भारतीय रेल

INDIAN RAILWAYS

पटियाला रेलइंजन कारख़ाना, पटियाला

PATIALA LOCOMOTIVE WORKS, PATIALA



HISTORY & TESTING RECORD OF 8W-DIESEL ELECTRIC TOWER CAR

DETC NO.	: M-277(230042)
TYPE	: 8 WHEELS
RAILWAY/DIVISION	: NCR/PRYJ
ELECTRIC TRACTION	: BHEL
DATE OF DISPATCH	: 29.08.2023

निर्माण रिकार्ड

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DETC NO. M-277-230042
RAILWAY/SHED: NCR/PRYJ
DOD: Aug 2023

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

PROJECT	Diesel Electric Tower Car with Under-Slung Propulsion
CUSTOMER	SSE/TRD/SBDR,PRYJ DIVISION, NCR
DETC DMW NO.	M-277 (230042)
. **DETC RLY/SHED**	NCR/SBDR, PRYJ
Date of Dispatch	29.08.2023
Propulsion system	BHEL

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

1.0 DETC Installed & Tested Equipments:

Equipment	Make	Serial No.
Diesel Engine -1	Cummins India Ltd	25473763
Diesel Engine -2	Cummins India Ltd	25476988
Traction Alternator-1	BHEL	315230075
Traction Alternator-2	BHEL	315230076
Power Rectifier- 1	BHEL	526070123
Power Rectifier-2	BHEL	526070116
Traction Motor-1	BHEL	408230147
Traction Motor-2	BHEL	408240011
Traction Motor-3	BHEL	408230145
Traction Motor-4	BHEL	408230148
Auxiliary Alternator-1	BHEL	2212711171
Auxiliary Alternator -2	BHEL	2212711164
Rectifier Regulator Unit- 1	BHEL	221271C1172
Rectifier Regulator Unit -2	BHEL	221271C1173
Control Cubicle-1	BHEL	220CAB1029
Control Cubicle-2	BHEL	220CAB2026
Driver Desk-1	BHEL	22000DD045
Driver Desk-2	BHEL	22000DD048
Master Controlleer-1	BHEL	9-MC-MU-D18-DT1
Master Controlleer-2	BHEL	9-MC-MU-D18-DT1
Driver Control Switch-1	BHEL	5452
Driver Control Switch-2	BHEL	5447
MSGC Panel	BHEL	2200MSG026
Resistor Panel	BHEL	526070101/102

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

2.0 SEQUENTIAL TEST

Purpose

Sequence test of control circuits.

Measuring and Testing Equipment, Auxiliary Equipment

- Digital Multimeter
- Continuity tester
- Wago connector
- DCS key
- Master Controller Unlock key
- DC Ammeter
- Insulation Tester
- All Electrical Circuit Schematics

Test Status

Individual test performance is recorded against each test performed.

Test Implementation

The fully completed routine test record is the only valid document to demonstrate that the routine test has been successfully completed. The Performed ok column in this routine test instruction merely serves the purpose of engaging the tester to verify the test progress.

All test steps in a chapter must have been successfully performed. If a test has been unsuccessful, the cause or causes must be established and remedied so that the test item can subsequently be tested with possible result. Before testing sequence test, all continuity test points are to be cleared.

Procedural Notes:

1. Disconnect all electronic system prior to Megger, Hi pot test and during welding.
3. Use DIGITAL multimeter only to check continuity and to read test point voltages.
4. Ensure that test lead does not touch body or ground during measurement of low voltage sources.

2.1 Visual Inspection

2.1.1 Rotating Equipment

Operation	Performed
• Inspect the rotating equipment for the following (Tr. Alternator, Tr. Motor, Aux alternator)	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

• No unwanted materials should be lying inside the machines.	OK
• No loose wires/ terminals should be available near the machines.	OK
• Ensure that the mounting bolts have been properly torque checked and marked.	OK
• Ensure that High Voltage electrical terminals are not exposed.	OK
• Check availability of warning boards	OK

2.1.2 Control Equipment and Wiring

Operation	Performed
• There should not be any loose hanging wires near the equipment / terminal boards.	OK
• Ensure all components are loaded and connections are intact.	OK
• Ensure all connectors are coupled tightly.	OK

2.1.3 Checking of TM chain cleat arrangement between TM Junction box to TM

SN	Equipment	Available
1.	Traction motor1	**OK**
2.	Traction motor2	**OK**
3.	Traction motor3	**OK**
4.	Traction motor4	**OK**

2.1.4 Inspection of Air ducts & Bellows before lowering DETC on bogies

Operation	Performed
• Traction Motor ducts are free from dirt and any foreign particle	OK
• No welding pore holes found in the TM bellows	OK
• Traction Motor bellows are free from damages	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

2.1.5 Inspection of Availability and Integration of Fuses

SN	Location	Fuse rating	Available
1	EQ.PANEL, 308-341	63A	**OK**
2	CC1, 341 – 311	32 A	**OK**
3	EQ Panel, 307 – 308	63 A	**OK**
4	CC1, 300 – 320	63 A	**OK**
5	Power Rectifier 1, F1-F9	550 A	**OK**
6	Power Rectifier 2, F1-F9	550 A	**OK**

3.0 Continuity Test

NOTE: CP and Driver desk are pre wired and continuity is already checked. Only external wiring and sensors cables continuity needs to be checked.

3.1 Grounding Cables Check

S.No.	EQUIPMENT	QUANTITY	AVAILABLITY	TIGHTNESS
1.	Tr. Alternator 1	2	OK	OK
2.	Tr. Alternator 2	2	OK	OK
3.	Power Rectifier 1	2	OK	OK
4.	Power Rectifier 2	2	OK	OK
5.	Traction Motor 1	1	OK	OK
7.	Traction Motor 2	1	OK	OK
8.	Traction Motor 3	1	OK	OK
9.	Traction Motor 4	1	OK	OK
10.	Control Cubicle 1	2	OK	OK
11.	Driver Desk 1	2	OK	OK
12.	Control Cubicle 2	2	OK	OK
13.	Driver Desk 2	2	OK	OK
14.	MSGC	2	OK	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

4.0 IR & HV Test for Power Circuit

4.1 Control Circuit

Operation	Performed
• Disconnect battery cables at the battery terminals of Control battery	OK
• Close the battery switch BIS110	OK
• Keep battery Switch (BCS 24) in open condition	OK
• Switch ON all switches and circuit breakers on the CP&DD	OK
• Open ground cut out switches GRCO-1 & 2	OK
• Insert DCS key and turn ON	OK
• Insert MC key and turn ON	OK
• Move ECS Switch to "RUN" position	OK
• Move Reverser handle to Forward or Reverse position	OK
• Move the Master Handle (MH) to 6th notch position on DD	OK
• Remove ECM 1 and ECM 2 connections	OK
• Disconnect LED panel from the circuit	OK
• Remove connector for Power rectifier 1 and 2	OK

4.2 Power Circuit

Operation	Performed
Rectifier	
• Disconnect positive (+ve) and negative (-ve) cables at the rectifier.	OK
• Short rectifier positive (+ve) and negative (-ve) terminals.	OK
• Short all the cables which are disconnected from rectifier.	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

The insulation resistance test is carried out with 1000 V Megger. Measure insulation resistance between shorted power cables at rectifier and body.

4.3 Procedure

4.3.1 Control circuit

The insulation resistance test is carried out with 500V Megger. Measure insulation resistance between wire terminals 300/100 and body

4.3.2 Power circuit - Rectifier

The insulation resistance test is carried out with 1000V Megger. Measure insulation resistance between shorted power cables at rectifier and body.

4.3.3 Observation

Test Condition	Acceptance Criteria	Observed
Power Circuit IR	> 5M Ohm	3000 MΩ
Control Circuit (DC 110V and 24V)	> 1M Ohm	03 MΩ

5.0 High Voltage test

5.1 Procedure

5.1.1 Control Circuit

High Voltage test is carried out at 2.5 KV AC voltages. The test voltage is applied between wire terminals 300/100 and body and should withstand for 01 minute.

5.1.2 Power Circuit

High Voltage test is carried out at 2.5 KV AC voltages. The test voltage is applied between shorted power cables at rectifier and body and should with stand for 01 minute.

5.1.3 Obervation

HV tester should not trip within 60 seconds in each of the above tests

Parameter	Control circuit		Power Circuit	
	Acceptance Criteria	Observed	Acceptance Criteria	Observed
Voltage Applied	1300 V AC	OK	2500 V AC	OK
Leakage Current	100mA	OK	100 mA	OK
Time Applied	60 Second	OK	60 Second	OK

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DETC no.M-277 (230042)

5.1.4 Post Test Operations

Operation	Performed
• Remove all shorting wires on the terminals	OK
• Restore all power cable connections	OK
• Connect the all removed connectors	OK

5.1.5 Batteries (110V & 24V)

Operation	Performed
• Ensure that interconnecting cables between each battery is connected and are tight.	OK
• Check the polarity of each battery and ensure that all are connected in series.	OK
• Connect the battery cable 308 at battery positive and 300 at battery negative terminal for 110V Battery.	OK
• Connect the battery cable 201 at battery positive and 200 at battery negative terminal for 24V Battery.	OK
• Measure the voltage of the battery at equipment panel or at battery charging socket using digital Multimeter. The voltage should be more than 100V across 308 and 300 terminals.	110 **V DC**
• Measure the voltage of the battery at equipment panel or at Knife Switch using digital Multimeter. The voltage should be more than 24V across 201 and 200/210 terminals.	24 **V DC**

Wait for one or two minutes after switching ON each Circuit breaker and observe for any overheating symptoms like smell, smoke, temperature etc. from the wire bunches. If any such symptoms are noticed there might be short circuit in wire bunch, check continuity in suspected area. Switch ON the following Circuit Breakers and ensure the circuit functionality is correct.

