INTEGRATED MANAGEMENT SYSTEM

ELECTRICAL STANDARD OPERATING PROCEDURES

Pipelines SBU

HINDUSTAN PETROLEUM CORPORATION LIMITED

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

1.1 Purpose:

Maintenance of Electrical system for ensuring reliable and stable system by adopting detailed preventive maintenance procedures to be carried out by Electrical maintenance department.

1.2 Scope:

Responsibility of carrying out related Electrical maintenance activities among different sections of pipeline. Defining procedures for operations and maintenance of Electrical System.

1.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge.

1.4 Work Permit:

For maintenance activities at one of the main stations, take cold work permit from the respective control room. If work is to be carried out at MOV/SV stations, then information has to be provided to respective controlling locations and take cold work permit from respective controlling location.

1.5 AMC and OEM Details:

S.No	Purchase Order Number and dated	Party Name and Contact Details	P.O Expiry Date

1.6 Usage:

Electrical system is considered as lifeblood of Pipelines Station. It involves various sub electrical systems, involving motors, transformers, HVAC, UPS, Batteries energy management systems, automation, fire and life safety systems, communications and security.

1.7 Importance:

Electrical system is used for maintaining continuity of Pipeline operations. Hence maintaining the efficiency and productivity of various units and equipment's is necessary for hassle free operations and delivery of product.

1.8 Safety Precautions and PPE Usage:

Functioning of Electrical System is very critical for ensuring proper functioning of Motors, and all associated equipment's such as UPS, HVAC SCADA,LDS system.

Following Safety Precautions and PPE to be used while handling Electrical equipment:

1. Follow all the proper safety regulations while doing any type of the Electrical Maintenance.
2. Proper Work Permit System (Hot Work/Cold Work/electrical Permit) to be followed.
3. Whenever working with HV /EHV, use tested hand gloves suitable for that particular voltage rating, gum boots of proper rating.
4. Electrical maintenance shall be performed in the supervision of the authorized personnel
5. Before taking up any equipment for maintenance please ensure proper electrical isolation of the same.
6. HT & EHT maintenance shall be done by the Electrical supervision having valid license to work on HT /EHT under the supervision of the authorized personnel.
7. Proper grounding must be provided which will protect the system from equipment safety and anti-interference. It will also protect the humans.

1.0 Maintenance of Out Door Circuit Breaker (CB):

1.1 Purpose:

To provide guidelines for maintenance of **Out Door Circuit Breaker** System.

1.2 Scope:

Scope of work includes maintenance of **Out Door Circuit Breaker** System provided at the location.

1.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

1.4 References:

1.5 Relevant records: Maintenance of **Out Door Circuit Breaker**: ISF/ELE/01

1.6 Frequency: Half Yearly

1.7 Maintenance Procedure: Take Cold Work Permit / Electrical Permit from shift In-charge.

1. Ensure that 66/33KV is isolated by using air break switches upstream of CB.
2. Earthing of over head conductors to discharge any stored energy using discharge rod / Earthing switch, after isolation.
3. Check control supply voltage and ensure within limits.
4. Switch off charger and see if batteries continue to provide the control supply. Switch on charger and check if there is some indication in charging current meters. If not rectify battery charger as required.
5. Check all lamps and fuses in the panel and chargers using multi-meter. Check the manual indications on the VCB.
6. Trip VCB by using the panel controls and close after that to verify functionality.
7. Simulate earth fault and over current through the relays and check CB for tripping. If the relay does not trip verify control circuit as per drawing and rectify the same.
8. After 1000 operations or 5 faulty trippings of CB it has to be inspected as per Manufacturer's recommendations.
9. Condition of the spring charging motor shall be checked.
10. All the moving parts of the CB shall be lubricated.
11. Ensure that the CB is earthed from the two sides.

12. Check the healthiness of SF6 gas alarm by shorting the circuit NOT by draining SF6 gas.

Checking & Testing of VCB Bottles in a frequency of 3 years.

Check healthiness of VCB bottles with the help of Vacuum Interrupter Tester: Veer Electronics make Vacuum Interrupter Tester tests the vacuum Interrupter Integrity by applying a Pulse DC Voltage across the Interrupter under Test. When this Voltage is applied to the Vacuum Interrupter, if Interrupter is defective then an electronic Buzzer gives Audio indication as well as red color Fault LED also gives visual indication of fault.

Vacuum Interrupter Kit:

13. Check electrical resistance of breaker. Resistance can be measured with the help of the Multimeter and verify it with the original value.
14. Check for interlock/ESD functionality in outdoor CB.:

15. Check working of space heater wherever applicable. Also check the temperature settings and adjust if needed.
16. Check for limit switch functionality of switchboard.
17. Check Oil Level and refill if required (For C.T/P.T.) Same can be checked with the help of oil level indicators present in the CT/PT.
18. Check physically insulation/separation of LA earthing strip from structure.
19. Check Fence earthing and condition of fencing. Double Earthing should be ensured. Running strip of GI/Copper should be used for effective earthing.

Carry out Third harmonic current testing of lightning/Surge: Online measurement of **Third Harmonic Resistive Leakage Current should** be carried out in a frequency of 3 years.

Test Procedure:

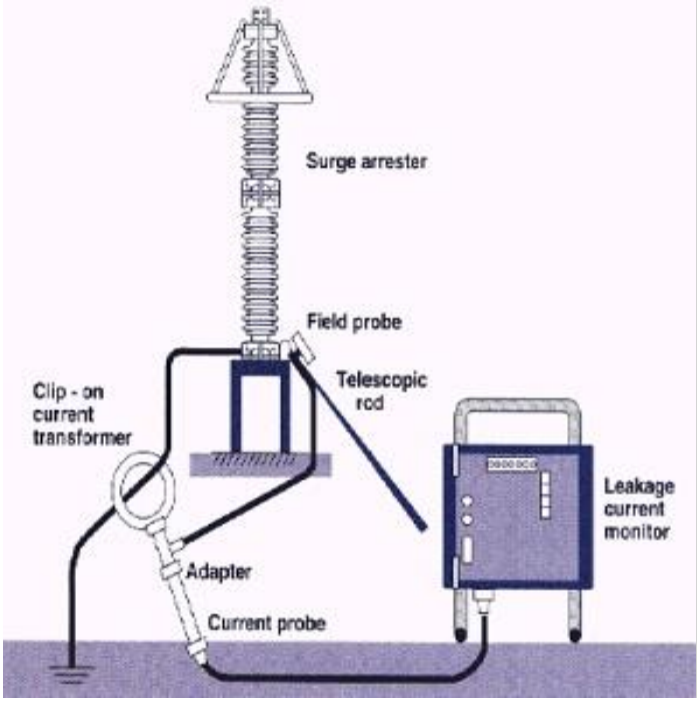
The total current (IT) through the Surge Arrester having Capacitive component (IC) and Resistive Current (IR) flows through the Leakage Current monitor. The IR component has 3rd, 5th and other harmonics present in it. When degradation of the metal oxide discs occur, the variation of 3rd harmonic Resistive currents is more pronounced than other harmonics currents, total current (IT) and total Capacitive current (IC).

Testing of surge arresters is carried out as follows:

A Test instrument with a clip on meter is connected in the ground connection of the arrester and following parameters are measured.

1. True rms value of total current, flowing through ground circuit.
2. Peak value of total current
3. True rms value of third harmonic leakage current.
4. Ambient temperature.

An increase in the third harmonic resistive component of leakage current brings the arrester to thermal overloading and finally causes breakdown. If the increase in the 3rd harmonic current is monitored and detected earlier, then arrester can be repaired or replaced, thus preventing damage



Note: Tool that measures the third harmonic resistive leakage current of the surge arrester as described in IEC 60099-5.

Interpretation of Test results:

The non-linear voltage- current characteristic of a metal-oxide arrester gives rise to harmonics in the leakage current when the arrester is energized with a sinusoidal voltage. The harmonic content depends on the magnitude of the resistive current and the degree of non-linearity, which is a function of voltage and temperature. The third harmonic content of the resistive current is typically 10 % to 40 % of the total Resistive current. An increase in the third harmonic resistive component of leakage current brings the arrester to thermal overloading and finally causes breakdown. If the increase in the 3rd harmonic current is monitored and detected earlier, then arrester can be repaired or replaced, thus preventing damage. The parameters of currents recorded are compared with previous measured values on the same arrester. The values are also compared with arrester of similar make and type, operating under similar conditions.

Acceptable limits of Third Harmonic Resistive Current as per CBIP Manual on EHV Substation Equipment Maintenance (Publication No. 294) (Refer Annexure - 1, Table 11.9) Table 1:

Life of LAs	Acceptable value of THRC	Remarks
New LA	Upto 20 µA	Normal
In Service LA	Upto 150 µA	Normal
In Service LA	150 to 350 µA	To be tested for IR & if found low, to be removed from service
In Service LA	>350 µA for Gapless type	To be removed from service
In Service LA	>500 µA for Gapless type	To be removed from service

2.0 Maintenance of Transformer & NGR

2.1 Purpose:

To provide guidelines for maintenance of **Transformer & NGR** System.

2.2 Scope:

Scope of work includes maintenance of **Transformer & NGR** System provided at the location.

2.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

2.4 References:

2.5 Relevant records: Maintenance of **Transformer & NGR**: ISF/ELE/02

2.6 Frequency: Yearly

2.7 Maintenance Procedure:

a) Take Cold Work Permit / Electrical Permit from shift In-charge.

b) Ensure isolation of the Transformer.

c) Remove from circuit before taking up maintenance.

d) Earth cable on both using earthing trucks follow the instructions on earthing trucks carefully.

e) Open up cable boxes and inspect visually for any moisture/Pest ingress, remove the said material and use fresh gasket if required.

f) Inspect bushing, insulators, marshaling box visually for any problems.

g)Simulate all alarm/trip conditions and ensure that the tripping does take place due to simulated conditions, if not check circuits and rectify.

h)Check OTI, WTI & Thermo well condition & record the same.

i) Check the condition of mercury bulbs S1 & S2.

j) Verify that current Alarm & trip settings are in line with recommended settings.

k)Check the connections in marshalling box for tightness.

l) Check for proper connection of probes to respective pots.

m) Using 5KV Megger take IR values of winding to earth and cable to earth.

n) Check dielectric strength of transformer oil if found less than 40 kV for 1 min. with 2.5 mm. Minimum gap then oil needs filtration. Carry out oil filtration to raise dielectric strength to 60 kV for 1 min. For 2.5 mm. minimum gap and record

a. Before filtration
b. After filtration and dielectric strength and B.D. of oil.

o) Check for online tap changer operation on Auto/Manual. Check the function of limit switches

p) Visually check dehydrating breather and oil level in it. Breather Silica gel should be blue colour *and oil should be appr.1".* If Silica gel has lost its blue colour it means that it is no longer effective and re-activation (by means of heating) or replacement fresh Silica gel is required.

q) Short across the NGR to discharge any energy stored in cable capacitance.

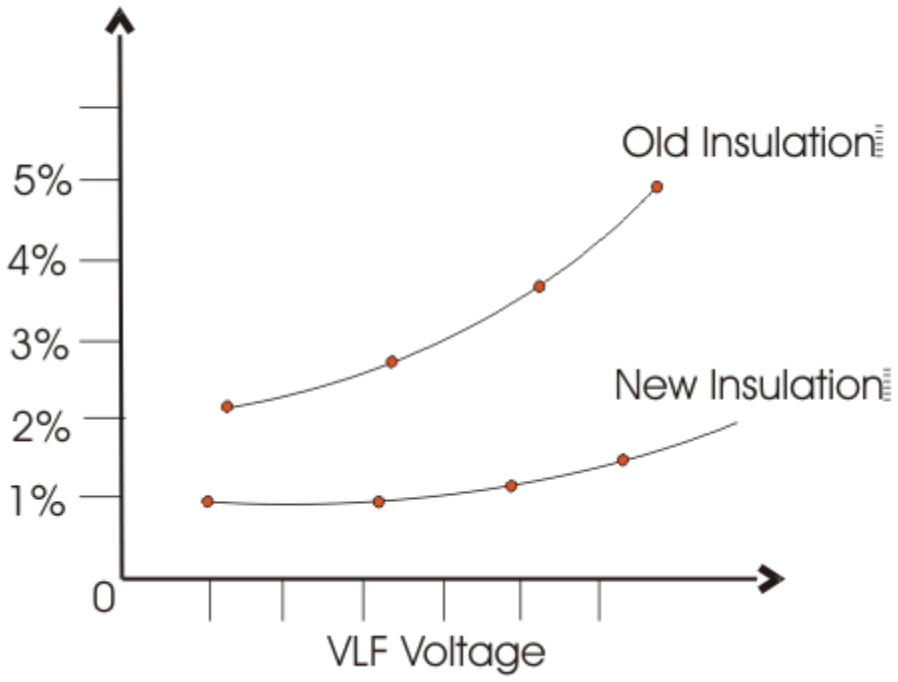
r) Before starting the job check using 6.6 KV live line tester.

s) Remove from circuit and measure resistance using multi-meter. The measured value should be + 10% of its rated value, if not look for grids which are open circuited or shorted & rectify.

t) Restore connections put back transformer in Circuit and return permit.

2.7 Tan Delta Testing of Transformer

Tan-delta test of transformer to be carried out once in 3 years. For Tan Delta test the cable, winding, current transformer, potential transformer, transformer bushing, on which tan delta test or dissipation factor test to be conducted, is first isolated from the system. A very low frequency test voltage is applied across the equipment whose insulation to be tested. First the normal voltage is applied. If the value of tan delta appears good enough, the applied voltage is raised to 1.5 to 2 times of normal voltage, of the equipment. The tan delta controller unit takes measurement of tan delta values. A loss angle analyzer is connected with tan delta measuring unit to compare the tan delta values at normal voltage and higher voltages, and analyze the results. During test it is essential to apply test voltage at very low frequency.



Results of Tan Delta Analysis

2.8 Dissolved Gas Analysis:

DGA testing of transformer oil should be conducted in once in 3 years. Ratios of different constituent mixtures to be analyzed.This test is used to determine the amount of specific gases generated in Transformer oil during service. The amount of gases and certain combinations of those is the first indication of a possible malfunction that may eventually lead to failure if not corrected. Some of the mechanisms which lead to generation of gases due to the chemical decomposition of oil are arcing, partial discharges, low energy sparking, severe overloading, overheating of the insulation etc. Certain empirical values are provided to give an indication of the impending failure. For DGA testing the sample should be obtained using a clean, moisture free, gas tight container. Care

should be taken to purge the container of all free gas at the time of drawing the sample. The first step in evaluating DGA results is to consider the concentration levels (in ppm) of each key gas. It is recommended that values for each of the key gases be trended over time so that the rate of change of the various gas concentrations can be evaluated. Basically, any sharp increase in key gas concentration is indicative of a potential problem within the transformer. Below is a table, which has been derived from ANSI/IEEE C57.104 information. The suggested action levels for key gas concentrations.

Interpretation of DGA Tests:

Dissolved gas concentration limit (ppm)								**Interpretation**
Hydrogen (H_2)	**Methane (CH_4)**	**Acetylene (C_2H_2)**	**Ethylene (C_2H_4)**	**Ethane (C_2H_6)**	**Carbon monoxide (CO)**	**Carbon dioxide (CO_2)**	**TDCG (*)**	
100	120	1	50	65	350	2500	720	Satisfactory
101 - 700	121 - 400	2 - 9	51 - 100	66 - 100	351 - 570	2500 - 4000	721 - 1920	Fault may be present
701 - 1800	401 - 1000	10 - 35	101 - 200	101 - 150	571 - 1400	4001 - 10000	1921 - 4630	Fault probably present
>1800	>1000	>35	>200	>150	>1400	>10000	>4630	Continued operation could result in failure

Note: The test should be performed in a laboratory and ASTM D 3612- 93 should be followed for extraction and analysis of the key dissolved gases. Refer IS 9434 for the sampling and testing procedure.

3.0 Maintenance of 66 / 6.6 or 33 / 6.6 KV (as applicable) Switch Boards & Breakers:

3.1 Purpose:

To provide guidelines for maintenance of 66/6.6 or 33/6.6 KV (as applicable) Switch Boards & Breakers.

3.2 Scope:

Scope of work includes maintenance of 66/6.6 or 33/6.6 KV (as applicable) Switch Boards & Breakers as provided in location.

3.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

3.4 References: OEM Handbook, OISD 137, OISD 149.

3.5 Relevant records: Maintenance of 66/6.6 or 33/6.6 KV (as applicable) Switch Boards & Breakers, **ISF/ELE/03** & Relay Calibration Report - **ISF/ELE/14**

3.6 Frequency: Half Yearly

3.7 Maintenance Procedure

1) Take Cold Work Permit / Electrical Permit from shift In-charge.
2) Isolate 66KV/33KV supply by using air break switches in the upstream of CB.
3) Earth the overhead conductors to discharge any stored energy using discharge rod after isolation.
4) Put off DC control supply and withdraw the breaker from the concerned panel (follow the guidelines on breaker truck).
5) Remove the connecting plug which carries the control wiring.
6) Earth the HT terminals using discharge rods.
7) Clean the mechanism with a waste cloth/rag to wipe off excess oil. Check breaker operation by operating it by its mechanical switch. Pull to close the breaker and Push to trip.
8) Lubricate all moving parts and pivots using manufactures recommended oil grade.
9) Visually check all parts for abnormal wear & tear.
10) Manually check all bus joints for tightness.
11) Check all fuses with a multimeter. Check all relay settings are as per latest Revision of Protection Coordination drawing for respective locations.

12) Rack-in the breaker, restore control wiring and DC control supply. Verify completion of maintenance as per format ISF/ELE/03

13) Calibrate the applicable relays in the switch boards as per instruction WI-ELE: 14

14) Restore 66KV/33KV supply by using air break switches in the upstream of CB.

