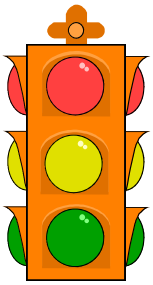
264396/2020/O/oDYCPLO/PLG/HQ/SR



WORK STUDY TO REVIEW THE SIGNAL STAFF STRENGTH IN SSE/SIG/KKR – SA DIVN

SOUTHERN RAILWAY

PLANNING BRANCH

G.275/WSSR-501920/2019-2020

WORK STUDY TO REVIEW
THE SIGNAL STAFF STRENGTH
IN SSE/SIG/KKR –
SALEM DIVISION

STUDIED BY

WORK STUDY TEAM
OF
PLANNING BRANCH

September 2020

(i)

INDEX

(i)

ACKNOWLEDGEMENT

The study team conveys its deep gratitude to DRM/SA, ADRM/SA, Sr.DSTE/SA, DSTE/SA, SSE/SIG/HQ/SA, SSE/SIG/KRR & other supervisors and staff of S&T Branch/ MAS Division for having rendered required data, valuable guidance and co-operation for completion of the study in time.

(ii)
TERMS OF REFERENCE

Work study to review the signal staff strength at SSE/SIG/KRR.

(iii)
METHODOLOGY

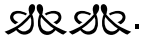
The following methodology has been adopted while conducting the study.

1. Collection of data.
2. Discussion and interaction with Officers and Unit officials.
3. Field Unit observation.
4. Working out the requirement on application of benchmark ratio and need basis.

(iv)

SUMMARY OF RECOMMENDATIONS

NIL



CHAPTER – I

1.0 INTRODUCTION

1.1 Indian Railway is an Organization having Welfare and Social obligation to the Nation for Safety, Security & Punctuality in train running operation. Capital and labour being the basic factors which contributed towards infrastructure and production. The Organization is also to be viewed as financially viable to make use of its machinery and manpower to achieve maximum utilization.

1.2 In Indian Railways, Signal & Telecommunication Department plays a vital role in the operation of trains with safety, punctuality and velocity. The Signal Branch is primarily responsible for the Signal network of entire Indian Railways to provide safe and efficiency in transportation system. Signaling systems provide safety, enhance line capacity and improve flexibility of the operations.

1.3 Signals are the Salient sentinel providing Safety in train operations. Procedures and practices in maintenance and operation are therefore vital to provide the Safety. The Signaling System is being continuously updated to meet the growing needs of traffic and hence new procedures are being evolved and implemented by Supplementary instructions, corrections and modifications to the Signal Engineering.

Signaling system has undergone a drastic advancement in technology such as MACL Signals, centralized RRI/SSI, automatic block system, data logger,BPAC, Audio frequency Track circuiting, Intermediate Block Signals, Train Actuated Warning System, Anti-collision Device, etc. This is going to be a continuous process in future also.

The most important terms in the terminology of S&T is interlocking between signals, points, Track Block Instruments, Level Crossing Gates which will facilitate their operation in a prescribed sequence to ensure safety.

1.4 The Signal and Telecommunication Department is responsible for the installation and maintenance of the Signalling system essential for the safe and speedy movement of trains and the Telecommunication systems required for the effective utilisation of the large fleet of locomotives, other rolling stock and track as well as for the administration of the vast Railway Network. In terms of the sophistication in Signalling and Telecommunication installations, Southern Railway occupies the place of pride among the various Indian Railway systems.The current systems of Signalling and Telecommunication provided in Southern Railway are mentioned below:

1.5 SIGNALLING

1.5.1 Multiple Aspects Colour Light Signalling (MACLS):

The Mechanical signals of Semaphore type (which are wire operated) are progressively replaced by Electrical signalling with Multiple Aspect Colour Light Signals (MACLS). MACL signals have better visibility, quick operation and less maintenance. MACL signals are working through underground cable. Out of total 539 block stations, 519 block stations have been provided with Multiple Aspect Colour Light Signalling system.

1.5.2 Route Relay Interlocking (RRI)/ Panel Interlocking (PI) and Central ControlPanels in Signal Control System:

In early days, mechanical signals, (which are operated from lever frame and interlocking through mechanical means) were installed. These mechanical signalling are mostly replaced by Electrical central control panel. In Electrical signalling, the signals are operated from central panel and interlocking is achieved electrically through specially designed signalling relays. The interlocking logic of signals and points are centrally controlled by large no. of signalling relays and achieved through safety circuits of fail-safe methods.

