# COMPERATIVE WORK STUDY OF ELECTRICAL COACHING DEPOT UMB & BSB HAVING HIGHEST BENCHMARK MPR WITH ELECTRICAL COACHING DEPOT CDG & BTI HAVING LOWEST BENCHMARK MPR

2018-19

WORK STUDY TEAM

| | | |
|---|---|---|
| SH. LALIT KUMAR | AWSO | LEADER |
| SH. RAM PARSHAD | CWSI | MEMBER |
| SH. RAJIV YADAV | CWSI | MEMBER |
| SH. YOGESH BADHWAR | CWSI | MEMBER |

GUIDANCE BY
SH. ASHOK KUMAR AGARWAL, SWSO

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CENTRAL PLANNING CELL
NORTHERN RAILWAY
HEADQUARTERS OFFICE,
BARODA HOUSE, NEW DELHI

## ***I N D E X***

## SYNOPSIS

Indian Railway is one of the largest government organization which transports passenger and freight traffic from one place to another at an optimum level of safety, security, reliability and punctuality. Railways constant endeavor has been to transform the benefits of improved performances to reach the people and national economy. Railways have been making all possible efforts to make journey more affordable and comfortable through adoption of modernization and system improvements

IR has introduced high speed sophisticated AC coaches to provide comfortable journey to rail users in Rajdhani and Shatabdi trains. The coaches are attended during preventive maintenance in shops/depots for fitness of AC equipments, fans and lights to avoid inconvenience to rail users. Considerable improvements have been achieved with the introduction of 110V DC electric supply in place of 24V DC which was not only the cause of poor service but demanded excessive maintenance with poor output. The least maintenance/ maintenance-free batteries have been provided by replacing old frequently attended/maintenance batteries. The End-on-Generation (EOG) is being used requiring least maintenance and ensures un-interrupted electric supply in Shatabdi/Rajdhani/Duronto and other trains. During the course of observations by Rly Board, it was found that bench mark MPR (man power ratio) of electrical coaching depots UMB and BSB are on higher side in comparison to electrical coaching depot CDG and BTI.

E & R Dte., Rly Board assigned a comparative work study of the electrical coaching depot having highest and lowest bench mark MPR to the Central Planning Cell, Northern Railway, HQ Office. The team reviewed the AC & train lighting staff vis-à-vis existing workload of electrical coaching depots UMB and BSB with higher benchmark MPR side in comparison to electrical coaching depot CDG and BTI with lowest benchmark MPR to find out the reasons of difference in MPR in the system of maintaining the coaches. The team held discussions at various levels to arrive at actual causes of difference in MPR.

## TERMS OF REFERENCE

A comparative Work Study of Activity Centres having highest and lowest benchmark MPR proposed vide E&R Dte. Railway Board's letter No. 217/E&R/2 (1)/1 dt 02.04.2018 for Electrical coaching Depot UMB & BSB & Electrical coaching Depot/CDG & BTI on Northern Railway.

## BASE FOR STUDY

Comparative work study of Electrical Coaching Depot UMB & BSB and Coaching Depot CDG & BTI is proposed on the basis of activity centers having highest and lowest benchmark MPR.

## METHODOLOGY ADOPTED

Method and work measurement techniques of work study were adopted to arrive at fruitful results as follows:-

1. Data Collection with reference to the calculation of Man Power Ratio of Electrical Coaching Depot of UMB, BSB, CDG & BTI and its analysis.

2. Factors effecting the MPR of Electrical Coaching Depot UMB, CDG, BTI & BSB

3. Work sampling/activity sampling to compare actual performance.

4. Held discussions at various levels.

5. Critical analysis of variation in MPR.

6. Observation and recommendations to improve MPR

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**SUMMARY OF SUGGESTIONS**

1. The combined staff strength of AC coaching UMB and ACSP should be separated to avoid ambiguity.
2. Coaches equipped with under slung AC units should be replaced with Roof Mounted AC package Units( RMPU) type LHB coaches in Coaching Depot BSB in phased manner to improve the MPR.
3. Activities which are not directly infringing safety should be out sourced.
4. Structural improvement like better drainage, illumination, cleaning of washing line pits to enhance efficiency of coaching depots.

