



AUSTRALIAN  
CONSTRUCTORS  
ASSOCIATION

# Construction & Building Industry Safety Guideline

## Electrical Isolations



## **Disclaimer**

This Guideline contains information regarding work health and safety. It includes some of your obligations under the work health and safety and electrical safety legislation that jurisdictional regulators administer. To ensure you comply with your legal obligations you must refer to the appropriate Acts and Regulations that apply in the jurisdiction where you are conducting your work.

This publication may refer to legislation that has been amended or repealed. When reading this Guideline you should always refer to the latest jurisdictional laws. It is the responsibility of the businesses and the individuals involved to ensure that a safe system of work is employed and that statutory requirements are met.

Australian Constructors Association disclaims any and all liability to any person or persons for any procedure, process or any other thing done or not done, as a result of this Guideline.

# Construction & Building Industry Safety Guideline

## Electrical Isolations

### Intent

To ensure appropriate electrical risk control measures are in place for performing electrical isolations and testing to prevent persons being electrocuted (killed) or injured by electricity; and property being destroyed or damaged. Common electrical risks, which may be present individually or combined are electric shock, arcing, explosion or fire and toxic gases.

### Scope

This standard sets out the minimum safe work practices to perform electrical work involving the isolation and proving de-energisation of low voltage electrical equipment.

This standard does not cover electrical work on high voltage electrical equipment.

### Safety Imperatives

- a. Prior to electrical equipment being worked on, consult with and gain authorisation to work from the person in control of the equipment.
- b. All energy sources shall be identified prior to commencing work.
- c. A safe work method statement must be developed, persons consulted and trained in its content, and the processes implemented and monitored. Consideration shall be given to the complexity of the electrical systems and varying stages of works planned.
- d. The competency and licence qualifications of electrical workers shall be verified prior to performing tasks with process audits on each worker being conducted on a regular basis. Records of such audits are to be maintained.
- e. Electrical testing equipment is to be correctly rated for the application. It shall be registered and tagged, calibrated and have its functionality confirmed, immediately prior to, and after each use. Electrical safety equipment shall be registered, fit for its intended purpose and tested to confirm safe prior to each use.
- f. A risk assessment shall be conducted prior to commencing any work and the determined risk control measures implemented and recorded.
- g. For electrical isolations and testing, all conductors (including neutral and earthing conductors) shall be regarded as energized until the exclusion zones are established, isolation completed, labelled, locked out and proven de-energised. Under a safe system of work the hazard control measures may include the appointment of a "safety observer-electrical".
- h. Electrical isolation reviews shall be conducted and appropriate action taken to address non-conformances. Records of the reviews shall be maintained.
- i. Before and after supply is restored, the appropriate checks and tests shall be performed to verify that the equipment is electrically safe and functioning as expected. Records of the checks and tests shall be maintained.

## Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility      S = Support role / Involved**

### Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
a.	Authorisation from the person in control of the equipment shall be given for isolations and performing work on electrical equipment.	<ul style="list-style-type: none"> <li>The person in control of the equipment shall be consulted and approval to isolate and work given.</li> <li>All stakeholders shall be notified of the intent to isolate. (Note: Others may be affected by the isolation)</li> </ul>	Before isolation	S	S	P	S	S	S	S	Authorisation from the person in control of the equipment is given for isolations and performing electrical work on electrical equipment.  All relevant parties are aware of the works to be performed	Clauses 147, 155 & 159 -WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)
b.	All energy sources shall be identified prior to electrical equipment being worked on.	<ul style="list-style-type: none"> <li>Consultation with the asset owner should be part of the process to identify all energy sources</li> <li>Procedures shall be adopted to identify alternative power supplies connected to the installation. Isolation procedures should include steps to ensure isolation of all alternative supplies.</li> </ul> <p><b>NOTE:</b> Alternative sources of supply may include inverter/UPS systems, standby generators, solar cells, ring main systems, main power with separate auxiliary power supplies for control, transformation up (backfeed from ELV controls), multiple control supplies and luminaires supplied from emergency sources of supply.</p>	Before isolation	P	P	P	P	S	S	S	All energy sources are identified prior to electrical equipment being worked on.	Clauses 147, 152 - 156 WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)  Section 4 Code of Practice : Managing Electrical Risks in the Workplace  Sections 2 & 3 AS/NZS 4836
c.	Safe work method statements (SWMS) and if required Isolation work permit systems must be developed, persons trained in their use, and the processes implemented and monitored. Consideration shall be given to the complexity of the electrical systems and varying stages of works planned.	A SWMS must and if required Isolation work permit systems must be used for any work being performed on or near electrical equipment where potential hazards of injury to personnel or equipment damage exist. The SWMS / work permit system must identify the electrical work, specify hazards, describe control measures and describe how they are to be implemented, including for example setting out relevant conditions of accessing electrical equipment, supervision of work, electrical and or mechanical isolation of equipment, use of safety	Before isolation	P	S	S	P	P	P	S	SWMS / Isolation permit systems are developed for the electrical work as required by the WHS Regulations, persons are trained in their use, and the processes implemented and monitored. Consideration was given to the complexity of the electrical systems and varying stages of works	Clause 161 WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)  Section 7 – Code of Practice : Managing Electrical Risks in

# Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility    S = Support role / Involved**

## Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
		observers, use of safety equipment, conditions of restoring operational status and other relevant matters.  <b>NOTE:</b> A SWMS / Permit systems may require practices additional to the requirements set out in this Guideline.									planned.	the Workplace  Section 3 AS/NZS 4836
d.	The competency and licence qualifications of electrical workers shall be verified prior to performing tasks with process audits on each worker being conducted on a regular basis. Records of such are to be maintained.	<ul style="list-style-type: none"> <li>▪ Personnel working on or near exposed energized conductors or equipment shall be licensed, authorised, and familiar with the equipment and be aware of all hazards. In some situations, specific training and authorization might be required or necessary before proceeding with the work.</li> <li>▪ Persons required to work in association with electrical equipment shall be authorised in procedures proving de-energisation and in the use of test instruments</li> </ul>	Before isolation	S	S	P	P	P	P	S	Compliance to a “Safe system of work” is achieved  Personnel working on or near exposed energized conductors or equipment are licensed, authorised, familiar with the equipment and aware of all hazards.	Clauses 146, 161 & 162 WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)  Section 4 – Code of Practice : Managing Electrical Risks in the Workplace  Section 8 AS/NZS 4836
e.	Electrical testing equipment is to be selected for the application. It shall be registered and tagged, calibrated and have its functionality confirmed, immediately prior to, and after each use.	<ul style="list-style-type: none"> <li>▪ Only approved testing equipment appropriate for the tests being performed shall be used for testing. The equipment shall be rated for the highest voltage and prospective fault current levels likely to be encountered in accordance with its operating instructions.</li> <li>▪ Test equipment shall pose no danger of electric shock to personnel or damage to the electrical equipment during testing. Test equipment shall comply with the following:                             <ul style="list-style-type: none"> <li>(a) Test equipment used in hazardous areas shall be of an approved design and shall be clearly marked as being suitable for use in</li> </ul> </li> </ul>	Before isolation and during process life	P	P	P	S	S	S	S	Compliance to a “Safe system of work” is achieved  Electrical testing equipment is selected for the application and used in the correct manner	Clause 161 WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)  Section 9 – Code of Practice : Managing Electrical Risks in the Workplace  Section 7 AS/NZS 4836