In the central panel, by mere operations of signal 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. RRI (Route Relay Interlocking) is provided in

major 49 Junctions and Terminal yards, while PI (Panel Interlocking) is provided at small 272 wayside stations.

1.5.3 Electronic Interlocking (EI):

As a technological development, the interlocking is achieved by means of solid state with electronics and software programming. Electronic interlocking signalling control system is being now inducted to achieve economy and flexibility.

This is a sophisticated Microprocessor based interlocking system through Microprocessor devices and software programming. In this system, there is less number of relays; alteration/additions in the yard are possible without much extra wiring. This system adopts the usage of latest CENLEC standard of software validation. EI systems are provided at 157 stations.

1.5.4 Absolute block System and Automatic Block System with Continuous Track Circuiting:

Trains are dealt with Single line, double line on absolute Block system and Double line triple line & Quadruple line on Automatic block sections. Automatic Block signalling system are mostly used when the train traffic become more congested and busy, especially in suburban area and also to increase line capacity. This eliminates the manual absolute block working and trains are signalled automatically depending upon the movement of trains ahead without much dependence of human element. This apart from ensuring safety & speed of train also detects any rail discontinuity in the controlled section.

1.5.5 BPAC (Block Proving by Axle Counter):

This enhances the Safety of the train by proving the complete arrival of the train and removes dependency of human element (Station Master) in verifying the complete arrival of the train. Also it helps in eliminating the delay associated in granting line clear for the train reception. Such, BPAC systems have been provided at 399 block sections.

1.5.6 Tokenless Block Working:

In the absolute Block system on single line, Token Block instruments were used. The token will be handed over to the driver of the train after granting line clear to enter in to the Block section. The driver has to reduce the speed for picking up the token. The process of handing over and picking up of token at every station is consuming time and laborious sometimes resulting in token missing and also takes more time during crossing which in turn causes more detention to trains.

1.5.7 Track Circuiting:

The track circuiting in the reception lines of the stations ensures the safety by preventing the reception of a train on occupied line. Track circuit detects the presence 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, punctual movement for train services. As a matter of safety policy and recommendations of Khanna committee report, the provision of complete track circuiting at stations are made available; in 518 stations are already provided with complete track circuiting and works at balance stations are in progress.

1.5.8 Audio Frequency Track Circuits (AFTC):

In Railway electrified sections, the conventional DC track circuits are found vulnerable to the interference of currents generated by the thyristor/Chopper controlled locomotives and hence Joint less Audio Frequency track circuits have been found to be the solution in such sections. The AFTC does not require insulated joints and can work for longer lengths and is suitable for AC electrified areas. These track circuits are more reliable because failures due to block joint shorting are avoided.

1.59 Level Crossing- Provision of Safety Devices:

As a precautionary measure to ensure safety to trains and road users, Interlocking of Level Crossing gates with the signalling arrangements in the station limits as well as outside stations limits is more important due to increased train and vehicular traffic. The LC gates are being taken up for interlocking on the basis of train vehicle units (TVUs). Accordingly in Southern Railway, out of 1863 manned level crossing gates, 1223 Level Crossing Gates have been interlocked; and work is in progress at 176 Nos. of LC gates. This will ensure safety to road users.

In addition to the above, unmanned gates are taken up for manning by Engineering Branch and at such manned gates, telephone facilities are provided from the nearest station so that gate will be closed well in advance before the train approaches these manned gates. All the manned gates (1863 gates) are provided with such telephone facility.

1.6 Train Protection and Warning System (TPWS):

The system is designed to avoid collision due to Signal Passing at Danger (SPAD). Continuous monitoring of the actual speed of train and applies Service Brake / Emergency Brake in case of over speeding.

TPWS controls the speed of train to be within the speed limits at turnouts and Permanent Speed Restrictions (PSR). Accidental roll back/forward of the train will be prevented by application of service brakes. TPWS system guides motorman during poor visibility of signal due to foggy weather/ obstruction of the signal.

1.6.1 Data Loggers:

These are microprocessor-based equipment, logging the events of the change of status of the various functions in field and Relayroom as well as recording the precise time also. For monitoring the operation of important signalling gears like Track circuits, Points, Signals, Battery chargers, Batteries etc. in Panel interlocked/RRI installations, Data loggers have been installed.

