

## INSTRUCTION No. TI/MI/0043 Rev.2



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GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS

MAINTENANCE INSTRUCTIONS  
FOR  
8-WHEELER TOWER WAGONS COVERING  
INSTRUCTIONS FOR DETC AND DHTC

November, 2017

Issued by:

TRACTION INSTALLATION DIRECTORATE  
RESEARCH DESIGNS & STANDARDS ORGANISATION  
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| Prepared by<br>JE/TW                                                                | Checked by<br>DDTI-II                                                               | Approved by<br>EDTI                                                                   |

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MAINTENANCE INSTRUCTIONS  
FOR  
8-WHEELER TOWER WAGONS COVERING  
INSTRUCTIONS FOR DETC AND DHTC

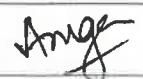
INSTRUCTION No. TI/MI/0043 Rev.2

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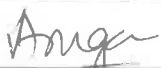
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**INSTRUCTION No. TI/MI/0043 Rev.2****MAINTENANCE INSTRUCTION FOR 8-WHEELER TOWER WAGONS  
COVERING INSTRUCTIONS FOR DETC AND DHTC.**

- 1.0. Objective: For upkeep of tower wagons and all time availability of tower wagons in working conditions.
- 2.0. Back Ground: Tower wagons are used for maintenance and attending to break downs of OHE for quick restoration of power supply to OHE. This special maintenance instruction has been prepared to maintain tower wagons so that its availability can be ensured all the time. Following maintenance instructions are to be followed for maintenance of various items of tower wagons.
- 3.0. Monthly Schedule (With engine stopped).
- 3.1. Contactor and relays:
- Inspect visually.
  - Manually operate contactor to check operation.
  - Check interlock and contactors.
  - Check operations and contactors.
- 3.2. Resistor & blocking diode: Check values and function of all resistors and diode and record it.
- 3.3. High and low voltage circuit: Check ground record insulation resistance of power Circuit.
- 3.4. Batteries:
- Clean dirt or any oil on top of battery.
  - Keep all terminal tight, clean and apply Vaseline petroleum jelly.
  - Ensure that vent plugs with float guide is clean and not broken.
  - Check specific gravity of electrolyte and maintain at  $1.245 \pm 0.005$ .
  - Check the water level for topping up with DM water. Top up the DM water as per the requirement i.e. twice in summer season and once in winter season in a month based on the float guide indicator.
- 3.5. Traction Motor: (M/s CGL, M/s Delcoremy & M/s Lucas TVS)
- Brush off loose dust or dirt before removing commutator cover.
  - Clean the commutator veering. Remove any copper beads from the commutator surface with fine caborandum cloth.
  - Deposit from dirt or greasy hands should be removed from solvent.
  - Examine the brush gear and clean the insulation of the brush arm.
  - Check that the brush ring sits correctly on the carbons and that the springs are in good condition.

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- (vi). Check carbon brushes for wear. Fit new brushes in place of worn out carbon brushes or any one which are unlikely to last until the next inspection. See data for minimum length and brush grade.
- (vii). Check carbon brushes for freedom in the brush holder and if striking cleans both the brush and inside of the brush holder.
- (viii). Do not shake the carbon, as solvent will eventually ooze out affecting the commutator and causing the brush to jam in the brush holder. If the brush appears to be excessively slack in the brush holder, check the brush size and discard the brush holder as the case may be.
- (ix). Top up suspension bearing lubrication oil and cardium compound in traction motors, gearbox.

### 3.6 Traction Alternator: (M/s Delcoremy, )

Maintenance of the charging system is limited to simple tasks designed to keep the system in good shape by eliminating the buildup of dirt and corrosion. The diodes in the alternator function as one way valves and the transistors in the regulator operate as fast switches, both are accurate and sensitive. They do not wear and never require adjustment but because they are sensitive to voltage change and high temperature the following precautions are vital to prevent them being destroyed.

- (i). Keep the alternator reasonably clean with a cloth moistened in kerosene (paraffin) or white spirit. Ensure that ventilation slots or air spaces are clear and run obstructed.
- (ii). Keep the regulator housing clean and ensure that cooling air pass freely over the housing.
- (iii). Ensure that the driving belt on the alternator has correct tension as, too slack will cause belt to slip and too tight will shorten the life of the belt.
- (iv). Check the mounting bolts for tightness.
- (v). Always identify a lead to its correct terminal when disconnecting or reconnecting. Any lead short circuit or wrong connection giving reverse polarity will immediately and permanently ruin the transistors and diodes.
- (vi). Never connect a battery in to the system without checking for correct polarity and correct voltage. Short circuiting or reverse polarity no matter how brief will cause immediate and permanent damage to transistors and diodes, besides possible damage to the loads.
- (vii). Never disconnect a lead without first stopping the alternator and turning any switches in the circuit to the 'OFF' position.
- (viii). Never disconnect the battery while the alternator is running. This will cause a voltage surge in the charging system that will immediately ruin the diodes or transistors.
- (ix). Always ensure that the regulator is mounted with the terminals vertically down.
- (x). Always ensure that the regulator mounting is such that it is not subjected to direct water splash.
- (xi). Always ensure that the alternator is not mounted close to the exhaust manifold without any protection.
- (xii). Brush off loose dust or dirt before removing cover.
- (xiii). Check tightness of connections.

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- (xiv). Check for any loose hardware especially on the rotating rectifier assembly.

#### 4.0. Three monthly schedule (with engine stopped)

4.1. Repeat all checks followed in monthly check.

4.2. Contactor and relays:

- (i). Inspect visually.
- (ii). Manually operate contactor to check operation.
- (iii). Check interlock and contactors.
- (iv). Check contactors contact tips for pitting.\

4.3. Resistor and blocking diode: Check values and function of all resistors and diode

4.4. High and low voltage: Check for ground, record insulation circuits resistance of power circuit and control circuit.

4.5. Batteries: Same as per clause 3.4 and also Check the battery Voltage in off line at no. load. Battery voltage shall be above 2.1 V/cell or 8.4 V per monoblock, if less, then charge the batteries.

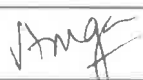
4.6. Traction Motor: Repeat the monthly service with following additional schedules:

- (i). Blow out machine using clean dry compressed air. Take particular care to direct air under the commutator in order to remove dirt lodged in the armature core ducts.
- (ii). Check tightness of all brush gear bolts.
- (iii). Check tightness of bolts securing axle caps and gear case
- (iv). Check air inlet bellows for cracking, tearing or collapsing.
- (v). Check for the leakage from the gear case and suspension bearings  
Ensure the lids of the axle suspension bearing oil wells fit correctly.
- (vi). Check all external leads for chaffing.
- (vii). Measure insulation resistance, it should not be less than one mega ohm.

4.7. Traction Alternator: Repeat the monthly service with following additional schedules:

- (i). Wipe off loose dirt on the outside surface of the alternator with a clean filter free cloth.
- (ii). Remove stubborn accumulation of dirt using xylene
- (iii). Clean all ventilating parts with filtered and compressed air at pressure of 1.75 to 2.8 kg/cm<sup>2</sup>.
- (iv). Clean inside of alternator using dry compressed air of a pressure of 1.75 to 2.8kg/cm<sup>2</sup>.

4.8. Cable Connections: Check for loosening adjoins on terminal board and equipment  
Check for insulation damage also.

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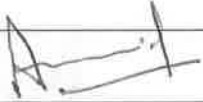
5.0. HALF YEARLY SCHEDULE (WITH ENGINE STOPPED)

|                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                          |
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| <b>Repeat all checks followed in three monthly check and ensure following additional schedules:</b> |                                                                                                                                                                                                                                                                                                                                                                                          |
| Master controller                                                                                   | Clean and inspect contact, fingers. Check mechanical Interlock                                                                                                                                                                                                                                                                                                                           |
| Control equipments shunts.                                                                          | Check condition and flexibility; replace worn frayed broken or corroded braided shunt.                                                                                                                                                                                                                                                                                                   |
| Control equipments                                                                                  | Check terminal connectors & connections and tighten if required.                                                                                                                                                                                                                                                                                                                         |
| Control Equipment                                                                                   | (i) Clean contactors<br>(ii) Replace contact tips if worn or pitted.                                                                                                                                                                                                                                                                                                                     |
| <b>Safety devices</b><br>(i) Cooling water temperature switch<br>(ii) Engine over speed switch      | (i) Remove and check on test bench and adjust if required.<br>(ii) Remove and check on test bench and adjust if required.                                                                                                                                                                                                                                                                |
| Engine RUN/STOP switch                                                                              | Check and clean contact                                                                                                                                                                                                                                                                                                                                                                  |
| Battery                                                                                             | Remove boxes from tower wagon and Check for any damage if any rectify Clean & repaint.                                                                                                                                                                                                                                                                                                   |
| Load Ammeters                                                                                       | Check calibration                                                                                                                                                                                                                                                                                                                                                                        |
| Traction Motor suspension bearing                                                                   | (i) Change oil.<br>(ii) Change wick lubricator if damaged.<br>(iii) Check bearing cap bolts for tightness.<br>(iv) Check bearing cap bolts for tightness.<br>(v) Check wear on motor suspension & nose suspension.<br>(vi) Check suspension bearing suspension.                                                                                                                          |
| Traction Motor                                                                                      | Repeat three monthly service including following additional schedules:-<br>(i) Clean the grease escape drain from P.E. outer bearing cap and P.E. end shield.<br>(ii) Clean all pinion and gear wheels check for tooth wear.<br>(iii) Clean lubricant from each gear case to ensure that it is not cracked and the seals are in good condition.<br>(iv) Replace felt seals if necessary. |

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## 6.0 YEARLY SCHEDULE (WITH ENGINE STOPPED)

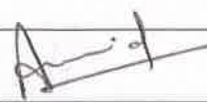
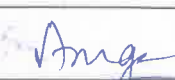
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| Repeat all checks followed in half yearly check with following additional schedules;                 |                                                                                                                                                                                                                                                                   |
| Gauge and meters                                                                                     | Remove and calibrate if required                                                                                                                                                                                                                                  |
| Electro pneumatic                                                                                    | Add drops of light machine oil (Teflon pickings do not require lubrication change neoprene bucket.                                                                                                                                                                |
| Warning lights                                                                                       | Clean and check.                                                                                                                                                                                                                                                  |
| Engine hour meter                                                                                    | Remove clean and calibrate.                                                                                                                                                                                                                                       |
| Engine Governor                                                                                      | Check setting as per markets instruction.                                                                                                                                                                                                                         |
| Traction Motor                                                                                       | Repeat Six Monthly service including following additional schedules.<br>(i) Check wear of tooth of pinion and gear wheel.<br>(ii) Lubricate commutator end bearing.                                                                                               |
| Master controller                                                                                    | Clean and inspect contact, fingers. Check mechanical Interlock                                                                                                                                                                                                    |
| Control Equipments shunts.                                                                           | Check condition and flexibility; replace worn frayed broken or corroded braided shunt.                                                                                                                                                                            |
| Control Equipments                                                                                   | Check connections and tighten if required. Terminal Connectors                                                                                                                                                                                                    |
| Control Equipment                                                                                    | (i) Clean contactors<br>(ii) Replace contact tips if worn or pitted.                                                                                                                                                                                              |
| <b>Safety devices</b><br>(ii) Cooling water temperature temp switch<br>(ii) Engine over speed switch | Remove and check on test bench and adjust if required.<br>Remove and check on test bench and adjust if required.                                                                                                                                                  |
| Engine RUN/STOP switch                                                                               | Check and clean contact                                                                                                                                                                                                                                           |
| Battery                                                                                              | (i) Check for any damage of Battery.<br>(ii) Clean all the ventilators so that air circulation remains good.<br>(iii) Check the batteries for any water leakage.<br>(iv) Check the batteries connection lead.                                                     |
| Load Ammeters                                                                                        | Check calibration                                                                                                                                                                                                                                                 |
| Traction Motor suspension bearing                                                                    | (i) Change oil.<br>(ii) Change wick lubricator if damaged.<br>(iii) Check bearing cap bolts for tightness.<br>(iv) Check bearing cap bolts for tightness.<br>(v) Check wear on motor suspension and nose suspension.<br>(vi) Check suspension bearing suspension. |

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| Traction Motor | <p>Repeat Three monthly service including following additional schedules:-</p> <ul style="list-style-type: none"> <li>(i) Clean the grease escape drain from pinion end (PE) outer bearing cap and P.E. end shield.</li> <li>(ii) Clean all pinion and gear wheels check for tooth wear.</li> <li>(iii) Clean lubricant from each gear case to ensure that it is not cracked and the seals are in good condition.</li> <li>(iv) Check the carbon brushes.</li> <li>(v) Clean the commutators</li> <li>(vi) Ensure proper spring tension (3.5Kg/Cm<sup>2</sup>)</li> <li>(vii) Check the Pig tails.</li> <li>(viii) Check the gap between holder and commutator (1.5 - 2.5mm)</li> <li>(ix) Check the inspection cover and its gasket.</li> <li>(x) Check the leather bellows.</li> <li>(xi) Blowing and cleaning air filters.</li> <li>(xii) Check for flash over, solder throwing, broken fan, any damages to commutators.</li> </ul> |
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7.0 Overhauling of traction motor: An overhaul is required after three to five years of service or if the performance is satisfactory the same can be done during POH of Tower Wagon. Maintenance of TMs can be done at Diesel/Electric loco Sheds/workshops and MEMU/EMU Sheds.

- (i). Remove as much dirt as possible particularly around the commutator covers, the axle-cap filler pipes and the armature bearing caps.
- (ii). Check the lateral and diametrical clearances of the axle suspension bearings; fit new bearings if the existing bearings are worn beyond the limits recommended (see data as given in the manual).
- (iii). Remove the motor from the bogie and using the oil-injection equipment, remove the pinion.
- (iv). Before dismantling the motor, give it a light run at 1500-2000 rev/min to check that the bearings are not noisy and that the vibration is not excessive.
- (v). Dismantle the motor (see under dismantling & reassembling). Clean the armature thoroughly, also the interior of the frame. Bake each at 90°C to remove moisture. (See workshop manual). After drying, check the insulation resistance while the machine is still hot. This should be at least one Meg. Ohm, if it is, apply a high voltage test. (See under HIGH VOLTAGE TESTS). Apply a commutator bar to bar comparison test to check for open or short circuited coils. Remove and clean the brush holders. Examine each brush holder for brush clearance, for brush spring pressure, for damaged insulators, for spring-hub wear, for loose or defective support pin insulation and burnt spots. Recondition as necessary. Fit new brushes if necessary.
- (vi). Check the wear plates on the nose suspension for wear, check the axle ways and the axle caps for wear, distortion and cracks. Examine all cables, fit a new cable in place of any that is chafed or otherwise damaged.
- (vii). If the field coils and the connections are tight, dry and are in good condition, repaint the whole of the interior with silicone gray finishing paint.

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- (viii). If field coils have to be removed, recondition them individually and on reassembly, refill the counter bores around the top pole studs with Tar Compound, Class-IV (Supplied by M/s Shalimar India) to exclude moisture.
- (ix). Inspect all other motor components for wear, distortion or other defects. Fit new bearings if necessary.
- (x). Inspect the shaft for damage to threads, bearing and pinion fits and ensure that the Shaft is straight. Further inspect the armature for loose bands, solder throwing or other defects. Recondition the armature as necessary.
- (xi). Treat the reconditioned or repaired armature with solventless polyester (GE702 or equivalent) insulating varnish. (For procedure, see Workshop Manual). The number of such treatments will depend upon the condition of the armature, but normally, twice will be sufficient.

**8.0 Maintenance of rectifier:** Except for blower, the rectifier unit as such is static equipment with no moving parts, hence little maintenance is required. However, regular inspection is necessary if trouble free operation is required.

- (i). The unit must be periodically cleaned with air blast. For inspection the front door can be opened easily by opening the locks and doors can be kept aside according to convenience.
- (ii). Checkup various contacts and terminal connections in the initial stage of operation and later once in six months.

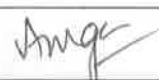
## 9.0 Maintenance of engine:

### 9.1 A-Check: On daily basis

- (i) Check previous days engine log book
- (ii) Fuel water Separator-Drain.
- (iii) Lubricating oil level- check
- (iv) Coolant level-check
- (v) Air intake restriction –check the red band indication.
- (vi) Water pump and alternator drive belts-check
- (vii) Level of oil in hydraulic Tank- check
- (viii) Radiator Core leakage or Choke- Check
- (ix) Air Tanks and Reservoirs- Drain.
- (x) Coolant, Fuel, oil and Air Leakages Check.

### 9.2 B- Check: Every 300 hours or 6 month, whichever is earlier?

- (i) Repeat all maintenance steps of A-Checks.
- (ii) Fuel Filter-Change
- (iii) Sediments from Fuel Tank-Drain
- (iv) Lubricating oil filter change
- (v) Lubricating oil bypass- Change
- (vi) Lubricating oil-change
- (vii) Lube oil Pressure Record
- (viii) Engine mounts- check
- (ix) Water pump-check

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- (x) Coolant concentration-Check
- (xi) Belts-Check and adjust, if required.
- (xii) Coolant Pipes condition-Check, if required replace.
- (xiii) Crankcase Breather- Clean
- (xiv) Crankcase Breather Element- Check, if required change.

### 9.3 C- Check: Every 1500 hours or 12 month whichever is earlier.

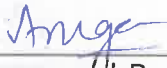
- (i) Repeat all maintenance steps of A Check & B Check
- (ii) Injector and valves-adjust
- (iii) Air cleaner Element- Change
- (iv) Radiator/oil cooler- clean externally
- (v) Water Pump Idler- Check
- (vi) Air cleaner Evacuator valve-Check & Change, if required.
- (vii) Alternator charging voltage-Check.

### 9.4 D- Check: Every 6000 hours or 24 month whichever is earlier.

- (i) Repeat all maintenance steps of A Check, B Check & C Check
- (ii) Fuel Pump and injector calibration-Check, if required calibrate.
- (iii) Cooling system-Flush and fill up with fresh premix Fleetguard Compleat EG 50:50.
- (iv) Vibration Damper, Viscous-Check.
- (v) Air compressor-check-Air outlet piping-Clean
- (vi) Air Retention time-record
- (vii) Water pump and Alternator Drive Belts-Replace.
- (viii) Turbocharger-inspect
- (ix) Turbocharger radial bearing clearing-inspect
- (x) Turbocharger axial clearance-inspect
- (xi) Vacuum indicator-change.

#### Note:

- When the red band appears on the indicator Change the air filter primary element. The safety element to be replaced at the time of the 3<sup>rd</sup> replacement of primary Element.
- After an initial adjustment at 1500 hours, it is recommended that the valves and injectors not be adjusted again prior to injector calibration at 6000 hours or 24 months interval.
- Hydraulic oil and hydraulic oil filters should be changed at every 2000 Hours or 18 months interval.
- Cummins recommended Engine Oil API 15W40 CH<sub>4</sub> or higher grade of CH<sub>4</sub> oil.
- Cummins recommended Hydraulic Oil Anti-Wear VG 68.
- Cummins recommended Coolant Premix Fleetgaurd Compleat EG 50:50.
- Do not intermix different brands or grades of oil or coolant.
- Must Change and optional Spares Parts list is mentioned in Annexure-04.
- Guidelines for Storage Procedure & preventive measure is mentioned in Annexure-05

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- Contact nearest M/s Cummins Authorized Service office for any clarification. Contact Details of nearest M/s Cummins Service manager is mentioned in **Annexure-06**.

#### 10.0 Maintenance of transmission:

##### 10.1 **Maintenance:**

- Transmission oil change interval – Every 1000 Hours or 6Months, whichever is earlier
- Transmission filter change interval – Every 250 Hours.
- Cooler lines should also be cleaned while maintenance is being carried out.
- Check for any leakage - If found arrest the leakage.
- Check whether all transmission related mountings are properly mounted or not.
- Check for manual selector lever, it should move easily and give a crisp detent feel in each position.

##### 10.2 **General Trouble Shooting Steps:**

- Check the oil level and ensure that oil is up to the level, if not take necessary action and bring the oil to level.
- Check for oil colour and smell.
- Check for transmission oil main pressure.
- Check for Individual clutch pressures.
- Check for any leakages.
- Check for shift lever linkages to control valve body.

##### 10.3 **Oil Level Checking Procedure:**

###### (i) **Location of oil level check plug:-**

- Oil level check plugs are provided in the rear right hand lower side of drop box when viewed from rear side.

###### (ii) **Before starting the engine-**

###### (a) Fluid level plugs

Remove FULL plug oil should be flowing from this plug which indicates the equipment can be started for further check.

###### (iii) **After starting of the engine-**

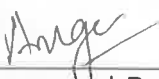
###### (a) Fluid level plugs

##### **Cold Check:-**

Remove the ADD plug, oil level must be at the ADD plug (dripping from this hole).Add or drain oil to bring it to this level.

##### **Hot Check:-**

Remove the FULL plug, oil level must be at the FULL plug (dripping from this hole).Add or drain oil to bring it to this level.

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**11.0 Maintenance of Axle drive:**

|                                                            |                                                                                                                                                                                   |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Three years or (approx 3,00,000 kms which ever is earlier. | Remove the final drives from the car disassemble the gears, shaft & sub-assembly and inspect the gears and bearing. The defective components must be replaced before re-assembly. |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**12.0 Maintenance of torsion rod assembly (torque arm assembly):** During maintenance of transmission system torque arm assembly must be thoroughly examined for its healthy ness such as check for any crack etc. Any non-destructive test like ultrasonic examination or DPT test may be carried out and ensure its healthiness before reinstallation.

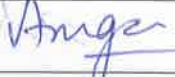
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| 1 | Check the tightness and locking of fasteners.                                                                                  | 6 Monthly |
| 2 | Lubrication of spherical joint to be done as and when required.                                                                |           |
| 3 | Spring disk to be checked physically, if found damage replace it                                                               | 6 Monthly |
| 4 | Pre-compression of spring disk to be maintained for the specified value by tightening the castle nut at one end of torque arm. |           |
| 5 | For torque tightening value of fasteners refer the manual of manufacturer.                                                     |           |
| 6 | Spherical joints and bushes are checked for wear.                                                                              |           |
| 7 | Ireclips and splt pins if failed, replace them.                                                                                |           |
| 8 | Refer relevant drawings for parts list & installation.                                                                         |           |

**13.0 Maintenance of lifting and swiveling platform**

|   |                                                    |                                                                                                                                                 |
|---|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Replace suction strainer.                          | Yearly                                                                                                                                          |
| 2 | Replace return line filter element.                | Yearly                                                                                                                                          |
| 3 | Drain oil tank, clean it and change oil.           | Yearly                                                                                                                                          |
| 4 | Replace seals of hydraulic cylinder                | Two yearly                                                                                                                                      |
| 5 | Replace guiding pads between telescopic structures | Two yearly                                                                                                                                      |
| 6 | Major overhaul                                     | At 72 months replacing guide pads between telescopic structures and replacing seals of hydraulic cylinder constitute a part of major over haul. |

**14.0 Overhaul during IOH/POH**

|       |                                                                                                                                                                                                   |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (i)   | During the overhaul the pantograph must be removed from the OHE car.                                                                                                                              |
| (ii)  | All the electrical equipments like traction motor to be overhauled as per the guidelines explained in the proceeding para.                                                                        |
| (iii) | After dismantling, check all ball bearings for wear of cage ball etc. and replace, if any.                                                                                                        |
| (iv)  | The upper and lower articulation tubes must be dismantled and repaired, if bent. The middle articulation shaft triangular bracket and equalizer arm etc. should be checked thoroughly for damage. |

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|       |                                                                                                                                                                                                                                                          |
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| (v)   | Dismantle and overhaul throttle valve                                                                                                                                                                                                                    |
| (vi)  | All mechanical parts, brake equipments, transmission system etc. to be thoroughly checked and accordingly carryout all repair /replacement for safety and smooth functioning as suggested in this document/Maintenance Manual of the equipment/supplier. |
| (vii) | Scratch the old paint. Clean the surface and apply paint as per Colour Scheme.                                                                                                                                                                           |

15.0 Maintenance Guidelines and schedule (Carriage Part) of 8-Wheeler OHE Inspection Car as per **annexure-01**.

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**Annexure-01****MAINTANANCE GUIDELINES AND SCHEDULE (CARRIAGE PART) OF  
8 -WHEELER OHE INSPECTION CAR****1.0 BODY REPAIRS**

- (i) Inspection and repair of body members are done after the Tower Car body is lifted off the wheels and axles are placed on trestles.
- (ii) All furnishing and other components from coach shell, which are stripped, are to be sent to the respective sections for maintenance.
- (iii) For major repairing work all the equipments (under slung, onboard and roof mounted) shall be removed from the tower wagon.

