



CS ENERGY CORPORATE PROCEDURE FOR  
**ELECTRICAL SAFETY MANAGEMENT**  
**CS-OHS-31**

Responsible Officer: Manager - Health and Safety

Approved: General Manager Production

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## Document History

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## 1.0 Purpose

The purpose of this Procedure is to provide guidance and information for planning and managing electrical switching, isolations and safe electrical work

## 2.0 Scope

This Procedure is applicable to all personnel at CS Energy owned and/or operated assets. This Procedure should be read in conjunction with the *Maintaining Electrical Installations Procedure* and the *Maintenance of Electrical Safety Equipment and Clothing (PPE) Procedure*.

This Procedure also defines specific electrical isolation and electrical maintenance requirements, which forms a component of CS Energy's overarching Permit to Work management system. For additional information pertaining to the planning, administering and authorisation processes relating to isolations, refer to the *PTW Manual*.

## 3.0 Responsibilities

The responsibilities for persons mentioned in this procedure are outlined below.

### 3.1 Electrical Worker

- Maintaining and complying with the conditions applicable with their electrical work license issued by the Electrical Safety Office and CS Energy procedures.
- Testing and proving de-energised before commencing electrical work.
- Assist in the development and implementation of JSEAs and the requirements of the PTW.
- Perform electrical work to comply with the Wiring Rules.
- Maintaining training necessary to act as an Authorized Person and Safety Observer as required.
- To de-energise and isolate items of electrical equipment as prescribed by CS Energy procedures.
- Confirm isolation points and devices are adequate, locked and signed or other precautions taken to stop the isolation point being accidentally closed prior to commencing electrical work.
- Use electrical safety equipment that is suitable for the type of work being performed.
- Ensure any electrical work done on electrical equipment is tested (to the extent it is effected by the work) and is electrically safe.
- Act as an authorised person or safety observer as required.

### 3.2 Authorised Person

- Implement the requirements of this procedure and the training provided when working in an authorised zone or in the proximity of energised exposed electrical parts or equipment.
- Identify and implement the safety requirements and controls necessary in the JSEA to work in proximity of energised exposed electrical equipment.
- Monitor and review the JSEA, particularly if new hazards are identified or introduced into the work and adjust the JSEA accordingly.

- Arrange for the provision of a safety observer (General or Electrical) for the type of work being performed.
- Instruct any workers of the changes to the work and JSEA.
- Arrange for the approval of any PTW authorising access to electrical equipment.
- Use electrical safety equipment and wear suitable personal protective clothing or equipment that is suitable for the type of work being performed.

### **3.3 Safety Observer (General)**

- Continuously observe that safety procedures and control measures in the JSEA are carried out by persons working in the authorised zone or other potentially hazardous situations.
- Give warnings when necessary to prevent inadvertent contact with energised electrical equipment.
- Provide assistance in case of an emergency.
- Remain at the work site at all times when a potential hazard exists.
- Not be distracted by other duties.
- Maintain the training requirements as outlined in this procedure.
- Use and wear suitable electrical safety equipment and clothing appropriate for the work.

### **3.4 Safety Observer (Electrical)**

- Act as the second electrical person to check live work practices and high voltage live electrical work being performed by the electrical worker and has the authority to stop the work.
- Continuously observe that safety procedures and control measures in the JSEA are carried out by persons working in the authorised zone or other potentially hazardous situations.
- Give warnings when necessary to prevent inadvertent contact with energised electrical equipment.
- Provide assistance in case of an emergency.
- Remain at the work site at all times when a potential hazard exists.
- Not be distracted by other duties.
- Maintain the training requirements as outlined in this procedure.
- Use and wear suitable electrical safety equipment and clothing appropriate for the work.

### **3.5 Qualified Person - Electrical Contractor License**

- Inform Site Management where electrical work does not comply with the conditions and restrictions included in the site electrical contractors licence.
- Inspects electrical work (new installations) that is performed on site by CS Energy electrical workers.
- Maintains their qualifications necessary for an electrical work licence and electrical contractors licence.
- Assists in investigations and reviews any electrical safety incidents, near misses and equipment with serious defects.

- Sign documents about the performance of electrical work for the site.
- Provide a Certificate of Testing and Safety for work performed as an electrical contractor to the persons for whom the electrical work was performed stating the electrical equipment is safe and keep a copy of the certificate for a period of 5 years.
- Ensures that electrical contractors provide a “certificate” signed by an “authorised person” for electrical work done on electrical installations.

