HAZARDOUS ENERGY

PURPOSE AND SCOPE

This Primary Standard provides information on the FSR controls and minimum requirements to eliminate or minimising the risk of fatalities, injuries and events from interactions with Hazardous Energy sources at Laing O'Rourke workplaces.

Section 1 – 'Requirements' in this document is Mandatory and must be achieved across all Laing O'Rourke Workplaces. Where alternative controls are implemented, these must be approved through the FSR/HSEMS Requirement Dispensation process.

Section 2 – 'How to Comply' in this document provides information and guidance on how to comply with the requirements. Laing O'Rourke Workplaces are required to follow this guidance or achieve an equivalent or higher level of safety/outcome, documenting alternatives in the Project Risk Assessment and/or WHS Management Plan.

REQUIREMENTS

PLANNING WORK

FSR Apply hazardous energy isolation methods in line with the hierarchy of control.

- Manage design processes to eliminate or reduce the interface with overhead/underground or vulnerable services so far as is reasonably practicable.
- Use isolations whenever guards/interlocks are removed/bypassed or tasks expose personnel to hazardous energy (e.g., maintenance, modifications, fault-finding, commissioning).
- Implement restricted access controls where equipment cannot be fully isolated to zero energy.

FSR Obtain an Isolation Permit for all group and multi-point isolations.

- Identify potentially harmful energy sources and appropriate isolation methods via competent persons.
- Identify hazardous energy sources and isolation points using diagrams, photos and line drawings/schematics
- Provide demarcation drawings with energisation permits and obtain appropriate approvals.
- Appoint isolation roles (e.g., authorised isolator, permit issuer, permit holder).
- Maintain a register of isolations that includes the isolation status

FSR Isolation locks, tags, and equipment must be readily available before work commences.

FSR Communicate isolation permit and all isolation changes to potentially impacted personnel.

- Use Notice of Energisation (NoE) system to communicate planned energisations site-wide at least 48 hours prior to energisation (read at each prestart until energised).
- Use information bulletins to communicate commissioning activities that do not require an NoE

FSR Develop a commissioning plan for Mechanical, Electrical, and Plumbing (MEP) systems and communicate it to relevant personnel.

  - Transition from construction to commissioning via a controlled handover (site-approved handover form and checklist covering construction completion and quality checks).
  - Provide commissioning/energisation awareness induction and training to potentially impacted persons.
- Where boundary isolations or group isolations are required, develop and implement processes to:
  - Enable the identification of people/groups that may be impacted by the isolation(s), and detail how communicated with impacted persons will be managed;
  - Detail the energy sources that require isolation, the methods of isolation and protection, and how the isolations will be secured;
  - Detail how the isolation will be proven, and who is responsible for completing the verification;
  - Consider activities being completed that could increase risks associated with the work being performed (e.g. hot work, confined space entry, work in remote/isolated locations etc); and
  - For High Hazard Systems detail how the isolation will be reversed, and the process to return to service, including persons/roles responsible for removing the isolation, and re-energising.
  - Maintain a Boundary Isolation Register where applicable.
- Work activity planning documents (e.g. Work Pack, methodology, permits) are complete and available on-site for all work involving utilities and services
  - Asset owner / network operator requirements are identified and incorporated into the work plan.
- Implement an Isolation (LOTO) training and competency systems that as a minimum details competency requirements for:
  - Permit Authority / Isolation Authority
  - Authorised Isolator / Company Appointed Competent Person (CA/CP)
  - Permit Issuer (Isolation, PTW, PTE)
  - Permit Holder (Isolation / Energisation)
  - Company Appointed Competent Person (CA/CP)
  - Workers Under Isolation (General Workforce)
- Where working in rail environments;
  - Ensure all Traction Power Zones have been identified and communicated in design and planning.
  - Network Operator access or closure provisions must be planned for to provide opportunity for work under isolation.

EXECUTING WORK

FSR Authorised Isolator and other relevant roles are appointed for each isolation.

FSR Clearly identify, tag, lock, and verify all isolation points to prevent inadvertent energisation.

  - Use tags (Danger/Out of Service/Do Not Operate) only as supplementary safeguards to isolation padlocks—never as substitutes.

FSR Identify, de-energise, and physically isolate all hazardous energy sources before starting work on plant, equipment, or installations.

FSR Treat all equipment and wiring as live until a competent person has verified the system is in a zero-energy state (e.g. bled or test-for-dead).

  - Electrical personnel (including standby) are CPR and LV rescue trained and an LV rescue kit is present and deployed during electrical work.

FSR Release all stored energy before opening any hoses or vessels under pressure.

FSR Persons working under an isolation must be trained and competent for the role that they hold.

FSR Never remove another person's danger tag or Personal Danger Lock without following the approved lock removal process.

- Each person attaches their own Personal (red) Danger Lock (PDL) displaying name and contact (one person, one lock);
- For isolations requiring a Permit to Work, workers must read/understand the permit, sign on, and place their red PDL on the specified hasp/lock box.

- Where required to work in close proximity to overhead electrical services:
  - Use accurate measurement devices to determine distance to conductors, taking factors such as thermal expansion/contraction and conductor blowout into account.
  - Plan for potential arcing, static electricity build-up capacitive coupling or induced voltage when working near overhead services.
  - Define minimum approach distances for overhead services and ensure training requirements for spotters/operators where approach distances may be breached.
  - Engage utility authority to supervise/control activities where required by the authority.
  - Implement appropriate controls and emergency rescue procedures in ERP to address potential arcing, static electricity build-up capacitive coupling or induced voltage.
  - Implement controls to identify and communicate the overhead wires through signage, goalposts, flagging etc, with details of the service and SAD.
  - Implement engineering controls to restrict plant from making contact with overhead services.
- Pre-commissioning of electrical services/circuits:
  - Implement boundary isolation and LOTO for incomplete circuits to separate construction from commissioning circuits.
  - Use a Permit to Energise (PTE) to remove boundary isolations and energise circuits/equipment
  - PTE requires NoE distribution before release.
  - Ensure consumer's mains, sub-mains, sub-circuits and connected equipment are terminated and tested by a Licensed Electrician before energisation/commissioning.
- During commissioning processes:
  - Delineate commissioning zones with barrier tape and warning signage; communicate locations on prestart maps.
  - Collate and hand over accurate as-built information promptly to prevent damage and maintain permanent records.
- Live work is only permitted if approved by the Project/Workplace Leader and in accordance with Live Working acceptable practices.
- Where working in rail environments;
  - Comply with Network Operator isolation and permit requirements.

FACILITIES, INSTALLATIONS, PLANT AND EQUIPMENT

FSR Where plant or equipment may encroach within the Safe Approach Distance of overhead wiring, obtain an appropriate electrical permit from the asset owner and implement the defined controls.

- Fit plant restriction devices (e.g., boom locks/chains) to prevent inadvertent encroachment into utility exclusion zones.

- Laydown and offloading areas are established away from known utility corridors.

- Confirm installation of protective shrouds/barriers for equipment within energised circuits prior to energisation.
- Operate energisation communication noticeboard(s) that display NoEs and clearly show areas under energisation. (include requirements linked to FSR control)
- Do not use E-stops, conveyor lanyards or similar control-circuit devices as the primary means of electrical isolation.
- Electrical systems must be isolated using devices designed for positive separation, such as main switches, circuit breakers, de contactors, other approved isolation devices, or electrical disconnection.