**Australian Constructors Association Construction & Building Industry Safety Guideline**

**P = Primary responsibility      S = Support role / Involved**

**Electrical Safety Guideline**

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
		<p>such locations.</p> <p>(b) Test probes and other equipment shall be designed and selected so that they cannot inadvertently short circuit between energized conductors and energized conductors and earth.</p> <ul style="list-style-type: none"> <li>▪ The terminals of test equipment should be shrouded and all other test sockets on measuring instruments should be designed so as to prevent inadvertent contact with any energized test socket and/or conductor when the equipment is in use.</li> <li>▪ Where appropriate, test leads and testing devices should be provided with suitable overcurrent protection.</li> <li>▪ When voltage detectors such as voltage testers are used to prove de-energisation, they shall be tested for correct operation immediately before use, and again immediately after use, particularly if the test result indicates zero voltage, to confirm that the instrument is still working correctly. Test equipment shall be checked for accuracy of operation at appropriate intervals.</li> </ul>										
f.	Electrical safety equipment shall be registered, fit for purpose and tested to confirm safe prior to each use.	<ul style="list-style-type: none"> <li>▪ Insulated tools and equipment shall be of an approved type and shall be in good order, regularly maintained and tested. Where any doubt exists that the insulation of tools and equipment might not be adequate, they should not be used.</li> <li>▪ Metallic, wire-reinforced or otherwise conductive ladders shall not be used on or near equipment if an electrical hazard might result from their use.</li> <li>▪ Persons using ladders, working in elevated positions</li> </ul>	Before isolation and during process life	P	P	P	S	P	S	S	<p>Compliance to a “Safe system of work” is achieved</p> <p>Electrical safety equipment is registered, fit for its purpose and used in the correct manner</p>	<p>Clause 161 WHS Regulations or jurisdictional equivalent (Qld, Vic &amp; WA)</p> <p>Section 9 – Code of Practice : Managing Electrical Risks in</p>

**Australian Constructors Association Construction & Building Industry Safety Guideline**

**P = Primary responsibility    S = Support role / Involved**

**Electrical Safety Guideline**

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
		<p>or near trenches should, wherever necessary, be protected with a fall prevention strategy consistent with the Hierarchy of Control.</p> <ul style="list-style-type: none"> <li>Barriers shall be of suitable material to effectively insulate and separate electrical workers from adjacent energized equipment. They shall be visually inspected for possible defects before and after each use.</li> <li>Insulating mats for use with equipment rated at voltages less than 650 V shall comply with and be tested according to the requirements of AS/NZS 2978. Insulating covers for use with equipment rated at voltages less than 650 V shall comply with and be tested according to the requirements of AS 4202. Insulating covers and mats shall be visually inspected for possible defects before and after each use.</li> <li>Protective clothing worn by electrical workers shall be appropriate for the purpose, fit correctly and be in good condition while work is being performed.</li> <li>Personal Protective Equipment (PPE) shall be selected in accordance with the type of work and the risks involved. Electrical workers working on or near exposed energized conductors shall wear flame retardant clothing covering the full body.</li> <li>Bracelets, rings, neck chains, exposed metal zips, watches, and other conductive items shall not be worn while doing work on or near exposed energized conductors. If worn, earplugs or earmuffs shall not be conductive.</li> </ul>										the Workplace Section 5 AS/NZS 4836
g.	A risk assessment shall be conducted prior to commencing any work and the determined	<ul style="list-style-type: none"> <li>An assessment shall be carried out at the workplace to assess all risks that might have the potential to cause harm or damage. All workers involved in the task shall participate in the hazard identification and</li> </ul>	Before isolation	P	P	P	S	S	S	S	Compliance to a "Safe system of work" is achieved.  All risks are identified with the	Clauses 34 -38, 147, 152 - 161 WHS Regulations or jurisdictional

# Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility      S = Support role / Involved**

## Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
	risk controls implemented.	risk assessment process <ul style="list-style-type: none"> <li>If the risk assessment has indicated that risks cannot be sufficiently controlled or eliminated to enable the work to be done safely on or near energized electrical equipment, then work must not proceed.</li> </ul>									involvement of the relevant workers and the appropriate risk controls planned	equivalent (Qld, Vic & WA) Sections 4 - 8 Code of Practice : Managing Electrical Risks in the Workplace  Sections 2 & 3 AS/NZS 4836
h.	For electrical isolations and testing, all electrical equipment and conductors (including neutral and earthing conductors) will be regarded as energised until the exclusion zones are established, isolation completed, labelled, locked out and proven de-energised. Under a safe system of work or legislative requirements the risk controls may require the appointment of a "Safety observer" to observe the electrical work task.	<ul style="list-style-type: none"> <li>All electrical conductors, including neutral and earthing conductors, shall be treated as energized until proven de-energized</li> <li>Where the risk assessment or legislative requirements determines that a safety observer is necessary for any work on or near exposed energized conductors, then work shall not be undertaken without the presence of a safety observer.</li> </ul> <p><b>The safety observer role</b></p> <ul style="list-style-type: none"> <li>continuously observe that safety procedures are carried out by personnel working in a potentially hazardous situation;</li> <li>not carry out any other work function that compromises their role</li> <li>give warnings when necessary to prevent inadvertent contact with energized electrical equipment;</li> <li>provide assistance in the case of an emergency;</li> <li>be capable of performing electrical rescue and Cardiopulmonary resuscitation (CPR);</li> <li>remain at the workplace at all times while a potential hazard exists; and</li> </ul>	During the isolation process	P	P	P	S	S	S	S	Compliance to a "Safe system of work" is achieved .  Appropriate risk treatments are implemented, monitored and reviewed	Clause 161 WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)  Section 7 Code of Practice : Managing Electrical Risks in the Workplace  Section 6 AS/NZS 4836  Clauses 154 - 156 WHS Regulations or jurisdictional equivalent (Qld, Vic & WA)  Sections 4 - 8 Code of Practice : Managing Electrical Risks in



# Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility    S = Support role / Involved**

## Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
		<ul style="list-style-type: none"> <li>▪ Not to be distracted by other duties.</li> </ul> <p><b>Isolation of electrical equipment</b></p> <ul style="list-style-type: none"> <li>▪ The electrical equipment to be worked on shall be isolated from all sources of supply either by opening switches, removing fuses or links, opening circuit breakers or removal of circuit connections. Control circuits or control systems (PLCs, emergency stops, etc.) shall not be used as a means of isolation, e.g. by operation of a stop button.</li> <li>▪ All other non-electrical sources of energy (e.g. counterweights on machines and stored hydraulic and pneumatic energy) shall be isolated and made safe. AS 4024.1 provides guidance on the safeguarding of machinery.</li> <li>▪ Consideration shall be given to the possibility of circuit wiring of electrical equipment or conductors becoming energized due to any operation of automatic control devices, e.g. thermostats, float switches, PLCs and other interface devices.</li> </ul> <p><b>Secure the isolation</b></p> <p>All points of isolation where a facility exists shall be locked off. Switches used for isolation should be provided with a locked device for securing the switch in the open position that requires a deliberate action to engage or disengage it. The securing device need not be an integral part of the switch and may be either -</p> <ul style="list-style-type: none"> <li>▪ an additional component, such as a clip, screw, bolt, pin or padlock that will prevent the switch from being operated; or</li> <li>▪ a physical locking device, lock-out or permit system, a personal danger tag or some other approved system. Isolation may be secured by removing and</li> </ul>										<p>the Workplace</p> <p>Section 3 AS/NZS 4836</p>

# Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility    S = Support role / Involved**

## Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
		<p>tying back connections.</p> <p><b>Tags—General</b></p> <ul style="list-style-type: none"> <li>Tags shall be clearly understandable and, where appropriate, dated and signed by all personnel involved in the work or by the supervisor in charge of the work party. If a formal permit system is used, the designated sign-on, lock out and tagging procedure shall be used.</li> </ul> <p><b>Danger tags</b></p> <ul style="list-style-type: none"> <li>Appropriate danger tags shall be placed at all points of switching, isolation or disconnection.</li> </ul> <p><b>Warning tags</b></p> <ul style="list-style-type: none"> <li>If used, warning tags shall be affixed as a warning that the device or equipment is not to be operated, except as indicated on the tag.</li> </ul> <p><b>Removal of tags</b></p> <ul style="list-style-type: none"> <li>Physical locks and tags shall only be removed with the permission of all signatories to the tags or in accordance with approved procedures.</li> </ul>										

# Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility    S = Support role / Involved**

## Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
		<p><b>Proving de-energisation</b></p> <ul style="list-style-type: none"> <li>All electrical conductors, unless proven to be de-energized, shall be treated as energized. Any voltage tests used to prove de-energisation shall be conducted between all conductors and between all conductors and a proven earth or shall be conducted to another approved procedure. Voltage test instruments used to prove de-energisation, shall be tested for correct operation immediately before use and again immediately after use to confirm that the detector is still working.</li> </ul> <p><b>Establishing exclusion zones</b></p> <ul style="list-style-type: none"> <li>The safe area of work should be identified by erecting barricades and warning signs or by other approved means as necessary. All personnel who are to work in the safe area shall be advised of its limits.</li> </ul> <p>WARNING: THE USE OF VOLTAGE PROXIMITY TESTERS THAT DETECT AN ELECTRIC FIELD SURROUNDING AN ENERGIZED CONDUCTOR MAY NOT BE SUITABLE FOR CABLES THAT ARE SURROUNDED BY A METALLIC SCREEN, CABLES CARRYING DIRECT CURRENT AND IN SOME OTHER CIRCUMSTANCES.</p>										
i.	Electrical isolation reviews shall be conducted and appropriate action taken to address non-conformances. Records of the reviews shall be maintained.	<p>Reviews of the effectiveness of, and compliance to, the isolation control measures shall be conducted throughout the process life.</p> <p>Non conformances shall be managed and recorded appropriately.</p>	During process life	P	S	S	S	P	S	S	<p>Compliance to maintaining a "Safe system of work" is achieved</p> <p>Electrical isolation reviews are conducted and the appropriate action taken to address non-conformances</p>	<p>Sections 2 &amp; 8 Code of Practice : Managing Electrical Risks in the Workplace</p>

## Australian Constructors Association Construction & Building Industry Safety Guideline

**P = Primary responsibility    S = Support role / Involved**

### Electrical Safety Guideline

Imperative Item.	Safety Imperative	Element Guidance	Element Timing	Authorised isolator	Electrical worker	Supervisor	Engineer	Safety Practitioner	Workplace Manager	General Manager	Expected Outcome	Standard, Regulation Reference
j.	Both before and after supply is restored, the appropriate checks and tests shall be performed to verify that the equipment is electrically safe and functioning as expected. Records of checks and tests shall be maintained.	<ul style="list-style-type: none"> <li>▪ After any repairs, alterations or additions to electrical equipment are made and before supply is restored, those parts that have been repaired, altered or added shall be in a safe state, and shall pass the appropriate tests required by AS/NZS 3000 in Australia. Before restoring supply after isolation, all relevant personnel shall be notified that supply is about to be restored and all exposed conductors shall be now considered energized. A visual inspection shall be conducted to ensure that all tools, surplus material and wastes have been removed before energisation.</li> <li>▪ Both before and after supply is restored, appropriate tests shall be done to confirm that equipment is earthed, polarity is correct, actives are switched and, if applicable, phase sequences are correct.</li> </ul> <p><b>NOTES:</b></p> <ol style="list-style-type: none"> <li>1. AS/NZS 3017 provides guidance on testing of low-voltage installations.</li> <li>2. It is recommended that the earth be connected first followed by the neutral and the actives.</li> </ol> <p>Precautions against the inadvertent operation of other equipment shall be carefully considered before supply is restored.</p>	After completing works, and prior to and after, re-energisation	P	P	P	S	S	S	S	Verification that the equipment is electrically safe and functioning as expected is performed	Section 6 Code of Practice : Managing Electrical Risks in the Workplace  Clause 8.2.1, 8.3.1 AS/NZS 3000

**Appendices:**

Appendix A - Special notes: Risk Control for Special Situations

Appendix B - Example of typical tags

Appendix C - Flow chart for electrical work as per AS/NZS 4836

Appendix D - Permit to work

**Key references applicable to this Safety Guideline:**

Code of practice – Managing electrical risks in the workplace AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)