**1.1 INSPECTION OF UNDERFRAME**

- (i) The under frame members should be thoroughly inspected for locating cracked/bent/corroded members. Corrosion is indicated by flaking of paint of metal, pitting and scale formation. Components like sole bar and trough floor which are not visible from both sides should be examined by tapping with a spiked hammer, proper illumination will be required to carry out the check. A component will require repair / replacement if it has lost more than 20% of its thickness.
- (ii) The under frame and shell members are categorized as vulnerable and not so vulnerable areas for corrosion.
- (iii) Particular attention should be paid to the vulnerable members and locations listed below: -
  - Sole bar, body pillars, and trough floor.
  - Sole bars, body pillars above lifting pads.
  - Sole bars and pillars behind the door pockets.
  - Sole bars and pillars at the door corners.
  - Head Stock
  - Sole bars and pillar.
- (iv) Procedure for inspection of under frame members for corrosion attention is laid down in RDSO technical pamphlet No C-7602.

**1.2 SOLE BAR, BOBY PILLAR AT LAVATORY AREA**

- (i) Examine visually supplemented by tapping with a spiked hammer sole bars, body pillars in the bays under after removing the accumulated dirt and cleaning the surface.
- (ii) If incidence of corrosion is noticed in the bottom half of the sole bar, the trough floor should be cut to a width of 300 mm and requisite length for examination of inside top half.
- (iii) If heavy corrosion is noticed, the sidewall should be cut to a height of 500mm from the bottom of covering sufficient length and all the exposed parts, after scraping and cleaning should be examined to determine the extent of corrosion.

|                                                                                     |                                                                                     |                                                                                       |
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**1.3 SOLE BAR AND PILLAR ABOVE THE LIFTING PADS**

- (i) Examine the above members in the same manner as described in clause 1.1 above.
- (ii) If signs of corrosion are noticed, the sidewall sheet above the lifting pads should be cut to a height of 500mm. above and to a length of half meter, on either side of lifting pads. Scrape the structural members, clean and examine minutely to ascertain the extent of corrosion.

**1.4 SOLE BAR AND PILLAR AT THE DOOR CORNERS**

Examine the above locations visually. If corrosion is noticed, cut to a width of half meter from the door corner. Remove accumulated dust. Structural members should be thoroughly scraped, cleaned and examined to assess the extent of corrosion.

**1.5 SOLE BAR AND BODY PILLAR AT LOCATIONS OTHER THAN DESCRIBED ABOVE**

- (i) Examine visible portion of sole bar through the end from above of the underframe.
- (ii) Remove the accumulated dust and scrape structural members to the extent possible. If corrosion is noticed, sidewall sheet in the area of corrosion should be cut to a height of 450mm from the bottom of covering for sufficient length for thorough examination.

**1.6 HEAD STOCK**

- (i) Examine visually inner headstock, outer headstock, stiffening immediately behind the buffers and the junction of the sole bar at the headstock for incidence of corrosion.
- (ii) Examine carefully the base of buffer assembly as corrosion has been primarily noticed at this location.
- (iii) Examine carefully the buffer base of headstock by chalk test or sound test for cracks and dents. Buffers fixing holes should not be elongated and no minor cracks to be allowed. Replace headstock if the wear is more than 4 mm i.e. when the thickness is below 4mm.

**1.7 TROUGH FLOOR**

- (i) Examine the trough floor in the bays adjoining the lavatories and from below for signs of corrosion, supplemented by tapping with a spiked hammer.
- (ii) If signs of corrosion are noticed in the above examination, the part should be thoroughly cleaned by scraping and an intensive inspection should be carried out to detect the extent of corrosion in the trough floor.
- (iii) Flooring in the lavatories and bays adjacent to lavatories of all coaches over six years old should be broken and trough floor thoroughly examined for incidence of corrosion.

**1.8 TUBULAR FRAME BELOW LAVATORIES**

- (i) Examine visually the tubes and joints for incidence of corrosion.

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- (ii) Corroded tubes shall be replaced. If corrosion is extreme, entire tubular frame should be replaced.

### 1.9 CORROSION REPAIRS TO UNDERFRAME MEMBERS

- (i) Corrosion repairs shall be carried out as per instruction laid down in RDSO technical pamphlet nos. C-7602.

It is essential to use corrosion resistant steel sheets for corrosion repairs of coaches. Welding electrodes and paints should be of the prescribed quality conforming to the relevant IS/IRS specifications.

Corrosion resistant steel sheet for trough floor, pillars, sidewall and roof to IRS M-41.

- Electrode: MMAW electrode Class D to IRS: M-28 shall be used. MIG/MAG welding wire class-IV to IRSM-46 may be used.
  - Paints ready mixed paint, air Drying Red Oxide, Zinc Chromic, priming-Specification to IS: 2074/1992, second Revision (Reaffirmed 2002) with additional requirements of ICF/MD/Spec-052 issue status: 02, revision no. 01 date 26.05.2006 by Brush/Spray so as to get Dry film thickness(DFT) of 40 microns min. Bituminous Anticorrosive solution to IRS P-30-2007 solution type, brushing quality.
- (ii) Where the corrosion noticed is of a very minor nature and has just started, there is no need to renew the parts. In those areas, the paint and the rust should be thoroughly cleaned to reach the bare metal and the surface treated with two coats of ready mixed paint, Air Drying, Red Oxide, Zinc Chrome, Priming Specification to IS: 2074/1992, second revision (Reaffirmed 2002) with Additional requirements of ICF/MD/SPEC-052 issue status: 02, Rev. No.1 date 26.05.2006 by brush/Spray so as to get Dry film Thickness (DFT) of 40 microns, min in addition, under-frame members should be given two coats of bituminous solution.
- (iii) Where the corrosion repairs are carried out on the under frame or its paint coat is damaged, the under frame should be painted with two coats of ready mixed paint, Air Drying, Red Oxide, Zinc Chrome, Priming Specification to IS: 2074/1992, second revision (Reaffirmed 2002) with Additional requirements of ICF/MD/SPEC-052 issue status: 02, Rev. No.1 date 26.05.2006 by brush/Spray so as to get Dry film Thickness (DFT) of 40 microns, min followed by the four coats system of Anticorrosive Bituminous Paint.
- (iv) For carrying out corrosion repairs to underframe members, the coach body should be lifted off the bogies and kept on trestles. For repairs to sidewall and end wall, no lifting is required.

### 1.10 HEAD STOCK

For replacement of headstock, the following parts need to be stripped first:

- i) Side buffers
- ii) Compreg board and Aluminum chequered sheet flooring
- iii) End partition and electrical wiring
- iv) Draw gear assembly
- v) End portion of BP/FP

|                                                                                     |                                                                                     |                                                                                       |
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Before the corroded portion is cut off, the auxiliary headstock and the two sole bar ends should be firmly supported on trestles. The corroded headstock is then replaced as per annexure-v of RDSO technical pamphlet No. C-7602. Only corrosion resistant steel (IRS M-41 or IS:2062 Fe 410 Cu WC) should be used for head stock repairs.

#### 1.11 SOLE BAR

For carrying out repairs to sole bar, it is necessary to strip first the interior fittings, laminate paneling and window frames. Before cutting off the corroded portion of sole bar, both the adjacent ends should be supported on trestles. The new sole bar piece should be welded from outside and inside. To facilitate welding from inside, the coach body should be lifted and kept on trestles.

#### 1.12 CORROSION REPAIR OF SOLE BAR

Repairs to sole bar for replacement of corroded portions at the locations mentioned below should be carried out as per annexure-II of RDSO technical pamphlet No. C-7602.

#### 1.13 SIDE WALL MEMBERS

For repairs to side and end wall sheets, the interior fittings, laminate paneling and window frames should be stripped first. Corrosion repair of side/end wall sheets and body pillars should be done as per annexure-III of RDSO technical pamphlet No. C-7602.

#### 1.14 TROUGH FLOOR

For replacement of trough floor, first Compreg board and Aluminum chequered sheet flooring needs to be stripped. Corrosion repairs to trough floor should be done as per the annexure-IV of RDSO technical pamphlet No. C-7602.

#### 1.15 ROOF

##### (i) Roof repairs

Tower car, roof should be checked for corrosion. Special attention should be paid at location where gutter mouldings are welded and ventilators bolted. Corroded roof should be repaired according to the instructions given in annexure VII of RDSO technical pamphlet no. C-7602.

##### (ii) TRA type roof ventilators repairs

Examine the roof ventilator for damage or corrosion or leakage. If no corrosion is observed then seal the joints and crevices with waterproof sealing agent as per IS/IRS Specification. Ventilators found beyond repairs should be replaced as per RDSO technical pamphlet no. C-7602 Annexure-VII.

After repairs and refitting, ventilators should be tested for water leakage at their base joints at the time roof testing.

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(iii) **Roof testing**

Tower car after POH repairs should be tested under water spray for roof leakage before they are finally turned out from the workshop. For this purpose, a fixture designed to simulate monsoon conditions should be provided in the workshop.

**1.16 REPAIRS TO DOOR HANDLES**

Examine the door handle for breakage, damages. If the fixing bolts are loose or missing, tighten the bolts. Replace the door handles, which are found beyond repairs.

**1.17 REPAIRS OF BODY SIDE DOOR**

The body side doors shall be repaired as per annexure VIII of RDSO technical pamphlet no. C-7602

**1.18 REPAIRS TO DOOR PIVOTS**

Examine the door pivots for corrosion, breakage or wear by cutting the bottom portion of outer panel. Cut the corroded portion of the door pillar (Z molding) and weld new piece joining the door pivot pin. If the female socket is worn or damaged beyond repairs then replace it. Replace the bush provided in the socket.

**1.19 REPAIRS TO PARTITION WALL SEAT PILLAR/MOUNTING PLATE**

Examine seat pillar/mounting plate for corrosion or breakage, etc. at bottom ends. If found corroded, repair the same as per RDSO technical pamphlet no. C-7602

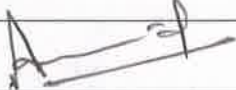
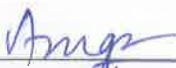
**1.20 REPAIRS TO DRAW AND BUFFING GEAR SUPPORT STRUCTURE**

- (i) Examine the draw gear support structure for corrosion, breakage, etc. If the corrosion is light, scrap off the rust to bare metal, clean well and re-paint. If the corrosion is heavy, replace the corroded angle or gusset plate with new support angle.
- (ii) Similarly examine the buffing gear support structure for corrosion, breakage, etc. if the corrosion is light, scrap off the rust to bare metal, clean well and re-paint. If the corrosion is heavy, replace the corroded angle or stiffeners.

**1.21 REPAIRS TO BODY BOLSTER**

Examine the body bolster for corrosion, breakage, wear, etc. If the corrosion is light, scrap off the rust to bare metal, clean well and re-paint. If the corrosion, breakage or wear are beyond repair, replace the body bolster. Check the area surrounding centre pivot pin mounting holes for cracks.

**1.22 REPAIRS TO CENTRE PIVOTS**

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Clean and examine the centre pivot for bent, wear, cracks. Cracks shall be detected by doing chalk testing or magnaflux dye penetration test. If the centre pivot is found cracked or worn beyond repair, it should be replaced. Check the mounting bolts for loose or missing. Tighten and lock the bolts with locking plate.

### 1.23 WATER TANK SUPPORT STRUCTURE

Examine the water tank support structure for corrosion, breakage, wear, etc. if the corrosion is light, scrap off the rust to bare metal, clean well and re-paint. If the corrosion, breakages are beyond repair, replace the corroded angle with new angle of suitable size as per the requirement. Replace the rubber/wooden packing if perished or damaged.

### 1.24 REPAIRS TO THE FLOOR CHANNEL

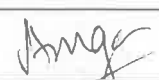
Examine the floor channel for corrosion, breakage, wear, etc. by cutting open the Compreg board and Aluminum chequered sheet flooring where the corrosion is suspected. If the corrosion is light, scrap off the rust to bare metal, clean well and re-paint. If the corrosion, breakages are beyond repair, replace the corroded channels with new channel of suitable size as per the requirement.

### 1.25 GENERAL

- (i) All repairs of cracks should be carried out by gauging and welding by suitable electrodes.
- (ii) CAUTION: No electric welding on the coach should be carried out without proper earthing from near the portion being welded. And in no case the earthing through the bogies and rails shall be permitted. In the absence of such earthing, the return current passes through axle roller bearings causing pitting of rollers and bearing failure in service.
- (iii) Distorted and bent parts should be heated and straightened.
- (iv) The parts used for repairs should be given proper surface treatment and applied with protective paint. Relatively thick sections such as sole bars, cross bearers, etc. should preferably be grit blasted and immediately thereafter given a protective coat of red oxide zinc chromate primer paint.
- (v) Welder's Qualification: Welders deputed to carry out welding work on coaches and coach components should be only those tested and certified as adequately skilled for welding work on coaches and coach components.

### 1.26 LIST OF TOOLS AND PLANTS

| Lifting shop               | Corrosion repair shop            |
|----------------------------|----------------------------------|
| 1. EOT cranes              | 1. EOT cranes                    |
| 2. Trestles for coach body | 2. Trestles for coach body       |
| 3. Inspection torches      | 3. Gas cutting plants            |
| 4. Spiked hammers          | 4. Multi-operator welding plants |
| 5. Ball peen hammers       | 5. CO <sub>2</sub> welding plant |

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| 6. Goggles for inspection staff | 6. Electrical angle grinders    |
| 7. Measuring tape               | 7. Pneumatic hand grinders      |
| 8. Measuring scale              | 8. Component painting equipment |
|                                 | 9. Phosphating plant            |

1.27 Examination and repair practice in maintenance depot shall be as per Annexure-03.

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## Annexure-02

### 2.0 BOGIES

#### 2.1 BRIEF DESCRIPTION OF BOGIES

Bogies currently being manufactured for OHE CAR are of light weight welded box section construction. Axles for these bogies with their self aligning spherical roller bearings mounted inside cast steel axle boxes are rigidly guided by telescopic dash pots and axle guide assemblies. Helical springs working in parallel with dashpots/hydraulic shock absorbers are used for both primary and secondary suspensions. Coach body is supported on two side bearers located 1600 mm (for BEML Bogie) and 1200mm (for ICF Bogie) apart on a floating bolster which in turn rests on two pairs of nested helical springs supported on a spring plank hung through swing links from bogie frame, Side bearer consists of metal slides immersed in oil baths well protected from dust ingress. The oil filling arrangements for side bearers have been provided similar to that of ICF bogie.

No weight is transferred through bogie pivot, which is located in the centre of the bolster. The pivot acts merely as a centre of rotation and serves to transmit acceleration and retardation forces and incorporates a resilient silent block bush which isolates noise from track and offers certain amount of constrain for nosing of bogie.

In case of BEML bogie the floating bolster is secured in the longitudinal direction to bogie frame by means of two anchor links with silent block bushes, located diagonally opposite to each other and transmit draw and braking forces between bogie frame and coach body through centre pivot. Rubber buffer have been provided on floating bolster beam to limit lateral swing.

Following are leading particulars of bogie:-

| SN | Description                           | BEML                 | ICF                  |
|----|---------------------------------------|----------------------|----------------------|
| 1  | Rigid wheel base                      | 2896 mm              | 2896 mm              |
| 2  | Diameters of wheel on tread           | 915 mm               | 952 mm               |
| 3  | Axle load                             | 16 tonnes            | 20.32 tonnes         |
| 4  | Supporting arrangement for coach body | Through side bearers | Through side bearers |

#### 2.2 FEATURES WHICH CONTRIBUTES IMPROVED RIDING COMFORTS

Rigidly guided axles mounted on self aligning spherical roller bearings, with practically no play in the longitudinal and lateral directions, helical springs working in parallel with dashpots/shock absorbers of specified characteristics, the diagonally opposite anchor links (in case of BEML bogie) for guiding the bolster and near ideal distribution of the total deflection between primary and secondary suspension obtained for these bogies have all contributed to superior riding comforts. It is therefore essential to ensure that these features are well maintained in service so as to obtain the desired performance throughout the life of these bogies.

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Riding comfort offered by a bogie depends exclusively on above design features and unless bogies are properly maintained and attended to during periodical, overhauls, riding deteriorates leading to subsequent heavier and costly maintenances.

## 2.3 OVERHAULING

OHE inspection car bogies are designed for good riding comforts with the help of self-aligning spherical roller bearings, hydraulic shock absorbers, and helical springs for suspensions. Proper handling & maintenance of these will result in longer life and satisfactory service.

The Bogies are required to be given proper maintenance as per the schedule mentioned in **Annexure -3**.

## 2.4 LIFTING THE CAR BODY OFF THE BOGIES

Coach body can be lifted off the bogies either by:

Two electric cranes with suitably designed swings and cradles; or four electrical, lifting jacks simultaneously operated by one control switch. OHE Car should not be lifted from any other point but from lifting pads. Four screw jacks each applied at four lifting pads provided in the body for this purpose, under no circumstances a lifting jack or sling should be applied on a bogie frame or at any other location except on lifting pads in the workshops or depots.

Cranes or jacks used for lifting should be operated uniformly and simultaneously without jerks, before lifting the coach, following components should be disconnected.

## 2.5 DYNAMO BELT ON NON-POWERED BOGIE

Cotter cover housing, split pin and cotter from centre pivot.

Lavatory chutes situated over the powered bogie.

Cordon shaft coupling connecting axle drive with transmission on powered bogie.

Air hose connecting brake pipe on under frame to the piping on bogies.

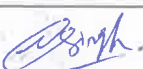
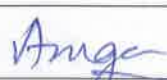
Parking brake chain.

Hose connection for sanding gear on powered bogies.

Earthing cable connections.

Speedometer cable connection on powered bogie.

Before finally lifting coach body, steel/wooden blocks of requisite thickness should be inserted in the recess in between the bolster and bogie frame. So as to keep the bolster springs compressed to avoid the bolster hitting the bogie frame and straining silent block bushes in anchor links.

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Coach should never be lifted from one end only as the centre pivot and the dashpot guides are likely to suffer damage and dents may occur on body panel near the body bolster.

Air vent screw on the bogie frame above dashpots should be unscrewed completely after cleaning the area around the air vent hole properly. This is done to release the air locked in the dashpots.

## 2.6 DISMANTLING OF BOGIES

Before dismantling, these bogies should be thoroughly cleaned all over and particularly near the air vent screw above the dashpot by using brush or scraper if necessary. Steel brushes should not be used for cleaning, as they are likely to damage the paint on bogie frame. Dismantle the cordon shaft by removing bolts connecting cordon shaft and axle drive. Also dismantle torque arm connected to transom. Support the axle drive with wooden blocks. Bogie frame with bolster may be lifted by means of a crane till all the 8 guide bushes disengage the lower spring seats and wheels rolled out. Bogie frame along with bolster assembly can then be put on trusses. The bolster may then be dismantled from bogie frame, after disconnecting shock absorber and anchor links, by compressing the bolster springs to relieve the load on the swing links and hanger pins.

## 2.7 ATTENTION TO BOGIE COMPONENTS

Following attention should be paid to bogie components during POH before assembling them.

### 2.7.1 BOGIE FRAME

Bogie frame should be checked thoroughly after cleaning for any possible cracks, particularly at places where bolster suspension brackets, brake block brackets are welded and at dashpot guide flanges. Threads on dashpot guide should also be checked for damages. Normally squareness and alignment of dashpots does not require checking. If biased wheel flange wear or wear in the rear cover of the roller bearing axle box have been observed, the squareness of guides and their alignment should be checked thoroughly with the help of alignment gauges. Wheelbase may be checked with the help of gauge. In the event of misalignment of dashpot guides or damaged guides which require replacement. Following procedure may be adopted.

Whenever a dashpot guide is damaged, it is to be replaced.

Alignment of axle box guides should be measured with reference to bolster spring suspension bracket. (hereafter referred to as BSS). Therefore, it is necessary to ensure that BSS are in proper alignment between themselves and the centers should form a rectangle within permissible tolerances as per Design bogie (ICF and BEML).

Centre punch mark should be made at centre of each BSS and measurements taken, if they are within the tolerance. There is no need to relocate these brackets and their centers taken as reference points for further rectification. Normally, these brackets are in correct alignment and do not require any attention.

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If BSS do not lie within the tolerances, the transverse centre line of bogie frame between headstocks should be marked and deviations on BSS from this line measured. Then one or more BSS should be cut out and re-positioned with correct alignment.

After ensuring that BSS are in correct alignment, the location of axle box guides from BSS are measured and checked with ICF bogies and BEML for this purpose guide caps with the centre hole blocked and marked with centre punch should be used.

Where the measurements of guides from BSS show a deviation from the dimension. The concerned pair of guides should be cut and re-welded in position. Guide should always be cut in pairs as the adjacent guide distances are to be maintained as per their respective drawings. Judicious selection of guides to be cut will minimize rectification work and normally 4 out of 8 guides on each frame need be cut and repositioned. These 4 guides could be either of those on one side of the frame or in two pairs of guides diagonally opposite to each other on either side.

While cutting out guides, care should be taken that only the weld metal is cut and guide flange or bogie frame are not damaged. The work calls for special skill and welder should practice cutting out welds on scrapped fabricated components before starting guide cutting.

Guides, which are cutout, need not be scrapped but the flange periphery should be built up by welding wherever spoiled or pitted by gas cutting and ground to shape. Care should be taken not to damage the threads of the guide cap.

#### 2.7.2 For re-welding dashpot guide

Locate new guide with the aid of setting gauges with reference to other guides. Two gauges, one giving the longitudinal and other diagonal location in relation to other guides are sufficient to locate it. However, a third gauge be used as a counter check with ICF bogie and BEML bogie.

Tack weld the guide to bogie frame taking care to see that oil hole of the guide is in alignment with that of bogie frame flange.

Remove the gauge and complete the welding.

Allow the frame to cool off.

Check the dimension of the guide in relation to others with the aid of master gauge. Check also the height of the guide in relation to other guides with a straight edge.

Any discrepancy in location is rectified by suitable local heating to the frame.

Use low hydrogen electrodes of approved brand for welding (Electrodes under IRS Class A3/A4 may be used).

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Important dimensions to be checked after rectification should be as per design bogie (BEML & ICF).

Bogie frame should be thoroughly checked for any cracks particularly at bolster suspension brackets and brake block brackets. The wear on the bush for the bolster suspension bracket should also be checked and if more than 0.5 mm, the bush should be changed.

The clearance between the bolts and the axle box should be as ICF bogie and BEML bogie. The stop screw should be adjusted every time the timber packings are inserted between the lower spring seat and the lower rubber washer to compensate tyre wear so as to obtain the prescribed clearance between axle box crown and the stop.

Bogie frame should be given one coat of anti corrosive black paint.

### 2.7.3 WHEELS AND AXLES (BEML Bogies)

The leading dimensions of powered wheels and axles set should be checked for single engine version, double engine version and for non powered wheel and axle as per drawings. These wheels are clearly marked with their axle capacity and should not be interchanged with other wheels under any circumstances.