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DETC no.M-277 (230042)

6.0 SEQUENCE TEST (Auxiliary Circuit)

Sr.no	Operation	Effect	Location	Performed in Cab-1
1	Turn 110 V BCS in 3 o'clock position and measure voltage between Cable No. 311 and 300	≈ 110 V	311 as positive.	OK
2	Turn ON EL+ MCB and check voltage between wire EL+ with respect to EL-.	≈ 110 V	EL- as negative	OK
3	Turn ON CFD MCB and CFDS toggle switch	≈ 110 V	Cab Fan Driver side should operate	OK
4	Turn ON LLD MCB and LLDS toggle switch	≈ 110 V	Cab Light Driver side should operate	OK
5	Turn ON SPLD/SPLG MCB followed by Turn On SPLDS & SPLGS toggle switch	≈ 110 V	Spot light Driver side should operate. Spot light Guard side should operate	OK
6	**Turn ON Aux MCB** and HLS,SM,V MCB and switch on 110 Voltmeter toggle switch	≈ 110 V	The voltmeter should read 110V approx.	OK
			Speedometer should turn ON.	OK
			110V Supply should be available at HLS on Control Cubicle and Driver Desk.	OK
			Horn Push Buttons on Driver side and Guard Side should operate.	OK
			Foot operated horn Switch should work.	OK
6.1	**Turn ON Aux MCB** and Tail light/Flasher Light MCB and switch on Tail light Toggle switch on Driver Desk.	≈ 110 V	Tail light should operate	OK
	Turn ON Flasher Light Toggle Switch on Driver Desk.		Flasher Light should operate at both converters.	OK

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DETC no.M-277 (230042)

6.2	**Turn ON Aux MCB** and Marker light MCB and Marker light toggle switch on Driver Desk.	≈ 110 V	Marker light should operate	OK
6.3	**Turn ON Aux MCB** and Head Light MCB and Toggle switch in Driver Desk	≈ 110 V	Head Light Should ON/OFF in Converter-**1** and **Dim/Bright**	OK
		≈ 110 V	Head Light Should ON/OFF in Converter-**2** and **Dim/Bright**	OK
6.3.1	**Turn ON Aux MCB** and Head Light MCB and Toggle switch in Driver Desk and Turn OFF Tail Light Toggle switch in Rear Cab.	≈ 110 V	Tail Light Should ON/OFF in Rear Side (Converter-**1).**	OK
		≈ 110 V	Tail Light Should ON/OFF in Rear side (Converter-**2).**	OK
6.4	**Turn ON Aux MCB** and HT Sensor MCB	≈ 110 V	Green LED should glow in HT Sensor Display unit.	OK

6.1 SEQUENCE TEST (Control Circuit 110V & 24V)

S.No.	Operation	Condition	Performed in Cab- I
1	Ensure 110V Supply across Cable No. 1600 & 320.	SUPPLY(+) FROM BATTERY+BCS(4 POLE) ON+SYSTEM CONTROL MCB-ON & SUPPLY (-) FROM BATTERY THROUGH 63A FUSE	OK
2	Supply to MASTER CONTROLLER(MC)	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON (Ensure the +ve 110V supply at 1602).	OK
3	EMY RELAY (EMR) ON	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON+EMY TRACTION CUT-OFF PB ON	OK
4	DMR RELAY ON	OPERATION1+DMMV MCB ON (Ensure 110V +ve available at Cable Nos. 1732 and 1734).	OK
5	DEAD MAN VALVE-ACTIVE	OPERATION 1+DMMV MCB ON+EMY RELAY ON+DEAD MAN RELAY ON+Operate F/R Switch on MC+Operate Master Handle on MC.	OK
6	GOV1 EXC RELAY (ER1) ON	OPERATION1+EXC MCB ON+DCS ON+TSS(TEST)+EXC ON/OFF SWITCH ON+ECS (RUN)+GOV1 CONTROL MCB ON+EMR ON+R11 RELAY ON+S11 ON	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

S.No.	Operation	Condition	Performed In Cab- I
7	GOV2 EXC RELAY (ER2) ON	OPERATION1+EXC MCB ON+DCS ON+TSS(TEST)+EXC ON/OFF SWITCH ON+ECS (RUN)+GOV2 CONTROL MCB ON+EMR ON+R12 RELAY ON+S12 ON	OK
8	EXC CONTROL RELAY-1 (ECR-1) ON	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON+Operate F/R in MC+MC(Notch-1 to 8) +ALT EXC MCB ON +GFR INOPERATIVE+ER1 ON+SR1 OFF+{LC1(CLOSE)/LC3(CLOSE)}	OK
9	EXC CONTROL RELAY-2 (ECR-2) ON	OPERATION1+CONTROL MCB ON+CONTROL ON/OFF SWITCH ON+Operate F/R in MC+MC(Notch-1 to 8) +ALT EXC MCB ON +GFR INOPERATIVE+ER2 ON+SR2 OFF+{LC1(CLOSE)/LC3(CLOSE)}	OK
10	RCFR1 RELAY ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+RCFR-1 Toggle Switch {SS-4 SWITCH ON}	OK
11	SAFETY RELAY1 ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+ {LPR RELAY ON/ RCFR1 RELAY ON/R11 RELAY ON/ RL21 RELAY ON}	OK
12	RCFR2 RELAY ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+{SS-5 SWITCH ON}	OK
13	SAFETY RELAY 2 ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+ {LPR RELAY ON/ RCFR2 RELAY ON/R12 RELAY ON/ RL22 RELAY ON}	OK
14	PARKING BRAKE APPLICATION MAGNET VALVE ACTIVE	OPERATION1+PARKING BRAKE MCB ON+DCS ON+PRESS PARKING BRAKE APPLICATION BUTTON ON	OK
15	PARKING BRAKE RELEASE MAGNET VALVE ACTIVE	OPERATION1+PARKING BRAKE MCB ON+DCS ON+PRESS PARKING BRAKE RELEASE PUSH BUTTON	OK
16	COMPRESSOR -1/2 UNLOADER VALVE ACTIVE	OPERATION1+COMPRESSOR UNLOADER MCB ON+COMPRESSOR GOVERNOR ACTIVE	OK
17	AIR DRIER ACTIVE	OPERATION1+COMPRESSOR UNLOADER MCB ON+ COMPRESSOR GOVERNOR INACTIVE	OK
18	CUT OUT RELAY (COR1 &2) ON	OPERATION1+OPERATION2+MC (NOTCH 4 & 8)+MCS1/MCS2 OPERATE	OK

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DETC no.M-277 (230042)

S.No.	Operation	Condition	Performed In Cab- I
19	PANTO MAGNET VALVE ACTIVE	OPERATION-1+CONTROL MCB ON+DCS ON+ +PANTO UP DOWN PRESSURE SWITCH ON+PANTO UP INDICATION	OK
20	SUPPLY TO CAMERA UNIT	OPERATION1+CCTV MCB ON	OK
21	SUPPLY TO TELEPHONE EXHANGE SYSTEM	OPERATION1+TELEPHONE EXCHANGE MCB ON+AUX MCB ON	OK
22	CFG ON	OPERATION1+[F+] MCB ON+CFG MCB ON+CFG SWITCH ON	OK
23	LLG ON	OPERATION1+[L+] MCB ON+LLG/CL MCB ON+LLGS SWITCH ON	OK
24	CLS ON	OPERATION1+LLG/CL MCB ON+CL SWITCH ON	OK
25	BM1 MOTOR ON	Ensure Supply at Cable No. 305 & 300+BM1 MCB ON	OK
26	BM2 MOTOR ON	Ensure Supply at Cable No. 306 & 300+BM2 MCB ON	OK
27	AAFR1 RELAY ON	Ensure Supply at Cable No. 301 and 300.	OK
28	AAFR2 RELAY ON	Ensure Supply at Cable No. 301 and 300.	OK
29	BATTERY CHARGING(120 AH)	OPERATION1	OK
30	SUPPLY TO HEATER UNIT	OPERATION1+HEATER MCB ON	OK
31	AEFR RELAY ON	OPERATION1+FAULT INDICATION MCB ON+DCS ON+AEFR-AUX (OFF)+AEFRCO CLOSE	OK
32	AEFR-AUX RELAY ON	OPERATION1+ DCS ON+ FAULT INDICATION MCB ON+AEFR RELAY ON	OK
33	SUPPLY TO CHARGING SOCKET	OPERATION1+CHARGING SOCKET MCB ON	OK
34	SUPPLY TO CHARGING SOCKET (DESK)	OPERATION1+CHARGING SOCKET MCB ON	OK
35	SUPPLY TO 24V SYSTEM	SUPPLY TO BATTERY CHARGER+BIS (CLOSE)+ENG1 PROTECTION MCB ON+ENG2 PROTECTION MCB ON+Ensure 24V across Cable No. 201 & 210.	OK
36	FOG LIGHT ON	OPERATION 35+24V –VE AUX MCB ON+FGL MCB ON+TURN ON FOG LIGHT TOGGLE SWITCH	OK

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DETC no.M-277 (230042)

37	SEARCH LIGHT ON	OPERATION 35+24V –VE AUX MCB ON+SL MCB ON+TURN ON SEARCH LIGHT TOGGLE SWITCH	OK
38	BATTERY CHARGING AMMETER 1 READING	SUPPLY TO BATTERY CHARGER+BIS (CLOSE)	OK
39	BATTERY CHARGING AMMETER 2 READING	SUPPLY TO BATTERY CHARGER+BIS (CLOSE)	OK
40	SUPPLY TO SPU1	OPERATION 35+R81 RELAY ON+R91 RELAY ON+S11 RELAY ON+TR11 TIMER (OFF)+ENG 1 SPU MCB ON	OK
41	SUPPLY TO SPU2	OPERATION 35+R82 RELAY ON+R92 RELAY ON+S12 RELAY ON+TR12 TIMER (OFF)+ENG 2 SPU MCB ON	OK
42	LOCAL RESET RELAY1 (LRR1) ON	OPERATION 35+LOCAL REMOTE SWITCH1(L)+LOCAL ENG-1 OFF PB(OFF)+PRESS LOCAL RESET PB ENG1(US)	OK
43	LOCAL RESET RELAY2 (LRR2)ON	OPERATION 35+LOCAL REMOTE SWITCH2(L)+LOCAL ENG-2 OFF PB(OFF)+PRESS LOCAL RESET PB ENG2(US)	OK
44	LOCAL ON/OFF RELAY 1 (R81) ON	OPERATION 35+ FC21 RELAY (OFF)+LOCAL REMOTE SWITCH1 (L)+LOCAL ENG-1 OFF PB(OFF)+PRESS LOCAL ENG-1 ON PB(US)	OK
45	LOCAL ON/OFF RELAY 2 (R82) ON	OPERATION 35+ FC22 RELAY (OFF)+LOCAL REMOTE SWITCH2 (L)+LOCAL ENG-2 OFF PB(OFF)+PRESS LOCAL ENG-2 ON PB(US)	OK
46	REMOTE ON/OFF RELAY1 (R91) ON	OPERATION 35+LOCAL REMOTE SWITCH1 (R)+OPERATE DCS ENG-1 ON SWITCH+S11 RELAY ON	OK
47	REMOTE ON/OFF RELAY2 (R92) ON	OPERATION 35+LOCAL REMOTE SWITCH2 (R)+OPERATE DCS ENG-2 ON SWITCH+S12 RELAY ON	OK
48	TR11 TIMER (ON)+TR21 TIMER (ON)+HM1(ACTIVE)	OPERATION 35+R81 RELAY (ON)/R91 RELAY (ON)	OK
49	TR12 TIMER (ON)+TR22 TIMER (ON) +HM2(ACTIVE)	OPERATION 35+R82 RELAY (ON)/R92 RELAY (ON)	OK
50	R31 RELAY (HCWT-1 IND) ON	OPERATION 35+ENG1 SAFETY MCB1 ON+TS11(91°C) CONTACT (CLOSE)	OK
51	R32 RELAY (HCWT-2 IND) ON	OPERATION 35+ENG2 SAFETY MCB1 ON+TS12(91°C) CONTACT (CLOSE)	OK
52	R11 RELAY (HCWT-1) ON	OPERATION 35+ENG 1 SAFETY MCB1 (ON)+ TS11(96°C) CONTACT (CLOSE)+{RR1 RELAY(ON)/LRR1 RELAY(ON)}	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