15) Inform Operations group and return permits.

16) Check availability of insulation mats as per **IS 15626**

Following table to be referred for proper placement of mats as per operating voltage level:

Table 1 Classes and Maximum Use Voltages

Sl No.	Class	ac (rms) kV	dc V
(1)	(2)	(3)	(4)
i)	A	3.3	240
ii)	B	11	1)
iii)	C	33	1)
iv)	D	66	1)

17) Check healthiness of VCB bottles with the help of Vacuum Interrupter Tester: Veer Electronics make Vacuum Interrupter Tester tests the vacuum Interrupter Integrity by applying a Pulse DC Voltage across the Interrupter under Test. When this Voltage is applied to the Vacuum Interrupter, if Interrupter is defective then an electronic Buzzer gives Audio indication as well as red color Fault LED also gives visual indication of fault.

Vacuum Interrupter Kit:

4.0 Maintenance of MCC / PCC/ASB Panels:

4.1 Purpose:

To provide guidelines for maintenance of **MCC / PCC/ASB Panels.**

4.2 Scope:

Scope of work includes maintenance of **MCC / PCC/ASB Panels** as provided in location.

4.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

4.4 References: OEM Manuals, OISD 137, OISD 149.

4.5 Relevant records: Maintenance of MCC / PCC/ASB Panels, **ISF/ELE/04.**

4.6 Frequency: Half Yearly

4.7 Maintenance Procedure:

1. Take Cold Work Permit from shift In-charge.
2. Ensure panel is de energized before taking up the work to ensure safety of personnel.
3. Check whether maintenance is carried out as per format No ISF/ELE 04
4. Check all fuses using multimeter.
5. Check all control wiring visually.
6. Check manual spring charging of breaker by withdrawing it to test position and put spring charging motor in switch ‘off’ position and use handle to charge spring manually or check operation of SFU, as applicable.
7. Checking of presence of Insulation Mats of proper ratings as per IS 15652:2006

5.0 Maintenance of Motors

5.1 Purpose:

To provide guidelines for maintenance of of Motors.

5.2 Scope:

Scope of work includes maintenance of 4.0 Maintenance of HT **Motors (Mainline motors)** provided in location.

5.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

References: OEM Handbook, OISD 137, OISD 149**.**

5.4 Relevant records: Maintenance of HT motors **ISF/ELE/05.**

5.5 Frequency: Yearly

5.5 Maintenance Procedure:

1) Take work permit from the Shift In-charge.
2) While working on HT motors cable end at the breaker has to be earthed using cable earthing trolley. Follow instructions on earth trolley for the same. Check with 6.6kv line tester before handling any terminals.
3) Arrange for electrical and mechanical isolation of item under maintenance.
4) Check working of protective devices including operation of thermal overload relay in the respective motor feeders. Ensure the relay is at recommended setting & record the same.
5) Check cable and motor winding IR values using a 1kv /5kv megger (1kv for LT motors and 5kv for HT motors).
6) If IR value is < 5 Mega Ohms for LT & < 50 Mega Ohms for 6.6kv motors then investigate the matter further as follows.
7) Arrange a competent outside party to dismantle the motor, dry out the windings in a suitable furnace, re-warnish the windings & reassemble. If IR values do not improve refer to manufacturer.

8) Check motor winding resistance and compare with the manufacturer's specifications to conclude if it is within the acceptable range.

Procedure for IR measurement of motor

- Keep the final breaker of the motor under test in "**TEST**" position.
- Open the cover of the terminal box of the motor.
- Discharge the residual voltage by connecting all the three phases(R, Y &B) to nearby earth strip.
- Disconnect the Cable from the motor terminals
- Using analog megger, Check the Insulation resistance between Phase and Earth (RE, YE & BE) and record the values. The voltage applied should be less than 6.6KV. (Preferably use 2000V).
- Now check the cable insulation resistance between Phase s (RY, YB & RB) and also between Phase and earth (RE, YE & BE) and record the values.
- If the values are found okay, then connect the cable to the motor terminals ensuring no loose contact.
- Close the motor terminal cover and put the breaker in "**SERVICE**" position.
- If the values are not okay, investigate further for the cause.

Carrying out cleaning of winding using Air Jet preferably dry air with max 2.5 bar pressure.: Carry out moisture absorption test (Dielectric Absorption Test): Moisture absorption is usually evaluated from the ratio of two values of insulation resistance measured with Insulation tester after 60 seconds and 30 seconds respectively. This ratio is called the Coefficient of moisture (dielectric) absorption, denoted by 'K'.

Damp installation will have a coefficient value close to 1. As the insulation dries out, the coefficient rises and when it becomes 1.3 or greater the insulation is considered to be dry.

The following table can be used as reference (Ref Table 20.20.2 of NFPA 70B):

Condition	60:30 Second Ratio	10:1 min ratio
Dangerous	----------	Less Than 1
Poor	Less than 1.1	Less than 1.5
Questionable	1.1 to 1.25	1.5 to 2
Fair	1.25 to 1.4	2 to 3
Good	1.4 to 1.6	3 to 4
Excellent	above 1.6	Above 4

If values are found satisfactory, restore equipment to its original condition.

Restore all electrical and mechanical isolations and restore equipment, inform to operations group and return the permit.

6.0 Maintenance of HT-Capacitor Banks:

6.1 Purpose:

To provide guidelines for maintenance of **HT/MV-Capacitor Banks.**

6.2 Scope:

Scope of work includes maintenance of **HT/MV-Capacitor Banks** as provided in location.

6.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

6.4 References:

OEM Manuals, OISD 137, OISD 149.

6.5 Relevant records:

Maintenance of MCC / PCC/ASB Panels, **ISF/ELE/06.**

6.6 Frequency: Half Yearly

6.7 Maintenance Procedure:

1) Take work permit from shift In-charge and isolate capacitor Bank.
2) Check input Voltage
3) Isolate and discharge the capacitor using discharging rod.
4) Check HRC fuses.
5) Check the tightness of all the wiring connections.
6) Check the capacitance and record
7) Restore the equipment and check for the Auto functioning.
8) Inform Operations group and return the permit.

7.0 Maintenance of DG Set

7.1 Purpose: To provide guidelines for maintenance of DG Set

7.2 Scope: Scope of work includes maintenance of DG Set as provided in location.

7.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

7.4 References: OEM Handbook, OISD 137, OISD 149.

7.5 Relevant records: Maintenance of DG Set, ISF/ELE/07, Refer IEEE 43 Standard 1974, 2000 for IT values of motor.

7.6 Frequency: Monthly

7.7 Maintenance Procedure:

1) Take work permit from the Shift In-charge.
2) DG set to be put into manual mode using key switch.
3) Put on set and check all controls and indications.
4) Clean panels using vacuum cleaner / blower.
5) Check all fuses using multi-meter.
6) Record charger voltage (Range 24 to 28V).
7) Start engine and record parameters in ISF/ELE/07 (from various gauges mounted on engine) i.e., RPM, Oil Pressure, Oil Temp.
8) Perform DG set / Bus coupler / Main Incomer Breaker interlock check. Ascertain that main incomer breaker is open (Main Supply is disconnected) as DG Set out going breaker (output supply) is closed & vice-versa for auto mode. For manual Mode, ascertain that DG outgoing breaker is not closed if mains supply is available & vice-versa.
9) Visually check for fuel and oil.
10) Visually check for any exhaust leakage
11) Check fan belt tension by hand, and it should not deflect more than 2cm, if the deflection is more tighten the fan belt.
12) Visually check the water temp gauge. Temp should be < 90^0C, if not rectify the problem as per manufacturer's manual

13) Ensure that all lamps are glowing (Multimeter is to be used to check the lamps that are 'off').

14) Restore the equipment, inform operation group and return the permit.

15) Check IR values of Alternator within a period of 12 months.

16) For rated voltage below 1KV, measured with a 500VDC Megger.

17) For rated voltage above 1KV, measured with a 1000VDC Megger.

18) In accordance with IEEE 43, clause 9.3, the following formula should be applied.

Min IR Value (For Rotating Machine) = (Rated voltage (v) /1000) + 1

19) Checking whether two sets of separate earthing is available for Neutral as well as for body.

8.0 Maintenance of Battery Charger :

8.1 Purpose: To provide guidelines for maintenance of Battery Charger

8.2 Scope: Scope of work includes maintenance of Battery Charger as provided in location.

8.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

8.5 References: OEM Handbook, OISD 137, OISD 149.

8.5 Relevant records: Maintenance of Battery Charger, ISF/ELE/07, Refer IEEE 43 Standard 1974, 2000 for IT values of motor.

8.6 Frequency: Quaterly

8.7 Maintenance Procedure

1. Take work permit from Shift In-charge.
2. Avoid touching any exposed components and uninsulated tools as it may result in electric shock.
3. Check all the parameters and record the same in format ISF/ELE/08.
4. Check all fuses using multi-meter.
5. Clean whether all meters are working otherwise check their respective fuses.
6. Clean the charger panel by using vacuum cleaner/blower.
7. Check all indication lamps.
8. Carry out functional test by putting off one charger and check whether other charger takes full load.
9. Restore the equipment, inform operation group and return the permit.

9.0 **Maintenance of Battery Bank:**

9.1 Purpose: To provide guidelines for maintenance of **Battery Bank** System.

9.2 Scope: Scope of work includes maintenance of **Battery Bank** System provided at the IP station and Main stations

9.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

9.4 References: OEM Guidelines, Do's and Don'ts for Battery Bank, OISD 137.

9.5 Relevant records: Maintenance of **Battery Bank:** ISF/ELE/09

9.6 Frequency: Monthly

9.7 Maintenance Procedure:

1. Take work permit from the Shift In-charge.
2. Use safety shoes and Apron and other personal protection devices before starting the work. Do not use uninsulated tools.
3. If acid splashes on body / eyes wash immediately.
4. a) If electrolyte level is not between red marks is out of range top up with distilled water.
    a. b) Specific Gravity limit: Between 1.180 to 1.230
    b. c) Battery voltage limit: 2.1 to 2.3 V

    c. -If battery is out of this range remove from circuit and charge separately using cell charger to bring parameters into range.
    d. -Charge the battery till terminal voltage is between 2.1 and 2.3 and Sp. Gravity >=1.200
5. Clean battery terminals with any sharp instrument to remove scales around the terminals and apply a film of petroleum jelly to all exposed lead parts.
6. Visually check connecting links for corrosion, scrape of corroded ones.
7. Manually check link tightness, tighten if necessary.
8. Check DC bus condition in DCDB for any damage or corrosion replace if required.
9. Restore the equipment, inform operation group and return the permit.

10.0 Maintenance of Uninterrupted Power Supply (UPS)

10.1 Purpose: To provide guidelines for maintenance of **UPS**

10.2 Scope: Scope of work includes maintenance of **UPS** provided at the location.

10.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

10.4 References: OEM Guidelines, OISD 137.

10.5 Relevant records: Maintenance of **UPS** : ISF/ELE/10

10.6 Frequency: Half Yearly

10.7 Maintenance Procedure.

1. Take work permit from the Shift In-charge.
2. Do not touch any part before testing.
3. Check fuses.
4. Check all meters visually.
5. Clean the panel using Vacuum cleaner / blower.
6. Check indication lamps.
7. Carry out Functional Test by putting of Main Supply and Check whether UPS is able to take load for 2-3 min. and transfer- re transfer test.
8. Record the Parameters as required in ISF/ELE/10
9. Restore the equipment, inform operation group and return the permit.

11.0 Maintenance of MOV Actuators

11.1 Purpose: To provide guidelines for maintenance of **MOV Actuators**.

11.2 Scope: Scope of work includes maintenance of **MOV Actuators** provided at the location.

11.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

11.4 References: OEM Guidelines, OISD 137.

11.5 Relevant records: Maintenance of **MOV Actuators**.: ISF/ELE/11

11.6 Frequency: Half Yearly

11.7 Maintenance Procedure

1. Ensure that necessary shut down is available before carrying out the Maintenance.
2. Take work permit from Shift In-charge.
3. Isolate power supply to the MOV.
4. Open actuator and remove control card.
5. Check contactors manually & control card visually for any damage. Check control fuses using multi-meter.Restore all connections to original state.
6. Check lubricating oil level (refer to Electrical manual) and top up, if required.
7. Take trial of the unit with operations group by using controls located in the control room.
8. Restore the equipment, inform operation group and return the permit.
9. Check for the condition of the O Rings of the actuator cover. In case O ring is defective of cut, it shall be replaced with new O ring.
10. Fuses shall be checked at both ends i.e. at the SFU & Actuator end. Fuse shall be checked for continuity & ratings.
11. Electrical operation shall be checked from remove /Local.
12. Check from PLC if any alarm is persisting for any particular MOV or Not. In case any alarm is persisting further diagnostics shall be done to rectify the alarm.

12.0 **Maintenance of Earthing Pits :**

12.1 Purpose: To provide guidelines for maintenance of **Earthing Pits**

12.2 Scope: Scope of work includes maintenance of **Earthing Pits** provided at the location.

12.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

12.4 References: OEM Guidelines, OISD 137, IS 3043.

12.5 Relevant records: Maintenance of **Earthing Pits** : ISF/ELE/10

12.6 Frequency: Half Yearly

12.7 Maintenance Procedure:

1. Take work permit from the Shift In-charge.
2. Measure grid resistance value using earth megger with earthing strips connected.
3. Detach earth strips from the electrode and measure the resistance.
4. Attach the earth strips and restore the earth pit to the grid.
5. Record both values in ISF/ELE/12. Grid resistance value should be the guiding factor for determining the health of earthing system and as long as this remains less than 1 ohm, higher resistance values of individual earth pits are acceptable. However, to keep the grid resistance below 1 ohm, earth pits with high resistance should be treated by adding one layer of common salt and one layer of charcoal followed by watering of the pit.

13.0 **Calibration (Clamp meter & Multimeter and other measuring electrical equipment's):**

13.1 **Purpose:** To provide guidelines for maintenance of **Earthing Pits**

13.2 **Scope:** Scope of work includes maintenance of **Earthing Pits** provided at the location.

13.3 **Responsibility:** Officer In-Charge-Electrical/Maintenance In-charge

13.4 **References:** ISO Calibration Schedule. OEM Recommendations.

13.5 **Relevant records:** Maintenance of **Earthing Pits** : ISF/ELE/13

13.6 **Frequency:** Yearly

13.7 **Maintenance Procedure:**

1. In case of Clamp meter for Calibrating AC current range setup the current injection kit and short the current output terminal with a thick PVC insulated wire (minimum 6 Sq mm) put the current measurement tong of standard Clampmeter having (calibration traceability certificate) along with the meter under test around the above mentioned wire. Increase current using the variac provided in the current injection kit and note the reading s in the standard clamp meter and the meter under test in the format No. ISF/ELE/15. Note that at least six readings must be taken well spread over the ranges of the meter under test.
2. For calibration of DC & AC Voltage ranges, setup the current injection kit for the relevant mode and connect the standard multimeter (having calibration traceability certificate) along with the meter under calibration to the relevant output terminals. Gradually increase the output of the kit using the variac provided and note the readings of the standard meter as well as the reading of the meter under test. At least six readings to be taken spread over the range of the meters/kit. Tabulate the results in format No. ISF/ELF/13.

3. Resistance and DC current ranges are for indicating only and for any measurement of these two parameters to be done using meters having calibration traceability only to (i.e., multifunction calibrators & 4.5-digit multimeter with electrical group in Station).
4. Person carrying out the calibration to check error percentage between the standard meter (having calibration traceability and meter under test and if the errors are within +/- 2% then the meter under test can be declared fit for use. Meters, which fail to meet the above criteria either, have to be discarded or else to be sent for repair in which case calibration has to be carried out once more to ensure the meter is within the +2% error limits for it to be accepted for use.

14.0 Relay Calibration Report :

14.1 Purpose: To provide guidelines for maintenance of **Relays,**

14.2 Scope: Scope of work includes maintenance of **Relays** provided at the location.

14.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

14.4 References: ISO Calibration Schedule. OEM Recommendations.

14.5 Relevant records: Maintenance of **Relays**: ISF/ELE/14

14.6 Frequency: Yearly

14.7 Maintenance Procedure:

1. Take work permit from the Shift In-charge.
2. Keep the Relay Test Kit ready for Calibrating / checking the settings of Relay.
3. Take out the relay from the panel for which Calibration / checking is to be done.
4. Connect the relay as per termination drawings.
5. Switch on the Power Supply to the Relay test Kit and feed the Voltage / Current to the relay and note down the voltage/ current at which the relay tripping occurs. In case of relays with time settings note down the time taken to trip the relay.
6. If any relay is out of Calibration more than + /- 5% error keep relay out of service and arrange to send to the Manufacturer for repairs and inform Location In-charge.
7. Prepare Calibration reports for the Relays in the Formats ISF/ELE/14.
8. Replace the relays in their original panels and ensure their settings as per latest Revision of following drawings.
9. Inform Operation group and return the permit.

