
- (v) Major deficiencies occurring at conceptual stage and then in the implementation phase.
- (vi) The proposals are framed without site verification and ground realities are not taken into account, which pushes up the cost at a later stage.
- (vii) The proposals are not technically feasible or deficient in respect of bringing out the scope of work in a proper manner.
- (viii) The proposals are not self-contained and not supported by adequate justification. The supportive plans, layout, etc. are not enclosed to the proposal to facilitate examination of the feasibility of the same.
- (ix) The proposals do not have sanction of the competent authority.
- (x) The financial implications of the proposal are not properly spelt out/ examined, resulting in back references from HQ/Finance.
- (xi) The requirement of fund not realistically assessed.
- (xii) Large variation in cost in the abstract estimate vis-a-vis detailed estimate.
- (xiii) The scope of work not properly examined resulting in material modification of high magnitude.
- (xiv) The proposals are not correctly assigned to respective Plan Head to which the works relate.
- (xv) The proposals are not submitted assigning their priorities, resulting in high priority works having been missed in some cases.
- (xvi) The proposals for staff quarters and the selection of stations where staff quarters are proposed are not decided in consultation with the organised labour.
- (xvii) Willful under estimation at the time of inclusion of works in Works Programme and later, at the time of detailed estimate, the costs getting considerably increased. In consequence, sanctioning of such estimates gets delayed because of large unexplained variations.
- (xviii) Proposals lacking qualitative improvement in 'abstract estimation' which is essential to give the sanctioning authority a reasonable overview of financial implications of the investment proposals.

- (h) **Submission of Proposals:** With a view to avoid above mentioned shortcomings/deficiencies and for the purpose of framing a self-contained proposal in a proper manner, the following aspects are to be kept in view while formulating the proposals
- (i) The proposals for works costing above Rs.5 crores each which require Board's prior approval for its inclusion in the PWP, should be framed and submitted to the Head Quarter's office with associated account's concurrence/observations well in advance as per the schedule laid down by CE's office each year. (Generally the vetted proposals mooted by the Division should reach the respective PHODs by the middle of May each year. These proposals, after examination and approval by the respective PHODs and vetting by FA & CAO should reach CE's office by first week of June. This time schedule will ensure adequate room for getting Board's prior approval for inclusion of the proposals of this category in the Works Programme which is required to be submitted to the Board's office by first week of September each year.)
  - (ii) As regards proposals costing below Rs.5 crores each, which require Board's acceptance for inclusion in the Works Programme, the time schedule for receipt of the same in the CE's office, duly concurred in by Head Quarter's finance, is middle of August. The time schedule needs to be followed truthfully at all levels.
  - (iii) While framing the proposals, it is necessary that the field verification is carried out by the proposal framing authority and that the proposals are well thought of. It is very important that the plans are prepared and the estimated cost is worked out based on detailed field assessment, technical plans, proper layout, realistic assessment of quantity of works etc. and only then the proposals are processed for inclusion in Works Programme.
  - (iv) While the abstract estimate forms a part of the proposal, it is of utmost importance to ensure that the scope of works and the cost aspects are given due consideration so that there is no large variation in the cost in the detailed estimate vis-à-vis the abstract estimate. The Board has expressed their serious concern in some cases where there had been wide variation in the anticipated cost shown at the time of sanctioning the proposals and that at the time of execution of works.
  - (v) Apart from this, planning with involvement of all concerned departments will obviate frequent change of scope of work and avoid introduction of large number of modifications, which are undesirable features and need to be controlled.
  - (vi) Justification: All proposals should have proper justification supported by necessary drawings.
  - (vii) Costing: While working out the cost, in addition to giving overall department wise break up, details of cost should also be furnished. Provision made towards Departmental and General charges should not exceed the limits prescribed. Cost as likely to prevail on 1st April of Programme Year may be assessed to avoid any revision of cost while sanctioning detailed estimates.
  - (viii) Efforts should be made to complete the on going works as expeditiously as possible so as to reduce their throw forward liability. New works that are essentially required need only be proposed. Divisions should indicate their priority in respect of works originating from them.

#### **OPENING OF WORKS**

- (ix) Departmental Heads at HQ's are required to critically scrutinise the proposals received from the Divisions with regard to its need, competing demands from other Divisions and limited availability of funds and priorities of the works and forward such of these proposals with modifications as found necessary to FA & CAO for concurrence endorsing a copy to CE. Prior to this, the various costs of sub-estimates of other Departments are to be got certified through them. They are also required to indicate priorities for works in respective Plan Heads. Cost of proposals sponsored at Head Quarter's level should be obtained from CE/CAO/CEE/CSTE/CME, as concerned, by the sponsoring PHODs and the same forwarded to FA & CAO for concurrence.
  - (x) The controlling PHOD at HQ should also arrange to reply any query raised by FA&CAO as expeditiously as possible in consultation with other Departments, where necessary, and obtain finance concurrence. Final proposal as concurred in by FA & CAO may be sent to CE in time.
  - (xi) Details of costs (latest sanctioned/updated cost), expenditure etc. of all works which are likely to appear as a Work in Progress in the Programme Year shall be furnished in the proforma as may be prescribed. In addition, progress of works in descriptive/quantitative terms should also be furnished. Any bottleneck / problem faced in progressing the works should also be brought out.
- (i) **Out-of-Turn Proposal:** After the Pink Book is circulated and Budget Grant is communicated to the Railways by the Board, sometimes, during the year, occasion arises when a very urgent work is required to be taken up for execution, which cannot be pending for the regular Works Programme for the next year. In such cases, the proposals are mooted on out-of-turn basis with the finance concurrence and GM's sanction or with the sanction of the Board, as the case may be, depending on the anticipated cost of the work. Board's sanction is required in respect of works costing more than the prescribed limits for our-of-turn sanction.
  - (j) **General:** An important requirement for effective investment planning is the realistic estimation of the project cost. Full details of the scheme must be worked out and detailed plans and estimate duly prepared. In the case of yard remodeling, line capacity works, goods shed facilities and important buildings, the estimate should be based on plans approved and signed by the concerned department who should scrutinise the plan to avoid the need for making any substantial modification in the required facility at a subsequent stage.

All schemes should be worked out comprehensively and sent to the Board along with other details of (i) the technical features, (ii) cost break up, (iii) benefit expected to accrue and (iv) financial implication. A sketch map of each proposal should also be sent. The Railway should clearly bring out the purpose of each scheme and confirm that the proposal meets the objective fully and that the scope and cost of the project have been arrived at after the fullest possible investigation including assessment of the financial implications. After the schemes have been scrutinized by the Board, the Railway is advised of the acceptance, with or without any modifications for inclusion in the Works Programme.

There has been a change in the budget document 2007-08. Accordingly, following scheme has been evolved for publishing various approved works.

| S.no | Book      | Details                | Cost of estimate | Approval of work  | Book published by  |
|------|-----------|------------------------|------------------|---|--------------------|
| 1    | LSWP      | Lumpsum works program  | < 1 cr           | <ul style="list-style-type: none"> <li>• DRM up to Rs 30 Lakhs</li> <li>• PHOD up to Rs 50 Lakhs</li> <li>• GM up to Rs 1 Cr</li> </ul> | Divisons/Workshops |
| 2    | LAW       | List of Approved works | 1Cr to 2.5 Cr    | Railway Board   | Zonal Railways     |
| 3    | Pink Book | Pink Book              | 2.5 Cr           | Railway Board.  | Railway Board      |

Note :-

1. Works are proposed / taken up plan head wise (Ex. Signalling works – PH 3300) with an Officer of concerned dept having a major portion work as coordinator.
2. A draft proposal of works for Pink book by Zonal Rly to Rly Board is known as preliminary works program (PWP) meant for discussion among various departments. Once finalized, Final works Program (FWP) is prepared on a book with Pink Cover, which is known as Pink Book.
3. Works once approved in Works Programme, Detailed estimates are to be prepared to be sanctioned by the competent authority before taking up Physical Execution of work. These works continue to be included every year in respective books, till they are finally completed.

## 7.7 Signalling Works -Requiring CRS Sanction (SEM Pt-I Ch.9.6.1)

The following signal and interlocking works when they are connected with or form part of a railway already opened for the carriage of passengers require the sanction of the CRS before they are commenced or opened

- (i) Additions/extensions or alterations to existing Block, Signalling and interlocking installations
- (ii) Change in Block, Signalling and Interlocking installations.
- (iii) New Stations temporary or permanent.
- (iv) Interlocking of level crossing, catch siding slip sidings, etc.

The zonal railway should submit the proposal to the concerned CRS, enclosing the relevant drawings and certificates etc. within one month of the expected commencement of the work.

## 7.8 Works -Not Requiring CRS Sanction (Para No 9.6.2, chapter IX of SEM Pt I Crection slip.10 & 22)

- (i) Provision of telephone at already manned Level Crossing gates.
- (ii) Provision of electrical or mechanical lifting barriers including emergency interlocked arrangements at already interlocked level crossing gates.
- (iii) Interlocking of existing LC gates within an already existing interlocked station yard by existing signals in same or shifted location
- (iv) Provision of all categories of track circuits in the station section

#### **OPENING OF WORKS**

- (v) Replacement of signalling assets without change in yard layout or signalling and interlocking scheme either in station or at mid section level crossing gates.
- (vi) Replacement of block instruments by any other approved type of instruments or provision of block proving axle counter or track circuiting using existing block instruments.
- (vii) The replacement of Block Instrument without any change in the system of block working.

*(Note:-the Personal approval of CSTE will be required for sanction of works mentioned in (i) to (vii) of SEM para 9.6.2 (given above) this will not be re-delegated to lower level. CSTE of the Railway will submit completion diagrams/Safety certificates&Quarterly statement of all such sanctions accorded by him to the concerned CRS.*

CSTE sanction is not given in a routine manner but following elaborated procedure. It is therefore, suggested that while giving sanctioning by CSTE, following must be ensured.

- (a) All relevant documents that are prepared by field units (for submission to CRS for his sanction) for commissioning of the works would be submitted to CSTE for his sanction. This includes Engineering scale/ Signalling Plans, SWR diagrams and SWR.
- (b) Format as per Annex. '44/1' shall be submitted duly filled up by the JA grade officer in- charge of the work for applying for CSTE's sanctions in terms of Para 9.6.2 of SEM-I . Similarly, CSTE's sanction shall also be communicated in the defined format enclosed as Annex. '44/2'.
- (c) Application for CSTE's sanction received in Headquarters office shall be scrutinised as per the check list laid down as Annex.'44/3' by Dy. CSTE/ In charge of design or CSTE( Planning) and put up for the consideration of the CSTE.
- (d) Personal approval of CSTE would be required and it shall not be delegated to any lower level.
- (e) Sanction would be recorded by CSTE as numbered sanctions maintaining a register for the same similar to sanction numbers being maintained by CRS.
- (f) The validity of CSTE's sanction shall be for a period of six months only. Re- validation of the sanction after six months may be considered based on unavoidable reasons.

#### **7.9 Application for CRS Sanction for Works**

- (a) Application to the **CRS**, for sanction for carrying out works affecting the running lines should be submitted in the manner specified below:

In the case of the Divisional Works the application should be made by Senior Divisional Engineer (Sr.DEN) and/or Sr.DSTE for track, bridges and signalling and interlocking works as the case may be. When a Junior Administrative Grade Officer does not exist on the division in any department the DRM/ADRM should sign the application. In case of works executed by Construction Organisation whether for Civil Engineering or Signal and Interlocking, applications will be signed by the JAG Officers for CE (Construction) or CSTE (Construction) as the case may be.

For Divisional works which involve both Civil Engineering and Signal and Interlocking, application shall be signed jointly by the JAG Officers of both Civil Engineering and Signal and Telecommunication Departments of the division. In the absence of a JAG Officer, the application will be signed by DRM/ADRM. In the case of works executed by Construction Organisation, application shall be signed by JAG officers representing CE (Construction) and CSTE (Construction).

(b) In all cases, the name and designation of the signatory should invariably be given.

The zonal railway should submit the proposal to the concerned CRS, enclosing the relevant drawings and certificates etc. within one month of the expected commencement of the work.

The application for CRS Sanction should accompany with the following documents:

1. Description of the proposed work
2. Approved drawings of the proposed work.
3. List of infringements to schedule of dimensions, if any.
4. List of deviations from, G & SR, SEM, if any.
5. Special restrictions, if any.
6. Rules for traffic working (SWR) and any other relevant information as necessary.

### **Procedure for obtaining Sanction & Commissioning of the works**

Arrange for obtaining the sanction of CRS with up to date and approved plans such as IP, LT, SM's slide control diagram, route control chart, etc., from CSTE .For Sanction of the CRS, apply on the standard proforma , "Application for Sanction" ([Annexure-37 SEM Pt-I](#))

1. The application must be complete in object of all relevant document therein and should be submitted at least one month before the proposed date of commissioning.
2. If any deviation of the plan approved by CRS, which effects the yard layout or signalling & interlocking arrangement or the system of train working, is found necessary, his prior approval to such a deviation should be obtained with reference to the application first made.
3. Assisting the operating department in preparation of Station working Rules.
4. CRS will convey his sanction through a number. He will also indicate while conveying his sanction whether he proposes to inspect the work before opening or not. If he proposes to inspect, fix up a date and intimate to CRS for his inspection at least 14 days before. After the CRS's inspection he will again convey his approval for commissioning.
5. Unless a work is to be inspected by CRS prior to opening, fix the date & time of opening and intimate to all the concerned. Whether CRS inspects prior to opening or not issue safety certificate in standard proforma ([Annexure-38, SEM Pt.1](#)), after thoroughly testing and satisfying all the safety and operational features before commissioning. The safety Certificate is to be signed jointly in case of joint work and it has to be counter signed by the officer who has applied for CRS sanction.

DSTE/ASTE After fully satisfying himself, bring the installation into use and issue a joint XR message (Jt. Telegram) with actual date & time of commissioning and with timings of 1st up and Dn. Trains passed.

#### **OPENING OF WORKS**

The SSE/SE/JE (signal) in-charge of the work shall submit a certificate on standard proforma No.S&T/CC/1 (Annexure 10 SEM Pt.1) Subsequently prepare the completion drawings with actual measurements of CSL, inter-signal distances, overlaps, sidings in IP and completion wiring diagrams, Location diagram, cable route plans, material statements, etc.and send them to Sr.DSTE.

The Dy.CSTE/Sr.DSTE/DSTE in turn will submit a report in a standard proforma No. S & T/CC/2 to CSTE for approval. Also obtained and send a certificate from DOS that necessary SWR has been issued, giving reference to sanction for deviations, of G&SR, SEM, Schedule of dimensions, etc., if any.

#### **7.10 Approved plans, Drawings and Specifications**

All works shall be carried out strictly in accordance with the approved plans, standard drawings and specifications and should conform to the provisions of this SEM where such are applicable. Deviations, if any, shall have the prior approval of the CSTE. All deviations shall be marked on the completion drawings and forwarded to the CSTE for correction of the tracings and issue of revised prints.

#### **7.11 Documents to Accompany Applications**

Documents to accompany the application are detailed in Annexure-37 SEM Pt-I and they should be complete in every respect.

#### **7.12 Submission of Safety Certificate**

- (a) The CRS in according his sanction may or may not propose to inspect the works.
- (b) If the CRS decides to inspect the work prior to opening, he will, after inspection in the company of the officers concerned, communicate in writing his sanction to open the work.
- (c) The Safety Certificate (Annexure-38 SEM Pt-I), together with the certificates referred to therein shall be completed and submitted before the work is opened, by the Engineer(s)-in-charge and a telegram dispatched to CRS. Copies of Safety Certificate should be sent to the DRM and CSTE
- (d) The Safety Certificate for engineering works should be signed by the Assistant Engineer concerned and countersigned by the Divisional Engineer. If any conditional sanction is given, it should be specifically certified that the conditions as stipulated are fulfilled. If the signalling/interlocking work is involved, the Safety Certificate should be signed jointly by the officers of Signal and Telecommunication department.
- (e) Safety Certificate shall be dispatched to the CRS expeditiously.
- (f) When phase working is involved, separate Safety Certificate should be issued, whenever each phase of work is completed.

#### **7.13 Deviations from Plans Approved by Commissioner of Railway Safety**

If any deviations from the plans approved by the CRS which affect the layout of lines or the arrangement of signals or the working rules, are found necessary, his prior approval to such deviations should be obtained with reference to his sanction.

## 7.14 Notification to Railway Officials when opening works

Except works arising out of accidents or breaches, no new work affecting the running of trains or the traffic working at stations should be brought into use until staff of all departments have been notified by means of a circular notice issued by the Divisional Safety Officer (DSO)/Divisional Operating Manager (DOM). Timely intimation of the date of opening of works should be sent to the DOM / DSO, wherever any new or revised working rules are to be brought into operation, to enable him to give the running staff due notice.

## 7.15 Signal Sighting Committee Report

All new and modified /altered signals must be inspected and passed by a "Signal Sighting Committee" consisting of SSE (Signal), SSE(LOCO) and Traffic Inspector (Operating). The 'SSC' Report (Annexure-8 SEM Pt-I) is required to be signed jointly by all the three and submitted before such signals are brought into use. The traffic notice issued in this connection with alterations to existing signals should have been issued within 3 months prior to the date of taking up the work.

## 7.16 Traffic Notice or Green Notice

Before any existing installation is altered or any new installation is introduced a traffic notice is to be obtained and issued to all the concerned. This traffic notice is issued for the information of all concerned regarding the work to be done, the date and time of commencement of the work, its probable duration etc. The arrangements for working of trains, the Station Masters who are required to issue caution orders will also be given in the traffic notice. If necessary, a temporary working instruction for working of traffic is also issued.

A "Traffic Notice" is a circular issued for all works affecting safe running of trains and requires imposition of speed restrictions with considerable regulation and detention to traffic. It is to be obtained and issued to all concerned with safe working of trains, before such work is taken up.

The objective of Traffic Notice is to give advance information to all concerned on the grounds of safety to enable them to rearrange the train services to suit the requirements of block and to impose speed restrictions as necessary.

It is issued by Sr.DOM. The concerned dept. will have to apply at least 7 days before the commencement of the work. The currency of Traffic Notice is 90 days (3 months). In case of a joint work, the application is made jointly by the concerned depts.

(In some Railways it is also termed as "Green Notice" or "Divl. Caution Notice" (DCN)

The application for Traffic Notice should contain the following information.

- (a) Nature and probable duration of work.
- (b) Speed restriction and caution orders to be followed
- (c) System of working of signals, interlocking & block during the period
- (d) Temporary working rules, temporary signals to be provided, if any
- (e) Various stages in which the work will be taken up and method of working trains in each stage
- (f) Whether the work will be taken up during day light hours or throughout the period with timings for speed restriction (any other relevant information as necessary)

## **7.17 Joint Inspection/Handing Over of New Assets (SEM Pt-I Ch.9.5)**

**7.17.1** Joint inspection by Divisional open line and construction organization both at supervisor & officer level shall be undertaken before taking up Non-interlocking of a station in connection with yard remodeling / interlocking changes or commissioning of signalling work for a new line / gauge converted line.

**7.17.2** Within 15 days of commissioning of signalling works another joint inspection both at Supervisor & officer level by Divisional open line and Construction Organization shall be undertaken. The deficiencies noted during these inspections shall be listed in two categories -

Category A - Items that shall be completed before handing over.

Category B- Items which may be completed after handing over as per a MOU to be entered between open line and construction organisation.

All the new signalling equipments and associated gadgets shall be handed over / taken over with in 2 months period after commissioning of the signalling works. After expiry of 2 months period, however the responsibility of day to day maintenance shall devolve on Divisional open line organization after commissioning.

In order to ensure that handing over / taking over of signalling assets is accomplished in a smooth manner, a specific handing over/ taking over procedure may be jointly issued by CSTE & CSTE(C) to bring out the items to be complied as above mentioned in paragraphs 7.17.1 & 7.17.2 .

### **As made / Completion Drawings**

The provisions of Para 8.8 of SEM part-1 (as reproduced below) stipulate the procedure regarding preparation of "As made" drawings.

### **Completion Drawings**

The Signal and Telecommunication Engineer-in-charge of Construction should submit signed Ferro copies to the CSTE for works completed. These should indicate the work as actually carried out including the dimensional details as actually measured at site, location of signals, details of cables were laid, wiring diagram, locking diagram etc.

After completion of work by the extra divisional organisations like construction, RE etc., the drawings of the completed works are to be prepared and handed over to maintenance organisation at the time of handing over the station to maintenance. Some drawings like Signalling plan, circuit diagrams, Locking Table/Table of control, panel diagram are to be modified if necessary to suit actual at site and remaining as made drawings are to be newly prepared.

The following as made documents are to be handed over to maintenance organization

- (a) As made Signaling plan.
- (b) As made Locking Tables / Table of Control or Both.
- (c) Station working Rules with working Rule diagram.
- (d) Locking diagram Chart.
- (e) As made circuit diagrams with contact Analysis.
- (f) Track circuit Bonding diagram.
- (g) Power Supply diagram.

- (h) Cable route and distribution particulars.
- (i) Location Box Particulars.
- (j) Relay Rack Particulars.
- (k) Panel diagram.
- (l) Copy of CRS's sanction.
- (m) Copy of Safety certificate
- (n) Copy of Inspector's completion certificate (Annexure-10 of SEM part-I)
- (o) Copy of Signal Sighting Committee Report (Annexure-8 of SEM part-I)

**(PROCEDURE FOR OBTAINING SANCTION AND CARRYING OUT WORKS AFFECTING SAFETY OF THE RUNNING LINE AND FOR OPENING NEW WORKS) (As per SEM Part-I, Annex.37)**

.....RAILWAY

**Application for Sanction**

Office-----  
Dated.....

Department-----

No. ....

From:

The.....  
Designation.....

To

The Commissioner of Railway Safety,

Sir,

I hereby apply for you sanction to.....

.....being commenced and opened for the public carriage of passengers, when ready

- (2) With reference to Chapter VI of the Rules for the Opening of a Railway, I beg to enquire whether you wish to inspect the work prior to its opening for the public carriage of passengers, in which case intimation will be given of the date of completion.
- (3) In the event of your deciding not to inspect the work prior to opening, the Engineer-in-charge will, on completion of the work, submit the Safety Certificate duly signed by him, prior to the opening of the work for public carriage of passengers and when required, also dispatch a telegram \*\* to your address intimating that the work has been opened and the Safety Certificate has been signed by him.
- (4) The application for the use of locomotives and rolling-stock to be drawn or propelled thereby on the proposed line, in accordance with Section 16(1) of the Indian Railways Act, 1890 (IX of 1890), is sent herewith/not required.

**OPENING OF WORKS**

(5) The following documents are appended

I) Temporary works

- (a) Description of proposed works.
- (b) Drawing of temporary works.
- (c) List of infringements to Schedule of Dimensions.
- (d) List of deviations from the Manuals of Instructions for signalling and Interlocking and Block signalling.
- (e) List of deviations from General and Subsidiary Rules.
- (f) Restrictions.
- (g) Rules for Traffic Working.
- (h) Documents for bridges as per Chapter VII of the Rules for the Opening of a Railway.

II) Permanent works

- (a) Description of proposed works.
- (b) Drawing of permanent works.
- (c) List of infringements to Schedule of Dimensions.
- (d) List of deviations from the Manuals of Instructions for Signalling and Interlocking and Block Signalling
- (e) List of deviations from General and Subsidiary Rules.
- (f) Restrictions.  
Rules for Traffic working.  
Documents for bridges as per Chapter VII of the Rules for the opening of a Railway.

(6) Certified that a detailed examination of the strength and arrangement of the materials to be used in the temporary permanent works in above connection, have been made and that the design and the materials to be used are up to the loads, which they will be required to carry and that their opening for public carriage of passengers will not be attended with any danger.  
(Delete temporary or permanent work, as the case may be)

Yours faithfully

Signature.....

Designation.....

Dated.....

No.....

From

**The Commissioner of Railway Safety,**

.....

**Sir,**

Your No.....

Sanction is accorded to the above work being carried out. % I do not propose to inspect the work prior to its opening for the carriage of passengers. When ready, it may be opened on a Safety Certificate (vide Paragraph 3 of your letter) which should be submitted to me direct without any delay.

% I propose to inspect the work prior to its opening for the public carriage of passengers. Advice of the date, when work will be ready for inspection should be intimated at least 14 days before it is proposed to open it.

.....  
Commissioner of Railway Safety

\*Here enter the name of work and mention whether permanent or temporary.

\*\*Form of telegram : " Reference sanction No.....dated.....work open at for public traffic on.....First train to pass.....No danger to public. Certificate signed."

@ If any of the documents are not sent, then 'NIL' to be written against such items. Working rules for extensive remodelling scheme may be sent in not later than one month before the date on which the work is to be brought into use, and in such cases " will follow " should be written instead of " NIL ".

% Strike out paragraph not applicable.

**Annexure-38 (SEM Pt-I )**  
**Safety Certificate**

-----RAILWAY

(When the Commissioner of Railway Safety does not inspect the work prior to opening, this certificate must be signed before opening temporary or new works)

From

The Divisional Railway Manager/ Deputy chief Engineer (construction)/Deputy chief signal and TelecommunicationEngineer(construction).....Division.

To

The Commissioner of Railway Safety,

.....  
Description of work.-.....

**Reference:** The Divisional Railway Manager/ Deputy chief Engineer (construction)/Deputy chief signal and TelecommunicationEngineer(construction)

Application ..... dated .....sanctioned under  
Commissioner of Railway Safety No.....dated.....,to commence  
and open the above work.

Following Permanent/Temporary work has been done.....  
.....  
.....

(1) I/We do hereby certify that, in the work abovementioned –

- (i) The Schedule of Dimensions has not been infringed\* except in regard to the items  
Sanctioned under letter No.....dated.....
- (ii) Engineering work has been carried out in accordance with Plan No.....  
\*except in regard to the alterations sanctioned under letter no.....dated.....
- (iii) \*The weight of rails, strength of bridges and general structural character of the works are such as have been prescribed under the rules.
- (iv) The\* Signalling/\*interlocking/\*Block-signalling has been carried out in accordance with Signalling Plan No.....and the requirements laid down in the signal engineering Manuals have been completed except in regard to the items sanctioned under letter No.....dated .....

The work has been carried out in accordance with the documents already supplied

- (2) A certificate from the Divisional Safety Officer/----- stating that necessary working rules have been issued and giving reference in regard to sanction to deviation  
(if any) from General and Subsidiary Rules is attached/not required.

\* To be scored out if not applicable

(3) I/we hereby certify that on the ----- 20-----, I/We we have carefully inspected and tested the above work and that I/We have satisfied myself/our self that it has been properly completed and is in good working order \*and that the work can be opened for public carriage of passengers without endangering the safety of the traveling public, or of the employees of the Railway, subject to the following speed restrictions.

@Temporary.....Kmph.....due  
to.....  
@Permanent.....Kmph.....due  
to.....

(4) The work is being opened on.....

\*Necessary in case of signaling and interlocking works only.

@ To be scored if not applicable.

.....  
Assistant Engineer  
Dated.....20----

Counter signed by  
-----  
Dated.....20.....

Assistant Signal & Telecommunication Engineer

Dated.....20----

Counter signed by:  
-----  
Dated.....20----

No-----

Dated.....20----

Countersigned and forwarded to Commissioner of Railway Safety for information:----

- 1.
- 2.
- 3.
- 4
- 5

The Divisional Railway Manager/  
Deputy chief Engineer (construction)/  
Deputy chief signal and Telecommunication  
Engineer(construction)

**Application for Sanction**

Office:.....  
Dated:.....

No.....

From

The.....  
Designation.....

To

Chief Signal & Telecommunication Engineer,

Sir,

I hereby apply for your sanction to..... being commissioned and opened for public carriage of passengers when ready as CRS sanction is not required as per para 9.6.2 of SEM Pt-I.

The following documents are enclosed:-

- a) Description of proposed works-
- b) Signalling and interlocking plan No. SIP-
- c) Panel front Plate Diagram No.(If it is panel)-
- d) Route Control Chart No-
- e) Station working Rule Diagram No-
- f) Station Working Rule for traffic working-
- g) List of infringement to Schedule of Dimensions-
- h) List of Deviations from the manuals of instruction for signalling and interlocking and Block signalling.
- i) List of deviations from General and Subsidiary Rules.
- j) Restrictions-
- k) The work will be executed by the following office.

**Modus Operandi**

The work of..... Shall be carried out after disconnection/non-interlock & traffic block if required at site. After completion of the work the reconnection memo shall be issued. The work will be commissioned by..... On receipt of the CSTE sanction and after signing the safety certificate and when required, also dispatch a telegram to your address to your address intimating that the work has been opened and the safety certificate signed and issued.

Yours faithfully

Signature.....

Designation.....

Dated:.....

No.....

From  
Chief Signal & Telecommunication Engineer,

To  
Sub:.....

Ref: Your Application No.....dated.....

In response to your application No.....dated..... Sanction  
is accorded to work.....being carried out.

I do not propose to inspect the work prior to its opening for the carriage of passengers when ready; it may be opened on a safety certificate which should be submitted to me direct without any delay.

I propose to inspect the work prior to its opening for the public carriage of passengers  
Advice of the date, when work will be ready for inspection should be intimated at least 14days  
before it is proposed to open it.

Chief Signal & Telecommunication Engineer,  
.....Railway

No.....  
Dated:.....

Strike out the paragraph not applicable.

Annexure '44/3'

**Check List**

Provision of .....at station  
on.....section of .....division.

List of documents enclosed:-

- i) Description of proposed works-
- m) Signalling and interlocking plan No. SIP-
- n) Panel front Plate Diagram No.(If it is panel)-
- o) Route Control Chart No-
- p) Station working Rule Diagram No-
- q) Station Working Rule for traffic working-
- r) List of infringement to Schedule of Dimensions-
- s) List of Deviations from the manuals of instruction for signalling and interlocking and Block signalling.
- t) List of deviations from General and Subsidiary Rules.
- u) Restrictions-
- v) The work will be executed by the following office

Yours Faithfully

Signature.....  
Designation.....  
Dated.....

## (ANNEXURE 8 Para 3.24.4 SEM Pt-I)

**ANEXURE-'8'**  
**(Para 3.24.4) RAILWAY**  
**SIGNAL AND TELECOMMUNICATION DEPARTMENT**  
**Signal Sighting Committee Report**

Division \_\_\_\_\_  
 Name of Work \_\_\_\_\_  
 Sighting of \_\_\_\_\_

We, the undersigned members of the Signal Sighting Committee having met at \_\_\_\_\_ and sighted the view of the Signals noted below recommend that their dimensions and locations should be as given against each:-

| Name of Station and Ref. of Signal /Warning Board/ Indication Board (Giving UP or DN) | Height of existing Signal /Warning Board/ Indication Board above rail level | Height of proposed Signal /Warning Board/ Indication Board above rail level | Distance in meters of the existing Signal /Warning Board/ Indication Board from the adjacent track | Distance in meters of the proposed Signal /Warning Board/ Indication Board from a fixed point | Distance in meters of the existing Signal /Warning Board/ Indication Board from the adjacent track | Is the existing Signal /Warning Board/ Indication Board on the left hand or right hand side of the track to which it refers | Is the proposed Signal /Warning Board/ Indication Board on the left hand or right hand side of the track to which it refers | Visibility of the proposed Signal /Warning Board/ Indication Board from Drivers point of view in normal weather (Meters) | Are light indicator and arm repeater required for the new signal | Remarks |      |      |
|---|---|---|--|---|--|---|---|--|--|---------|------|------|
| (1)   | (2)   | (3)   | (4)  | (5)   | (6)  | (7)   | (8)   | (9)  | (10)   | (11)    | (12) | (13) |
|   |   |   |  |   |  |   |   |  |  |         |      |      |

Signature \_\_\_\_\_  
 Designation \_\_\_\_\_  
 Date \_\_\_\_\_

Signature \_\_\_\_\_  
 Designation \_\_\_\_\_  
 Date \_\_\_\_\_

## CHAPTER –8: ESTIMATES

**8.1** Estimates help in forecasting the cost of the work. This forecasting enables the approving authority to understand the quantum of expenditure involved and plan the expenditure accordingly before approving the work.

Extracts from Indian Railways code for the Engineering Department are given in **SEM part -1 Para 5.3 and 5.4 and as Annexure – 24**, which are reproduced hereunder:-

### **8.2 General Instructions applicable to Estimates**

**8.2.1** While preparing the Abstract Estimate in accordance with the Code Rules, the expenditure for Stores may be grouped under Cabin Equipment, Point gear and connections, Signal fittings and connection, Cable and line wire, Track Circuits. Block Instruments, Station Master's Control Instrument, Control and Cabin telephones, etc., besides Labour, Tools and Plant, Establishment Charges, Freight and Contingencies, Works to be done by other Departments, e. g., construction of cabin and other buildings, construction of staff quarters, provision of wooden sleepers, power supply arrangements, etc., are to be included where necessary.

**8.2.2** While preparing the detailed estimates in accordance with the Code Rules, the following guidelines shall be observed:-

- (a) Details of cost of cabin, staff quarters and other buildings and electric power connections shall be included, by obtaining them from the Departments concerned and shall be provided for under separate sub works.
- (b) Establishment and Supervision charges, where necessary, shall be included. Additional weight-age for works to be done under traffic conditions should be provided.
- (c) Provision shall be made for additional quarters required for additional maintenance staff to be posted as a result of the scheme. Provision shall also be made for additional Stores/Office accommodation where necessary.

**8.2.3** For preparing estimate for Line Capacity Work, the Operating Department will advise the Signal and Telecommunication Department of the detailed traffic requirements. If this requires preparation of a Plan or Sketch for estimating purpose the Signal and Telecommunication Department will arrange to do so and detailed estimates shall be prepared only after the arrangements shown on the Plan or Sketch are agreed to by the Operating Department. In other cases, the estimates shall be prepared on the basis of requirements furnished by the Operating Department. In both cases, the justification for the proposed work will be furnished by the Operating Department together with the anticipated financial implications.

A similar procedure shall be followed for works to be executed for other departments, e.g., Electrical, Civil Engineering (CE), etc.

**8.2.4** Where works are customarily executed through the agency of contractors, each Divisional Office shall maintain the Schedule of Rates, issued under the authority of the CSTE/CSTE (Construction). The Schedule of Rates (SOR) may be reviewed and revised by the CSTE/CSTE (Construction) every five years or at shorter intervals as considered necessary. No variation in the Schedule of Rates is permissible without the specific authority of the CSTE/CSTE (Construction).

**8.2.5** Each Divisional Office shall maintain the Price List of Stores as issued by the Stores Department

**8.2.6** The DSTE shall be in possession of copies of the authorised Scheduled of Rates and Price Lists of Stores and amendments advised to him from time-to-time.

### **8.3 Reports accompanying Estimates -The reports shall generally include the following:**

**8.3.1** A clear description of the work to be carried out and the object to be gained by its execution together with such information as will enable the sanctioning authority to appreciate the necessity for the work.

**8.3.2** Reasons for the adoption of the proposed lay out or design with special reference to any from usual practice and its special feature, if any.

**8.3.3** When the Project is of a nature involving scientific points or other considerations of special character such as a new Signalling or Telecommunication System not tried out before, the reports shall contain a complete account of the basis on which every part of it has been framed, the various considerations in regard to Signalling and Telecommunication details, economy of construction, utility of the practical working of the Project when carried out and the method by which it is proposed to execute any portion of the work involving unusual difficulties of construction, if any.

**8.4** In case of works of important nature like, Centralised Traffic Control, Automatic Signalling etc., a complete account of the various considerations in regard to engineering details, economy of construction and utility of the Project shall be given. Any local considerations which may affect the Project shall also be fully detailed.

#### **Matter extracted from Annexure-24 of SEM Part-I**

### **8.5 Kinds of Estimates – All proposals for**

- (a) The construction or purchase of new works or assets;
- (b) the renewals and replacements of existing works or assets chargeable to Depreciation Fund /Development Fund or Open Line Works- Revenue when estimated to cost more than Rs.10000 ; or if chargeable to Revenue when estimated to cost more than Rs.50,000.
- (c) the scrapping, dismantlement or abandonment of existing works or assets
- (d) the repairing or reconditioning, if estimated to cost more than Rs.50,000 of existing works or assets
- (e) Temporary and experimental works or assets;
- (f) renewals and replacements on worked lines, and
- (g) renewals of ballast.

Should, subject to the provisions of paragraph 1103 regarding urgent works, be scrutinised by the authority competent to sanction them before any expenditure or liability is incurred thereon. For the purpose of this scrutiny, all such proposals should be presented in the form of one or other of the following estimates, according to the circumstances mentioned in paragraphs 702 to 713.

- (i) Abstract Estimates.
- (ii) Detailed Estimates.
- (iii) Supplementary Estimates.
- (iv) Revised Estimates.
- (v) Project Abstract Estimates.
- (vi) Construction Estimates.
- (vii) Completion Estimates.

**ESTIMATES**

Note- (1) For "New Minor Works- costing Rs.5,000 and less, for renewals and replacement works chargeable to Revenue costing Rs.50,000 and less and for " Reconditioning Works" costing Rs. 50,000 and less detailed estimates need not be prepared for formal sanction. Rough estimates should, nevertheless, be prepared and kept on record by the Executive Engineer.

