LOCKOUT & TAG OUT (LOTO) PROCEDURE

Rev No.	Reason for Revision	Prepared By	Reviewed By	Approved by
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01	Standardization of Procedure	Satish Surve (Lead Engineer- Corp Safety)	Navendra Singh (Group Head – P & CB; Corp Safety.)	Vijay Chourey (Chief – Corp Safety)

Contents

1. OBJECTIVE:

Objective of this procedure is to provide minimum requirements for lockout and tag out of energy- isolating devices to protect any Person from hazardous energy including electrical, mechanical, hydraulic, pneumatic, or any other energy.

2. SCOPE:

2.1. This procedure applies to all operating and project sites of The Tata Power Company Ltd and all it's Group companies.

3. EXPECTED RESULTS:

3.1. Manage jobs being done involving energy sources safely.

3.2. Control of incidents in Jobs involving sources of energy.

3.3. Compliance to Regulatory requirements related to safety from energy sources.

4. ACCOUNTABILITY & RESPONSIBILITY:

4.1. ACCOUNTABILITY: Concerned Divisional Heads / Asset Custodians.

4.2. RESPONSIBILITY:

4.2.1. Permit Acceptor shall be responsible to ensure that only trained and authorized people are deployed for the jobs.

4.2.2. Person In-Charge/Shift In-Charge (Permit Issuer) shall be responsible for but not limited to isolation / draining / blinding / venting of process equipment before releasing it for maintenance / inspection in their respective plants/areas.

4.2.3. Maintenance Supervisors shall be responsible for maintenance activities as per the process requirements and must use appropriate Personal protective equipment while carrying out maintenance activities.

4.2.4. Person In-Charge/Shift In-Charge and all the concerned permit holders of the job shall be responsible for lockout and tag out

Note: Refer Annexure – 1 for detailed Responsibility Matrix.

5. GLOSSARY/ DEFINITIONS:

Authorized person: A qualified Person trained and authorized in the lockout/tag out procedure to make and verify isolations.

Control device: A device used to execute a system change by manual, remote, automatic, or partially automatic means (e.g., push buttons, emergency buttons or stops, selector switches, and other control-circuit type devices).

Danger Tag: A tag that is placed with intention of warning to the persons that device is under isolation and must not be operated/switched on.

Executing Person/Maintenance Engineer: Affected Person who is executing the job on the equipment which is subjected to lockout / tag out.

Energy-isolating device: A mechanical device that physically prevents the transmission or release of energy, including but not necessarily limited to, the following:

- A manually operated electrical circuit breaker
- A Fuse
- A disconnect switch
- A manually operated switch that disconnects a circuit from all ungrounded supply conductors and prevents all poles from being operated independently. (Group Operated Device)
- A line valve
- Slip plates, blanks, and physical disconnections
- A mechanical block or any similar device used to block or isolate energy.

Hasps: device used to put multiple locks on isolation point.

Hazard Identification & Risk Assessment: Hazard Identification & Risk Assessment is done to identify and evaluate the hazards, Risk and put controls measures for safe execution of activities.

Hazard: Source or situation with potential for harm, something that can cause body injury / occupational illness, damage company property.

Hazardous energy: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, nuclear radiation or any other energy that, if not controlled, could cause injury to Personnel or damage to property and/or environment.

- Electrical hazards are present when conductors or components that may be electrically energized could cause injury to Personnel or damage to property.
- Mechanical hazards are present when the unexpected start-up of the system, equipment, or machine, or the release of stored energy while adjusting, maintaining, or servicing systems, equipment, or machines could cause injury to Personnel or damage to property.
- Process hazards are present when the unexpected release of gases, liquids, or solids could cause injury to Personnel or damage to property. These hazards can exist during such tasks as installation, fabrication, servicing, or maintenance of pipelines, vessels, or associated equipment Isolation—Separation of the equipment, machinery or area where work is to occur from sources of hazardous energy or materials in such a way that only a conscious and deliberate act can restore the connection.

Job Safety Analysis: Job safety analysis (JSA) is a procedure which helps integrate accepted safety and health principles and practices into a particular task or job. In a JSA, for each basic step of the job, it is required to identify potential hazards and to recommend the safest way to do the job.