### **3.6 PTW Administrator/Person with delegated authority by the Site Manager**

- Approve persons for the role of Authorised Person, Safety Observer – General and Safety Observer – Electrical.
- Approve the application of a PTW for live work on energised electrical equipment with assistance from the RPEQ – Electrical and site HAS.
- Maintain a site training register for licensed electrical workers, authorised persons and safety observers.

### **3.7 Site Manager**

- Allocate sufficient resources to ensure the requirements of this procedure are implemented on site.
- Nominate suitable persons to act as the qualified person, RPEQ – Electrical and PTW Administrator for the site.
- Ensure that an annual audit is conducted on the electrical safety requirements for the site.
- Ensure that electrical safety incidents are investigated and actions implemented
- Maintain an electrical contractor’s license for the site.

### **3.8 Worker**

- Report any electrical near misses, incidents or electrical hazards.
- Not undertake electrical work or testing for de-energised unless they are licensed electrical workers for the work.
- Use suitable electrical safety equipment and personal protective clothing for the type of work being performed.
- Not perform live work unless it is accordance with the requirements of this procedure.
- Not enter any exclusion zones or operate vehicles or plant within exclusion zones or authorised zones associated with exposed energised electrical components or parts.
- Not interfere with any electrical isolation, locking devices, danger tags or locks on electrical isolation points.
- Only work on electrical equipment, which has been tested and proven de-energised at the location of the work.

## 4.0 Electrical Work

### 4.1 Basic Requirements

CS Energy has an obligation as an employer, a person in control of electrical equipment and an Electrical Entity to ensure that:

- Its business or undertaking is electrically safe.
- All electrical equipment controlled by or used is electrically safe.
- Persons and property affected by electrical work are safe.
- Persons performing work involving contact with or near to exposed parts are electrically safe.
- Electricity Entity works are electrically safe and operated in a way that is electrically safe.
- Its works are inspected, tested and maintained.

CS Energy has a specific obligation to ensure that persons, operating plant or vehicles do not come into direct contact with an electrical part, or enter an exclusion zone, unless the part is isolated in conformance with PTW procedures, or the work has been authorised in accordance with this procedure (sections of this procedure deal with testing and commissioning where direct contact may be required to perform work).

**Personnel must be authorised by Site Management (Site PTW Administrator) to test and prove de-energised and to perform work in an “Authorised Zone” or “Exclusion Zone.”**

*For clarification of the term “Authorized Zone” refer to the definitions.*

*For clarification of the term “Exclusion Zone” refer to the explanatory details and table within Attachment 1.*

*For clarification of work for isolation, testing, live work etc. Refer to the Electrical Safety Guidelines (Attachment 2).*

**All personnel are to treat any exposed part as if it is energised until it is isolated and proven not to be energised. CS Energy requires electrical workers, electrical technicians, and electrical engineers to implement a test for de-energised before commencing work (test before you touch).**

### 4.2 Identifying and Controlling Electrical Risks - JSEA

#### 4.2.1 Risk Assessment

To work on or near any electrical equipment, it is first necessary to determine whether it is safe to do so by undertaking a risk assessment. If the risk assessment has indicated that electrical risks cannot be sufficiently eliminated or controlled to enable the work to be done safely on or near energised electrical equipment, then work must not proceed. Consideration is also to be given to the consequences of electrical work that may affect not only the safety of persons at the work area but also the safety of persons who are remote from the work.

Where practicable the assessment should be carried out at the worksite and all workers involved in the electrical work are to be consulted, participate in the assessment and develop control measures. The control measures shall reduce to an acceptable level

any conceivable risk of any person performing the work, entering the work area, and or coming into contact with energised exposed conductors.

As part of pre-work planning and the JSEA process, the following types of issues are to be considered:

- The location to be worked in, whether it is in the vicinity of entity works or in the vicinity of electrical installations.
- Cramped working conditions, confined spaces.
- Multiple sources of supply, inadvertent operation of equipment (such as the operation of control devices, standby generators and non-electrical equipment).
- Damp situations, heat, work height, work environment, noise, unstable work areas, site conditions, weather conditions, organizational requirements and competency of personnel.
- Reference to facility drawings, electrical drawings and service drawings.
- The method of work being used, whether it is via machinery, portable electrical tools or by the use of hand tools.
- Prospective fault levels.
- Operational pressures to carry out the work or restore electricity generation and supply.
- Specific overhead lines, conductors or cables or equipment under tension or likely to fall.
- Underground and in-situ electrical cables.
- Removing wall sheeting during a building refurbishment.
- Penetrating a wall cavity or ceiling space with a hand tool or portable electric tool.
- Using portable electrical tools to cut piping that may contain water.
- Excavating on site in preparation for a new facility or building.
- Digging holes for the erection of fence posts.
- Any other activity that may require penetration into the ground or work in the vicinity of in-situ electrical installations and entity works.
- Voltages between phases, between phases and neutral and between phases and earth (including metalwork, damp situations, other conductive surfaces and persons nearby).
- Voltages across open switch contacts, across undischarged capacitors, across the secondary terminals of transformers (including current transformers), on disconnected conductors (particularly neutrals), induced voltages, voltages between different earthing systems and voltages caused by static electricity.
- In multiple earthed neutral (MEN) installations the rise in the earth potential in an installation due to a high resistance return path to the distribution neutral.
- Incorrect wiring connections, fault equipment (the frame of the fault equipment may become energised).
- Voltages from other sources of supply including illegal connections, uninterruptible power supplies and motor generators.
- Rescheduling the work so that the electrical equipment can be de-energised.