The Dataloggers are used as predictive maintenance tool regarding deterioration of the performance of signalling gadgets. The Dataloggers are

also useful devices for detecting the cases of passing the signal at danger by the driver and also gives important clues in case of accidents. So far 479 stations have been provided with the Data loggers in Southern Railway. This being modern equipment useful for predictive maintenance, more number of such equipments is programmed for improving the system reliability.

Also these Dataloggers are networked to through Rly OFC system or BSNL channels with Divisional HQ office, S&T Test room, Zonal HQ's and Railway Board for remote monitoring and taking print-outs as and when needed.

1.6.2 Integrated Power Supply System (IPS):

With the introduction of more and more modern Electrical Signalling Systems, the continuous availability of power supply is more important and essential. To get reliable power supply, the concept of Integrated Power Supply (IPS) has been introduced wherein the different signal power supplies like 110 VAC, 110 VDC, 24 VDC etc. are derived from the common system, which work on common battery, DC-DC converter, modular power packs. This IPS will enhance the reliability of working of the signalling system.

IPS system, as a measure of improving reliability of power supply to various signalling gadgets, has been introduced at 357 stations. It also reduces the maintenance load involved in maintaining a large number of individual battery sets and avoids blanking of signals.

1.6.3 LED Signals for Colour Light Signalling (LED):

LED signals (which have long life and better visibility) are now introduced as a measure of improving reliability. The colour light signals and the light aspects of mechanical signals (lit by incandescent bulbs having limited hours of working and getting fused either prematurely or due to ageing and voltage fluctuations resulting in frequent replacement) are replaced by LED type progressively. This type of LED signal has enhanced the reliability by reducing the incidences of signal lamp fusing besides consuming less power. LED lit signals have been provided at 519 stations.

1.6.4 Keeping the above objectives in view, an analysis is made to study the present system of functioning in SSE/SIG/KRR Unit of SA Division through Benchmarking and need basis as a means of reducing cost and improving productivity. It is the process of comparing the performance with the most successful competitor who is managing with optimum productivity level. With the increased DESUS and further scope of growing technology, the workload Vs requirement of the manpower is critically examined in the subsequent chapters.

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CHAPTER-II

2.0 PRESENT SCENARIO

2.1 The Signal Department of SA Division is functioning under the overall control of Sr.DSTE who is assisted by ADSTE, SSEs and Supervisors in extending Co-operation for smooth and efficient functioning of the Department with sub units/sections.

2.2 This study is pertaining to SSE/SIG/KRR and the existing system of manning this depot comprises location, jurisdiction, scale check, deployment, activities and authority of control.

2.2.1 **Location**

Office of the SSE/SIG/KRR is situated in the Karur station.

2.3 The following are the stations in the jurisdiction of SSE/Sig/KRR:

1. CVD
2. PAS
3. URL
4. KMD
5. PGR
6. MPLM
7. KRR
8. MONR
9. NMKL
10. KLGN
11. ED
12. PALM
13. EDU

2.4 Types of signaling and system of working:

1. Absolute block system
2. Multiple Aspect Color Light Signaling (MACLS)
3. Semaphore signals

2.5 Duty hours of staff

07.00-17.00 hrs
18.00-06.00 hrs

2.6 Block Instruments:

All the double line stations are provided with SGE type lock and Block instruments and FM block instrument.

2.7 The actual staff strength of this Depot is 30 as against the sanctioned strength of 53. **The scale check statement is placed as Annexure-I**. The assets details are placed in Annexure-II. This unit is responsible for efficient upkeep of Signaling assets. SSE/SIG/KRR is responsible for the maintenance and functioning of the installations under his charge and co-ordination with DSTE/SA for all technical matters. In addition he has to carry out testing overhauling, carrying out of alterations to the existing signals and interlocking installation in accordance with appropriate plans and instructions.

2.8 The present staff position is detailed as below.

SL. NO	Category	Actual	
		KRR (West)	KRR (East)
1	SSE/JE Signal	1	2
2	Sr.Tech/Sig	2	2
3	Tech/1/SM	1	2
4	Tech/II/SM	2	2
5	Tech III/SM	0	1
6	Helper	0	3
	Total	6	12

2.9 SIGNAL UNITS

As per the signaling assets installed under the control of SSE/SIG/KRR the lever units are given below (as on 01/09/2020). **The list of Signal assets and units of SSE/SIG/SA is placed in Annexure-II**.

