

### **Schedule of Work**

**Name of Work: Outsourcing of maintenance of PSI assets under jurisdiction of DEE/TRD/AII , Ajmer Division for period of two years.**

<b>S N</b>	<b>Description</b>	<b>Unit</b>	<b>Qty</b>	<b>Unit Rate</b>	<b>Amount</b>
1	Yearly Schedule Maintenance of TSS	Each	8	124370.00	994960.00
2	Half Yearly Schedule Maintenance of TSS	Each	8	63665.00	509320.00
3	Monthly Schedule Maintenance of TSS	Each	80	34657.00	2772560.00
4	Yearly Schedule Maintenance of SP/SSP	Each	36	32190.00	1158840.00
5	Half Yearly Schedule Maintenance of SP/SSP	Each	36	17507.00	630252.00
6	Monthly Schedule Maintenance of SP/SSP	Each	360	4932.00	1775520.00
7	Fortnightly Maintenance of Battery and Battery Charger of TSS, SP & SSP	Each	1056	1697.00	1792032.00
8	Quarterly Maintenance of 5/10/25 kVA AT at stations & LC gates	Each	372	1650.00	613800.00
9	Rectification of 25 KV dropout fuse	Each	120	1831.00	219720.00
10	Manning of TSS/SP/SSP in case of Emergency , SCADA failure , VIP movement & OFC Block .( 8Hrs Each) ( one skilled staff and one unskilled staff)	Each	110	2005.00	220550.00
11	Breakdown call of TSS ( 8Hrs)	Each	16	5602.00	89632.00
12	Breakdown call of SP/SSP ( 8Hrs)	Each	72	3811.00	274392.00
13	Breakdown call of AT (8 Hrs)	Each	12	3810.00	45720.00
14	Supply and repainting of PSI equipments like Traction Transformer, CB, BM, PT, AT etc as per site requirement with water proof gray enameled paint from any of RDSO approved brand paint i.e. Asian or Berger brand / make paint confirming to IS:2932 or latest.	Sq-M	1310	74.00	96940.00
15	Supply and repainting of PSI assets i.e. Fencing Panels, Fencing uprights, barbed wires, TSS / Switching posts and Tubular Poles at TSS in electrified section with Aluminium Paint from any of RDSO approved brand / make confirming to IS:2339 or latest.	Sq-M	3300	68.00	224400.00
16	Supply and spreading of ballast / pabbles / gravels in Switching Stations / TSS yard.	CuM	200	2666.00	533200.00
17	Supply and erection of Earth pit cover and Box	Nos.	150	1712.00	256800.00
18	Hiring of 15T crane on hourly basis	Hour	150	2045.00	306750.00
19	Providing data entry operator at OHE depots.	Man-Days	2504	1037.00	2596648.00
20	Reinforce concrete for cable trench and cover	CuM	116	2510.00	291160.00
21	Supply of material for single earth electrode	Nos.	60	4079.00	244740.00
22	Erection of material for single earth electrode	Nos.	60	1865.00	111900.00
23	Provision of repair of PSI equipment through OEM/Authorised vander on Emergency/Urgent basis	LS	1	1000000	1000000.00
<b>Total Cost of Work</b>					<b>16759836.00</b>

**(Cost of the work : One Crore Sixty Seven Lakhs Fifty Nine Thousand Eight Hundred Thirty Six Rupees Only)**

### SPECIAL CONDITIONS OF CONTRACT

1. The scope of work covered under this contract is “To carry out the all the schedule maintenance & breakdown attending (replacement / attending of defective parts and accessories and maintain the equipment in safe and efficient working conditions) of all the Power Supply Installation equipments. Manning of switching posts as per the requirement of Railways during breakdown / VIP movements”.
2. The procedure and planning to carry out the work should be discussed with Senior Divisional Electrical Engineer (Traction Distribution) Ajmer and or his authorized representative.
3. The contractor shall provide uniform to all the skilled and unskilled staff hired for this work. Code & type of the uniform shall be decided by Sr.DEE/TRD/Ajmer after awarding of work. Contractor shall ensure that each hired person must be equipped with android mobile phone so that multimedia communication can be done by Railway representative. All other requisite petty items, accommodation, to & fro transportation, other financial liabilities of contractual labour etc shall be provided to all by contractor, Railway shall not be responsible for the same.
4. All the details of staff engaged in the work along with requisite documents must be uploaded at Shramik Kalyan Portal by the contractor.
5. All the maintenance work will be carried out under the supervision & in the presence of authorized representative of Railway.
6. Standard Performa of maintenance will be signed jointly by Railway representative & the supervisor of the contractor.
7. No accommodation etc. will be provided to the contractor or his staff. The arrangement for the stay of the contractor’s staff shall be made by the contractor at his own cost.
8. The contractor and his employees shall neither be treated as railway employee, nor shall they have any right for claiming the same.
9. The identity card should be issued to the staff nominated to work in the railway premises by the contractor indicating Name of the person, Name of the firm and place of work etc. If identity card is not issued to contractor workers, workers will not be permitted to work in the Railway premises. The list of the workers should be submitted to this office for records in advance. All the identity cards will be countersigned by railway representative. However, the contractor shall have to supply the cards along with recent stamp size photograph of the employee at least before 07 days of the start of work.
10. Safety of contractor’s labour/workers will lies upon the contractor. Railway will not be responsible for any accident or casualty or harm to the contractor’s labour/workers.

11. The work should be carried out in such a manner that there is no harm to Railways staff and equipment installed at site. The contractor will be responsible for any loss or damage caused by him or by his labour and recoveries for all such things, as decided by Senior Divisional Electrical Engineer (Traction Distribution) Ajmer, shall be made from contractor's payment.
12. All the personnel safety gears, equipments & gadgets like safety belts, helmets, safety shoes, hand gloves of appropriate voltage level capacity etc shall be provided to all the staff by contractor.
13. Program of maintenance activity shall always be planned/submitted by contractor in consultation with Railway Supervisor, a week well in advance to concern work in-charge.
14. Railway will arrange for the 110 V / 230 V supply free of cost at the switching station as per feasibility. In case if requirement of generator (for AC supply) will be arranged by contractor itself.
15. Railway will arrange necessary shutdown for the maintenance work or as well as in case of breakdowns. The work will be carried out in presence of Railway representative.
16. If any day maintenance of equipment is not carried out due to some problem from Railway side, or due to some eventuality, then the maintenance shall be carried out in next day or agreed mutually. However all efforts will be made by the railway. No extra payment will be given to the tenderer for such event.
17. The contractor should have all the T&P, required to carry out the breakdown as well as preventive maintenances during the contract period, in his possession. Moreover, these T&P should have latest scheduled calibration certificate.
18. Railway administration shall not be responsible for any accident/theft, fire, damages etc. to the contractor during the period of contract.
19. Maintenance register in hard binding copy shall be prepared by the contractor and maintained at each OHE depot in the standard maintenance format. This maintenance register should be updated by the contractor and jointly signed with Railway representative. Contractor has to maintain this registers as per prescribed format at his own cost and will produce at any time if demanded by the Railway authority. Contractor also to provide the maintenance proforma for each maintenance at his own cost.
20. Any damage to Railway property while carrying out the maintenance shall be sole responsibility of contractor and replacement shall be done by the contractor at his own cost.
21. The tenderer shall indemnify the Railway against any or all claims, which may arise under the Motor Vehicles ACT or Workman's compensation Act or any other

act or stature having bearing over the services and for engagement of workmen, directly or indirectly for performance of work under the contract.

22. The tenderer shall indemnify the Railway and its employees against any penalties as PRINCIPAL EMPLOYER, for any failure of the tenderer to honor various Central/ State Government laws/ enactments.
23. The contractor shall at all times keep the Railway Administration indemnified against and shall reimburse the Railway Administration for all claims, demands, suites, losses, damages, costs charges and expenses what so ever which the Railway Administration may sustain or incur in case of any injury to any person or to any property resulting directly or indirectly from any act of omission or commission on the part of the contractor or his servant and employees in the conduct of the business for the purpose for which this contract is granted.
24. The tenderer shall be liable to honour Central & State Govt. laws, statutory rules, regulations, notification like legislation, local self Govt./ Municipal requirement, Employment of Children Act, 1958 etc. and shall be solely responsible for any breach thereof. Railway stands indemnified against any penalty/prosecutions consequent to the violations (deliberate or inadvertence) by the contractor or his employees, representative etc. of such statutory provisions in force.
25. The contractor shall be responsible for compliance of the provisions of the hours of employment regulations in respect of the staff employed by him in the manner decided upon by the appropriate authorities.
26. The contractor shall pay to his staff engaged in connection with the contract not less than wages being the wage notified from time to time by the competent state, center or local authority empowered thereof. The wage paid shall not be less than those prescribed by any law enacted by the Govt. of India or by state Govt. concerned in so far as it may be applicable to such staff engaged on such work on the railways. The contractor shall maintain proper record of payments and submit to the administration a certificate every month that he has paid wages in accordance with the provisions of this clause.
27. The contractor has to ensure compliance with the provisions of "The Contract Labour (Regulation and Abolition) Act, 1970 and "The Contract Labour (Regulation and Abolition) Central Rules, 1971 as amended from time to time.
28. Contractor is responsible for the payment of wages to the staff deployed under section 21 of "The Contract Labour (Regulation and Abolition) Act, 1970 and to ensure compliance especially with the Rules 63 to 83 of "The Contract Labour (Regulation and Abolition) Central Rules, 1971 in this regard.
29. Contractor is responsible for maintenance and exhibition of records as prescribed in section 29 of the "The Contract Labour (Regulation and Abolition) Act, 1970.
30. The contractor is responsible for the maintenance of Muster Roll, Wages Register, Deduction Register and Overtime register as per rule 78 of "The Contract Labour (Regulation and Abolition) Central Rules, 1971.

31. The contractor shall be governed by the general conditions of contract and security deposit, performance guarantee, Income Tax etc. shall be deducted as per extant rules.
32. All the instruments, T&Ps and M&Ps required for testing & measurement of equipments as per maintenance schedule of PSI equipments shall be arranged by the contractor. No T&P, M&P and testing instruments shall be provided or arranged by Railway.
33. It is the contractor's responsibility to complete all the preventive maintenance schedules within stipulated time period as under:
  - (a) Traction Substation:**
    - (i) Yearly schedule in 11 days
    - (ii) Half Yearly schedule in 06 days
    - (iii) Monthly schedule in 05 days
  - (b) SP / SSP:**
    - (i) Yearly schedule in 04 days
    - (ii) Half Yearly schedule in 03 days
    - (iii) Monthly schedule in 01 day
  - (c) Auxiliary Transformer with changeover panel:**
    - (i) Yearly schedule in 01 days
    - (ii) Quarterly/ Half Yearly schedule in 01 days

**Enough competent manpower with transportation facilities should be provided by the firm to carry out scheduled maintenance of items defined in the tender within time frame. The contractor has to deploy sufficient number of skilled & unskilled man power accordingly. No Railway transportation will be provided for the execution of the work.**

**Contractor will depute minimum 07 Nos. staff ( 03 Skilled and 04 Un skilled) and 01 supervisor with transportation facility & T&P for maintenance & breakdown during contract period. Contractor may require to increase manpower if there is shortfall in schedule maintenance or additional requirement at breakdown site. ( Mentioned manpower in the para are other than the Data Entry operator to be provided under NS-19)**

The contractor should deploy a qualified Diploma Electrical Engineer (Diploma in Electrical Engineering or Electrical & Electronics Engineering), during complete contract period to supervise complete maintenance work & maintain all the records properly. Moreover out of the staff deployed by the contractor for maintenance purpose **skilled staff** should has been possessed minimum ITI (Electrical related) or Diploma (Electrical) as educational qualification. In addition unskilled staff should also be deployed for maintenance purpose has been possessed minimum 8<sup>th</sup> pass . Railway (concerned field officer) shall issue competency to the concern staff followed by viva-voce for working in the 25KV electrified territory.