The wheel profile should be checked and re-turned to standard profile as per RDSO/SK-91146 (latest alteration) and tread should be machined to machining standard N11 while tyre turning. The axle box covers, speedometer with cover and earthing assembly with cover should be removed after cleaning the axle box and replaced with special covers, (with a hole in the centre) secure this in position by using 4 axle box bolts before mounting the wheel set on lathe for tyre turning to prevent entry of any foreign matter in the bearing.

Variation in the tread circumference of the wheel on the same axle should not exceed 1.6 mm i.e. 0.5 mm in diameter. Large variation in wheel diameter will lead to biased flange wear. Under the same bogie, the variation in wheel diameter between one pair of wheels and the other should not exceed 5 mm and that between two bogies under the same car, the maximum variation should not exceed 13 mm.

Wheel gauge should be within the tolerance of +1/-1mm.

Under no circumstances, wheels, which have reached the condemning, limit, as indicated by grooves on the wheel rim/tyre should be used.

In case any wheel is de-wheeled and repressed on, the pressing on pressure maintained as per the values shown in BEML drawing No. 901-81003, 902-81003 & 901-81004 for powered single engine version, powered double engine version and for non powered wheel sets respectively, should be strictly adhered to and a record of wheel pressing on pressure maintained.

Earthing arrangement has been provided in the front cover of the axle box

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Unscrew screws connecting housing and front cover of axle box.

Dismantle the housing, earthing spring and earthing piece.

Check for the condition of the spring

Check for the wear of earthing piece. If there is any cracks or broken or if the length 65 mm is less than 50 mm it should be replaced with a new one.

## 2.7.4 WHEELS AND AXLES (ICF Bogies)

The OHE are provided with composite design of wheels consisting of rolled steel wheel centres with renewable tyres. The tyres of TC bogies are fastened to the wheel disc with glut rings and 4 locking keys to ensure more positive securing.

### Tyre profile

- The new/re-turned tyre profile shall be as per RDSO sketch no.91146 (latest revision/alteration).
- The condemning limits for the flange wear, roof wear, deep flange, sharp flange, hollow tread wear and flat surface on tyre shall be as per the condemning gauge shown in plate 45 of IRCA, Part-IV.
- Wheel gauge should be within the tolerance of  $\pm 1$  mm.

### WHEEL DIAMETER

| New   | Condemning | Last shop issue size |
|-------|------------|----------------------|
| 952mm | 877mm      | 885mm                |

Permissible variation on wheel tread diameter.

- The permissible variation in tread diameter of wheels at the time of tyre turning or wheel replacement are as follows:-

Wheels of the same axle 0.5mm

Wheels of the same bogie 5.0mm

Wheels between two bogies 13.0mm  
under the same coach

- No separate service limits are specified as the above figures have been fixed to allow for the differential wear likely to develop between successive tyre turnings/wheel changing. It is therefore, not necessary to withdraw OHE car stock from service specifically for restoring the differential between wheel diameters to be within the prescribed limits.

Material specification for wheel and axle

|                                                                                     |                                                                                     |                                                                                       |
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The material specification applicable to the wheels and tyres are as follows:

- a) Tyres IRS specification R-15/95
- b) Axle IRS specification R-43/92

Note: Weld reclamation of Axle should never be done.

## 2.8 ROLLER BEARINGS

These bogies have been fitted with double row self-aligning spherical roller bearing. These bearings are mounted directly on the axle as per design Bogie ( BEML & ICF).

### 2.8.1 LUBRICATION OF ROLLER BEARING

The quantity of grease required to be filled in axle box during renewal is given below:

|             |        |
|-------------|--------|
| SKF bearing | 2 Kg   |
| FAG bearing | 1.5 Kg |

List of approval brand of grease is given below:

| Supplier of grease | Type of bearing |            |
|--------------------|-----------------|------------|
|                    | SKF             | FAG        |
| I.O.C.L.           | SERVOGEM 3      | SERVOGEM 3 |
| H.P.C.L.           | ---             | LITHON 3   |
| B.P.C.L.           | ---             | POLYPAK 3  |

The different types of grease should not be mixed together.

### 2.8.2 INSPECTION OF ROLLER BEARING

Thoroughly clean the exterior of axle box and then remove the front cover from the body casting. Examine the grease, if it is discolored fully, bearing should be dismantled and thoroughly inspected. If the grease is in good condition, bearing need not be dismantled, but be washed and cleaned in position with petrol or white spirit.

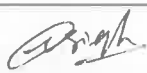
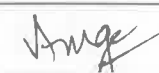
When dismantled scoop out all accessible grease from the front by the hand and by using a rubber scraper take out all grease. Wash the bearing with spirit or petrol.

Ensure that tracks, rollers and cages of bearing are free from damage. Measure the bearing clearance using a feeler gauge. If the roller and tracks are not pitted or flaked and cage is not worn, that is rollers do not fall out when the outer ring is swiveled at an angle, the bearing is in good condition. Maximum bearing clearance of 0.33 mm is permissible.

### 2.8.3 DISMANTLING

Roller bearing can be dismantled as described below:-

Straighten the folded tabs of the triangular locking plate, unscrew the hexagon head screws holding the securing cup. Remove the securing cup, then push the injector adapter ring on the journal against the bearing and clamp it firmly against the bearing inner ring. Connect the oil injection pump capable of developing a minimum pressure of 740 kg/sq.mm to the adaptor ring and pump in thick cylinder oil IS: 1589-60 Type I

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Gr-3, so that a film of oil is formed between the bearing and the axle journal. Remove the adapter ring as soon as the oil film is formed. Fit the withdrawal tool over the bearing outer ring, then push the locking ring forward, so that the claws of the sleeve engage the inside face of the bearing outer ring. Due to oil film between the journal and the inner ring the bearing can be easily dismounted by turning the withdrawal screw.

After removing the bearing, remove the rear cover and the sealing ring.

Wash and examine the bearing and other components.

#### 2.8.4 FELT SEALING RING

The felt sealing ring should be examined and if found damaged, replaced. However, it is advisable that every alternate POH, the felt ring is renewed.

Felt used should have the following properties:

Density -  $0.36 \text{ gm/cm}^3$

Oil absorbing power for the felt should be such that after it is immersed in oil at  $29^\circ\text{C}$ , its weight is increased by 130 to 150 %.

#### 2.8.5 MOUNTING OF ROLLER BEARING & ASSEMBLING OF AXLE BOX

Soak felt ring in cylinder oil to IS: 1589-60 Type I Gr-3 heated to  $40^\circ\text{C}$  to  $50^\circ\text{C}$  for 30 minutes and fit in the groove in rear cover.

Clean and examine journal and ensure that threaded holes for locking screw are perfect.

The collar should be shrunk fit on axle journal after heating the collar in a neutral oil bath. With the help of a mounting sleeve. Make sure that the collar firmly butts against journal shoulder.

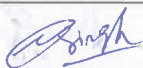
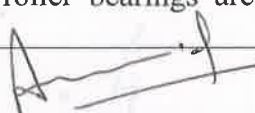
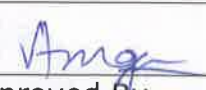
Fit the rear cover with four bolts along with rubber 'O' ring and felt sealing ring in position. Fill in the 'V' grooves and the cavity in the rear cover upto the face of the ring with approved brand of grease.

Heat the roller bearing in a hot oil bath and slide it over the journal carefully with the help of a mounting tool. Push the bearing forward till it firmly butts against the ring. The stamped face of the bearing should be kept outwards while fitting the bearing so that the stamping can be seen during inspection. After the bearing cools off, remove the mounting tool and pack the bearing with grease.

Assemble the required securing cup and lock plate with hexagon screw. The securing screw is locked by bending over the tabs provided in the locking plate against flat of bolt heads.

#### 2.8.6 Check that the axle box can be rotated freely by hand.

The working space for mounting and dismounting of roller bearing must be absolutely clean and the table on which roller bearings are cleaned must be free from iron

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fillings, dust, etc. Kerosene oil may be used for cleaning the roller bearing and journals. The cleaning bath should be changed every time to keep it free from dust and foreign matter. Steel trays with lids should be used for cleaning roller bearing.

## 2.8.7 AXLE BOX HOUSING

Double row self-aligning direct mounted spherical roller bearings are housed in accurately machined cast steel axle boxes. The axle boxes are also provided with light alloy front and back covers secured by four bolts. Axle boxes and covers should be thoroughly cleaned and checked for cracks particularly at the bolt holes of the covers which have shown proneness to failures. The bolts should be examined for worn threads, straightness, etc., before reuse and should be well-tightened and locked by spring washers and split pins to ensure that the covers and the axle box housing form a water tight assembly and protect bearing from dust and moisture.

## 2.8.8 AXLE BOX SPRINGS

Axle box springs are of helical type manufactured as per RDSO specification WD-01-HLS (latest revision/amendment). from centreless ground Chrome Vanadium steel rods. These springs are also shot-peened to obtain high fatigue life. It is necessary to check these springs for cracks and measure their free height to ensure that they meet the design requirements.

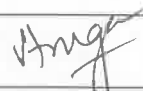
All the springs shall be grouped in categories and used on bogies as per instructions detailed in RDSO technical pamphlet no.C-8419 (latest revision/amendment).

For BEML bogie the axle box spring shall be as per BEML drawing No 901-81027.

**2.8.9 LOWER SPRING SEAT:** Lower spring seat on axle box wing in which, guide bush of dashpot moves up and down does not wear in service. In the absence or inadequate quantity of oil in the dashpot, the inside surface is likely to wear. If the surface is worn more than 0.4mm in diameter or if the surface is scored or otherwise damaged, the lower spring seat should be replaced. All lower spring seats should be carefully checked for cracks before reuse.

**2.8.10 DASHPOTS AND AXLE GUIDE ASSEMBLIES:** Axle box guides are accurately machined hollow forgings welded to the bogie frame to ensure that the wheels set are rigidly guided in parallel. These guides are fitted with bronze bushes at the lower end to give the close guidance of wheel set both in lateral and longitudinal direction. The lower spring seat is filled with oil and the assembly is sealed with rubber ring to make it oil tight. Holes on the bogie side frame above each guide are provided to top up the damping fluid when required as shown.

**2.8.11** Following components which form the dashpot assembly, should be thoroughly examined and renewed as indicated: -

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| SN | Description of Component              | For ICF                                                         | For BEML      | Renew, if component                                  |
|----|---------------------------------------|-----------------------------------------------------------------|---------------|------------------------------------------------------|
| 1  | Guide                                 | EMU/M-0-3-005 (with guide cap)<br>EMU/M-0-3-094 (with circlips) | 922-83014     | Bottom thread worn or cracked at the root of radius. |
| 2  | Upper spring seat or protective tube. | EMU/M-0-1-001                                                   | EMU/M-0-1-001 | Damaged, dented or cracked                           |
| 3  | Dust shield spring                    | T-0-1-012                                                       | T-0-1-012     | Distorted or broken or otherwise defective.          |
| 4  | Dust shield                           | T-0-1-619                                                       | 411-81114     | Examine at every POH and change if required.         |
| 5  | Guide ring                            | T-0-1-640                                                       | 411-81162     | Cracked, broken or worn.                             |
| 6  | Rubber packing ring                   | T-0-1-632                                                       | 411-81147     | Replace at every POH.                                |
| 7  | Guide bush                            | EMU/M-0-1-023                                                   | EMU/M-0-1-023 | Worn out more than 1.2m in diameter.                 |
| 8  | Spring clip                           | T-0-1-614                                                       | 411-81160     | Distorted or broken.                                 |
| 9  | Guide cap                             | EMU/M-0-1-021                                                   | 922-83014     | Threads damaged or worn, holes blocked.              |

In case of the total diametric clearance more than 1.6mm between the guide bush and the lower spring seat based on maximum bore diameter and minimum bush diameter, the part shall be renewed. These measurements should be taken with micrometer so that clearance can be assessed accurately.

It should be ensured that the spring clip item 8 above, should be made from steel to IS:727 C-60 Gr.3.or Material specification mentioned in respective drawings.

The rubber-packing item 6 (For BEML Bogie) above should be made of acrylonitrile rubber an oil resisting quality of rubber or Material specification mentioned in respective drawings. 5% of the lot received should be tested as follows, before accepting the same for use.

**i) Hardness 80-90 shore A (ASTM D 676-89 T)**

Accelerated ageing test in accordance with ASTM Spec. No. D 573-53. Maintain the ring at 70 degree centigrade for 7 days. The ring should not show more than 10 points increase in durometer hardness.

**(ii) Oil resistance test:**

This should be carried out in accordance with ASTM-D 471-59 T . A piece of ring when immersed in dashpot oil at 100 degree centigrade for 70 hours shall not show any reduction in volume and increase in volume shall not be more than 10% of the original volume.

The holes in guide caps should be thoroughly cleaned at every POH.

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- (iii) Following are the approved brands of oil for use on the dashpot.

| Supplier | Brand name    |     |
|----------|---------------|-----|
| I.O.C.L. | SERVOLINE     | 100 |
| H.P.C.L. | YANTROL       | 100 |
| B.P.C.L. | BHARAT UNIVOL | 100 |

- (iv) Approximately 1.7 liters of oil is required per dashpot. The level of the oil in a dashpot can be ascertained in service by unscrewing the bolt provided for topping oil on bogie frame and using a flexible wire dipstick inserted through the vent hole on bogie frame. The level of oil when vehicle is empty should be 97mm for ICF Bogie 85mm for BEML Bogie from guide cap inner surface and should be topped up when the level is less than this. It is necessary to ensure that the bolt on leather washer is tightened well to avoid ingress of dust through the hole, which will lead to scoring of dashpot bronze bush. Oil spilt over the dashpot while replenishing should be wiped clean so that the leakage of oil. If any, subsequently may be detected easily.

Hole provided in the vent screw should be blocked and leather washers should be used as permissible alternative to copper asbestos washers.

#### 2.8.12 BOLSTER SPRINGS

- The bolster spring shall be as per RDSO specification WD-01-HLS (latest revision/amendment).
- Bolster spring for BEML bogie shall be as per their drawing No 901-82029

#### 2.8.13 SPRING PLANKS (LOWER SPRING BEAM)

All springs planks should be carefully checked for cracks, etc. before reuse.

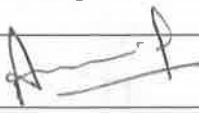
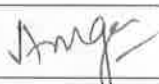
#### 2.8.14 SHOCK ABSORBERS

Hydraulic shock absorbers which are set to offer resistance of  $\pm 600$  kg at a speed of 10 cm/sec have been fitted to work in parallel with bolster springs. These shock absorbers normally give trouble free service and require no attention in between two POHs.

However, a shock absorber which is found either leaking or physically damaged should be renewed. As the resistance of these shock absorbers is likely to deteriorate in service. The shock absorbers be got overhauled from their respective manufacturers, tested and renewed as and when required.

#### 2.8.15 RUBBING PLATE

Nylon rubbing plate has to be fitted to the bolster which serves as cushion between the bolster and bogie frame. Initial clearance of 1mm on each side has been provided between the nylon rubbing plate and steel plate. During POH this clearance must be maintained by fitting steel packing of suitable thickness. During service this

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clearance should not exceed 3mm on each side.

#### 2.8.16 EQUALISING STAYS

Equalising stays connecting the spring plank and bolster, pin jointed at both ends have been provided on these bogies to prevent lateral thrust on bolster springs. It is necessary to remove the pins at every POH, clean and oil them to ensure that they are free to rotate when reassembled, a restricted movement at these joints is likely to prevent free movement of bolster. The free movement of the pins can be ensured by greasing the assembly periodically.

The pins should be provided with washers and split pins to ensure that they do not fall out in service.

#### 2.8.17 CENTRE PIVOT (BEML Bogie)

The centre pivot arrangement is shown in Fig-8a not designed to transmit any vertical load and all that it does is transference of tractive and braking forces.

In case the silent block bush requires removal. It should be removed carefully by means of a Tubular, dolly registering on the outer ring to avoid damage to the rubber bush. Under no circumstances should force be used either on the rubber or on the inner bush for removing silent block bush.

Rubber sealing used on centre pivot should be carefully examined to ensure that it is not torn or perished to avoid foreign matter coming in contact with the silent block bush.

The type of fit as per IS:919 Part 1 and Part 2 between the silent block and sleeve is H7-u8 and the tolerance on the pivot pin is c9. This requirement should be met.

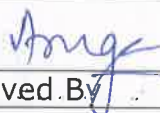
Centre pivot is secured to underframe by means of four bolts with nuts and spring washers. The nuts being tack welded to body bolster. It should be ensured that all bolts are correctly tightened with spring washers.

The silent block sleeve is secured to bogies by means of two studs with nuts and spring washers. It should be ensured that these fasteners are correctly provided.

#### 2.8.18 CENTRE PIVOT (ICF Bogie)

The centre pivot arrangement is shown in Fig 8b. The body bolster of the under frame is provided with a bush of inner Dia 90mm in top and 150mm Dia hole at the bottom and the centre pivot pin, when fitted to the body bolster, perfectly fits into these holes as shown in Fig 8b. Any wear due to bogie rotation is taken up by the upper and lower bushes between the centre pivot pin and the bolster. While fitting the centre pivot to body bolster, it should be ensured that:

- (i) The clearance between the centre pivot pin and guide bush in the body bolster is H7-

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- (ii) Centre pivot pin plate has a machined surface so as to bear squarely on the body bolster.

After fitting the pivot pin to the body bolster, there should be no clearance between the centre pivot pin plate and body bolster. The bolts for securing the pivot plate to the body bolster do not transmit any tractive or braking forces. These are meant only for securing the centre pivot while the force from the centre pivot to the body bolster are transmitted through the mating surfaces between pivot pin and body bolster. It is, therefore, extremely essential to ensure that the design clearance between the pivot pin and the body bolster guide bush are maintained. The lower and the upper bushes in Fig. 8b should be replaced when the total diametrical wear exceeds 1mm. Before lowering the centre pivot the bogie bolster, the pivot bearing of the bolster should be filled with 3 litres of oil.

#### 2.8.19 SIDE BEARERS:

- (i) Side bearers consists of a hard wearing ground steel plate immersed in an oil bath with a floating bronze wearing piece which has a self aligning spherical top surface on which the body rests and transmits the vertical load. The oil well is provided with a cover to prevent ingress of dust. The hard ground plate and the spherical bronze-wearing piece are likely to wear in service.
- (ii) The hard ground plate should be renewed when the wear exceeds 1.5 mm i.e. the thickness is less than 8.5 mm or ridges are observed on the plate. The bronze-wearing piece should be renewed when the wear on the mating surface reaches 3 mm i.e. when the height reduces to 42mm or damages occur to the oil grooves. Sharp edges, which are known to develop at the periphery of the wearing piece, are likely to impair lubrication and should be rounded off, if any, before re-using.
- (iii) The oil well wall is welded on to bolster. Oil may leak out of the well due to porous welding and the vehicles continue to be in service without oil. Absence of oil, apart from causing excessive wear, leads to undue constraint for bogie rotation on curves and produces screeching noise. It is necessary the porous welds are gouged and rewelded, and the oil well is filled with the requisite quantity of oil. Any of the following oils can be used for the side bearer and the quantity required per side bearer is 2.5 liters.

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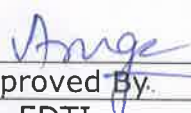
| SUPPLIER    | BRAND NAME        |
|-------------|-------------------|
| 1. I.O.C.L. | SERVOLINE 100     |
| 2. H.P.C.L. | YANTROL 100       |
| 3. B.P.C.L. | BHARAT UNIVOL 100 |

- (vi) It is important to ensure that dust seal cover on the side bearer sits effectively all over without any gap on the oil well and the sleeve slides freely on the guide to ward off dust and moisture coming in contact with the oil.
- (v) If side bearers are not properly maintained. It is likely to cause grating noise. It is, therefore, advised that following precaution should be taken during POH in shops.
- The top cover should be properly fitted to the oil container, and the cover sleeve should be able to slide freely on the guide.
  - The oil and the sliding surfaces should be free from dust and other contamination.
  - The mating surface of the convex bronze bearing piece, and the concave surface of the guide, and the wearing surface of the plate should be smooth and properly bedded together.
  - When the oil is contaminated, it should be removed and the housing thoroughly cleaned and 2.5 liters of fresh approved brand of oil should be filled in.
  - The bronze wearing piece should be provided with 1 mm. relief over the periphery and the sharp edges of the oil grooves to be rounded off.

#### 2.8.20 ANCHOR LINKS (For BEML Bogie)

- (i) Anchor links should be carefully examined for cracks at weld as these have shown proneness to occasional failures. The rubber in silent block should also be carefully examined for deterioration. Appearance of fretting on edges of rubber is an indication of deterioration of rubber. Whenever a silent block is to be replaced. It must be from those that have been duly tested and received from Railway/RDSO approved sources to avoid preloading of the anchor link while assembling on bogie, ensure that the assembly can be done without forcing the link into position. This can be done conveniently after lowering the body on the bogies.
- (ii) OHE car should not be permitted to run with broken anchor links as this is the only medium to transfer the draw and braking forces from the body to the bogie and vice versa.
- (iii) Test for silent blocs: Five percent of the purchased silent blocs for centre pivot and anchor links should satisfy the following test before accepting the lot.

#### 2.8.21 ANCHOR LINK SILENT BLOCKS

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- (i) Torsion test: Specimen is held in a specially devised gadget and the pin subjected to torsion until it undergoes a deflection of 8 degrees about the axis of the pin. This test is repeated 10 times on either direction and the load is noted. The silent block bush is considered suitable if this deflection takes place with a torque of 5000 kg cm, and the permanent set is not more than 0.5 degree.
- (ii) Side swing: The specimen is held in the above gadget and the torsional force in a plane the axis of the pin is applied. Torque to attain a twist of 8 degrees should be 4000 kg cm and a permanent set of 0.5 degree is acceptable.
- (iii) Radial load test: A radial force of 4.5 tonnes is applied and the deflection is noted. A deflection of 1.5 mm has been accepted although 1 mm is considered good.

#### 2.8.22 ENTRE PIVOT SILENT BLOCK

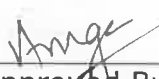
- (i) Torsion test: Specimen is held in a specially devised gadget and the inside sleeve subjected to torsion until it undergoes a deflection of 7 degrees about the axis of the sleeve, the silent block is considered suitable if this deflection takes places with a minimum torque of 25000 kg cm.
- (ii) Radial load: Max. deflection of 1.5 mm at 9000 kg load.

#### 2.8.23 HANGER AND HANGER BLOCKS

- (i) Hanger and hanger blocks shown in Fig 7b. for BEML Bogie and Fig 7a for ICF bogie, should be thoroughly cleaned after dismantling and examined carefully for cracks/wear/and other damages. The extent of permissible wear on these components is indicated below:

| Description of component     | New size mm                   | Condemning mm  | Wear in mm | Shop issue size mm |
|------------------------------|-------------------------------|----------------|------------|--------------------|
| Hanger                       | BEML<br>ICF<br>384.0<br>246.0 | 387.0<br>249.0 | 3.0<br>3.0 | 386.0<br>247.5     |
| Hanger block, top and bottom | BEML<br>ICF<br>9.5<br>9.5     | 8.0<br>8.0     | 1.5<br>1.5 | 8.5<br>8.5         |
| Pin                          | BEML<br>ICF<br>37.0<br>45.0   | 35.5<br>43.5   | 1.5<br>1.5 | 36.0<br>44.0       |

- (ii) The wear on the hanger cannot be made good by welding as it is made of class-I steel case carborised. The wear on the hanger block can however, be built up by welding with matching electrodes after preheating to 250 °C as it is made of class-III

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steel. The hanger block should then be normalised and machined to the dimensions shown on drawings.