**8.6 The Abstract Estimate-** An abstract estimate is prepared in order to enable the authority competent to give administrative approval to the expenditure, of the nature and the magnitude contemplated work to form a reasonably accurate idea of the probable expenditure and such other data sufficient to enable that authority to gauge adequately the financial prospects of the proposal. Abstract estimates avoid the expense and delay of preparing estimates for works in detail at a stage when the necessity or the general desirability of the works proposed has not been decided upon by competent authority. An abstract estimate should contain a brief report and justification for the work, specifications and should mention whether funds are required in the current year and to what extent. It should also show the cost sub-divided under main heads and sub-heads or specific items, the purpose being to present a correct idea of the work and to indicate the nature of the expenditure involved. The allocation if each item as between Capital, Development Fund, Open Line Works-Revenue, Depreciation Reserve Fund and Revenue should be indicated.

Note-(1) Administrative approval to a work or scheme should be accorded by the authority competent to do so (vide paragraph 748), after a through examination of its necessity, utility and financial prospects. See also rules in Chapter II of Indian Railway Financial Code.

### Abstract Estimate

Department, ..... Division ..... station

Estimate No .....

Framed by ..... Division

Description or work .....

Plan No .....

Reference .....

|  | Capital<br>s | DF  | DRF | OLWR | Ordy.<br>Rev. | Deposit | Misc.<br>advances | Total |
|--|--------------|-----|-----|------|---------------|---------|-------------------|-------|
|  | (1)          | (2) | (3) | (4)  | (5)           | (6)     | (7)               | (8)   |
| Existing<br>sanctioned<br>estimate(if any)<br>Present estimate |              |     |     |      |               |         |                   |       |
| Total  |              |     |     |      |               |         |                   |       |

Cost Of Stores ..... To be Purchased ..Rs ..... Rs .....

Funds..... To stock .....Rs .....

Report and Justification-Specification.

Enclosed-\* Details of cost with allocation (Form E.704). Sub estimate. Has Accounts Officer agreed to the pro. allocation ?

Station : ..... Signature : .....  
Date ..... Designation : .....

\*Required in case of any existing sanctioned estimate.

**8.7 Detailed Estimates-** On receipt of administrative approval to a project or scheme other than that for which construction estimate in Form E.553 is prepared and, conveyed through the sanction to the, abstract estimate relating thereto detailed estimates for various works should be prepared and submitted for technical sanction of the competent authority. It should be prepared in sufficient detail to enable the competent authority to make sure that the abstract estimate sanctioned by a higher authority is not likely to be exceeded. No work included in an abstract estimate should be commenced till a detailed estimate for the same is prepared and sanctioned and adequate funds are allotted by the competent authority. The detailed estimate of an open line work will comprise (i) statements showing details of estimated cost and (ii) an outer sheet giving the abstract of cost of work, the report, the financial; justification and the allocation.

**Note-Technical Sanction-**The sanction of the competent authority to the detailed estimate of a work is called the "technical sanction ". The authority according technical sanction should satisfy itself that (i) the details of the scheme as worked out are satisfactory, (ii) the methods proposed for the execution of the work are adequate; and (iii) the cost has been estimated from reliable data and is likely to be reasonably accurate.

(2) In the case of works within his power of sanction, the GM may, in lieu of the procedure of preparing Abstract Estimates for administrative approval, prescribe that both the administrative approval and the technical sanction should be accorded on the detailed estimates.

**8.8 Supplementary Estimate** should be prepared for any item of work, which ought to have been included in the first instance in an estimate already sanctioned but has not been so included, or which it is found later, should be considered as being a part or a phase of an estimate already prepared and sanctioned, if it cannot be met out of contingencies (see paragraph 727). Such a supplementary estimate should be prepared in the same form and the same degree of detail as the main estimate and for all purposes be treated as a part of the main estimate.

**8.9 Revised Estimate.-** As soon as it becomes apparent that the expenditure on a work or project is likely to exceed the amount provided therefor in the detailed estimate or construction estimate a revised estimate should (subject to provision of paragraph 1336) be prepared and submitted for the sanction of the competent authority. It should, unless otherwise ordered by the sanctioning authority, be prepared in the same form and the same degree of detail as the original estimate accompanied by a comparative statement showing the excess or saving under each sub-head of account against the latest sanction. In cases where a supplementary estimate or a previous revised estimate has been sanctioned by the Railway Board, it should be made clear how the original sanction has been modified by such further sanctions.

**8.10 The Project Abstract Estimate-**The abstract estimate of a Construction Project should be submitted for the approval of the Railway Board on Form E. 554 "Abstract cost of Railway" accompanied by (i) an abstract estimate of junction arrangements, (ii) a narrative report explaining the salient features arid major items of expenditure (iii) detailed estimates on Form, E. 553 prescribed for a construction estimate under the following heads:-

**Capital-** 1120-Land Structural Engineering Works.-1132-Tunnels,1151 and 1152-Major Bridges, 1153 and 1154 Minor Bridges, 1140-Ballast and Permanent Way, (Detailed estimate for one kilometer). 1180 and 1190--General Charges Establishment and General Charges- Other than Establishment, 2000-Rolling

**Note.**-Heads shown above are for Plan Head 'New lines' as an example.

These detailed estimates should be prepared from an engineering survey report.

### **ESTIMATES**

Note.-The abstract estimate for an undemonstrative project chargeable to Development fund will be prepared in the same detail as the abstract estimate for a construction project chargeable to Capital.

**8.11 The Construction Estimate:-** When it is decided to undertake the execution of a new line gauge conversion, or doubling of lines a final location survey should be made, and based on the information collected in that survey detailed estimates of all the works included in the project as a whole should be prepared (of paragraph 540). These detailed estimates are collectively called the "Construction Estimate", of the Project. It should be prepared after a careful examination of the various details of construction involved in the Project. It should be prepared in such detail as to render it possible to dispense with working estimates, or any other further estimating after the Construction Estimate has been sanctioned (except when supplementary or revised estimates are necessary). It should provide for the buildings and equipment of the Railway, upto a standard that will be sufficient for Working such traffic as may be expected during the first year or two after opening of the line. It is the basis on Which technical sanction to the various works included in the construction of a Project is accorded.

**8.12 Completion Estimate.-** A Completion Estimate is prepared in supersession of a construction estimate as provided in paragraph 1701. It should show in a tabular form (E. 713) the following particulars in respect of all the works included in, the construction estimate :

- (i) amount of sanctioned estimate
- (ii) actual expenditure on all works up to the date of construction estimate
- (iii) commitments on that date
- (iv) anticipated further outlay
- (v) total estimated cost ; and
- (vi) difference between the sanctioned estimate and the he estimated cost.

An abstract of the completion estimate showing the above particulars against the various heads of capital classification should be submitted for information or sanction, vide paragraph 1703 to the Railway Board together with brief explanations for excesses of not less than Rs.10,000 or 10 per cent over the provision under sub-heads of account and for savings of 20% or 1 lakh whichever is less, occurring under any main head of account. Provision for further outlay should be made or completed on the date of closing of the construction estimate. All works not started on that date should be dealt with separately as open line works both as regards estimate and expenditure. In forwarding, therefore, estimates for sanction for works in connection with new lines opened, it should be clearly indicated whether the cost of the work is chargeable to capital or Open Line Capital.

Note: The completion estimate of an unremunerative construction project chargeable to Development Fund will be prepared in the same detail as the original construction estimated using the various heads of capital classification for the purpose.

**8.13 Estimates for Railway, Project-** Scope A Construction Estimate (Form E. 553) should be prepared in such detail as to reduce to a minimum the probability of omission of any item of expense which is capable of being foreseen. It should be remembered particularly that the provision for contingencies allowed in the estimate is not intended to meet items of expense which can be foreseen and which are reasonably likely to occur. With good estimating it should seldom be necessary to encroach, to any appreciable extent, on the provision for contingencies.

**8.14 Provision for contingencies.**- Provision for unforeseen contingencies should be made in all estimates at 3 per cent of the total estimated cost. All incidental expenditure which can be foreseen such as works establishment, sheds for workmen and stores should be separately estimated and provided for in the estimates. The provision for contingencies should not be diverted to any new work or repair which is not provided for the estimate, and of which the cost exceeds Rs. 1,000 without the sanction of the authority who sanctioned the estimate.

**8.15 Schedule of Rates.**-To facilitate the preparation of estimates, a schedule of rates of each kind of work, commonly executed should be maintained in each open line division, and it will be the duty of the CEf when inspecting the divisional offices, to see, that correct schedules of the rates at which work is actually being carried out, are invariably recorded in a complete and satisfactory, manner. The regulations for the due record of rates in a clear and systematic manner for their periodical revision to bring them on line with the rates prevailing in the market and those paid by other government departments will be laid down by the GM.

#### Estimates of Deposit Works:

A Railway Administration is occasionally required to execute works for and at the cost of other Government departments, local bodies, private persons etc. Such works are referred to in this Code as "Deposit Works" (see also paragraph 1843 for a definition of this term), To meet the cost of plans and estimates of such works as also those to be carried out for other Departments out of Railway funds, which are subsequently not carried out, charges at the following sliding scale shall be levied on the total of the estimate inclusive of Departmental Charges

|                        | Rs.      | Rs.   | Per cent |
|------------------------|----------|---|----------|
| For works costing over | 1,00,000 | -   | 2        |
| For works costing over | 60,000   | but not more than 1,00,000                    | 2 ½      |
| For works costing over | 30,000   | but not more than 60,000                      | 3        |
| For works costing over | 20,000   | but not more than 30,000                      | 3 ½      |
| For works costing over | 10,000   | but not more than 20,000                      | 4        |
| For works costing over | 1,000    | but not more than, 10,000                     | 4 ½      |
| For works costing over | 1,000    | and below 5 % subject to a minimum of Rs. 25. |          |

The acceptance of the government departments or the payment in cash by the local bodies or private individuals concerned should be obtained to the above percentage charges before, the work of preparation of plans and estimates is taken in hand. In cases where the proposed works are subsequently carried out, these percentage charges should be adjusted against departmental charges.

The levy of the above percentage charges may, at the discretion of the GM, be waived in particular case subject to the conditions laid down in paragraph 1138.

*Note.-The scale of charges prescribed in this rule does not apply to assisted sidings, recovery of preliminary expense in respect of which has been separately provided for under paragraph 1825.*

**8.16** In preparing estimates of works for other departments, local bodies, private individuals, etc., particular care should be taken to see that,

(i) Railway freight and carriage charges of materials proposed to be used in the works are provided for at the rates applicable to the public and not at the concessional rates applicable to railway material ; (works of Branch Line Companies are not governed by this rule, but by the relevant contracts),

(ii) Departmental charges at the prescribed rates (paragraph 1137) are provided for.

## **ESTIMATES**

**8.17** All estimates of deposit works should be got accepted by the parties ordering the works before submission to the competent railway authority for sanction. In the case of works, which under the rules (see paragraph 1851) are to be maintained after completion by the Railway compartment at the cost of the department, local body, private forms individuals ordering the work, the acceptance of the party concerned should also be obtained for the recurring expenditure that is likely to be incurred on repairs, maintenance, etc.

**8.18** No work asked for by another government department should be commenced till a detailed estimate for the same has been accepted by the, department concerned and sanctioned by the competent railway authority. No work asked for by local bodies, private individuals etc. should be commenced till a detailed estimate for the same has been sanctioned by the competent Railway authority and the estimated cost thereof deposited with the Railway. The amounts so deposited should be credited to the head-deposits – miscellaneous.

## **8.19 Competency of Sanction:**

The previous sanction of an authority higher than the GM of Indian Railways is necessary

(i) To expenditure on new lines or rolling stock or surveys not provided in the sanctioned budget for the year or carried forward from the sanctioned budget of the previous year

(ii) To expenditure on other works not provided in the sanctioned budget or carried forward from the sanctioned budget of any previous year except

(a) (i) Track renewal works- costing not more than Rupees two lakhs

(ii) Other works- costing not more than Rupees one lakh;

(iii) Machinery and Plant- costing not more than Rupees Fifty thousands.

Provided that the total lump-sum provision, made in the budget for such works is not exceeded.:;

(b) (i) On line capacity works costing above, Rupees one lakh but not more than Rupees ten lakhs each

(ii) On track renewal works costing above Rupees two lakhs but not more than Rupees five lakhs each

(iii) On other than line capacity and track renewal works costing above Rupees one lakh but not more than Rupees five lakhs each.

Subject to ceiling of Rupees one crore in all in a financial year provided that the sanctioned budget (other than sum) for works in these categories is not exceeded.

*Note.- (1) The works thrown forward from previous years may be taken up only if the funds required for them can be found by re-appropriation within the sanctioned allotment.*

2) The savings in the, lump sum provision made in the sanctioned budget shall not be utilized for the category o works in (b) above without the prior approval of the Railway Board.

3) The GM may sanction expenditure on new works out of turn in respect of users' amenities including goods shed and booking office not exceeding Rs.1 lakhs in each case provided the funds required for such works as provided in the sanctioned budget for works in these categories is not exceeded and expenditure up to Rs.50,000 in each case in respect of existing Rly Schools Institutes, hospitals and dispensaries provided the lump sum provision in the sanctioned budget is not exceeded.

(iii) To expenditure on works provided in the sanctioned budget for the year or carried forward the sanctioned budget of any previous year as follows :

(a) **Works sanctioned under the lump sum provision:** To an excess over the total lump sum provision in the sanctioned budget for such works.

(b) **Works outside the lump sum provision:-** Rolling Stock, Track renewals and other works to an excess over the estimated cost as entered in the sanctioned budget or sanctioned separately, as follows

(i) of more than 25 per cent over the original estimated cost

(ii) of more than 15 per cent over the first revised cost

(iii) of more than 10 percent over the second and further revised estimated cost.

Provided further that all codal provisions regarding sanctions for material modification are strictly followed.

(c) **Surveys:-** To an excess over 10 per cent on original estimate sanctioned by higher authority (GM can sanction survey estimates costing upto Rupees 1 lakh each provided the surveys are included in the sanctioned budget)

Note: (1) The works thrown forward from Previous years may be taken up only if the, funds required for them can be found by re-appropriation within sanctioned allotment.

(2) The amount first given in the Budget or sanctioned separately by higher authority shall be the original estimated cost and the revised amount given in subsequent Budgets or sanctioned separately by higher authority, the second, third, etc., revised estimated-cost.

(3) The powers of sanction to excess over estimated costs allowed in item (b) above shall not make the cost of such works exceed Rupees one crore in any case.

(4) The Powers for sanctioning the excess over the estimated costs of works outside the lump sum provision as in item (b) above shall not be re-delegated to lower authority in respect of works, the original estimated cost of which is over 50 lakhs .

(iv) To the scale of:

- a) A portion of a railway line
- b) In item of the authorised Rolling stock or
- c) Any other railway asset costing over Rs. 3 lakhs.

**8.20 Currency of Sanction-**The sanction to an estimate will ordinarily remain current for five years from the date on which it has been accorded unless it has been renewed for a further term by the acceptance of a revised estimate. Acceptance by competent authority however, of a budget estimate which includes specific provision/for expenditure on a work which is in progress, may be regarded as reviving for the year in which provision is made, the sanction to the estimate regardless is of the five years limit. But if no work has been commenced on a sanctioned scheme within two years of the date on which the sanction was accorded to the estimate, such sanction should be held to have lapsed and fresh sanction should be obtained from the competent authority by the submission of an up-to-date estimate, if necessary.

## **ESTIMATES**

**8.21 Scope of the sanction to an Estimate:** The authority granted by a sanction to an estimate should, on all occasions, be looked upon as strictly limited to the precise objects for which the estimate was intended to provide. Accordingly any anticipated or actual saving on a sanctioned estimate for a definite project should not, without special authority be applied to carry out additional work not contemplated in the original projector fairly contingent on its actual execution. Saving due to the abandonment of a substantial sanction of any project should not be considered as available, for work on other sections.

## **The Execution of Works**

**8.22** The ordinary rule is that no work may be commenced and no liability or expenditure incurred on a work until a detailed estimate for it has been sanctioned and an allotment of the requisite funds made by competent authority, This rule pertaining to preparation of estimate does not apply in the following cases:

- (i) For the construction or purchase of new work or asset under the category of new Minor works if estimated to cost upto Rs.5,000.
- (ii) For renewals and replacements of existing works and assets chargeable to Open Line Works Revenue as a new minor work if estimated to cost upto Rs.10,000.
- (iii) For renewal and replacements of assets charged to Development Fund and Depreciation Reserve Fund if estimated to cost Upto Rs.10,000.
- (iv) For renewals and replacements of assets charged to Revenue if estimated to cost upto Rs.50,000; and
- (v) For repairs and reconditioning of existing assets if estimated to cost upto Rs.50,000 (of para 701).

**8.23 Work started on Urgency Certificates.**-In addition to the exception mentioned in the preceding paragraph the following are the only classes of work on which expenditure or liability may be incurred prior to the receipt of sanction of the authority competent to sanction the estimates under the ordinary rules :

- (i) Works, which are considered to be urgently necessary to safeguard life or property or to repair damage to the line caused by flood, accident or other unforeseen contingency, so as to restore or maintain through communication.
- (ii) Works considered urgent but not falling within (i) above, as for instance, works required to meet the immediate needs, to traffic, which are considered by the GM so urgent that they must be started before the earliest date by which detailed estimates could be prepared.

**8.24** In according administrative approval or sanction and in allotting funds, if required, the competent authority will give such instructions as he considers necessary regarding the execution of the work to executive officers subordinate to him and fix a date by which the detailed estimate for the work should be prepared and got sanctioned. He will at the same time furnish a copy of his sanction and instructions to the Accounts Officers.

**8.25 Material Modifications**-No material modification in a work or scheme as sanctioned, should be permitted or undertaken without the prior approval of the authority who has sanctioned the estimate. In the case of estimates sanctioned by the Railway Board or higher authority, instances of what will be considered to be a material modification of a sanctioned project or work are given in paragraph 4.26 below.

**8.26** The following may be taken as material modifications on lines under construction and open line works estimated to cost rupees one crore and over :

- (a) Any change in the alignment likely to affect the facilities offered to the public in the neighbourhood or likely to increase or decrease the length of the line by over one kilometre.
- (b) Introduction of any new station or omission of any station.
- (c) Any alteration in the type or number of engines or vehicles provided in an estimate for rolling stock.
- (d) A change in the layout of a yard affecting the general method of working or increasing or reducing the trains that can be dealt with.
- (e) Any departure from the standards of construction as prescribed in Chapter II or as accepted by the Railway Board in the Abstract Estimate or use of any second hand material if it affects the speed of trains or the number of trains to be dealt with than contemplated originally.
- (f) The introduction or omission of any work or facility involving a sum of Rs.5 lakhs and over.
- (g) Any modification of, I sub-work provided for in the estimate of a sanctioned work involving an additional outlay on that sub-work of more than Rs.5 lakhs.
- (h) The introduction of any new sub-work not provided for in the estimate of a sanctioned work involving an outlay of more than Rs.5 lakhs.
- (j) Any alteration in the standards of interlocking.

**8.27 Departmental Charges** - When work is undertaken by the Engineering Department of a Railway for outside parties Railways, Government Department, Public bodies (eg., Municipalities, Port Trust, etc.) and employees of the Railway, Departmental charges should be levied to cover the cost of tools and plant and of establishment supervision. The charges liveable will be 12 ½ per cent on the total cost of the work (wages and materials) including the cost of land, except where a rate higher than 12 ½ per cent is charged to Governmental Departments on a reciprocal basis. The charge will be levied once only on the total outlay on a work (cash and stores and will not be addition to a first charge of 12 ½ per cent on the value of stores).

*Note.-* (1) The above rules do not apply to works undertaken Engineering Workshops to which the rules applicable to works undertaken in workshops of the Locomotive and Carriage and Wagon Department apply.

(2) Railway Units of the Territorial Army.-The charges under the foregoing rules may be remitted in the case of works not exceeding Rs.5010 in cost executed by the Engineering Department of a Railway for Railway Units of the Territorial Army provided that no additional establishment is entertained for such works.

**8.28 Remission of Departmental Charges**-The GM may, at his discretion, waive wholly or partially the recovery of the Departmental charges liveable under Paragraph 4.27 provided that

- (a) the Railway gains some advantage, not necessarily financial, by such remission
- (b) the reasons for the remission are recorded in each case and the remission is allowed with the concurrence of the Financial Adviser and Chief Accounts Officer; and
- (c) the non-incurrence of extra charges on accounts of tools and plant and establishment supervision does not in itself constitute sufficient justification for the remission.

## CHAPTER- 9: SCHEDULE OF MAINTENANCE OF SIGNALLING APPARATUS, PAINTING PROGRAMME

### CONTENTS

- Maintenance of Mechanical/Electrical/Block Signalling Equipments
- Prescribed Schedule of Maintenance of Mechanical/Electrical/Block Signalling Equipments
- Signalling Equipments that require painting
- Coloring Scheme for various Signalling equipments

The following are the guidelines for the maintenance of signalling gears in terms of SEM provisions and various rules.

### 9.1 Maintenance of Mechanical Signalling Equipments(SEM Pt. Ch XII):

#### 9.1.1 Examine

- (a) Check for intactness of parts and / or break
- (b) Check that all moving parts are free and working satisfactorily.
- (c) Check that all nuts, bolts, screws etc. are secured.
- (d) Check that all split pins are in position and opened.
- (e) Check for excessive wear and tear.
- (f) Check all adjusting screws for slackness of nuts and for stripped threads.
- (g) Check square-ness of various notches such as, notches in point stretcher blades, detector slides etc.
- (h) Check rodding run, detect weak places due to rust, corrosion etc. Check roller foundations for sinking, leaning and shifting, check for proper squareness of cranks and compensators.
- (i) Check that cross rods and wires are free of track-circuited rails and are not in contact with ballast.
- (j) Check that all wire connections are secured in position and are clear of moving parts and / or obstructions.
- (k) Check all timbers for intactness.
- (l) Check that there is no movement in the foundations or frames.
- (m) Check that covers are in correct position and properly secured.
- (n) Check that all signal posts, sighting / warning boards, shunting limit boards, block section limit boards, stop boards are true for plumb and free from damage.
- (o) Check signal stays for slackness
- (p) Check signal lamps for defective door, fount, burner etc.
- (q) Check proper focusing of signals
- (r) Check the floating of double wire compensator and also examines that pawl plate assmbly does not cross the broken wire mark or rests on the bottom stopper of the toggle rod.
- (s) Check that all signal arms are horizontal in the “ON” position.
- (t) Check square ness of the faces of the lock plunger, rotary detector rims and locks on the lock plunger.

- (u) Check that the points are for correct square ness not at out of square due to creep.
- (v) Check that the diversion wheels are free to rotate and the wire rope guides are properly provided and have the necessary clearance.
- (w) Check that all foundations for cranks etc. are intact.

#### **9.1.2 Gauge and Test**

Using appropriate test gauge, apparatus like points, detectors etc. should be tested to ensure correct setting of point's detectors and adjustment of clutch levers.

#### **9.1.3 Renew / Replace**

Renew items like wire pulleys, nuts and bolts, pins, signal roundels, top and bottom rollers, parts of cranks and compensators etc. wherever necessary.

#### **9.1.4 Report to the Supervisor**

- (a) Excessive wear and tear of the equipment.
- (b) Any defect observed in the design of any equipment
- (c) Excessive deterioration of equipment, requiring major renewals.
- (d) Foundations, which are shaking or in anyway damaged.
- (e) Excessive loss on stroke or equipment working very hard
- (f) Particulars of equipment in need of painting. All other cases that are beyond the competence of the Technician and requires immediate attention of Inspector.

#### **9.1.5 Clean**

Remove all grit, greasy matter and dirt from components, mounting plates or foundations.

#### **9.1.6 Lubricate**

- (a) Oil and lubricate points or holes on all pin bearings etc. using oil of correct specification.
- (b) Clean the grease nipples and grease all points with correct grade of grease with grease gun until surplus grease exudes.
- (c) Graphite detector shoes, angles, slides, locking trays, rodding on rollers etc.

### **9.2 Maintenance of Electrical Signalling Equipments: (Refer Annex-II)**

#### **9.2.1 Examine**

- (a) Check for completeness of parts and/or breakages.
- (b) Check that all moving parts are free and working satisfactorily.
- (c) Check that all nuts, bolts, screws, etc., are secured.
- (d) Check that all split pins are in position and opened.
- (e) Check that all terminals, insulation and connections are secured.

- (f) Check for excessive wear and tear.
- (g) Check that covers are in correct position and properly secured
- (h) Check all location boxes and apparatus cases for corrosion and attack by white ants, etc. Check that they are secured and locked.
- (i) Check all track circuits for the following
  - (i) Defective bonds
  - (ii) Slack fish plate bolts and loose packing in vicinity of insulated rail joints
  - (iii) Adequate arrangement to arrest creep
  - (iv) Loose dog spikes likely to touch the fish plate
  - (v) Creep of metal or burr formation on running surface towards end post
  - (vi) Loose bearing plates likely to bridge the joint due to creep
- (j) Check all batteries. Check various equipments for their correct operating voltages and current
- (k) Check for cleanliness of all contact points and contact surfaces to ensure good electrical continuity, taking care not to alter contact pressure.
- (l) Check various indicators to see that they return to their normal position after the intended operation is over.
- (m) Check all color light signals for proper focusing. Renew lamps / reflectors, lenses etc. as required.
- (n) Check that electric slots / reversers do not hold when de-energised and coil core does not retain any residual magnetism.
- (o) Check token / tablet pouches for intactness replace if any deformation.
- (p) Check the effectiveness lightning dischargers of various circuits.
- (q) Check various repeaters for proper functioning.
- (r) Check the normal, back and indication locks on the various levers and ensure that they cannot be released without fulfilling the required conditions in case of conventional mechanical frames.
- (s) Check that all cables, wiring and overhead lines are in good condition and properly secured. Check overhead line wires especially for loose wire binders, excessive sag, slack stays, broken and dirty insulators, proper alignment and posts for damage and true for plumb.
- (t) Check electric key transmitters and ensure that the key cannot be extracted without being transmitted.

### **9.2.2 Renew / Replace**

Renew small items, batteries, nuts, bolts, pins etc. as required. Replace defective insulations.

### **9.2.3 Report to the Supervisor**

- (a) Excessive wear and tear of equipment.
- (b) Any defect observed in the design of any equipment.
- (c) Excessive deterioration of equipment requiring major renewal. Defective relays.
- (d) Insulated Rail Joints or parts requiring special attention of P-Way staff.
- (e) Particulars of signalling equipment in need of painting.
- (f) Power supply failures or fluctuations requiring immediate attention.
- (g) All other cases that are beyond the competence of the maintainer and require immediate attention of the Inspector.

### **9.2.4 Clean**

- (a) Outdoor Equipment and that Under Cabin ,Remove all grit, grease and dirt from exterior and interior and water from interior. Greasy matter and carbon deposits due to sparking to be removed in electrical equipment.
- (b) Indoor Equipment and that Inside Cabin or Relay Room
  - (i) Unsealed: Remove dust with dry rag or brush from both interior and exterior.
  - (ii) Sealed: Remove dust with dry rag or brush from exterior

### **9.2.5 Lubricate**

- (a) Oil and Lubricate points or holes on all pins, bearings etc. using oils of correct specification.
- (b) Clean the grease nipples and grease all points with correct grade of grease with grease gun until surplus grease exudes.

## **9.3 Maintenance of Block Instruments**

*Please refer IRISSET notes on various types of block instruments.*

## **9.4 Painting Programme**

### **9.4.1 Equipment to be painted**

The following are the main items of signalling equipment that need regular painting

- (a) Signal arms, point indicators, boards and markers
- (b) Signal posts and Signal fittings.
- (c) Interlocking frames, their levers & fittings.

- (d) Ground and miscellaneous gear, such as rodding, guide roller assembly, cranks, compensators, turnout wheels
- (e) Lifting barriers, if maintained by Signal and Telecommunication department.

#### **9.4.2 Coloring Scheme**

Items detailed in Para above shall be painted in accordance with coloring scheme shown for the respective item in Annexure-25 Para 18.35 of SEM Pr-II

**Electrical signalling equipment shall be painted in accordance with the Color Scheme shown for the respective items in Annexure 29 Para 19.106 of SEM Pt-II**

#### **9.4.3 Interval of Painting**

The general principles for fixing intervals shall be the following

- (a) Signal arms, indicators, etc., which are required to be painted to conventional shapes and / or colors shall be painted once in a year.
- (b) Signal posts which are to be kept conspicuous and cabin levers which are to be distinguished by colors, shall be painted once in three years.
- (c) Rodding, guide roller assembly, etc., which only need a protective covering, shall be painted once in six years.

**Note:** The intervals mentioned above may be reduced in areas where, on account of weather or other local conditions painting at shorter intervals is necessary.

#### **9.4.4 Record of Painting**

- (a) Each JE/SE/SSE(Signal) shall maintain a Painting Register, one page or more being allotted to each station or cabin on his section. Record of the painting work done with dates of commencing and completing the work shall be regularly entered in this register.
- (b) Each JE/SE/SSE(Signal) shall also record the date of painting with particulars of the programme carried out in the Signal Incidences Book maintained at each station. This should be done on the very first inspection after painting work has been completed.

#### **9.4.5 Painting Programme**

- (a) Each SSE/JE shall be responsible to see that the Signal and Telecommunication equipment under his charge is painted regularly at intervals as detailed in Annexure. To ensure regular painting, each SSE/JE should prepare and maintain a six yearly programme. For preparing the yearly programme, each SSE/JE may split his section into six suitable sub-sections and enter the details of stations and the particulars of various equipments to be painted. Various paints required for carrying out the work should also be worked out by each SSE/JE for the purpose of requisitioning the painting materials. To ensure timely supply, he must submit his requisitions to the Sr.DSTE sufficiently in advance.
- (b) Each SSE/JE shall supply a six copies of the yearly programme to the Sr.DSTE for his information and record.

- (c) Each SSE/JE must draw out a programme of work painter under his charge and give him definite instructions about the painting work to be carried out. Painters must be instructed to record the daily programme of work.

#### **9.4.6 Painting Register**

- (a) Each SSE/JE must maintain a painting register, one page or more being allotted to each station or cabin on his section. Record of the painting work done with dates of commencing and completing the work must be regularly entered in this register.
- (b) Each SSE/JE must also record the date of painting with particulars of the programme carried out in the Signal Failure and Inspection Book maintained at each Station. This should be done on the very first inspection by the SSE/JE after painting work has been completed.

#### **9.4.7 Inspection**

- (a) Each Sectional SE/JE and in-charge SSE must, during the course of his monthly / quarterly inspection, see that the painters are making satisfactory progress and that the painting work done is in accordance with the Instructions.
- (b) Each Sr.DSTE shall see that the painting programme is strictly adhered to and that it is completed in time. He shall during the course of his Inspection, also see that all the equipment and apparatus is kept properly painted in accordance with the Instructions.

#### **9.4.8 General Instructions**

- (a) Paints should be stored in a cool, dry place away from flame or direct light.
- (b) All containers should be kept securely closed when not in use, to avoid loss of material due to skimming and contamination. Paints, especially quick drying paints, should not be left open to the atmosphere.
- (c) Paints from pigments and pastes must be prepared in accordance with standard specifications.
- (d) Linseed oil or Turpentine should not be added to ready mixed paints. Mixing of kerosene with paints is not allowed.

#### **9.4.9 Painting of Steel Works**

- (a) The surface of metal should be clean and free from dirt. Scale, deteriorated old paint and rust and should be cleaned and the surface must be perfectly dry before application of paint. Painting should be done preferably during dry weather.
- (b) For a new steel work, three coats of paints should be applied. First coat should be of 'Red Lead', the second of 'Red Oxide' and the third of the specific paint recommended for the structure. When repainting a structure if the old paint does not show any signs of blistering, scaling or crackling, it need not be scrapped off. It may be used as a foundation for the new coat.
- (c) When there are patches of blistering, scaling or cracking, these patches should be cleaned down to the steel and treated in a manner as recommended for a new structure.

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- (d) The surface of metal should be cleaned by scrapping, chipping or scrubbing with brick-bats. No chemical of any kind must be used. Old paint may be burnt, if necessary, and then scrapped off.
- (e) Paint should be applied with brushes and spread evenly, smoothly and as thin as possible. Rags or waste cotton should not be used for the application of paint.
- (f) Brushes should be thoroughly cleaned in proper driers after use.

**9.4.10 Numbering of Points and Signals**

- (a) The cabin lever number of points and facing points lock bars should be painted in 50 mm letters on the web and close to the toe of the switch rail.
- (b) The number of the cabin operated lever, operating the signal should be painted in 50 mm letters at the back of the signal arm blade.
- (c) Numbers of interlocking frame levers should also be painted on the front and backside of the main girder supporting the frame opposite each lever in 30 mm with white letters.

**9.4.11 Dates of Painting**

The year and the month of painting work must be clearly and neatly shown on all interlocking frames, signal posts, block instruments, Station Master's Slide Control frames and instruments.

**9.4.12 Color Scheme for Block Signalling Equipment (Annexure-25 Para 18.35 of SEM Pt-II)**

(a) Single Line Token and Tablet Instruments

|   |     |              |
|---|-----|--------------|
| (i) Body  | ... | Grey Enamel  |
| (ii) Operating Handle, Bell except Gong,<br>Station Master's Control Lock | ... | Black Enamel |

(b) Single Line Token less Block Instruments

|                               |     |              |
|-------------------------------|-----|--------------|
| (i) Body                      | ... | Grey Enamel  |
| (ii) Operating handle, if any | ... | White        |
| (iii) Base                    | ... | Black Enamel |

(c) Double Line Block Instruments

|                   |     |               |
|-------------------|-----|---------------|
| (i) Wood Work     | ... | Spirit Polish |
| (ii) Metal Casing | ... | Green Enamel  |

(d) Token Delivery Nets

...