Job: A piece of physical work defined by time or other limits that has a clear start and end point

Lock: Locks that are different from one another; each lock can be opened by its individual key only.

Locking: placing a lockout device on a hazardous-energy-isolating device at a point of Isolation.

Lockout device: A piece of equipment that prevents the unauthorized or accidental operation of a hazardous-energy-isolating device. Locks are an essential element of a lockout device.

Lockout: Isolation of a source of hazardous energy, including releasing any residual hazardous energy that might be present, and securing an isolation point by locking it.

LOTO: Lock out and Tag Out

LOCK OUT TAG OUT: Lockout is defined as the "Control of Hazardous Energy - In practice, lockout is the isolation of energy from the system (a machine, equipment, or process) which physically locks the system in a safe mode. The energy-isolating device can be a manually operated disconnect switch, a circuit breaker, a line valve, or a block (Note: push buttons, selection switches and other circuit control switches are not considered energy-isolating devices). The locking device (or lockout device) can be any device that has the ability to secure the energy-isolating device in a safe position.

Tag out is a labelling process that is always used when lockout is required. The process of tagging out a system involves attaching or using an indicator (usually a standardized label)

Note: ONLY the authorized individual who placed the lock and tag onto the system is the one who is permitted to remove them. This procedure helps to make sure the safety of Affected Person, who operates or maintains or works on machinery or equipment, which is subjected to lockout/ tag out.

Maintenance: Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include, but not necessarily limited to, lubrication, alignment, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the Person may be exposed to the unexpected energization or startup of the equipment or release of hazardous energy.

Maintenance Engineer: A Person who is solely responsible for the execution of the intended maintenance activity. Normally he will be the permit acceptor.

Non Routine Job / Task: Where an SOP / SMP is not available or the conditions of the SOP / SMP have changed

Operation Engineer /Field Operator: the Person who is responsible for the operation of a machine, system, or equipment in the field.

Permit to Work: The written or printed document that is issued by the Owner to execute job as per Permit to work procedure applicable in TATA POWER.

Person In-Charge/Shift In-Charge: A Person who is the custodian or owner of the area or process and or associated equipment. He / She are authorized by the management to exercise his / her exclusive rights for the operation and use of the

process and or its associated equipment in the designated area. Also referred as "Proprietor / Owner" in the TATA POWER LOTO Standard.

Qualified Person: A Person trained and authorized to work with the equipment and who understands the hazards involved.

Risk Assessment: A systematic and structured process whereby hazards present in a workplace, or arising from workplace activity, are identified, risks assessed / evaluated, and decisions prioritized in order to reduce risks to acceptable levels.

Risk: The likelihood (probability) which can lead to potential negative consequences.

Severity: The level of consequence / harm of an event that could occur due to exposure to the hazard present

Shall: Mandatory requirement

Should: Optional requirement

Stored energy: Hazardous energy that can continue to exist after equipment is isolated (e.g., the hazardous energy contained in springs, flywheels, pressurized fluids or gases, pneumatically controlled devices, capacitors, or gravity).

Tagging: Placing a specific tag on a lock or point of isolation to identify who placed the lock and when it was placed.

Tag out: Placement of danger tag

Task / Activity: A sequence of steps taken to conduct a job. A task is a sub element of a Job.

Team Leader: A qualified and authorized Person who shall undertake overall responsibility for a lockout/tag out to place and keep all hazardous energy sources under lockout/tag out and to account for all Persons working with him on the job or task. He is normally expected to lead the executing team at the work location.

Testing: A process in which a qualified Person checks the machine / equipment to verify whether its performance meets the intended need.

Troubleshooting: A process for identifying malfunctioning components within a system that is done in both energized and de-energized systems.

Try/trying: proving the effectiveness of isolation by attempting to make a machine, system, or equipment operate without being inhibited by interlocks or other means that would impede the "try" step. System cannot be started up without the authorized individual's knowledge.

6. PROCEDURE:

The essential elements of Lockout and Tag out procedure is -

- General requirements for Lockout / Tag out.
- Preparation for Lockout / Tag out.
- Sequence of Locking /Tagging /Verification of de-energization
- Restoring Equipment back to Service/Operation
- Temporary Removal of Lockout/Tag out Devices

6.1. General Requirements for Lockout / Tag out:

6.1.1. Person in-charge/Shift in-charge shall be the only agency that will control and shall ensure necessary provision for providing field hasp including hasp for electrical Lockout.

