



ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION

PRD1/462(01)/2013-14

O/o the VC & MD
Hyderabad -624

CIRCULAR No 15/2013-MED, date: 26/07/2013

Sub: Special Focus on Electrical Maintenance- Observance of Bus Electrical Systems Fortnight from 16.08.2013 to 31.08.2013 - Reg.

- Ref: 1) Circular No.14/83 - MED Dated 1-7-1983 on Maintenance of Electrical systems.
2) Circular No. 26/93 MED., Dt. 18 06 1993 on preventive maintenance of Tata Electrical system.
3) Circular No 1/93 MED., Dt. 29-01 1993 on preventive maintenance of Ashok Leyland Electrical system.

In the present competitive environment in transport sector, retaining the customer is utmost importance for further flourishing of an Organization like ours.

The opportunity given by the esteemed commuters to provide punctual, reliable, safe and breakdown free (**Zero breakdown**) services with a clean and tidy bus, if utilized properly, will go in a long way in retaining the patronage. It is quite relevant to recall these opportunities and rededicate ourselves for the healthy and prosperity of our organization.

All of us know that the good condition Vehicle will yield good earnings, the healthy fleet reveals the Maintenance Standards of the Depot. The Breakdown rate at corporate level during the year 2012-13 is 0.07 per 10,000 kms of operation.

On reviewing the Breakdown rate it is observed that 7% of Breakdowns were due to Electrical reasons i.e., Alternator & Self Starter failures. It clearly shows that the preventive maintenance on the Electrical System is not followed scrupulously and the failures are not analyzed critically.

In spite of several guidelines issued from time to time from Head Office on Maintenance of **Electrical System**, it is observed that some of Units (Depots) were neglecting the above aspects, due to which the contribution of **Electrical Failures** are more.

Apart from this the Corporation is spending around 40 Crores on Electrical Maintenance every year. During the Year 2012-13 around Rs.20 Crores was incurred on Batteries and around Rs.6Crores was incurred for Overhauling of Self Starters and Alternators in the Corporation. Apart from this around Rs.14Crores was spent on Electrical parts such as Combination Switch, Head Lights Bulbs, Piano Switches, Indicator, 2Way Switches Flashers, Battery Terminals and Wiring Kits etc.

In the recent past the Vehicles which were introduced in the Corporation was equipped with the Latest Models Self Starter, Alternator, EMR, LED Lighting, LED Destination Boards, LED Indicators & Multiplex Wiring etc.

In order to have awareness on the Latest Models and to reduce the expenditure and to avoid enroute failure of Vehicles, it is felt that a comprehensive special drive on Bus Electrical Maintenance practices is necessary to brush up and drive the Units (Depots) towards improved practices of Electrical Maintenance.

Accordingly, it is decided to conduct "Electrical Care Fortnight" during the month of August from 16.08.2013 to 31.08.2013. The aim of this Fortnight is to keep all the Electrical systems on stipulated track besides refreshing the knowledge and skills of the supervisors and the concerned staff on the New Technology Developments on Electrical Systems such as Multiplex Wiring, LED Destination Boards, LED Lighting, Latest Models of Self Starters & Alternators.

The following aspects have to be taken care during the Electrical care fortnight which is broadly divided into three phases.

1. Preparatory Planning:

- **At Depots (1st August – 15th August):** During the preparatory planning the concerned Depot Managers are advised to take **Census of all the Vehicles** for the Lapses on Electrical Systems as per the check list enclosed in the **Annexure – 1**.
- **At Zonal Workshops((1st August – 15th August):** During the preparatory planning the concerned Works Managers are advised to check the Non Moving items, Floor Balances and Obsolete Items in the Electrical Section and action to be taken to segregate them into **Scrap/ Serviceable/Retrieval** and focus on the improvement of the Upkeep of **Electrical Section**.
- Works Managers are also advised to carry out the **Quality Checks** during the Overhauling of **Electrical Items**.