15. Maintenance Out door Switch yard 66KV/33KV Switch Yard.

15.1 Purpose: To provide guidelines for maintenance of **Switch Yard**

15.2 Scope: Scope of work includes maintenance of **Switch Yard** provided at the location.

15.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

15.4 References:

15.5 Relevant records: Maintenance of **Switch Yard**, ISF/ELE/15

15.6 Frequency: Yearly

15.7 Maintenance Procedure:

1. General Housekeeping shall be taken up. Ensure removing all the vegetation, dried grass etc. from the area.
2. Lighting of the yard shall be thoroughly checked.
3. Check the condition gang operating switch.
4. Check the condition of the Earth switch.
5. Check the condition of the lighting arrestor
6. Earthing grid shall be checked for the resistance. Ensure the earthing of the structural of switch yard.
7. Condition of the chain link fencing shall be checked. Painting of the gate shall be checked. Check the earthing of the fencing
8. Check all the jumpers/tubular bus bars for the tightness. In case any loose connection is found, the jumper/tubular bus bar shall be opened and tightened.
9. Check the condition of the tubular bus bars.
10. Check the oil level of CT/PT

16. Maintenance of LV Capacitor Bank

16.1 Purpose: To provide guidelines for maintenance of **LV Capacitor Bank**

16.2 Scope: Scope of work includes maintenance of **LV Capacitor Bank** provided at the location.

16.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

16.4 References: OEM Guidelines, OISD 137

16.5 Relevant records: Maintenance of **LV Capacitor Bank**, ISF/ELE/16

16.6 Frequency: Yearly

16.7 Maintenance Procedure:

1. Isolate the panel by switching off the SFU from LV switchboard.
2. Ensure general housekeeping of the panel using Blower/Vacuum Cleaner.
3. Ensure tightness of all the terminals /connections.
4. Check the earthing of the penal fron 2 sides.
5. Check the SFU & contactors of the individual capacitors.
6. Check the functionality of the APFC relay.
7. Isolate the panel by switching off the SFU from LV switchboard.
8. Ensure general housekeeping of the panel using Blower/Vacuum Cleaner.
9. Ensure tightness of all the terminals /connections.
10. Check the earthing of the penal fron 2 sides.
11. Check the SFU & contactors of the individual capacitors.
12. Check the functionality of the APFC relay.

17.0 Maintenance of the VFD Drive

17.1 Purpose:

To provide guidelines for maintenance of **VFD Drive**.

17.2 Scope:

Scope of work includes maintenance of **VFD Drive** provided at the location.

17.3 Responsibility:

Officer In-Charge-Electrical/Maintenance In-charge

17.4 References: OEM Handbook, OISD 137

17.5 Relevant records: Maintenance of **Transformer & NGR**: ISF/ELE/19, ISF/ELE/20

17.6 Frequency: Yearly

17.7 Maintenance Procedure

1. Wait 10 minutes after turning off the medium-voltage primary power supply before opening the front cover of Power Cell Panel. Failure to observe this precaution would be extremely hazardous.
2. Before starting inspection or maintenance make sure that the indicator LED "CHARGE" on the front of Power Cell Panel immediately after turning off the power since residual voltage stays in the capacitor.
3. Maintenance, inspection, and parts replacement must be performed by a technician who thoroughly understands the structure and circuits of the inverter.
4. Be certain that tool, etc. are not left in the panels after maintenance, inspection, or parts replacement.

5. Many devices that are sensitive to static electricity, such as COMS-IC, are used in the control board. Take a special care when handling the control board. (Touching the

control board with bare hands can severely damage it by static electricity. Remove static electricity from your hands before working.)

6. Always use an electrostatic shielding bag when handling or inspecting the printed circuit boards.Use an insulated measuring instrument, such as insulated oscilloscope probe, instead of simply grounding the instrument. Otherwise, the inverter of a measuring instrument may be damaged.

6. Check the following items during periodic inspections.

7. Turn off the power supply, make sure that all LEDs on the front cover of the cell control board are unlit, and then wait at least 5 minutes (10 minutes after turning off a medium voltage power supply) before starting inspection.

8. Touching terminals immediately after turning off the power supply may result in electric shock.

Transformer

- Inspect the transformer as described below.
- Check the external appearance
- Retighten the bolts of transformer I/O terminals and primary voltage tap terminals
- Measure the transformer secondary voltage.
- Turn on the control power supply and medium-voltage power supply, and measure the input voltages to the power cells as shown in Fig. 8.2
- Measure the input voltage of each power cell by using a digital multimeter AC range. (Measure the input voltage across L1, L2, L3 of each power cell.) The measured input

voltage must be the rated voltage (630 VAC) ±10 V. If the majority of measured values exceed the allowable range, adjust the primary voltage tap (+10, +5, or 0% can be selected).

Power Cells

- Inspect the transformer as described below.
- Check the external appearance.
- Check for discoloration indicating burn marks, for leakage form the smoothing capacitor, and for protruding safety valves and expansion of the smoothing capacitor.
- Retighten the bolts of input terminal L1, L2, and L3.
- Retighten the bolts of output terminals T1 and T2.
- Re-insert the optical fiber cable connector.
- Retighten the screws and bolts inside the Power Cell Panel.
- Check the main circuit fuse and control circuit fuse.
- Check for discoloration and looseness.
- 6. Clean the heat sink.
- If dirt and dust have accumulated on the heat sink, use dry air of 39.2 × 104 to 58.8 × 104 pa (4 to 6 kg'cm2) to clean it.

Megger Check (Measurement of Insulation Resistance)

1. Measure insulation resistance of the Inverter primary circuit.
   Use a 1000 V Megger insulation resistance tester. The measured insulation resistance must be 30MΩ or more.

As the primary circuit is grounded at high-resistance for input voltage detection, isolate both the grounding line and the detection signal lines that are connected to the control board before measuring insulation resistance.

2. Measure insulation resistance of the Inverter secondary circuit (motor side)

   Use a 1000 V Megger insulation tester. The measured insulation resistance must be 2MΩ or more.

   As the secondary circuit is grounded at high-resistance for output voltage detection and ground-fault detection, isolate the high-resistance resistor and Power Cell output cables connected to the output terminals before measuring insulation resistance.

   (If secondary switchgear is provided, it is convenient to open the contactor at the secondary switchgear output terminals and measure the insulation resistance at the secondary switchgear output terminals.)

Screws, Bolts, and Connectors

Loose I/O terminal bolts and/or loose board connectors can cause failure of malfunction of the Inverter. During periodic inspection, be sure to retighten the screws and bolts and re-insert the connector securely.

Inspect the following terminals and connectors.

- Medium-voltage I/O terminals
- Input and output voltage detection circuit (high-resistance section)
- Transformer I/O terminals and primary voltage tap terminals
- Transformer output terminal block
- Power cell I/O terminals and optical fiber cable connector
- Power cell screws, bolts, and connectors

- Control power supply input terminals
- Control transformer I/O terminals
- Cooling fan contactor I/O terminals
- Control fuse I/O terminals
- Screws, bolts, and connectors of each control board
- External I/O terminals

Tighten the M10 bolts or M20 bolts of medium-voltage I/O terminals with a tightening torque of 1800 to 2300 N·cm or 3150 to 3950 N·cm, respectively.

Air Filter

If the air filter is clogged with dirt and dust, the cooling capacity of the Inverter will be degraded, resulting in abnormal temperature rise. Check the air filter for dirt and dust at each daily inspection, and periodically clean it with neutral detergent.

Control Board

Visually check the control board for the following items.

1. Abnormal smell pr discoloration of the board
2. Loose screws or connectors

Cooling Fan

Inspect the cooling fan as described below.

1. Check for abnormal vibration or noise.

2. Retighten the mounting bolts.
3. Measure the motor insulation resistance.

   Use a 500 V megger tester. The measured resistance must be 10MΩ

4. Servomotor bearing

The service life of a bearing is approx. 15,000.

Note: for detailed replacement procedure please refers manufacturer's Manual.

Part Name	Standard Replacement Period*	Replacement Method and Remarks
Cooling fan	1 to 2 years (15,000 service hours)	Replace the bearings. (bearings on motor and fan)
Power cell smoothing capacitor	5 years	Replace with a new capacitor. (Determine replacement need after inspection)
Fuses	10 years	Replace with new fuses.
Aluminum capacitor on the printed circuit board	5 years	Replace with a new board. (Determine replacement need after inspection.)
Lithium battery	5 years	Replace with a new battery (Connect a battery to the CPU board with connector.) Product name: CR6L-CN014S manufactured by FDK Corporation Specification: 3 V/2000 mAh
Breaker and power fuses	-	Determine replacement need after inspection.

18.0 Maintenance of the AC Plant UNIT for VFD

18.1 Purpose: To provide guidelines for maintenance of **AC Plant unit for VFD**

18.2 Scope: Scope of work includes maintenance of **AC Plant unit for VFD** provided at the location.

18.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

18.4References: OEM Handbook, OISD 137

18.5Relevant records: Maintenance of **AC Plant unit for VFD**: ISF/ELE/22

18.6Frequency: Half Yearly

18.7Maintenance Procedure

1. The out door units shall be thoroughly cleaned with the blower and if required out door units can be cleaned with the help of water.
2. Ensure that all the copper piping / tubing is covered with the insulation.
3. The Indoor units (AHU) filter shall be carefully removed and cleaned with the compressed air, water or detergent if required.
4. The motorized fire dampers shall be checked for the operation.
5. The compressors shall be checked for the adequate pressure by using the pressure guage.
6. The soft touch panel on the AHU of the AC Plant has setting for the temperature etc. these setting shall be noted in the record and fir future reference.

7. The power panel shall be thoroughly cleaned and check for any open cable entry holes, loose wires and terminations.
8. The annunciation system shall be checked.
9. The Drain water system/piping for the extra water from the AHU shall be checked for any leakage.

19 Maintenance of the of the Window & Split AC

19.1 Purpose: To provide guidelines for maintenance of **Window & Split AC**

19.2 Scope: Scope of work includes maintenance of **Window & Split AC** provided at the location.

19.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

19.4 References: OEM Handbook, OISD 137

19.5 Relevant records: Maintenance of **Window & Split AC**: ISF/ELE/21

19.6 Frequency: Half Yearly

19.7 Maintenance Procedure

1. The Indoor unit shall be cleaned thoroughly and the filter shall be cleaned and washed with the water.
2. The outdoor split units shall be cleaned with the air blower and if required washed with the water.
3. All the copper tubing of the split units shall be properly insulated.

20 Maintenance of the HIGH MAST

20.1 Purpose: To provide guidelines for maintenance of **HIGH MAST**

20.2 Scope: Scope of work includes maintenance of **HIGH MAST** provided at the location.

20.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

1. **References: OEM Manual**
2. **OISD 137 : Inspection of electrical equipment**
3. **OISD 180 : Lightning Protection**

20.4 Relevant records: Maintenance of **HIGH MAST**: ISF/ELE/25

20.5 Frequency: Quarterly

20.6 Maintenance Procedure

1. Carry out general cleaning using rust remover/ cleaner
2. Clean dirt on gear train of double drum winch and lubricate using fresh grease
3. Bring down the toroidal mast ring down by using the winch
4. Clean the power panel using blower
5. Check all terminations
6. Pushbutton operations shall be checked individually and recorded
7. Using 1000 V dc, measure and record the following:
   a) Insulation Resistance of Motor:
      Connect one terminal to R-phase and other to earth. Switch on 1000 V Megger and record the value of IR. Repeat for all phase terminations.
   b) Insulation Resistance of Cable:
      Record Phase-Phase IR values for cable using 1000 Vdc megger.
   c) Measure winding resistance of motor phase to phase.
8. Check condition of capacitors, ballasts in the junction boxes.

9. All fuses shall be checked.
10. Check operation of space heater and aviation light.
11. During working on power panel ensure availability of insulation mat beneath.
12. After recording all checks , box up all JBs and panels and pull up the mast ring.
13. Verify proper body earthing (double) connections to individual earth pits, separated from grid.

21. Electrical Lockout / Tag out:

III Work Instructions

Once the need for carrying out a job is ascertained the following general procedure shall be adapted for uniformity:

a. Identify:

Basis the nature of job in hand, a detailed Job Safety analysis is required to be carried out identifying in steps the potential Hazards involved in the execution of the work. These will include the Electrical equipment and jobs on any processes involving use of electrical energy.

In this process, the specific equipment or component with equipment identification no./tag no. to be isolated shall be clearly identified.

b. Locate:

Upon identification of the equipment/ processes requiring attention towards electrical Safety procedures, the isolation device shall be properly located and matched with the equipment identification number to ascertain that the two are a match.

c.Work Permits/ De-energisation Permits

Once the procedure for execution of work has been outlined, discussed and JSA implemented, Work permits/ De-energisation permits shall be processed with approvals from proper authorities and after carrying out and recording appropriate checks in the check-list for Work permits/ De-energisation permits. Once the equipment is de-energized vide valid electrical isolation permit, cold work permit shall be issued for the required job on the de-energized equipment. The entry no. for de-energization in LOTO Register shall be mentioned in the work permit for traceability.

d. Inform/ Communicate

Once the permits have been obtained, everyone in the immediate work-area and control room shall be intimated of the intentions of the work and shall be removed to safe location.

e.De-energize/ Deactivate

All potentially Hazardous Electrical energy sources identified during the process shall be De-energized / Deactivated or blocked against unexpected movements or release of stored energy.

f. Lock-Out and Tag-out

Each person performing electrical work on an equipment must verify that the circuit is de-energized and they must install the LOCKS and TAGS issued to them. The tags shall carry

details of electrical isolation permit, equipment name & date/time of issue along-with serial no. of entry in the LOTO Register for traceability. The tag shall be signed by the Electrical Incharge.

g. Test

With due precautions, if the situation so permits, the authorized electrical maintenance personnel performing work on an equipment shall attempt to operate the equipment or its components to verify that it has been properly isolated and/or immobilized. This shall be duly recorded in the maintenance log book.

A properly verified/calibrated voltage measuring device shall be used to test for absence of voltage in the circuit. Measured Voltage to be recorded in work permit and signed by Electrical in charge.

A post Lock-Out Tag-out assessment shall be carried out once again to ensure that all possible hazards have been accounted for and mitigated.

h. Perform

Once the LOTO has been accomplished and testing done to ascertain proper isolation of the equipment, the work shall be performed safely following site specific Safe Work procedures.

Validity of the work permits and observance of all check-list items of the Work Permit

system shall be routinely checked for corrective actions. The work shall be immediately stopped in case any deviation is observed till corrected and certified again to take up the work safely.

i. Work-Completion

Upon completion of the work obtain clearance /permission from the concerned maintenance engineer/ Electrical Incharge for notifying all concerned regarding the intentions to re-energize the equipment.

j. Re-energisation Work Permit

Obtain authorization for re-energisation in the work permit from the electrical maintenance personnel under intimation to designated safety officer/ Control room Officer. Carryout and record pre-startup /re-energisation checks on the process being undertaken.

k. Notify

Notify all concerned personnel/ Control room of the intention to re-energize/restart the equipment, for maintaining safety precautions.

l. Remove LOTO notifications

Remove Locks and Tags on temporary basis from the equipment being re-energized. Keep them in safe custody with the maintenance personnel till the equipment energisation process has been satisfactorily completed.

m. Re-energize

Re-energize the equipment in coordination with persons involved in the activity. Check the vital parameters and maintain the system under close watch till the parameters stabilize.

In case of any findings requiring the equipment to be again taken out of service, record the same and initiate shut down process and again put the LOTO system on the equipment. Ensure that the proper Locks/ Tags are placed on the equipment.

n. Register

Hand over the Locks with Keys and Tags to the Maintenance / Control Room Officer and account for proper closure in the LOTO register to note that the equipment under LOTO has been put back in service and the Lock/ Tag released are again available for service, whenever required. For better monitoring of LOTO items (comprising of padlocks, hasps, etc.), each item shall be numbered which shall match with the LOTO kit list maintained in the LOTO register.

o. PRECAUTIONS DURING REMOVAL OF LOTO EQUIPMENTS

A. The Lock and Tags should be removed off the equipment only when:

a. the work has been completed and the equipment has been inspected for assurance towards safety during its testing or re-commissioning to service.

b. all tools, restraints and testing devices have been removed and properly accounted for and stored along with any parts, lubricants and other materials.

c. all personnel have been cleared from the immediate area and machine guards wherever applicable and safety devices have been replaced/ ensured to be functional.

B. The Keys shall be handed over/ shall be in safe custody of the Electrical Incharge and keys for all Locked out equipment shall be maintained separately so as to ensure that the same are not released during the time the concerned Lock is in Use at the equipment. A separate LOTO key-box (with locking facility) for housing keys of locked out equipment shall be provided in the Control Room. The lock to the key-box shall have two keys, one shall be in the custody of the Electrical Incharge & the other shall remain under the custody of the Control Room Shift Incharge which shall be handed/taken over & duly recorded in the shift log-book handing-over note on shift-basis.

C. The power should be restored only when all the repair work is complete, requisite permit has been obtained, all checks have been carried out and all persons are positioned safely. All persons involved with the job/ control room should be notified that the Lockout/ Tag

out is complete, the electrical supply is being restored and they need to remain clear of the equipment and electrical supply.

V TRAINING

Employees/ Personnel working at the Location/ Contractors personnel should be briefed regarding the LOTO procedure through a training module on LOTO and electrical Safety.

This should be done to ensure that they know, understand and follow the applicable provisions of the hazardous energy control procedures.

Training record should be maintained.

VI EVALUATE AND UPDATE

Constantly review the procedure and based on field observations/ experience provide continuous inputs for evaluating and updating the procedure for further strengthening the LOTO System.

Relevant Records:

1. **Electrical LOTO Records: ISF/ELE/26**

22.0 : Thermography

22. 1 Purpose: To provide guidelines for Thermography

22.2 Scope: Scope of work includes maintenance for Thermography of electrical panel

22.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

22.4 References: OEM Handbook, OISD 137

22.5 Relevant records: Maintenance of **Window & Split AC**: ISF/ELE/27

22.6 Frequency: Half Yearly

22.7 Maintenance Procedure

Carry out infrared thermography of following equipments and note down the values of differential temperature for similar components. Thermography should be carried out with a thermograph where thermal image of the equipment is taken and the captured infrared image can be used to capture the equipment temperature profile. Thermography of equipments has to be carried out in an interval of 6 months.