6.1.2. Each plant control room shall have a comprehensive procedure of monitoring and control of field, through proper documentation and shift-to-shift communication so that no device(s) remain unnoticed.

6.1.3. All hardware used for hazardous energy control must be durable enough to withstand the workplace environment and must be used solely for the purpose of control of hazardous energy.

6.1.4. If there is a loss of key, the concerned person shall inform the Person In-charge/Shift in-Charge by a formal written communication about the facts. Division chief shall be the only approving authority for breaking any locks of the energy-isolating device.

6.1.5. For ease of identification of the department to which the executing Persons/Team leader is associated, the locks shall be identified by defined colors as mentioned below-

- Electrical Department – Red,
- Mechanical Department – Yellow,
- Process/Operation Department– Black,
- Instrumentation Department – Blue,
- Others - Green.

6.1.6. Tag out and Tags: If an energy-isolating device is not capable of being locked out, a tag out procedure (Tagging System) shall be followed.

6.1.7. Where Tag out procedure (Tagging System) is used for hazardous energy control, the Person must be fully aware of limitations of tags.

6.1.8. Tags are essentially warning devices affixed to energy-isolating devices, and do not provide the physical restraint on those devices that is provided by a lock. Tags may evoke a false sense of security, and their meaning needs to be understood well.

6.1.9. When a tag is attached to an energy-isolating means, it shall not be removed without authorization of the authorized Person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

6.1.10. Tags must be securely attached to energy-isolating devices so that they cannot be inadvertently or accidentally detached during use. Tags must be legible and understandable by all Persons, whose work operations are or may be in the area, in order to be effective.

6.1.11. Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace.

6.2. Preparation of Lockout / Tag out (LOTO) :

6.2.1. Before work is started on any equipment, System or process, the Person In-Charge/Shift In-Charge shall be responsible for Preparation for Lockout / Tag out.

6.2.2. He / She shall ensure that all hazardous energy sources are identified (Chemical, Electrical, Mechanical or other) to determine which switches, valves or other energy-isolating devices apply to machinery or equipment to be locked and tagged out.

6.2.3. Where stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) may be encountered, identification of such type(s) of stored or residual energy shall be ensured. Appropriate methods of dissipating or restraining such energy (by methods such as, but not necessarily limited to, grounding, repositioning, blocking, bleeding down, etc.) shall be ensured.

6.2.4. For equipment preparation, pertaining to plant operational processes involving line breaks, the prime consideration shall be of proving that isolations are intact and giving a tight shut off.

6.2.5. Each case shall be carefully considered by the Person In-charge/Shift In-charge, taking into account the hazardous properties of the materials involved and the details of plant design.

6.3. Sequences of Locking /Tagging /Verification of de-energization:

6.3.1. Person In-Charge/Shift In-Charge shall ensure that all the type of energy that the System or equipment utilizes, shall understand the hazards of the energy, and shall know the methods to control the energy. In cases where complex lockout or multiple energy sources are involved the Person In-Charge/Shift In-Charge shall generate an energy source identification sketch (a computer generated, hand written or in any other form) to properly identify all energy sources.

6.3.2. Field operator/Operation Engineer shall ensure the equipment is not in operation and shall select the local/remote selector switch to local/Off position. She/he shall provide required danger tag as per job requirement on the Local Control Switch (LCS) or other control device.

6.3.3. Field Operator/Operation Engineer shall use the energy source identification sketch wherever applicable, isolate all energy sources by operating the valve, or other energy-isolating device(s) so that the equipment is isolated from its energy source(s). (Refer Annexure – 2) for Guidelines for positive isolation and special precautions).

6.3.4. Field Operator/Operation Engineer shall ensure that stored energy (such as that in springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) shall be dissipated or restrained by methods such as, but not necessarily limited to repositioning, blocking, draining, venting, bleeding down, etc.

6.3.5. All such energy isolation points shall be provided with lockout device (Hasp)

6.3.6. After energy source(s) isolation, the equipment shall be cleared by purging / draining / depressurizing / decontaminating and ensuring that the equipment / line is totally free of hazardous material.