REQUIREMENT DEFINITIONS

Term	Definition
Hazardous Energy	Any energy source that is stored or induced that can cause harm (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravity,).
Isolation	The process of de-energising and physically securing energy sources to prevent inadvertent energisation.
Isolation Permit / Service Isolation permit.	Formal authorisation used for group isolations or any isolation protecting two or more people; details steps to de-energise, isolation points, and verification of zero energy.
Authorised Isolator	A competent person appointed to plan, apply, verify, and sign off isolations as per the permit and procedure.
Permit Issuer	The person authorised to issue permits (e.g., Isolation Permit, PTW, PTE), confirming controls and verification steps are in place.
Permit Holder	The responsible person in charge of the work under the permit who ensures compliance and that all workers sign on/off.
Lockout/Tagout (LOTO)	A system using locks and tags to secure isolation points so equipment cannot be operated until all locks/tags are removed through a controlled process.
Personal (Red) Danger Lock (PDL)	A uniquely keyed personal lock placed by each worker (one person, one lock) to protect themselves from re-energisation; includes name and contact.
Group Isolation	An isolation method for multiple workers using a group lock box and hasps; each person applies their PDL to the hasp/box.
Group Lock Box	A secure box holding isolation keys; workers place PDLs on the box to maintain protection without directly locking each point.
Do Not Operate Tag	A warning tag used to deter operation of isolated or unsafe equipment; supplementary to locks.
Test for Dead	A verification by a competent/qualified person that equipment or circuits are de-energised before starting work.
Isolation Points	Physical locations where energy can be isolated (e.g., switches, valves, breakers); must be identified, tagged, locked, and verified.
Boundary Isolation	Isolation applied at construction/commissioning interfaces to control downstream circuits and separate construction from live systems.
Boundary Isolation Register	A controlled record that tracks boundary isolations applied, status, and verification.
Boundary Locks	Locks applied to boundary isolation points to control energy and segregate construction from commissioning circuits.

Term	Definition
Energisation	The act of applying power or energy to circuits/equipment after controls, checks, and approvals are completed.
Notice of Energisation (NoE)	A site-wide communication advising planned energisations (issued ≥48 hours prior; read at prestarts until completed).
Information Bulletin (Commissioning)	A notice used to communicate commissioning activities that do not require an NoE. Information Bulletins are distributed and briefed at prestart.
Permit to Energise (PTE)	Formal authorisation to remove boundary isolations and energise circuits/equipment; requires prior NoE distribution.
Commissioning Zones	Clearly delineated areas (barrier tape/signage) where commissioning/energisation is occurring; locations are shown on prestart maps.
Safe Approach Distance	The minimum clearance required from overhead services; breaching distances requires specific controls and trained spotters/operators.
Induced Voltage	Hazardous voltages that can appear on conductors near energized lines. Management requires planning for earthing, bonding, insulation or separation to prevent electrical discharge.
Capacitive Coupling	Transfer of electrical energy via electric fields (electrostatic coupling) between an energized conductor and a nearby metal object or circuit.
Arcing (Arc Flash)	A dangerous electrical discharge through air; requires risk controls and emergency procedures in the ERP.
Unavoidable Live Work	Live electrical work permitted only under strict approval by the Project/Workplace Leader and with appropriate controls.
Asset Owner / Network Operator	The entity that owns or operates utility assets; their requirements must be identified, incorporated, and complied with (incl. access/closures).
Traction Power Zone	Defined electrical sections of the electrical network that distributes electricity to rail network. Includes infrastructure such as Overhead Lines (OLE), feeder stations or sub stations, return conductor paths and other electrical infrastructure. Must be identified and communicated in design/planning for safe isolations.
Temporary Works Design (re: services)	Design activities that account for the location/condition of services and integrate protective treatments/isolations.

HOW TO COMPLY

The **'How to Comply'** of this document provides information and guidance on how to comply with the requirements. Laing O'Rourke Workplaces are required to follow this guidance or achieve an equivalent or higher level of safety/outcome, documenting alternatives in the Project Risk Assessment and/or WHS Management Plan.

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1.0 RISK MANAGEMENT

A risk assessment must be carried out to determine the level of risk to workers and the type(s) of control method/s or protection to be provided. This risk assessment will be conducted in accordance with **System Requirement Risk Assessment and SiD**.

When choosing the most appropriate control measure, the following hierarchy of controls must be considered:

Type of control	Example
▼ Elimination	• Remove or decommission the equipment entirely so no energy source remains. • Design-out the need to work on energised systems (e.g., prefabricated components assembled off-site with no live energy).
▼ Substitution	• Replace hydraulic systems with mechanical alternatives that have no stored pressure. • Replace mechanical switching equipment with automated switching equipment removing persons from exposure to high voltage electricity.
▼ Isolation	• Lock Out / Tag Out (LOTO) of electrical, mechanical, hydraulic, pneumatic, or fluid systems. • Installation of physical disconnects, blanking plates, removal of fuses, valve lockouts, or applying Personal Danger Locks (PDLs).
▼ Engineering Controls	• Fixed guarding over moving parts; interlocked barriers preventing access to live components. • Pressure relief valves, mechanical chocks, earth leakage devices (RCDs), insulated covers, remote-operated isolation switches. • Designing systems with zero stored energy before access (fail-safe design).
▼ Administrative Controls	• Safe Work Method Statements (SWMS) and Permit to Work systems for isolations/energisation. • Competency requirements, LOTO training, signage, exclusion zones, spotters, pre-start briefings. • Energisation notices, boundary isolation procedures, commissioning communication boards.
▼ PPE	• Insulating gloves, arc-rated clothing, face shields, dielectric boots, hearing protection, thermal PPE. • Using LV Rescue Kits and insulating mats when required.

1.1 ENGINEERED SAFETY

Engineered safety principles must be applied to all work involving hazardous energy sources. The highest priority is to eliminate exposure to hazardous energy wherever reasonably practicable, in accordance with the WHS hierarchy of control. This includes eliminating work on or around energised plant by redesigning tasks, altering work sequences, selecting alternative construction or maintenance methods, or modifying equipment so that personnel are never required to interact with energised systems.

Where exposure cannot be fully eliminated, the work must be engineered to minimise hazardous energy interactions and reduce the complexity of systems.

Methods to achieve this may involve:

- Simplifying system configurations or reducing operational circuits

- Selecting equipment with lower stored energy potential or inherent built in safety controls, such as automatic shutdown features, fail safe modes, and passive protective systems
- Reducing the number of, or relocating isolation points for safer worker access
- Integrating interlock systems that prevent access unless energy is safely isolated
- Designing layouts that support the physical separation of plant/infrastructure, vehicles, and personnel

If hazardous energy interaction remains unavoidable, further engineered controls are implemented to reduce risk. These may include:

- Incorporating remote operation, no touch, or distance guarding systems
- Modifying plant or equipment to enable safer isolation, including lockable isolation devices suited to LOTO procedures
- Installing boundary isolations for any augmented or live services
- Sequencing works to avoid interactions with live services or energy zones
- Temporarily relocating, shielding, or fully de energising systems so workers are not exposed during the task.

Any hazardous energy that remains after redesign and engineered mitigation must be controlled through verified isolation/s, interlocked access systems, engineered barriers, and other safeguards outlined within this standard, and actions aligned with legislative requirements and Australian Standards.

1.2 HAZARD IDENTIFICATION

Hazard identification for work involving hazardous energy is critical due to the dynamic nature of energised systems, the potential for unexpected re energisation, and the presence of hidden or stored energy.

