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**GOVERNMENT OF INDIA – MINISTRY OF RAILWAYS
RESEARCH DESIGNS STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW – 226011**

No. EL/3.6.1

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**SPECIAL MAINTENANCE INSTRUCTION
NO. RDSO ELRS/SMI/0235 - 2005 REV. '0'**

1.0 TITLE : Schedule for extended IOH/AOH for electric locos after completion of 32 yrs.

2.0 OBJECT: Railway Board vide their letter no. 2004/Elec(TRS)/138//Pt dt 28-10-04 have decided that the locomotives which become due for POH after completion of 32 yrs of service should not be sent for POH as codal life of electric locomotives is 35 yrs. Such locomotives should be attended for extended IOH on becoming due for POH and subsequently extended AOH as per the inspection schedule. Railway Board have also asked RDSO to formulate a detailed schedule for extended IOH and subsequently AOH.

The issue was also discussed during 30th MSG Meeting held at Mumbai/W. Railway on 17th & 18th January'05 where it was decided that schedules of extended IOH should be finalized by RDSO. During POH coordination meeting held at ELS/Tughlakabad on 18-3-05 the issue of extended IOH was also discussed.

Accordingly, the existing schedule of AOH, IOH and POH as envisaged in the RITES final report (December'1999) for electric locomotives have been reviewed. Based on the above, the schedules of works to be carried out during extended AOH and extended IOH have been finalised.

3.0 INSTRUCTIONS:

- (i) The schedules of work to be carried out during extended AOH are given in Annexure 'A'.
- (ii) The schedules of work to be carried out during extended IOH are given in Annexure 'B'.

4.0 APPLICATION: All electric locomotives which have completed life more than 32 yrs.

5.0 AGENCY OF IMPLEMENTATION: All Electric Loco Sheds, POH Shops.

6.0 PERIODICITY OF IMPLEMENTATION: Electric locos due POH/AOH after completion of 32 yrs life.

7.0 REFERENCE: RITES Final Report (Dec, 1999) & Railway Board's letter no 2004/Elect(TRS)/138/7/Pt dt 28-10-2004.

8.0 DISTRIBUTION: As per Mailing List No. EL/M/0019

DA: 1. Annexure 'A' – 10 pages
2. Annexure 'B' – 1 page

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EXTENDED AOH**E-1 Section (Maintenance Group)**

1. Loco roof and body
 - Blowing of loco before inspection
 - Cleaning of loco roof and body
 - Trouble shooting
 - Tightness of all bolts on roof
 - Condition of look out glass, gasket, sunwisers
 - Check fixation of door hinges, shutters
2. Silicon rectifier and Supervisory control equipment.
 - Checking of tightness of cells with torque wrench
 - Dusting & Cleaning
 - Checking & clearance to earth
 - Visual checks of connections and cleaning
 - Diode checking with cell tester
 - Check string fuses
 - Check potential dividing resistance visually
 - Check RC network (with instrument)
 - Check functioning of Sporkog units

E- 2 Section

1. Batteries:
 - Conduct cyclic charge and discharge test
 - Tighten the terminals
 - Apply Vaseline to the terminals studs and nuts
 - Check electrolyte level top up if necessary
 - Clean all the insulators
 - Check the individual cell voltage with all lights ON and baby compressor working.
 - Check the plates and container lot buckling swelling, corroding, cracking etc.
 - Conduct capacity test
 - Check. container for cracks
2. Battery charger:
 - Clean the dust and dirt
 - Check the connections
 - Cleaning preferably done by compressed air
 - Adjust the CHBA 110 ± 1.0 V with nominal trickle charge 3 to 5 A.
3. CGR Assembly
 - Measure contact gap, check wear limit, if necessary replace contact.
 - Check contact pressure.
 - Lubricate mech, joints/pins.
 - Play of cam on cam shaft.