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## 1.0.0 INTRODUCTION

1.1.0 In its endeavor to provide comfortable and affordable journey to rail users, Railways have adopted modern techniques due to modernization and upgraded systems. Modernization and improved services which have resulted in increase the revenue expenditure.

1.1.1 The electrical maintenance of coaches is a vital activity as it is comfort oriented service. A coach thorough fit to run but may not be electrically fit becomes a cause of complaint and a major factor for loss of railway revenue as well as cause of detention.

1.1.2 A considerable number of staff is engaged for carrying out the electrical maintenance activities in coaches. Due to modernization, certain activities have either been closed or modified. After adoption of 110V DC supply in place of 24V DC supply, a lot of activities have been closed as 24V supply equipments required more maintenance in comparison to 110V DC supply. After introduction of EOG and replacement of under slung AC equipments in conventional type Self Generating (SG) coaches with Roof Mounted AC Package Unit (RMPU) in the coaches have resulted less maintenance.

1.1.3 Keeping in view above, Rly Board assigned to conduct a comparative work study of the electrical coaching depots having highest and lowest bench mark MPR to Northern Railway, Central Planning Cell, HQ Office. The work study team reviewed the AC & train lighting staff vis-à-vis existing workload to find out the reasons of difference in MPR in the system of maintaining of coaches. The team held discussions at various levels to arrive at actual causes of difference in MPR.

## 2.0.0 STAFF POSITION, COMPARATIVE WORKLOAD, MPR CALCULATION, CRITICAL ANALYSIS, GENERAL OBSERVATIONS AND RECOMMENDATIONS.

### 2.1.0 STAFF POSITION

The total sanctioned and on roll staff strength of Electrical Coaching Depots UMB, BSB , CDG & BTI as provided by Depot Incharges are as under:-

| Elect Coaching Depot | Deptt | Sanctioned strength | On Roll | Variation |
|---|---|---|---|---|
| Ambala | AC COACHING | 51 | 14 | 10 |
| | ACSP | | *27* | |
| | TL | 61 | *35* | 26 |
| | **Total** | **112** | **76** | **36** |
| CDG | AC | 146 | 79 | 67 |
| | TL | 57 | 44 | 13 |
| | **Total** | **203** | **123** | **80** |
| BTI | AC | 13 | 9 | 4 |
| | TL | 40 | 30 | 10 |
| | **Total** | **53** | **39** | **14** |
| BSB | AC | 102 | 167 | +65 |
| | TL | 133 | 88 | 45 |
| | **Total** | **235** | **255** | **+20** |

2.1.1 The maintenance activities broadly carried out by AC & train lighting staff. Work study team visited the Base depots and observed the following activities :-

1. Primary maintenance at base depots.
2. Secondary maintenance at destination/terminals/STR
3. Sick line attention of coaches.
4. Enroute examination to passing through train attention.
5. Escorting important/nominated trains.

### 2.1.2 PRIMARY MAINTENANCE

The primary based trains on completion of their trip are given primary maintenance by electrical train lighting staff in base depots in which dynamos/alternators are given extensive maintenance. In the present scenario 24 V dynamos have been replaced by 110 V alternators which

require less time for maintenance as compared to conventional dynamos. To ensure un-interrupted electric supply distribution, the regulators, main fuses, MCBs and junction boxes are checked and changed/repaired if required. The axle pulley is checked and optimum belt tension is maintained. Battery is checked by measuring voltage and specific gravity and distilled water is added whenever required. Lighting system is checked to ensure that all Tube lights, lamps & fans are in working order. Defective switches and lamps are repaired/replaced. Every lamp reflector is opened and cleaned. The complete examination of fan blades/carbon brushes is carried out if required. It is ensured that all fans in coaches are in working order. Simultaneously, the extensive wiring examination is also carried out and repaired/attended as required.

### 2.1.2 SECONDARY MAINTENANCE

Extensive inspection is carried out during secondary maintenance. The difference is that during primary maintenance the deficiency/defects are attended whenever required but during secondary maintenance deficiencies are attended. The other difference is that the schedules are adhered only for primary maintenance base coaches.

### 2.1.3 SCHEDULE MAINTENANCE

The primary based coaches are given thorough examination and repair of AC/TL equipments carried out periodically i.e., fortnightly/monthly schedules as per extent instructions by the concerned department in addition to the regular primary maintenance. Keeping in view the safety and public amenity, special attention is given to all equipments. Heavy repairs are undertaken at base depots for under gear equipments, alternators, batteries, switch gears, wiring etc.