2. Plan of Action during the Electrical Care Maintenance (16th August'13 to 31st August'13):

• At Depots:

- Display of banners and permanent Display of Electrical Maintenance care practices on flexi sheets at appropriate places.
- Brainstorming sessions to be conducted involving the Electricians and the concerned Staff.
- Classroom like training on the gravity of lapses, their repercussion, Awareness on attention etc.
- All the relevant circulars and latest guidelines shall be explained and Discussed in detail.
- Allocation of works with time bound implementation.
- Sending of Electricians for practical training at respective Zonal Workshops.

• At Zonal Workshops:

- Analysis of Electrical Units Failures.
- Measures to be implemented to reduce the Electrical Failures at Workshops.
- Practical Training for the Depot Electricians to be organized exclusively for the Latest Models duly involving the OEMs.

3. Attention and Rededication:

All the Electrical Defects on Vehicles shall be attended in this fortnight with the assistance of workshops and stores.

The Depot Managers are advised to involve themselves in setting the standards of Electrical Maintenance practices at the respective Depots. They shall effectively utilize the Electrical Maintenance care fortnight and lead the supervisors and their team with a result oriented approach.

The Dy.Chief Mechanical Engineers have to take lead throughout the Fortnight and see that the correct Electrical systems are established so strongly that the same are continued in future with normal supervisory attention as such. They should see that staff is sufficiently motivated to run the Electrical Maintenance Care system effectively and efficiently in the coming months.

The Dy.Chief Mechanical Engineers are advised to send the Depot wise consolidated Census reports to the Head Office and advised to visit all the Depots and carryout the random inspection of Vehicles on Electrical Systems.

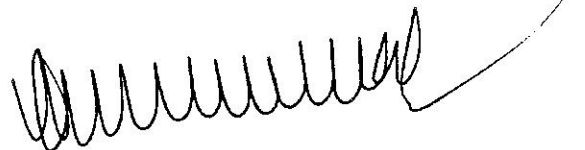
Depot wise observations and action taken plan to improve the Electrical System shall be sent to Head Office.

The **Regional Managers** are advised to bestow their personal attention in inculcating the very purpose of 'Electrical Maintenance care Fortnight' among the supervisors and work men.

The Regional Managers are advised to **conduct an exclusive meeting** with the Depot Managers, Maintenance in charges, Electricians and the Sch-1 mechanics **during the Electrical Maintenance care Fortnight** to review specifically on the lapses of Electrical Maintenance activity and **set goals to the Depots**. During the Meeting, Mechanical Engineering Department Team from Head Office will also participate to review the action taken during the **Bus Electrical Systems Fortnight**.

The **Regional Managers** are advised to send the **detailed compliance** report on the "Electrical Maintenance Care Fortnight" conducted in the respective Region, by **15th Sept' 2013** to Head Office.

The **Executive Directors** of the Zones are requested to ensure the effective **Implementation** of "Electrical Maintenance care Fortnight". **Evaluation of Depots** on their committed and result oriented efforts during the fortnight may be appreciated as apart of motivation and recognition. The **Zonal Workshop** under respective jurisdiction shall also conduct 'Electrical Maintenance care Fortnight" in the **relevant way** to **prune the quality checks** and to motivate the staff to achieve and continue the required quality standards.



Vice Chairman & Managing Director

Copy to: DIR (V&S) for information.

Copy to: All Executive Directors/FA & CAO for information and necessary action.

Copy to: CME (O)/CME (C&B)/CCOS & CE (IT) for information and necessary action.

Copy to: All Regional Managers for information and necessary action.

Copy to: All Dy.CMEs, COSs & Works Managers for information and necessary action.

Copy to: Principals of TA & ZSTCs for information and necessary action.

Copy to: Depot Managers for information and necessary action.

Copy to: All Garrage in-charges for information and necessary action.

