



**DALMIA CEMENT (B) LIMITED – CEMENT PLANT**  
**ARIYALUR**  
**ELECTRICAL MANUAL**

Issue No: 02	Rev. No: 00	Effective Date: 01.11.2019	ELEC/SOP/002
Issued By: M.R		Approved By: HOD - ELECTRICAL	
SOP for Clearing the LOTO Permit in HT Feeders			

**Scope** : Connecting the equipments to the HT Electrical sources

**Responsibility** : Electrical Engineer/Electrical Shift Engineer/Technicians

**Accountability** : Section In charge

**PPE:**

1. Electrical Safety Gloves
2. Safety Shoes
3. Safety helmet

**Tools:**

1. Racking Key
2. LOTO Lock
3. Earth Truck
4. Rescue Rod

**Hazards:**

Risk Associated

Electrical Shock

Burn injury

Electrocution (Fatal)

Electrical Flash

Electrical Fire

Mitigating Measures

Tested Electrical Rubber Hand Gloves

Arc flash suit

Proper Trainings

**Training needs:**

1. Electrical shock recovery Training
2. Emergency preparedness
3. First aid including CPR training
4. Electrical safety training



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**Procedure for other than Electrical work**

1. After the Completion of the work the performer will approach the Issuing authority (SH Mech) with existing isolation permit duly filled with name, signature, date and time as completion of jobs.
2. Then Issuing authority will insure and give clearance with his name and signature.
3. Then performer shall approach Isolating authority (Electrical Engineer / Shift Engineer) with duly filled LOTO permit as Energy source can be restored for remove LOTO.
4. Before Clearing the LOTO Date, Time, Equipment Description, Name & Signature will be verified.
5. Isolating authority (Electrical Engineer / Shift Engineer) removes the lock and DO NOT OPERATE TAG of performing authority as well as Isolating authority.
6. In case more than one performing authority taken LOTO isolation permit for the same equipment then Isolating authority lock and tag remain there. Isolating authority lock and tag shall remove along with last performing authority lock and tag.
7. Isolating authority (Electrical Shift Engineer / Electrical Engineer /Electrician) will Rack in the breaker by HT hand gloves.
8. Isolating authority (Electrical Shift Engineer / Electrical Engineer) will switch on the Control MCB and check the Healthiness of the Feeder with CCR.
9. Isolating authority (Electrical Shift Engineer / Electrical Engineer)will put his name and signature on LOTO isolation permit as connected energy sources restored.

**Procedure for Electrical work at HT Motor Terminals, HT Panel Bus bar, Transformer Terminals, HT Capacitor & HT Isolator**

1. After the Completion of the work the performer will approach the Issuing authority (SH Mech) with existing isolation permit duly filled with name, signature, date and time as completion of jobs.
2. Then Issuing authority will insure and give clearance with his name and signature.



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3. Then performer shall approach Isolating authority (Electrical Engineer / Shift Engineer) with duly filled LOTO permit as Energy source can be restored for remove LOTO.
4. Before Clearing the LOTO Date, Time, Equipment Description, Name & Signature will be verified.
5. In case of Bus bar maintenance, Isolating authority (Electrical Engineer / Shift Engineer) removes the DO NOT OPERATE TAG of performing authority as well as Isolating authority.
6. In case more than one performing authority taken LOTO isolation permit for the same equipment then Isolating authority DO NOT OPERATE TAG & lock remain there. Isolating authority tag shall remove along with last performing authority DO NOT OPERATE TAG and Lock.
7. Isolating authority (Electrical Shift Engineer / Electrician) will Rack out the Earth Truck by

<b>S.NO</b>	<b>Description</b>	<b>Section</b>	<b>Document No</b>
1	SOP for issuing LINE CLEAR in HT Feeders	All Sections	ELEC/SOP/001
2	SOP for clearing LINE CLEAR in HT Feeders	All Sections	ELEC/SOP/002
3	SOP for issuing LINE CLEAR in LT Panels	All Sections	ELEC/SOP/003
4	SOP for clearing LINE CLEAR in LT Feeders	All Sections	ELEC/SOP/004
5	SOP for LT Motors Maintenance	All Sections	ELEC/SOP/005
6	SOP for LT Panel Maintenance	All Sections	ELEC/SOP/006
7	SOP for HT Motors Maintenance	Raw Mill, Pyro & Cement Mill	ELEC/SOP/007
8	SOP for HT Panel Maintenance	All Sections	ELEC/SOP/008
9	SOP for Transformer Maintenance	All Sections	ELEC/SOP/009
10	SOP for GRR Maintenance	Raw Mill and Cement Mill	ELEC/SOP/010
11	SOP for LRS Maintenance	Cement Mill	ELEC/SOP/011



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12	SOP for Lighting maintenance	All Sections	ELEC/SOP/012
13	SOP for Maintenance of Slip rings of Packer & Stacker Reclaimer	RMH I and Packing Plant	ELEC/SOP/013
14	SOP for Earth Pit Maintenance	All Sections	ELEC/SOP/014
15	SOP for EOT Crane maintenance	All Sections	ELEC/SOP/015
16	SOP for Online Greasing of HT & LT Motors	Raw Mill, Pyro & Cement Mil	ELEC/SOP/016
17	SOP for Overhauling of LT Motor	All Sections	ELEC/SOP/017
18	SOP for Testing of transformer oil	All Sections	ELEC/SOP/018
19	SOP for MRSS Maintenance	110KV SS	ELEC/SOP/019
20	SOP for Battery Maintenance	All Sections	ELEC/SOP/020
21	SOP for Cleaning Handling of Hand Blower	All Sections	ELEC/SOP/021
22	SOP for Handling of Electrical / Battery Waste	All Sections	ELEC/SOP/022
23	SOP for Power Cable Replacement in Lift	Pyro , Cement mill and Paking plant	ELEC/SOP/023
24	SOP for trouble shooting in live panel	All Sections	ELEC/SOP/024
25	SOP for operation of Auto Power Factor Controller.	All Sections	ELEC/SOP/025
26	SOP for issuing LOTO of ESP chamber TRAFO	Pyro-Cooler	ELEC/SOP/026
27	SOP for lifting of ESP chamber LOTO	Pyro-Cooler	ELEC/SOP/027
28	SOP for filtration of transformer oil	All Sections	ELEC/SOP/028
29	SOP for capacitor panel maintenance	All Sections	ELEC/SOP/029
30	SOP for truck loader maintenance	Packing Plant	ELEC/SOP/030



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31	SOP for maintenance of passenger lift	All Sections	ELEC/SOP/031
32	SOP for usage of hydraulic bearing puller	All Sections	ELEC/SOP/032
33	SOP for maintenance of power contactor	All Sections	ELEC/SOP/033
34	SOP for maintenance of circular slip ring	RMH	ELEC/SOP/034
35	SOP for oil replacement of HT motor bearing	All Sections	ELEC/SOP/035
36	SOP for overhead electrical insulators cleaning	110KV SS	ELEC/SOP/036
37	SOP for temporary lighting arrangement	All Sections	ELEC/SOP/037
38	SOP for air circuit breaker maintenance	All Sections	ELEC/SOP/038
39	SOP for vacuum circuit breaker maintenance	All Sections	ELEC/SOP/039
40	SOP for usage & disposal of CRC container	All Sections	ELEC/SOP/040
41	SOP for tri-vector meter Setting	Cement Mill and 110KV SS	ELEC/SOP/041
42	SOP for locking the coupling of RM and CM main motors	All Sections	ELEC/SOP/042
43	SOP for online Blowering of HT/LT motor	All Sections	ELEC/SOP/043
44	SOP for Power resume during blackout	All Sections	ELEC/SOP/044
45	SOP for 3200kw BHEL motors bearing replacement	Raw Mill and Cement Mill	ELEC/SOP/045
46	SOP for Split and Window AC maintenance	Utility	ELEC/SOP/046
47	SOP for trouble shooting in travel clutch	RMH	ELEC/SOP/047
48	SOP for trouble shooting in wall mounting fan	Utility	ELEC/SOP/048
49	SOP Portable Machine fitness certification	All Sections	ELEC/SOP/049



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**SOP for Clearing the LOTO Permit in HT Feeders**

50	SOP for Overhauling of Drum motor	Packing Plant	ELEC/SOP/050
51	SOP for Overhauling of Geared Motors	All Sections	ELEC/SOP/051
52	SOP for Fire alarm maintenance	All Sections	ELEC/SOP/052
53	SOP for Overhauling of Thruster brake Motors	All Sections	ELEC/SOP/053
54	SOP for Operation of MRN relay	Cement Mill and 110KV SS	ELEC/SOP/054
55	SOP for LTMR Replacement and Program	All Sections	ELEC/SOP/055
56	SOP for SEPAM RELAY SETTING CHANGE	All Sections	ELEC/SOP/056
57	SOP for Micom Relay Setting	All Sections	ELEC/SOP/057
58	SOP for MCC Feeder Maintenance	All Sections	ELEC/SOP/058
59	SOP for Electrical Siren maintenance	All Sections	ELEC/SOP/059
60	SOP for CPP LT power Change over	Cement Mill	ELEC/SOP/060
61	SOP for Electric shock treatment	All Sections	ELEC/SOP/061

**SCOPE** : Isolating the equipments from the HT Electrical source

**Responsibility** : Electrical Engineer/Electrical Shift Engineer/Technicians

**Accountability** : Section In charge

**PPE:**

4. Electrical Safety HT Gloves
5. Safety Shoes
6. Safety helmet

**Tools:**

5. Racking Handle
6. LOTO Lock
7. Earth Truck
8. Rescue Rod



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Hazards:

**Risk Associated**

Electrical Shock  
Burn injury  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

**Mitigating Measures**

Required PPEs  
Proper Trainings

Training needs:

5. Electrical shock recovery Training
6. Emergency preparedness
7. Fire fighting
8. First aid including CPR training
9. Electrical safety training

**Procedure for other than Electrical work**

10. For Electrical Isolation Performing Authority who want to electrical isolation, duly filled the LOTO form with full description of equipment no's, isolation points, type of isolation etc.
11. The Performer has to get the approval from the Issuing authority /concerned section head (Mech).
12. The Performer who requires the Electrical Isolation shall approach electrical shift engineer/ electrical engineer with duly filled and authorized LOTO with Lock and Tag.
13. Electrical Engineer / Shift Engineer (authorized isolator) will verify the LOTO form, Date, Time, Equipment Description & other data with Name & Signature of performer.



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14. Electrical Shift Engineer / Electrician Ensure that the feeder is in off condition. If it ON inform to performing authority as per procedure.
15. Electrical Shift Engineer / Electrician will switch off the control MCBs of the particular feeder.
16. Electrical Shift Engineer / Electrician will rack out the breaker of the Particular feeder by wearing HT hand gloves.
17. The performer shall ensure that the breaker is racked out and then locks out the feeder with his lock and displays DO NOT OPERATE TAG with his name and signature.
18. Isolating authority also lockout the feeders with his lock and provide his tags with performing authority name, his name and signature.
19. Authorized Isolator duly filled LOTO part "C" with their Name & Signature.
20. Now the Performer once again approach the Issuing authority /concerned section head (Mech).
21. Issuing authority shall authorize the isolation permit after confirming the all isolation.

**Procedure for Electrical work at HT Motor Terminals, HT Panel Bus bar,  
Transformer Terminals, HT Capacitor & HT Isolator**

1. For Electrical Isolation Performing Authority who want to electrical isolation, duly filled the LOTO form with full description of equipment no's, isolation points, type of isolation etc.
2. The Performer has to get the approval from the Issuing authority /concerned section head (Mech).
3. The Performer who requires the Electrical Isolation shall approach electrical shift engineer with duly filled and authorized LOTO with Lock and Tag.





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4. Shift Engineer (authorized isolator) will verify the LOTO form, Date, Time, Equipment Description & other data with Name & Signature of performer.
5. Electrical Shift Engineer / Electrician Ensure that the feeder is in off condition. If it ON inform to performing authority as per procedure.
6. Electrical Shift Engineer / Electrician will switch off the control MCBs of the particular feeder.
7. Electrical Shift Engineer / Electrician will rack out the breaker of the Particular feeder by HT hand gloves.
8. Electrical Shift Engineer / Electrician will insert the Bus bar Earth truck in case of Isolation done in Incomer for Maintenance of HT panel board (MRSS located at CMBH LC, CMBH, RMBH & CCR HT Boards).
9. The performer shall ensure that the Earth truck is inserted and discharged through earthing. Then displays DO NOT OPERATE TAG with his name and signature.
10. Isolating authority also provide his tags with performing authority name, his name and signature.
11. Electrical Shift Engineer / Electrician will Rack in the cable Earth truck for particular feeder. (ALL HT motors, Transformers, HT capacitors and other Load center out goings).
12. After Discharge the residual voltage, Electrical Shift Engineer / Electrician will Rack Out the cable Earth truck from outgoing feeder (ALL HT motors, Transformers, HT capacitors and other Load center out goings).
13. Electrical Shift Engineer / Electrician will insert the Breaker in test position for particular feeder.
14. The performer shall ensure that the breaker is in test position and then locks out the feeder with his lock and displays DO NOT OPERATE TAG with his name and signature.
15. Isolating authority also lockout the feeders with his lock and provide his tags with performing authority name, his name and signature.



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16. Authorized Isolator dully filled LOTO part “C” with their Name & Signature.
17. Now the Performer once again approach the Issuing authority /concerned section head (Mech).
18. Issuing authority shall authorize the isolation permit after confirming the all isolation.

**Emergency / Emergency Shut OFF:**

1. If electrical shock injury or burn are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

1. Refer Line clearance certificates.
2. JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: Isolating Electrical Power in HT feeders	Date:	Analysis by: Electrical Engineer	Reviewed by: Electrical Manager
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Electrical	Approved by: HOD Electrical
Reqd./recommended PPE: Rubber Hand Gloves, Safety shoes, Safety helmet, Arc flash suit				
<b>Sequence of Basic Job</b>	<b>Potential Hazards</b>	<b>Recommended Safe</b>	<b>What Could Go</b>	<b>Corrective Action</b>



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**SOP for Clearing the LOTO Permit in HT Feeders**

Steps		Job Procedure	Wrong	
Take Permit Put on PPE,				
Switch off the control MCB in particular feeder	Electric shock	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Rack out the HT breaker	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
Rack In and Rack Out Earth truck		Wear safety helmet, safety shoes , hand gloves, arc flash suit	Tools and material may fall on human body	Without PPE don't perform the job
Lock the feeder	Electrical shock	Use Tested Electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use

**Scope** : Connecting the equipments to the HT Electrical sources

**Responsibility** : Electrical Engineer/Electrical Shift Engineer/Technicians

**Accountability** : Section In charge

**PPE:**

7. Electrical Safety Gloves
8. Safety Shoes
9. Safety helmet

**Tools:**

9. Racking Key
10. LOTO Lock
11. Earth Truck
12. Rescue Rod

**Hazards:**

Risk Associated  
Electrical Shock  
Burn injury

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Arc flash suit



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Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

Proper Trainings

Training needs:

- 10. Electrical shock recovery Training
- 11. Emergency preparedness
- 12. First aid including CPR training
- 13. Electrical safety training

**Procedure for other than Electrical work**

- 22. After the Completion of the work the performer will approach the Issuing authority (SH Mech) with existing isolation permit duly filled with name, signature, date and time as completion of jobs.
- 23. Then Issuing authority will insure and give clearance with his name and signature.
- 24. Then performer shall approach Isolating authority (Electrical Engineer / Shift Engineer) with duly filled LOTO permit as Energy source can be restored for remove LOTO.
- 25. Before Clearing the LOTO Date, Time, Equipment Description, Name & Signature will be verified.
- 26. Isolating authority (Electrical Engineer / Shift Engineer) removes the lock and DO NOT OPERATE TAG of performing authority as well as Isolating authority.
- 27. In case more than one performing authority taken LOTO isolation permit for the same equipment then Isolating authority lock and tag remain there. Isolating authority lock and tag shall remove along with last performing authority lock and tag.



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28. Isolating authority (Electrical Shift Engineer / Electrical Engineer /Electrician) will Rack in the breaker by HT hand gloves.
29. Isolating authority (Electrical Shift Engineer / Electrical Engineer) will switch on the Control MCB and check the Healthiness of the Feeder with CCR.
30. Isolating authority (Electrical Shift Engineer / Electrical Engineer)will put his name and signature on LOTO isolation permit as connected energy sources restored.

**Procedure for Electrical work at HT Motor Terminals, HT Panel Bus bar, Transformer Terminals, HT Capacitor & HT Isolator**

8. After the Completion of the work the performer will approach the Issuing authority (SH Mech) with existing isolation permit duly filled with name, signature, date and time as completion of jobs.
9. Then Issuing authority will insure and give clearance with his name and signature.
10. Then performer shall approach Isolating authority (Electrical Engineer / Shift Engineer) with duly filled LOTO permit as Energy source can be restored for remove LOTO.
11. Before Clearing the LOTO Date, Time, Equipment Description, Name & Signature will be verified.
12. In case of Bus bar maintenance, Isolating authority (Electrical Engineer / Shift Engineer) removes the DO NOT OPERATE TAG of performing authority as well as Isolating authority.
13. In case more than one performing authority taken LOTO isolation permit for the same equipment then Isolating authority DO NOT OPERATE TAG & lock remain there. Isolating authority tag shall remove along with last performing authority DO NOT OPERATE TAG and Lock.
14. Isolating authority (Electrical Shift Engineer / Electrician) will Rack out the Earth Truck by wearing HT hand gloves.If it is HT incomer (MRSS located at CMBH LC, CMBH, RMBH & CCR HT Boards).



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15. In case of Outgoing and motor, s feeder's maintenance, Isolating authority (Electrical Engineer / Shift Engineer) removes the LOTO lock and DO NOT OPERATE TAG of performing authority as well as Isolating authority.
16. Follow the step no-6
17. Isolating authority (Electrical Shift Engineer / Electrician) will Insert & Rack in the breaker by HT hand gloves.
18. Isolating authority (Electrical Shift Engineer) will switch on the Control MCB and check the Healthiness of the Feeder with CCR.
19. Isolating authority (Electrical Shift Engineer) will put his name and signature on LOTO isolation permit as connected energy sources restored.

**Emergency / Emergency Shut OFF:**

If electrical shock injury or burn are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

3. Refer Line clearance certificates.
4. JSA as enclosed below.

**JOB SAFETY ANALYSIS :(JSA)**

<b>Job Safety Analysis</b>	Job: Clearing Electrical shutdown permit in HT feeders	Date:	Analysis by: Electrical Engineer	Reviewed by: Electrical Manager
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Electrical	Approved by: HOD Electrical
Reqd./recommended PPE: Arc Flash suit, Rubber Hand Gloves, Safety shoes, Safety helmet				



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**SOP for Clearing the LOTO Permit in HT Feeders**

Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Clear the permit Put on PPE,				
Open the Lock Rack in the HT breaker Rack Out Earth Truck	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves , Arc flash suit	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Switch ON the control MCB in particular feeder	Electrical shock	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use

**Scope** : Isolating the equipments from the LT Electrical source

**Responsibility** : Electrical Engineer/Shift Engineer

**Accountability** : Section Head

**PPE:**

- 10. Electrical Safety Gloves
- 11. Safety shoes
- 12. Safety helmet

**Tools:**

- 13. Racking Key
- 14. LOTO Lock and Tag

**Hazards:**

Risk Associated  
Electrical Shock  
Burn injury  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Proper Trainings



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Training needs:

- 14. Electrical shock recovery Training
- 15. Emergency preparedness
- 16. Fire fighting
- 17. First aid including CPR training
- 18. Electrical safety training

**Procedure:**

- 31. The LOTO permit having 2 pages, with two copies.
- 32. The Performing Authority (Process, Mech, Elect, Civil, Inst etc) have to assess the required energy isolation on first page and take a approval from section head (Mech.).
- 33. The Person (Performing Authority) who requires the Electrical Isolation shall approach to Electrical Engineer/shift Engineer .
- 34. Electrical Engineer / Shift Engineer (Isolating Authority) will verify the Energy Isolating Permit (LOTO) form, Date, Time, Equipment Description & other data with Name & Signature of Performing Authority.
- 35. Electrical Shift Engineer / Electrician will switch off the incoming MCCB / Switch Fuse Unit / Isolator of the particular feeder by wearing electrical hand gloves.
- 36. The Performing Authority shall ensure that the feeder is switched off, and then locks out the feeder with his lock and displays DO NOT OPERATE TAG.





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**SOP for Clearing the LOTO Permit in HT Feeders**

37. Electrical Isolating Authority will sign on Isolation Permit with their Name & Signature and put Electrical Lock and DO NOT OPERATE TAG with his name and signature.

38. Now the Performing Authority will approach further to Issuing Authority for issuing the LOTO permit and proceed for work.

**Emergency / Emergency Shut OFF:**

2. If electrical shock injury or burn is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

5. Refer Line clearance certificates.
6. JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: issuing Electrical shutdown permit in LT feeders	Date:	Analysis by: Electrical Engineer	Reviewed by: Electrical manager
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Electrical	Approved by: HOD Electrical
Req'd/recommended PPE: Rubber Hand Gloves, Safety shoes, Safety helmet,				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Take Permit Put on PPE				
Switch off the Power SFU/MPCB/ MCCB in	Electrical shock	Use Tested Electrical Rubber Hand Gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage



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**SOP for Clearing the LOTO Permit in HT Feeders**

particular feeder				before use
Open the feeder door and Switch OFF control MCB	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic inspection
		Wear safety helmet, safety shoes , hand gloves ,	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Tested Electrical Rubber Hand Gloves	Damaged Gloves / Not checked before use	Periodic replacement / To check for Damage before use
Close the feeder door and fix the lock on the MPCB/SFU/MCCB handle with OFF condition	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic inspection

**Scope** : Connecting the equipments to the LT Electrical sources

**Responsibility** : Electrical Engineer/Shift Engineer

**Accountability** : Section Head

**PPE:**

- 13. Electrical Safety Gloves
- 14. Safety shoes
- 15. Safety helmet

**Tools:**

- 15. Racking Key
- 16. LOTO Lock

**Hazards:**

Risk Associated  
Electrical Shock  
Burn injury  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Proper Trainings



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Training needs:

- 19. Electrical shock recovery Training
- 20. Emergency preparedness
- 21. Fire fighting
- 22. First aid including CPR training
- 23. Electrical safety training

**Procedure:**

- 39. After the Completion of the Works in an Equipment (which taken for Energy Isolation), the Performing authority shall approach to Issuing Authority (Section Head Mech.) to ensure the completion of job .
- 40. Issuing Authority will ensure the completion of job and Authorized to performing authority to approach to Isolating Authority for Clearing the Isolation permit with his name and signature.
- 41. Now Performing Authority shall approach to isolating Authority (Electrical Engineer / Shift Engineer) for connecting equipment with source. And remove their lock and “DO NOT OPERATE” tag.
- 42. Isolator (Electrical Engineer / Shift Engineer) will remove the electrical lock and “DO NOT OPERATE” Tag with his name and signature on LOTO permit.
- 43. Electrical Shift Engineer / Electrician will switch ON the MCCB / Switch Fuse Unit / Isolator by wearing electrical hand gloves and check the healthiness of the Feeder with CCR.



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**SOP for Clearing the LOTO Permit in HT Feeders**

44. The Performing Authority has to inform to CCR operator readiness of the equipment to operate it.

**Emergency / Emergency Shut OFF:**

3. If electrical shock injury or burn is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

7. JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Clearing Electrical shutdown permit in LT feeders	Date:	Analysis by: Electrical Engineer	Reviewed by: Electrical Manager
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Electrical	Approved by: HOD Electrical
Req'd/recommended PPE: Rubber Hand Gloves, Safety shoes, Safety helmet, Arc flash suit				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Clear Permit , Put on PPE,				
Remove the LOTO from the particular feeder	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic Inspection
Open the feeder door and Switch ON control MCB	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Inspect the PPEs/Tools before use.
	Electrical shock/ Burn injury.	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use



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**SOP for Clearing the LOTO Permit in HT Feeders**

		Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic Inspection
Close the feeder door, Switch ON the Power SFU/MPCB/ MCCB of particular feeder	Electrical shock	Use Tested electrical rubber hand gloves ,	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use

**Scope** : Describing LT motor maintenance procedure to Electricians

**Responsibility** : Electrical Engineer

**Accountability** : Section In-charge

**PPE:**

- 16. Nose mask
- 17. Goggles
- 18. Rubber Hand Gloves
- 19. Cotton Gloves
- 20. Safety shoes
- 21. Safety helmet

**Tools:**

- 17. Megger
- 18. Multi meters
- 19. Wire brush
- 20. Hand Blower
- 21. Waste Cloth
- 22. Suitable spanner
- 23. Hammer
- 24. Insulated Screw driver

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

- 24. Electrical shock recovery Training



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- 25. Emergency preparedness
- 26. Fire fighting
- 27. First aid training

**Procedure:**

- 45. Take the Line Clearance for the particular Motor as per ELEC/SOP/003.
- 46. Clean the Motor with Wire Brush, Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 47. Clean the Motor Cooling Fans and Check the Condition of the Cooling Fan, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 48. Discharge the Motor terminals after opening the terminal box Cover.
- 49. Check the Power Cable Connection Tightness & Condition of Terminal Block with proper tools.
- 50. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding.  
After checking the Insulation resistances again discharge the motor terminals.
- 51. Close the Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
- 52. Clean the LPB and Check the Control Wiring Tightness. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 53. Check the Motor and LPB Body earthing.
- 54. Check the Condition of LPB Actuators and Contacts.
- 55. Close the LPB Door Properly.
- 56. Clear the LC as per ELEC/SOP/004.
- 57. Take Trial if Possible and record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

- 1. If electrical shock injury or body injury is there, give First aid and inform to the Safety



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department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

1. Refer Line clearance certificates.
2. JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: LT motor maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Electrical safety Gloves, Cotton Gloves, Safety shoes, Safety helmet				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of Motors	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Open the motor terminal box cover to discharge	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Check the tightness of terminals	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand	Tools and material may fall on human body	Without PPE don't perform the job



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## SOP for Clearing the LOTO Permit in HT Feeders

		gloves		
Check the insulation resistance, winding resistance, inductance Again discharge the motor Close the terminal box cover	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use Calibrated meters	Faulty meters	Meter shall be calibrated periodically
Clean the LPBS	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles	Periodic replacement
	Respiration problem	Wear Nose mask	Damaged nose mask	Periodic replacement
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the control wiring tightness	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves	Periodic replacement
Check the Motor and LPBS body earthing, closing of LPBS, give clearance for trial	Body Injury	Use proper tools	Nonstandard /damaged tools	handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : Describing LT Panel maintenance procedure to Electricians

**Responsibility** : Electrical Engineer

**Accountability** : Section Head

**PPE:**

- 22. Nose mask
- 23. Goggles
- 24. Tested Electrical Rubber Hand Gloves
- 25. Cotton Gloves
- 26. Safety shoes
- 27. Safety helmet





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**Tools:**

- 25. Wire brush
- 26. Hand Blower
- 27. Waste Cloth
- 28. Suitable spanner
- 29. Hammer
- 30. Insulated Screw driver

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

- 28. Electrical shock recovery Training
- 29. Emergency preparedness
- 30. Fire fighting
- 31. First aid training

**Procedure:**

- 58. Take the LOTO for the particular Panel as per ELEC/SOP/003.
- 59. Clean the Panel with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 60. Discharge the Panel terminals after opening Panel door.
- 61. Check the all Power and control cable connection tightness with proper tools.
- 62. If the Condition of the Contact Kits is not good, replace with new Contact Kits.