White

(e) Line Clear pick-up Apparatus

|               |     |       |
|---------------|-----|-------|
| (i) Post      | ... | White |
| (ii) Fittings | ... | Black |

**MAINTENANCE SCHEDULE OF MECHANICAL SIGNALLING GEARS**

(Annexure-7 Para 12.192 of SEM Pt-II)

| Sl.<br>No | Maintenance work to be done  | Periodicity          |                        |                            |
|-----------|--|----------------------|------------------------|----------------------------|
|           |  | Signal<br>Maintainer | JE/ (Sig)<br>Sectional | SSE<br>(Sig) In-<br>charge |
| 1         | 2  | 3                    | 4                      | 5                          |
| 1.        | <b>CABIN: General</b>  |                      |                        |                            |
| 1.1       | Cleaning the ground floor & locking.   | F                    | M                      | Q                          |
| 1.2       | Checking cabin diagram, pull chart, station working instructions, maintainer's programme up to date and warning board (DW cabin) | -                    | M                      | Q                          |
| 1.3       | Test locking against interlocking table and yard diagram and broken wire test (if D.W.).   | -                    | Random check           | Y                          |
| 1.4       | Check the sealing and locking tray, resetting handle box etc.  | F                    | M                      | Q                          |
| 1.5,      | Check if the lever frame is due for overhauling.   | -                    | M                      | Q                          |
| 1.6       | Check the installation as per current plan.  | -                    | M                      | Q                          |
| 1.7,      | Check interchangeability of keys of padlocks where available.  | F                    | M                      | Q                          |
| 1.8       | Check from the operator any defect or discrepancy of the gears.  | F                    | M                      | Q                          |
| 1.9       | Conduct Dynamometer test, if double wire frame.  | -                    | -                      | HY                         |
| 1.10      | Check the signals are visible from place of operation  | F                    | M                      | Q                          |
| 2         | <b>LEVER FRAME</b>   |                      |                        |                            |
| 2.1,      | Check bolts and nuts for tightness and opening of split pins including the safety bolts for D.W. compensator.                    | F                    | M                      | Q                          |
| 2.2       | Lubricate all accessible parts.  | F                    | M                      | Q                          |
| 2.3       | Operate lever and check that full stroke is transmitted  | M                    | Q                      | HY                         |
| 2.4       | Check the painting of levers   | -                    | Q                      | HY                         |
| 2.5       | Check the tripping of DW clutch levers   | -                    | M                      | Q                          |
| 2.6,      | Check all connections including down rods to detect cracks, slipped threads and spacing.   | F                    | M                      | Q                          |
| 2.7       | Check if pulley block in DW cabin is in order.   | F                    | M                      | Q                          |

**SCHEDULE OF MAINTENANCE OF SIGNALLING  
APPARATUS, PAINTING PROGRAMME**

| Sl.<br>No | Maintenance work to be done  | Periodicity          |                        |                            |
|-----------|--|----------------------|------------------------|----------------------------|
|           |  | Signal<br>Maintainer | JE/ (Sig)<br>Sectional | SSE<br>(Sig) In-<br>charge |
| 1         | 2  | 3                    | 4                      | 5                          |
| 2.8       | Check the DW compensators that when the transmission is at rest, both the grips of Locking Pawl are disengaged with the teeth of Ratchet Rod. The weights must be floating freely and in level with each other. During lever operation, check that they engage with the Ratchet Rod teeth. | M                    | Q                      | HY                         |
| 2.9       | Adjust weight levers in such a way that during the hottest period of the day   | M                    | Q                      | HY                         |
| 2.10      | Check the lubrication of compensator wheel grooves and wire rope with graphite   | F                    | M                      | Q                          |
| 2.11      | Check the drum lock fitted on coupled Clutch / Clutch / Direct levers for effectiveness.   | F                    | M                      | Q                          |
| <b>3.</b> | <b>LEAYOUTS &amp; CRANKS</b>   |                      |                        |                            |
|           | Examine, clean, oil and observe cranks & wheels for lost motion or worn out parts & check the foundations are rigid. All badly worn out pins is replaced.  | F                    | M                      | Q                          |
| <b>4.</b> | <b>RODDING RUN</b>   |                      |                        |                            |
| 4.1       | Check the rodding run in true alignment, spacing of roller trestles, free from vegetation growth.  | F                    | M                      | Q                          |
| 4.2       | Check the rollers are moving freely & replace the missing or broken parts & check whether the alignment requires earthwork.  | M                    | Q                      | HY                         |
| 4.3       | Check joints are good and make solid connection  | F                    | M                      | Q                          |
| 4.4       | Check the rodding run under the track is clear of rails and obstruction.   | M                    | Q                      | HY                         |
| 4.5       | Check the couplings, adjusting screws and joints for looseness, stripped threads or slack nuts; and lubricate threads  | F                    | M                      | Q                          |
| 4.6       | Check the rodding run for any weak places due to rust, corrosion etc.  | M                    | Q                      | HY                         |
| 4.7       | Check the position of compensators when a point or lock does not work properly.  | As & when required   | -                      | -                          |
| 4.8       | Check whether the roller trestles require realignment due to shifting or sinking.  | Q                    | HY                     | Y                          |
| 4.9       | Check the adjusting sleeve of the adjusting crank and check for loss of stroke.  | Q                    | HY                     | Y                          |
| <b>5</b>  | <b>WIRE TRANSMISSION (SINGLE WIRE)</b>   |                      |                        |                            |
| 5.1       | Check for alignment level, corrosion and for kinks.  | M                    | Q                      | HY                         |
| 5.2       | Check for the wear on the pulleys, damaged or broken pulleys to be replaced.   | M                    | Q                      | HY                         |

| Sl.<br>No | Maintenance work to be done   | Periodicity          |                        |                            |
|-----------|---|----------------------|------------------------|----------------------------|
|           |   | Signal<br>Maintainer | JE/ (Sig)<br>Sectional | SSE<br>(Sig) In-<br>charge |
| 1         | 2   | 3                    | 4                      | 5                          |
| 5.3       | Check the wire run underneath the track for rubbing against ballast, bottom of rails or sides of sleepers and also for corrosion and kinks in the troughing underneath level crossings. | M                    | Q                      | HY                         |
| 5.4       | Check the wire joints and split links and adjacent joints do not get entangled.   | M                    | Q                      | HY                         |
| 5.5       | Check for spacing of stakes (is not allowed more than 10Mts)  | M                    | Q                      | HY                         |
| 5.6       | Check wheels are rigidly fixed on foundation and replace worn out wheels.   | M                    | Q                      | HY                         |
| <b>6.</b> | <b>DOUBLE WIRE</b>  |                      |                        |                            |
| 6.1       | Check all transmission work freely and loss of stroke at the end of the transmission must be avoided.   | F                    | M                      | Q                          |
| 6.2       | Check all pulleys are parallel to the wire run. Check that there is no binding in any part of transmission.   | F                    | M                      | Q                          |
| 6.3       | Check the spacing of the stakes is not more than 15m for points & detector, & 20 m for signals.   | M                    | Q                      | HY                         |
| 6.4       | Check disconnecting pins are available at the end of transmission for conducting broken wire test.  | M                    | Q                      | HY                         |
| 6.5       | Check pull wire and return wire are properly identified by painting.  | M                    | Q                      | HY                         |
| 6.6       | Check the wheel guides are intact and avoid wire slipping from turnout wheels.  | M                    | Q                      | HY                         |
| <b>7</b>  | <b>POINTS</b>   |                      |                        |                            |
| 7.1       | Cleaning and lubricating of moving parts. Also checkpoint chairs are cleaned regularly by Permanent way staff.  | W                    | M                      | Q                          |
| 7.2       | Check the gauge of the points, opening of the switches and squaring and packing condition of sleepers under gauge tie plate and slide chair-fixing bolts.                               | W                    | M                      | Q                          |
| 7.3       | Make visual check regarding the condition of switches sleepers, gauge tie plate.  | W                    | M                      | Q (jointly with PWI)       |
| 7.4       | Check the switches are housed properly against stock rail and check spring on the switches equally in the normal & reverse positions.   | W                    | M                      | Q                          |
| 7.5       | Check the points for obstruction test   | W                    | M                      | Q                          |
| 7.6       | Check the ends of plunger of the lock and notches are square.   | W                    | M                      | Q                          |
| 7.7       | Check the lock plunger is 12 mm clear from the stretches blades when unlocked. In case of EFP locks, check locking Dog protrudes 3 mm (at least) after locking both the stretches.      | W                    | M                      | Q                          |

**SCHEDULE OF MAINTENANCE OF SIGNALLING  
APPARATUS, PAINTING PROGRAMME**

| <b>Sl.<br/>No</b> | <b>Maintenance work to be done</b>   | <b>Periodicity</b>           |                                |                                     |
|-------------------|--|------------------------------|--------------------------------|-------------------------------------|
|                   |  | <b>Signal<br/>Maintainer</b> | <b>JE/ (Sig)<br/>Sectional</b> | <b>SSE<br/>(Sig) In-<br/>charge</b> |
| 1                 | 2  | 3                            | 4                              | 5                                   |
| 7.8               | Check for tightness of Bolts & Nuts and arrange for tightening / replacing missing bolts and nuts of Flexible stretchers.                                  | W                            | M                              | Q                                   |
| 7.9               | Check lock bars are straight and examine the driving pieces for intactness.  | W                            | M                              | Q                                   |
| 7.10              | Check the lock bar clips and stops for tightness and lubricate the bearing of clips.   | W                            | M                              | Q                                   |
| 7.11              | Badly worn out clips to be replaced and check if creep is affecting the working of lock bar.   | W                            | M                              | Q                                   |
| 7.12              | Check that lock bars lie 38 mm below the top of the rail.  | F                            | M                              | Q                                   |
| 7.13              | Check the broken wire locks & also check the point mechanism is butting against its stop in normal & reverse.  | W                            | M                              | Q                                   |
| 7.14              | Check that no two similar wards exist for conflicting train movements for hand plunger lock, electric key transmitting.                                    | -                            | M                              | Q                                   |
| <b>8.</b>         | <b>DETECTORS</b>   |                              |                                |                                     |
| 8.1               | Check the signal wires to the detectors are in alignment & check when the signal is returned to "ON" all signal slides are travelling back to their stops. | F                            | M                              | Q                                   |
| 8.2               | Check for obstruction test.  | W                            | M                              | Q                                   |
| 8.3               | Lubricate the detector slides thoroughly.Check the cross slides for any undue play. Also check the detectors are fixed rigidly.                            | W                            | M                              | Q                                   |
| <b>9</b>          | <b>SIGNALS</b>   |                              |                                |                                     |
| 9.1               | Check the condition of the post, fittings, level of arms and the posts are properly plumbed and lubricate working parts.                                   | F                            | M                              | Q                                   |
| 9.2               | Inspect the platforms where provided for decayed or losses boards.   | F                            | M                              | Q                                   |
| 9.3               | Cleaning of the roundels, glasses and lenses.  | Applicable for traffic staff | Applicable for traffic staff   | Applicable for traffic staff        |
| 9.4               | Check the founts of signal lamps are in good repair. Check for damaged flame guard, leaky founts and broken burners and non-standard wick.                 | F                            | M                              | Q                                   |
| 9.5               | Check the focusing of signals.   | M                            | M                              | Q                                   |
| 9.6               | Testing of signals.  | M                            | M                              | Q                                   |
| 9.7               | Where double wire signal mechanism is used, check lubrication of cam path.   | F                            | M                              | Q                                   |
| 9.8               | Check all signal lamps are overhauled.   | Y                            | Y                              | Y                                   |
| 9.9               | Cleaning of signal arms. Painting to be got done if required.  | Q                            | HY                             | Y                                   |
| 9.10              | Check adjustment of back light.  | M                            | Q                              | HY                                  |

W=Weekly; F=Fortnightly; M=Monthly; Q=Quarterly; HY=Half Yearly; Y=Yearly

**SCHEDULE OF MAINTENANCE OF ELECTRICAL SIGNALLING EQUIPMENT**  
(Annexure 30 Para 19.148 of SEM Pt-II)

| SI.<br>No. | Maintenance work to be done  | Periodicity          |                       |                              |
|------------|--|----------------------|-----------------------|------------------------------|
|            |  | Signal<br>Technician | JE (Sig)<br>Sectional | SSE (Sig)<br>(In.<br>Charge) |
| 1          | 2  | 3                    | 4                     | 5                            |
| 1.         | <b>SECTION 'B' – COLOR LIGHT SIGNALS</b>   |                      |                       |                              |
| 1.1        | Check the cleanliness of Lenses. Housing shall be kept clean   | F                    | M                     | Q                            |
| 1.2        | Check the lamps are replaced as per the extent instructions  | F                    | M                     | Q                            |
| 1.3        | Check the lamps are working at 90% of rated voltage  | F                    | M                     | Q                            |
| 1.4        | Check the lamps used are tested prior to replacement   | ...                  | M                     | Q                            |
| 1.5        | Check the bulbs are seated properly  | F                    | M                     | Q                            |
| 1.6        | Check the focusing of signals  | M                    | M                     | Q                            |
| 1.7        | Check all adjusting nuts are properly tightened  | F                    | M                     | Q                            |
| 2          | <b>SECTION 'C' SIGNAL MACHINE</b>  |                      |                       |                              |
| 2.1        | Check the machine is in good condition, free from dirt, rust and dust, peeling off of electroplating.                                      | F                    | M                     | Q                            |
| 2.2        | Check lubrication of all the gearing and bearings  | F                    | M                     | Q                            |
| 2.3        | Check all the contacts for cleanliness, freedom from pitting and proper adjustment   | F                    | M                     | Q                            |
| 2.4        | Check the cleanliness and smoothness of the commutator   | F                    | M                     | Q                            |
| 2.5        | Check and drain out any oil accumulated at the bottom of the case. Oil the machine with good quality high grade lubricating oil to IS:1628 | F                    | M                     | Q                            |
| 2.6        | Check smooth operation of gear train free of noise   | F                    | M                     | Q                            |
| 2.7        | Check the wear on the brush. If the wear is such that the tensioning spring touches the brush carrier, replace the brush.                  | F                    | M                     | Q                            |
| 2.8        | Conduct positive test. Take off signal, observe latching without clutch slipping; if clutch slips, adjust the clutch.                      | F                    | M                     | Q                            |
| 2.9        | Negative test. Near 45° & near 90° before hold off device engages, cut off supply. Signal should return to "ON"                            | ...                  | M                     | Q                            |
| 2.10       | Check the gasket on the cover in position  | F                    | M                     | Q                            |

**SCHEDULE OF MAINTENANCE OF SIGNALLING  
APPARATUS, PAINTING PROGRAMME**

| Sl.<br>No. | Maintenance work to be done  | Periodicity          |                       |                              |
|------------|--|----------------------|-----------------------|------------------------------|
|            |  | Signal<br>Technician | JE (Sig)<br>Sectional | SSE (Sig)<br>(In.<br>Charge) |
| 1          | 2  | 3                    | 4                     | 5                            |
| 2.11       | Check effectiveness of snubbing  | F                    | M                     | Q                            |
| <b>3</b>   | <b>SECTION 'E' – REVERSERS</b>   |                      |                       |                              |
| 3.1        | Check oiling of all moving parts. Ensure oil holes are not clogged by dirt or excessive oil. Lubricate with axle oil Medium to IS: 1628. Ball bearing must be greased with graphited grease (Grease A No. 0 to IS: 408)  | F                    | M                     | Q                            |
| 3.2        | Remove the dashpot assembly from reverser & check if the oil level is lower than 35 mm above the bottom of the sliding cylinder. Insulation oil for transformer to IS: 335 shall be used for topping up. As the gap between sliding cylinder and plunger is very little, any sludge in the oil will block the passage & may affect the functioning of dashpot. If the oil is found to be sludgy, it shall be removed. Check the dashpot spring is not broken or cracked. | ...                  | ...                   | Y                            |
| 3.3        | Check screws, bolts and nuts-open split pins   | F                    | M                     | Q                            |
| 3.4        | Check the surfaces of armature & core are clean. Check the lubrication of sliding bar of electromagnet and see it slides freely in the bracket.  | F                    | M                     | Q                            |
| 3.5        | Polarity to the coil of reverser to be changed   | M                    | ...                   | ..                           |
| 3.6        | Check the voltage and current of reverser coil   | ...                  | M                     | Q                            |
| 3.7        | Check the insulation of the coil   | ...                  | Q                     | HF                           |
| 3.8        | Check the position of spectacle lever and operating lever to see whether arrow mark on them coincide with the arrow marks on the bridge. If the marks are shifted, check if the dashpot spring has lost tension or the down rod has loosened. Action to be taken as situation warrants.  | F                    | M                     | Q                            |
| <b>4.</b>  | <b>SECTION 'F'- POINT MACHINES</b>   |                      |                       |                              |
| 4.1        | Check the machines are kept free from rust, dirt and fixtures. Check for tightness. Point chairs in which signalling and interlocking gears are connected (generally upto third sleeper from toe of the switch) shall be cleaned regularly by signal staff.  | F                    | M                     | Q                            |
| 4.2        | Check lubrication of all gears and bearings  | F                    | M                     | Q                            |
| 4.3        | Check the cleanliness & smoothness of commutator   | F                    | M                     | Q                            |
| 4.4        | Check the contacts for freedom from pitting and proper adjustment.   | F                    | M                     | Q                            |
| 4.5        | Check for proper ballasting and packing of sleepers..  | F                    | M                     | Q                            |

| Sl.<br>No. | Maintenance work to be done   | Periodicity          |                       |                              |
|------------|---|----------------------|-----------------------|------------------------------|
|            |   | Signal<br>Technician | JE (Sig)<br>Sectional | SSE (Sig)<br>(In.<br>Charge) |
| 1          | 2   | 3                    | 4                     | 5                            |
| 4.6        | Tighten all nuts, check nuts & bolts. Tighten lock nuts holding the detector slides and lock slides with lugs are kept tight. After tightening, the nut and lock nut should be turned in opposite direction towards each other to lock the nut. | F                    | M                     | Q                            |
| 4.7        | Check the wires carefully to keep them neatly dressed and clear of all moving parts.  | F                    | M                     | Q                            |
| 4.8        | Lubricate the slides, rollers & pins with axle oil Medium grade to IS: 1628. Avoid overflow of oil  | F                    | M                     | Q                            |
| 4.9        | Ensure all the bridge contacts make and break at the same time  | F                    | M                     | Q                            |
| 4.10       | Check the pins of switch extension piece for any rib formation or excessive wear.   | F                    | M                     | Q                            |
| 4.11       | Conduct obstruction test  | F                    | M                     | Q                            |
| 4.12       | Check the functioning of overload arrangement and out of correspondence.  | F                    | M                     | Q                            |
| 4.13       | Check the tripping at overload of Friction Clutch   | ...                  | M                     | Q                            |
| 4.14       | Insulation tests on the point machine to be conducted   | ...                  | HF                    | Y                            |
| 4.15       | Check all grease nipples provided are in position. Recommended type of grease should be used.   | M                    | Q                     | HF                           |
| 4.16       | Check the setting of switches for having required amount of spring. Action.   | F                    | M                     | Q                            |
| 4.17       | Measure the voltage & current at Motor terminals for both normal & reverse operations. These should be within the specified limits according to the different types of Point machines.  | ...                  | M                     | Q                            |
| 5          | <b>SECTION 'G' – ELECTRICAL DETECTORS</b>   |                      |                       |                              |
| 5.1        | Check that contacts make or break at same time. Check that the cross protection contact makes only after concerned detection contact open. Normal detection opens then only normal shunt contact to close and vice-versa.                       | F                    | M                     | Q                            |
| 5.2        | Check that sleepers are packed well   | F                    | M                     | Q                            |
| 5.3        | Check tightening of all nuts and screws   | F                    | M                     | Q                            |
| 5.4        | Check slides and rollers are lubricated with axle oil Grade Medium to IS: 1628  | F                    | M                     | Q                            |
| 5.5        | Check the wires are neat and tidy.  | F                    | M                     | Q                            |
| 5.6        | Obstructions test.  | F                    | M                     | Q                            |
| 6          | <b>SECTION 'I' – RELAYS</b>   |                      |                       |                              |
| 6.1        | Check deposit of dust on relays and clean   | F                    | M                     | Q                            |
| 6.2        | Check for any high resistance on any contact  | WN                   | ...                   | ...                          |

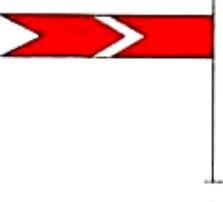
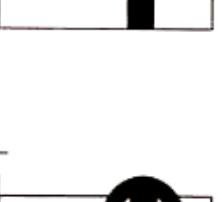
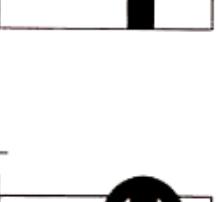
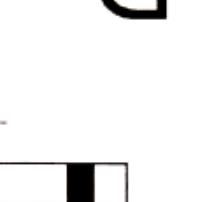
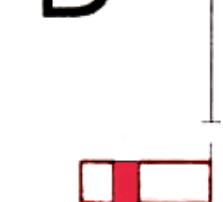
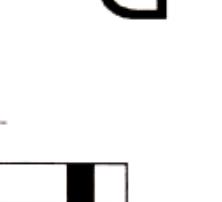
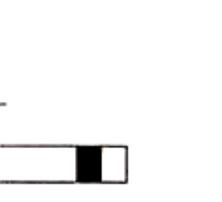
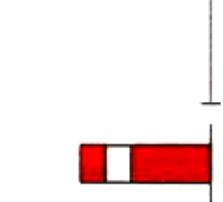
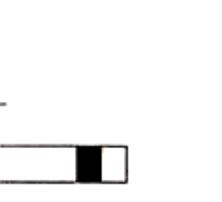
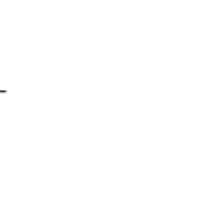
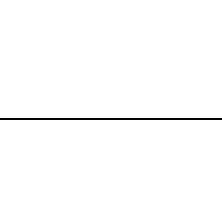
**SCHEDULE OF MAINTENANCE OF SIGNALLING  
APPARATUS, PAINTING PROGRAMME**

| <b>Sl.<br/>No.</b> | <b>Maintenance work to be done</b>   | <b>Periodicity</b>           |                               |                                       |
|--------------------|--|------------------------------|-------------------------------|---------------------------------------|
|                    |  | <b>Signal<br/>Technician</b> | <b>JE (Sig)<br/>Sectional</b> | <b>SSE (Sig)<br/>(In.<br/>Charge)</b> |
| <b>1</b>           | <b>2</b>   | <b>3</b>                     | <b>4</b>                      | <b>5</b>                              |
| 6.3                | Visual Inspection of plug-in relays & maintenance register.                                  | TY                           | ...                           | ...                                   |
| 6.4                | Check overhauling of shelf type track and line relays.                                       | ...                          | ...                           | Q                                     |
| 6.5                | Check the accuracy of Time Delay Circuits.   | ...                          | M                             | Q                                     |
| <b>7</b>           | <b>SECTION 'J' – STATION MASTER'S SLIDE CONTROL FRAME</b>                                    |                              |                               |                                       |
| 7.1                | Check free working of all slides   | F                            | M                             | Q                                     |
| 7.2                | Check proper making of all contact springs   | F                            | M                             | Q                                     |
| 7.3                | Check the condition of the wiring  | F                            | M                             | Q                                     |
| 7.4                | Test the Mechanical locking  | ...                          | ...                           | Y                                     |
| <b>8</b>           | <b>SECTION 'K' – KEY TRANSMITTERS</b>  |                              |                               |                                       |
| 8.1                | Check lubrication & free working of all moving parts   | F                            | M                             | Q                                     |
| 8.2                | Check cleanliness & good adjustment of all contact springs                                   | F                            | M                             | Q                                     |
| 8.3                | Check the keys of one transmitter does not fit in any other key transmitter at that station. | ...                          | M                             | Q                                     |
| 8.4                | Check and ensure that key cannot be extracted irregularly                                    | F                            | M                             | Q                                     |
| 8.5                | Check the seals are intact.  | F                            | M                             | Q                                     |
| <b>9.</b>          | <b>SECTION'L'-LEVER LOCKS</b>  |                              |                               |                                       |
| 9.1                | Check cleanliness and lubrication of all working / moving parts                              | F                            | M                             | Q                                     |
| 9.2                | Check the forced drop feature of the lever lock  | F                            | M                             | Q                                     |
| 9.3                | Check the notches are square and true  | F                            | M                             | Q                                     |
| 9.4                | Tighten all bolts, nuts, terminals & locking screws  | F                            | M                             | Q                                     |
| 9.5                | Check the cleanliness & proper adjustment of contacts  | F                            | M                             | Q                                     |
| 9.6                | Check contacts are not making other than the required position.                              | F                            | M                             | Q                                     |
| 9.7                | Check contacts are not making other than the required position                               | F                            | M                             | Q                                     |
| <b>10</b>          | <b>SECTION 'M' – ARM AND LIGHT REPEATERS</b>   |                              |                               |                                       |
| 10.1               | Check that the circuit controllers are rigidly fixed to the Signal post.                     | F                            | M                             | Q                                     |
| 10.2               | Check the circuit controller adjustment  | F                            | M                             | Q                                     |
| 10.3               | The audible warning device where provided is in order. Check the wiring is protected.        | F                            | M                             | Q                                     |
| 10.4               | Check that thermostat contacts are correctly adjusted and in working order.                  | F                            | M                             | Q                                     |
| 10.5               | Check correct functioning and ensure that no conflicting indication is available.            | F                            | M                             | Q                                     |

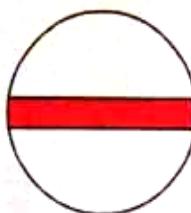
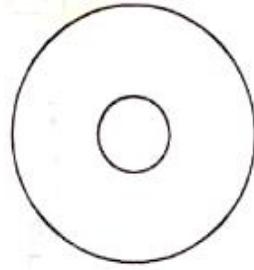
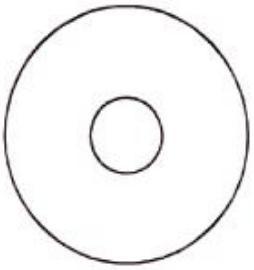
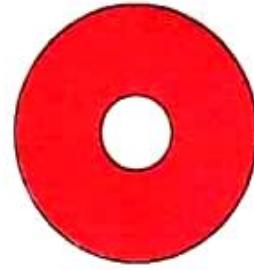
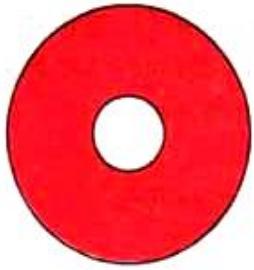
Note: W=Weekly; F=Fortnightly; M=Monthly; Q=Quarterly; HY=Half Yearly; A=Annual;  
TY=Once in three years; WN=When necessary.

## Mechanical Signalling Gear

**(Annexure 6 Para 12.134 of SEM Pt-II) Semaphore signal arms, Point indicators, Boards and Markers**

| <u>Signal</u>                           | <u>Front</u>  | <u>Shape</u>   | <u>Back</u>  | <u>Remarks</u>  |
|---|---|--|--|---|
| a) Warner Signal<br>(two aspect)        |    |    |    | a) Fish tailed bar 175 mm wide, 250 mm from the nose.   |
| b) Distant Signal<br>(multiple aspect)  |    |    |   | b) Fish tailed bar 175 mm wide, 250 mm from the nose.   |
| c) Stop Signal                          |   |   |  | c) Bar 175 mm wide, 250 mm from the nose.   |
| d) Goods Signal                         |  |  |  | d) (i) Bar 175 mm wide, 250 mm from the nose.<br>(ii) Diameter of ring outside 450 mm, inside 300 mm. |
| e) Dock Signal                          |  |  |  | e) (i) Bar 175 mm wide, 250 mm from the nose.<br>(ii) Letter 'D' height 450 mm.                       |
| g) Calling-on Signal                    |  |  |  | g) Bar 175 mm wide, 250 mm from the nose.   |
| h) Shunt Signal<br>(Miniature Arm type) |  |  |  | h) Bar 125 mm wide, 175 mm from the nose.   |

**SCHEDULE OF MAINTENANCE OF SIGNALLING  
APPARATUS, PAINTING PROGRAMME**

| <u>Signal</u>                       | <u>Shape</u>  |  | <u>Remarks</u>                      |
|-------------------------------------|---|--|-------------------------------------|
|                                     | <u>Front</u>  | <u>Back</u>  |                                     |
| k) Shunt Signal<br>(Disc type)      |    |    | k) Bar 150 mm wide.                 |
|                                     | <b>Point Facing</b>   | <b>Point Trailling</b>   |                                     |
| m) Point Indicator<br>(Target type) |   |   | m) Points set for straight.         |
| n) Point Indicator<br>(Target type) |  |  | n) Trap open or derail on the line. |

| <u>Signal</u>                      | <u>Shape</u> | <u>Remarks</u>  | <u>Signal</u>        | <u>Shape</u> | <u>Remarks</u>   |
|------------------------------------|--------------|---|----------------------|--------------|--|
| q) 'S' marker for outlying sidings |              | q) (i) Disc diameter : 1 metre.<br>(ii) Letter 'S' height : 300 mm<br>40mm thick.<br>(iii) Height of centre of disc from rail level. : 2000 mm.<br>(iv) Bands on the post : 300 mm wide, Black & White bands alternately. | s) Caution Indicator |              | s) (i) Two 130 mm Yellow lights (White back lights)<br>(ii) Black triangle base : 400 mm.<br>(iii) Bands on the post : 300 mm wide, Black & White bands alternately.<br><br>(Ref.- Annexure 8/4-Para 807 & 808 of P-Way Manual)  |
| r) Shunting limit board            |              | r) (i) Rectangular board : 600 mm x 1 metre<br>(ii) Height from rail level to the underside of the board containing the cross. : 2000 mm<br>(iii) Bands on the post : 300 mm wide Black & White bands alternately.        | t) Speed Indicator   |              | t) (i) Equilateral triangular board-side : 1 metre.<br>(ii) Letters indicating speed-height : 300 mm, 40 mm thick<br>(iii) Height from rail level to bottom of the board : 2000 mm<br>(iv) Bands on the post : 300 mm wide Black & White bands alternately.<br><br>(Ref.- Annexure-8/4 Para 807 & 808 of P-Way Manual) |
| v) Goods warning board             |              | v) (i) Rectangular board : 535 x 1800 mm.<br>(ii) Yellow band & circle as shown : 140 mm.<br>(iii) Plastic reflector as shown<br>(iv) Bands on the post : 300 mm wide, Black & Yellow bands alternately.                  |                      |              |  |

**COLOR SCHEME FOR MECHANICAL SIGNALLING EQUIPMENT**

(Annexure 6 Para 12.134 of SEM Pt-II sheet No.6)

| SI.No. | Equipment   | Color  |
|--------|---|--|
| 1      | Signal arms, point indicators, boards & markers   | As per shape & color as shown in figure  |
| 2      | <b>Signal Post &amp; signal fitting</b>   |  |
| a)     | <b>Signal post</b>  |  |
|        | i) Up to a height of 2 meters above rail level.   | Black  |
|        | ii) Remaining of the post   | White  |
| b)     | Signal spectacle & other fittings on the post   | Black  |
| c)     | Shunt signal counter weight, side facing cabin man  | White  |
| 3      | Interlocking frames, their levers and fittings:   |  |
| a)     | Levers above quadrants shall be painted with enamels in colors as under:-   |  |
|        | i) Warner Lever   | Green  |
|        | ii) (a) Distant signal lever 45 degree aspect   | Yellow   |
|        | (b) Distant signal lever 90 degree aspect   | Green  |
|        | iii) Other Signal levers  | Red  |
|        | iv) (a) Slot lever mechanical   | Same color as of the lever slotted with a 150 mm wide blue band in the middle.       |
|        | (b) Slot lever Electrical   | Same color as of the lever slotted with a 150 mm wide yellow band in the middle Back |
|        | v) Point lever  | Black  |
|        | (vi) Facing point lock lever  | Blue   |
|        | (vii) Economical Facing point lock lever  | Upper Half-Black<br>Lower Half-Blue  |
|        | viii) Station Master's Control lever  | Upper Half-White<br>Lower Half-Black   |
|        | (ix) Level crossing Gate control lever  | Chocolate  |
|        | (x) Release Lock Lever  | Black with a 150 mm wide Blue band in the middle.                                    |
|        | (xi) Detector (Double Wire)   | Red and Blue bands 150 mm wide alternately.  |
|        | (xii) Route lever   | Upper half-Red<br>Lower half - Black   |
|        | (xiii) Siding key control lever   | Black  |
|        | (xiv) King lever  | Red & White bands 150 mm wide alternately.   |
|        | (xv) Spare lever  | White  |
| (b)    | <b>Interlocking frame parts and fittings except levers above quadrants.</b>   |  |
|        | (i) Interlocking frame supports, Quadrants, Levers below Quadrants, locking troughs, Drop Block, Catch Handle connections, Indicator plates.                          | Black  |
|        | (ii) Down rods between lever tail and pedestal crank  | Black  |
| 4      | Ground and Miscellaneous- Cranks, compensators, wheels, stakes facing point locks, lock bars detectors, cabin wire adjusters, interlocking key boxes and foot. Rests. | Black  |

**COLOR SCHEME FOR ELECTRICAL SIGNALLING EQUIPMENT**

(Annexure 29 Para 19.106 of SEM Pt-II)

| <b>SI. No.</b> | <b>EQUIPMENT</b>  | <b>COLOR</b>   |
|----------------|---|--|
| 1.0            | <b>Color Light Signal: Post</b>   | (a) In double distant territory, distant signal post shall be painted with alternate black and yellow strips @ 300 mm.<br>(b) All other signals shall be painted with white aluminum paint.<br>(c) Implantation distance from center line of nearest track along with arrow indicating towards nearest track maybe painted on signal post in following colours:-<br>i) Black on white back ground for normal implantation<br>ii) Red on white back ground for implantation distance less than 2.36mts. |
|                | Fittings (Hood & mechanism box)   | Black  |
|                | Back cover and background, if any.  | Painted black with diagonal cross of aluminum.   |
| 2.0            | <b>Electrical Signalling apparatus:</b>   |  |
| 2.1            | Station Master control frame and power frame cases  | Green Enamel   |
| 2.2            | Pont machines, signal machines, out side electrical detectors, electric reversers, electric lever locks, circuit controllers, key transmitters. | Black  |
| 2.3            | Illuminated atarack daiogram frame work   | Black Enamel   |
| 3.0            | <b>The Junction boxes ,Battery Boxes, and Apparatus cases</b>   |  |
| 3.1            | Junction boxes - Post type  |  |
| 3.1.1          | Inside  | White  |
| 3.1.2          | Out side.   | Chocolate (Red Oxide Paint shall be used)  |
| 3.2            | <b>Junction Boxes:- Ground type and Apparatus case</b>  |  |
| 3.2.1          | Inside.   | White  |
| 3.2.2          | Out side  | White (aluminum paint shall be used)   |
| 3.3            | <b>Battery Boxes:</b>   |  |
| 3.3.1          | Inside  | White  |
| 3.3.2          | Outside   | Grey or aluminum   |
| 3.4            | <b>Key Transmitter Boards</b>   | Grey   |
| 3.5            | Slot, Track and Luminous Indicator Boards   | Spirit polish  |
| 3.6            | Casing, capping & troughing   | Spirit Polish  |
| 3.7            | Piping  | Black  |
| 4.0            | Rail and Other Posts for Overhead Wire:   |  |
| 4.1            | Post up to 1.5 m above ground   | Black  |
| 4.2            | Remaining of Post   | Red Oxide  |
| 4.3            | Cross arms  | Black (unless galvanized)  |
| 5.0            | Cable stakes, cable markers:  | Black  |
| 5.1            | Cable Stakes  | Black  |
| 5.2            | Cable Marker Body   | Black  |
| 5.3            | Cable Marker Figures  | White  |

## CHAPTER 10: PERIODICAL TESTING AND OVERHAULING OF MECHANICAL AND ELECTRICAL SIGNALLING APPARATUS

### CONTENTS

- Periodical Testing & Overhauling of Mechanical Apparatus
- Periodical Testing & Overhauling of Electrical Apparatus
- Periodical Testing & Overhauling of Panel Installations

### **10.1 Periodical Testing and Overhauling of Mechanical Apparatus**

Descriptions of various mechanical gears, which are required to be periodically inspected and/or tested, are given in the SEM. The procedure to be adopted for the purpose is also detailed in the Manual. An extract from the same is given below for ready reference. For detailed instructions the Manual may be referred to.

#### **10.1.1 Cabin**

Ground floor of cabin must be kept locked and the lock must be provided with duplicate keys, one key must be kept by the technician and the other must be handed over to the SM for safe custody for the use of inspecting officials.

Each SSE/JE(S) must see that the cabin diagram, pull chart, cabin master's instructions and technician's programme provided in the cabin are up to date.

#### **10.1.2 Interlocking Frames**

They shall be tested annually and overhauled at the intervals not exceeding 3 years. Lost motion and loss of stroke developed should be checked which should be within specified limits.

#### **10.1.3 Point Rodding and Fittings**

Rods must be kept in true alignment; joints should be checked for good connections. Guide roller assembly should be checked for intactness. Missing parts should be replaced. Rigidity of rod run depends upon them.

#### **10.1.4 Cranks and Compensators**

Their foundations and studs for should be checked for looseness, which causes loss of stroke. Their holes should be checked to ensure that they do not become oblong and cause loss of stroke.

#### **10.1.5 Detectors**

Shoes and angle slides should be checked for free movements. Obstruction test should be carried out monthly and it should be ensured that the notches are of correct size and square and the signal slide is obstructed first by the closed switch point detector slide, during obstruction test.

#### **10.1.6 Points**

Switches found chipped or damaged should be promptly replaced by SSE(S)/JE (P Way). Loose packing should be rectified by observing the point during the passage of train.

Adjust screw nuts of points should be kept well tightened by using spanner of correct size and not by hammering.

Check whether switch is set against the stock rail properly and for sufficient length. (at least up to 6 sleepers)

Check whether the spring in the lever operating the points is sufficient and equal in both normal and reverse positions.

Check for wheel marks on lock bars. The lock bar should be 38 mm below the rail level.

Lock bar should be checked to ensure that the lock bar clips have not developed much wear. Lock bar clips should be overhauled once a year.

Check and ensure that the sleeper on which cranks are fixed are rigidly held and do not cause loss of stroke.

The plunger of the FP lock should be kept adjusted to be clear by 12 mm from split stretcher blades when unlocked.

The edges of notches and that of FP lock plunger should be square and sharp.

Check the holding down bolt of FP locks, cranks, slide chairs and see that they are well-tightened.

It should be ensured that all oil holes have been cleaned and split pins are in position and opened out. The importance of the split pins cannot be overemphasized.

#### **10.1.7 Signals**

Check level of signal arm and see that the arms are clean and properly painted. See that backlights are in their correct position.

See that counter-weights are securely fastened and the safety bolt is in position.

Cracked roundels should be promptly replaced.

Inspect signal lamps (fixed on signal post) for corrosion of parts and dirt on lens. All the lamps should be overhauled once a year and the date of overhauling marked on each lamp. Burners also should be inspected for their soundness.

Signal posts should be kept for true plumb otherwise focus will be thrown out and elegance will be spoiled. Deck boards should be checked to detect decayed or loose boards.

Wire transmission should be checked for missing pulleys, broken wheels, bent pulley stakes and kinks in the wire. Wires running under level crossing and near water column should be specially checked for corrosion.

#### **10.1.8 General**

Painting of apparatus should be done periodically as per programme.

Grass, Weeds, dirt, cinders or any other accumulation under rodding run and wire transmission should be cleared.

Lubrication should be efficient and black mineral oil should be used for the purpose except for mechanical locking for which graphite should be used. Cam path should be kept well-lubricated with grease.

### **10.1.9 Double Wire Interlocking Frames**

Dynamometer test should be carried out once in 6 months. The force required to operate a lever should not exceed 35 Kgs (75 lbs) and in the case of signal lever without detector it should not exceed 27 Kgs (60 lbs). Clutch levers should be checked to see that the clutch does not trip after completion of lever movement. The spring must be adjusted to cause tripping with a pull of 28 Kgs of dynamometer (62 lbs). With 24 Kgs (52 lbs) pull, the clutch must not lift more than 2.5 mm.

The clutch of a point lever should trip with the portion of test piece between stock and tongue rail and the catch of the lever itself should get locked unless connections are restored.

Broken wire locks must be tested for easy movement every quarterly, lifting the compensator weights. Broken wire tests should be carried out at least once a year. To check the integrity of broken wire locks of point's mechanisms, the wire must be disconnected near the lead out one at a time. This should also cause tripping of the clutch lever.

