LOCKOUT / TAGOUT
WORK INSTRUCTION
MECHANICAL AND ELECTRICAL

1. PURPOSE AND SCOPE

This document is applicable to all qualified and competent Electrical and Mechanical EMS Technicians who carry out isolations on site. The purpose of this work instruction is to identify hazards and isolation points on both mechanical and electrical equipment in order to minimise the risk of injury to personnel. This will ensure that work can be done safely and enable equipment to be restored to normal state upon completion.

The Lockout/ Tagout is a planned safety procedure implemented by competent personnel to disable the energy supply, systems or circuits before conducting maintenance therefore lowering the overall level of risk when working with this equipment.

This also includes life preserving circuits i.e., fire alarms, Co2 alarms, BACS circuits etc. The Tagout will ensure that personnel are notified when equipment, systems or circuits are not in a normal configuration. This work instruction also applies to project and maintenance works performed by Capability EMS personnel or contractors under their control.

The Health and Safety at Work Act 1974 places a duty on employers to ensure, as far as is reasonably practicable, a safe system of work is in place. Mandatory permits are an essential component of working in a safe environment. The implementation and correct use of these will ensure that The Pirbright Institute is complying with current legislation to ensure that work activities are carried out under a safe system of work, minimising risk to employers.

Failure to follow this lockout procedure may result in injury to personnel or damage to equipment. This will also lead to disciplinary.

2. RISK ASSESSMENT

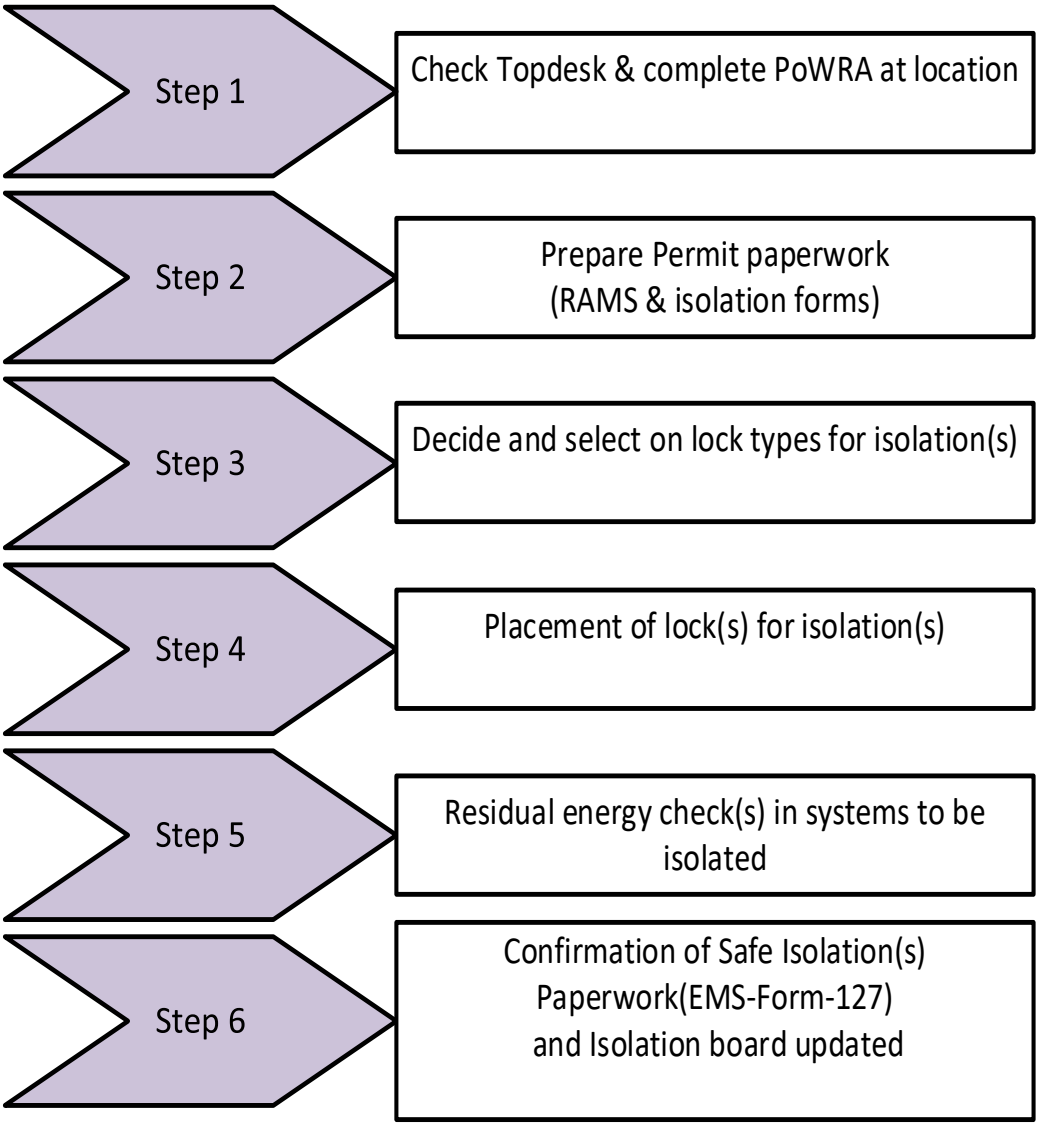
At the Pirbright Institute it is a mandatory requirement to produce a Point of Work Risk Assessment (PoWRA) prior to any works commencing.
All works performed by EMS personnel requiring a Mandatory Permit require a task specific Risk Assessment to be completed via the Permit to Work (PtW) form Section 2 & 3.
All works performed by contractors require a task specific risk assessment submitted in advance of the works. This is reviewed by the responsible person prior to the permit being issued to ensure that the risk assessment is suitable and sufficient for the task.