2.10 TYPES OF S&T FAILURES

The following are the various classifications of S&T failures which affect the Train operation:

i) Signal failures.

ii) Track failure.

iii) Point failure.

iv) BPHC/LC/AC failure.

2.11 The total no. of signal units of KRR unit& DESUS for SA division as a whole is **5427 (KRR West) & 12,222 (KRR East)** respectively as per the data given by SSE/Sig/KRR of S&T department of SA division.

2.13 Outsourcing

Many activities can be outsourced in the unit of SSE/Sig/KRR as being done in other divisions of Southern Railway. Some of such activities recommended by Railway Board are listed below and it seems that no such activities are outsourced as on date.

- Trenching and laying/renewal of cables
- Loading/unloading
- Solar panel maintenance
- Related works with tracks, points & crossings
- Repair& Return Contract (RCC) for charger, Inverter, IPS, Data logger, Digital Axle counter, SSI etc
- Truck/pick up van on hiring basis

2.14 Duties of Technicians

- Periodical maintenance of signals, block instruments, Interlocking gears
- Panels, RRIs, track circuits both preventive and repairs.
- Replacement of spare parts, equipment's etc.
- Attending the failures
- Restoration of works during accidents and unusual occurrences.
- Cleaning, lubricating, Testing etc. of equipments.
- Assisting Engineers, Electrical staff wherever S&T items are involved.
- Disconnection works.
- Maintenance of records.
- Collection of store items and T&P etc

2.15 MAINTENANCE SCHEDULE:

Maintenance of Signaling gears by Technicians- Fortnightly

Inspection by JE - Monthly

Inspection by SSE -Quarterly

Footplate Inspection -Monthly

Joint Footplate Inspection	-Quarterly
Joint Inspection of Points & Crossings	-Quarterly
Joint Inspection of Track Circuits	-6 months
Joint Inspection with TRD	-Yearly

2.16 <u>Reliability measures in Southern Railway for 2019-20 is as below:</u>

- Directed Maintenance
- Replacement of batteries and battery chargers
- Integrated Power Supply for RE area
- Improvement to earthing of control/block etc.
- IRS point machine
- Shelf type track relays
- Surge protection arrangements
- Overhauling of lever frames
- Overhauling of Block Instruments.

CHAPTER III

3.0 CRITICAL ANALYSIS

3.1 The outturn and workload of SSE/SIG/KKR (East & West) Depot has been analyzed with the sanctioned strength and actual deployment of staff. The man power requirement for entire activities has been worked out based on the present suitable concept of benchmark technique.

3.2 On critical examination of the scale check of SSE/SIG/KRR (East & west) it could be seen that the total sanction strength and actual strength in category wise is as follows: **(KKR/East)**

Sl. No.	Category	Pay Band + GP Rs.	Sanction	Actual
1.	SSE/KKR/East	9300-34800 +4600	2	2
2.	Sr.Tech	9300-34800 +4200	1	2
3.	Tech I	5200-20200 + 2800	5	2
4.	Tech II	5200-20200 + 2400	0	2
5.	Tech III	5200-20200 + 1900	0	1
6.	Helper	5200-20200 + 1800	3	3
		Total	**11**	**12**

(KKR/West)

Sl. No.	Category	Pay Band + GP	Sanction	Actual
1.	SSE/KKR/West	9300-34800 +4600	2	1
2.	Sr.Tech	9300-34800 +4200	1	2
3.	Tech I	5200-20200 + 2800	1	1
4.	Tech II	5200-20200 + 2400	0	2
5.	Tech III	5200-20200 + 1900	0	0
6.	Helper	5200-20200 + 1800	0	0
		Total	**4**	**6**

3.3 DESU, DETU & DISTUs:

DESU i.e Divisional Equated Signal Units is derived from the total signaling assets of the concerned depot. Likewise DETU is derived from the total telecom assets of a particular depot. As far as DISTU is concerned, is a combination of DESU & DETUs. The product value/applying factor of signal and Telecom Units is to convert into DISTUs i.e. Divisional Equated Signal Units which varies from Division to Division is placed in **Annexure**

3.4 STAFF REQUIEMENT:

In general, the staff requirements worked out considering the yardsticks n vogue. Since, the yardstick is very old and lot of changes has been taken in the system of working, Railway Board has formulated a new concept to work out the staff requirement which is Benchmarking. This is very useful, zero based and helps in system improvement comparing by unit to unit. It is one of the best tools available to identify the slack areas of the organisation itself and thereby implementation of the best practices followed at best areas, so that the identified slack area can also become the best in a phased manner.