## 4.2.2 Applying Control Measures

The application of control measures is the process of considering each hazard in turn and following the “hierarchy of controls”. The aim is to eliminate or reduce the potential effects of each hazard. The hierarchy of controls is to:

- (a) eliminate the hazard, which is always the first priority, e.g. by rescheduling work to a time when work can be done de energised;
- (b) separate the worker from the hazard, e.g. by distance or by barriers; and/or
- (c) reduce the level of hazard, e.g. by the use of safety equipment, personal protective equipment (PPE), a safety observer or by training workers in working in the presence of a hazard.

The electrical work is be checked in advance, particularly where other services are likely to be present or affected, eg gas, telephone, data communications, water pipes, other electrical circuits, other energy sources and where other trades are likely to be working.

Work should avoid jeopardizing the operation of lighting and equipment essential for safety or for the preservation of life, eg emergency lighting, evacuation alarms, fire control systems.

CS Energy’s Excavation Procedure includes specific controls to address underground service hazards, inclusive of the need to properly located underground electrical cables.

## 4.2.3 Awareness

Electrical workers, supervisors, safety observers, and those assisting electrical workers working on or near electrical equipment, will be trained to understand the potential hazards involved. They must maintain an adequate physical and mental ability when working on or near electrical equipment. If personnel are temporarily or permanently physically or mentally impaired eg under the influence of alcohol, drugs, fatigue or are injured to a level that adversely affects their work performance, they shall not undertake work.

## 4.3 Isolating

Isolation of remote controls via software logic alone is not acceptable. All electrical conductors, including earthing conductors, shall be treated as energised until proven de-energised.

An electrical isolation essentially consists of the following steps:

### 4.3.1 Isolate and/or De-energise the Installation or Equipment

Isolation of electrical energy and/or de-energising to undertake work on an electrical installation or electrical equipment is to be undertaken in accordance with the processes defined within CS Energy’s PTW Manual.

### 4.3.2 Test to Prove De-energised

- Testing to prove de-energised must include a risk assessment and this can be done using a JSEA for the low voltage activity or Form S1885 Live Electrical Work Checklist for high voltage activities.

- Only those testing devices maintained in accordance with CS Energy's Maintenance of Electrical Safety Equipment and Clothing (PPE) Procedure are to be used.
- Authorized Persons, Electrical Engineers, Electrical Technicians required to perform electrical work when isolating must test and confirm the electrical equipment is de-energised.
- Correct operation of the testing device is to be verified immediately before and after proving de-energised.
- Low voltage equipment is to be proven de-energised at the intended point(s) of contact with the conductors.
- All phases of high voltage equipment are to be proven de-energised using an approved high voltage detector before earthing equipment is applied.
- During isolation, testing and prior to work commencing, it may not be practical to isolate all live conductors adjacent to the work area in accordance with Section 4.4.1. Where this is the case, these conductors are to be shrouded where practicable with approved insulating mats and covers and specific personal protective equipment is to be used to ensure the work can be done safely.

**Note:** *Non-electrical workers are not authorised to test and prove de-energised within CS Energy.*

Where switchgear contains inbuilt component/s as a part of their design to prove de-energised, such as visible breaks, mechanical interlocks or LED indicators, earthing switches can be closed without a test to prove de-energised. Where these design features are not in place, a risk assessment must be conducted before undertaking a test to prove de-energised. A test to prove de-energised can only be undertaken when the risk assessed for the task is low.

#### **4.3.3 Earth and short-circuit the installation or equipment (although this is usually not undertaken for low voltage items)**

Operator earths are to be applied immediately following the equipment is confirmed as being isolated and tested to prove de-energised.