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**SOP for Clearing the LOTO Permit in HT Feeders**

63. Open all the Power Contactors Arc Chute and Clean the Arc Chute, Fixed & Moving Contacts.

while cleaning use PPEs like Nose mask, goggles and hand Gloves.

64. Check the Panel and Door earthing.

65. Close the Panel Door Properly with Panel Key.

66. Ensure closing of dummy cable entries.

67. Clear the LOTO as per ELEC/SOP/004.

68. Record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

4. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

8. Refer Line clearance certificates.

9. JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: LT panel maintenance	Date:	Analysis by: M.Ramesh Kumar	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Tested Electrical Rubber Hand Gloves, Cotton Gloves, Safety shoes, Safety helmet				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Put on PPE, Take Permit				



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## SOP for Clearing the LOTO Permit in HT Feeders

Cleaning of Panels	Eye irritation,	Wear goggles	Damaged goggles / non standard goggles / Not wearing Goggle.	Periodic replacement / Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Discharge the panel terminals by open the panel door, Check the tightness of Power and control terminals	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the Contactor kit, Open power contactor arc chute  Clean arc chute and fixed and moving contact	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the Panel Door earthing, close the door properly.  Clear permit	Use proper tools	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : Describing HT Motors Maintenance procedure to Electricians

**Responsibility** : Electrical Engineer

**Accountability** : Section Head

**PPE:**



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- 28. Nose mask
- 29. Goggles
- 30. Electrical safety Gloves
- 31. Cotton Gloves
- 32. Safety shoes
- 33. Safety helmet

**Tools:**

- 31. Wire brush
- 32. Hand Blower
- 33. Waste Cloth
- 34. Suitable spanner
- 35. Hammer
- 36. Insulated Screw driver
- 37. Discharge rod

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

- 32. Electrical shock recovery Training
- 33. Emergency preparedness
- 34. Fire fighting
- 35. First aid including CPR training

**Procedure:**

- 69. Take the LOTO for the particular Motor as per ELEC/SOP/001.



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70. Clean the Motor with Wire Brush / Hand Blower / Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
71. Open the Stator, Rotor and Slip ring Cover While opening handle the covers firmly.
72. Discharge the Stator, Rotor terminals with discharge rod.
73. Clean the Stator Terminal Box, Rotor Terminal Box, Star Connection Terminal Box, Cooling Fans & Cooling Tubes with wire brush / hand blower /cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
74. Clean the Slip Ring Chamber, Carbon Brushes & Holders with hand blower and cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
75. Check the tightness of power and control terminations.
76. Check the Condition of Carbon Brushes, Measure the Length of Carbon Brushes.
77. Replace the Carbon Brushes, if worn out.
78. Check the Spring Tension of the Carbon Brush Holders properly.
79. Check the Condition of Insulators in all the Terminal Box and Slip Ring & Carbon Brush Holders.
80. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding.  
After checking the Insulation resistances again discharge the motor terminals with discharge rod.
81. Close the all Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
82. Check the oil level in the bearings. Top up if the level is less than the normal indicated level.  
For makeup oil level, use proper instrument and avoid spillage of oil in the ground.
83. In case of any oil spillage while working, it is to be collected and returned store for recycling as per SOP / ELEC / 022.
84. Clean the LPB and Check the Control Wiring Tightness, while cleaning use PPEs like Nose mask, goggles and hand Gloves.



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85. Check the Motor and LPB Body earthing.
86. Check the Condition of LPB Actuators and Contacts.
87. Close the LPB Door Properly.
88. Clear the LOTO as per ELEC/SOP/002 and Check the Healthiness of the motor with CCR.
89. Take Trial if Possible and record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

5. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

10. Refer LOTO permit.
11. JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety</b>	Job: LT panel	Date:	Analysis by:	Reviewed by:
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**SOP for Clearing the LOTO Permit in HT Feeders**

<b>Analysis</b>	maintenance			
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Electrical safety Gloves, Cotton Gloves, Safety shoes, Safety helmet				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of motor	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Discharge the motor terminals by open the motor door, Check the tightness of Power and control terminals	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the motor carbon brushes, Clean the motor cooler cooling Tubes Clean the LPB and	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training



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**SOP for Clearing the LOTO Permit in HT Feeders**

check the tightness of control wiring	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the bearing oil level and top up if required	Body Injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
	Oil spillage	Use proper instrument, collection tray for spillage	Non use of trays / funnels Oil may contaminate ground	Training for tools handling/ Periodic replacement/ Aspect Impact awareness
Check the insulation resistance, winding resistance, inductance  Again discharge the motor  Close the terminal box cover	Electric shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use good condition of meter and test lead	Faulty meters	Lead can be checked
Check the motor Door earthing, close the door properly.  Clear permit	Body Injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : Describing HT panel maintenance procedure to Electricians

**Responsibility** : Electrical Engineer

**Accountability** : Section Head





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**SOP for Clearing the LOTO Permit in HT Feeders**

**PPE:**

- 34. Nose mask
- 35. Goggles
- 36. Electrical safety Gloves
- 37. Cotton Gloves
- 38. Safety shoes
- 39. Safety helmet

**Tools:**

- 38. Paint brush
- 39. Hand Blower
- 40. Waste Cloth
- 41. Suitable spanner
- 42. Insulated Screw driver

**Hazards:**

**Risk Associated**

Electrical Shock  
Minor body injury

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

- 36. Electrical shock recovery Training
- 37. Emergency preparedness
- 38. Fire fighting
- 39. First aid training

**Procedure:**

- 90. Take the LOTO permit for the particular Panel as per ELEC/SOP/001.
- 91. Draw out and remove the Breaker from breaker chamber
- 92. Clean the Panel with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.



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93. Discharge the terminal before opening the cable chamber or bus bar chamber through EARTH DISCHARGE TRUCK and after opening discharge through EARTH DISCHARGE ROD.
94. Open the all Panel Doors and Covers While opening doors and covers handle them firmly.
95. Check the all Power and control terminals connection tightness with proper tools.
96. Ensure the discharge condition of Closing and tripping Springs
97. Clean the Breaker with hand blower / cloth while cleaning use PPEs like nose mask, goggles and hand Gloves.
98. Check the contact resistance of Breaker poles with micro ohm meter.
99. Check the insulation resistance value of Breaker poles, after checking the Insulation resistances discharge the poles with discharge rod.
100. Check the Trip and Closing Coil for tightness with proper tool.
101. Check the plug in contacts of Breaker.
102. Check the Panel and Doors earthing.
103. Ensure closing of dummy cable entries.
104. Insert and rack in the breaker by wearing hand gloves.
105. Close the Panel Door Properly with Panel Key.
106. Clear the LC as per ELEC/SOP/004 and Check the Healthiness of the panel with CCR.
107. Record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

6. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

12. Refer LOTO.



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13. JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: HT panel maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Electrical safety Gloves, Cotton Gloves, Safety shoes, Safety helmet				
Put on PPE, Take Permit				
Switch off power and control supply	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use
Draw out and remove breaker from breaker chamber	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use
Cleaning of Panels	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
open the panel door	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use



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<b>Issued By: M.R</b>	<b>Approved By: HOD - ELECTRICAL</b>
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## SOP for Clearing the LOTO Permit in HT Feeders

	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Discharge the panel terminals by discharge rods	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use
		Use Earth rods	Damaged earth rods	Replace it, if not repairable
Check the tightness of Power and control terminals	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Ensure the discharge condition of Closing and tripping Spring	Body injury	Discharge the closing and tripping spring tension	Charged spring cause the body injury	Ensure your body parts are away from springs while discharging
Clean the Breaker with hand blower	Eye irritation	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the contact resistance of Breaker poles with micro ohm meter	Electrical shock	Connect the micro ohm meter to electrical source by proper power chord with plug top arrangement	Damaged power chord without plug top	Check the power chord before connecting to electrical source Replace if damage. Ensure the plug top



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## SOP for Clearing the LOTO Permit in HT Feeders

		Use the micro ohm meter with proper probe arrangement	Damaged probe	Check the power chord before connecting to electrical source Replace if damage
		Use calibrated meter	Faulty meters	Meter shall be calibrated periodically
Check the insulation resistance value of Breaker poles	Electrical shock	Use the insulation tester with proper probe arrangement	Damaged probe	Check the power probe before connecting to electrical source Replace if damage
		If it is motorized insulation tester, then connect it with proper power chord	Damaged power chord	Check the power chord before connecting to electrical source Replace if damage Ensure the plug top
		If it is manually operated insulation tester, then use insulated handles for rotation	Non insulated handle	Check the handle, make it insulated
Discharge the poles with discharge rod	Electrical shock	Use calibrated insulation tester	Faulty tester	Periodical calibration required
		Use Earth rod	Damaged Earth rods	Replace it, if not repairable
Check the Trip and Closing Coil for tightness	Body injury	Use proper tools	Damaged tools/inappropriate Tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the plug in contacts of breaker	Body injury	Use proper tools	Damaged tools/inappropriate Tools	Training for tools handling/ Periodic replacement
Check the Panel and Doors earthing. Ensure closing of dummy cable entries	Body injury	Use proper tools	Damaged tools/inappropriate Tools	Training for tools handling/ Periodic replacement

**Scope/Purpose** : This Procedure is to establish for maintenance of Transformer

**Responsibility** : Section Engineer – Electrical



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**Accountability** : Section Head-Electrical

**PPE:**

1. Safety helmet,
2. Safety shoe,
3. Rubber Gloves.
4. Cotton gloves.
5. Safety belt

**Tools:**

1. Tester
2. Megger
3. Tool kit
4. Hand blower
5. Discharge rod
6. BDV Test kit

**Hazard Analysis:**

**Risks associated**

Electric Shock  
Oil Slippery

**Mitigating Measures**

Use of proper tool, Tested Electrical Rubber Hand Gloves

**Training needs:**

1. Usage of tools and Nature of Hazards

**Procedure:**

108. Take the LOTO permit for HT side of the transformer as per ELEC/SOP/001.
109. Take the LOTO permit for LT side of the transformer as per ELEC/SOP/003.
110. Discharge the power terminals with discharge rod.
111. Clean the transformer with Wire Brush / Hand Blower / Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.



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112. Open the Primary, Secondary terminal box and Bus duct covers while opening handle the covers firmly. While opening the bus duct covers use proper PPEs like Safety belts.
113. Discharge the Primary and Secondary terminals with discharge rod.
114. Clean the Primary Terminal Box, secondary Terminal Box and Bus duct with hand blower /cloth, while cleaning use PPEs like Nose mask, goggles, Safety belt and hand Gloves.
115. Check the Primary, Secondary and Bus Duct power terminal and Joints for tightness with proper tools, while checking the bus duct use proper PPEs like Safety belts.
116. Check the all control terminals for tightness with proper tools.
117. Check the all oil valve for oil leakage.
118. Check the condition of breather and Silica Gel condition if required please replace. If silica gel replaced used silica gel to be returned to store with proper return slip.
119. Check the oil level in the conservator tank and top up if the level is less than the normal indicated level. For makeup oil level, use proper instrument and avoid spillage of oil in the ground.
120. Check the break down voltage test for transformer oil.
121. Check the condition gas operated relay.
122. Check the body earthing and neutral earthing of the transformers.
123. Check the insulators / bushing of the primary , Secondary and Bust Duct.
124. Check the radiators to avoid oil leakage.
125. In case of any oil spillage while working, it is to be collected and recycled and used again.
126. Check the Insulation Resistance, Winding Resistance of the Primary & Secondary windings. After checking the Insulation resistances again discharge the terminals with discharge rod.
127. Close the all Terminal box and bus duct covers and box up with Silicon Paste to restrict the dust entry, while closing the bus duct covers use proper PPEs like Safety belts.



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128. Clean the LPB and Check the Control Wiring Tightness, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
129. Check the LPB Body earthing.
130. Check the Condition of LPB Actuators and Contacts.
131. Close the LPB Door Properly.
132. Clear the LOTO permit as per ELEC/SOP/002 in the HT Side
133. Clear the LOTO permit as per ELEC/SOP/004 in the LT Side
134. Charge the transformer and record all Check point in the concern Check list.

***DON'TS:-***

1. Don't start the work before switching "off" the transformer.
2. Don't touch the transformer primary and secondary terminal before discharging.
3. Don't disconnect the Neutral Link when transformer is ON.

**Emergency / Emergency Shut OFF:**

7. If electrical shock injury or burn is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.
8. Switch off Emergency LPB provided nearby transformers.

**Records/Annexure:**

JSA is enclosed below.





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## SOP for Clearing the LOTO Permit in HT Feeders

### JOB SAFETY ANALYSIS :( JSA)

Job Safety Analysis	Job: Transformer Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electricians/ Contract supervisor	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe, & Rubber Gloves, Safety belt				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Obtain LOTO permits	Electrical shock.	LOTO permit procedure	Usage of Improper tools	Usage of proper tools
Cleaning of transformers	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
	Electric shock	Use the hand blower with proper plug top	Not using plug top for hand blower	Training for tools handling/ Periodic replacement
Open the terminal cover / Busduct.	Spanner may slip	Use proper tools	Tools may be improper	Tool box training before performing the job.
Discharge the transformer primary and secondary terminals.	Electrical shock	Use Electrical safety gloves	Damaged Gloves	Periodic replacement.
Primary / Secondary Terminations / Bus bar Tightness checkup	Spanner may slip Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
	Fall from height	Wear safety belt	Damaged safety belt	Use belts certified by competent authority and check the validity before use.
Check the oil level /	Oil leakage	Don't leak the oil into	Slippery may occur	Provide drum / tray



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**SOP for Clearing the LOTO Permit in HT Feeders**

Leakage		the Ground	Ground contamination	for collection
Oil BDV Test	Oil spillage	Keep the oil containers closed and keep oil samples in tray	Improper handling may lead to oil spillage	Handle oil samples with care. Training for tools handling/ Periodic replacement/ Aspect Impact awareness
	Electric shock	Use proper plug top for oil BDV kit. Close the oil test container lid before applying voltage	Non use of plug top / Non checking of lid for interlock	Training on oil BDV testing method / Periodic checkup of plug top
Transformer IR / WR test	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use good condition meter and test lead meters	Faulty meters	Lead to be checked before use
LPB / Control wiring tightness checking, cleaning	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles	Periodic replacement
	Respiration problem	Wear Nose mask	Damaged nose mask	Periodic replacement
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves	Periodic replacement
Boxing up transformer terminal box and bus duct	Body Injury	Use proper tools	Nonstandard /damaged tools	handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope/Purpose** : This Procedure is to establish and ensure safe Maintenance Practices in GRR

**Responsibility** : Section Engineer – Electrical



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**Accountability** : Section Head-Electrical

**PPE:**

6. Safety helmet
7. Safety shoe
8. Rubber Gloves
9. Nose Mask

**Tools:**

7. Insulated tools
8. Air Blower
9. Screw Driver
10. Cutting-Plier
11. Discharge Rod
12. Spanner set
13. Test Lamp
14. Fuse Puller

**Hazard Analysis:**

**Risks associated**

Electrical shock

**Mitigating Measures**

Use of insulated tools & proper discharging methods

**Training needs:**

2. Usage of tools and Nature of Hazards
3. Usage of PPEs

**Procedure:**



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135. Take the LOTO permit of the particular Motor Feeder (11KV HT Feeder) as per ELEC/SOP/001
136. Take the LOTO permit of the GRR Power Supply as per ELEC/SOP/003.
137. Open the Doors in the GRR Control panel and Discharge the power terminals of GRR with discharge rod.
138. Open the Doors in the Resistance Panel and Clean the Complete Resistance Bank. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
139. Check the Tightness of all resistance bank terminal tightness, while doing the tightening handle the tools firmly.
140. Check the Condition of all Insulators for good condition if not good, replace with new.
141. Check the condition of resistance bank if resistance plate / coil is not in good condition, replace with New one.
142. Check the Power Connection Tightness in the Power Contactor Cubicle and resistance bank. While doing the tightness, handle the proper tools firmly.
143. Open all the Power Contactors Arc Chute and Clean the Arc Chute, Fixed & Moving Contacts. while cleaning use PPEs like Nose mask, goggles and hand Gloves.
144. If the Condition of the Contact Kits is not good, replace with new Contact Kits.
145. Fix the Arc Chute and Check for Free Movement of the Moving Mechanism for all Contactors
146. Check the Control Wiring Tightness in the Resistance Panel & control panel with proper tool.
147. Check the resistance value for all resistance Banks
148. Clean the GRR Control Panel with hand blower / cloth. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
149. Close the all panel doors and box up with Silicon Paste to restrict the dust entry.
150. Check the Resistance bank and control panel Body earthing.



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151. Clear the LOTO permit as per ELEC/SOP/004 for the power supply of GRR.
152. Clear the LOTO permit as per ELEC/SOP/002 for the motor feeder and check the healthiness in the CCR.
153. Take Trial if Possible and record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

9. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

14. Refer LOTO permit certificates.
15. JSA as enclosed below.



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## JOB SAFETY ANALYSIS: (JSA)

<b>Job Safety Analysis</b>	Job: Maintenance of GRR	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Supervisor	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of Panels	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
open the panel door,	Body injury	Use Proper PPE Use proper tools	Tools and material may slipped	Tool box talk Periodic replacement.
Discharge the panel terminals by discharge rod	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Check condition and tightness of resisters / Power and control terminals , condition of Insulators	Body injury	Use proper tools Wear safety helmet, safety shoes , hand gloves	Nonstandard /damaged tools	Periodic replacement. Tool box training
Checked Power contactor	Body injury	Use proper tools	Tools and material may fall on human body	Periodic replacement. Tool box training
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Measure the resistance value of resistance bank	Electric shock	Use Calibrated meters	Faulty meters	Meter shall be calibrated periodically
Check the panel earthing condition and close all panel doors	Body injury	Use proper tools	Tools and material may fall on human body	Periodic replacement. Tool box training

**Scope** : Describing LRS maintenance procedure to Electricians



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**Responsibility** : Electrical Engineer

**Accountability** : Section Head

**PPE:**

- 40. Nose mask
- 41. Goggles
- 42. Tested Electrical Rubber Hand Gloves
- 43. Cotton Gloves
- 44. Safety shoes
- 45. Safety helmet

**Tools:**

- 43. Paint brush
- 44. Hand Blower
- 45. Waste Cloth
- 46. Suitable spanner
- 47. Insulated Screw driver
- 48. Discharge Rod

**Hazards:**

**Risk Associated**

Electrical Shock  
Minor body injury

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

- 40. Electrical shock recovery Training
- 41. Emergency preparedness
- 42. First aid training

**Procedure:**

- 154. Take the LOTO of the particular Motor Feeder (11KV HT Feeder) as per ELEC/SOP/001
- 155. Take the LOTO of the LRS Power Supply with as per ELEC/SOP/003.



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156. Open the Doors in the LRS Panel and Clean. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
157. Discharge the power terminals of LRS with discharge rod.
158. Check the Tightness of all LRS power terminal tightness. While doing the tightening handle the tools firmly.
159. Check the Condition of bushings for good condition. if not good, replace with new one.
160. Check the Water level in the LRS tank and top up if the level is less than the normal indicated level. For makeup water level, use proper instrument and avoid spillage of water in the ground.
161. Check the Power Connection Tightness of the Power Contactor of LRS short circuiting contactor. While doing the tightness, handle the proper tools firmly.
162. Open all the Power Contactors Arc Chute and Clean the Arc Chute, Fixed & Moving Contacts. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
163. If the Condition of the Contact Kits is not good, replace with new Contact Kits.
164. Fix the Arc Chute and Check for Free Movement of the Moving Mechanism for all Contactors
165. Check the Control Wiring Tightness in the Resistance Panel & control panel with proper tool.
166. Clean the LRS Control Panel with hand blower / cloth. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
167. Close the all panel doors and box up with Silicon Paste to restrict the dust entry.
168. Check the LRS box and control panel Body earthing.
169. Clear the LC as per ELEC/SOP/004 for the power supply of LRS.
170. Clear the LC as per ELEC/SOP/002 for the motor feeder and check the healthiness in the CCR.

Take Trial if Possible and record all Check point in the concern Check list.





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## Emergency / Emergency Shut OFF:

1. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

## Records/Annexure:

16. Refer Line clearance certificates.

17. JSA as enclosed below.

## JOB SAFETY ANALYSIS:(JSA)

<b>Job Safety Analysis</b>	Job: LRS maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Tested Electrical Rubber Hand Gloves, Cotton Gloves, Safety shoes, Safety helmet.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of Panels	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training/ Check before use
	Respiration problem	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Check before use
	Body injury	Use Proper PPE Use proper tools	May be damaged Tools and material may slip	Tool box talk
Open the panel door. Discharge the panel terminals by discharge rod	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
Check the tightness of Power and control terminals	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check Short circuit contactor	Body injury	Use proper tools	Nonstandard /damaged tools	Periodic replacement. Tool box training



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		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Periodic replacement.
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**Scope** : Maintenance of lighting at different locations.

**Responsibility** : Electricians

**Accountability** : Electrical Engineer

**PPE:**

- 46. Nose mask
- 47. Goggles
- 48. Cotton Gloves/LT rubber gloves
- 49. Safety shoes
- 50. Safety helmet
- 51. Full body harness with double lanyard as per the requirement

**Tools:**

- 49. Test lamp
- 50. Suitable spanner
- 51. Cutting pliers
- 52. Screw Driver
- 53. MCB mini lock
- 54. Fiber Ladder

**Hazards:**

**Risk Associated**

Electrical Shock  
Minor body injury  
Fall from height  
Fire hazards in false ceiling type fitting

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles  
Full body harness with double lanyard  
Remove the capacitor and periodic checklist  
for the false ceiling type fittings

**Training needs:**

- 43. Emergency preparedness
- 44. First aid training



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**Procedure:**

171. Ensure that supply of light fitting switched off and make necessary localized MCB
172. For approaching the light fitting which are in height use full body harness
173. Remove the fitting from the location and clean fitting with hand blower / cloth and while removing fitting use proper tools and PPEs like Nose mask, goggles and hand Gloves.
174. Check / replace (if necessary) the accessories like bulb, choke, igniter, capacitor, while doing replacement handle the accessories firmly and avoid the fall of accessories.
175. Ensure the capacitor was removed from false ceiling light fitting.
176. Ensure any hole on roof top sheet to be closed.
177. Follow the periodic checklist for false ceiling fitting.
178. Check and tight the connections of the accessories in the fitting with proper tools.
179. Check and tight the connections of the panel / switch board in the panel with proper tools.
180. Ensure closing of dummy cable entries.

**Emergency / Emergency Shut OFF:**

10. If any injuries or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

18. JSA as enclosed below.



# DALMIA CEMENT (B) LIMITED – CEMENT PLANT ARIYALUR ELECTRICAL MANUAL

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Issued By: M.R		Approved By: HOD - ELECTRICAL	
SOP for Clearing the LOTO Permit in HT Feeders			

## JOB SAFETY ANALYSIS :( JSA)

<b>Job Safety Analysis</b>	Job: Lighting maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Cotton Gloves, Safety shoes, Safety helmet, Full body harness with double lanyard.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE,				
Removing fitting	Tools slip	Use suitable tools	Tool may be damaged	Tool box talk Periodic replacement
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Periodic replacement
	Electrical shock	Use Insulated tools	Insulation Damaged	Inspect before use. Periodic replacement
	Fall from height	Use safety belt with double lanyard	Defective safety belt	Check the belt condition before use / Check the inspection validity
Cleaning of fitting	Irritation of eye	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training/ Follow SOP
	Inhalation of Dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
Replacement of Bulb, choke, Igniter, Capacitor	Cut injury	Use hand gloves	Damaged bulb can cause injury / Residual charge may be available	Handle with care / use hand gloves without fail. / Discharge the capacitor



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			in capacitor	
Check the termination tightness of all accessories	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the termination tightness of panel MCB and replace if required	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**SCOPE** : Describing Slip Rings maintenance of Packer & stacker /Reclaimer

**Responsibility** : Electrician /Engineer

**Accountability** : Section In-charge

**PPE:**

- 52. Nose mask
- 53. Goggles
- 54. Cotton Gloves
- 55. Safety shoes
- 56. Safety helmet

**Tools:**

- 55. Megger
- 56. Multi meters
- 57. Wire brush
- 58. Hand Blower
- 59. Waste Cloth
- 60. Suitable spanner
- 61. Hammer
- 62. Insulated Screw driver

**Hazards:**



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Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

Training needs:

- 45. Electrical shock recovery Training
- 46. Emergency preparedness
- 47. First aid including CPR training

**Procedure:**

- 181. Take the LOTO for the particular equipment as per ELEC/SOP/003.
- 182. Clean the Slip ring Chamber body with Wire Brush, Hand Blower & Cloth. While cleaning, use PPEs like Nose mask, goggles and hand Gloves.
- 183. Open the Slip ring Cover. While opening, handle the covers firmly.
- 184. Discharge the Power terminals after opening the Covers.
- 185. Check the Power Cable Connection Tightness & Condition of Terminal Block with proper tools.
- 186. Clean the Slip Ring Chamber, Carbon Brushes & Holders with hand blower and cloth. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 187. Check the Condition of Carbon Brushes, Measure the Length of Carbon Brushes.
- 188. Replace the Carbon Brushes, if worn out.
- 189. Check the Spring Tension of the Carbon Brush Holders properly.
- 190. Check the Condition of Insulators in all the Slip Ring & Carbon Brush Holders.



