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Government of India - Ministry of Railways
Research Designs & Standards Organisation,
Manak Nagar, Lucknow-226 011.

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Special Maintenance Instructions No.EL-RS/SMI 112

1. Title:

Maintenance Instructions for Electric Loco & EMU Batteries(lead acid type) of 90 Ah and 75 Ah capacity at 5 hrs rate covered by IS:7660.

2. Application:

All electric loco & EMU's using 90 Ah and 75 Ah lead acid batteries.

3. Reason and objective for Instructions:

The periodical Inspection of Electric Loco and EMU Sheds of various Railways, have indicated that maintenance procedure is at variance from Railway to Railway. The maintenance procedure to initially charge the batteries & norms to do maintenance at AOH, IOH & POH are not standardised.

4. Reference drawing/maintenance instructions:

1. These batteries conform to IS:7660 wherein drawings and other technical particulars are available for reference.

2. The respective maintenance manuals for manufacturers viz M/s. Chloride, M/s.AMCO and M/s Standard Batteries are available on the subject.

5. Tools required for implementing these instructions:

1. Voltmeter having 0-150V dc range and 0-5V dc range. The voltmeter should be of 0.5 accuracy to IS:1248. A digital type voltmeter is preferable.

2. Ammeter 0-15A dc range. The accuracy should be as specified for voltmeter.

3. Hydrometer-to check specific gravity of individual cell.

.....2/-

For Electric Locomotives

6. Periodicity of implementation of the SMIs in the Sheds:

i) At the time of IA, every months.
ii) At the time of IB, every two months.
iii) At the time of IC, every 4 months.
iv) At the time of AOH, IOH & POH.

For EMU's

i) At the time of every month.
ii) At the time of every 4 month.
iii) At the time of every year.

7. Agency for implementation:

i) All Electric Loco & EMU maintenance, Shed battery maintenance staff.

ii) Battery maintenance staff of POH shops for Electric Loco & EMU Workshops.

8. How to put a new battery in service:

i) The battery should be kept upright while unpacking. The cell should be carefully examined for any evidence of damage in transit. All damages should be immediately reported to the manufacturer of the battery, if any made good.

ii) The cells should be filled with a battery grade sulphuric acid of specific gravity 1.230 to a level 20 mm over separator guard generally. In some makes the height above the separation may be more and for this purpose manufacturer's instructions should be followed.

iii) The battery should then be allowed to stand for 12 hours The level will fall due to absorption after filling in and should be restored by adding more acid of the filling in gravity.

iv) The initial charging current should be 3.5A for 75 Ah battery and 4.5A for 90 Ah battery. The charging should continue for 60 hours or more till following conditions have been satisfied.

A) The specific gravity of the electrolyte and the voltage of each cell duly corrected for temperature difference (See IS:7660 for temperature correction) remain constant over 3 successive hourly readings.

B) Each cell is gassing freely.

.....3/-

v) If the temperature of electrolyte during charging reaches 40°C, reduce the charge current and increase time proportionately if temperature of electrolyte reaches 52°C suspend the charge allow the battery to cool down and again start charging. At the end of charge specific gravity should not exceed 1.255 at 27°C. If it does withdraw some electrolyte from the cell and replace with pure distilled water. Charge for another hour and test again. Before the battery is put into service the electrolyte should be adjusted to correct level.

vi) The battery should be loaded in battery box after ensuring that battery compartment is well drained and ventilated. Any iron or wooddn runners which support the battery should be smeared with petroleum jelly. The batteries should sit quite firmly and evenly on the runners without any twisting or straining. The connecting cables should be well bolted and sufficiently lay to prevent pulling on the battery terminal.

vii) Punch month & year of commissioning on the lug.

Note: The above instructions are of general type can be slightly modified based on the details given in the maintenance manual of Battery by the manufacturers.

9. Adjustment of charging voltage & current.

The battery in this application is used intermitted and after this it is floating across charging sources. Therefore, charging voltage should ~~xx~~ not be high otherwise batteries will get overcharged resulting in less life. The recommended charging voltage is 108V which should be adjusted at input terminals of battery. The precision grade voltmeter should be connected at positive and negative terminals where charging is applied. If the battery is fully charged the charging current shall not exceed 1A. If battery is discharged the charging current will be more than 1A and will depend upon state of the battery.

10. Monthly maintenance (1A Schedule)

Check the level of electrolyte in each cell add distilled water wherever needed. Check all intercell connectors for tightness. Charge the battery at 9A/7.5 as applicable for upto 10 hours. Note Specific gravity of each cell. It should not differ by 10 points in any case, and specific gravity should be reach 1.25.

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11. Bi-monthly maintenance(IB Scheduled)

Report as above.

12. Four monthly maintenance (IC Schedule)

Check the level of electrolyte in each cell and add distilled water wherever necessary. Take out the monoblocks of battery and clean them and apply petroleum jelly on terminals to avoid Sulphation. Check Sp gravity of each cell. It is likely to differ from cell to cell. ~~XXX~~ To eliminate this inequality.Equalizing charge is necessary.

During the course of service, some of the cells in a set may fall slightly out of step. It is therefore, essential that the battery should be given equalising charge. This will restore all cells of the battery set to a fully charged condition.
The equalizing charge should be given as described below:-

Initially charge the battery at 9/7.5A respectively for 90 Ah and 75 Ah battery for 10 hours. After 10 hours for normal charging reduce the charging rate 50% of normal charging, untill the specific gravity in all cells stops increasing for a period of 3 hours. Equalise the sp gravity of cells after adding electrolyte of filling in gravity if necessary.

13. Yearly maintenance (AOH Schedule)

Take out the cell and do capacity test as per IS:7660. If the capacity is above 80% or rated capacity at 27°C, only then battery should be allowed to go in service. Complete all tests as prescribed for IC schedule.

14. Condemning Capacity:

If the capacity test indicates that capacity is less than 80% of rated capacity the battery should be condemned.

15. Completed Life:

If the above procedure is correctly followed batteries should last about 5 years. In case of premature failure of battery in capacity test. Plates should be examined by taking them out and if plates are in good condition.replacement of separators will many times restore the capacity.

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16. Record of Battery life :

Each shed and shop should maintain a record of batteries condemned as per proforma given below. Entries should be made in the register as and when cells are condemned.

S.No.	Make & Type	Date of condemnation	Date of Manufacture	Date of commission	Capacity at the time of condemnation at 5 hr.rate.	Life obtained

17. Distribution (As per list attached for loco sheds)

(P.R. Khullar)
Krita Maha Nideshak(Vidyut.