34. Subject as otherwise provided for in this contract all notices to be given on behalf of the president of India and all other action to be taken on his behalf may be given by the Sr. DEE/TRD/Ajmer or any other officer authorized by him to do so.
35. In the event of the contractor failing to comply with or committing any breach of any of the terms of his agreement, the Railway Administration can terminate the agreement forthwith as per GCC.
36. Railway shall not be responsible to sort any dispute between hired persons and contractor. It is sole responsibility of contractor to hire persons with NO criminal background ensuring the same at his own responsibility. Police verification certificate of all the persons hired by the contractor must be submitted in two copies, one copy to concern SSE in-charge and one copy in the office of SrDEE/TRD/Ajmer without fail prior to taking the hired persons on-duty.
37. The quantity of work as prescribed in the schedule of work may decrease/ increase and will be binding on the contractor.
38. Contractor shall return all the released material if any, to the concerned depot of Railways.
39. Replacement/rectification of all defective component/cards by the contractor shall be done as per need basis, so as to maintain complete system healthy. The contractor should ensure 100% reliability of all associated equipments to ensure correct switching operation.
40. All maintenance instruction/schedule prescribed by OEM shall be strictly followed. If the major overhauling of any equipment is required during the execution of the contract, it should be carried out through OEM / authorized dealer of OEM.
41. The tenderer will carry out the AMC works as and when the due date comes as per the mutually agreed schedule. Railway will inform to the tenderer about the preferred date.
42. After the test the result will be tabulated and jointly signed by Firm and Railway Representative after satisfactory working.
43. All safety precaution shall be taken by the contractor during maintenance. In case any loss or damages to the equipments on account of contractor during working. The cost will be deducted from the running bill of the firm.
- 44. All the necessary requisite mandatory compliance i.e. Competency certificate for the staff , Uniform , Police verification certificate/ Application, Id card and Maintenance proforma will required to be fulfilled by the firm within 15 Days. In case of noncompliance of these , strict action will be taken as per rules.**
- 45. Penalty Clause (No penalty shall be imposed, if delay is on account of Railways):**
  - a) After issuance of LoA, the contractor has to start the maintenance work within 20 days and all the arrangement of T&P, transportation facilities and competent manpower has to done in this duration.
  - b) In case the contractor performance in maintaining the system is unsatisfactory and frequently interruptions are experienced, the railway shall be at liberty to terminate the contract after fixing a month notice without prejudice to any other conditions of contract.

- c) **For not carrying out the maintenance even after lapse of 10 days of schedule/due date:** If any of the schedule maintenance activity is not carried out by the contractor even after lapse of 10 days of schedule/due date then penalty of 5% of the unit price of activity amount shall be imposed on per day basis ( counted after the lapse of grace period of 10 days) until schedule maintenance activity is executed by the contractor as per tender conditions.
- d) **For not attending the maintenance call on the day as per schedule activity planned by Railway representative:** In case a maintenance activity is planned on a particular day & intimated to contractor by Railway representative and contractor's staff fails to attend the activity a token penalty of Rs. 5,000/- per instance shall be imposed on the contractor.
- e) **For any skilled or unskilled staff causing nuisance/intoxication/in-disciplinary act/misbehaviour/absconding from duties:** In this case token penalty of Rs. 2,000/- shall be imposed on the contractor. Moreover, after repetition of such act 03 times, contractor shall replace the staff within 07 days of intimation from Railway representative, failing which penalty of Rs. 5,000/- per day (08<sup>th</sup> day onwards, including 8<sup>th</sup> day too) shall be imposed.
- f) **In case of failure of equipment or its associated parts, which are under this contract:** Contractor shall not be liable for failure to perform any obligation or delay in performance resulting from any or beyond the control of contractor or from any act of God or strike or riots or sabotage etc.. However if it is established that any breakdown is a result of inadequate / improper maintenance work carried out by the contractor, Railway will impose a penalty of Rs. 5,000/- every such incidence. The cost of damages / loss if any to railway shall also be recovered from contractor.
- g) **Non-utilization of Power Block / Bursting of Power Block / Poor progress for every hour of Power Block:** If contractor's staff fails to utilize power block / shows poor progress for every hour of power block utilized / burst a power block as proved in Railway findings a penalty of Rs. 2000/- on flat rate basis per occasion shall be imposed on the contractor. If block burst results in detention of train operation the penalty amount will be Rs. 10000/- per occasion.
- h) **In case of wrong operation of switchgear/any equipment:** Penalty of Rs. 2,000/- per such incidence shall be imposed. If wrong operation results in detention of train operation / breach in safety norms the penalty amount will be Rs. 10000/- per occasion. The cost of damages / loss if any to railway shall also be recovered from contractor.
- i) **Breakdown Call:** If the contractor failed to provide manpower and arrangement within timeframe given below, penalty at the rate of 1000/- per hour delay (calculated after lapse of prescribed timeframe & upto time of restoration of breakdown) will be imposed:

S. No.	Location	Timeframe to Reach	
		Daytime	Night Hours (22.00 Hrs. to 06.00 Hrs.)
1.	Ajmer/ BangurGram / Bijainagr Depot as desired by Railway.	30 Mins. After receipt of information	45 Mins. After receipt of information.

j) Above mentioned penalty shall be applicable on all the items mentioned in the Schedule of Qty & Rates and covered under the scope of work of this tender.

k) All the penalties imposed by the Railway Administration referred to above will be deducted from the regular bills and contractor shall have no right for any objection.

Decision of Sr.DEE/TRD/Ajmer shall be final and binding to the contractor. In case of any dispute regarding interpretation of any of the above quoted clauses, decision of the Sr. DEE/TRD/Ajmer will be final and binding of the contractor.

**46. Price and Payment clause :**

- i. Rates in above SOR are inclusive of GST of @18% or applicable as per extant rules.
- ii. The following payment terms shall be applicable subject to certification of work to the satisfaction of the engineer. 100% of prices of item mentioned in schedule of quantity & rates after successful completion of maintenance/requisite activity as per explanatory note of tender followed by special conditions of contract and certified by work in-charge on **quarterly** basis.
- iii. Price variation clause is not applicable on this contract.

**47. Guarantee Period :**

The Contractor shall Guarantee satisfactory working of all the equipment & the installations maintained by him, shall be guaranteed for trouble free and satisfactory performance during the contract period. Penalty clause as mentioned in the SCC shall be applicable.

**48 . Notes**

- Below mentioned explanatory notes has been prepared as per present practice being adopted as per various Maintenance Instructions issued by Railway Board / RDSO / HQ / CORE etc. However if there is any change in the Maintenance Instruction, contractor has to carry out the maintenance work accordingly without any extra charge.
- The Checking and maintenance of all items of switching Yards/Stations in the sections of proposed works including AOH & POH as case may be shall be carried out in line with relevant Paras of ACTM Vol-II Part- I of Indian Railways with its latest correction slips and as per Latest SMIs if any during contract period OR as per the Procedure in vogue in TRD organization of respective Divisions. No additional payment will be made for any additional man power deployment in attending to latest maintenance instructions if any. In case of disputes between above standards if any, the decision of Sr.DEE/TRD/Ajmer is the final and contractor is bound to act accordingly.



**Item No. 1 :****Yearly Schedule Maintenance of TSS :****General Works on TSS :**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Building	Check for roof cleaning , leakage and condition of building . attend the same if any deficiency.
3	Lightning screen	Check & tight strain clamp of wire. If observe any defect attend it.
4	Structure & fencing	Check structure and fencing for soundness.
5	Trenches	Open and clean trenches for possibility of lizard and other insects' entry in control panels / equipments.
6	Tree & branches etc.	Check & prune the tree branches near to live conductor as required

**Traction Power Transformer 21.6/30 MVA or 30/42 MVA**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Transformer tank, bushings, taps changer, radiator and connection joints	Check infrared temperature scanning. Infrared temperature scanning is to be done preferably at the time of full load to find any overheating.
3	OIP condenser bushing	Measure, record & compare the test for Tan-delta, capacitance and IR (Shearing bridge may be used for tan delta & capacitance). Compare with earlier value. In case of deviation in reading from standard value inform to railway for further course of action.
4	Gasket joints of transformer	Check & tight the bolts evenly to avoid uneven pressure in case of leakage only.
5	Rod gap setting of bushing	Check rod gap setting , adjust if required
6	Oil filled bushing (not hermetically sealed)	Test for BDV and acidity. In case low BDV and high acidity, filter/replace oil as per supplier catalogue
7	Test oil in transformer	Test oil as per Annexure –I. The oil sample is tested as per confirm to IS 1886:2000. If the oil value does not meet the requirement oil to be replaced.
8	Dissolved gas analysis (DGA) on oil	Oil sample taken for DGA as per RDSO guide line at Annexure2.04 of ACTM Vol.-II Part-I. Test result compare with the RDSO Guideline and action taken accordingly.
9	Working of tap changer switch	Move the tap setting switch up and down full range so that by self-wiping action good contacts are assured.
10	Relays, alarm & their circuits	Check relay and alarm contacts, their operation, fuses etc. And relay accessories. Clean the components, replace contacts and fuses if necessary. Change the relay setting if necessary.
11	Control boxes & Terminal boxes/ cable	Check for water tightness of boxes & terminal boxes, Replace gasket, if required.
12	Temperature indicators	Check for pockets, holding thermometer oil to be replenished, if required.
13	Dial, type of gauge	Check pointer for free movement. Adjust, if required.
14	Earth resistance	Measure & record earth resistance by earth tester. Take suitable action, if earth resistance is high.
15	Buchholz relay	Check operation and measure the insulation resistance by 500V megger and continuity test for contacts with test lock screw set as 5°.

16	Voltage ratio test with wheat stone bridge, voltmeter	Precautions to be taken as per normal practice being followed for measurements with wheat stone bridge. Compare the trends of the ratio with reference to pre commissioning / factory value/ earlier test.
17	Winding resistance test with wheat stone bridge voltmeter – ammeter etc.	The test conducted on principal tap by applying DC current. The measured value should be converted to 75°C for conversion. Compare the value with the pre-commissioning/ factory test values. Deviation in absolute value should be less than $\pm 5\%$ of pre- commissioning or factory set value.

#### **132/220 kV SF- 6 Circuit Breaker :**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Connector	Check & Clean Connector nuts, bolts, washer and biometric strip. Polish the surface and freely place bimetallic strip properly, If provided.
3	Screen Operation timing	Check & record closing & opening timing with timer as per OEM.
4	Closing & trip coil	Check & record closing & trip coil parameter as per OEM: i. Voltage, ii. Watt, iii IR Value Check with measuring instrument (500 V megger & millimeter)
5	Spring	Check & record spring charging motor parameter as per OEM: i. Voltage, ii. Watt, iii IR Value Check with measuring instrument (500 V megger & millimeter)
6	Contact resistance (CB close position)	Check & record contact resistance of fixed & moving contact with contact resistance meter.
7	Check the setting of Gas Pressure & note it etc.	

#### **25 kV Vacuum Circuit Breaker / Interrupter:**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Auxiliary switches connected in conjunction with mechanism	Check for correct position of the auxiliary switches and carry out few close & open operations. Signals occurred correctly and driving level is correctly positioned auxiliary switch.
3	Cable glands	Check tightness of the fairleads and locked. The free fairleads must be covered with relative plate and blocked.
4	Terminal Connectors	Check & clean connector, nuts, bolt, washer and bimetallic strip. Polish the surface and freely place bimetallic strip properly, If provided.
5	Measure & record the Closing & Tripping timing by timer in millisecond as per OEM.	
6	Measure the Contact resistance in Micro ohms as per OEM etc.	
7	Speed regulator	Inspection of free movement
8	Reduction gear	Oil leakage / abnormal sound
9	Fasteners of motor limit switch and auxiliary switches	Tightness of the fasteners and terminal screws, split pins/snap pins etc. Tighten/locking to be done if found loose.

10	Closing (at 85%) and tripping (at 70% of rated)	If not operate change the coil
11	Open/Close operation	Operate 10 electrically and 10 manually operations
12	Contact Resistance	Contact resistance of main contacts shall be measured by micro ohm meter and shall be as per OEMs specified value.

#### **Auxiliary Transformer**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Winding continuity	Measure & Record winding continuity on all tapings with multimeter/ 500 V megger
3	Tap changer	Check the smooth operation of tap changer on all tapings.
4	Acidity of oil	Check the acidity of transformer oil
5	Ratio test	Conduct ratio test by applying AC supply to HV winding and measure the voltage at LV side winding.
6	Jumpers	Check HT and LT jumpers & lugs for loose & flash mark. Replace if loose & flash.
7	Painting	Paint to be done, if color of tank is faded/ rusted.
8	DO fuse wire etc.	Replace the fuse wire with new one.

#### **25 kV Potential Transformer**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Duplicate earthing	Check duplicate earth conditions for broken & loose. Attend the same.
3	Oil testing if possible	Test the oil with BDV tester. If possible.
4	Ratio test	Conduct ratio test by applying AC supply to HV winding and measure the voltage at LV side winding.
4	Painting etc.	Paint to be done, if color of tank is faded/ rusted.

#### **Current Transformer 220kV / 132 kV/25kV**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Arching horn gap If provided	Check & measure arching horn gap as required
3	Oil testing, if possible	Test the oil with BDV tester.
4	Painting	Check for painting, if color of tank is faded/ rusted.
5	Polarity test	Conduct polarity test and check the direction of current.
6	Ratio test etc.	Conduct ratio test by applying current HV winding and measure the current LV side winding

#### **132 kV/220 kV Isolator Type – Double pole, Triple pole**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Operation of isolator (Double & Triple pole)	Check the operation of isolator slowly and check for simultaneous operation of blades on the poles and correct alignment of blade tips in the fixed contact jaws of the poles.
3	Insulation resistance	Measure & record IR values of pedestal and tie rod insulators with 2.5 kV megger.
4	Operating handle of main blade and earth blade, if provided	Check the locking arrangement to the operating handle of main blades and earth blade.

