

## 10.1 COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT

---

### 2. Scope of Work:

The scope of work for this contract has been divided into 2 sub categories. One for maintenance of Diesel Engine by M/s Cummins India Ltd.

And the other for the maintenance of Traction Electric equipment by M/s CG Ltd.

The details are as given below:

### 2.1 Diesel Engine:

The Scope covers carrying out preventive maintenance including spares and coolant for the following engine model TCD2015 V6 of powering DETC.

During the tenure of the contract Deutz shall carry out B Check, C Check and D Check Preventive Maintenance visits including 6 break down visits per engine.

Periodicity of B Check is at 300 hours or six months and C check at 1500 hours or one year whichever occurs earlier.

The scope also covers the 'D' checks maintenance schedule required to be carried out at 6000 hours or two years whichever occurs earlier.

It is assumed that the engine will work total 3600 working hours in a year. So, a total 12 nos. of B Check and two C Check will be required to be carried out per engine per year.

D Check Maintenance will be due within 2 years period and will be carried out within 4-5 working days. Apart from this six Break down visits per engine will be provided under the contract as and when required.

It is to be noted considering the periodicity of the D Check Maintenance total 3 nos. of D Check will be carried out per engine during the total 5 year's tenure of the contract. This depends upon engine operating hours/period crossed after previous D check maintenance.

Maintenance spares along with Belts, Hoses, Gauges and some electrical items like Sensors, switches (Temperature & Pressure) etc. are considered under the scope of the contract. Repairs of Starter motor and 24 V Battery charging alternator are also considered under the contract along with repairs of components like Fuel Pump, Injectors, Water Pump and Cylinder heads required to be done during D Check maintenance.



Any additional Parts requirement apart from the maintenance will be treated separate from the contract and will be charged extra at actuals as per the applicability on case to case basis and YOY basis.

Service visit will be considered of 8 Hours as one full working day. Any additional visit apart from maintenance visits (Inclusive of B, C and D Check), and 6 Break down visits will be charged extra as per the rates given on year wise basis.

Following activities to be covered in B and C check schedules:

- Check safety controls.
- Checking Battery Lead Connections of engine Battery.
- Checking gravity of distilled water.
- Check and replenish the Lube oil level and coolant during the visit, if required.
- Check condition of the hoses, belts etc.
- Check performance of the engines and inform on the performance or any abnormality.
- Provide all maintenance spares required for B check maintenance including coolant required during B check maintenance.
- Replacement of Lube oil & Coolant at desired intervals to maintain the health of engine and stocking quantity for topping up at sites. Only Coolant is in Deutz Scope.  
**Lub Oil and Hydraulic Oil will be in end user's scope.**

Following activities to be covered in D check schedule:

- Repair of Cylinder Heads
- Repair & Calibration of PT Pump /Fuel Pump.
- Repair & Calibration of Injectors
- Repair of Turbocharger
- Repair of Water Pump.
- Change of Coolant.
- Descaling of Cooling System.
- Checking of Vibration Damper
- Adjustment of Injectors and Valve Travel
- Replacement of Cylinder Head Gaskets
- Replacement of Rocker Housing Gaskets.
- Replacement of Tappet Cover Gaskets etc. and all other items as per D Check Maintenance Schedule.

## **2.2 Transmission Electrics and Control System:**

Under this Comprehensive maintenance contract, the following maintenance services will be provided:

- Quarterly preventive maintenance and checks of all the equipments covered under our scope of supply.
- Replacement of any defective or worn out parts as mentioned in the quarterly preventive maintenance schedule.
- Annual overhauling and preventive maintenance and checks of the equipments.
- Replacement of any defective or worn out parts as mentioned in the annual preventive maintenance schedule.
- Providing technical support and necessary suggestions to enhance the performance of the equipments.

Note: The Replaced Components, equipments or any other parts will become property of Inder.

### **2.2.1 Quarterly preventive maintenance schedule**

- These preventive maintenance schedules will be carried out after every quarter of AMC.
- The check points and the work to be carried out during Quarterly preventive maintenance schedule shall be as per Annexure I.
- The components shall be replaced as per the details given in Annexure III.
- Any other service apart from the ones mentioned in schedule or any fresh work or assignment will be charged for, at the charges agreed at that point of time.