PHYSICAL INSPECTION OF VEHICLES ON ELECTRICAL SYSTEMS AT DEPOTS

Sl. No	Description	Vehicle No	Vehicle No	Vehicle No	Vehicle No
		11Z 123			
	Check List (1st Aug'13 to 3rd Aug'13)				
1	Check the Working Condition of Battery Cut Off Switch				
2	Check the Condition of Combination Switch				
3	Check the Working Condition of SS Button & Company/Firm Names to be noted				
4	Check the Condition of SS Ignition Key				
5	Check the Working Condition of Amper Meter				
6	Check the Working Condition of Warning Lamps in the Dash Board				
7	Check the Working Condition of 2Way Switch				
8	Check the Condition of Switches and Switch Board				
9	Check the Wiring Harness at Dash Board				
10	Check the Working Condition of the Roof Lights (Tube Lights)				
11	Check the Working Condition of the LED Roof Lights				
12	Check the Working Condition of the LED Indicators				
13	Check for the Loose Wiring at Roof Lights				
14	Check the Working Condition of D/Board Lights (FMR)				
15	Check the Working Condition of Conductor Light (Old Type/Latest Type)				
16	Check the Working Condition of AC Circuit				
17	Check the Working Condition of Bell Connection (High End Vehicles)				
18	Check the Working Condition of Inverter and Cell Chargers (High End Vehicles)				
19	Check the Audio & Video working condition (High End Vehicles)				
20	Check the Working Condition of Reading Lamps and AC Lowers (High End Vehicles)				
21	Check the Alignment of Alternator Pulley with Water pump Pulley				
22	Check Self Starter Mounting Bolts				
23	Check for Loose Wiring at Self Starter				

PHYSICAL INSPECTION OF VEHICLES ON ELECTRICAL SYSTEMS AT DEPOTS

Sl. No	Description	Vehicle No	Vehicle No	Vehicle No	Vehicle No
		11Z 123			
24	Check the Earth Connection at 3 Points (Battery, SS & Alternator Negative to be Given to Chassis)				
25	Check the Missing of Self Starter cover				
26	Check the Condition of Pinion Teeth				
27	Check the Clutch Slip of Self Starter				
28	Check/Adjust Engine Late Starting problem				
29	Check the Fly Wheel Ring Condition				
30	Check the Mounting Bolts of Alternator				
31	Check the Bearing Play/Sound of the Alternator				
32	Check the Working condition of Pilot Bulb				
33	Check/Clean the Surface of the Battery				
34	Check/Topup Distill Water if necessary				
35	Check formation of Sulphation on + & -ve Poles				
36	Check the Battery Cable connections				
37	Check the Battery Box Condition				
38	Check the working Condition of Head Lights				
39	Check the Working Condition of Indicators & Brake Lights				
40	Check the Working Condition of Dipper				
41	Check the Head Light Focusing				
	Availability of Tools At Depots				
1	Hydrometer				
2	Cell Tester				
3	Bench Wise				
4	Work Bench				
5	Battery Charger Working Condition (Lastet/Old)				
6	Census of Removed Units in the Section (Floor Balances				
7	Upkeep of the Electrical Section				

MAINTENANCE MEASURES FOR ELECTRICAL UNITS

BATTERY: AT DEPOT LEVEL

- 1) Top of the battery should be dry and clean from dust.
- 2) Vent plugs holes shall be cleaned to vent out gas generated
- 3) DM water shall be there on top of the separators (Min.10mm).
- 4) Cell wise voltage and specific gravity shall be checked. Gravity should not below 1.200 and voltage should be 2 volts. If the specific gravity is less, then the battery shall be charges on bench charging with 8-10 amps current. The gravity shall be recorded for every 6 hours and battery charging shall be disconnected once it is ensured the gravity won't rise further.
- 5) Positive, negative terminal and lug should be soldered to cables and shall be kept clean, tight and applied with petroleum jelly.
- 6) There shall not be any vibrations of the battery in the battery box. Proper packing on sides, flooring (with Ballata and wooden packing) shall be ensured. Due to vibration of the battery the active material (Lead and Lead Oxide) will fall down and prone for short circuiting.
- 7) Both the batteries in a bus shall be properly matched i.e. age of the battery shall be same as far as possible.
- 8) Battery cable length shall be less with no joints to avoid voltage drop.
- 9) For sliding type battery boxes, the trolleys shall have free movement to take out the batteries.
- 10) Proper working condition of the batteries with specific range of specific gravity and voltage is important for total electrical system functioning i.e. for engine starting, life of self starter and alternator, body lighting etc.