S.No.	Operation	Condition	Performed In Cab- I
53	R12 RELAY (HCWT-2) ON	OPERATION 35+ENG 2 SAFETY MCB1 (ON)+ TS11(96°C) CONTACT (CLOSE)+{RR2 RELAY(ON)/LRR2 RELAY(ON)}	OK
54	R41 RELAY (LLOP-1) ON	OPERATION 35+ENG 1 SAFETY MCB1 (ON)+{RR1 RELAY(ON)/LRR1 RELAY(ON)/PS11 CONTACT(CLOSE)}	OK
55	R42 RELAY (LLOP-2) ON	OPERATION 35+ENG 2 SAFETY MCB1 (ON)+{RR2 RELAY(ON)/LRR2 RELAY(ON)/PS12 CONTACT(CLOSE)}	OK
56	R51 RELAY (OS-1) ON	OPERATION 35+ENG1 SAFETY MCB1(ON){RR1 RELAY(ON)/LRR1 RELAY (ON)+LM CONNECTOR TO BE CONNECTED IN LCC B1	OK
57	R52 RELAY (OS-2) ON	OPERATION 35+ENG2 SAFETY MCB1(ON){RR2 RELAY(ON)/LRR2 RELAY (ON)+ LM CONNECTOR TO BE CONNECTED IN LCC B1	OK
58	R71 RELAY (HOF-1) ON	OPERATION 35+ENG 1 SAFETY MCB1(ON)+{RR1 RELAY (ON)/LRR1 RELAY(ON)+LIMIT SWITCH AT HYDRAULIC TANK(DE-ENGAGED)	OK
59	R72 RELAY (HOF-2) ON	OPERATION 35+ENG 2 SAFETY MCB1(ON)+{RR2 RELAY (ON)/LRR2 RELAY(ON)+ LIMIT SWITCH AT HYDRAULIC TANK(DE-ENGAGED)	OK
60	FC21 RELAY (ENG-1 TRIP) ON	OPERATION 35+ENG 1 SAFETY MCB1(ON)+{R21 RELAY(OFF)/R41 RELAY(OFF)/R51 RELAY(OFF)/R61 RELAY(OFF)/R71 RELAY (OFF)}	OK
61	FC22 RELAY (ENG-2 TRIP) ON	OPERATION 53+ENG 2 SAFETY MCB1(ON)+{R22 RELAY(OFF)/R42 RELAY(OFF)/R52 RELAY(OFF)/R62 RELAY(OFF)/R72 RELAY (OFF)}	OK
62	R21 RELAY (LHOL) ON	OPERATION 53+ENG 1 SAFETY MCB2(ON){RR1 RELAY (ON)/LRR1 RELAY(ON)}	OK
63	R22 RELAY (LHOL) ON	OPERATION 53+ENG 2 SAFETY MCB2(ON){RR2 RELAY (ON)/LRR2 RELAY(ON)}	OK
64	R61 RELAY (LCWL-1) ON	OPERATION 53+ENG 1 SAFETY MCB2(ON){RR1 RELAY (ON)/LRR1 RELAY(ON)}	OK
65	R62 RELAY (LCWL-2) ON	OPERATION 53+ENG 2 SAFETY MCB2(ON){RR2 RELAY (ON)/LRR2 RELAY(ON)}	OK
66	S11 RELAY (ENG-1 ON) ON	OPERATION 1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG1 ON SWITCH(ON)+ FC21 RELAY(OFF)	OK

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DETC no.M-277 (230042)

S.No.	Operation	Condition	Performed In Cab- I
67	S12 RELAY (ENG-2 ON) ON	OPERATION 1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG2 ON SWITCH(ON)+ FC22 RELAY(OFF)	OK
68	RR1+ RR2 RELAYS (REMOTE READY TO START) ON	OPERATION1+CONTROL MCB(ON)+READY TO START MCB(ON)+Ensure +ve 110V supply at Cable No. 1661+ OPERATE READY TO START SWITCH IN DCS	OK
69	S13 RELAY (ENG-1 OFF) ON	OPERATION1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG-1 OFF SWITCH IN DCS	OK
70	S14 RELAY (ENG-2 OFF) ON	OPERATION1+ENGINE CONTROL SUPPLY MCB(ON)+DCS ON+ECS(IDLE)+OPERATE ENG-2 OFF SWITCH IN DCS	OK
71	TRACTION CONTROL SUPPLY ON LED(ON)	OPERATION1+CONTROL MCB ON +LAMP TEST MCB ON+LAMP TEST SWITCH ON+CONTROL ON/ OFF SWITCH ON	OK
72	ENGINE 1 ON LED(ON)	OPERATION1+FAULT NDICATION MCB ON+ LAMP TEST MCB ON+LAMP TEST SWITCH ON+ DCS ON+S11 RELAY ON	OK
73	ENGINE 2 ON LED(ON)	OPERATION1+FAULT NDICATION MCB ON+ LAMP TEST MCB ON+LAMP TEST SWITCH ON+ DCS ON+S12 RELAY ON	OK
74	ENGINE 1 TRIP LED(ON)	OPERATION1+FAULT NDICATION MCB ON+LAMP TEST MCB ON+DCS ON+FC21 RELAY ON	OK
75	ENGINE 2 TRIP LED(ON)	OPERATION1+FAULT NDICATION MCB ON+LAMP TEST MCB ON+DCS ON+FC22 RELAY ON	OK
76	MOTOR EARTH FAULT LED(ON)	OPERATION1+FAULT NDICATION MCB ON+LAMP TEST MCB ON +DCS ON+GR RELAY ON	OK

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DETC no.M-277 (230042)

S.No.	Operation	Condition	Performed In Cab- I
77	PARKING BRAKE APPLICATION LED	OPERATION1+FAULT NDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+OPERATE PBG APPL SWITCH	OK
78	ALTERNATOR1 EXCTATION ON LED(ON)	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+ECR1 RELAY ON	OK
79	ALTERNATOR2 EXCTATION ON LED(ON)	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+ECR2 RELAY ON	OK
80	HCWT ENG1 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+R31 RELAY OFF	OK
81	HCWT ENG2 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+R32 RELAY OFF	OK
82	AUX ALT 1 FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+AAFR1 RELAY OFF	OK
83	AUX ALT 2 FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+AAFR2 RELAY OFF	OK
84	RECT1 FUSE FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+RL11 RELAY ON(In Rect-1)	OK
85	RECT2 FUSE FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+RL12 RELAY ON(In Rect-2)	OK

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DETC no.M-277 (230042)

S.No.	Operation	Condition	Performed In Cab- I
86	RECT1 COOL FAN FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+RCFR1 RELAY OFF	OK
87	RECT2 COOL FAN FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+RCFR2 RELAY OFF	OK
88	GOV-1 SUPPLY FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+ER1 RELAY OFF	OK
89	GOV-2 SUPPLY FAILURE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+ER2 RELAY OFF	OK
90	TRACTION MOTOR OVERLOAD LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+{MOLR1/MOLR2/MOLR3/MOLR4} RELAY ON	OK
91	PANTO UP LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+PANTO GOVERNOR CONTACT(CLOSE)RELAY ON	OK
92	DEAD MAN BRAKE APPL LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+DMR RELAY OFF	OK
93	AUX EARTH FAULT LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+AEFR ON+AEFR(AUX) RELAY ON	OK
94	LOW LUBE OIL PRESSURE ENG1 LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+R41 RELAY OFF	OK
95	LOW LUBE OIL PRESSURE ENG2 LED ON	OPERATION1+FAULT INDICATION MCB ON+ LAMP TEST MCB ON+DCS ON+R42 RELAY OFF	OK

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DETC no.M-277 (230042)

96	ENGINE1 IDLE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+ECR1 RELAY OFF+S11 RELAY (ON)	OK
97	ENGINE2 IDLE LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON +DCS ON+ECR2 RELAY OFF+S12 RELAY (ON)	OK
98	EMY TRACTION CUT OFF LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+EMR RELAY ON	OK
99	LUBE OIL TEMP TOO HIGH ENG1 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+LUBE OIL TEMP SW ENG1(OPEN)	OK
100	LUBE OIL TEMP TOO HIGH ENG2 LED ON	OPERATION1+FAULT INDICATION MCB ON+LAMP TEST MCB ON+DCS ON+LUBE OIL TEMP SW ENG2(OPEN)	OK
101	REV1 FOR(ON)	TO GIVE EXTERNAL AIR PRESSURE (5-7 kg/SqCm) TO EQUIPMENT GOVERNOR+OPERATION1+OPERATION2+ECS-RUN(CLOSE)+MASTER CONTROLLER(19-20)	OK
102	REV1 REV(ON)	TO GIVE EXTERNAL AIR PRESSURE TO EQUIPMENT GOVERNOR+OPERATION1+OPERATION2+{ECS-RUN(CLOSE)/TSS(ON)}+MASTER CONTROLLER(23-24)	OK
103	LC1+LC3 (ON)	TO GIVE EXTERNAL AIR PRESSURE TO EQUIPMENT GOVERNOR+{OPERATION 99/OPERATION 100}+SS1 ON+SS2 ON+SS3 ON+GROUND RELAY(OFF)+SAFETY RELAY1(OFF)+MOLR1(OFF)+ MOLR3(OFF)+MCS1(OFF)	OK
104	LC2+LC4 (ON)	TO GIVE EXTERNAL AIR PRESSURE TO EQUIPMENT GOVERNOR+{OPERATION 99/OPERATION 100}+SS1 ON+SS2 ON+SS3 ON+GROUND RELAY(OFF)+SAFETY RELAY2(OFF)+MOLR2(OFF)+ MOLR4(OFF)+MCS2(OFF)	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

7.0 Engine Cranking Prerequisites

Operation	Effect/Observation	Location	Performed In ENG-1
• Switch on BCS 110 V to power up the 110V control circuit		CC1	OK
• Switch on 24V Knife Switch to power up the 24V control Circuit		CC1	OK
• Switch all the Control and Aux MCBs (24V & 110V)	• Availability of power supply at the input terminals of LCCs.	CC1	OK
• Turn ON DCS key	• LED Panel will power up and display the default indications	DD	OK
• Keep ECS in IDLE Position		DD	OK
Ensure following:			
• Excitation Control Switch is off.		DD	OK
• Check 24 V battery status.	• 24 V voltmeter should show 24 V approx.	CC1	OK
• Check 110 V battery status	• 110 V voltmeter should show 110 V approx.	CC1	OK
• Check the master controller	• Master controller handle should be at 0 position	DD	OK
• Check Engine RPM meters	• 'ENG RPM' should indicate 0	CC1	OK
• There should be no active faults in the system.	• No Fault indications on the LED Panel.	DD	OK
• Operate Ready to Start Toggle Switch for a second to reset and release.	• All the relays will retain their healthy state. • All the fault Indications will disappear in LED Panel.	CC1 DD	OK

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DETC no.M-277 (230042)

• Operate Engine 1 / 2 Start toggle switch for 3 to 4 Seconds and Release.	• Engine will crank and Engine RPM shows 700 RPM in RPM Meter 1 / 2.	CC1 &2	OK
	• Engine 1 / 2 ON relay picks up	CC1	OK
	• Eng 1 / 2 ON and Eng 1 / 2 Idle indication will appear in LED Panel.	DD	OK