1. Two pole/Four Pole Structure.
2. Outdoor CB & Isolators.
3. Transformers and NGR
4. HT/LT Switch Board
5. DG and AMF Panel
6. UPS & Battery Charger
7. VFD
8. Capacitor Bank
9. Panels as required.

As per NETA guidelines following criteria to be followed:

प्राथमिकता/ Priority	समान घटक के बीच डेल्टा टी/ **Delta T between similar component's under similar load**	परिवेशी वायु तापमान का डेल्टा टी / **Delta T Over ambient air temperature**	**अनुशंसाएँ/ Recommendations**
4	1 to 3 deg C	1 to 10 deg C	Possible deficiency, warrants investigation
3	4 to 15 deg C	11 to 20 deg C	Indicates probable deficiency repair as time permits
2	----------	21 to 40 deg C	Monitor until corrective measures can be accomplished
1	Greater than 15 deg C	Greater than 40	Major Discrepancy repair immediately.

For additional information on Thermography ASTM E1934 may be referred.

23.0 : Switchgear Room & Substation Building

23. 1 Purpose: To provide guidelines for Thermography

23. 2 Scope: Scope of work includes maintenance for Thermography of electrical panel

23.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

23.4 References: OEM Handbook, OISD 137

23.5 Relevant records: Switchgear Room & Substation Building: ISF/ELE/28

23.6 Frequency: Half Yearly

Maintenance Procedure

Inspection of switchgear room & substation building has to be carried out in an interval of 6 months. Following are the work instruction as per the checklist.

1. Check for the illumination level by the use of Lux Meter. Check whether the value is more than 150 Lux as per OISD 244.

2 Check for operation of emergency lighting provision and its auto-changeover circuit operation

3 Check for ventilation and pressurisation system.

4 Carry out pre-monsoon Pond test for roof. This can be done by filling the roof till 1.0 cm of water on the roof top and check for leakages. Also block the drain points before carrying out the pond test.

5 Check for sealing of cable and bus duct entries.

6 Check for housekeeping including movement of door/ shutters.

7 Check for water drainage arrangement.

8 Check for provision of insulating mats conforming to IS: 15652:2006 having ISI mark, shock treatment chart, fire extinguisher (suitable for electrical fires), updated SLD, sand filled buckets, MCP, Earthing rods, Electrical PPEs, and telephone.

9 Check for condition of trench, cover slabs, and cover plates.

10 Check for marking on the switchboard for identification of circuits and provision of danger, caution board. Marking should be across the fixed and removable portion of the rear side of the panel for safety.

24.0: Maintenance of HVWS

24. 1 Purpose: To provide guidelines for **maintenance of HVWS**

24. 2 Scope: Scope of work includes **maintenance of HVWS**

24.3 Responsibility: Officer In-Charge-Electrical/Maintenance In-charge

24.4 References: OEM Handbook, OISD 137

24.5 Relevant records: Maintenance of HVWS: ISF/ELE/29

24.6 Frequency: Half Yearly

24.7 Procedure:

Maintenance and testing of HVWS has to be carried out in an interval of 6 months.

1. Check the condition of Deluge Valve
2. Check for physical damage of sprinkler head and associated piping, discharge pipe and couplings.
3. Check for Deluge Valve Operation: Operate by
4. Check for Deluge Valve Bypass line Operation
5. Check for Deluge Valve panel functioning
6. Check for Cleaning of sprinkler / Nozzle heads for particles, jamming.
7. Check for operation of Butterfly Valve.
8. Check for check the condition of Strainer
9. Check for Pressure Gauge Calibration
10. Check DV Panel Batteries.
11. Check for tripping of transformer after HVWS operation.
12. Check for corrosion in pipelines.

Standard Operating Procedure for HVWS

1) Close main butterfly valve on main Hydrant Line to block/cut water supply of HVWS System.
2) Close all valve fitted in HVWS system except for Pressure Gauge isolation valve.
3) Open 25 mm priming line to build pressure in fire detection line.
4) Open Main Valve & Check Deluge Valve is not releasing water from its outlet.
5) Now the deluge valve is in its Set Position.
6) Open Isolation Valve which is fitted after Deluge Valve System.

Note: - Normally ensure- all the valve is in open condition as shown in diagram HVWS.1

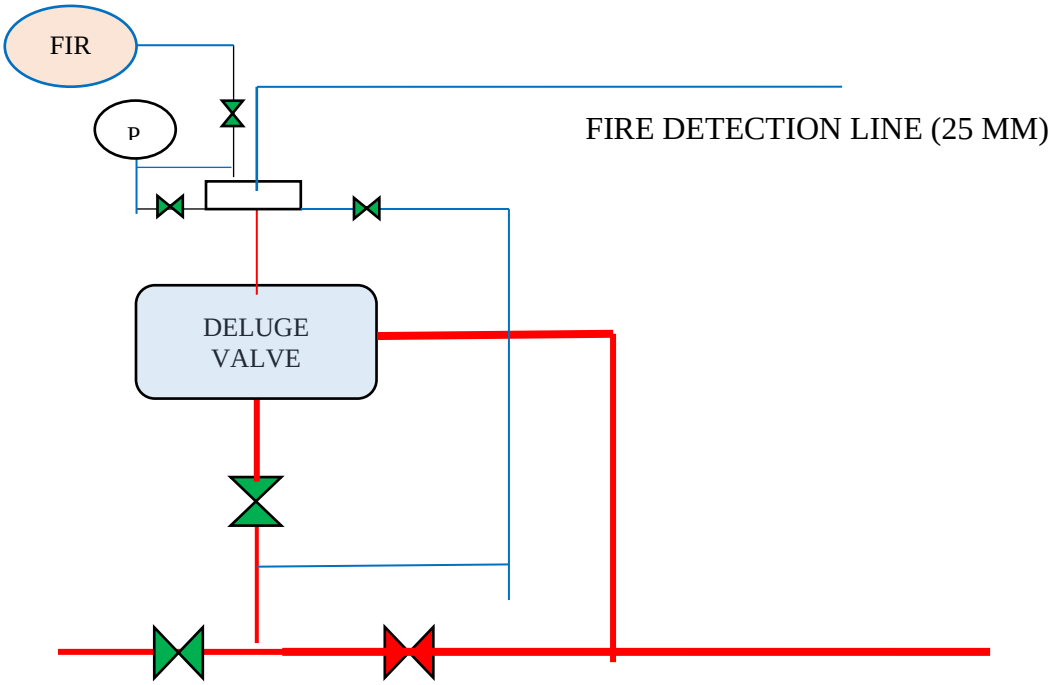
Don'ts:

1) Do not close the priming valve, downstream and upstream stop valves, while the system is in service.
2) Do not cut power of Deluge Valve Panel.

Do's

1) Ensure releasing device is maintained in the open position, when actuated, to prevent the deluge valve from closure.
2) Always maintain pressure at the inlet of HVWS system.
3) In case of Leak inform Control Room officer.

Diag: HVWS.1



Note: Ensure That Valve Indicated In Green Are in Open Condition

25.0 : SOLAR PV MODULES MAINTENANCE

25.1PURPOSE

To provide guidelines to carry out maintenance of Solar PV Modules Power System

25.2 REFERENCES

Solar PV Module OEM
MNRE Guidelines

25.3 RESPONSIBILITY

Officer In-charge - Electrical

25.4Relevant records: Maintenance of Solar PV Panels: ISF/ELE/30

25.5Frequency: Half Yearly

25.6 INSTRUCTIONS

1 Take work permit from shift In-charge.
2 Carry out the maintenance of Solar PV Modules as below:

- ✓ Inspect PV modules for defects that can appear in the form of burn marks, discoloration, delamination, or broken glass.
- ✓ Check modules for excessive soiling from dirt buildup or animal droppings.
- ✓ Ensure that the module wiring is secure and not resting on the roof, hanging loose and exposed to potential damage, bent to an unapproved radius, or stretched across sharp or abrasive surfaces.
- ✓ Inspect conduits for proper support, bushings, and expansion joints, where needed.
- ✓ Look for debris inside the boxes and any evidence of damaging water intrusion. Look for discoloration on the terminals, boards, and fuse holders.
- ✓ Open the door to the disconnect(s) and look for signs of corrosion or damage.
- ✓ Check for torque marks on the terminals.

3 Carry out the maintenance of Inverter & MPPT CC Panel as below:

- ✓ Perform a visual inspection of the interior and exterior of the inverter. Look for signs of water, rodent, or dust intrusion into the inverter.
- ✓ Check for torque marks on the field terminations.

- ✓ Record and validate all voltages and production values from the human- machine interface (HMI) display.
- ✓ Record last logged system error.
- ✓ Clean the inside of the cabinet.
- ✓ Check fans for proper operation
- ✓ Check continuity of system ground and equipment grounding.
- ✓ Check mechanical connection of the inverter to the wall or ground.
- ✓ Check internal disconnect operation.

4 Carry out the maintenance of PV Module installation site as below:

- ✓ Ensure roof drainage is adequate, roof drains are not clogged, and confirm that there are no signs of water pooling in the vicinity of the array
- ✓ Check for vegetation growth or other new shade items such as a satellite dish
- ✓ Check for ground erosion near the footings of a ground mount system and condition of supports.
- ✓ Confirm appropriate expansion joints are used where needed in long conduit runs
- ✓ Confirm electrical enclosures are only accessible to authorized personnel, are secured with padlocks or combination locks, and have restricted access signage
- ✓ Check for corrosion on the outside of enclosures and the racking system
- ✓ Check for cleanliness throughout the site—there should be no debris in the inverter pad area
- ✓ Check for loose hanging wires in the array
- ✓ Check for signs of animal infestation under the array

स्थान/Location : **उपकरण/Equipment** : आउटडोर सी.बी./रिले और कंट्रोल पैनल/Outdoor CB/C.T./P.T./Relay & control panel

दिनाँक/Date : उपकरण संख्या/Equipment N :

समय अंतराल/Frequency : वार्षिक/Yearly

नीचे दी गयी राशियों को एकत्र करें/Record the parameters given below:

क्रम संख्या S.No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/ Remarks
1	कंट्रोल सप्लाई चेक करें और कंट्रोल विभव लिखे/Check control and auxiliary supply and record control voltage.		
2	आई.एस.एफ./विद्युत/08 और आई.एस.एफ./विद्युत/09 के अनुसार बैटरी और चार्जर की फंक्शनैलिटी चेक करें/Check Batteries and charger functionality as per the ISF/ELE/08 & ISF/ELE/09.		
3	आंतरिक हानि को चेक करें और चलने वाले भागों में लूब्रिकेशन करें/Check for internal Damages if any and lubricate moving parts.		
4	स्प्रिंग चार्जिंग मैकेनिज़्म चेक करें/Check the condition of spring charging mechanism.		
5	सभी इंडीकेशन लैम्प, फ्यूज़ और एम.सी.बी. को चेक करें/Check working of all indication lamps, fuses and MCB		
6	सभी एस.एफ.6 प्रेशर इंडीकेटर और मैकेनिकल इंडीकेटर की स्थिति खुला/बन्द/स्प्रिंग चार्ज या डिस्चार्ज को चेक करें/Check the conditions of all SF6 pressure indicator and mechanical indication for the status of opened/closed/ spring charged or discharged.		
7	एस.एफ.6 गैस अलार्म की स्वस्थता की जॉच सर्किट शार्ट करके करें ना कि एस.एफ.6 गैस निकाल कर/Check the healthiness of SF6 gas alarm by shorting the circuit **NOT by draining SF6 gas.**		

क्रम संख्या S.No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/ Remarks
8	बाहरी यूनिट के सभी पोर्सलीन भागों को साफ करें/Check and clean all porcelain parts of outdoor unit.		
9	सर्किट ब्रेकर में आनेवाले ट्यूबुलर/जम्पर कनेक्शन की टाईटनेस की जाँच करें / Check for tightness of incoming tubular bus bar /jumper connections to circuit breaker.		
	सर्किट ब्रेकर की फंक्शनैलिटी टेस्ट करें / Test CB functionality.		
10	आई.एस.एफ./विद्युत/12 के अनुसार अर्थ रेजीस्टेंस-ग्रिड/अकेली अर्थ-पिट जाँचे/Check earth resistance-grid/individual earth pit as per ISF/ELE/12.		
11.	क्षेत्र का साधारण प्रकाश/General illumination of the area.		
12	अग्नि बुझाने वाले डी.सी.पी. और सी.ओ.2 की उपलब्धता जाँचे/Check for the availability of DCP & CO2 type of fire extinguisher		
	सर्किट ब्रेकर के रिले और नियंत्रण पैनल Relay & Control Panel of CB		
13.	अर्थ फाल्ट और ओवर करेंट रिले के एक्टिवेट होने पर सर्किट ब्रेकर का ट्रिप होन जाँचे । रिले कैलीब्रेशन आई.एस.एफ./विद्युत/12 के अनुसार किय जान चाहिये/सCheck for tripping of CB due to activation of E/F and O/C relays. Relay calibration shall be carried out as per the ISF/ELE/14.		
14.	सर्किट ब्रेकर का रेमोट ऑपरेशन जाँचे/Check the remote operation of CB through R&C panel.		
15.	विभिन्न कनेक्शन, अन्दरुनी वायरिंग की टाईटनेस को जाँचे/Check tightness of the various connections, internal wiring in R&C panel.		
16.	इंडीकेशन लैम्प, फ्यूज, मीटरिंग और सेमाफर इंडीक़ेटर की फंक्शनैलिटी जाँचे/Check functionality of indication lamps, fuses, metering and semaphore indicator functionality.		
17.	अलार्म एन्नुसिएटर की फंक्शनैलिटी सिमुलेशन अलार्म द्वारा जाँचे/Check functionality of alarm annunciator by simulation alarm.		

क्रम संख्या S.No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/ Remarks
18.	ब्रेकर के विद्युत प्रतिरोध की जाँच करें। Check electrical resistance of breaker.		
19	आउटडोर सीबी में गूंथ/ईएसडी कार्यक्षमता के लिए जाँच करें Check for interlock/ESD functionality in Outdoor CB		
20	अंतरिक्ष हीटर की कार्यप्रणाली की जाँच करें Check working of space heater wherever applicable.		
21	स्विचबोर्ड की सीमा स्विच कार्यक्षमता के लिए जाँच करें। Check for limit switch functionality of switchboard.		
22	तेल के स्तर की जाँच और यदि जरूरी हुआ तो भरेन ! Check Oil Level and refill if required (For C.T/P.T.)		
23	संरचना से ला अर्थिंग पट्टी के इन्सुलेशन/जुदाई की जाँच करें Check insulation/separation of LA earthing strip from structure		
24	बाड़ लगाने के ग्राउंडिंग स्थिति की जाँच करे ! Earthing of fencing and check condition of fencing.		
	तीन वार्षिक टेस्ट/Three Yearly Tests		
25.	3 साल के आंतराल पर VCB बोत्तल कि जांच करे/Checking & Testing of VCB Bottles in a frequency of 3 years.		
26	3 साल की एक आवृत्ति में बिजली/वृद्धि अरेस्टर के तीसरे हार्मोनिक परीक्षण करे! Carry out Third harmonic current testing of lightning/Surge arrestor in a frequency of 3 years.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No. : ISF/ELE/02		Issue No. : 01
Issue date : XX/XX/XXXX		Revision No. : 00
Document Title: **Maintenance Report –Transformer & NGR**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment: **Transformer & NGR**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: वार्षिक/Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1	क्षेत्र की सामान्य साफ सफाई/General House keeping of the area		
2	पेंट, ट्रांसफार्मर के करोजन और गेट की स्थिति जाँचे/Check conditions of paint, corrosion on transformer and gates.		
3	केबल सीलिंग बॉक्स का निरीक्षण करे/Inspect Cable sealing boxes.		
4	दोनों ट्रांसफार्मर और एन.जी.आर. की बुशिंग, पोर्सलीन इंसूलेटर को जाँचे/Check bushing, porcelain insulators for any damages of both transformer and NGR		
5	मारसलिंग बॉक्स हाऊसिंग का निरीक्षन करे/Inspect Marshaling box housing.		
6	अर्थ रेजिस्टेंस और टर्मिनल की निरंतरता जाँचे/Check earth resistance & terminals for continuity		
7	गेट के अर्थिंग जाँचे/Check the earthing of the gates		
8	करोजन और गन्दगी के लिए कंजर्वेटर टैंक जाँचे/Check conservator tank for corrosion and sludging.		
9	लो लेवल अलार्म फन्क्सनिंग जाँचे/Check low Level alarm functioning.		
10	Check and calibrate OTI, WTI. Check Thermo well condition		
11	बुकोल्ज रिले जाँचे/Check buccholz relay functioning.		