- At least one set of operator earths is to be applied to the conductors to be worked on under the isolation process. Operator earths may be, in order of preference:
  - an earth switch, or
  - a portable earthing device connected to a permanent earthing point.
- High voltage earthing is to be done in accordance with the HVIA Guidelines.
- Operator earths may be removed during a PTW suspension for test in accordance with the PTW process and such that:
  - connection and disconnection of test instrumentation is performed while the earths are connected, and
  - the work party have ceased work and are clear of the equipment to be tested.
- Working earths, which are earths applied by the OIC Work during work activities, are to have a current carrying capacity adequate to discharge stored or induced charge at the work area and be able to safely limit a rise in potential at the work area.
- The time, location, placement and removal of working earths is to be recorded within Section 7 of the PTW Form and the OIC Work is to ensure that all working earths associated with a PTW are removed prior to surrendering the PTW.

- In addition to the previous safety and working earth requirements, the following earthing principals are to be complied with:
  - where an earth switch is available it is to be closed prior to applying portable earthing devices, if practicable,
  - earthing equipment is to be installed as close as practicable to any persons required to work on the isolated electrical equipment, so that the earthing equipment where possible is within sight of those required to perform the work,
  - tails of portable earthing devices are to be connected to the permanent earthing point before being connected to the de-energised electrical conductors,
  - all de-energised phases are to be earthed,
  - where individual single phase earths are installed, each earth is to be connected to the same earth system and the tails are to be as close as practical on the same permanent earthing point to form an effective short circuit,
  - electrical equipment is not to be earthed through fuses or circuit breakers that may operate in the event of unintentional re-energisation, and
- Where the work involves the connection, cutting, or disconnection of high voltage conductors, portable earthing devices are to be applied on either side of as close as practicable to the proposed break/connection with both devices connected to a permanent earthing point.
- When isolating electrical equipment with multiple feeds operator earths are to be placed on each source of supply.
- Portable earthing devices are to be of an approved design and suitable for conditions at the particular work locations in which they are used. Additional to this, portable earthing devices:
  - joints are not to be interfered with,
  - tails are not to be extended, and
  - are to be marked with the following: fault current rating, due date for test, manufacturer and unique identifier.

#### 4.4 Performing Electrical Work

##### Persons performing electrical work must be:

- competent and authorised to work on CS Energy equipment;
- the holder of a current electrical work licence;
- an electrical apprentice or an electrical engineer in the practice of their profession; and
- **TEST BEFORE YOU TOUCH** to prove de-energised.

Licensed electricians must perform activities permitted by the class of licence they hold.

Electrical engineers are permitted to perform electrical work where the work is part of their practice as an electrical engineer - electrical work of a commissioning or fault finding nature.

Live electrical work is not to be performed under any circumstance unless it is not practical to do so due to one or more of the following being applicable.

- It is necessary in the interests of safety, whether or not electrical safety, for the work to be performed while the electrical equipment is energised (e.g. emergency lighting).
- A supply of electricity is necessary for the proper performance of the electrical work, (e.g. testing of plant returned to service).
- There is no reasonable alternative to performing the electrical work other than by live means. (e.g. testing for fault finding).
- The work consists of testing to prove de-energised.

#### 4.4.1 Requirements for Live Work

When it is not practicable to work de-energised in accordance with Section 4.1, the following requirements are to be ensured.

- The OIC for the work has developed a safe system of work (which includes a JSEA with Form S1885 Live Electrical Work Checklist and PTW), in consultation with all personnel involved in the work.
- An explanation is detailed within the JSEA that clarifies why it is not practicable or why there is no alternative to performing the electrical work other than by a live means.
- The live work is authorised to be undertaken only after consultation with the Site PTW Administrator (or person with delegated authority) and the person in control of the electrical installation, electrical equipment or entity works (the site PTW Administrator may involve the RPEQ, CS Energy's site qualified person, site HSA or others as necessary to provide advice and review the JSEA developed to perform live work).
- The person(s) performing the work is qualified and trained in the safe work practices for the live work to be performed.
- Testing equipment and tools appropriate for the live work to be performed have been provided, maintained and are used correctly.
- Clothing and personal protective equipment appropriate for the live work to be performed have been provided, maintained and are used correctly.
- The isolation point of the electrical supply for the equipment being worked on is clearly identified and able to be easily reached without having to travel long distances or move around/over plant equipment or obstructions - this may require the use of a two-way radio with a person located at the isolation point for the circuit being worked on.
- The work area is clear of obstructions and allows easy access and egress.
- There is a safety observer, observing the performance of the electrical work, unless the work involves testing electrical equipment where the testing task can be done safely without the need for a safety observer.
- Unauthorised persons are prevented from entering the work area by a means of barrier exclusion, signage or both.