7.1 Engine Shutdown procedure:

Operation	Effect/Observation	Location	Performed in ENG-1
• Take the Master Handle to 0 notch and Reverser Switch to Neutral Position.	• Engine RPM will reduce to 700 RPM viewed at RPM Meter and Eng Idle Indication will appear in LED Panel	CC and DD	OK
• Press Engine 1 / 2 Off toggle switch.	• Engine 1 / 2 Trip indication appears in the LED panel.	DD	OK

7.2 Engine Safety Checks
Low Hydraulic Oil Level

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engin 1 / 2 is running.	• Engine 1 / 2 ON and Eng 1 / 2 Idle Indication in the LED panel.	DD	OK
• Connect a jumper wire between Cable No. LHOL 1A and LHOL 1B at Level Sensor End.	• LHOL indicator displays LO	CC1	OK
	• Engine will shutdown	Under Frame	OK
	• Engine 1 trip indication will be displayed.	LED Panel	OK
•	• In LHOL, LO indication disappears.	CC1	OK

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DETC no.M-277 (230042)

Remove the jumper wire.			
• Re Crank the Engine As per Procedure mentioned above.			OK

High Cooling Water Temperature Fault Test

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engine 1 / 2 is running.	• Engine 1 / 2 ON and Alt- 1 / 2 Exc. ON indication in the LED panel.	DD	OK
• Disconnect the TS11 and TS12 at Engine end.	• HCWT-1 Indication appears, Engine-1 Excitation will cut-off and Eng-1 Idle Indication will appear	DD	OK
• Restore the TS11 and TS12 at the Engine and Re Crank the Engine	• Engine trip indication will disappear in the LED panel and Eng-1 ON and Eng-1 Idle Indication will appear	DD	OK

Low Lube Oil Pressure Fault Test

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engine 1 / 2 is running.	• Engine 1 / 2 ON and Eng 1 / 2 Idle Indication in the LED panel.	DD	OK
• Disconnect the PS11 at Engine end.	• Low Lube Oil Pressure Eng 1 / 2 indication will appear in LED Panel	DD	OK
	• Engine will shutdown	Under Frame	OK
	• Engine 1 / 2 trip indication will be displayed.	LED Panel	OK

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DETC no.M-277 (230042)

• Restore the PS11 at Engine end and Engage Ready to Start Switch in DCS	• Low Lube Oil Pressure Eng 1 / 2 and Engine 1 / 2 trip indication will disappear	DD	OK
• Re Crank the Engine As per Procedure mentioned above.			OK

Low Coolent Level fault Test

Operation	Effect/Observation	Location	Performed in ENG-1
• Ensure Engine 1 / 2 is running.	• Engine 1 / 2 ON and Eng 1 / 2 Idle Indication in the LED panel.	DD	OK
• Connect a jumper wire between Cable No. LCWL 1A & LCWL 1B for ENG-1 and LCWL 2A & 2B for ENG-2 at Level Sensor End.	• LCWL 1 / 2 indication displays LO	CC1	OK
	• Engine will shutdown	Under Frame	OK
	• Engine 1 trip indication will be displayed.	LED Panel	OK
• Remove the jumper wire.	• In LCWL, LO indication disappears.	CC1	OK
• Re Crank the Engine As per Procedure mentioned above.			OK

8.0 LOAD TEST

Load test is carried out to check the performance of power pack installed in the DETC coach along with interconnected control system. It ensures that the power pack delivers rated output in each notch at rated speed as per the designed requirement.

Load test can be a fountain of valuable information revealing engine trouble such as low horse power, black smoke in the exhaust, hunting under load, and as well as some electrical problems like power circuit ground detection (Grounding of Alternator, Rectifier and cables up to CP can be detected).

Diesel engine (CUMMINS/BHEL) and Traction Alternator, Rectifier along with ECM shall be used for this test. After setting up the load bench, move Master Handle (MH) from IDLE to 8th notch in steps while keeping Reverser Handle (RH) in F/R position. In Load test, notch wise engine rpm and output power in kilowatts is maintained by the ECM under power limit mode.

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DETC no.M-277 (230042)

8.1 Test Status

Record test results in the format given below.

8.2 Test Equipment

- Digital Multimeters
- DCS key
- Master Controller Unlock key
- DC Clamp Ammeter

8.4 Test Programme

8.4.1 Test Preparations

Operation	Performed in ENG-1
• Ensure Engine is OFF and all circuit breakers and battery isolation switches are OFF.	OK
• Connect the load bank between wire no. P5(Eng-1)/P6(Eng-2) and G0.	OK
• Connect the Digital Multimeters (10A) in LCCs for measuring Actuator and Field Current.	OK
• Connect the Digital Multimeter for voltage and Digital Clamp meter for current measurement at load Bank.	OK
• Crank the Engine as per the instructions provided above.	OK
• Allow engine to run for 15 minutes before loading.	OK

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

8.4.2 Traction Alternator Load Test

8.4.2.1 Notch wise Load Test

Operation	Performed in ENG-1
Start the power pack at notch-0 with load bank plate slightly dipped into the water and adjust the plate so that voltage and current LED in the LCC does not glow.	OK
Turn ON the excitation switch and change the notch position to 1st. Measure the DC current/DC voltage and calculate the power output i.e. kW reading.	OK
If the kW is lower than required, rotate the kW pot in LCC against 1st notch in clockwise direction (Load ramp-Up LED glows while adjusting the knob in LCC) until the kW matches with the required value. If kW is not increasing after 2-3 rotations, dip the plate into water to increase the load capacity and again check the kW.	OK
If kW is higher than required, rotate the kW pot against the 1st notch in anti-clockwise direction (Load ramp-Down LED glows) until the kW output matches the required value.	OK
Repeat the above steps for each of the notches.	OK
Cross-check the readings after restart and in both ascending & descending orders of notch.	OK
Record the actuator current, excitation current, Load voltage and current.	OK

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DETC no.M-277 (230042)

8.4.2.2 Notch wise Load Test Report

Load Test Engine A

Diesel Engine S. no.	25473763	**Traction Alternator S. no.**	315230075
Woodward ECM (Engine Control module)S. no.	22689655	**Amplifier S. no.**	U 36A / 44

Engine Safety Check

Item	Action	Performed	Remarks
HWT 1(High Water temp above 91 ° C	LED INDICATION	OK	
HWT 2(High Water temp above 91 ° C	EXCITATION OFF	OK	
LLOP(Low lube oil Pressure)	ENGINE TRIP	OK	
OS (Over speed)	ENGINE TRIP	OK	
LCWL (Low Coolant Water Level)	ENGINE TRIP WITH DELAY	OK	
LHOL(Low hydraulic Oil Level)	ENGINE TRIP WITH DELAY	OK	
HOFF (hydraulic Oil flow failure)	ENGINE TRIP	OK	
RCFR(Rectifier cooling fan failure)	EXCITATION OFF	OK	
RFF	EXCITATION OFF	OK	

Prior to load testing ensure following:

a. FP pressure should be between 5-7 kg/cm2
b. Hydraulic oil pressure should be between 130-200 bar at 1800 rpm

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DETC no.M-277 (230042)

Load test chart (Engine A) BHEL

Notch position	Engine RPM	Voltage (V)		Current (I)		KW (P) ± 3%		(P) Reference (kW)		(V)Limits		(I) limit		I actuator	I field
		Ref (V)	Act (V)	Ref (A)	Act (A)	Ref (kw)	Act (kw)	Lower Limit	Upper Limit	Ref	Act	Ref	Act	Ref	Ref
1	700	120	121	125	126	15	15	14.6	15.5	175	176	390	391	15	20
2	1000	150	155	200	201	31	31	30	32	260	260	450	452	18	17
3	1200	230	231	310	311	71	71	69	73	360	360	510	512	30	25
4	1300	280	281	350	351	98	98	95	101	450	450	570	572	38	29
5	1400	350	351	375	376	131	130	127	135	490	490	630	629	42	35
6	1500	400	401	405	406	162	161	157	167	550	551	700	703	53	38
7	1650	420	421	450	451	189	190	183	194	600	605	770	773	60	38
8	1800	425	426	490	491	208	209	202	214	660	660	810	811	66	38

After setting power, voltage & Current of the engine in full power. Run engine till full hydraulic pressure is attained. During this time monitor Engine Coolant Temperature;

Note down final reading of following gauges:

Gauge	Value	Unit
EWT	80	°C
LOT	85	°C
LOP	45	psi

Load Test Engine B

Diesel Engine S. no.	25476988	**Traction Alternator S. no.**	315230076
ECM (Engine Control module)S. no.	22607787	**Amplifier S. no.**	U241/43

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DETC no.M-277 (230042)

Engine Safety Check

Item	Action	Performed	Remarks
HWT 1	LED INDICATION	OK	
HWT 2	EXCITATION OFF	OK	
LLOP	ENGINE TRIP	OK	
OS	ENGINE TRIP	OK	
LWL	ENGINE TRIP WITH DELAY	OK	
LHOL	ENGINE TRIP WITH DELAY	OK	
HOFF	ENGINE TRIP	OK	
RCFR	EXCITATION OFF	OK	
RFF	EXCITATION OFF	OK	

Prior to load testing ensure following:

c. FP pressure should be between 5-7 kg/cm2

d. Hydraulic oil pressure should be between 130-200 bar at 1800 rpm

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Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

Load test chart (Engine B) BHEL

Notch position	Engine speed	V ref	V	I ref	I	P ref	P	(P) Reference (kW)		Upper limits				I actuator	I field
	Rpm	(V)	(V)	(A)	(A)	(kW)	(kW)	Lower limit	Upper Limit	V ref	V msrd	I ref	I msrd	(A)	(A)
1	700	120	121	125	126	15	15	14.6	15.5	175	176	390	390	15	18
2	1000	150	156	200	201	31	31	30	32	260	261	450	450	17	17
3	1200	230	231	310	311	71	71	69	73	360	362	510	510	26	24
4	1300	280	281	350	351	98	98	95	101	450	451	570	572	37	28
5	1400	350	351	375	376	131	131	127	135	490	492	630	631	43	33
6	1500	400	402	405	406	162	161	157	167	550	551	700	703	48	38
7	1650	420	422	450	451	189	189	183	194	600	600	770	771	50	36
8	1800	425	426	490	491	208	208	202	214	660	660	810	811	56	37

After setting power, voltage & Current of the engine in full power. Run engine till full hydraulic pressure is attained. During this time monitor Engine Coolant Temperature;

Note down final reading of following gauges:

Gauge	Value	Unit
EWT	85	°C
LOT	90	°C
LOP	45	psi

9.0 MOVEMENT TEST

9.1 Purpose

To ensure DETC movement in right direction as per Reverser Handle position.

9.2 Measuring Equipments and Test Setup

- Multimeter

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DETC no.M-277 (230042)

- Wago connector
- DCS key
- Master Controller Unlock key

9.3 Test Status

Record the test results in the table given below

9.4 Test Implementation

Forward and Reverse movement about 10 kmph has been taken with all Traction Motors. Individual Traction Inverter data is recorded by performing the bogie cut out of each Line Contactor in MSGC. Forward and Reverse movement of Traction Motors performed and data is recorded. Based on recorded data, we verified the performance of the motor during movement test.