### **2.2.2. Annual preventive maintenance schedule**

- The annual maintenance shall be carried out along with the 4<sup>th</sup> quarterly maintenance schedule during each year of the AMC.
- The check points and the work to be carried out during Annual preventive maintenance schedule shall be as per Annexure II.
- The components shall be replaced as per the details given in Annexure III.
- Any other service apart from the ones mentioned in schedule or any fresh work or assignment will be charged for, at the charges agreed at that point of time.

Please note that any breakdown maintenance will not be a part of this contract. However, we will provide our services for breakdown maintenance, which will be charged separately based on the work content during the breakdown maintenance.

### **2.2.3. No. of scheduled visits:**

**1<sup>st</sup> Year of AMC:**

A total of 4 visits (3 for quarterly overhauling (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>) and 1 for quarterly (4<sup>th</sup>) along with annual overhauling)

**2<sup>nd</sup> Year of AMC:**

A total of 4 visits (3 for quarterly overhauling (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>) and 1 for quarterly (4<sup>th</sup>) along with annual overhauling)

**3<sup>rd</sup> Year of AMC:**

A total of 4 visits (3 for quarterly overhauling (1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>) and 1 for quarterly (4<sup>th</sup>) along with annual overhauling)

**4<sup>th</sup> Year of AMC:**

A total of 4 visits (2 for quarterly overhauling (1<sup>st</sup> and 3<sup>rd</sup>) and 2 for quarterly (2<sup>nd</sup> and 4<sup>th</sup>) along with annual overhauling schedule which will be carried out on half yearly basis)

**5<sup>th</sup> Year of AMC:**

A total of 4 visits (2 for quarterly overhauling (1<sup>st</sup> and 3<sup>rd</sup>) and 2 for quarterly (2<sup>nd</sup> and 4<sup>th</sup>) along with annual overhauling schedule which will be carried out on half yearly basis)

**3. Scope of Responsibility**

The items stated here are responsibilities of both INDER and the customer.

**3.1 INDER RESPONSIBILITIES**

- Meet the customer's service schedule date.
- Perform all of the Maintenance service tasks.
- Ensure all action items are completed.
- Inform and provide recommendations to the customer about any action items not included in the Statement of Work.

**3.2 CUSTOMER RESPONSIBILITIES**

- Provide dates and times when the scheduled work can be performed.
- Dismounting and mounting of equipments from the bogie in case of heavy overhauls.
- Facilitate site access for INDER service personnel.
- Notify INDER service personnel of any security clearance requirements in advance of arrival.
- Provide skilled / unskilled manpower as per shift requirement for operation of equipment.
- Notify INDER service personnel of any safety training and safety equipment requirements.

- Provide an on-site point of contact.
- Sign the completed Maintenance forms.
- Spare parts kits are the customer's responsibility.

**INDER** shall provide service from 10:00 AM to 07:00 PM on all working days as per the schedule mentioned to keep the machines / equipment in good working condition. The service consists, corrective maintenance and includes carrying out the necessary repairs and fittings of parts. The maintenance service with the following conditions includes:

The Service Engineers shall attend the faults within 72 working hours from the time when the complaint is received by **INDER**.

No component(s) / spare(s) shall be removed without informing the competent authority.

#### **4. Unauthorized attendance / abnormal usage misuse**

Failure of equipment due to voltage fluctuations, abnormal voltage, defects in your electrical installation abnormal usages or misuse is not covered by this contract. Tempering with or repair of the equipment or Service equipment at any time and under any circumstance whatsoever by any on with the exception of our authorized representative will render the contract null and void. All failures resulting from the above will be rectified on additional chargeable basis.

#### **5. Working hours**

Unless and otherwise specially agreed to all services will be rendered during our normal working hours in all working days of the week (i.e. not on Sunday, Normal holidays and other Public holidays). Your cooperation is solicited to ensure that our engineers do not have to waste their time waiting this delays service to next customer.