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
12	वाइंडिंग और केबल की आई.आर. वैल्यू लिखे/Record IR value for Windings and Cable a)H.V. to Earth : R-Y Y-B B-R b)L.V. to Earth : R-E Y-E B-E c) H.V. to L.V.		
13	वाइंडिंग रेसिस्टेंस लिखे/Record Winding Resistance: -प्राथमिक/Primary a)U1-V1 b)V1-W1 c)W1-U1 -द्वितीय/Secondary d)U2-V2 e)V2-W2 f)W2-U2		
14	तेल को फिल्टर करे/Carry out testing of transformer and OLTC oil as per IS 1866: i) B.D. ii) डाइ-इलेक्ट्रिक क्षमता/Dielectric Strength अ) फिल्टर से पहले/Before Filtration ब) फिल्टर के बाद/After Filtration (If required)		
15	ऑनलोड टैप चेंजर ऑपरेशन ऑटो/मानवीय जाँचे/ Check for on load tap changer operation on Auto/Manual.		
16	ब्रिदर सिलिका जेल जाँचे और ज़रूरत हो तो बदले/Check Breather silica gel, replace if required.		
17	एक्सप्लोजन वेंट जाँचे, इसको बदले यदि ज़रूरत हो/Check Explosion Vent, if damaged replace it.		
18	ट्रांसफार्मर फाउंडेशन और यार्ड की स्थिति जाँचे/Check condition of Transformer Foundation and Yard		
19	तेल सोंखने की पिट और ड्रेनेज व्यवस्था जाँचे/Check condition of Oil soak pit and drainage arrangement (if applicable)		
20	एन.जी.आर. वैल्यू जाँचे/Check NGR value		

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
21.	टूटी ग्रिड जाँचे, सही करे Check broken grids , rectify if any		
2.2	क्षेत्र में विद्युत आपातकालीन बन्द की फंक्सनैलिटी जाँचे/Check the functioning of the Electrical ESDs in field		
23	नियंत्रण कक्ष में विद्युत आपातकालीन बन्द की फंक्सनैलिटी जाँचे/Check the functioning of the Electrical ESDs (4 nos) in Control Room.		
24.	टैग नम्बर, रेटिंग, प्राथमिक और द्वितीय विभव, बी.डी. वैल्यू, ट्रांसफार्मर तेल की टेस्टिंग तारीख का ठीक से दिखना जाँचे/Check for the proper display of the Tag No., Rating, primary & secondary Voltage, BD value, testing due date for transformer oil.)		
25.	दोनों कंजर्वेटर तैंक में तेल का लेवल जाँचे/Check the oil level for both the conservator tank		
26.	अग्नि बुझाने वाले डी.सी.पी./सी.ओ.2 की उपलब्धता जाँचे/Check for the availability of the DCP/CO2 type fire extinguisher.		
27.	पोलराजेसन नापे*! यदि पोलराईजेसन इंडेक्स <2.0, वाइंडिंग को बनाने वाले के अनुसार वांनिश किया जाना चाहिए/Measure polarization index* of winding. Polarization index shall be less than 2.0.		
28	HVWS की कार्यक्षमता की जाँच करे/ Check functionality of HVWS (sprinkler system) in Auto/Manual modes		
29	त्रंस्फोर्मेर से सोअक पित के पिपे कि जांच करे !/Check for any leakages in pipe from transformer to soak pit.		
30	खाई कवर, स्लैब और यार्ड में पृथ्वी इलेक्ट्रोड की स्थिति की जाँच करें।/Check condition of Trench Cover, slabs and Earth electrodes in the Yard.		
	तीन वार्षिक टेस्ट/Three Yearly Test		

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
31	एक बार 3 साल में ट्रांसफार्मर की तान-डेल्टा परीक्षण करे !/Tan-delta test of transformer		
32	तीन साल में एक बार ट्रांसफार्मर तेल की गैस विश्लेषण करे! DGA testing of transformer oil.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No. : ISF/ELE/03		Issue No. : 01
Issue date : XX/XX/XXXX		Revision No. : 00
Document Title: **Maintenance Report – 66/6.6KV Switch Board & Breakers**		

स्थान/Location :

उपकरण/Equipment : **33/6.6 kV स्विचबोर्ड/ब्रेकर/Switch Boards/Breakers (Indoor Type)**

दिनाँक/Date :

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: अर्द्धवार्षिक/Half-Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1	किसी अनियमित टूट/आंतरिक हानि को जाँचे/Check any abnormal wear/internal damages.		
2	सभी घूमने वाले भागों और जोड़ों को जाँचे और लूब्रीकेट करे/Check and lubricate all moving parts and joints		
3	सभी बस बार इंसूलेटर को चटक(यदि कोई) के लिये जाँचे. इंसूलेटर को साफ करें/Inspect all bus insulators for cracks (if any). Clean the insulators.		
4	सभी बस जोड़ों को टाईटनेस और टरमिनेशन को ढीले कांटैक्ट के लिए जाँचे/Check all bus joints for tightness and terminations for loose contacts		
5	रिले कम्पार्टमेंट को उड़े हुए फ्यूज़ और लूज़ कनेक्शन के लिये जांचे/Check relay compartment for blown fuses and loose connections		
6	ब्रेकर ऑपरेशन प्रोटेक्शन, कंट्रोल और इंटर्लाकिंग सर्किट के साथ जाँचे/Check breaker operation with protection, control & interlocking circuits.		
7	सामान्य सफाई करे/Carry out general cleaning		
8	स्पेस हीटर ऑपरेशन जाँचे/Check space heater operation		
9	रिले सेटिंग प्रोटेक्शन की नवीनतम ड्राइंग के अनुसार सुनिश्चित करे/Ensure the relay setting as per latest drawings of Protection.		

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

10	इन्सुलेशन मैट की उपलब्धता की जांच IS 15626 के अनुसार सुनिश्चित करे ! Check availability of insulation mats as per IS 15626		
	तीन वार्षिक टेस्ट/Three Yearly Test		
11.	एक बार 3 साल में VCB बोतलों के healthiness की जाँच करेंCheck healthiness of VCB bottles (once in 3 years)		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No. : ISF/ELE/04		Issue No. : 01
Issue date : XX/XX/XXXX		Revision No. : 00
Document Title: **Maintenance Report – PCC/MCC Panel**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : **पी.सी.सी./एम.सी.सी. पैनल**
PCC/MCC/ASB Panels

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : अर्द्धवार्षिक/Half Yearly

क्रम संख्या **S. No.**	निर्देश/**Instructions**	निरीक्षण/ **Observation**	टिप्पणी/**Remarks**
1	सभी फ्यूज जाँचे/Check all fuses.		
2	पूर्ण कंट्रोल वायरिंग और आंतरिक कनेक्शन जाँचे/Check complete control wiring and terminal connections.		
3	ब्रेकर के केस में स्प्रिंग चार्जिंग मानवीय और विद्युत माध्यम से/आने वाले एस.एफ.यू. के केस में कांटैक्ट और मैकेनिज्म ठीक तरह से ऑपरेशन के लिये जाँचे/In case of breakers check spring charging by manual and electrical means/In case of incomer SFU check contacts and mechanism visually for proper operation.		
4	वैक्यूम क्लीनर/ब्लोवर द्वारा पैनल की सफाई करे/Carry out cleaning of the panels using vacuum cleaner/blower		
5	सभी मीटर जाँचे। कोई मीटर गलत रीडिंग दिखा रहा हो तो पुनः कैलीब्रेशन की व्यवस्थाकरे/Check all meters visually. Arrange to recalibrate any meters showing abnormal readings.		
6	सभी स्पेस हीटर को ठीक तरह से चलने को जाँचे/Check all space heaters for proper functioning		
7	रिले सेटिंग प्रोटेक्शन की नवीनतम ड्राइंग के अनुसार सुनिश्चित करे/Ensure the relay setting as per latest drawings of Protection.		
8.	सभी अतिरिक्त केबल प्रवेश की सीलिंग सुनिश्चित करे/Ensure sealing of all the spare cable entries.		
9.	सभी इंडीकेशन लैम्प जाँचे/Check all the indicating lamps.		

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Pipeline Head	Management Representative	
Date :	Date :	

क्रम संख्या S. No.	निर्देश/Instructions	निरीक्षण/ Observation	टिप्पणी/Remarks
10.	करोजन प्रभाव जाँचे/Check corrosion effect (ext.).		
11.	पैनल की अर्थिंग जाँचे/Check for the earthing of the panels.		
12.	कैलीब्रेशन पुनः करे/Replay Calibration.		
13.	ब्रेकर का विद्युत रेसिस्टेंस जाँचे/Check for the Electrical Resistance of the breaker.		
14.	सभी इंटरलाक जाँचे/Check all the interlocks.		
15.	ब्रेकर अन्दर डालना और बाहर निकालना जाँचे/Check CB Rack in & Rack out mechanism.		
16.	स्पेस हीटर का चलना जाँचे/Check the functioning of the space heater.		
17.	सभी केबल और टरमिनेशन की टाईटनेस जाँचे/Check for the tightness of all cables & termination.		
18.	उचित रेटिंग्स के इन्सुलेशन मैट की उपस्थिति की जांच IS 15652:2006 के अनुसर करे! Checking of presence of Insulation Mats of proper ratings as per IS 15652:2006		
19.	जीआईएस स्विचगियर्स के लिए गैस के दबाव की जाँच करे! Checking of gas pressure of the enclosure for GIS Switch gears wherever applicable.		

नोट: इस फार्मेट में एस.वी. स्टेशन भरेंगे/Note: SV Stations shall be covered with this format

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/05		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Motor**		

स्थान/Location :
दिनाँक/Date :

उपकरण/Equipment: एच.टी.मोटर/**HT Motors**
उपकरण संख्या/Equipment No :
समय अंतराल/Frequency: वार्षिक/Yearly

क्रम संख्या **Sl.No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
1	मोटर केबल को टर्मिनल से अलग करे। लग्स और इंसूलेटर बूसिंग को साफ करे/Disconnect motor cable from terminals, clean lugs and insulator bushings		
2	मोटर की सफाई सुनिश्चित करे/Ensure Cleaning of the motor.		
3	यदि ज़रूरत हो तो केबल अंत को दोबारा टेप करे/Re-tape cable ends if required		
5	अर्थिंग टेप की निरंतरता जाँचे/Checked the earthing strip continuity		
6	सभी नींव के नट व बोल्ट के कसाव को जाँचे/Checked for tightness of all foundation nuts and bolts.		
7	शोर के लिए बीयरिंग जाँचे/Check bearings for noise		
8	किसी तेल लीकेज के लिए बीयरिंग जाँचे/Check bearings for any oil leakage		
9	बचाव यंत्र की कार्य प्रणाली जाँचे/Check working of Protective devices		
10	लोड पर धारा नापे/Record current drawn on load found satisfactory लोड पर धारा/Load current : RYB		
11	आइ.आर.वैल्यू/Record I.R. valves (2.5KVAV Meggar)*: अ)मोटर/Motor : RE, YE, BE ब)केबल/Cable : RY, YB, BR : RE, YE, BE		
12	वाइंडिंग रेसिस्टेंस नापे/Record winding resistance: a)U-Vb)V-Wc)W-U		

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Pipeline Head	Management Representative	
Date :	Date :	

13	करोजन (बाहरी) प्रभाव जाँचे/Check Corrosion effects(external)		
14	सहायक पैरों, पेडेस्टल और आधार पत्ती की स्थिति/Condition of Supporting Legs Pedestal & base plate		
15	कम्पन और ताप रीडिंग जाँचे/Check for vibration and temperature readings.		
16	पोलराज़ेसन नापे। यदि पोलराइज़ेसन इंडेक्स <2.0, वाइंडिंग को बनाने वाले के अनुसार वार्निश किया जाना चहिए/Measure polarization index*. If polarization index is less than 2.0. Winding shall be varnished as per the manufacturer's recommendations.		
17	बीयरिंग का इंसूलेशन रेसिस्टेंस नापे/Measure Insulation resistance of the bearing		
18.	मोटर के जे.बी. पर स्पेस हीटर की कार्यता जाँचे/Check the functioning of the Space heater at the motor JB		
19.	विभिन्न सी.टी. की स्थिति और टाईटनेस जाँचे/Check for the condition of Diff. CTs and its tightness.		
20	Check and record thermal overload setting for motor feeder		
21	मोटर के विन्दिंग सफयी हवा के जेट से करे जिसका दबाव 2.5 बार से अधिक न हो !/Carrying out cleaning of winding using Air Jet preferably dry air with max 2.5 bar pressure.		
21	स्लीवे बअरिंग के तेल नमुने कि जाँचे/Check sleeve bearing oil sample & verify lubricating oil characteristics **		
22	नमी अवशोषण परीक्षण करे!/Carry out moisture absorption test (Dielectric Absorption Test)		

- * IR Value shall be at least 5 M ohm as per CEA Regulation 33.
- * If neutralization value increases by 0.2 between 2 checks. The presence of moisture causes black pigmentation on the bearing
- *Applicable to critical HT motors only

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/06		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Capacitor Bank**		

स्थान/Location :
दिनाँक/Date :

उपकरण/Equipment: कैपेसिटर बैंक/**Capacitor Bank**
उपकरण संख्या/Equipment No :
समय अंतराल/Frequency: अर्द्धवार्षिक/Half Yearly

क्रम संख्या S. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/ Remarks
1	पैनल की सामान्य सफाई करे/Check for the general cleaning of all the panels		
2	पैनल लैंप, मीटर, स्विच, फैन ठीक से कार्य कर रहे हैं कि यह सुनिश्चित करें/Check for proper functioning of panel indication lamps, meters, switches & fans		
3	रिले कैलिब्रेटेड हैं कि यह सुनिश्चित करें, सेटिंग्स की जाँच करें, ट्रिपिंग का अनुकरण करें /Verify calibration & settings of protective relays installed in the panel and simulate tripping		
4	निर्वात की स्थिति की जाँच करें/ Check condition of various parts in the vacuum contactors such as individual poles, coil, vacuum interrupters, etc. as per manufacturer's recommendations		
5	सुनिश्चित करें कि सभी कनेक्शन उचित तरह से संयुक्त हैं, / Check for proper tightness of all connections including that of control or auxiliary circuit		
6	अर्थिंग रेसिस्टेंस और अर्थिंग निरंतरता जाँचे/Check earthing resistance and earthing continuity		
7	पेंट और एच.आर.सी. फ्यूज़ जाँचे/Check paint and HRC fuses		

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Pipeline Head	Management Representative	
Date :	Date :	

क्रम संख्या S. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/ Remarks
8	वोल्टेज ट्रांसफॉर्मर स्वस्थ हैं यह सुनिश्चित करें/Check healthiness of the potential transformers		
9	सीरीज़ रिएक्टर की आई.आर. वैल्यू नापे/Measure I.R. Values of series Reactor: a)केबल/Cable: R-Y Y-B B-R R-E Y-E B-E B) वाइडिंग्/Winding : U-E, V-E, W-E		
10	सीरीज़ रिएक्टर की वाइंडिंग रेसिस्टेंस नापे /Measure winding Resistance of Series Reactor U-U1 V-V1 W-W1		
11	आर.वी.टी. की आई.आर. वैल्यू नापे / Measure IR values of RVT R-E Y-E B-E N-E		
12	सीरीज़ रिएक्टर और आर.वी.टी की बी.डी. और डाइ-इलेक्ट्रिक क्षमता वार्षिक नापे/Check B.D. And dielectric strength of oil of Series Reactor and RVT yearly (Not applicable for dry-type) a)फिल्टर से पहले/Before filtration b) फिल्टर के बाद/After filtration		
13	Capacitances रिकॉर्ड करें, वे स्वीकार्य सीमा के भीतर हैं यह सुनिश्चित करें/ Check & record individual capacitance values and verify that the variations are within acceptable limits.		
14	ए.पी.एफ.सी.आर. कार्यता जाँचे /Check the functionality of APFCR		
15.	करेजन प्रभाव, पेंट और तेल लीक जाँचे/Check corrosion effects, paint and oil leaks		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

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Pipeline Head	Management Representative	
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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/07		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – DG Set**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment: डी.जी.सेट/**DG set**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: मासिक/Monthly

क्रम संख्या **S.No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
1	*पैनल की सामान्य सफाई करे/Check for the general house keeping of the panel*		
2	*फंक्सनल टेस्ट किए गये/Functional Tests carried out*		
3	बैटरी वोल्टेज (24 V +- 2) तथा चार्जिंग विद्युत् (> 1A) की जाँच करें ! Check battery Voltage (24 V +- 2) and Charging current (> 1A). इलेक्ट्रोलाइट और विशिष्ट गुरुत्व के स्तर की जांच करे !/Check Level of Electrolyte and Specific Gravity is within permissible limit.		
4	इंजन घुमाव जाँचे/Check engine RPM (1500 + - 50)		
5	तेल का दबाव जाँचे/Check oil Pressure (>3 kg/cm2).		
6	कोई तेल/ईंधन लीक जाँचे/Check any Oil/Fuel leaks		
7	*बाहर निकलने वाला ए.सी. विभव नापे/Check AC output voltage.*		
8	पंखे की बेल्ट का तनाव जाँचे/Check fan belt tension		
9	एक्ज़ास्ट लीकेज जाँचे/Check any exhaust leakage		
10	पानी का ताप जाँचे/Check water temp. < 90 Deg.		
11	बीयरिंग की स्थिति जाँचे/Check bearing condition		
12	ठंडा करने वाला यंत्र जाँचे/Check cooling system		

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Pipeline Head	Management Representative	
Date :	Date :	

13	केबल सीलिंग/टर्मिनेशन बाक्स की स्थिति जाँचे/Check condition of Cable sealing /T. boxes		
14	बाहरी हानि/करोजन प्रभाव जाँचे । आंतरिक नुकसान जाँचे/Check external damage/corrosion effects. Check internal damages		
15	कोई असामान्य आवाज़/गर्माहट जाँचे/Check any abnormal noise/surface heating		
16	घुमने वाले भागों और गार्ड प्रोवीजन को जाँचे/Check provision of guards o moving parts		
17	बचाव यंत्र की कार्यता जाँचे/Check working of protective devices		
18	नींव की स्थिति और नींव बोल्ट की टाईटनेस जाँचे/Check condition of foundation and check tightness of foundation bolts		
19	स्पेस हीटर की कार्यता जाँचे/Check working of space heater		
20	अलग न्युत्रल और बोदी अर्थिंग के दो सेट जाँचे ! Checking whether two sets of separate earthing is available for Neutral as well as for body.		
21.	ए.एम.एफ. पैनल जाँच/AMF Panel Checking		
22.	डी.जी. सेट का ऑपरेटिंग लाजिक जाँचे/Check the operating logic of the DG Set.		
23.	डी.जी.सेट को स्वतः शुरूवात के लिए जाँचे/Check DG set for the Auto Start.		
24	Perform DG Set/Bus Coupler/Main Incomer interlock checking		
	वार्षिक चेक/Yearly Checks		
25	12 महीने की अवधि के भीतर आवर्तित्र के इन्सुलेशन प्रतिरोध को जाँचे ! Check IR values of Alternator within a period of 12 months.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/08		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Battery Charger**		

स्थान/Location :

उपकरण/ Equipment : बैटरी चार्जर/**Battery Charger**

दिनाँक/Date :

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: तिमाही/Quarterly

ए.सी. इंपुट विभव / I/P Voltage - AC	
इंपुट धारा (अ)/I/P Current (A)	
डी.सी. ऑउट्पुट विभव/O/P Voltage-DC (V)	
ऑउट्पुट धारा/O/P Current (A)	
दोनों चार्जर अ और बी के लिए समान / **Common for Both Charger A&B**	

चार्ज/डिस्चार्ज/Charge/Discharge (A)	
बैटरी बैंक विभव/Battery Bank Voltage (V)	
चार्जर ब/**Charger B**	

ए.सी. इंपुट विभव/I/P Voltage - AC (V)	
इंपुट धारा/ I/P Current - AC (A)	
डी.सी. ऑउट्पुट विभव/O/P Voltage-DC (V)	
ऑउट्पुट धारा /O/P Current (A)	

क्रम संख्या **Sl. No.**	निर्देश/**Instructions**	निरीक्षण/ **Observation**	टिप्पणी/ **Remarks**
1	पैनल की सामान्य सफाई करे/Carry out general cleaning of Panels.		
2.	सभी स्क्रू, बोल्ट और नट की टाईटनेस को जाँचे/Check for the tightness all the screws, bolts & nuts.		
3.	सभी टर्मिनेशन की टाईटनेस जाँचे/Check the tightness of all the terminations.		
4.	सभी इंडीकेशन लैम्प की कार्य प्रणाली जाँचे/Check for the functioning of all the indicating lamps.		