Keeping the above concept in view, thorough examination of the collected data is analyzed by the study team, requirement of manpower is arrived, to create a healthy competition and to improve the related efficiency.

3.5 APPLICATION OF UNIFORM YARSTICK:

The application of yardstick for shunt signals, calling on signals, shunting permitted indicators, route indicators, LED lamps etc., under broad categories is not very scientific as some of the subsidiary signals have no light in normal aspect and their working time depends on failures, shunt moves, reception of obstructed roads, etc Which is occasional only. So also, the allocation of equal points for all roads is not very scientific since the dealing of trains is mainly on main lines, especially at Intermediate stations. The sub-categorization of certain equipments like panel / RR, LC gates are not very rational especially for routine maintenance and inspection.

There is no guideline to the extent of reduction of signal units on account of outsourcing and AMC in some activities like BPAC, Data logger, IPS etc. So, a detailed analysis of the signal units seems to be necessary in the study.

3.6 DESU based calculation :

DESU i.e., Divisional Equated Signal Units is a derived unit from Signal units after the addition of many other factors and constants like Annual Train Kilometers, Route Kms etc and the abbreviations in the formula are as under.

A1	=	Total No. of signal units =84142
F	=	Annual Train Kms
H	=	Passenger & proportion of Mixed trains
J	=	Goods including goods proportion of mixed
K	=	Departmental trains
L	=	EMU train

Total F (SA Div) (H+J+K+L) = 12511.877

Calculation of A2

G = Total Route Kms	=	859.00
F/G - 7.3 (12511.877/859) -7.3	=	7.266
A2 = A1 x (F/G-7.3) x 3.42/100		
84142 x7.266x3.42/100	=	**20907.989**

Calculation of A3

Signal units/Route Km	=	97.953
Value of Y	=	0.000
A3 = A1 x Y/100	=	0.000

Calculation of A4

Z=F/G	=	14.57
A4 = A1 x Z x 0.94/100		
84142 x 14.57 x 0.94/100	=	11520.464

Calculation of A5

A5 = G x 1.67 (859 x 1.67)	=	1434.530
DESU= A1+A2+A3+A4+A5		
(84142+20907.989+11520.464+1434.53)	=	118004.983
DESU	**=**	**1,18,005**

3.7 Apart from attending failures, signal maintainer has to perform the routine, preventive check and maintenance. Also in changing scenario of signaling ie., Electronic Signalling system, warrants outsourcing of certain activities such as maintenance activities through EOM/AMC contracts for the electronic items like charger inverter, CVT, IPS, Data logger, AFTC, Digital Axle Counter etc. Therefore the study team has adopted benchmarking methodology to arrive the man power requirement for rightsizing the man power to improve the efficiency coupled with productivity.

3.8 Calculation: KRR (West)

SIGNAL UNITS FOR KRR (West)	= 5427 -Copy placed in annexure 4
Traffic Density etc	= (DESU for SA is 1,18,005)
Signal Units for SA So, (1,18,005/84,142=1.4)	= 1.4

So DESU for KRR (West) Section is 5427 X1.4 = 7597.8

As per the current IR AVERAGE issued by Railway Board in the Month of March 2020 (**Placed as Annexure)** SA division falls under the classification **'Divisions less than 120 DISTUs'.** The current IR average with less than 120 DISTU's which has the manpower of 1.53 per 1000 DESU**.**

If the current IR average of benck marking norms of Jan 2020 given by RB is adopted, the man power required for SSE/Signal/KKR (west) would be **12 only** (7597.8 /1000 X 1.53).

3.9 Actual Requirement:

In view of the technical skill required for the inspection / maintenance of modern equipments, the actual staff strength as on date can be continued.