### 2.1.4 MAINTENANCE OF TERMINAL TRAINS/STR.

On arrival of trains at platforms the terminating stations, the lamps and fans are switched off after examining electric equipments. On placement of trains at originating station on the platform, the Electrical coaching staff attends Air-conditioning system of AC coaches, lamps, light points and fans.

### 2.1.5 ESCORTING STAFF

The staff is required to be sent to escort primary based trains in AC coaches so as to attend air conditioning system & electric train lighting defects if any, enroute/during the run of train.

2.1.6 Topping up of distilled water is necessary in the lead acid batteries of coaches to meet the requirement of deficient distilled water in battery cells. For this purpose, the distilled water generating plants are installed at major electric coaching depots at UMB, CDG, BTI & BSB.

**2.2.0 CATEGORY WISE STAFF POSITION**: Category wise staff position of AC & TL staff working in Electrical coaching depots UMB, CDG, BTI and BSB is as under:

***A.) TL COACHING Staff:-***

| ***Cadre*** | ***UMB*** | | | ***CDG*** | | | ***BTI*** | | | ***BSB*** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *S/S* | *O/R* | *Vac* | *S/S* | *O/R* | *Vac* | *S/S* | *O/R* | *Vac* | *S/S* | *O/R* | *Vac* |
| Supervisor | 02 | 02 | -- | 02 | 02 | -- | 02 | 01 | 01 | 08 | 03 | 05 |
| Ministerial | 01 | 01 | -- | -- | -- | -- | 01 | -- | 01 | 02 | 01 | 01 |
| Artisan | 41 | 20 | 21 | 37 | 14 | 23 | 22 | 21 | 01 | 83 | 34 | 49 |
| Gr 'D' | 17 | 12 | 05 | 18 | 28 | +10 | 15 | 08 | 07 | 40 | 50 | +10 |
| Total | 61 | 35 | 26 | 57 | 44 | 13 | 40 | 30 | 10 | 133 | 88 | 45 |

B***.) AC COACHING Staff:-***

| **Cadre** | **UMB*** | | | **CDG** | | | **BTI** | | | **BSB** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **S/S** | **O/R** | **Vac** | **S/S** | **O/R** | **Vac** | **S/S** | **O/R** | **Vac** | **S/S** | **O/R** | **Vac** |
| Supervisor | 02 | 03 | +1 | 06 | 06 | -- | -- | -- | -- | 09 | 06 | +03 |
| Ministerial | 01 | 01 | -- | 02 | 02 | -- | -- | -- | -- | 02 | 02 | -- |
| Artisan | 35 | 30 | 05 | 74 | 34 | 40 | 05 | 05 | -- | 58 | 56 | +02 |
| Gr 'D' | 13 | 07 | 06 | 64 | 37 | 27 | 08 | 04 | 04 | 33 | 103 | 70 |
| Total | 51 | 41 | 10 | 146 | 79 | 67 | 13 | 09 | 04 | 102 | 167 | -65 |

****Inclusive of Air Conditioning Stationary Plant (ACSP) staff. The work load of ACSP is more than AC coaching. Both ACSP and AC coaching of UMB Depot are supervised by the common SSE, designated as SSE/ACSP & AC Coaching.***

**2.2.1 Workload of Electrical Coaching Depots UMB, CDG, BTI and BSB is depicted below.**

**2.2.2 (i) Electrical Coaching Depot UMB**

| SN | Activity | Workload | |
|---|---|---|---|
| | | ***TL*** | ***AC*** |
| 1 | Primary maintenance | 52 coach holding | 04 Coach holding |
| 2 | Secondary maintenance. | -- | - |
| 3 | Passing through trains | 652 coach per day | 116 coach per day |
| 4 | Sick line | 52 coach holding | 04 Coach holding |
| 5 | Store Handling | 52 coach holding | 04 Coach holding |