Hazard based risk assessments are situated within 'Oshens'. If no risk assessments are available, highlight this to your line manager. This work instruction process is associated with risk assessment RA000125 (Oshens)/ EMS-RA-011(Q-Pulse)

3. PROCESS

At The Pirbright Institute we have two variants of the Lockout procedure; "Personal Lockout" and "Permit Lockout" Both ensure a highly effective safe working environment, when used in the correct manner, and both are based on informed and/ or operational judgement. A permit will **NOT** be required for the personal lockout. For **BOTH** procedures, a Point of Work Risk Assessment (PoWRA) **WILL** be conducted by a Competent Person (CP).

3.1 Process flowchart- Electrical systems



4. Personal Lockout

The Personal Lockout system has been introduced to maintain a Safe System of Work (SSoW) whilst controlling and minimising risks to personnel and equipment. All Technicians and BACS Engineers have a personalised padlock (Blue) and identification card. If required, lock out devices and various lengths of chain or cable locks are also available from the Permit Station.

Maintenance tasks are assigned via Topdesk and Engineers use this system to retrieve their jobs, . Upon the safe completion of maintenance tasks, the Technician and BACS Engineer will make the necessary engineering checks before removing the locks and de-isolating the system/electrical supplies, reinstating the equipment/ system/ circuit before moving on to the next task. This method can only be used if the task can be started AND completed within the Technicians daily working hours or the BACS Engineers working shift. A Permit Lockout procedure will be used when the Personnel Lockout procedure is not durable enough when outweighed against the increased risk

This would be on occasions such as:

- When the task completion time will extend beyond your normal working hours
- If the Technician/ BACS Engineers feels that the associated risks are deemed sufficient to warrant a mandatory permit.
- All isolations required for contractor works to take place when isolations impact multiple pieces of equipment not associated with the primary locks.

This procedure is associated with MANDATORY PERMITS and as such, must be strictly adhered to. Once permission is given, the following must be adhered to:

- Permit to Work form must be completed
- Mechanical AND/OR Electrical isolations are made, and the isolators are locked in position using lockout devices and padlocks (Red). A sign or tag (indicating date, time, person, reason for works) will be used to indicate that maintenance work is in progress.

Any stored energy i.e., connectors contained within inverters (either mechanical or electrical) or battery backup systems must be dissipated before the work starts. If more than one Technician or BACS Engineer participates in the work, each of them should lock off the energy source with their own padlock. Multi-padlock hasps and/or lock out boxes, can be used in such circumstances.

Before working on such equipment, it is essential that the effectiveness of the isolation is verified by a suitably trained, qualified and competent person.

5. Contractor Works

Isolation of site services to enable contractor works of any type should always be performed by a TPI Technician under permit.

Following this, contractors should also add their own padlocks to the isolation, either locally (utilising a hasp) or at the central permit station (utilising a lock out box).