Before any work begins, hazardous energy risks must be systematically identified. Typical energy sources that may be encountered include:

- Electrical (electrical power supply, static charges, batteries, capacitors);
- Mechanical (mechanical drives, moving and rotating machinery);
- Pressure (compressed air, vacuum, hydraulics);
- Gravitational (counterweights, vehicle runaways, conveyor rotation, hung-up material, etc.);
- Potential (springs, structural strain);
- Thermal (hot or cold surfaces and substances, heat radiation);
- Noise and vibration;
- Non-ionizing radiation (lasers, welding, electro-magnetic fields, microwaves);
- Hazardous substances (corrosive, poisonous, asphyxiant, flammable, explosive, reactive substances).

Effective hazardous energy identification includes:

- Assessment of the physical work area with a competent person familiar with the systems involved
- Review of the task and work method to understand where exposure to hazardous energy may occur
- Verification of energy source information, including system drawings, schematics, single line diagrams, isolation design, manufacturers data, and isolation point data
- Positive identification of all hazardous energy sources (electrical, mechanical, hydraulic, pneumatic, chemical, thermal, stored/induced)
- Consultation with asset owners, network operators, or relevant authorities

- Identification of stored energy hazards such as pressure, tension, gravity, heat, rotating parts, or capacitors
- Engagement of competent electrical, mechanical, or engineering personnel as required.

1.3 RISK ASSESSMENT

Risk of exposure to live energy sources during construction, commissioning / energisation are to be identified on the project risk assessment with applicable and adequate controls defined.

Typical risks to be assessed include but not limited to:

- Contact with live electrical systems (including induced voltages, arcs, static electricity, capacitive coupling)
- Release of stored energy (hydraulic, pneumatic, mechanical, thermal, chemical, gravitational)
- Inadvertent re energisation due to inadequate isolation, incorrect switching, or unauthorised removal of locks/tags
- Energy from interconnected systems such as back feeds, UPS units, back-up, or parallel supplies
- Failure of isolation devices or incorrect identification of isolation points
- Uncontrolled activation of plant, control circuits, or automated systems
- Proximity to energised overhead or underground services
- People or plant entering restricted zones around energised equipment
- Environmental changes (temperature, moisture, vibration) affecting equipment or stored energy levels
- Commissioning, testing, or temporary supplies altering the energy state unexpectedly

Proposed work methodologies must be planned and risk assessed, with proposed controls verified on-site through inspections and engagement with authorised isolators, supervisors, operators, and competent technical personnel. These inspections are used to confirm assumptions made during planning align with the actual condition of equipment, circuits, plant, and energy-storage systems prior to work commencing.

Controls must follow the hierarchy of control and be supported by engineered safeguards, safe work methods, isolation permits, physical barriers, exclusion zones, competent supervision, inspections, and defined hold points. These measures ensure no worker approaches or interacts with plant, equipment, or installations until a zero-energy state is verified and the area is confirmed safe.

1.4 SAFE WORK METHOD STATEMENT (SWMS)

Where work involving hazardous energy sources is identified, a Safe Work Method Statement (SWMS) is to be developed prior to the works commencing and cover the entire activity from preparation to work until return to service has occurred. The SWMS shall out line or be supported with a work pack that:

- Identifies all hazardous energy sources.
- Identifies all energised equipment by referencing manufacturers, suppliers, designers or importers instructions and diagrams.
- Permit To Work required to support the work.
- Detailed work methodologies and controls to be complied with during execution of the works.

2.0 TRAINING AND COMPETENCY

Role	Competency Requirement
Permit Authority / Isolation Authority	• Competent in establishing isolation systems in compliance with this procedure and permit to work requirements • Ability to prepare, validate and verify isolation schedules and complete isolation documentation • Skilled in communicating isolation system requirements and conditions and ensuring worker understanding • Manage Services Interfaces and coordination activities with network operators/asset owners. • Ability to keep complete records in support of isolation systems.
Authorised Isolator / Company Appointed Competent Person (CA/CP)	• Formal isolation training and competency assessment • Ability to identify all hazardous energy sources (electrical, mechanical, hydraulic, pneumatic, stored energy, etc.) • Competent in applying isolations, locking/tagging, using isolation devices, and verifying zero-energy states • Ability to prepare and verify isolation schedules and complete isolation documentation • Able to control isolation locks and lock boxes, maintain keys, and supervise workers under the permit • Required licence and technical competency for the class of work performed (e.g., Licensed Electrician)
Permit Issuer (Isolation, PTW, PTE)	• Competency in permit systems (Isolation Permit, PTW, PTE) • Ability to review isolation plans, confirm appropriate controls, and verify isolation integrity • Skilled in communicating permit conditions and ensuring worker understanding • SME in their respective construction discipline • Competent in field inspection and audit approaches necessary to review implementation of permit system and requirements.
Permit Holder (Isolation / Energisation)	• Training in permit conditions, isolation boundaries, and safe work sequencing • Ability to brief workers and control work under the permit • Competency in sign-on/off procedures and ensuring compliance with permit requirements
Company Appointed Competent Person (CA/CP)	• Advanced isolation competency • Ability to prove de-energisation ("test for dead") • Competent to hold isolation locks and control lock boxes, maintain keys, and supervise all workers under the permit • Must be able to verify that all isolations remain intact until work is complete
Workers Under Isolation (General Workforce)	• LOTO awareness training • Ability to correctly apply their Personal Danger Lock (PDL) and Danger Tag • Understanding of isolation boundaries, zero-energy requirements, and personal lock responsibilities (one person, one lock) • Competency in reading and understanding relevant permits
Mechanical / Electrical Fitters	• Technical competency relevant to their trade • Competency in isolating plant and equipment, releasing stored energy, and verifying safe conditions • Trained in correct application of PDLs and confirmation of isolation points • Ability to identify incorrect or unsafe isolation arrangements
Licensed Electrician	• Electrical licence as required

Role	Competency Requirement
	• Competent in testing, terminating, and verifying electrical circuits before energisation • Ability to isolate, test for dead, and certify circuits as safe prior to commissioning • Competency in managing live work only where unavoidable and authorised
Standby Electrical Person	• CPR and Low-Voltage (LV) Rescue training • Competent in electrical emergency response and use of LV rescue kit • Familiarity with electrical isolation and energisation risks
Spotter (Utilities / Overhead Services)	• Trained spotter competency • Ability to monitor approach distances and maintain exclusion zones • Understanding of overhead/underground services, arcing, static build-up, and induced voltage risks • Competency in communication and signalling
Services Coordinator (Utilities / Services)	• Training in identifying underground/overhead services using non-destructive methods Competency in service verification, delineation, and exclusion zone setup • Ability to issue and manage Utilities/Services permits and maintain service records
Supervisor / Foreman	• Training in hazardous-energy risks, isolation requirements, and service strike prevention • Competent to verify isolations, ensure daily inspections, enforce permit requirements and permit conditions • Ability to stop work when controls change and re-brief crews • Understanding of commissioning boundaries and energised-area access controls
Project Engineer	• Training in hazardous-energy identification, isolation planning, and system interface risks • Ability to interpret service plans, isolation diagrams, and energisation drawings • Competency in coordinating temporary works and boundary isolations as part of commissioning
HSE Advisor	• Hazardous-energy hazard identification training • LOTO / isolation system awareness • Competency in verifying controls, monitoring WHS compliance, and reviewing SWMS for hazardous-energy work • Understanding of arc flash, induced voltage, exclusion zones and emergency response requirements
Energisation Permit Authority	• Competency to review energisation documentation, test results, and demarcation drawings • Ability to confirm installation completeness and approve energisation readiness • Skilled in verifying that boundary isolations and required controls remain intact
Construction Personnel Working in Commissioning Zones	• Commissioning/Energisation awareness training • Understanding of delineation controls, boundary isolations, and energisation communication (NoE, information bulletins) • Ability to recognise energised areas and comply with access restrictions

3.0 CONTROL MEASURES

3.1 IDENTIFICATION OF HAZARDOUS ENERGY SOURCES

To support engineered safety practices and effective isolation design across the life of the project, details of energisation points and sources of hazardous energy on the project are compiled and addressed during the planning phase of works and progressively during the execution of works. Details of hazardous energy sources, drawings/diagrams, and identification of energisation points are compiled and maintained to ensure:

- Information Sufficiency: All energised equipment and services are positively identified using manufacturer/supplier/designer/importer information (manuals, schematics, single-line diagrams), and current site drawings.
- If original diagrams are missing or insufficient, create updated information such as simple drawings, isolation maps, photos, or marked up schematics to show all energisation and isolation points before work begins.
- Minimum Content: These documents clearly show energisation points, isolation points, switches, valves, breakers, interlocks, supply lines/pipes, back-feed paths, power sources (including temporary generation/UPS), and control/SCADA points.
- Verification: Field verification (walk-downs) confirms that the drawings/diagrams match as-installed conditions with discrepancies resolved, and documents updated prior to isolation or alternatively, prior to authorising energisation.