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/ Observation	टिप्पणी/ Remarks
5.	वोल्टमीटर और अमीटर की कार्य प्रणाली जाँचे/Check for the functioning of Voltmeters & ammeters.		
6.	चार्जर सर्किट का ऑपरेशन जाँचे/Check for the operation of the charger circuit.		
7.	चेंज ओवर सर्किट जाँचे/Check for the change over circuit (Energy Back up).		
8.	पैनल की अर्थिंग जाँचे/Check for the Earthing of the panel.		
9.	आइसोलेटर कांटैक्ट और इंसूलेशन के भागों और वायरिंग के रंग उड़ने का निरीक्षण करे/ Inspect the components & wiring for any discoloration or burnt insulation as well as isolator contacts.		
10.	प्लग साकेट जाँचे/Check the plug socket.		
11.	मेस और फिल्टर को सफाई के लिए जाँचे/Check the mesh or filters backing the louvers for cleanliness.		
12.	पैनल की आंतरिक वायरिंग जाँचे/Check the inter panel wiring of the panel.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/09		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Battery Bank**		

स्थान/Location :

उपकरण/Equipment : बैटरी बैंक/**Battery Bank**

दिनाँक/Date :

समय अंतराल/Frequency : मासिक/Monthly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1	बैटरी कक्ष की सामान्य सफाई करे/Carry out general cleaning of Battery Room		
2	वेंटीलेशन यंत्र की कार्यता जाँचे/Check functioning of Ventilation system		
3	कक्ष में अम्ल वाष्प बनने को जाँचे/Check for formation of Acid Vapors in room		
4	इलेक्ट्रोलाईट का बाहर निकलना जाँचे/Check for spillage of Electrolyte		
5	इलेक्ट्रोलाईट का लेवल नापे/Check level of Electrolyte		
6	सुरक्षा यंत्रों की स्थिति और उपलब्धता जाँचे/Check for availability & condition of safety equipment, caution boards.		
7	अम्ल सुरक्षित तल की स्थिति जाँचे/Check condition of Acid proof flooring		
8	बैटरी टर्मिनल को साफ करे और पेट्रोलियम जेली लगाए/Clean battery terminal and apply petroleum jelly		
9	बैटरी टर्मिनल/कनेक्शन की टाईटनेस जाँचे/Check for tightness of battery terminals/Connections		
10	वेंट प्लग की रूकावट जाँचे/Check for blockage of vent plugs		
11	टर्मिनल पर करोजन प्रभाव जाँचे/Check for corrosion effects on terminals		
12	कोई टूट/क्रैक, सहायक की स्थिति जाँचे/Check for any damages/Cracks, condition of supports.		
13.	12 महीने के चक्र के भीतर बैटरी का क्षमता परीक्षण करे ! /Conduct the capacity Test within 12 month cycle. (Minimum curative discharge@C10 for 2 hrs.) Y/as per OEM		
14.	सरक्षा यंत्रों की उपलब्धता जाँचे, जैसे- रबर अप्रैन, चश्मा और अम्ल सुरक्षा दस्ताने/Check for the availability of the safety equipments. Viz. Rubber apron, goggle & acid proof gloves.		
15	बैटरी बैंक के शीर्ष पर कोई बिजली फिटिंग न हो !		

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	No electrical fitting at the top of Battery Bank (Electrical fitting shall be on the wall.)		
16	इलेक्ट्रोलाइट और विशिष्ट गुरुत्व के स्तर की जांच करे ! Check Level of Electrolyte and Specific Gravity is within permissible limit		
17	अम्ल निराकरण गड्ढे की स्थिति की जाँच कैल्शियम कार्बोनेट की आवश्यकता है, तो Check the condition of Neutralization pit and add calcium Carbonate if required.		

टिप्पणी/Remarks if any:

_____

___

स्थान/Location :	उपकरण/Equipment : बैटरी बैंक/Battery Banks
दिनाँक/Date :	समय अंतराल/Frequency : मासिक/Monthly

Battery No.	Battery Voltage	Specific Gravity	Remarks

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/10		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – UPS**		

स्थान/Location :

दिनाँक/Date :

उपकरण/ Equipment : यू.पी.एस./**U.P.S**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency:अर्द्घवार्षिक/Half Yearly

क्रम संख्या **Sl. No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
1	*फंक्शनल टेस्ट करे/Carryout Functional Test*		
2	सभी फ्यूज़,एम.सी.बी. और ई.एल.सी.बी. जाँचे/Check all fuses, MCBs and ELCBs,		
3	आंतरिक हानि और कांटैक्ट की पीटिंग जाँचे/Check for internal damages & pitting of contacts		
4	पैनल की सफाई करे/Carryout panel cleaning		
5	सभी इंडीकेशन लैम्प जल रहे हैं । सभी मीटर जाँचे/Check all the indication lamps are glowing .Check all meters visually.		
6	निम्न चीजे लिखे/Record the parameters given below a)ए.सी. विभव लोड पर पावर सप्लाई/AC Voltage on load with Power supply b).बैटरी पर ए.सी. विभव (बिना पावर सप्लाई)AC Voltage on battery (Without Power supply) c)चार्जिंग विभव/Charging voltage d)बैटरी विभव/Battery voltage e)चार्जिंग धारा/Charging Current f)डिस्चार्ज धारा (पावर बिना)Discharging current (i.e. without power)		
7	बचाव यंत्रों और चेंग ओवर सर्किट की कार्य प्रणाली जाँचे/Check operation of protective devices and change over circuits		
8	वायरिंग कनेक्शन की टाईटनेस जाँचे/Check tightness of wiring connections		
9.	पैनल की अर्थिंग जाँचे/Check for the earthing of the panel		

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Pipeline Head	Management Representative	
Date :	Date :	

10.	बैक अप जाँचे/Check for the Back up		
11	घोषणा करनेवाला के कामकाज के लिए जाँच करें/Check for functioning of annunciator		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/11		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – MOV Actuator**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : एम.ओ.वी./ **MOV**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: अर्द्घवार्षिक/ Half-Yearly

		एम.ओ.वी /MOV	एम.ओ.वी /MOV	एम.ओ.वी /MOV	एम.ओ.वी /MOV	एम.ओ.वी /MOV
क्रम संख्या S. No.	निर्देश/Instructions					
1	पावर और नियंत्रण केबल कनेक्शन जाँचे/Check power and control cable connections.					
2	लोकल में विद्युत कार्य प्रणाली जाँचे /Check Electrical operation from local.					
3	रिमोट में विद्युत कार्य प्रणाली जाँचे Check Electrical operation from Remote.					
4	सही टाईटनेस के लिए आंतरिक वायरिंग जाँचे/Check all internal wiring connections for proper tightness.					
5	लिमिट और टार्क स्विच की कार्य प्रणाली जाँचे/Check limit and torque switches for functioning.					
6.	डबल कम्प्रेशन ग्लैंड की टाईटनेस जाम्चे/Check the tightness of Double Compression Glands					
7.	ओरिंग और एफ.एल.पी. कवर की सही टाईटनेस की स्थिति जाँचे/Check the condition of O Rings and for proper tightness of FLP cover.					
8.	एक्चूएटर और एस.एफ.यू. अंत पर फ्यूज़ जाँचे/Check fuses at both actuator & SFU end.					

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

		एम.ओ.वी /MOV	एम.ओ.वी /MOV	एम.ओ.वी /MOV	एम.ओ.वी /MOV	एम.ओ.वी /MOV
9.	एस.एफ.यू. फीडर में सही फ्यूज़ रेटिंग जाँचे/Check for the proper fuse rating in the respective SFU feeder					
10.	पी.एल.सी. चित्र में किसी एक्चूएटर के चल रहे रूकावट को जाँचे/Check if any faults are persisting for that particular MOV actuator in PLC graphics					

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/12		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Earthpit**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : अर्थिंग पिट/**Earthing Pits**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : अर्द्धवार्षिक/Half Yearly

अर्थ पिट संख्या Earth Pit No.	स्वतः वैल्यू/I. Value	ग्रिड वैल्यू/ G. Valu e	बाहरी हानि जाँचे/Check for External Damages	पिट मार्कर की उपलब्धता जाँचे/Check for availability of Pit Markers	अर्थिंग कंडक्टर की निरंतरता जाँचे/Check continuity of Earthing conductors	Check continuity of lightning strip down conductors*	टिप्पणी/Re marks

सीमा/Limits : LP < 5Ω , EP < 2Ω and IP < 1Ω. Grid < 1Ω

*Lighting strip down conductors are applicable only for LA-type earth pits which are used for structural earthing & NOT equipment/instrumentation earthing

Work Permit No.

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

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Date :	Date :	

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/13		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Calibration Report**		

स्थान/Location :

उपकरण/Equipment :

दिनाँक/Date :

समय अंतराल/Frequency

मीटर की जानकारी/Details of Meter under test :

बनावट/Make :

माडल/Model :

सीरियल संख्या/Serial No. :

स्टैंडर्ड मीटर की जानकारी/Details of Standard Meter :

बनावट/Make :

माडल/Model :

सीरियल संख्या/Serial No.:

कैलीब्रेशन वैलिडिटी/Calibration Validity :

कैलीब्रेशन एजेंसी/Calibration Agency :

क्रम संख्या Sl. No	इंपुट टाईप/Input Type	स्टैंडर्ड मीटर रीडिंग/Standard Meter reading	टेस्ट मीटर की रीडिंग/Meter under test reading	% गलती/% error	टिप्पणी/Remarks

टेस्ट किये जाने वाला मीटर उपयोग के लिए सही/गलत है/Meter under test is fit/unfit for use :

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

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Date :	Date :	

रिले कैलीब्रेशन रिपोर्ट /Relay Calibration Report

रिपोर्ट संख्या/Report No.:

दिनाँक/Date:

पैनल संख्या/Panel No. :

स्थान/Location :

C.T./P.T. Ratio :

समय अंतराल/Frequency : वार्षिक/Yearly

सर्किट डिज़ाइन/Circuit Designation :

रिले जानकारी/Relay Particulars :

रिले माडल संख्या/Relay Model No.:

रिले सीरियल संख्या/Relay Serial No. :

रिले रेंज़/Relay Range :

टेस्ट परिणाम/Test Results :

फेज़/Phase	PS	TM	धारा/Current passed in Amps.	लगाया विभव/Voltage Applied	समय/Time taken to Trip	विभव/Voltage at Tripping	समय/Time as per Graph	गलती /% Error
R Phase								
Y Phase								
B Phase								

Setting	Pick-up Volt	Drop-out Volt

टिप्पणी/Remarks :

रिले कैलीब्रेशन रिपोर्ट - अ/Relay Calibration Report -A

रिपोर्ट संख्या/Report No.:
दिनाँक Date :
सर्किट डिज़ाइन/Circuit Designation:
स्थान/Location :
C.T./ P.T. Ratio :
समय अंतराल/Frequency : वार्षिक/Yearly

रिले माडल संख्या/Relay Model No :

रिले सीरियल संख्या/Relay Sl. No :

रिले रेंज़/Relay Range :

टेस्ट परिणाम/Test Results :

	%	Bias
A		
B		
C		

Sl. No	Phase	Injected Current terminal Nos.	Injected Current in Amps	Time to Trip in Sec	As per Graph	Remarks
1	A					
2						
3	B					
4						
5	C					
6						

11. Settings after testing:

	%	Bias
A		
B		
C		

Remarks :

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

रिले कैलीब्रेशन रिपोर्ट - ब / Relay Calibration Report -B

रिपोर्ट संख्या/Report No.:
दिनाँक Date :
सर्किट डिज़ाइन/Circuit Designation:
स्थान/Location :
C.T./P.T. Ratio :
समय अंतराल/Frequency : वार्षिक /Yearly

रिले माडल संख्या/Relay Model No. :
रिले सीरियल संख्या/Relay Sl. No. :
रिले आक्जिलरी सप्लाई/Relay Aux. Supply :
टेस्ट परिणाम/Test Results :

क्रम संख्या **Sl. No.**	कोड संख्या **Code No.**	विवरण/**Description**	वैल्यू/Value/Sub Code
(a)	01	मोटर पहचान संख्या/Motor Identification No.	
(b)	02	सी.टी. प्राथमिक रेटिंग/C.T. Primary Rating	
(c)	03	सी.टी. द्वितीय रेटिंग C T Secondary Rating	
(d)	04	अर्थ फाल्ट कनेक्शन/Earth Fault Connections	
(h)	12	(L_{stl}) स्टालिंग धारा सेटिंग/Stalling Current Setting (XL_s)	
(i)	13	(L_2) ऋण फेस सीक्वेंस धारा सेटिंग/Negative Phase Sequence Current Setting (XL_s)	
(j)	15	(I_0) रेसीड्युयल धारा सेटिंग/स्Residual E/F Current Setting in mA	
(k)	16	(I_{st}) शुरूवात धारा सेटिंग/Starting Current Setting (Xls)	
(m)	22	(TH) गर्माहट समय नियतांक/Heating Time constant setting (In Minutes)	
(n)	28	(T_{stl}) खडे समय के साथ स्टाल Stall with Stand Time (In secs.)	
(o)	29	(T_{st}) शुरूवाती समय/Starting Time (In sec.)	
(q)	32	(t_0)समय सेटिंग/E/F Time Setting (sec.) E/F Relay Injected 800 mA Tripping at	

टिप्पणी/Remarks :

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

रिले कैलीब्रेशन रिपोर्ट - स / Relay Calibration Report -C

A) फेस और न्यूट्रल सर्किट की सत्यता/Verification of Phase and Neutral Circuitry

Current injected (Amps.)	Current Display			
	R-PHASE	Y-PHASE	B-PHASE	NEUTRAL

B) Earth Fault element :

Pick-up Current =

Injected Tripping Current =

Tripping Time =

C) Stalling Protection :

Pick-up Current =

Injected Tripping Current =

Tripping Time =

D) Pro-Long Start :

Pick-up Current =

Injected Tripping Current =

Tripping Time =

E) Negative Phase Sequence Protection :

Injected Tripping Current =

Tripping Time =

F) Thermal Protection:

Injected Tripping Current =

Tripping Time =

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/15		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – 66KV/33KV SwitchYard.**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment: **66KV/33KVस्विचयार्ड/SwitchYard.**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: वार्षिक/Yearly

निम्न चीजें लिखे/Record the parameters given below:

क्रम संख्या **S. No.**	**निर्देश/Instructions**	**निरीक्षण/Observation**	**टिप्पणी/Remarks**
1	स्विचयार्ड की सफाई करे/Check the general house keeping of the switch yard.		
2	यार्ड में प्रकाश की स्थिति जाँचे/Check the condition of the yard lighting.		
3	स्विचयार्ड से सूखी घास हटाए/Remove vegetation/Dried plants etc if any from the switch yard area.		
4	जी.ओ.डी. का विद्युत/मानवीय ओपरेशन जाँचे/Check the operation of the GOD electrically/manually as applicable and its interlocks wherever applicable.		
5	जी.ओ.डी. को लूब्रीकेट करे/Lubricate the GOD		
6	तेल का सही तल जाँचे/Check for the proper level in oil filled CT/PT units. Leakages to be arrested if any.		
7	अर्थ स्विच का ऑपरेशन जाँचे/Check the operation of Earth switch.		
8	स्विचयार्ड की बनावट की सही अर्थिंग जाँचे/Check the proper earthing of the structures of the switch yard.		
9	लाइटनिंग अरेस्टर की स्थिति जाँचे/Check the condition of Lighting Arresters (LA)		
10	जम्पर कनेक्शन की टाइटनेस जाँचे/Check the tightness of the Jumper connections.		
11	ट्यूबुलर बसबार की स्थिति जाँचे/Check the conditions of the tubular bus bars (applicable for 66 KV switchyard)		
12.	चेन से जुडी दीवार की स्थिति जाँचे/Check the condition of the chain link fencing		