## 2.8.24 BOGIE BRAKE GEAR

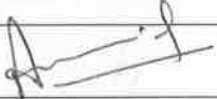
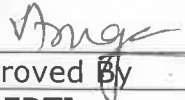
- (i) Maximum radial clearance of 1mm between the brake gear pins and bushes is permitted. If the clearance is more the worn out part should be replaced and standard clearance maintained.
- (ii) Brake block should be replaced when they wear out to the thickness of 16mm by removing the looped key from the brake head.
- (iii) An adjusting palm pull rod with holes at regular intervals is provided in the brake rigging to take up slack in rigging due to wear. Adjusting should be done by relocating the pin in different holes on the palm pull rod.

## 2.8.25 ACTION TO BE TAKEN BEFORE REASSEMBLING THE BOGIE

After attending to the various components as detailed in para 2.6 above, the bogie may be reassembled taking into consideration the following aspects. The two wheel and axle sets selected for the bogie should not have variation of more than 5 mm on tread diameter. The difference in tread diameter between wheel sets under two bogies of a coach shall not be more than 13 mm. The axle box spring selected for tower car should be of same group of spring as detailed in C-8419 (latest revision/amendment)..The two pairs of axle box springs selected for each axle should not vary in their free height by more than 3 mm and their load deflection characteristics should be as per RDSO specification WD-01- HLS (latest revision/amendment). Wooden packing of requisite thickness to be selected for use on lower spring seat for taking up the wheel wear and maintaining buffer height. Top and bottom rubber pads on the axle box spring should not be used again if they are not in good condition. The two pairs of bolster spring sets selected for bogie shall not vary in free height or more than 3 mm and their load deflection characteristics should be as per RDSO specification WD01 HLS (latest revision/amendment). Mating surfaces of the convex wearing piece and the concave surface of side bearer and the wearing surface of the wearing plate should be smooth and properly bedded.

## 2.8.26 EQUENCE OF REASSEMBLING THE BOGIE

Assemble the bogie bolster, spring plank, equalising stays, bolster spring sets, to the bogie frame with the help of a chain and jack. Assemble the roller bearing and axle boxes as detailed and ensure that the bearing is effectively secured. Place axle box helical spring on the lower spring seats with rubber rings and wooden packings and fill in the dashpot with any of the approved brand of oils up to specified levels. Insert rubber pad, upper spring seat, dust shield spring, dust shield, rubber packing ring and guide bush and the axle box guide and lock the bush in the position and ensure that the bush sits tight against the rubber packing ring and the 2 mm hole in the guide is in alignment with that on the bush via the groove in guide bush. Lower the bogie frame with the bolster assembly on the wheel and axle sets taking care to ensure that all the 8 guide bushes engage in lower spring seat and the bogie frame is set evenly on the 4

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axle boxes. Insert the cotter in the centre pivot, then lock it with split pin. After inserting the cotter, fit the bottom centre pivot cover housing. Assemble dynamo belt on non powered bogie. Fit lavatory chute. Engage bolster strap. Engage axle box strap. Connect air hoses connecting brake pipe on underframe to the piping on bogies. Connect parking brake chain. Connect hoses for sanding gear on powered bogie. Connect speedometer cable. Connect earthing cables to axle boxes & under frame.

### 2.8.27 RUNNING CLEARANCES

After assembling bogie and lowering car body. The clearances between the top of bogie bolster and bottom of bogie frame above bolster springs and the clearance between top of the axle box casting are checked with the dimensions shown. Fig. 4b for BEML bogie & Fig 4a for ICF bogie.

### 2.8.28 ATTENTION REQUIRED FOR BOGIES ON OPEN LINES (DEPOTS)

Lifting the body of the bogies: Instruction contained in Para 2.4 above should be strictly adhered to while lifting the body off the bogies.

Dismantling of bogies: Instructions contained in para 2.5 above should be strictly adhered to while dismantling the bogies.

### 2.8.29 ATTENTION TO THE BOGIE COMPONENTS

Car Depots should not try to weld a damaged axle box guide or replace the same. The bogie should be sent to workshops for welding the guide and checking the alignment. The bogie frame should, however, be checked for cracks, particularly at the bolster suspension brackets and brake block brackets.

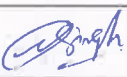
The instructions contained in conference Rules, Part-IV for the examination of wheel profile, axle should be strictly adhered to. Wheel sets showing biased flange wear, i.e. one flange wearing faster than the other should be withdrawn from service and sent to shops for examination and rectification. OHE CAR have been provided with 16 tonnes and 20 tonnes wheel and axle sets. Which are marked clearly on the wheels. It is important that these wheels are not mixed up with wheel assembly which are used on other stocks. Maximum permissible flat on wheels of these coaches should be limited to 50mm.

Roller bearing should not be attended to in Car Sheds. All that would be necessary in service is to feel the axle boxes for any tendencies on their part to get overheated. If any axle box shows tendency to run hot. The wheel set which run hot should be replaced in sicklines and the damaged wheel sets sent to shops for attention.

Four bolts securing the rear and front cover of the axle box shall be examined to ensure correct assembly with spring washer and split pins.

Whenever a spring is to be replaced, it should be done in accordance with RDSO Spring Maintenance Manual No. C-8419 (Latest Revision).

Free height of all the Axle box and bolster springs for OHE CAR should be within the

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tolerance as shown in C-8419 (Latest Revision).for used spring and as per RDSO Specification No. WD-01-HLS (Latest Revision) for new springs.

Whenever dashpots in primary suspension show signs of oil leakage through sealing rings, the bogie should be lifted and the rubber sealing ring checked and replaced if need be. In the event, the diametrical clearance between the guide bush and the lower spring seat should also be checked and if more than 1.6 mm the components worn out should be replaced.

Level of oil in dashpot should be checked at intervals of one month with the help of a dip stick. It is important that oil level is checked after vehicle has been standing for at least 30 minutes as otherwise froth in dashpot oil formed when the vehicle is running may give wrong indication. The oil level should not be less than 85 mm for BEML Bogie and 97mm for ICF Bogie. from the top surface of the guide cap.

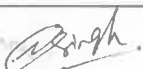
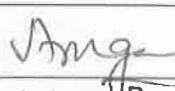
If hydraulic shock absorbers used on secondary suspension show any sign of oil leakage or other damages, the same should be replaced with a shock absorber completely overhauled. For this purpose, the sicklines should maintain "imprest" for use as unit change assemblies. Leaky shock absorbers should be sent to the workshop for overhauling. The shock absorbers should be checked to ensure that four securing studs are properly tight.

The brake blocks should be replaced when worn out to a thickness of 20 mm for BEML bogie and 16mm ICF bogie. The maximum diametrical clarence between brake pins and bushes should be limited to 2mm.

Oil in the side bearer should be checked at an interval of one month and oil replenished through the side bearer oil filing arrangement. If it is found that the oil leaks through the weld, the weld should be gauged and rewelded poperly. The bronze wearing piece and the hard ground steel plate should be replaced, if need be, i.e. when the bronze piece has worn out by 3 mm or has developed sharp edges. The pemissible wear on the steel plate is 1.5 mm. Whenever bogies are run out, a checks as indicated in par 2.6.15 should be made on side bearers. This will avoid grating noise on curves.

The safety straps for brake beam and equalising stay should be checked for proper securing arrangement. Straps for the bolster and axle boxes, should be checked for proper secuing arrangement. Straps for the bolster and axle boxes should be checked for adequate running clearances. If hard wooden packings are requied to be used on lower spring seats for taking up the wheel wear, the packings of proper thickness should be used.

It should be ensured that the screw for the vent hole are properly tightened with leather washer and locked with steel wire. If a silent block is observed to have fretting on edges, whether on anchor link or on centre pivot, it should be removed and replaced with a new one. The securing studs for the anchor link should be examined for proper fastening. The four bolts securing the centre pivot to the underframe should also be examined for proper assembly with spring washer and nuts being tack welded. Under no circumstances wheels which have reached the condemning limit

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indicated by the grooves on the wheel rims/tyres should be used. OHE CAR should not be allowed to run in service with a broken dashpot or a broken spring. OHE car should be immediately sent to shops/depots for replacing the broken dashpot guides or broken springs. Equalising stays should be carefully examined to ensure the correct assembly with washers and split pins. All welds and the body of the equalising stays should also be examined for cracks. Bogies with bent, cracked or broken stays should not be allowed in service.

Equalising stays have been provided with grease nipples. These should be lubricated periodically to ensure its free movement. The bolster assembly should be examined in position to ensure that the hanger blocks, pins and shackles are in good condition. Dashpots and side bearers of these bogies should be checked for possible oil leaks and in the event of signs of leakage, the level of the oil should be checked and replenished. Before replenishing oil in side bearer a flexible wire 3 mm diameter should be inserted through the hole to ensure that the hole is not blocked.

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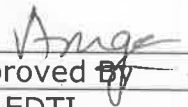
**Annexure-3****SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR**  
**(Daily Check)**

(i) 8-WHEELER OHE Car:

(ii) Cumulative km.:

(iii) Date :

| No.        | Details of work to be carried out                                                        | Condition/Action | Sign. | Remarks |
|------------|------------------------------------------------------------------------------------------|------------------|-------|---------|
| <b>1.0</b> | <b>8-WHEELER OHE CAR</b>                                                                 |                  |       |         |
| 1.1        | Fill water in lavatory over head tank.                                                   |                  |       |         |
| 1.2        | Drain condensate from automatic drain valves of brake system.                            |                  |       |         |
| 1.3        | Drain the moisture manually on daily basis.                                              |                  |       |         |
| 1.4        | Check the leakage of air pressure, if any, rectify the same.                             |                  |       |         |
| 1.5        | Check the brake application and relieving before leaving the depot.                      |                  |       |         |
| 1.6        | Check the working of horns during starting.                                              |                  |       |         |
| 1.7        | Check the oil level of axle drive, if found less, add upto maximum mark.                 |                  |       |         |
| 1.8        | Check the Transmission oil level in the oil tank , if found less, add upto maximum mark. |                  |       |         |
| 1.9        | Ensure correct level of radiator water, lube oil in ADGB & fuel in tanks.                |                  |       |         |

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## SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR

(Car body, Under frame, Bogies, Brake Rigging etc.)

### Weekly Schedule

(i) 8-WHEELER OHE Car:

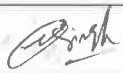
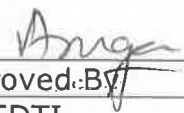
(ii) Cumulative km.:

(iii) Date :

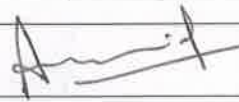
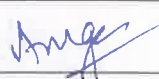
| No.        | Details of work to be carried out                                                                                | Condition/Action | Sign. | Remarks |
|------------|------------------------------------------------------------------------------------------------------------------|------------------|-------|---------|
| <b>1.0</b> | <b>8 WHEELER OHE CAR</b>                                                                                         |                  |       |         |
| 1.1        | Repeat all Daily checks                                                                                          |                  |       |         |
| 1.2        | Drain condensate from all the air reservoirs, and filter through cut off cocks.                                  |                  |       |         |
| <b>2.0</b> | <b>Car Body</b>                                                                                                  |                  |       |         |
| 2.1        | Car body should be washed both from outside and inside.                                                          |                  |       |         |
| <b>3.0</b> | <b>Shell</b>                                                                                                     |                  |       |         |
| 3.1        | Visually check body panels/end walls for damages.                                                                |                  |       |         |
| 3.2        | Visually inspect window bars for damage/missing.                                                                 |                  |       |         |
| 3.3        | Examine body side doors for proper working/damages.                                                              |                  |       |         |
| 3.4        | Inspect door handles for damages/missing.                                                                        |                  |       |         |
| <b>4.0</b> | <b>Under frame</b>                                                                                               |                  |       |         |
| 4.1        | Visually examine centre pivot mounting bolts and attend if needed.                                               |                  |       |         |
| 4.2        | Check condition of head stock/sole bar.                                                                          |                  |       |         |
| 4.3        | Visually inspect centre pivot cover.                                                                             |                  |       |         |
| <b>5.0</b> | <b>Bogie</b>                                                                                                     |                  |       |         |
| <b>5.1</b> | <b>Bogie frame</b>                                                                                               |                  |       |         |
| 5.1.1      | Examine visually the condition of bogie side frame, transom, longitudinal, bolster etc. at all welded locations. |                  |       |         |

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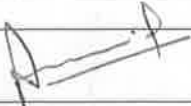
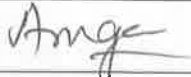
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| 5.1.2      | Examine rubber stopper/stop screw of axle box crown for damage/ missing /loose.                                              |  |  |  |
| 5.1.3      | Inspect axle box safety straps/ loops for damage/breakage/ missing                                                           |  |  |  |
| 5.1.4      | Inspect bolster safety straps/loops for damage/ breakage /missing.                                                           |  |  |  |
| 5.1.5      | Inspect brake hanger brackets for damages.                                                                                   |  |  |  |
| 5.1.6      | Inspect safety brackets for brake hanger pins.                                                                               |  |  |  |
| 5.1.7      | Check visually BSS hanger brackets.                                                                                          |  |  |  |
| <b>5.2</b> | <b>Primary Suspension</b>                                                                                                    |  |  |  |
| 5.2.1      | Visually examine axle box springs for breakage/damage.                                                                       |  |  |  |
| 5.2.2      | Visually examine dashpot oil filling special screw for deficiency.                                                           |  |  |  |
| 5.2.3      | Check oil leakages in dashpot through defective seals/vent screws                                                            |  |  |  |
| 5.2.4      | Visually examine axle box clearance.                                                                                         |  |  |  |
| <b>5.3</b> | <b>Secondary Suspension</b>                                                                                                  |  |  |  |
| 5.3.1      | Visually examine bolster springs breakages/damages.                                                                          |  |  |  |
| 5.3.2      | Visually examine Bolster lower spring beam.                                                                                  |  |  |  |
| 5.3.3      | Visually examine BSS hangers, hanger blocks, BSS pins.                                                                       |  |  |  |
| 5.3.4      | Visually examine equalizing stay rods and pins (small and big).                                                              |  |  |  |
| 5.3.5      | Visually check rubbing plate.                                                                                                |  |  |  |
| 5.3.6      | Visually examine Equalizing stay brackets.                                                                                   |  |  |  |
| 5.3.7      | Examine and attend safety loops of bolster.                                                                                  |  |  |  |
| 5.3.8      | Check and attend safety loops of Equalizing stay rod.                                                                        |  |  |  |
| 5.3.9      | Examine vertical shock absorbers for damages.                                                                                |  |  |  |
| <b>5.4</b> | <b>Brake rigging</b>                                                                                                         |  |  |  |
| 5.4.1      | Check brake-rigging arrangement for any defects/deficiencies. and check tread brake wherever tread brake units are provided. |  |  |  |

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| 5.4.2      | Examine brake beams breakages/damages.                                                                                                  |  |  |  |
| 5.4.3      | Check and attend brake beam safety wire ropes/safety straps.                                                                            |  |  |  |
| 5.4.4      | Check and attend brake shoe head and key and replace if necessary.                                                                      |  |  |  |
| 5.4.5      | Check and replace worn brake blocks.                                                                                                    |  |  |  |
| 5.4.6      | Visually inspect brake hangers, brake gear pins and cotters/split pins and replace if necessary.                                        |  |  |  |
| 5.4.7      | Visually inspect damaged/missing brake gear bushes and replace if necessary.                                                            |  |  |  |
| 5.4.8      | Examine lever hanger pins.                                                                                                              |  |  |  |
| <b>6.0</b> | <b>Draw gear</b>                                                                                                                        |  |  |  |
| 6.1        | Check and replace damaged/missing split pins/ cotter/rivets.                                                                            |  |  |  |
| 6.2        | Examine draw hook, draw bars and rubber pads for damages.                                                                               |  |  |  |
| 6.3        | Check conditions of the screw coupling and its components and replace if required.                                                      |  |  |  |
| 6.4        | Check condition of draw beam and locating pins on it.                                                                                   |  |  |  |
| 6.5        | Examine visually draft key locking pins.                                                                                                |  |  |  |
| <b>7.0</b> | <b>Buffing gear</b>                                                                                                                     |  |  |  |
| 7.1        | Visually examine buffer plungers for damage/drooping/stroke length.                                                                     |  |  |  |
| 7.2        | Examine buffer mounting bolts and attend if necessary.                                                                                  |  |  |  |
| 7.3        | Examine visually buffer casing for cracks/damages.                                                                                      |  |  |  |
| <b>8.0</b> | <b>Running gear</b>                                                                                                                     |  |  |  |
| 8.1        | Examine visually axle box for grease oozing out, warm axle box if any.                                                                  |  |  |  |
| 8.2        | Visually examine wheel tyre profile and thickness of tyre and check with tyre profile gauge if they appear to be near condemning limit. |  |  |  |
| 8.3        | Visually inspect axle box covers.                                                                                                       |  |  |  |
| 8.4        | Inspect wheel tread for shattered rim, spread rim, shelled tread, thermal cracks, heat checks.                                          |  |  |  |

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| <b>9.0</b>  | <b>Seats and berths</b>                                                                                                                                                                                |  |  |  |
| 9.1         | Examine the holding/securing brackets for seats and berths and attend if necessary.                                                                                                                    |  |  |  |
| 9.2         | Examine and repair damaged upholstery cushions and curtains.                                                                                                                                           |  |  |  |
| 9.4         | Seats and frames should be cleaned.                                                                                                                                                                    |  |  |  |
| 9.5         | Cushion should be cleaned with duster. Oil or head stain and dirty spots if any should be cleaned with mild soap solutions and wipe dry.                                                               |  |  |  |
| <b>10.0</b> | <b>Doors</b>                                                                                                                                                                                           |  |  |  |
| 10.1        | Examine doors for proper functioning and securing with hinge pivots. Doors should not graze with floor or doorsill plates.                                                                             |  |  |  |
| 10.2        | Examine door locks, latches firmly secured with correct sized screws and properly/smoothly engaging in their slot. The tongue of gravity type latch should be in proper alignment with its slot plate. |  |  |  |
| 10.3        | Visually examine window shutters for smooth working and proper locking.                                                                                                                                |  |  |  |
| <b>11.0</b> | <b>Windows</b>                                                                                                                                                                                         |  |  |  |
| 11.1        | Check window-balancing mechanism for proper function.                                                                                                                                                  |  |  |  |
| 11.2        | Examine window safety catches for proper engagement in their slots.                                                                                                                                    |  |  |  |
| 11.3        | Check lavatory banjo shutters for damage/missing.                                                                                                                                                      |  |  |  |
| 11.4        | Window bars should be provided and fixed in prescribed manner and replaced if damaged.                                                                                                                 |  |  |  |
| <b>12.0</b> | <b>Interior fittings</b>                                                                                                                                                                               |  |  |  |
| 12.1        | Examine laminated panels and mouldings for damage/cracks.                                                                                                                                              |  |  |  |
| 12.2        | Examine tower bolts of backrests for proper working.                                                                                                                                                   |  |  |  |
| 12.3        | Examine ventilation grills for damages.                                                                                                                                                                |  |  |  |
| 12.5        | Examine luggage racks/bunks for breakage.                                                                                                                                                              |  |  |  |
| <b>13.0</b> | <b>Lavatory and lavatory fittings</b>                                                                                                                                                                  |  |  |  |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

|      |                                                                               |  |  |  |
|------|-------------------------------------------------------------------------------|--|--|--|
| 13.1 | Check lavatory hinge door for proper function                                 |  |  |  |
| 13.2 | Examine lavatory door latches/ tower bolts for proper function                |  |  |  |
| 13.3 | Examine push cock and flush valve for proper function                         |  |  |  |
| 13.4 | Check and attend leakage in pipes, pipe fittings.                             |  |  |  |
| 13.5 | Clean drain grills and drain holes in bathroom and wash basin if found choked |  |  |  |
| 13.6 | Check and replace damaged/ missing mirrors / shelves / soap dishes            |  |  |  |
| 13.7 | Examine squatting pans and foot rest for damages                              |  |  |  |



|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR**  
**(Car body, Under frame, Bogie, Brake Rigging etc.)**

**MONTHLY SCHEDULE**

- (i) 8-WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date :

| S No. | Details of work to be carried out                                                                                                                                                                                                               | Condition/Action | Sign. | Remarks |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------|---------|
| 1.0   | <b>Repeat all items of Weekly Schedule</b>                                                                                                                                                                                                      |                  |       |         |
| 2.0   | <b>Bogie</b>                                                                                                                                                                                                                                    |                  |       |         |
| 2.1   | <b>Bogie frame</b>                                                                                                                                                                                                                              |                  |       |         |
| 2.1.1 | Examine oil level in side bearer oil-bath and oil-filling cap replenish oil if needed.                                                                                                                                                          |                  |       |         |
| 2.2   | <b>Primary Suspension</b>                                                                                                                                                                                                                       |                  |       |         |
| 2.2.1 | Add specified grade of oil in dashpot.                                                                                                                                                                                                          |                  |       |         |
| 2.3   | <b>Brake System</b>                                                                                                                                                                                                                             |                  |       |         |
| 2.3.1 | Externally clean the brake system pneumatic pipes and check for leakages. If required tighten the end fittings.<br>Check the mounting fasteners of Air reservoir/ Distributor valve/ relay valve magnet valve and other brake system equipments |                  |       |         |
| 2.3.2 | Check and attend brake block adjuster.                                                                                                                                                                                                          |                  |       |         |
| 2.3.3 | Examine and attend brake levers.                                                                                                                                                                                                                |                  |       |         |
| 2.3.4 | Examine and attend brake hanger lever brackets.                                                                                                                                                                                                 |                  |       |         |
| 3.0   | <b>Seats</b>                                                                                                                                                                                                                                    |                  |       |         |
| 3.1   | Disinfect the seats and frames.                                                                                                                                                                                                                 |                  |       |         |
| 4.0   | <b>Lavatory and lavatory fittings</b>                                                                                                                                                                                                           |                  |       |         |
| 4.1   | Intensive cleaning of lavatory pans and commode with cleaning agent                                                                                                                                                                             |                  |       |         |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR**  
**(Coach body, Under frame, Bogie, Brake Rigging etc.)**

**QUARTERLY SCHEDULE**

- (i) 8 WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date :

| S No. | Details of work to be carried out                                                 | Condition/Action | Sign. | Remarks |
|-------|-----------------------------------------------------------------------------------|------------------|-------|---------|
| 1.0   | Repeat all items of Monthly Schedule                                              |                  |       |         |
| 2.0   | Intensive cleaning of OHE Car                                                     |                  |       |         |
| 3.0   | Under frame                                                                       |                  |       |         |
| 3.1   | Examine trough floor and other under frame members from underneath for corrosion. |                  |       |         |
| 4.0   | Bogie                                                                             |                  |       |         |
| 4.1   | Secondary Suspension                                                              |                  |       |         |
| 4.1.1 | Check bolster clearance.                                                          |                  |       |         |



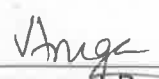
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR**  
**(Coach body, Under frame, Bogie, Brake Rigging etc.)**