5	Bearing	Check & clean the bearings of rotating bushings of insulator and lubricate with grease.
6	Bus connections and bimetallic strips	Check & clean for tightness, sign of oxidation on bus connections and bimetallic strips correct if necessary. Replace bimetallic, if required
7	Paint etc.	Check & replace rusted parts and paint the on rusted parts, if any

### **25 kV Isolator Type – Single pole, Double pole, and Bipolar**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Operation of isolator (Double pole)	Check the operation of isolator slowly and check for simultaneous operation of blades on the poles and correct alignment of blade tips in the fixed contact jaws of the poles.
3	Interlocking operation	Check & clean interlocking operation with circuit breaker.
4	Blade tips and fixed contact fingers	Check the condition of the blade tips and fixed contact fingers for any sign of overheating and presents of buffs. Clean the buffs.
5	Clearances of blade	Measure the clearances of blade in open position. Measure and record and adjust if necessary.
6	Insulation resistance	Measure & record IR values of pedestal and tie rod insulators with 2.5 kV megger.
7	Bus connections and bimetallic strips	Check & clean for tightness, sign of oxidation on bus connections and bimetallic strips correct if necessary. Replace bimetallic, if required
8	Paint etc.	Check & replace rusted parts and paint the on rusted parts, if any
9	Adjustable stop set-screws for proper condition and correct positioning	Check the adjustable stop set-screws for proper condition and correct positioning

### **198/120/42 kV Surge Arrester**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Lightning arrestor (LV side) HT-E	Check, measure & record insulation resistance of each unit of lightning arrestor with by 2.5/5.0 kV megger
3	Lightning arrestor (HV side) HT-E	Check, measure & record insulation resistance of each unit of lightning arrestor with by 2.5/5.0 kV megger
4	Earth resistance	Check & record the earth resistance of each earth connection with earth resistance meter.
5	Lightning arrestor details	Check & record the following: i. location; ii. Rating; iii. Make; iv. Sr. no v. Date of Mfg; vi. Date of commission; vii. Date of measurement; viii. IR value; ix. THRC value of leakage current; x. No of surges passed
6	THRC leakage current value etc.	Check & record leakage current before and after cleaning of LA with THRC meter

### **Capacitor Bank**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Ten Delta (Dielectric loss angle)	Measure & record the Ten Delta of the capacitor units with the help of a standard shearing bridge.

3	Capacitance value of capacitor	Measure & record the readings of the capacitance up to the first decimal value by digital multimeter. Changes in values beyond 6% indicate that the capacitor bank is likely to fail.
4	Protective relays	Check record of functioning of protective relays and setting.
5	NCT setting	Check & record the NCT relay setting and change in the NCT relay settings are required to be examine.
6	Fasteners and the connectors	Check proper tightening of the fasteners and the connectors. Tighten, if loose
7	Temperature of capacitor etc.	Check & record the temperature rise in 24 hrs of the capacitor unit with by suitable thermometer on the can of the capacitor bank.

#### **Series Reactor**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Insulation resistance of winding	Check insulation resistance & record: Winding to earth (ambient temp also to be recorded) with 2.5 kV megger.
3	Painting	Paint to be done, if color of body is faded.
4	Earthing connections	Check & tighten earthing connections. Replace the rusty or overheated bolts and nuts if necessary.
5	Terminal Connector & Bus-bar connectors	Check & tighten of bolts and nuts of top & bottom. Replace the rusty or overheated bolts and nuts if necessary.
6	Coil etc.	Check coil for warm and find out the reason and attend it.

#### **Control and Relay Panel**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Operation of relay	Check & record operation of all relays.
3	Contactors, push button, switches	Check & clean all contactors, push button and switches for burnt, carbonize or corroded marks. Replace if defective.
4	Check voltage etc.	Check & record voltage between + (ve) to Earth & - (ve) to Earth. If observe more differ and take action.

#### **Earthing & Bonding**

SN	Item	Inspection & Work to be Carried out
1	Carry out all work done half yearly schedule	
2	Buried rail etc.	Check condition of connections rail to buried rail and mat to buried rail. Clean & tighten all connections

#### **AC/DC Distribution Panel**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Cable glands	Check cable holes and unwanted holes. Provide proper size of glands, close unwanted holes and gaps.
3	Cable ends	Check for crimping of cable ends with connectors/lugs and cable ends crimped with suitable size of connectors/lugs
4	Insulation resistance of cable	Measure & record the insulation resistance of cable at room temperature with 500 V megger.
5	Stickers / paint	Check stickers / paint to MCBs/rotary switch. Paste new sticker / paint to MCBs / rotary switch, if faded.
6	Painting etc.	Paint to be done, if color of panel is faded/ rusted.

**Maintenance and monitoring through Thermo vision Camera (TSS):**

Same as done in monthly schedule.

**Busbars, Clamps and Connectors**

Same as done in monthly schedule. In addition, measure with a low resistance measuring instrument the contact resistances of all connections which are carrying heavy current.

**Para 20207 of ACTM Vol. II Part-I****Annexure-I**

(The values from latest IS: 1866-2000 has been taken while ACTM table is having the values from IS: 1866-1983) APPLICATION AND INTERPRETATION

OFTTESTSONTRANSFORMEROILINSERVICE

SN	Tests	Value as per IS:1866 - 2000 permissible limits	To be re-conditione	To be replaced.
1.	Electric strength (Breakdown voltage)	Min. 40 kV	Less than the value specified	--
2.	Specific resistance (Resistivity) Ohm-cm at 90°C	Above $1 \times 10^{12}$	Between $0.1 \times 10^{12}$ to $1 \times 10^{12}$	Below $0.1 \times 10^{12}$
3.	Water content Below 145 kV Above 145 kV	Max. 40 ppm	> 40 ppm	--
4.	Dielectric dissipation factor, Tan delta at 90°C	0.2 or less	--	Above 0.2
5.	Neutralization value mg KOH/ g of oil.	0.3 or less	--	Above 0.3
6.	Interfacial tension N/ m	0.015 or more	--	Below 0.015
7.	Flash point in 0 C	140 or more	125 and above but below 140	Below 125
8.	Sludge	Non- detectable, Results below 0.02% by mass may be neglected	Sediment	Perceptible sludge
9.	Dissolved Gas Analysis	Refer tables given below		

**RANGE OF GAS LEVELS**  
(All concentrations are in PPM)

Gas	0-4 years	4-10 years	10 years
Methane	10-30	30-80	30-130
Ethane	10-30	30-50	30-110
Ethylene	10-30	30-50	50-150
Acetylene	10-16	10-30	10-40
Hydrogen	20-150	150-300	200-500
Carbon Monoxide	200-300	300-500	500-700
Carbon Dioxide	3000-4000	4000-5000	4000-10,000

### GAS LEVELS FOR DIFFERENT FAULT CONDITIONS

(All concentrations are in PPM)

Fault Gases	Hydrogen H <sub>2</sub>	Methane CH <sub>4</sub>	Ethane C <sub>2</sub> H <sub>6</sub>	Ethylene C <sub>2</sub> H <sub>4</sub>	Acetylene C <sub>2</sub> H <sub>2</sub>	Carbon dioxide
Arcing	500-1000	20-130	10-30	10-30	40-100	3000-4000
Partial Discharge	500-1000	20-130	10-30	10-30	10-15	3000-4000
Hot spot	20-150	10-30	10-30	150-200	10-15	3000-4000
Gradual Overheating	20-150	10-30	150-200	10-30	10-30	3000-4000

The testing of insulating oil should be done at recognized NABL accredited laboratory. All the testing facilities, equipments, tools and plants etc., shall be arranged by the tenderer. The price also includes the collection of oil samples from traction transformer installed at various places. It also include the cost towards man and materials whatever required in the work such as steel tube, containers, detergent, cleaning cloth labeling and sealing , storage and transportation. Four copies of test reports are to be made for each transformer in every year in which point from which sample is taken, details of transformer (Location, make, Rly. Identification No. & capacity) shall be written and binded copies in 1 set shall be submitted to Sr.DEE/TRD/AII office & 03 sets to concern depot in-charge.

DGA testing of traction transformer and auxiliary transformer oil shall be carried out as mentioned above . If test results does not fall under above mentioned limits then necessary corrective action are to be taken by the contractor as advised by Railway representative, in this case decision of Sr. DEE/TRD/Ajmer shall be final and binding to the contractor.

#### **Item No. 2 :**

#### **Half Yearly Schedule Maintenance of TSS :**

##### **General Works on TSS**

SN	Item	Inspection & Work to be Carried out
1	General cleanliness	Check surface of the roadway, proper drainage, rail access and pathways in the substation. Roadway and pathway should be firm and sufficiently elevated to prevent water-logging and proper drainage.
2	Vegetation	Check & clean vegetation near around equipment and yard.
3	Tree and branches	Check & trim tree branches likely to come in the vicinity of live lines.
4	Stored lubricating or transformer	Check for security and fire risk. Keep oil safe place and no combustible material is in the vicinity of oil.
5	Caution, danger board, shock treatment chart and other boards	Check & clean for damages, availability and well secured, replace if damage

6	Fire buckets and first aid box	Fill up fine sand in fire buckets. Sand will be provided by the contractor. Check first aid box for expiry of medicine and brought to the notice of Railway supervisor if any .
7	Structure and plant foundations	Check for any sinking or cracking and go round the structural work for checking tightness of various bolts and nuts.
8	All indication lamps on control panels	Check loose connections, fuse indication etc. Tighten the same and replace the fuse indication if required.
9	All jumpers, bus bars , insulation clamp & other connections	Check visually for flash/ spark marks on jumper, bus bars / conductor , insulators , clamp , nuts & bolts. Tighten the respective bi-metallic clamp/ connections. Replace if required.
10	Discharge rod etc.	Check for cable strands broken and damages. If strands 20% broken replace the cable.
<p>Apart from above activities, following shall be ensured once in a month:</p> <ul style="list-style-type: none"> <li>• Masonry work for repair of existing cable trenches and foundation muffs/cracks</li> <li>• Screening of ballast.</li> <li>• Cleaning of cable trenches and trench cover by blower.</li> <li>• Pruning of trees, development of switching stations.</li> <li>• Cleaning /repairing of foundations, earth pit chambers whitewashing if any.</li> <li>• Spraying of herbicide, anti weed over switch yard if required.</li> <li>• Throwing of mud away from switching stations.</li> <li>• Painting of various equipments, earth strips etc as per RDSO specifications.</li> </ul> <p>All petty items desirable for cleaning purpose shall be arranged by the contractor for which no extra payment shall be given.</p>		

### **Traction Power Transformer 21.6/30 MVA or 30/42 MVA**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly schedule	
2	Test oil sample with oil test kit	BDV and Acidity tests carried out. Compare the report with previous reports and take action as indicated in enclosed ANNEXURE-I
3	Insulation resistance of winding and polarization. Index (PI) with 2.5 kV or 5 kV megger for HV- LV, HV-E & LV-E.	<p>Insulation resistance is to be measured for: 10 sec., 60 sec. and 600 sec. For HV-LV, HV-E and LV-E. Calculate PI (Polarization index) by the IR ratio of R60/R10 and R600/ R60.</p> <p>Insulation resistance values should be compared with the last recorded value. Ambient temperature and Oil Temp. (OTI) shall be recorded. Compare PI values with values at the time of commissioning/ last recorded.</p> <p>PI Insulation/ condition</p> <p>&lt; 1.0 Dangerous</p> <p>1.0 - 1.1 Poor</p> <p>1.1- 1.25 Questionable</p> <p>1.25 - 2.0 Satisfactory</p> <p>&gt;2.0 Good</p> <p>If PI value is less than 1.1, oil should be filtered. In case the value does not improve even after filtrations periodic overhauling should be under taken.</p>
4	Alarm and tripping devices	Check for proper functioning. Rectification/replacement in case found defective.



5	PRD / explosion vent Check & investigate for operation of PRD/ explosion vent for any damage and presence of oil. Check connection and operation of PRD / explosion vent. Replace the damage PRD with new PRD.
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### 132/220 kV SF-6 Circuit Breaker:

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly schedule	
2	All the moving part of the mechanism	Check, clean & lubricate the gear, bearing cum shaft rollers and latches.
3	Insulation Resistance of pole unit when breaker in open position)	Check & record IR value of pole unit with 2.5/5.0 kV megger as per OEM: i. Top-Bottom, ii. Top- Earth, iii. Bottom - Earth
4	Insulation Resistance of pole unit (when breaker in close position)	Check & record continuity and IR value of pole unit with 2.5/5.0 kV multimeter & 2.5/5.0 kV megger as per OEM: i. Top-bottom – for continuity, ii. Top & bottom - earth
5	Insulation resistance between control circuit to ground	Measure & record the insulation resistance between control circuit to ground with 500 V megger.
6	Gas pipe line	Check pipe line & joints by gas detector or soap water for leakage.
7	Spring charging motor	Check & clean commutator, carbon brushes size and spring tension, free movement of motor, temperature and lubricate. Replace bearing if jam.
8	Charging time of spring etc.	Check & record time for charging the spring at nominal tension.