Prior to repairing, maintaining, adjusting or cleaning of plant, equipment or systems, all possible energy sources that have the potential to cause injury, damage or uncontrolled energy release are to be identified, assessed, and isolated using effective methods to achieve a zero-energy state.

3.2 ISOLATION PRACTICES

Isolation of plant, equipment, or services typically involves:

- The operation of electrical switches, removal of fuses or battery terminals, and the disconnection of active conductors by withdrawal of plugs from electricity supply sockets
- Closure of service or process valves, and the blanking of pipelines
- Securing of hatchways, manholes and other entries to confined spaces
- The provision of restraints, chocks, locking pins and other fastening devices
- Erection of barriers and other safeguards.

When developing isolation processes, consider the isolation methods detailed in the Appendix 3 - 'Isolation Selection Guide'

3.3 SERVICE ISOLATION PERMIT

Processes relating to permit application, permit issuing, supervision and permit holder requirements are outlined within **Primary Standard Permit to Work**. Key elements relating to the Service Isolation Permit are:

- A Service Isolation Permit is required for all group and multi-point isolations.
  - **Group isolation**: Process to manage more than one trade or more than six people from a single trade working under an isolation.
  - **Multi-point isolation**: Isolation of hazardous energy that requires more than one isolation point to fully de-energise or secure a plant, system, or process. May include single or multiple energy sources.
- One permit may cover multiple workers operating on the same energy source that feeds the service, utility, plant or equipment.

- The isolation must be applied by an Authorised Isolator appointed by the Isolation Authority.
- The Authorised Isolator must:
  - verify the energy source is de-energised
  - apply the isolation lock/s
  - hold the permit
  - control isolation locks by placing keys within a lockbox at all times and applied the Green lock box/activation lock. Or, retain control of the isolation lock key for single point isolations with hasp directly applied.
  - maintain responsibility for all workers covered by the permit
  - ensure all work completed under the permit is safe to perform
  - release the lock box and isolation locks only after all works are complete and the permit is closed

Isolations identified as low risk (i.e. one person and one energy source) are to be managed as per site rules determined in consultation with the Permit Authority at the workplace/project.

Each project will appoint an Isolation Authority, Authorised Isolator/s and other relevant roles require for effective isolation management. Workers required to perform work under an isolation are trained and competent for their role.

3.3.1 SINGLE POINT ISOLATION / SIMPLE ISOLATION

A single point isolation uses one isolation point (for example, one valve on a pipe or one circuit breaker on a switchboard). If several people need to work under this isolation, they can all attach their locks using a single scissor lock (hasp). Where the workgroup is larger than 6 (a typical hasp) a group isolation must be used.

The Permit Issuer will ensure that:

1. The required isolation points have been identified and verified by an Authorised Isolator in consultation with the Permit Applicant
2. An Authorised Isolator has placed the single point, confirmed it has been checked as correct for the intended scope, and is effectively controlled with a service isolation lock and hasp installed.
3. An Authorised Isolation has confirmed zero-energy (test/prove-deenergised).
4. The key for the service isolation lock is held by the Authorised Isolator for the duration of the job and current permit.
5. Confirm the permit holder acknowledgement of responsibility to ensure:
   a. The workforce is briefed on the permit and isolations.
   b. Control the work covered by the permit and that it is done safely
6. All personnel sign on the permit and install their personal danger locks Ensure the Service Isolation Permit is validly issued. Permit Holder to Ensure:
7. Make sure everyone signs onto the permit and puts on their own personal danger lock and tag.
8. Control the work covered by the permit and that it is done safely.
9. All locks and tags are removed only by the people who put them on
10. Advise the Authorised Isolator of the completion of works.
11. Apply an out of service tag to the hasp at times where Personal Danger Locks have been removed but incomplete work remains.

12. Once advised by the Permit Holder that all Personal Danger Locks have been removed and works are complete, the Authorised Isolator confirms that any final checks are done with plant and equipment safe for isolations to be removed.
13. After the permit is signed off and all other locks are removed, the Authorised Isolator removes the service isolation lock and return plant and equipment to the required configuration.

3.3.2 MULTI-POINT ISOLATION / GROUP ISOLATION / COMPLEX ISOLATION

A multi-point isolation is an isolation that requires several points of isolation. It supports the isolation of more complex systems and work within areas controlled by a multi-point isolation by way of a lock box. They are also utilised to support isolations for larger workgroups that single point isolations cannot accommodate.

1. Required isolation points have been identified and verified by an Authorised Isolator in consultation with the Permit Applicant.
2. An Authorised Isolator has applied all required isolations, service isolation locks are placed to control the isolation point/s, and isolations have been verified by another Authorised Isolator.
3. All keys to service isolation locks are placed in a lock box that is controlled by an Authorised Isolator.
4. 4The system is proven de-energised, and all keys to all Service Isolation Locks are confirmed by the Authorised Isolator to be within the lockbox, with an Isolation Tag and Lock Box Lock (Green)/ Activation Lock is placed on the lock box to secure the key/s.
5. The key to the Lock Box Lock (Green)/ Activation Lock shall remain with the Authorised Isolator or controlled by other processes outlined in project procedures.
6. The applicable lock box number and corresponding Service Isolation Permit number are confirmed and recorded on the permit prior to issuing and the permit number is recorded on the lock box isolation tag.
7. Confirm the permit holder acknowledgement of responsibility to ensure:
8. The workforce is briefed on the permit and isolations.
9. All personnel sign on the permit and install their personal danger locks and tags to the corresponding lock box.
10. Advise the Authorised Isolator of the completion of works.
11. Apply an out of service tag to the lock-box at times where Personal Danger Locks have been removed but incomplete work remains.
12. Once advised by the Permit Holder that all Personal Danger Locks have been removed and works are complete, an Authorised Isolator confirms that any final checks are done to confirm that plant, equipment, or systems are safe for isolations to be removed.
13. After the permit is signed off and all other locks are removed, the Authorised Isolator removes their Lock Box (Green) Lock /Activation Lock allowing for the removal of service isolation locks and the return of plant, equipment, or systems to the required configuration.

Lock box must be selected in consideration of the size of the workgroup. Hasps may be used in conjunction with lockboxes to increase available capacity or improve workgroup identification. For widespread systems or isolations, large group lock boxes or lock boards may be required to accommodate involved work groups and worker numbers.