**Six Monthly Schedule**

- (i) 8 WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date :

| No.        | Details of work to be carried out                                                                                            | Condition/Action | Sign. | Remarks |
|------------|------------------------------------------------------------------------------------------------------------------------------|------------------|-------|---------|
| <b>1.0</b> | <b>Repeat all items of Quarterly Schedule</b>                                                                                |                  |       |         |
| <b>2.0</b> | <b>Shell</b>                                                                                                                 |                  |       |         |
| 2.1        | Thoroughly clean and remove dust, rust accumulated at underframe and pillars with coir brush and compressed air.             |                  |       |         |
| 2.2        | Examine for corrosion of sole bar and other under frame members with torch light or inspection lamp.                         |                  |       |         |
| 2.3        | Touch up damaged paint both inside and outside.                                                                              |                  |       |         |
| 2.4        | Check roof ventilator for damages.                                                                                           |                  |       |         |
| <b>3.0</b> | <b>Bogie</b>                                                                                                                 |                  |       |         |
| <b>3.1</b> | <b>Bogie frame</b>                                                                                                           |                  |       |         |
| 3.1.1      | Examine condition of side bearer wearing piece and wearing plate.                                                            |                  |       |         |
| <b>3.2</b> | <b>Primary Suspension</b>                                                                                                    |                  |       |         |
| 3.2.1      | Check and attend axle guide assembly if necessary.                                                                           |                  |       |         |
| 3.2.2      | Check axle box clearance with gauge.                                                                                         |                  |       |         |
| <b>4.0</b> | <b>Draw gear</b>                                                                                                             |                  |       |         |
| 4.1        | Ensure that wear on screw coupling shackle pins, trunion pins, shackle/link holes and draw hook holes should not exceed 3mm. |                  |       |         |
| 4.2        | Ensure that wear at any section on draw hook should not exceed 10mm.                                                         |                  |       |         |
| <b>5.0</b> | <b>Buffing gear</b>                                                                                                          |                  |       |         |
| 5.1        | Ensure the length is within 584-635mm.                                                                                       |                  |       |         |
| 5.2        | Inspect buffer plunger false plate for wear and profile.                                                                     |                  |       |         |
| <b>6.0</b> | <b>Running gear</b>                                                                                                          |                  |       |         |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

| No.        | Details of work to be carried out                                                                                              | Condition/Action | Sign. | Remarks |
|------------|--------------------------------------------------------------------------------------------------------------------------------|------------------|-------|---------|
| 6.1        | Check with wheel distance gauge for loose or tight wheel.                                                                      |                  |       |         |
| <b>7.0</b> | <b>Flooring</b>                                                                                                                |                  |       |         |
| 7.1        | Inspect and attend damaged/cracked flooring.                                                                                   |                  |       |         |
| 7.2        | Examine and attend opened joints.                                                                                              |                  |       |         |
| 7.3        | Examine Drain holes in trough floor for accumulation of water due to clogging if noticed. Inspect affected area for corrosion. |                  |       |         |



|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR****(Coach body, Under frame, Bogie, Brake rigging etc.)****Yearly Schedule**

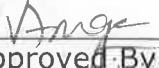
- (i) 8 WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date :

| No. | Details of work to be carried out                                | Condition/Action | Sign. | Remarks |
|-----|------------------------------------------------------------------|------------------|-------|---------|
| 1.0 | Repeat all items of Six-monthly Schedule                         |                  |       |         |
| 2.0 | Lavatory and lavatory fittings                                   |                  |       |         |
| 2.1 | Thorough flushing of water tanks                                 |                  |       |         |
| 3.0 | Ultrasonic Testing of wheel set.                                 |                  |       |         |
| 4.0 | Overhaul all Brake equipments, except brake cylinder.            |                  |       |         |
| 5.0 | Replace rubber kits during yearly repairing of pneumatic valves. |                  |       |         |

**SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR****(Coach body, Under frame, Bogie, Brake rigging etc.)****Eighteen Months**

- (i) 8 WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date :

| No. | Details of work to be carried out                                      | Condition/Action | Sign. | Remarks |
|-----|------------------------------------------------------------------------|------------------|-------|---------|
| 1.0 | Repeat all items of Yearly Schedule                                    |                  |       |         |
| 2.0 | Bogie                                                                  |                  |       |         |
| 2.1 | Run out the bogies and attend all the items as mentioned in Annexure-2 |                  |       |         |

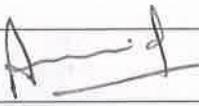
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**SCHEDULE OF STANDARD EXAMINATION OF 8-WHEELER OHE CAR**  
**(Coach body, Under frame, Bogie, Brake rigging etc.)**

**Thirty six Months**

- (i) 8 WHEELER OHE Car
- (ii) Cumulative km.:
- (iii) Date :

| No.        | Details of work to be carried out                                                                                            | Condition/Action | Sign. | Remarks |
|------------|------------------------------------------------------------------------------------------------------------------------------|------------------|-------|---------|
| <b>1.0</b> | <b>Repeat all items of 18 Months Schedule</b>                                                                                |                  |       |         |
| <b>2.0</b> | <b>Brake</b>                                                                                                                 |                  |       |         |
| 2.1        | Overhaul the safety switch.                                                                                                  |                  |       |         |
| 2.2        | Clean the chokes, exhaust plugs, mesh filters in the distributor valves and check proper functioning of all sub- assemblies. |                  |       |         |
| 2.3        | Overhaul the drivers brake valve. Replace all the rubber items, clean filters.                                               |                  |       |         |
| 2.4        | Check for proper functioning of relay valves and replace the damaged/ worn out items.                                        |                  |       |         |
| 2.5        | Replace rubber-sealing washer of air brake hose coupling.                                                                    |                  |       |         |
| 2.6        | Check all the hose assemblies of brake system for damage or over ageing replace if required.                                 |                  |       |         |

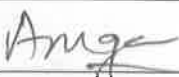
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**SCHEDULE OF STANDARD EXAMINATION OF 8 WHEELER OHE CAR**  
**(Coach body, Under frame, Bogie, Brake rigging etc.)**

**54 Months**

- (i) 8-WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date :

| No. | Details of work to be carried out                                                                                                                                                                                                 | Condition/Action | Sign. | Remarks |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------|---------|
| 1.0 | <b>Repeat all items of 18 Months Schedule</b>                                                                                                                                                                                     |                  |       |         |
| 2.0 | <b>Brake System</b>                                                                                                                                                                                                               |                  |       |         |
| 2.1 | Replace all the rubber items and choke in the brake system equipments like safety valves, Auto Drain Valves Drivers Brake valve, Relay valve Tread brake Block units, Isolating cocks, Dust collectors, Angle cocks, filters etc. |                  |       |         |
| 2.2 | Check the Distributor Valve sub assemblies and entire assembly for proper functioning, replace rubber items, chokes and springs only if required. Entire distributor valve does not need overhauling for 6 years.                 |                  |       |         |
| 2.3 | Replace all hose assemblies if not done so far.                                                                                                                                                                                   |                  |       |         |

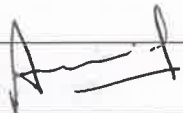
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| Prepared by                                                                         | Checked By                                                                          | Approved By                                                                           |
| JE/TW                                                                               | DDTI-II                                                                             | EDTI                                                                                  |

**SCHEDULE OF STANDARD EXAMINATION OF 8-WHEELER OHE CAR**  
**(Coach body, Under frame, Bogie, Brake rigging etc.)**

**Periodical Overhaul (Seventy Two months)**

- (i) 8 WHEELER OHE Car  
(ii) Cumulative km.:  
(iii) Date:

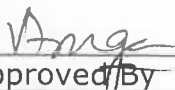
| No. | Details of work to be carried out                                                  | Condition/Action | Sign. | Remark |
|-----|------------------------------------------------------------------------------------|------------------|-------|--------|
|     | The following sequence of work should be generally followed during POH of OHE Car  |                  |       |        |
| 1.  | Verification of deficiencies.                                                      |                  |       |        |
| 2.  | Pre-inspection and Lifting of OHE Car body                                         |                  |       |        |
| 3.  | Stripping                                                                          |                  |       |        |
| 4.  | Body repair.                                                                       |                  |       |        |
| 5.  | Fitting of Water Tank, Plumbing & Leakage testing                                  |                  |       |        |
| 6.  | Repair of internal panels                                                          |                  |       |        |
| 7.  | Fitment of shutters                                                                |                  |       |        |
| 8.  | Fitment of doors                                                                   |                  |       |        |
| 9.  | Fitment of berths and seats                                                        |                  |       |        |
| 10. | Repair, maintenance & fitment of screw coupling.                                   |                  |       |        |
| 11. | Painting and finishing                                                             |                  |       |        |
| 12. | Repair and maintenance of bogie                                                    |                  |       |        |
| 13. | Repair and maintenance of brake system including overhauling of Distributor valve. |                  |       |        |
| 14. | Repair and maintenance of Axle Box Guide Arrangement                               |                  |       |        |
| 15. | Repair and maintenance of rolling gear                                             |                  |       |        |
| 16. | Lowering of coach body on bogies.                                                  |                  |       |        |
| 17. | Brake Testing                                                                      |                  |       |        |
| 18. | Testing of branch wiring                                                           |                  |       |        |
| 19. | Testing of electrical equipment                                                    |                  |       |        |
| 20. | Final Inspection & Dispatch                                                        |                  |       |        |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

## Annexure-04

Spare items for M/s Cummins India Limited make Engine**MODEL N-743-L**

| Sr.No. | Part No.   | Description                               | Qty.    | Category  |
|--------|------------|-------------------------------------------|---------|-----------|
| 1      | KIT3238521 | B CHECK KIT N743/855                      | 1       | Mandatory |
| 2      |            | Valvoline Cummins Oil<br>Ltrs 15-W-40 CH4 | 50 Lts. | Mandatory |
| 3      | 4055643    | KIT,AIR CLEANER                           | 1       | Mandatory |
| 4      | 125019     | GASKET BREATHER<br>COVER                  | 1       | Mandatory |
| 5      | 3167218    | INHIBITOR,CORROSION                       | 1       | Mandatory |
| 6      | KITBM50745 | GASKET CYLINDER<br>HEAD                   | 1       | Mandatory |
| 7      | 3046418    | ROD,PUSH                                  | 12      | Optional  |
| 8      | 3046431    | ROD,PUSH                                  | 6       | Optional  |
| 9      | BM30073    | CONNECTION,FUEL<br>INLET                  | 6       | Optional  |
| 10     | BM30075    | CONNECTION,FUEL<br>DRAIN                  | 6       | Optional  |
| 11     | 146483     | SCREEN,FILTER                             | 1       | Mandatory |
| 12     | 154088     | SEAL,RECTANGULAR<br>RING                  | 1       | Mandatory |
| 13     | AX1013359  | RADIWASH_3LTR                             | 3       | Mandatory |
| 14     | 9097       | GASKET WATER PUMP                         | 1       | Mandatory |
| 15     | 168306     | SCREW,SLOTTED SET                         | 18      | Optional  |
| 16     | S 212      | NUT,REGULAR<br>HEXAGON                    | 18      | Optional  |
| 17     | 178570     | BELT,V                                    | 1       | Mandatory |
| 18     | 178597     | BELT,V                                    | 2       | Mandatory |
| 19     | 178567     | BELT,V                                    | 1       | Mandatory |
| 20     | 135675     | THERMOSTAT                                | 1       | Mandatory |
| 21     | 186780     | SEAL,THERMOSTAT                           | 1       | Mandatory |
| 22     | 3931904    | SEALANT LIQUID<br>GASKET                  | 2       | Mandatory |
| 23     | 123716     | ELEMENT,BREATHER                          | 1       | Mandatory |
| 24     | 3166497    | PUMP,WATER                                | 1       | Optional  |
|        |            | <b>PT Pump</b>                            |         |           |
| 25     | KIT3880567 | PT PUMP REPAIR<br>KIT(PTG AUTO)           | 1       | Optional  |
| 26     | AR41043    | WEIGHT,CARRIER                            | 1       | Optional  |
| 27     | BM73133    | HOUSING,GOVERNOR                          | 1       | Optional  |
| 28     | 3034243    | PUMP,GEAR FUEL                            | 1       | Optional  |
|        |            | <b>Injectors</b>                          |         |           |
| 29     | KIT3880779 | KIT,INJECTOR REPAIR -<br>N743             | 6       | Optional  |
| 30     | 167157     | BALL,CHECK                                | 6       | Optional  |
| 31     | 3045006    | PLUG,INJECTOR<br>ORIFICE                  | 6       | Optional  |
|        |            | <b>Cylinder Head</b>                      |         |           |
| 32     | KIT3880581 | CYLINDER HEAD<br>REPAIR KIT               | 3       | Optional  |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

|    |         |                           |   |          |
|----|---------|---------------------------|---|----------|
|    |         | <b>ACC DRIVE</b>          |   |          |
| 33 | 3880497 | SHAFT,ACCESSORY DRIVE     | 1 | Optional |
| 34 | 3026556 | BEARING,THRUST            | 1 | Optional |
| 35 | 3026557 | BEARING,THRUST            | 1 | Optional |
| 36 | 3004316 | SEAL,OIL                  | 1 | Optional |
| 37 | 181236  | SEAL,KEYWAY               | 1 | Optional |
| 38 | 190397  | SLEEVE,WEAR               | 1 | Optional |
| 39 | 3069101 | GASKET,ACC DRIVE SUPPORT  | 1 | Optional |
| 40 | 116391  | BUSHING                   | 1 | Optional |
|    |         | <b>Air Compressor</b>     |   |          |
| 41 | 5277629 | KIT,UNLOADER VALVE        | 1 | Optional |
| 42 | 165430  | PISTON AIR COMPRESSOR     | 1 | Optional |
| 43 | 3245718 | RING SET PISTON (SERVICE) | 1 | Optional |

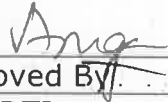
Note: -ESTIMATE MAY VARY AFTER DISMANTLING AND INSPECTION BASED ON CONDITION BASED BASIS OF PARTS HOSES, GASKETS, SWITCHES, CLAMPS & SENSORS ARE TO BE PROCURED SEPARATELY AS AND WHEN REQUIRED. OPTIONAL PARTS CHANGE REQUIRED BASED ON THE CONDITION OF INDIVIDUAL PART PRICES RULING AT THE TIME OF DELIVERY WILL BE APPLICABLE TAXES EXTRA.



|                                                                                     |                                                                                     |                                                                                       |
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|  |  |  |
| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**MODEL NT-855-R BC**

| Sr.No. | Part No.   | Description                               | Qty.    | Category  |
|--------|------------|-------------------------------------------|---------|-----------|
| 1      | KIT3238528 | B CHECK KIT NT/NTA                        | 1       | Mandatory |
| 2      |            | Valvoline Cummins Oil<br>Ltrs 15-W-40 CH4 | 60 Lts. | Mandatory |
| 3      | KIT3238156 | KIT AIR CLEANER<br>ELEMENTS               | 1       | Mandatory |
| 4      | 254608     | GASKET,BREATHER                           | 1       | Mandatory |
| 5      | 4024946    | UPPER ENGINE GASKET<br>SET                | 1       | Mandatory |
| 6      | 3067459    | GASKET,ROCKER LEVER<br>COVER              | 3       | Mandatory |
| 7      | 3167218    | INHIBITOR,CORROSION                       | 1       | Mandatory |
| 8      | 3046420    | ROD,PUSH                                  | 12      | Optional  |
| 9      | 3046430    | ROD,PUSH                                  | 6       | Optional  |
| 10     | AX1013359  | RADIW ASH_3LTR                            | 4       | Mandatory |
| 11     | 168306     | SCREW ,SLOTTED SET                        | 18      | Optional  |
| 12     | S 212      | NUT,REGULAR<br>HEXAGON                    | 18      | Optional  |
| 13     | 217638     | BELT,V RIBBED                             | 1       | Mandatory |
| 14     | 504867     | BELT,V                                    | 1       | Mandatory |
| 15     | 135675     | THERMOSTAT                                | 1       | Mandatory |
| 16     | 186780     | SEAL,THERMOSTAT                           | 1       | Mandatory |
| 17     | 208128     | GASKET,THERMOSTAT<br>HOUSING              | 1       | Mandatory |
| 18     | 209961     | HOSE,FLEXIBLE                             | 1       | Mandatory |
| 19     | 3931904    | SEALANT LIQUID<br>GASKET                  | 2       | Mandatory |
| 20     | 3065060    | HOSE,FLEXIBLE                             | 1       | Mandatory |
| 21     | 3081053    | HOSE,PLAIN                                | 1       | Mandatory |
|        |            | <b>PT Pump</b>                            |         |           |
| 22     | AR41043    | W EIGHT,CARRIER                           | 1       | Optional  |
| 23     | BM73133    | HOUSING,GOVERNOR                          | 1       | Optional  |
| 24     | 212602     | GEAR,TACHOMETER<br>DRIVE                  | 1       | Optional  |
| 25     | 212613     | HUB,JAW COUPLING                          | 1       | Optional  |
| 26     | 212601     | SHAFT,FUEL PUMP<br>DRIVE                  | 1       | Optional  |
| 27     | S 16052    | BEARING,BALL                              | 1       | Optional  |
| 28     | 3058555    | BARREL,GOVERNOR                           | 1       | Optional  |
| 29     | 3803615    | KIT,SEAL                                  | 1       | Optional  |
| 30     | 212668     | KEY,SQUARE                                | 1       | Optional  |
| 31     | 3015665    | SHAFT,TACHOMETER<br>DRIVE                 | 1       | Optional  |
| 32     | KITBM68356 | GASKET GOVERNOR<br>SET                    | 1       | Optional  |
| 33     | 3046200    | SPIDER,JAW COUPLING                       | 1       | Optional  |
| 34     | 163944     | BUSHING                                   | 1       | Optional  |
| 35     | 3034243    | PUMP,GEAR FUEL                            | 1       | Optional  |
| 36     | 3234051    | SCREEN                                    | 1       | Optional  |
| 37     | 147901     | W ASHER,SEALING                           | 2       | Optional  |
| 38     | AR40132    | PLUNGER,GOVERNOR                          | 1       | Optional  |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

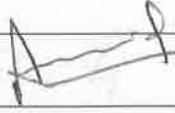
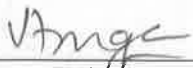
|    |            |                           |    |          |
|----|------------|---------------------------|----|----------|
|    |            | <b>Injectors</b>          |    |          |
| 39 | KIT3238442 | KIT BARREL PLU AND CUP    | 6  | Optional |
| 40 | 167157     | BALL,CHECK                | 6  | Optional |
| 41 | 3045006    | PLUG,INJECTOR             | 6  | Optional |
| 42 | 193736     | ORIFICE                   | 18 | Optional |
| 43 | 3054999    | SEAL,O RING               | 6  | Optional |
| 44 | 3804700    | SCREEN,FILTER             | 6  | Optional |
|    |            | KIT,STC TAPPET REPAIR     | 6  | Optional |
|    |            | <b>Cylinder Head</b>      |    |          |
| 45 | KIT4986817 | KIT CYL HEAD NTBC REPAIR  | 3  | Optional |
|    |            | <b>ACC DRIVE</b>          |    |          |
| 46 | 3880497    | SHAFT,ACCESSORY DRIVE     | 1  | Optional |
| 47 | 3026556    | BEARING,THRUST            | 1  | Optional |
| 48 | 3004316    | SEAL,OIL                  | 1  | Optional |
| 49 | 3026557    | BEARING,THRUST            | 1  | Optional |
| 50 | 181236     | SEAL,KEYWAY               | 1  | Optional |
| 51 | 190397     | SLEEVE,W EAR              | 1  | Optional |
| 52 | 3069101    | GASKET,ACC DRIVE SUPPORT  | 1  | Optional |
| 53 | 116391     | BUSHING                   | 1  | Optional |
|    |            | <b>Air Compressor</b>     |    |          |
| 54 | 3880524    | KIT REPAIR 2CYL AIR COMPR | 1  | Optional |
| 55 | 165430     | PISTON AIR COMPRESSOR     | 2  | Optional |
| 56 | 3245718    | RING SET PISTON (SERVICE) | 2  | Optional |
|    |            | <b>Water Pump</b>         |    |          |
| 57 | 3050394    | SHAFT,W ATER PUMP         | 1  | Optional |
| 58 | 3063246    | BEARING,BALL              | 2  | Optional |
| 59 |            | RING,RETAINING            | 1  | Optional |
| 60 | 3602788    | IMPELLER,W ATER PUMP      | 1  | Optional |
| 61 | 196844     | SPACER,BEARING            | 1  | Optional |
| 62 | 3002385    | GASKET,W ATER PUMP        | 1  | Optional |
| 63 | 3609826    | SEAL,W ATER PUMP          | 1  | Optional |
|    |            | <b>Turbo Charger</b>      |    |          |
| 64 | 3545661    | KIT,TURBO REPAIR 4LG      | 1  | Optional |
| 65 | 3521440    | COLLAR,THRUST             | 1  | Optional |
| 66 | 3759619    | SLINGER,OIL               | 1  | Optional |
| 67 | 3500717    | HOUSING,TUR BEARING       | 1  | Optional |
| 68 | 3759618    | PLATE,OIL SEAL            | 1  | Optional |
| 69 | 3521731    | SHAFT & W HEEL            | 1  | Optional |

Note: -ESTIMATE MAY VARY AFTER DISMANTLING AND INSPECTION BASED ON CONDITION BASED BASIS OF PARTS HOSES, GASKETS, SWITCHES, CLAMPS & SENSORS ARE TO BE PROCURED SEPARATELY AS AND WHEN REQUIRED. OPTIONAL PARTS CHANGE REQUIRED BASED ON THE CONDITION OF INDIVIDUAL PART PRICES RULING AT THE TIME OF DELIVERY WILL BE APPLICABLE TAXES EXTRA.