AS/NZS 4836 Safe working on low voltage electrical installations

AS/NZS 3017 Electrical installations—Verification guidelines

AS/NZS 3012 Electrical installations—Construction and demolition sites

AS/NZS 4024 Safeguarding of machinery

<b>Table 1: Legislative Summary</b>	
<b>Jurisdiction</b>	<b>Legislation</b>
Commonwealth	Work Health and Safety Act, 2011 Work Health and Safety Regulations, 2011 - Chapter 4, Part 4.7
Australian Capital Territory	Work Health and Safety Act, 2011 Work Health and Safety Regulations, 2011 - Chapter 4, Part 4.7
New South Wales	Work Health and Safety Act, 2011 Work Health and Safety Regulation, 2011 - Chapter 4, Part 4.7
Northern Territory	Work Health and Safety (National Uniform Legislation) Act, 2011 Work Health and Safety (National Uniform Legislation) Regulations, 2011 - Chapter 4, Part 4.7
Queensland	Work Health and Safety Act, 2011 Work Health and Safety Regulations, 2011 Electricity Safety Regulations, 2013 – <b>Note:</b> The Qld legislation mirrors the electrical safety legislative provisions adopted by other jurisdictions under the Model WHS Regulations, however with different Regulation numbering.
South Australia	Work Health and Safety Act, 2012 Work Health and Safety Regulations, 2012 - Chapter 4, Part 4.7
Tasmania	Work Health and Safety Act, 2012 Work Health and Safety Regulations, 2012 - Chapter 4, Part 4.7
Victoria	Occupational Health and Safety Act 2004

	Occupational Health and Safety Regulation, 2007. <b>Note:</b> WHS Act and Regulations not yet introduced in this jurisdiction.
Western Australia	Occupational Health and Safety Act 1984  Occupational Health and Safety Regulation, 1996. <b>Note:</b> WHS Act and Regulations not yet introduced in this jurisdiction.

**Table 2: Regulatory Guide – Particular requirements that may be relevant to performing electrical isolations on energised electrical installations and equipment. Note: This is not a complete list of all regulations that may be applicable for the work. Reference must be made to the relevant Work Health and Safety Regulation or jurisdictional equivalent OHS Regulation for a complete list of regulatory requirements.**

<b>Work Health and Safety Regulation</b>	<b>Subject area</b>
Regulation 32	Application of Part 3.1
Regulation 33	Specific requirements must be complied with
Regulation 34	Duty to identify hazards
Regulation 35	Managing risks to health and safety
Regulation 36	Hierarchy of control measures
Regulation 37	Maintenance of control measures
Regulation 38	Review of control measures
Regulation 39	Provision of information, training and instruction
Regulation 44	Provision and use of personal protective equipment
Regulation 147	Electrical safety – Risk management
Regulation 152	Application of Division 4 of the Regulations
Regulation 155	Duty to determine whether equipment is energised
Regulation 156	De-energised equipment must not be inadvertently re-energised
Regulation 157	Electrical work on energised electrical equipment – when permitted
Regulation 159	Unauthorised access to equipment being worked on
Regulation 161	How the work is to be carried out

## **Appendix A**

### **Special notes: RISK CONTROL FOR SPECIAL SITUATIONS**

#### **Capacitors**

When working on equipment that includes capacitors, electrical workers should be made aware that substantial energy can be present and therefore arcs could be produced that might cause electrocution burns or electric shock to workers or ignite gases or solid material.

Capacitors and associated circuitry shall be proved to be de-energized and fully discharged before commencing work on them and their associated circuit wiring. This may be achieved by using and maintaining approved safe discharging devices or by following the manufacturer's instructions. A voltage tester shall be used to prove that these units are discharged, immediately before performing work, because capacitors that do not have discharge devices attached might re-instate the full line voltage.

Care should be taken against the harmful effects of arcing when applying discharging devices. Short-circuiting or earthing of capacitor terminals with metal objects such as spanners or screwdrivers can result in an arc, blast and flash burn injuries and should not be attempted. Use only approved devices.

NOTE: If a capacitor is not discharged then the requirements for work on or near exposed energized conductors applies.

#### **Hazardous areas**

Work on or near electrical equipment within hazardous areas, e.g. petrochemical installations, grain storage, flour mills and fine particle process areas, shall only be performed using approved procedures.

#### **NOTES:**

- 1 AS/NZS 2381.1 specifies requirements for the selection, installation and maintenance of electrical equipment in hazardous areas. AS/NZS 3800 specifies requirements for electrical equipment to be used in explosive atmospheres.
- 2 Regulatory authorities may have requirements regarding the competency of electrical workers working in hazardous areas.