Figure 1 Example of Lock Box (Green) Lock/Activation Lock

Figure 2 Lock box with Lock Box (Green) Lock/Activation Lock

3.4 ISOLATION DEVICES

Isolation devices selected must be capable of providing a positive, secure and verifiable isolation that is appropriate to the energy source, equipment, environment, and task to be performed. The device and methodology must be chosen by an Isolating Authority familiar with the equipment and work to be performed. See Appendix 3 – 'Isolation Selection Guide' for more detail on options to be used based on the hazardous energy present.

Each Isolation Point is to be secured with a Service Isolation Lock. Where a lock colour is not specified by the client or asset owner, Black service isolation locks will be used for hazardous energy isolations. Other default lock colour conventions are shown in Appendix 4 – 'Lock Colours and Use Definitions'.

Where an isolation point is not fitted with a lockable device, a secondary device must be selected and applied to ensure continuous and effective control of the isolation for the duration of the works.

Use of DANGER, OUT OF SERVICE or DO NOT OPERATE tags should be regarded as an additional safeguard. They are supplementary to isolation padlocks and under no circumstances should tags or notices be used in place of or as a substitute for isolation padlocks.

3.5 TEST FOR DEAD AND CONFIRM DE-ENERGISED

All systems will be treated as live unless tested for dead and confirmed de-energised.

Verification of a de-energised state is a necessary step to ensure that all energy sources have been effectively isolated prior to work starting. The isolation is to be confirmed by methods such as:

- visual inspection of the isolation point
- opening drain valves (where applicable)
- attempting to start or operate the equipment
- checking indicator lamps
- using test instruments or other suitable means

Electrical testing for dead must be performed by competent and authorised persons only to ensure that they comply with Australian Standards and Electrical Entity isolation requirements for Low and High Voltage installations.

When isolations are applied, it is important to remember that hazardous stored energy may still remain within the system. To prevent injury, the following actions can be taken to ensure that any residual energy is safely controlled or released:

- confirm that all moving components have completely stopped
- apply grounding or earthing leads where required
- discharge any built up pressure
- relieve tension in springs or physically restrain spring loaded mechanisms
- secure any parts or loads that may drop or shift
- immobilise hydraulic or pneumatic equipment that could move unexpectedly
- open vents and bleed points to release trapped air or fluids

- drain pipelines and shut off process valves
- insert a blank, spade, or similar device where no isolation valve exists
- purge tanks, vessels, or process lines to remove hazardous contents
- allow extreme temperatures to stabilise or provide suitable protective clothing where heat or cold cannot be eliminated

3.6 PERSONAL (RED) DANGER LOCK AND PERSONAL DANGER TAG

The purpose of a Personal Danger Lock and Personal Danger tag are to alert others that the person named on these devices is working on the plant or equipment and that the isolation point it is attached to must remain isolated until that person has completed their work.

Each worker performing work where hazardous energy is isolated must apply their own personal danger lock and tag:

- Each lock is to be coloured red and be appropriately labelled (Danger: Locked Out, Do Not Remove) and identify the individual that placed the lock.
- They must be uniquely keyed and no duplicate keys are to exist for any personal danger lock.
- Each lock must display the name and contact details of the person placing it.
- Each authorised worker should always keep the key to their own lock with them.
- Each authorised worker is solely responsible for putting their lock on and taking it off.
- If a job needs multiple locks to be placed (as may be required in rail network lockout practices, or control of multiple lock boxes), the same worker keeps the individual keys for each lock they've applied.
- Locks are to be removed when the work is completed or prior to leaving site (at the end of the shift.

Figure 3 Example of Personal Danger Tag

Figure 4 Examples of Personal Danger (Red) Lock

Note: If plant or equipment remains in a hazardous state at the end of a shift or when leaving the site, the worker must ensure an OUT OF SERVICE tag is applied and notify the supervisor/permit holder that the work is not complete.

3.6.1 FORCED LOCK REMOVAL

If a personal danger lock remains in place and the lock owner is absent or cannot return to site within a reasonable timeframe, the person in control of the work may initiate the forced lock removal process.

This may only proceed under exceptional circumstances and with Project Leader approval or as aligned to Project Specific Isolation procedures. The Authority to Remove Personal Danger Tag and Lock - Form is completed by the relevant Supervisor and used to record forced lock removal decisions and approvals.

Exceptional circumstances include:

- A key is lost or damaged, or

- Where the individual has inadvertently left a personal lock on an isolation point and has left site and cannot return, or
- Where removal of the isolation is critical to allow safe operation of the plant or equipment.

The process requires that the Permit Authority:

- Confirm the location of the lock owner ensuring they are not present within the workplace and therefore not in a potential position of harm if isolation is removed
- If after reasonable steps to contact the worker have been made and the location of the worker cannot be confirmed, conduct a thorough search of the equipment and work area controlled by the isolation to ensure that no person is present.
- Assess the plant/equipment and determine if removal of the lock/tag or isolation can be done safely and does not present danger to site personnel or equipment
- Verify the plant/equipment is fully assembled, guards/covers are in place, and the condition is safe to operate
  - if unsafe, maintain the isolation, apply an OUT OF SERVICE tag, and record that work is incomplete
  - if safe, remove the personal lock and tag following the approved removal process
- Notify the lock owner as soon as practicable that their lock/tag was removed, the reason, and the status of the equipment
- Document the approval for the forced lock removal on the Authority to Remove Personal Danger Tag and Lock – Form.
- Entry the removal on the applicable permit and captured it as an Observation within Intelex to record the occurrence and actions taken.

3.7 LIVE WORK

Electrical work on energised equipment is generally prohibited, with the standard expectation being that equipment is isolated, locked out, and proven de energised before any work begins. Live electrical work should only occur when de energising is not reasonably practicable, or when the task specifically requires the equipment to remain energised such as when:

- necessary for testing
- necessary for the proper performance of the work or fault finding
- no reasonable alternative method exists
- necessary to maintain essential services or ensure safety

Where unavoidable, it must be formally approved by the Project/Workplace Leader, risk assessed with elevated controls, and undertaken by competent personnel under a PTW with appropriate PPE, rescue capability, and supervision.

Live work must only be carried out by competent licensed electrical worker, using appropriate live work tools, insulated equipment, and test instruments.

A safety observer is required for all live work unless the energised work qualifies as low risk testing or involves extra-low voltage work. The safety observer must:

- Be competent
- Have no other duties
- Be able to rescue and respond immediately

All equipment used for live work must be tested and inspected to verify correct operation and compliance.

3.8 COMMISSIONING AND ENERGISATION

Commissioning and start-up represent the final phases of a construction project, where all installed systems are verified to ensure they are correctly built, compliant, and operating within their required performance parameters before being placed into service.

During this phase, the risk profile of the work shifts with the introduction of Hazardous Energy. Systems that were previously non-energised during construction may now be introduced to electrical, mechanical, hydraulic, pneumatic, or other hazardous energy sources. As a result, new and elevated risks emerge that were not present during earlier construction activities.

To manage these risks, additional controls must be implemented before any energisation occurs. These controls may include physical separation, guarding, engineered safety features, isolation procedures, and administrative controls such as permits and energisation readiness checks. These measures must be established and verified prior to energisation because uncontrolled exposure to stored or live energy within plant and equipment has the potential to cause serious incidents or fatalities.

'Appendix 1 – Energisation of New Plant and Equipment Flowchart' provides an example flowchart to support the safe Energisation of New Plant and Equipment.

3.8.1 CONSTRUCTION BOUNDARY ISOLATION PROCEDURE

A construction boundary isolation procedure/energisation procedure will be developed for the project where energisation and commissioning has been identified as a risk on the Project Risk Assessment (PRA).

Boundary isolations are used to control power or energy sources and isolate downstream construction systems from commissioning systems and activities. Boundary locks are placed by the authorised personnel to control energy.