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

क्रम संख्या S. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
13.	चेन से जुडी दीवार की अर्थिंग जाँचे/Check the earthing of the chain link fencing.		
14.	चेन से जुडी दीवार की पेंटिंग की स्थिति जाँचे/Check the condition of painting of the chain link fencing. (structure if applicable)		
15.	एल.ए. काउंटर की रीडिंग लिखे/Record the reading of LA counter (wherever applicable)		
16.	स्विचयार्ड का अर्थग्रिड जाँचे/Check the Earth Grid of the switch yard.		
17.	ना चढने वाले गार्ड/कटीले तार का प्रावधान जाँचे/Check for the Provision of Anti climbing guards/barbed wires.		
18.	खतरा बोर्ड जाँचे/Check for the installation of the danger boards.		
19.	ओ.एह. लाइन का अधिकतम लटकाव जाँचे/Check for the excessive sagging of the OH lines		
20.	ओ.एह. लाइन और एच.टी. लाइन के बीच दूरी जाँचे/Check for clearances between Oh lines & various HT connections		
21.	स्विचयार्ड में लाकिंग व्यवस्था जाँचे/Check for the locking arrangement for switch Yard.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/16		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – LV Capacitor Bank**		

स्थान/Location :

उपकरण/Equipment : एल.वी. कैपेसिटर बैंक/LV Capacitor Bank

दिनाँक/Date :

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : वार्षिक/Yearly

निम्न चीजे लिखे/Record the parameters given below:

क्रम संख्या **S. No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
1	सामान्य सफाई करे/Carry out general cleaning		
2	वायरिंग कनेक्शन की टाईटनेस जाँचे/Check tightness of wiring connections		
3	एस.एफ.यू. कानट्रैक्टर फीडर की कार्यता जाँचे/ Check the functionality of SFU Cum contactor feeders.		
4	ए.पी.एफ.सी.आर. कार्यता जाँचे /Check the functionality of APFCR		
5	प्रत्येक कैपेसिटर की धारिता जाँचे/Check the capacitance of each capacitor		
6	पैनल की पेंटिंग की स्थिति जाँचे/Check the condition of painting of the panel.		
7.	एच.आर.सी. फ्यूज़ की स्थिति जाँचे/Check the condition of HRC fuses		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

Approved By	Issued By	CONTROLLED COPY
Pipeline Head	Management Representative	
Date :	Date :	

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/17		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – LT Motors**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : एल.टी. मोटर /LT **Motors**

उपकरण संख्या/Equipment No:

समय अंतराल/Frequency : वार्षिक/Yearly

क्रम संख्या **Sl.No.**	निर्देश/**Instructions**	निरीक्षण./**Observation**	टिप्पणी/**Remarks**
1	मोटर केबल को टर्मिनल से अलग करे। लग्स और इंसूलेटर बूसिंग को साफ करे/Disconnect motor cable from terminals, clean, lugs and insulator bushings		
2	मोटर की सफाई सुनिश्चित करे / Ensure Cleaning of the motor.		
3	यदि ज़रूरत हो तो केबल अंत को दोबारा टेप करे/Re-tape cable ends if required		
5	अर्थिंग टेप की निरंतरता जाँचे/Checked the earthing strip continuity		
6	सभी नींव के नट व बोल्ट के कसाव को जाँचे/Checked for tightness of all foundation nuts and bolts.		
7	शोर के लिए बीयरिंग जाँचे/Check bearings for noise		
8	बचाव यंत्र की कार्य प्रणाली जाँचे/Check working of Protective devices		
9	लोड पर धारा नापे/Record current drawn on load found satisfactory लोड पर धारा/Load current: R YB		

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10	आइ.आर. वैल्यू/Record I.R. valves: a)मोटर/Motor : RE, YE, BE b)केबल/Cable : RY, YB, BR : RE, YE, BE		
11	वाइंडिंग रेसिस्टेंस नापे/Record winding resistance: b)U-V b)V-W c)W-U		
12	करोजन (बाहरी) प्रभाव जाँचे/Check Corrosion effects(external)		
13	सहायक पैरों, पेडेस्टल और आधार पत्ती की स्थिति/Condition of Supporting Legs Pedestal & base plate		
14	कम्पन और ताप रीडिंग जाँचे/Check for vibration and temperature readings.		
15.	पोलराज़ेसन नापे। यदि पोलराइज़ेसन इंडेक्स <2.5, वाइंडिंग को बनाने वाले के अनुसार वार्निश किया जाना चहिए/Measure polarization index*. If polarization index is less than 2.5. Winding shall be varnished as per the manufacturer's recommendations.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

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पद Designation:

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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/18		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Flame Proof JB**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment: अग्निरोधी जे.बी./Flame Proof JB

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : वार्षिक/Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/ Remarks
1.	किसी बाहरी हानि को जाँचे/Visual check for any external damage		
2.	धूल और गन्दगी के एकत्र होने को जाँचे और साफ करे/Check for any accumulation of dust & dirt and clean the same.		
3.	दोनों तरफ से जे.बी. की सही अर्थिंग जाँचे/Check for the proper earthing of JB from 2 sides		
4.	गास्केट की स्थिति जाँचे/Check the conditions of gaskets (water tightness)		
5.	सभी प्रयोग मे न आने वाले छेंदों मे प्लग लगाए/Plug all the unused holes in the JB		
6.	सभी बोल्ट, ग्लैंड की पूर्णता और टाईटनेस को जाँचे/Check for completeness of all the bolts, glands and their tightness.		
7.	किसी भी करोजन प्रभाव को जाँचे/Check for any corrosive effects.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/18		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – LV VFD**		

स्थान/Location:

उपकरण/Equipment : **एल.वी. वी.एफ.डी. / LV VFD**

उपकरण संख्या/Equipment No :

दिनाँक/Date :

समय अंतराल/Frequency : अर्द्धवार्षिक/Half-Yearly

क्रम संख्या **Sl. No.**	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1.	सामान्य सफाई करे/Carry out general housekeeping of the panel		
2.	इंडीकेशन लैम्प को जाँचे/Check functioning of indication lamps		
3.	मीटरिंग की सही कार्यता जाँचे/Check metering for proper functionality		
4.	टर्मिनेशन की टाईटनेस जाँचे/**Check the tightness of the terminations**		
5.	केबल प्रवेश के सभी अतिरिक्त छेंदों को प्लग करे/Plug all the spare holes for the cable entry		
6.	पैनल फिल्टर की सफाई करे/Carry out cleaning of the panel filters		
7.	ठंडा करने वाले पंखों की स्थिति जाँचे/Check the conditions of the cooling fans		
8.	पैनल की सही अर्थिंग जाँचे/Check proper earthing of the panel		
9.	लोकल/रिमोट में कार्यता जाँचे/Check the functionality in the local remote		
10.	की-पैड से कार्यता जाँचे/Check the functionality from the keypad		
11.	डाटा एकत्र होने का निरीक्षण करे/Carry out analysis of the data log		
12.	सभी इंटरलॉक जाँचे/Check for the functionality of all the interlocks		
13.	मॉडबस की सम्बध्ता जाँचे/Check for the Modbus connectivity.		

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क्रम संख्या **Sl. No.**	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
14.	सी.आई. डोजिंग पम्प पैनल के केस में पी.एल.सी. की कार्यता जाँचे/Check for the proper functionality of the PLC in case of the CI Dosing Pump panel.		
15.	फ्यूज़ जाँचे/Check fuses		
16.	रिले/कांट्रैक्टर गर्माहट के लिए जाँचे/Check relay/contactors for undue heating.		
17.	टाइमर की कार्यता जाँचे/Check the functionality of the timers		
18.	पॉवर और नियंत्रण सर्किट के लिए सही विभव जाँचे/Check for proper voltage for power & control circuitry.		
19.	.....कर्यत जाँचे/Check for the functionality of…		
20.	पैनल स्पेस हीटर की सर्किट जाँचे/Check for circuitry of panel space heater, illumination.		
21.	हार्मोनिक फिल्टर यूनिट जाँचे/Check harmonic filter unit		
22.	स्टेशन पी.एल.सी. का सही एन्नसियेशन जाँचे/Check for proper annunciation to station PLC		
23.	मीटरिंग/इंडीकेशन - एल.सी.एस. को जाँचे/Check for respective LCS-indication/metering		
24.	**पैनल की अलग अलग इंस्ट्रूमेंटेशन और विद्युत अर्थिंग जांचे**/Check for the separate instrumentation & electrical earthing of the panel.		
25.	पैनल के दरवाज़े की कार्यता जाँचे/Check for the smooth functioning of the panel door		
26.	सभी केबल की सही पहचान करे/Check for the proper identification of all the cables.		

नोट:/**NOTE**: यह फार्मेट बूस्टर पम्प और सी.आई. डोजिंग पम्प की वी.एफ.डी. के लिए है/This format is applicable for the VFDs of booster pumps and CI dosing pumps.

टिप्पणी/Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

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Pipeline Head	Management Representative	
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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/20		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – MV VFD**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : **एम.वी. वी.एफ.डी. / MV VFD**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : अर्द्धवार्षिक/Half-Yearly

क्रम संख्या **Sl. No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
1.	सामान्य सफाई करे/पैनल साफ करे/Carry out general housekeeping/cleaning of the panel		
2.	ताप, आद्रता जाँचे और लिखे / Check & record the ambient temperature, humidity		
3.	वी.एफ.डी.. के पास हानिकारक गैस, तेल वाष्प और गन्दगी की उपस्थिति जाँचे/Check for any presence of the dust, oil mist and harmful gases near the VFD system		
4.	मशीन को असामान्य कम्पन के लिए जाँचे/Check the drives for any abnormal vibration		
5.	प्रमुख सर्किट विभव और नियंत्रण सर्किट विभव जाँचे/Check the main Circuit voltage and the control circuit voltage.		
6.	वी.एफ.डी. के ड्राई टाईप ट्रांसफार्मर को किसी गन्ध या हमिंग के लिए जाँचे/Check dry type transformer of VFD for any smells or humming.		
7.	ठण्डा करने वाले पंखे को किसी असामान्य कम्पन या ध्वनि के लिए जाँचे/Check cooling fan for any abnormal vibration or noise.		
8.	वायु फिल्टर को साफ करे और जाम्चे/Check & clean the air filter.		
9.	सभी इन्डीकेशन लैम्प की कार्यप्रणाली जाँचे/Check functioning of all the indicating lamps, annunciator panel.		
10.	विभिन्न मीटरों को इंडीकेशन और सही नाप के लिए जाँचे/Check for the correct measurement & indication of various meters.		

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11.	वी.एफ.डी और वी.एफ.डी पी.एल.सी.के मध्य मॉडबस कम्युनिकेशन जाँचे/Check the modbus communication between VFD & VFD PLC.		
12.	मशीन के सभी फ्यूज़ जाँचे/Check all the fuses of the drives.		
13.	प्रज्जवलन और स्पेस हीटर सर्किट जाँचे/Check for illumination & space heater circuits.		
14.	ऑन बोर्ड पी.एल.सी. सिस्टेम की सही कार्यप्रणाली जाँचे/Check for the proper functionality of On Board PLC system.		
15.	**ट्रंसफार्मर पैनल, पॉवर सेल पैनल / Transformer Panel, power cell Panel**		
16.	प्रमुख सर्किट और भूमि टर्मिनल के मध्य मेगर जाँचे/Megger check between the main circuit terminal and ground terminals.		
17.	ढीले स्क्रू,बोल्ट और कनेक्टर जाँचे और टाईट करे /Check & tighten loose screw, bolts & connectors		
18.	प्रत्येक भाग को अधिक गर्माहट की आशंका के लिए जाँचे/Check for trace of overheats on each part, if any.		
19.	केबल को किसी शीत हानि के लिए निरीक्षित करे/Inspect the cable for any sheath deterioration		
20.	ड्राई टाईप ट्रांसफार्मर के प्राथमिक और द्वितीय विभवों को जाँचे/Check the Primary & secondary voltages of the dry type transformer.		
21.	स्मूथिंग सन्धारित्र को लीक, प्रोटर्डिंग और बढाव के लिए जाँचे/Check and confirm that the smoothing capacitor is not leaking, protruding and has not expanded.		
22.	स्मूथिंग सन्धारित्र की धारिता नापे/Measure capacitance of the smoothing capacitor.		
	नियंत्रण पैनल/Control Panel		
23.	सभी बचाव और इंडीकेशन सर्किट की कार्यप्रणाली जाँचे/Check the functioning of all the protective & indication circuits.		
24.	सभी रिले की कार्यप्रणाली जाँचे/Check the functioning of all the relays		

25.	सभी कांटैक्ट रिले की स्वस्थता जाँचे / Check healthiness of all the contacts relays.		
26.	प्रिंटेड सर्किट बोर्ड को किसी असामान्य गन्ध और रंगहीनता लके लिए जाँचे/Check the printed circuit board for any discoloration and abnormal smells.		
27.	पैनल ई.एस.डी. की कार्यप्रणाली जाँचे/Check the functionality of the panel ESD		
28.	सही नियंत्रण सप्लाई विभव जाँचे/Check for the proper control supply voltage.		
29.	सही ऑक्ज़ीलरी सप्लाई विभव जाँचे/Check for the proper auxiliary supply voltage.		
	सीरीज़ रिएक्टर/Series Reactor		
30.	सीरीज़ रिएक्टर को साफ करे/Clean the series reactor		
31.	नियंत्रण/पॉवर केबल टर्मिनेशन की दृढता जाँचे/Firmness of termination of control/power cables.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/21		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Window & Split AC Unit**		

स्थान/Location :

उपकरण/Equipment : **विन्डो और स्प्लिट ए.सी.यूनिट / Window & Split AC Unit**

दिनाँक/Date :

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : अर्द्घवार्षिक/Half-Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	ए.सी.यूनिट संख्या/पहचान/AC unit No./Identification			
	विन्डो यूनिट / Window Units				
1.	इंपुट विभव जाँचे और लिखे/Check & record the input voltage				
2.	यूनिट की सामान्य सफाई करे/Carry out the general cleaning of the units				
3.	कम्प्रेशर का गैस दबाव जाँचे /Check the gas pressure of the compressor.				
4.	पंखे की मोटर की कार्यत जाँचे/Check the working of the fan motors				
5.	सन्धारित्र की स्वस्थता जाँचे/Check the healthiness of the capacitor				
6.	थर्मोस्टैट की कार्यता जाँचे/Check the working of the thermostat				
7.	रिमोट की कार्यता जाँचे/Check the functioning of the remotes				
8.	लौउर स्विंग मोटर की कार्यप्रणाली जाँचे/Check the working or the louver swing motor				
9.	फिल्टर साफ करे/Clean the Filters				
	स्प्लिट यूनिट/Split Units				
10.	विन्डो यूनिट के सभी टेस्ट करे/All the Check of the Window Units				
11.	अन्दरूनी और बाहरी यूनिट को साफ करे/Clean the outdoor & Indoor units				
12.	एक्सपोज कॉपर पाइप को इंसूलेशन के लिए जाँचे/Check the insulation of the exposed copper pipes.				
13.	अन्दरूनी यूनिट के फिल्टर साफ करे/Clean the filters of the indoor units.				

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नोट/NOTE: एस.वी. स्टेशन के ए.सी. यूनिट की मेंटेनेन्स प्रमुख स्टेशन से साथ की जानी चाहिए/Maintenance of the AC units at SV stations shall be carried out along with the Main stations

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/22		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – AC Plant for VFD**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : **वी.एफ.डी. के लिए ए.सी.प्लांट /AC Plant for VFD**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : अर्द्धवार्षिक/Half-Yearly

क्रम ख्या **Sl. No.**	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
	बाहरी कंडेंसर यूनिट/Out door condenser Units		
1.	कंडेंसर को धूल रहित करने के लिए साफ करे/Clean the condensers to make it free from dust.		
2.	इंसूलेशन के लिए सभी कॉपर पॉईपिंग जाँचे/Check all the copper piping for the insulation.		
	अन्दरूनी ए.एच.यू. /Indoor AHU		
3.	सभी कम्प्रेशर मे गैस दबाव जाँचे/Check the gas pressure in all the compressors.		
4.	रिले की कार्यता जाँचे/Check the functioning of the relay		
5.	ताप सेंसर की कार्यता जाँचे/Check the functioning of the temp. Sensor.		
6.	सॉफ्ट की-पैड से यूनिट की सभी सेटिंग जाँचे/Check all the settings of the Unit from the soft keypad.		
7.	अग्नि डैम्पर की कार्यता जाँचे/Check the functioning of the Fire dampers.		
8.	ए.एच.यू. से अधिक पानि निकलने के लिए पॉईपिंग जाँचे/Check the piping for the excess water draining from AHU		
9.	सभी कॉपर ट्यूबिंग के सभी इंसूलेशन जाँचे/Check all the insulation of all the copper tubing.		
	पॉवर और नियंत्रण पैनल/Power & Control Panel		
10.	पैनल की सामान्य सफाई करे/Carry out general cleaning of the panel.		