SAFETY AND BYPASS CHECKS (Before Movement)

SN	Test	Readings/Result	Remarks
1.	SA9 Brake Apply and release physical check at all wheels	OK	
2.	A9 Brake Apply and release physical check at all wheels	OK	
3	Parking Brake Apply and release physical check at designated wheels	OK	
4	Equipment Governor Bypass	OK	
5	Rectifier Cooling Fan - 1 Failure Bypass	OK	
6	Rectifier Cooling Fan - 2 Failure Bypass	OK	
7	Brake Pressure Control Governor Bypass	OK	
8	Parking Brake Governor Bypass	OK	
9	Functioning of Movement Restriction at 10KMPH interlock while Lifting platform is in up condition. (Excitation Off)	OK	
10	Power Ground fault in Power Pack-1 and Resetting	OK	
11	Power Ground Fault in Power pack-2 and Resetting	OK	
12	Control Circuit Earth fault (+)	OK	
13	Control Circuit Earth fault (--)	OK	

Signature of JE/SSE (Testing)

JAI PRAKASH GAUTAM

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

LOCAL MOVEMENT TEST FROM CAB-1

SN	Test	Readings/Result	Remarks
1.	Forward movement with engine-1 in ON condition + TM-1 Traction Motor only Included (10Kmph) Notch-1	TM-1 160 A	
2.	Reverse movement with engine-1 in ON condition + TM-1 Traction Motor only Included (10Kmph) Notch-1	TM-1 165 A	
3	Forward movement with engine-1 in ON condition + TM-3 Traction Motor only Included (10Kmph) Notch-1	OK	
4	Reverse movement with engine-1 in ON condition + TM-3 Traction Motor only Included (10Kmph) Notch-1	OK	
5	Forward movement with engine-1 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-1 Current	TM-1 165 A	
6	Reverse movement with engine-1 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-1 Current	TM-1 170 A	
7	Forward movement with engine-2 in ON condition + TM-2 Traction Motor only Included (10Kmph) Notch-1	TM-2 170 A	
8	Reverse movement with engine-2 in ON condition + TM-2 Traction Motor only Included (10Kmph) Notch-1	TM-2 175 A	
9	Forward movement with engine-2 in ON condition + TM-4 Traction Motor only Included (10Kmph) Notch-1	OK	
10	Reverse movement with engine-2 in ON condition + TM-4 Traction Motor only Included (10Kmph) Notch-1	OK	
11	Forward movement with engine-2 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-2 Current	TM-2 170 A	
12	Reverse movement with engine-2 in ON condition + Both Traction Motors Included (10Kmph) Notch-1 TM-2 Current	TM-2 175 A	
13	Forward movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 165 A TM-2 170 A	
14	Reverse movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 170 A TM-2 175 A	
15	Speedometer over speed alarm function working (Ensure WD : 952mm)	OK	
16	Braking Performance SA9	OK	
17	Braking Performance A9	OK	

Signature of JE/SSE (Testing)

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

18	Deadman Braking Performance	OK	
19	Emergency Braking Performance	OK	
20	Head light both beams glowing with proper focusing	OK	
21	Driver and Guard side both Tail Lights glowing	OK	
22	Driver and Guard side both Marker Lights glowing	OK	
23	Flasher Light working properly	OK	
24	Search Light glowing	OK	
25	Fog light Glowing	OK	

LOCAL MOVEMENT TEST FROM CAB-2

SN	Test	Readings/Result	Remarks
1.	Forward movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 170 A	
		TM-2 175 A	
2.	Reverse movement with both engines are in ON condition + All Traction Motors are Included (10Kmph) Notch-1	TM-1 165 A	
		TM-2 170 A	
3.	Head light both beams glowing with proper focusing	OK	
4.	Driver and Guard side both Tail Lights glowing	OK	
5.	Driver and Guard side both Marker Lights glowing	OK	
6.	Flasher Light working properly	OK	
7.	Search Light glowing	OK	
8.	Fog light Glowing	OK	
9.	Braking Performance SA9	OK	
10.	Braking Performance A9	OK	
11.	Deadman Braking Performance	OK	
12.	Emergency Braking Performance	OK	

Signature of JE/SSE (Testing)

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PATIALA LOCOMOTIVE WORKS, PATIALA
Testing & Commissioning Format For 8W Diesel Electric Tower Car (DETC)

DETC no.M-277 (230042)

HV SENSOR, HL-TL AND LOCAL ON/OFF PERFORMANCES IN CAB I & II

SN	Test	Readings/Result	Remarks
1	Headlight-Tail light Interlock performance	OK	
2	H.V Sensor Performance	OK	
3	Engine- 1 local On / Off Function	OK	
4	Engine- 2 local On / Off Function	OK	

ALL GOVERNORS PERFORMANCE

Equipment Governor Pressure Setting (Brake Team Scope)			**MR Governor(ADV Setting) SAN Scope**		
Cut-in	4.2Kg/SqCm	OK	Cut-in	6Kg/SqCm	OK
Cut-off	3.4Kg/SqCm	OK	Cut-off	7Kg/SqCm	OK
BPC Governor Pressure Setting (Brake Team Scope)			**Parking Brake Apply and Release**		
				DCS Switch Configuration	Function
4.2Kg/SqCm	4.2Kg/SqCm	OK	Apply	OK	OK
3.4Kg/SqCm	3.4Kg/SqCm	OK	Release	OK	OK

Signature of JE/SSE (Testing)

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PATIALA LOCOMOTIVE WORKS, PATIALA

DETC No. M-277(230042)				
Sr. No.	**DESCRIPTION**	**PL. No.**	**MAKE**	**Sr. No.**
1	CAB HEATER (CAB-1)	31902017	TOP GRIP	587
2	CAB HEATER (CAB-2)	31902017	TOP GRIP	588
3	SPEEDOMETER (CAB -1)	30906313	AAL	
4	SPEEDOMETER (CAB -2)	30906313	AAL	
5	SPOT LIGHT	36766215	ALTOS	-----
6	CLUSTER LIGHT	36766227	ALTOS	-----
7	MARKER & TIAL LIGHT	31907663	PTC	1126,1128,1129 & 1130
8	FLASHER LIGHT	45158563	ALTOS	582 & 583
9	FLASHER UNIT	45158563	ALTOS	576 & 577
10	FOG LIGHT	45026725	HELLA	-----
11	SEARCH LIGHT	45026713	HELLA	-----
12	HEAD LIGHT	30767040	SIGNATON	585 & 586
13	DC-DC CONVERTER	31907490	SIGNATON	571 & 572
14	BATTERY 24v	45178185	MICROTEX	
15	BATTERY 110v	45170289	AMAR RAJA	
16	FAN 06No.	45180910	LEC	1699,1700,1701,1702,1703 & 1704
17	FAN 04No.	45979753	LEC	1151,1152,1153 & 1154
18	TELEPHONE	45979005	ELIXER (BEETEL)	-----
19	CCTV	31902110	CP PLUS	201

JAI PRAKASH GAUTAM

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SSE/ECS

PATIALA LOCOMOTIVE WORKS,PATIALA

DETC No.	230042

1. BOGIE FRAME:

BOGIE	FRAME NO	Make	PL No.	PO No. & dt.	Warranty Period
Panto side	SL-356	ECBT	10992169	01212419102586	As per PO/IRS conditions
Radiator Side	SL-377	ECBT		01212419102586	

2. Hydraulic Dampers (Vertical and Lateral) Make: IAI 400/ESCORT 200/ GABERIAL 400/ ESCORT 200

3. AXLES:

LOCATION	1	2	3	4
S.NO	S-1248	AY-199	L-8018	R-7535
Ultrasonic Testing	OK	OK	OK	OK

4. WHEEL DISCS NO. AND TYPE

LOCATION	1	2	3	4
GEAR END	DM/23-614	DM/23-613	DM/23-636	DM/23-407
Ultrasonic Testing	OK	OK	OK	OK
FREE END	DM/23-635	DM/23-615	DM/23-616	DM/23-854
Ultrasonic Testing	OK	OK	OK	OK

5. AXLE ROLLER BEARING (Warranty: As per PO/IRS conditions)

LOCATION		1	2	3	4
Gear End	MAKE	NBC	NBC	NBC	NBC
	PO NO. & dt	102618	102618	102618	102618
Free End	MAKE	NBC	NBC	NBC	NBC
	PO NO. & dt	102618	102618	102618	102618

6. WHEEL DISC PRESSING (PRESSURE IN KN): SPECIFIED 77.2-115.6 T

AXLE NO	1	2	3	4
BULL GEAR END	892	1003	982	942
FREE END	1009	982	970	964

DETC No.	230042

7. DIAMETER AFTER PROFILE TURNING: SPECIFIED 952-955 mm

AXLE NO.	1	2	3	4
DIA IN mm GE	953	953	953	953
DIA IN mm FE				
WHEEL PROFILE GAUGE (1600±1mm)	OK	OK	OK	OK

8. SUSPENSION TUBE & ITS TAPER ROLLER BEARING:

AXLE NO.		1	2	3	4
S.T.	MAKE	BHEL	BHEL	BHEL	BHEL
G.E. BEARING	MAKE	FAG	FAG	FAG	FAG
F.E. BEARING	MAKE	FAG	FAG	FAG	FAG

9. GEAR CASE & BACKLASH:

AXLE NO.	1	2	3	4
MAKE	BHEL	BHEL	BHEL	BHEL
BACKLASH (0.200 – 0.700mm)	0.530	0.550	0.560	0.520

10. TRACTION MOTOR : (PL No. 30906313, Warranty: As per PO/IRS conditions)

LOCATION	MAKE	PO No. & date	S. NO.
1	BHEL	100246	408230147
2	BHEL	100246	408240011
3	BHEL	100246	408230145
4	BHEL	100246	408230148



SSE/ Bogie Shop

Air-brake equipments details of DETC-M-277

S.No.	Description	PL no.	QPL /Nos.	Supplier	Item Sr. no.
1	Distributor Valve	30358334	1	SD	24592
2	A9 brake Valve		2		-
3	SA9 brake valve		2		-
4	C2 Relay Valve		1		03-03-23
5	Auto Drain valve		3		-
6	Air whistle		4		-
7	PRV Limiting valve		4		-
8	Three way magnet valve(Parking)		2		
9	Three way magnet valve(Horn)		2		
10	Three way magnet valve(MR)		1		
11	Three way magnet valve(Compressor)		1		
12	Safety valve		1	RECON	-
13	Wiper motor	31646037	4	ESSBEE	-
14	Dome Wiper motor	31357647			
15	Air Dryer	31357179	1	PRAG	3220-03-23p
16	Pantograph assembly	31920706	1	CONTRANSYS	11490-07/22
17	Servo Motor	31920706	1	CONTRANSYS	11834-09/22
18	PANTO MOUTING INSULATOR	31906011	4	SIL	11-18