AT WORK SHOP LEVEL:

- 1) After receiving the battery from depots they shall be checked physically for damages if any and tally with the details of history card along with date of fitment and date of removal and no.of days.
- 2) If the battery received in under warranty period such batteries shall be kept separately and inform to AWM-II/WM and also to COS in writing for further claim on the supplier.
- 3) For all other batteries specific gravity and cell voltage shall be checked for all cells. If specific gravity above 1.1 and voltage 1.5 volts, those batteries can be reconditioned by way of keeping them on charging.
- 4) While recharging the entire electrolyte shall be decanted, clean the plates in water and top up with fresh electrolyte. After 36 hours the batteries shall be checked for gravity and voltage for every 6 hours.
- 5) For Charging new batteries received from stores RTC No. shall be punched and electrolyte (1.2 Specific gravity) shall be topped up. After 12 hours of topping up electrolyte (to allow the electrolyte to become cool). 16 batteries shall be connected in series with 200 volts and 10amps.
- 6) After 70 hrs charging the gravity shall be checked for every 6 hrs and once there is no further rise in the gravity then the batteries shall be taken out from the charging connection. Cell wise readings for gravity and voltage shall be recorded in a register. The gravity of fully charged battery shall not be below 1.24.
- 7) For pre-charged batteries, the gravity in each cell shall not be less than 1.22 and battery voltage shall be 12.3 volts.

- 8) The DM water plant shall be maintained properly. The caustic soda (2.5Kg) shall be mixed with 30 Ltrs. Of DM water and poured in anion. Hydrochloric acid (10Ltrs) shall be mixed with 22 Ltrs. Of DM water poured in cation. After one hour the DM water shall be drawn for further usage.

ALTERNATOR:

AT DEPOT LEVEL:

- a) Ensure PVC pilot bulb (3 watt capacity) is functioning (Daily item)
- b) The negative for alternator should be taken from self starter or from chassis.
- c) Alternator fixing bracket shall be tight and firm(Weekly)
- d) Fan and pulley shall be firm and tight.
- e) Baring play shall be checked periodically(Sch-III)
- f) The wear and tear of the "O" ring in SRE shield inner side shall be checked periodically((Sch-III)
- g) The wear and tear of carbon brushes shall be checked periodically. (Sch-III)
- h) The negative connection for alternator shall be taken from self starter.
- i) Ensure tightness of alternator fixing bolts. Use 8mm box spanner for alternator bolts and 24mm box spanner for tightening the pulley.
- j) Turn off the cutout or disconnect the connections of alternators and battery while carrying out welding works on the bus.
- k) The fan belt should be tightening $\frac{3}{4}$ inch movement required in the middle of the belt.

FOR DRIVERS:

- 1) Don't use self starter button for more than 20 sec at a stretch. Other wise armature is prone to burn.
- 2) Observe the pilot bulb glow off while engine is running.

AT WORK SHOP LEVEL:

- 1) Check condition of alternator for any damages.
- 2) Strip the alternator and identify the spares damaged.
- 3) Check the output resistance and leakages of rotor and stator on test bench.
The resistance for rotor shall be in between 10.9 to 13.6 and that of stator should be in between 4 and 5. Check the polarity of the diodes.
- 4) All the spares shall be washed in kerosene and the rotor and stator shall be washed in petrol.
- 5) All spares, rotor and stator shall be allowed to dry after washing.
- 6) Replace the damaged spares/ parts with serviceable/new one and carryout the assembling the alternator.
- 7) After assembling carryout the load test on test bench i.e. 30 amps load for 30 amps alternator 50 amps alternator 75 amps alternator and 90 amps load for 90/100 amps alternator.
- 8) After checking all the items fix the dust cover and make the unit available for dispatch.