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191. Check the Insulation Resistance of the Slip rings. After checking the Insulation resistances again discharge the slip ring power terminals.
192. Close the Slip ring cover and box up with Silicon Paste to restrict the dust entry.
193. Check the Slip ring Chamber body earthing.
194. Clear the LOTO as per ELEC/SOP/004.
195. Take Trial if Possible and record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

11. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

19. Refer Line clearance certificates.

20. JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Slip ring maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Cotton Gloves, Safety shoes, Safety helmet.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of Slip Rings	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training/ Follow SOP
	Respiration problem	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand	Tools and material may	Without PPE don't



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**SOP for Clearing the LOTO Permit in HT Feeders**

		gloves	fall on human body	perform the job
Open the Slip Ring box cover and discharge	Electrical shock	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
		Use proper tools	Tool may be damaged PPE damaged	Periodic replacement. Check before use
	Tool slip and minor injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
Check the tightness of terminals	Body injury	Wear safety helmet, safety shoes , hand gloves	PPE Damaged	Periodic replacement. Check before use
Check the insulation resistance and discharge	Electrical shock	Use good meter with good probes	Faulty meters / Damaged probes	Meter shall be calibrated periodically. Check the condition before use.
Checking Carbon Brush Tension	Cut injury in finger	Use proper tools	Tools faulty	Check tools before use.

**Scope** : This Procedure is to establish and ensure safe method of Earth Pit Maintenance

**Responsibility** : Section Engineer – Electrical

**Accountability** : Section Head-Electrical

**PPE:**

- 10. Safety helmet,
- 11. Safety shoe,
- 12. Rubber Gloves.

**Tools:**

- 15. Insulated tools
- 16. Discharge rods
- 17. Earth Meggar

**Hazard Analysis:**

**Risks associated**

**Mitigating Measures**





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Electrical shock

Use of proper tools

**Training needs:**

4. Usage of tools and Nature of Hazards
5. Usage of PPEs

**Procedure:**

1. Get general work permit from the concerned Electrical section in-charge.
2. Open the Earth Pit Chamber Cover, while opening handle the cover firmly, and take care about  
Insects / snake bite.
6. Clean the Pit with Wire Brush / Hand Blower / Cloth. While cleaning, use PPEs like Nose mask, goggles and hand Gloves.
7. Open the earth flat from the Earth Electrode.
8. With the Earth Tester, Measure the Earth Pit Resistance Value (Individual Value)
9. Connect the Earth Flats and Measure the Earth Pit Resistance Value (Grid Value)
10. Add Water and Salt / Char coal to the Pit if required, While water pouring, avoid water spillage in the ground.
11. If required measure the Earth Resistance after a day or two for confirming the earth resistance within the range.
12. Check the Condition of Bolts, Nuts and Washers, if required replace and apply the Grease to avoid the rust. While applying, avoid spillage of Grease.
13. Close the Earth Pit Chamber Cover. While closing, handle the cover firmly

**Emergency / Emergency Shut OFF:**



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12. If electrical shock injury or burn is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Earth pit maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electricians	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Checking Physical condition	Injury due to fall of slab / material	Proper handling of Weight objects	Slip while displacing the slabs	Proper Handling methods
	Injury due to insects / snake bite	Be alert while opening earth pit cover and inspect for insects /snake availability	Not taking care on this aspect	Tool box talk before job
Earth flat disconnection & re-connection	Electric shock	Proper discharging methods	Usage of Improper tools & Non availability of alternate Discharge path	Usage of proper tools & Proper arrangement of Alternate discharge path



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**SOP for Clearing the LOTO Permit in HT Feeders**

	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body. Fingers can get caught between earth flats.	Without PPE don't perform the job/ Proper training / Follow SOP
Measuring Earth pit value	Electric shock	Safe Maintenance procedure	Improper measuring tools	Usage of Proper instruments

**Scope** : This Procedure is to establish and ensure safe Maintenance activities of EOT Crane.

**Responsibility** : Section Engineer – Electrical

**Accountability** : Section Head-Electrical

**PPE:**

- 13. Safety helmet,
- 14. Safety shoe,
- 15. Rubber Gloves.
- 16. Safety belt

**Tools:**

- 18. Insulated tools
- 19. Discharge rods

**Hazard Analysis:**

**Risks associated**

Fall from height  
Electrical shock

**Mitigating Measures**

Use of safety belt  
Use of proper tools

**Training needs:**

- 14. Usage of tools and Nature of Hazards
- 15. Usage of PPEs

**Procedure:**

- 196. Take the LOTO permit for the particular Crane as per ELEC/SOP/003.



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197. Discharge the bus bars properly. While discharging use PPEs like Safety Belt.
198. Clean the bus bars, panels, motors, and other accessories with Wire Brush / Hand Blower / Cloth. While cleaning, use PPEs like Nose mask, goggles, hand Gloves and Safety belt.
199. Open the Doors, Covers of panels, motor terminal box and other accessories, while opening handle the covers firmly and use PPEs like safety belts.
200. Clean the panel chambers, motor terminal box, and other accessories with Wire Brush / Hand Blower / Cloth. While cleaning use PPEs like Nose mask, goggles, safety belt and hand Gloves.
201. Check the Connection tightness of motor terminal, Panel Power and Control connections, GRR power connections and accessories Connections. While checking the tightness, use the tools firmly and Safety belt.
202. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals.
203. Close the all covers & Doors and box up with Silicon Paste to restrict the dust entry.
204. Clean the LPB and Check the Control Wiring Tightness. While cleaning use PPEs like Nose mask, goggles and hand Gloves
205. Check the Motors, Panels and LPB Body earthing.
206. Check the Condition of LPB & Limit Switches actuators and Contacts.
207. Clear the LOTO permit as per ELEC/SOP/004.
208. Take Trial if Possible and record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**



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13. If electrical shock injury or burn is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

JSA is enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: EOT Crane Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electricians	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe, Rubber Gloves & Safety belt.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Obtain LOTO permit	Electric shock	LOTO permit procedures	Usage of Improper tools	Usage of proper tools
Ensure Power supply is disconnected	Electric shock	Proper inspection methods	Usage of Improper tools	Usage of proper tools
Opening of panels, motor terminal box and other accessories	Electric shock	Use Proper tools	Electric shock due to dischargeable components	Follow up of proper discharging methods
	Fall from height	Use safety belt with double lanyard	Defective safety belt	Check the belt condition before use / Check the inspection validity
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Periodic replacement
Cleaning of motor, panels and other accessories	Irritation of eye	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training/ Follow SOP
	Inhalation of Dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
Tightness checkup of panel power and control connections, motor terminations,	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job



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GRR, and other accessories				
Checking of motor IR / WR /IN values	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use Calibrated meters/ Good probes	Faulty meters / damaged probes	Meter shall be calibrated periodically and check meter and probes before use. / Replace faulty probes
Closing of panels, motor terminal box and other accessories	Body Injury	Use proper tools	Nonstandard /damaged tools	handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : Describing Online greasing procedure to Electricians

**Responsibility** : Electrical Engineer

**Accountability** : Section Head

**PPE:**

- 57. Nose mask
- 58. Goggles
- 59. Cotton Gloves
- 60. Safety shoes
- 61. Safety helmet

**Tools:**

- 63. Paint brush
- 64. Hand Blower
- 65. Waste Cloth
- 66. Suitable spanner
- 67. Grease gun

**Hazards:**

**Risk Associated**  
Minor body injury

**Mitigating Measures**  
Safety shoes, gloves, helmet, goggles

**Training needs:**



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- 48. Emergency preparedness
- 49. Fire fighting
- 50. First aid training

**Procedure:**

- 209. Clean the Grease gun with cotton cloth and refill the gun with applicable fresh Grease. While refilling, avoid spillage of grease and take care spring tension of grease gun.
- 210. Before greasing the motor, please avoid loose clothing.
- 211. Clean and open the Grease nipples. While cleaning and opening, use PPEs like Hand gloves, goggles & Nose mask.
- 212. Apply the required quantity grease by pressing the grease gun gently.
- 213. Clean and close the grease nipples. While cleaning and closing, use PPEs like Hand gloves, goggles & Nose mask.
- 214. In case of any grease spillage while working, it is to be collected and returned store for recycling as per SOP / ELEC / 022.

**Emergency / Emergency Shut OFF:**

- 14. If body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

- 21. Refer Line clearance certificates.
- 22. JSA as enclosed below.



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## SOP for Clearing the LOTO Permit in HT Feeders

Job Safety Analysis	Job: Online greasing	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Cotton Gloves, Safety shoes, Safety helmet				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Clean the Grease gun with cotton cloth and refill the gun with applicable fresh Grease while refilling,	Body injury	Wear goggles, Wear safety helmet, safety shoes , hand gloves	Damaged PPE/non standard PPE	Periodic replacement
avoid spillage of grease and take care spring tension of grease gun.	Body injury	Fill the grease in proper manner Clean the spillage grease immediately. Lock the handle against spring tension	Spillage of grease causes the soil contamination. Spring if not handled properly can cause hand injury	Without PPE don't perform the job, Avoid the spillage of grease. And clean the floor immediately Care to be taken while locking the handle against spring tension
Avoid loose clothing	Body injury	Wear cover all suit, safety goggles, cotton clothes, safety shoes, safety helmet	Loose cloth may get caught with the rotating shaft makes severe injuries	before approach the motor, make sure of proper clothing and PPE
Cleaning and opening of grease nipples	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand	Nonstandard /damaged	Without PPE don't





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		gloves , nose mask	tools	perform the job
Apply required quantity of grease, Cleaning and Closing of grease nipples	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves , nose mask	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : This Procedure to establish and ensure safe method of Overhauling of LT Motors

**Responsibility** : Section Engineer – Electrical

**Accountability** : **Section** Head-Electrical

**PPE:**

- 17. Safety helmet,
- 18. Safety shoe,
- 19. Rubber Gloves.

**Tools:**

- 20. Insulated tools
- 21. Lifting Equipments
- 22. EOT Hoist

**Hazard Analysis:**

**Risks associated**

Injury  
Electric shock

**Mitigating Measures**

Use of proper Handling equipments  
Use of Proper Testing procedure & Insulated tools

**Training needs:**

- 16. Usage of tools and Nature of Hazards
- 17. Usage of PPEs

**Procedure:**



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215. Take the LOTO permit for the particular Motor as per ELEC/SOP/003 and General Work permit.
216. Clean the Motor with Wire Brush, Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
217. Clean the Motor Cooling Fans and Check the Condition of the Cooling Fan, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
218. Discharge the Motor terminals after opening the terminal box Cover while opening, handle cover firmly.
219. Disconnect the motor power and earth connections after marking of connection while disconnecting, use proper tools.
220. Decouple the motor and dismantling coupling from the motor shaft with proper puller and tools.
221. Shift the Motor to dust free environment for overhauling. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
222. Dismantle the Cooling fan cover and Cooling fan while dismantling, use proper tools.
223. Dismantle both end covers / shields and bearing housing while dismantling use proper tools.
224. Remove the rotor from stator body. While removing handle the rotor and tools firmly to avoid the stator winding damage.
225. Clean the rotor and stator winding with hand blower / cloth while cleaning use PPEs like Nose mask, goggles and hand Gloves.
226. Clean the End shields, cooling fan and cooling fan covers with hand blower / cloth. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
227. Apply the varnish to the stator winding if required.



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228. If varnish applied stator winding is to be dried out in the clean environment.
  229. Assemble rotor in to the Stator body with proper tools. While assembling, handle the rotor firmly and avoid the stator winding damage.
  230. Remove / Change the bearings if required to replace with proper puller and tools.
  231. Apply the Grease in the Bearing housing and Bearings while apply avoid the spillage of grease on the ground.
  232. Assemble end covers and Bearing housing with proper tools and ensure no availability of foreign material in the stator body.
  233. Assemble the cooling fan and cooling fan covers. While assembling, Use proper tools.
  234. Check the Power Cable Connection Tightness & Condition of Terminal Block with proper tools.
  235. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals.
  236. Take no load trial if possible and use rubber Mat & Gloves for trial run.
  237. Close the Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
  238. Shift the Motor to motor bed. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
  239. Assemble coupling on the motor shaft properly.
  240. After mechanical alignment and coupling, Connect the motor power and earth connections as per marking. While connecting, use proper tools.
  241. Clear the LOTO permit as per ELEC/SOP/004.
- Take Trial if Possible and record all Check point in the concern Check list



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**Emergency / Emergency Shut OFF:**

15. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

23. Refer LOTO permit.

24. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Overhauling of LT Motors	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves, Cotton hand gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning of Motors	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Open the motor terminal box cover to discharge	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Cable disconnection and decoupling	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Shifting of Motor	Fall of object	Proper shifting method	Slip during shifting	Double holding method



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**SOP for Clearing the LOTO Permit in HT Feeders**

Dismantling of motor	Injury due to striking	Proper dismantling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Heating of Bearings	Burn of old grease	Proper Heating method	Improper heating method	Usage of proper heating instruments
Applying Varnish	Unconsciousness	Proper Varnishing method	Release of Toxic gases during varnishing	Usage of quality varnish & Proper Varnishing method
Heating of Winding	Electric Shock	Proper heating method	Open ended terminals	To be take extra precaution during heating
Assembly of motor	Injury due to striking	Proper assembling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Shifting, cable connection	Fall of object	Proper shifting method	Slip during shifting	Double holding method
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Trial Run of Motor	Electric shock	Proper method for Trial run	Open ended terminals / Improper Earthing	Usage of proper trial methods & Ensuring proper earthing
	Motor dis-positioning / Run through	Proper method for Trial run	Un fixed motor base	Usage of fixing bolts Use rubber mat.
	Body injury due to loose clothing	Wear cover all suit, safety goggles, cotton clothes, safety shoes, safety helmet	Loose cloth may get caught with the rotating shaft makes severe injuries	before approach the motor, make sure of proper clothing and PPE

**Scope** : This Procedure is to establish and ensure safe method of Testing of Transformer Oil

**Responsibility** : Section Engineer – Electrical

**Accountability** : **Section** Head-Electrical

**PPE:**

- 20. Safety helmet,
- 21. Safety shoe,
- 22. Rubber Gloves.

**Tools:**



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- 23. Insulated tools
- 24. Oil test kit

**Hazard Analysis:**

**Risks associated**

Electrical shock  
Slippery due to Oil spillage

**Mitigating Measures**

Use of proper tools and PPE  
Proper Handling methods

**Training needs:**

- 18. Usage of tools and Nature of Hazards
- 19. Fire fighting training
- 20. Usage of PPEs

**Procedure:**

- 1) Get work permit from the concerned Electrical section in-charge.
- 2) Clean the bottom and top sample valve by cloth, while cleaning use PPEs like hand Gloves.
- 3) Clean the sampling cubicle with cloth and rinse with transformer oil while rinsing, avoid transformer oil spillage.
- 4) Ensure the gap between electrodes of sampling cubicle 2.5mm.
- 5) Use Insulated tools for Sampling & Testing.
- 6) Ensure presence of Fire fighting equipments near to testing place.
- 7) Open the Bottom / Top sample valve carefully and collect the sample in sampling cubicle and close the valve while collecting the sample, avoid oil spillage in the ground. Then immediately close the sampling cubical to avoid moisture entry.
- 8) Clean and power up the test kit with proper earthing.
- 9) Place the sampling cubicle in the test kit.
- 10) Increase the voltage up to 60KV and check the withstanding interval. Requirement is  $\geq 60KV$  for 3Minutes.



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- 11) If break down happened in voltage before required value, oil filtration is required.
- 12) Do the Same test for Top & Bottom valve samples.
- 13) Record the values in the concern check list.
- 14) Avoid spillage of oil while testing and handling of oil.
- 15) Stay away from test kit During Testing.
- 16) Dispose the tested oil / waste oil as per proper disposal methods.

**Emergency / Emergency Shut OFF:**

16. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

25. LOTO permit
26. Testing of Transformer Oil
27. JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Testing of Transformer oil	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Sampling	Injury due to oil spillage	Proper sampling	Slip / broken valves	Proper sampling method & Usage of hand



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**SOP for Clearing the LOTO Permit in HT Feeders**

	/ over through	method	during sampling	gloves
Testing	Electric shock	Proper Testing procedure	Live circuit / Usage of Improper tools	Switch off the test kit & Usage of proper tools
	Oil splash / Oil burning	Proper Testing method	Oil splash / Oil overheat due to Faulty Trip circuit	Ensuring protection circuit for Proper tripping
	Unconsciousness	Proper Testing method	Release of Toxic gases due to oil overheat / burn	Use of PPEs & Stay away from test kit

**Scope** : This Procedure is to establish and ensure safe Maintenance Practices in Substation

**Responsibility** : Section Engineer – Electrical

**Accountability** : **Section** Head-Electrical

**PPE:**

- 23. Safety helmet
- 24. Safety shoe
- 25. Rubber Gloves
- 26. Safety Belt
- 27. Nose Mask

**Tools:**

- 25. Insulated tools
- 26. Air Blower
- 27. Screw Driver
- 28. Cutting-Plier
- 29. Discharge Rod
- 30. Spanner set
- 31. Test Lamp
- 32. Fuse Puller





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### 33. Ladder

#### Hazard Analysis:

##### Risks associated

Electrical shock  
Fall from Height  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

##### Mitigating Measures

Use of insulated tools  
Use of Ladder  
proper discharging methods  
Safety belt

#### Training needs:

- 21. Usage of tools and Nature of Hazards
- 22. Usage of PPEs

#### Procedure:

- 242. Take the LOTO permit as per ELEC/SOP/001 and work permit.
- 243. Switch off the 110kV circuit breaker in the yard.
- 244. Open the switch yard incoming isolator while opening use PPEs like hand gloves and close the earth switch of the isolator.
- 245. Connect Discharge Rods in each phase.
- 246. Place the Ladder to approach Insulators & Buses.
- 247. Check & Ensure the Ladder is locked for that position.
- 248. Wear safety belt and climb up in ladder.
- 249. Clean the all insulators, bushings, CTs, PTs lightning arresters, Isolators and Breakers with cloth while cleaning, use PPEs like Nose mask, Hand Gloves, Goggles and Safety belt.
- 250. Clean the Isolator contacts and apply petroleum jelly.
- 251. Clean the on line tap changer control panel and transformer marshalling box with blower while cleaning, use PPEs like Nose mask, Hand Gloves, Goggles and Safety belt.



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252. Check the tightness of all CT and PT connections with proper tool while checking, use PPEs like safety belt.
253. Check the connection tightness of Transformer marshalling box and On line tap changer control panel.
254. Check the all power connection in the switch yard with proper tools.
255. Check and clean the circuit breaker local control panel with hand blower / cloth.
256. Clean the neutral grounding resistor, neutral isolating switch with hand blower, cloth while cleaning use PPEs like nose mask and goggles.
257. check and tight (if required) the power and control connections of the neutral grounding resistor, neutral isolating switch while tightening use proper tools.
258. Remove the grass in the switch yard while removing takes care about insects.
259. Check the body earthing connection of all equipments.
260. Check the earthing connection of the lightening arrestor and transformer neutral earthing.
261. Remove Ladder and place in storage place.
262. Remove Discharge Rods.
263. Normalize the Isolators & Earth switches.
264. Clear the LOTO permit as per ELEC/SOP/002.
265. Clear the Work permit.

**Emergency / Emergency Shut OFF:**

17. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**



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28. JSA is enclosed below.

29. LOTO Permit

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Substation Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician & Contract Employee	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe, Safety Belts & Rubber Gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Switch Off & Isolation	Electric Shock	Use Tested Electrical Rubber Hand Gloves	Partial opening of Isolator switches / Control circuit failure	Proper Switch off & Isolation methods
			Hand gloves may be damaged	Periodic replacement
Maintenance Activities	Electric shock due to un-discharged components	Proper Discharging methods	Live circuit / Usage of Improper tools	Proper discharge methods & permanent connection of Discharge rods during Maintenance
	Body injury	Wear safety helmet, safety shoes, hand gloves	Tools and material may fall on human body	Without PPE don't perform the job



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**SOP for Clearing the LOTO Permit in HT Feeders**

Insulators cleaning	Fall from Height	Use Good condition Ladder	Slip from ladder/ Damage ladder	Usage of proper ladder / IS approval Ladder
		Use safety belt/ Check belt condition before use	Not wearing safety belt/Not checked belt condition.	Ensuring proper lock arrangement/ Height work training/Use IS approval safety belt

**Scope/Purpose** : This SOP is applicable to Safe working for usage and maintenance of Batteries.

**Responsibility** : Electrician / Engineer

**Accountability** : Section Head

**PPE:**

- 28. Goggle
- 29. Nose mask
- 30. Hand gloves
- 31. Safety Shoes
- 32. PVC Apron

**Tools:**

- 34. Hydrometer
- 35. Insulated Spanners / Tools
- 36. Voltmeter

**Hazard Analysis:**

**Risks associated**

Burn injury due to acid  
Suffocation due to toxic gases

**Mitigating Measures**

Usage of acid proof gloves  
Usage of nose mask



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Electric shock

Usage of Insulated tools and Safety shoes

**Training needs:**

- 23. Fire fighting
- 24. Emergency preparedness
- 25. First aid procedure
- 26. Battery maintenance procedures
- 27. MSDS training

**Procedure:**

- 266. Take proper work permit from electrical & safety dept as per the work condition.
- 267. Clean the all Batteries with cloth / hand blower while cleaning, use PPEs like Nose mask, acid resistant Hand Gloves and Goggles.
- 268. Remove the corrosion at the terminal connection of the battery. While removing, use acid resistant hand gloves.
- 269. Check the specific gravity of electrolyte with hydro meter.
- 270. Top up the electrolyte with de-mineralized water / battery water if required. While top up, avoid spillage of water.
- 271. Check the individual voltage of each batteries with multi meter.
- 272. Replace the battery if voltage is not there in the individual battery.
- 273. If battery is replaced, old battery is to be returned to store for recycling as per SOP / ELEC / 022.
- 274. Check the tightness of power cable with proper tool while checking the tightness, use PPEs like acid resistant hand gloves.



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**SOP for Clearing the LOTO Permit in HT Feeders**

- 275. Discharge the batteries for not more than five hours if required.
- 276. Then check the individual batteries voltage total voltage of battery bank
- 277. Record the all check points in the concern check list

**Emergency / Emergency Shut OFF:**

If burn injury or electric shock is there, First aid will be given and inform to the Electrical department or Safety department or Call Emergency number 3108/9865152222 / 9750963761.

**Records/Annexure:**

JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Usage and Maintenance of batteries	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Req'd/recommended PPE: Goggle, Nose mask, acid resistant Hand gloves, Safety shoes, PVC Apron				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning the Batteries	Electric shock / Burn injury	Use acid proof hand gloves / use safety shoes/ PVC Apron	Gloves may be not in good condition	Re-check before use.
Checking the electrolyte condition	Acid spillage / Burn injury	Use acid proof hand gloves/ PVC Apron	Gloves may be not in good condition	Re-check before use.
Checking the Battery / Cell voltage	Electric shock	Use Proper Instruments & Insulated Tools	Improper Electrical Insulation & wrong measuring instrument	Re-check the measuring instrument before use.



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**Scope** : Cleaning with blower and handling of Hand Blower

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head

**PPE:**

1. Safety Helmet,
2. Safety Shoe,
3. Safety Hand Gloves.
4. Nose Mask
5. Goggles

**TOOLS:**

1. Hand Blower,

**Hazard Analysis:**

<b>Risk associated:</b>	<b>Mitigation Measures</b>
<b>Effect of Shock</b>	<b>Suitable glove</b>
<b>Effect of Eye Irritation</b>	<b>Use of Goggle</b>
<b>Dust inhalation</b>	<b>Use of Nose mask</b>

**Procedure:**

278. Check the hand blower for good condition
279. Connect the hand blower carefully to nearest 230V Supply point with 3 core and 3 pin plug.
280. While connecting blower avoid damaged cable / jointed cable.
281. Switch on and Check the blower for abnormality.
282. Before start to clean with blower, wear hand gloves, Nose mask and Goggles
283. If required, use safety belt also.
284. Ensure panel / equipment should be in off condition before cleaning with blower.
285. After completion of cleaning disconnect the blower safely.