To assist in compliance with this section of the procedure a generic JSEA for testing to prove de-energised for low voltage isolations may be used provided it includes the requirements of this section for live work and the relevant items in Form S1885 Live Electrical Work Checklist.

#### **4.4.2 Introduction of an electrical energy source**

Insulation testing, injection testing or the introduction of any low or high voltage electrical energy source into plant or equipment is considered live electrical work and requires a risk assessment to be completed and the adoption of suitable control measures. A JSEA is required for low voltage live work and Form S1885 Live Electrical High Voltage Work Checklist is to be completed prior to the introduction of the high voltage electrical energy or source.

#### **4.4.3 Areas of Reduced Mobility**

Care should be taken when working in areas of reduced mobility because of restriction of movement and the inability to readily escape from the area. Examples of areas of reduced mobility can be as follows:

- (a) restricted areas in and around switchboards.
- (b) working on a ladder, scaffold, or elevated work platform.
- (c) working in a trench.
- (d) working in a pit or a tunnel.

**Note:** CS Energy has procedures in place for work at heights and confined spaces.

#### **4.4.4 Trafficable Areas**

Persons working near traffic areas, including vehicular and pedestrian, are to install barricade tape, barriers, signage and if necessary, lighting for personnel safety and protection. Caution should be exercised and appropriate preventative action taken when working in a passageway or narrow access area, eg where a door might be inadvertently opened or closed and propel persons into an energised electrical source, it should be restrained while work is being undertaken.

#### **4.4.5 Illumination**

Work areas shall be provided with lighting that is both adequate and suitable. Lamps should be protected against breakage.

#### **4.4.6 Permit to Work System**

CS Energy has a Permit to Work System for any work being performed on or near electrical equipment where potential hazards of injury to personnel or equipment damage exist. The permit to work system sets out the relevant conditions for access to plant and electrical equipment and for restoring operational status and other relevant matters.

#### **4.4.7 Plant Safety System Fault**

In the event that a fault develops on a plant safety system, a safety notification is to be raised on the defect and given a suitable priority. If the faulty component of a plant safety system is required to be altered before complete repairs can be completed, the safety system alteration shall be risk managed. Alterations to the safety system are not

to affect or change the original prioritisation of the safety notification, and therefore total repair of the safety system will not be adjusted by the application of the alternation.

#### 4.4.8 Use of Tools, Equipment or Plant with Exposed Conductive Parts

Metal items such as tape measures, rules, reinforced tape, ladders, scaffolding and guards on portable lamps, shall not be used on or near exposed energised conductors. If the use of hand tools with conductive parts is unavoidable on or near exposed energised conductors, a JSEA shall be undertaken and safe control measures implemented.

#### 4.4.9 High Fault Current Levels

Persons working on or near energised exposed conductors of electrical equipment should be aware that fault currents (many times the rated current of the supply transformer) could flow for short times during fault conditions. Procedures and protective safety equipment for this type of work are to be assessed as part of the JSEA developed for the work.

**Warning:** Arcs that are produced under these conditions have the energy to cause an explosion, melt metallic switchboard cubicles, and cause severe burns and flash burns to the face and eyes and injury through impact from flying debris or dislodged components. Over current circuit protection might not operate to safeguard the worker in such circumstances.

#### 4.4.10 Explosive Atmospheres and Hazardous Areas

The JSEA is to identify the risks and control the hazards associated with work on or near electrical equipment within hazardous areas, eg gas and fuel installations, coal handling areas and fine particle process areas. The type of work, equipment allowed and precautions required may include the need for intrinsically safe equipment, the use of gas detectors and monitoring of the environment. Workers working in hazardous areas are to be trained and certified. Drawings of hazardous area classifications are to be made readily available to the electrical workers required to work in those areas.

Potential sources of ignition include:

- (a) Electric tools, test equipment and instruments, eg mains and battery-powered appliances such as inspection hand lamps, drills, torches and test equipment.
- (b) Personal affects eg jewellery, watches, cigarette lighters, matches, and battery-operated items such as hearing aids, mobile telephones, pagers key ring torches and transistor radios.
- (c) Clothing made from wool, wool blends, nylons (unless treated with an antistatic process) and polyvinyl materials (especially those having a nylon base). It is possible for these materials to generate an electrical spark sufficient to ignite a flammable gas or vapour mixture.
- (d) Actions such as:
  - any form of welding or brazing;
  - use of a hacksaw;
  - drilling of any type;
  - impact of a hammer or chisel onto concrete or metal; or
  - rubbing or movement of plastics.

