SPECIAL MAINTENANCE INSTRUCTION NO. ELRS/SMI/0003-2000 (REV. 001)

1.0 TITLE

Procedure for rewinding of auxiliary motors.

2.0 APPLICATION:

All auxiliary motors fitted on conventional electric locomotives and 3-phase drive electric locomotives.

It superscedes earlier SMI No. ELRS/SMI/0003 of Nov. 1978

3.0 OBJECT:

3.1 Failures of auxiliary motors in many cases are due to use of non-standard material during rewinding, inadequate rewinding facilities and incorrect procedure for rewinding of the motors.

3.2 The Special Instructions which follow are to lay down a uniform standard procedure, so that a minimum quality of rewinding is assured and improvement in reliability level of motors can be achieved.


4.0 PROCEDURE FOR REWINDING:

4.1.0 Preparation of failed stator for rewinding:

Inspect the failed stator winding carefully and investigate the probable cause of failure of the winding. Make a report for future reference.

4.1.1 Cut the failed stator winding overhang.

4.1.2 Remove the wedges and winding wires carefully so that stator slots are not damaged.

4.1.3 Clean the stator slots free of old insulation and file very safely to remove any sharp corners and burrs. Wipe off all foreign materials.

4.1.4 Inspect the slot portion of the stator with the help of hand lamp for any damage.
4.2.0 MAKING OF COILS:

4.2.1 Discard the first layer of winding wire from the beginning of each reel so that scratches etc., if any, on the wire may not come in the winding portion.

4.2.2 Use the correct coil former as per specified drawing of OEM.

4.2.3 Form the coils using the specified wire size with the specified number of turns and parallel paths, with the help of the correct former, taking care not to exert excessive tension. Lay the turns of the coils in uniform layers to avoid excessive inter-turn voltage.

4.2.4 Put the coils on suitably designed coil stands. Do not put coils over each other.

4.3.0 SLOT INSULATION:

4.3.1 Cut a suitable size of slot liner and insert it in one slot. Examine it for correct size. Accordingly, cut the other pieces of slot liners.

4.3.2 Insert 'U' shaped slot liner in each slot, properly cuffed at both ends, with the overall length extending approximately 10 mm beyond slot ends.

4.4.0 COIL INSERTION INTO SLOTS:

4.4.1 Insert the coils in the insulated slots carefully turn by turn, ensuring adequate protection to the insulating enamel. Lay the coils in uniform layers. Care should be taken so that first and last turns of the coil should not be adjacent to each other in a slot.

4.4.2 In the overhang portion, the first turn of one slot group should not lie adjacent to the last turn of the next slot group.

4.5.0 PLACEMENT OF COIL SEPARATOR AND INTERPHASE SEPARATOR:

Insert the proper size coil separators and inter-phase separators while coils insertion into slots.

4.6.0 PLACEMENT OF SLOT WEDGE:

Insert the wedge separator and place the epoxy bonded glass fibre laminates in the slot applying light mallet blow from the end slightly. Lubricate the wedge top by applying varnish before driving into slots. Slot wedges should be suitably champhered as per OEM's drawing.

4.7.0 COIL CONNECTION:

4.7.1 Scratch the enamel from the coil ends. Care should be taken that no sharp edge remains on the wire.
4.7.2 Insert proper size silicon elastomer sleeves on coil ends.

4.7.3 Make the coil connections for each phase separately as per winding diagram after verifying the continuity and correct sequence of the coils.

4.7.4 Connect the phase connections by connecting lead wire of specified size and specification. The lead wire should not be excessively long.

4.7.5 Braze the joints by brazing using Ruptam 14 (BA Cu P5 to IS 2927) silver alloy. Do not use tin or tin lead, solders for any connection in auxiliary motors.

4.7.6 Star point shall be formed inside the stator overhang. The star point shall be adequately brazed and insulated ensuring best workmanship. Cover the brazed joint with half lap, 2 layers with Nomex 410, 2 mil. thick tape. On insulated joint, apply silicon adhesive sealant. Use a marker for easy identification and access of the star point.

4.7.7 Put on the sleeves on joints and connecting lead wires. It should be assured that the sleeves not only cover the brazed portion but also cover well beyond the scratched insulation portion of the winding wire and connecting lead wire.

4.7.8 The connecting leads and joints are to be tied rigidly on the overhang of the winding & staggered using glass cord. The leads should be tied securely on the overhang of the winding at their exit from the winding to the terminal block.

4.7.9 Make the overhang uniformly round shaped with the help of rubber faced mallet.

4.7.10 Tie glass cord tightly at intervals on the coil overhang at both ends.

4.7.11 A compression type rubber gland shall be used for securing the flexible leads at the entry of terminal block and rubber grommet should also be used.

4.7.12 Take out the U V & W connecting leads to the terminal board and cut the excess length of cables.

4.7.13 Crimp the proper size terminal socket to the terminal leads. Care should be taken that connecting cable should be well gripped by the insulated socket tube. The crimped socket and joints shall comply with BS 4579 Pt. 1.

4.7.14 The winding shall be impregnated with vacuum pressure impregnation (VPI) process. For details of process and impregnating varnish refer RDSO SMI No. ELRS/SMI/86-2000(Rev.001) of 29.11.2000.

5. TESTS:

The following tests should be carried out on rewound stators/assembled motors at the stages mentioned below:
<table>
<thead>
<tr>
<th>No.</th>
<th>Tests</th>
<th>Stage</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dielectric test between phases to phase and phase to earth at 2 KV for 15 Sec.</td>
<td>Before making phase connections.</td>
</tr>
<tr>
<td>2.</td>
<td>Continuity of winding</td>
<td>After completion of winding and before impregnation.</td>
</tr>
<tr>
<td>3.</td>
<td>Insulation resistance</td>
<td>-do-</td>
</tr>
<tr>
<td>4.</td>
<td>Surge test at 5 KV ‘P-P’</td>
<td>-do-</td>
</tr>
<tr>
<td>5.</td>
<td>Insulation resistance</td>
<td>-do-</td>
</tr>
<tr>
<td>6.</td>
<td>-do-</td>
<td>After assembly, on assembled motor.</td>
</tr>
<tr>
<td>7.</td>
<td>Measurement of winding resistance</td>
<td>-do-</td>
</tr>
<tr>
<td>8.</td>
<td>Direction of rotation</td>
<td>-do-</td>
</tr>
<tr>
<td>9.</td>
<td>No load test at 415V &amp; 500V.</td>
<td>-do-</td>
</tr>
<tr>
<td>10.</td>
<td>High voltage test at 2.64KV for 1 Min.</td>
<td>-do-</td>
</tr>
<tr>
<td>11.</td>
<td>Vibration test</td>
<td>-do-</td>
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</table>

6. **PERIODICITY OF IMPLEMENTATION**:
   Whenever the rewinding of auxiliary motor is done.

7. **AGENCY OF IMPLEMENTATION**:
   All Electric Loco Sheds/ POH Workshops doing rewinding of auxiliary motors.

8.0 **REFERENCE:**
   8.1 RDSO SMI No. ELRS/SMI/5 of 21st December 1977(for method of connecting lead wires to the stator winding wires).
   8.2 Discussion with motor manufacturers.

9.0 **INSTRUCTION DRAWING**: Nil

10.0 **DISTRIBUTION**: As per attached mailing list.

(R K Kulshrestha)
for Director General (Elec)