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**SOP for Clearing the LOTO Permit in HT Feeders**

286. Store / Stack the blower in safe and dry place.

**Emergency / Emergency Shut OFF:**

18. If electrical shock injury or body injury are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job:	Date:	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Electrician	Supervisor: Sec.Engr	Department: Electrical	Section: Plant	Approved by: HOD
Req'd/recommended PPE:				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Procedure	What Could Go Wrong	Corrective Action
Blower connection with supply	Electrical Shock	Use proper Plug Top	Damaged Plug Top	Inspect before use
		Use proper wire	Wire may be open near gland	Check before use.
Cleaning of equipments	Injury to eye (irritation) while using Blowering	Use safety goggles	Goggles May Damaged	Inspect before use.
	Inhalation of Dust	Use Nose mask	Nose mask damage	Inspect before use Periodically replacement

**Scope** : This SOP is applicable to Safe Handling of Electrical /Battery Waste





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**Responsibility** : Electrician / Engineer

**Accountability** : Section In-Charge

**PPE:**

- 33. Goggle
- 34. Nose mask
- 35. Hand gloves
- 36. Safety Shoes

**Tools:**

**Nil**

**Hazard Analysis:**

**Risks associated**

Burn injury due to acid  
Suffocation due to toxic gases  
Cut injury due to damaged lamp

**Mitigating Measures**

Usage of acid proof gloves  
Usage of nose mask  
Usage of Gloves

**Training needs:**

- 28. First aid procedure

**Procedure:**

- 287. After replacement of electrical spares /scraps, collect and put them in to the concern dust bin.
- 288. Periodically collect the Spares / Scrap from dust bin and return it to store with below format.
- 289. If battery is replaced, immediately return them to store.
- 290. Use following format for returning to store.



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S.No	Description	Qty	Remark
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

**Emergency / Emergency Shut OFF:**

**19.** If burn injury or cut injury is there, First aid will be given and inform to the Electrical department or Safety department or Call Emergency number 3108/9865152222 / 9750963761.

**Records/Annexure:**

JSA is enclosed below.



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**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Handling electrical waste	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Goggle, Nose mask, Hand gloves, Safety shoes				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Collecting the waste spare from dust bin.	Cut Injury	Use hand gloves / use safety shoes	Gloves may be not in good condition	Re-check before use.
	Suffocation due to toxic gases	Use Nose Mask	Nose mask damaged	Re-check before use.
Handling of batteries	Acid spillage / Burn injury	Use acid proof hand gloves	Gloves may be not in good condition	Re-check before use
				Periodically replacement

**Scope** : Replacement of damaged power cable in Pre heater, Cement mill and Cement Silo lift

**Responsibility** : Electricians

**Accountability** : Electrical Engineer

**PPE:**

- 62. Nose mask
- 63. Goggles
- 64. Cotton Gloves
- 65. Safety shoes
- 66. Safety helmet
- 67. Full body harness with double lanyard

**Tools:**

- 68. DE Spanner set
- 69. Ring Spanner set



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- 70. Waste Cloth
- 71. Box spanner set
- 72. Hammer

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury  
Fall from height

Mitigating Measures  
Electrical Safety Gloves  
Safety shoes, gloves, helmet, goggles  
Full body harness with double lanyard

**Training needs:**

- 51. Emergency preparedness
- 52. First aid training

**Procedure:**

1. LOCK OUT AND TAG OUT for the lift
2. Take the appropriate work permit
3. Remove all three phase HRC fuse from the Lift panel at the ground Floor
4. Barricade around the lift at ground floor, go to the Junction box floor
5. Fix the roller pulley in suitable place above the cable hanging
6. Tie the head end of rope in the fixed column and opposite end of rope with hanging cable through roller pulley and hold tightly
7. Disconnect the power cable from the outgoing terminals of the Junction box and remove the cable clamps.
8. Lose the rope slowly till cable reaches the ground floor.
9. Disconnect the old power cable from the incoming terminals of the Lift Cabin control panel and remove it away.



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10. Unknot the cable from the rope and remove the cable away.
11. Lay the new power cable up to cabin control panel, terminate and connect it in the incoming terminal.
12. Knot the other end of cable with rope and pull it up to junction box. ( must have some sag)
13. Fix the cable in the clamp and connect it in the junction box.
14. Remove the pulley and ropes.
15. Connect the HRC fuse in mains controls panel.
16. Get the line clearance and Switch ON the lift feeder.
17. Take trail run of lift and record three phase current.
18. If it is found normal, surrender the work permit. Otherwise take LOTO of the feeder and cross check everything once again.
19. Do the house keeping and Update the maintenance record.
20. Close the work permit.

**Emergency / Emergency Shut OFF:**

20. If any injuries are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

30. Refer Line clearance certificates.
31. JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: Cable replacement of lift	Date:	Analysis by:	Reviewed by:
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**SOP for Clearing the LOTO Permit in HT Feeders**

Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
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Reqd./recommended PPE: Nose mask, Goggles, Electrical safety Gloves, Cotton Gloves, Safety shoes, Safety helmet

Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Fixing the roller pulley	Tools slip	Use suitable tools	Tool may be damaged	Tool box talk Periodic replacement
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Periodic replacement
Tie the rope with cable	Slip and fall from height	Use full body harness	Damaged condition	Inspect before use Periodic replacement.
Disconnection / connection the Cable from JB	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
Check the tightness of terminals	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Training for tools handling/ Periodic replacement

**Scope** : Trouble shooting in live panel for control scheme only

**Responsibility** : Engineer/Electricians

**Accountability** : Electrical Manager

**PPE:**

- 68. Nose mask
- 69. Goggles
- 70. Safety shoes
- 71. Safety helmet
- 72. Rubber hand gloves

**Tools:**

- 73. Test lamp
- 74. Insulated tools
- 75. Multi meter



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**SOP for Clearing the LOTO Permit in HT Feeders**

76. Line Tester

**Hazards:**

**Risk Associated**

Electrical Shock  
Minor body injury  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles  
Re- fresher Training

**Training needs:**

- 53. Emergency preparedness
- 54. First aid training
- 55. First aid including CPR training
- 56. Electrical safety training

**Procedure:**

- 21. Use proper PPE.
- 22. Only Use electrical safety shoes for trouble shooting in live panel and stand on rubber mat.
- 23. Use only insulated hand tools.
- 24. Use tested electrical rubber hand gloves wherever required.
- 25. Only qualified Technician / Engineer personnel work on live panels.
- 26. Do not carry out the work in Live Panel if Place / person are in wet condition.
- 27. Be alert and keep yourself beside the panel during opening the panel cover.
- 28. After opening the live panel inspect and ensure that there are no bare live power conductor are in exposed. If any power conductor in exposed, take LOTO and do necessary arrangement for cover the same.



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29. For testing the control supply are tightening the terminal point use the line tester or connector in straight position, don't put in inclined position.

30. After finishing the Job, close all panel doors / covers properly.

**Emergency / Emergency Shut OFF:**

21. If any injury or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

32.JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Trouble shooting in live panel	Date:	Analysis by: Section engineer	Reviewed by: Section head
Title of employee doing job: Engineer / Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Tested Electrical rubber hand gloves, Safety shoes, Safety helmet, Safety Goggle				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Opening of live panel cover	Body injury	Use suitable tools	Tool may be damaged	Inspect before use





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**SOP for Clearing the LOTO Permit in HT Feeders**

	Panel flash over and Burned injury	Keep yourself beside the panel	Not follow the procedure	Tool box talk/Proper Training
		Wear safety Goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
Trouble shooting	Short circuit.	Use Insulated tools	Insulation may damage.	Inspect before use
		Testing tools to be hold straight	Not follow the procedure	Tool box talk/SOP Training
	Panel flash over and Burned injury	Wear safety Goggles / Electrical glove	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
		Power conductor to be covered by shroud	Failed to inspect or cover	Inspect before start the job

**Scope** : SOP is applicable for operation of APFC.

**Responsibility** : Shift Electrical engineer/Shift Technicians

**Accountability** : Section Head Electrical

**PPE:**

- 37. Safety helmet,
- 38. Safety shoe,
- 39. Goggles
- 40. Electrical gloves

**Tools:**

- 37. General Tools



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**Hazards:**

**Risks associated**

Electrical Shock  
Flashover of contactor.  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Feeder to be locked properly.

**Training needs:**

- 29. Work related training
- 30. Emergency preparedness
- 31. Fire fighting
- 32. First aid including CPR training
- 33. Electrical safety training

**Procedure for operation of APFC.**

1. During power export, all APFC panel to be selected in auto mode only.
2. During power import, load variation are more and if power factor is not able to maintain as required (PF 0.99), one APFC can be take in Manual mode at CMBH and CCR load center as per requirement.
3. Before taking in Manual mode ensure the entire chamber door to be fully closed and tight with given panel lock or lock bolt.
4. Operate the required capacitor bank one by one.
5. During switch on capacitor bank, keep your body away from front of operating bank.
6. Switching time delay between one capacitor bank to other will be 30 seconds.



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**SOP for Clearing the LOTO Permit in HT Feeders**

7. Once one capacitor bank is switched off, the same bank should not be on before 40 seconds.
8. Put back all the APFC in auto mode when export started.

**Emergency / Emergency Shut OFF:**

22. If hand/leg injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9865952222

**Records/Annexure:**

33.JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: Resume the power during blackout	Date: 01 – 04 - 2014	Analysis by: Shift Incharge	Reviewed by: Section Head
Title of employee doing job: shift engineer / Electricians	Supervisor: Shift In charge	Department: Electrical	Section: All Section	Approved by: Electrical HOD
Reqd./recommended PPE: Safety helmet, Safety shoe, safety goggle & Gloves.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Operating of APFC panel cover	Panel flash over and burned injury	Ensure Tightness of panel door	Not checked during operation	Tool box talk/Proper Training



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**SOP for Clearing the LOTO Permit in HT Feeders**

		Keep yourself beside the panel	Not follow the procedure	Tool box talk/ SOP Training
		Wear safety Goggles /	Damaged goggles/non standard goggles/ Not wearing goggles	Periodic replacement/Training

**Scope :** For Issuing LOTO of ESP Chamber Transformers

**Responsibility :** Electrical section Technician / Section Engineer

**Accountability :** Electrical Section Engineer / Head

**PPE:**

6. Electrical Safety Gloves
7. Safety shoes
8. Safety helmet

**TOOLS:**

2. Spanner,
3. Fuse Remover/ Puller,
4. Discharging Rod.

**Hazard Analysis:**

**Risk associated:**

Flash Over of Panel

Effect of Shock

Effect of hand injury

**Mitigation Measures**

Use of Safety Harness

Tested Electrical Rubber Hand Gloves

Use proper size spanner

**Procedure:**

1. Take / Receive the LOTO Clearance from performing authority for ESP.
2. Ensure the ESP transformer is switched off from CCR.



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**SOP for Clearing the LOTO Permit in HT Feeders**

3. Switch off the MCCB from MCC.
4. Remove the Pad locks "P1, P2, P3" from all 03 panels.
5. Insert the "P1, P2 & P3" padlocks at individual Transformer at ESP top.
6. Rotate the Transformer operating handle from "HV to Earth" Position. Ensure the locking at Earth position and remove the Pad Locks "E1, E2, E3".
7. Do the Visible Earthing of Transformer in the higher voltage side for all the 3 transformer.
8. Insert the Removed "E1, E2, E3" padlocks at appropriate slot in "Safety Interlock Box" and remove the master pad lock "X".
9. Insert the master Key "X" at appropriate location & remove the individual padlock of Individual inspection doors.
10. Provide the Earth Discharge rod in "Emitting Electrode – Pipe type" from the entire Inspection Door.
11. Insert the appropriate Padlock of individual Inspection door and remove the Chain interlock.
12. Now it is safe to work / allow to work inside the ESP.

**Emergency Shut- off:**

23. In case of emergency, trip the particular MCC Feeder.
24. If any injuries are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

1. Energy isolation permit
2. JSA



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**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Issue of LC to ESP Chamber	Date:	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Cooler	Approved by: HOD
Reqd./recommended PPE: Tested Electrical Rubber Hand Gloves, Safety shoe, Safety helmet.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Opening of Transformer HT side cover	Hand injury due to slip of tools	Use of hand glove	Fail to use / damaged hand glove	Improving the awareness through pep talk Condition based replacement of PPE
Earthing of Emitting electrode	Hand injury due to slip of tools	Use of hand glove	Fail to use / damaged hand glove	Improving the awareness through pep talk Condition based replacement of PPE
Earthing of Transformer	Electrocution	Usage of rubber hand glove	Fail to use / damaged hand glove	Improving the awareness through pep talk Condition based replacement of PPE



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**Scope** : For Lifting LOTO of ESP Chamber Transformers  
**Responsibility** : Electrical section Technician / Section Engineer  
**Accountability** : Electrical Section Engineer / Head

**PPE:**

9. Safety Hand Gloves (Suitable Electrical Insulated glove)
10. Safety Helmet,
11. Safety Shoe,
12. Safety Hand Gloves.

**TOOLS:**

5. Spanner,
6. Fuse Remover/ Puller,
7. Discharging Rod.

**Hazard Analysis:**

**Risk associated:**

Flash Over of Panel  
Effect of Shock  
Effect of hand injury

**Mitigation Measures**

Use of Safety Harness  
Suitable Electrical Insulated glove  
Use proper size spanner

**Procedure:**

1. Ensure / confirm the persons worked inside are come out of the ESP.
2. Remove the Padlock by properly making the chain interlock. Applicable for all Inspection doors.
3. Remove the Earth Rod from individual Inspection doors and close the door.
4. Remove the Earthing of Transformer HT side Earthing.
5. Provide the entire Inspection door Padlocks at "Safety Interlock box" and remove the master Key "X".
6. Insert the Master key "X" at appropriate location to remove the Transformer Keys "E1, E2, E3" from Safety Interlock box.



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**SOP for Clearing the LOTO Permit in HT Feeders**

7. Insert the Transformer Padlocks at appropriate Transformer slot and rotate the Handle from Earth to Live Position.
8. Ensure the handle position at HV side and remove the Pad locks "P1, P2, P3"
9. Insert the removed Padlocks "P1, P2, P3" at individual Transformer control Panel.
10. Switch "On" the individual panel SFU at ESP controller panel.
11. Switch On the SFU from MCC to charge the ESP control panel.
12. Confirm the healthiness of ESP status in CCR.
13. Lift the LOTO for Charging the ESP from CCR.

**Emergency / Emergency Shut OFF:**

If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

34. Refer LOTO certificates.
35. JSA as enclosed below.





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**SOP for Clearing the LOTO Permit in HT Feeders**

<b>Job Safety Analysis</b>	Job: Issue of LC to ESP Chamber	Date:	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Cooler	Approved by: HOD
Req'd/recommended PPE:				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Procedure	What Could Go Wrong	Corrective Action
Opening of Transformer HT side cover	Hand injury due to slip of tools	Use of hand glove	Fail to use / damaged hand glove	Improving the awareness through pep talk Condition based replacement of PPE
Earthing of Emitting electrode	Hand injury due to slip of tools	Use of hand glove	Fail to use / damaged hand glove	Improving the awareness through pep talk Condition based replacement of PPE
Earthing of Transformer	Electrocution	Usage of rubber hand glove	Fail to use / damaged hand glove	Improving the awareness through pep talk Condition based replacement of PPE

**Scope** : Filtration/Topping up/Replacement of Transformer Oil

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head

**PPE:**

- 13. Safety Hand Gloves (Suitable Electrical Insulated glove)
- 14. Safety Helmet,
- 15. Safety Shoe,
- 16. Safety Hand Gloves.



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**TOOLS:**

8. Spanners,
9. Hand Blower,
10. Waste Cloth,
11. Screw Driver,
12. Discharge Rod,
13. HT/ LT Megger's,
14. Oil BDV test Kit.

**Hazard Analysis:**

**Risk associated**

Flash Over of Panel  
Effect of Shock  
Effect of Eye Irritation  
Dust inhalation

**Mitigation Measures**

Use of Safety Harness  
Suitable Electrical Insulated glove  
Use of goggles  
Nose mask

**Procedure:**

1. Take the LOTO for the Transformer with CCR Clearance.
2. Clean the Transformer Main Tank, Radiators, Terminal Box, Marshalling Box and other accessories.
3. Check the Oil Level in the Conservator Tank.
4. Check for any Oil Leakage at Terminal Bushings, Main Tank, Radiators, Bucholz Relay, Conservator Tank and other all areas.
5. If any Oil Leakage found arrest the Leakage.
6. Check the BDV of the oil through Test kit.
7. If BDV is less than 45 KV, Connect the filtration machine's inlet and outlet to filtering valves on the transformer.
8. Bypass the Bucholz relay before starting the filtration.
9. Ensure no oil spillage on the ground while filtration.
10. Ensure the oil filters are clean and filter cartridge is replaced with new one.
11. Set the temperature of 70 DEG C and start the filtration.



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**SOP for Clearing the LOTO Permit in HT Feeders**

12. Ensure minimum five circulations are completed with the controlled temperature of 65 – 70 DEG C.
13. Test the BDV of the transformer oil at the end of the fifth cycle.
14. Continue the filtration till the BDV is reached > 65 KV at 2.5 mm electrode gap.
15. Top up the oil till the 50 % of the conservator level.
16. Disconnect the filtration machine.
17. Release air from the Bucholz replay and other air vents.
18. Take the Bucholz relay in line.
19. Take out the sludge from the filter unit and send to stores for disposal.
20. Lift the LOTO and Charge the Transformer.

**Emergency / Emergency Shut OFF:**

25. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

36. Refer LOTO permit certificates.
37. JSA as enclosed below.

<b>Job Safety Analysis</b>	Job: Trafo Oil Replacement	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety Shoe, Goggle, helmet, Hand gloves, Nose mask				



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## SOP for Clearing the LOTO Permit in HT Feeders

Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning of transformer	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
	Electric shock	Use the hand blower with proper plug top	Not using plug top for hand blower	Training for tools handling/ Periodic replacement
Check the oil level / Leakage	Oil leakage	Don't leak the oil into the Ground	Slippery may occur Ground contamination	Provide drum / tray for collection
Connect the filtering machine and opening of transformer oil sampling valve	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Oil leakage	Don't leak the oil into the Ground	Slippery may occur Ground contamination	Provide drum / tray for collection
	Electric shock	Connect the transformer oil filtering machine to a suitable socket outlet with proper plug top / Feeder	Not using plug top for socket connections	Training for tools handling/ Periodic replacement
Start transformer oil circulation	Oil leakage	Don't leak the oil into the Ground	Slippery may occur Ground contamination	Provide drum / tray for collection
Collecting oil sample in specified bottles	Oil spillage	Keep the oil containers closed and keep oil samples in tray	Improper handling may lead to oil spillage	Handle oil samples with care. Training for tools handling/ Periodic replacement/ Aspect Impact awareness
Cleaning of spilled oil by using cotton	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP



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**SOP for Clearing the LOTO Permit in HT Feeders**

Replacement of Oil	Occupational health problem due to skin contact with Grease/Oil	Use non-penetrated hand gloves	Damaged hand glove/ fail to use	Condition Based Replacement of PPE's.
Measurement of BDV	Oil spillage	Keep the oil containers closed and keep oil samples in tray	Improper handling may lead to oil spillage	Handle oil samples with care. Training for tools handling/ Periodic replacement/ Aspect Impact awareness
	Electric shock	Use proper plug top for oil BDV kit. Close the oil test container lid before applying voltage	Non use of plug top / Non checking of lid for interlock	Training on oil BDV testing method / Periodic checkup of plug top
Disconnect the machine and normalize transformer	Body injury	Wear safety helmet, safety shoes, hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Oil leakage	Don't leak the oil into the Ground	Slippery may occur Ground contamination	Provide drum / tray for collection

**Scope** : This Procedure is to establish and ensure safe method of Capacitor Panel Maintenance.

**Responsibility** : Section Engineer – Electrical

**Accountability** : Section Head-Electrical

**PPE:**

- 41. Safety shoe,
- 42. Electrical Rubber hand gloves

**Tools:**

- 38. Insulated tools
- 39. Discharging Rod

**Hazard Analysis:**

**Risks associated**

Electrical shock

**Mitigating Measures**

Use of insulated tools & Tested Electrical Rubber Hand Gloves



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**Training needs:**

- 34. Usage of tools and Nature of Hazards
- 35. Usage of PPEs
- 36. Meggers

**Procedure:**

- 17) Take the LOTO for the particular equipment as per ELEC/SOP/001 and 003
- 18) Get work permit from the concerned Electrical section in-charge.
- 19) Discharge the Capacitor panel / capacitor terminals.
- 20) Clean the capacitor panel / capacitors.
- 21) Clean the bus bars.
- 22) Check the capacitors.
- 23) Measure the capacitance values.
- 24) Check the discharge resistors.
- 25) Check the feeders.
- 9) Return the Work permit.

**Emergency / Emergency Shut OFF:**

If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.



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**Records/Annexure:**

38. JSA is enclosed below.

39. LOTO Electrical Isolation permit

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Capacitor Panel Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety shoe & Rubber Gloves, nose mask, safety goggles				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Jo.b Procedure	What Could Go Wrong	Corrective Action
Discharge capacitor terminals and panel	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/To check for damage before use
		Use Earth rods	Damaged earth rods	Replace it, if not repairable
Clean the capacitor bank Cleaning of capacitor panel and bank	Eye irritation	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training



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## SOP for Clearing the LOTO Permit in HT Feeders

	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Capacitor, discharge resister, panel checking, terminal tightness and measurement of values	Electric shock	Use the insulation tester with proper probe arrangement	Damaged probe	Check the power probe before connecting to electrical source Replace if damage
		Earth rod to be proper insulated	Insulation may be damaged	To be re-check before use.
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : Truck Loader Maintenance

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head

### **PPE:**

- 17. Safety Hand Gloves (Suitable Electrical Insulated glove)
- 18. Safety Helmet,
- 19. Safety Shoe,
- 20. Nose mask.

### **TOOLS:**

- 15. Screw Driver
- 16. Hand Blower
- 17. Fuse Remover/ Puller
- 18. Waste Cloth





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<b>Issued By: M.R</b>	<b>Approved By: HOD - ELECTRICAL</b>
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**SOP for Clearing the LOTO Permit in HT Feeders**

**Hazard Analysis:**

**Risk associated:**

Effect of Shock

Effect of Eye Irritation

Dust inhalation

**Mitigation Measures**

Suitable Electrical Insulated glove

Use of goggles

Use of Nose mask

**Procedure:**

1. Take the truck loader down by pressing the hoist down push button.
2. Take LOTO for truck loader.
3. Open X3, X4, X5 & X7 JB blower it & check control cable tightness.
4. Open all the power JB & blower the JB.
5. Check for any loose connection in power JB.
6. Check Hoist & travel drive motor.
7. Check all the cable Festooning arrangement. If required replace the damaged wheel.
8. Check for the cable sag & tighten it if required.
9. Open the main control panel & blower it.
10. Check all the control & power cable tightness at the panel.
11. Open all the power contactor & clean with CRC.
12. Replace the power contactor kits if required.

**Emergency Shut- off:**

26. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**



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40. Refer Line clearance certificates.

41.JSA as enclosed below.

<b>Job Safety Analysis</b>	Job: Truck Loader Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Packing Plant	Approved by:
Reqd./recommended PPE: Safety shoe, Helmet, Goggle, Nose mask				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Isolation of feeder	Electrocution/Electrical fire	Use hand gloves Use Fire proof suit	Fail to use of PPE/suit	Educating importance of PPE through pep talk
Cleaning of Motor body parts, Control	Eye irritation,	Wear goggles	Damaged goggles / non standard	Periodic replacement /



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**SOP for Clearing the LOTO Permit in HT Feeders**

JB's & Panel			goggles / Not wearing Goggle.	Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Measurement of IR / WR value of Motors	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use Calibrated meters. Good probes	Faulty meters, damaged probes	Meter shall be calibrated periodically. Check and ensure meter and probe condition before use.
Check the Contactor kit, Open power contactor arc chute Clean arc chute and fixed and moving contact	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job



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**SOP for Clearing the LOTO Permit in HT Feeders**

**Scope** : Maintenance of Passenger Rack & Pinion Lift

**Responsibility** : Section Engineer – Electrical

**Accountability** : Section Head - Electrical

**PPE:**

- 43. Safety helmet,
- 44. Safety shoe,
- 45. Hand Glove
- 46. Safety Harness

**Tools:**

- 40. Multimeter.
- 41. Brush.
- 42. Spanner Set

**Hazard Analysis:**

**Risks associated**

Effect of Shock  
Effect of Eye Irritation  
Dust Inhalation  
Fall from height

**Mitigating Measures**

Suitable Electrical Hand Glove  
Use of Goggles  
Use of Nose Mask  
Use of safety belt

**Procedure:**

1. Take LOTO for The Passenger Lift
2. Clean the Motor, Brake & all Equipment in the Lift
3. Check the Pinion Conditions, Guide Roller Condition.
4. Provide the greasing for Rack



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**SOP for Clearing the LOTO Permit in HT Feeders**

5. Check and Change the Gear Box Lubricating Oil if Required
6. Check brake condition & Measure the Gap feeler Gauge and record.
7. Check the motor mounting bolts.
8. Check the all floor door were closing interlock proper
9. Check the safety device physical conditions for any crack/ loosen bolt.
10. Check Tar Door, Cage door, Top/Bottom Limit, Interlocks
11. Check the Manual Release Level working condition
12. Check and Clean the floor level sensor
13. Check the TFT&TFR Condition
14. Check & Clean all the floor call Push Button station
15. Clean all power contactor with CRC
16. Tighten all the power & Control Circuit both the Base panel & Cage Panel
17. Clean the Lift Pit and check the mast base condition and Cage rest spring condition
18. Take Trail Run of Lift.