The items listed in Items (a), (b) and (c) above should not be taken or worn into a hazardous area unless:

- (a) they are certified for use in the conditions into which they are to be taken.
- (b) the area has been determined to be safe by appropriate personnel (i.e. site HSA, RPEQ, trained gas detectors who can confirm an explosive atmosphere does not exist).
- (c) Electrical workers required to work in hazardous areas are to have hazardous area training.

#### **4.4.11 Fault Finding or Testing**

The risk of electric shock or arc, blast and flash burn injuries exists when performing fault finding or testing on or near exposed energised conductors. To manage this risk the following precautions, in addition to those in Clause 4.2.1 shall be taken:

- (a) use approved test equipment for the application and ensures that it is selected for the appropriate operating range.
- (b) complete a JSEA for the activity or Form S1885 Live Electrical Work Checklist.
- (c) check and confirm correct operation of test equipment on a known supply.
- (d) consider the effects at the worksite and remotely of:
  - bridging out of safety and control interlocks
  - inadvertent initiation of equipment operation;
  - inadvertent energisation of equipment'
  - bridging of terminals
  - forcing of contactors and interlocks; and
  - forcing of software interlocks, e.g. programmable logic controllers,

#### **4.4.12 Testing Plug in Equipment**

When testing for faults in electrical equipment that plugs into a socket outlet rated at up to and including 20A, when it is energised, a residual current device (RCD) or an isolating transformer shall be used.

#### **4.4.13 Operating Work on Electrical Equipment**

The risk of electric shock or arc, blast and flash burn injuries exists when performing operating work on or near exposed energised conductors. To manage this risk, the following precautions shall be taken.

Identify all the hazards and environmental considerations (e.g. position of energised exposed conductors, cramped conditions, moving equipment such as cranes, elevating work platforms, hot or wet conditions and hazardous areas).

- (a) complete a JSEA for the activity or Form S1885 Live Electrical Work Checklist.
- (b) use the appropriate equipment and PPE.
- (c) do not operate switches under load unless they are designed for the purpose
- (d) ensure that all portable operating equipment is rated for the highest voltage of the electrical equipment and is in good condition, and

#### 4.4.14 Cutting Cables or Wiring Enclosures

When carrying out work that involves cutting cables or wiring enclosures, the cables shall be treated as energised and the procedures for working on or near exposed energised conductors shall be followed until tests prove that the cable is de-energised.

**Warning:** *The use of testers that detect an electric field surrounding an energised conductor may not be suitable for cables that are surrounded by a metallic screen, cables carrying direct current and in some other circumstances.*

#### 4.4.15 Removing Out of Service Electrical Equipment and Cables

Before removal of out of service or decommissioned electrical equipment, the equipment and cables shall be isolated from all sources of supply and appropriate tests made to ensure the equipment and cables are de-energised.

#### 4.4.16 Precautions when Leaving Electrical Work Unfinished

Electrical workers have a responsibility to ensure that the work they are doing does not present a hazard to others at the workplace. This also means leaving the worksite in a safe state for access by others. Means of making the workplace safety should include the following:

- (a) Terminating exposed conductors and where necessary, providing mechanical protection.
- (b) Physically securing cables.
- (c) Tagging and taping off cables.
- (d) Where appropriate, informing relevant parties that the work is not complete.
- (e) Taking any necessary precautions to ensure that equipment cannot become energised.
- (f) Ensuring that switchboards are clearly and correctly labelled in relation to their status.

#### 4.4.17 Capacitors

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

Capacitors and associated circuitry shall be proved to be de-energised 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 capacitor 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 of Clause 3.2.5 for work on or near exposed energised conductors applies.*

#### 4.4.18 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.

**Note:** AS2676.1 and AS2676.2 provide guidance on safety practices during battery installation and maintenance.

#### 4.4.19 Elevated Electrical Equipment Poles and Structures and Overhead Conductors

Extra caution should be exercised when working on or near exposed energised overhead conductors or other energised electrical equipment in elevated positions. In elevated positions, even a light shock can result in a fall that could prove fatal. Approved safety harnesses and other necessary safety equipment and PPE shall be used where appropriate. If a safety observer is necessary, the safety observer shall be competent in relevant rescue procedures.

Poles and structures shall be tested and inspected to approved procedures to establish, as far as practicable, whether they are structurally sound for the work to be carried out without special precautions. The testing and inspection shall be performed before climbing the poles or structures or before accessing them by means of elevating work platforms.