6.3.7. Person In-Charge/Shift in-charge shall submit list of all applicable isolation points for isolation/de-energization. Operation Engineer shall identify energy source(s). All such energy isolation points shall be provided with lockout device (Hasp) with Lock and Danger tag (Refer Annexure –3). Simultaneously the Maintenance Engineer or Team Leader shall provide his lock on the Hasp and retain the key of the locks in his custody till the job is over. Refer Annexure –5 for recommended LOTO methods for electrical energy sources.

6.3.8. Person In-Charge/Shift in-Charge shall ensure that equipment containing radiation sources, are locked out & tagged out by RSO (Radiation Safety officer) or by authorized Person, in accordance with radiation source manufacturer's lockout / tag out recommendations.

6.3.9. The Maintenance Engineer or Team leader shall provide the lock on each of the field energy-isolating device, as per the energy source identification sketch, wherever applicable, and retain the key to the lock till the job is over.

6.3.10. After ensuring that no Persons are exposed to any hazard, Field Operator/Operation Engineer as a check on having disconnected the machinery or equipment from the energy sources, the Operation Engineer, in presence of Maintenance Engineer or Team Leader, shall operate (TRY) the push button or other control device to make certain that the machinery or equipment will not operate. Danger tag (Refer Annexure-3) shall then be placed on LCS or other control device.

6.4. Restoring Equipment back to Service/Operation:

6.4.1. After servicing or maintenance is completed, Maintenance Engineer or Team leader shall check that the equipment and the area around the equipment is cleared and equipment guards, Safety devices, etc. have been reinstalled, temporary ground removed and ready for intended operation.

6.4.2. Maintenance Engineer or Team leader shall ensure that all Persons have safely moved out of the hazardous zone.

6.4.3. Maintenance Engineer or Team leader shall verify that control devices are in "OFF" position. All blinds/ blocks, etc. shall be removed prior to removal of locks.

6.4.4. Maintenance Engineer or Team leader shall remove all locks provided on lockout devices (Hasps) at the energy-isolating points, including electrical energy source and clear his/her 'danger tags'.

6.4.5. Field Operator/Operation Engineer shall check & inspect the integrity of the equipment and remove his/her danger tags'

6.4.6. The equipment is now normalized for restoration into operation as per Safe Operating Procedure (SOP).

6.5. Temporary Removal of Lockout/Tag out Devices:

6.5.1. In situations where the energy sources are locked and tagged, and there is a need for temporary re-energizing for testing / taking trial of the equipment, machine or part thereof ; Permission shall be obtained from Shift In-Charge before temporary re-energization. The following points shall be mutually agreed upon between the Person in-Charge/Shift In-charge and the Executing Persons/ Team Leader.

- Scope of testing
- Testing procedure
- Duration of testing
- Assessment of hazards as an outcome of testing

6.5.2. Additional precautions to be taken during the restoration of energy, duration of testing and re-isolation of energy. In all cases, the temporary removal of Lockout / Tag out devices shall include, but not necessarily limited to, the following steps:

6.5.2.1. Person In-Charge/Shift In-Charge shall ensure that the area in the vicinity of the target equipment / machinery is cleared.

6.5.2.2. Person In-Charge/Shift In-Charge shall ensure that all Persons inside the hazard zone are informed that equipment / machinery needs to be re-energized for testing / trial

6.5.2.3. Person In-Charge/Shift In-Charge shall ensure that all Persons (all groups of persons in case multiple groups are working) on the job, safely clear the job to enable testing / trial and remove their lockout temporarily.

6.5.2.4. After getting final clearance from executing Person/ Team Leader, the Person In-Charge/Shift In-Charge shall re-energies the equipment / machinery for testing / trial.

6.5.2.5. After completion of testing / trial, 'Operating Permit/ Permit-to-Work' shall be cleared by the executing Person/ Team Leader. Person In-Charge/Shift In-Charge shall de-energies the equipment / machinery.

6.5.2.6. For complex situations (as judged by Person In-Charge/Shift In-charge) the Person In-Charge/Shift In-charge should ensure that a specific written procedure covering all of the above points is prepared and reviewed with all Persons involved in the testing.