3.10 Calculation: KRR (East)

SIGNAL UNITS FOR KRR (East) = 12,222 -Copy placed in annexure4

Traffic Density etc = (DESU for SA is 1,18,005)

Signal Units for SA = 1.4
So, (1,18,005/84,142=1.4)

So DESU for KRR(East) Section is 12,222 X1.4 = 17110.8

As per the current IR AVERAGE issued by Railway Board in the Month of Jan 2020 **(Placed as Annexure)** SA division falls under the classification **'Divisions less than 120 DISTUs'.** The current IR average with less than 120 DISTU's which has the manpower of 1.53 per 1000 DESU**.**

If the current IR average of bench marking norms of Jan 2020 given by RB is adopted, the man power required for SSE/Signal/KRR (East) would be **26 only** (17110.8 /1000 X 1.53).

3.11 Actual Requirement:

In view of the technical skill required for the inspection / maintenance of modern equipments, the actual staff strength as on date can be continued.

3.12 To sum up, the Sanction Vs Requirement is as follows:

Sanction Vs Requirement KRR (West)

Sl. NO	Category	Sanction	Actual	Requirement	Surplus
1	SSE	2	1	2	0
2	Sr.Tech	1	2	1	0
3	Tech I	1	1	1	0
4	Tech II	0	2	0	0
5	Tech III	0	0	0	0
6	Helper	0	0	0	0
Total		**4**	**6**	**4**	**0**

Sanction Vs Requirement KRR (EAST)

Sl. NO	Category	Sanction	Actual	Requirement	Surplus
1	SSE	2	2	2	0
2	Sr.Tech	1	2	1	0
3	Tech I	5	2	5	0
4	Tech II	0	2	0	0
5	Tech III	0	1	0	0
6	Helper	3	3	3	0
Total		**11**	**12**	**11**	**0**

Summary of Recommendations:- NIL

CHAPTER – IV

4.0 Planning Branch's Remarks on co-ordinating officer's Views :

CHAPTER – IV

5.0 FINANCIAL SAVINGS:

NIL

264396/2020/O/oDYCPLO/PLG/HQ/SR

SOUTHERN RAILWAY

No.SA/P.483/IX/S&T/

Divisional Office,
Personnel Branch,
Salem
Date:30.08.2019

Dy.CPLO/Hd qrs/MAS

Kind attention :Shri.C.Balaji,Chief Planning Inspector

Sub: Work study to review of the staff strength of SSE/Signal KRR(East &West)
Ref: Your letter No.G.275/WSSR-501920/2019-20 dt 30.08.2019

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Reference to the letter cited, the details of Sanction,Actual and vacancy position in respect of the staff of SSE/Signal/KRR (East &West) are furnished below:

SNo	category	pay level	**Sanction**	**Actual**	**Vacancy**
1	SSE/ KRR/East	7	2	2	0
2	Sr.Tech/ KRR/East	6	1	2	+1
3	Tech I/ KRR/East	5	5	2	3
4	Tech II/ KRR/East	4	0	2	+2
5	Tec.III/ KRR/East	2	0	1	+1
6	Helper/ KRR/East	1	3	3	0
Total			**11**	**12**	**+1**
1	SSE/KRR/West	7	2	1	1
2	Sr.Tech/KRR/west	6	1	2	+1
3	Tech.Gr.I/ KRR/west	5	1	1	0
4	Tech.Gr.II/ KRR/west	4	0	2	+2
5	Tech.III/ KRR/west	2	0	0	0
6	Helper/ KRR/west	1	0	0	0
Total			**4**	**6**	**+2**