### 25 kV Vacuum Circuit Breakers & Interrupters:

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly schedule	
2	All the moving part of the mechanism	Check, clean & lubricate the gear, bearing cum shaft rollers and latches.
3	All cir clip, split clip and dowel pin	Check for availability and damages. Replace, if damage.
4	Spring stroke	Measure & record spring stroke contact pressure.
5	Contact wear indication	Check contact wear mark. If green not seen, contacts are worn off.
6	Insulation Resistance of pole unit (when breaker in open position)	Check & record IR value of pole unit with 2.5/5 kV megger as per OEM: i. Top-bottom ii. Top-Earth iii.Bottom - earth
7	Insulation Resistance of pole unit (when breaker in close position)	Check & record IR value of pole unit with 2.5/5.0 kV multimeter & 2.5/5.0 kV megger as per OEM: i. Top-bottom – for continuity, ii. Top & bottom - earth
8	Insulation Resistance Of Motor; Closing coil Tripping coil; AC& DC wiring	Check & record IR value with 500 V megger of: i.Motor ii. Closing coil iii. Tripping coil iv. AC wiring & DC wiring
9	Top cover	Check sealing of top cover for any moisture trapping.
10	Wipe & Travel measurement etc.	Measure & record the wipe & travel measurement as per OEM.

**Auxiliary Transformer:**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in monthly schedule	
2	BDV of oil	Take sample of oil from bottom of tank and check the BDV of oil with BDV tester.
3	Additional arching horn on fixed 9- ton	Check flash mark on arching horn and measure the gap of arching horn.
4	Insulation resistance	Measure & record insulation resistance between i. HV- Earth (use 2.5 kV megger); ii. HV- LV (use 2.5 kV megger); iii. LV- Earth(use 500 V megger)
5	Earth resistance	Check earth connections, measure & record the earth resistance by earth tester.
6	LT cable etc.	Check & replace damage, overheating of wires, lugs etc. of LT cable. Measure & record IR value of cable: i. Between AT to ICDP switch ii. Between ICDP switch to control panel by 500 V megger.

**25 kV Potential Transformer**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in monthly schedule	
2	Insulation resistance	Measure & record insulation resistance between i. HV- Earth (use 2.5 kV megger); ii. HV- LV (use 2.5 kV megger); iii. LV- Earth(use 500 V megger)
3	Rod gap, If provided etc.	Check & record rod gap setting

**Current Transformer 220kV/132 kV/25 kV**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in monthly schedule	
2	Earth link	Check & tight earth link in secondary box.
3	Insulation resistance	Measure & record insulation resistance between i. HV- Earth (use 2.5 kV megger); ii. HV- LV (use 2.5 kV megger); iii. LV- Earth(use 500 V megger)
4	Fuses	Check fuse for proper rating & overheating, replace if necessary.
5	Arching horn, if provided etc.	Check arching horn for flash mark and measure the gap of arching horn.

**220 / 132 kV Isolator: Type – Double pole, Triple pole**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in addition to monthly schedule	
2	Isolator	Check damages, flash mark, chipping insulators replace, if required. Clean with dry cotton cloth for dirtiness.
3	Small parts	Check all nuts, bolts, split pins for good condition. Replace if rusted or defective
4	Jaws	Check the spring of jaws for proper gripping.
5	Main contacts	Check overheating and clean main contacts and lightly wipe with petroleum jelly.
6	Articulated joints, sliding and bearing surface	Check & clean all articulated joints, sliding and bearing surface with kerosene oil and lubricate.
7	Interlock	Check operation of interlock and lubricate all moving parts.
8	Arcing horn, if provided	Check arcing horn for correct alignment. Working satisfactory, if provided.

9	HV connections	Check & tight HV connections for overheated /rusted. Replace if required
10	Earthing of operating handle etc.	Check earthing of operating handle with copper flexible wire.

### **25 kV Isolator: Type – Single pole, Double pole and Bipolar:**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in addition to monthly schedule	
2	Main contacts	Check overheating and clean main contacts and lightly wipe with petroleum jelly.
3	Small parts	Check all nuts, bolts, split pins for good condition. Replace if rusted or defective.
4	Simultaneous operation of blades (double pole)	Check & simultaneous operation of blade for correct alignment. If variation adjust it.
5	Locking arrangement	Check the condition of locking arrangements to the operating handle and provision of padlocks.
6	Arcing horn, if provided	Check arcing horn for correct alignment. Working satisfactory, if provided.
7	Earthing of operating handle etc.	Check earthing of operating handle with copper flexible wire.

### **198/120/42 kV Surge Arrester**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in addition to monthly schedule	
2	Leakage current , if monitor provided etc.	Measure & record of leakage current

### **Capacitor Bank**

SN	Item	Inspection & Work to be Carried out
1	Check all points stated carried out in addition to monthly schedule	
2	Tension on connections	Check & release the excessive tension on the connections. If required
3	Corrosion on metallic parts	Check & clean rust collection/corrosion mark on the metallic part by cleaning agent.
4	Current and voltage variation etc.	Check, measure & record current and voltage variation for the capacitor bank for at least 24 hrs and record.

### **Series Reactor**

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain insulator	Check damages, flash mark, chipping insulators replaced, if required. Clean with dry cotton cloth for dirtiness.
2.	Connection on bushing	Check the tightness of bolts and nuts. Replace the rusty or overheated bolts and nuts if necessary.
3.	Earthing connections	Check & tight the earth connections. If found loose.
4.	Terminal Connector & Bus- bar connectors	Check & tight the bolts and nuts of top & bottom connectors. Replace the rusty or overheated bolts and nuts if necessary.
5.	Coil etc.	Check visually of coil for warm. If warm find out the reason & attend it.

### **Control and Relay Panel**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly schedule	
2	Indication and recording instrument	Check all indication and recording instrument for healthiness. replace if defective.
3	Relay	Check & clean outer terminals of relay.

4	Door gasket & hinges	Check & replace gasket for damages. Replace with new if necessary.
5	All connections etc.	Check & tight all connection. Tighten if loose. Remove cobwebs.

#### AC/DC Distribution Panel

SN	Item	Inspection And Work To Be Carried Out
1.	Distribution panel	Check & clean the panel outside and inside with dry cloth.
2.	Voltmeter	Check the function of voltmeter.
3.	Earth terminals	Check & tight earth termination points on both ends. Attend if any deficiency.
4.	MCB	Check visual operation for proper functioning and rating.
5.	Temperature at termination points	Measure & record the temperature at termination points. If variation is more than 5 deg. with room temp, ensure the tightness.
6.	LED	Check & replace the defective LED with tested LED.
7.	Fuses	Check all fuses for proper rating & overheating, replace if necessary.
8.	Holes in panel etc.	Check & plug the holes to avoid entry of moisture and insects.

#### Busbars, Clamps and Connectors:

Immediately after switching off the power supply and earthing the lines, feel by hand all connectors and clamps on busbars and equipment terminals which carry heavy currents to see if they are too hot. If any connection is too hot, it indicates poor contact. Open up the connector, carefully clean the contact surfaces, touch up the high spots on the contact surfaces so that the mating surfaces bed well together; apply a very light coat of vaseline, refit and tighten up. Wherever applicable, replace bimetallic strip.

#### Earthing & Bonding

SN	Item	Inspection & Work to be Carried out
	Bonding & earth connection with structure	Check physically soundness & tightness of bonding & earth connection with structure, lightning arrestor, and electrical equipment inter panel connection.
2	Earth resistance of electrical equipment body, fencing and structure with electrode	Measure & record the earth resistance of electrical equipment body, fencing, structures by earth tester.
3	Shielding wire	Check termination of shielding wire condition and bonding with structures.
4	Earth resistance of each electrode after disconnection	Measure & record the earth resistance of each electrode after disconnecting it from common earth system by earth tester.
5	Combined earth resistance of TSS with rail etc.	Measure & record the earth resistance of combined electrode without disconnecting it from common earth system by earth tester.

- **Maintenance and monitoring through Thermo vision Camera (TSS):**  
Same as done in monthly schedule.

**Item No. 3****Monthly Schedule Maintenance of TSS :****General Works on TSS**

SN	Item	Inspection & Work to be Carried out
1	General cleanliness	Check surface of the roadway, proper drainage, rail access and pathways in the substation. Roadway and pathway should be firm and sufficiently elevated to prevent water-logging and proper drainage.
2	Vegetation	Check & clean vegetation near around equipment and yard.
3	Tree and branches	Check & trim tree branches likely to come in the vicinity of live lines.
4	Stored lubricating or transformer oil	Check for security and fire risk. Keep oil safe place and no combustible material is in the vicinity of oil.
5	Caution, danger board, shock treatment chart and other boards	Check & clean for damages, availability and well secured, replace if damage.
6	Fire buckets and first aid box	Fill up fine sand in fire buckets . Sand will be provided by the contractor. Check first aid box for expiry of medicine and inform the Railway supervisor if any .
7	Structure and plant foundations	Check for any sinking or cracking and go round the structural work for checking tightness of various bolts and nuts.
8	All indication lamps on control panels	Check loose connections, fuse indication etc. Tighten the same and replace the fuse indication if required.
9	All jumpers, bus bars , insulation clamp & other connections	Check visually for flash/ spark marks on jumper, bus bars / conductor , insulators , clamp , nuts & bolts. Tighten the respective bi-metallic clamp/ connections. Replace if required.
10	Discharge rod etc.	Check for cable strands broken and damages. If strands 20% broken replace the cable.

Apart from above activities, following shall be ensured once in a month:

- Masonry work for repair of existing cable trenches and foundation muffs/cracks
- Screening of ballast.
- Cleaning of cable trenches and trench cover by blower.
- Pruning of trees, development of switching stations.
- Cleaning /repairing of foundations, earth pit chambers whitewashing if any.
- Spraying of herbicide, anti weed over switch yard if required.
- Throwing of mud away from switching stations.
- Painting of various equipment and earth strips etc as per RDSO specifications.

All petty items desirable for cleaning purpose shall be arranged by the contractor for which no extra payment shall be given.

### Traction Power Transformer 21.6/30 MVA or 30/42 MVA :

SN	Item	Inspection & Work to be Carried out
1	Maximum Temperature of transformer oil on dial indicator	Check and compare it with the previous values. Abnormal change in the temperature should be further investigated and reset indicator.
2	Maximum Temperature of transformer winding on dial indicator	Check and compare it with the previous values. Abnormal change in the temperature should be further investigated and reset indicator.
3	Oil level in conservator (MOLG)	Check as per transformer oil temperature indicator (OTI). If low, top up with the filtered oil.
4	Buchholz Relay	Check for gas collection. In case gas is collected its DGA testing to be done.
5	Oil level in OIP condenser bushing	Check for oil level with reference to the oil level indicator: <ul style="list-style-type: none"> <li>In case of sealed bushing, if no oil/less than minimum level indication. Measure Tan- Delta &amp; capacitance and compare the test values recorded earlier.</li> <li>In case of oil filled bushing if any leakage is</li> </ul>
6	Tap changer	Check & record the position of standby and service transformer.
7	Tank, Radiators, Conservator, Bushing, Oil level indicator, gauges	Check & clean dirt deposits, leakage and crack. If crack/leakage is observed, replace /attend it.
8	Dehydrating breather	Check breather for choking due to insect build /dirt. If is choked, remove the dirt etc. Check the intactness of gasket and color of the silica gel. If gasket is damage and silica gel is pink, replace the same, with new gasket and dry silica gel or recondition the old silica gel. If the silica gel is too wet check the BDV of transformer oil. Check oil level in the oil cup. Fill up oil in breather cup if required.
9	Heater in marshalling box	Check for proper functioning. In case not working, the connection should be checked and rectified.
10	Sound	Check abnormal humming, observe arrest the humming sound.
11	All external connection etc.	Check visually that all connections are normal without any discoloration due to local heating. In case of any sign of heating, clean and tighten the bolts and nuts.

### 132kV /220 kV SF-6 Circuit Breaker

SN	Item	Inspection & Work to be Carried out
1	Surface of porcelain pole insulator unit	Check for damages, flash mark, chipping insulators. Replace if required. Clean with dry cotton cloth for dirtiness.
2	Counter reading	Check operation of counter and record counter reading of CB: Before maintenance;                      and                      After maintenance
3	Gas pressure	Check & record gas pressure and temperature. refill if required.
4	Heater, thermostat & lamp	Check function of heater, thermostat & lamp. If any defect attend it.

5	Mechanism box	Open the cover check & clean mechanism box for condensation rain water, gasket of door, dust and hinges. Arrest the reason for rain water and attend it.
6	Main terminal	Check the main terminal for discoloration, overheated & rusted nuts, bolts & washer. Replace, if required.
7	Shock observer	Check the oil leakage from shock absorber. Repair or replaced, if necessary.
8	Local/Remote switch operation	Check the operation of breaker on local and remote switch. Breaker should have open & close on selected position.
9	Local and remote switches	Check the function of local and remote switch.
10	Position of indicator	Check alignment and missing indicator.
11	Limit switch & auxiliary contact	Check & clean the function of auxiliary limit switch, switches, contact, connection and terminal block for tightness.
12	Condenser tripping device	Check the function of CTD proper operation. If defective, attend the same
13	Anti pumping device	Check the function of APD for proper operation. If defective, attend the same.
14	Interlocking	Check the function of interlock with isolator.
15	Earth connections & foundation etc.	Check & tighten the earth connections & foundation bolts. If found loose.
16	Colour of silica gel	Check the colour of silica gel. Replace if colour changes from deep blue to white/pink colour
17	Unusual Sound	Check any unusual sound during Electrical / Manual operation.