**Emergency / Emergency Shut OFF:**

27. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

42. LOTO permits
43. JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

Job Safety Analysis	Job: Passenger Lift Operation	Date:	Analysis by:	Reviewed by:
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**SOP for Clearing the LOTO Permit in HT Feeders**

<b>Title of employee doing job: Technician</b>	<b>Supervisor: Section Engineer</b>	<b>Department: Electrical</b>	<b>Section: Plant</b>	<b>Approved by:</b>
<b>Req'd/recommended PPE: Safety helmet, Safety Harness, Safety shoe, &amp; Rubber Gloves.</b>				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Isolation of feeder/control supply	Electrocution/Electrical fire	Use hand gloves Use Fire proof suit	Fail to use of PPE/suit. Damaged PPE / Suit	Educating importance of PPE through pep talk. Periodic replacement/To check for damage before use
Cleaning of Lift	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Body injury	Wear safety helmet, safety shoes, hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Fall hazard	.Use Safety belt during work done at height.	Defective safety belt	Without PPE don't perform the job Check safety belt condition before use
Cleaning of Lift Pit	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggles/ Heavy dust accumulated	Periodic replacement/Training



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**SOP for Clearing the LOTO Permit in HT Feeders**

	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing mask/ Heavy dust accumulated	Periodic replacement /Training
	Falling of object from the Top	Ensure no Person working in the Top	Not Ensured	Educating thru' pep talk
Cleaning of Limit switch / proxy switch	Body injury	Wear safety helmet, safety shoes, hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Fall hazard	.Use Safety belt during work done at height.	Defective safety belt	Without PPE don't perform the job Check safety belt condition before use
Greasing of Rack	Fall hazard	.Use Safety belt during work done at height.	Defective safety belt	Without PPE don't perform the job Check safety belt condition before use
	Body injury	Wear safety helmet, safety shoes, hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the Lift Brake and measuring the gap	Hand injury	Wear safety helmet, safety shoes, hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Cleaning of Power Contactor	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job



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**Scope** : Usage of Hydraulic Bearing Puller  
**Responsibility** : Electrical section Technician / Section Engineer  
**Accountability** : Electrical Section Engineer / Head

**PPE:**

- 21. Safety Helmet,
- 22. Safety Shoe,
- 23. Safety Hand Gloves.
- 24. Goggles

**TOOLS:**

- 19. Hydraulic Puller

**Hazard Analysis:**

<b>Risk associated:</b>	<b>Mitigation Measures</b>
Fracture of Hand/Body	Usage of Packing Cover Proper training

**Procedure:**

1. Ensure that hydraulic bearing puller is in locking condition with bearing while using for bearing removal.
2. Use correct size supporting rods for proper seating.
3. Use the appropriate size tri-square for removing bearing.
4. Ensure that legs are properly connected to bearing.
5. Use cover for legs after proper seating.
6. Use hands to catch the legs if necessary.
7. Use lifting rod to lift in proper way.
8. After removing the bearing release the hydraulic pressure.
9. Remove all legs & supporting rods by carefully holding it.





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**Emergency / Emergency Shut OFF:**

28. If any injury is there, give First aid and inform to the Safety department or Call  
Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

JSA as enclosed below.

**Records/Annexure:**

<b>Job Safety Analysis</b>	Job: Usage of motor bearing puller	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Sec.Engr	Department:	Section:	Approved by:
Reqd./recommended PPE: Safety shoe, safety helmet, goggle, hand glove				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Motor bearing removal using hydraulic puller	Injury to hand while using hydraulic puller.	Follow SOP & Avoid inspection in Operational area	While applying Bearing puller Bearing may broke into pieces and hit to the body	Bearing removal should be done only in Bearing Chamber
	Oil spillage from hydraulic hose / fittings.	Check the hose connections after fixing.	Wrong threads fixing / Hose may have damage	Check the puller hydraulic system and hose before each usage. / Clean the oil spillage and correct the root cause.



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**SOP for Clearing the LOTO Permit in HT Feeders**

	Bearing grease may spill./ Ground contamination	While removal hold the bearing properly.	Grease may slip from bearing housing /	After removal of bearing keep the bearing in tray
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**Scope** : Maintenance of Power Contactor

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head

**PPE:**

- 25. Tested Electrical Rubber Hand Gloves
- 26. Safety Helmet,
- 27. Safety Shoe,
- 28. Cotton Gloves.
- 29. Nose mask

**TOOLS:**

- 20. Screw Driver
- 21. Hand Blower
- 22. Fuse Remover/ Puller
- 23. Waste Cloth

**Hazard Analysis:**

**Risk associated:**

- Flash Over of Panel
- Effect of Shock
- Effect of Eye Irritation
- Dust inhalation

**Mitigation Measures**

- Tested electrical rubber hand glove
- Use of goggles
- Use of Nose mask

**Procedure:**

1. Take the LOTO for the required Feeder.
2. Switch OFF main and aux power supply then rack out the feeder.



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3. Check the tightness of Power and Control cable connection of feeder.
4. Remove the power cable from contactor properly.
5. Clean the Feeder with Brush/Hand Blower & Cloth.
6. Open the contactor and all arc chutes and kits.
7. Clean all arc chutes & kit with CRC, cloth.
8. Ensure that all contacts/arc chutes are good if anything found in poor condition, then replace it with new one.
9. Then assemble the contactor properly & ensure that all contact Kits / Arc chutes are fixed back as before.
10. Check and Clean the coil & core.
11. Measure the coil resistance and check the operation of coil then close.
12. Restore all the contactor power / control connections back in position.
13. Check the feeder is properly inserted.
14. Lift the LOTO and Check the feeder working condition & inform to CCR operator.

**Emergency / Emergency Shut OFF:**

29. If any injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

JSA - as enclosed below.



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**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: Power contactor Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Tested electrical rubber hand gloves, Helmet, Safety shoes, cotton glove, Nose mask				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Isolation of feeder/control supply	Electrocution/electrical Fire	Use hand glove	Fail to use of PPE	Educating importance of PPE through pep talk
	Hand injury due to slip of tools	Use proper tool	Fail to Carry the proper tool	Periodical inspection of tools
Removal of module / contactor connections	Hand injury due to slip of tools	Use proper tool	Fail to Carry the proper tool	Periodical inspection of tools
Cleaning of fixed / moving kits with CRC	Eye irritation,	Wear goggles	Damaged goggles / non standard goggles / Not wearing Goggle.	Periodic replacement / Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training



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	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Assembling and fixing back	Hand injury due to slip of tools	Use proper tool	Fail to Carry the proper tool	Periodical inspection of tools

**Scope** : For Maintenance Circular Slipping

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head

**PPE:**

- 30. Tested Electrical Rubber Hand Gloves,
- 31. Safety Helmet,
- 32. Safety Shoe,
- 33. Safety Hand Gloves.
- 34. Nose mask

**TOOLS:**

- 24. Spanners,
- 25. Hand Blower,
- 26. Waste Cloth,
- 27. Screw Driver,
- 28. Motor Checker.

**Hazard Analysis:**

**Risk associated:**

Effect of Shock  
Effect of Eye Irritation  
Dust inhalation

**Mitigation Measures**

Tested Electrical Rubber Hand Gloves  
Use of Goggles  
Use of Nose mask

**Procedure:**

1. Take the LOTO for the circular stacker & Reclaimer with CCR Clearance.



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2. Take LOTO for the Control supply from the instrumentation.
3. Open the Slip ring door with Proper tool.
4. Blower the Slip ring with hand blower.
5. Check the Brush holder spring tension.
6. Check the cable tightness.
7. Ensure all carbon brushes are in their positions. If not correct it.
8. Ensure all tools are taken out from the slip ring chamber.
9. Check the megger value between PH to Earth and Phase to phase.
10. Close the Slip ring door with proper tools.
11. Lift LOTO and check the brush alignment in running condition.

**Emergency / Emergency Shut OFF:**

30. If any injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

1. LOTO permit
2. JSA as enclosed below.



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**SOP for Clearing the LOTO Permit in HT Feeders**

<b>Job Safety Analysis</b>	Job: Circular Slip ring Maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Raw Material Handling	Approved by:
Reqd./recommended PPE: Safety shoe, Rubber Hand Gloves, Nose Mask, Goggle				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Isolation of feeder/control supply	Electrocution	Use Tested rubber hand gloves	Fail to use of PPE	Educating importance of PPE through pep talk
Measurement of IR value of outgoing cable.	Injury to head due to striking against some solid object	Follow permit procedure and SOP	Body may contact with charged conductor	Wear Hand gloves, Proper Probe Position
	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use Calibrated meters and good probe	Faulty meters / Defective probe	Meter shall be calibrated periodically / Check meter and probe condition before use.
Open and Cleaning of slip ring unit	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand	Tools and material may fall on human body	Without PPE don't perform the job/ Proper



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**SOP for Clearing the LOTO Permit in HT Feeders**

		gloves		training / Follow SOP
Checking of tightness of power cables	Hand injury due to slip of tool	Use proper tool	Failed to carry proper tool	Educating importance of tools through pep talk
Checking of carbon brush holder tension	Hand injury due to sudden release of spring	Use Hand Glove	Forgotten to wear hand glove	Educating importance of PPE through pep talk
Close the slip ring door, lift LOTO and take trial run	Hand injury due to slip of tool	Use proper tool	Failed to carry proper tool	Educating importance of tools through pep talk

**Scope** : Oil Replacement/Top up of HT Motor Bearing

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head

**PPE:**

35. Tested Electrical Rubber Hand Gloves,
36. Safety Helmet,
37. Safety Shoe,
38. Cotton Gloves.
39. Nose mask.

**TOOLS:**

29. Spanners,
30. Hand Blower,
31. Waste Cloth,
32. Screw Driver,
33. Oil replacement cane.

**Hazard Analysis:**

**Risk associated:**

**Mitigation Measures**





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Effect of Eye Irritation

Use of Nose Google

Dust inhalinataion

Use of Nose mask

**Procedure:**

1. Ensure the operating hours and oil level.
2. Take LOTO for the same motor.
3. Check the oil temperature is low i.e. below 40°C.
4. Check the oil color and oil degradation level.
5. Clean the oil cane properly and fill the oil as per required quantity.
6. Clean the bearing out side frame and drain the old oil into waste oil cane by removing drain plug.
7. To remove small waste contamination fill some fresh oil by closing the drain plug and after drain the oil.
8. Close & tight the drain plug
9. Now fill the oil as per OEM requirement (21 liters)
10. lose the oil filling plug & tight.
- 11.Lift the LOTO and check control supply from CCR.

**Emergency / Emergency Shut OFF:**

31. If any injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

1. LOTO permit.
2. JSA as enclosed below.



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**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Oil Top up for HT Motor Bearing	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Plant	Approved by:
Req'd/recommended PPE: Safety shoe, Helmet, Goggle, Nose mask, Cotton glove.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Cleaning HT Motor Bearing Housing	Injury to head due to striking against some solid object or due to impact with something falling on head from height	Use Helmet	Walking around the motor without seeing the floor, Projecting materials, power cables, portable equipments which lead to Slip, Trip, Fall / Falling from height objects Impact to body.	Educating importance of PPE through pep talk. (Always wear Helmet, Safety shoe, Hand Gloves, Nose mask, Goggles in the work location, avoid Temporary power connections.
	Eye Injury due to dust particle falling in eye	Use Safety Goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training/ Follows SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
Oil replacement	Occupational	Use hand gloves	Fail to Follow the	Restriction of Un



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ELECTRICAL MANUAL**

<b>Issue No: 02</b>	<b>Rev. No: 00</b>	<b>Effective Date: 01.11.2019</b>	<b>ELEC/SOP/002</b>
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<b>Issued By: M.R</b>	<b>Approved By: HOD - ELECTRICAL</b>
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**SOP for Clearing the LOTO Permit in HT Feeders**

of HT Motor	health problem due to skin contact with Grease/Oil		instruction given in the procedure	authorized person for Greasing / oil changing
	Injury of person due to falling on rotating equipment	"Ensure protection guards on rotating parts are in position	Guard not fixed/ Fail to Check	Educating importance of guards / checking through pep talk.
Opening /closing of Oil Plug	Hand injury due to slip of Tool	Keep hand free form Oil	Fail to clean the Hand	Educating through pep talk.

**Scope/Purpose** : This Procedure to establish and ensure safe method of Overhead Electrical Insulators cleaning in Substation.

**Responsibility** : Section Engineer – Electrical

**Accountability** : Head-Electrical

**PPE:**

- 47. Safety helmet,
- 48. Safety shoe,
- 49. Tested Electrical Rubber Hand Gloves
- 50. Nose mask
- 51. Safety belt

**Tools:**

- 43. Cotton cloth/cotton waste

**Hazard Analysis:**

**Risks associated**

Fall from height  
Dust

**Mitigating Measures**

Use of Safety belt  
Nose mask



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**Training needs:**

- 37. PEP TALK about Nature of Hazards
- 38. Awareness about electrical circuits
- 39. Usage of PPEs

**Procedure:**

- 1) Get work permit from the concerned Electrical section in-charge.
- 2) Take LOTO permit as per procedure SOP 03
- 3) Ensure the overhead lines are physically isolated.
- 4) Discharge the Overhead lines and earth the system thru' earth rods till the job is completed.
- 5) Barricade the cleaning area from others.
- 6) Tool box instruction to be given to the contract workers including contract supervisor before entering the switch yard.
- 7) Use ladder to approach the insulators.
- 8) Use Hand gloves & Safety belt during cleaning.
- 9) Supervisor must present at the site during the work for monitoring the people for safe activities / conditions.
- 10) Clean the insulators.
- 11) Remove the foreign materials from the work site after cleaning.
- 12) Remove the ladder and Barricades.
- 13) Remove the Discharge rods.
- 14) Return the Work permit.



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### Emergency / Emergency Shut OFF:

If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

### Records/Annexure:

- 44. JSA is enclosed below.
- 45. LOTO Electrical Isolation permit
- 46. Isolation matrix.

### JOB SAFETY ANALYSIS: (JSA)

<b>Job Safety Analysis</b>	Job: Overhead Electrical insulators cleaning	Date: 05.05.2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Electrician & Contract helpers	Supervisor: Section Supervisor	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Safety helmet, Safety shoe, Rubber Gloves, Nose mask & Safety belt.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Insulator Cleaning	Injury due fall from height	Use /Good condition Ladder	Slip from ladder/ Damage ladder	Usage of proper ladder
		Use safety belt/ Check belt condition before use	Not wearing safety belt/Not checked belt condition.	Ensuring proper lock arrangement/ Height work training
	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard	Periodic replacement / Proper training /



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			goggles/ Not wearing goggle	Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Insulator Cleaning	Electric shock due to live circuit	Proper Barricading & physical isolation of live areas	Lack of knowledge about Live circuit	Work permit with LOTO system & Appropriate Tool box instruction

**Isolation Matrix**

Activity	Isolation Type	Tag /Name of the Equipment							
		Electrical Energy					Other Energy		
Maintenance of 25/30 MVA Power transformer	Name and Tag for the Equipment	1.Open CB -8 at CMBH LC	2.Open Incoming SF 6 breaker at switch yard	3.Open Incoming Isolator at switch yard	4.Open 11 KV breaker at 110 KV control room	nil	nil	nil	nil

**Scope/Purpose** : This Procedure is to establish and ensure safe method of Temporary Lighting Arrangement

**Responsibility** : Section Engineer – Electrical



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**Accountability** : Head-Electrical

**PPE:**

- 52. Safety shoe,
- 53. Safety helmet
- 54. Safety belt

**Tools:**

- 44. Insulated tools

**Hazard Analysis:**

**Risks associated**

Electric shock  
Fall from height  
Electrocution (Fatal)

**Mitigating Measures**

Usage of Trippers & Insulated tools  
Usage of ladders, Safety belt & Life line if required

**Training needs:**

- 40. Usage of tools and Nature of Hazards
- 41. Usage of PPEs
- 42. First aid including CPR training
- 43. Electrical safety training
- 44. Height work training

**Procedure:**

1. Get work permit from the concerned Electrical section in-charge.
2. Use 30mA ELCB for the lighting circuit & ensure the tripper operation.



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3. Use 24V lamps only for the confined space illumination.
4. Use 24V/230V lamps for outdoor illumination.
5. Ensure proper earthing for 230V lighting circuits.
6. Use ladder & Safety belt for fixing lamps at heights.
7. Ensure the lamp is free from hazards of fall / water entry.
8. Ensure the position of lamp not to glare the work area.
9. Return the Work permit.

**Emergency / Emergency Shut OFF:**

32. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

47. JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**





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**SOP for Clearing the LOTO Permit in HT Feeders**

<b>Job Safety Analysis</b>	Job: Temporary Lighting Arrangement	Date: 01.05.2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: O&M Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Req'd/recommended PPE: Safety shoe, Safety helmet, Safety belt& Life line.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Climbing up	Fall from height	Use Good condition Ladder	Slip from ladder/ Damage ladder	Usage of proper ladder. Check ladder before use.
		Use safety belt and maintain three point contact.	Not wearing safety belt/Not checked belt condition.	Ensuring proper lock arrangement/ Height work training/ Check belt condition before use
Lamp fixing & circuit connection	Electric shock	Use electrical gloves / Ensuring proper earthing	Improper earthing	Usage of 30mA ELCB & ensuring Tripper operation
	Tools fall from height / body injury	Ensure barricading underneath the work area. Care to use tools	Not barricading / Not using proper tools	Training thru' pep talk before job startup.

**Scope/Purpose** : This Procedure is to establish and ensure safe method of Air Circuit Breaker



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**Maintenance**

**Responsibility** : Section Engineer – Electrical

**Accountability** : Head-Electrical

**PPE:**

- 55. Safety shoe,
- 56. Tested Electrical Rubber Hand Gloves
- 57. Cotton gloves
- 58. Safety Helmet

**Tools:**

- 45. Insulated tools

**Hazard Analysis:**

**Risks associated**

Injury due to charged spring  
Injury due to tip over of breaker  
Electrocution (Fatal)

**Mitigating Measures**

Proper handling methods  
Tested Electrical Rubber Hand Gloves  
Proper training

**Training needs:**

- 45. Usage of tools and Nature of Hazards
- 46. Usage of PPEs
- 47. Electrical shock recovery Training
- 48. Emergency preparedness
- 49. First aid including CPR training
- 50. Electrical safety training

**Procedure:**



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1. Get work permit from the concerned Electrical section in-charge.
2. Draw out the breaker from cubicle.
3. Ensure spring in discharged condition before starting the maintenance.
4. Clean the circuit breaker.
5. Check the fixed & moving contacts.
6. Check the arcing & pre-arcing contacts.
7. Check, clean & lubricate the spring and spring charging mechanism.
8. Check the current transformer and its terminal tightness.
9. Check the auxiliary contacts & limit switches.
10. Check the opening/closing coil and measure its resistance value.
11. Check the IR value and contact resistance of breaker.
12. Check the close/open operation manually.
13. Check the close/open operation electrically in Test position.
14. Switch off the AC & DC sources and ensure the spring in discharged condition.
15. Restore the breaker in cubicle.
16. Return the Work permit.

**Emergency / Emergency Shut OFF:**

If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.



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**Records/Annexure:**

48. JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Air Circuit Breaker maintenance	Date: 10.05.2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Req'd/recommended PPE: Safety shoe & Rubber Gloves, Nose mask, Goggles, Cotton gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning / checking of circuit breaker	Injury due to Bounce of handle	Ensuring proper engagement of manual spring charging handle	Slip of handle if not engaged properly / lock mechanism in not in tact	Usage of proper handle / ensuring proper lock mechanism
	Injury due to release of charged spring	Ensuring spring is discharged before assessing any moving part	Mishandling / Improper flag operation	Proper handling & ensuring flag operating mechanism
	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
IR value and contact resistance measurement	Electrical shock	Ensure good megger and good probes for measurement	Defective instrument / Damaged probe	Use calibrated instrument / Check the instrument and probes before use.
Lifting /shifting of circuit breaker	Injury due to slipping	Ensuring proper holding position & usage of suitable material for lifting & shifting of breaker	Improper holding methods / inferior lifting arrangement	Before handling, refer manual for proper holding methods & use tested and approved lifting accessories

**Scope/Purpose** : This Procedure is to establish and ensure safe method of Vacuum Circuit Breaker Maintenance

**Responsibility** : Section Engineer – Electrical



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**Accountability** : Head-Electrical

**PPE:**

- 59. Safety shoe,
- 60. Tested Rubber Hand Gloves
- 61. Safety helmet
- 62. Nose mask
- 63. Goggle

**Tools:**

- 46. Insulated tools

**Hazard Analysis:**

**Risks associated**

Injury due to charged spring  
Injury due to tip over of breaker  
Electrocution (Fatal)

**Mitigating Measures**

Proper handling methods  
Tested Rubber Hand Gloves  
Proper training

**Training needs:**

- 51. Usage of tools and Nature of Hazards
- 52. Usage of PPEs
- 53. Electrical shock recovery Training
- 54. Emergency preparedness
- 55. First aid including CPR training
- 56. Electrical safety training

**Procedure:**



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1. Get work permit from the concerned Electrical section in-charge.
2. Draw out the breaker from cubicle.
3. Ensure spring in discharged condition before starting the maintenance.
4. Clean the circuit breaker.
5. Check the fixed & moving contacts.
6. Check the physical condition of Vacuum bottles.
7. Check, clean & lubricate the spring and spring charging mechanism.
8. Check the auxiliary contacts & limit switches.
9. Check the opening/closing coil and measure its resistance value.
10. Check the insulation resistance and contact resistance value at closed condition.
11. Check the close/open operation manually.
12. Check the close/open operation electrically in Test position.
13. Switch off the AC & DC sources and ensure the spring in discharged condition.
14. Restore the breaker in cubicle.
15. Return the Work permit.

**Emergency / Emergency Shut OFF:**

If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**



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49. JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Vacuum Circuit Breaker maintenance	Date: 10.05.2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Safety helmet, Safety shoe, goggle, nose mask & Tested Rubber Hand Gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning / checking of circuit breaker	Injury due to Bounce of handle	Ensuring proper engagement of manual spring charging handle	Slip of handle if not engaged properly / lock mechanism not in tact	Usage of proper handle / ensuring proper lock mechanism
	Injury due to release of charged spring	Ensuring spring is discharged before assessing any moving part	Mishandling / Improper flag operation	Proper handling & ensuring flag operating mechanism
	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
IR value and contact resistance measurement	Electrical shock	Ensure good megger and good probes for measurement	Defective instrument / Damaged probe	Use calibrated instrument / Check the instrument and probes before use.
Lifting /shifting of circuit breaker	Injury due to slipping	Ensuring proper holding position & usage of suitable material for lifting & shifting of breaker	Improper holding methods / inferior lifting arrangement	Before handling, refer manual for methods & use tested and approved lifting accessories proper holding

**Scope** : Usage & Disposal of CRC Container

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head



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**PPE:**

- 40. Safety Helmet,
- 41. Safety Shoe,
- 42. Safety Hand Gloves.
- 43. Goggles
- 44. Nose mask

**Hazard Analysis:**

**Risk associated:**

Contact with Eye  
Contact with skin  
Inhalation

**Mitigation Measures**

Use of Goggles  
Use Hand Glove  
Use of Nose Mask

**Procedure:**

**Do's & Don'ts**

- 1. Do not Pierce the container.
- 2. Do not Burn Even after Use.
- 3. Do not Spray on a naked flame.
- 4. Do not spray on the Incandescent Material.
- 5. Store the material below 50 dec C

**First Aid Measure**

- 1. In case of Contact with Eye: Immediately flush with plenty of water for 15 Min.
- 2. In case Contact with Skin: Wash the affected area with soap and water
- 3. Incase Inhalation: Remove person to fresh air, keep the person calm and Call a physician.
- 4. For all above after First Aid Contact Physician.

**Disposal Procedure**

Return the Empty Container to store with proper scrap disposal note.





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**Emergency / Emergency Shut OFF:**

If any type of injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

50. JSA is enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Disposal of CRC Container	Date: 10 - 05 - 2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Safety shoe, Safety helmet, Goggle, Hand gloves, Nose mask.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Spray the CRC	Direct contact with Eye, Skin, & Inhalation	Use of PPE – Goggles, Glove, Nose mask.	Fail to Use PPE	Create & Improve the Awareness through PEP talks.
Collection and disposal of CRC container	Residual pressure, Residual flammable material	Do not pierce, Store below 50 Dec C	Piercing the container / Improper strage	Create & Improve the Awareness through PEP talks.

**Scope** : SOP for Trivector Meter

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head



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**PPE:**

- 45. Safety Helmet.
- 46. Safety Shoe.
- 47. Goggle.

**TOOLS:**

- 1. Trivector Meter Manual.

**Hazard Analysis:**

**Risk associated:**

- Flash Over of Panel
- Effect of Shock
- Effect of Eye Irritation

**Mitigation Measures**

- Use of Safety Harness
- Suitable Electrical Insulated glove
- Use of goggles

**Parameter Available in the Demand controller**

The Trivector meter we are using here is EM 3460 Smart demand controller.  
This meter is having 3 sections in it. They are trip, parameters and function.