7. RECORDS :

7.1 LOTO Register (TPSMS/CSP/LOTO/001 /FORM/001) – Retention – One years

8. TRAINING & COMMUNICATION

8.1. Training of this procedure shall be covered as per Safety Training Need identified across divisions.

8.2. Initial Communication to be done through Corporate Communication, Email and subsequently shall be made available at safety portal at Sangam.

9. VERIFICATION

9.1. Verification of implementation shall be done during Safety audit, field safety visit and site inspections.

10. EXEMPTION: Any Exception to this procedure shall only be done as per Document Control .Procedure (TPSMS/GSP/DC/014/)**.**

11. REFERENCES:

- Indian Factory Act 1948 and State Factory Rules
- TATA POWER Permit to work procedure (TPSMS/CSP/PTW/008)
- Tata Power Electrical Safety Procedure (TPSMS/CSP/ELEC/010)

12. REVIEW: Review of this procedure shall be done as and when but not later than once in every three (03) years. Typical Factors like Changes in legislation, Review of Incident Reports, Inspection & Audit findings, Feedback from users, Recommendations in Incident investigation reports may be inputs for the review and revision of the procedure.

13. ATTACHMENTS/APPENDIX :

Annexure – 1 – Responsibility Matrix
Annexure – 2 - Guidelines for Positive Process Isolation
Annexure – 3- Sample Danger Tag & Sample Hasp device
Annexure – 4 – Sample LOTO Register (TPSMS/CSP/LOTO/001/FORM)
Annexure – 5 - Electrical Isolation Method

Annexure - 1

Responsibilities Matrix

Sr No	Activity Description	Responsibility
1	Ensure that equipment / machine / system is shut down and cleared	Person In-Charge/Shift In-Charge
2	Provision of Hasp on source of Hazardous energy after isolation	Person In-Charge/Shift In-Charge, Maintenance Engineer/Technician.
3	Electrical Isolation request	Person In-Charge/Shift In-Charge / Maintenance Engineer
4	Electrical Isolation of Equipment	Person In-Charge/Shift In-Charge
5	Provision of lock on Hasp and retaining key till completion of the job	Maintenance Engineer / Executing Persons/ Team leader
6	Trying (Verifying) effectiveness of isolation.	Person In-Charge/Shift In-Charge in presence of Maintenance Engineer / Executing Persons/ Team leader
7	Written Request in case Key is missing & clearance from SBU/Site Head thru' Departmental Head	Person In-Charge/Shift In-Charge /Maintenance Engineer / Executing Person/ Team leader
8	Authorizing to breaking of lock on source based on written request	SBU/Site Head

Annexure - 2

Guidelines for Positive Process Isolation:

- The most positive method of isolation is the complete physical disconnection of the line with blind flange or blank put on the live end. Where there is work on pressurized hydrocarbon system or entry into a vessel, physical disconnection is the mainly recommended method of isolation. If this method is not reasonably practical, then, as a next best method, the insertion of a slip plate with the correct size, specific MOC and appropriate pressure rated blind is preferred for the purpose of authorizing a confined space entry.
- Isolations shall be checked by one of the following methods:
    - By releasing pressure or draining liquid via a suitable vent or drain point. Do not rely on pressure gauges - pressure should be seen to be released. Check that drain points or vents are clear and free from chokes. If the isolating valves are holding, flow of material should stop after pressure is vented.

Caution: It is not possible to provide specific instructions covering the various ways in which the equipment can be freed from hazardous process materials before maintenance work can take place. In some cases this may be achieved by pumping out and draining to a safe place; in other cases by blowing; or in the case of gases by purging or steaming. In some instances decontamination is carried out after the section of item can be fully isolated, in other cases it will be necessary to purge or pump out before valves can be closed and slip plates fitted. Each case must be carefully considered by the Person In-Charge/Shift In-Charge, taking into account the hazardous properties of the materials involved and the details of plant design.

- In many situations, remotely operated valves and motor operated valves (MOV) are the only isolations. Basically for these on-off type valves the correct procedure is to positively disable it, by either disconnecting the instrument air supply or remove the actuating signal wires or in the case of MOVs electrical lockout / tag out is to be ensured.
- Having achieved line/equipment isolation by the closure of single or double isolation valves, this valve isolation must remain effective until the purpose of the isolation has been achieved and the Work Permit signed off. To ensure this, the valve or valves must be locked/tagged in the closed position or open position in the case of vent/drain valves.