6. Written Scheme of Examination

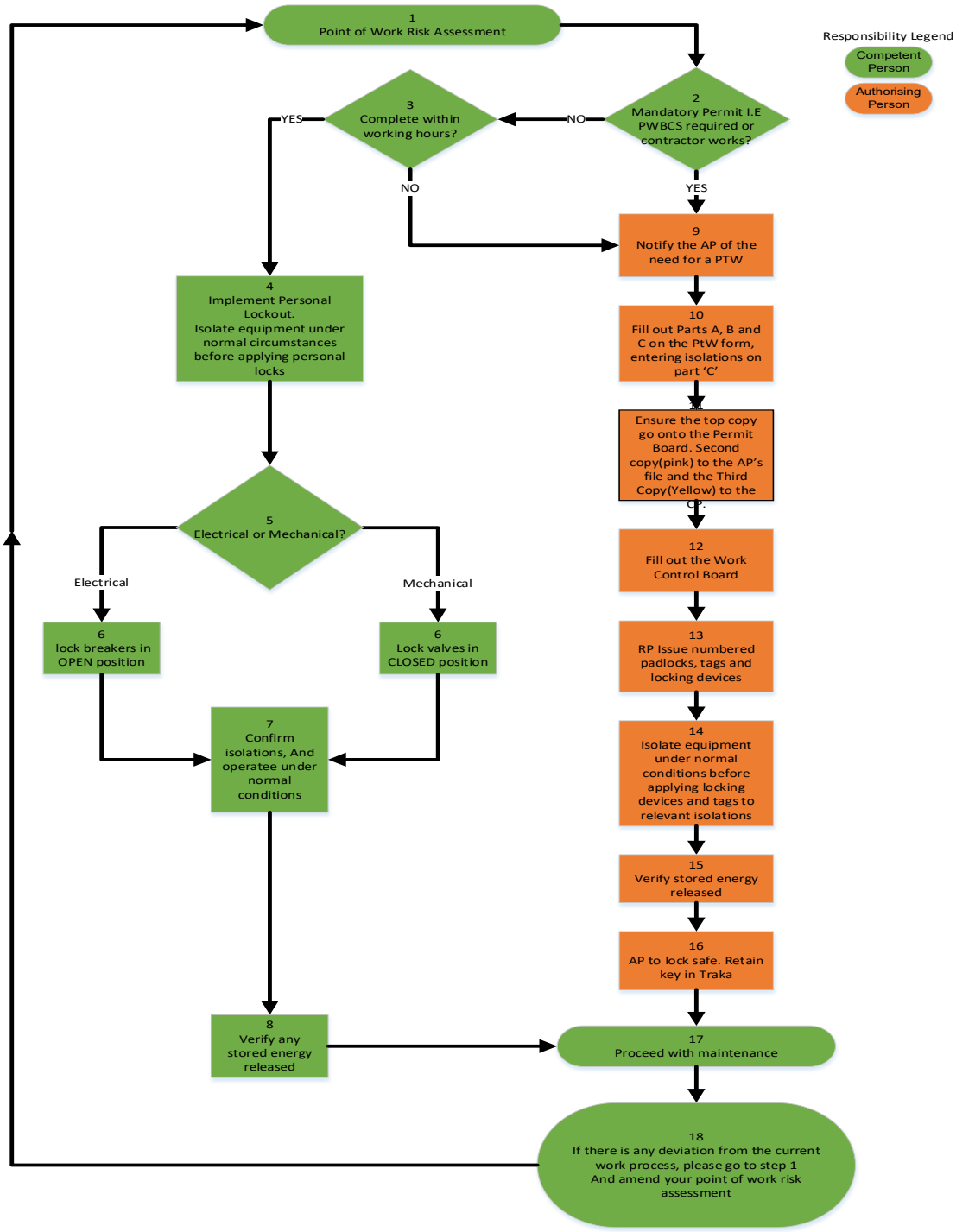
All users and owners of pressure systems need to be able to demonstrate that their equipment is safe to use and that they are firmly aware of its safe operating limits. A written scheme of examination is a document containing information about selected items of plant or equipment which form a pressure system, operate under pressure and contains a 'relevant fluid'.

The term 'relevant fluid' is defined in the *Pressure Systems Safety Regulations 2000* and covers compressed or liquefied gas, including air, at a pressure greater than 0.5 bar (approximately 7 psi) above atmospheric pressure; pressurised hot water above 110 °C; and steam at any pressure.

If any plant or equipment is going to fall outside of its examination or test date, the competent person (i.e., Insurance inspector) will need to be contacted to request an extension prior to the expiry date.