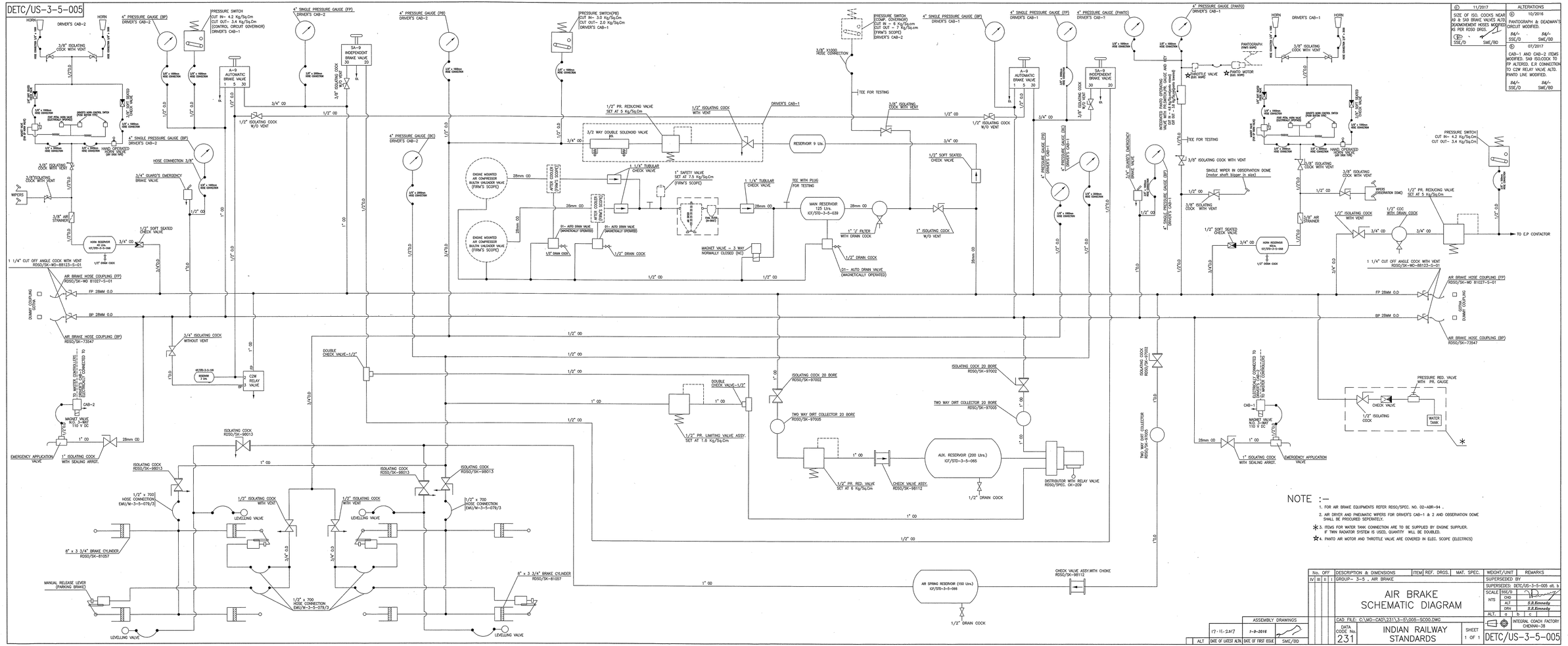
SSE/Testing

SSE/ABS

PATIALA LOCOMOTIVE WORKS, PATIALA			
DETC-NCR-230042/PRYJ(M-277)			
S.NO.	NAME OF COMPONENTS	COMPANY	MFG. DATE & SN
1	SHELL	DTL	06/23 & 11
2	HYDRAULIC PLATFORM	ORION	6500
3	LIFTING RAM	ORION	6500
4	STARTER BATTERY CHARGER	RAMYAA ELECTRO-GEAR(P) LTD.	2112-23-873
5	RECTIFIER REGULATOR UNIT	KEL	221271C1172, 221271C1173
6	RECTIFIER A & B	BHEL	526070123 , 526070116
7	MOTOR SWITCH GROUP CUBICAL	BHEL	2200MSG026
8	AUX. ALTERNATOR-1 &2	KEL	2212711164 ,221271171
9	ENGINE 1 & 2	CUMMINS INDUSTRIES	09/22 & 25476988 , 05/22 & 25473763
10	ALTERNATOR 1 & 2	BHEL	315230076, 315230075
11	CONTROL CUBICAL-1	BHEL	220CAB1029
12	CONTROL CUBICAL-2	BHEL	220CAB2026
13	RESISTANCE PANEL	BHEL	526070101/102
14	10 KV GENERATOR SET	COOPER CORPORATION PVT LTD INDIA	11/22 & L2217961
15	RADIATOR	CUMMINS INDUSTRIES	22-05-2022
16	DRILLING MACHINE	SIDDHAPURA	NOT MENTION
17	3KV DG WELDING SET	HIMALYAN	HM230P-20221202202, MAR-2023
18	HYDRAULIC TROLLEY MOTOR	ABB	3G3J2152400534
19	CONTROL PANEL FOR RAM	ORION	6500
20	FUEL TANK	SIRHIND BODY BUILDERS	06/22 & 51
21	CABLE DRUM	GOSPEL	06/23 & 10

Sign. Ashok Kumar
SSE/DETC/LAS

Sign. Desh Bandh,
SSE/DETC/LAS


DETC/US-3-5-005
HORN
DRIVER'S CAB-2
3/8" ISOLATING COCK WITH VENT
4" PRESSURE GAUGE (BP)
PRESSURE SWITCH CUT IN- 4.2 Kg/Sq.Cm CUT OUT- 3.4 Kg/Sq.Cm (CONTROL CIRCUIT GOVERNOR)
4" SINGLE PRESSURE GAUGE (FP)
4" PRESSURE GAUGE (PB)
PRESSURE SWITCH(PB) CUT IN- 3.0 Kg/Sq.Cm CUT OUT- 2.0 Kg/Sq.Cm
PRESSURE SWITCH, COMP. GOVERNOR CUT IN - 8 Kg/Sq.cm CUT OUT - 9.5 Kg/Sq.cm
4" SINGLE PRESSURE GAUGE (BP)
4" SINGLE PRESSURE GAUGE (FP)
4" PRESSURE GAUGE (PANTO)
A-9 AUTOMATIC BRAKE VALVE
SA-9 INDEPENDENT BRAKE VALVE
3/8" ISOLATING COCK W/O VENT
1/2" PR. REDUCING VALVE SET AT 5 Kg/Sq.Cm
1/2" ISOLATING COCK WITH VENT
3/2 WAY DOUBLE SOLENOID VALVE (A)
RESERVOIR 9 Ltr.
4" PRESSURE GAUGE (BC)
4" SINGLE PRESSURE GAUGE (BP)
HOSE CONNECTION 3/8"
3/4" GUARD'S EMERGENCY BRAKE VALVE
WIPERS
3/8" AIR STRAINER
1/2" SOFT SEATED CHECK VALVE
HORN RESERVOIR 40 Ltrs. ICF/STD-3-5-058
ENGINE MOUNTED AIR COMPRESSOR BUILTIN UNLOADER VALVE (FIRM'S SCOPE)
AFTER COOLER (FIRM'S SCOPE)
1" SAFETY VALVE SET AT 7.5 Kg/Sq.Cm (FIRM'S SCOPE)
1/4" TUBULAR CHECK VALVE
1 1/4" TUBULAR CHECK VALVE
TEE WITH PLUG FOR TESTING
MAIN RESERVOIR 125 Ltrs. ICF/STD-3-5-039
1" 'J' FILTER WITH DRAIN COCK
1" ISOLATING COCK W/O VENT
1/2" SOFT SEATED CHECK VALVE
01- AUTO DRAIN VALVE (MAGNETICALLY OPERATED)
1/2" DRAIN COCK
MAGNET VALVE – 3 WAY NORMALLY CLOSED (NC)
1/2" DRAIN COCK
TEE FOR TESTING
3/8" ISOLATING COCK WITH VENT
SINGLE WIPER IN OBSERVATION DOME (motor shaft bigger in size)
3/8" ISOLATING COCK WITH VENT
1/2" PR. REDUCING VALVE SET AT 5 Kg/Sq.Cm
1/2" ISOLATING COCK WITH VENT
1/2" CCC WITH DRAIN COCK
PRESSURE SWITCH CUT IN- 4.2 Kg/Sq.Cm CUT OUT- 3.4 Kg/Sq.Cm
TO E.P CONTACTOR
1 1/4" CUT OFF ANGLE COCK WITH VENT RDSO/SK-MD-88123-S-01
AIR BRAKE HOSE COUPLING (FP) RDSO/SK-MD B1027-S-01
FP 28MM O.D
BP 28MM O.D
DUMMY COUPLING
AIR BRAKE HOSE COUPLING (BP) RDSO/SK-73547
3/4" ISOLATING COCK WITHOUT VENT
DOUBLE CHECK VALVE-1/2"
1/2" PR. LIMITING VALVE ASSY. SET AT 1.6 Kg/Sq.Cm
ISOLATING COCK 20 BORE RDSO/SK-97002
TWO WAY DIRT COLLECTOR 20 BORE RDSO/SK-97005
AUX. RESERVOIR (200 Ltrs.) ICF/STD-3-5-065
1/2" DRAIN COCK
DISTRIBUTOR WITH RELAY VALVE RDSO/SPEC. GH-209
CHECK VALVE ASSY. RDSO/SK-98112
AIR SPRING RESERVOIR (150 Ltrs.) ICF/STD-3-5-066
1/2" DRAIN COCK
CHECK VALVE ASSY.WITH CHOKE RDSO/SK-98112
ISOLATING COCK RDSO/SK-98013
TWO WAY DIRT COLLECTOR RDSO/SPEC. GH-209
PRESSURE RED. VALVE WITH PR. GAUGE
CHECK VALVE
1/2" ISOLATING COCK
WATER TANK
CAB-1
CAB-2
MAGNET VALVE N.C. 3-WAY 110 V DC
1" ISOLATING COCK WITH SEALING ARRGT.
EMERGENCY APPLICATION VALVE
ELECTRICALLY CONNECTED TO 'D1' MOTOR CONTROLLER
TO WATER CONTROLLER ELECTRICALLY CONNECTED TO 'D1' MOTOR CONTROLLER
RSSB/S-3-5-126 'F' DTA
CDW RELAY VALVE
ISOLATING COCK RDSO/SK-98013
1/2" x 700 HOSE CONNECTION EMU/M-3-5-079/3
1/2" ISOLATING COCK WITH VENT
LEVELLING VALVE
8" x 3 3/4" BRAKE CYLINDER RDSO/SK-81057
MANUAL RELEASE LEVER (PARKING BRAKE)
NOTE :–
1. FOR AIR BRAKE EQUIPMENTS REFER RDSO/SPEC. NO. 02-ABR-94 .
2. AIR DRYER AND PNEUMATIC WIPERS FOR DRIVER'S CAB-1 & 2 AND OBSERVATION DOME SHALL BE PROCURED SEPERATELY.
*3. ITEMS FOR WATER TANK CONNECTION ARE TO BE SUPPLIED BY ENGINE SUPPLIER. IF TWIN RADIATOR SYSTEM IS USED, QUANTITY WILL BE DOUBLED.
★4. PANTO AIR MOTOR AND THROTTLE VALVE ARE COVERED IN ELEC. SCOPE (ELECTRICS)
ALTERATIONS
© 11/2017
SIZE OF ISO. COCKS NEAR A9 & SA9 BRAKE VALVES ALTD. DEADMOVEMENT HOSES MODIFIED AS PER RDSO DRGS.
SSE/D SME/BD
10/2016
PANTOGRAPH & DEADMAN'S CIRCUIT MODIFIED.
Sd/- SSE/D Sd/- SME/BD
07/2017
CAB-1 AND CAB-2 ITEMS MODIFIED. SA9 ISO.COCK TO FP ALTERED. E/R CONNECTION TO CDW RELAY VALVE ALTD. PANTO LINE MODIFIED.
Sd/- SSE/D Sd/- SME/BD
ASSEMBLY DRAWINGS
ALT DATE OF LATEST ALTN 17-11-2017 DATE OF FIRST ISSUE 1-9-2016 SME/BD
No. OFF IV III II I
DESCRIPTION & DIMENSIONS
ITEM REF. DRGS. MAT. SPEC.
GROUP– 3–5 , AIR BRAKE
AIR BRAKE SCHEMATIC DIAGRAM
WEIGHT/UNIT REMARKS
SUPERSEDED BY
SUPERSEDES: DETC/US–3–5–005 alt. b
SCALE NTS
SSE/D
CHD
ALT
DRN S.R.Kennedy
ALT. a b c
CAD FILE: C:\MD-CAD\231\3-5\005-SC00.DWG
DATA CODE No. 231
INDIAN RAILWAY STANDARDS
SHEET 1 OF 1
INTEGRAL COACH FACTORY CHENNAI–38
DETC/US–3–5–005
FORM I.R A1c 1470 x 600