Special Precautions

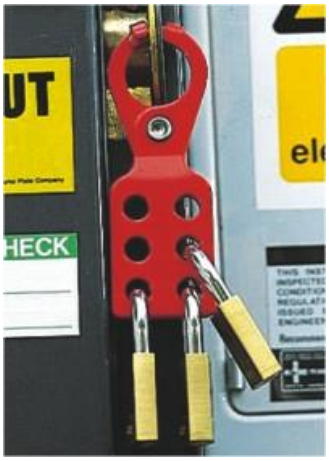
- For equipments like pump / blowers etc where shafts / blades may rotate even after handing over, are to be locked suitably against rotation using locking device before taking up maintenance work.

- Existing slip plates should not be relied upon for positive isolation since they may be corroded. They should be removed, inspected & replaced where necessary by new ones.
- Process and service lines, or equipment, e.g., a pump casing, relying on valve isolations must not be left with open ends. Blanks must be fitted to the open ends immediately after the section of the line or part of the equipment that is removed.
- Always ensure that slip plates compatible with the process materials confirm to the piping design standards to which the plant was designed and these should be fitted as close as possible to the equipment to be isolated. Always ensure that blind detail is entered in the blind register.
- Where cutting or welding is to take place, the line or equipment must be purged and either slip plates must be fitted after the section or item has been isolated or the item of the equipment must be removed and open ends leading to other process equipment blanked off.
- Equipment containing corrosive chemicals must be washed or steamed out, where possible after depressurizing and draining. Where residual contamination is unavoidable, full protective clothing should be worn.
- In case isolation is required again due to some problem (like change in DOR), then this procedure is to be followed afresh.
- For work on an Electrical distribution system, all Lockout / Tag out activities will be the same. However, to avoid back feeding of power, isolations shall be ensured from all possible paths (Upstream and downstream).
- While working on electrical installation, after lock out / tag out is done, equipment shall be discharged safely of all its residual energy. If required, special care may be taken to keep the terminals earthed till the completion of the job.
- Diesel engine driven / battery operated equipment shall be made inoperable by disconnecting and removing battery cables safely.
- For isolation of electrical source where lock out provision is absent, physical disconnection of outgoing power conductors shall be ensured.

Annexure - 3

Sample Danger Tag and Hasp device

Front **Back**



Annexure – 4

TPSMS/CSP/LOTO/001/FORM/001

Sample LOTO register

	LOTO Applied					LOTO Removed				
SN	Date & Time	Lock & Tag No.	Permit No	Applied by Name & Emp No	Sign By Shift In-Charge	Date & Time	Lock & Tag No.	Permit No	Removed by Name & Emp No	Sign By Shift In-Charge

Annexure – 5

Electrical Isolation Method:

Note: Ensure proper earthing is in place prior to commencement of job.

Sr No	Electrical Energy Source	Location of LO/TO point	LO/TO	Isolation method
1	220KV source	Breakers/Isolators on respective bay locations /panels	Lock Out & Tag Out	Switch Off and Isolate Control Supply
2	132KV source	Breakers/Isolators on respective bay locations /panels	Lock Out & Tag Out	Switch Off and Isolate Control Supply
3	33kV, 22kV, 11kV, 6.6KV and 5kV source	Breakers/Isolators on respective bay locations /panels	Lock Out & Tag Out	Switch Off, Isolate Control Supply and Rack out
4	415V Source	MCC / PDB feeder	Lock Out & Tag Out	Rack out / Fuse removal
5	415V or less Source with LO provision	DB / Power points / Control Panels	Lock Out & Tag Out	Fuse removal
6	415V or less Source without LO provision	DB / Power points / Control Panels	Lock Out & Tag Out	Switching OFF power from MCB/ELCB/ Isolator
7	Lighting circuit Distribution (230V)	LDB	Lock Out & Tag Out	Switching OFF power from MCB/ELCB/ Isolator
8	415V / 230V/110V sockets	Socket	Lock Out & Tag Out	Removal of plug
9	220V DC	MCC / PDB feeder	Lock Out & Tag Out	Rack out / Fuse removal