#### 4.4.20 Proving De-energised

Any voltage tests used to prove de-energised shall be conducted between all conductors and between all conductors and a proven earth or shall be conducted to another approved procedure. Voltage detectors used to prove de-energised, shall be tested for correct operation immediately before use and again immediately after use to confirm that the detector is still working.

**Warning:** The use of testers that detect an electric field surrounding an energised conductor may not be suitable for cables that are surrounded by a metallic screen, cables carrying direct current and in some other circumstances.

#### 4.4.21 Identify the Safe Area of Work

The safe area of work for authorised zones and exclusion zones is to be identified as part of preparing the JSA. The risk assessment for erecting barricades is to assess the proximity of other workers, duration of the work being performed and the hazards involved. All personnel who are to work in the area shall be advised of its limits by the OIC.

#### 4.4.22 Work on De-energised Equipment

Work on de-energised equipment shall only proceed if the equipment is isolated and any other exposed conductors in the work area are either:

- (a) de-energised and isolated; or
- (b) separated by barriers or by distance.

If the above requirements are not satisfied, then the work shall be done in accordance with the energised working procedures.

#### 4.4.23 Working Near or In Direct Contact with Exposed Parts

For work involving direct contact with electrical parts is to be performed as detailed below. Workers are not to not come into direct contact with an electrical part unless:

- the person is an authorised person (authorised by CS Energy's Site PTW Administrator) for the electrical part which is low voltage, or
- the electrical part is isolated from all sources of electricity, and
- tested to ensure it is, or otherwise confirmed to be, isolated from all sources of electricity, and
- if the electrical part is a high voltage electrical part, it is earthed.

Items of operating plant or vehicles must not come into direct contact with an electrical part (low voltage overhead insulated electric line) unless:

- the item is operating plant and it is being operated by an authorised person (authorised by CS Energy's PTW Administrator) for the electrical part, and a safety observer is being used.

#### 4.4.24 Work Within Exclusion Zones for Electrical Parts

Persons, operating plant or vehicles must not enter or work within an exclusion zone of an electrical part unless:

- the electrical part is isolated from all sources of electricity;
- tested to ensure it is, or otherwise confirmed to be, isolated from all sources of electricity; and
- if the electrical part is a high voltage electrical part, it is earthed.

For identification of the term exclusion zone refer to the table within Attachment 1.

If it is not practicable to test or otherwise confirm the isolation of electricity for an electrical part, entry into the area, or the work may be performed if:

- the work can be performed safely as determined by a JSEA;
- detailed work instructions have been established in relation to the practice and these have been made known to those performing the activity; and
- at least one of the following applies:
  - (a) suitable barriers or earthed metal shields are installed between the person, operating plant or vehicle and the electrical part;
  - (b) the work is testing and the electrical part or the electrical equipment of which the part is a component is designed in a way requiring the work to be performed while the person, operating plant or vehicle is within the exclusion zone; or
  - (c) the work is earthing of the electrical part of the electrical equipment of which the part is a component and the earthing is performed after the electrical part or equipment has been isolated and proved to be de-energised.

**Note:** Working within an exclusion zone is deemed as live work and as such specific requirements as per Section 4.4.27 are to be ensured.

#### 4.4.25 Specific Overhead Line Considerations

Specific overhead line hazards and controls are to be identified within a JSEA where operating plant such as the following may come into contact with overhead lines during work activities on site:

- cranes;
- elevating work platforms;
- earth moving equipment; or
- any other plant that may come into contact with overhead lines.

Pre-work planning and consultation (including preparation of a JSEA) with plant operators, plant hire companies and contractors is to be undertaken by the OIC to minimise the likelihood of exclusion zones being entered and to ensure a safe system of work has been identified prior to activities commencing.

Only authorised persons or instructed persons are to operate plant near overhead lines. To ensure this is the case where contracted parties are involved in the work, CS Energy authorised persons are to supervise the work and undertake pre-work consultation with plant operators to ensure all relevant issues are discussed and documented.

A safety observer is to be used at all times where entry into an exclusion zone is possible or where work is performed within an authorised zone.

A part of pre-work planning and performing the JSEA process the following types of issues are to be considered:

- Size and dimensions of the load(s).
- The conductive nature of the operating plant or the load(s) and the likelihood of it becoming live due to induced voltages.
- Special precautions for the lifting of the load(s) above or over electric lines.
- The method of securing the load(s).
- Whether any part of the load(s) may move inadvertently during lifting and slewing.
- Whether unexpected movement of the operating plant may cause it to enter an exclusion zone or contact an overhead line.
- Whether wind factors could cause the operating plant or load to enter an exclusion zone or contact an overhead line.