## 25 kV Vacuum Circuit Breakers & Interrupters:

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain pole insulator unit	Check for damages, flash mark, chipping insulators. Replace if required. Clean with dry cotton cloth for dirtiness.
2.	Magnetic actuator operating mechanism and drive link assembly if applicable	Check presence of dust, looseness of bolts and distortion in the Operating mechanism. Clean the same with dry cloth tighten the bolts and investigate the problem in mechanism & rectify.
3.	Counter reading	Check operation of counter and record counter reading of CB/BM: - Before maintenance    - After maintenance
4.	Mechanism box	Open the cover check & clean mechanism box for condensation rain water, gasket of door, dust and hinges. Arrest the reason and attend it.
5.	Heater, thermostat & lamp	Check function of heater, thermostat & lamp. If any defect attend it.
6.	Position of indicator	Check alignment and missing indicator. Check and observe visually condition of open/close and spring charge indication and correct if required.

7.	Control circuit	Check & record operating voltage, control circuit wiring and connection should have proper lugs and ferule number in terminal box.
8.	Tripping mechanism	Check & correct operation of tripping mechanism.
9.	Shaft of the pole assembly	Check visibility of red band on the shaft of the pole assembly.
10.	Auxiliary circuits	Check the connections & function of auxiliary control circuit and supply voltage is correct.
11.	Local/Remote switch operation	Check the operation of breaker on local and remote switch. Breaker should have open & close on selected position.
12.	Connections	Check loose/overheating connections. Tight if found loose.
13.	Earth connections & foundation bolts	Check & tight the earth connections & foundation bolts.
14.	Condenser tripping device for CB	Check the function of CTD proper operation. If defective, attend the same
15.	Anti pumping device for BM	Check the function of APD for proper operation. If defective, attend the same.
16.	Interlocking etc.	Check the function of interlock with isolator.
17.	Colour of silica gel	Check the colour of silica gel. Replace if colour changes from deep blue to white/pink colour
18.	Unusual Sound	Check any unusual sound during Electrical / Manual operation

#### Auxiliary Transformers:

SN	Item	Inspection And Work To Be Carried Out
1.	Visual inspection of transformer.	Check any sign of oil leakage, overheating. If observe attend it.
2.	Cleaning of transformer	Clean the transformer externally - conservator, bushing and tank with clean cotton cloth.
3.	Silica gel	Check the condition of silica gel. If color is pink reactivate/ replace. Check oil in the cup of breather. Top up the oil in cup if required.
4.	Connections	Check, clean & tight all connections of HT and LT bushing terminals.
5.	Oil level in conservator	Check & top up oil level in conservator with new filtered oil up to mark, if required.
6.	AT enclosure	Check & clean AT enclosure of vegetation and other material.
7.	Condition of pole mounted ICDP switch, control panel and its fuses	Check condition of pole mounted ICDP switch, control panel and its fuses. Replace overheated of lugs, fuses and tighten loose connections.
8.	Caution board and anti climbing device	Check caution board and anti climbing device for availability and conditions.



9.	Earthing connections	Check & tight the earth connections. If found loose.
10.	Arcing horn	Check flash mark on arcing horn. Attend if flashover mark observe
11	Drop Out (DO) fuse	Check condition of DO fuse barrel and fuse element. Replace the breakage, overheating and non standard fuse wire.
12	Sound of equipment etc.	Check any unusual sound of equipment.

#### **Current Transformers 220 kV/132 kV / 25 kV :**

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain bushing	Check damages, flash mark, chipping insulators replace, if required. Clean with dry cotton cloth for dirtiness.
2.	Terminal connectors	Check overheated/rusted terminal connectors. Replace if any sign of overheated/rusted.
3.	Terminal bolts, nuts & washers	Check tightness of terminal bolts, nuts & washers. Replace if any sign of rusting/oxidation.
4.	Oil level	Check oil level for leakage. Top up oil if required and arrest the leakage.
5.	Earthing connections	Check & tight the earth connections. If found loose.
6.	Arching horn, if provided	Check flash mark on horn tips.

#### **25 kV Potential Transformers:**

SN	Item	Inspection And Work To Be Carried Out
1.	Inspection of PT	Check oil leakage, chip or insulator broken and any sign of overheating, if observe attend it.
2.	Terminal	Check any overheating of terminal. Replace if found overheated.
3	Terminal bolts, nuts & washers	Check & replace of terminal bolts, nuts and washer. If found any sign of rusting / oxidation.
4	Oil level	Check oil level in PT& top up with new oil up to mark, if required.
5	Fuse	Check fuse and neutral link for proper rating and tightness. Replace the fuse if necessary.
6	Earthing etc.	Check & tight the earth connections. If found loose.

#### **220 kV / 132 kV Isolators:**

SN	Item	Inspection And Work To Be Carried Out
1.	Isolator	Check visually the conditions of the support insulator. If observe any abnormality attend it.
2.	Mechanism & earthing	Check & clean mechanism, operation, tightness of earthing connection and lubricate the moving parts.
3.	Operation of Isolator	Check operation of the isolator for correct adjustment of blade and smooth hand operation.
4.	Interlock	Check working of interlock without obstruction.
5.	Earthing connections etc.	Check & tight the earthing of the frame with its fittings. Lead of earthing heel if provided.

**198/120/42 kV Surge Arresters:**

SN	Item	Inspection And Work To Be Carried Out
1.	Visual inspection of lightning arrestor	Check sign of overheating if observe. Find out the reason and attend it.
2.	Surface of porcelain bushing	Check damages, flash mark, chipping insulators replaced, if required. Clean with dry cotton cloth for dirtiness.
3.	Surge counter, if provided	Check & record the number of discharges of surge counter, if meter is provided.
4	Earthing terminal & earthing strip	Check & tight earthing terminal & strip, tighten if loose.
5	Guarding ring, if provided etc.	Check guarding ring connections, tighten if loose.

**Series Reactor**

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain insulator	Check damages, flash mark, chipping insulators replaced, if required. Clean with dry cotton cloth for dirtiness.
2.	Connection on bushing	Check the tightness of bolts and nuts. Replace the rusty or overheated bolts and nuts if necessary.
3.	Earthing connections	Check & tight the earth connections. If found loose.
4.	Terminal Connector & Bus- bar connectors	Check & tight the bolts and nuts of top & bottom connectors. Replace the rusty or overheated bolts and nuts if necessary.
5.	Coil etc.	Check visually of coil for warm. If warm find out the reason & attend it.

**Capacitor Bank :**

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain insulator	Check damages, flash mark, chipping insulators replaced, if required. Clean with dry cotton cloth for dirtiness.
2.	Dielectric	Check dielectric leakage/ seepage. If leakage/seepage is found : i. Minor seepage may be attended by M-seal (fast drying type compound).
3.	Birdcage in and around the traction sub station	Check & remove birdcage in and around the traction substation to avoid bird electrocution.
4.	Temperature of the capacitor units etc.	Check physically for any abnormal temperature rise of the capacitor units. If abnormal temperature rise of the capacitor units. Find out the reason and rectify.

**25 kV Isolator: Type – Single pole, double pole and Bipolar**

SN	Item	Inspection And Work To Be Carried Out
1.	Isolator	Check damages, flash mark, chipping insulators replace, if required. Clean with dry cotton cloth for dirtiness.
2.	HV connections	Check & tight HV connections for overheated / rusted. Replace if required.
3.	Operation of Isolator	Check the hand operation of the isolator for correct adjustment of blade and smooth hand operation.
4.	Interlock	Check operation of interlock and lubricate all moving parts.
5.	Earthing connections etc.	Check & tight the earthing of the frame with its fittings.

**Control & Relay Panel:**

SN	Item	Inspection And Work To Be Carried Out
1.	Cleaning of panel	Check & clean accumulated dust externally & internally with dry cloth.
2.	Indicating and recording instrument	Check all indicating and recording instrument are working normally.
3.	Relay	Check & clean outer terminals of relay for any abnormality.
4.	Cable connections	Check & tighten all cable connections, if found loose.
5.	Terminal board	Check & clean terminal board, cable damage and cable leads with dry cotton cloth and attend the damage cable.
6.	Fuses	Check all fuses for proper rating & overheating, replace if necessary.
7.	Earthing connections	Check & tight the earth connections. If found loose.
8.	Doors	Check doors & hinges for intactness.
9.	Holes in panel etc.	Check & plug the holes to avoid entry of moisture and insects.
10.	Note of voltage and current variations	Note and record in the Register the ranges of voltage and current variations during a 15 minute period at the time of the day when inspection was carried out. Abnormal voltage or current should be noted for corrective action.

**AC/DC Distribution Panel:**

SN	Item	Inspection And Work To Be Carried Out
1.	Distribution panel	Check & clean the panel outside and inside with dry cloth.
2.	Voltmeter	Check the function of voltmeter.
3.	Earth terminals	Check & tight earth termination points on both ends. Attend if any deficiency.
4.	MCB	Check visual operation for proper functioning and rating.
5.	Temperature at termination points	Measure & record the temperature at termination points. If variation is more than 5 deg. with room temp, ensure the tightness.
6.	LED	Check & replace the defective LED with tested LED.
7.	Fuses	Check all fuses for proper rating & overheating, replace if necessary.
8.	Holes in panel etc.	Check & plug the holes to avoid entry of moisture and insects.

**Maintenance and monitoring through Thermo vision Camera (TSS):**

- Check entire TSS using thermos vision camera and submit the images to the concerned supervisor.
- The temperature of hot spots is compared with adjacent/nearby similar components.

**Point to be checked:**

1. (For DC) Rectifier Panel, Incoming & out going bus bar/cable termination.
2. Cable Termination of cable isolators ends connection.
3. All joints, connections terminals, jumpers, PG clamps of incoming switch yard and outgoing switch gear.
4. Transformer bushing connection.
5. Bus bar joints.
6. LA, CT, PT connections from bus bar and PG clamps.
7. HV side bi-polar isolators, Single pole isolator contact and bus bar.
8. Power cable terminations and joints provided in sub-stations.

**Note:**

Single line diagram for all posts to be prepared indicating all cut points where temperature is to be observed & record to be maintained on diagram along with summary indicating the hot points observed & corrective action taken.

### Busbars, Clamps and Connectors

Immediately after switching off the power supply and earthing the lines, feel by hand all connectors and clamps on busbars and equipment terminals which carry heavy currents to see if they are too hot. If any connection is too hot, it indicates poor contact. Open up the connector, carefully clean the contact surfaces, touch up the high spots on the contact surfaces so that the mating surfaces bed well together; apply a very light coat of vaseline, refit and tighten up. Wherever applicable, replace bimetallic strip.

### Item No. 4

#### Yearly Schedule Maintenance of SP/SSP

##### General Works on SP / SSP

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly and half yearly schedule	
2.	Building	Check for roof cleaning , leakage and condition of building . Complain to Civil Dept. if any deficiency.
3.	Lightning screen	Check & tight strain clamp of wire. If observe any defect attend it.
4.	Structure & fencing	Check structure and fencing for soundness. Put drops of oil in the hinges of the doors.
5.	Trenches	Open and clean trenches for possibility of lizard and other insects' entry in control panels / equipments
6.	Tree & branches etc.	Check & prune the tree branches near to live conductor as required.

### 25 kV Vacuum Interrupter / Circuit Breaker

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly & half yearly schedule	
2.	Auxiliary switches connected in conjunction with mechanism	Check for correct position of the auxiliary switches and carry out few close & open operations. Signals occurred correctly and driving
3.	Cable glands	Check tightness of the fairleads and locked. The free fairleads must
4.	Terminal Connectors	Check & clean connector, nuts, bolt, washer and bimetallic strip. Polish the surface and freely place bimetallic strip properly, If provided.
5.	Measure & record the Closing & Tripping timing by timer in millisecond as per OEM.	
6.	Measure the Contact resistance in Micro ohms as per OEM etc.	
7.	Speed regulator	Inspection of free movement
8.	Reduction gear	Oil leakage / abnormal sound
9.	Fasteners of motor limit switch and auxiliary switches	Tightness of the fasteners and terminal screws, split pins/snap pins etc. Tighten/locking to be done if found loose.
10.	Closing (at 85%) and tripping (at 70% of rated voltage i.e. 110V DC) operation check	If not operate change the coil

11.	Open/Close operation	Operate 10 electrically and 10 manually operations
12.	Contact Resistance	Contact resistance of main contacts shall be measured by micro ohm meter and shall be as per OEMs specified value.