Such tests should also be carried on signal transmission to ensure that the signal arm will return to "ON" under broken wire conditions.

### **10.1.10 Methods of Testing**

- (a) Visual Inspection of the locking provided in the interlocking troughs and comparing the same against the approved tappet locking plan.
- (b) Testing against the interlocking table.
- (c) Testing against the interlocking and yard diagram.

Record of testing is to be maintained in

- (a) Signal failure and inspection book at the station
- (b) Register maintained by the SSE / JE(S) and
- (c) Cards in divisional and headquarters office.

Date of testing should be painted conspicuously on the interlocking frame.

### **10.1.11 Overhauling of Interlocking Frames, Interlocking Key Boxes and SM Slide Control Frames**

The SSE/JE(S) must make a prior check to ascertain that the material needed for overhauling is available and if not available, must requisition the same sufficiently in advance so that it is available for the work in time. For Interlocking frames above 20 working levers the SSE / JE(S) must intimate the Sr.DSTE at least one month in advance, that the overhauling is due, to enable him to arrange for the issue of necessary traffic working instructions and notifications.

Overhauling of more than one interlocking frame at the same station should not be undertaken at the same time. Programme of overhauling should be drawn out on at the divisional level on monthly basis, preferably spread over a period of 9 months of a calendar year so that overhauling work that may fall into arrears due to unforeseen circumstances can be completed during the remaining 3 months. A copy the programme shall be supplied to each Supervisory SSE/JE who has to carry out the overhauling.

## Instructions for working traffic during overhauling

- (a) When a lever frame, SM's control frame or interlocked key box or any other interlocking frame is overhauled, the station must be worked in accordance with the special instructions to be issued by each Railway.
- (b) Facing points, which are neither interlocked nor key locked, shall be locked for the passage of a train either by a clamp or by a through bolt locking the nose of the switch rail to the stock rail. Such clamp or through bolt are to be provided with a padlock by which it can be locked in position. It is not sufficient to lock the lever working the points.

So, the special instructions stipulate the clamping and padlocking of points and that the SM shall be responsible for ensuring that all the facing points over which the train will pass, are correctly set, clamped and pad locked and that all trailing points over which the train will pass are correctly set before taking off signals. The manner in which the SM will ensure this must be clearly laid down. Detailed temporary working instructions for each station shall be prepared by the Sr. DOM for each phase of the work and supplied to the station before overhauling is commenced.

- (c) A notification showing the date and time when the overhauling work would be taken up, its probable duration and instructions for the SM to issue caution orders to Loco Pilots and for Loco Foreman to advise Loco Pilots to observe the temporary speed restrictions must be issued jointly by DOM / DSO and DSTE.
- (d) For the portion of the yard, which is controlled by the cabin to be overhauled
  - (i) The Loco Pilot shall be issued a caution order at the last stopping station instructing him of the speed restriction of 15 KMPH at the station where locking is being overhauled.
  - (ii) When the work of overhauling cannot be completed by sunset of the day of commencement and is likely to extend a few days, temporary caution indicator and speed indicator (15 KMPH) shall be provided as prescribed in way and works manual at the station where locking is being overhauled.
- (e) Only after the SM has assured himself that the line has been correctly set and facing points locked for the required movement, he may permit the signals to be taken "OFF" for the reception or dispatch of a train.
- (f) Disconnection Memo on prescribed form must always be given by the in-charge SSE/JE(S) to the SM on duty and his signature should be obtained before and after the work. The issue of caution orders and the imposition of speed restriction of 15 KMPH should remain in force until the interlocking frame has been tested by the authorised official and normal working restored.

### 10.1.12 Overhauling of SM Slide Control Frames

- (a) This work will be done under the personal supervision of SSE/JE(S). The work will not be undertaken while cabin interlocking frame connected with the SM's slide control frames is being overhauled.
- (b) All signals shall be lowered for the reception and dispatch of trains as usual.
- (c) The SSE/JE(S) in-charge must issue disconnection memo on prescribed form to the SM and Cabin master on duty before starting and after completion of overhauling work. The following precautions should also be taken to ensure the safety of train movements.

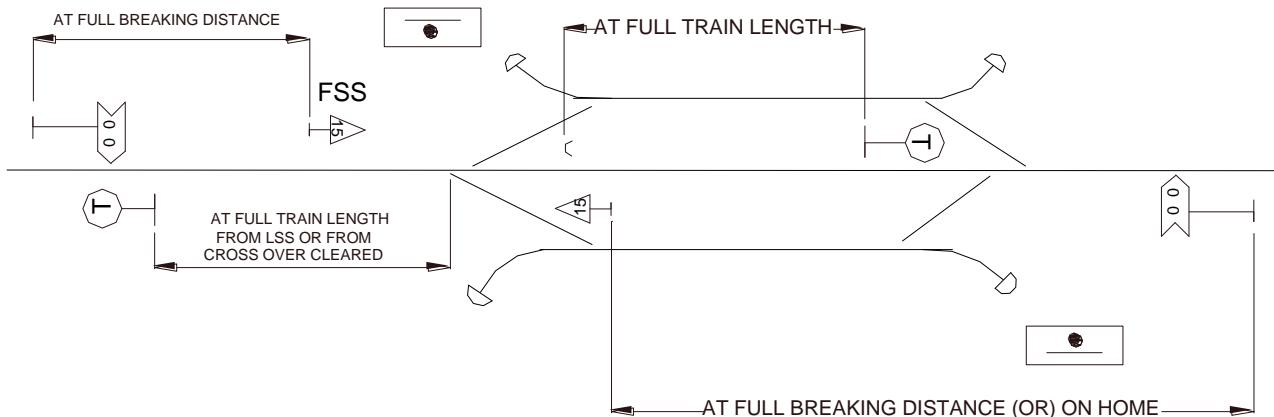
- (i) SM on duty should be instructed to see that no slide is pulled for taking "OFF" a signal without informing him.
- (ii) Cabin master on duty should likewise be instructed to see that no signals are taken off by him unless permitted by the SM on duty.
- (iii) It should be ensured that no electric slot or key is transmitted in an unauthorized manner and that no conflicting slot or key is transmitted by the SM.

As a precautionary measure, the battery must be kept disconnected. It should be connected only when a slot or key is to be transmitted by the SM.

Records of overhauling should be maintained at the station, with the SSE/JE(S) and in Divisional and Headquarters Offices.

#### **10.1.13 Procedure for OH of a Lever Frame and Resumption of Normal Working**

- (a) Apply at least 7 days before and obtain "Traffic Notice" and circulate it to all concerned well in advance or at least 72 Hrs. prior to taking up the work.
- (b) Issue a message / telegram to the concerned station / cabin at least 24 hrs prior to taking up the work with proposed time & date with speed restrictions (caution order) to be observed.
- (c) On the actual date of "Non-Interlocking" for OH, if permitted issue S&T Disconnection memo with actual time.
- (d) No run through is permitted during NI. Disconnect all proceed aspects.
- (e) Nominate and provide one "Free Home Signal"
- (f) Keep "Distant" and 'Warner' signals at "ON"
- (g) Arrange to provide 15 KMPH speed board, caution board & termination board on both sides of the affected cabin as shown below.



**Fig: 11.1**

- (h) Arrange to provide tents at suitable locations as required by operating staff and provide magneto telephone communication with controlling SS / SM.

- (i) Before opening the interlocking frame test the locking and ensure that it is as per Locking Table & IP
- (j) Remove the bridle-bars / locking tappets / locking pieces etc. and put identification marks
- (k) Carry out necessary repairs/replacements and other OH work and ensure proper cleaning, lubrication and graphiting of bars, plungers, tappets, locking trays etc.
- (l) Fix the bars, plungers etc in their original position and ensure proper fixing of pins, links, screws, nuts & bolts, splitting of split pins and strap bars etc.
- (m) Test the locking as per Locking Table
- (n) If found correct, ensure proper closing, locking & sealing of covers.
- (o) Issue reconnection memo, cancel the message, remove the speed / caution boards and restore normal working of signals, interlocking, block etc.
- (p) Make an entry in the failure register part 'B' with all details.
- (q) Date of OH to be painted on the lever frame description board
- (r) A certificate of OH on prescribed form should be submitted by SSE/JE(S)
- (s) Painting of Lever frame is to be done subsequently (once in 3 years)(Cable meggering can be taken up during the NI period of OH of lever frames)

#### **10.1.14 Resumption of Normal Working**

It will be the personal responsibility of the Sr.DSTE/DSTE/ASTE to test all interlocking frame above 30 working levers as soon as possible after the completion of overhauling by the SSE/JE(S) and to introduce normal working. As regards interlocking up to 30 working levers, normal working can be introduced by the SSE/JE(S). Sr.DSTE/ DSTE/ASTE must, however, test the locking as soon as possible after normal working has been resumed by the SSE/JE(S).

#### **10.1.15 Certificate of Overhauling**

Locking overhauling certificates on the prescribed form must be submitted by the SSE/JE(S) to the Sr.DSTE in duplicate who after necessary scrutiny will forward one copy of the same to the CSTE.

### **10.2 Periodical Testing and Overhauling of Electrical Apparatus**

The detailed instructions in this regard are given in the SEM. A summary of the important instructions is given below for ready reference.

#### **10.2.1 Track Circuits**

Check connections of battery and relay as well as jumper connections and rail bonds. Check that the Track Circuit is not over energised. Relay should be inspected for any irregular operation.

The operating characteristics of the relay should be checked once every two years. Relay shall not be put in service unless the characteristics are in accordance with the limits specified on the relay. A register should be kept for this purpose.

Track Relays of shelf type must be overhauled at intervals not exceeding 10 to 12 years. Plug-in type track relays are to be replaced after 12 years (or earlier if warranted).

Condition of insulation joints should be checked. Record of replacement of insulation joints should be checked. Defective bonding should be checked by taking voltage reading at every 15 rail lengths. Special check should be made of the jumper connections when a portion of the track circuit is in parallel.

Ballast should be maintained clean and at least 50 mm (2") clear of the rail. Ash pits and water columns are troublesome spots, which should be checked regularly.

Main cable should be tested once a year and tail cables once in 6 months. Train shunt test must be taken every time a track circuit is adjusted. It should be taken at parallel portions of the track also with minimum 0.5 ohm resistance.

Track circuit test record card should be maintained for each track circuit in the prescribed form, which should be easily accessible for inspection. Duplicate card should be available in the office of SSE(S)/ JE(S) and should be sent to the office of Sr.DSTE once a year for inspection.

#### **10.2.2 Electrical Signal Machine**

All contacts must be kept clean and in proper adjustments. Commutator must be clean, smooth and should have a bright appearance. The signal arm should return to "ON" position on opening machine circuit.

The minimum operating values of the signal machine motor and hold clear OFF device should be tested at least once in 3 months.

#### **10.2.3 Electrical Point Machine**

The points stretcher bar and lock connections should be so adjusted that it withstands the gauge test. Commutator should be clean and the brushes properly bedded on the commutator.

Point machine should be tested from the interlocking frame to ascertain that the points correspond with the position of the operating lever (lever operated point machines).

The operating voltage and current of the machine must be tested at least once in 3 months.

#### **10.2.4 Color Light Signals**

Check and ensure that lens and lamps are clean. Lamps should be replaced in accordance with their codal life unless suitable protective devices have been provided. In case of double filament lamps, it should be replaced when any one filament fails. Working voltage of the lamp must be maintained as close as practicable to the rated voltage.

#### **10.2.5 Key transmitter**

Check and ensure that the key holes are not worn out and that only the correct transmitter key can be placed in each transmitter and key cannot be extracted irregularly.

#### **10.2.6 Electrical Lever Locks**

Check and ensure that lock armature works freely and in the case of forced drop locks, the locking portion is properly forced down for each locking operation. The face of the locking notch in the plunger and the locking portion should be in good condition. Cross protection, time

release and track locking, approach locking, indication locking etc. should be tested once in a quarter.

#### **10.2.7 Electrical slots and Reversers**

All moving parts should work freely and should be well lubricated. Special care should be taken during rainy weather to prevent rusting and sticking of parts.

To counter residual magnetism the connections at the coil should be reversed periodically (fortnightly).

The voltage at the reverser coil terminals should not be more than 25% above the recommended minimum operating voltage.

Ensure that the signal cannot be cleared with the reverser not energised and also that there is no tendency for the reverser to stick when de-energised. They should be tested every month.

#### **10.2.8 Earths**

Earths should be regularly watered. Earth connections should be carefully examined and kept intact and joints should be soldered.

Block earths and their connections must be examined at intervals not exceeding one month and should be tested for resistance once a year. Where the resistance exceeds 10 ohms, action should be taken to reduce the resistance.

#### **10.2.9 Testing and Overhauling of Electrical Locking**

Power interlocking frames, provided with electrical locking must be tested at least once a year and overhauled at least once in 3 years. For testing, a test lamp or a buzzer shall be placed on the lock of the particular lever and all normal and reverse contacts on other levers must be checked one by one.

The insulation of wiring must not be less than one meg-ohm ( $1M\Omega$ ).

The mechanical locking of power interlocking frames must also be tested for lost motion. The lost motion of a lever should not exceed the specified limits.

#### **10.2.10 Other Apparatus**

Batteries must be tested and cleaned every month and recharged at regular intervals. Test results must be maintained in the battery history card.

Approach locking, indication locking, track locking, time release, cross protection, route locking and back locking should be tested once in a quarter.

**Annual Return -** Each SSE/JE(S) must submit a return of all apparatus to DSTE. This must be submitted in duplicate, a copy of which is sent to CSTE after check by DSTE.

**Fire fighting Equipments:** They must be maintained in such a way that they are fit for immediate use.

Actual trials should be conducted periodically to test appliances for fitness, and staff in the knowledge of working of firefighting equipment and method of operation.

### **10.3 Periodical Testing of Panel Installations**

Systematic methods such as marking on locking/selection tables and suitably and clearly marking on the circuit diagrams while checking the circuits and equipment should be adopted to ensure that all circuits have been completely checked.

**10.3.1** Suitable proforma should be devised for recording the tests of electrical equipment before testing of the installation is taken up to ensure availability of records of the tests and their analysis. The checking and testing of electrical signal installations may be divided into five different groups as detailed below:

- (a) Physical inspection of the installation.
- (b) Checking of wiring cables
- (c) Testing of individual circuits.
- (d) Testing of individual apparatus and
- (e) System testing of the installation

#### **10.3.2 Testing Instruments**

Suitable instruments should be used in the testing of electrical signalling circuits. Calibration of these instruments should be checked periodically.

#### **10.3.3 Physical Inspection of the Installation**

- (a) It shall be checked that the work has been carried out in accordance with the approved plans and that equipment is of proper type and is in good condition.
- (b) The following aspects shall be checked during the physical inspection
  - (i) The signals, location boxes and other outdoor equipment are as per approved plans and are in good condition. Arrangements for proper ventilation, where provided, are not choked.
  - (ii) Each location contains all the apparatus required as per approved plans, the apparatus is of approved type and that the power supply equipment, batteries, fuses, etc., are installed according to the approved plan and specification.
  - (iii) The location of insulation joint, jumper wiring, traction bonding in electrified areas, point machines, switch locks and other apparatus is as per approved plans and their condition is satisfactory.
  - (iv) The electrolyte, inter-connections between cells, cell voltage etc., are in required condition as per relevant specifications or instructions.
  - (v) Each wire is tagged or marked where feasible so that it can be identified at each end and the nomenclature on the tag corresponds to that on the wiring diagram. The tags or other sleeves of identification shall be of insulating material.
  - (vi) The number of wires terminated on each terminal or relay terminal boards or other devices are counted and tallied with the number of wires shown in the wiring diagrams.
  - (vii) All connections on terminals and binding posts are properly secured.

- (viii) The lightning arrestors are properly connected and earthed as per plan.
- (ix) Detailed specifications & instructions for inspection and testing of different types of equipment as applicable to them should be available.
- (x) All other equipment such as lever frames, cable sheaths, signal screens, location huts, etc., in A.C. electrified areas are properly earthed as per requirements
- (xi) No equipment including relays are due for overhauling.

#### **10.3.4 Checking of the wiring**

- (a) Wiring shall be checked to ensure that it has been carried out as per approved wiring diagram. Point to point testing shall be carried out before plugging in the relays. Wires shall be tested one by one for continuity and insulation. Prior to conducting continuity and insulation test, contact occupancy test must be carried out for each relay as per the contact analysis available. The number of contacts allotted must tally.
- (b) During the course of continuity testing, wire count test shall also be done simultaneously to verify the number of wires actually available on each contact.
- (c) All cables shall be tested in accordance with the instructions given in Chapter XV (15.23) of the SEM.

#### **10.3.5 Test of individual circuits**

- (a) It shall be checked that each individual circuit is actually controlled by the proper contacts of the relays or other devices as per wiring diagram.
- (b) Where feed to a particular device is controlled through two or more paths in parallel, the check of each path must be carried out separately.
- (c) Cases of extraneous feed of even small magnitude or wrong operation of any relay shall be investigated and remedial action taken to rectify fault.
- (d) Once the indoor wiring works are completed before conducting the system testing, simulation test shall be conducted. This will ensure the correctness of indoor system, complete. System testing shall be carried out after all the field functions are connected to the relay room.

#### **10.3.6 Testing of individual apparatus**

Testing shall be done as per relevant Paras of Chapter XIX of SEM in accordance with specification & instructions applicable to each individual apparatus.

#### **10.3.7 System Testing of Installation**

- (a) After the tests mentioned in previous Paras have been carried out, the electrical installation shall be subject to the detailed operational / system tests.
- (b) These tests shall be planned carefully. Requisite number of staff considered essential for carrying out such tests should be selected and deputed to concerned locations. They should be equipped with requisite tools, meters, portable telephones and / or walkie-talkie sets so that they are in contact with the official in-charge of testing and other testing parties and take such action as directed.

- (c) These tests shall be carried out against approved Selection Table/Control Table/Route Chart and Signalling Plan.
- (d) Checks against signalling plans for main signal routes and a few spot checks of the remaining routes shall also be carried out.
- (e) Following guide lines are laid down for carrying out system tests

**(i) Signal Control Circuits**

Each route shall be set individually by operating control lever or switches and / or button (s) as the case may be. After checking that the signal for this particular route has been cleared, each track circuit controlling the signal shall be shunted individually to check that the signal goes back to danger. Similar tests shall again be made by de-energizing point detection relays and other relays controlling this route. Each such relay will be de-energized individually and it shall be checked that the signal goes back to danger.

**(ii) Approach Locking**

Each route shall be set up individually. After ensuring that the signal for this particular route has been cleared, each track circuit controlling the approach locking shall be de-energised in turn. The signal shall be put back to "ON". Efforts shall be made to alter the route under test and to set up conflicting route. It shall be checked that it is not possible to cancel the route set up and / or to set up a conflicting route and / or to individually operate any point in the route under test. This locking shall be effective till the set route is cancelled and the time-release circuit has operated provided the track beyond the signal is not occupied.

**(iii) Route Release**

- Tests shall be carried out to ensure that once a signal is cleared for a particular route, position of none of the points in the route can be changed when track circuit immediately in advance of the signal is de-energised.
- Where sectional route release is provided, it shall be ensured that a sub route does not release only by picking up of the concerned track relay but the same should be released only after the next track circuit has also dropped and picked up.
- Where sectional route release is not provided tests shall be made to ensure that the entire route remains locked when any of the track circuits beyond the signal up to the track circuit controlling the last point is de-energised.
- In cases where the route is controlled by single track circuit the route shall be released after prescribed time delay to be effective after the concerned track circuit has been occupied and cleared by the train.

**(iv) Time Release**

Time release, where provided, shall be tested to ensure that it will be possible to alter the route or set up a conflicting route or change the position of the points in the route only after the signal is put back to "ON" and the prescribed time interval has lapsed. Similar tests shall be carried out for overlap release, where time release is provided for releasing the overlap after the occupation of the berthing track.

### (v) Dead Approach Locking

Where dead approach locking is provided, the same test procedure as in (b) above will be adopted except that there is no controlling track circuit to be de- energised. After the signal has been taken "OFF", the approach locking shall be effective till the signal is put back to "ON" and time release circuit has operated.

### (vi) Signal Indication Circuits

Indication of "ON" aspect of all signals shall be checked for its correspondence with aspect displayed at site. Each signal shall then be cleared after setting its route and the indication of each aspect shall be checked for its correspondence with the aspect displayed at the site. This test shall be carried out for each signal as well as for direction type route indicator where provided. In the case of later, it shall also be ensured that the indication relay is not energised and the indication does not appear until the minimum number of lamps as required is actually lit.

### (vii) Point Controlling Circuits

Each point shall be set to reverse position by operating the controlling lever/switch/button. After the point has been fully reversed, each track circuit controlling the point shall be individually shunted in turn and operation of points to normal position shall be attempted. It shall not be possible to operate the point under these conditions. These tests shall be repeated with the point set in normal position, attempt being made to operate it to the reverse position.

With the obstruction in the points, the point shall be operated from normal to reverse and reverse to normal and it shall be checked that the overload relay where provided gets energised and the feed to the motor is cut off immediately. Where over load relay is not provided, the feed to the motor shall be cut off after the lapse of a prescribed time.

The out of correspondence test shall be carried out by opening cut out contact of one end of point machine and the point lever /knob / button operated. The other end of the point may operate but the point indication relay shall not energise.

### (viii) Point Indication Circuit

The point shall be operated from normal to reverse and reverse to normal and the position of point detection relay as well as the indication of the point in the cabin/panel shall be checked for correspondence with the position of the points at site. It shall also be checked that with the obstruction in the point, the detection relay is de-energised and both normal and reverse point indication in the cabin / panel are extinguished in case of electromechanical signal and flashing indication in case of PI /RRI installations.

The operation of the detection relay to the correct position as well as its de-energisation should be checked by making and breaking the relevant point detector contacts at site.

### (ix) Crank handle interlocking

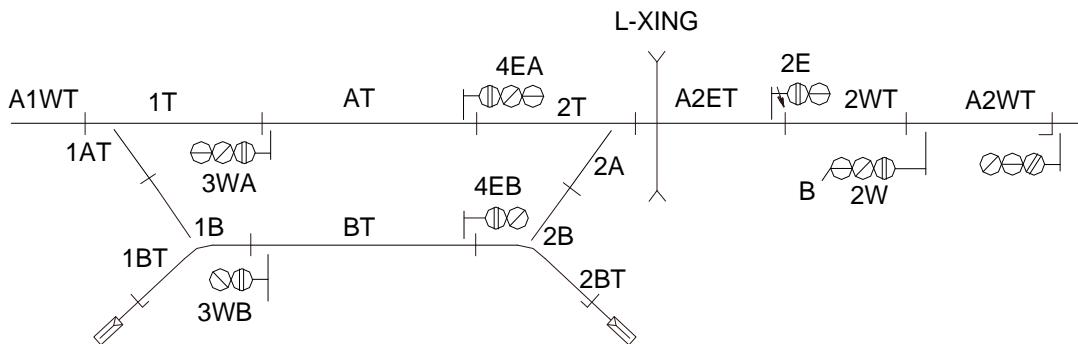
It shall be checked that when the crank handle is removed from its normal position in Electric Key Transmitter/other approved Relay interlocking arrangement, the signals reading over the concerned route/zone cannot be taken "OFF" nor the points could be operated from the cabin / panel. It shall also be checked that when the signal reading over the concerned route / zone is taken "OFF", the crank handle can not be released from its normal position in Electric Key Transmitter / other approved Relay interlocking arrangement.

**(x) Testing of Track Circuits**

Testing and inspection shall be done as per SEM Chapter XVII.

**10.3.8 Typical testing Procedure for Panel Interlocking/Route Relay Interlocking Installations**

Typical testing procedure for panel interlocking /Route Relay interlocking installations are given below. It shall be ensured that the interlocking system conforms to the approved relay interlocking specification.



| Sl.No | Signal No. | Route  | Route Held by             |                 | Controlled By tracks                | Lock& Detects points |         | Locks Route points | Remarks                                  |
|-------|------------|--------|---------------------------|-----------------|-------------------------------------|----------------------|---------|--------------------|--|
|       |            |        | Approach tracks           | Back lock track |                                     | Normal               | Reverse |                    |  |
| 1.    | 2W         | 2WBT   | A2WT (120SEC. Time delay) | 2WT A2ET 2T 2BT | 2WT, A2ET, 2T, 2BT, BT, 1BT         | 1                    | 2       | 4EB 2E             | Controlled by closed position of LC gate |
| 2.    | 2W         | 2WB1 1 | A2WT (120SEC. Time delay) | 2WT A2ET 2T 2BT | 2WT, A2ET, 2T, 2BT, BT, 1BT, 1TA1WT | -                    | 1.2     | 4EB 2E 3WB         | Controlled by closed position of LC gate |

**(a) Point Locking**

Operate point No. 2 to reverse position and clear the signal route No. 2WBI by operating signal switch / button. Operate point knob 2 to normal. The point should remain locked. Restore the point knob to reverse. De-energise 2RWKR. Signal 2WBI shall go to "ON". Restore the signal switch/button to normal. When point No. 2 is free, shunt the track 2T. Turn the point knob 2 from reverse to normal. The point should remain locked.

**(b) Approach locking**

Take 'OFF' signal for route No. 2WBI by setting the points in required position. Normalize the signal switch with A2WT clear. The signal assumes "ON" position. Try to alter the route, it should be free.

Again take "OFF" signal for route No. 2WBI. Shunt the approach Track A2WT. Normalize the signal switch/button. Try to alter the route. Route should be held till the route is cancelled and 120 sec time delay has lapsed.

**(c) Interlocking of signals**

Clear the signal route 2WBI after setting the route. Try to clear the signal 4EB by operating the relevant switch/button. Signal 4EB should remain in "ON" position and signal 2W should continue to display "OFF" aspect. Similar tests shall be carried out for signal 2E also.

**(d) Track Circuit Controls**

Clear the signal route 2WBI again. Shunt the track 2WT. Signal should go to "ON". Remove the shunt, the signal should not re-clear. Normalize route and re-clear again. Shunt A2ET and other controlling track circuits one by one. Signal should go to "ON" in all cases. Remove the shunt. Normalize the route.

**(e) Back locking**

- (i) Clear the signal 2W for route 2 WBI again. Shunt the track 2WT. The signal should go to "ON". Normalize the signal switch/button. The route should be held. Shunt and clear all the back locking tracks as per selection table in sequence. The route shall be released by sequential proving of tracks as per the provisions of Para 4.3.3 of Relay interlocking specification IRS: S 36-87.
- (ii) Clear the signal route 2WBI again and de-energize the L-Xing gate control relay. The signal should go to "ON". Re-energize the relay, the signal should assume "OFF" aspect.

**10.3.9 Periodicity of Tests**

- (a) All the tests indicated in Para 10.3.1 shall be conducted at the time of new installation or making any alteration to the existing installations.
- (b) **Periodical Testing :** In a working installation, the following periodical tests shall be done
  - (i) Physical inspection as per Para 10.3.3 above - once in a year or earlier to the extent feasible
  - (ii) System tests as per Para 10.3.7 above - once in three years or earlier
  - (iii) Insulation tests on cables as per Para 15.23.1 of SEM
  - (iv) Test of individual apparatus in accordance with specifications and instructions applicable for each apparatus as stipulated in Chapter XIX
    - It will be personal responsibility of supervisory SSE/JE (Signal) to test all electrical signalling circuits of relay interlocking up to 20 routes.
    - It will be personal responsibility of Signal Officer concerned to test all electrical signalling circuits of relay interlocking with more than 20 routes.

**10.4 Periodic Overhauling of Block Instruments**

Periodical overhauling interval shall not exceed ten years for Single Line Token Block Instruments and seven years for Double Line Block Instruments and Handle type Single Line Token less Block Instruments. Push Button Token less Block Instruments do not require overhauling. The associated polarised relay shall also be overhauled along with the Block Instrument.

## **CHAPTER -11: PUSH TROLLIES AND MOTOR TROLLIES**

### **CONTENTS**

- Precautions to be taken while working Trolleys and Lorries
- Compliment of Equipments for Trolleys and Lorries
- Signals to be Displayed on Trolleys and Lorries
- Working of Trolleys and Lorries in Different Situations

### **11.1 General instructions**

The Rules for working trollies, motor trollies and lorries are contained in Para 15.18 to 15.27 of chapter XV of GR, supplemented by the subsidiary rules issued by individual railways. The instructions contained in this chapter are in emphasizing of these rules and will not supersede the G&SR of Railways.

### **11.2 Distinction between Trolley, Motor Trolley and Lorry**

- (a) A vehicle, which can be lifted bodily off the line by four men, shall be deemed to be a trolley. Any similar but heavier vehicle (which includes Dip Lorry) shall be deemed to be a lorry.
- (b) Any trolley which is self-propelled, by means of a motor, is a motor trolley.
- (c) A trolley shall not, except in cases of emergency, be used for the carriage of permanent way or other heavy material, and when a trolley is so loaded, it shall be deemed, to be a lorry.

### **11.3 Certificate of Competency**

- (a) No trolley, motor trolley or lorry shall be placed on the line except by a qualified person appointed in this behalf by special instructions.
- (b) Such qualified person shall accompany the trolley, motor trolley or lorry and shall be responsible for its proper protection and for its being used in accordance with special instructions.
- (c) The qualified person shall hold a certificate of competency, which shall be issued according to prescribed instructions.
- (d) Staff in whose favour a certificate is issued should be literate, having knowledge of Hindi or other local languages, should have passed the prescribed medical test and should be conversant with the rules for working of trollies, motor trollies and lorries, as the case may be. The certificate of competency will be issued for a specified period by an officer authorised to do so and shall be renewed periodically.

### **11.4 Responsibility for Safe Working**

- (a) The official-in-charge of trolley/motor trolley/ lorry is responsible at all times for its safe working. When more than one person holding competency certificate travels in a trolley, the official working the trolley is responsible for its safe working.
- (b) It shall be clearly understood by officers and staff that they are to take every possible precaution and protection against accidents. When entering a tunnel or cutting or proceeding over a long bridge or curve, the official-in-charge will make sure that no train is likely to be met. While approaching a level crossing the official-in-charge, should look out for road traffic and ensure safe passage of his vehicle over the level crossing.

## 11.5 Efficient Brakes

No lorry, trolley or motor trolley shall be placed on the line unless it is fitted with efficient brakes. The brakes should be tested before the commencement of each journey. It is desirable that trollies and lorries working on ghat section are fitted with screw down brakes in addition to ordinary hand/foot brakes. It will be the responsibility of the official-in-charge to ensure the adequacy of braking.

## 11.6 Attachment to Trains Prohibited

No trolley / motor trolley/ lorry shall be attached to a train.

## 11.7 Working on Track Circuited Sections

Each Railway shall issue subsidiary rules for the working of trollies / motor trollies / Lorries in sections where treadles or track circuits form part of the block instruments or where automatic signalling has been provided.

The person in charge of trolley/lorry should have the insulation of his trolley tested and certified once in every six months by an Inspector of the S&T.

## 11.8 Numbering of Trollies/ Motor Trollies/ Lorries

Each trolley / motor trolley and lorry shall be marked with its number, code initials of the department, the designation and headquarters of the official-in-charge.

## 11.9 Conveyance of Trollies/Motor Trollies/Lorries by Trains

(a) No trolley, motor trolley or lorry should be loaded in a train without the consent of the guard in-charge of the train, who will direct where it is to be placed.

(b) In the case of an accident / emergency, trollies / motor trollies may be carried by Mail / Express trains on which there are restrictions normally for loading of trolley / motor trolley.

(c) When loading a motor trolley with petrol in the tank, the following rule should be adhered to

"A quantity of petrol not exceeding 9.00 liters may be left in the tank provided that,

- (i) The flow of petrol in the carburetor has been cut off
- (ii) Any pressure has been released from the tanks
- (iii) The tank is in sound condition and closed by a well fitting cap; and
- (iv) The engine has been run by the official-in-charge until the carburetor has become exhausted and the engine stops automatically."

## 11.10 Trollies, Motor Trollies and Lorries not in use

(a) A trolley, motor trolley or lorry, when not in use shall be placed clear of the line, and wheels thereof secured with a chain and padlock.

(b) When a trolley / motor trolley is placed on a platform to be loaded into a train, it should be under the charge of a trolley man and placed where it will not be in the way of passengers or working staff.

(c) Whenever possible, motor trollies should be placed in a shed, the key of which shall be in the possession of the official-in-charge.

## 11.11 Conveyance of Non-Railway officials

Trolleys shall not be used for the conveyance of persons other than railway officials. In special cases, magistrates, police, civil, telegraph, military, medical and forest deptt personnel or a person requiring medical aid, may be conveyed by trolley by order of the competent authority (ADSTE or above), after a bond on prescribed form is signed indemnifying the Railways against all liabilities and risks. Contractors and their agents may be conveyed on trolley in connection with works, provided they have executed a general indemnity bond.

## 11.12 Trolley Refuges and Observation Posts

- (a) Trolley Refuges - Trolley refuges over long bridges should be provided at such intervals, as prescribed in the Schedule of Dimensions. In cuttings and high banks trolley refuges should be provided at suitable intervals.
- (b) Observation Posts - Where, owing to curves in cuttings or other causes view of the line is restricted, "observation posts" should be established at such sites as command the best view in both directions for the use of flagmen, thus enabling hand signals being conveyed to the trolley on line.

## 11.13 Equipment for Trolley / Motor Trolley / Lorry

Each trolley / motor trolley / lorry shall have the following equipment

- (a) Two hand signal lamps,
- (b) Two red and two green hand signal flags,
- (c) 12 detonators,
- (d) A chain and a padlock,
- (e) A copy of the Working Time Table and all correction slips and appendices, if any, in force on that section of the railway over which the trolley, lorry or motor trolley is to run,
- (f) A motor horn and a search light (for motor trolley only),
- (g) Two banner flags and additional detonators (for lorry only) and
- (h) Such other articles as may be prescribed by the Railway Administration in this behalf.

*Note - The official-in-charge of the trolley / motor trolley / lorry shall also be in possession of a watch in addition to the prescribed equipment.*

## 11.14 Signals for Trolley / Motor Trolley / Lorry

- (a) Day Signal - Every trolley, motor trolley or lorry when on the line shall show a red flag by day, fixed to a staff which will be placed on a socket and conspicuously visible in both directions.
- (b) Night Signal - On a double line the night signal shall be red light in the direction from which trains are expected and white in the other direction and on a single line, red in both directions. Where on double line, single line working is introduced, the night signal should be as per a single line. When working within the station limits, the light displayed at night shall be red in both directions.

- (c) Signals within long tunnels - On sections where there are long and dark tunnels, the night signals prescribed must be displayed during the day in addition to the red flag. In the case of thick foggy or tempestuous weather impairing visibility, light signals must be displayed in addition to the red flag.
- (d) Removal of Trolley / Motor trolley / Lorry - As soon as a trolley / motor trolley / lorry is removed from the track and placed clear of it, the red flag or light signal shall be removed, but care should be taken to see that this signal is not taken off before the lines have been cleared of all the obstructions.

### **11.15 Working of Trolleys**

- (a) Manning of Trollys: Trollys in all cases shall be manned by four men.
- (b) Mode of working of trolley: Trollys in all cases should be pushed and not pulled.
- (c) Working under block protection
  - (i) Trolley may be worked under block protection wherever it is possible to do so without interference to train service
  - (ii) Trollys should be worked under block protection in the night, foggy weather and during dust storm, when the visibility is poor.
  - (iii) Sections with restricted visibility due to curves/cuttings or due to other local conditions specified by Railway Administration should be worked under block protection.
  - (iv) When working under block protection, trolleys will be worked in the same manner as trains.
- (d) Working without Block protection
  - (i) During day time in sections with normal visibility the official-in-charge shall before leaving a station / block post, ascertain the whereabouts of the trains likely to be met.
  - (ii) In sections with restricted visibility when the official-in-charge, is not able to block the section and work under block protection, he will follow the following procedure -
    - The SM will on receipt of advice from official-in-charge (in triplicate on form Annexure-I) giving his trolley programme ascertain and fill in particulars of trains running on the section, retain one copy and return the other two to the official-in-charge of the trolley.
    - As a reminder that the block section is occupied by the trolley and caution orders must be issued, a small placard with words "Trolley on Line", will be hung in front of the block instrument, until advice of the removal of the trolley is received.
    - If telegraph and telephone communications are interrupted and the SM is unable to communicate with the station at the other end of the block section, the official-in-charge of the trolley will be advised of this fact and the form (Annexure-I) shall be endorsed accordingly. When communication between the two stations is restored, the messages referred to above will be exchanged, if the trolley has not cleared the section or removal report has not been received.

#### **PUSH TROLIES AND MOTOR TROLIES**

- From the time of exchange of the messages, until intimation has been received that the trolley has cleared the block section, the SM at both ends of the block section shall issue caution orders to Loco Pilots of all trains entering the block section. On the double line, caution order should be issued for both Up and Down trains.
- The issue of caution orders in no way relieves the official-in-charge of the duty of complying strictly with the rules for protecting the trolley.
- On arrival of the trolley at the other end of the block section, the person-in-charge of the trolley shall fill in the removal report and send it to the SM who will return the third copy signed. The SM will then advise the SM at the other end of the trolley having cleared the section.
- If the trolley is removed from the track at the station not provided with telegraph or telephone instruments or in the block section and if it is not intended to place it on the track again, the official-in-charge of the trolley shall fill in the removal report and send it to the SM at the nearest block station. In the former case, the SM will send written advice by the first train in either direction to the next block station. The SM at the latter station should then advise the SM at the other end of the removal of the trolley.
- SM at the both ends of the block section will enter remarks in the train registers pertaining to the block section concerned showing the times at which the trolley entered and cleared the block section and the number of the trolley.