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4. Auxiliary contacts.
 - Visual inspection cleaning.
 - Lubrication.
5. Transformer
 - Capacitors and resistors: Cleaning of condenser tube, surge absorbers, capacitors and resistors by dry cloth and checking up of connections.
 - Clean and tight connection of RCAPTFP.
 - Oil level indicator.
 - Functioning of QPH relay.
 - Functioning of Air flow relay QVRH.
 - Check condition of transformer oil e.g. acidity, dielectric strength etc. and carry out dissolved gas analysis and if necessary filter the oil.
 - ETTFP/1 & 2.
 - Check the fixation of shunts.
 - Check and adjust the gap.
 - Position and proper fixation of ETTFP.
 - Breather (PHGR).
 - Check the proper working of PHGR.
 - Overhaul PHGR.
6. Tap changers
 - Check up the condition of selector.
 - Tangential play of moving contacts.
 - Dismantle contact system & clean.
 - Carry out inspection of wearing parts and renew, if necessary.
7. SMGR
 - Overhaul.
 - Quick inspection of SMGR.
 - Switch angle should be check up.
8. Electro-pneumatic contactors L1-L6 and shunting contactors.
 - Overhaul
 - Lubrication.
 - Dusting of insulating parts.
 - Checking up of connections, nuts & bolts.
 - Lubrication of articulation point.
 - Change rubber gasket/buckets.
 - Check for air leakage.
 - Check up the condition of coil for overheating.
 - Check coil Q factor and reject if difference is above $\pm 8\%$ and also check proper bedding, auxiliary contacts arc chute.
 - Check the contact gap and pressure of main and auxiliary contacts.
9. Electro-magnetic contactors
 - Check the condition of coil for overheating and arc chute.
 - Check the tightness of connections.
 - Check contactor bedding, contact pressure of auxiliary and main contact and contact gap.
 - Check Q factor.

10. ZPT
 - Dusting and cleaning and check for free movement, proper contact and finger pressure.
11. CTF and J
 - Overhaul.
 - Check for any air leakage.
 - Check the shunt condition and tightness.
 - Tighten all nuts and bolts of switch.
 - Check the condition of rubber buckets and replace, if necessary.
 - Check the contact gap and pressure of main auxiliary contacts and contact bedding.
 - Lubricate servomotors and cams.
12. Master controller
 - Overhaul.
 - Check the tightness of connection and tightness of couplers.
 - Slight lubrication of pins of articulation of interlocking mechanism.
 - Grease interlocking cams.
 - Dusting and cleaning.
13. SL, SJ and ATFEX
 - Check the tightness of connections.
 - Blow through side cover.
 - Clean Teflon piece, remove bottom cover and blow.
 - Check for the overheating marks.
14. MU couplers – Dusting & cleaning.
15. Driver's switch desk
 - Check the condition of BL/Switches.
 - Check the condition of pilot lamp holders and connections check RS1-2.
 - Lubricate the rollers and actuating bars.
 - Check limit switches, switches of BL box and replace worn out contacts and clean.
16. Headlight.
 - Check the functioning, holders and connections.
 - Overhaul/replace.
17. Switch Board
 - Dusting and cleaning, check the condition of switches and connections. check the condition of fuses and fuse boards.
 - Lubricate the rollers and actuating parts or pin.
18. Terminal board
 - Checking the condition, connections and cleaning.
19. All resistances
 - Checking the condition, connections and cleaning.
20. Auxiliary programme switches
 - Check the contacts for flash mark and proper contacts.

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21. Body side filter
 - Remove, clean and refit.
 - Change supporting gaskets.
22. Dynamic brake resistor
 - Examine insulators and supports.
 - Wipe insulators with a lean and dry cloth.
 - Check tightness of nuts, bolts and screws.
 - Blow out resistor bank with dry compressed air.
 - Inspect resistor for damage, overhaul and record resistance.
23. Check connection tightness of VEPT, VESA, VEF.

E-3 Section:

1. Traction Motor

Commutator:

- Examine thoroughly with the help of torch light.
- Commutator surface for grooves and high mica.
- Commutator riser for solder run out creep.
- Clean commutator cleaning with spirit and cloth.
- Inspect visually commutator end banding and rises for abnormality.

Brush gear:

- Measure spring tension and check up condition.
- Examine the condition of pig tails and replace carbon brushes if reached to condemning size.
- Check up spring pins by hand.
- Rotate rocker arm and check brush holders and insulators.

Brush holder:

- Free movement of brush in holders.

Inspection cover:

- Existence and condition.

Arcing horns:

- Condition of arcing horns and clearance.
- Checking arcing ring condition for any signs of burning.
- V cone cleaning.

Terminals:

- Checking of connections.
- Check flexibility assembly.

Interpole:

- Out going lead for crack.

Brush holder insulator:

- Overhaul.
- Examine the holder insulator for proper glaze.
- Grease both end bearings.

2. Auxiliary machines:

- Overhaul.
- Check looseness of cooling fan blade.
- Check the alignment and realign the driving and driven shaft.
- Check the duct for cracks and fixing bolt.

Couplings:

- Overhaul.
- Adjustment, alignment and lubrication. Replace on age basis.
- Check foundation bolts and terminal connections.
- Grease the bearings.

3. Arno convertor:

- Check up tightness of terminal connections and foundation bolts.
- Check visually for top circulating ring of rotor and its top position of rotor bars for cracks.
- Grease bearings.