The plant or equipment would be 'locked off and tagged out' under The Institutes Safe System of Work procedure and Line Managers will be informed

7. Flowchart


1
Point of Work Risk Assessment
2
Mandatory Permit I.E PWBCS required or contractor works?
NO
YES
3
Complete within working hours?
YES
NO
4
Implement Personal Lockout.
Isolate equipment under normal circumstances before applying personal locks
5
Electrical or Mechanical?
Electrical
Mechanical
6
lock breakers in OPEN position
6
Lock valves in CLOSED position
7
Confirm isolations, And operatee under normal conditions
8
Verify any stored energy released
9
Notify the AP of the need for a PTW
10
Fill out Parts A, B and C on the PtW form, entering isolations on part 'C'
Ensure the top copy go onto the Permit Board. Second copy(pink) to the AP's file and the Third Copy(Yellow) to the
12
Fill out the Work Control Board
13
RP Issue numbered padlocks, tags and locking devices
14
Isolate equipment under normal conditions before applying locking devices and tags to relevant isolations
15
Verify stored energy released
16
AP to lock safe. Retain key in Traka
17
Proceed with maintenance
18
If there is any deviation from the current work process, please go to step 1
And amend your point of work risk assessment
Responsibility Legend
Competent Person
Authorising Person

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8. INSTRUCTIONS

8.1 Step by Step actions

- Fill out a Point of Work Risk Assessment (this must be completed for each task).
- Is a Mandatory Permit required? (If you are a Contractor or the risk is deemed sufficient enough to warrant a Mandatory Permit.) If YES go to step nine, if NO then go to step three.
- Items containing a (P) are MANDATORY, in addition to.
- When the task completion time will extend beyond your normal working hours
- If the Technician or BACS Engineer feels that the associated risks are deemed sufficient enough to warrant a mandatory permit. Can the task be completed within your working day? If YES go to step four. If NO go to step ten.
- Implement 'personal' Lockout, isolate equipment under 'normal' circumstances before applying personal padlocks and tags. Isolate relevant valves and/or breakers and apply the lockout to each isolation, locking them in the 'valve closed' position and/or the 'breaker open' position.

  NOTE: Double isolations will be conducted where appropriate OR when risk dictates.

- Ensure personnel are safe BEFORE confirming the equipment has been isolated, THEN confirm the isolations.
- Verify any stored energy on the equipment/system/circuit has been released

8.2 LOTO lock Out devices

8.2a. LOTO Locks

Red Locks-These are the standard LOTO locks located on the LOTO board. These are used for permitted work for a duration longer than 24 hrs. Once locks are on, the keys are returned to the key safe in Mod 2 via the controlling Supervisor.

Blue locks- These are personal locks that have been issued to individuals with their identification card. This is applied when starting work on a piece of equipment and is removed when the task is completed. This is for work no longer than 24 hrs and does not require a permit to work. The key will be in the possession of the individual at all times. Personal locks will have an identification card of the named lock owner attached to the lock when in use.

Black locks- These are used for long term isolations and redundant equipment and to isolate any equipment that is decommissioned or a long-term isolation. A long-term Isolation is any equipment that has been LOTO for more than 10 weeks. Black Locks can only be removed by the named responsible person to ensure that no equipment is reinstated without having a review of any compliance or safety items aligned to the equipment. Keys will be held in a key safe that is dedicated to Black Locks only and away from the normal LOTO board and only accessed by E grade staff.

8.3 Simple Isolation

This is an isolation that only requires one lock to be used to isolate one piece of equipment.

If a single lock is used to isolate a piece of equipment a LOTO clasp will be required. the clasp will be applied to the isolator and a Red LOTO lock will be applied to the clasp. The key will be placed in the key safe and all individuals work on the equipment will apply their personal blue locks to the clasp. If a person comes off the job, then the blue lock is removed so at the end of the working day only the red lock will be in place. On re commencing work the next day the individuals will reapply their lock again

8.4 Complex Isolation

This is an isolation that requires multiple locks to be used to enable the safe isolate of one piece of equipment. Equipment with more than one isolation lock will require A LOTO Box to be used to hold all the keys. The key for the LOTO box will be removed and stored in the key safe in Mod 2. Access to this key will be controlled by the Supervisors or Senior Maintenance Owner.

If a piece of equipment needs three isolation point lock off to enable the equipment to be made safe to work on, three keys to the locks will need to go into the LOTO box. A fourth lock will then be applied to the closed LOTO box and the key to this lock will go in the key safe in Mod 2.