### **Auxiliary Transformer**

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly & half yearly schedule	
2.	Winding continuity	Measure & Record winding continuity on all tapings with multimeter/ 500 Vmegger.
3.	Tap changer	Check the smooth operation of tap changer on all tapings.
4.	Acidity and BDV of oil	Check the acidity and BDV of transformer oil as per relevant IS from NABL accredited LAB.
5.	Ratio test	Conduct ratio test by applying AC supply to HV winding and measure the voltage at LV side winding.
6.	Jumpers	Check HT and LT jumpers & lugs for loose & flash mark. Replace if loose & flash.
7.	Painting	Paint to be done, if color of tank is faded/ rusted.
8.	DO fuse wire etc.	Replace the fuse wire with new one.

### **25 kV Potential Transformer**

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly & half yearly schedule	
2.	Duplicate earthing	Check duplicate earth conditions for broken & loose. Attend the same.
3.	Oil testing	Test the oil with BDV tester as per relevant IS from NABL accredited lab.
4.	Ratio test	Conduct ratio test by applying AC supply to HV winding and measure the voltage at LV side winding.
5.	Painting etc.	Paint to be done, if color of tank is faded/ rusted.

### **25kV Current Transformer**

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly & half yearly schedule	
2.	Arching horn gap If provided	Check & measure arching horn gap as required.
3.	Oil testing	Test the oil with BDV tester as per relevant IS from NABL accredited lab.
4.	Painting	Check for painting, if color of tank is faded/ rusted.
5.	Polarity test	Conduct polarity test and check the direction of current.
6.	Ratio test etc.	Conduct ratio test by applying current to HV winding and measure the current LV side winding.

### **25 kV Isolator Type – Single pole and Bipolar**

SN	Item	Inspection And Work To Be Carried Out
1	Carry out following work in addition to monthly & half yearly schedule:	

2	Operation of isolator (Double pole)	Check the operation of isolator slowly and check for simultaneous operation of blades on the poles and correct alignment of blade tips in the fixed contact jaws of the poles.
3	Interlocking operation	Check & clean interlocking operation with circuit breaker.
4	Blade tips and fixed contact fingers	Check the condition of the blade tips and fixed contact fingers for any sign of overheating and presents of buffs. Clean the buffs.
5	Clearances of blade	Measure the clearances of blade in open position. Measure and record and adjust if necessary.
6	Insulation resistance	Measure & record IR values of pedestal & tie rod insulators with 2.5 kV megger.
7	Bus connections and bimetallic strips	Check & clean for tightness, sign of oxidation on bus connections and bimetallic strips correct if necessary. Replace bimetallic, if required
8	Paint etc.	Check & replace rusted parts and paint the on rusted parts, if any
9	Adjustable stop set-screws	Check the adjustable stop set-screws for proper condition and correct positioning

## 42 kV Surge Arrester

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly & half yearly schedule:	
2.	Lightning arrester (LV side) HT-E	Check, measure & record insulation resistance of each unit of lightning arrester with by 2.5/5.0 kV megger.
3.	Lightning arrester (HV side) HT-E	Check, measure & record insulation resistance of each unit of lightning arrester with by 2.5/5.0 kV megger.
4.	Earth resistance	Check & record the earth resistance of each earth connection with earth resistance meter.
5.	Lightning arrester details	Check & record the following: i. location; ii. Rating; iii. Make; iv. Sr. no v. Date of Mfg vi. Date of commission; vii. Date of measurement viii. IR value ix. THRC value of leakage current; x. No. of surges passed
6.	THRC leakage current value etc.	Check & record leakage current before and after cleaning of LA with THRC meter.

## Control and Relay Panel

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly and half yearly schedule	
2	Operation of relay	Check & record operation of all relays.
3	Contactors, push button, switches	Check & clean all contactors, push button and switches for burnt, carbonize or corroded marks. Replace if defective. Also check and correct springiness of contact springs
4	Check voltage etc.	Check & record voltage between + (ve) to Earth & - (ve) to Earth. If observe more differ and take action.

## Earthing & Bonding

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out all work done in half yearly schedule	
2.	Buried rail etc.	Check condition of connections rail to buried rail and mat to buried rail. Clean & tighten all connections.

**AC/DC Distribution Panel**

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition monthly and half yearly schedule	
2.	Cable glands etc.	Check cable holes and unwanted holes. Provide proper size of glands, close unwanted holes and gaps.
3.	Cable ends	Check for crimping of cable ends with connectors/lugs and cable ends crimped with suitable size of connectors/lugs.
4.	Insulation resistance of cable	Measure & record the insulation resistance of cable at room temperature with 500 V megger.
5.	Stickers / paint	Check stickers / paint to MCBs/rotary switch. Paste new sticker / paint to MCBs / rotary switch, if faded.
6.	Painting etc.	Paint to be done, if color of panel is faded/ rusted.

**Maintenance and monitoring through Thermo vision Camera (TSS):**

Same as done in monthly schedule.

**Busbars, Clamps and Connectors**

Same as done in monthly schedule. In addition, measure with a low resistance measuring instrument the contact resistances of all connections which are carrying heavy current.

**Item No.5****Half Yearly Schedule Maintenance of SP/SSP:****General Works on SP/SSP:**

SN	Item	Inspection And Work To Be Carried Out
1.	General cleanliness	Check surface of the roadway, proper drainage, rail access and pathways in the substation. Roadway and pathway should be firm and sufficiently elevated to prevent water-logging and proper drainage.
2.	Vegetation	Check & clean vegetation near around equipment and yard.
3.	Tree and branches	Check & trim tree branches likely to come in the vicinity of live lines.
4.	Caution, danger board, shock treatment chart	Check & clean for damages, availability and well secured, replace if damage.
5.	Fire buckets and first aid box	Fill up fine sand in fire buckets. Sand will be provided by the contractor. Check first aid box for expiry of medicine and brought to the notice of Railway supervisor if any.
6.	Structure and plant foundations	Check for any sinking or cracking and go round the structural work for checking tightness of various bolts and
7.	All jumpers, bus bars , insulation clamp & other connections	Check visually for flash/ spark marks on jumper, bus bars / conductor , insulators , clamp , nuts & bolts. Tighten the respective bi-metallic clamp/ connections. Replace if required.
8.	Discharge rod etc.	Check for cable strands broken and damages. If strands 20% broken replace the cable.

Apart from above activities, following shall be ensured once in a month:

- Masonry work for repair of existing cable trench and foundation muffs/cracks
- Screening of ballast.
- Cleaning of cable trenches and trench cover by blower.
- Pruning of trees, development of switching stations.
- Cleaning /repairing of foundations, earth pit chambers whitewashing if any.
- Spraying of herbicide, anti weed over switch yard if required.
- Throwing of mud away from switching stations.
- Painting of various equipments and earth strips etc as per RDSO specifications.

All petty items desirable for cleaning purpose shall be arranged by the contractor for which no extra payment shall be given.

### 25 kV Vacuum Interrupter/ Breaker :

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly schedule.	
2.	All the moving part of the mechanism	Check, clean & lubricate the gear, bearing cum shaft rollers and latches.
3.	All cir clip, split clip and dowel pin	Check for availability and damages. Replace, if damage.
4.	Spring stroke	Measure & record spring stroke contact pressure.
5.	Contact wear indication	Check contact wear mark. If green not seen, contacts are worn off.
6.	Insulation Resistance of pole unit (when breaker in open position)	Check & record IR value of pole unit with 2.5/5 kV megger as per OEM: i Top-Bottom ii Top- Earth iii Bottom - Earth
7.	Insulation Resistance of pole unit (when breaker in close position)	Check & record continuity & IR value of pole unit with multi meter & 2.5/5 kV megger as per OEM: i. Top-bottom –for continuity ii. Top & bottom - earth
8.	Insulation Resistance of Motor; Closing coil Tripping coil; AC& DC wiring	Check & record IR value with 500 V megger of: i. Motor ii. Closing coil iii. Tripping coil iv. AC wiring & DC wiring
9.	Top cover	Check sealing of top cover for any moisture trapping.
10.	Wipe & Travel measurement etc.	Measure & record the wipe & travel measurement as per OEM.

### Auxiliary Transformer:

SN	Item	Inspection And Work To Be Carried Out
1.	Check all points stated	carried out in monthly schedule
2.	BDV of oil	Take sample of oil from bottom of tank and check the BDV of oil with BDV tester.
3.	Additional arching horn on fixed 9- ton insulator	Check flash mark on arching horn and measure the gap of arching horn.
4	Insulation resistance	Measure & record insulation resistance between i. HV- Earth (use 2.5 kV megger); ii. HV- LV (use 2.5 kV megger); iii. LV- Earth(use 500 V megger)



5.	Earth resistance	Check earth connections, measure & record the earth resistance by <del>earth tester</del>
6.	LT cable etc.	Check & replace damage, overheating of wires, lugs etc. of LT cable. Measure & record IR value of cable: i. Between AT to ICDP switch. ii. Between ICDP switch to control panel by 500 V megger.

### 25 kV Potential Transformer

SN	Item	Inspection And Work To Be Carried Out
1.	Check all points stated carried out in monthly schedule	
2	Insulation resistance	Measure & record insulation resistance between i. HV- Earth (use 2.5 kV megger); ii. HV- LV (use 2.5 kV megger); iii. LV- Earth(use 500 V megger)
3.	Rod gap, If provided etc.	Check & record rod gap setting

### 25 kV Current Transformer

SN	Item	Inspection And Work To Be Carried Out
1.	Check all points stated carried out in monthly schedule	
2.	Earth link	Check & tight earth link in secondary box.
3	Insulation resistance	Measure & record insulation resistance between i. HV- Earth (use 2.5 kV megger); ii. HV- LV (use 2.5 kV megger); iii. LV- Earth(use 500 V megger)
4.	Fuses	Check fuse for proper rating & overheating, replace if necessary.
5.	Arching horn, if provided etc.	Check arching horn for flash mark and measure the gap of arching horn.

### 25 kV Isolator: Type – Single pole, double pole and Bipolar

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly schedule	
2.	Main contacts	Check overheating and clean main contacts and lightly wipe with
3.	Small parts	Check all nuts, bolts, split pins for good condition. Replace if
4.	Simultaneous operation of blades (double pole)	Check & simultaneous operation of blade for correct alignment. If
5.	Locking arrangement	Check the condition of locking arrangements to the operating handle and provision of padlocks.
6.	Arcing horn, if provided	Check arcing horn for correct alignment. Working satisfactory, if
7.	Earthing of operating handle etc.	Check earthing of operating handle with copper flexible wire.

**42 kV Surge Arrester**

SN	Item	Inspection And Work To Be Carried Out
1.	Carry out following work in addition to monthly schedule	
2.	Leakage current , if monitor provided etc.	Measure & record of leakage current

**Control and Relay Panel**

SN	Item	Inspection & Work to be Carried out
1	Carry out following work in addition to monthly schedule	
2	Indication and recording	Check all indication and recording instrument for healthiness. Replace if defective.
3	Relay	Checks if tap and time settings of the relay are in order.
4	Door gasket & hinges	Check & replace gasket for damages. Replace with new if
5	All connections etc.	Check & tight all connection. Tighten if loose. Remove cobwebs.

**Earthing & Bonding**

SN	Item	Inspection And Work To Be Carried Out
1	Bonding & earth connection with structure	Check physically soundness & tightness of bonding & earth connection with structure, lightning arrestor, and electrical equipment inter panel connection.
2	Earth resistance of electrical equipment body, fencing and structure with electrode	Measure & record the earth resistance of electrical equipment body, fencing, structures by earth tester.
3	Shielding wire	Check termination of shielding wire condition and bonding with structures.
4	Earth resistance of each electrode after disconnection	Measure & record the earth resistance of each electrode after disconnecting it from common earth system by earth tester.
5	Combined earth resistance of SP/SSP with rail etc.	Measure & record the earth resistance of combined electrode without disconnecting it from common earth system by earth tester.

**AC/DC Distribution Panel**

Same as done in monthly schedule.

**Maintenance and monitoring through Thermo vision Camera (SP/SSP):**

Same as done in monthly schedule.

**Busbars, Clamps and Connectors**

Same as done in monthly schedule.