#### **6. Damage / Loss**

**INDER** will not be liable for any damage /total destruction of any part of equipment, which may occur in process of handling the equipment, accidents, humidity or causes other than ordinary use unless it is proved that the same was due to wrongful act or negligence on part of **INDER** Staff.

#### **7. Force Majeure**

No liability shall be attracted to us for non- performance or delayed execution of the contract because of force majeure i.e. due to any cause, which is beyond the control of **INDER**.

#### **8. Duration of contract**

These above rates are quoted considering that engines and electrics will get commissioned in Dec 2019 and Warranty period for the engine will be from 2019 to 2020. Hence the AMC rates are quoted beyond Warranty period for 5 years i.e. from the Year 2021 up to 2024.

From : 1<sup>st</sup> Jan 2021

To : 31<sup>st</sup> Dec 2025**11. Price**

	<b>Consumable Spares</b>	<b>Labour</b>	<b>Total</b>
<b>1st year</b>	21,95,398	11,45,777	33,41,175
<b>2nd year</b>	4,42,232	10,33,514	14,75,746
<b>3rd year</b>	20,97,557	13,60,245	34,57,802
<b>4th year</b>	4,98,655	12,36,262	17,34,917
<b>5th year</b>	26,60,983	16,23,343	42,84,326

**12. Rate of unscheduled visit**1<sup>st</sup> year : 12500/per day/per person2<sup>nd</sup> year : 13500/per day/ per person3<sup>rd</sup> year : 15000/per day/ per person4<sup>th</sup> year : 16000/per day/ per person5<sup>th</sup> year : 18000/per day/ per person

- Prices mentioned are exclusive of all taxes. Sales Tax (VAT) as applicable would be charged on the Spares Component and Service Tax would be levied on the labor charges as per the prevailing rates.
- The above prices are applicable up to a maximum of 3600 hours operation of an Engine in every year.
- Travel Cost/Board & Lodging are included in the above rates.



Annexure I  
Quarterly preventive maintenance schedule

---

S. No.	Work to be carried out	Observations	Work carried out	Remarks
<b>1. Traction Alternator C1009A1</b>				
1	Check for any abnormal sound from the bearings			
2	Check for any looseness in the coupling bolts			
3	Check for any looseness in the mounting bolts			
4	Check for any leakage of grease from the bearing covers			
5	Check for any foreign material inside the terminal box			
6	Check for the minimum clearances between the terminals and bus bars inside the terminal box			
7	Check for the looseness of the V belts			
8	Check for any other mechanical damage			
9	Check for any foreign material inside the terminal box			
10	Check and note down the Insulation Resistance of Main stator winding			

11	Check and note down the Insulation Resistance of Exciter stator winding			
12	Check and note down the Insulation Resistance of Main Rotor winding			
13	Check and note down the Insulation Resistance of Exciter Rotor winding			
<b>2. Traction Motor TM2141C</b>				
1	Check for any ingress of Cardium compound in the bearings			
2	Check for any looseness in the in the suspension tube and gear case bolts			
3	Check for any excessive leakages of Cardium compound from the gear case			
4	Check for any leakage of grease from the bearing covers			
5	Check for any foreign material inside the terminal box			
6	Check for any dent or rubbing marks over the surface			
7	Check for any abnormal sound from the bearings			
8	Check for any other mechanical damage			
9	Check for the wear of the			



	carbon brushes and replace if necessary			
10	Check the finish of the commutator and look for the formation of patina over the commutator's surface			
11	Check for the gap of the brush holder over the commutator's surface			
12	Check and note down the insulation resistance of main pole windings			
13	Check and note down the insulation resistance of armature along with the inter pole windings			
14	Check for the tightness of the hardware of sandwich mounting			
15	Check for any cuts, perforation or any other damages in the bellow arrangement			
<b>3. Control Panels</b>				
1	Check for proper contacts of all the tips of the master controller			
2				
3	Check for any obstruction in the movement of master controller main and reverser handle			
4	Check for any leakage from the pneumatic arrangement of the			

	master controller			
5	Check for the proper operation of all the push button switches			
6	Check for the proper operation of all the toggle switches			
7	Check for the proper operation of all the MCBs			
8	Check for the proper operation of all the fuses			
9	Check for any leakages in the pneumatic pipes of MSGC			
10	Check for any leakages from the magnet valves of EP Contactor and EP Reverser			
11	Ensure that proper clearances and creepage distances are maintained among the bus bars			
12	Check for any looseness in the mounting hardwares of each of the components			
13	Check for any external damages to the FRP covers of MSGC			
14	Check for any excessive carbon deposition over the contact tips of the master controller			
15	Ensure that all the relays and contactors are working satisfactorily			
16	Ensure the proper operation of GFR			