Blower motor for DBR & AUX. compressor

- Measure the brushes and replace, if necessary.
- Measure spring tension of brush holder and record.
- Check the looseness and cracks of cooling fan blade and lubricate bearings.

E-4 Section

1. Air blast circuit breaker

- Overhaul.
- Apply thin oil film of BBC 909 oil on main contacts.
- Remove main contacts, check worn out F & C contacts, replace if necessary.

Isolating switch:

- Check the pressure on fixed contact by spring balance.

Lubrication:

- Lubricate the isolating contacts by graphite grease.
- Lubricate the pin insulator with right oil.

Control block:

- Checking of mechandus pin and various clearances.

2. General purpose relay:

Auxiliary contacts:

- Check contact, contact pressure and wipe.
- Visually examine and clean contacts, terminals and contact support bus bar connectors.

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- Check and tighten wiring terminals.
- Check hardware for tightness.
- Check proper alignment and bedding of contacts.

Coil

- Check coil for electrical or mechanical damage.
- Dusting – all relay parts.

Bolts, nuts, screws and wiring screws

- Tighten the nuts and fixing screws.

Time delay relay:

- Check the time setting and operation.
- Overhaul all relays and test.

3. Speedometer/Energy-cum-speed monitoring system:

- Overhaul.
- Calibrate.
- Lubricate gear box.
- Check collector comb, dropping resistance and multicore cable. Clean and polish collector comb and replace carbon brush, if necessary.
- Overhauling of speedometer.

4. HOM

- Check operation.
- Clean and lubricate.

M- 3 Section

1. Pantograph

- Clean insulators and check for any damage.
- Check static pressure.
- Check contact pressure as per SMI-64 and SMI-72.
- Nuts and bolts tightness.
- Check copper shunts for base connection, plunger for free movement and lubricate.
- Check roof bars connection.
- Lubricate all bearings and moving parts.
- Check and change graphite grease.

2. VESA, VEPT, VEF

- Overhaul, throttle valve VEPT, VESA & VEF.
- Check for any air leak in the pipe line.

1. DAB/MPF/A9/SA9

- Overhaul and check the free operation.

2. Filters

- Check all the filters including filter-cum-silencer and clean.
- Check gaskets and replace, if necessary.

3. Isolating cocks

- Lubricate and check free movements.

4. Non-return valves, reducing valves and check valves
 - Clean and check the function.
 - Overhaul and replace gaskets.
5. Wiper and servomotor
 - Check operation.
 - Overhaul servomotor.
6. Vacuum and air hoses
 - Check condition and replace if necessary.
7. PV
 - Check foundation bolts, breather valve coupling, fan and its blade and clean the equipment and tray.
 - Check function of oil pump.
 - Lubricate couplings.
 - Fill oil.
 - Check suction and drain pipe.
 - Overhaul complete unit and replace worn out components and gaskets.
8. CP and CPA
 - Overhaul.
 - Check foundation bolts, fan and its blade and clean the equipment and tray.
 - Check coupling and lubricate.
 - Check intercooler, after cooler.
 - Check drain pipe of trays and suction pipe.
 - Lubricate bearings.
9. DJ non-return valve
 - Overhaul.
10. DJ pneumatic connections
 - Check for leakage.
11. Vacuum release valve
 - Overhaul.
12. Cotton filters
 - All cotton filters to be cleaned.
 - Replace cotton filter.
13. D24(B), D24(F)
 - Overhaul.
14. Air admission valve
 - Check function and ensure proper length of spindle.
15. Safety valves
 - Overhaul and adjust setting.

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16. Sanding valves
 - Overhaul.
17. HS4, HB5, F1, VA-IB, MU-2B
 - Overhaul.
 - Distributor valve.
 - Checks function.
18. Overhaul all valves and replace gaskets, match seating.
19. Horns and Horn valve
 - Check diaphragm, 'O'ring and rubber seat.
 - Overhaul and replace rubber components.
20. Gauges
 - Check all gauges.
 - Overhaul and calibrate.

Section M1

1. Bogie frame/loco underframe:
 - Thorough cleaning of bogie frame, washing with the compound.
 - Check for critical section cracks.
2. TM axle suspension bearing
 - Oil samples to be tested for presence of moisture and dirt.
 - Check TM axle cap bolts for tightness.

Felt wick:

 - Remove complete wick assembly and clean wicks by soaking them in specified lubricants.
 - After soaking, remove the foreign material from lubricating surface with soft bristle brush, do not use wire bristle.

Oil pump

 - Dismantle and overhaul.
3. Traction motor nose suspension
 - Check the condition of nose suspension bolts, etc and inspect for wear on nose suspension wear plate.
4. Bogie pivot casting and side mounting pads
 - Check visually for any cracks as far as practicable. If necessary, by magnetic particle/dye-penetrant method.
 - Check centre pivot side housing for cracks, check side bearer cover for proper seating.
5. Buffers
 - Lubricate.
 - Check wear plate under buffer for war and tightness of bolt.