(R.Umanathan)
Asstt.Personnel Officer/S&T
For Divisional Personnel Officer/SA

NO	SSE/KRR SECTION STATIONS/LCs Description	unit	PALM Nos	PALM Tot unit	LC 12 Nos	LC 12 Tot unit	LC 18 Nos	LC 18 Tot unit	LC 20 Nos	LC 20 Tot unit	EDU Nos	EDU Tot unit	Total Nos	Total Units
	SIGNALS													
1	Single Wire operated Semaphore/Disc Signal	1		0		0				0		0	0	0
2	Double Wire Operated2Aspect LQ or UQ Semaphore /Disc Signal	1.5		0		0		0		0		0	0	0
3	Power operated2asp.LQorUQ.Sema./Disc Sig.	2.5		0		0		0		0		0	4	10
4	Power operated 3asp.UQ.Sema./Disc Sig.	3		0		0		0		0		0	0	0
5	Double Wire OperatedMulti aspectSema.Sig.	2		0		0		0		0		0	0	0
6	Signal arm or light repeater			0		0		0		0		0	0	0
7	Single/Double Wire Sema.Signals with reverser	1.5		0		0		0		0		0	0	0
8	Signal arm or light repeater /Panel Indication each	1	**88**	**88**	8	8	8	8	14	14	82	82	1287	1287
9	Electrically lit Semaphore Signal	4		0		0		0		0		0	4	16
10	Colour Light Signal 2 Aspect	5	6	30	4	20	4	20	6	30	5	25	149	745
11	Colour Light Signal Multiple Aspect	6	6	36		0		0		0	7	42	103	618
12	Route Indicator Per Route	5	6	30		0		0		0	4	20	66	330
13	Colour/Position Light Shunt Signal and ShuntPermit indicator	4	**10**	**40**		0		0		0	6	24	59	236
14	Calling On Signal in Colour light area	0.5	2	1		0		0		0	2	1	43	22
15	Illuminated A,AG signs and guards rep.signal	0.5		0		0		0		0		0	0	0
16	Auto Signal/APB Signal only	8		0		0		0		0		0	0	0
17	I.B.S.Signal/Mid-Section L.C.Gate Stop Signal	10		0	2	20	2	20	2	20		0	36	360
18	Slot or Control for Signal,Point,Siding,Crank-Handle,Inter cabin, station Master's ,Level Crossing Gate Mechanical or Electrical.	2	8	16		0		0		0	9	18	119	238
	TRACK CIRCUITS			0		0		0		0		0	0	0
21	Single Rail D C Track circuits	4	21	84		0		0		0		0	188	752
22	Double Rail DC Track circuits	5		**0**		0		0		0	10	50	29	145
23	50 cycle AC track circuit	6		0		0		0		0		0	0	0
24	Electronic Track circuit	6		0		0		0		0		0	0	0
25	83 1/3 cycle AC track circuit	8		0		0		0		0		0	0	0
26	D C.Coded Track circuit	12		0		0		0		0		0	0	0
27	Axle Counter complete/including multi entry	20		0		0		0		0		0	0	0
	POINTS			0		0		0		0		0	0	0
31	Electrical Swith Lock	3		0		0		0		0		0	0	0
32	Key Locked Points	3	**0**	**0**		0		0		0		0	8	24
33	Rod worked facing point with lock	3		0		0		0		0		0	0	0
34	Rod worked FPL without lock/lock retaining bar	2		0		0		0		0		0	0	0
35	Double wire operated FP without lock	2.5		0		0		0		0		0	0	0
36	Double wire operated facing point and lock	3		0		0		0		0		0	0	0
37	Electrically operated point and lock	6	13	78		0		0		0	2	12	89	534
38	Electro pneumatically operated point and lock	6		0		0		0		0		0	0	0

39	outlying siding point	28	0	0		0		0		0		0	0	0
	SSE/KRR SECTION STATIONS/LCs		PALM		LC 12		LC 18		LC 20		EDU		Total Nos	Total Units.
NO	Description	unit	Nos	Tot unit	Nos	Tot unit	Nos	Tot unit	Nos	Tot unit	Nos	Tot unit		
51	LC gate telephone only within station limit	2		0		0		0		0		0	11	22
52	LC gate telephone only outside station limit	10	**1**	**10**	1	10	1	10	1	10	3	30	48	480
53	LC.-wing gates interlocked within station limit	3		0		0		0		0		0	1	3
54	LC Gate LB winch operated within station limit	4		0		0		0		0	2	8	12	48
55	Lcgate LB motor operated within station limited	6		0		0		0		0		0	0	0
56	LC.-wing gates interlocked outside station limit	15		0		0		0		0		0	4	60
57	LC.gate LB winch operated outside station limit	20		0	1	20	1	20	1	20	1	20	47	940
58	LC.Gate LB motor operated outside station limit	30		0		0		0		0		0	0	0
	BLOCK INSTRUMENTS			0		0		0		0		0	0	0
61	Single line Token Block Instruments per pair	5		0		0		0		0		0	0	0
62	Single line Tokenless Block Instruments per pair	6	1	6		0		0		0	1	6	16	93
63	Double Line Block Instruments per pair			0		0		0		0		0	0	0
64	Extra weightage for RE area	1	**2**	**2**		0		0		0		0	4	4
65	Key Transmitter per pair	1	**6**	**6**	2	2	2	2	2	2	4	4	82	82
66	Block panel including different types of interface equipment	4		0		0		0		0		0	1	4
67	BPAC	100	2	200		0		0		0	2	200	28	2800
	OTHER SYSTEMS			0		0		0		0		0	0	0
71	Route Relay/Panel Interlocking EquipmentComplete per route	2	**40**	**80**	2	4	2	4	2	4	30	60	581	1162
72	Centralised Traffic control equipment complete per function / indicator	6		0		0		0		0		0	0	0
73	Mechanised Hump yard equipment complete per classification line	5		0		0		0		0		0	0	0
74	Mechanised Hump yard - Retarder each	50		0		0		0		0		0	0	0
75	AWS- per track magnet	2		0		0		0		0		0	0	0
76	Indicator Boards-shunting/block limit,sightingetc	0.5	**4**	**2**	2	1	2	1		0	3	2	95	48
	NEW ITEMS					0		0		0			0	0
77 a	DATA LOGGER (a)UP TO 256 PORTS	10		0		0		0	1	10		0	13	130
77 b	(b) BEYOND 256 PORTS	20	1	20		0		0		0	1	20	13	260
78	GENERATOR	25	**1**	**25**		0		0		0	1	25	29	651
79	SOLAR PANEL PER LOCATION	1	2	2		0		0	2	2	2	2	78	78
80	POINT TO POINT COMMN	1	4	4		0	0	0		0	4	4	41	41
				760.0		85.0		85.0		112 0		654 5		12222.0