#### **Batteries**

Accidental short-circuiting of battery terminals or connections might create substantial arcs that can cause personal injuries or ignite hazardous gases or material. Appropriate precautions shall be taken when working on or near batteries or equipment that contains batteries.

#### **Cold-cathode lighting systems**

Cold-cathode systems of illumination, including outline lighting systems, may have open circuit voltages up to 15 000 V.

#### **Alternative power supplies**

Procedures shall be adopted to identify alternative power supplies connected to the installation. Isolation procedures should include steps to ensure isolation of all alternative supplies.

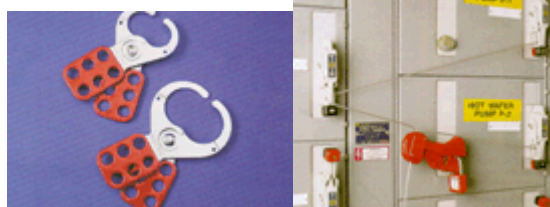
NOTE: Alternative sources of supply may include inverter/UPS systems, standby generators, solar cells, ring main systems, main power with separate auxiliary power supplies for control, transformation up (backfeed from ELV controls), multiple control supplies and luminaires supplied from emergency sources of supply.

## Appendix B

### Example of typical tags

#### Lock Out

Lockout is the use of a special lock and system to prevent inadvertent or unauthorised power activation during equipment maintenance or repair. These can include switches with a built-in-lock, chains and lock, lockout jaws (hasps), padlocks, cover (blanking) plates secured such that they need tools to activate the energy source.



#### Tag Out

The application of a “Danger” tag is designed to visually warn of the danger of injury/illness to personnel operating/maintaining equipment/associated equipment and also to prevent damage to the equipment which will result from the operation of plant, equipment or machinery.



The “Out of Service” tag procedure is designed to ensure the protection of workers, plant or equipment and to identify equipment which is out of service for repair, alteration, commissioning or decommissioning.



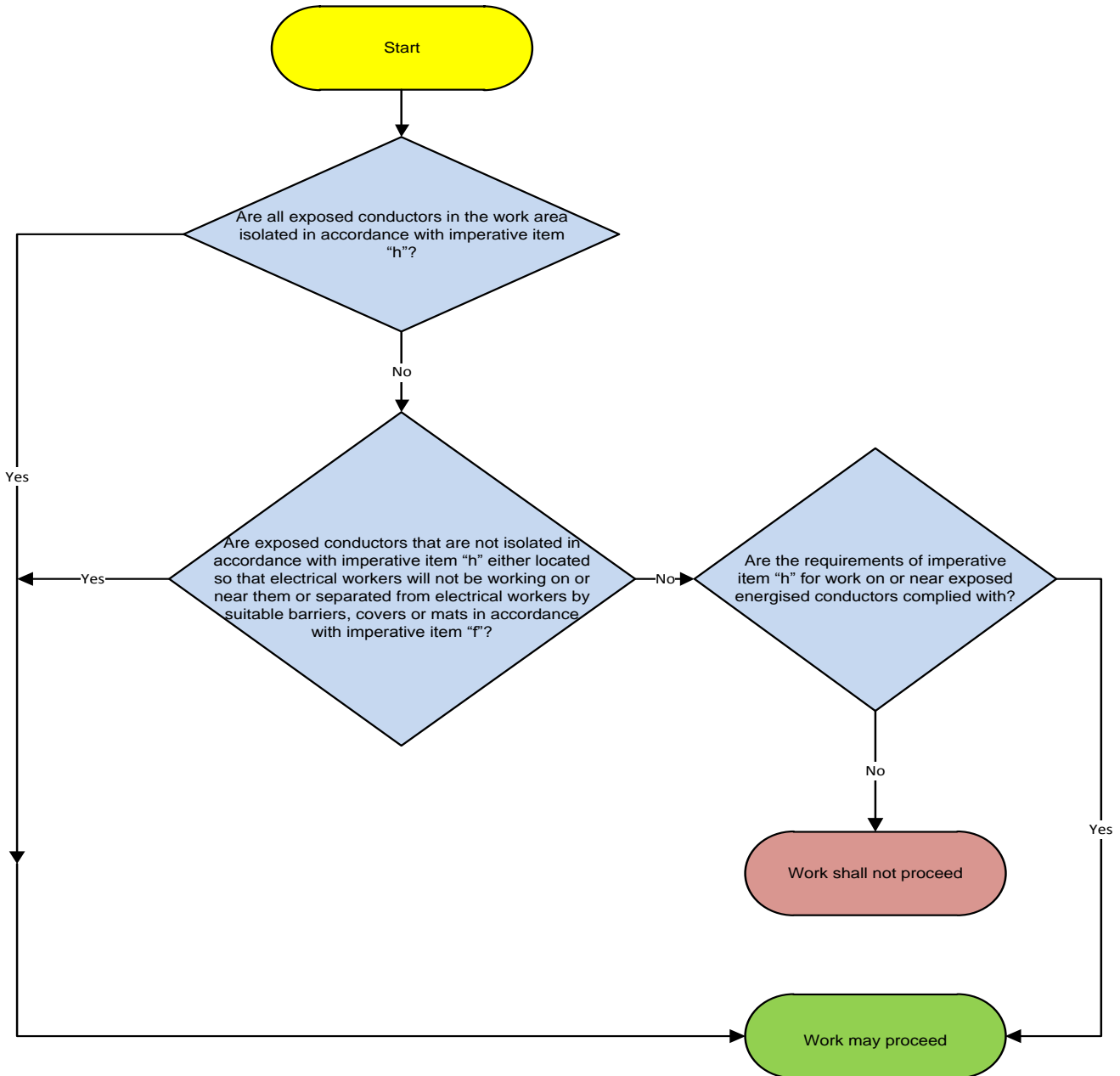
**Note:** A tag is not a positive effective isolation device. They must be used in addition to physical locking devices and a visual warning only.