6. Equaliser:
 - Check for free runs of equalizer pin and condition of wear liners.
 - Check equalizer for cracks.
7. Suspension springs
 - Visually inspect springs for any cracks or breakage.
8. Friction snubbers
 - Check the snubber assembly for broken springs inserting a stiff wire from bottom seat.
9. CBC coupler and transition screw coupling
 - Check CBC coupler for proper working and presence of locking pin.
 - Check transition screw coupling for crack.
 - Check the wear plate under CBC coupler and replace, if worn out.
10. Wheel and axles.
 - Check wheel for crack and other defect.
 - Measure and record wheel flange root wear, wheel dia and reprofile if necessary.
 - Measure wheel gauge.
 - Ultrasonic testing of axle.
11. Axle boxes and roller bearings
 - Check grease condition.
 - Check the fixation of screw of bearing end plate.
 - Remove old grease – replace with fresh.
 - Check the lateral and longitudinal clearances between axle boxes and pedestal horn liners of all axles.
 - Check the condition of liners and replace, if necessary.
 - Grease suspension roller bearings.
12. Brake gear
 - Give a general check on the brake rigging for loose nuts, pins, cylinder piston working.
 - Clean brake cylinder and check for proper working.
 - Check for war on brake shoes and replace the shoes. Check the piston strokes after fitting new brake shoe.
 - Observe for any leak in the bogie hose pipe connection and rectify.
 - Check the fixing bolts of brake cylinder.
 - Overhauling of brake cylinder.
13. Gear case
 - Check gear case for any damage to felt seal and oil leakage.
 - Check gear case bolts for tightness. Checks of leakage, if so rectify.
 - Check of level top up if necessary.
14. Earthing Brush
 - Check connection of earthing shunts and ensure proper tightness.
 - Check the condition of earthing brush mounted near the traction motor oil pump. replace brush, if necessary.
15. Slack adjuster
 - Lubricate slack adjuster.

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16. Hand brake
 - Clean the hand brake parts and check visually for any looseness.
 - Apply the hand brake and ensure that the brake shoes are binding on the wheels.
 - Lubricate hand brake parts, brake gear pins and bushes with oil.
17. Sanding
 - Check and fill the specified grade of sand in all the boxes.
18. Rail Guard and Cattle Guard
 - Check cattle guard for proper fixing.
 - Check rail guard for proper fixing and its proper height, adjust.

EXTENDED IOH

Extended IOH of locos may be done at the homing shed itself or at workshop nominated for the purpose. During extended IOH, in addition to thorough inspection of all mechanical and electrical items detailed under extended AOH (Annexure-A), the following items also should be attended to -

- Remove all electrical equipment including pantograph, circuit breaker, tap changer, SMGR, rectifiers, smoothing reactors, traction motors, auxiliary machines along with blowers, compressor and exhausters from the locomotive. Overhaul and replace worn out items and rubber components.
- Overhaul all traction gears and check up their P and K values and record them.
- Electrical panels (Ba/TK panel) need not to be removed from loco only the equipment of these panels should be overhauled.
- Take out transformer oil sample for check up of dielectric strength, dissolved gas analysis and acidity. If found beyond the permissible limit, replace the transformer oil.
- Remove all brake equipment and electro-pneumatic valve from the locomotive and clean the pneumatic pipe with the help of pressurized air. Overhaul and replace worn out items and rubber components, if any, match metallic seating of pneumatic valves and test them for their proper function.
- Clean the cable trenches. Examine for any damage to cable, lugs and repair it. Provide proper cable sheathing and cleats. Measure and record insulation resistance of all HT and LT cables. Tighten all the terminal connections.
- Dismantle bogie, brake riggings and clean the bogie in washing tank. Check up for any crack and weld it as per the instructions laid down by RDSO. Overhaul these equipments and replace all worn out components. Ensure squareness of bogie frame. Overhaul axle box bearings and all wheels should be reprofiled.
- All the dimension of the underframe should be recorded. The deformation if any should be set right. In case camber cannot be corrected as per permissible limit the locomotive should be condemned following the extent procedure.
- Corroded portion of superstructure and underframe should be repaired.
- Only safety related modifications to be carried out during extended IOH.
- All approved modifications which can be executed in the shed should be carried out.
- All reservoirs should be cleaned and tested for their safe working.

On completion of extended IOH, the loco should be subjected to detailed HT and LT testing and should also be given a short trial run before it is declared fit for traffic.

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