**Item No. 6 :****Monthly Schedule Maintenance of SP/SSP :****General Works on SP /SSP**

SN	Item	Inspection And Work To Be Carried Out
1.	General cleanliness	Check surface of the roadway, proper drainage, rail access and pathways in the substation. Roadway and pathway should be firm and sufficiently elevated to prevent water-logging and proper drainage.
2.	Vegetation	Check & clean vegetation near around equipment and yard.
3.	Tree and branches	Check & trim tree branches likely to come in the vicinity of live lines.
4.	Caution, danger board, shock treatment chart	Check & clean for damages, availability and well secured, replace if damage.
5.	Fire buckets and first aid box	Fill up fine sand in fire buckets. Sand will be provided by the contractor. Check first aid box for expiry of medicine and brought to the notice of Railway supervisor if any.
6.	Structure and plant foundations	Check for any sinking or cracking and go round the structural work for checking tightness of various bolts and
7.	All jumpers, bus bars , insulation clamp & other connections	Check visually for flash/ spark marks on jumper, bus bars / conductor , insulators , clamp , nuts & bolts. Tighten the respective bi-metallic clamp/ connections. Replace if required.
8.	Discharge rod etc.	Check for cable strands broken and damages. If strands 20% broken replace the cable.
<p>Apart from above activities, following shall be ensured once in a month:</p> <ul style="list-style-type: none"> <li>• Screening of ballast.</li> <li>• Cleaning of cable trenches and trench cover by blower.</li> <li>• Pruning of trees, development of switching stations.</li> <li>• Cleaning /repairing of foundations, earth pit chambers whitewashing if any.</li> <li>• Spraying of herbicide, anti weed over switch yard if required.</li> <li>• Throwing of mud away from switching stations.</li> <li>• Painting of various equipments and earth strips etc as per RDSO specifications.</li> </ul> <p>All petty items desirable for cleaning purpose shall be arranged by the contractor for which no extra payment shall be given.</p>		

**25 kV Vacuum Interrupters/Breakers:**

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain pole insulator unit	Check for damages, flash mark, chipping insulators. Replace if required. Clean with dry cotton cloth for dirtiness.
2.	Magnetic actuator operating mechanism and drive link assembly if applicable	Check presence of dust, looseness of bolts and distortion in the operating mechanism. Clean the same with dry cloth tighten the bolts and investigate the problem in mechanism & rectify.
3.	Counter reading	Check operation of counter and record counter reading of CB/BM: - Before maintenance - After maintenance

4.	Mechanism box	Open the cover ,check & clean mechanism box for condensation rain water, gasket of door, dust and hinges. Arrest the reason and attend it.
5.	Heater, thermostat & lamp	Check function of heater, thermostat & lamp. If any defect attend it.
6.	Position of indicator	Check alignment and missing indicator. Check and observe visually condition of open/close and spring charge indication and correct if required.
7.	Control circuit	Check & record operating voltage, control circuit wiring and connection
8.	Tripping mechanism	Check & correct operation of tripping mechanism.
9.	Shaft of the pole assembly	Check visibility of red band on the shaft of the pole assembly.
10.	Auxiliary circuits	Check the connections & function of auxiliary control circuit and supply voltage is correct.
11.	Local/Remote switch operation	Check the operation of breaker on local and remote switch. Breaker should have open & close on selected position.
12.	Connections	Check loose/overheating connections. Tight if found loose.
13.	Earth connections & foundation bolts	Check & tight the earth connections & foundation bolts.
14.	Condenser tripping device for CB	Check the function of CTD proper operation. If defective, attend the same.
15.	Anti pumping device for BM	Check the function of APD for proper operation. If defective, attend the same.
16.	Interlocking etc.	Check the function of interlock with isolator.
17.	Colour of silica gel	Check the colour of silica gel. Replace if colour changes from deep blue to white/pink colour
18.	Unusual Sound	Check any unusual sound during Electrical / Manual operation

### **Auxiliary Transformer:**

SN	Item	Inspection And Work To Be Carried Out
1.	Visual inspection of Transformer.	Check any sign of oil leakage, overheating. If observe attend it.
2.	Cleaning of transformer	Clean the transformer externally - conservator, bushing and tank with clean cotton cloth.
3.	Silica gel	Check the condition of silica gel. If color is pink reactivate/ replace. Check oil in the cup of breather. Top up the oil in cup if required.
4.	Connections	Check, clean & tight all connections of HT and LT bushing terminals.
5.	Oil level in conservator	Check & top up oil level in conservator with new filtered oil up to mark, if required.

6.	AT enclosure	Check & clean AT enclosure of vegetation and other material.
7.	Condition of pole mounted ICDP switch, control panel and its fuses	Check condition of pole mounted ICDP switch, control panel and its fuses. Replace overheated of lugs, fuses and tighten loose connections.
8.	Caution board and anti climbing device	Check caution board and anti climbing device for availability and conditions.
9.	Earthing connections	Check & tight the earth connections. If found loose.
10.	Arcing horn	Check flash mark on arcing horn. Attend if flashover mark observe.
11	Drop Out (DO) fuse	Check condition of DO fuse barrel and fuse element. Replace the breakage, overheating and non standard fuse wire.
12	Sound of equipment etc.	Check any unusual sound of equipment.

### 25 kV Current Transformers:

SN	Item	Inspection And Work To Be Carried Out
1.	Surface of porcelain bushing	Check damages, flash mark, chipping insulators replace, if required. Clean with dry cotton cloth for dirtiness.
2.	Terminal connectors	Check overheated/rusted terminal connectors. Replace if any sign of overheated/rusted.
3.	Terminal bolts, nuts & washers	Check tightness of terminal bolts, nuts & washers. Replace if any sign of rusting/oxidation.
4.	Oil level	Check oil level for leakage. Top up oil if required and arrest the leakage.
5.	Earthing connections	Check & tight the earth connections. If found loose.
6.	Arching horn, if provided etc.	Check flash mark on horn tips.

### 25 kV Potential Transformers:

SN	Item	Inspection And Work To Be Carried Out
1.	Inspection of PT	Check oil leakage, chip or insulator broken and any sign of overheating, if observe attend it.
2.	Terminal	Check any overheating of terminal. Replace if found overheated.
3	Terminal bolts, nuts & washers	Check & replace of terminal bolts, nuts and washer. If found any sign of rusting / oxidation.
4	Oil level	Check oil level in PT& top up with new oil up to mark, if required.
5	Fuse	Check fuse and neutral link for proper rating and tightness. Replace the fuse if necessary.
6	Earthing etc.	Check & tight the earth connections. If found loose.

### 42 kV Surge Arresters:

SN	Item	Inspection And Work To Be Carried Out
1.	Visual inspection of lightning arrestor	Check sign of overheating if observe. Find out the reason and attend it.
2.	Surface of porcelain bushing	Check damages, flash mark, chipping insulators replaced, if required. Clean with dry cotton cloth for dirtiness.
3.	Surge counter, if provided	Check & record the number of discharges of surge counter, if meter is provided.

4	Earthing terminal & earthing strip	Check & tight earthing terminal & strip, tighten if loose.
5	Guarding ring, if provided etc.	Check guarding ring connections, tighten if loose.

### 25 kV Isolator Type – Single pole, double pole and Bipolar

SN	Item	Inspection And Work To Be Carried Out
1.	Isolator	Check damages, flash mark, chipping insulators replace, if required. Clean with dry cotton cloth for dirtiness.
2.	HV connections	Check & tight HV connections for overheated / rusted. Replace if required.
3.	Operation of Isolator	Check the hand operation of the isolator for correct adjustment of blade and smooth hand operation.
4.	Interlock	Check operation of interlock and lubricate all moving parts.
5.	Earthing connections etc.	Check & tight the earthing of the frame with its fittings.

### Control & Relay Panel

SN	Item	Inspection And Work To Be Carried Out
1.	Cleaning of panel	Check & clean accumulated dust externally & internally with dry cloth.
2.	Indicating and recording instrument	Check all indicating and recording instrument are working normally. Make a note of flag indications, if any, then reset.
3.	Relay	Check & clean outer terminals of relay for any abnormality.
4.	Cable connections	Check & tighten all cable connections, if found loose.
5.	Terminal board	Check & clean terminal board, cable damage and cable leads with dry cotton cloth and attend the damage cable.
6.	Fuses	Check all fuses for proper rating & overheating, replace if necessary.
7.	Earthing connections	Check & tight the earth connections. If found loose.
8.	Doors	Check doors & hinges for intactness.
9.	Holes in panel etc.	Check & plug the holes to avoid entry of moisture and insects.
10.	Note of voltage and current variations	Note and record in the Register the ranges of voltage and current variations during a 15 minute period at the time of the day when inspection was carried out. Abnormal voltage or current should be noted for corrective action

### AC/DC Distribution Panel:

SN	Item	Inspection And Work To Be Carried Out
1.	Distribution panel	Check & clean the panel outside and inside with dry cloth.
2.	Voltmeter	Check the function of voltmeter.
3.	Earth terminals	Check & tight earth termination points on both ends. Attend if any deficiency.
4.	MCB	Check visual operation for proper functioning and rating.
5.	Temperature at termination points	Measure & record the temperature at termination points. If variation is more than 5 deg. with room temp, ensure the tightness.
6.	LED	Check & replace the defective LED with tested LED.
7.	Fuses	Check all fuses for proper rating & overheating, replace if necessary.
8.	Holes in panel etc.	Check & plug the holes to avoid entry of moisture and insects.

**Maintenance through Thermo vision Camera (SP/SSP):**

- Check entire SP/SSP using thermo vision camera and submit the images to the concerned supervisor.
- The temperature of hot spots is compared with adjacent/nearby similar components.

**Point to be checked during Thermo Vision:**

1. Incoming & out going bus bar/cable termination.
2. Cable Termination of cable isolators ends connection.
3. All joints, connections terminals, jumpers, PG clamps of incoming switch yard and outgoing switch gear.
4. Bus bar joints.
5. LA, CT, PT connections from bus bar and PG clamps.
6. Single pole isolator contact and bus bar.

**Note: Single line diagram for all posts to be prepared indicating all cut points where temperature is to be observed & record to be maintained on diagram along with summary indicating the hot points observed & corrective action taken.**

**Busbars, Clamps and Connectors**

Immediately after switching off the power supply and earthing the lines, feel by hand all connectors and clamps on busbars and equipment terminals which carry heavy currents to see if they are too hot. If any connection is too hot, it indicates poor contact. Open up the connector, carefully clean the contact surfaces, touch up the high spots on the contact surfaces so that the mating surfaces bed well together; apply a very light coat of vaseline, refit and tighten up. Wherever applicable, replace bimetallic strip.

**Item No. 7 :****Fortnightly Maintenance of Battery and Battery Charger of TSS, SP & SSP**

Maintenance of Battery & Battery Charger of each switching stations (All TSSs)/posts (All SPs & SSPs) should be done fortnightly as per the following check lists and recorded in the register available at switching stations/posts -

SN	Item	Inspection And Work To Be Carried Out
1.	Specific gravity	Check and record the specific gravity of each cell.
2.	Distilled water	Check the level of electrolyte of the cells. Top up, if necessary. Distilled water will be arranged by Contractor.
3.	Temperature	Check & record the temperature of each cell.
4.	Sulphation	Check & clean Sulphation on terminal connectors & apply petroleum jelly.
5.	Condition of plate	Check & clean physical condition such as cracks, distortions and accumulation of whitish deposit.
6.	Cell voltage	Check & record the voltage of each the cells.
7.	Total voltage	Check & record the total voltage of the battery.
8.	Vent plugs	Check the clear passage of gases. If hole blocked, clean it.
9.	Sedimentation and any internal damage	Check the cells for undue sedimentation and any internal damage. If observe clean it. If the battery is not in a healthy condition or if there is excessive Accumulation of sediment, whole battery should be replaced with a new
10.	Inter cell connections	Check & clean with dry cloth. Replace defective nuts, bolts & washers.
11.	AC & DC panel Voltage	Check AC and DC voltage on panel and record AC and DC voltage.

12.	Battery charger	Check smooth operation of all switches of battery charger. Note charging rate and AC Voltage. If the battery is not in a fully charged condition, boost charging should be given as required (done by supervisor official). Yearly: Open the covers of battery charger and blow out all dust. Check tightness of all connections, bolts, nuts and screws. Measure and record the insulation resistance of the transformer windings of the battery charger with 500 V megger.
13.	Battery room	Clean the room.
14	Charger	Check & clean the charger outside and inside with dry cloth.
15	Voltmeter & Ammeter	Check the proper function of voltmeter & ammeter.
16.	Overheating	Check any sign of overheating inside the charger. Find out the reason and attend it.
17	Terminal connection	Check the terminal connection on the disconnecting link. Replace any overheating of terminal connectors, if found overheated or rusted.
18	Earth terminals	Check & tight the earth connections. If found loose.
19	MCB	Check visual operation for proper functioning and rating.
20	Three pin plug with socket	Check & replace overheating or defective three pin plug/ socket.
21	Termination ends of the cable	Check & tight all termination ends of the cable, if loose.
22.	Transformer winding	Measure & record the insulation resistance of winding at room temperature
23.	Electrolyte condenser	Measure & record the capacitance value with LCR meter. Replace if open circuited/ short circuited.
24.	Cable glands	Check cable holes and unwanted holes. Provide proper size of glands, close unwanted holes and gaps.
25.	Cable ends etc.	Check for crimping of cable ends with connectors/lugs and cable ends crimped with suitable size of connectors/lugs.

#### Item No. 8

#### Quarterly maintenance of 5/10/25KVA Auxiliary Transformers at Stations and LC gates :

Quarterly maintenance of AT shall be carried out in line with Para 20223-20254 of ACTM Vol-II part-I of Indian Railways with its latest correction slips. The job shall cover checking & maintenance of AT (Quarterly) as mentioned below:

##### A) Auxiliary Transformer (Quarterly)

1. Clean externally the tank, conservator, bushings, sign of oil leakage, overheating and attend it.
2. Check and top up oil level in conservator.
3. Check silica-gel breather. If silica-gel is pink, replace it with new dry silica-gel and recondition the old silica-gel. Makeup oil if required.
4. Check for proper condition and alignment of dropout fuse element and assembly.  
Replace the breakage, overheating and non standard fuse wire.
5. Check & attend flash mark on arcing horn and record arcing horn gap settings.
6. Check, clean & tight all HT, LT bushing terminals and earthing connections.
7. Check & clean AT enclosure of vegetation and other material.
8. Check condition of pole mounted ICDP switch, control panel and its fuses.