Before starting any work, all individuals working on the equipment will need to apply their personal blue lock to the LOTO box. If a person comes off the job, then the blue lock is removed so at the end of the working day only the red lock will be in place. On re- commencing work the next day the individuals will apply their locks again

All LOTO isolation for Red or Black locks should be logged on Form EMS-Form 127 by the individual who is applying the locks.

All LOTO Red and Black locks will require a tag to be applied to the lock when applying the locks

9.2b. MCCB and MCB Lockout devices

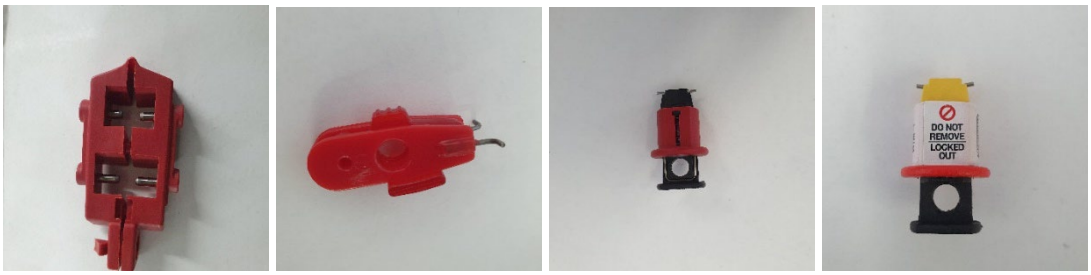

Fig1- Circuit breaker lockout (Snap-on circuit breaker and push lock)

Fig 2- Lockout danger tags

Fig 3- Universal circuit breaker lockout

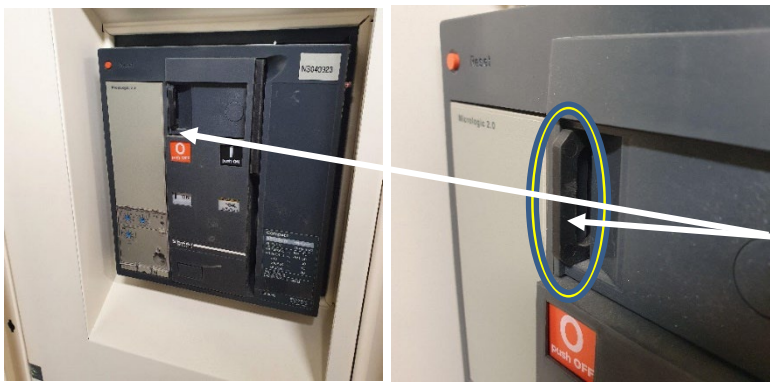

Fig 3- MCCB

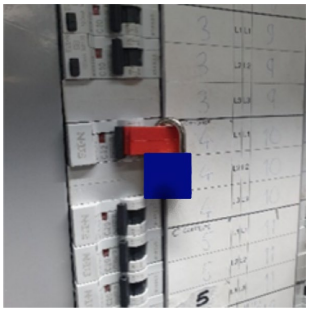

Fig 4- MCB locked off with personal lock

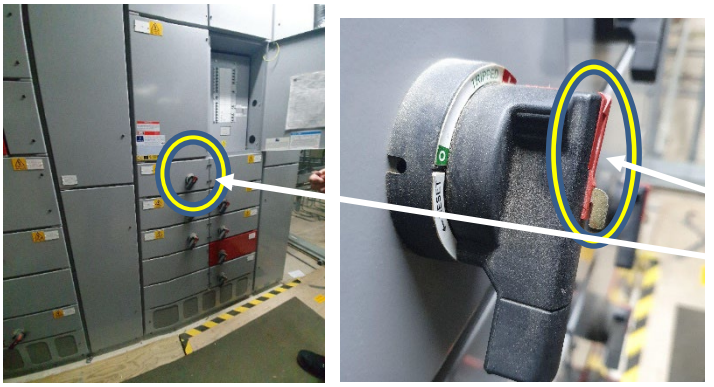

Fig 5- Isolators

Fig 6- MCB with example push lock circuit breaker lockout device

Fig 7 - Hasp Lockout

9. Step by step action

Step by step actions (*See Process Flowchart 4.1)*	
a	Check Topdesk and complete PoWRA at location: • Ensure there is a CMMS (Topdesk) task raised and you have the task number noted as you will need it. • Use a Point of Work Risk Assessment at the location of works; this will check if more than one LOTO is required as there may be multiple voltages or types on the equipment you wish to isolate - Refer to manufacturer's instructions. • Please NOTE: If this is to control isolations made by contractors (as per their RAMS) must be made using their own company's locks and none are to be supplied by the EMS dept.