Boundary isolations can only be removed with a Permit to Energise (PTE) and an accompanying Notice of Energisation (NoE).

Refer to the **Construction Boundary Isolation Procedure Template** to develop project-specific procedures. This provides the minimum requirements that should be included in the site procedure.

- Provide commissioning/energisation awareness induction and ongoing Isolation competency maintenance for relevant roles.
- Implement boundary isolation and barrier controls for incomplete circuits to separate construction from commissioning circuits, controlling downstream construction circuits with boundary locks.
- Establish commissioning zones with warning barrier tape, install prominently placed signage, and show commissioning zone locations on prestart maps and brief affected personnel.
- Use PTE to remove boundary isolations and energise equipment
- Do not release PTE until the NoE has been distributed within required timeframes.
- Ensure consumer's mains, sub-mains, sub-circuits and connected equipment are terminated and tested by a Licensed Electrician prior to energisation/commissioning.

The colour of locks used for Boundary Isolations is to be outlined within the site-specific boundary isolation procedure/energisation procedure and align with project requirements. Where a lock colour is not specified by the client or asset owner, Blue Boundary Isolation locks will be used for hazardous energy isolations. See Appendix 4 – Lock Colours and Use Definitions.

3.8.2 COMMISSIONING ZONE DELINEATION AND COMMUNICATION

A Commissioning Zone is a clearly defined area established to separate construction activities from commissioning and energisation works. It represents the exclusion zone around the plant, equipment,

or system being commissioned and may include only the equipment itself or a broader surrounding area, depending on project specific risk assessments and energisation requirements.

Commissioning Zones must be:

- Delineated using blue/white barrier tape and clear commissioning signage (refer to Figure 6).
- Displayed on site prestart maps and communicated to all personnel during prestart meetings.
- Shown on the Site Energisation Noticeboard so all workers are aware of upcoming or active commissioning activities.

The size and shape of a Commissioning Zone must be determined by the Project, based on the nature of the system being commissioned, potential hazardous energy exposure, and the required clearance distances to prevent unauthorised access.

Figure 5 Example of commissioning warning tape and tags

Figure 6 Example of commissioning warning signage

3.8.3 COMMISSIONING LOCKS

A commissioning Lock is used on an isolation device within the commissioning zone to indicate that the service, plant, or equipment is ready to be commissioned. Commissioning Locks may be in place downstream of the Construction Boundary Isolation point, in preparation for commissioning activities. In this case, the controls for a construction boundary continue to apply.

3.8.4 CONSTRUCTION BOUNDARY ISOLATION LOCK & COMMISSIONING LOCK REGISTER

A Construction Boundary Lock Isolation Register will be maintained to document the location and details of the Construction Boundaries and Locks.

A Commissioning Lock Isolation Register will be maintained to document the location and details of the Commissioning Locks.

Keys to Construction Boundary Locks and Commissioning Locks will be secured within Lock Boxes controlled by Lock Box locks. The keys to the corresponding lock boxes will be held under the control of the Permit Authority or delegate Isolation Authority assigned to commissioning.

For typical lock colours, see 'Appendix 4 – Lock Colours and Use Definitions'

3.8.5 PERMIT TO ENERGISE (PTE)

A Permit To Energise (PTE) is required to support the safe and controlled introduction of Hazardous Energy to new plant, equipment, or services. A PTE is used to control the removal of Construction Boundary Isolations and energise the plant, equipment or services listed on PTE.

The PTE request shall be completed in consultation with the Permit Holder and the Permit Authority or Delegate Isolation Authority responsible for control of Commissioning activities.

The Permit Applicant/Permit Holder will prove to the permit authority that the plant, equipment, or system requested to be energised is:

- Installed as per the specification, is safe to operate;
- Quality assurance documentation is complete; and

- Provide highlighted delineation drawings detailing the energised circuits required.

Any works that is not complete, that is directly or indirectly connected to the system must be isolated. An isolation integrity test that includes physical try test (check for dead) must be completed.

The Permit Authority shall then acknowledge the work completed is correct as per installers approved Inspection verification documentation. The PTE can then be issued after the NoE has been distributed and communicated in the correct timeframes.

Only boundary isolations outlined and specified in the permit may be removed.

Refer to **Permit to Energise Template** to support development of project specific process where required.

3.8.6 NOTICE OF ENERGISATION (NOE)

A Notice of Energisation (NoE) is a sitewide notice advising personnel of a planned upcoming energisation.

The NoE highlights what circuits, equipment and physical area/s are to be energised and what date the energisation will occur.

A NoE is typically required for energisation of Hazardous Energy Systems, e.g. energising a section of a project.

NoE's are required to include sufficient detail and supporting information to identify the plant, equipment, or systems being energised. Information may include but is not limited to the following:

- Marked up single line diagrams.
- Marked up layout drawings.
- Details of the new installation.
- Any exclusion zones, controls etc.; and
- Contact details for the Permit Holder or Supervisor.

NoE's should be communicated:

- Highlighting the plant, equipment and physical area to be energised and the date / time the energisation will occur;
- 48 Hours before energization;
- To personnel attending the Daily Pre-start Meetings until energisation has occurred.
- Placed on the Site Energisation Noticeboard.

NOTE: The PTE cannot be released until the NoE has been distributed and communicated within the correct timeframes.

Refer to **Notice of Energisation Template** to develop a project specific process.

3.8.7 ENERGISATION COMMUNICATION NOTICEBOARD

Where identified in commissioning plans or through risk assessment, energisation noticeboard(s) must be implemented to communicate the areas that are under energisation or commissioning zones scheduled to be energised.

NoEs should be displayed on the Energisation Communication Noticeboard.

Figure 7 Example of energisation status noticeboard

3.8.8 INFORMATION BULLETINS

Information bulletins are used to communicate commissioning activities that do not require a NoE e.g. extra low voltage such as a 24-volt system testing.

Information bulletins must be distributed ahead of a commissioning activity and must be communicated at the next available prestart.

Refer to **Commissioning Information Bulletin Template** to develop a project specific process.

3.8.9 POST ENERGISATION

Once equipment or an area has been energised under a PTE, the following steps should be followed:

- Energised equipment/area to be monitored by suitably qualified personnel to ensure the energisation has not resulted in any abnormalities or anomalous behaviours to the on-site equipment/environment.
- If any defects are found, i.e., leaks in pipework or tripping of electrical circuits, the equipment must be immediately isolated, following Project Isolation Procedures and the practices outlined above, and appropriate repairs carried out and documented.
- Access to commissioning Zone will continue to be controlled with signage and appropriate demarcation.
- Switchboards and Plant rooms must be locked. Access will be controlled and authorised by the area supervisor.

If further works are to be carried out post energisation, a Service Isolation Permit must be obtained.

4.0 INSPECTIONS

Daily inspections to confirm the integrity of isolations should be performed prior to the commencement of each shift. These inspections will include:

- Visual inspection of isolation points, including locks, tags, valves, breakers etc.
- Verification of correct lockout and tagging as outlined on permit to work.
- Check for stored energy release, including pressure, springs, gravity, tension.
- Test and prove de-energised.

Daily inspections will also confirm the integrity of commissioning zone delineations and boundaries, ensuring that they remain in place and effective.

4.1 PRE-ENERGISATION INSPECTIONS

Pre-Energisation checks using the Pre-Energisation Form must be performed for all plant, equipment, or systems that are to be energised. Checks and inspections must be successfully completed prior to applying for a Permit to Energise (PTE).

A Pre-energisation walkdown must take place involving the Permit Authority or Delegate Isolating Authority responsible for control of Commissioning activities, a relevant CA/CP if required, and the person responsible for the service or equipment being energised.