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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

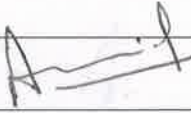
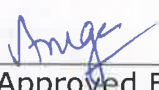
**MODEL -NT-855-R**

| Sr.No. | Part No.   | Description                               | Qty.    | Category  |
|--------|------------|-------------------------------------------|---------|-----------|
| 1      | KIT3238528 | B CHECK KIT NT/NTA                        | 1       | Mandatory |
| 2      |            | Valvoline Cummins Oil<br>Ltrs 15-W-40 CH4 | 60 Lts. | Mandatory |
| 3      | KIT3238156 | KIT AIR CLEANER<br>ELEMENTS               | 1       | Mandatory |
| 4      | 254608     | GASKET,BREATHER                           | 1       | Mandatory |
| 5      | 4024946    | UPPER ENGINE GASKET<br>SET                | 1       | Mandatory |
| 6      | 3067459    | GASKET,ROCKER LEVER<br>COVER              | 3       | Mandatory |
| 7      | 3167213    | INHIBITOR,CORROSION                       | 1       | Mandatory |
| 8      | 3046420    | ROD,PUSH                                  | 12      | Optional  |
| 9      | 3046430    | ROD,PUSH                                  | 6       | Optional  |
| 10     | AX1013359  | RADIW ASH_3LTR                            | 4       | Mandatory |
| 11     | 168306     | SCREW ,SLOTTED SET                        | 18      | Optional  |
| 12     | 3004316    | SEAL OIL                                  | 1       | Optional  |
| 13     | 181236     | SEAL KEY W AY                             | 1       | Optional  |
| 14     | 3008947    | SEAL KEY W AY                             | 1       | Optional  |
| 15     | 190397     | SLEEVE W EAR                              | 1       | Optional  |
| 16     | 3069101    | GASKET ACC.DRIVE                          | 1       | Optional  |
| 17     | S 212      | NUT,REGULAR<br>HEXAGON                    | 18      | Optional  |
| 18     | 217638     | BELT,V RIBBED                             | 1       | Mandatory |
| 19     | 504867     | BELT,V                                    | 1       | Mandatory |
| 20     | 135675     | THERMOSTAT                                | 1       | Mandatory |
| 21     | 186780     | SEAL,THERMOSTAT                           | 1       | Mandatory |
| 22     | 208128     | GASKET,THERMOSTAT<br>HOUSING              | 1       | Mandatory |
| 23     | 209961     | HOSE,FLEXIBLE                             | 1       | Mandatory |
| 24     | 3931904    | SEALANT LIQUID<br>GASKET                  | 2       | Mandatory |
| 25     | 3065060    | HOSE,FLEXIBLE                             | 1       | Mandatory |
| 26     | 3081053    | HOSE,PLAIN                                | 1       | Mandatory |
|        |            | <b>PT Pump</b>                            |         |           |
| 27     | AR41043    | W EIGHT,CARRIER                           | 1       | Optional  |
| 28     | BM73133    | HOUSING,GOVERNOR                          | 1       | Optional  |
| 29     | 212602     | GEAR,TACHOMETER<br>DRIVE                  | 1       | Optional  |
| 30     | 212613     | HUB,JAW COUPLING                          | 1       | Optional  |
| 31     | 212601     | SHAFT,FUEL PUMP<br>DRIVE                  | 1       | Optional  |
| 32     | S 16052    | BEARING,BALL                              | 1       | Optional  |
| 33     | 3058555    | BARREL,GOVERNOR                           | 1       | Optional  |
| 34     | 3803615    | KIT,SEAL                                  | 1       | Optional  |
| 35     | 212668     | KEY,SQUARE                                | 1       | Optional  |
| 36     | 3015665    | SHAFT,TACHOMETER<br>DRIVE                 | 1       | Optional  |
| 37     | KITBM68356 | GASKET GOVERNOR<br>SET                    | 1       | Optional  |
| 38     | 3046200    | SPIDER,JAW COUPLING                       | 1       | Optional  |
| 39     | 163944     | BUSHING                                   | 1       | Optional  |
| 40     | 3034243    | PUMP,GEAR FUEL                            | 1       | Optional  |

|                                                                                     |                                                                                     |                                                                                       |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

|    |            |                           |    |          |
|----|------------|---------------------------|----|----------|
| 41 | 3234051    | SCREEN                    | 1  | Optional |
| 42 | 147901     | W ASHER, SEALING          | 2  | Optional |
| 43 | AR40132    | PLUNGER, GOVERNOR         | 1  | Optional |
|    |            | <b>Injectors</b>          |    |          |
| 44 | KIT3880782 | KIT BARREL PLU AND CUP    | 6  | Optional |
| 45 | 167157     | BALL, CHECK               | 6  | Optional |
|    |            | PLUG, INJECTOR            |    |          |
| 46 | 3045006    | ORIFICE                   | 6  | Optional |
| 47 | 193736     | SEAL, O RING              | 18 | Optional |
| 48 | 3054999    | SCREEN, FILTER            | 6  | Optional |
|    |            | <b>Cylinder Head</b>      |    |          |
| 49 | KIT3880582 | CYLINDER HEAD REPAIR KIT  | 3  | Optional |
|    |            | <b>ACC DRIVE</b>          |    |          |
|    |            | SHAFT, ACCESSORY DRIVE    |    |          |
| 50 | 3880497    | DRIVE                     | 1  | Optional |
| 51 | 3026556    | BEARING, THRUST           | 1  | Optional |
| 52 | 3026557    | BEARING, THRUST           | 1  | Optional |
| 53 | 116391     | BUSHING                   | 1  | Optional |
|    |            | <b>Air Compressor</b>     |    |          |
| 48 | 3880524    | KIT REPAIR 2CYL AIR COMPR | 1  | Optional |
|    |            | PISTON AIR COMPRESSOR     |    |          |
| 49 | 165430     | RING SET PISTON (SERVICE) | 2  | Optional |
| 50 | 3245718    |                           | 2  | Optional |
|    |            | <b>Water Pump</b>         |    |          |
|    |            | IMPELLER, W ATER PUMP     |    |          |
| 51 | 208134     | PUMP                      | 1  | Optional |
| 52 | 3000889    | SHAFT, W ATER PUMP        | 1  | Optional |
| 53 | S 16073    | BEARING, BALL             | 2  | Optional |
| 54 | 112302     | RING, RETAINING           | 1  | Optional |
| 55 | 196844     | SPACER, BEARING           | 1  | Optional |
| 56 | 3038997    | OIL SEAL                  | 1  | Optional |
| 57 | 3038998    | SEAL, OIL                 | 1  | Optional |
| 58 | 3609826    | SEAL, W ATER PUMP         | 1  | Optional |
| 59 | 3002385    | GASKET, W ATER PUMP       | 1  | Optional |
|    |            | <b>Turbo Charger</b>      |    |          |
| 60 | 3545661    | KIT, TURBO REPAIR 4LG     | 1  | Optional |
| 61 | 3751240    | RING, THRUST              | 2  | Optional |
| 62 | 3759618    | PLATE, OIL SEAL           | 1  | Optional |
| 63 | 3759619    | SLINGER, OIL              | 1  | Optional |
|    |            | HOUSING, TUR              |    |          |
| 64 | 3500717    | BEARING                   | 1  | Optional |
| 65 | 3500433    | SHAFT & WHEEL             | 1  | Optional |

Note: -ESTIMATE MAY VARY AFTER DISMANTLING AND INSPECTION BASED ON CONDITION BASED BASIS OF PARTS HOSES, GASKETS, SWITCHES, CLAMPS & SENSORS ARE TO BE PROCURED SEPARATELY AS AND WHEN REQUIRED. OPTIONAL PARTS CHANGE REQUIRED BASED ON THE CONDITION OF INDIVIDUAL PART PRICES RULING AT THE TIME OF DELIVERY WILL BE APPLICABLE TAXES EXTRA.

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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**MODEL KTA-19-R**

| Sr.No. | Part No.   | Description                               | Qty.    | Category  |
|--------|------------|-------------------------------------------|---------|-----------|
| 1      | KIT3238514 | B CHECK KIT N743/855                      | 1       | Mandatory |
| 2      |            | Valvoline Cummins Oil<br>Ltrs 15-W-40 CH4 | 75 Lts. | Mandatory |
| 3      | KIT3238358 | KIT AIR CLEANER<br>ELEMENT                | 2       | Mandatory |
| 4      | 254608     | GASKET,BREATHER                           | 1       | Mandatory |
| 5      | KIT4072233 | GASKET SET                                | 1       | Mandatory |
| 6      | 3167218    | INHIBITOR,CORROSION                       | 1       | Mandatory |
| 7      | 3017961    | ROD,PUSH                                  | 12      | Optional  |
| 8      | 3057139    | ROD,PUSH                                  | 6       | Optional  |
| 9      | AX1013359  | RADIW ASH 3LTR                            | 4       | Mandatory |
| 10     | 168306     | SCREW ,SLOTTED SET                        | 18      | Optional  |
| 11     | S 212      | NUT,REGULAR<br>HEXAGON                    | 18      | Optional  |
| 12     | 178598     | BELT,V                                    | 1       | Mandatory |
| 13     | 178567     | BELT,V                                    | 1       | Mandatory |
| 14     | 3931904    | SEALANT LIQUID<br>GASKET                  | 2       | Mandatory |
| 15     | 135675     | THERMOSTAT                                | 2       | Mandatory |
| 16     | 186780     | SEAL,THERMOSTAT                           | 2       | Mandatory |
| 17     | 207058     | GASKET,THERMOSTAT<br>HOUSING              | 1       | Mandatory |
| 18     | 3016142    | HOSE,PLAIN                                | 1       | Optional  |
| 19     | 3803852    | KIT,KV POSE SEAL                          | 1       | Optional  |
|        |            | <b>PT Pump</b>                            |         |           |
| 20     | AR41043    | W EIGHT,CARRIER                           | 1       | Optional  |
| 21     | BM73133    | HOUSING,GOVERNOR                          | 1       | Optional  |
| 22     | 3034243    | PUMP,GEAR FUEL                            | 1       | Optional  |
| 23     | KIT3880567 | PT PUMP REPAIR<br>KIT(PTG AU              | 1       | Optional  |
|        |            | <b>Injectors</b>                          |         |           |
| 24     | KIT3880785 | KIT INJECTOR REPAIR-<br>KTA               | 6       | Optional  |
| 25     | 167157     | BALL,CHECK                                | 6       | Optional  |
| 26     | 3045006    | PLUG,INJECTOR<br>ORIFICE                  | 6       | Optional  |
| 27     | 193736     | SEAL,O RING                               | 6       | Optional  |
| 28     | 3054999    | SCREEN,FILTER                             | 6       | Optional  |
| 29     | 3010510    | SEAL,O RING                               | 6       | Optional  |
| 30     | 205216     | SEAL,O RING                               | 6       | Optional  |
| 31     | 207244     | SEAL,INJECTOR                             | 6       | Optional  |
|        |            | <b>Cylinder Head</b>                      |         |           |
| 32     | KIT3238299 | KIT CYL HEAD REPAIR<br>K6                 | 6       | Optional  |
|        |            | <b>ACC DRIVE</b>                          |         |           |
| 33     | 3880497    | SHAFT,ACCESSORY<br>DRIVE                  | 1       | Optional  |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

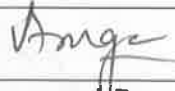
|    |         |                               |   |          |
|----|---------|-------------------------------|---|----------|
| 34 | 3026556 | BEARING,THRUST                | 1 | Optional |
| 35 | 3026557 | BEARING,THRUST                | 1 | Optional |
| 36 | 116391  | BUSHING                       | 1 | Optional |
| 37 | 3069101 | GASKET,ACC DRIVE<br>SUPPORT   | 1 | Optional |
|    |         | <b>Air Compressor</b>         |   |          |
| 38 | 3880524 | KIT REPAIR 2CYL AIR<br>COMPR  | 1 | Optional |
| 39 | 165430  | PISTON AIR<br>COMPRESSOR      | 2 | Optional |
| 40 | 3245718 | RING SET PISTON<br>(SERVICE)  | 2 | Optional |
|    |         | <b>Water Pump</b>             |   |          |
| 41 | 206948  | SEAL,OIL                      | 1 | Optional |
| 42 | 3609826 | SEAL,W ATER PUMP              | 1 | Optional |
| 43 | 3042827 | SHAFT,W ATER PUMP             | 1 | Optional |
| 44 | 70183   | RING,RETAINING                | 1 | Optional |
| 45 | 205258  | RING,RETAINING                | 1 | Optional |
| 46 | 145623  | SEAL,O RING                   | 1 | Optional |
| 47 |         | BEARING,BALL                  | 1 | Optional |
| 48 |         | BEARING,BALL                  | 1 | Optional |
| 49 | 205243  | IMPELLER,W ATER<br>PUMP       | 1 | Optional |
| 50 |         | COCK DRAIN                    | 1 | Optional |
| 51 | 2884938 | GASKET,W ATER PUMP<br>SUPPORT | 2 | Optional |
| 52 | 205258  | RING,RETAINING                | 1 | Optional |
| 53 | 205288  | GASKET,W TR TRF<br>CONNECTION | 1 | Optional |
| 54 | 205289  | GASKET,W TR TRF<br>CONNECTION | 1 | Optional |
|    |         | <b>Turbo Charger</b>          |   |          |
| 55 | 3545647 | KIT,TURBO REPAIR<br>HC5A      | 1 | Optional |
| 56 | 3523980 | SLINGER,OIL                   | 1 | Optional |
| 57 | 3523429 | HOUSING,TUR<br>BEARING        | 1 | Optional |
| 58 | 3521033 | SHAFT & W HEEL                | 1 | Optional |
| 59 | 3591522 | COLLAR THRUST                 | 1 | Optional |

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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**MODEL N-855-R**

| Sr.No. | Part No.   | Description                               | Qty.    | Category  |
|--------|------------|-------------------------------------------|---------|-----------|
| 1      | KIT3238521 | B CHECK KIT N743/855                      | 1       | Mandatory |
| 2      |            | Valvoline Cummins Oil<br>Ltrs 15-W-40 CH4 | 60 Lts. | Mandatory |
| 3      | 4055644    | KIR,AIR CLEANER                           | 1       | Mandatory |
| 4      | 254608     | GASKET,BREATHER                           | 1       | Mandatory |
| 5      | 4024946    | UPPER ENGINE GASKET<br>SET                | 1       | Mandatory |
| 6      | 3067459    | GASKET,ROCKER LEVER<br>COVER              | 3       | Mandatory |
| 7      | 3167218    | INHIBITOR,CORROSION                       | 1       | Mandatory |
| 8      | 3046418    | ROD,PUSH                                  | 12      | Optional  |
| 9      | 3046431    | ROD,PUSH                                  | 6       | Optional  |
| 10     | AX1013359  | RADIW ASH 3LTR                            | 4       | Mandatory |
| 11     | 181236     | SEAL KEY W AY                             | 1       | Optional  |
| 12     | 3931904    | SEALANT LIQUID<br>GASKET                  | 2       | Optional  |
| 13     | 3008947    | SEAL KEY W AY                             | 1       | Optional  |
| 14     | 190397     | SLEEVE W EAR                              | 1       | Optional  |
| 15     | 3069101    | GASKET ACC. DRIVE                         | 1       | Optional  |
| 16     | 168306     | SCREW ,SLOTTED SET                        | 18      | Optional  |
| 17     | 3004316    | SEAL OIL                                  | 1       | Optional  |
| 18     | S 212      | NUT,REGULAR<br>HEXAGON                    | 18      | Optional  |
| 19     | 3058383    | BELT,V                                    | 2       | Mandatory |
| 20     | 4085738    | BELT,V                                    | 1       | Mandatory |
| 21     | 135675     | THERMOSTAT                                | 1       | Mandatory |
| 22     | 186780     | SEAL,THERMOSTAT                           | 1       | Mandatory |
| 23     | 3931904    | SEALANT LIQUID<br>GASKET                  | 2       | Mandatory |
| 24     | 208128     | GASKET,THERMOSTAT<br>HOUSING              | 1       | Mandatory |
|        |            | <b>PT Pump</b>                            |         |           |
| 25     | AR41043    | W EIGHT,CARRIER                           | 1       | Optional  |
| 26     | BM73133    | HOUSING,GOVERNOR                          | 1       | Optional  |
| 27     | 212602     | GEAR,TACHOMETER<br>DRIVE                  | 1       | Optional  |
| 28     | 212613     | HUB,JAW COUPLING                          | 1       | Optional  |
| 29     | 212601     | SHAFT,FUEL PUMP<br>DRIVE                  | 1       | Optional  |
| 30     | S 16052    | BEARING,BALL                              | 1       | Optional  |
| 31     | 3058555    | BARREL,GOVERNOR                           | 1       | Optional  |
| 32     | 3803615    | KIT,SEAL                                  | 1       | Optional  |
| 33     | 212668     | KEY,SQUARE                                | 1       | Optional  |
| 34     | 3015665    | SHAFT,TACHOMETER<br>DRIVE                 | 1       | Optional  |
| 35     | KITBM68356 | GASKET GOVERNOR<br>SET                    | 1       | Optional  |
| 36     | 3046200    | SPIDER,JAW COUPLING                       | 1       | Optional  |
| 37     | 163944     | BUSHING                                   | 1       | Optional  |
| 38     | 3034243    | PUMP,GEAR FUEL                            | 1       | Optional  |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

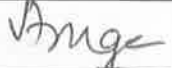
|    |            |                           |    |          |
|----|------------|---------------------------|----|----------|
| 39 | 3234051    | SCREEN                    | 1  | Optional |
| 40 | 147901     | W ASHER, SEALING          | 2  | Optional |
| 41 | AR40132    | PLUNGER, GOVERNOR         | 1  | Optional |
|    |            | <b>Injectors</b>          |    |          |
| 42 | KIT3880782 | KIT INJECTOR REPAIR-NT855 | 6  | Optional |
| 43 | 167157     | BALL, CHECK               | 6  | Optional |
| 44 | 3045006    | PLUG, INJECTOR ORIFICE    | 6  | Optional |
| 45 | 193736     | SEAL, O RING              | 18 | Optional |
| 46 | 3054999    | SCREEN, FILTER            | 6  | Optional |
|    |            | <b>Cylinder Head</b>      |    |          |
| 47 | 3880582    | CYLINDER HEAD REPAIR KIT  | 3  | Optional |
|    |            | <b>ACC DRIVE</b>          |    |          |
| 48 | 3880497    | SHAFT, ACCESSORY DRIVE    | 1  | Optional |
| 49 | 3026556    | BEARING, THRUST           | 1  | Optional |
| 50 | 3026557    | BEARING, THRUST           | 1  | Optional |
| 51 | 116391     | BUSHING                   | 1  | Optional |
|    |            | <b>Air Compressor</b>     |    |          |
| 52 | 3880524    | KIT REPAIR 2CYL AIR COMPR | 1  | Optional |
| 53 | 165430     | PISTON AIR COMPRESSOR     | 2  | Optional |
| 54 | 3245718    | RING SET PISTON (SERVICE) | 2  | Optional |
|    |            | <b>Water Pump</b>         |    |          |
| 55 | 208134     | IMPELLER, WATER PUMP      | 1  | Optional |
| 56 | 3000889    | SHAFT, WATER PUMP         | 1  | Optional |
| 57 |            | BEARING, BALL             | 2  | Optional |
| 58 | 112302     | RING, RETAINING           | 1  | Optional |
| 59 | 196844     | SPACER, BEARING           | 1  | Optional |
| 60 | 3038997    | OIL SEAL                  | 1  | Optional |
| 61 | 3038998    | SEAL, OIL                 | 1  | Optional |
| 62 | 3609826    | SEAL, WATER PUMP          | 1  | Optional |

Note: -ESTIMATE MAY VARY AFTER DISMANTLING AND INSPECTION BASED ON CONDITION BASED BASIS OF PARTS HOSES, GASKETS, SWITCHES, CLAMPS & SENSORS ARE TO BE PROCURED SEPARATELY AS AND WHEN REQUIRED. OPTIONAL PARTS CHANGE REQUIRED BASED ON THE CONDITION OF INDIVIDUAL PART PRICES RULING AT THE TIME OF DELIVERY WILL BE APPLICABLE TAXES EXTRA.

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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**MODEL VTA-1710-L**

| Sr.No.               | Part No.   | Description                            | Qty.     | Category  |
|----------------------|------------|----------------------------------------|----------|-----------|
| 1                    | KIT3238519 | B CHECK KIT VT1710                     | 1        | Mandatory |
| 2                    |            | Valvoline Cummins Oil Ltrs 15-W-40 CH4 | 110 Lts. | Mandatory |
| 3                    | KIT3238358 | KIT AIR CLEANER ELEMENT                | 2        | Mandatory |
| 4                    | 254608     | GASKET,BREATHER                        | 2        | Mandatory |
| 5                    | KIT3240239 | GASKET SET                             | 1        | Mandatory |
| 6                    | 3167218    | INHIBITOR,CORROSION                    | 2        | Mandatory |
| 7                    | 3046419    | ROD,PUSH                               | 10       | Optional  |
| 8                    | 3046432    | ROD,PUSH                               | 4        | Optional  |
| 9                    | AX1013359  | RADIW ASH 3LTR                         | 3        | Mandatory |
| 10                   | 168306     | SCREW ,SLOTTED SET                     | 36       | Optional  |
| 11                   | S 212      | NUT,REGULAR HEXAGON                    | 36       | Optional  |
| 12                   | 3040377    | BELT,V                                 | 2        | Mandatory |
| 13                   | 178655     | BELT,V                                 | 1        | Mandatory |
| 14                   | 135675     | THERMOSTAT                             | 2        | Mandatory |
| 15                   | 186780     | SEAL,THERMOSTAT                        | 2        | Mandatory |
| 16                   | 3020187    | SEAL OIL                               | 1        | Mandatory |
| 17                   | 3033215    | GASKET,THERMOSTAT HOUSING              | 2        | Mandatory |
| 18                   | 3931904    | SEALANT LIQUID GASKET                  | 2        | Mandatory |
| 19                   | 3081053    | HOSE,PLAIN                             | 2        | Mandatory |
| <b>PT Pump</b>       |            |                                        |          |           |
| 20                   | KIT3880567 | PT PUMP REPAIR KIT(PTG AU              | 1        | Optional  |
| 21                   | AR41043    | W EIGHT,CARRIER                        | 1        | Optional  |
| 22                   | BM73133    | HOUSING,GOVERNOR                       | 1        | Optional  |
| 23                   | 3034222    | PUMP,GEAR FUEL                         | 1        | Optional  |
| <b>Injectors</b>     |            |                                        |          |           |
| 24                   | KIT3238363 | KIT,BARREL PLU CUP BIG                 | 12       | Optional  |
| 25                   | 167157     | BALL,CHECK                             | 12       | Optional  |
| 26                   | 3045006    | PLUG,INJECTOR ORIFICE                  | 12       | Optional  |
| 27                   | 193736     | SEAL,O RING                            | 36       | Optional  |
| 28                   | 3054999    | SCREEN,FILTER                          | 12       | Optional  |
| <b>Cylinder Head</b> |            |                                        |          |           |
| 29                   | 127554     | COLLET,VALVE                           | 96       | Optional  |
| 30                   | 145701     | VALVE,EXHAUST                          | 24       | Optional  |
| 31                   | 170296     | GUIDE,VALVE SPRING                     | 48       | Optional  |
| 32                   | 172034     | GUIDE,VALVE SPRING                     | 48       | Optional  |
| 33                   | 211999     | SPRING,VALVE                           | 48       | Optional  |
| 34                   | 135957     | VALVE,INTAKE                           | 24       | Optional  |
| 35                   | 127930     | INSERT,VALVE                           | 24       | Optional  |

|                                                                                     |                                                                                     |                                                                                       |
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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

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|----|---------|---------------------------|----|----------|
| 36 | 3872815 | INSERT, VALVE             | 24 | Optional |
| 37 | 3006456 | GUIDE, VALVE              | 48 | Optional |
| 38 | 3007759 | STEM                      | 12 | Optional |
| 39 | 3406702 | SEAL, O RING              | 12 | Optional |
| 40 |         | SLEEVE, INJECTOR          | 6  | Optional |
|    |         | KIT CYL HEAD REPAIR K6    |    |          |
|    |         | <b>ACC DRIVE</b>          |    |          |
| 41 | 3880497 | SHAFT, ACCESSORY DRIVE    | 1  | Optional |
| 42 | 3026556 | BEARING, THRUST           | 1  | Optional |
| 43 | 3026557 | BEARING, THRUST           | 1  | Optional |
| 44 | 116391  | BUSHING                   | 1  | Optional |
| 45 | 200808  | GASKET, ACC DRIVE SUPPORT | 1  | Optional |
|    |         | <b>Water Pump</b>         |    |          |
| 46 | 209806  | SHAFT, W ATER PUMP        | 1  | Optional |
| 47 | 3003350 | SPACER, SEAL              | 1  | Optional |
| 48 | 3003353 | SEAL, OIL                 | 2  | Optional |
| 49 | 3003354 | BEARING, ROLLER           | 1  | Optional |
| 50 | 3011230 | GASKET, W ATER PUMP       | 1  | Optional |
| 51 | 3609826 | SEAL, W ATER PUMP         | 1  | Optional |
| 52 | 4072619 | IMPELLER, W ATER PUMP     | 1  | Optional |
|    |         | <b>Turbo Charger</b>      |    |          |
| 53 | 3545661 | KIT, TURBO REPAIR 4LG     | 2  | Optional |
| 54 | 3751240 | RING, THRUST              | 4  | Optional |
| 55 | 3759618 | PLATE, OIL SEAL           | 2  | Optional |
| 56 | 3759619 | SLINGER, OIL              | 2  | Optional |
| 57 | 3500717 | HOUSING, TUR BEARING      | 1  | Optional |
| 58 | 3500433 | SHAFT & WHEEL             | 1  | Optional |

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| Prepared by<br>JE/TW                                                                | Checked By<br>DDTI-II                                                               | Approved By<br>EDTI                                                                   |

**M/s CUMMINS GUIDELINE FOR ENGINE STORAGE AND PREVENTION**

Engine Storage - Long Term

Page 1 of 5

**000-005 Engine Storage - Long Term****General Information****▲ WARNING ▲**

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [120°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

**▲ WARNING ▲**

Coolant is toxic. Keep away from children and pets. If not reused, dispose of in accordance with local environmental regulations.

**▲ CAUTION ▲**

After 24 months in storage, the engine cooling system must be drained and flushed with a suitable solvent or a hot, lightweight mineral oil. Repeat flushing procedure a second time before being put back into service.

This procedure describes the proper method for the long-term (more than 6 months) storage of an engine that is currently in running condition. This procedure applies to this engine either remaining in chassis - or being removed out of chassis upon completion of the steps below.

**Prepare the Engine for Long Term Storage****▲ CAUTION ▲**

Do not use fuel system preservative oil on Natural Gas or Propane Engines.