17	Check for excessive carbon deposition over the contacts of the EP Contactor			
18	Remove any excessive dirt/ FRP deposition over the over load relays			
19	Check for looseness of the arc chute assembly over the EP Contactors			
20	Check for the any excessive carbon deposition over the contacts of EP reverser			
21	Ensure that all the cables are properly secured to the terminal blocks			
22	Check for blockage of air inlet nets of MSGC			
23	Visually check for any damages to the control cables			
24	Ensure that all the ammeters and voltmeters are working satisfactorily			
<b>4. Power Rectifier</b>				
1	Check for looseness in the mounting arrangement			
2	Check the condition of resistors and capacitors			
3	Check whether red plunger of any of the micro switches is			

	projecting out. If so, replace the corresponding fuse.			
4	Check the condition of diodes			
5	Please check whether the blower is working or not			
6	Check for all the contact tightness and terminal connections			
7	Check the insulation resistance of all the high voltage points using 1500 V Megger			
8	Check the insulation resistance of all the low voltage points using 1000 V Megger			
<b>5. Auxiliary Alternator</b>				
1	Readjust the position of the auxiliary alternator so as to maintain the requisite tension in the V belts			
2	Check for the condition of the pulley			
3	Check for any looseness in the mounting bolts			
4	Check for any leakage of grease from the bearing covers			
5	Check for any foreign material inside the terminal box			
6	Clean the terminal box assembly with compressed air			
7	Check for looseness in all the			



	terminal contacts			
--	-------------------	--	--	--

**Annexure II**  
**ANNUAL OVERHAULING SCHEDULE**

---

S. No.	Work to be carried out	Observations	Work carried out	Remarks
<b>1. Traction Alternator C1009A1</b>				
1	Check for the run out of the coupling plate			
2	Visual check for any development of cracks in the fan			
3	Check for presence of any metal parts in the used grease			
4	Check for looseness of the pulley over the shaft			
5	Note down the winding resistance of all the four windings			
6	Visually check the condition of the diode wheel assembly			
<b>2. Traction Motor TM2141C</b>				
1	Check for the condition of the felts and seals of the gear case and replace, if necessary			
2	Check for the level of cardium compound in the gear case and			

	replenish, if necessary			
3	Check for any ingress of cardium compound in the bearings			
4	Check for presence of any metal parts in the used grease			
5	Check for any cuts or damages over the traction motor main cables			
6	Check for the perpendicularity of brush holders			
7	Check for the spring tension of the brush holder springs			
<b>3. Control Panels</b>				
1	Check for spring tension of the contact tips of the master controller			
2	Check for any cracks or excessive wear of the cams of the master controller			
3	Ensure that all the LEDs of the indication panel are working satisfactorily			
4	Check for the pick up of EP Contactors			
5	Check for blockage of air inlet nets of MSGC			
6	Check for any excessive wear of the EP Contactor contacts			
<b>4. Power Rectifier</b>				
1	Clean the rectifier unit with			

	compressed air			
2	Clean the insulator with cloth or brush			
3	Short the AC terminals R, Y and B along with the DC terminals P5 and G0 and conduct dielectric test at 2000V, 50 Hz for 30 seconds for high voltage points			
4	Short the terminals of terminal board TB1 having ferrule nos. 1608 and 320. Apply a voltage of 1000V, 50 Hz for 30 seconds			
<b>5. Auxiliary Alternator</b>				
1	Short the AC terminals R, Y and B and carry out dielectric test at 500 V, 50 Hz for 30 seconds			
2	Measure the insulation resistance of the stator winding using 500 V Megger			

## Annexure III

### LIST OF CONSUMABLE SPARES FOR DETC/ US

---

These spares should be maintained by the end user and shall furnish the components during overhauling as per the details given.