#### **(e) Protection In Block Section**

- (i) When a trolley is worked without block protection and when a clear view is not obtainable for an adequate distance of 1200 Mts on BG and 800 Mts on MG/NG, the following precautions should be taken
  - On double line, he must depute a flagman with detonators to precede or follow the trolley, and to exhibit a hand danger signal at a distance of not less than 1200 Mts on BG and 800 Mts on MG/NG in the direction from which trains may approach.
  - On single line, depute a flagman with detonators to precede and another to follow the trolley and to exhibit hand danger signals at a distance of not less than 1200 Mts on BG and 800 Mts on MG/NG.
  - Where necessary, intermediate flagman should be posted to relay signals.
- (ii) The distance at which the signals are to be exhibited may be suitably increased in the case of MG high-speed routes where the speeds are more than 75 kmph, under special instructions by the Railway Administration.
- (iii) The flagman should only be withdrawn when a clear view of at least 1200 Mts on BG and 800 Mts on MG/NG can be obtained in the direction from which trains may approach.
- (iv) When a train is sighted, the flagman should wave the red flag vigorously to warn the official-in-charge of the trolley of the approach of the train, and at the same time place three detonators 10 Mts apart on the line to protect the trolley. The detonators should be removed only on receipts of hand signals from the official-in-charge by waving of a green flag to withdraw the danger signal indicating that the trolley has been removed.

When conditions are such that the flagman can not be seen by the official-in-charge of trolley, the latter must arrange before entering the section to take with him sufficient men with hand signals who will be placed in suitable positions between the trolley and the flagman so that the signals from the flagman can be repeated to the person-in-charge of the trolley and vice versa.

On sighting an approaching train or the flagman's signal, the trolley must be removed clear of the line and kept in such a manner that it cannot roll towards the line.

- (f) Trolleys travelling together - When two or more trolleys are running together in the same direction in the same line, care should be taken to ensure that they are kept at least 100 Mts apart to safeguard the trolley in rear from colliding with the front one, in case the front trolley has to be stopped suddenly for any reason.

### **11.16 Working of Motor Trolleys**

- (a) A motor trolley shall be run in accordance with special instructions.

A Motor trolley shall always run under Block Protection and shall be treated and signaled as a train. Motor trolley shall not be placed on any line without the permission of the Station Master in writing.

### **11.17 Procedure when working under Block Protection on Double Line and Single Line sections provided with Token less block instruments.**

- (a) Whenever a Motor Trolley has to enter a Double Line section or a Single Line section, where tokenless Block Instruments are provided, the Station Master of the block station from where the Motor Trolley has to leave, will obtain 'Line Clear' from the Station Master at the other end of the block section on block telephone without the operation of the block instruments.
- (b) When a motor trolley is to be dispatched into a block section provided with IBS, the block section between the two block stations shall be treated as one block section, till the motor trolley clears into the block station in advance.

Then Station Master will prepare an authority to enter the block section in duplicate in the prescribed form (T/A1525) which includes (a) authority to proceed and (b) authority to pass LSS and IBS if any at 'ON' and hand over one foil to the person in-charge duly obtaining his signature in the counterfoil.

While leaving the station, the relevant free starter signal, May however, be taken 'off'. Immediately after the departure of the Motor Trolley, the Station Masters at both ends of the block section shall immediately place the 'trolley on line' cap on the plunger of the block instruments to serve as a visual reminder that the section is occupied by the Motor Trolley.

- (c) On double line section, the Station Master of the station from where Motor Trolley has left shall advise the Station Master of the station at which the Motor Trolley has to arrive, to turn the block commutator at his station to TOL and lock the same in that position. The TOL red indication shall serve as an additional visual warning at both the stations. At the receiving station, the Station Master will arrange for the reception signals to be taken 'off'.

On arrival at the station in advance, the official in-charge of the Motor Trolley will deliver the authority to the Station Master with an endorsement to the effect, that the Motor Trolley has arrived duly signing with date and time on it. The authority will be retained by the Station Master and pasted in the Station Diary.

#### **PUSH TROLLIES AND MOTOR TROLLIES**

On double line, the Station Master at the receiving station after verifying and ensuring that the Motor Trolley has arrived into his station, shall turn the block handle from TOL position to 'line closed' position and clear the block section supported by a Private Number.

On single line, Station Master of the station in advance, after the arrival of Motor trolley into the station, inform the Station Master of the station in rear, the time of arrival of the Motor trolley supported by a Private Number.

All the entries should be made in red ink in the TSR at both the stations

#### **11.18 Procedure for working of Motor trolley in Automatic Block System**

Automatic Block System shall be suspended duly introducing Absolute Block System for working Motor trolley/s.

Let the block stations be X & Y [GR 9.01 (b)].

- (a) X shall obtain line clear from Y for motor trolley.
- (b) Y shall grant line clear to X for Motor trolley only when Y-X Automatic block section is clear of all trains.
- (c) X shall prepare T/A.1525 and hand over to the in-charge motor trolley and X shall not allow any train into X-Y Automatic block section till the motor trolley reaches Y.
- (d) A Motor trolley / Motor trollies may be allowed to follow a Motor trolley during day light hours and in clear weather only. Following Motor trollies shall be given T.1525. X shall not allow any train into X-Y Automatic Block section till the last motor trolley reaches Y.
- (e) Entries should be made in red ink in the TSR at both the block stations

#### **11.19 Procedure when a Motor trolley / Motor trollies following a train or Motor Trolley**

- (a) A Motor Trolley / Motor trollies may be allowed to follow a train / Motor Trolley during day light hours and in clear weather only. However, Motor Trolley shall not be allowed to follow a goods train on the sections specified in Subsidiary Rule (GR15.25.7.4.)
- (b) Before a Motor Trolley / Motor trollies is / are permitted to follow a train or another Motor Trolley, the Station Master of the station from where the Motor Trolley / Motor Trollies is/are to leave, shall advise the Station Master of the station in advance by a message and obtain his permission supported by a Private Number for each Motor Trolley.

The Station Master of the station, from where the Motor Trolley/Motor Trollies is/are following, will prepare a Motor Trolley permit/permits (T.1525) in duplicate, which includes authority to pass the LSS, if any at 'ON' and deliver it to the official in-charge of the Motor Trolley/Motor Trollies and obtain his signature/s in the counter-foil. The out report for the preceding Train/Motor Trolley and the following Motor Trolley / Motor trollies shall be sent separately and recorded in the TSR.

In a block section provided with IBS, if a Motor Trolley/Motor Trollies is/are permitted to follow a train/Motor Trolley, Station Master shall treat the entire section between the two block stations as one block section, till the following/last motor trolley clears into the block station in advance.

The Motor Trolley/Motor Trollies following the train or another Motor Trolley shall obey the signals for the train or the leading Motor Trolley. When following a train/Motor Trolley, the last following Motor Trolley shall, in this sense, be regarded as the last vehicle of the train/Motor Trolley. In other words, signals taken 'off' for the preceding train or the Motor Trolley shall not be put back to 'on' until the last following Motor Trolley has passed such signals. The Motor Trolley/ Motor Trollies will be admitted on the same line as the train or the Motor Trolley, which it / they, is /are following.

At station, where reversers are in use in conjunction with track circuiting, the signal levers shall not be put back to normal and the road for the reception of the preceding train or Motor Trolley shall not be altered until the last following Motor Trolley has been admitted on the same line. The person in-charge of the following Motor Trolley/Motor Trollies shall pass the signal / signals at 'on' and enter the station with special caution.

The 'arrival report' for the preceding Train / Motor Trolley and the following Motor Trolley / Motor Trollies shall be sent and recorded separately in the TSR. Where the Block Instruments are in use, the block section should not be cleared on the Block instrument after the arrival of the preceding Train / Motor Trolley, but the 'arrival report' should be sent. Where token working is in force, the token received from the preceding Train / Motor Trolley shall be kept in his safe custody by the Station Master on duty and inserted in the Block instrument for clearing the section only after the arrival of the last following Motor Trolley.

On arrival of the (last) following Motor Trolley at the station, the official in-charge will sign in the TSR in token of his Motor Trolley having arrived intact, indicating the time of arrival. The Station Master on duty at the station in advance, on receipt of the Motor Trolley permit, will advise the Station Master of the station in rear by issuing the message and then clear the block section

(c) Till receipt of this message, the Station Master of the station allowing the Motor Trolley / Motor trollies to follow a Train / Motor Trolley shall not grant / obtain LC on single line and shall not grant LC on double line for another train. All these messages exchanged shall be recorded in the TSR at both the stations.

When a Motor Trolley / Motor Trollies is / are following another Motor trolley, the leading / following Motor Trolley / Motor Trollies will in addition to the usual 'authority to proceed' be given a caution order to the effect that a Motor Trolley / Motor Trollies is / are following.

When a Motor Trolley follows train / another Motor trolley, the distance between the train and Motor Trolley or Motor Trollies should be at least 150 Mts. This should be ensured by the official in-charge of the following Motor Trolley.

Entries should be made in red ink in the TSR at both the stations for the Motor Trolley / Motor Trollies following the train / Motor trolley in the usual manner

## **11.20 Breakdown of Motor Trolley**

(a) In the event of complete break-down of Motor Trolley in the section, the same shall be removed clear off the track and the Station Master of the nearest station advised in writing to clear the section. The token or the line clear ticket, if any, shall also be sent with the memo. The same procedure shall be observed, if for any reason, a Motor Trolley is removed from the track while in the section. Once a Motor Trolley has been removed from the line, it shall not be replaced on the line, unless the line has been blocked for it.

**PUSH TROLIES AND MOTOR TROLIES**

(b) Before a Motor Trolley is to be replaced on the line, intimation in writing shall be sent to the nearest Station Master stating in which direction the Motor Trolley will proceed. The Station Master will, when the train service permits, arrange to block the line from a specified hour or after the passage of a particular train. The LC- token or the written authority in form T.1525 will, then be sent to the official-in-charge of the Motor Trolley together with the manuscript memo.

To ----- (Designation of the official-in-charge) at Km-----

Line is blocked for your Motor Trolley from ----- Hours----- after the passage of ----- train until the arrival of your Motor Trolley at ----- station.

Token number ----- or authority number-----sent herewith.

Signature of official (To whom handed over)

Signature of Station Master

The carbon copy of this memo shall be kept by the issuing Station Master. The person in-charge shall not place the Motor Trolley on the line until he has received the above memo together with the LC token or the written authority in form T.1525.

- (c) In the event of break-down of the following Motor Trolley in section, it shall be removed clear off the track and the official in-charge shall send intimation in writing to the Station Master of the nearest station to this effect along with the Motor Trolley permit.
- (d) If the Breakdown is of the preceding Motor Trolley, this advice may be sent to the Station Master of the station in advance through the official in-charge of the following Motor Trolley. The official-in-charge of the preceding Motor Trolley will also hand over to the official in-charge of the following Motor Trolley, the LC token or the written authority (T.1525) as the case may be, which shall be handed over to the Station Master of the station in advance by the official-in-charge of the following Motor Trolley in addition to the Motor Trolley permit in his possession.

### **11.21 Spring Points in the path of Motor Trolley**

- (a) Motor Trolleys by virtue of their lightness are not able to trail through spring-loaded points and, therefore, will derail while passing over such points.
- (b) The Station Master, before granting LC for the Motor Trolley shall advise the Station Master at the other end of the block section to issue caution order to the official-in-charge of the Motor Trolley warning him about the presence of the spring points duly furnishing the location.
- (c) Similarly if the station from where the Motor Trolley is being dispatched has a Catch Siding taking off the running line or any other spring points over which the Motor Trolley has to pass while being dispatched from a station, the Station Master of that station shall issue a caution order to the official-in-charge of the Motor Trolley warning him of the presence of the spring points duly furnishing the location.
- (d) Warning Boards have been provided for the guidance of Motor Trolleys short of spring points. The official-in-charge of the Motor Trolley shall stop short of the spring points, lift the Motor Trolley off the track, if necessary, and place it on the correct line, before proceeding further.

## 11.22 Speed of Motor Trollies

At night a Motor Trolley shall run at a speed not exceeding 30 KMPH.

The speed of a Motor Trolley shall not exceed 15 KMPH over points and crossings.

### **Responsibility of person-in-charge of Motor Trolley with regard to level crossing gate**

The Official in-charge / Loco Pilot of a Motor Trolley while approaching level crossing gates should exercise caution and ensure that the level crossing gates are closed against road traffic before passing the gate. He may, however, pass the gate signals, where provided, in the 'on' position, if they are not taken 'off'

## 11.23 General

Attaching to Train prohibited:- A Motor Trolley shall under no circumstances be attached to a train.

Movement of Motor Trolley, within station limits:- A Motor Trolley shall not be placed on any line at a station without the permission of the Station Master. A Motor Trolley which has arrived at a station or which has been placed on line can be moved from one line to the other only with the consent of the Station Master. The movement may be either a shunt move or by lifting the Motor Trolley off the track..

Care over curves and cuttings:- Great care shall be exercised while approaching curves or cuttings and at such places where the view ahead is not clear. The person in-charge of Motor Trolley shall apprehend danger in such places and reduce the speed of Motor trolley efficiently to stop short of any obstructions.

## 11.24 Working of Motor Trollies during total interruption of communications

If there is total interruption of communications, the Station Master on duty shall advise the official in-charge of Motor Trolley of the same and the Motor Trolley shall be worked on the section under the rules of working of trains during total interruption of communications.

## 11.25 Working of Cycle Trollies and Moped Trollies

- (a) Cycle Trollies - Cycle trolleys are those trolleys, which are propelled by pedaling instead of pushing. It may be pushed when necessary but not pulled. A cycle trolley shall be manned by at least four men, including the persons pedaling or driving.
- (b) Moped Trollies - These are light motor trolleys, which can be lifted off the track normally by three men. They should be manned by at least three men including the Loco Pilot. These may be worked as per the rules pertaining to a trolley, for which the Railway Administration may issue special instructions, as necessary.

***Note :- Cycle Trollies and Moped Trollies are not currently prevalent in many Railways***

**PUSH TROLLIES AND MOTOR TROLLIES**

(Annexure-I)

**Trolley/Motor Trolley/Lorry Notice**

**(Working without line clear)**

Notice No.....

Station.....

Dated.....

To

The SM.....Station.

Trolley/Motor Trolley/lorry No.....is required to work between  
..... and ..... It will leave

.....station at.....hours

Kilometer.....at.....hours this day for  
.....Station/Kilometer

.....  
Official - in – charge

To

The Official-in-charge

Daily and extra trains due to arrive at or pass this station up to.....hours have  
actually done so except.

No.....minutes late

.....The following extra trains,

special trains and light engines will enter..... section as shown.

I have exchanged advice with.....station/block post and shall issue  
caution orders to all Loco Pilots until I receive advice of removal of the trolley/motor trolley/lorry.

.....  
SM/.....

**Removal Report**

Reference trolley/motor trolley/lorry Notice No.....dated.....

trolley/motor trolley/lorry No.....arrived at.....

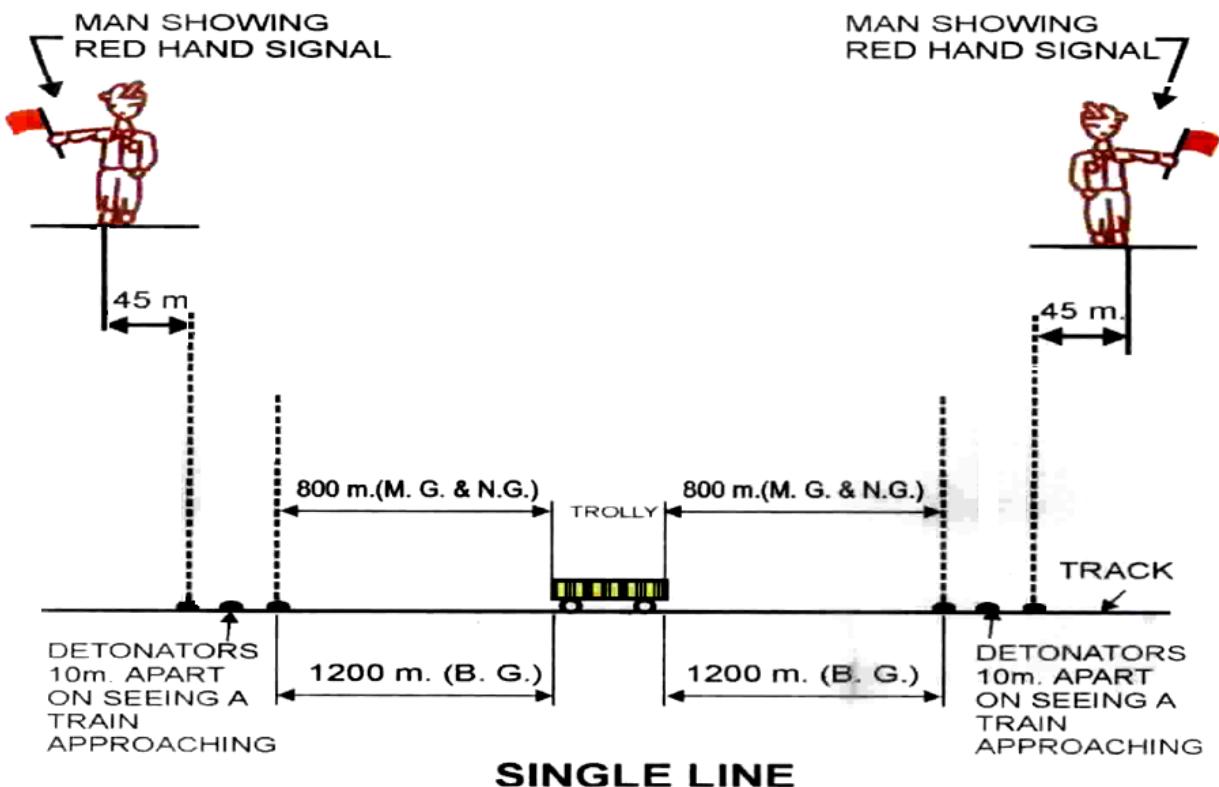
.....at.....hours/was removed from the track at kilometer.

Removal report received at.....hours.

SM.....Station.

Official-in-charge.

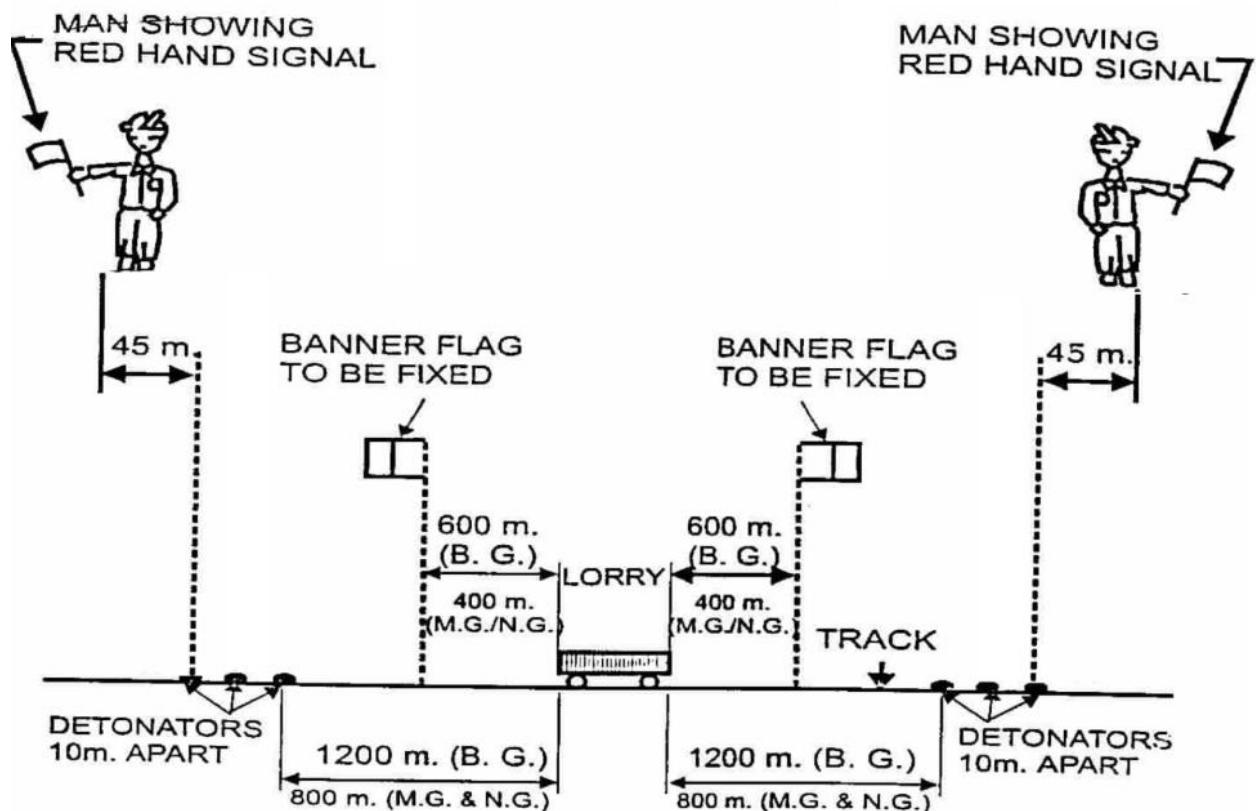
## PROTECTION OF TROLLY ON LINE



Note:

1. In meter gauge sections, where sanctioned speed is more than 75 kmph, the distance of protection will be increased as specified by the administration.
2. In case of double line, the flagman is to be deputed either to follow or to precede the trolley, as the case may be.

**PUSH TROLIES AND MOTOR TROLLIES**  
**PROTECTION OF LORRY ON LINE**



**SINGLE LINE**

Note:

1. In meter gauge sections where maximum speed is more than 75 kmph, the distance of protection will be increased as specified by the administration
2. In double line, protection is to be done in direction of approaching train
3. Detonators should be placed on the line when the lorry comes to a stop.

## **CHAPTER-12: WORKING OF TRAINS IN ABNORMAL CONDITIONS AND EMERGENCIES**

### **CONTENTS**

- Working of Trains during Total Interruption of Communication

#### **12.1 Rules for Working Trains during Total Interruption of Communication on Double Line Section**

In the event of total interruption of communications between two block stations on a double line section, i. e. when LC cannot be obtained by any one of the following means stated in the order of preference

- (a) Block Instruments, Track Circuits or Axele Counters;
- (b) Telephone attached to the Block Instruments;
- (c) Station to Station fixed telephones wherever available;
- (d) Fixed telephone such as Railway auto phones and BSNL telephones
- (e) Control Telephone; and
- (f) VHF Sets;

the following procedure shall be adopted for train passing.

**12.1.1** Before any train is allowed to enter a block section in advance, it shall be brought to a stop and the Loco pilot and guard of the train shall be advised of the circumstances by the SM on duty.

**12.1.2** The SM shall give the Loco pilot of each train Form No. T/C602 which contains;

- (a) An "Authority to Proceed without Line Clear" on the prescribed form
- (b) A caution order restricting the speed to 25 KMPH over the straight and 10 KMPH when approaching or passing any portion of the line where the view ahead is not clear due to curve, obstruction, rain, fog or any other cause
- (c) An authority on the prescribed form to pass LSS in 'on' position.

**12.1.3** In the event of a Loco pilot approaching any portion of the line where the view is not clear, a railway staff with hand signals must be sent ahead to guide the movement of train. A sharp look out ahead should be kept and the engine whistle freely used.

**12.1.4** No train shall be allowed to enter the block section until there is a clear interval of 30 minutes between the train about to leave and the train, which immediately preceded.

**12.1.5** Fixed signals with the exception of the LSS may be taken "OFF" for the reception and departure of trains. The FSS shall, however, be taken off only after the train has been brought to a stand outside it.

**12.1.6** A tunnel should be entered only after it has been ascertained that it is clear. If there is any doubt on this point, the train should be piloted by a railway employee equipped with hand signals and detonators.

**12.1.7** The guard shall keep a sharp look out in the rear and be prepared to exhibit a stop hand signal to prevent the approach of a train from the rear and to protect it if necessary.

- 12.1.8** When a train is stopped in the block section, the guard shall immediately exhibit a stop hand signal towards the rear and check up that the tail board / tail lamp is correctly exhibited. If the stoppage is on account of accident, failure, obstruction or other exceptional cause and the train cannot proceed, the Loco Pilot shall sound the prescribed code of whistle to apprise the guard of the fact, whereupon the guard shall protect the train by placing one detonator at 250 Mts from the train on the way out and 2 detonators, 10 Mts. apart, at 500 Mts. from the train, irrespective of the gauge. When a train is detained outside signals and if the detention exceeds or is likely to exceed 10 minutes it shall also be protected accordingly. In the absence of the guard the duty of protecting the train shall devolve on the Loco Pilot.
- 12.1.9** No train shall be backed. In exceptional circumstances when it may be unavoidable to back a train, the train shall be backed only after providing protection by placing one detonator at 250 Mts and two detonators (10 Mts apart), at 500 Mts in rear of the point up to which the train is to be backed.
- 12.1.10** Before entering a tunnel, the headlights / side / taillights / other lights shall be lit.
- 12.1.11** When approaching the station ahead, the Loco pilot must bring his train to a stop outside the FSS and sounds continuous whistle. If no one from station turns up within 10 minutes, the train shall be protected as per Para 12.1.8 above and the Loco pilot may send his assistant Loco Pilot thereafter, to the station or the cabin to inform the SM / Cabin Master of the fact that the train is waiting at the signal for its admission into station. In the absence of assistant Loco pilot, the guard, after protecting the train, shall give this information.
- 12.1.12** The Loco pilot's of all trains shall hand over the "Authority to Proceed without Line Clear" to the SM of the station at the other end of the affected section. These shall be kept by the SM in his safe custody for inspection by the Traffic Inspector of the section, who shall prepare a report on the working of trains and shall forward the same along with his report to the DRM within 7 days of resumption of communication.
- 12.1.13** A record of all trains passed over the block section on "Authority to Proceed without Line Clear" during the course of total interruption of communications shall be maintained in the TSR books at both the stations concerned.
- 12.1.14** Trains must continue to work on this system until one of the means of communications, mentioned in Para 12.1 above is restored.
- 12.1.15** As soon as any one of the means of communications has been restored, the SM must send a message to the SM at the other end of the section on prescribed form. On receipt of the above message the SM at the other end of the station must acknowledge the same on prescribed form.
- 12.1.16** LC shall not be obtained or given by means of communications restored until both the stations are satisfied that all trains and engines etc., dispatched from their stations have arrived complete at the other station. When the trains arrive complete at the stations, after restoration of communication, their number and their arrival time will be communicated to the other SM concerned under exchange of PNs. Thereafter an intimation about this shall be given to controller also, and normal working resumed. If however, communications with the controller has not restored the controller shall be advised of the position immediately on restoration of communication with him.

## 12.2 Rules for Working Trains During Total Interruption of Communication on Single Line Sections

In the event of total interruption of communications between two block stations on a single line section, i. e. when LC cannot be obtained by any one of the following means stated in the order of preference

- (a) Block Instruments, Track Circuits or Axle Counters
- (b) Telephone attached to the Block Instruments
- (c) Station to Station fixed telephones wherever available
- (d) Fixed telephone such as Railway auto phones and BSNL telephones
- (e) Control Telephone; and
- (f) VHF Sets / Mobile Phones

The following procedure shall be adopted for train passing.

*NOTE - These instructions shall also be followed when during total interruption of communication, an accident to train or track or other obstructions precludes the use of one of the lines on a double line section or when total interruption of communications occurs during single line working on a double line section.*

**12.2.1** The SM who has a train to dispatch through the affected block section shall open communication by establishing contact with the SM of the block station at the other end of the affected block section by sending an engine or self propelled vehicle or any other vehicle enumerated below, in the order of preference laid down.

- (a) Light engine
- (b) Train engine, after it is detached from the train on instructions from SM on duty
- (c) Motor trolley / tower wagon accompanied by a guard or SM other than the SM on duty
- (d) Trolley / cycle or moped trolley accompanied by a guard/SM other than the SM on duty
- (e) Diesel car / Rail motorcar / EMU rake, after ensuring that all passengers have detrained

**12.2.2** Before the light engine/train engine/motor trolley/tower wagon /trolley/cycle trolley/moped trolley/ diesel car/ rail motor car/EMU rake is sent into affected block section to open communications, the Loco pilot/motorman/guard/SM being sent to do so shall be advised by the SM on duty of the circumstances in which and the purpose for which he is being sent. The SM on duty shall also satisfy himself that the Loco pilot/motorman/ guard/SM being sent to open communications thoroughly understands the rules for working of trains during total Interruption of communications on the single line. If the Loco pilot/motorman/guard/SM who is being sent to open communications is not conversant with the rules, the SM on duty shall explain these rules to such staff. The SM on duty shall also obtain the signature of the Loco pilot / motorman / guard / SM in ink on prescribed form in token of staff having fully understood the circumstances in which and the purpose for which he is being sent and the rules for working of trains during total interruption of communications on single line.

**12.2.3** Before dispatching the light engine/train engine/motor trolley / tower wagon / trolley / cycle trolley / moped trolley / diesel car / rail motorcar / EMU rake, the SM on duty shall hand over to the Loco pilot /motorman / guard/ SM being sent to open communications, the following documents

- (a) An “Authority to Proceed without Line Clear” on the prescribed form (separate forms to be used for Up and Down trains).
- (b) A caution order, specifying the speed up to which the engine or self propelled vehicle or other vehicle referred above may run through the affected block section.
- (c) An authority on the prescribed form, to pass the LSS in the “ON” position.
- (d) A line clear enquiry message addressed to the SM of the block station at the other end of the affected section asking LC for the train waiting to be dispatched.
- (e) A conditional line clear message to the SM of the block station at the other end of the affected block section permitting him
  - (i) To return the light engine / train, either light or attached to a train waiting to be dispatched from his station, or attached with another engine, or
  - (ii) To return tower wagon / diesel car / rail motorcar / EMU rake running by itself, or
  - (iii) To return motor trolley / trolley / cycle trolley / moped trolley either running by itself or loaded in a train waiting to be dispatched from his station.
- (f) The line clear enquiry message asking line clear for the trains to be dispatched through the affected block section, and the conditional line clear message for the return journey of the engine or self propelled vehicle or other vehicle referred above, as the case may be, shall be written on prescribed message forms for being sent through the Loco pilot / motorman / guard / SM going to open communications.

**12.2.4** After an engine or self propelled vehicle or other vehicle is dispatched to the next station to open communications with LC enquiry message, and a CLC message for the return journey of the engine or self propelled vehicle or other vehicle, no other train or engine or self propelled vehicle or other vehicle shall be allowed to leave the station and proceed in the same direction until the engine or self propelled vehicle or other vehicle sent to open communications returns.

**12.2.5** The engine or self propelled vehicle or other vehicle proceeding on “Authority to Proceed without Line Clear” shall proceed at a speed not exceeding 15 kmph by day when the view is clear and 10 kmph during night or when the view is obstructed, making free use of the engine whistle or horn of the self propelled vehicle, where provided. In thick, foggy or tempestuous weather or in dust storm etc, when visibility is impaired, the engine or self propelled vehicle or other vehicle proceeding “Authority to Proceed without Line Clear” shall proceed at walking speed only, making repeated use of the engine whistle or horn of self propelled vehicle, where provided, preceded at an adequate distance by two men on foot, one displaying a red light and the other carrying fog signal ready for immediate use. Normally one of these men will be provided by the SM from his group D staff and the other from the crew of the engine or the person whose motor trolley/trolley/cycle trolley/moped trolley is being used. In case of single manned self-propelled vehicle, both these men shall be provided by the SM. The SM on duty shall explain to both of them their duties, in the presence of the Loco pilot / motorman / guard / SM in-charge of the self-propelled vehicle or other vehicle being sent to the next station and satisfy himself that they understand the same.

- 12.2.6** In the event of an engine/self propelled vehicle / other vehicle proceeding on "Authority to Proceed without Line Clear" meeting in the mid-section, an engine / self propelled vehicle / other vehicle sent from the other end, the Loco pilot / motorman / guard / SM as the case may be, shall taking into consideration the importance of the train for which they are proceeding to get LC, the distance from the nearest station, gradients to be encountered, the presence of catch sidings, etc., decide to which of the two stations the engines / self propelled vehicle / vehicles should proceed. Before proceeding, the engines or self propelled vehicles shall, if possible, be coupled up. If the engines / self-propelled vehicle cannot be coupled up, they should run at a safe speed and adequate distance apart. In the case of motor trolley / trolley /cycle trolley / moped trolley, meeting an engine and brake van /diesel car / rail motor car / EMU rake, the motor trolley /trolley / cycle trolley shall, if possible, be loaded in the brake van / diesel car / rail motor car / EMU rake.
- 12.2.7** On sighting the station to which the engine / self propelled vehicle other vehicle running by itself or with another similar unit coupled together or separately, are proceeding, the leading engine / self propelled vehicle / other vehicle shall stop outside in rear of the FSS. The engine or self-propelled vehicle or other vehicle following the leading engine / self propelled vehicle / other vehicle, shall stop at a safe distance behind the leading engine / self-propelled vehicle / other vehicle. The SM shall be advised of the stoppage outside the FSS either by using the engine whistle / horn of the self-propelled vehicle, if provided, or by sending a man if necessary. They shall not enter the station till permitted by the SM either by taking "OFF" the relevant signals or otherwise.
- 12.2.8** When the engine/self propelled vehicle / other vehicle / vehicles have been admitted into the station, the "Authority to Proceed without Line Clear", the LC enquiry message and the CLC message giving the LC for the return journey shall be delivered to the SM on duty, who shall keep these documents in his safe custody and also post the LC Enquiry message and the CLC message in his relevant books. On the authority of the CLC message for the return journey, the SM on duty shall make out a CLC ticket and hand it over to the Loco pilot / motorman / guard / SM to return to the station from where he came with his engine (either light or attached to a train or another engine or a self propelled vehicle if one is waiting to proceed in that direction) / other vehicle / vehicles.
- 12.2.9** In case of the engine or self-propelled vehicle or other vehicle returning to the station from which he was sent without reaching the next station, the "Authority to Proceed without Line Clear", the LC enquiry message and the CLC message for the return journey shall be taken back by the SM on duty of the station from which they were issued and cancelled.
- 12.2.10** The SM on duty, before dispatching the engine either light or attached to a train / self-propelled vehicle / other vehicle, on the return journey shall hand over to the Loco pilot / motorman / guard / SM, CLC reply message for the LC enquiry message giving LC for the train waiting at the other station, thereby authorising the SM at that station to start the train waiting there on complete arrival of the engine, either light or attached to a train / self-propelled vehicle / other vehicle at his end.
- 12.2.11** On the return journey, the engine either light or attached to a train / diesel car / rail motorcar / EMU rake / train loaded with motor trolley / trolley /cycle trolley / moped trolley may run at booked speed observing speed limits in the WTT and other relevant rules. The motor trolley / trolley / cycle trolley / moped trolley returning by itself may run at their normal speed observing the rules governing their running on LC.
- 12.2.12** On reaching the station, the engine either light or attached to a train / self-propelled vehicle / other vehicle shall again stop outside the FSS of the station and thereafter be guided by the instructions from the SM who may arrange to receive in by taking "OFF" the relevant signals or otherwise.

- 12.2.13** On arrival at the station the CLC reply message shall be handed over to the SM and the SM on its authority shall issue a CLC ticket for the waiting train.
- 12.2.14** If there be an even flow of trains in both directions, CLC enquiry message for each succeeding train may be sent through the guard of the preceding train.
- 12.2.15** The arrival and departure times of all trains, engine, and trollies etc. which are passed under the above rules must be carefully recorded in relevant books and TSR.
- 12.2.16** If the SM at one end of the interrupted section has more than one train to dispatch in the same direction before another train is normally expected from the opposite direction, he shall, in such cases, send the available engine of a train to obtain LC not only for that train but also for the following trains which may be waiting or expected at his station. In the LC enquiry message it shall be stated that these later trains will be dispatched after the first train at intervals of 30 minutes. After the Loco Pilot returns with the LC for the required number of trains to the station at which he had left the train, the SM shall dispatch the first train on CLCT and shall also endorse on CLCT that a particular train (giving its number and description in full) shall follow at a specified interval. The SM shall give similar information to the guard also in writing. The Loco pilot of the second and subsequent following trains shall be given a caution order restricting the speed to 25 kmph over the straight when the view ahead is clear and to 10 kmph when approaching or passing any portion of the line where the view ahead is not clear due to curve, obstruction, rain, fog or any other cause.
- When dispatching a second and subsequent trains, the particulars of the last preceding train along with its time of departure will be endorsed on the CLCT as also the particulars of the train that would follow. The CLCT for the last train of the series should be endorsed with the particulars of the preceding train together with its time of departure.
- While adopting this procedure, the guards and the Loco Pilots should be instructed to keep a sharp look out and be prepared to stop short of any obstruction.
- 12.2.17** When a train is stopped in the block section the guard shall immediately exhibit a stop hand signal towards the rear and check up that the tailboard or tail lamp is correctly exhibited. If the stoppage is on account of accident, failure or obstruction or other exceptional cause and the train can not proceed, the Loco pilot shall sound the prescribed code of whistle to apprise the guard of the fact, whereupon the guard shall protect the trains by placing one detonator at 250 Mts from the train on the way out and 2 detonators, 10 Mts apart, at 500 Mts from the train, irrespective of the gauge. When a train is detained outside signals and if the detention exceeds or is likely to exceed 10 minutes, it shall also be protected accordingly. In the absence of the guard, the duty of protecting the train shall devolve on the Loco Pilot.
- 12.2.18** When trains follow one another, no train shall be backed. In exceptional circumstances when it may be unavoidable to back a train, the train shall be backed only after providing protection by placing one detonator at 250 Mts and two detonators, 10 Mts apart, at 500 Mts from the point up to which the train is to be backed.
- 12.2.19** Trains must continue to work on this system until any one of the means of communications mentioned in Para 12. 2 above is restored by the competent authority.
- 12.2.20** As soon as any of the means of communications has been restored, the SM must send a message to the SM at the other end of the section on prescribed form. On receipt of the message, the SM at the other end of the section must acknowledge it in the prescribed form.

