

# Comparative Work Study of Benchmarking MPR of TRD for Non-Suburban Divisions Mumbai and Solapur

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## SYNOPSIS OF THE STUDY

Study Number	: WSCR/BM/TRD/BB-SUR/01/18-19
Name of Study	: Comparative Work Study of Benchmarking MPR of TRD for Non-Suburban Divisions Mumbai and Solapur.
Proposed by	: E&R Directorate
Department	: Electrical
Division	: Mumbai & Solapur
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Date of Completion	: 23.04.18
Date of Submission	: 24.04.18
No. of Recommendations	: 2
Sanctioned Strength	: BB – 2087 SUR - 203
No. of Men studied	: BB – 1117 SUR - 113
No. of vacancies	: BB – 970 SUR - 90

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## **TERMS OF REFERENCE**

A Comparative Work Study of Activity Centers having highest and lowest benchmark MPR is proposed vide letter number 2017/E&R/2(1)/1 dated 03.04.2018. For Central Railway the comparative work study is proposed for TRD staff for Non-suburban ETKM of Mumbai Division and Solapur Division.

The Work Study is included WSCR/BM/TRD/BB-SUR/01/18-19 for the year 2018-19.

## **BASE FOR STUDY**

Comparative Work Study of for TRD staff for Non-suburban ETKM of Mumbai Division and Solapur Division of Central Railway is proposed on the basis of these activity centers having highest and lowest benchmark MPR.

Benchmark MPR of Mumbai Division for TRD non-suburban is 0.76 Electrified Track Kilometre and Benchmark MPR of Solapur Division for TRD non-suburban is 0.22 Electrified Track Kilometre

## **METHODOLOGY**

1. Collection of data with reference to the calculation of Man Power Ratio of TRD Department of respective Divisions
2. Collection of factors effecting the MPR of Mumbai Division as well as Solapur Division
3. Calculation of MPR of Mumbai and Solapur Division
4. Critical Analysis of variation in MPR of Mumbai and Solapur Division
5. Observation and recommendations to improve MPR

## **SUMMARY OF OBSERVATIONS**

Following observations are made for the variation in Benchmark MPR in TRD Department of Mumbai Division and Solapur Division,

1. Structural difference like age of assets, type of transformers, type of catenary and contact wire working conditions, higher number of ROB/FOB, additional workload due to 110KV feeder station and transmission line the MPR of Mumbai Division is higher than that of Solapur Division.
2. Functional difference like outsourcing of certain activities and unification of OHE/PSI cadre has resulted into reduction of MPR of Solapur Division.

## **SUMMARY OF RECOMMENDATION**

Following steps are suggested for achieving better MPR in TRD department of Mumbai Division,

1. Identification of areas where the activities can be done on contractual basis, for example the activities which are not directly related to safety aspect.
2. Possibility of Unification of Cadre of PHE/PSI and Cable Staff and formation of the multi-functional gangs may be explored to achieve better manpower ratio.

## CHAPTER 1

### CALCULATION OF MPR OF MUMBAI AND SOLAPUR DIVISION

1.0 Benchmark MPR for TRD: As per the benchmarking norm issued by E&R Directorate, Railway Board, Man Power Ratio of TRD Department in 5 divisions of Central Railways is given in following table,

Division	Non Suburban	Suburban
Mumbai Division	0.76	--
Bhusawal Division	0.32	--
Nagpur Division	0.27	--
Pune Division	0.50	--
Solapur Division	0.22	--

It can be seen that in Central Railway highest benchmark MPR in TRD for Non-Suburban Division is in Mumbai Division that is 0.76 Personnel per Electrified TKM and lowest benchmark MPR for same cadre is in Solapur Division that is 0.22 Personnel per Electrified TKM.

Indian Railway Benchmark for TRD Staff in Division is 0.33 Men per electrified TKM at ADA Division of SER

1.1 Formulae for MPR: Above benchmarking MPR is derived by obtaining the ratio of 'total man on roll personnel in TRD branch of electrical department' and 'Total Non-suburban Electrified Track Kilometers (ETKM)' by following formula.

$$\text{MPR} = \frac{\text{Total man on roll personnel in TRD branch of electrical department}}{\text{Total Non-suburban Electrified Track Kilometers (ETKM)}}$$

For Calculation of Total Man on Roll for the cadre On roll number of Officers, all Supervisor staff and Ministerial staff, Technical Group 'C' and 'D' staff of TRD organisation in the division is taken into consideration.

1.2 Proforma: The Proforma for calculation of Man Power Ratio (MPR) for Electrical TRD Branch is as under,

Sr. No.	Name of Division	Total Men on Roll	Electrified Track Kms	MPR (Pers. On Roll per Electrified TKms)
1	Mumbai Division			
2	Solapur Division			

Above Proforma is utilised for calculation of MPR i.e Personnel on Roll per Electrical Track Kilometre.

1.3 Methodology: For assessments of the reason for such wide variation in benchmark Man power Ratio, work study team collected sanctioned strength and man on roll personnel in TRD branch of electrical department including Officers, all Supervisor staff and Ministerial staff, Technical Group 'C' and 'D' staff of TRD organisation along with Re-

engaged of retired railways staff & Contractual staff. Work Study team also collected total Non-suburban Electrified Track Kilometers (ETKM) for respective Division.