Replace

- overheated of lugs, fuses and tighten loose connections.
9. Check caution board and anti climbing device for availability and conditions.
10. Check any unusual sound of equipment.



**B) Auxiliary Transformer (Half yearly)**

1. Do all the test as indicated in schedule-A.
2. Measure and record insulation resistance of all windings with 2.5KV megger along with winding and ambient temperature.
3. Test Oil samples for BDV.
4. Check foundation and structure assembly for proper conditions and tightness.
5. Measure and record earth resistance. Take remedial action if earth resistance is above prescribed limits.
6. LT cable Check & replace damage, overheating of wires, lugs etc. of LT cable. Measure & record IR value of cable: i. Between AT to ICDP switch, ii. Between ICDP switch to control panel by 500 V megger.

**C) Auxiliary Transformer (Yearly)**

1. Do all the test as indicated in schedule-A & B.
2. Test oil sample for acidity.
3. Measure & Record winding continuity on all tapings with multimeter/ 500 V megger
4. Check the smooth operation of tap changer on all tapings.
5. Conduct ratio test by applying AC supply to HV winding and measure the voltage at LV side winding.
6. Check HT and LT jumpers & lugs for loose & flash mark. Replace if loose & flash.
7. Paint to be done, if color of tank is faded/ rusted.
8. Replace the fuse wire with new one.

**Item No. 9**

**Rectification of 25 kV Drop Out Fuse :**

Rectification of 25 kV dropout fuse shall be carried out in line with Para 20223-20254 of ACTM Vol-II part-I of Indian Railways with its latest correction slips.

The job shall cover Rectification of 25KV dropout fuse in 5/10/25KVA Auxiliary Transformer. Rectification to be done immediately, as and when required. The fuse wire shall be provided by contractor.

Nominated staff for the above job should be available to reach the working spot round the clock. The transportation facility for movement of staff will be arranged by contractor itself.

**Item No. 10**

**Manning of TSS/SP/SSP in case of Emergency, SCADA failure, VIP movement & OFC Block .( 8Hrs Each) ( one skilled staff and one unskilled staff) :**

In case of failure of SCADA, VIP movement & OFC block , manning of the concerned switching post will have to be done. The prices shall cover the payment/wages to the staff to be deployed at each switching station as directed by Railway's Engineer.

Manning shall be done as per the requirement of the Railways. One skilled (ITI) and one unskilled staff should be there. The Skilled staff should be fully conversant with operation of various equipments installed in switching post.

The staff shall be deployed after test and trial by Railway and on issue of competency certificate. The staff deployed shall act in accordance with instructions/ directions given by Traction Power Controller/authorized representative of Railway.

The staff shall not leave the working place (Switching post) in any case without prior permission of purchaser's representative. The price shall cover conveyance charges to the staff for going and coming to the working place.

**Item No. 11,12,13****Breakdown call of TSS/SP/SSP/AT (8 Hrs):**

(a) At the time of any breakdown the contractor's representative will be intimated on telephone and the contractor's men should be available as and when any equipment / circuit get faulty. The contractor should have adequate competent staff with him to meet any exigency/emergent situation. The contractor should have the necessary tools & tackles including vehicle etc for meeting the exigency/emergent situation.

(b) All the tools & plants required for attending break down will have to be arranged by the contractor. All the required T&P should be planned and arranged by the contractors well in advance.

**Item No. 14:****Supply and repainting of PSI equipments like Traction Transformer, CB, BM, PT, AT etc as per site requirement:**

The price shall cover the supply of paint and complete repainting of PSI equipments like Traction Transformer, CB, BM, PT, AT etc as per site requirement with water proof gray enameled paint from any of RDSO approved brand paint i.e. Asian or Berger brand / make paint confirming to IS:2932 or latest including rubbing / scrubbing of surface to remove corrosion/foreign material etc from PSI equipments as per instruction of Engineer in charge at site.

The small patches or small patch rusting painting will be covered under maintenance schedule. Only complete repainting of any equipment will be paid under this item.

The rates are calculated in Sq.m as per requirement for the entire section. The man power deputed shall leave the work spot with the permission of engineer in charge. This work will be executed as per satisfaction of Railway Supervisor.

**Item No. 15****Supply and repainting of PSI assets i.e. Fencing Panels, Fencing uprights, barbed wires, TSS / Switching posts and Tubular Poles at TSS in electrified section:**

The price shall cover the supply of paint and repainting of PSI assets i.e. Fencing Panels / uprights, barbed wires, TSS / Switching posts and Tubular Poles at TSS in electrified section with Aluminum Paint from any of RDSO approved brand / make confirming to IS:2339 or latest as per instruction of Engineer in charge at site.

The rates are calculated in Sq.m as per requirement for the entire section. The man power deputed shall leave the work spot with the permission of engineer in charge. This work will be executed as per satisfaction of Railway Supervisor.

**Item No. 16:****Supply and spreading of ballast / pebbles / gravels in Switching Stations / TSS yard:**

The price shall cover the supply and spreading of 20mm graded as per IS crushed stone ballast / pebbles / gravels in Switching Stations / TSS yard. The graded ballast shall be between 30mm to 15mm machine crushed without any mixing of soil. The price shall also cover the spreading and leveling of ballast in switch yard smoothly with a good workmanship.

This price shall also include the following:

- a) Removal of wild vegetation in switch yard in existing ballast areas along with its roots.
- b) Cleaning of existing ballast and screening of soil from existing ballast.
- c) Smoothing and re-spreading of existing ballast so collected.

The rates are calculated in Cum as per requirement for the entire section. The man power deputed shall leave the work spot with the permission of engineer in charge.

#### **Item No. 17:**

##### **Supply and erection of Earth pit cover and Box:**

The price shall cover the Supply and erection of Earth Pit Box with cover as per RDSO specification/ drawing available latest. The rates are calculated in numbers of Earth Pit Box with cover provided as per requirement for the entire section. The man power deputed shall leave the work spot with the permission of engineer in charge.

#### **Item No. 18**

##### **Hiring of 15T crane on hourly basis :**

The job shall cover Hiring of 15T capacity road crane and crane operator with more than 10 mtr zip height. The requirement of crane is on need basis as on when required over Ajmer division. Payment will be made on Hourly basis. All tools & materials required for crane operation to be arranged by contractor.

#### **Item No. 19**

##### **Providing data entry operator at OHE depots.:**

The scope includes the provision of data entry operator at various railway offices as per Railway requirement. TDMS portal available online at website (<http://tdms.railsaver.gov.in/TDMS/>) consists of various module, submodule and asset masters which enables us to record data of Masts/Portals, Turnout/X-over, ATD/Regulating equipment, Cantilever assembly, PTFE, Section insulator, over line structure, HT crossing, breakdown accidents involving OHE, Foot plate inspection, Thermo-graphy of TRD assets for health check, live line current collection checking, implantation register to keep an eye of the locations of critical implantation which can directly affect the safety of trains and passengers in the electrified territory, to record maintenance planning data, data regarding locations needing attention, asset replacement register for TRD assets, Maintenance schedules and data regarding maintenance of each and every assets of Traction substation, sectioning and paralleling post as well as sub sectioning and paralleling post and other assets related to traction distribution, to capture asset maintenance details, planning and generate exception/compliances based on threshold values & to record OHE failures which affect punctuality and safety of the train operation. TDMS consists of various modules such as OHE module, PSI asset modules, Tower wagon module, RC-SCADA module and traction power control module. All these modules cover each and every tiny detail of these traction distribution assets for example their asset population which could be in thousands for each of the above-mentioned individual items. The maintenance details of all of these assets, defects and deficiency noted in the foot patrolling regarding the health of all these assets falling in a section so as any of these do not go unnoticed to impact the reliability of OHE and thus safety of train operation on a later date. The jurisdiction of all the depots is segregated and all these depots are bestowed with the responsibility of maintenance of every traction distribution item falling under their jurisdiction and for proper up-keeping of the record of every such

maintenance activity, to avoid confusion. The data entry operator will also keep the record of specific maintenance instructions for a particular depot for the assets falling under its jurisdiction, will feed relevant data on computers taken from papers or over phone from various officials of the division/headquarters etc specific for a particular depot, later the maintenance schedule for maintaining all TRD assets under the jurisdiction of a particular OHE depot will be prepared based on those special instructions in requisite format. His job will cover typing and composing, downloading of data, e-mail correspondence, scanning, printing and designing, making presentation, preparation of reports, data analysis, tabulation works, monitoring the maintenance progress through charts to be submitted to Divisional as well as headquarter official for analyzing and preparing the road map, converting paper information as soft copy, excel sheet feeding and analysis etc. and other relevant works as and when required by the depot in-charge. Other than above TDMS work, his job will also cover all other data entry work as advised by depot in-charge

**Other Special Conditions for "Data Entry Operator":**

- (a) One dedicated data entry operator per depot over & above the number of staff mentioned elsewhere in specification should be employed.
- (b) The data entry operator should at least be graduate with fluency in Computer work.
- (c) Contractor will ensure rest or leave to his staff as per rules of labor laws. No payment will be made to firm regarding the rest or leave of the staff.
- (d) If any staff/worker of the contractor is found indulging in undesirable or unlawful activities e.g. criminal acts, alcoholism, drugs, misuse of premises, theft etc., the contract will be liable to be terminated.
- (e) The cost of damage to the railway property if incurred due to act of omission/ commission by contractor or its employee during the execution of work will be borne by the contractor.
- (f) The working hour or shift timings shall be decided by Railways and binding on the contractor. The shift timings normally will be from 08:00 hrs. to 17.00 hrs. However, Railways may change these timings on administrative or operational considerations. The decision of Railways in this regard would be final & binding on the contractor.
- (g) Contractor's staff will not be permitted to perform duty in consecutive shifts.
- (h) If in the opinion of Railways, it appears that the staff deployed by the contractor is incompetent or lacks comprehension or is not capable of carrying out the job effectively, the contractor must replace such staff by any other suitable staff within 7 days" notice period & till such time same staff will work from such date of intimation by the Railways to the contractor, a failure to which may attract a penalty of Rs 500/- day for every day after 7th day.
- (i) The contractor must ensure that deputed staff shall not be changed frequently.
- (j) The work of entering the data and generation of reports shall be completed on daily basis except for the reports which may be required fortnightly/ monthly.
- (k) Data entry into system is a real-time on-line process. Therefore, the nature of job of the staff is continuous type of work. The job should be completed within the shift hours.
- (l) Contractor shall ensure correct entry of the data into the system. In case of any wrong data entries the contractor shall be responsible for the loss which may be incurred by the railways. Railways reserve the right to recover the loss so incurred from the bills of the contractor.
- (m) Various data required to be fed into the system shall be provided by the Sr.DEE/TRD/AII or his authorized representatives on daily basis. All manual entry has to be authorized by authorized Railway personnel.
- (n) Computer system and accessories required for data entry work will be made available by Railways.
- (o) Contractor / data entry operator has to maintain the confidentiality on data and other office related information. Railways reserve the right to take appropriate action in case of any data breach by Contractor / data entry operator is found.

**Item No. 20****Reinforce concrete for cable trench and cover**

The price shall cover the provision of cable Trenches and its cover made with Reinforced concrete including digging of soil/surface as per RDSO specification/ drawing available latest and as per instruction of Engineer in charge at site. Rates are calculated in CuM as per requirement for the entire section. The man power deputed shall leave the work spot with the permission of engineer in charge. All released materials to be handed over to Railways.

**Item No. 21 & 22****Supply and Erection of material for single earth electrode**

The price shall cover supply, Erection, testing and commissioning of an earth electrode assembly as per latest RDSO Specification for PSI with all accessories & fasteners. The price also covers the provision of a protective concrete box with removable cover. The price shall cover cost of testing and commissioning of an earth electrode confirming to IS 3043, IS 1239 or RDSO Specification with latest amendment. The price also covers cost for manual excavation of earth for providing earth station, cost for wooden charcoal, salt to found earth resistance within limits and erection of protective concrete box and RCC cover. The price also cover cost of marking the earth resistance measurement details (Earth pit number, earth resistance value etc.) on earth pit cover box with yellow and black paint or as desired by concern SSE/JE (TRD).

**Item No. 23****Provision of repair of PSI equipment through OEM/Authorised vendor on Emergency / Urgent basis:**

The price shall cover the repairing of equipment through OEM/Authorized vendor in case of any fault/repair. The payment will be made as per the original repair cost quoted by the OEM/Authorized vendor and no extra payment made other than the repair cost of the work. In case of requirement under this NS, immediate action will be required to be taken by the firm as per Railway request.