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11.	सभी टर्मिनल, बोल्ट आदि की टाईटनेस जाँचे/Check the tightness of all the terminals, bolts etc.		
12.	सभी बसबार कनेक्शन के टाईटनेस जाँचे/Check the tightness of the all the busbar connection.		
13.	बसबार के इंसूलेशन की स्थिति जाँचे/Check the condition of the insulation of the bus bars		
14.	सभी एस.एफ.यू. और कॉटैक्तर की स्थिति जाँचे/Check conditions of all the SFU & Contactors		
15.	सभी मीटर की कार्यता जाँचे/Check the functioning of all the meters		
16.	एन्नशिएशन सर्किट की कर्यता जाँचे/Check the working of the annunciation circuit		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/23		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – EOT Crane**		

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment : **ई.ओ.टी. क्रेन / EOT Crane**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : वार्षिक/Yearly

क्रम संख्या **Sl. No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
1.	इंकमिंग फीडर में इंपुट विभव जाँचे/Check the input voltages at the incoming feeder.		
2.	एस.एफ.यू.अंत पर फ्यूज़ की स्वस्थता जाँचे/Check the healthiness of the fuses at the SFU end.		
3.	सभी टर्मिनेशन के टाईट्नेस जाँचे/Check the tightness of all the terminations.		
4.	ई.ओ.टी. क्रेन की सफाई करे/Carry out the general house keeping EOT crane		
5.	टर्मिनल/कांटैक्टर की सी.आर.सी.क्लिनर से सफाई करे/Clean the terminal/contactors with the CRC cleaner.		
6.	रिमोट नियंत्रण पैनल की कार्यता जाँचे/Check the functioning of the remote control panel		
7.	हूटर की कार्यता जाँचे/Check the functioning of the hooter		
8.	सभी अग्नि प्रूफ लाईट की स्वस्थता जाँचे/Check healthiness of the all the flame proof lights.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/24		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Cable Cellar Room/Cable Trench**		

स्थान/Location :

उपकरण/Equipment **केबल सेलर रूम/केबल ट्रेंच /Cable Cellar Room/Cable Trench**

दिनाँक/Date :

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: वार्षिक/Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1.	क्षेत्र की सफाई करे/Check for the General Housekeeping of the area.		
2.	सेलर रूम का सही प्रज्जवलन जाँचे/Check for the proper illumination of the Cellar Room.		
3.	सीलिंग के सभी अतिरिक्त खुलाव और केबल प्रविष्टी जाँचे/Check for the sealing of the all the extra openings and cable entries. (No ingress of foreign material, water dust etc.)		
4.	धातु ट्रे सहायक, करोज़न की स्थिति जाँचे/Check for the condition of the metal tray supports corrosion, if any.		
5.	केबल टैंग की उपलब्धता जाँचे/Check for the availability of the cable tags .		
6.	सभी केबल ट्रेंच/पिट रेत से भरी और ढकी होनी चाहिए/All the approaching cable trenches/pits shall be filled with sand & covered.		
7.	केबल ट्रे की अर्थिंग जाँचे/Check for the earthing of the cable trays.		
8.	सेलर रूम के गेट की लॉकिंग जाँचे/Check for the locking of the gates of the Cellar Room.		
9.	सेलर रूम में अग्नि बुझाने वाले डी.सी.पी./सी.ओ.2 की उपलब्धता जाँचे/Check for the availability of the DCP/CO_2 type fire extinguishers in Cellar Room.		

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क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
10	प्रमुख एचटी केबल का आंशिक अवतारण परीक्षण करे और परिणामों का विश्लेषण करे !/ Carry out partial discharge testing and analyze results for major HT cables.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/26		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Electrical LOTO Record**		

	EQUIPMENT DETAILS			PERMIT OPENING DETAILS							PERMIT CLOSING DETAILS				
Sr. No.	Equipment Name	Feeder No.	Nature of Problem	EIP No.	Date/Time of Issue-EIP	LOTO Item No. used	CWP No.	Date/Time of Issue-CWP	Signature of Shift Incharge	Signature of Electrical Incharge	Date/Time of Closure-EIP	Date/Time of Closure-CWP	Signature of Shift Incharge	Signature of Electrical Incharge	Remarks

Abbreviations: **EIP**-Electrical Isolation / Energisation Permit, **CWP**-Cold Work Permit, **LOTO**- Lockout/Tagout

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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/25		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – Highmast**		

स्थान/Location : उपकरण/Equipment : High Mast

दिनाँक/Date : उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : तिमाही/Quarterly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/ Observation	टिप्पणी/ Remarks
1	किसी अनियमित टूट/आंतरिक हानि को जाँचे/Check any abnormal wear/internal damages.		
2	सामान्य सफाई करे/Carry out general cleaning		
3	सभी घूमने वाले भागों और जोड़ों को जाँचे और लूब्रीकेट करे/Check and lubricate all moving parts and joints in Double Drum Winch		
4	मास्ट रिंग को नीचे उतारकर विंच रोप का ऑपरेशन जांचे/Check for Operation of winch by bringing the toroidal mast ring down.		
5	Panel Checklist: a) Control wiring Termination b) Contactor Cleaning c) Push button operation for Raise d) Push button operation for lowering e) Circuit operation in Auto mode f) Circuit operation in Manual mode g) Lighting Power Cable condition at Panel End		
5	इन्सुलेशन अवरोध जाँचे/Measure Insulation Resistance a) Motor (i)R-E (ii) Y-E (iii) B-E b) Cable (i) R-Y (ii) Y-B (iii) B-R Winding Resistance of motor a) U-V b) V-W c) W-U		

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क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/ Observation	टिप्पणी/ Remarks
6	सभी जोड़ों को टाईटनेस और टरमिनेशन को ढीले कांटैक्ट के लिए जाँचे/Check all joints for tightness and terminations for loose contacts		
5	उड़े हुए फ्यूज़ और लूज़ कनेक्शन के लिये जांचे/Check for blown fuses and loose connections		
6	Mechanical Checklist: a) Remove dirt or any foreign particle on the winch and wire b) Check oil bath level c) Check proper Fastening of Bolts d) Gear teeth condition e) Alignment of Drive shaft of winch with motor f) Any corrosion		
7	प्रत्येक लाईट को चलाकर जाँचे/Check for individual operation of each light		
8	स्पेस हीटर ऑपरेशन जाँचे/Check space heater operation		
9	एवियशन लाईट की कार्य-रतता जाँचे/Check functionality of Aviation Light		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

स्थान/Location :

दिनाँक/Date :

उपकरण/Equipment थेर्मोग्रफी/**Thermography**

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency: अर्धवार्षिक/Half Yearly

क्रम संख्या Sl. No.	**निर्देश/Instructions**	**निरीक्षण/Observation**	**टिप्पणी/Remarks**
निम्नलिखित उपकरणों के अवरक्त thermography करे और सभि घटकों के लिए अंतर तापमान को लिख लें/Carry out infrared thermography of following equipments and note down the values of differential temperature for similar components.			
1.	दो पोल/चार ध्रुव संरचना/Two pole/Four Pole Structure		
3.	आउटडोर सीबी और आइसोलेतर/Outdoor CB & Isolators		
4.	ट्रांसफॉर्मर और एनजीआर/Transformers and NGR		
5.	एचटी/एलटी बोर्ड स्विच HT/LT Switch Board		
6.	डीजी और AMF पैनल/DG and AMF Panel		
7.	यूपीएस और बैटरी चार्जर/UPS & Battery Charger		
8.	वी एफ डी/ VFD		
9.	संधारित्र बैंक/Capacitor Bank		
10	आवश्यकता के अनुरुप महत्वपूर्ण उपकरण तथा पैनलों का ! Any other critical equipments and panels location wise as deemed to be necessary.		

निम्नलिखित मानदंडों NETA दिशानिर्देशों के अनुसार पालन किया जाना/ **As per NETA guidelines following criteria to be followed:**

प्राथमिकता/ Priority	समान घटक के बीच डेल्टा टी/**Delta T between similar component's under similar load**	परिवेशी वायु तापमान का डेल्टा टी/**Delta T Over ambient air temperature**	**अनुशंसाएँ/Recommendations**
4	1 to 3 deg C	1 to 10 deg C	Possbile deficiency, warrants investigation
3	4 to 15 deg C	11 to 20 deg C	Indicates probable deficiency repair as time permits
2	----------	21 to 40 deg C	Monitor until corrective measures can be accomplished
1	Greater than 15 deg C	Greater than 40	Major Discrepancy repair immediately.

(विस्तृत उपकरण बुद्धिमान रिपोर्ट अलग-अलग संलग्न किया जाना है/Detailed Equipment wise reports to be attached separately)

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

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पद Designation:

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Pipeline Head	Management Representative	
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	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/28		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Report – Switch Gear Room & Substation Building**		

स्थान/Location:

दिनाँक/Date :

उपकरण/Equipment: स्विचगियर कक्ष व सबस्टेशन बिल्डिंग/Switchgear Room & Substation Building

उपकरण संख्या/Equipment No :

समय अंतराल/Frequency : अर्ध वार्षिक/Half Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1.	रोशनी के स्तर के लिए जाँच करें। Check for the illumination level.		
2.	आपातकालीन प्रकाश व्यवस्था और इसकी ऑटो बदलाव सर्किट आपरेशन के ऑपरेशन के लिए जाँच करें ! Check for operation of emergency lighting provision and its auto-changeover circuit operation		
3.	वेंटिलेशन और दबाव प्रणाली कि जाँच करें ! / Check for ventilation and pressurisation system.		
4.	केबल और बस वाहिनी प्रविष्टियों की सीलिंग के लिए जाँच करें / Check for sealing of cable and bus duct entries		
5.	गृह व्यवस्था और दरवाज़ा के संचलन जाँच करें ! Check for housekeeping including movement of door/ shutters.		
6.	IS 15652: 2006 के अनुरूप इन्सुलेट मैट के प्रावधान के लिए जाँच करें: सदमे उपचार चार्ट आग की बोतल, एमसीपी अर्थिंग रॉड, पीपीई, टेलीफोन कि जाँच करें! / Check for provision of insulating mats conforming to IS: 15652:2006 having ISI mark, shock treatment chart, fire extinguisher (suitable for electrical fires), updated SLD, sand filled buckets, MCP, Earthing rods, Electrical PPEs, and telephone.		
7.	खाई, कवर स्लैब, और कवर प्लेटों की हालत के लिए जाँच करें। / Check for condition of trench, cover slabs, and cover plates.		

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क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
8.	जाँच करें सर्किट की पहचान कि गयि है और खतरे का प्रावधान है, सावधानी बोर्ड के लिए स्विचबोर्ड पर अंकन के लिए जाँच करें। अंकन सुरक्षा के लिए पैनल के पीछे की तरफ से तय की और हटाने योग्य हिस्से भर में होना चाहिए। / Check for marking on the switchboard for identification of circuits and provision of danger, caution board. Marking should be across the fixed and removable portion of the rear side of the panel for safety.		
	Yearly Checks		
9.	छत का प्री-मानसून तालाब परीक्षण करें ! Carry out pre-monsoon Pond test for roof.		
10.	पानी की निकासी व्यवस्था के लिए जाँच करें। Check for water drainage arrangement.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

	HINDUSTAN PETROLEUM CORPORATION LIMITED INTEGRATED SYSTEM OF PROCEDURES	
Document No.: ISF/ELE/29		Issue No.: 01
Issue date: XX/XX/XXXX		Revision No.: 00
Document Title: **Maintenance Report – HVWS**		

स्थान/Location :

दिनाँक/Date:

उपकरण/Equipment:एचवीडब्ल्यूएस/**HVWS**

उपकरण संख्या/Equipment No:

समय अंतराल /Frequency:आर्ध वार्षिक/Half Yearly

क्रम संख्या Sl. No.	निर्देश/Instructions	निरीक्षण/Observation	टिप्पणी/Remarks
1	जल-प्रलय वाल्व की स्थिति की जाँचे! Check the condition of Deluge Valve		
2	स्प्रिंकलर का सिरा जुड़े पाइपिंग और निर्वहन पाइप और कपलिंग को जाँचे ! Check for physical damage of sprinkler head and associated piping, discharge pipe and couplings.		
3	जल-प्रलय वाल्व आपरेशन के लिए जाँच करें ! Check for Deluge Valve Operation		
4	जल-प्रलय वाल्व के बाईपास लाइन आपरेशन के लिए जाँच करें/Check for Deluge Valve Bypass line Operation		
5	जल-प्रलय वाल्व के पैनल . के कामकाज की स्थिति की जाँचे ! Check for Deluge Valve panel functioning		
6	फव्वारा/नोजल सिर की सफाई के लिए जाँच करें ! Check for Cleaning of sprinkler/Nozzle heads for particles, jamming.		

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Pipeline Head	Management Representative	
Date :	Date :	

7	तितली वाल्व के लिए जाँच के लिए जाँच करें Check for operation of Butterfly Valve.		
8	छलनी की स्थिति की जाँच के लिए जाँच करें ! Check for check the condition of Strainer		
9	दबाव नापने का यंत्र कैलिब्रेशन के लिए जाँच करें !/Check for Pressure Gauge Calibration		
10	चेक डीवी पैनल बैटरियों कि जाँच करें Check DV Panel Batteries.	Annually	10
11	HVWS ऑपरेशन के बाद ट्रांसफार्मर की ट्रिपिंग के लिए जाँच करें।/ Check for tripping of transformer after HVWS operation.		
12	पाइपलाइनों में जंग के लिए जाँच करें। Check for corrosion in pipelines.		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation:

स्थान/Location :

उपकरण/Equipment: सोलर प्लांट Solar Plant

दिनाँक/Date:

उपकरण संख्या/Equipment No:

समय अंतराल /Frequency:आर्ध वार्षिक/Half Yearly

क्रम संख्या **Sl. No.**	निर्देश/**Instructions**	निरीक्षण/**Observation**	टिप्पणी/**Remarks**
	PV Module		
1	जलने के निशान, मलिनकिरण, प्रदूषण, या टूटे हुए ग्लास जैसे दोषों के लिए पीवी मॉड्यूल का निरीक्षण करें।/Inspect PV modules for defects such as burn marks, discoloration, delamination, or broken glass.		
2	गंदगी या जानवरों की बूंदों से अत्यधिक मिट्टी के लिए मॉड्यूल की जाँच करें।/ Check modules for excessive soiling from dirt buildup or animal droppings.		
3	सुनिश्चित करें कि मॉड्यूल वायरिंग सुरक्षित है और छत पर आराम नहीं कर रहा है, ढीले लटक रहा है और संभावित नुकसान से अवगत कराया गया है, एक अप्रकाशित त्रिज्या के लिए मुड़ा हुआ है, या तेज या घर्षण सतहों पर फैला है।/ Ensure that the module wiring is secure and not resting on the roof, hanging loose and exposed to potential damage, bent to an unapproved radius, or stretched across sharp or abrasive surfaces.		
4	जहाँ आवश्यक हो, उचित सहायता, झाड़ियों और विस्तार जोड़ों के लिए कंडक्ट्स का निरीक्षण करें।/ Inspect conduits for proper support, bushings, and expansion joints, where needed.		
5	बक्से के अंदर मलबे की तलाश करें और पानी से नुकसान के किसी भी सबूत की जांच करें। टर्मिनलों, बोर्डों और फ्यूज धारकों पर मलिनकिरण के लिए देखें। / Look for debris inside the boxes and check for any evidence of damage by intrusion of water. Look for discoloration on the terminals, boards, and fuse holders.		
	Invertor		
6	इंवर्टर के आंतरिक और बाहरी का एक दृश्य निरीक्षण करें। इन्वर्टर में पानी, कृंतक, या धूल के संकेत देखें।/ Perform a visual inspection of the interior and exterior of the inverter. Look for signs of water, rodent, or dust intrusion into the inverter.		

7	मानव-मशीन इंटरफ़ेस (HMI) प्रदर्शन से सभी वोल्टेज और उत्पादन मूल्यों को रिकॉर्ड और मान्य करें। एमपीपीटी प्रभारी नियंत्रक आउटपुट को बैटरी वोल्टेज रेट किया जाएगा / Record and validate all voltages and production values from the human- machine interface (HMI) display. **MPPT Charge Controller output to be rated battery voltage**		
8	अंतिम लॉग सिस्टम त्रुटि रिकॉर्ड।/ Record last logged system error.		
9	उचित संचालन के लिए प्रशंसकों की जाँच करें।/ Check fans for proper operation.		
10	फ़्यूज़ के स्वास्थ्य की जाँच करें।/ Check healthiness of Fuses.		
11	सिस्टम ग्राउंड और उपकरण ग्राउंडिंग की निरंतरता की जांच करें।/ Check continuity of system ground and equipment grounding.		
12	अर्थिंग के लिए इन्वर्टर के मैकेनिकल कनेक्शन की जाँच करें! / Check mechanical connection of the inverter to the wall or ground.		
13	आंतरिक डिस्कनेक्ट ऑपरेशन की जाँच करें।/ Check internal disconnect operation.		
	PV Installation Site		
14	सुनिश्चित करें कि छत की निकासी पर्याप्त है, छत की नालियों को भरा नहीं गया है, और पुष्टि करें कि सरणी के आसपास के क्षेत्र में पानी के जमाव के कोई संकेत नहीं हैं। / Ensure roof drainage is adequate, roof drains are not clogged, and confirm that there are no signs of water pooling in the vicinity of the array		
15	सौर स्थापना के पास वनस्पति विकास के लिए जाँच करें / Check for vegetation growth or other new shade items such as a satellite dish		
16	ग्राउंड माउंट सिस्टम और समर्थन की स्थिति के चरणों के पास जमीन के कटाव की जाँच करें।/ Check for ground erosion near the footings of a ground mount system and condition of supports.		
17	विद्युत बाड़ों की पुष्टि करें केवल अधिकृत कर्मियों के लिए सुलभ हैं, पैडलॉक या संयोजन ताले के साथ सुरक्षित हैं, और एक्सेस साइनेज प्रतिबंधित है / Confirm electrical enclosures are only accessible to authorized personnel, are secured with padlocks or combination locks, and have restricted access signage		

18	बाड़ों और रैकिंग प्रणाली के बाहर जंग के लिए जाँच करें / Check for corrosion on the outside of enclosures and the racking system		

टिप्पणी : Remarks if any:

द्वारा किया गया Work done by:

नाम Name:

पद Designation:

जांचकर्ता Reviewed by :

नाम Name:

पद Designation: