**INTRODUCTION**

Signal and Telecommunication Department is responsible for installation and maintenance of Signalling system essential for the safe & speedy movement of trains and Telecommunication systems required for the effective utilization of the large fleet of locomotives and other rolling stock and track as well as for the administration of the vast Railway Network. Telecommunication is a vital infrastructure for managing any transportation network. Indian Railway has an in-house Railway Telecommunication Network for managing Train operations and staff management and to offer Passenger Amenities. In terms of the sophistication in Signalling and Telecommunication installations, Central Railway occupies the pride of place among the various Indian Railway systems. Organizational setup and duties of officers and other salient features of the department are detailed below.
A. SALIENT FEATURES

1.0 SIGNALLING

1.1 Multiple Aspect Colour Light Signalling (MACL)

Mechanical signals of Semaphore type are progressively replaced by Electrical signalling with Multiple Aspect Colour Signals (MACL). MACL signals have better visibility, quick operation and less maintenance.

1.2.1 Route Relay Interlocking (RRI) and Central Control Panels in signal control system

By mere operations of knobs and route buttons, routes are set automatically and signals are cleared with absolute safety. The entire station is track circuited. Points and signals are operated by individual knobs/slides in small yards.

1.2.2 Panel Interlocking system

Unlike Route relay interlocking, in panel interlocking points and signals are operated individually. This is being adopted in smaller wayside stations.

1.2.3 Solid State Interlocking

As a technological development, the solid state with electronics system having software programming, solid-state interlocking signalling control system is being now inducted to achieve economy and flexibility. This sophisticated microprocessor based interlocking system works through Microprocessor devices and software programming. In this system there is less number of relays, and alterations/additions in the yard is possible without much extra wiring.

1.3 Automatic Block Signalling with Continuous Track Circuiting

Automatic Block signalling systems are mostly used when the train traffic become more congested and busy, especially in suburban area and to increase line capacity. This eliminates block working and trains are signalled automatically without much dependence on human element. This ensures train safety, speed and also detects any rail discontinuity.
1.4 Token less Block working

In the absolute block system in single line, Token Block instruments are used. The token will be handed over to the driver of train after granting line clear to enter in the Block section. The process of handing over of token at every station is time consuming and laborious resulting in token missing. The system of token less block working helps to increase line capacity on single line sections.

1.5 LED signals for colour light signalling (LED)

In the colour light signals light aspects of mechanical signals are lit by incandescent bulbs. These bulbs have limited hours of working and get fused due to ageing and voltage fluctuations. The bulbs have to be replaced frequently. As an improvement, LED lit signals are now introduced. LED signals are having longer life and better visibility. This type of signal has enhanced the reliability by reducing the incidences of signal lamp fusing. It also affords good visibility to the drivers and more signals are likely to be converted to LED signals.

1.6 Replacement of over aged assets

Over aged signalling assets are normally to be replaced after a codal life of 25 years. Most of the signal systems are obsolete mechanical type and no spares are now available in the trade. The mechanical signals are operated from the mechanical lever frame from cabin. Most of the signalling systems have become over-due for replacement. With the sanction of the Special Railway Safety Fund the over aged assets are being replaced on priority basis.

1.8 Track circuiting

Track circuit detects the presence or absence of the train on the track. This is the backbone of the signalling system. This ensures complete safety to the train in case of human failure. Due to high utilisation of the track capacity, this ensures safe, speedy and punctual movement for train services.

1.9 Level crossing

The unmanned gates are taken up for manning where telephone facilities are provided from the nearest station so that gate will be closed well in advance before the train approaches the manned gates. LC gates are being taken up for interlocking on the basis of train vehicle units (TVUs) to ensure safety for both trains and road users.
1.10 Train protection & Warning system

This system will give information to the driver to regulate the train speed depending upon the aspect of the signal in advance. In case, the driver fails to do so, the train will be automatically stopped by applying brake without the intervention of the driver. This ensures that whenever any train stops on the track, the following trains stop automatically, thus ensuring safety.

1.11 Train Actuated Warning Device

Whenever train approaches an unmanned level crossing, a hooters sounds giving warning to the road users well in advance about the approach of the train thereby avoiding any accident.

1.12 Networking of Data Loggers

This is a modern equipment used for monitoring the operation of important functions like Track circuits, Points, Signals, Battery chargers, Batteries etc. installed in Panel interlocked/RRI installations. These are microprocessor-based equipment logging the events of the change of status of the various functions in field and relay rooms and recording the precise time also. The data loggers are useful devices for detecting the cases of passing the signal at danger by the driver and give important clues in case of accidents. The data loggers are also used as predictive maintenance tools regarding deterioration of the performance of signalling gadgets.

1.13 Integrated Power Supply System (IPS)/ Non-conventional energy sources

With the introduction of more and more modern Electrical Signalling Systems, the dependency on the power supply becomes more essential. To get reliable power supply, the concept of Integrated Power Supply (IPS) has been introduced wherein, the different signal power supplies like 110 AC, 110 VDC, 24 DC etc. are derived from the common system, which works on common battery, i.e. DC-DC converter, modular power packs. This IPS will enhance the working of the signalling system especially in RE (Railway Electrification) area.

2.0 TELECOMMUNICATION
2.1. Train Control Communication:

Movement of each and every train is monitored by a controller at the nearest divisional Hqrs. Facility is also provided to the driver or guard to communicate with divisional Hqrs through portable telephone which can be easily connected to the overhead line wires which are running parallel to the track or connected to the Emergency Telephone sockets provided at every KM in the section where controls are working through under ground
cables. An emergency portable telephone is kept in the Guard’s compartment of each and every train.

**2.2. Block Circuits**

Running of trains in each section (between any two stations) is controlled by block circuits through which running of only one train in a section at one time is Electrically ensured in addition to oral confirmation. Overhead lines of Railway or BSNL and underground cables are used for this purpose.

**2.3 Optical Fibre Cable network**

Optical Fibre Cable is laid along the track to provide a reliable and noise free communication. OFC network is widely used for Railway Control Communication taking advantage of its all long haul high bandwidth circuit interconnecting Railway Telephone Exchange. Passenger Reservation System, Unreserved Ticketing System, Network Freight Operating Management system have been transferred through railway OFC.

In Southern Railway distribution of various media for Telecommunication is as follows:
1. OFC and RE quad cable in Electrified sections
2. OFC and 4/6 quad cable
3. Only OFC.
4. Railway owned overhead line.
5. Rented overhead line/ channels/ bandwidth from BSNL

**2.4 Railway Telephone Network**

There is an in-house Railway Telephone Network connecting all-important offices, officials, Way stations, Divisional Headquarters & Zonal Head Quarters. Railway telephones exchanges are inter-connected through Railway OFC network, Railway Microwave network and are supported by rented BSNL channels as stand by.

**2.5 Wireless communication System**

Driver, Guard, Supervisors & officers of permanent way, Mechanical, Electrical and Signal & Telecom departments are provided with 5 watts hand held walkie-talkies, which can be used to establish communication between moving train & adjacent stations. Every railway station is provided with 25 watts VHF set for this purpose.

**2.7 Data network**

There is an exclusive PRS network connecting Chennai and all the PRS centers of Central Railway and other Metros. The centers are connected either through Railway OFC network or hired channels from BSNL. Similarly there is a Freight Operating Management System
network for monitoring the movement of freight transport. Coach Operation Information System is a network for coach management and this is under implementation.

2.8 Passenger Amenities
Safety, security and comfortable journey of the passengers are the aims of Railways in train operation. To meet this objective, the following facilities have been provided in almost all-important stations.
- Continuous announcement through public address system
- Electronic display board
- IVRS system for giving on line information about availability of Accommodation, arrival & departure of trains.
- Call centers and integrated IVRS for giving all types of passenger Information.

2.9 Voice Recorder
Train operation information between controllers at Divisional headquarters and way stations are normally passed through control circuits. All such conversations between section controller and station Master are recorded at control office, which can be used for train management at any time of investigation in case of any accident/mishap.

2.10 Rail net
Railway has its own data network for management purpose called “RAILNET”. This is widely used for file transfer, e-mail and public information. Public can visit site www.gov.railnet.in. This network spreads through entire Railway system connecting divisional headquarters, Zonal headquarters, workshops and hospitals.

2.11 Disaster Management
Telecom plays a vital role in Disaster Management. To meet the requirement of Disaster Management a universal number is provided at all control offices which can be accessed from any part of India duly pre fixing the city code. There are Accident Relief Trains and Medical Relief Vans placed at strategic locations. All such ARTs and MRVs are equipped with mobile INMARSAT telephones, walkie-talkie sets and public address system. Video conferencing equipments and wireless satellite based modems are also being added.

2.12 Video conferencing
Video conferencing facilities are available in divisional headquarters, zonal headquarters and Railway board, for administrative purpose.

2.13 Maintenance
Maintenance of all equipments is carried out through the maintenance set up of staff at Divisions, Way stations and in specialized laboratories. However, since the telecom technology is changing fast, Annual Maintenance Contract through reputed firms wherever
necessary is being opted. Maintenance is carried out as per the schedule drawn up in Telecom Manual.

2.14 BSNL Telephone:

BSNL telephones have been provided at all Railway stations for giving train information to the public.

2.15 Computerization And Networking

The following activities of Production Control Organisation have been computerized.

- Work Order releasing
- Production control Documents.
- Estimated Annual Requirements for Stock Items.
- Bill of Materials for all manufacturing items.
- Rate Revision of manufacturing items.
- Inspection details – inspection of inward items.
- Vendor evaluation
- Demand and Dispatch position details.

Notable Achievements:-

- **Signalling:**
  1. 7 nos. of gates interlocked.
  2. 6 nos. of PIs/EIs at Warora, Ajni ‘A’, Ajni ‘B’ & Ajni ‘C’ commissioned.
  3. 1 no. of EI commissioned at Bharatwada.
  4. One shunt signals has been interlocked at Amla.
  5. Alteration work in signaling system at Nagpur RRI for provision of Home Land Platform no. 8.
  6. Absolute block working provided between Parasia - Chhindwara section.
  7. 8 nos. of mechanically operated interlocked gates have been converted into electrical operation.
  8. LED signals provided are as under:

<table>
<thead>
<tr>
<th>Main signals</th>
<th>Route signals</th>
<th>Shunt Signals</th>
<th>Calling On Signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>Provided</td>
<td>Total Population</td>
<td>Provided</td>
</tr>
<tr>
<td>3829</td>
<td>3829</td>
<td>1488</td>
<td>742</td>
</tr>
</tbody>
</table>

9. 83 nos. of point machines replaced.
10. 109 nos. of IPS provided.
11. One no. of Multi section digital axle counter has been provided with dual detection.
12. Line wise segregation of 18 Multi section digital axle counters has been completed.
13. 85 nos. of Data loggers provided.
14. 69 nos. of Data loggers networked.
15. 7 nos. of stations provided with Fuse Alarm system provided.
16. All the stations of Nagpur Division have been provided with PPTC fuses in parallel with existing outdoor location fuses.
17. 13 nos. of sliding booms provided.
18. 1379 nos. of over aged batteries replaced.

❖ **Telecom:**

1. Telephone exchanges at Ravi Nagar, Dharampeth & Mount Road, Nagpur replaced. The exchange commissioned at Ravi Nagar has been connected to Nagpur main exchange through PRI connectivity. Ravi Nagar main exchange is connected to Dharampeth & Mount road exchanges through SIP protocol.
2. Telephone exchanges at Amla, Betul & Junnardeo replaced. The exchange commissioned at Amla has been connected to Nagpur main exchange through PRI connectivity. Amla Main exchange is connected to Betul & Junnardeo exchanges through SIP protocol.
3. DRM Intercom exchange replaced at Nagpur.
4. 11 nos. of BSNL leased lines surrendered.
5. Provided & commissioned 50 line exchanges in ART Amla and Wardha.
6. UTS/PRS provided on 2 mb channel in Amla-Chhindwara section.
7. Coach Guidance System and Indicator Board provided at newly commissioned platform no.8, Nagpur.
8. Subscriber cable connected to telephone exchanges of Ravi Nagar, Dharampeth & Mount Road, Nagpur replaced.
PASSSENGER AMENITIES:

1. Universal Fair Display has been provided and commissioned at 14 Nos. PRS terminals at Nagpur Main Reservation Office and 02 Nos. UTS terminals at Ajni.

2. Provided and commissioned 26” LCD Television with DTH connection at newly constructed State of Art “Maharaja Kaksh” Retiring Room at Nagpur Station.

3. Provided and commissioned 42” LED Television and 32” LCD Television at newly constructed AC Waiting Hall and New Booking Office along with DTH connection at PF. No. 1 of Nagpur Station.

4. Provided and commissioned Rest House Booking Terminal on UTS network at entrance of “Maharaja Kaksh” Retiring Room at Nagpur Station.

5. To facilitate passengers, Integrated Coach Guidance indication system at 15 stations.