**Trip:**

- shed
- restore
- DM>UL
- PdDM > UL

**Parameters:**

- UL
- ESLD
- MAX. DM
- Pd DM
- VA **h**
- VAR **h**
- V **Avg**



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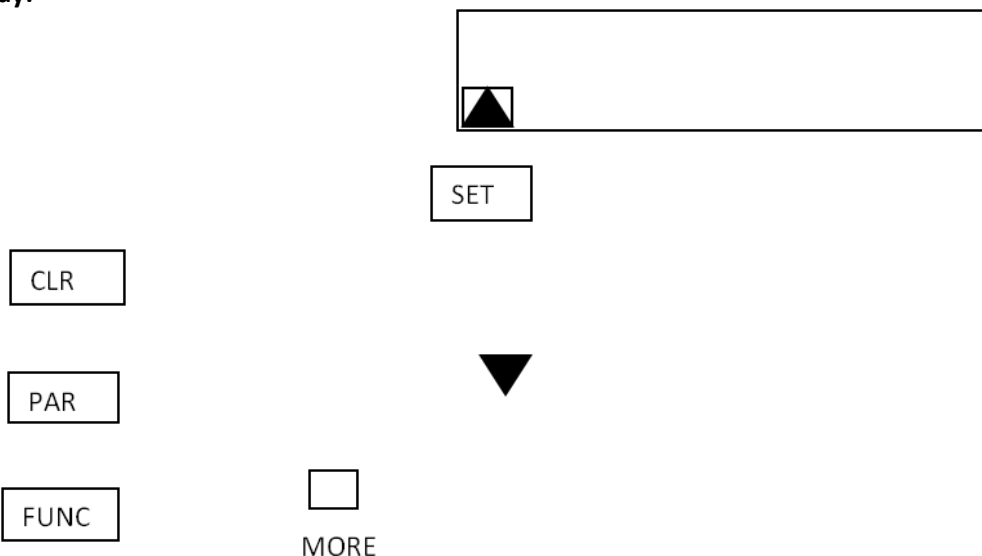
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- F Avg
- LL
- PdIN
- DM
- Spr LD
- W h
- PF Avg
- A h
- Hrs  $\Sigma$

**Function:**

- INTEG
- PROFILE
- OLD
- THD%

**Display:**



**Procedure:**



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1. To read the value that are present in the parameter section, press the PAR option  
Until the desired parameter is glowing.  
For example: we want to measure the VA, we have to press PAR option till the LED beside VA is turned ON.
2. Similarly there is another option called FUNC, using this button we can select the options present in function column.
3. In this function option there are 4 options as mentioned above. To select the required function press the FUNC option till the LED beside the required function.
4. Certain options in the parameter list are in two different colors, that means they can be used to check two different values. Operation of this can be explained as, we can measure the apparent power by using the option VA, this same parameter when selected can be used for checking the value of VA h.
5. This is possible when we select the function INTEG from the function block and VA option from the parameter block. Similarly, we can measure avg PF, V avg, etc.
6. This means we can easily identify which value we are reading by checking the blocks of parameter and the function blocks properly.
7. Once we selected the required option that is for suppose we selected 'V', then we can measure not only the total voltage but also we can measure the line voltages by pressing the option 'more' and also the phase differences.
8. The option HRS gives the day/ date/month and also the time at that moment.
9. In the OLD option present in the function block, previously deleted data is Present.

**Emergency Shut- off:**

If any injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761



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**Records/Annexure:**

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Parameter selection of tri vector meter	Date: 20 - 5 – 2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Engineer	Supervisor: Sec.Engr	Department: Electrical	Section: MISS	Approved by: HOD
Reqd./recommended PPE: Safety Shoe, Safety helmet, Goggle.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Identification of Tri Vector Meter	Trip of Power due to wrong selection of Meter.	Cross check with Display which is Displayed	Fail to Cross check the Meter Display not Available	Ensure the SOP to Followed Once in the Year Cross check the Displays.

**Scope** : Locking the coupling after alignment of RM and CM main motors

**Responsibility** : Electrical/Mechanical Engineer

**Accountability** : Electrical/Mechanical Section Head

**PPE:**

- 48. Safety Helmet,
- 49. Safety Shoe,
- 50. Safety Hand Gloves.

**TOOLS:**

- 34. Spanners,
- 35. Hand Blower,
- 36. Waste Cloth,
- 37. Venire caliper
- 38. Filler gauge



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**Hazard Analysis:**

**Risk associated:**

Effect of Eye Irritation  
Dust inhalation

**Mitigation Measures**

Use of Google  
Use of Nose mask

**Procedure:**

**A ) When motor base bolt not disturbed.**

1. Measure the gap between both sides coupling before removing the coupling pins.
2. Measure the coupling locking plate float gap both side before removing the coupling pins.
3. Check and note down the bearing positioning pointer.
4. Inspect the bearing as required.
5. Assemble the bearing housing and recheck the bearing positioning pointer and set as before opening the coupling pin.
6. Maintain the coupling gap as measured before opening.
7. Lock the coupling and maintain the both side float gap as before opening of coupling pin.

**B ) When motor base bolt disturbed.**

1. After alignment of motor and gear box, open the drive end motor bearing housing cover.
2. Measure the clearance between shaft collar and bearing thrust pad ( motor and coupling both side.)
3. Adjust the rotor shaft (by taking in or out) and maintain clearance between shaft collar and bearing thrust pad both side equal.
4. Assemble the bearing housing and set the bearing positioning pointer center of mark given on motor shaft for future reference.
5. Lock the coupling and maintain the both side float gap  $\pm 0.75$  mm.



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**SOP for Clearing the LOTO Permit in HT Feeders**

6. While load trial, Magnetic center to be checked by pointer

**Emergency / Emergency Shut OFF:**

33. If any injury is there, give First aid and inform to the Safety department or Call  
Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

- 3. LOTO permit.
- 4. JSA as enclosed below.
- 5. Isolation Matrix

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: coupling locking after alignment	Date:	Analysis by: section Engineer	Reviewed by: Section Head
Title of employee doing job: Technician/fitter	Supervisor: Section engineer	Department: Electrical	Section: Plant	Approved by: HOD Electrical
Reqd./recommended PPE:				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Cleaning HT Motor Bearing Housing	Injury to head due to striking against some solid object or due to impact with something falling on head from height	Use Helmet	Walking around the motor without seeing the floor, Projecting materials, power cables, portable equipments which lead to Slip, Trip, Fall / Falling from height	Educating importance of PPE through pep talk. (Always wear Helmet, Safety shoe, Hand Gloves, Nose mask)



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			objects Impact to body.	
	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
Removing/Fixing of bearing housing top cover	Body injury	Use proper and correct size of lifting tools	Holding mechanism of lifting tools may break	Check the holding mechanism before use.  Tool box training before start the job.
		Use the hand gloves	Damaged hand gloves	To be replaced periodically.

**Isolation Matrix**

Activity	Isolation Type	Tag /Name of the Equipment							
		Electrical Energy					Other Energy		
Inspection of bearing and locking of coupling	<i>Name and Tag for the Equipment</i>	1.Mill Main Motor Breaker out	2.Mill Aux. Drive( if chain is connected)	GB lubrication pumps LOTO	Tension hydraulic pump LOTO	nil	Ensure Mill aux. drive chain in remove condition	Ensure to No maintenance job in EOT crane	nil

**Scope** : Online Blowing of HT/LT motor

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Engineer / Head





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**PPE:**

- 51. Safety Helmet,
- 52. Safety Shoe,
- 53. Safety Hand Gloves.
- 54. Fire proof suit

**TOOLS:**

- 39. Spanners,
- 40. Hand Blower,
- 41. Waste Cloth.

**Hazard Analysis:**

**Risk associated:**

- Effect of Eye Irritation
- Dust inhalation
- Slippage of tools

**Mitigation Measures**

- Use of Google
- Use of Nose mask
- Proper Usage/handling the tool

**Procedure:**

1. Ensure the weather condition should be dry and less wind velocity.
2. Connect the blower properly with Industrial Single phase socket.
3. While blowing the motor , people should maintain minimum clearance between live parts and the blower.
4. Clean the area after completion of the work.

**Emergency Shut- off:**

- 34. Trip the Motor
- 35. If any injuries are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.



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**Records/Annexure:**

**JSA enclosed**

<b>Job Safety Analysis</b>	Job: Online blowring of HT Motor slipring	Date:	Analysis by:	Reviewed by: SH
Title of employee doing job:	Supervisor: Sec.Engr	Department: Electrical	Section: Plant	Approved by: HOD
Req'd/recommended PPE:				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Cleaning of motor body parts	Contact with live / rotating parts	Keep safe distance while blowing	Blower hose may contact with rotating parts, which leads to Entrapment	Avoid contact with moving parts maintain safe distance for Blowing
	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
Opening / Closing of Chamber door	Leg injury due to fall of Chamber door	Door to be lifted by two person	Lifting by one person	Educating by pep talk

**Scope** : SOP is applicable for resume the power supply within 5 to 6 minutes for Kiln Aux. drive during black out.



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**Responsibility** : Shift Electrical engineer

**Accountability** : Section Head Electrical

**PPE:**

- 64. Safety helmet,
- 65. Safety shoe,
- 66. Nose Mask.
- 67. Safety Gloves.
- 68. Torch light

**Tools:**

- 47. General Tools
- 48. Cycle

**Hazards:**

**Risks associated**

- 1. In case night hit with objects and fall

**Mitigating Measures**

Keep torch light during night

**Training needs:**

- 57. Work related training
- 58. Emergency preparedness

**Procedure for resuming the power supply during black out.**

- 9. Shift Engineer will approach to CMBH load center
- 10. One shift Technicians will approach to CCR load center and start the CCR DG and wait for further instruction of Shift Engineer.
- 11. Other Technician will approach to 110 KV switch yard by cycle and observed the availability of EB power.
- 12. Shift Engineer will observed 11 KV voltage on CB 8 board ( to ensure the availability of EB power)
- 13. **If 11 KV voltages is not available on CB8**, shift Engineer will informed to CCR LC technicians for changed over the DG supply for kiln aux. And after confirming the DG supply Shift engineer will give clearance to CCR operator for running the KILN aux. only and some area lighting.



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14. **If 11 KV voltage available on CB 8**, Shift engineer will note down the Alarm from annunciation, protection relay (P127) mount on CB 8 and CB 6 and Master trip relay on CB8.
15. Clear the all alarm from protection relay (P127) on CB 8 and CB6 board , reset the Master trip relay, reset the alarm of annunciation by acknowledge and reset PB on Bus coupler board and *immediately give the clearance to CPP for closing the CB 8*.
16. After closing CB- 8, instruction to be given to CCR load center technicians for normalized the LT side power and go to the RMBH load center and normalized the LT side power and shift engineer will normalize the power at CMBH LC LT side power (LT side power normalized , means of closing the distribution Transformer incomer at PCC by pressing the neutral contactor PB and same time closing the TNC )
17. After normalizing the power Shift Engineer will give the clearance for kiln aux. and lightings during peak time (between 5.35 PM to 10.10 PM) and Kiln section during normal time (10.10 pm to next day 5.45 PM).
18. Follow up to CPP for resume the CPP power. After synchronizing the CPP clearance shall be given for all section from confirmation of CPP.
19. **Continuation of point 5 (If 11 KV voltages is not available on CB8)** shift engineer contact to 110 KV Technicians for further information.
20. 110 KV technicians will check the availability of 110 KV by observing the voltage on CRP panel.
21. If 110 KV power available and 11 KV breakers tripped then note down the all alarms and reset the alarms by means of re-setting master trip relay, clearing the alarms of protection relay and acknowledge and reset the PB on 11 KV boards.
22. Shift Engineer will contact 110 KV technician and based on information, give the instruction to technician to closing the 11 KV breaker. Before giving the instruction to closing the 11 KV breaker at 110 KV, shift Engineer must ensure CB - 8 breaker in open condition.



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23. After Closing the 11KV breaker at 110 KV ,shift engineer will follow the point No- 6,7,8,9 and 10.and the same time give the instruction to CCR technicians for changeover CCR power from DG to EB.
24. **If EB Power not available** Shift Engineer will contact EB ( Through Mr. Sudhakar) for resuming the EB power and contact to CPP for resume the CPP Power.
25. If delay more than 20 minutes to resume the both source, Switch on RMBH DG and CMBH DG and give clearance for lighting power.
26. After Resuming the EB power Follow the Point no 14&15.And change over the RMBH , CCR and CMBH DG to normal power.

**Emergency / Emergency Shut OFF:**

36. If electrical shock injury or burn are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

- 51.JSA as enclosed below.

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: Resume the power during blackout	Date: 01 – 04 - 2014	Analysis by: Shift Incharge	Reviewed by: Section Head
Title of employee doing job: shift engineer / Electricians	Supervisor: Shift In charge	Department: Electrical	Section: All Section	Approved by: Electrical HOD
Req'd/recommended PPE: Safety helmet, Safety shoe, Mask & Gloves.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Approaching the LC during black out in night	Hit with objects and fall	Go with torch light	Torchlight may not work due to not charging	To be charge in day time and ensuring by Siemens in charge.
Change over from normal to DG and vice versa.	May be flash over.	Follow instruction of changeover.	Lacking of aware	Periodical pep talk.

**Scope** : Replacement of DE and NDE bearing of 3200 KW BHEL Motor.



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**Responsibility** : Electrical Engineer

**Accountability** : Section Head

**PPE:**

- 73. Goggles
- 74. Asbestos hand Gloves
- 75. Cotton Gloves
- 76. Safety shoes
- 77. Safety helmet

**Tools:**

- 77. Hand Blower
- 78. Waste Cloth
- 79. Suitable spanner
- 80. Hammer
- 81. Shaft extension Arrangement.
- 82. Induction Heater.

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Electrical Safety Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

- 57. Emergency preparedness

**Procedure:**



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291. Take the LOTO for the particular Motor as per ELEC/SOP/001.
292. Clean the Motor Bearing housing area with Hand Blower / Cloth.
293. Make necessary arrangement for extension of shaft in case of NDE bearing replacement.
294. Support the Motor Rotor on two no's 100 Ton Jack.
295. Removed the bearing housing and bearing grease cup bolts
296. Removed bearing housing it will come along with bearing outer race.
297. Clean the grease from the Shaft by cloth and remove the Inner race Slip Ring Chamber, Carbon Brushes & Holders with hand blower and cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
298. Check the Condition of Carbon Brushes, Measure the Length of Carbon Brushes.
299. Replace the Carbon Brushes, if worn out.
300. Check the Spring Tension of the Carbon Brush Holders properly.
301. Check the Condition of Insulators in all the Terminal Box and Slip Ring & Carbon Brush Holders.
302. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals with discharge rod.
303. Close the all Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
304. Check the oil level in the bearings. Top up if the level is less than the normal indicated level. For make up oil level, use proper instrument and avoid spillage of oil in the ground.
305. In case of any oil spillage while working, it is to be collected and returned store for recycling as per SOP / ELEC / 022.



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- 306. Clean the LPB and Check the Control Wiring Tightness, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 307. Check the Motor and LPB Body earthing.
- 308. Check the Condition of LPB Actuators and Contacts.
- 309. Close the LPB Door Properly.
- 310. Clear the LOTO as per ELEC/SOP/002 and Check the Healthiness of the motor with CCR.
- 311. Take Trial if Possible and record all Check point in the concern Check list.

**Emergency / Emergency Shut OFF:**

- 37. If electrical shock injury or burn are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

- 52. Refer LOTO permit.
- 53. JSA as enclosed below.





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## SOP for Clearing the LOTO Permit in HT Feeders

### JOB SAFETY ANALYSIS :( JSA)

<b>Job Safety Analysis</b>	Job: LT panel maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Req'd/recommended PPE: Nose mask, Goggles, Electrical safety Gloves, Cotton Gloves, Safety shoes, Safety helmet				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of motor terminals by open the motor door, Check the tightness of Power and control terminals	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles	Periodic replacement
	Respiration problem	Wear Nose mask	Damaged nose mask	Periodic replacement
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Electrical safety gloves	Damaged Gloves	Periodic replacement.
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
Check the motor carbon brushes, Clean the motor cooler cooling Tubes		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles	Periodic replacement
	Respiration problem	Wear Nose mask	Damaged nose mask	Periodic replacement
	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety	Tools and material may fall on human	



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Check the motor Door earthing, close the door properly. Clear permit	Body Injury	shoes , hand gloves  Use proper tools  Wear safety helmet, safety shoes , hand gloves	body  Nonstandard /damaged tools  Tools and material may fall on human body	Without PPE don't perform the job  Training for tools handling/ Periodic replacement  Without PPE don't perform the job
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**Scope** : Describing Split & window AC maintenance procedure.

**Responsibility** : Electrical Engineer.

**Accountability** : Section Head

**PPE:**

- 78. Nose mask
- 79. Goggles
- 80. Tested Electrical Rubber Hand Gloves
- 81. Cotton Gloves
- 82. Safety Shoes
- 83. Safety Helmet
- 84. Full Body Harness.

**Tools:**

- 83. Wire Brush
- 84. Hand Blower
- 85. Waste Cloth
- 86. Suitable Spanners
- 87. Certified FRP Ladder.
- 88. Insulated Screw Driver

**Hazards:**

Risk Associated  
Electrical Shock

Mitigating Measures  
Tested Electrical Rubber Hand Gloves



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Minor body injury

Safety shoes, gloves, helmet, goggles, FRP ladder.

Training needs:

- 58. Electrical shock recovery Training
- 59. Emergency preparedness
- 60. Work at height

**Procedure for Indoor Unit Maintenance:-**

- 312. Switch OFF for the particular Split AC control MCB.
- 313. Remove the AC power supply Plug top from the socket.
- 314. Clean the AC Indoor with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 315. Remove the front cover from the Indoor.
- 316. Remove the dust filter from the Indoor.
- 317. Clean the dust filter with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 318. Check the all Power and control board cable connection tightness with proper tools.
- 319. Check the Indoor blower condition.
- 320. Check the Indoor condensation coil.
- 321. Clean the indoor condensation coil with water and Hand Blower & cleaning brush. while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 322. Close the AC indoor front cover properly.
- 323. Fix the dust filter properly.
- 324. Ensure closing of front door properly.

**Procedure for Outdoor Unit Maintenance:-**

- 1. Remove the Split AC outdoor top cover.



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2. Clean the outdoor with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
3. Check the compressor terminal and capacitor terminal.
4. If any abnormal found in terminal, terminal wire clip to be changed.
5. Check the compressor gas pressure and record.
6. If gas level low, R22 gas to be filled. While gas filling use PPEs like Nose mask, goggles and and gloves. .
7. R22 gas cylinder tapping nut to be proper tide for avoiding the any gas leak.
8. After checking gas pressure, Dummy to be closed properly.
9. Check the Outdoor fan condition.
10. Clean the outdoor fan leaf properly with brush and cloth.
11. Check heat exchanger gas leakage and clean with water with bush and cotton waste.
12. Close the outdoor cover properly.
13. Check the remote battery condition.
14. If battery low, Battery has to be replaced.
325. Ensure the tools quantity.
326. Insert the plug top in power socket.
327. Switch ON the control MCB.
328. Check total AC current and record.
329. Check Indoor and Outdoor noise level.

**Procedure for Window AC Unit Maintenance:-**

1. Switch OFF for the particular window AC control MCB.
2. Remove the AC power supply Plug top from the socket.
3. Clean the AC front door with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
4. Remove the front cover from the window AC.
5. Remove the dust filter from the window AC.
6. Clean the dust filter with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.



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7. Check the all Power and control board cable connection tightness with proper tools.
8. Remove the AC unit from the unit.
9. Check the AC blower condition.
10. Check the condensation coil.
11. Clean the condensation coil with water and Hand Blower & cleaning brush. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
13. Check the compressor terminal and capacitor terminal.
14. If any abnormal found in terminal, terminal wire clip to be changed.
15. Check the compressor gas pressure and record.
16. If gas level low, R22 gas to be filled. While gas filling use PPEs like Nose mask, goggles and gloves. .
17. R22 gas cylinder tapping nut to be proper tide for avoiding the any gas leak.
18. After checking gas pressure, Dummy to be closed properly.
19. Insert the AC unit to body.
20. Close the door cover properly.
21. Fix the dust filter properly.
22. Check the remote battery condition.
23. If battery low, Battery has to be replaced.
24. Ensure the tools quantity.
25. Insert the plug top in power socket.
26. Switch ON the control MCB.
27. Check total AC current and record.

**Emergency / Emergency Shut OFF:**

38. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**



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54. Refer Line clearance certificates.

55. JSA as enclosed below.

## JOB SAFETY ANALYSIS :( JSA)

<b>Job Safety Analysis</b>	Job: LT panel maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Tested Electrical Rubber Hand Gloves, Cotton Gloves, Safety shoes, Safety helmet, certified ladder, certified safety belt.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE, Take Permit				
Cleaning of Indoor and Outdoor.	Eye irritation,	Wear goggles	Damaged goggles / non standard goggles / Not wearing Goggle.	Periodic replacement / Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Fall from height	Use proper FRP ladder	Gripper of the ladder may damage	Certified ladder to be use. Before use has to be inspect.
Check and fill R22 gas	Eye irritation,	Wear goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
		Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training



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**SOP for Clearing the LOTO Permit in HT Feeders**

	Respiration problem Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
Box up the AC	Fall from height	Use proper FRP ladder	Gripper of the ladder may damage	Certified ladder to be use. Before use has to be inspect.
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : Trouble shooting in live panel for control scheme only

**Responsibility** : Engineer/Electricians

**Accountability** : Electrical Manager

**PPE:**

- 85. Nose mask
- 86. Goggles
- 87. Safety shoes
- 88. Safety helmet
- 89. Rubber hand gloves

**Tools:**

- 89. Test lamp
- 90. Insulated tools
- 91. Multi meter
- 92. Line Tester

**Hazards:**

**Risk Associated**

Electrical Shock  
Minor body injury  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles  
Re- fresher Training

**Training needs:**



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- 61. Emergency preparedness
- 62. First aid training
- 63. First aid including CPR training
- 64. Electrical safety training

**Procedure:**

- 31. Use proper PPE.
- 32. Only Use electrical safety shoes for trouble shooting in live panel and stand on rubber mat.
- 33. Use only insulated hand tools.
- 34. Use tested electrical rubber hand gloves wherever required.
- 35. Only qualified Technician / Engineer personnel work on clutch.
- 36. Do not carry out the work in clutch if Place / person are in wet condition.
- 37. Be alert and keep yourself beside the clutch during opening the clutch cover.
- 38. After opening the clutch inspect and ensure that there is no live power supply in clutch coil. If required take LOTO and do necessary arrangement for isolation the power supply.
- 39. Ensure tightness in clutch coil wire connector.
- 40. Ensure clutch plate gap <0.4mm by peeler gauge.
- 41. Gap should adjust through adjustable nut.
- 42. Ensure clutch coil resistance and IR value.
- 43. After finishing the Job, close covers properly.
- 44. Switch ON the clutch power supply .
- 45. Ensure coil voltage 24VDC.
- 46. If coil volt not came. Then check SMPS and control fuse.
- 47. If coil voltage 24VDC came, Then should take trial with slow travel dive.





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- 48. Ensure noise, clutch output during slow travel move condition.
- 49. If nothing observed, then we will take trial through fast travel drive.
- 50. During fast travel running, slow travel motor should not rotate.
- 51. If rotate slow drive motor, Then clutch gap should be increased little bit.

**Emergency / Emergency Shut OFF:**

- 39. If any injury or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

- 56.JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Trouble shooting in live panel	Date:	Analysis by: Section engineer	Reviewed by: Section head
Title of employee doing job: Engineer / Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Tested Electrical rubber hand gloves, Safety shoes, Safety helmet, Safety Goggle				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Opening of live panel cover	Body injury	Use suitable tools	Tool may be damaged	Inspect before use
	Panel flash over and Burned injury	Keep yourself beside the panel	Not follow the procedure	Tool box talk/Proper Training
		Wear safety Goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
Trouble shooting	Short circuit.	Use Insulated tools	Insulation may	Inspect before use



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**SOP for Clearing the LOTO Permit in HT Feeders**

			damage.	
		Testing tools to be hold straight	Not follow the procedure	Tool box talk/SOP Training
	Panel flash over and Burned injury	Wear safety Goggles / Electrical glove	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
		Power conductor to be covered by shroud	Failed to inspect or cover	Inspect before start the job

**Scope** : Trouble shooting in wall mounting fan.

**Responsibility** : Engineer/Electricians

**Accountability** : Electrical Manager

**PPE:**

- 90. Nose mask
- 91. Goggles
- 92. Safety shoes
- 93. Safety helmet
- 94. Rubber hand gloves

**Tools:**

- 93. Test lamp
- 94. Insulated tools
- 95. Multi meter
- 96. Line Tester
- 97. FRP “A”type ladder.

**Hazards:**



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**Risk Associated**

Electrical Shock  
Minor body injury  
Electrocution (Fatal)  
Electrical Flash  
Electrical Fire  
Fall from height

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles,  
FRP ladder, Re- fresher Training

**Training needs:**

- 65. Emergency preparedness
- 66. First aid training
- 67. First aid including CPR training
- 68. Electrical safety training

**Procedure:**

- 52. Use proper PPE.
- 53. Only Use electrical safety shoes for trouble shooting in live panel and stand on rubber mat.
- 54. Use only insulated hand tools and FRP “A” type ladder.
- 55. Use tested electrical rubber hand gloves wherever required.
- 56. Only qualified Technician / Engineer personnel work on wall mounting fan.
- 57. Do not carry out the work in wall mounting fan if Place / person are in wet condition.
- 58. Switch OFF the power supply and unplug the wall mounting fan wire.
- 59. Ensure power supply availability at switchboard socket. If not came please check distribution board. If not came please follow below procedures.
- 60. Be alert and keep yourself beside the fan during removing the wall mounting fan.
- 61. After removing the wall mounting fan inspect and ensure that there is no live power supply in fan.



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62. Ensure glass fuse healthiness. If glass fuses getting fail. Ensure the fan motor winding resistance, insulation Value, circuit connection and capacitor.