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|                      |                       |                     |
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- Operate the engine at high idle until the coolant temperature is 70°C [158°F].
- Turn the engine off.
- Drain the oil.
- Install the drain plugs.
- Fill the engine oil pan sump to the high mark using Tectyl™ 910 or equivalent engine preservative oil. This will provide long term engine rust protection. The oil **must** meet military specification MIL-PRF-21260, Type P-10, Grade 2, SAE 30.

**Internal Preservation of the Fuel System with Mechanically and Electronically Actuated Injectors.**

**CAUTION**

Do not use diesel fuel containing bio components for internal preservation of fuel system for engine storage. Fuel properties degradation may cause damages and lead to premature failure of fuel system components.

- Disconnect the fuel lines to the engine fuel filter and the injector return line.
- Use Diesel Pump and Injector calibration fluid that meets ISO 4113 standard, SAE J967d standard and Bosch VS 15665-OL standard.

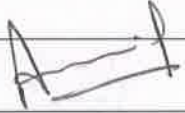
**NOTE:** Using calibration fluid allows storage for up to 12 months. After 12 months the engine fuel system must be drained and flushed again with fresh calibration fluid. Repeat after each 12-month period.

Alternatively you can use the diesel fuel with 0 percent bio components content for Internal Preservation of the Fuel System.

**NOTE:** Using diesel fuel with 0 percent bio components content allows storage for up to 6 months. After 6 months, the engine fuel system must be drained and be flushed again with fresh diesel fuel with 0 percent bio components content. Repeat after each 6-month period.

- Start the engine.
- After the engine is operating smoothly, transfer the fuel supply line to the container of calibration fluid or the container of diesel fuel with 0 percent bio components content.
- Let the engine run for approximately 25 minutes at low idle in order to ensure that the engine preservative oil (Tectyl™ 910 E or equivalent) is distributed around the engine and its internal components and that the calibration fluid or the diesel fuel with 0 percent bio components content flows out of the injector return line.
- Turn the engine OFF.
- Connect the fuel lines to the fuel filter and the injector return line.
- Drain all the preservative oil from the engine oil pan sump, the air compressor (if applicable), and drain all the oil filters and all the fuel filters.
- Install the drain plugs.

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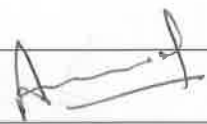
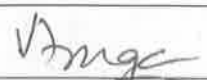
### CAUTION

Before starting another Internal Preservation of the Fuel System procedure again (after passing a storage period) it is required to fill the engine oil pan sump to the high mark using Tectyl™ 910 or equivalent engine preservative oil.

- If the engine is being stored as a loose engine, drain the engine coolant and cover all cooling system openings with plastic and tape.
- If the engine is **not** being removed from chassis and the engine has an extended life coolant with rust inhibitor, then coolant does **not** need to be drained.
- If the engine will remain in storage for over 24 months, the engine cooling system **must** be drained and flushed with a suitable solvent or a hot, lightweight mineral oil. Repeat after each 24-month period.
- Remove the intake and exhaust manifolds.
- Spray preservative oil into the intake and exhaust ports in the cylinder heads and in the exhaust manifolds **only**. Do **not** use preservative oil on the intake manifold or any fuel system components as this may permanently damage sensors or valves.
- Spray preservative oil in the inlet port on the air compressor (if applicable).
- Remove the rocker lever covers.
- Spray the rocker levers, the valve stems, the springs, the valve guides, the crossheads, and the push rods with preservative oil.
- Install the rocker lever covers, intake and exhaust manifolds.
- Brush or spray the preservative oil on all the exposed metal surfaces that are **not** painted. Preservative oil should **not** be applied to any plastic, rubber, or similar surfaces. Make sure to coat the flywheel, flywheel housing and all other unpainted machined surfaces with this preservative oil. Use a rust preservative oil compound that meets military specification MIL-C-16173C, type P-2, Grade 1 or 2.
- For components containing exposed bearings that are **not** easily accessible e.g. Fan Hubs, remove the component to aid access. Brush or spray preservative oil on all surfaces that are **not** painted and refit the component. Use a rust preservative oil compound that meets military specification, MIL-C-16173C, type P-2, Grade 1 or 2.
- Cover all the openings (engine and components) with heavy paper and tape to prevent dirt and moisture from entering the engine. Cover the entire engine with plastic.
- Put a warning tag on the engine. The tag **must** indicate:
  - Do **not** operate the engine.
  - Do **not** bar the crankshaft.
  - The engine has been treated with preservatives.
  - The coolant has been removed.
  - The date of treatment.
  - The date of the 6 week inspection if required.

### CAUTION

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The engine must be stored in an area that is dry and has uniform temperature.

- Remove any external drive belts to prevent localized stretching and deformation.
- If the engine can be stored inside a designated storage facility isolated from the external environment, ignore the following step.
- Excluding the crankshaft, ensure that all external dynamic engine components are rotated every 6 weeks. Ensure parts are free from corrosion, debris and water ingress. Record and date this on the engine tag created.

#### Remove the Engine from Long Term Storage

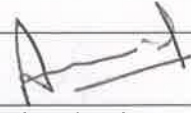
To remove the engine from long term storage, follow the following steps:

#### CAUTION

To reduce the possibility of personal injury, avoid direct contact of hot oil with your skin.

- Flush the engine preservative oil out of the engine by removing the plug from the main engine oil rifle and pumping a hot, lightweight mineral oil through it. Make sure that the engine crankshaft is barred at least three to four revolutions during this flushing procedure.
- Drain all the mineral oil that was used to flush the engine clean of the engine preservative oil.
- Install the drain plugs.
- Install new oil, fuel and coolant filters.
- Fill the engine to the high mark with engine oil.
  - If the engine has been in storage for less than 24 months and if the cooling system was drained, fill the cooling system with coolant. See the Coolant Recommendations and Specifications procedure in Section V of the corresponding owners and/or operation and maintenance manual for antifreeze, water, and Supplemental Coolant Additive (SCA) specifications.
  - If the engine has been in storage for 24 months, every 24 months the engine cooling system **must** be drained and flushed with a suitable solvent or a hot, lightweight mineral oil. Fill the cooling system with coolant. See the Coolant Recommendations and Specifications procedure in Section V of the corresponding owners and/or operation and maintenance manual for antifreeze, water, and SCA specifications.
  - If the engine has been in storage for less than 24 months and the engine has an extended life coolant with a rust inhibitor, drain the cooling system. Fill the cooling system with coolant. See the Coolant Recommendations and Specifications procedure in Section V of the corresponding owners and/or operation and maintenance manual for antifreeze, water, and SCA specifications.

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- Adjust the engine brake (if applicable) and valve clearances. See the Overhead Set procedure in the corresponding base Troubleshooting and Repair Manual or Service Manual for the engine being serviced.
- Tighten the intake and exhaust manifold mounting capscrews.
- Prime the lubricating system.
- Reinstall any external drive belts that were removed.
- Replace all spark plugs. See the Spark Plugs procedure in the corresponding base Troubleshooting and Repair Manual or Service Manual for engine being serviced (if applicable).
- Make sure all fuel lines are securely tightened and all fuel shutoff valves are open prior to attempting to start the engine.
- Start the engine.
  - Note that it might take multiple cranking attempts to start the engine. Do not crank the engine more than 30 seconds at a time as this might cause the starter to overheat and fail.
  - Note that the engine might run rough until the fuel system is completely primed or until all residual fuel system preservative oil is completely flushed out of the fuel system (if the fuel has been treated with fuel system preservative oil).
- Install the exhaust aftertreatment components (if applicable).
- Force an active regeneration (if applicable).

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Annexure-6

**CONTACT DETAILS OF NEAREST AUTHORIZED SERVICE OFFICE AND SERVICE MANAGER OF M/S CUMMINS**

| Sr No | DEALERS ZONE | HIP NAME                               | CITY    | State       | CONTACT PERSON                                  | ADDRESS                                                                        | TEL NO. OFFICE                                                                                                     | FAX NO       | Mobile No.                                                         | AREA COVERED                                                                                                                                                                                                                                                                                                                                                                                              | E-mail                                     |
|-------|--------------|----------------------------------------|---------|-------------|-------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| 1     | EAST         | Eastern Diesel Sales & Service         | Silchar | Assam       | Mr. PO Polson (GM Service)<br>Mr. PP John (HOD) | SONAI ROAD, P.O. - LINK ROAD, (POST BOX NO.49) CACHAR, SILCHAR - 788 006 ASSAM | Single Point Contact<br>9854080955 / 03842 - 225100 / 225892                                                       | 03842-225853 | P O Polson (GM Service) 9435070799<br>Mr. PP John (HOD) 9854080959 | Assam districts:- Cachar, Hallakandi, North cachar hills & Karimkani.<br>NE states:- Tripura, Mizoram & Manipur, East Sikkim, North Sikkim, South Sikkim, West Sikkim, Bankura, Birbhum, Burdwan, Darjeeling, East Midnapore, Hoogly, Howrah, Jalpaiguri, Koch Bihar, Kolkata, Maldah, Murshidabad, Nadia, North Dinajpur, North 24-parganas, Puruliya, South Dinajpur, South 24-parganas, West Midnapore | popaulson721@gmail.com<br>johnsons@bsnl.in |
| 2     | EAST         | Garuda Power Private Limited           | Kolkata | West Bengal | BS Jayant / DR Deshpande                        | Joka Industrial Plaza, Diamond Harbour Road, Post : Joka Kolkata - 700104      | <br>033-24381028 / 033-24380165 | 033-24381029 | BS Jayant 94340-09385 (HOD)<br>DR Deshpande 7044074201 (HOD)       |                                                                                                                                                                                                                                                                                                                                                                                                           | gppl@garudapower.com                       |
| 3     | EAST         | JAIKAR TECHNO PRIVATE LIMITED, DHANBAD | Dhanbad | Jharkhand   | RS CHAHAL                                       | Katras Road, Opposite Super Bazar, Dhanbad-826001 (Jharkhand).                 | 0326-2304398 / 2301451                                                                                             | 0326-2304398 | RS CHAHAL - (HOD) 94 311 21923<br>J.S. Chahal (HOD) 94 311 24541   | Bokaro, Dhanbad, Dumka, Giridih                                                                                                                                                                                                                                                                                                                                                                           | jkdieles@gmail.com                         |

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| Prepared by<br>JE/TW                                                                  | Checked by<br>DDTI-II                                                                 | Approved by<br>EDTI                                                                  |

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|---|------|--------------------------------------------|-------------|-----------|------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 4 | EAST | JAIKAR TECHNO PRIVATE LIMITED, HAZARIBAGH  | Hazaribagh  | Jharkhand | RS CHAHAL  | PTC Road, Korrah, Hazaribagh, PIN - 825 301 JHARKHAND                                | 06546- 266497 / 266553                                                    | 06546- 266947                | RS CHAHAL (HOD) 94 311 21923                                            | Hazaribagh                                                                                                                                                                                                           | jkd_haz@sify.com       |
| 5 | EAST | JAIKAR TECHNO PRIVATE LIMITED, JAMSHEDPUR  | Jamshedpur  | Jharkhand | RS CHAHAL  | NH-33, Pardihi (Near Sahara City), P.O - M.G.M , Mango, Jamshedpur- 834012 Jharkhand | 0657-2363776, 2363778                                                     | 0657- 2363776                | RS CHAHAL (HOD) 94 311 21923                                            | Bokaro, East Singhbhum                                                                                                                                                                                               | jkd_jsr@sify.com       |
| 6 | EAST | JAIKAR TECHNO PRIVATE LIMITED, MUZAFFARPUR | Muzaffarpur | Bihar     | A S CHAHAL | Satpura Colony, Aghoriabazar Post Office RAMNA, Muzaffarpur - 842002 BIHAR           | (0621) 2273226 / 27                                                       | NA                           | A.S. Chahal (HOD) 94 311 24509                                          | Araria, Champaran, Darbhanga, Gopalganj, Katihar, Kishanganj, Madhepura, Madhubani, Muzaffarpur, Paschim Champaran, Purbi Champaran, Purnia, Saharsa, Samastipur, Saran, Sheohar, Sitamarhi, Siwan, Supaul, Vaishali | jkd muz@gmail.com      |
| 7 | EAST | JAIKAR TECHNO PRIVATE LIMITED, NOAMUNDI    | Noamundi    | Jharkhand | RS CHAHAL  | Main Road, P.O- Noamundi Bazar, Dist - Singhbhum(West) PIN- 833218, JHARKHAND        | SPC- 9279832991 - Samanti (9234662979- JB Sahu)                           | NA                           | RS CHAHAL (HOD) 94 311 21923 SWAPAN GHOSH (Branch Manager) 94 311 10164 | Singhbhum                                                                                                                                                                                                            | jkd_nmd@sify.com       |
| 8 | EAST | JAIKAR TECHNO PRIVATE LIMITED, PATNA       | Patna       | Bihar     | R S CHAHAL | M-3/21 SRI KRISHNAPURI, NEAR BASAWAN PARK, PATNA 800001, BIHAR                       | SPC - 930481- 4959 (Anu Singh) 93048-14950 (Vinod) / 93048-14966 (Smaeer) | 0612- 2541277 , 3263520 / 21 | R S Chahal (HOD) 94 311 21923                                           | Aurangabad, Banka, Begusarai, Bhabua, Bhagalpur, Bhojpur, Buxar, Gaya, Jahanabad, Jamui, Khagaria, Luckeesarai, Munger, Nalanda, Nawada, Patna, Rohtas, Sheikhpura, Deogarh,                                         | jkdieselsptn@gmail.com |

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| Prepared by<br>JE/TW                                                                  | Checked By<br>DDTI-II                                                                 | Approved By<br>EDTI                                                                  |



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|----|------|----------------------------------------|----------|-----------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
|    |      |                                        |          |           |                                                                   | 25                                                                                  |                                                                               |                                                                                        | & Meghalaya.                                                                                                                               |                                                              |
| 14 | EAST | JaiKar Techno Private Limited          | Ranchi   | Jharkhand | Mr. Swapan Ghosh                                                  | Plot No.43, Near Imam Kothi, Old Hazaribagh Road, Kokar, Ranchi 834 009 , Jharkhand | N/A                                                                           | Swapan Ghosh<br>9234550164                                                             | Chatra, East Singhbhum, Garhwa, Giridih, Godda, Gumla, Koderma, Lohardaga, Palamau, Ranchi                                                 | jaikartechno.ranchi4@gmail.com                               |
| 15 | EAST | Sachin Sales & Service Private Limited | Jorhat   | Assam     | Mr.Supriyo Charbroty (Service manager)<br>Mr Jayanta Sharma (HOD) | 1, August Kranti Path, Beltola - Khanapara Road, Beltola, Guwahati - 781 028        | Single Point Contact (Dealer Customer Care) 9435136459 / 0361-2229024 / 25    | Supriyo Chakraborty (Service manager) 9706009307<br>Mr Jayanta Sharma (HOD) 9706009345 | Assam districts:- Golaghat, Jorhat, Charaideo, Majuli Island & Sivasagar. Nagaland districts:- Zuenbutto & phek.                           | Supriyo@jsgroup.net.in<br>Jayanta.sharma@jsgroup.net.in      |
| 16 | EAST | Sachin Sales & Service Private Limited | Tinsukia | Assam     | Mr.Pulak Boruah (Operation manager) Mr Jayanta Sharma (HOD)       | Gilapukhari Road, Bordoi Nager, Tinsukia, 786125                                    | Single Point Contact (Dealer Customer Care) 9435108802 / 03742309806/ 2300878 | Pulak Boruah (Operation manager) 9706009310<br>Mr Jayanta Sharma (HOD) 9706009345      | Assam districts:- Tnsukia & Dibrugarah. Arunanchal Pradesh:- Anjaw, Changlang, Dibang Valley, East Siang, Lohit, Upper Siang & West Siang. | pulak.boruah@jsgroup.net.in<br>Jayanta.sharma@jsgroup.net.in |

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|----|-------|------------------------------|---------|-------|-----------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 17 | EAST  | Garuda Power Private Limited | Tezpur  | Assam | Mr.Souren Sen (HCS)<br>S N Bagchi (HOD) | EX POLICE LINE , TEZPUR,<br>DIST SONITPUR 784 001,<br>ASSAM                                | Single Point<br>Contact (Dealer<br>Customer Care)<br>943505775 /<br>03712 - 220936 | NA               | Mr.Souren Sen (HCS)<br>9435563058<br>S N Bagchi (HOD)<br>94350 81479           | Assam districts:-<br>Darrang, Dhemaji,<br>North Lakhimpur,<br>Sonitpur,<br>Bongaigaon, Kamrup<br>Rural, Barpeta,<br>Rangiya, Goalpara,<br>Kokrajhar, Baksha,<br>Dhubri, Chirang,<br>Nalbari, Udaiguri,<br>South Salmara-<br>Mankachar, Barpeta<br>& Bishwanath.<br>Arunachal Pradesh<br>districts:- East<br>Kameng, East Siang,<br>Lower Subansiri,<br>Tawang, Upper<br>Subansiri, West<br>Kameng &<br>Papumpare. | samarendra.bagchi<br>i@yahoo.com<br>souren.sen@garu<br>dapower.com |
| 18 | NORTH | Excel Diesel                 | Lucknow | UP    | AK Pandey                               | B-2/390, Sector A,<br>Sitapur Road Scheme,<br>Aliganj, Lucknow 226<br>021<br>UTTAR PRADESH | 0522 4152300 /<br>4152317<br>SPC -<br>9793839000,<br>9793846000                    | 0522-<br>4152301 | AK Pande (HOD)<br>99 355 93565<br>Ritesh Singh,<br>(MGR SER) - 99 355<br>93576 | Azamgarh, Bahraich,<br>Ballia, Balrampur,<br>Barabanki, Basti,<br>Deoria, Faizabad,<br>Gonda, Gorakhpur,<br>Hardoi, Kushinagar,<br>Lucknow,<br>Maharajganj,<br>Maunathbhanjan,<br>Pratapgarh, Rae<br>Bareilly, Sant Kabir<br>Nagar, Shravasti,<br>Sidharthnagar,<br>Sitapur, Sultanpur                                                                                                                            | admin@exceldies<br>el.com                                          |

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|----|-------|--------------------|----------|-------------|------------------------------|---------------------------------------------------------------------|--------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------|
| 19 | NORTH | Gulati Diesels     | Karnal   | Haryana     | Ajay Gulati                  | Plot No.18 / 3, H.S.I.D.C., Industrial Area, Karnal-132001, Haryana | 0184 - 2221600<br>SPC - 98122-09023 - Mahendra Khurana | 0184- 2221600 | Ajay Gulati (HOD)<br>98 120 43138<br>Amit Gulati (HOD)<br>98 123 55555<br>Rajesh Bareja (Service Head)<br>98 122 09014 | Fatehabad, Hisar, Jind, Kaithal, Karnal, Kurukshetra, Panipat, Sirsa, Yamunanagar | RohtashKalyan@ulatidiesels.com |
| 20 | NORTH | Jakson Enterprises | Agra     | UP          | Rajiv Hooda/ Pradyumn Pathak | 46-B, LAJPAT KUNJ KHANDARI ROAD AGRA 282005                         | 0562-2962461<br>8057901427 - SPC                       |               | 08057901401 - Prashant Trivedi (Branch Manager)                                                                        | Mainpuri, Mathura, Etah, Firozabad, Agra                                          |                                |
| 21 | NORTH | Jakson Enterprises | Meerut   | UP          | Rajiv Hooda/ Pradyumn Pathak | A4, Pallav Puram, Phase-1, Modi Puram Meerut.                       | Pramod Sharma-8057901549<br>SPC-8057901480             |               | Umesh Chaudhary (DGM) 08057901456                                                                                      | Meerut, Bagpat, Bijnor, Muzzafar Nagar, Saharanpur                                |                                |
| 22 | NORTH | Jakson Enterprises | Jhansi   | UP          | Rajiv Hooda/ Pradyumn Pathak | B-19, Avas Vikas Colony, Nandan Pura Jhansi-284003                  | 05102480083<br>9792971560 - SPC                        |               | 9792971549 - LK Shukla (Service Manager)                                                                               | Jhansi, Lalitpur, Mahoba, Jalaun, Auraiya, Etawah, Banda                          | arvind.pandey1@jakson.com      |
| 23 | NORTH | Jakson Enterprises | Haridwar | Uttaranchal | Rajiv Hooda/ Pradyumn Pathak | N 11, Shivalik Nagar, Haridwar, Uttaranchal, Pin Code 249403        | 01334-232552<br>SPC- Preeti 8057901548                 |               | Avneesh Sharma-8057901546                                                                                              | Haridwar, Uttar Kashi, Tihri, Chamoli                                             | avneesh.sharma@jakson.com      |
| 24 | NORTH | Jakson Enterprises | Dehradun | Uttaranchal | Rajiv Hooda/ Pradyumn Pathak | 216, Saket Colony, Ajabpur Kalan, Dehradun                          | 08057901440 - Katar Singh                              |               | 08057901440 - Katar Singh                                                                                              | Dehradun                                                                          |                                |

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| 25 | NORTH | JAIKAR TECHNO PRIVATE LIMITED | Mohali    | Punjab | KS Chahal       | E-220, PHASE - VIII B INDUSTRIAL FOCAL POINT MOHALI 160071                           | 0172-4323333                                                  | 0172-4323300   | K S Chahal (HOD)<br>98 726 62200<br>KULBHUSHAN RAI (COO)<br>98 154 21182                           | Chandigarh, Ambala, Panchkula, Hoshiarpur, Patiala, Rupnagar, SAS Nagar (Mohali), SBS Nagar (Nawanshahar), Fatehgarh Sahib                                                                                                      | serviceadvisor.chd@jaikar.com                                                           |
| 26 | NORTH | JAIKAR TECHNO PRIVATE LIMITED | Singrauli | MP     | R S Chahal      | New Market, PO: Singrauli, Dist. Singrauli (MP) Pin- 486 889.                        | 07805- 268712<br>07805- 268718<br>SPC - 9755085240 (Vijayrao) | 07805- 268711  | Akhar Ansari SER - 94<br>253 31809<br>Bharathan - 09753216324<br>R S Chahal - (HOD)<br>09431121923 | districts of Mirzapur & Sonbhadra in the state of Uttar Pradesh and Sidhi in the state of Madhya Pradesh                                                                                                                        | rajinder_schahal@sify.com                                                               |
| 27 | NORTH | Svam Power Plants Pvt. Ltd.   | Noida     | UP     | Sudhir Malhotra | Svam Power Plants Pvt. Ltd. A-107, Sector-63 Noida-201301.                           | Noida<br>Tel: 0120-4792444 (30 lines)                         | N/A            | Mr. Sudhir Malhotra, (HOD)<br>Mobile no. +91 9810017488                                            | Bulandshahr, Gautam Budh Nagar, Ghaziabad                                                                                                                                                                                       | svam.noida@svammpower.com<br>parts.noida@svammpower.com<br>service.noida@svammpower.com |
| 28 | NORTH | Pal Engineers                 | Jammu     | J&K    | Prashant Luthra | Sewa Complex, Opposite Fire Station, Gangyal, National Highway Jammu 180 010         | 0191-2484028, 2484029<br>SPC - 9697045744                     | 0191-2484059   | Prashant Luthra (HOD)<br>98100-06669<br>Sudhir Mehra (GM) - 9858414152                             | Anantnag, Chilas, Gilgit, Gilgit Wazara, Jammu, Kashmir North, Leh-Ladakh, Mirpur-Muzaffarabad, Punch, Riasi, Kargil, Pulwama, Doda-Kistwar, Udhampur, Budgam, Kupwara, Bandipura, Srinagar, Kathua, Rajauri, Ramban, Ganderbal | service_paleng@luthragroup.net                                                          |
| 29 | NORTH | Pal Engineers                 | Baddi     | HP     | Prashant Luthra | SCO 013, Block A, M1 Plaza, Jharmajri, Baddi, DIST. Solan - 173205, Himachal Pradesh | 01795 - 271360, 61, 62<br>SPC - 88946-11222                   | 01795 - 271359 | Prashant Luthra (HOD)<br>09810006669<br>Lalit Kapoor - 8894789801                                  | Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahul & spiti, Mandi, Shimla, Sirmaur, Solan, Una                                                                                                                           | service@palengin.eers.in                                                                |