***(ii) Electrical Air Conditioning Stationary Plant (ACSP)/UMB:-***

| S N | Assets | Nos. | No of Staff Deployed for maintenance |
|---|---|---|---|
| 1 | Window AC 1.5 Tons | 250 | 27 staff |
| 2 | Split AC 1.5/2.0 tons | 147 | |
| 3 | Water cooler | 152 | |
| 4 | Refrigerators | 61 | |
| 5 | Package type AC Plant in DRM Off Cap 17.0/11 Tons | 03 of 17 tons.<br>03 of 11 tons. | Out sourced |
| 6 | VRF System 10 ton/12 HP | 02 | |

The present sanctioned and on roll staff of AC coaching Depot & ACSP of UMB is unified. As per data provided by the depot Incharge the deployment of staff is as under:

| S. N. | Total on roll staff strength | On roll | |
|---|---|---|---|
| | | For AC Coaching | For ACSP |
| 1 | 41 | 14 | 27 |

**2.2.3 Calculation of Man Power Ratio (MPR).**

Formulae MPR: MPR = $\frac{\text{Total on roll strength}}{\text{Total Coach Holding of TL/AC depots}}$

For calculation of MPR total no. of on roll staff , all supervisors, ministerial, artisan and group “D staff” of Train lighting and AC coaching depot are taken in to consideration.

## 2.3.0 *MPR CALCULATION*

### 2.3.1 Electrical Coaching Depot UMB

| S. No. | Depot | Unit | | Coach holding | On roll staff | MPR per coach |
|---|---|---|---|---|---|---|
| 1 | UMB | TL | Primary | 52 | 35 | 49/56 =0.87 |
| | | | Secondary | - | | |
| | | AC | Primary | 04 | 14 | |
| | | | Secondary | - | | |
| | | Total | | 56 | 49 | |

The above table reveals that the MPR of Electrical coaching depots UMB comes to 0.87 but as per Board's letter no. 2017/E&R/02(1)/1 dt.02-04-18 the MPR of UMB is 1.49 per coach.

During the course of review, it was observed that both ACSP and AC coaching staff of UMB is unified and supervised by common SSE designated as SSE/ACSP & AC Coaching. As per data provided by Depot incharge, staff is unified i.e. out of 41 on roll staff 27 staff are deployed for the maintenance of AC Stationary Plants and 14 are deployed for AC Coaching. Thus benchmark MPR of Electrical Coaching Depot, UMB with on roll strength of 49 (i.e. 35+ 14) comes to 0.87.

Factors affecting the MPR of Electrical Coaching Depot Ambala (UMB):

1. Staff of AC coaching and AC Stationary Plant (SP) are unified under common SSE
2. Staff of Ac coaching and AC Stationary Plant (SP) should be separated
3. AC coaches at UMB are of SGAC (Self Generating under slung) type which requires more maintenance.
4. Heavy traffic density of passing through trains increases the wear-tear of the equipments and requires more maintenance staff.

### 2.3.2 Electrical Coaching Depot CDG.

| SN | Activity | Workload | |
|---|---|---|---|
| | | TL | AC |
| 1 | Primary maintenance | 98 coach holding | 70 Coach holding |
| 2 | Secondary maintenance. | 212 coach holding | 46 coach holding |
| 3 | Terminating trains/STR | 89 coach per day | 44 coach per day |
| 3 | Passing through trans | 246 coach | 63 coach per day |
| 4 | Sick line | 98 coach holding | 70Coach holding |
| 5 | Store Handling | 98 coach holding | 70 Coach holding |

**MPR Calculation**

| S. No. | Depot | Unit | | Coach holding | On roll staff | MPR per coach |
|---|---|---|---|---|---|---|
| 1 | CDG | TL | Primary | 98 | 44 | 123/426=0.28 |
| | | | Secondary | 212 | | |
| | | AC | Primary | 70 | 79 | |
| | | | Secondary | 46 | | |
| | | Total | | 426 | 123 | |

The above table reveals that the MPR of Electrical coaching depot CDG comes to 0.28 on the existing workload but as per Board's letter no. 2017/E&R/02(1)/1 dt.02-04-18 the MPR of CDG is 0.23 per coach which may vary due to slight difference in workload.