- 12.2.21** Thereafter, intimation about this shall be given to the controller. If, however, communication with the controller has not got restored by this time, the controller shall be advised as soon as the communication with him is restored.
- 12.2.22** On the section where total interruption of communications occurs, the Traffic Inspector of the section must scrutinise the train passing records of the station and submit his report to the DRM within 7 days of the resumption of communications.

### **12.3 Single Line Working on Double Line Sections During Total Interruption of Communication**

The following rules must, in addition to the rules prescribed in Para 12.2 Rules for Working Trains During Total Interruption of Communication on Single Line Sections", be observed by the staff.

- 12.3.1** Whenever an accident to a train or track or other obstruction precludes the use of one line on a double line section during total interruption of communication, single line working shall be introduced only after a responsible official of the engineering department not less than an inspector in rank, has certified that the other line on which single line working is to be introduced is free and safe for passage of trains. Such engineering official shall give the certificate only to the SM of the station at the end of the affected section for which the unobstructed line shall be the right line for dispatching train. On receipt of this certificate, the SM will follow the rules prescribed in Para 12.2 for opening of communications.
- 12.3.2** Loco pilot's of trains, including light engines, shall be given a caution order on which, shall be stated clearly
- (a) The line on which the train is to run
  - (b) Kilometerage where the obstruction exists
  - (c) Any restriction of speed which may be imposed by permanent way & works staff and
  - (d) An assurance to the effect that any trap points on the line in question have been spiked or clamped and pad locked.
- 12.3.3** All the cross-over points in the facing direction over which the train shall proceed, while temporary single line working is in force, shall be clamped and padlocked.
- 12.3.4** In the case of train proceeding on the right line
- (a) The LSS of the station in rear of the affected section may be passed in the "ON" position on a written authority issued by the SM in the prescribed form. In case the LSS is the starter, in addition to the written authority, proceed hand signal shall also be shown at the foot of the signal.
  - (b) Approach stop signals, if any, of the station in advance of the affected section may be taken "OFF".
- 12.3.5** In the case of a train proceeding on the wrong line
- (a) The train shall be piloted out of the station on a written authority issued by the SM after all the facing points have been correctly set and locked and trailing points correctly set over which the train will pass.

- (b) On reaching the next station, the Loco pilot shall bring his train to a stop opposite the FSS pertaining to the right line or at the LSS pertaining to the wrong line (on which his train is running), whichever he comes across first.
- (c) The SM of the station in advance shall depute a railway servant in uniform at the foot of the signal (whichever the train would encounter first) who shall stop the train on stop hand signal and thereafter pilot it in to the station on a written authority issued by SM.

**12.3.6** It will be the responsibility of the person-in-charge of the first engine or self propelled vehicle or other vehicle, sent under "Authority to Proceed without Line Clear" to inform all the gateman and Gangmen enroute about the introduction of temporary single line working as also the line on which it is proposed to run the trains.

This information shall be conveyed through the Loco pilot of a subsequent train also, if necessary.

**12.3.7 Resumption of normal working**

- (a) If after the introduction of single line working, communications are restored between the two affected stations, the trains will continue to run under special rules until action is taken in accordance with the instructions contained in these rules for the cancellation of the procedure. Thereafter, trains will be run in accordance with the Instructions for the movement of traffic during temporary single line working on double line.
- (b) If, however, before communications are restored the other line is released for the passage of traffic, trains shall be worked in accordance with the instructions for running of trains on double line section during total interruption of communications

**12.4 Rules for Single Line Working on Double Line Sections when one Line is Obstructed**

**12.4.1** Whenever an accident to a train or track or other obstruction precludes the use of one of the lines on a double line section, the traffic may temporarily be worked over single line under one of the following systems

- (a) By obtaining line clear on electric speaking instruments.
- (b) By the installation of single line block instruments and shunting limit boards demarcating the block section in the wrong direction if the affected line is likely to remain out of use for a substantial period.

**12.4.2** When it is desired to introduce temporary single line working on double line, on electric speaking instruments, the SM at one end of the affected section shall, on receipt of reliable information in writing that one line is clear, take steps to introduce temporary single line working on that line in consultation with the controller and the SM of the station at the other end of the section.

**12.4.3** If there is reason to suspect that the line over which temporary single line working is to be introduced is also fouled or damaged, temporary single line working must not be introduced until a responsible engineering official of rank not less than that of an inspector has inspected the section and certified that the road is safe for the passage of trains.

**12.4.4** Single line working shall be introduced between the nearest stations provided with crossover between the Up and Down lines on either side of the obstruction. If there is an IB hut between the two stations, the same shall be treated as closed and the commutator of the block instruments at such block huts shall be kept locked in TOL position throughout the period single line working is in force. The signals at such block huts shall be kept in "ON" position throughout and these shall be passed by the Loco Pilots on a written authority in the prescribed form issued by the SM of the adjoining block station.

**12.4.5** All trains will be worked in accordance with the rules for the use of electric speaking instruments on single line and LC shall be obtained on the telephone attached to block instruments or control telephone or VHF set.

**12.4.6** At all stations on the portion of the section on which single line working has been introduced, the commutator of the block instruments pertaining to both obstructed and unobstructed lines shall be kept in TOL position throughout the period single line working is in force. At these stations, if the train is running on the right line, the LSS shall be kept in "ON" position. In case the train is running on the wrong line, all fixed signals shall be kept in "ON" position.

**12.4.7** After ascertaining that one of the lines is clear for the passage of traffic, the SM proposing single line working shall issue message containing the following information under exchange of PNs to the SM at the other end of the affected section

- (a) Cause of introduction of single line working
- (b) The line on which single line working is proposed
- (c) Source of information that the said line is clear
- (d) Place of obstruction
- (e) Restriction of speed, if any, on the line
- (f) Name of intermediate stations, if any, which would be out of use
- (g) Assurance that the trap points, if any, have been spiked or clamped and padlocked
- (h) Assurance that if the train is running on the right line, the LSS shall be kept in the "ON" position and in case the train is running on the wrong line, all fixed signals shall be kept in the "ON" position and
- (i) The number and timings of the last train, which arrived or left the block station issuing the message;

**12.4.8** On receipt of acknowledgement from the SM conformed by a PN, single line working may be introduced. LC will be obtained on telephone attached to block instruments or control telephone or VHF set, and trains run in accordance with the instructions contained in Chapter XIV of the G & SR.

**12.4.9** A caution order shall also be handed over to the Loco Pilot of each train or light engine, on which shall be clearly stated

- (a) The line on which the train or light engine is to run,
- (b) The kilometers between which the obstruction exists,
- (c) Any restriction of speed which may have been imposed by way and works staff,
- (d) An assurance to the effect that any trap points on the line in question have been spiked or clamped and

(e) The Loco pilot shall also be given a written authority in the prescribed form to pass the LSS in "ON" position. In case the LSS is the starter, in addition to the written authority, he shall also be shown proceed hand signal at the foot of this signal.

**12.4.10** An endorsement will also be made on the caution order given to the Loco pilot of the first train to inform all gang men and persons in-charge of trollies / lorries which he may encounter on the way about the introduction of temporary single line working and specifying the road on which the trains will run. This information shall be conveyed through the Loco pilot of a subsequent train also if necessary.

**12.4.11** The speed of the first train passing over the temporary single line, will be restricted to 25 kmph. Subsequent trains may run at their booked speed, subject to observance of the other speed restrictions imposed by way and works staff.

**12.4.12** When a train is stopped between stations on account of accident, failure, obstruction or other exceptional cause and the Loco Pilot finds that it cannot proceed, it shall be protected as per Rule 6.03 of GR.

**12.4.13** In case of a train proceeding on the right line

(a) The LSS of the station in rear of the affected section may be passed in the "ON" position on a written authority issued by the SM in the prescribed form. In case the LSS is the starter, in addition to the written authority, proceed hand signal shall also be shown at the foot of this signal.

(b) The approach stop signals, if any, of the station in advance of the affected section, may be taken "OFF" for reception.

**12.4.14** In the case of a train proceeding on wrong line

(a) The train shall be piloted out of the station on a written authority issued by the SM after all the facing points have been correctly set and locked and trailing points correctly set, over which the trains will pass.

(b) On approaching the next station, the Loco Pilot shall bring his train to a stop opposite the FSS pertaining to the right line or at the LSS pertaining to the wrong line (on which the train is running), whichever the Loco pilot comes across first.

(c) The SM of the station in advance shall depute railway servant in uniform at the foot of the signal (whichever the train would encounter first) who shall stop the train on stop hand signal and thereafter pilot it into the station on a written authority issued by the SM.

**12.4.15** All the crossover points in the facing direction over which the train shall proceed, while temporary single line working is in force, shall be clamped and pad-locked.

**12.4.16** Resumption of Normal Working

(a) On receipt of a written certificate from a responsible engineering official that the obstructed track is free and safe for passage of trains, the SM will issue a message to the other station or stations as the case may be, under exchange of PNs and decide in consultation with controller the train, after passage of which, the normal working has to be introduced.

(b) When double line working is introduced, the block instruments and all fixed signals including those of IB huts, which were treated as closed, shall be brought into use immediately. An entry shall also be made in TSR of all stations concerned showing the time double line working was suspended, time single line working was introduced and the time normal working was resumed. The Loco pilot of the first train entering the section after normal working is resumed shall inform all gatemen and gangmen on the way about resumption of normal working.

**12.4.17** All the records in connection with temporary single line working shall be retained at the station and the Traffic Inspector of the section must scrutinize them and submit his report to the DRM within seven days of the resumption of normal working.

**Note** - *The term SM wherever used in this part includes Cabin Master.*

## Annexures

### Operating Forms

**Railway Board Letter No.97/Safety (A&R)/29/15 dated 10.08.2000 – New Operating Forms introduced with effect from 01.01.2001.**

| S.No | Description  | Form Number |
|------|--|-------------|
| 1.   | Signal & Telecommunication Disconnection/Reconnection Notice   | S&T (T/351) |
| 2.   | Advance authority to pass defective signals at station   | T/369(1)    |
| 3.   | Authority to Pass signals at 'on' or defective position  | T/369-(3b)  |
| 4.   | Caution Order  | T/409       |
| 5.   | Caution Order 'NIL'  | T/A 409     |
| 6.   | Reminder Caution Order (Not in vogue on SCR)   | T/B 409     |
| 7.   | Train Examination Advice/Report  | T/431       |
| 8.   | Authority to proceed for material train<br>(Return to originating station)   | T/462       |
| 9.   | Authority to proceed for material train<br>(Proceed to Next Station)   | T/A 462     |
| 10.  | Authority to proceed for track machine<br>(Return to Originating station)  | T/465       |
| 11.  | Authority to proceed for track machine<br>(Proceed to next station)  | T/A 465     |
| 12.  | Authority to receive a train on an obstructed line   | T/509       |
| 13.  | Authority to Start from a Non- signaled line   | T/511       |
| 14.  | Authority to start from a line with common Starter signal  | T/512       |
| 15.  | Authority to proceed for relief Engine/Train into an occupied block section  | T/A 602     |
| 16.  | Authority for opening communication during Total Interruption of Communication on single line section                            | T/B 602     |
| 17.  | Authority for working of trains during Total Interruption of Communication on double line section                                | T/C 602     |
| 18.  | Authority for Temporary Single Line working on double line   | T/D 602     |
| 19.  | Line Clear Enquiry message asking Line Clear for despatch of trains during Total failure of communication on single line section | T/E 602     |

|     |   |           |
|-----|---|-----------|
| 20. | Conditional Line Clear message  | T/F 602   |
| 21. | Conditional Line Clear ticket (Up)  | T/G 602   |
| 22. | Conditional Line Clear ticket (Down)  | T/H 602   |
| 23. | Message on restoration by any one of the means of communication   | T/I 602   |
| 24. | Block Ticket  | T/J 602   |
| 24. | Written permission given by Guard to Loco Pilot when the Engine or portion of a train is allowed to proceed to next station from mid-section    | T/609     |
| 25. | Shunting order  | T /806    |
| 26. | Authority to pass Automatic / Semi-automatic / Manually operated / gate stop signals.   | T/A 912   |
| 27. | Authority to proceed without Line Clear on Automatic Block signalling territories   | T/B 912   |
| 28. | Authority to proceed for relief engine / train into an Automatic block signalling section   | T/C 912   |
| 29. | Authority to proceed on Automatic Block System during prolonged failure of signals  | T/D 912   |
| 30. | Line Clear Inquiry message issued by train despatching station  | T/A 1425  |
| 31. | Line Clear reply message issued by train receiving station  | T/B 1425  |
| 32. | UP Paper Line Clear Ticket  | T/C 1425  |
| 33. | Down Paper Line Clear Ticket  | T/D 1425  |
| 34. | Trolley/Lorry/OHE Ladder Trolley notice   | T/ 1518   |
| 35. | Authority for Trolley / Lorry / Motor trolley to be used on Token less sections in Absolute Block System and Automatic Block system territories | T /A 1525 |
| 36. | Motor trolley Permit (Following)  | T/ 1525   |
| 37. | Authority to proceed for Tower wagon and to return to starting station  | T/ 1708   |
| 38. | Authority to proceed for tower wagon to proceed to Station in advance   | T/A 1708  |

**ANNEXURE**

**Statements showing the various books of reference and their distribution among the staff  
(annexure 36 Para SEM Pt-I)**

| Sl.<br>No | Publications  | Scale                        |                              |                                     |                               |                          |  |                      |
|-----------|---|------------------------------|------------------------------|-------------------------------------|-------------------------------|--------------------------|--|----------------------|
|           |   | Office of                    |                              |                                     | Personal Possession of        |                          |  |                      |
|           |   | Divl.<br>S&T<br>Engi<br>neer | Asst.<br>S&T<br>Engi<br>neer | Superviso<br>ry Signal<br>Inspector | Divl./Dist<br>S&T<br>Engineer | Asst.<br>S&T<br>Engineer | Supervisory<br>and<br>Sectional<br>Signal<br>Inspector | Signal<br>Maintainer |
| 1         | Rules for the opening of a Railway for the Public carriage of passengers. | 1                            | 1                            | -                                   | 1                             | 1                        | -  | -                    |
| 2         | General and Subsidiary Rules  | 1                            | 1                            | 1                                   | 1                             | 1                        | 1  | 1                    |
| 3         | Schedule of Dimensions (B.G/M.G/N.G as applicable)                        | 1                            | 1                            | 1                                   | 1                             | 1                        | 1  | 1                    |
| 4         | Signal Engineering Manual   | 1                            | 1                            | 1                                   | 1                             | 1                        | 1  | 1                    |
| 5         | Telecommunication Manual  | 1                            | 1                            | 1                                   | 1                             | 1                        | 1  | 1                    |
| 6         | Block Working Manual  | 1                            | 1                            | 1                                   | 1                             | 1                        | 1  | 1                    |
| 7         | Accident Manual   | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 8         | A.C. Traction Manual  | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 9         | Permanent Way Manual  | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 10        | Track Manual  | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 11        | Indian Government Railway Code for the Engineering Department             | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 12        | Indian Government Railway Establishment Code                              | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 13        | Indian Government Railway Financial Code                                  | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 14        | Indian Government Railway Code for Stores Department                      | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 15        | Indian Government Railway Code for Accounts Department.                   | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |

| Sl.<br>No | Publications  | Scale                        |                              |                                     |                               |                          |  |                      |
|-----------|---|------------------------------|------------------------------|-------------------------------------|-------------------------------|--------------------------|--|----------------------|
|           |   | Office of                    |                              |                                     | Personal Possession of        |                          |  |                      |
|           |   | Divl.<br>S&T<br>Engi<br>neer | Asst.<br>S&T<br>Engi<br>neer | Superviso<br>ry Signal<br>Inspector | Divl./Dist<br>S&T<br>Engineer | Asst.<br>S&T<br>Engineer | Supervisory<br>and<br>Sectional<br>Signal<br>Inspector | Signal<br>Maintainer |
| 16        | Schedule of Powers of Divisional/ District and Assistant Officers in other than Establishment matters (as published). | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 17        | Pass Manual   | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 18        | The Hours of Employment Regulations with notifications as issued.   | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 19        | Payment of Wages Act with Notifications as issued.  | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 20        | Working Time Table and Appendix thereto.  | 1                            | 1                            | 1                                   | 1                             | 1                        | 1  | 1                    |
| 21        | Alphabetical List of Railway stations.  | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 22        | Telegraph Code  | 1                            | 1                            | 1                                   | -                             | -                        | -  | -                    |
| 23        | Catalogue of Stores   | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 24        | Indian Railways Act   | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 25        | Indian Workmen's Compensation Act   | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 26        | Indian Electricity Act  | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 27        | Indian Petroleum Act.   | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 28        | I.R.S Drawings  | 1                            | 1                            | * 1                                 | -                             | -                        | -  | -                    |
| 29        | I.R.S. Specifications (as required)   | 1                            | 1                            | -                                   | -                             | -                        | -  | -                    |
| 30        | Railway Standard Drawings   | 1                            | 1                            | * 1                                 | -                             | -                        | -  | -                    |

\* as required

## Foot Plate Inspection

ANNEXURE '4'

Para Nos. 3.9.3

Form No. S&amp;T/FP

..... RAILWAY

**Foot Plate Inspection of Signals****RECORD OF OBSERVATION**

|  |   |                          |
|--|---|--------------------------|
| 1. Date :                                    | Driver's Equipment<br>Spectacles                                    | <input type="checkbox"/> |
| 2. Section :                                 | Detonators  | <input type="checkbox"/> |
| 3. Train No. :                               | 14. First Aid Box   | <input type="checkbox"/> |
| 4. Engine No. :                              | Other Equipments  | <input type="checkbox"/> |
| 5. Driver's name :                           | 15. Headlight   | <input type="checkbox"/> |
| 6. Asst. Driver or Fireman's name :          | 16. ....<br>Obsevance of Speed Restrictions and Caution Orders      | <input type="checkbox"/> |
| 7. Guard's name :                            | 17. ....<br>Placing of Engineering Signals.                         | <input type="checkbox"/> |
| 8. Weather : Clear/Cloudy/Foggy              | 18. Whistling while approaching Level Crossing Gate and 'W' Boards. | <input type="checkbox"/> |
| 9. Visibility : Good/Fair/Poor               | Remarks :   |                          |
| 10. Long/Short Hood Leading                  |   |                          |
| 11. Speedometer                              |   |                          |
| 12. Fireman/Asst. Driver calling out signals |   |                          |
| 13. Vigilance Control Devices                |   |                          |
| Note:      Yes      No                       |   |                          |

Further Remarks :

## ANNEXURE '4'

Page 2

| Station . . .  |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|--|---------------------------------|------------|----------|---|------------|----------|---|------------|----------|----|------------|----------|---|------------|----------|--------|--|--|--|--|--|--|
| Time Arrival<br>Departure/Passing  |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Signal . . .   | D<br>W                          | O          | H        | S | AS         | D<br>W   | O | H          | S        | AS | D<br>W     | O        | H | S          | AS       | D<br>W |  |  |  |  |  |  |
| Aspect   | 90° G. . .                      |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | 45° Y. . .                      |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | 0° R. . .                       |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Droop,<br>improperly<br>lowered |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Visibility   | Good . . .                      |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Adequate . . .                  |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Insufficient                    |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Reason<br>( Code) .             |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Light . . .  | Good . . .                      |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Dim . . .                       |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Out of focus                    |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Out . . .                       |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Interference from<br>fixed light   |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Token Delivery   |                                 | PU<br>App. | Platform |   | PU<br>App. | Platform |   | PU<br>App. | Platform |    | PU<br>App. | Platform |   | PU<br>App. | Platform |        |  |  |  |  |  |  |
| Pouch . . .  | Good                            |            | Worn out |   | Good       | Worn out |   | Good       | Worn out |    | Good       | Worn out |   | Good       | Worn out |        |  |  |  |  |  |  |
| Driver Checking Token  |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Lamp Torch displayed   |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Flag/<br>Light<br>Showing  | Driver . . .                    |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Station . . .                   |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Off . . .                       |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Guard . . .                     |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
|  | Cabin . . .                     |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Adequacy of Lights in<br>cabins  |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| Lighting Boards . . .  |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |
| * Code.      B - Back ground.      O - Obstruction.      T - Trees.      L - Lights. |                                 |            |          |   |            |          |   |            |          |    |            |          |   |            |          |        |  |  |  |  |  |  |

## Revised Codal life of assets

**As per Advance correction slip. No. 62 (of Indian Railway Finance Code Vol-1 para 219)  
dated 24.5.06**

| <b>SIGNALLING SYSTEM</b> |  |   |   |
|--------------------------|--|---|---|
| <b>SI.<br/>No</b>        | <b>CLASS OF<br/>ASSETS</b>   | <b>ROUTES</b>   | <b>AVERAGE LIFE<br/>IN YEARS</b>                      |
| 1.                       | Electrical/<br>Mechanical<br>Signalling<br>System                      | Route- A<br>Route-/ Suburban Section<br>Big yards on all routes | 25 Years.   |
|                          |  | Routes-B<br>Routes-D<br>Routes-D- "special"                     | 25 to 28 Years depending<br>Upon location & condition |
|                          |  | Routes-'E'<br>Routes-'E'-‘special’                              | 30 Years  |
| 2                        | Electronic signaling system like SSI, Axle counter, AWS,AFTC,IPS etc., |   | 15 years or based on<br>Obsolescence.                 |

| <b>TELECOMMUNICATION EQUIPMENT</b> |  |                                  |
|------------------------------------|--|----------------------------------|
| <b>SI.<br/>No</b>                  | <b>CLASS OF ASSETS</b>                                       | <b>AVERAGE LIFE IN<br/>YEARS</b> |
| 1                                  | Microwave Equipments   | 12-15 Years                      |
| 2                                  | Exchange & accessories including Telephone equipment         | 12-15 Years                      |
| 3                                  | Under Ground Cables  | Quad-20 Years                    |
|                                    |  | OFC -20 Years                    |
| 4                                  | Overhead alignment   | 25 Years                         |
| 5                                  | All other electronic /wireless items including OFC equipment | 12-15 Years                      |
| 6                                  | Cell Phones  | 5-8 Years                        |
| 7                                  | FAX  | 10 Years                         |
| 8                                  | Walkie –Talkie Sets/VHF                                      | 5-8 Years                        |
| 9                                  | Datacomm. Equipment, Routers, Modems, PCs etc.               | 5-8 Years                        |

| <b>COMPUTER AND OTHER IT SYSTEM</b> |   |                              |
|-------------------------------------|---|------------------------------|
| <b>SI.<br/>N</b>                    | <b>Class of aSSE(S)ts</b>   | <b>Average life in years</b> |
| 1                                   | Passive Networking equipment (viz .Network Cabling)   | 10                           |
| 2                                   | Larger Multiuser system (s) & Active Networking Equipment viz. mis systems including external storage systems and their inter connects) | 6                            |
| 3                                   | PRS systems   | 4                            |
| 4                                   | Small Multi-user system (s) and Power Supply equipments viz. Individual office LANs, UPS)   | 4                            |
| 5                                   | PCs   | 3                            |
| 6                                   | Secondary Systems (viz. Painters, Portable computers, Dumb Terminals )  | 3                            |

**SIGNALLING EQUIPMENTS**

| S.<br>N<br>O | Class of assets                      | Life in<br>terms<br>of<br>operations | Average life in years |    |           |               |                |
|--------------|--------------------------------------|--------------------------------------|-----------------------|----|-----------|---------------|----------------|
|              |                                      |                                      | Routes                |    |           |               |                |
|              |                                      |                                      | A                     | B  | C/<br>Sub | D & D<br>spl' | E & E<br>'spl' |
| 1            | Crank and compensators               | 50,000                               | 2                     | 2  | 1         | 4             | 4              |
| 2            | Lock Bars Clips                      | 1,00,000                             | 3                     | 3  | 3         | 5             | 7              |
| 3            | FPL with bolt detection              | 3,00,000                             | 8                     | 8  | 8         | 15            | 15             |
| 4            | Mechanical Detector                  | 5,00,000                             | -                     | 15 | -         | 20            | 25             |
| 5            | Circuit breakers                     | 5,00,000                             | 15                    | 15 | 15        | 25            | 30             |
|              | Lever locks                          | -                                    | 7                     | 7  | 7         | 12            | 15             |
| 6            | EKT                                  | -                                    | 10                    | 10 | 10        | 15            | 15             |
| 7            | SM's Slide frame                     | -                                    | 30                    | 30 | 30        | 30            | 30             |
| 8            | EPD & Reversers                      | -                                    | 15                    | 15 | 15        | 20            | 20             |
| 9            | Signal Machines                      | 1,50,000                             | -                     | 10 | -         | 20            | 20             |
| 10           | Signal wire Transmission             | -                                    | 3                     | 3  | 3         | 3             | 3              |
| 11           | Point Machine                        | 3,00,000                             | 12                    | 12 | 7         | 15            | 15             |
| 12           | Plug in and shelf type relays        | 10,00,000                            | 25                    | 28 | 25        | 28            | 30             |
| 13           | Track feed battery charger           | -                                    | 10                    | 10 | 10        | 10            | 10             |
| 14           | Signal Transformers, Transformer.    | -                                    | 12                    | 12 | 12        | 12            | 12             |
|              | Battery chargers, DG Sets, inverters | -                                    | 10                    | 10 | 10        | 10            | 10             |
| 15           | Batteries                            |                                      | 4                     | 4  | 4         | 4             | 4              |
| 16           | Block instruments                    | -                                    | 25                    | 25 | 25        | 25            | 25             |
| 17           | Cable                                | -                                    | 20                    | 20 | 20        | 20            | 20             |
| 18           | Block instruments Electromechanical  |                                      | 20                    | 20 | 20        | 20            | 20             |

**2.5.5 CIVIL ENGINEERING ASSETS - RAIL & FASTENINGS etc**

| S.NO | CLASS OF ASSESTS                 | AVERAGE LIFE IN YEARS |        |      |      |
|------|----------------------------------|-----------------------|--------|------|------|
|      |                                  | ROUTES                |        |      |      |
|      |                                  | A & B                 | C(Sub) | D    | E    |
| 1.   | Rails                            | 20                    | 15     | 30   | 30   |
| 2.   | Wooden sleepers                  | 10                    | 10     | 10   | 10   |
| 3.   | Metal sleepers(Cast iron& steel) | 20                    | 20     | 20   | 20   |
| 4.   | Fittings steel trough            | 10                    | 10     | 10   | 10   |
| 5.   | Concrete sleepers                | 35                    | 35     | 40   | 40   |
| 6.   | Elastic Rail clips               | 5-8                   | 5-8    | 8-10 | 8-10 |
| 7.   | Rubber Pads/Liners               | 2-4                   | 2-4    | 4    | 4-6  |
| 8.   | Switches                         | 4                     | 2/3    | 5    | 5    |
| 9.   | Crossings                        | 5                     | 4/5    | 8    | 8    |

## PROCEDURE FOR PERIODICAL TESTING OF PI (BRITISH) INSTALLATION

**Note:-** The tests shall be carried out as per the following procedure and entries shall be made in the appropriate columns in 'Periodical Testing of PI /EI / RRI Installation Register'. (Divisions should publish annual program of periodical testing of PI/RRI/EI similar to that of testing / overhauling of lever frame etc and monitor.)

| <b>SI.<br/>No.</b> | <b>Description</b>  | <b>Periodicity</b> |
|--------------------|---|--------------------|
| 1                  | <b>Point Control / Track Locking</b>  |                    |
| 1.1                | <p>For PI installation, check that route initiation is not possible when any one of point is not in required position for the signal movement. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First operate one point to unfavorable condition and keep other points in favorable condition, i.e., operate point to reverse if point is required in normal condition and vice-versa. Try the signal route under test and observe that route initiation is not possible. Now operate this point to required position and another one point to unfavorable condition (keep other points in favorable condition) and check with the same procedure and observe that route initiation is not possible. Check this for each individual point at a time.</p> | 1 Year             |
| 1.2                | <p>Check that it is not possible to take OFF a signal when detection of any point required in the Route or Overlap or in Isolation not available. (SEM Para 13.38.3, 13.38.4, 21.6.1)</p> <p><b>Procedure</b> - First break the detection of the point in required position (preferably by loosing the circuit fuse) i.e., in normal or in reverse condition. Try to clear the signal under test and observe that signal does not clear. Make the detection of the point and try to clear the signal again and observe that signal has been cleared. Test with this procedure for each individual point at a time.</p>  | 1 Year             |
| 1.3                | <p>Check that it is not possible to operate any point which is locked in signal movement, by WWN, WN and by EWN, WN button. (SEM Para 13.38.3, 13.38.4, 13.39.1 (i), 21.8.2)</p> <p><b>Procedure</b> - First clear the signal under test. Check the detection and locking indication of all the points in route, overlap and isolation. Try to operate all points one by one with WWN, WN and by EWN, WN button and observe that it is not possible to operate any point which is locked in the signal route.</p>   | 1 Year             |
| 1.4                | <p>Check that the detection of individual point required in Route, Overlap and Isolation is proved in HR relay of signal control circuit. (SEM Para 13.38.3, 13.38.4, 13.38.5 (a), 13.39.1(i))</p> <p><b>Procedure</b> - First clear the signal under test. Break the detection of the point (preferably by loosing the circuit fuse) and observe that HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect. This procedure is to be followed for all points individually.</p>  | 1 Year             |

|     |   |        |
|-----|---|--------|
|     | Check the correspondence between point position at site (both ends), point group or point relay and point indication on operating / indication panel. (This test is to be carried out whenever point machine changed or point wiring changed or after cable meggering.) Also check that with obstruction in the point, observe the detection relay is de-energised and flashing indication on operating / indication panel. (SEM Para 13.38.5 (h))  |        |
| 1.5 | <b>Procedure</b> - First set the point/crossover to Normal position. Observe on panel steady Normal indication and also check the position of point group and detection relay position is showing energised for Normal position. Verify from the site that both ends (where applicable) of the points are set to normal position and to proper line. Break the detection contact, control contact and crank handle contact from first end of point machine one by one and observe that every time panel indication & point group / indication relay changes accordingly. Repeat the procedure for second end and observe the indication on panel & relay position correspondence accordingly. Operate the point to Reverse and repeat the procedure for reverse condition. Operate the point from N to R & R to N with obstruction test piece in the point and check that with obstruction in the point, the detection relay is not picking up and showing flashing indication on operating / indication panel. | 3 Year |
| 1.6 | Check that when concern point track circuits are clear, point does not operate by EWN & WN button from Normal to Reverse or Reverse to Normal and EWN counter also does not operate.  | 1 Year |
|     | Check the track locking for points and observe that in the track drop condition, it is not possible to operate the point from N to R or R to N with WWN & WN buttons & it is possible to operate the points by EWN & WN buttons. (SEM Para 13.38.5 (g), 13.39.1(i))   |        |
| 1.7 | <b>Procedure</b> - First de-energises point zone track circuit (one at a time) by disconnecting the links of TPR on CT rack / location box and check that point does not operate by WWN & WN buttons from Normal to Reverse and Reverse to Normal. Now operate the point by EWN & WN buttons and observe that the point gets operated from Normal to Reverse and from Reverse to Normal. Also check that EWN counter increments by one number at every operation.(all point zone track circuits to be checked individually). Ensure proper sealing of EWN button after is testing completed.  | 1 Year |
| 1.8 | Check the timing of WJR when point is operated from Normal to Reverse and Reverse to Normal with obstruction in the point. (SEM Para 13.38.5 (g))   |        |
|     | <b>Procedure</b> - First keep obstruction piece in the point. Now operate the point Normal to Reverse and record the time of motor operation. Operate the point Reverse to Normal and record the time of motor operation and observe in both operation, the motor operation time is 10 to 15 seconds.   | 1 Year |
| 2   | <b>Track Circuit Control</b>  |        |
|     | Check that it is not possible to take 'OFF' a signal when any Track Circuit required in the Signal Route or Overlap or in Isolation / fouling is fail. (SEM Para 13.38.3, 13.38.4, 21.6.1)  |        |
| 2.1 | <b>Procedure</b> - First fail the track circuit required for signal. Try to clear the signal under test and observe that signal does not clear. Pick-up the track circuit and observe that signal has been cleared. Test with this procedure for individual track circuit at a time.  | 1 Year |

**ANNEXURE**

|     |  |        |
|-----|--|--------|
|     | Check that individual Track Circuit required in Route, Overlap and Isolation / fouling is proved in HR relay of the signal control circuit. (SEM Para 13.38.3, 13.38.4, 13.38.5 (a), 13.39.1(iv))  |        |
| 2.2 | <b>Procedure</b> - First clear the signal under test. De-energise the controlling track circuit of the signal and observe that HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect. Energise the controlling track circuit of the signal and observe that the signal does not re-clear automatically. Cancel the signal route and reclear the signal by pressing GN & UN, de-energise other track circuits mentioned in selection table one by one and observe that every time HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect. This procedure is to be checked for all track circuits individually. | 1 Year |
| 3   | <b>Gate Control</b>  |        |
| 3.1 | Check that it is not possible to take OFF a signal until concerned LC gate required for that signal is closed & locked against road traffic. SEM Para 13.38.3, 13.38.4, 21.7)  |        |
| 3.1 | <b>Procedure</b> - First try the signal route under test with LC gate open condition and observe that signal cannot be taken OFF. Now close the LC gate against the road traffic and observe gate closed indication on panel. Withdraw the control on LC gate by pressing XN & XRN buttons and observe LC gate closed & locked indication on panel. Also check that on withdrawal of LC gate control, signal assume OFF aspect.  | 1 Year |
| 3.2 | Check that concerned LC gate relay (XCKR/NR) is proved in HR relay of the signal control circuit. (SEM Para 13.38.3, 13.38.4, 13.38.5 (a))   |        |
| 3.2 | <b>Procedure</b> - First clear the signal under test. De-energise the XCKR/NR relay by disconnecting the links of XCKR/NR relay on CT rack / location box and observe that HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect.   | 1 Year |
| 3.3 | Check that it is not possible to release control to open the LC gate which is locked in signal movement until the signal movement is completed or LC gate becomes free due to concerned route section is released by sequential route release. (SEM Para 13.38.3, 13.38.4, 21.7)   |        |
| 3.3 | <b>Procedure</b> - First clear the signal under test. Check that the LC gate is close & locked and there is steady indication on the panel. Try to release the control to open the LC gate by pressing XN & XXN buttons and observe that it is not possible to release the control to open the gate. Try to release control to open the gate after train arrived completely or clear the LC gate and concerned route section is released (where sectional route release provided) and observe that it is possible to release the control to open the gate.   | 1 Year |
| 4   | <b>Slots / Controls</b>  |        |
| 4.1 | Check that it is not possible to take OFF a signal until concerned slot / control is received. (SEM Para 21.6.6)   |        |
| 4.1 | <b>Procedure</b> - First try the signal route under test without receiving the slot / control and observe that the signal cannot be taken OFF.   | 1 Year |
| 4.2 | Check that concerned slot / control is proved in HR relay of the signal control circuit. (SEM Para 13.38.3, 13.38.4, 13.38.5 (a))  |        |
| 4.2 | <b>Procedure</b> - First clear the signal under test. De-energise the slot/control relay by disconnecting the links on CT rack / location box and observe that HR relay of the signal drops and aspect of signal changes from OFF aspect to ON aspect.   | 1 Year |

|     |   |        |
|-----|---|--------|
|     | Check that it is not possible to release the slot/control which is locked in signal movement. (SEM Para 13.38.3, 13.38.4)   |        |
| 4.3 | <b>Procedure</b> - First clear the signal under test. Check the slot/control locked steady indication on the panel. Try to release the slot/control by pressing the concerned buttons and observe that it is not possible to release the slot/control. Try to release slot/control after train arrived completely or clear the concerned sub route and the route section is released (where sectional route is provided), it is possible to release the slot/control.   | 1 Year |
| 5   | <b>Approach Locking</b>   |        |
|     | Check that it is not possible to cancel the route set up and / or to set up a conflicting route and / or to individually operate any point and / or open the LC gate and / or release control of crank handle which is locked in the route until the set route is cancelled and the time release circuit has operated, when any one of the approach lock track circuit is occupied provided the track beyond the signal is not occupied. (SEM Para 13.38.3, 13.38.4, 13.38.5 (b), 13.39.1(ii))  |        |
| 5.1 | <b>Procedure</b> - First clear the signal under test. De-energise the concerned approach locking track circuit by disconnecting the links of the TPR on the CT rack / location box. Throw signal aspect to 'ON' by 'ERN' & 'GN' button. Try to cancel the route by three button cancellation (EUUYN) and observe the flashing indication of timer appeared on the panel. Try to operate the points, release control & release the control to remove crank handle key and observe that it is not possible to operate the points, open the LC gate & remove the crank handle key. The route shall not be cancelled till 120 seconds and timer circuit operated completely. Cancel the signal route by three button cancellation (EUUYN cancellation) after time delay of 120 seconds and the timer indication become steady on the panel. Check that EUUYN counter increases by one number at every cancellation. | 1 Year |
| 5.2 | Check the approach locking with individual track circuit occupied condition at a time, where more than one track circuits are provided for approach locking. (SEM Para 13.38.3, 13.38.4)  | 1 Year |
| 5.3 | For dead approach locking, it shall not possible to cancel the signal route without time delay irrespective of the approach track circuit is occupied or not, with three button cancellation. Whenever a signal has been taken 'OFF', the approach locking shall be effective till the signal is put back to 'ON' and time release circuit has been operated provided the track beyond the signal is not occupied. (SEM Para 13.38.3, 13.38.4, 13.38.5 (e))   | 1 Year |
|     | <b>Procedure</b> - First clear the signal under test. Throw signal aspect to 'ON' by 'ERN' & 'GN' button. Try to cancel the signal route by three button cancellation (EUUYN) and observe the flashing indication of timer appeared on the panel. Cancel the signal route by three button cancellation after the time delay of 120 seconds and the timer indication become steady. (The route shall not be cancelled till the time delay of 120 seconds completed and timer circuit operated completely.)   | 1 Year |
|     | Check that when approach locking track circuits are pick-up, signal route can be cancelled with out time delay, with three button cancellation operation.   |        |
| 5.4 | <b>Procedure</b> - First clear the signal under test. Keep all the approach locking track circuits in energise condition. Throw signal aspect to 'ON' by 'ERN' & 'GN' button. Cancel the signal route by three button cancellation (EUUYN) and observe that the signal route gets cancel immediately without time delay. Check that EUUYN counter increases by one number at every cancellation.  | 1 Year |