भारत सरकार
GOVERNMENT OF INDIA
रेल मंत्रालय
MINISTRY OF RAILWAYS
पटियाला रेल इंजन कारखाना, पटियाला
Patiala Locomotive Works, Patiala

फैक्स / FaxNo.91-175-2306413
ई मेल /E.mail ID. dycmelocodmw@gmail.com,
फोन / Phone 0-175-2396426
पटियाला 147003, भारत
PATIALA - 147 003, INDIA

No:-PLW/M/SSE/LAS/Tech-14 **Date: - 09.08.2023**

All Dy CEE/ZR & Divl. Consignees,
DFCCIL consignees
NRC Consignees.

Sub.:- Strict Adherence to Maintenance Instructions for 8W-DETC/US
Ref.:-Maintenance Instructions for 8-wheeler tower wagons covering instructions for DETC AND DHTC TO RDSO instruction no. TI/MI.0043 Rev-0.

In ref. to the above, it is most important to emphasize the criticality of adhering to the maintenance instructions outlined by RDSO for the 8W-DETC/US units that are being manufactured and supplied to ZR/NRC. These instructions have been issued by RDSO vide Instruction no. TI/MI.0043 Rev-0, and it is imperative that they are diligently be followed to guarantee the proper upkeep and continuous availability of 8W-DETC/US in best possible working conditions.

The 8W-DETC/US units serve a pivotal role in achieving the 100% electrification work over IR and also for the maintenance and speedy resolution of breakdowns in the Overhead Equipment (OHE), ensuring the prompt restoration of power supply. In light of this specialized function, a comprehensive set of maintenance instructions has been particularly crafted to ensure the consistent operational readiness of the 8W-DETC/US at all times.

A copy of the maintenance instructions for the 8W-DETC/US units, which is being dispatched to you for the detailed maintenance of various components of these units. As such, it is requested for unwavering commitment to the stipulated maintenance schedule detailed within the instructions. Adhering to the scheduled and preventive maintenance is paramount in facilitating seamless and uninterrupted services for completion of OHE work, maintenance and quick interventions during breakdowns, thereby expediting the restoration of power supply to the OHE. The reliability and effectiveness of the 8W-DETC/US units rely directly on the rigorous observance of these maintenance instructions. By rigorously following these maintenance guidelines, Consignee can collectively ensure that the 8W-DETC/US remain fully operational and ready for deployment whenever the need arises.

In view of the above, upholding these maintenance instructions are pivotal in ensuring the continued functionality and availability of these critical units. So that guarantee the reliability and efficiency of operations also be ensured accordingly. Copy of RDSO instruction no. TI/MI.0043 Rev-0. is enclosed for adherence please.

It is for kind information and further necessary action to ensure the above.

RATTAN LAL KHULLAR
Digitally signed by RATTAN LAL KHULLAR
Date: 2023.08.09 01:56:31 +05'30'

Dy CME/Loco

Copy to:-.
PCEE: for kind information please.
CEE/Loco. : for kind information please
Secy. to PCO: for kind information please
Dy CEE/Design: : for information please
Dy CME/Design : for information please

Government of India
Ministry of Railways
Research Designs & Standards Organization
Manak Nagar, Lucknow – 226011

INSTRUCTION NoTI/MI.0043 Rev-0

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 <u>Monthly Schedule (With engine stopped).</u>

3.1 Contactor and relays:
(i) Inspect visually.
(ii) Manually operate contactor to check operation.
(iii) Check interlock and contactors.
(iv) 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:
(i) Clean dirt or any oil on top of battery.
(ii) Keep oil terminal tight, clean and apply vaseline petroleum jelly.
(iii) Ensure that vent plug is clean.
(iv) Check specific gravity of electrolyte.

3.5 Traction Motor:
(i) Brush off loose dust or dirt before removing commutator cover.
(ii) Clean the commutator veering. Remove any copper beads from the commutator surface with fine caborandum cloth.
(iii) Deposit from dirt or greasy hands should be removed from solvent.

(iv) Examine the brush gear and clean the insulation of the brush arm.
(v) Check that the brush ring sits correctly on the carbons and that the springs are in good condition.
(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 of traction motors, gearbox.

3.6 Traction Alternator:
(i) Brush off loose dust or dirt before removing cover.
(ii) Check tightness of connections.
(iii) Check for any loose hardware especially on the rotating rectifier assembly.

4.0 **<u>Three monthly schedule (with engine stopped)</u>**

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:
(i) Clean dirt or any oil on top of battery.
(ii) Keep all terminals tight, clean and apply vaseline petroleum jelly.
(iii) Ensure that vent plugs are clean.
(iv) Check specific gravity of electrolyte.

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: Monthly service plus.

(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^2.
(iv) Clean inside of alternator using dry compressed air of a pressure of 1.75 to 2.8kg/cm^2.

4.8 Cable connections:
Check for loosening adjoins on terminal board and equipments check for insulation damage also.

5.0 HALF YEARLY SCHEDULE (WITH ENGINE STOPPED)

Repeat all checks followed in three monthly check and ensure following additional schedules:	
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 (ii) Replace contact tips if worn or pitted.
Safety devices (i) Cooling water temperature switch (ii) Engine over speed switch	(i) Remove and check on test bench and adjust if required. (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. Clean & repaint.
Load Ammeters	Check calibration
Traction Motor suspension bearing	(i) Change oil. (ii) Change wick lubricator if damaged. (iii) Check bearing cap bolts for tightness. (iv) Check bearing cap bolts for tightness. (v) Check wear on motor suspension & nose suspension. (vi) Check suspension bearing suspension.

Traction Motor	Repeat three monthly service including following additional schedules:- (i) Clean the grease escape drain from P.E. outer bearing cap and P.E. end shield. (ii) Clean all pinion and gear wheels check for tooth wear. (iii) Clean lubricant from each gear case to ensure that it is not cracked and the seals are in good condition. (iv) Replace felt seals if necessary.
YEARLY SCHEDULE WITH ENGINE STOPPED	
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. (i) Check wear of tooth of pinion and gear wheel. (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 (ii) Replace contact tips if worn or pitted.
Safety devices (ii) Cooling water temperature temp switch (ii) Engine over speed switch	 Remove and check on test bench and adjust if required. Remove and check on test bench and adjust if required.
Engine RUN/STOP switch	Check and clean contact

Battery	(i) Remove boxes from tower car. Clean and repaint. (ii) Check for any damage. (iii) Clean all the ventilators so that air circulation remains good. (iv) Check the batteries for any water leakage. (v) Check the voltages of batteries and put batteries on charging if required. (vi) Check the specific gravity of each batteries. Top up if required. (vii) Check the batteries connection lead. (viii) Apply petroleum jelly on all Connection (ix) Prescribed minimum water level and specific gravity.
Load Ammeters	Check calibration
Traction Motor suspension bearing	(i) Change oil. (ii) Change wick lubricator if damaged. (iii) Check bearing cap bolts for tightness. (iv) Check bearing cap bolts for tightness. (v) Check wear on motor suspension and nose suspension. (vi) Check suspension bearing suspension.
Traction Motor	Repeat three monthly service including following additional schedules:- (i) Clean the grease escape drain from pinion end (PE) outer bearing cap and P.E. end shield. (ii) Clean all pinion and gear wheels check for tooth wear. (iii) Clean lubricant from each gear case to ensure that it is not cracked and the seals are in good condition. (iv) Check the carbon brushes. (v) Clean the commutators (vi) Ensure proper spring tension (3.5Kg/Cm²) (vii) Check the Pig tails. (viii) Check the gap between holder and commutator (1.5 - 2.5mm) (ix) Check the inspection cover and its gasket. (x) Check the leather bellows. (xi) Blowing and cleaning air filters. (xii) Check for flash over, solder throwing, broken fan, any damages to commutators.

6.0 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 electric loco sheds or workshops.

(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^{o}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. 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 sports. 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.
(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.

7.0 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.

8.0 Maintenance of engine

Daily Maintenance: **A- Check**

SN	Maintenance step	Remarks
(i)	Check previous days engine log book	Correct as required.
(ii)	Drain water & sedimentation from fuel filter through drain cock.	Before starting the engine.
(iii)	Check engine oil level and top up if necessary	Must be slightly less than or equal to 'H' mark on dip stick when engine is stopped and has stood for 20 minutes or more (must be measured after all oil is drained back into oil pan).
(iv)	Check for fuel, oil, water and exhaust leaks	Correct if leaking.
(v)	Fill radiator/surge tank with treated water (Chromate concentration 3500 PPM)	Radiator cap must be firmly tightened back into the radiator/surge tank neck. Engine must not be operated without the aeration and overhauling of the coolant, check engine radiator water level.
(vi)	Check air cleaner, oil level and change oil, if required (if oil bath type) clean dust pan	Use clean engine oil
(vii)	Check airline connection for leaks	Correct as required.
(viii)	Remove and clean air compressor breather, if equipped.	Fill with clean oil upto the mark.
(ix)	Drain air receiver tank at the beginning of every day and close the drain cock.	-
(x)	Clean crank case breather.	Discard paper type element if clogged.
(xi)	Check oil level in hydraulic governor, if provided.	Check for leaks. Use engine oil for topping up (as shown in fig 3.1)
(xii)	Start the engine and note the oil pressure both at idling and maximum speed.	If there is a change in oil pressure from that recorded in the log book on earlier occasion then stop engine and check through trouble shooting technique the cause for oil pressure change and correct if necessary.
(xiii)	Record oil pressure	Refer operation and maintenance manual for lube oil pressure limits
(xiv)	Fill fuel tank at the end of the day.	Use clean fuel and a strainer. Also clean the cap and surrounding area before opening the filler cap. Fill fuel at the end of the day allowing diesel to settle. Drain sediment from fuel filter water separator bowl.
(xv)	Idle running for 15 minutes	To see the engine in good working condition run idle for 15 minutes & check engine oil, transmission oil pressure, battery charging , air pressure meters & also check water , oil and fuel leakage.