#### 1) TRACTION ALTERNATOR C1009TA

##### 1.1 V Belts

To be replaced in 2<sup>nd</sup> and 5<sup>th</sup> year of the AMC during annual overhauling schedule

##### 1.2 Ball Bearing

To be replaced in 5<sup>th</sup> year of the AMC during annual overhauling schedule.

#### 2) TRACTION MOTOR TM2141C

##### 2.1 Carbon Brushes

To be replaced during 2<sup>nd</sup> quarterly and annual overhauling schedule of each year.

##### 2.2 Arm. Bearings (CE and PE)

To be replaced in 5<sup>th</sup> year of the AMC during annual overhauling schedule.

#### 3) CONTROL GEAR

##### 3.1 Cams (Master Controller)

To be replaced in 1<sup>st</sup> and 4<sup>th</sup> year of the AMC during annual overhauling schedule

##### 3.2 Switching contacts (Master Controller)

To be replaced in 1<sup>st</sup> and 4<sup>th</sup> year of the AMC during annual overhauling schedule

##### 3.3 Main contacts (EP Contactor)

To be replaced in 3<sup>rd</sup> year of the AMC during annual overhauling schedule

##### 3.4 Main contacts (EP Reverser)

To be replaced in 3<sup>rd</sup> year of the AMC during annual overhauling schedule





### **3.5 Magnet valves (EP Contactor)**

To be replaced in 3rd year of the AMC during annual overhauling schedule

### **3.6 Magnet valves (EP Reverser)**

To be replaced in 3rd year of the AMC during annual overhauling schedule

**LIST OF RECOMMENDED CONSUMABLE SPARES FOR DETC/ US****1) DIESEL ENGINE**

S.No.	Description	Cost / Unit	Qty	Total Cost in Rs.
1	Valve Check	750	1	750
2	Pump, water and Idler	27500	1	27500
3	Hose flexible	23300	2	46600
4	Injector	31000	6	186000
5	Gasket, Fuel Pump	30	1	30
6	Belt, V- ribbed	3350	2	6700
7	Gause, Pressure	750	1	750
8	Ammeter	400	1	400
9	Belt, V- ribbed	600	2	1200
10	Gsket, Hydraulic Pump	75	1	75
11	Valve, Check	330	1	330
12	Harness, wiring	1550	1	1550
13	Motor, Hydraulic	135000	1	135000
14	Hour meter	7400	2	14800
15	Tachometer	26400	2	52800
16	Switch, Over speed	3540	1	3540
17	Valve, Check	2250	1	2250
18	Valve, Shut off	6100	3	18300
19	Valve, Air shut off	2210	1	2210
20	Pump, Hydraulic	279000	1	279000
21	Turbo Chrgeer	90100	3	270300
22	Gauge, Pressure	1170	2	2340
23	Gauge, Temperature	1120	2	2240
24	Gauge, Temperature	1130	2	2260
25	24 V Battery cahrging alternator	95000	1	95000
26	Pickup, magnetic	8000	1	8000
27	Switch, Temperature	3800	1	3800
28	Starting Motor	71000	1	71000
29	Gauge, Temperature	1160	1	1160
30	Hose flexible	610	2	1220
31	Hose flexible	1100	2	2200
32	Hose flexible	1800	2	3600
33	Hose flexible	2200	2	4400
34	Hose flexible	2270	2	4540

35	Hose flexible	2530	2	5060
36	Element, Lube Oil Filter	470	15	7050
37	Corrosion Inhibitor	490	15	7350
38	Element, Air cleaner	1225	1	1225
39	Element, Air cleaner	5275	15	79125
40	Kit, Super Byp Filter Elem	1000	15	15000
41	Kit, Fuel Filter and ring	670	15	10050

**2) TRACTION ALTERNATOR C1009A1**

S. No.	Description	Cost / Unit	UOM	Qty	Total Cost in Rs.
1.1	Ball Bearing	50000	Sets	2Sets	100000
1.2	Diodes	102000	No	2Nos	204000
1.3	Aluminum Fan	47000	No	1No.	47000
1.4	Pulley	41000	No	1No	41000
1.5	V Belts	8000	Sets	1No	8000