**ANNEXURE**

|     |   |        |
|-----|---|--------|
| 6   | <b>Back Locking</b>   |        |
| 6.1 | <p>Tests shall be carried out to ensure that once a signal is cleared for a particular route, position of none of the points / LC gates in the route (including overlap and isolation) can be changed when track circuit immediately in advance of the signal or any of the track circuit controlling up to the last point in the route is de-energised. (SEM Para 13.38.3, 13.38.4, 13.38.5 (c), 13.39.1 (v))</p> <p><b>Procedure:-</b> First clear the signal under test. De-energise the concerned back locking track circuit and observe that the signal goes to danger. Try to cancel the route by three button cancellation (EUUYN) when any one of the back locking track circuit is occupied and observe that it is not possible to cancel the signal route and also not possible to operate the points or release the control to open the LC gate or to release the control for the crank handle.</p>  | 1 Year |
| 6.2 | Check the back locking condition with individual track circuit occupied at a time. (SEM Para 13.38.3, 13.38.4, 13.38.5 (c), 13.39.1 (v))  | 1 Year |
| 7   | <b>Signal Aspect Control</b>  |        |
| 7.1 | Indication of 'ON' aspects of all signals for their correspondence with aspects displayed at site. Similarly indication of 'OFF' aspect of the signal shall be checked for correspondence displaced at site after clearing the signal. (13.38.5 (f))  | 1 Year |
| 7.2 | <p>Check the intra signal cascading of the signal</p> <p>Procedure - First clear the signal under test for its higher permissive aspect i.e., DG for three aspect signal or HG for two aspect signal. Now remove the higher permissive aspect of the signal (DG or HG as the case may be) and observe that the aspect of the signal changes to next restrictive aspect i.e., when DG aspect of a signal removed, HG aspect will lit and when HG aspect of a signal removed, RG aspect will lit. Check with this procedure for all signals.</p>  | 1 Year |
| 7.3 | <p>Check inter signal cascading. (SEM Para 13.38.3, 13.38.4)</p> <p>First clear the signal under test. Observe that the OFF aspect of the signal is related with the aspect of the signal in advance. Observe that the DG aspect of the signal under test is related with the DG or HG &amp; HHG aspect of the next signal, and when DG/HG or HHG (as the case may be) aspect of the signal in advance is removed, the aspect of the signal under test is changed to HG aspect. Also observe that when signal in advance is in blank condition, signal in rear cannot be taken OFF.</p>   | 1 Year |
| 7.4 | <p>Check the aspect controlling of Distant and inner distant signal.</p> <p><b>Procedure -i)</b> First clear all signals of main line and observe the DG aspect for distant and inner distant signal. Remove DG aspect of inner distant signal and observe that inner distant signal aspect changes to HG &amp; HHG aspect. Now remove HG or HHG aspect of inner distant signal and observe that the distant signal aspect changes from DG to HG &amp; HHG. Now connect HG, HHG / DG aspect of inner distant signal and observe all main line signals display DG aspects.</p> <p>ii) Remove DG aspect of distant signal and observe that distant signal aspect changes to HG &amp; HHG. Now connect DG aspect of distant signal and observe all main line signals display DG aspects.</p> <p>iii) When all signals are normal, remove HG aspect of inner distant signal and check that HHG aspect lit.</p> <p><b>Note:-</b> In single distant territory, DG aspect of distant signal will changes to HG aspect under the effect of cascading.</p> | 1 Year |

|     |  |        |
|-----|--|--------|
|     | Check that the signal with direction type route indicator cannot be kept at OFF when three No. of lamps of direction type route indicator are removed or when only two numbers of route lamps of direction type route indicator are lit. (13.38.5 (f))   |        |
| 7.5 | <b>Procedure</b> - Clear the signal for diversion line and observe that signal assumes HG aspect after route indicator is lit. Check that all the five route lamps of route indicator are lit. Remove one by one three no. of route lamps of direction type route indicator and observe that by removing the third lamp, flashing route indication appears on panel and signal aspect of the signal changes from HG to RG. Connect route lamps one by one and observe that the signal aspect changes from RG to HG when three or more route lamps lit at the route indicator.  | 1 Year |
| 7.6 | Check that the 'OFF' aspect of a previously cleared signal assume its original OFF aspect after restoration of power supply in case of power supply failure.<br><b>Procedure</b> - First clear the main signal under test. Disconnect the AC power supply for more than 10 seconds and after reconnecting the power supply observe that signal assume its original OFF aspect.   | 3 Year |
| 8   | <b>Crank Handle Locking</b>  |        |
| 8.1 | Check that it is not possible to remove the crank handle key from KLR/EKT without receiving the control/slot to remove the crank handle key. (SEM Para 21.8.7)<br><b>Procedure</b> - Try to remove the crank handle key from the KLR/EKT without control/slot and observe that it is not possible to remove the key. Release control by pressing CHYN and point button (and KLR push button for co-operative type), now try to release the crank handle key by pressing concerned KLR push button and observe that the Key can be remove.  | 1 Year |
| 8.2 | Check that when a crank handle slot is given or crank handle key is removed, it is not possible to take 'OFF' the signals related to that crank groups.(SEM Para 13.38.3, 13.38.4, 13.38.5 (i))<br><b>Procedure</b> - First remove crank handle key by releasing concerned slot and then try to clear the signal and observe that it is not possible to clear the signal. (Stations where non co-operative feature to remove CH key is provided, release the control for crank handle and try to clear the signal under test and observe that it is not possible to clear the signal.) Insert and lock the crank handle key and withdraw the CH slot/control by pressing CHYRN & concerned point buttons. Now try to clear the signal and observe that it has been cleared. Check this for all crank handles individually. | 1 Year |
| 8.3 | Check that it is not possible to take back (withdraw) the control/slot of crank handle when the crank handle key is out.<br><b>Procedure</b> - First remove crank handle key by releasing concerned slot. Observe red steady indication on the panel. Try to take back the crank handle control/slot by pressing CHYRN & concerned point button keeping the crank handle key out and observe that it is not possible to receive the crank handle control/slot. Insert and turn the key in the KLR, observe red flashing indication on the panel, now receive back the control/slot by pressing CHYRN & concern point button and observe that the flashing red indication changed to yellow steady and the crank handle key gets locked in the KLR.   | 1 Year |

**ANNEXURE**

|      |   |        |
|------|---|--------|
|      | Check that it is not possible to release control to remove the crank handle key which is locked in signal movement until the signal movement is completed or the crank handle control/slot becomes free due to concerned route section is released by sequential route release. (SEM Para 13.38.3, 13.38.4, 13.38.5 (i))  |        |
| 8.4  | <b>Procedure</b> - First clear the signal under test. Check the crank handle locking indication of all the crank handle groups in route, overlap and isolation. Try to release slot/control to remove the crank handle key by pressing CHYN & concerned point buttons and check that it is not possible to release the slot/control and remove the crank handle key. Check this for all crank handles individually.   | 1 Year |
| 8.5  | Check that crank handle normal control (CHKLCR) is proved in HR relay of the signal control circuit. (SEM Para 13.38.3, 13.38.4, 13.38.5 (a))<br><b>Procedure</b> - First clear the signal under test. De-energise the CHKLCR relay by disconnecting the links of CHKLCR on CT rack / location box and observe that HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect.   | 1 Year |
| 9    | <b>Signal to Signal Locking</b>   |        |
| 9.1  | Clear the signal under test. Try to clear the "LOCKS" signal given in Remark column. It shall not be possible to initiate the route of the signal and there should not be any change in aspect of signal under test. (SEM Para 13.38.3, 13.38.4, 13.39.1(iii))<br><b>Procedure</b> - First clear the signal under test. Set the route by operating points required for the signal which is to be tested for direct locking (point setting is required for PI installation). Try the "LOCKS" signal mentioned in Remarks column and observe that it is not possible to initiate the route & signal to clear. | 1 Year |
| 9.2  | Check the converse locking immediately after checking of main locking.<br><b>Procedure</b> - Cancel the signal route cleared for the testing mentioned in Sr.No.9.1. Now clear the signal mentioned in Remarks column and try to clear the signal under test. Check that it is not possible to initiate the route and not possible to clear the signal.   | 1 Year |
| 10   | <b>Route Release</b>  |        |
| 10.1 | Check the route release for individual signal route as per the track circuit position given in selection table. (SEM Para 13.38.3, 13.38.4)<br><b>Procedure</b> - Firsr clear the signal route under test. Check the route release of the signal route by pick-up and drop of the track circuits as per selection table and observe that the route is released after last track circuit picks up.   | 1 Year |
| 10.2 | Check that the signal route is not released when ON aspect of main signal is removed and train received on proper signal.<br><b>Procedure</b> - First clear the main signal under test. Remove ON aspect of the main signal and observe on passing of the train, the signal route is not released. Now connect the ON aspect and check that the route section has been released as soon as the ON aspect is connected.  | 3 Year |
| 10.3 | In case where the route section is controlled by single track circuit, the route section is not released by drops and pick-up of the route section track circuit but it is released after prescribed time delay. This timer circuit will be effective after the concerned track circuit has been occupied. (SEM Para 13.38.5 (c) (iv)).   | 1 Year |

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|       | Check the route release of a signal movement for light engine as well as long train.  |        |
| 10.4  | <b>Procedure</b> - First clear the signal under test. Drop and pick-up the track circuits similar to light engine movement (max. 2 track circuits drop at a time) and observe the proper releasing of route. Now re-clear the signal again. Drop all the track circuits from foot of the signal to the berthing track circuits sequentially and pick-up all track circuits sequentially similar to long train and observe that the route of the signal releases properly.   | 1 Year |
| 11    | <b>General Testing</b>  |        |
| 11.1  | Check the working of SM's Key. Ensure that signal can be thrown to danger when SM's Key is out. (SEM Para 21.2.13.f)  |        |
| 11.1  | <b>Procedure</b> - Remove the SM's Key and check that it is not possible to clear any signal, operate any point, cancel the route, release control to open the gate, release control to remove crank handle key etc. and also check that it is possible to throw any cleared signal to danger.  | 1 Year |
| 11.2  | Check the working of all Buzzers (SM's Key out, signal failure, point failure, NCR, crank handle failure, IBS failure, etc.)  | 1 Year |
| 11.3  | Check the working of all Counters (EUYN, EUUYN, OYN, COGGN, EWN, etc.)  | 1 Year |
| 11.4  | Check panel indications of operating and/or indication panel. (SEM Para 21.3)<br><b>Procedure</b> - Check all normal indications on panel like button check indications, all CH indications, all point indications, LC gate indications etc. Clear the signal route and check all route set indications, point lock indication, signal indication, etc. Check track occupied indications when the track circuit is occupied.  | 1 Year |
| 11.5  | Check the working of Flasher. Ensure that when power supply of Flasher is disconnected, flasher indication provided on panel does not become steady.<br><b>Procedure</b> - Check the Flasher monitoring indication provided on panel for its proper working. Disconnect the operating power supply of flasher relay and observe that the Flasher monitoring indication does not become steady on the panel.   | 1 Year |
| 11.6  | Check the automatic release of overlap after 120 Seconds when train come on berthing track circuit. (SEM Para 13.38.5 (d), 21.5.8)<br><b>Procedure</b> - First clear the home signal route and allow train to stand on berthing track circuit and last sub route to release completely. Observe that the timer indication provided for the particular overlap starts flashing. Observe after 120 seconds the overlap has been released and overlap indication has been disappeared on the panel.  | 1 Year |
| 11.7  | Check that Calling On signal can be taken 'OFF' with all track circuits fail. Also check that Calling On signal put back to 'ON' when CO track circuit picks up. (SEM Para 21.4.3 (Note-i))<br><b>Procedure</b> - First de-energise all track circuits from foot of the CO signal up to next stop signal. Try to clear the Calling On signal with out CO track circuit occupied and observe that it is not possible to clear the Calling On signal. De-energise the CO track circuit and try the Calling On signal and observe that after time delay of 60/120 seconds the Calling On signal is cleared. Now energise the CO track circuit and check that Calling On signal replace to ON aspect. | 1 Year |
| 11.8  | Check LSS (advance starter signal) cannot be taken 'OFF' without Line Clear   | 1 Year |
| 11.9  | Check the alignment of dominos and yard diagram on the operating , indication panel.  | 1 Year |
| 11.10 | Check all buttons of the panel for their proper working and also check all the buttons for the spring action and sticking tendency.   | 1 Year |

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| 11.11 | Check that the panel layout is matching with the yard.  | 1 Year |
| 11.12 | Check the operation time of all timers and ensure that the timings are as per requirements.   | 1 Year |
| 11.13 | Check the flashing frequency of the flasher. It should be approximately one stroke per second.  | 1 Year |
| 11.14 | Check that the work has been carried out in accordance with the approved plans and the equipments are of proper type and are in good conditions. (SEM Para 13.34.1)   | 1 Year |
| 11.15 | Check the signals, location boxes and other out-door equipments are as per approved plans and are in good condition. Also check that the ventilation, where provided, are not choked. (SEM Para 13.34.2.a)  | 1 Year |
| 11.16 | Check that each location contains all the apparatus required as per approved plans, the apparatus is of approved type and that the power supply equipments, batteries, fuses, etc, are installed according to the approved plan and specification. (SEM Para 13.34.2.b)         | 1 Year |
| 11.17 | The location of insulated joint, jumper wiring, traction bonding in electrified areas, point machines, switch locks and other apparatus is as per approved plans and their condition is satisfactory. (SEM Para 13.34.2.c)  | 1 Year |
| 11.18 | Check that the electrolyte, inter-connections between cells, cell voltage etc., are in required condition as per relevant specifications or instructions. (SEM Para 13.34.2.d)  | 1 Year |
| 11.19 | Check that each wire is tagged or marked where feasible so that it can be identified at each end and the nomenclature on the tag corresponds to that on the wiring diagram. Also check that the sleeves of identification shall be of insulating material. (SEM Para 13.34.2.e) | 1 Year |
| 11.20 | Check that the number of wires terminated on each terminal or relay terminal boards or other devices are counted and tallied with the number of wires shown in the wire count chart. (SEM Para 13.34.2.f)   | 1 Year |
| 11.21 | Check that all the connections on terminals and binding posts are properly secured. (SEM Para 13.34.2.g)  | 1 Year |
| 11.22 | The lightening and surge arrestors are properly connected and earthed as per plan. (SEM Para 13.34.2.h)   | 1 Year |
| 11.23 | Check that all other equipments such as lever frames, cable sheaths, signal screens, location huts, etc., in electrified areas are properly earthed. (SEM Para 13.34.2.j)   | 1 Year |
| 11.24 | Check that no equipment including relay are due for overhauling. (SEM Para 13.34.2.k)   | 1 Year |

**Note:-** The procedure described here does not supersede the provisions given in SEM Part I and II, but it is elaborated wherever considered necessary.

| <b>Precautions During Testing</b> |  |
|-----------------------------------|--|
| 1                                 | Before testing it must be ensure that all the points, all signals, all LC gates, all crank handles and other gears are properly functioning.   |
| 2                                 | To clear a signal in PI installations (non route setting type), keep all points in the route, overlap and isolation in required position unless as mentioned in the testing procedure. |
| 3                                 | Ensure sealing of all emergency operation buttons and relays after the testing.  |
| 4                                 | Following additional precautions shall be taken during testing and checking so that-   |

|   |  |
|---|--|
| a | No signal taken 'OFF' for a train movement is thrown to 'ON' in the face of the train.                             |
| b | No signal which will create a conflicting or unsafe movement is taken 'OFF', when train movements are in progress. |
| c | No point and Isolation in a route set for a train movement is disturbed.   |
| d | No track relay of an occupied track circuit is energised.  |
| e | No voltage higher than permissible voltage is applied to the equipment.  |
| f | There should be no risk of electric shock to testing or operating personnel.                                       |

### Periodical Testing of PI / EI / RRI Installation Register (General Testing / Physical Inspection)

(Periodicity of Testing - As mentioned in the procedure, or after making any alteration to existing installation to the extent feasible)

| Sl. No. | Description  | Date of Testing | Remarks |
|---------|--|-----------------|---------|
| 1       | Check the working of SM's Key. Ensure that signal can be thrown to danger when SM's Key is out. (Sr. No. 13.1)   |                 |         |
| 2       | Check the working of all Buzzers (SM's Key out, signal failure, point failure, NCR, IBS failure, etc.) (Sr. No 13.2)   |                 |         |
| 3       | Check the working of all Counters (EUYN, EUUYN, OYN, COGGN, EWN, etc.) (Sr. No 13.3)   |                 |         |
| 4       | Check panel indications of operating and/or indication panel. (Sr. No. 13.4)   |                 |         |
| 5       | Check the working of Flasher. Ensure that when power supply of Flasher is disconnected, flasher indication provided on panel does not become steady. (Sr. No. 13.5)                  |                 |         |
| 6       | Check the automatic release of overlap after 120 Seconds when train come on berthing track circuit. (Sr. No. 13.6)   |                 |         |
| 7       | Check that Calling On signal can be taken 'OFF' with all track circuits fail. Also check that Calling On signal put back to 'ON' when CO track circuit picks up. (Sr. No. 13.7)      |                 |         |
| 8       | Check LSS (advance starter signal) cannot be taken 'OFF' without Line Clear. (Sr. No. 13.8)  |                 |         |
| 9       | Check the alignment of dominos and yard diagram on the operating , indication panel.   |                 |         |
| 10      | Check all buttons of the panel for their proper working and also check all the buttons for the spring action and sticking tendency.  |                 |         |
| 11      | Check that the panel layout is matching with the yard.   |                 |         |
| 12      | Check the operation time of all timers and ensure that the timings are as per requirements.  |                 |         |
| 13      | Check the flashing frequency of the flasher. It should be approximately one stroke per second.   |                 |         |
| 14      | Check the aspect controlling of Distant and inner distant signal.(Sr. No.7.4)  |                 |         |
| 15      | Check that the number of wires terminated on each terminal or relay terminal boards or other devices are counted and tallied with the number of wires shown in the wire count chart. |                 |         |

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| 16 | Check that the work has been carried out in accordance with the approved plans and the equipments are of proper type and are in good conditions.   |  |  |
| 17 | Check the signals, location boxes and other out-door equipment are as per approved plans and are in good condition.  |  |  |
| 18 | Check that each location contains all the apparatus required as per approved plans, the apparatus is of approved type and that the power supply equipments, batteries, fuses, etc, are installed according to the approved plan and specification.         |  |  |
| 19 | The location of insulated joint, jumper wiring, traction bonding in electrified areas, point machines, switch locks and other apparatus is as per approved plans and their condition is satisfactory.  |  |  |
| 20 | Check that the electrolyte, inter-connections between cells, cell voltage etc., are in required condition as per relevant specifications or instructions.  |  |  |
| 21 | Check that each wire is tagged or marked where feasible so that it can be identified at each end and the nomenclature on the tag corresponds to that on the wiring diagram. Also check that the sleeves of identification shall be of insulating material. |  |  |
| 22 | The lightening arrestors are properly connected and earthed as per plan.   |  |  |
| 23 | Check that all other equipments such as lever frames, cable sheaths, signal screens, location huts, etc., in electrified areas are properly earthed.   |  |  |
| 24 | Check that no equipment including relays are due for overhauling.  |  |  |

**PROCEDURE FOR PERIODICAL TESTING OF PI / RRI (SIEMENS / ABB) / EI  
INSTALLATIONS.**

**Note:-** The tests shall be carried out as per the following procedure and entries shall be made in the appropriate columns in 'Periodical Testing of PI /EI / RRI Installation Register'. (Divisions should publish annual program of periodical testing of PI/RRI/EI similar to that of testing / overhauling of lever frame etc and monitor.)

| Sr.<br>No. | Description  | Periodicity |
|------------|--|-------------|
| 1          | <b>Route Section</b>   |             |
| 1.1        | <p>Check that individual route section is proved in signal control by cancelling individual 'U(R)S' by 'EUYN' operation and observing that signal goes to danger for individual route section. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First clear the signal under test. Cancel the route section with EUYN &amp; concerned point / signal button and observe that signal goes to danger. Test all route sections individually.</p>   | 1 Year      |
| 1.2        | <p>Check that Main / Shunt signal cannot be taken OFF on previously set route section. Also check that Calling On signal can be taken OFF on previously set Route. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First clear the signal under test. Normal all the route sections with EUYN &amp; concerned point / signal buttons except one route section. Try the signal under test again and observe that it is not possible for the route to initiate and signal to clear. Also check that Calling On signal (if applicable for that route) can be taken OFF. Test with this procedure for all route sections individually.</p>   | 1 Year      |
| 1.3        | <p>Check that concerned route section is not set when route section / overlap mentioned in 'ELIMINATED' column of selection table is set previously. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - Open the seal cover of route group, mini group interlock relay of concerned U(R)S , U(R)PS and/or overlap setting interlock relays i.e. OVZ2U(R/N)R mentioned in 'ELIMINATED' column and latch the reverse coil to set condition manually. Try to clear the signal under test and observe that route initiation is not possible. Normalise these relays after the testing and close the relay cover and re-seal the relay. (for PI &amp; RRI only)</p>  | 3 Year      |
| 1.4        | <p>Check the route release of a signal movement for light engine as well as long train.</p> <p><b>Procedure</b> - First clear the signal under test. Drop and pick-up the track circuits similar to light engine movement (max. 2 track circuits drop at a time) and observe the proper releasing of route. Now re-clear the signal again. Drop all the track circuits from foot of the signal to the berthing track circuits sequentially and pick-up all track circuits sequentially similar to long train and observe that the route of the signal releases properly.</p>   | 1 Year      |
| 2          | <b>POINT CONTROL/ TRACK LOCKING</b>  |             |
| 2.1        | <p>For PI installation, check that route initiation is not possible when any one of the points is not in the required position for the signal movement. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First operate one point to un favorable condition and keep other points in favorable condition, i.e., operate point to reverse if point is required in normal condition and vice-versa. Try the signal route under test and observe that route initiation is not possible. Now operate this point to required position and another one point to un favorable condition (keep other points in favorable condition) and check with the same procedure and observe that route initiation is not possible. Check this for each individual point at a time.</p> | 1 Year      |

**ANNEXURE**

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| 2.2 | <p>Check that all points required for signal movement are operated in chain operation in 'RRI/EI' installations. (by GN &amp; UN press) (SEM Para 21.2.6)</p>   | 1 Year |
|     | <p><b>Procedure</b> - First operate all the points to unfavorable conditions i.e., operate the points to reverse if points are required in normal condition and vice-versa. Try the signal route under test and observe that all points are operated in required position by pressing GN &amp; UN buttons.</p>  |        |
| 2.3 | <p>Check that it is not possible to take OFF a signal when detection of any point required in the Route or Overlap or in Isolation not available. (SEM Para 13.38.3, 13.38.4, 21.6.1)</p>   | 1 Year |
|     | <p><b>Procedure</b> - First break the detection of the point in required position (preferably by loosing the circuit fuse) i.e., in normal or in reverse condition. Try to clear the signal under test and observe that signal does not clear. (For EI &amp; RRI installation, route will initiate &amp; for PI installation, route will not initiate). Make the detection of the point and observe that signal has been cleared. (for EI &amp; RRI installation. For PI installation press GN &amp; UN again) Test with this procedure for each individual point at a time.</p>  |        |
| 2.4 | <p>Check that it is not possible to operate any point which is locked in the signal movement, by WWN, WN and by EWN, WN buttons. (SEM Para 13.38.3, 13.38.4, 13.39.1 (i), 21.8.2)</p>   | 1 Year |
|     | <p><b>Procedure</b> - First clear the signal under test. Check the detection and locking indication of all the points in route, overlap and isolation. Try to operate all points one by one with WWN, WN and by EWN, WN buttons and observe that it is not possible to operate any point which is locked in the signal route.</p>   |        |
| 2.5 | <p>Check that the detection of individual point required in Route, Overlap and Isolation is proved in GR1/ GR2/HR relay of signal control circuit.( by bobbing detection of point, signal OFF aspect should also bob and after breaking detection of point for more than 5 seconds, signal should not re-clear automatically.) (SEM Para 13.38.3, 13.38.4, 13.38.5 (a), 13.39.1(i))</p>   | 1 Year |
|     | <p><b>Procedure</b> - First clear the signal under test. Break the detection of the point for a moment (preferably by loosing the circuit fuse) and observe that GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect for a moment &amp; then restores to OFF aspect after making the detection of the point. Now break the detection of point for more than 5 seconds and observe that GR1, GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect and does not re-clear automatically after making of detection of the point. This procedure is to be followed for all points individually.</p> |        |
| 2.6 | <p>Check the correspondence between point position at site (both ends), point group or point relay and point indication on operating / indication panel. (This test is to be carried out whenever point machine changed or point wiring changed or after cable meggering.) Also check that with obstruction in the point, observe the detection relay is de-energised and flashing indication on operating / indication panel. (SEM Para 13.38.5 (h))</p>   | 3 Year |

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| 2.6 | <p><b>Procedure</b> - First set the point/crossover to Normal position. Observe on panel steady Normal indication and also check the position of point group and detection relay position is showing energised for Normal position. Verify from the site that both ends (where applicable) of the points are set to normal position and to proper line. Break the detection contact, control contact and crank handle contact from first end of point machine one by one and observe that every time panel indication &amp; point group / indication relay changes accordingly. Repeat the procedure for second end and observe the indication on panel &amp; relay position correspondence accordingly. Operate the point to Reverse and repeat the procedure for reverse condition. Operate the point from N to R &amp; R to N with obstruction test piece in the point and check that with obstruction in the point, the detection relay is not picking up and showing flashing indication on operating / indication panel.</p> |        |
| 2.7 | <p>Check that when concern point track circuits are clear, point does not operate by EWN &amp; WN button from Normal to Reverse or Reverse to Normal and EWN counter also does not operate.</p>  | 1 Year |
| 2.8 | <p>Check the track locking for points and observe that in the track drop condition, it is not possible to operate the point from N to R or R to N with WWN &amp; WN buttons &amp; it is possible to operate the points by EWN &amp; WN buttons. (SEM Para 13.38.5 (g))</p> <p><b>Procedure</b> - First de-energise point zone track circuit (one at a time) by disconnecting the links of TPR on CT rack / location box and check that point does not operate by WWN &amp; WN buttons from Normal to Reverse and Reverse to Normal. Now operate the point by EWN &amp; WN buttons and observe that the point gets operated from Normal to Reverse and from Reverse to Normal. Also check that EWN counter increments by one number at every operation. (All point zone track circuits to be checked individually). Ensure proper sealing of EWN button after testing completed.</p>  | 1 Year |
| 2.9 | <p>Check the timing of WJR when point is operated from Normal to Reverse and Reverse to Normal with obstruction in the point. (SEM Para 13.38.5 (g))</p> <p><b>Procedure</b> - First keep obstruction piece in the point. Now operate the point Normal to Reverse and record the time of motor operation. Operate the point Reverse to Normal and record the time of motor operation and observe in both operation, the motor operation time is 10 to 15 seconds.</p>  | 1 Year |
| 3   | <b>Track Circuit Control</b>   |        |
| 3.1 | <p>Check that it is not possible to take 'OFF' a signal when any Track Circuit required in the Signal Route or Overlap or in Isolation / fouling is fail. (SEM Para 13.38.3, 13.38.4, 21.6.1)</p> <p><b>Procedure</b> - First fail the track circuit required for signal. Try to clear the signal under test and observe that signal does not clear. Pick-up the track circuit and observe that signal has been cleared. Test with this procedure for each individual track circuit at a time.</p>   | 1 Year |
| 3.2 | <p>Check that individual Track Circuit required in Route, Overlap and Isolation / fouling is proved in GR1, GR2 or HR relay of the signal control circuit. ( by bobbing track circuit, signal 'OFF' aspect should also bob and after de-energising track relay for more than 5 seconds, signal should not re-clear automatically.) (SEM Para 13.38.3, 13.38.4, 13.38.5 (a), 13.39.1(iv))</p>   | 1 Year |

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| 3.2 | <p><b>Procedure</b> - First clear the signal under test. De-energise the track circuit for a moment and observe that GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect for a moment &amp; then restores to OFF aspect after energising the track circuit. Now de-energise the track circuit for more than 5 seconds and observe that GR1,GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect and does not re-clear automatically after energising track circuit. This procedure is to be checked for all track circuits individually.</p> |        |
| 4   | <b>Overlap</b>  |        |
| 4.1 | <p>Check that concerned Overlap is proved in signal control by normalizing Overlap interlock relays and observing signal goes to danger. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First clear the signal under test. Open the seal cover of overlap setting interlock relays i.e. OVZ2U(R/N)R and normal manually the concerned overlap setting interlock relays. Observe that the overlap setting illumination on panel disappeared and signal aspect goes to danger. Close the relay cover and re-seal the relay. (for PI &amp; RRI only)</p>  | 3 Year |
| 4.2 | <p>Check that Main / Shunt signal cannot be taken OFF on previously set Overlap. Also check Calling On signal can be taken OFF on previously set Overlap.</p> <p><b>Procedure</b> - First clear the signal under test. Cancel all route sections by EUYN and concern point/signal buttons. Keep only overlap in set condition. Try to re-clear the signal by pressing GN &amp; UN buttons and observe that route initiation is not possible. Also check that Calling On signal (if applicable for that route) can be taken OFF.</p>   | 1 Year |
| 4.3 | <p>Check that concerned Overlap is not setting and signal under test cannot be taken OFF when another Overlap mentioned in 'ELIMINATED' column is set previously. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - Open the seal cover of overlap setting interlock relays i.e. OVZ2U(R/N)R mentioned in 'ELIMINATED' column and latch the reverse coil to set condition manually. Try to clear the signal under test and observe that route initiation is not possible. Normalise 'ELIMINATED' overlap by OYN &amp; UN buttons. Close the relay cover and re-seal the relay. (for PI &amp; RRI only)</p>                    | 3 Year |
| 5   | <b>Gate Control</b>   |        |
| 5.1 | <p>Check that it is not possible to take OFF a signal until concerned LC gate required for that signal is closed &amp; locked against road traffic. (SEM Para 13.38.3, 13.38.4, 21.7)</p> <p><b>Procedure</b> - First try the signal route under test with LC gate open condition and observe that signal cannot be taken OFF. Now close the LC gate against the road traffic and observe gate closed indication on panel. Withdraw the control on LC gate by pressing XN &amp; XRN buttons and observe LC gate closed &amp; locked indication on panel and signal assume OFF aspect.</p>   | 1 Year |
| 5.2 | <p>Check that concerned LC gate relay (XCKR/NR) is proved in GR1/ GR2/HR relay of the signal control circuit. ( by bobbing concerned XCKR relay, signal OFF aspect should also bob and after de-energizing the XCKR relay for more than 5 seconds, the signal should not re-clear automatically.) (SEM Para 13.38.3, 13.38.4, 13.38.5 (a))</p>  | 1 Year |

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| 5.2 | <p><b>Procedure</b> - First clear the signal under test. Keep XN &amp; XRN buttons in press condition to ensure that XCKR relay can pick up immediately. De-energise the XCKR/NR relay for a moment by disconnecting the links of XCKR/NR relay on CT rack / location box and observe that GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect for a moment &amp; then restores to OFF aspect after energising the XCKR/NR relay by connecting the links. Now de-energise the XCKR/NR relay for more than 5 seconds and observe that GR1, GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect and does not re-clear automatically after energising XCKR/NR relay. Release XN &amp; XRN buttons</p>   |        |
| 5.3 | <p>Check that it is not possible to release control to open the LC gate which is locked in signal movement until the signal movement is completed or LC gate becomes free due to concerned route section is released by sequential route release. (SEM Para 13.38.3, 13.38.4, 21.7)</p> <p><b>Procedure</b> - First clear the signal under test. Check that the LC gate is close &amp; locked and there is steady indication on the panel. Try to release the control to open the LC gate by pressing XN &amp; XXN buttons and observe that it is not possible to release the control to open the gate. Try to release control to open the gate after train arrives completely or clears the LC gate and concerned route section is released (where sectional route release provided) and observe that it is possible to release the control to open the gate.</p>   | 1 Year |
| 6   | <b>Slots / Controls</b>  |        |
| 6.1 | <p>Check that it is not possible to take OFF a signal until concerned slot / control is received. (SEM Para 21.6.6)</p> <p><b>Procedure</b> - First try the signal route under test without receiving the slot / control and observe that the signal cannot be taken OFF.</p>  | 1 Year |
| 6.2 | <p>Check that concerned slot / control is proved in GR1 &amp; GR2 / HR relay of the signal control circuit.( by bobbing concerned slot / control relay, signal OFF aspect should also bob and after de-energizing the slot / control relay for more than 5 seconds, the signal should not re-clear automatically.) (SEM Para 13.38.3, 13.38.4, 13.38.5 (a))</p> <p><b>Procedure</b> - First clear the signal under test. De-energise the slot/control relay for a moment by disconnecting the links on CT rack / location box and observe that GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect for a moment &amp; then restores to OFF aspect after energising the slot/control relay. Now de-energise the slot/control relay for more than 5 seconds and observe that GR1, GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect and does not re-clear automatically after energising slot/control relay.</p> | 1 Year |
| 6.3 | <p>Check that it is not possible to release the slot/control which is locked in signal movement. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First clear the signal under test. Check the slot/control locked steady indication on the panel. Try to release the slot/control by pressing the concerned buttons and observe that it is not possible to release the slot/control. Try to release slot/control after train arrives completely or clears the concerned sub route and the route section is released (where sectional route is provided), it is possible to release the slot/control.</p>   | 1 Year |