(xvi)	Speedo-meter	Record the reading of hour meter & speedometer.
(xvii)	V-Belts	Check tension of V-Belts of alternators

Every 1500 hours or 1 year which ever is earlier. **B- Check**

(i)	Repeat all maintenance steps of Checks A & B	
(ii)	Check thermostat operation	It should start opening
(iii)	Check fan hub and drive	Check mounting bolts and bearing end play
(iv)	Check impeller water pump for play	Correct if necessary
(v)	Check for turbocharger oil leaks	Correct as required
(vi)	Tighten turbocharger mounting nuts	Tighten to the specified torque. Do not tighten when engine is hot condition.
(vii)	Check inlet air restriction	Check after cleaning dry type air cleaner element. If restriction is in excess of 25" water, a new element must be fitted.
(viii)	Clean oil bath air cleaner	Remove complete assembly and clean inclusive of fixed screens.
(ix)	Clean and tighten all electrical connections.	
(x)	Check generator brushes and commutators	Replace and clean as required
(xi)	Clean entire engine	High pressure and soap water mixture preferred after spraying engine with cleanser taking care of protecting electrical system.
(xii)	Tighten all mounting bolts and nuts	Tighten as required. Over tightening may result in distortion or damage.
(xiii)	Clean aneroid air breather. If provided	Replace breather if necessary.
(xiv)	Check engine blow by.	Reading in excess of recommended limits. Corrective action must be taken through analysis with the help of trouble shooting chart.
(xv)	Clean radiator	Blow air through the radiator core in opposite direction to the normal flow of air, if working under dusty/dirty condition.(Reserve flushing operation)
(xvi)	Check air compressor	Check shaft and clearance.
(xvii)	Adjust injectors and valves	Clean fuel inlet connection screens. Final adjustments must be carried out with engine hot and with correct torque as specified (refer O & M manual)
(xviii)	Change hydraulic governor oil/ aneroid oil	Use engine lubricating oil
(xix)	Check vibration damper	If steam is not available , then use clean soap water solution as outlined in 'C 'check it.
(xx)	Change the engine oil, recommended oil 15W40	
(xxi)	Brakes	Check the working of brakes

		i) Service Brake – a) Gradual application and gradual release type applied on all wheels. ii) Emergency Brake – Lift on type emergency valve in service. iii) Parking brakes – Manually operated through mechanical linkages

Check every 6000 hours or 3 years which ever is earlier. C- Check

SN	Maintenance Steps	Remarks
(i)	Repeat all maintenance steps of check A & B	
(ii)	Check exhaust and inlet manifold and nuts.	
(iii)	Tighten all mounting bolts and nuts.	
(iv)	Clean Turbocharger diffuser and impeller and check end float.	
(v)	Check turbo charger bearing clearances	Only end float on semi floating bearing if in excess of limits, replace it.
(vi)	Check crank shaft end float	If in excess of recommended limits, corrective action is indicated
(vii)	Clean injector inlet screens	Must be done only if performance deterioration is evident. Some of the indications for performance deterioration are. 1. Black smoke 2. Change in fuel manifold pressure 3. Loss of power 4. Malfunction of aneroid. 5. Clean and calibrate all injector. 6. Check fuel pump calibration. 7. Replace aneroid bellows and calibrate.
(viii)	Replace fuel pump filter screen and magnet.	
(ix)	Steam clean engine.	If steam is not available, then use clean soap water.

9.0 Maintenance of transmission

9.1 Oil Change: The oil should be changed every 1000 hours of operation or sooner, depending upon operating conditions. Also, the oil must be changed whenever there are traces of dirt or evidence of high temperature indicated by discoloration or strong odour. The filter screen in the sump should be removed and cleaned with mineral sprits at each oil change.

The filter element should be replaced at each oil change and at 200-hour intervals between oil changes. The filter shells should be cleaned. New gaskets and seal rings

must be used when replacing filter elements. After installation, check the filter for oil leakage while the vehicle engine is running.

10.0 Maintenance of Axle drive

1	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.

11.0 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.

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	Irclips and splt pins if failed, replace them.	
8	Refer relevant drawings for parts list & installation.	

12.0 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.

13.0 **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.
(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.

***

Annexure-1

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 underframe 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 underframe 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 underframe members for corrosion attention is laid down in RDSO technical pamphlet No C-7602.

1.2 SOLE BAR, BODY 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.

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.
(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: IRS class B2 of approved brands.
- Paints: Red oxide zinc chromate primer – IS 2074-62. Bituminous anti-corrosive solution to IRSP30-96 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 red oxide zinc chromate primer. In addition, underframe members should be given two coats of bituminous solution.

(iii) Where the corrosion repairs are carried out on the underframe or its paint coat is damaged, the under frame should be painted with two coats of red oxide zinc chromate primer followed by the four-coat system of anti-corrosive 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

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 CORRISION 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.

(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

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_2 welding plant
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-3.

Annexure-2

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.

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 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.

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 as shown in Fig.1 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. (hitherto 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 shown in Fig 2a for ICF bogie and Fig 2b for BEML bogie.

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.

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 those shown in Fig 2a for ICF bogies and Fig 2b for 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 given in Fig 2a for ICF bogies and Fig 2b for BEML. 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 Fig 3a for ICF bogie and Fig.3 b for 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).

Important dimensions to be checked after rectification should be as per Fig.2b for BEML bogie and Fig 3a for ICF bogie.

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 per Fig 4a for ICF bogie and fig 4b for 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 as shown in Fig. 5a. for single engine version, Fig. 5b for double engine version and for non powered wheel and axle as shown in fig. 5c 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

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

a) The new/re-turned tyre profile shall be as per RDSO sketch no.91146 (latest revision/alteration).

b) 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.

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

Wheel diameter

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

Permissible variation on wheel tread diameter.

a) 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 under the same coach	13.0mm

b) 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

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

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 shown in Fig. 6a for ICF bogie and Fig.6 b, Fig. 6c & Fig. 6d for BEML bogie.

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 dismounted and thoroughly inspected. If the grease is in good condition, bearing need not be dismounted, but be washed and cleaned in position with petrol or white spirit.

When dismounted 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 dismounted 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 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 gm/cm^3

Oil absorbing power for the felt should be such that after it is immersed in oil at 29^{o}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° C to 50° 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 '0' 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 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 shallbe 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: -

SN	Description of Component	For ICF	For BEML	Renew, if component
1	Guide	EMU/M-0-3-005 (with guide cap) EMU/M-0-3-094 (with circlips	**901-83014**	Bottom thread worn or cracked at the root of radius.
2	Upper spring seat or protective tube.	EMU/M-0-1-001	901-81019	Damaged, dented or cracked
3	Dust shield spring	T-0-1-012	901-81016	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	411-81109	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	901-81021	Worn out more than 1.2m in diameter.
8	Spring clip	T-0-1-614	411-81111	Distorted or broken.
9	Guide cap	EMU/M-0-1-021	901-81013	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.

(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

i) The bolster spring shall be as per RDSO specification WD-01-HLS (latest revision/amendment).

ii) 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 ±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 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 1and 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 roatation 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-e8.
(ii) Centre pivot pin plate has a machined surface so as to bear squarely on the body bolster.

(iii) After fitting the pivit 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 exceed 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 re-welded 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.

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

(iv) 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 sourecs 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

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

(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 ^{o}C as it is made of class-III 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 SEQUENCE 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 levelsInsert 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 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 clearences 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 in the relevant drawings/figurers of BEML & 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 2.6 above should be strictly be 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 with drawn 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 sevice is to feel the axle boxes for any tendencies on their part to get overheated. If any axle box shows to 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 font 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 Maintanence Manual No. C-8419(Latest Revision).

Free height of all the Axle box and bolster springs for OHE CAR should be within the 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 intevals 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 absrobers 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 absobers 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 arangement. 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 indicated by the grooves on the wheel rims/tyres should be used.OHE CAR should not be allowed to run in sevice 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.

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
1.0	**8-WHEELER OHE CAR**			
1.1	Fill water in lavatory over head tank.			
1.2	Drain condensate from automatic drain valves of brake system.			

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
1.0	**8 WHEELER OHE CAR**			
1.1	Repeat all Daily checks			
1.2	Drain condensate from all the air reservoirs, and filter through cut off cocks.			
2.0	**Car Body**			
2.1	Car body should be washed both from outside and inside.			
3.0	**Shell**			
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.			
4.0	**Under frame**			
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.			
5.0	**Bogie**			
5.1	**Bogie frame**			
5.1.1	Examine visually the condition of bogie side frame, transom, longitudinal, bolster etc. at all welded locations.			
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.			
5.2	**Primary Suspension**			
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.			
5.3	**Secondary Suspension**			
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.			
5.4	**Brake rigging**			
5.4.1	Check brake-rigging arrangement for any defects/deficiencies. and check tread brake wherever tread brake units are provided.			
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.			
6.0	**Draw gear**			
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.			
7.0	**Buffing gear**			
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.			
8.0	**Running gear**			
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.			
9.0	**Seats and berths**			
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.			
10.0	**Doors**			
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.			
11.0	**Windows**			
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.			
12.0	**Interior fittings**			
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.			
13.0	**Lavatory and lavatory fittings**			
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 chocked			
13.6	Check and replace damaged/ missing mirrors / shelves / soap dishes			
13.7	Examine squatting pans and foot rest for damages			

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	**Repeat all items of Weekly Schedule**			
2.0	**Bogie**			
2.1	**Bogie frame**			
2.1.1	Examine oil level in side bearer oil-bath and oil-filling cap replenish oil if needed.			
2.2	**Primary Suspension**			
2.2.1	Add specified grade of oil in dashpot.			
2.3	**Brake System**			
2.3.1	Externally clean the brake system pneumatic pipes and check for leakages. If required tighten the end fittings. 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	**Seats**			
3.1	Disinfect the seats and frames.			
4.0	**Lavatory and lavatory fittings**			
4.1	Intensive cleaning of lavatory pans and commode with cleaning agent			

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.			

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
1.0	**Repeat all items of Quarterly Schedule**			
2.0	**Shell**			
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.			
3.0	**Bogie**			
3.1	**Bogie frame**			
3.1.1	Examine condition of side bearer wearing piece and wearing plate.			
3.2	**Primary Suspension**			
3.2.1	Check and attend axle guide assembly if necessary.			
3.2.2	Check axle box clearance with gauge.			
4.0	**Draw gear**			
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.			
5.0	**Buffing gear**			
5.1	Ensure the length is within 584-635mm.			
5.2	Inspect buffer plunger false plate for wear and profile.			
6.0	**Running gear**			
6.1	Check with wheel distance gauge			

No.	Details of work to be carried out	Condition/Action	Sign.	Remarks
	for loose or tight wheel.			
7.0	**Flooring**			
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.			

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			

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			

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
1.0	**Repeat all items of 18 Months Schedule**			
2.0	**Brake**			
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.			

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	**Repeat all items of 18 Months Schedule**			
2.0	**Brake System**			
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.			

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 rolling gear			
15.	Lowering of coach body on bogies.			
16.	Brake Testing			
17.	Testing of branch wiring			
18.	Testing of electrical equipment			
19.	Final Inspection & Dispatch			

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