Pre-Energisation checks confirm construction is complete with plant and equipment installed as per design and ITP/ITR requirements.

Visual inspections are utilised to ensure:

- Area is clean and clear
- Barriers and signage are in place
- Commissioning zones are delineated
- Protective shrouds/barriers installed
- Boundary isolations established and sign off by authorised isolators.
- Signage and delineation measures confirmed to be established.
- Permit-to-energise and NoE-verification inspections completed.

Inspection of all mains, sub mains, circuits and terminations must be performed by a licensed electrician (tested, terminated, verified) and documented.

4.2 SUPPLY CHAIN

Where isolations or work involving hazardous energy are performed by subcontractors their controls and procedures must be audited to ensure compliance with Laing O'Rourke's standards. This will be performed in accordance with SR Supply Chain Management and will includes but not limited to auditing:

- Permit processes
- Isolation diagrams and tagging systems
- Authorised isolator competencies

5.0 INCIDENT AND EMERGENCY PROCEDURES

All incidents involving hazardous energy including electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, or stored energy sources must be managed in accordance with **SR Event Management, Reporting, and Investigation.** Any required regulatory notification must be completed in accordance with applicable jurisdiction specific electrical safety legislation, WHS laws, and specific project or contractual requirements.

Where work activities involve the potential for uncontrolled release of hazardous energy, projects must ensure that hazardous energy risks are fully assessed during planning and that adequate emergency response arrangements are established before work begins. Requirements of **SR Emergency Planning and Response** must be applied during planning, execution, and review.

Work involving hazardous energy risks must not begin until:

- All workers have been briefed on the emergency response plan, understand the required actions, and know the roles and responsibilities of responders.
- All necessary emergency response equipment is on site, inspected, and positioned close to the work area (equipment may service multiple areas where assessed as suitable).

- The Emergency Response Plan has been tested, validated, and confirmed as effective for the specific hazardous energy scenario.

Minimum response actions during a Hazardous Energy Emergency will include but are not limited to:

- Stop work immediately.
- Make the area safe without exposing additional personnel to hazardous or unverified energy sources.
- No person is to approach damaged system, or exposed energy source until a competent technical person (e.g., qualified electrical or mechanical tradesperson) confirms it is safe. Only access injured workers when safe to do so.
- All personnel must follow the site Emergency Management Plan, relevant SWMS, and any direction provided by the asset owner, supply authority, or engineering authority.
- If safe to do so, and only by trained and authorised personnel, isolate hazardous energy using approved isolation points, valves, disconnects, emergency stops, or system depressurisation controls.
- Personnel must remain clear of:
  - Exposed or energised conductors
  - Pressurised lines or equipment
  - Arc flash zones
  - Rotating or moving machinery
  - Chemical or thermal release zones
  - Areas where hazardous energy may remain stored or unverified
- Contact emergency services where required.
- Initiate any site-specific rescue or retrieval arrangements, Low Voltage Rescue procedures, mechanical containment actions, system pressure relief steps, or thermal injury response.
- Begin notification protocols, including the asset owner, Project Leadership, organisational safety teams, and regulatory bodies where a notifiable event is triggered.
- Commence incident reporting and investigation as required by SR Event Management, Reporting, and Investigation.

Following any hazardous energy emergency, no system, equipment, or work area is to be re energised until it has been inspected, tested, and declared safe by a Qualified Technical Person or equivalent competent authority for the energy source involved.

5.1 EMERGENCY EQUIPMENT

Emergency equipment suitable for hazardous energy incidents must be readily available, fit for purpose, and inspected regularly. This may include, but is not limited to:

- Fire extinguishers (including types rated for electrical and energy related fires)
- Fire blankets
- Low Voltage Rescue Kits and insulated rescue hooks
- Pressure relief tools, system bleed equipment, spill kits, and thermal burn first aid kits
- Voltage detectors, energy isolation verification devices, and lockout/tagout hardware
- Arc flash rated PPE, insulated gloves, face shields, and energy rated barriers
- Communication devices for emergency escalation

Competencies and capabilities of workers supporting emergency response is to be planned for and confirmed, to ensure required level of response is achieved and maintained during work involving hazardous energy.

6.0 REGULATIONS, CODES AND STANDARDS

Key legislation, codes and standards relating to this primary standard are outlined the Laing O'Rourke Health and Safety Legal Register.

7.0 PLANS, FORMS AND TEMPLATES

For relevant plans, forms and templates see the Laing O'Rourke HSEMS at www.lorhsems.com.

8.0 APPENDICES

- APPENDIX 1 - ENERGISATION OF NEW PLANT AND EQUIPMENT FLOWCHART
- APPENDIX 2 - ROLES AND RESPONSIBILITIES
- APPENDIX 3 – ISOLATION SELECTION GUIDE
- APPENDIX 4 – LOCK COLOURS AND USE DEFINITIONS