SIGNALLING UNITS OF SSE/Sig/KRR (WEST) Section

Sl.No	Description	Unit	CVD Nos	PAS Nos	URL Nos	KMD Nos	PGR Nos	MPLM Nos	KRR Nos	MONR Nos	NMKL Nos	KLGN Nos	ED Nos	LC Nos	Total Nos	Total Units
1	Colour light Signal 2 Aspect	5	6	4	3	6	5	3		6	7	4		20	64	320
2	Colour light Signal Multiple Aspect	6	6	6	6	6	4	6		6	7	6			53	318
3	Route Indicator per route	5	4	4	2	4	3	2		4	6	2			31	155
4	Colour /Position light Shunt Signal and Shunt Permit Indicator	4	8	8	2	3		6		2	2	2			33	
5	Calling on Signals	0.5	2	2	2	2	2	2		2	2	2			0	164
6	Illuminated A.AG signs and guards repeater signals	0.5													18	9
7	IBS signal/Mid section LC gate stop signals	10	11	14	10	4		4	4	2	2	4	4		0	0
8	Slot or control for signal,Point,Siding,Crank handle,Inter cabin,Station Master's,Level crossing Gate Mechanical or Electrical	2	3	10	3	7	6	2							59	590
9	Single rail track circuit	4	16	16	12	21	17	14		18	20	12		2	31	62
10	Double Rail DC Track circuit	5													148	592
11	Axle counter complete/including multi entry	20	2	2	2	2	2	2	2	2	2	2	1		0	0
12	Key locked points	3		4		2									21	420
13	Electrically operated point and lock	6	8	8		8	10	4		8	12	4			6	18
14	LC gate telephone only within station limit.	2	2	5	2	2	1	1			1				62	372
15	LC swing gates interlocked within station limit	3													14	28
16	LC Gate LB winch operated within station limit	4	1	3	1	2	2								0	0
17	LC Gate LB winch operated outside station limit	20	8	7	4	2		2	2	1	1	2			9	36
18	Double line Block Instrument per pair	6													29	580
19	Single line tokenless Block instrument per pair	6	2	2	2	2	2	2	2	2	2	1	1		0	0
20	Extra weightage for RE area	1	1	1	1	1	1	1		1	1	1			20	120
21	Key transmitter per pair	1	2	6	2	4	4							40	9	9
22	Route relay/panel Interlocking Equipment Complete per route	2	32	34	16	32	25	22		30	38	20		60	58	58
23	Indicator Boards Shunting/block limit,sighting etc	0.5	2	2	2	2	2	2		2	2	2		26	309	618
24	DATA LOGGER (a) Upto 256 PORT (b) Beyond 256	10	8	7	4	2		2	2	1	1	2			44	22
25	Generator	20	1	1	1	1	1	1		1	1	1			29	290
26	Solar panel per location	25	2	2	2	2	2	2		2	2	2			9	180
27	Point to point communication	1													18	450
		1	2	2	2	2	2			2	2	2			0	0
															16	16
																5427