In addition to this, the data related to activities carried out in-house and number of staff deployed, activities out sourced, best practices of the centre, practices need to be improved, practices/activities which may be further outsourced was also collected for assessment of such variation in MPR of said Divisions.

**1.4 Man Power Ratio Calculation:** Man power ratio for Non-Suburban section of Solapur and Non-Suburban & Suburban section of Mumbai Division is calculated in following paragraphs.

**1.4.1 Solapur Division:**

Solapur Division is entirely a Non-Suburban Division. Scale check of TRD department and total ETKM is as under,

Sr.	Cadre	Sanctioned Strength	Man On Roll	Vacancies
1	Officers	5	5	0
2	Supervisor staff	26	9	17
3	Ministerial staff	--	--	--
4	Technical Group 'C'	140	36	104
5	Group 'D' Staff	32	63	-31
Total		203	113	90

- Total Men on Roll in TRD department : 113
- Total Electrified Track Kilometre : 538
- Man Power Ratio (MPR) : 0.21

*Therefore, the Benchmark MPR of TRD non-suburban Division Mumbai Division is 0.21 Personnel per Electrified TKM.*

**1.4.2 Mumbai Division:** Electrified track Kilometres of Mumbai Division comprises of both suburban and Non-suburban sections. ETKM for each type is as under,

- Suburban Section : 1281 ETKM
- Non-Suburban Section : 459 ETKM

TRD Department of Mumbai Division is divided into 4 districts, namely Kurla, Kalyan, Lonavla and Panvel District. Sanctioned strength for these 4 district, is given in following table,

Cadre	Total			CLA			KYN			LNL			PNVL		
	SS	MoR	Vac	SS	MoR	Vac	SS	MoR	Vac	SS	MoR	Vac	SS	MoR	Vac
Officers	10	10													
Supervisor staff	214	161	53	89	65	24	54	43	11	24	18	6	47	35	12
Ministerial staff	55	29	26	21	13	8	18	9	9	11	3	8	5	4	1
Technical Group 'C'	676	359	317	295	156	139	194	96	98	81	37	44	106	70	36
Group 'D' Staff	1132	558	574	442	201	241	353	159	194	184	79	105	153	119	34
Total	2087	1117	970	847	435	412	619	307	312	300	137	163	311	228	83

TRD Department of Mumbai Division serves both suburban and Non-suburban section. Since most of the TRD district have both suburban and non-suburban tracks within their jurisdiction staff deployed in these is utilised as per the requirement in both suburban and non-suburban areas. Therefore separate bifurcation of cadre as suburban and non suburban is not available.

To arrive the MPR of both suburban and non suburban TKM, work study team has bifurcated the existing staff proportionately to arrive a logical MoR serving these TKMs.

Type of ETKM	ETKM	% of Total ETKM	Proportionate Staff
Non Suburban	459	26%	295
Suburban	1281	74%	822
Total	1740	100	1117

Therefore, on proportionate distribution, it is arrived that the in Suburban sections 1281 ETKM is served by 822 staff and in Non Suburban Sections 459 ETKM is served by 295 staff.

1.5 Summary: On the basis of the data provided in above para 1.4 and the Proforma as per para 1.2 the calculation of MPR for TRD Department of Mumbai Division (Suburban & Non-Suburban) and Solapur Division (Non-Suburban) is given in following table,

Sr. No.	Name of Division	Total Men on Roll	Electrified Track Kms	MPR (Pers. On Roll per Electrified TKms)
1	Mumbai Division (Suburban)	822	1281	0.64
2	Mumbai Division (Non-Suburban)	295	459	0.64
3	Solapur Division (Non-Suburban)	113	538	0.21

*Therefore, the Benchmark MPR of TRD non-suburban Division Mumbai Division is 0.64 Personnel per Electrified TKM.*



## CHAPTER 2

### CRITICAL ANALYSIS OF VARIATION IN MPR OF MUMBAI AND SOLAPUR DIVISION

2.0 The MPR of Solapur Division is 0.21 whereas the MPR of Mumbai Non-Suburban Division is 0.64 Personnel per Electrified TKM. For assessment and critical analysis of the variation in this MPR between Solapur and Mumbai Division, work study team has gone through the procedure of working and other conditions affecting the workload of TRD department.

#### 2.1 Factors affecting the MPR of Solapur Division

Following points are noted by work study team for comparative less MPR in Solapur.