### 2.3.3 Electrical Coaching Depot BTI.

| SN | Activity | Workload | |
|---|---|---|---|
| | | **TL** | **AC** |
| 1 | Primary maintenance | 91 coach holding | 02 Coach holding |
| 2 | Secondary maintenance. | 90 coach holding | 18 coach holding |
| 3 | Terminating trains/STR | - | - |
| 3 | Passing through trans | 84 trains | 47 coach per day |
| 4 | Sick line | 91 coach holding | 02 Coach holding |
| 5 | Store Handling | 91 coach holding | 02 Coach holding |

**MPR Calculation**

| S. No. | Depot | Unit | | Coach holding | On roll staff | MPR per coach |
|---|---|---|---|---|---|---|
| 1 | BTI | TL | Primary | 91 | 30 | 39/201=0.19 |
| | | | Secondary | 90 | | |
| | | AC | Primary | 02 | 09 | |
| | | | Secondary | 18 | | |
| | | Total | | 201 | 39 | |

The above table reveals that the MPR of BTI Electrical coaching depots comes to 0.19 on existing workload but as per Board's letter no. 2017/E&R/02(1)/1 dt.02-04-18 the MPR of BTI is 0.23 per coach. During the course of review, it was observed that the MPR of Electrical Coaching Depot, BTI has improved.

### 2.3.4 Electrical Coaching Depot Varanasi (BSB).

| SN | Activity | Workload | |
|---|---|---|---|
| | | TL | AC |
| 1 | Primary maintenance | 196 coach holding | 61 Coach holding |
| 2 | Secondary maintenance. | 50 coach holding | 11 coach holding |
| 3 | Terminating trains/STR | 89 coach per day | 23 train |
| 3 | Passing through trans | 90 trains per day | 70 trains coaches |
| 4 | Sick line | 196 coach holding | 61 Coach holding |
| 5 | Store Handling | 196 coach holding | 61 Coach holding |

**MPR Calculation**

| S. No. | Depot | Unit | | Coach holding | On roll staff | MPR per coach |
|---|---|---|---|---|---|---|
| 1 | BSB | TL | Primary | 196 | 88 | 255/318=0.80 |
| | | | Secondary | 50 | | |
| | | AC | Primary | 61 | 167 | |
| | | | Secondary | 11 | | |
| | | Total | | 318 | 255 | |

The above table reveals that the MPR of BSB Electrical coaching depots comes to 0.80 on existing workload but as per Board's office letter no. 2017/E&R/02(1)/1 dt.02-04-18 the MPR of BSB is 1.49 per coach. During the course of review, it was observed that the MPR of Electrical Coaching Depot, BSB has improved to 0.80.

**Factors affecting the MPR of Electrical Coaching Depot Varanasi (BSB):**

1) *Most of the AC coaches at BSB are of under slung type which requires more maintenance in comparison to RMPU type AC coaches.*
2) *Heavy traffic density increases the wear-tear of the equipments and thereby requires more maintenance staff.*
3) *The structural facilities like over aged assets and congested space for maintenance.*

## 3.0.0 CRITICAL ANALYSIS

3.1.0 During the course of review it was observed that both Air Conditioning Stationary Plant (ACSP) and Electrical Coaching of UMB staff are combined and supervised by common SSE, designated as SSE/ACSP & AC Coaching. As Staff is combined and out of on roll 41 AC staff 14 staff are deployed for maintaining AC coaches and 27 staff are maintaining Air Condition Stationary Plants (ACSP). The workload of ACSP is more than AC coaching maintenance. Due to combined staff of AC Coaching and ACSP, MPR comes to higher side. Considering 14 staff for AC coach maintenance, MPR comes to 0.87 instead of 1.49.

3.2.0 During the course of review it was observed that at Electrical Coaching Depot, BSB most of the AC Coaches are of under slung type which require more maintenance than the RMPU type AC coaches. The MPR of Electrical Coaching Depot, BSB comes to 0.80 in comparison to 1.49 as per Railway Board's letter. the other reasons of increased MPR are heavy traffic density, over aged infrastructure and congested space for Electrical Coaching Depot BSB.