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|----|-------|----------------------------------|-----------|-----------|------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| 30 | NORTH | Rajasthan Diesel Sales & Service | Udaipur   | Rajasthan | Vijay Bagrecha   | E-39/40, Mewar Industrial Area, Road No.5, Udaipur- 313003 (Rajasthan ). | 0294 - 3051400 / 0294 - 3051401<br>Service - 3051413, 3051415, 3051414<br>Parts - 3051406, 3051407                                                                                              | 0294-2491697   | Vijay Bagrecha (HOD)<br>94 141 65573<br><br>GR Sharma (Service Manager)<br>94141-65571 | Mandsaur, Neemuch, Ajmer, Banswara, Baran, Bharatpur, Bhilwara, Bundi, Chittaurgarh, Dhaulpur, Dungarpur, Jalor, Jhalawar, Karauli, Kota, Pali, Rajsamand, Sawaimadhopur, Sirahi, Udaipur | spc@rdssudr.com<br>headoffice@rdssudr.com<br>fieldservice@rdssudr.com |
| 31 | NORTH | Sudhir Sales & Services Limited  | Ludhiana  | Punjab    | Mr. Naveen Sehra | Verma Arcade, B XX - 2027, Gobind Nagar, PAV Road, Ludhiana - 141001     | 0161-4386000 to 4386008                                                                                                                                                                         | N/A            | 997199 5995 (Kunal Malhotra)<br><br>98 760 32506 (NAVEEN SEHRA)                        | Amritsar, Bathinda, Faridkot, Firozpur, Gurdaspur, Jalandhar, Kapurthala, Ludhiana, Mansa, Moga, Muktsar, Sangrur, Fazilka, Pathankot, Taran-Tarn, Abohar, Barnala                        | spc@sudhirgroup.com                                                   |
| 32 | NORTH | Svam Power Plants Private Ltd.   | Faridabad | Haryana   | Sudhir Malhotra  | A-3/2, Nehru Ground, Neelam Bata Road, N.I.T Faridabad-121001 (Haryana)  | 0129 - 4028316, 4028317, 4028318, 4028319 (Faridabad).<br><br>0124-4139000 (Gurgaon)<br>Ashok Nijhara, VP 98 100 22321<br>S Mukherjee, Service 98 104 32220<br>Anil Gupta, Service 98 104 46483 | 0129 - 4028320 | Sudhir Malhotra, MD 98 100 17488                                                       | Bhiwani, Faridabad, Gurgaon, Jhajjar, Mahendragarh, Rewari, Rohtak, Sonapat                                                                                                               | svam.fbd@svampower.com                                                |

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|----|-------|----------------------------------------------------------------------|-----------------|-------------|-----------------------------------------|----------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 33 | NORTH | URSS<br>Techservi<br>ces<br>Private<br>Limited                       | Jaipur          | Rajasthan   | Rajeev Singh                            | B-2, Jayanti Market, M I<br>Road,<br>Jaipur 302 001.                                         | 0141 - 2367884 /<br>2367883 /<br>2367890              | 0141-<br>2362559  | 98 290 67884 (HOD)<br>Rajeev Singh<br>9829069884 Mr.<br>Venugopalan (Service<br>Managers)     | Alwar, Barmer,<br>Bikaner, Churu,<br>Dausa, Ganganagar,<br>Hanumangarh,<br>Jaipur, Jaisalmer,<br>Jhunjhunun,<br>Jodhpur, Nagaur,<br>Sikar, Tonk                                                                                         | spc@urssjpr.com<br>venugopalan.mp<br>@urssjpr.com<br>parts@urssjpr.co<br>m |
| 34 | SOUTH | Maniranja<br>n Diesel<br>Sales &<br>Service<br>Pvt Ltd.<br>Bangalore | Mysore          | Karnataka   | Tanveer Khan<br>(HOD)                   | No.34-B,<br>Industrial Area,<br>Bannimantap 'A' Layout,<br>MYSORE - 570015<br>KARNATAKA      | 0821 - 2496290 /<br>2492006 /<br>2496205 /<br>2496206 | 0821-<br>2498367  | Tanveer Khan (HOD)<br>98 440 69052<br>Mr.WAJAT KHAN 98459<br>39359                            | Chamarajanagar,<br>Chikmagalur, Hassan,<br>Kodagu, Mandya,<br>Mysore, Nilgris                                                                                                                                                           | deshmukh@manir<br>anjan.com<br>tanveer@maniran<br>jan.com                  |
| 35 | SOUTH | JN<br>Machineri<br>es Private<br>Limited                             | Madurai         | TN          | A SUDHIR / K<br>Nagarajan               | Natham Road, Marani<br>vilakku,<br>Oomachikulam, Madurai -<br>625 014.<br>TAMIL NADU         | 0452 - 2681765 /<br>2680001                           | 0452-<br>2681515  | A.Sudhir (HOD)<br>98 947 83483<br>K Nagarajan (HOD)<br>99 944 93933                           | Arivalur,<br>Dharmapuri,<br>Dindigul,<br>Kanniyakumari,<br>Karur, Madurai,<br>Namakkal,<br>Perambalur,<br>Pudukkottai,<br>Ramanathapuram,<br>Salem, Sivaganga,<br>Theni,<br>Tiruchirappalli,<br>Tirunelveli, Tuticorin,<br>Virudhunagar | jnmmdu@jnmachi<br>neries.com                                               |
| 36 | SOUTH | Powerica<br>a limited<br>Service<br>Division                         | Pondich<br>erry | Pondicherry | P RAMNATHAN<br>(HOD)                    | No. 481, Ground Floor,<br>Vazhuthavur Main Road,<br>Muthirapalayam,<br>Pondicherry - 605 009 | 0413 - 2274242<br>SPC No. is 0413 -<br>3247365        | 0413-<br>2279292  | S Mullainathan -<br>8754466522<br>K.Raghunath -<br>9840278416                                 | Pondicherry,<br>Karaikal,<br>Nagapattinam,<br>Cuddalore,<br>Villupuram, Tanjore,<br>Kumbakonam,<br>Tiruvallur                                                                                                                           | s.mullainathan@p<br>owericaltd.com<br>k.raghunath@pow<br>ericaltd.com      |
| 37 | SOUTH | Maniranja<br>n Diesel<br>Sales &<br>Service<br>Pvt Ltd.<br>Bangalore | Bangalor<br>e   | Karnataka   | C.N.Deshmukh (HOD)/Ashirwad<br>Deshmukh | NO 1/7 NGEF<br>Quarters,Near ESI<br>Office,NGEF<br>layout,Byappanahalli,Ban<br>galore 560038 | 080 - 40906464 /<br>080 - 40906463                    | 080 -<br>25203035 | C.N.Deshmukh/Ashirwad<br>Deshmukh - 94 484<br>96939<br>MG Kulkarni (Ser. Mgr)<br>94 484 96912 | Bangalore, Tumkur<br>,Hosur,<br>Rannagar,Channapa<br>tna,Chikablapur,Kola<br>r                                                                                                                                                          | deshmukh@manir<br>anjan.com,<br>ashirwad@manira<br>njan.com                |

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| 38 | SOUTH | Maniranjana Diesel Sales & Service Pvt Ltd. Coimbatore | Coimbatore             | TN             | N D THAKUR           | 101 Shastri Nagar, Opp. Koval Medical Center, Aerodrome, P. O. Coimbatore 641014                                                 | 0422 - 4520251, 4520252, 4520253                                                                       | 0422 - 4520254 | N.D.Thakur (HOD)<br>94 437 17531<br>S.Rajgopalan - 98 940 17593                                         | Tirupur, Coimbatore, Erode, Krishnagiri(Hosur Taluka),                                                                                                                                                    | mrdss@md3.vsnl.net.in          |
| 39 | SOUTH | Naveen Diesels                                         | Cuddapah               | AP             | Atul Krishna         | D NO.1/2113-1, New RTC Bus stand, Railway station road, Prakash Nagar, KADAPA 516004                                             | SPC - 08562 - 258010<br>SA -9493896327 (Suresh)                                                        | 08562 258012   | Atul Krishna (CEO)<br>94 938 96324<br>P.D.Sanjeev (Dy.GM)<br>94 938 96315                               | Chittoor, Cuddapah, Kurnool, Nellore                                                                                                                                                                      | ekbkadapa@gmail.com            |
| 40 | SOUTH | Powerica Limited (Service Division)                    | HUBLI                  | Karnataka      | P RAMINATHAN (HOD)   | NO 72, ANURADHA SHANTI COLONY (SOUTH) OLD INCOME TAX OFFICE ROAD VIDYA NAGAR City : HUBLI, District : DHARWAD, State : KARNATAKA | 0836-2271262<br>SPC - 96 864 47105                                                                     | 0836- 2271013  | Mr.CS Patil<br>9663309437                                                                               | Bagalkot, Belgaum, Bidar, Bijapur, Dharwad, Gadag, Gulbarga, Haveri                                                                                                                                       | csp@powericaltd.com            |
| 41 | SOUTH | The Primemo vers                                       | Shimoga                | Karnataka      | K R RAJASEKHAR (HOD) | Plot No.42 & 43, Mandli -Kallur Ind.Estate, Shimoga-577202 (Karnataka)                                                           | 08182 - 223412, 220635<br>99801-79949 - Divya                                                          | 08182- 220615  | KR.Rajasekhar (HOD)<br>98 458 44688<br>B.V.Suresh - Ser Ex - 98 458 88355                               | Chitradurga, Dakshina Kannada, Davangere, Shimoga, Udupi, Uttara Kannada                                                                                                                                  | hod@theprimemo vers.co.in      |
| 42 | SOUTH | Srinivasa Sales & Services Pvt Limited                 | Hyderabad & Vijayawada | AP & Telengana | Mr.M. Venugopal      | # 27-33-46, Gudavallivari Street, Governorpet, Vijayawada-520002 (AP.)                                                           | (Vijaywada)<br>Single point contact<br>08666514444<br>(Hyderabad)<br>SPC - 8297563185 / 040 - 67174444 | 0866- 2575335  | M VENUGOPAL<br>8886456789 (HOD)<br>M Gokul (VP)<br>8886712345<br>Sunil Saw (Head Service)<br>8297124444 | Adilabad, East Godavari, Guntur, Hyderabad, Karimnagar, Khammam, Krishna, Mahbubnagar, Medak, Nalgonda, Nizamabad, Prakasam, Rangareddi, Srikakulam, Visakhapatnam, Vizianagaram, Warangal, West Godavari | adminvja@srinivasaservices.com |

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|----|-------|-----------------------------------------|------------|-----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 43 | SOUTH | Sunitha Sales & Service Private Limited | Cochin     | Kerala    | KARTHIK JOB / C V Ganesh | PB NO. 20, HILL PALACE ROAD, NEAR RAILWAY OVER BRIDGE, TRIPUNITHURA, KOCHI - 682 301 KERALA                                                                                                                                                         | 0484 - 2777177 / 2775760 / 2775761            | 0484-2775900   | P.N. Job (HOD) 98 954 52177<br>Karthik Job (HOD) 98 470 12808<br>C.V.Ganesh 98 470 54777<br>Pramod Kumar (Ser. Mgr) - 9388924471 | Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur, Wayanad, Lakshadweep | kochi@ssscummins.co.in           |
| 44 | SOUTH | Sunny Diesel Sales & Service            | Port Blair | A & N     | V THIAGARAJAN            | Reg. Office: 27, DasmeshMarket, Dr. Diwan Singh Gurudwara Line, Port Blair-744101. Phone No.03192-231558<br>Adm. Office: Survey No. 4/2, Prothrapur, Garacharma (Post), Port Blair-744105<br>Phone No. 03192-251119, 250395<br>Fax No. 03192-250558 | 03192 - 213430 / 251119                       | 03192 - 250558 | MR V Thiagarajan (HOD) - 94 342 81145<br>MR PANDIAN 93 320 33088                                                                 | Andaman and Nicobar                                                                                                                                                    | andamansdss@gmail.com            |
| 44 | SOUTH | The Primemo vers.                       | Shimoga    | Karnataka | K R RAJASEKHAR (HOD)     | Plot No.42 & 43, Mandli - Kallur Ind.Estate, Shimoga-577202 (Karnataka)                                                                                                                                                                             | 08182 - 223412, 220635<br>99801-79949 - Divya | 08182-220615   | KR.Rajasekhar (HOD) 98 458 44688<br>B.V.Suresh - Ser Ex - 98 458 88355                                                           | Chitradurga, Dakshina Kannada, Davangere, Shimoga, Udupi, Uttara Kannada                                                                                               | hod@theprimemo vers.co.in        |
| 45 | SOUTH | Powerica Limited (Service Division )    | Hospet     | Karnataka | P RAMNATHAN (HOD)        | Ground Floor, Krishna Inclave no. 353, Station Road, Hospet- (Karnataka).                                                                                                                                                                           | 08394 - 221601                                | 08394-221602   | Mr. Wison Fernandes 9480849510                                                                                                   | Anantpur, Bellary, Koppal, Raichur                                                                                                                                     | wilson.fernandes@powericaltd.com |

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|----|------|----------------------------------------------|-------------|--------------|-----------------|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 46 | WEST | POWERIC A LIMITED, (SERVICE DIVISION) TALOJA | Mumbai      | Maharashtra  | K. Raman        | B-8, MIDC Industrial Area, Talaja, Dist Raigad, Maharashtra - 410208                                          | 022-27405650                                                                                                      | 022 - 27412221 | K RAMAN<br>MOB-09967137017                                                                                                   | Greater Mumbai, Thane                                                                                                                                             | k.raman@poweric.altd.com                              |
| 47 | WEST | Deccan Sales & Service Private Limited       | Indore      | MP           | R S Patil       | W. A. 107 & 108, Sector "A", Scheme No. 94, RING ROAD, Near Bombay Hospital, INDORE - 452 010, MADHYA PRADESH | 0731 - 3924200, 3924201, 1,3924209<br>SPC 0731-3259101<br>spc.indore@deccandiesels.com                            | 0731-2553979   | R. S. Patil - CMD<br>98270-39095, 93762-29890<br>Praveen Yadav - CEO<br>98270-39097<br>Pawan Sharma - Ser Mgr<br>93007010102 | Alirajpur, Badwani, Burhanpur, Dewas, Dhar, Indore, Jahbua, Khandwa, Khargone, Ratlam, Shajapur, Ujjain                                                           | spc.indore@deccandiesels.com                          |
| 48 | WEST | Deccan Sales & Service Private Limited       | Vadodra     | Gujarat      | R S Patil       | 276/3, GIDC INDUSTRIAL ESTATE, MAKARPURA, VADODARA - 390010, GUJARAT                                          | 0265 - 3042555 / 4 / 3 / 2 / 6 / 8 / 9<br>SPC : 07878009009                                                       | 0265 - 3042555 | Sudhir Shejwalkar<br>Operation Head 93762-29893<br>Vikas Patil<br>Service Manager 9328606927                                 | Bharuch, Dahod, Narmada, Panch mahal, Surat, Vadodara                                                                                                             | spc.gujarat@deccandiesels.com                         |
| 49 | WEST | Madhunil Engineering Services Pvt Ltd.       | Navi Mumbai | Maharashtra  | BHARAT KULKARNI | Plot W.109-B, MIDC T.T.C Area Khairne, Thane-Belapur Road, Navi Mumbai-400709                                 | 022-27680678                                                                                                      | 022-27682047   | Bharat Kulkarni (HOD)<br>98 211 46393<br>Jeevan Gaikwad (Mgr. Service)<br>98 704 99810                                       | Raigarh                                                                                                                                                           | kulkarni@madhunil.com                                 |
| 10 | EAST | Karm Sales and Service                       | Raipur      | Chhattisgarh | KDR MISHRA      | BARKAT PLAZZA, NEAR LUKKAD PETROL PUMP, RING ROAD NO.02, HIRAPUR, RAIPUR :492010 ( C.G.)                      | 0771-4015100 / 9617772564<br>MOBILE NUMBER AFTER OFFICE HOUR : 9617772565 ( AFTER 06.00 P.M TO MORNING 8.30 A.M.) | 0771-4015151   | K.D.R. Mishra (HOD)<br>94252-37050, 9617772560<br>P K Deva - 98 935 52708 (Jabalpur)                                         | Bastar, Dantewada, Dhamtari, Durg, Kanker, Kawardha, Mahasamund, Raipur, Rajnandgaon, Balaghat, Chhindwara, Dindori, Jabalpur, Katni, Mandla, Narsimhapur, Panna, | service@karmsales.com ;<br>cidbusupport@karmsales.com |

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|----|------|-----------------------------------------|------------|-------------|------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 52 | WEST | Trident Services Private Limited        | Pune       | Maharashtra | SANJAY TANDON / V NAGESHWARAN / SAMPAT HARPALE | 1st Floor, "KAMADHENU" 106/A Senapati Bapat Road, (Opp. Chatushringi Temple), PUNE - 411 016 | 020 66266222 , 66266223<br>66266200 , 98814 98040<br>25671243 / 25671244 / 25653032 / 25653036 | 020-25671245   | Sanjay Tandon (HOD) 98 220 41149<br>V Nageshwar (HOD) 98 220 02930<br>Sampat Harpale (HOD) 98 505 50120<br>Vivek Ballal (GM SER) 98 505 50140<br>Avinash Kulkarni (Service Manager) 98 50550121 | Kolhapur, Pune, Ratnagiri, Sangli, Satara, Sindhudurg                                                                                                | tridents@eth.net             |
| 53 | WEST | Trinity Mahalasa Durga Sales & Services | Panjim     | GOA         | D V Talekar / Suresh Rau / Partha Talekar      | Pandit Niwas , Near PWD office,Baina,Vasco Da Gama, Goa 403802                               | 0832-6650137<br>0832-6720300<br>SPC - 96 577 22684                                             | 0832 2514072   | DV Talekar (HOD) 96 577 22661<br>Partha Talekar (HOD) 96 577 22666<br>Prashant Kamat (Ser Mgr) - 96 577 22667                                                                                   | GOA                                                                                                                                                  | mahalasadurga@eth.net        |
| 54 | WEST | Trinity Mahalasa Durga Sales & Services | Aurangabad | Maharashtra | Suresh Rau                                     | C 220, MIDC INDUSTRIAL AREA PANDHARPUR VILLAGE : WALUJ AURANGABAD 431 136 MAHARASHTRA        | 0240 6624472 / 6624473                                                                         | 0240 - 6624623 | S S RAU (HOD) 96 577 22577 , 94 229 44647<br>Indrajit Rau (HOD) 96 577 22555<br>Prakash Zodge (Serv. Mgr) - 96 577 22553                                                                        | Ahmednagar, Akola, Aurangabad, Bid, Buldhana, Dhule, Hingoli, Jalgaon, Jalna, Latur, Nanded, Nandurbar, Nashik, Osmanabad, Parbhani, Solapur, Washim | info.agd@trinitymahalasa.com |

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|----|-------|----------------------------------------|-----------|-------------|------------------------------|------------------------------------------------------------------------------------|---------------------------------------|--------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 55 | WEST  | Deccan Sales & Service Private Limited | Vapi      | Gujarat     | R S Patil                    | PLOT NO. 2908/1, BEHIND TELEPHONE EXCHANGE, GIDC CHAR RASTA VAPI - 396195, GUJARAT | 0260-6545598, 99<br>SPC : 07878009009 | 0260-2430986 | Abhish Dharmadhikari<br>Branch Head<br>9510582555<br>Gopal Patil<br>Service Manager<br>9327406902 | Bharuch, Dahod, Narmada, Panch mahal, Surat (including the area of Hazira, Sompapur, Dumas, Magdala), Navsari Vadodara, The Dangs & Valsad (Including Vapi), in the state of Gujarat, Union Territory of Daman & Diu, Dadra & Nagar Haveli. | spc.gujarat@deccandiesels.com |
| 56 | NORTH | Jakson Enterprises                     | Kanpur    | Uttaranchal | Rajiv Hooda/ Pradyumn Pathak | Magarwara, Dist Unnao, Uttar Pradesh - 209862                                      | 0515-2833666<br>SPC- 9919222207       |              | Rakesh Srivastava- (Branch Manager)<br>9919222208                                                 | Kapur, Fatehpur, Allahabad, Varanasi, Kannauj                                                                                                                                                                                               | rakesh.srivastava@jakson.com  |
| 57 | NORTH | Jakson Enterprises                     | Varanasi  | Uttaranchal | Rajiv Hooda/ Pradyumn Pathak | M- S2 /644<br>Varuna Vihar Colony, Sikraul, Varanasi, Uttar Pradesh 221 002        | SPC- 9919222207                       |              | Pappu-7720028489                                                                                  | Kapur, Fatehpur, Allahabad, Varanasi, Kannauj                                                                                                                                                                                               | pappu.kumar@jakson.com        |
| 58 | NORTH | Jakson Enterprises                     | Allahabad | Uttaranchal | Rajiv Hooda/ Pradyumn Pathak | Varuna Vihar Colony, Sikraul                                                       | SPC- 9919222207                       |              | Subhajeet Basak- 9792971504                                                                       | Kapur, Fatehpur, Allahabad, Varanasi, Kannauj                                                                                                                                                                                               | subhajeet.basak@jakson.com    |
| 59 | NORTH | Sudhir Sales & Services Limited        | Bhopal    | MP          | Naveen Shehra                | Varanasi,                                                                          | 0755-4226667                          | 0755-4226663 | Ravindra Nimbalwar- 9827706235                                                                    | Betul, Bhind, Bhopal, Chhatarpur, Damoh, Datia, Guna, Gwalior, Harda, Hoshangabad, Morena, Raisen, Rajgarh, Sagar, Sehore, Shajapur, Sheopur, Shivpuri, Tikamgarh, Vidisha                                                                  | spcbhopal@sudhirgroup.com     |

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|----|-------|--------------------------------|-----------|---------|-----------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 60 | NORTH | Svam Power Plants Pvt. Ltd.    | New Delhi | Delhi   | Sudhir Malhotra | Uttar Pradesh                                                           | Delhi<br>Tel: 011-49481333 (30 Lines)<br>N/A<br>Okhla<br>Tel: 011-49481222 (30 Lines)                                                      | Mr. Sudhir Malhotra, (HOD)<br>Mobile no. +91 9810017488 | Delhi state                                                                 | svam.un@svampower.com<br>parts.udyognagar@svampower.com<br>service.udyognagar@svampower.com<br>svam.okh@svampower.com<br>parts.okhla@svampower.com<br>svam.noida@svampower.com<br>parts.noida@svampower.com<br>service.noida@svampower.com |
| 61 | NORTH | Svam Power Plants Pvt. Ltd.    | Noida     | UP      | Sudhir Malhotra | PIN-221002                                                              | Noida<br>Tel: 0120-4792444 (30 lines)<br>N/A                                                                                               | Mr. Sudhir Malhotra, (HOD)<br>Mobile no. +91 9810017488 | Bulandshahr, Gautam Budh Nagar, Ghaziabad                                   | svam.noida@svampower.com<br>parts.noida@svampower.com<br>service.noida@svampower.com                                                                                                                                                       |
| 62 | NORTH | Svam Power Plants Private Ltd. | Faridabad | Haryana | Sudhir Malhotra | A-3/2, Nehru Ground, Neelam Bata Road, N.I.T Faridabad-121001 (Haryana) | 0124-4139000 (Gurgaon)<br>Ashok Nijhara, VP 98 100 22321, 7042198369<br>Subhas Verma (GM Services, Faridabad)<br>9810175250<br>Anil Gupta, | Sudhir Malhotra, MD 98 100 17488                        | Bhiwani, Faridabad, Gurgaon, Jhajjar, Mahendragarh, Rewari, Rohtak, Sonapat | svam.fbd@svampower.com                                                                                                                                                                                                                     |

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