1. TRD assets are newly commissioned which requires less maintenance.
2. DD-BGVN section 62.5 TKM & GR-WD section 96.39 TKM (Total-158.89 TKM), are recently commissioned hence no any AOH/POH maintenance activities are due.
3. As entire SUR division has been electrified recently, no any major asset is due for POH.
4. 06 nos of TRD depots have been commissioned but only 03 nos Tower Wagon are working rest 03 commencements will require more staff.
5. In RCC /SUR, only one TPC board (DD-MMR) is functional, but after commissioning of TRD SUR & DD-BGVN & WD-GR section, 2 additional TPC board have been commissioned (TPC DD-SUR & TPC WD-SUR).
6. As Best Practice, Division is not maintaining artisan streams/cadre for OHE & PSI assets due to this unified arrangement Division is able to attend any type of TRD failure i.e. OHE/PSI. which result in best utilisation of staff & improves the orientation & skill of staff.
7. Division has outsourced following two activities,
  - a. Annual maintenance contract of SCADA for ANK-KSTH section. (Provision of 2 staff)
  - b. Four heavy motor vehicle for four TRD depots in DD-MMR section. (Provision of 4 staff)

During the discussion with officials of TRD department, it was revealed that present benchmarking of 0.21 does not give the actual evaluation of MPR because most of the TRD assets are recently commissioned. At present these recently commissioned assets are not due for AOH/POH, These assets will require substantial workforce when actual workload is shifted to departmental maintenance.

#### 2.2 Factors affecting the MPR of Mumbai Division

In comparison to above, Non-suburban section of Mumbai Division has higher MPR than that of Solapur, due to following points,

1. Electrified section is old and requires regular maintenance for this purpose.
2. All work of maintenance and up-keeping are done departmentally.
3. No activity is outsourced by TRD department of Mumbai Division.
4. Apart from Over Head Equipments and PIS assets division is also maintaining 110KV transmission line having a length of 330 Kms.
5. There is a Grid Substation of 110KV which is drawing 60 MW power from grid and uses above said transmission line for distribution to substation, this entire establishment is maintained departmentally.

6. At present OHE of Mumbai Division is un-regulated. The catenary size of Mumbai Division is 323 sq.mm where as in other Division the size is 65 sq.mm which is lighter catenary. Similarly contact wire size is 193 sq.mm which in other divisions is 107 sq.mm.
7. Panto passing under the OHE wire in Mumbai Division is more as compared to Solapur Division. Since in Mumbai Division 1732 local trips per day and average 212 nos of Mail/Express trains run daily which are very much higher as compared to other Divisions. One EMU is having 4 panto graphs and panto passing under OHE is nearly 7140 per day which is very much high.
8. Hence the maintenance required for OHE is more. Hence the maintenance required for OHE is more due to more panto passing.
9. There are more FOB and ROB per ETKM in Mumbai Division compared to Solapur Division. Due to which more periodical maintenance of OHE is required.
10. Capacity of transformer of Mumbai Division is more, Mumbai Division is having 30 MVA transformers while other divisions are having 13.5/21.6 MVA transformer.

### 2.3 Summary of observation:

On the basis of above para 2.1 and 2.1 following can be summarized,

Sr.	Description of Asset/Workload/Activities	Mumbai Division	Solapur Division
1	Outsourcing	No Activity Outsourced	Certain Activities Outsourced
2	Maintenance of Assets	All maintenance done departmentally	Many assets are still under OEM maintenance.
3	Age of Assets	Old Assets. requiring regular AOH/POH	New Assets. AOH/POH yet not due.
4	Tower Wagon	All depots having Tower Wagon	Only 3 out of 6 Depots having tower wagon.
5	Multi-functioning	Separate OHE and PSI cadre.	Combined OHE and PSI cadre. resulting into multi-functioning of staff
5	Departmental Transmission line	110 KV transmission line, length 330 kms.	No departmental Transmission line.
6	Grid Substation	110 KV at Thakurli	No grid Substation
7	Type of OHE	Unregulated with oversized catenary and contact wire	Regulated with standard size.
8	Panto passing	Very high due to EMU rakes and more no of M/Exp.	Relatively low.
9	FOB and ROB	More	Less
10	Capacity of transformer	Mostly 30 MVA	Mostly 13.5/21.6 MVA

From above summary of comparison between Mumbai Division and Solapur Division, it can be seen that due to structural difference in system and functional difference in operation MPR of Mumbai Division is relatively higher than that of Solapur Division.

## CHAPTER 3

### OBSERVATION AND RECOMMENDATIONS TO IMPROVE MPR

3.0 On the basis of critical analysis of the variation in MPR of TRD departments of Solapur and Mumbai Division following observation and recommendations are made by Work study team.

3.1 **Observation:**

It is observed that, the difference in MPRs of Mumbai Division and Solapur Division is due to following reasons,

1. Structural difference like age of assets, type of transformers, type of catenary and contact wire, working conditions, higher Panto passing, higher number of ROB/FOB, additional workload due to 110KV feeder station and transmission line; are the reason for comparatively higher MPR of Mumbai Division.
2. Functional difference like outsourcing of certain activities and unification of OHE/PSI cadre has resulted into comparative reduction of MPR of Solapur Division.

3.2 **Recommendations:**

Following steps are suggested for achieving better MPR in TRD department of Mumbai Division,

3. Identification of areas where the activities can be done on contractual basis, for example the activities which are not directly related to safety aspect.
4. Possibility of Unification of Cadre of PHE/PSI and Cable Staff and formation of the multi-functional gangs may be explored to achieve better manpower ratio.

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