## Appendix C

Note: Refer also to the guidance shown in the Code of Practice – Managing Electrical Risks in the Workplace

Flow chart for electrical work as per AS/NZS 4836



**Appendix D**

**Example Permit to work**

Permit to work						
<b>Location:</b>	WORKPLACE / PROJECT / WORK AREA			<b>Permit No:</b>		
<b>Issue Date/Time:</b>	/	/	:	<b>Expiry Date/Time:</b>	/ / :	
<b>Task risk assessment File Title &amp; No:</b>				<b>Task risk assessment Date:</b>	/ /	
<b>Description of Work:</b>						
<b>Supervisor:</b>	PRINT NAME		<b>Authorised Isolator:</b>	PRINT NAME		
<b>Witness:</b>	PRINT NAME		<b>Test Equip – Pre-test:</b>	RESULT & SIG.		
<b>Plant to be isolated: (For multiple isolations witness shall verify and initial next to each isolation point)</b>						
<b>1.</b>	ISOLATION POINT		<b>INIT</b>	<b>8.</b>	ISOLATION POINT	
<b>2.</b>				<b>9.</b>		
<b>3.</b>				<b>10.</b>		
<b>4.</b>				<b>11.</b>		
<b>5.</b>				<b>12.</b>		
<b>6.</b>				<b>13.</b>		
<b>7.</b>				<b>Test Equipment – Post-test:</b>	RESULT & SIG.	
<b>Lockbox No. &amp; Location (Multiple Isolations):</b>	<b>No.</b>	LOCATION OF LOCKBOX				

Transfer of Authorised Isolator Responsibility for isolations in place longer than 1 shift/day.				
<b>Name:</b>	FROM	<b>Name:</b>	TO	<b>DATE</b>
<b>Sign:</b>	FROM	<b>Sign:</b>	TO	<b>DATE</b>
<b>Name:</b>	FROM	<b>Name:</b>	TO	<b>DATE</b>
<b>Sign:</b>	FROM	<b>Sign:</b>	TO	<b>DATE</b>
<b>Long – Term Isolation Extended Transfer of Responsibility Sheet Numbers:</b>				

<b>Additional Requirements/Special Conditions/Notes?</b>