**ANNEXURE**

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| 7   | <b>Approach Locking</b>   |        |
| 7.1 | <p>Check that it is not possible to cancel the route set up and / or to set up a conflicting route and / or to individually operate any point and / or open the LC gate and / or release control of crank handle which is locked in the route until the set route is cancelled and the time release circuit has operated, when any one of the approach lock track circuit is occupied provided the track beyond the signal is not occupied. (SEM Para 13.38.3, 13.38.4, 13.38.5 (b))</p> <p><b>Procedure</b> - First clear the signal under test. De-energise the concerned approach locking track circuit by disconnecting the links of the TPR on the CT rack / location box. Throw signal aspect to 'ON' by 'ERN' &amp; 'GN' button. Try to cancel the route by three button cancellation (EUUYN) and observe the flashing indication of timer appeared on the panel. Try to operate the points, release control &amp; release the control to remove crank handle key and observe that it is not possible to operate the points, open the LC gate &amp; remove the crank handle key. The route shall not be cancelled till 120 seconds and timer circuit operated completely. Cancel the signal route by three button cancellation (EUUYN cancellation) after time delay of 120 seconds and the timer indication become steady on the panel. Check that EUUYN counter increases by one number at every cancellation.</p> | 1 Year |
| 7.2 | Check the approach locking with individual track circuit occupied condition at a time, where more than one track circuits are provided for approach locking. (SEM Para 13.38.3, 13.38.4)  | 1 Year |
| 7.3 | <p>For dead approach locking, it shall not possible to cancel the signal route without time delay irrespective of the approach track circuit is occupied or not, with three button cancellation. Whenever a signal has been taken 'OFF', the approach locking shall be effective till the signal is put back to 'ON' and time release circuit has been operated provided the track beyond the signal is not occupied. (SEM Para 13.38.3, 13.38.4, 13.38.5 (e))</p> <p><b>Procedure</b> - First clear the signal under test. Throw signal aspect to 'ON' by 'ERN' &amp; 'GN' button. Try to cancel the signal route by three button cancellation (EUUYN) and observe the flashing indication of timer appeared on the panel. Cancel the signal route by three button cancellation after the time delay of 120 seconds and the timer indication become steady. (The route shall not be cancelled till the time delay of 120 seconds completed and timer circuit operated completely.)</p>   | 1 Year |
| 7.4 | <p>Check that when approach locking track circuits are pick-up, signal route can be cancelled with out time delay, with three button cancellation operation.</p> <p><b>Procedure</b> - First clear the signal under test. Keep all the approach locking track circuits in energise condition. Throw signal aspect to 'ON' by 'ERN' &amp; 'GN' button. Cancel the signal route by three button cancellation (EUUYN) and observe that the signal route gets cancel immediately without time delay. Check that EUUYN counter increases by one number at every cancellation.</p>  | 1 Year |
| 8   | <b>Back Locking</b>   |        |
| 8.1 | Tests shall be carried out to ensure that once a signal is cleared for a particular route, position of none of the points / LC gates in the route (including overlap and isolation) can be changed when track circuit immediately in advance of the signal or any of the track circuit controlling up to the last point in the route is de-energise. (SEM Para 13.38.3, 13.38.4, 13.39.1 (v))   | 1 Year |

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| 8.1 | <b>Procedure:-</b> First clear the signal under test. De-energise the concerned back locking track circuit and observe that the signal goes to danger. Try to cancel the route by three button cancellation (EUUYN) when any one of the back locking track circuit is occupied and observe that it is not possible to cancel the signal route and also not possible to operate the points or release the control to open the LC gate or to release the control for the crank handle.  |        |
| 8.2 | Check the back locking condition with individual track circuit occupied at a time.(SEM Para 13.38.3, 13.38.4, 13.39.1 (v))  | 1 Year |
| 9   | <b>Signal Aspect Control</b>  |        |
| 9.1 | Indication of 'ON' aspects of all signals for their correspondence with aspects displayed at site. Similarly indication of 'OFF' aspect of the signal shall be checked for correspondence displaced at site after clearing the signal. (13.38.5 (f))  | 1 Year |
| 9.2 | <p>Check the intra signal cascading of the signal</p> <p>Procedure - First clear the signal under test for its higher permissive aspect i.e., DG for three aspect signal or HG for two aspect signal. Now remove the higher permissive aspect of the signal (DG or HG as the case may be) and observe that the aspect of the signal changes to next restrictive aspect i.e., when DG aspect of a signal removed, HG aspect will lit and when HG aspect of a signal removed, RG aspect will lit. Check with this procedure for all signals.</p>  | 1 Year |
| 9.3 | <p>Check inter signal cascading. (SEM Para 13.38.3, 13.38.4)</p> <p>First clear the signal under test. Observe that the OFF aspect of the signal is related with the aspect of the signal in advance. Observe that the DG aspect of the signal under test is related with the DG or HG &amp; HHG aspect of the next signal, and when DG/HG or HHG (as the case may be) aspect of the signal in advance is removed, the aspect of the signal under test is changed to HG aspect. Also observe that when signal in advance is in blank condition, signal in rear cannot be taken OFF.</p>   | 1 Year |
| 9.4 | <p>Check the aspect controlling of Distant and inner distant signal.</p> <p><b>Procedure -i)</b> First clear all signals of main line and observe the DG aspect for distant and inner distant signal. Remove DG aspect of inner distant signal and observe that inner distant signal aspect changes to HG &amp; HHG aspect. Now remove HG or HHG aspect of inner distant signal and observe that the distant signal aspect changes from DG to HG &amp; HHG. Now connect HG, HHG / DG aspect of inner distant signal and observe all main line signals display DG aspects.</p> <p>ii) Remove DG aspect of distant signal and observe that distant signal aspect changes to HG &amp; HHG. Now connect DG aspect of distant signal and observe all main line signals display DG aspects.</p> <p>iii) When all signals are normal, remove HG aspect of inner distant signal and check that HHG aspect lit.</p> <p><b>Note:-</b> In single distant territory, DG aspect of distant signal will changes to HG aspect under the effect of cascading.</p> | 1 Year |

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| 9.5  | <p>Check that the signal with direction type route indicator cannot be kept at OFF when three No. of lamps of direction type route indicator are removed or when only two numbers of route lamps of direction type route indicator are lit. (13.38.5 (f))</p> <p><b>Procedure</b> - Clear the signal for diversion line and observe that signal assumes HG aspect after route indicator is lit. Check that all the five route lamps of route indicator are lit. Remove one by one three no. of route lamps of direction type route indicator and observe that by removing the third lamp, flashing route indication appears on panel and signal aspect of the signal changes from HG to RG. Connect route lamps one by one and observe that the signal aspect changes from RG to HG when three or more route lamps lit at the route indicator.</p> | 1 Year |
| 9.6  | <p>Check that the 'OFF' aspect of a previously cleared signal assume its original OFF aspect after restoration of power supply in case of power supply failure.</p> <p><b>Procedure</b> - First clear the signals under test. Disconnect the AC power supply for more than 10 seconds and after reconnecting the power supply observe that signal assume its original OFF aspect.</p>  | 3 Year |
| 10   | <b>Crank Handle Locking</b>  |        |
| 10.1 | <p>Check that it is not possible to remove the crank handle key from KLR/EKT without receiving the control/slot to remove the crank handle key. (SEM Para 21.8.7)</p> <p><b>Procedure</b> - Try to remove the crank handle key from the KLR/EKT without control/slot and observe that it is not possible to remove the key. Release control by pressing CHYN and point button (and KLR push button for co-operative type), now try to release the crank handle key by pressing concerned KLR push button and observe that the Key can be remove.</p>   | 1 Year |
| 10.2 | <p>Check that when a crank handle slot is given or crank handle key is removed, it is not possible to take 'OFF' the signals related to that crank groups. (SEM Para 13.38.3, 13.38.4, 13.38.5 (i))</p> <p><b>Procedure</b> - First remove crank handle key by releasing concerned slot and then try to clear the signal and observe that it is not possible to clear the signal. (Stations where non co-operative feature to remove CH key is provided, release the control for crank handle and try to clear the signal under test and observe that it is not possible to clear the signal.) Insert and lock the crank handle key and withdraw the CH slot/control by pressing CHYRN &amp; concerned point buttons. Now try to clear the signal and observe that it has been cleared. Check this for all crank handles individually.</p>         | 1 Year |
| 10.3 | <p>Check that it is not possible to take back (withdraw) the control/slot of crank handle when the crank handle key is out.</p> <p><b>Procedure</b> - First remove crank handle key by releasing concerned slot. Observe red steady indication on the panel. Try to take back the crank handle control/slot by pressing CHYRN &amp; concerned point button keeping the crank handle key out and observe that it is not possible to receive the crank handle control/slot. Insert and turn the key in the KLR, observe red flashing indication on the panel, now receive back the control/slot by pressing CHYRN &amp; concern point button and observe that the flashing red indication changed to yellow steady and the crank handle key gets locked in the KLR.</p>  | 1 Year |

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| 10.4 | <p>Check that it is not possible to release control to remove the crank handle key which is locked in signal movement until the signal movement is completed or the crank handle control/slot becomes free due to concerned route section is released by sequential route release. (SEM Para 13.38.3, 13.38.4, 13.38.5 (i))</p> <p><b>Procedure</b> - First clear the signal under test. Check the crank handle locking indication of all the crank handle groups in route, overlap and isolation. Try to release slot/control to remove the crank handle key by pressing CHYN &amp; concerned point buttons and check that it is not possible to release the slot/control and remove the crank handle key. Check this for all crank handles individually.</p>  | 1 Year |
| 10.5 | <p>Check that crank handle normal control (CHKLCR) is proved in GR1 &amp; GR2 / HR relay of the signal control circuit. (by bobbing CHKLCR, signal OFF aspect should also bob and after de-energising CHKLCR for more than 5 seconds, signal should not re-clear automatically.) (SEM Para 13.38.3, 13.38.4, 13.38.5 (a))</p> <p><b>Procedure</b> - First clear the signal under test. Keep CHYRN &amp; concerned point buttons in press condition to ensure that CHKLCR relay can pick up immediately. De-energise the CHKLCR relay for a moment by disconnecting the links of CHKLCR on CT rack / location box and observe that GR2/HR relay of the signal drops and the aspect of signal changes from OFF aspect to ON aspect for a moment &amp; then restores to OFF aspect after energising the CHKLCR. Now de-energise the CHKLCR relay for more than 5 seconds and observe that GR1, GR2/HR of signal drops and the aspect of signal changes from OFF aspect to ON aspect and does not re-clear automatically after energising CHKLCR relay. Release CHYRN &amp; point buttons</p> | 1 Year |
| 11   | <b>Signal to Signal Locking</b>   |        |
| 11.1 | <p>Clear the signal under test. Try to clear the "LOCKS" signal given in Remark column of the selection table. It shall not be possible to initiate the route of the signal and there should not be any change in aspect of signal under test. (SEM Para 13.38.3, 13.38.4, 13.39.1(iii))</p> <p><b>Procedure</b> - First clear the signal under test. Set the route by operating points required for the signal which is to be tested for direct locking (point setting is required for PI installation). Try the "LOCKS" signal mentioned in Remarks column of the selection table and observe that it is not possible to initiate the route &amp; signal to clear.</p>  | 1 Year |
| 11.2 | <p>Check the converse locking immediately after checking of main locking.</p> <p><b>Procedure</b> - Cancel the signal route cleared for the testing mentioned in Sr.No.11.1. Now clear the signal mentioned in Remarks column and try to clear the signal under test. Check that it is not possible to initiate the route and not possible to clear the signal.</p>   | 1 Year |
| 12   | <b>Route Release / Locking Table</b>  |        |
| 12.1 | <p>Check that when route section / overlap mentioned in "Conflicting" column is previously in set condition, it is not possible to set the route section / overlap. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - Open the seal cover of route group, mini group interlock relay of concerned U(R)S , U(R)PS and/or overlap setting interlock relays i.e. OVZ2U(R/N)R mentioned in 'Conflicting' column and latch the reverse coil to set condition manually. Try to clear the signal and set the route overlap under test and observe that it is not possible to set the route / overlap. Normalise these relays after the testing and close the relay cover and re-seal the relay.</p>  | 3 Year |

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| 12.2 | <p>Check that the points are correctly set and locked as per the position mentioned in locking table. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First set the route section under test by clearing the signal and cancelling all route sections except the route section under test by EUYN operation. Check the point setting as per locking table and also check that it is not possible to operate the points by WWN &amp; WN.</p>   | 3 Year |
| 12.3 | <p>Check the route release for individual route section as per Locking Table</p> <p><b>Procedure</b> - i) First set the route section under test by clearing the signal and cancelling all route sections except the route section under test by EUYN operation. Check that the UYR1/UYR2 circuit is as per the locking table by pick-up &amp; dropping of concerned track circuits. Observe that the route section is released after UDKR relay and UYR1/UYR2, picks up.</p>   |        |
| 12.4 | <p>Check that the route section is not released when ON aspect of main signal (if protected by the signal) is removed and train received on proper signal. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - Set the route section under test. Remove ON aspect of that signal if protected by the route section and observe on passing of the train, the route section not released. Now connect the ON aspect and check that the route section has been released as soon as the ON aspect is connected.</p>   | 3 Year |
| 12.5 | <p>Check that it is not possible to release the control to remove crank handle key when concerned route section / overlap is set. (SEM Para 13.38.3, 13.38.4)</p> <p><b>Procedure</b> - First set the route section under test by clearing the signal and cancelling all route sections except the route section under test by EUYN operation. Check that the crank handle locking indication of the concerned crank handle groups on the panel. Try to release slot/control to remove the crank handle key by pressing CHYN &amp; concerned point buttons and check that it is not possible to release the slot/control and remove the crank handle key.</p> |        |
| 12.6 | In case where the route section is controlled by single track circuit, the route section is not released by drop and pick-up of the route section track circuit but it is released after prescribed time delay. This timer circuit will be effective after the concerned track circuit has been occupied. (SEM Para 13.38.5 (c) (iv))   | 1 Year |
| 13   | <b>General Testing</b>  |        |
| 13.1 | <p>Check the working of SM's Key. Ensure that signal can be thrown to danger when SM's Key is out. (SEM Para 21.2.13.f)</p> <p><b>Procedure</b> - Remove the SM's Key and check that it is not possible to clear any signal, operate any point, cancel the route, release control to open the gate, release control to remove crank handle key etc. and also check that it is possible to throw any cleared signal to danger.</p>   | 1 Year |
| 13.2 | Check the working of all Buzzers (SM's Key out, signal failure, point failure, NCR, crank handle failure, IBS failure, FCOR, communication fail, etc.)  |        |
| 13.3 | Check the working of all Counters (EUYN, EEUYN, OYN, COGGN, EWN, FCOR, etc.)  | 1 Year |
| 13.4 | <p>Check panel indications of operating and/or indication panel. (SEM Para 21.3)</p> <p><b>Procedure</b> - Check all normal indications on panel like button check indications, all CH indications, all point indications, LC gate indications etc. Clear the signal route and check all route set indications, point lock indication, signal indication, etc. Check track occupied indications when the track circuit is occupied.</p>   | 1 Year |

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| 13.5  | Check the working of Flasher. Ensure that when power supply of Flasher is disconnected, flasher indication provided on panel does not become steady.   | 1 Year |
|       | <b>Procedure</b> - Check the Flasher monitoring indication provided on panel for its proper working. Disconnect the operating power supply of flasher relay and observe that the Flasher monitoring indication does not become steady on the panel.  |        |
| 13.6  | Check the automatic release of overlap after 120 Seconds when train come on berthing track circuit. (SEM Para 13.38.5 (d), 21.5.8)   | 1 Year |
|       | <b>Procedure</b> - First clear the home signal route and allow train to stand on berthing track circuit and last sub route to release completely. Observe that the timer indication provided for the particular overlap starts flashing. Observe after 120 seconds the overlap has been released and overlap indication has been disappeared on the panel.   |        |
| 13.7  | Check that Calling On signal can be taken 'OFF' with all track circuits fail. Also check that Calling On signal put back to 'ON' when CO track circuit picks up. (SEM Para 21.4.3 (Note-i))  | 1 Year |
|       | <b>Procedure</b> - First de-energise all track circuits from foot of the CO signal up to next stop signal. Try to clear the Calling On signal with out CO track circuit occupied and observe that it is not possible to clear the Calling On signal. De-energise the CO track circuit and try the Calling On signal and observe that after time delay of 60/120 seconds the Calling On signal is cleared. Now energise the CO track circuit and check that Calling On signal replace to ON aspect. |        |
| 13.8  | Check LSS (advance starter signal) cannot be taken 'OFF' without Line Clear  | 1 Year |
| 13.9  | Check the alignment of dominos and yard diagram on the operating , indication panel.   | 1 Year |
| 13.10 | Check all buttons of the panel for their proper working and also check all the buttons for the spring action and sticking tendency.  | 1 Year |
| 13.11 | Check that the panel layout is matching with the yard.   | 1 Year |
| 13.12 | Check the operation time of all timers and ensure that the timings are as per requirements.  | 1 Year |
| 13.13 | Check the flashing frequency of the flasher. It should be approximately one stroke per second.   | 1 Year |
| 13.14 | Check that the work has been carried out in accordance with the approved plans and the equipments are of proper type and are in good conditions. (SEM Para 13.34.1)  | 1 Year |
| 13.15 | Check the signals, location boxes and other out-door equipments are as per approved plans and are in good condition. Also check that the ventilation, where provided, are not choked. (SEM Para 13.34.2.a)   | 1 Year |
| 13.16 | Check that each location contains all the apparatus required as per approved plans, the apparatus is of approved type and that the power supply equipments, batteries, fuses, etc, are installed according to the approved plan and specification. (SEM Para 13.34.2.b)  | 1 Year |
| 13.17 | The location of insulated joint, jumper wiring, traction bonding in electrified areas, point machines, switch locks and other apparatus is as per approved plans and their condition is satisfactory. (SEM Para 13.34.2.c)   | 1 Year |
| 13.18 | Check that the electrolyte, inter-connections between cells, cell voltage etc., are in required condition as per relevant specifications or instructions. (SEM Para 13.34.2.d)   | 1 Year |

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| 13.19 | Check that each wire is tagged or marked where feasible so that it can be identified at each end and the nomenclature on the tag corresponds to that on the wiring diagram. Also check that the sleeves of identification shall be of insulating material. (SEM Para 13.34.2.e) | 1 Year |
| 13.20 | Check that the number of wires terminated on each terminal or relay terminal boards or other devices are counted and tallied with the number of wires shown in the wire count chart. (SEM Para 13.34.2.f)   | 1 Year |
| 13.21 | Check that all the connections on terminals and binding posts are properly secured. (SEM Para 13.34.2.g)  | 1 Year |
| 13.22 | The lightening and surge arrestors are properly connected and earthed as per plan. (SEM Para 13.34.2.h)   | 1 Year |
| 13.23 | Check that all other equipments such as lever frames, cable sheaths, signal screens, location huts, etc., in electrified areas are properly earthed. (SEM Para 13.34.2.j)   | 1 Year |
| 13.24 | Check that no equipment including relay are due for overhauling. (SEM Para 13.34.2.k)   | 1 Year |

**Note:-** The procedure described here does not supersede the provisions given in SEM Part I and II, but it is elaborated wherever considered necessary.

**Precautions During Testing**

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| 1 | Before testing it must be ensure that all the points, all signals, all LC gates, all crank handles and other gears are properly functioning.   |
| 2 | To clear a signal in PI installations (non route setting type), keep all points in the route, overlap and isolation in required position unless as mentioned in the testing procedure. |
| 3 | Ensure sealing of all emergency operation buttons and relays after the testing.  |
| 4 | Following additional precautions shall be taken during testing and checking so that-   |
| a | No signal taken 'OFF' for a train movement is thrown to 'ON' in the face of the train.   |
| b | No signal which will create a conflicting or unsafe movement is taken 'OFF', when train movements are in progress.   |
| c | No point and Isolation in a route set for a train movement is disturbed.   |
| d | No track relay of an occupied track circuit is energised.  |
| e | No voltage higher than permissible voltage is applied to the equipment.  |
| f | There should be no risk of electric shock to testing or operating personnel.   |

**Periodical Testing of PI / EI / RRI Installation Register (General Testing / Physical Inspection)**

**(Periodicity of Testing - As mentioned in the procedure, or after making any alteration to existing installation to the extent feasible)**

| Sr. No. | Description  | Date of Testing | Remarks |
|---------|--|-----------------|---------|
| 1       | Check the working of SM's Key. Ensure that signal can be thrown to danger when SM's Key is out. (Sr. No. 13.1)                                 |                 |         |
| 2       | Check the working of all Buzzers (SM's Key out, signal failure, point failure, NCR, IBS failure, FCOR, communication fail, etc.) (Sr. No 13.2) |                 |         |
| 3       | Check the working of all Counters (EUYN, EUUYN, OYN, COGGN, EWN, FCOR, etc.) (Sr. No 13.3)   |                 |         |
| 4       | Check panel indications of operating and/or indication panel. (Sr. No. 13.4)   |                 |         |

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| 5  | Check the working of Flasher. Ensure that when power supply of Flasher is disconnected, flasher indication provided on panel does not become steady. (Sr. No. 13.5)  |  |  |
| 6  | Check the automatic release of overlap after 120 Seconds when train comes on berthing track circuit. (Sr. No. 13.6)  |  |  |
| 7  | Check that Calling On signal can be taken 'OFF' with all track circuits fail. Also check that Calling On signal put back to 'ON' when CO track circuit picks up. (Sr. No. 13.7)  |  |  |
| 8  | Check LSS (advance starter signal) cannot be taken 'OFF' without Line Clear. (Sr. No. 13.8)  |  |  |
| 9  | Check the alignment of dominos and yard diagram on the operating , indication panel.   |  |  |
| 10 | Check all buttons of the panel for their proper working and also check all the buttons for the spring action and sticking tendency.  |  |  |
| 11 | Check that the panel layout is matching with the yard.   |  |  |
| 12 | Check the operation time of all timers and ensure that the timings are as per requirements.  |  |  |
| 13 | Check the flashing frequency of the flasher. It should be approximately one stroke per second.   |  |  |
| 14 | Check the aspect controlling of Distant and inner distant signal.(Sr. No.9.4)  |  |  |
| 15 | Check that the number of wires terminated on each terminal or relay terminal boards or other devices are counted and tallied with the number of wires shown in the wire count chart.   |  |  |
| 16 | Check that the work has been carried out in accordance with the approved plans and the equipments are of proper type and are in good conditions.   |  |  |
| 17 | Check the signals, location boxes and other out-door equipment are as per approved plans and are in good condition.  |  |  |
| 18 | Check that each location contains all the apparatus required as per approved plans, the apparatus is of approved type and that the power supply equipments, batteries, fuses, etc, are installed according to the approved plan and specification.         |  |  |
| 19 | The location of insulated joint, jumper wiring, traction bonding in electrified areas, point machines, switch locks and other apparatus is as per approved plans and their condition is satisfactory.  |  |  |
| 20 | Check that the electrolyte, inter-connections between cells, cell voltage etc., are in required condition as per relevant specifications or instructions.  |  |  |
| 21 | Check that each wire is tagged or marked where feasible so that it can be identified at each end and the nomenclature on the tag corresponds to that on the wiring diagram. Also check that the sleeves of identification shall be of insulating material. |  |  |
| 22 | The lightening arrestors are properly connected and earthed as per plan.   |  |  |
| 23 | Check that all other equipments such as lever frames, cable sheaths, signal screens, location huts, etc., in electrified areas are properly earthed.   |  |  |
| 24 | Check that no equipment including relays are due for overhauling.  |  |  |

## Short term Reliability improvement action plan

| Sl. no. | Item  | Remarks |
|---------|---|---------|
| 1       | Provision of slide boom type barriers   |         |
| 2       | Replacement of worn out gears viz. ,winch, wires at mech. LC gates                |         |
| 3       | Provision of redundancy in BPAC   |         |
| 4       | Improvement in ELB with double magnet/ locking                                    |         |
| 5       | Provision of redundancy in t rack circuit at critical locations                   |         |
| 6       | Provision of auto resetting arrangements in IBS                                   |         |
| 7       | Modification in CEL make counter  |         |
| 8       | Relay failures: circuits with more than 45 contacts to be bifurcated.             |         |
| 9       | Provision of dual fuses panels with alarms  |         |
| 10      | Signal: replacement of CRU of old design  |         |
| 11      | Provision of failure alarms for ATs, ,IPS,TF chargers ETC.,                       |         |
| 12      | Provision of earthing arrangement at EI stations as per RDSO guidelines           |         |
| 13      | Replacement of defective signalling cables in yards where P.way works carried out |         |
| 14      | Directed maintenance  |         |
| 15      | Replacement of EKT type locks at vulnerable locations                             |         |
| 16      | Insulated tools to be supplied to ESMs JEs  |         |
| 17      | Post supply check of materials by RDSO  |         |

## Short term Reliability improvement action plan-2

| Sl. no. | Item   | Remarks |
|---------|--|---------|
| 1       | LC gate breakage   |         |
| a)      | slide boom type Gates  |         |
| b)      | ELBs with improved arrangements  |         |
| 2       | Dual track circuits at critical locations using Axle counters (B/S)                                |         |
| 3       | BPAC : Redundancy at worst locations   |         |
| 4       | IBS: Auto resetting arrangement  |         |
| 5       | Modified LED Signals   |         |
| 6       | Relay circuits bifurcation at the stations having more than 45 contacts                            |         |
| 7       | Fuse alarm system: Dual fuse panels with alarm   |         |
| 8       | Provision of PPTC Fuses  |         |
| 9       | Failure alarms for   |         |
| a)      | Track feed chargers  |         |
| b)      | 230V Power Supply (ATs,& DGs)  |         |
| 10      | Earthing and Surge Protection as per RDSO' guidelines for EI installations                         |         |
| 11      | Replacement of defective cables  |         |
| 12      | Directed maintenance at stations by SE/JE  |         |
| 13      | Post supply check of materials particularly cables by RDSO (2samples per month to be sent to RDSO) |         |
| 14      | Networking of Dataloggers with Zonal HQrs & divisions  |         |
| 15( a)  | Provision of Inverter/IPS at PI/MACLS station to avoid signal blanking                             |         |
| (b)     | Provision of Inverter/IPS at LC gates to avoid signal blanking                                     |         |
| 16      | Linking of Dataloggers with Control Office   |         |

## **IMMEDIATE ACTION PLAN FOR PREVENTING SIGNAL INCIDENCES DUE TO LIGHTING EFFECTS**

### **I. IPS FOR SIGNALLING GEARS AT STATIONS**

1. Availability and intactness of Class B & C SPD which are being supplied with IPS in a separate wall mounted box shall be checked.
2. The equi-potential bonding of indoor signalling equipment including IPS rack should be provided in the Power and EI rooms and connected to low resistance earth less than  $1\Omega$  as per RDSO scheme.
3. The length of cables from SPDs to earth bus bar and from equipment to earth bus bar should be Shortest possible without any bends.
4. The size of the cable from SPD to earth bus bar should be minimum 19sq mm copper cable and the size of the cable from equipment to earth bus bar should be minimum 10 sq mm copper cable.
5. All connections from equipment or SPD to earth bus bar shall be using exothermic welding.
6. In order to achieve low resistance of less than  $1\Omega$ , multiple earth pits may be provided
7. Typical bonding and earthing connections for signalling equipments as per typical sketch given in RB L.no.2011/SIG/SF/1 dated 19.8.11 annxe.-I

### **II. Universal axle counters (UAC) and SSDAC**

1. Suitable class C SPDs should be provided in the power line, communication line and rest line for surge protection as per typical sketch given in RB L. no.2011/SIG/SF/1 dated 19.8.11.annxe ii &iii.
2. Low resistance earth of value less than  $5\Omega$  needs to be provided in the location boxes where EJB of universal axle counters or field unit of Digital axle counter is provided as per typical sketch given in RB L. no.2011/SIG/SF/1 dated 19.8.11.annxe – iv

### **III. Electronic interlocking**

1. Railways should take action to achieve earthing/ surge protection arrangements as approved by RDSO as per the direction issued on 22.06.2011. Specific items to be ensured are indicated in RB L. no.2011/SIG/SF/1 dated 19.8.11 annxe.v.
2. No new EI shall be commissioned until the OEM has certified and given a certified at an appropriate level that the installation work complies with all points of check list and that earthing and surge protection arrangements are needed for the EI. Practice of OEM certificate shall also be followed for IPS, DACs, Data loggers, AFTCs etc including their installation and commissioning.
3. It was concluded that the weakest link in regard to failures due to lightening is control panel. To avoid this adoption of only VDUs appears the only solutions. Lightening prone operating- cum-indication panel may be progressively replaced with operating VDU with dual arrangements.
4. The practice of switching of Operating –cum-indication Panel during bad weather condition and working on Operating VDU panel should also be adopted immediately in lighting prone stations. During monsoon season power supply cards, CPU cards and non-vital I/O cards should be unplugged further from the card file of the standby system of EI.

#### **IV. Track circuits**

1. Track feed chargers should be monitored using potential free contact available in the charger.
2. Industrial grade rectifier element should be provided for improving the quality.
3. Two chokes should be provided in parallel at the feed end.
4. Sliding type variable resistance should be replaced with Disc Type Variable Resistance. Disc Type Variable Resistance should be provided in parallel at feed end
5. Self type restoring type PPTC fuses to be provided.

#### **V. LED SIGNAL**

1. Modified Current Regulators Units (CRUs) shall be provided replacing the existing current regulators to make it more reliable.

#### **VI. GENERAL**

1. The armouring of all cables should be properly earthed at both ends.
2. Cable armour continuity to be maintained while making joint of the cable.

### **Inspection of materials**

**Following critical item will be inspected by RDSO as per instruction contained in Board's letter No.74/RS(G)/379/2Pt. dated;4/3/91 and 18/6/91:-**

- i. All types of signalling relays; Block instruments,. Axle counters equipments, Signal machines, Point machines, Colour light signal transformers, Electrical signal lamps, Voltage stabilizers and other power supply equipment, Electric signal reversers, Signal roundels and lenses, Electric lever lock and circuit controller, Circuit controller, Electric key transmitter, Fuses, Fuse Block & Terminal blocks (PBT Type), Electric Point and lock detector.

Signalling items other than those mentioned above may be inspected by RDSO provided the order value is more than Rs. 1 lakh. Inspection in respect of order below Rs.1 lakh may be got done by RITES, subject to supplies being from sources approved by RDSO. All mechanical equipments are inspected by RITES.

## Review questions

### Chapter-1

#### **Subjective questions**

1. What are the general rules applying to railway servants?
2. What precautions to be taken by the railway servant for the books supplied to ?
3. What are the DOs and DONTs to be followed by the railway servant while on duty ?

#### **Objective Questions**

1. Periodicity of footplate inspection carried out by JE/SSE(S)----- (once in a month)
2. Periodicity of footplate inspection carried out by In charge SSE(S) ----- (Once in three months)

### Chapter-2

#### **Subjective questions**

1. Enumerate the general duties of J.E/SSE (open line)
2. Enumerate the general duties of J.E/SSE (construction)
3. What observations shall be made JE/ SSE(S) while doing foot plate inspection?
4. Write the duties of S.E/SSE(S) in charge of the section
5. what are the books to be carried when attending for CSTE/DRM/CRS inspection?
6. Enumerate the general duties of signaling officers
7. what are the additional duties of Signal engineers?
8. Write short notes on the following
 

|                    |                                       |
|--------------------|---------------------------------------|
| a) DMTR            | b) Measurement Book                   |
| c) Returned stores | d) Signal sighting committee (S.S.C.) |

#### **Objective Questions**

- |   |          |
|---|----------|
| 1. Normal life of Signalling apparatus—(both Mechanical and power)----- | 25 Years |
| 2. Normal life of Underground Signalling Cables -----                   | 30 Years |
| 3. Normal life of Block token instruments -----                         | 25 Years |

### Chapter-3

#### **Subjective question**

1. Write the duties of on duty SM when an approach stop signal is defective
2. Write the duties of on duty SM when a departure stop signal is defective
3. Write procedure for passing a Gate stop signal at ON
4. Write procedure for passing an IB signal at ON
5. Write duties of Loco Pilot when an approach stop signal is defective/at ON
6. Write the situations in which disconnection need not be issued but suitable precaution are taken up
7. Write the disconnection and reconnection procedure of signaling gears

#### **Objective Questions**

- 1 Procedure to pass gate stop signal at ON----- (Wait for one minute by day and two minutes by night and pass the signal at ON)
- 2 Procedure to pass IB stop signal at ON----- (Wait for five minute by day and two minutes by night and pass the signal at on at 15/8 kmph)

**ANNEXURE**

- 3 The refresher training for all technician staff (Electrical and Mechanical) should be given once in ----- (Three years)
- 4 The validity of competency certificate issued by Zonal Training Institute is ----- (Three years)

## Chapter-4

**Subjective Questions**

1. Write short notes on Schedule of Dimensions (Revised 2004)
2. Write the purpose of Schedule of Dimensions

**Objective Questions**

1. Schedule of dimensions formulated in ----- (1913)
2. Schedule of dimensions revised in ----- (2004)
3. Minimum distance between center to center of track in BG ----- (5.3 / 4.265)
4. Minimum clearance of checkrail at level crossing ----- (51mm)
5. Minimum depth of space for wheel flange from rail level ----- (38mm)

## Chapter-5

**Subjective Questions**

1. Write short notes on the following?
  - (a) IRS specification (b) RDSO specification
2. Write different types of drawings and their dimension?
3. Write different types of signaling plans/circuit diagrams and their approval

**Objective Questions**

1. The dimension of Signalling plan is ----- and ----- (297 mm, any length)
2. The dimension of Locking Table is ----- and ----- (297 mm, any length)
3. RDSO stands for ----- Research Designs and Standards Organisation
4. Head quarters of CCRS ----- (Lucknow)
5. RITES stands for ----- (Rail India Technical and Economical services)
6. DGS & D stands for ----- (Directorate General of Supplies and Disposal)
7. Signal sighting committee consists of ----- (Loco Inspector, Traffic Inspector, Signal inspector)
8. Type of Block Instrument approved by ----- (CRS)
9. Signalling plans/Locking tables approved by ----- (CSTE/Dy. CSTE)

## Chapter-6

**Subjective Question**

1. Write the information to be recorded in signaling plan/I P?
2. Write the items to be checked on engineering plan?
3. Write the difference between SWR & WRD?
4. What checks to be done on points & crossing before taking over from Engg dept for interlocking
5. Write the classifications of routes provided on Broad gauge?

## Objective Questions

| SI No. | Question  | Answer                              |
|--------|---|-------------------------------------|
| 1      | Allowed gauge tolerances on straight line (BG)                  |                                     |
| 2      | Allowed gauge tolerances on curved with radius 350mm or more    |                                     |
| 3      | Maximum permissible speed on A route                            | 130 to 160kmph                      |
| 4      | Maximum permissible speed on B route                            | Above 100 to 130kmph                |
| 5      | Maximum permitted gradient in station yard                      | 1 in 400                            |
| 6      | recommended gradient  | 1 in 1200                           |
| 7      | If gradient steeper than 1 in 80 falling towards the station    | Catch siding should be provided     |
| 8      | If gradient steeper than 1 in 100 falling away from the station | Slip siding should be provided      |
| 9      | Maximum super elevation permitted in BG                         | 165mm                               |
| 10     | Maximum super elevation permitted in MG                         | 100mm                               |
| 11     | SWR shall prepare based on                                      | G&SR, BWM                           |
| 12     | SWR shall revise once in a                                      | 5 years or after 3 correction slips |

## Chapter-7

### Subjective Questions

1. Write the procedure for obtaining CRS sanctions for signaling works?
2. What are the documents to be enclosed for obtaining CRS sanction?
3. What are the works, which does not require CRS sanction?
4. What are the works, which require CRS sanction?

### Objective Questions

1. Green notice issued by----- (Sr. DOM)
2. Currency of CRS sanction----- (12 months)
3. Safety certificate issued by----- (ASTE/AEN)
4. CRS Stands for ----- (Commissioner of Railway Safety)
5. Currency of Green Notice is ----- (Three months)

## Chapter-8

### Subjective questions

1. Types of Estimates and explain in brief?

## Chapter-9

### Subjective Questions

1. Write the maintenance schedule of mechanical signaling gears such as cabin, lever frame, cranks, Rod Run, Points and LC Gate etc?
2. Write the maintenance schedule of Electrical signaling gears such as CLS, Point Machine, EPD, EKT, Block Instrument, Power supply Equipment (Chargers ,Battery bank, IPS etc.)

### **Objective Questions**

1. Lock bar should be at ----- mm below rail level (38 mm)
2. Speed restriction during overhauling of LF (15 kmph)
3. Resumption of normal working of lever frame with more than 20 working levers shall be done by ----- ( ASTE/DSTE)
4. Token censes to be carried out----- ( Once in Six months)
5. Period of Over hauling of lock bar clips ----- ( Once in a year)
6. Signal posts, lever frames to be painted ----- ( Once in three years)
7. Point testing to be carried out ----- ( Once in a month by J.E/SSE)

## **Chapter-10**

### **Subjective Questions**

1. Write the procedure for overhauling of Lever frame, SM control and LC gate.
2. Write the maintenance and testing schedule of the following gears
  1. Lever Frame
  2. LC gate
  3. Point Machine
  4. Track circuits
  5. Color Light Signals
  6. Battery Charger
  7. IPS
  8. Block Instrument
  9. Earthing arrangement
  10. Axle Counters

## **Chapter-11**

### **Subjective Questions**

1. Define Trolley, Motor trolley & Lorry.
2. Protection of Lorry on a S/L and D/L
3. Minimum Equipment of Trolley/Lorry/Motor Trolley

### **Objective Questions**

- 1 Maximum number of persons allowed to travel on a trolley-----(10)
- 2 Maximum number of persons allowed to travel on a motor trolley with 4 HP motor-----(7)
- 3 Maximum number of persons allowed to travel on a motor trolley with 6 HP motor-----(10)
- 4 Min no of persons to travel on a motor trolley-----(4)
- 5 Trolley competency certificate is valid for----- ( One year)
- 6 Protection of lorry in single line when stopped in mid section for unloading----- ( By placing banner flag at 600 mts and three detonators at 1200 mts in the direction of train approach)

## **Chapter-12**

### **Subjective questions**

1. Write the working of trains during total interruption of communication on S/L.
2. Write the working of trains during total interruption of communication on D/L.