63. Ensure fan motor shaft rotating freely or getting jam.

64. If Coil getting short or open, send to recondition.

65. If getting jam, check the motor shaft bush condition and lubrication.

66. Clean & lubricate or to change the new bush.

67. Cleaning the fan leaf, motor body and mesh also.

68. After finishing the Job, Assemble properly.

69. Then take trial and to be observe noise and direction. If found all are normal, then fix to Existing location.

70. Before fix the wall, alert and keep yourself beside the fan during removing the wall mounting fan

71. Ensure power socket voltage 230VAC.

72. Then insert the plug and switch ON the power supply.

**Emergency / Emergency Shut OFF:**

40. If any injury or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

57. JSA as enclosed below.

**JOB SAFETY ANALYSIS :(JSA)**

<b>Job Safety Analysis</b>	Job: Trouble	Date:	Analysis by:	Reviewed by: Section head
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**SOP for Clearing the LOTO Permit in HT Feeders**

	shooting in live panel		Section engineer	
Title of employee doing job: Engineer / Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Tested Electrical rubber hand gloves, Safety shoes, Safety helmet, Safety Goggle, FRP ladder.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Removing and opening of fan	Body injury	Use suitable tools	Tool may be damaged	Inspect before use
		Keep yourself beside the fan	Not follow the procedure	Tool box talk/Proper Training
		Wear safety Goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
Trouble shooting	Short circuit.	Use Insulated tools	Insulation may damage.	Inspect before use
		Testing tools to be hold straight	Not follow the procedure	Tool box talk/SOP Training
	Burned injury	Wear safety Goggles / Electrical glove	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training
		Power conductor to be covered by shroud	Failed to inspect or cover	Inspect before start the job

**Scope** : Portable & welding machine fitness certification

**Responsibility** : Electrical Engineer

**Accountability** : Section Head



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**PPE:**

- 95. Goggles
- 96. Insulated hand Gloves
- 97. Safety shoes
- 98. Safety helmet
- 99. Nose Mask

**Tools:**

- 98. Hand Blower
- 99. Waste Cloth
- 100. Suitable spanner
- 101. Screw Driver
- 102. Multimeter
- 103. Brush

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Electrical Safety Gloves  
Safety shoes, gloves, helmet, goggles

**Training need:**

Emergency preparedness

**Procedure:**



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- 330. Check type of the Machine.(Hand Blowers, Vacuum Cleaner, Drilling Machine, Grinding Machine, Bricks Cutting Machine, Metal Cutting Machine, Castable Mixture machine, Vibrator machine, Hammer Breaker, Hot Air Blower, Metal Extension Board, 24V Transformer, Water Pressure Pump, Welding Machine)
- 331. Check the Condition of the Portable tool as per Check List ELEC/CM/14 and welding Machine as per Check List ELEC/CM/028.
- 332. Check the Condition of the plug Top condition and proper termination.
- 333. Check the Condition of the cable, Ensure it's should not have any joint. If Joint is there need to replace.
- 334. Check the Earth wire Continuity.
- 335. Check the Tool Switch condition and operation.
- 336. Check the physical damage of tool.
- 337. Check the all covers of welding Machine
- 338. Check the condition of welding Machine Incoming Switch/MCB
- 339. Check the condition of welding Machine Primary Terminals and terminal cover in place.
- 340. Check the condition of welding machine secondary terminals and cable connections.
- 341. Clean the machine with brush or Blower
- 342. Check the machine body earthing
- 343. Check the insulation value of phase to earth and note down in checklist
- 344. Clean all Terminals and tools by brush or Hand Blower
- 345. Check the Tools Operation with supply (wear Electrical Insulated safety hand Gloves while Testing)



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346. Paste the Fitness sticker as per standard Colour Code (April to June – Red Colour, July to September – Yellow Colour, October to December – Blue Colour, January to March – Green Colour)
347. Get the signature from Concern Electrical Engineer and Concern Department Section Engineer

**Emergency / Emergency Shut OFF:**

41. If electrical shock injury or burn are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

58. Refer Check List ELEC/CM/14.
59. JSA as enclosed below.





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**SOP for Clearing the LOTO Permit in HT Feeders**

**JOB SAFETY ANALYSIS :( JSA)**

<b>Job Safety Analysis</b>	Job: Portable Tools Fitness Certification	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Required /recommended PPE:  1. Goggles 2. Insulated hand Gloves 3. Safety shoes 4. Safety helmet 5. Nose Mask				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Put on PPE,  Cleaning of Tools and Terminals	Eye irritation,  Respiration problem  Body injury	Wear goggles  Wear Nose mask  Wear safety helmet, safety shoes , hand gloves	Damaged goggles/non standard goggles Damaged nose mask  Tools and material may fall on human body Damaged Gloves	Periodic replacement  Periodic replacement  Without PPE don't perform the job
Checking the tool with Supply	Electrical shock	Use Electrical safety gloves	Nonstandard /damaged tools	Periodic replacement.

**Scope** : This Procedure to establish and ensure safe method of Overhauling of Drum Motors.

**Responsibility** : Section Engineer – Electrical

**Accountability** : **Section Head-** Electrical

**PPE:**

- 69. Safety helmet,
- 70. Safety shoe,
- 71. Cotton gloves,



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72. LT Rubber gloves.

**Tools:**

- 49. Insulated tools,
- 50. Lifting Equipment's.
- 51. Bearing Puller
- 52. Bearing Fitting Kit

**Hazard Analysis:**

**Risks associated**

Injury  
Electric shock

**Mitigating Measures**

Use of proper Handling equipments  
Use of Proper Testing procedure & Insulated tools

**Training needs:**

- 59. Usage of tools and Nature of Hazards
- 60. Usage of PPEs

**Procedure:**

- 348. Take the LOTO permit for the particular Drum Motor as per ELEC/SOP/003 and General Work permit.
- 349. Clean the Drum Motor with Wire Brush, Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
- 350. Discharge the Motor terminals after opening the terminal box Cover while opening, handle cover firmly.
- 351. Disconnect the motor power and earth connections after proper marking of connection, while disconnecting, use proper tools.



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352. Shift the Drum motor to dust free environment for overhauling. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
353. Drain out the oil from Drum motor using proper tools such as trays and dispose the oil as per disposal process.
354. Remove the End cover with fixed shaft from the rotating drum. While removing, handle the end cover properly.
355. Remove the motor unit from the rotating drum and handle the motor properly.
356. Clean the oil from rotor and stator winding with winding cleaner, cloth and hand blower while cleaning use PPEs like Nose mask, goggles and hand Gloves.
357. Apply the varnish to the stator winding if required.
358. If varnish applied stator winding is to be dried out in the clean environment.
359. Remove / Change the bearings if required to replace with proper puller and tools.  
Before replace the new bearing, check the condition of bearing.
360. Check the condition of Electric brake if it is in the motor, found any abnormal change the brake.
361. Check the condition of power cable flexible leads, if required change the flexible leads.
362. Change the oil seals if required and use proper tools.
363. Assemble the motor unit with Rotating drum, while assembling, handle the motor firmly and avoid the stator winding damage.
364. Fix the End cover with fixed shaft to the rotating drum.
365. Fill the Drum motor with required quantity of oil as per specification.
366. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals.
367. Place the drum motor on its stand and give the motor power, earth connections with proper tools.



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368. Take no load trial, and then disconnect the motor power & earth connection.
369. Shift the Motor to its location. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
370. After mechanical alignment, connect the motor power and earth connections as per marking. While connecting, use proper tools.
371. Check the motor Direction. Change the phase sequence if required.
372. Close the Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
373. Clear the LOTO permit as per ELEC/SOP/004.
- Take Trial if Possible and record all Check point in the concern Check list

**Emergency / Emergency Shut OFF:**

- 42.** If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

60. Refer LOTO permit.
61. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Overhauling of Drum Motors	Date:	Analysis by:	Reviewed by:
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## SOP for Clearing the LOTO Permit in HT Feeders

Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves, Cotton hand gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning of Motors	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem due to dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Oil spillage	Use oil tray	Oil tray may	Follow SOP
Open the motor terminal box cover to discharge	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Cable disconnection and decoupling	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Shifting of Motor	Fall of object	Proper shifting method	Slip during shifting	Double holding method
Dismantling & assembling of motor	Injury due to striking	Proper dismantling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Applying Varnish	Unconsciousness	Proper Varnishing method	Release of Toxic gases during varnishing	Usage of quality varnish & Proper Varnishing method
Heating of Winding	Electric Shock	Proper heating method	Open ended terminals	To be take extra precaution during heating
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Trial Run of Motor	Electric shock	Proper method for Trial run	Open ended terminals / Improper Earthing	Usage of proper trial methods & Ensuring

**Scope** : This Procedure to establish and ensure safe method of Overhauling of Geared Motors

**Responsibility** : Section Engineer – Electrical

**Accountability** : Section Head-Electrical

**PPE:**

73. Safety helmet,

74. Safety shoe,



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75. LT Rubber Gloves.

76. Cotton gloves

**Tools:**

53. Insulated tools

54. Lifting Equipment's

55. Bearing puller

56. Bearing fitting kit

**Hazard Analysis:**

**Risks associated**

Injury

Electric shock

**Mitigating Measures**

Use of proper Handling equipments

Use of Proper Testing procedure & Insulated tools

**Training needs:**

61. Usage of tools and Nature of Hazards

62. Usage of PPEs

**Procedure:**

374. Take the LOTO permit for the particular Geared Motor as per ELEC/SOP/003 and General Work permit.

375. Clean the Geared Motor with Wire Brush, Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.

376. Discharge the Motor terminals after opening the terminal box Cover while opening, handle cover firmly.

377. Disconnect the motor power and earth connections after marking of connection while disconnecting, use proper tools.

378. Drain out the oil from gear box using proper tools such as trays and dispose the oil as per SOP.

379. Decouple the motor and Remove the geared box from motor with proper tools.



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380. Shift the Motor to dust free environment for overhauling. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
381. Remove the pinion from motor shaft with proper puller/ tools.
382. Dismantle the Cooling fan cover and Cooling fan while dismantling, use proper tools.
383. Dismantle both end covers / shields while dismantling use proper tools.
384. Remove the rotor from stator body. While removing handle the rotor and tools firmly to avoid the stator winding damage.
385. Clean the oil from rotor and stator winding with winding cleaner, cloth and hand blower while cleaning use PPEs like Nose mask, goggles and hand Gloves.
386. Clean the End shields, cooling fan and cooling fan covers with hand blower / cloth. While cleaning use PPEs like Nose mask, goggles and hand Gloves.
387. Apply the varnish to the stator winding if required.
388. If varnish applied stator winding is to be dried out in the clean environment.
389. Remove / Change the bearings if required to replace with proper puller and tools. Before replace the new bearing, check the condition of bearing.
390. Assemble rotor in to the Stator body with proper tools. While assembling, handle the rotor firmly and avoid the stator winding damage.
391. Assemble end covers with proper tools and ensure no availability of foreign material in the stator body.
392. Change the oil seal if required.
393. Assemble the cooling fan and cooling fan covers. While assembling, Use proper tools.
394. Check the Power Cable Connection Tightness & Condition of Terminal Block with proper tools.
395. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals.



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396. Take no load trial if possible and use rubber Mat & Gloves for trial run.
397. Close the Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
398. Shift the Motor to motor bed. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
399. Assemble Gear box with motor. Before assemble check the condition of gear box, if required service the gear box with the help of mechanical department.
400. After mechanical coupling, connect the motor power and earth connections as per marking. While connecting, use proper tools.
401. Clear the LOTO permit as per ELEC/SOP/004.
- Take Trial if Possible and record all Check point in the concern Check list

**Emergency / Emergency Shut OFF:**

43. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

62. Refer LOTO permit.
63. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Overhauling of LT Motors	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves, Cotton hand gloves.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>





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## SOP for Clearing the LOTO Permit in HT Feeders

Cleaning of Motors	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
	Oil spillage	Use oil tray	Oil tray may damaged	Check before use
Open the motor terminal box cover to discharge	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Cable disconnection and decoupling	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Shifting of Motor	Fall of object	Proper shifting method	Slip during shifting	Double holding method
Dismantling of motor	Injury due to striking	Proper dismantling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Applying Varnish	Unconsciousness	Proper Varnishing method	Release of Toxic gases during varnishing	Usage of quality varnish & Proper Varnishing method
Heating of Winding	Electric Shock	Proper heating method	Open ended terminals	To be take extra precaution during heating
Assembly of motor	Injury due to striking	Proper assembling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Shifting, cable connection	Fall of object	Proper shifting method	Slip during shifting	Double holding method
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Trial Run of Motor	Electric shock	Proper method for Trial run	Open ended terminals / Improper Earthing	Usage of proper trial methods & Ensuring proper earthing
	Body injury due to loose clothing	Wear cover all suit, safety goggles, cotton clothes, safety shoes, safety helmet	Loose cloth may get caught with the rotating shaft makes severe injuries	before approach the motor, make sure of proper clothing and PPE

**Scope** : This Procedure to establish and ensure safe method of Fire alarm Maintenance.



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<b>Issued By: M.R</b>	<b>Approved By: HOD - ELECTRICAL</b>
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**SOP for Clearing the LOTO Permit in HT Feeders**

**Responsibility** : Section Engineer – Electrical

**Accountability** : **Section Head**-Electrical

**PPE:**

1. Nose mask
2. Goggles
3. Cotton Gloves
4. Safety shoes
5. Safety helmet
6. Full body harness with double lanyard

**Tools:**

57. Insulated tools
58. FRP Ladder
59. Hot air blower
60. Agar bathi

**Hazard Analysis:**

**Risks associated**

Injury  
Electric shock  
Fall from height

**Mitigating Measures**

Use of proper Handling equipments  
Use of Proper Testing procedure & Insulated tools  
Full body harness with double lanyard

**Training needs:**

1. Emergency preparedness
2. First aid training

**Procedure:**



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402. Take Electrical and Height Work permit for Fire alarm maintenance.
403. If the detector located in confined location such as Trench, tunnel etc., Take confined space work permit.
404. Clean the Fire alarm panel with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
405. Check the tightness of power & control terminals and use 440Volts Insulated Rubber hand gloves.
406. Check and ensure the panel double earthing.
407. In panel, Note down the list of troubles/ Alarms if any.
408. If there are no troubles/ alarms, then go to step no: 10, otherwise go to next step.
409. In panel check the "SHORT" LED glowing. If LED is glowing, the circuit got short circuited and the detectors in that circuit shown in trouble.
410. Check the circuit using multimeter for any short circuit and isolate the faulty detectors/ cables from the circuit. If possible replace the detectors/ rectify the faulty cable.
411. Remove the detector from its detector base, while removing handle the detector firmly and avoid the fall of detector, use FRP ladder and Full body harness.
412. Clean the detectors one by one using Hand blower and use proper PPEs like Nose mask, goggles and Rubber hand Gloves.
413. Refix the detector with its base in same location.
414. Check the healthiness of detector
  1. If it is Smoke detector, check by using Agar bathi.
  2. If it is Heat detector, check by using Hot air blower.
415. Check the healthiness of panel
416. Check the battery voltage in panel.
417. Check the healthiness of hooters.



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## SOP for Clearing the LOTO Permit in HT Feeders

### Emergency / Emergency Shut OFF:

44. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

### Records/Annexure:

64. JSA as enclosed below.

### JOB SAFETY ANALYSIS: (JSA)

Job Safety Analysis	Job: Overhauling of LT Motors	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe, Rubber Gloves, Cotton hand gloves & Full body harness with double lanyard.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning of detectors	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
Removing the detectors	Tools slip	Use suitable tools	Tool may be damaged	Tool box talk Periodic replacement
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Periodic replacement
	Fall from height	Use safety belt with double lanyard	Defective safety belt	Check the belt condition before use / Check the inspection validity
Check the termination tightness of all accessories	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
	Body injury due to loose clothing	Wear cover all suit, safety goggles, cotton clothes, safety shoes, safety helmet	Loose cloth may get caught with the rotating shaft makes severe injuries	before approach the motor, make sure of proper clothing and PPE



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**SOP for Clearing the LOTO Permit in HT Feeders**

**Scope** : This Procedure to establish and ensure safe method of Overhauling of Thruster break Motors

**Responsibility** : Section Engineer – Electrical

**Accountability** : **Section Head**-Electrical

**PPE:**

- 77. Safety helmet,
- 78. Safety shoe,
- 79. Cotton gloves,
- 80. LT Rubber gloves.

**Tools:**

- 61. Insulated tools,
- 62. Lifting Equipment's.

**Hazard Analysis:**

**Risks associated**

Injury  
Electric shock

**Mitigating Measures**

Use of proper Handling equipments  
Use of Proper Testing procedure & Insulated tools

**Training needs:**

- 63. Usage of tools and Nature of Hazards
- 64. Usage of PPEs

**Procedure:**

- 418. Take the LOTO permit for the particular Motor as per ELEC/SOP/003 and General Work permit.
- 419. Clean the Motor with Wire Brush, Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.



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420. Discharge the Motor terminals after opening the terminal box Cover while opening, handle cover firmly.
421. Disconnect the motor power and earth connections after marking of connection while disconnecting, use proper tools.
422. Remove the motor by removing the cotter pin and shaft on the both top and bottom end of the motor.
423. Shift the Motor to dust free environment for overhauling. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
424. Drain the oil from the bottom drain plug.
425. Dismantle the top end cover with bearing housing, while dismantling use proper tools.
426. Remove the stator winding assembly from the thruster, while removing handle the stator firmly to avoid the stator winding damage.
427. Dismantle the bottom cover in order to access the impeller with proper tools and check the condition of the Teflon impeller and Teflon covers on both the ends of the impeller.
428. Clean the rotor, stator winding and thruster assembly with cloth, while cleaning use PPEs like goggles and hand Gloves.
429. Check the condition of the rotor and extended shaft, if it is found damaged remove the rotor and replace it or if possible repair it with proper tools.
430. Check the condition of the DE, NDE bearing and DE oil seal.
431. If required, remove and replace the bearings and oil seal using proper tools.
432. If required, remove and replace the Teflon impeller and covers using proper tools.
433. Check the stator winding resistance and insulation value using certified measuring instruments.
434. Apply the varnish to the stator winding if required.



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- 435. If varnish applied stator winding is to be dried out in the clean environment.
  - 436. Assemble the impeller and close the bottom cover with proper tools.
  - 437. Assemble the stator winding over the rotor, while assembling; handle the stator firmly to avoid stator winding damage.
  - 438. Ensure no availability of foreign material in the stator and rotor assemblies and fix the top end cover and Bearing housing with proper tools and body.
  - 439. Check the Power Cable Connection Tightness & Condition of Terminal Block with proper tools.
  - 440. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals.
  - 441. Fill the thruster with transformer oil.
  - 442. Take no load trial if possible and use rubber Mat & Gloves for trial run.
  - 443. Close the Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry.
  - 444. Shift the Motor to EOT crane machine room. While shifting, handle the motor properly and avoid the fall of motor & tools. For shifting the motor use tested lifting equipment and other accessories.
  - 445. Fix the motor in the spring loaded break assembly with proper locking shaft and cotter pin.
  - 446. Connect the motor power and earth connections as per marking. While connecting, use proper tools.
  - 447. Clear the LOTO permit as per ELEC/SOP/004.
- Take Trial if Possible and record all Check point in the concern Check list

**Emergency / Emergency Shut OFF:**



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45. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

- 65. Refer LOTO permit.
- 66. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Overhauling of LT Motors	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe & Rubber Gloves, Cotton hand gloves.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Cleaning of Motors	Eye irritation of dust.	Wear goggles	Damaged goggles/non standard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
	Oil spillage	Use oil tray	Slip due to oil spillage	Follow SOP
Open the motor terminal box cover to discharge	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Cable disconnection and decoupling	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Shifting of Motor	Fall of object	Proper shifting method	Slip during shifting	Double holding method





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**SOP for Clearing the LOTO Permit in HT Feeders**

Dismantling of motor	Injury due to striking	Proper dismantling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Applying Varnish	Unconsciousness	Proper Varnishing method	Release of Toxic gases during varnishing	Usage of quality varnish & Proper Varnishing method
Heating of Winding	Electric Shock	Proper heating method	Open ended terminals	To be take extra precaution during heating
Assembly of motor	Injury due to striking	Proper assembling methods	Slip of tools during striking	Usage of proper tools Tool box Pep talk
Shifting, cable connection	Fall of object	Proper shifting method	Slip during shifting	Double holding method
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Trial Run of Motor	Electric shock	Proper method for Trial run	Open ended terminals / Improper Earthing	Usage of proper trial methods & Ensuring proper earthing
	Body injury due to loose clothing	Wear cover all suit, safety goggles, cotton clothes, safety shoes, safety helmet	Loose cloth may get caught with the rotating shaft makes severe injuries	before approach the motor, make sure of proper clothing and PPE

**Scope** : SOP for MRN 3-1-1 DM Relay

**Responsibility** : Electrical section Technician / Section Engineer

**Accountability** : Electrical Section Head

**PPE:**

- 55. Safety Helmet.
- 56. Safety Shoe.
- 57. Goggle.

**TOOLS:**

- 2. MRN 3-1-1 DM Relay Manual.

**Hazard Analysis:**

**Risk associated:**

**Mitigation Measures**



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Flash Over of Panel	Use of Safety Harness
Effect of Shock	Suitable Electrical Insulated glove
Effect of Eye Irritation	Use of goggles

**Parameter Available in the MRN 3-1-1 DM Relay**

**Parameters:**

Green LED - L1, L2, L3, f,  $\Delta\theta$ , min, max, RS, FR,  
 Green LED - U<, U<<, U>, U>>, Fn, f1, f2, f3, 1/3,  
 RED LED - tU<, tU<<, tU>, tU>>, T, tf1, tf2, tf3,  $\Delta\theta$

**Function:**

set/reset,  
 -, +,  
 enter, trip

**Display & Setting**

Function	Display shows	Pressed pushbutton	Corresponding LED	Type of relay
Normal operation	CSE			all types
Measured operating values	Actual measured value Min. and max. values of voltage, frequency and vector surge	<SELECT/RESET> one time for each value	L1, L2, L3, f, min, max $\Delta\theta$ df	MRN3-1 MRN3-2
Transformer ratio of the CT's	(SEK) 1.01-6500=prim	<SELECT/RESET><+><->	L1, L2, L3	
Setting values: star/delta connection	Y/DELT	<SELECT/RESET><+><->	$\Delta/Y$	
Parameter switch/ext. Trigger for FR	SET1, SET2, B_S2, R_S2, B_FR, R_FR, S2_FR	<SELECT/RESET><+><->	P2	
Switch-over LED flash No LED flash	FLSH NOFL	<SELECT/RESET><+><->		



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## SOP for Clearing the LOTO Permit in HT Feeders

undervoltage (low set) tripping delay of low set element undervoltage (high set) tripping delay of high set element overvoltage (low set) tripping delay of low set element overvoltage (high set) tripping delay of high set element rated frequency frequency measuring repetition frequency element f1 tripping delay of frequency element f1 frequency element f2 tripping delay of frequency element f2 frequency element f3 tripping delay of frequency element f3 1-of-3/3-of-3 measurement threshold for vector surge setting value df/dt measuring repetition df/dt	setting value in volt	<SELECT/RESET><+><->	U<	
	setting value in seconds	>	tu<	
	setting value in volt	<SELECT/RESET><+><->	U<<	
	setting value in seconds	>	tu<<	
	setting value in volt	<SELECT/RESET><+><->	U>	
	setting value in seconds	>	tu>	
	setting value in volt	<SELECT/RESET><+><->	U>>	
	setting value in seconds	>	tu>>	
	setting value in Hz	<SELECT/RESET><+><->	f <sub>N</sub>	
	setting value	>	T	
	setting value in Hz	<SELECT/RESET><+><->	f <sub>1</sub> t <sub>f1</sub>	
	setting value in seconds	>		
Blocking	setting value in Hz	<SELECT/RESET><+><->	f <sub>2</sub> t <sub>f2</sub>	
	setting value in seconds	>		
	setting value in Hz	<SELECT/RESET><+><->	f <sub>3</sub> t <sub>f3</sub>	
	setting value in seconds	>		
	1Ph/3Ph	<SELECT/RESET><+><->	1/3	MRN3-1
	setting value in degree	>	Δθ	MRN3-1
	setting value in Hz/s	<SELECT/RESET><+><->	df	MRN3-2
	setting value in periods	>	dt	
	EXIT	<+> until max. setting value	LED of blocked parameter	
	Under voltage blocking of frequency and vector surge meas- uring (df/dt for MRN3-2)	<SELECT/RESET><+><->	f, Δθ, df	
	Slave address of serial interface	>	RS	
	Baud-Rate <sub>1)</sub>	<SELECT/RESET><+><->	RS	
Parity-Check <sub>1)</sub>  Recorded fault data: star— connection: U1, U2, U3 delta-connection: U12, U23, U31 frequency	even odd no	<SELECT/RESET><+><->	RS	
	1 - 32	>		
	1200-9600	<SELECT/RESET><+><->		
	tripping values in Volt	>	L1, L2, L3, U<, U<<, U>, U>>	
	tripping values in Volt	<SELECT/RESET><+><->	L1, L2, L3 U<, U<<, U>, U>>	
	one time for each phase	>		
	one time for each phase	>		



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## SOP for Clearing the LOTO Permit in HT Feeders

rate of change of frequency vector surge	tripping values in Hz	<SELECT/RESET><+><-> > one time for each phase	f, f1, f2, f3	
	tripping value in Hz/s	<SELECT/RESET><+><-> >	df	MRN3-2
	tripping value in degree	<SELECT/RESET><+><-> > one time for each phase	$\Delta\theta + L1, L2$ or $L3$	MRN3-1
Delete failure memory	wait	<-><SELECT/RESET>		
Enquiry failure memory	FLT1; FLT2....	<+><->	L1, L2, L3, U<U<, U>, U>> f, $\Delta\delta\phi/\delta\tau$ , $\Delta\theta$	
Save parameter?	SAV?	<ENTER>		
Save parameter!	SAV!	<ENTER> for about 3 s		
Function	Display shows	Pressed pushbutton	Corresponding LED	Type of relay
Trigger signal for the fault recorder	TEST, P_UP, A_PI, TRIP	<SELECT/RESET><+><-> >	FR	
Number of fault occurrences	S=2, S=4, S=8	<SELECT/RESET><+><-> >	FR	
Display of date and time	Y=99, M=10, D=1, h=12, m=2, s=12	<SELECT/RESET><+><-> >		
Software version	First part (e.g. D02-) Sec. part (e.g. 6.01)	<TRIP> one time for each part		
Manual trip	TRI?	<TRIP> three times		
Inquire password	PSW?	<SELECT/RESET>/<+>/<->/<ENTER>		
Relay tripped	TRIP	<TRIP> or fault tripping		
Secret password input	XXXX	<SELECT/RESET>/<+>/<->/<ENTER>		
System reset	CSE	<SELECT/RESET> for about 3 s		



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**Emergency Shut- off:**

If any injury is there, give First aid and inform to the Safety department or Call Emergency number  
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**SOP for Clearing the LOTO Permit in HT Feeders**

**Records/Annexure:**

**JOB SAFETY ANALYSIS :(JSA)**

<b>Job Safety Analysis</b>	Job: Parameter selection of tri vector meter	Date: 20 - 5 – 2013	Analysis by: SE	Reviewed by: SH
Title of employee doing job: Engineer	Supervisor: Sec.Engr	Department: Electrical	Section: MISS	Approved by: HOD
Reqd./recommended PPE: Safety Shoe, Safety Helmet, Goggle.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Identification of Tri Vector Meter	Trip of Power due to wrong selection of Meter.	Cross check with Display which is Displayed	Fail to Cross check the Meter Display not Available	Ensure the SOP to Followed Once in the Year Cross check the Displays.