## 4.0.0 SUMMARISED MPR OF ELECTRICAL COACHING DEPOT

| S. No. | Depot | Unit | | Coach holding | On roll staff | MPR per coach as per existing work load | *MPR as per Rly. Board* |
|---|---|---|---|---|---|---|---|
| 1 | UMB | TL | Primary | 52 | 35 | **49/56=0.87** | *1.49* |
| | | | Secondary | - | | | |
| | | AC | Primary | 04 | 14 | | |
| | | | Secondary | - | | | |
| | | Total | | 56 | 49 | | |
| 2 | CDG | TL | Primary | 98 | 44 | **123/426=0.28** | *0.23* |
| | | | Secondary | 212 | | | |
| | | AC | Primary | 70 | 79 | | |
| | | | Secondary | 46 | | | |
| | | Total | | 426 | 123 | | |
| 3 | BTI | TL | Primary | 91 | 30 | **39/201=0.19** | *0.23* |
| | | | Secondary | 90 | | | |
| | | AC | Primary | 02 | 09 | | |
| | | | Secondary | 18 | | | |
| | | Total | | 201 | 39 | | |
| 4 | BSB | TL | Primary | 196 | 88 | **255/318=0.80** | *1.49* |
| | | | Secondary | 50 | | | |
| | | AC | Primary | 61 | 167 | | |
| | | | Secondary | 11 | | | |
| | | Total | | 318 | 255 | | |

***The table at para 4.0.0 reveals that:***

1. Only two Electrical Coaching Depots i.e. BSB & CDG having coach holding 318 & 426 respectively fulfill the bench mark norms of more than 300 coach holding. However Electrical Coaching Depots/UMB and BTI have coach holding 56 & 201 respectively which are less than 300.

2. During the conduct of study it was observed that in Electrical Coaching Depot/UMB the benchmark MPR calculation i.e. 1.49 is based on the combined maintenance staff of AC Coaching and Air-Conditioning Stationary Plant (ACSP) maintenance staff. If the staff deployed for AC Coaching maintenance is excluded from the on roll staff of ACSP maintenance, the MPR comes to 0.87 which is less than the Rly. Board benchmark MPR of Electrical Coaching Depot/UMB.

3. Electrical Coaching Depot, BSB having higher MPR maintains 72 no. of AC coaches, comprising 18 nos. RMPU type and remaining 54 Self generating AC under slung types requires more man power for maintenance in comparison to RMPU type coaches as per prevailing guidelines (yard stick) issued Rly. Board

4. Over aged infrastructure and congested space for Electrical Coaching Depot at BSB resulting higher MPR in comparison to lower MPR of BTI & CDG. The CDG Depot is equipped with latest maintenance facilities for coach maintenance.

5. In Electrical Coaching Depots, generally, more staff is required for Primary maintenance of AC/TL coaches as compared to Secondary maintenance, which is just double from secondary maintenance as per existing Railway Board's yardstick. MPR has been calculated taking combined coach holding for primary and secondary maintenance. Hence, in those Depots, where primary maintenance coach holding is more, the MPR will be higher. Whereas, these factors have not been taken into consideration while calculating the MPR. Therefore, these MPR cannot be applied universally on all Electrical Coaching Depots.

## 5.0.0 Activities which are outsourced at the Electrical Coaching Depots.

| S. No. | Depot | Activities out sourced | No. of contractual staff | No. of retired staff re-engaged. |
|---|---|---|---|---|
| 1 | UMB | - | - | - |
| 2 | CDG | - | - | - |
| 3 | BTI | AMC of 25 KVA inverter in AC coaches. | - | - |
| 4 | BSB | Maintenance and escorting staff activities of 03 power cars. | - | - |
| | | Attendant activities of 18 AC coaches(Train no. 22407/08) | - | - |

## 6.0.0 Best practices of the Electrical Coaching Depots.

| S. No. | Depot | Best practices |
|---|---|---|
| 1 | UMB | Repairing of 110 V DC fans. |
| | | Repairing of RRU(Regulator cum rectifier unit) |
| | | Repairing of alternators of TL & AC coaches |
| 2 | CDG | - |
| 3 | BTI | Repairing of DC fans 110 V DC. |
| | | Repairing of RRU(Regulator cum rectifier unit) |
| | | Repairing of alternators of TL & AC coaches. |
| 4 | BSB | Defective suspension (bush and pin) of alternator are changed at washing line instead of sick line to avoid detention of coaches and unnecessary shunting. |
| | | Welding work of battery box is being done at washing line instead of sick line to avoid unnecessary shunting & detention o coaches. |
| | | Testing of AC coach equipments i.e. Compressors, condenser motors, blower motors, thermostat, over load relays, MCCBs etc. in electronic lab in depot. |