8.1 APPENDIX 1 – ENERGISATION OF NEW PLANT AND EQUIPMENT FLOWCHART

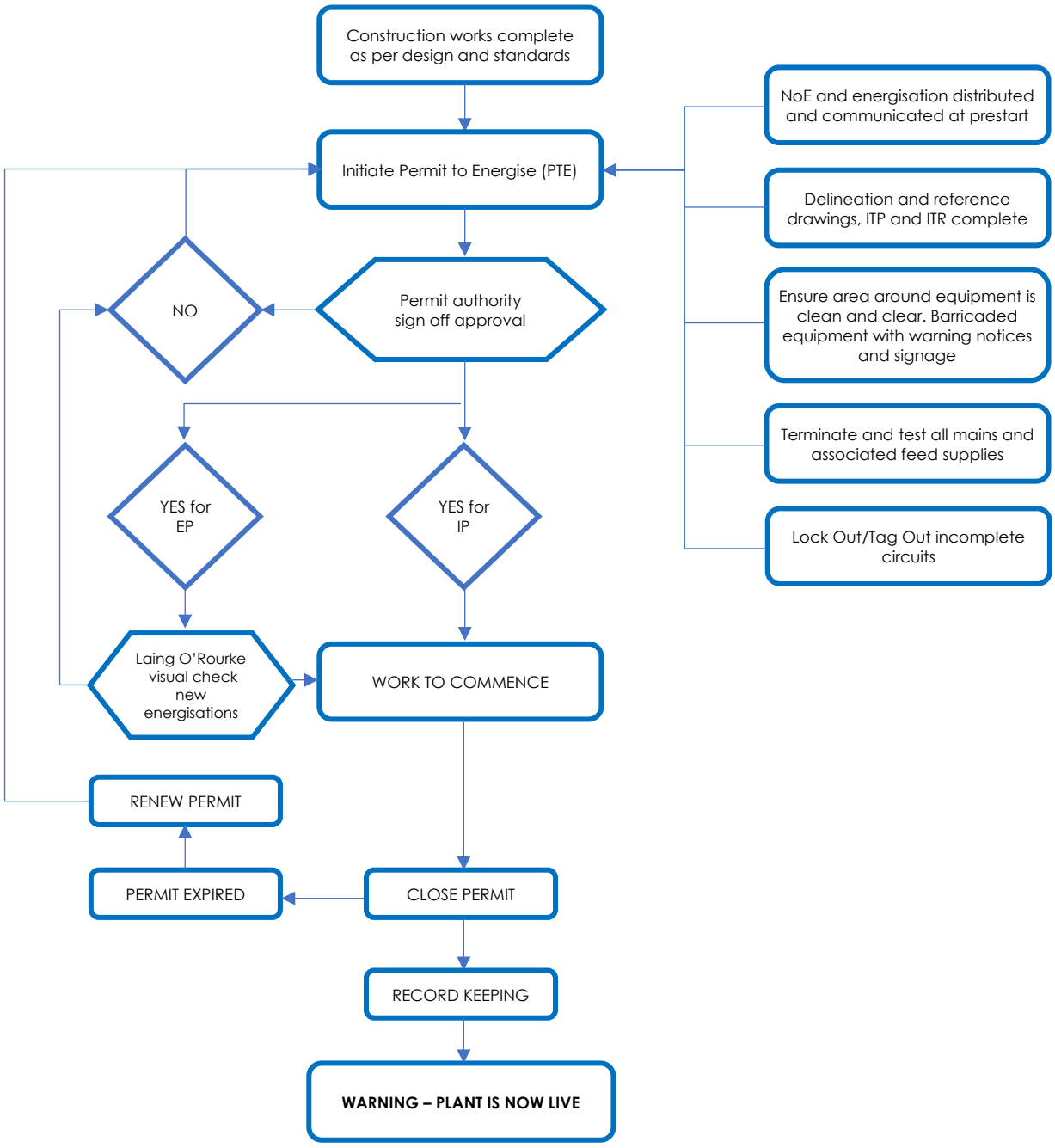

Figure 3 Energisation process

8.2 APPENDIX 2 – ROLES AND RESPONSIBILITIES

Table 1 Isolation Roles and Responsibilities

Role	Responsibilities
Project Leader	• Assign authority and appoint personnel involved in the LOTO procedure.
Isolation Authority / Permit Authority	• Ensure the Isolation system is implemented in accordance with the Permit to Work Primary Standard and this Primary Standard.
Permit Issuer	• Appointed by the Project Leader. • Must have relevant construction or isolation/tagging experience and be an SME in at least one major construction discipline. • Review and approve permits submitted by the Permit Applicant. • Conduct field inspections and audits.
Authorised Isolator	• Must have construction and/or isolation/tagging experience and be competent within their trade. • Competency declared by employer or LOR line manager and formally appointed by Project Leader. • Permitted to isolate plant/equipment for Lock Holders for single or multiple isolation points. • Required for ANY service isolation. • Complex isolations must be verified by a second Authorised Isolator.
Permit Holder	• Appointed by the Project Leader or delegate. • Receives the approved permit from the Permit Issuer and holds it on behalf of the work group. • Ensures Lock Holders have correctly applied their locks and understand the isolation.
Lock Holder	• Deemed competent in applying their Red Personal Danger Lock and Personal Danger Tag. • Performs work requiring an isolation on an LOR project/site. • Not permitted to conduct their own isolations; may only apply locks/tags to confirmed isolations or lock boxes.
Permit Applicant	• Completes and submits the Service Isolation Permit with all required information. • Provides marked-up drawings/diagrams/schematics of affected systems and areas. • Supplies detailed information on electrical and mechanical equipment (e.g., DB details, isolation valves, asset IDs, manuals, documentation, redline drawings, recent changes).

Table 2 Energisation roles and responsibilities

ROLE	RESPONSIBILITY
SUPERVISOR	• Ensure that access and egress to all energised areas of work are clean and clear, provide site information at pre-start & work parties in and around the area informed of the energisations, isolations and personal danger locks (PDL's) are applied to equipment that is not to be energised within the circuit. • Verify the (CA, CP) energisation permit is in place and audit works in and around the area of works permit.
LICENSED ELECTRICIANS	• Ensure that all planned work of energisation of plant / equipment is tested and terminated and all equipment not required in the circuit is isolated and made safe.
OPERATORS	• Trained & competent persons to operate plant and equipment they operate. Under the supervision of the energisation permit.

8.3 APPENDIX 3 – ISOLATION SELECTION GUIDE

Hazardous Energy Type	Typical Isolation Devices	Notes / Considerations
Electrical Energy	• Main isolation switches • Circuit breakers rated for isolation • Switch-disconnectors / de-contactors • Local motor isolators • Fused isolators • Lockable distribution board isolators • Lockable plug-and-socket systems • Withdrawable MCC or racked-out switchgear • Electrical Disconnection Points	Must provide a **positive break** in all live conductors. Control-circuit devices E-Stops must **not** be used as primary isolation.
Mechanical Energy	• Mechanical locking pins • Travel stops / mechanical stoppers • Coupling disconnects (belt/chain removal) • Actuator locking devices	Ensure all stored movement is neutralised. Mechanical restraint must be secure and verified.
Hydraulic / Pneumatic / Pressure Energy	• Isolation valves (ball, gate, butterfly, knife-gate) • Double block and bleed • Blanking plates / spades / blinds • Lockable pneumatic shut-off valves • Hydraulic dump valves • Vent / bleed valves • Line stoppers / insertion plugs	Isolation must include **pressure release** (bleed-off / depressurisation). Lock handles where possible.
Process Energy (fluids, gases, slurries)	• Spades, spectacle blinds, line blinds • Flange removal • Purge and drain points • Lockable sampling points • Locked-open drains/depressurisation lines	Must include proven depressurisation or draining to achieve zero-energy state.
Thermal Energy / Hazardous Substances / Chemicals	• Steam isolation valves (lockable) • Lockable chemical/thermal line valves • Chemical dosing isolation valves • Blanking plugs/caps • Line blinds/spades	Confirm temperature/heat is dissipated and no residual hot fluid remains. Additional controls may be required for stored product (venting, draining, neutralisation).
Stored Energy (gravity, springs	• Spring release mechanisms • Gravity restraints / mechanical props • Rotor/shaft locking devices • Mechanical supports, jacks	Stored energy must be **released, secured or physically restrained** before work.
Control / Functional Isolation *(Not Primary Isolation)	• Software interlocks • Keyed interlock systems • Control circuit isolators • Permit-restricted modes	May be used as **secondary controls**. **Never** rely on these as the primary means of isolation.

8.4 APPENDIX 4 – LOCK COLOURS AND USE DEFINITIONS

Default Lock Colour and Use Definitions

Colour	Description	Definition
	**Construction Boundary Isolation Lock**	A blue lock is used on a lock-out device in conjunction with a Construction Boundary Isolation Register and is installed by Authorised Isolator/s within the Commissioning Team. A blue lock indicates that energy has never passed this point and that the equipment cannot be energised as it is physically segregated from its upstream energy source. Can only be removed with a PTE and accompanying NoE.
	**Commissioning Lock**	A yellow lock is used on a lock-out device to indicate that plant and / or equipment is ready to be commissioned and is installed by Authorised Isolator/s within the Commissioning Team. A yellow lock indicates that energy has never passed this point, but the equipment is physically connected to the upstream energy source and is ready for commissioning. Can only be removed with a PTE and accompanying NoE.
	**Service Isolation Lock (S I L)**	A black lock is used on a lock-out device in conjunction with a Service Isolation Permit and is installed by an Authorised Isolator. A Service Isolation Lock is to be used to isolate plant/equipment that has been energised.
	**Personal Danger Lock (PDL)**	A red lock is used by Lock Holders signed onto the Service Isolation Permit and is secured to the isolation point (for simple isolations) or to a Lock Box (for complex isolations).
	**Lock Box Lock**	A green lock is used on Lock Boxes to indicate that the isolations are complete and to secure the keys for preservation of the isolation integrity. The green lock is used for Lock Boxes securing • Multi-point service isolations, key held under the control of the Authorised Isolator. • Construction Boundary isolations, key held under the control of the Permit Authority or delegate Isolation Authority assigned to commissioning. • Commissioning isolations, key held under the control of the Permit Authority or delegate Isolation Authority assigned to commissioning.