**Scope** : This Procedure to establish and ensure safe method of LTMR Replacement and Programming.

**Responsibility** : Section Engineer/Shift Engineer – Electrical

**Accountability** : **Section Head**-Electrical

**PPE:**

7. Nose mask
8. Goggles
9. Cotton Gloves
10. Safety shoes
11. Safety helmet
12. Electrical Rubber Hand gloves

**Tools:**



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- 63. Insulated tools
- 64. Hand Blower
- 65. Laptop with Communication cables
- 66. MCC Feeder Rack in/ out handle

**Materials:**

- 1. LTMR

**Hazard Analysis:**

**Risks associated**

Injury  
Electric shock

**Mitigating Measures**

Use of proper Handling tools  
Use of Proper Isolating, Testing procedure & Insulated tools

**Training needs:**

- 3. Emergency preparedness
- 4. First aid training
- 5. LTMR Program Knowledge

**Procedure:**

- 448. Take Electrical Work permit for LTMR Replacement and programming.
- 449. Switch OFF the Power Supply (Control MCB remains ON condition) and Remove the Feeder HMI port in LTMR
- 450. Plug the Laptop HMI port in LTMR.
- 451. Communicate the LTMR through Laptop by selecting Connect icon in Power suite software.
- 452. Click “LTMR to PC” for Download data’s to Laptop.
- 453. Save as the Setting’s file in Laptop Desktop with Corresponding feeder Name.



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**SOP for Clearing the LOTO Permit in HT Feeders**

454. If required Download Logic file also ( DOL or RDOL)
455. Note down the HMI, Node address, Contactor Rating and FLC like major data's.
456. By selecting Disconnect icon to disconnect the LTMR Communication to Laptop in power suite software then Unplug Laptop HMI port in LTMR.
457. Switch OFF Control MCB and Plug out the control cable to Door.
458. Rack out Feeder Module by using rack out handle. While rack out use PPEs like goggles and Electrical Rubber Hand gloves.
459. Clean the Feeder Module with Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves.
460. Note down the connection details for Power and Control terminals.
461. Remove the Control Connection (Plugs) in LTMR and Power Cable From Power Contactor. (Power cable was taken through LTMR).
462. Replace Old LTMR with Same Model New LTMR in Feeder Module with Proper tools.
463. Connect Control and Power Connections in LTMR and power Contactor with proper tools.
464. Cross Check the connections with earlier noted data.
465. Remove the Profibus connection plug in LTMR.
466. Rack in the Feeder by using rack out handle. While rack in use of PPEs like goggles and Electrical Rubber Hand gloves.
467. Ensure the Profibus connection plug in LTMR (Should be removed condition).
468. Plug in the Control cable to Door and Switch ON Control MCB. While switch on use of PPEs like goggles and Electrical Rubber Hand gloves.
469. Plug the Laptop HMI port in LTMR.
470. Communicate the LTMR trough Laptop by selecting Connect icon in Power suite software.





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471. Browse and select the setting file which was downloaded for particular feeder then Click “PC to LTMR” for Upload data’s from Laptop.
472. If required Upload Logic file also ( DOL or RDOL)
473. By selecting Disconnect icon to disconnect the LTMR Communication to Laptop in power suite software.
474. Communicate the LTMR trough Laptop by selecting Connect icon in Power suite software.
475. Click “LTMR to PC” for Download data’s to Laptop.
476. Cross check the Settings, Node Address and HMI address with earlier noted data.
477. By selecting Disconnect icon to disconnect the LTMR Communication to Laptop in power suite software.
478. Switch OFF control MCB and Connect Profibus Connector in LTMR.
479. Switch ON the Control MCB and Check the Bus Fault Status, if appears check Profibus connection otherwise Remove the Laptop HMI plug and Connect the Feeder HMI plug in LTMR.
480. Switch ON the Power Supply and take trail Run through DCS.
481. Defeat the Feeder and Remove the Feeder HMI port in LTMR.
482. Plug the Laptop HMI port in LTMR.
483. Communicate the LTMR trough Laptop by selecting Connect icon in Power suite software.
484. Click LTMR to PC for Download data’s to Laptop.
485. Check the Running parameter of the motor.
486. By selecting Disconnect icon to disconnect the LTMR Communication to Laptop in power suite software.
487. Remove the Laptop HMI plug and connect the Feeder HMI plug in LTMR.
488. Close the Feeder door carefully and give clearance for operation.



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**SOP for Clearing the LOTO Permit in HT Feeders**

**Emergency / Emergency Shut OFF:**

46. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

67. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: LTMR replacement and Program loading	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer/ Shift Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe, Rubber Gloves, Cotton hand gloves & Full body harness with double lanyard.				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Feeder Rack in/Out	Electrical Shock	Wear Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Cleaning of Feeder Module	Eye irritation,	Wear goggles	Damaged goggles / non standard goggles / Not wearing Goggle.	Periodic replacement / Proper training
	Respiration problem	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Changing of LTMR	Tools slip	Use suitable tools	Tool may be damaged	Tool box talk Periodic replacement

**Scope** : This Procedure to establish and ensure safe method of SEPAM RELAY SETTING CHANGE.

**Responsibility** : Section Engineer/Shift Engineer – Electrical

**Accountability** : **Section Head**-Electrical

**PPE:**

- 13. Safety shoes
- 14. Safety helmet



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15. Rubber Gloves

**Tools:**

67. Laptop with Communication cables

**Hazard Analysis:**

**Risks associated**

Injury  
Electric shock

**Mitigating Measures**

Use of proper Handling tools  
Use of Proper Isolating tools

**Training needs:**

6. Emergency preparedness
7. First aid training
8. SEPAM SETTING Knowledge

**Procedure:**

489. Take Electrical Work permit for SEPAM relay setting upload and download.
490. Switch OFF the Power Supply (ACB or SFU) and if ACB then Rack out with proper Rubber gloves.
491. Plug the Laptop Communication cable connector in SEPAM Relay communication port.
492. Communicate the SEPAM relay through Laptop by selecting “connect to front face” Icon in SF2841 software.
493. Click the “Protections” option to set the setting parameters
494. Click the “50/51-1” option and set the required values in Setting Group A, Setting Group B for Phase Overcurrent (1).



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495. Click the “50/51-2” option and set the required vales in Setting Group A, Setting Group B for Phase Overcurrent (2).
496. Click the “50N/51N-1” option and set the required vales in Setting Group A, Setting Group B for Earth Fault (1).
497. Click the “50N/51N-2” option and set the required vales in Setting Group A, Setting Group B for Earth Fault (2).
498. Click the “46” option and set the required vales for Negative sequence current/unbalance Protection.
499. If require Recloser operation then Click the “79” option and set required values .
500. Upload the setting to SEPAM relay
501. Unplug the Laptop Communication cable connector in SEPAM Relay communication port
502. Cross check the SEPAM Relay setting by manually.
503. Rack in the ACB with proper Rubber gloves.
504. Switch ON the power Supply (ACB or SFU).

**Emergency / Emergency Shut OFF:**

47. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

68. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Sepam relay setting upload and download	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Engineer	Supervisor: Section Engineer/ Shift Engineer	Department: Electrical	Section: Plant	Approved by:
Reqd./recommended PPE: Safety helmet, Safety shoe, Rubber Gloves.				



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**SOP for Clearing the LOTO Permit in HT Feeders**

Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Feeder Rack in/Out	Electrical Shock	Wear Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use

**Scope** : SOP for Micom Relay Settings

**Responsibility** : Electrical Shift Engineer / Section Engineer

**Accountability** : Electrical Section Engineer / Head

**PPE:**

- 58. Safety Helmet.
- 59. Safety Shoe.
- 60. LT Gloves.

**TOOLS:**

- 3. Micom Relay Manual

**Hazard Analysis:**

**Risk associated:**

Flash Over of Panel  
Effect of Shock  
Effect of Eye Irritation

**Mitigation Measures**

Use of Safety Harness  
Suitable Electrical Insulated Gloves  
Use of goggles

**Training needs:**

- 1. MICOM Relay Setting Knowledge
- 2. Emergency Preparedness



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3. First Aid Training

**Procedure:**

505. Take Electrical Work permit for MICOM relay settings.
506. Isolate the Power Supply (VCB) and then Rack out with proper Rubber gloves.
507. Note down the Settings to enter in the Micom Relay based on the applications of the HT Feeder (whether Incomer, Motor or Transformer applications)
508. By using Up/Down arrow keys, go to 'Protection G1' Parameter.
509. Scroll down to "Protection G1" to set the following parameters
510. Select the "[50/51] *Phase Overcurrent*" option and enter the required values as per application.
511. Select the "[50N/51N] *Earth fault protection*" option and enter the required values as per application.
512. Select the "*Undercurrent Protection*" option and enter the required values as per application.
513. Select the "*Negative Sequence Overcurrent Protection*" option and enter the required values as per application.
514. Select the "*Thermal Overload Protection*" option and set the required values for Thermal Overload.
515. Cross check the MICOM Relay setting by manually.
516. Rack-In the VCB with proper Rubber gloves.
517. Switch ON the power Supply (VCB).

**Emergency / Emergency Shut OFF:**



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48. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

69. JSA as enclosed below.

**JOB SAFETY ANALYSIS: (JSA)**

<b>Job Safety Analysis</b>	Job: Micom Relay Setting	Date: 22.06.2013	Analysis by: Section Engineer	Reviewed by: Section Head
Title of Employee doing job: Engineer	Supervisor: Engineer	Department: Electrical	Section: Load Centre	Approved by: HOD
Required / Recommended PPE: Safety Shoe, Safety Helmet, Gloves.				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Identification of Micom Relays	Trip of Power due to wrong selection of Meter.	Cross check with Display which is Displayed	Fail to Cross check the Meter Display not Available	Ensure the SOP to be Followed Once in the Year Cross check the Displays.

**Scope** : MCC Feeder Maintenance  
**Responsibility** : Electrical section Technician / Section Engineer  
**Accountability** : Electrical Section Engineer / Head

**PPE:**



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- 61. Safety Hand Gloves (Suitable Electrical Insulated glove)
- 62. Safety Helmet,
- 63. Safety Shoe,
- 64. Nose mask.

**TOOLS:**

- 42. Screw Driver
- 43. Hand Blower

**Hazard Analysis:**

**Risk associated:**

- Effect of Shock
- Effect of Eye Irritation
- Dust inhalation

**Mitigation Measures**

- Suitable Electrical Insulated glove
- Use of goggles
- Use of Nose mask

**Procedure:**

- 13. Switch off the Feeder.
- 14. Open the Module door.
- 15. Switch off control MCB.
- 16. Remove the Modbus Cable.
- 17. Remove the Female Connector of Indication Lamps and Emergency push button.
- 18. Take the Rack out Handle.
- 19. Rack out the module with Handle with rubber hand gloves.
- 20. Blower it and open the Power contactor coil and Kits& clean with CRC.
- 21. Replace the power contactor kits if required.
- 22. Check the tightness of Power & Aux contactor, Relay, and control cables in the module.
- 23. Put the module Back and Rack in with Handle
- 24. Put back the Modbus and Female connector of indication Lamps.
- 25. Switch on the control supply.





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26. Close the module door and Switch on the Feeder

**Emergency Shut- off:**

49. If electrical shock injury or body injury is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

70. Refer Line clearance certificates.

71.JSA as enclosed below.

<b>Job Safety Analysis</b>	Job: MCC Feeder Maintenance	Date:	Analysis by:	Reviewed by:
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**SOP for Clearing the LOTO Permit in HT Feeders**

Title of employee doing job: Technician	Supervisor: Sec.Engr	Department: Electrical	Section: All Load centers	Approved by:
Reqd./recommended PPE: Safety shoe, Helmet, Goggle, Nose mask				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Procedure	What Could Go Wrong	Corrective Action
Isolation of feeder	Electrocution/Electrical fire	Use hand gloves Use Fire proof suit	Fail to use of PPE/suit	Educating importance of PPE through pep talk
Check the Contactor kit, Open power contactor Clean fixed and moving contact	Respiration problem Body injury	Wear Nose mask	Damaged nose mask/ Not wearing Nose mask	Periodic replacement / Proper training
	Respiration problem	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
	Eye irritation,	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job

**Scope** : 3Ph Electro mechanical Siren

**Responsibility** : Engineer/Electricians

**Accountability** : Electrical Manager

**PPE:**

- 16. Nose mask
- 17. Goggles
- 18. Safety shoes
- 19. Safety helmet
- 20. Ear plug

**Tools:**

- 104. Multimeter
- 105. Megger
- 106. Insulated tools

**Hazards:**



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**SOP for Clearing the LOTO Permit in HT Feeders**

Risk Associated  
Electrical Shock  
Minor body injury

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles

**Training needs:**

9. Electrical shock recovery Training
10. Emergency preparedness
11. First aid training

**Procedure:**

1. Take the LOTO permit for the particular Motor as per ELEC/SOP/003 and General Work permit.
2. Clean the Siren with Wire Brush, Hand Blower & Cloth, while cleaning use PPEs like Nose mask, goggles and hand Gloves
3. Discharge the Motor terminals after opening the terminal box Cover Check the Winding resistance of Motor by Multi-meter
4. Check the Power Cable Connection Tightness & Condition of Terminal Block with proper tools.
5. Check the Insulation Resistance, Winding Resistance and Inductance of the Motor winding. After checking the Insulation resistances again discharge the motor terminals.
6. Remove the Impeller cover / Air intake unit with suitable tools
7. Clean the Impeller & inner surface of Impeller
8. Check the impeller condition whether any crack in its surface
9. Check the tightness of Impeller in Rotor.
10. Covering the Air Intake unit/ Impeller cover



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11. Close the Motor Terminal box cover and box up with Silicon Paste to restrict the dust entry
12. Check the motor Earthing condition
13. Clear the LOTO permit as per ELEC/SOP/004
14. Take the trial of Siren after Servicing

**Emergency / Emergency Shut OFF:**

50. If any injury or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

72. Refer Line clearance certificates
73. JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Siren maintenance	Date:	Analysis by:	Reviewed by:
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section:	Approved by:
Reqd./recommended PPE: Nose mask, Goggles, Electrical safety Gloves, Cotton Gloves, Safety shoes, Safety helmet				
<b>Sequence of Basic Job Steps</b>	<b>Potential Hazards</b>	<b>Recommended Safe Job Procedure</b>	<b>What Could Go Wrong</b>	<b>Corrective Action</b>
Put on PPE, Take Permit				



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**SOP for Clearing the LOTO Permit in HT Feeders**

Cleaning of Siren	Eye irritation of dust.	Wear goggles	Damaged goggles/ nonstandard goggles/ Not wearing goggle	Periodic replacement / Proper training / Follow SOP
	Respiration problem of dust	Wear Nose mask	Damaged nose mask/Not wearing Nose mask	Periodic replacement/ Proper training/ Follow SOP
	Body injury	Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job/ Proper training / Follow SOP
Open the motor terminal box cover to discharge	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Check the tightness of terminals	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves	Tools and material may fall on human body	Without PPE don't perform the job
Check the insulation resistance, winding resistance, inductance  Again discharge the motor  Close the terminal box cover	Electrical shock	Use Tested Electrical Rubber Hand gloves	Damaged Gloves / Not checked before use	Periodic replacement/ To check for Damage before use
		Use Calibrated meters	Faulty meters	Meter shall be calibrated periodically

**Scope** : Cement mill PCC supply resuming through CPP LT supply during Block out

**Responsibility** : Engineer/Electricians

**Accountability** : Electrical Manager

**PPE:**

21. Safety helmet,
22. Safety shoe,
23. Nose Mask.
24. Safety Gloves.
25. Torch light



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**Tools:**

- 68. General Tools
- 69. Cycle

**Hazards:**

Risk Associated  
Electrical Shock  
Minor body injury  
In case night hit with objects and fall

Mitigating Measures  
Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles  
Keep torch light during night

**Training needs:**

- 12. Electrical shock recovery Training
- 13. Emergency preparedness
- 14. First aid training
- 15. Plant Power distribution awareness training

**Procedure:**

- 15. Ensure the availability of 11Kv Supply in Grid Incomer CB8 & CPP Incomer feeder CB6
- 16. Ensure the availability of 110 KV supply from TNEB in yard
- 17. After Ensuring the TNEB supply non availability, Inform to CPP shift for starting the LT DG from CPP
- 18. Ensure the CMBH breaker for CPP DG is in OFF condition
- 19. Ensure the PCC Incomer 1 & 2 in OFF condition



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20. Opening the All Breakers in PCC except Lighting Transformer feeder
21. Switch ON the Bus coupler Breaker for receiving supply from CPP
22. After running the DG, CPP person Switch ON the CMBH LT Breaker with proper communication to Plant shift Engineer
23. Ensuring the supply availability in CPP DG incomer feeder at CMBH, shift engineer will switch ON the Breaker for charging the PCC
24. Charging the Breakers in PCC one by one with respect to DG capacity (rated  $3 \times 625 = 1875 \text{Kw}$ ) (Cement mill Group can't run through this DG)

**Emergency / Emergency Shut OFF:**

51. If any injury or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

74. Refer Line clearance certificates
75. JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

<b>Job Safety Analysis</b>	Job: Power supply change over	Date: 01 – 04 - 2014	Analysis by: Shift Incharge	Reviewed by: Section Head
Title of employee doing job: shift engineer / Electricians	Supervisor: Shift In charge	Department: Electrical	Section: All Section	Approved by: Electrical HOD
Req'd/recommended PPE: Safety helmet, Safety shoe, Mask & Gloves.				
<b>Sequence of Basic Job</b>	<b>Potential Hazards</b>	<b>Recommended Safe</b>	<b>What Could Go</b>	<b>Corrective Action</b>



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**SOP for Clearing the LOTO Permit in HT Feeders**

Steps		Job Procedure	Wrong	
Approaching the LC during black out in night	Hit with objects and fall	Go with torch light	Torchlight may not work due to not charging	To be charge in day time and ensuring by Siemens in charge.
Change over form normal to DG and vice versa.	May be flash over.	Fallow instruction of changeover.	Lacking of aware	Periodical pep talk.

**Scope** : All Electrical HT & LT Panels, Boards.

**Responsibility** : Engineer/Electricians

**Accountability** : Electrical Manager

**PPE:**

- 26. Nose mask
- 27. Goggles
- 28. Safety shoes
- 29. Safety helmet
- 30. Rubber hand gloves

**Tools:**

- 107. Hot Stick
- 108. Insulated tools

**Hazards:**

**Risk Associated**

Electrical Shock  
Minor body injury  
Electrocution (Fatal)

**Mitigating Measures**

Tested Electrical Rubber Hand Gloves  
Safety shoes, gloves, helmet, goggles  
Re- fresher Training

**Training needs:**

- 16. Emergency preparedness
- 17. First aid including CPR training
- 18. Electrical safety training





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**Procedure:**

**73. BREAK THE ELECTRICAL CONTACT :**

Free the Victim from electrical contact promptly, Switch of supply immediately if possible. Otherwise use a Dry stick, dry rope, dry cloth or other nonconductor to separate the victim from the electrical contact. DONT USE BARE HANDS WITHOUT PROTECTION

**74. INSPECT THE VICTIM:**

- Quickly feel the victim's mouth and throat and remove any foreign body (tobacco, false teeth, etc...).If the mouth is tight shut, pay no more attention to it. Can be looked later. Begin artificial respiration immediately. ALSO SEND FOR DOCTOR .DELAY MAY RESULT DEATH.
- In case of prolonged artificial respiration, the victim can be laid on a Door or other flat surface so that his head and chest are six to eight inches lower than his feet. Flow of Blood to the Heart will be promoted and there will be better chance for recovery
- The victim should not be moved from the place of artificial respiration until he is breathing normally on his own. He may than be moved but only in the lying position.

**75. ARTIFICIAL RESPIRATION:**

Position 1:



Place the victims face down with his arm folded one over the other and head resting on them.

Kneel down with one or both of your knees / near the victims head.

Place your hand on the on the victims back beyond the line of armpits, with your fingers spread outwards and downwards and thumbs touching each other.

Position 2:



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As you count one, two, three, move forward, keeping arm straight until they are nearly vertical, thus steadily pressing the victims back. This completes expiration.

**Position 3:**



As you proceed to count four, move backward releasing pressure and slide your hand down wards along the victims arm and grasp his upper arms just above the elbows. Continue to move backwards

**Position 4:**



As you move back counting five, six, seven raise and pull the victims arms towards you, until you feel tension in his shoulders. This expands his chest and results in respiration. As you count eight, lower the victim's arms, and move your hands up to the initial position.

Repeat above cycle 12 times a minute. When the victim starts breathing synchronize your steps with his breathing until he breaths strongly. Then stop

**76. ARRANGE FOR STANDBY OPERATOR:**

- In carrying out artificial respiration, it may be necessary to change the operator. This must be done without losing the rhythm of respiration.



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**SOP for Clearing the LOTO Permit in HT Feeders**

- Continual artificial respiration for at least four hours. Breathing has returned even after eight hours in case of electric shock, but in such instances the victim will show some signs of recovery which will call for continued effort on the part of rescuers.
- After obtaining the Doctors advice on arrival, the victim can be shifted, and artificial respiration can also give simultaneously, if necessary.
- A brief return of natural respiration is not a certain indication for stopping the resuscitation permanently. The victim, after a temporary recovery of respiration, may stop breathing again. The victim must therefore be watched and if natural breathing stops, artificial respiration should be resumed immediately.

77. Never give an unconscious man anything to drink. It may choke him

**Emergency / Emergency Shut OFF:**

52. If any injury or electrical shock is there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

76.JSA as enclosed below.

**JOB SAFETY ANALYSIS:(JSA)**

Job Safety Analysis	Job: Trouble shooting in live panel	Date:	Analysis by: Section engineer	Reviewed by: Section head
Title of employee doing job: Engineer / Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Plant	Approved by: HOD
Reqd./recommended PPE: Tested Electrical rubber hand gloves, Safety shoes, Safety helmet, Safety				



**DALMIA CEMENT (B) LIMITED – CEMENT PLANT  
ARIYALUR  
ELECTRICAL MANUAL**

**Issue No: 02      Rev. No: 00      Effective Date: 01.11.2019      ELEC/SOP/002**

**Issued By: M.R      Approved By: HOD - ELECTRICAL**

**SOP for Clearing the LOTO Permit in HT Feeders**

Goggle				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Opening of live panel cover	Electric Shock	Use Rubber Hand Gloves	Gloves validity may be expired	Inspect before use
	Panel flash over and Burned injury	Keep yourself beside the panel	Not follow the procedure	Tool box talk/Proper Training
		Wear safety Goggles	Damaged goggles/non standard goggles/ Not wearing Goggle.	Periodic replacement/ Proper training

20. wearing HT hand gloves.If it is HT incomer (MRSS located at CMBH LC, CMBH, RMBH & CCR HT Boards).
21. In case of Outgoing and motor, s feeder's maintenance, Isolating authority (Electrical Engineer / Shift Engineer) removes the LOTO lock and DO NOT OPERATE TAG of performing authority as well as Isolating authority.
22. Follow the step no-6
23. Isolating authority (Electrical Shift Engineer / Electrician) will Insert & Rack in the breaker by HT hand gloves.
24. Isolating authority (Electrical Shift Engineer) will switch on the Control MCB and check the Healthiness of the Feeder with CCR.
25. Isolating authority (Electrical Shift Engineer)will put his name and signature on LOTO isolation permit as connected energy sources restored.



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<b>Issued By: M.R</b>	<b>Approved By: HOD - ELECTRICAL</b>
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**SOP for Clearing the LOTO Permit in HT Feeders**

**Emergency / Emergency Shut OFF:**

If electrical shock injury or burn are there, give First aid and inform to the Safety department or Call Emergency number 3108/9865152222/9750963761.

**Records/Annexure:**

77. Refer Line clearance certificates.

78.JSA as enclosed below.

**JOB SAFETY ANALYSIS :(JSA)**

<b>Job Safety Analysis</b>	Job: Clearing Electrical shutdown permit in HT feeders	Date:	Analysis by: Electrical Engineer	Reviewed by: Electrical Manager
Title of employee doing job: Electrician	Supervisor: Section Engineer	Department: Electrical	Section: Electrical	Approved by: HOD Electrical
Reqd./recommended PPE: Arc Flash suit, Rubber Hand Gloves, Safety shoes, Safety helmet				
Sequence of Basic Job Steps	Potential Hazards	Recommended Safe Job Procedure	What Could Go Wrong	Corrective Action
Clear the permit Put on PPE,				
Open the Lock Rack in the HT breaker Rack Out Earth Truck	Body injury	Use proper tools	Nonstandard /damaged tools	Training for tools handling/ Periodic replacement
		Wear safety helmet, safety shoes , hand gloves , Arc flash suit	Tools and material may fall on human body	Without PPE don't perform the job
	Electrical shock	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use
Switch ON the control MCB in particular feeder	Electrical shock	Use Tested electrical rubber hand gloves	Damaged Gloves/ Not checked before use	Periodic replacement/ To check for Damage before use