SELF STATER: AT DEPOT LEVEL:

- 1) For effective working and good life of self starter the condition of battery its gravity and cell voltage is important. The armature of the self starter may be burn if either of these two are low.
- 2) The negative connection for self starter shall be connected to chassis.
- 3) Ensure self starter ignition key is tight and firm,
- 4) Ensure that carbon is not deposited below the starter push button.
- 5) The contact points of solenoid switch shall be free from carbon deposits and the carbon points shall be cleaned with smooth emery paper. The first contact (moving contact) gap shall be 3.79mm
- 6) Lubricate the DE shield for every 10000 Kms of operation(Sch.III)
- 7) Ensure tightness and firmness of the plunger nut and lubrication of plunger(Sch.III)
- 8) Ensure proper position of C bush, D bush and pinion bush.
- 9) Clean the commutator of the armature and ensure it is dust and carbon free.
- 10) Observe the wear and tear of carbon brushes and tightness of the fixing screw of brush gear.
- 11) Ensure the pinion teeth are not excessively worn out.
- 12) Tighten the clutch plate (brass and steel) with 125 ft lb torque.
- 13) Ensure proper mounting of self starter on engine.
- 14) Petroleum jelly to be applied on solenoid plunger and spring.

FOR GBS-5 SELF STARTER: AT WORK SHOP LEVEL:

ARMATURE:

- 1) Check the armature body short and grwler short.
- 2) Wash the armature in petrol.
- 3) Clean the commutator with smooth emery paper and clean the segments with hack-saw blade.
- 4) Tighten the trip plate screws
- 5) Check the armature shaft threads.
- 6) Apply petroleum jelly to the plunger rod.
- 7) Observe the CE bushes with pin baring if worn out replace.

CLUTCH PLATES:

- 1) Wash the clutch plates in kerosene and wipe dry.
- 2) Check the plates if it is smooth should be replaced.
- 3) Adjust the clutch assembly to slip at 125 to 150 ft lb.
- 4) Check DE bush with pinion if there is play change the DE bush, and check the felt pad in the DE shield.

PINION:

- 1) Check the pinion bushes and teeth if worn out replaced.

BODY:

- 1) Check the auxiliary field coil resistance with common wire to positive wire the ohms should be 1.9 ohms and common wire and negative wire should be 1.4 ohms.
- 2) Check the continuity of field coil

SOLINIOD SWITCH:

- 1) Check the solenoid switch coil resistance it should be 5 ohms
- 2) Contact points if worn out should be cleaned with emery paper, if not possible to be replaced with new one.
- 3) First contact gap should be 3.79mm and observe the trigger if worn out replace.
- 4) Tighten the bottom nut to the plunger and apply petroleum jelly to the plunger.
- 5) Observe the fixed contact screws and bushes if worn out replaced.

BRUSH GEAR:

- 1) Check the carbon brushes spring tension the tension should be tight all 4 sides equally.
- 2) Observe the insulation bushes for the brush gear.

C-E Shield:

- 1) Observe minor cracks on the CE shield
- 2) Tighten pin bearing screws.
- 3) Observe the terminals (Positive and negative) and insulation bushes if worn out replaced.

9m 14 SELF STARTERS:**AT WORK SHOP LEVEL:**

- 1) Check the commutator for body short with 110AC current.
- 2) Check the growler Short
- 3) Clean the commutator segments.
- 4) Check the body short of field coils with AC current the resistance should be 2-4 ohms.
- 5) Carbon brushed should be parallel replaced the worn out with new ones.
- 6) Check the condition of brush gear springs and ensure that the base of all 4 bushes parallel and uniform.
- 7) Check the bearing bush condition of fixing bracket, end cover and internal cover. They should be parallel and uniform other wise change the bushes.
- 8) Replace worn out engaged lever with new one.
- 9) The gap between the drive assembly and fixing bracket should be 0.22mm.