Step by step actions (*See Process Flowchart 4.1)*	
b	<u>Prepare Permit Paperwork (RAMS& Isolation forms):</u> • Identify the risks by either 1) reviewing prepared RAMS for task, or 2) completing your own RAMS using appropriate RAMS form. This will outline / assess the appropriate control measures for task and identify the requirement an isolation (LOTO) control to be carried out. • Identify the method by either 1) reviewing prepared RAMS for task, or 2) write a step by step method statement on your RAMS form. • Obtain an isolations form EMS-FORM-127 noting how many locks you require and their number details etc. • Complete an EMS-FORM-098 (Permit to Work Form) at Mod 2 permit station. See "Responsibilities" section for information on Competent Person (CP), Responsible Person (RP), and Authorising Person (AP) NB: EMS will not supply locks to Sub-Contractors at any time and will not take responsibility for their isolations
c	<u>Decide and Select on Lock Type(s) for Isolation:</u> • Type of locks used are dependent on the follow factors: • If the work will finish the same day before your shift ends – use your own personal locks(Blue) • If the work will take longer period than your own work day – use permit locks (RED) • Permit locks must be taken from the Electrical LOTO board by the Permit station in MOD 2 and must be used with tag(s) with the following details: Name: Dept: Number of lock and expected completion date. • Put the tag with the lock that is being used to detail that it was put on by yourself. • Fill out the LOTO board details at the bottom of the LOTO board: -Date and time, approved by, lock number and comments etc.

Step by step actions (*See Process Flowchart 4.1)*	
d	<u>Placement of Lock(s) for Isolation(s):</u> 1. Inform your supervisor what areas/systems need to be isolated 2. Inform BACS if this has any impact on their systems, (NOTE: if you are isolating any AHU's for the SAPO4 or CL3 containment areas for ISO's or Plowright) then a PWBCS must be prepared. If all is ok then you can proceed to the item that is to be isolated and follow the isolating testing regime with the supply energised. 3. Test the test meter to a known live source or proving unit 4. Test the item you wish to isolate is live and then isolate (turn off) via the most local means (isolator or breaker). 5. Test the item you wish to isolate has zero voltage. 6. Test the test meter again to prove that it has not failed during test. 7. Lock off with a suitable lock and tag detailing the following information: • who is the responsible person • when equipment has been locked off • identify the equipment that is being worked on • contact details.
e	<u>Residual Energy Check(s) in systems to be isolated:</u> Even after equipment has been isolated in step 4 and the LOTO process has been carried out, you must look for stored energy. For example; VSD's with capacitors, UPS systems with batteries or switching strategy's with Generator back up, BACS control cables, hydraulics/pneumatics, gauges. From these checks make a note of any further isolations that may be required and/ or to discharge stored energy follow the manufacturer's instructions on how to correctly proceed. If unsure check with your supervisor.
f	<u>Confirmation of Safe Isolation(s) & Paperwork Updated:</u> This step of the LOTO process is all about making sure. Checks to be made are: 1. Have you correctly shut down and isolated the piece of equipment you wanted to work on 2. Have you correctly isolated and locked them off correct system / point (e.g. right breaker locked off)?. 3. Will anyone else be relying on your isolation and if so has a multiple padlock device been used? (E.g., Mechanical Engineer changing fan bearings) 4. If in doubt then call your Supervisor to come and double check. 5. Make sure the isolation form is updated with appropriate information and signed off. Make sure the permit is signed and completed by all relevant personnel required (CP, RP, and AP). Information on the Electronic Permit Board and LOTO board is to be removed 6. Return all paperwork to Permit station including isolation form. 7. Paperwork used in process subject to internal and external inspections and/or audits.

10. TRAINING REQUIREMENTS

- Refer to QA-SOP-29 for training requirements.
- Electrical Installation Training
- Permit to Work training
- LOTO Toolbox talk
- Electrical Safety Toolbox talk

11. REFERENCES & RELATED DOCUMENTS

- Health and Safety at Work Act 1974
- The Electricity at Work Regulations 1989.
- The Safe Isolation of Plant and Equipment HSG 253.
- Electricity at Work: Safe working practices HSG85
- Pressure Systems Safety Regulations 2000
- Template version EMS-FORM-045
- QA-SOP-29 Training at The Pirbright Institute
- Permit to Work Process EMS-WI-085
- Permit to Work form EMS-FORM-098
- Isolation Form EMS-FORM-127
- Electrical Safety checklist EMS-Form-356