**3) TRACTION MOTOR TM2141C**

S. No.	Description	Cost / Unit	UOM	Qty	Total Cost in Rs.
2.1	Carbon Brushes	6400	Sets	2Sets	12800
2.2	Brush Holders	9100	No	4Nos	36400
2.3	Arm. Bearings (CE and PE)	68500	Sets	2Sets	137000
2.4	Sus. Bearing (GWE and RWE)	120000	Sets	2Sets	240000
2.5	Gear Case	54000	Sets	1Set	54000
2.6	Pinion	30600	No	1No	30600
2.7	Main Cables	55000	Sets	1Set	55000

S. No.	Description	Cost / Unit	UOM	Qty	Total Cost in Rs.
--------	-------------	-------------	-----	-----	-------------------

4)

3.1	Set of Bearings	18000	Sets	2Sets	36000
3.2	Rotor Fan	12000	No	1No	12000
3.3	Pulley	9000	No	1No	9000

**AUXILIARY ALTERNATOR****5) POWER RECTIFIER**

S. No.	Description	Cost / Unit	UOM	Qty	Total Cost in Rs.
4.1	Regulator Rack	33000	No	1	33000
4.2	Excitation Transformer	6000	No	2	12000
4.3	Current Transformer	3000	No	2	6000
4.4	Voltage Detector DT 1	2160	No	1	2160
4.5	Voltage Detector DT 2	1800	No	1	1800
4.6	Field Rectifier Diodes D5, D6, D7	1800	Sets	1	1800
4.7	Magnetic Amplifier	21600	No	1	21600
4.8	Capacitor assembly C1, C2 & C3	1200	Set	2	2400
4.9	Rheostat Rh1 & Rh2 - 1 no each	1000	Set	2	2000
4.10	Rectifier Board Assembly	18200	No	1	18200
4.11	Control Rectifier Assembly	3000	No	1	3000
4.12	Phase fuse	500	No	2	1000
4.13	Field Fuse	250	No	2	500
4.14	DMC Terminals (7 Nos/set)	1500	Set	1	1500
4.15	Resistance RB I	600	No	1	600

4.16	Power Diode	1600	No	1	1500
4.17	Gasket for Rect. & Reg. Assembly	300	No	2	600

**6) CONTROL GEAR**

<b>S. No.</b>	<b>Description</b>	<b>Cost / Unit</b>	<b>UOM</b>	<b>Qty</b>	<b>Total Cost in Rs.</b>
5.1	HRC Fuses	1000	Set	3	3000
5.2	Resistors 36ohms, 300W	2800	Set	2	5600
5.3	Earth Fault Relay	11800	No	2	23600
5.4	General Purpose Relay	3400	No	20	68000
5.5	Toggle Switches	500	No	5	2500
5.6	Reverse Current Diode	3500	No	2	7000
5.7	Arc Chutes for Contactor	5100	No	2	10200
5.8	Cam Switches -Master Controller	2200	No	10	22000
5.9	MCB	650	No	10	6500

**LIST OF SPECIAL TOOLS**

---

EQUIPMENT	QTY	
1. <u>TRACTION ALTERNATOR</u>		} 2,80,000/- Per Set.
1.1 Lifting Shackle	1 No	
2 <u>TRACTION MOTOR</u>		
2.1 Lifting Shackle	1 No	
2.2 Extractor for PE Bearing inner race	1 No	
2.3 Extractor for CE bearing	1 No	
2.4 CE protecting sleeve and lifting cap	1 No	
2.5 Retaining plate for PE Bearing	1 No	
2.6 Lifting Cap P.E.	1 No	
2.7 Protecting Sleeve PE Bearings	1 No	
3. Auxiliary Alternator	No Special Tools required.	
4. Control Gear	No Special Tools required	
5. <u>Diesel Engine</u>		} 3,50.000/- Per Set
5.1 Fixture,injection timing		
5.2 Pressure gauge, 0-160 in		
5.3 Assy,dial ind & sleeve		
5.4 Holder,dia indicator		
5.5 Multimeter,digital		