## 7.0.0 Practices needs to be improved in the Electrical Coaching Depots.

| S. No. | Depot | Best practices |
|---|---|---|
| 1 | UMB | Self Generated Coaches equipped with under slung AC units to be replaced by RMPU coaches. |
| | | Dynamo drive for checking function of alternator or regulator. |
| | | Replacement of conventional fans by BLDC fans, replacement of ordinary FTL tubes with LED tube lights. |
| | | The infrastructure of washing line pit be properly maintained for maintenance of coaches. |
| 2 | CDG | Self Generated Coaches equipped with under slung AC units to be replaced by RMPU coaches |
| | | Replacement of old fans by BLDC fans, replacement ordinary FTL tubes with LED tube lights. |
| | | Dynamo drive for checking of function of alternator or regulator. |
| | | The infrastructure of washing line pit be properly maintained for maintenance of coaches. |
| 3 | BTI | Self Generated Coaches equipped with under slung AC units to be replaced by RMPU coaches |
| | | Dynamo drive for checking of function of alternator or regulator. |
| | | Replacement of old fans by BLDC fans, replacement ordinary FTL tubes with LED tube lights. |
| | | The infrastructure of washing line pit be properly maintained for maintenance of coaches. |
| 4 | BSB | Self Generated Coaches equipped with under slung AC units to be replaced by RMPU coaches |
| | | Area of electrical coaching complex is congested and should be enhanced for better efficiency. |
| | | Provision of initial charging of lead acid batteries. |
| | | Dynamo drive for checking of function of alternator or regulator. |
| | | Replacement of old fans by BLDC fans, replacement ordinary FTL tubes with LED tube lights. |
| | | The infrastructure of washing line pit be properly maintained for maintenance of coaches. |

## 8.0.0 Activities which may be outsourced in the Electrical Coaching Depots.

| S. No. | Depot | Activities |
|---|---|---|
| 1 | UMB | Cleaning of switch boards, tube lights and fans etc. |
| 2 | CDG | Maintenance, operation and escorting activities of power cars. |
| | | Cleaning and maintenance of switch boards, tube lights and fans. |
| | | AMC of fresh and returned air filter of AC coaches. |
| | | Washing of condenser and evaporators coils. |
| 3 | BTI | Cleaning and maintenance of switch boards, tube lights and fans. |
| | | AMC of fresh and returned air filter of AC coaches. |
| | | Washing of condenser and evaporators coils. |
| | | Escorting activities in AC coaches. |
| 4 | BSB | Activities of Coach attendant are partially outsourced, should be fully outsourced. |
| | | AMC of batteries. |
| | | Cleaning and maintenance of switch boards, tube lights and fans. |
| | | AMC of fresh and returned air filter of AC coaches. |
| | | Washing of condenser and evaporators coils. |

## 9.0.0 OBSERVATION AND RECOMMENDATIONS

9.1.0 On the basis of critical analysis, variation in MPR of Electrical Coaching Depots at UMB, CDG, BTI and BSB, the work study team makes the following observations and recommendations.

## 10.0.0 OBSERVATIONS:

i. It is observed that, staff of both Air Conditioning Stationary Plant (ACSP) & AC Coaching are combined and supervised by common SSE designated SSE/ACSP & AC Coaching , due to which MPR of Electrical Coaching Depot comes to higher side.

ii. Heavy traffic density of passing through trains in UMB and BSB.

iii. Most of the AC Coaches in Electrical Coaching Depot BSB are under slung type which requires more maintenance than the RMPU type, where as in CDG Coaching most of the coaches are of RMPU type which require less man power for maintenance.

iv. Over aged infrastructure and congested space for Electrical Coaching Depot at BSB required more manpower which directly influences the MPR.

## 10.1.0 SUGGESTIONS:

The following steps are suggested for achieving better MPR in the Electrical Coaching Depots.

i. The combined staff strength of AC coaching UMB and ACSP should be separated to avoid ambiguity.

ii. Coaches equipped with under slung units should be replaced with RMPU type LHB coaches in Electrical Coaching Depot BSB in phased manner to improve the MPR.

iii. Activities which are not directly infringing safety should be out sourced.

iv. Structural improvement like better drainage, illumination, cleaning of washing line pits to enhance efficiency of coaching depots.