**Note:** *Power Station specific procedures that ensure a level of safety equal to or exceeding the above requirements may also be used as a supplement to ensure a safe system or work where overhead lines present a hazard.*

#### 4.4.26 Specific Underground and In-Situ Electrical Considerations

Specific electrical hazards and controls are to be identified within a JSEA where work activities on site, such as the following, may cause persons or operating plant to come into contact with electrical cables and installations:

- Removing wall sheeting during a building refurbishment.
- Penetrating a wall cavity or ceiling space with a hand tool or portable electric tool.
- Using portable electrical tools to cut piping that may contain water.
- Excavating on site in preparation for a new facility or building.
- Digging holes for the erection of fence posts.
- Any other activity that may require penetration into the ground or work in the vicinity of in-situ electrical installations and entity works.

As part of pre work planing and JSEA processes the following types of issues are to be considered. These include:

- the location to be worked in whether it be in the vicinity of entity works or in the vicinity of electrical installations;

- unauthorised persons are prevented from entering the work area by a means of barrier exclusion, signage or both;
- reference to power station drawings, electrical drawings and service drawings; and
- the method of work being used, whether it is via machinery, portable electrical tools or by the use of hand tools.

As electrical lines and cables are manufactured in many ways and are often protected by a range of varying electrical conduits, thorough pre-work cable inspection and identification is to be undertaken prior to undertaking work within buildings or facilities.

Where excavation activities or the driving of items into the ground is required, CS Energy's Excavation Procedure is to be implemented which includes specific controls to address underground service hazards, inclusive of the need to properly located underground electrical cables.

Cable locating devices or services are to be used to identify the location of underground or in-situ services.

#### **4.4.27 High Voltage Line Work**

Work must not be performed on high voltage live lines unless the work:

- is authorised by the issuing of a PTW and supported by a JSEA and Form S1885 Live Electrical High Voltage Work Checklist,
- is in accordance with a high voltage live line work management plan approved by;
  - an electrical engineer who has the expertise as a professional engineer in the performance of high voltage live line work, or
  - a person who is deemed to have the above expertise by those in control of the electrical equipment requiring work.
- is performed by a trained and competent person(s);
- as described by the PTW, states the voltages of the electrical equipment upon which the high voltage live line work is to be performed; and
- as described by the PTW and high voltage live line work management plan, is fully discussed and clarified amongst those involved in the work, the electricity entity or other persons who might reasonably be expected to have a stake in the work.

#### **4.4.28 Work on or Near Exposed Energised Conductors in Switchboards or Cubicles**

The risk of electric shock or arc, blast and flash burn injuries exists when performing work on or near exposed energised conductors. To manage this risk, the following precautions shall be taken.

- (a) Before commencing any work on or near exposed energised conductors an assessment of the associated risks shall be made.
- (b) A JSEA is to be established for the low voltage work activity to document the risks and control measures. Form S1885 Live Electrical Work checklist is to be used for any high voltage (HV) live electrical work.
- (c) Where a JSEA determines that isolation or the use of suitable barriers is impracticable, a safety observer shall be used as a precaution against potential injury or damage.
- (d) Any persons undertaking work on or near exposed energised conductors are to be trained as an authorised person for the work to be carried out.

- (e) When work is to be carried out on or near exposed energised conductors, precautions shall be taken to prevent the possibility of simultaneous contact with conductors at different voltages.
- (f) PPE that is appropriate and suitable for the task shall be worn. PPE shall be of correct fit and in good condition. Safety eyewear should be worn when working on or near exposed energised conductors.
- (g) All work on exposed energised conductors shall be done from a stable work platform.
- (h) When working on energised electrical equipment having earthed metal, precautions shall be taken to ensure earthing continuity is always maintained to any component part of the equipment at all times or work shall be carried out to an approved procedure. Temporary protective earthing conductors may be required to be installed when removing electrical equipment from earthed metal, eg an electrical component part separated from its normal earthing medium. Temporary protective earthing conductors shall be rated to withstand the prospective short circuit current of the primary protection without failing.
- (i) Particular care should be taken when removing neutral connections as test may have indicated a de-energised situation. However, when these connections are removed, a voltage may be present between conductors or between conductors and earth.
- (j) Only conductors at the same voltage should be worked on at any one time. Insulating barriers, covers or mats shall be used in the work area between conductors of different phases or voltage or work shall be carried out to an approved procedure. The conductive path between electrical workers and conductors and between electrical workers and earth (including building materials such as concrete and steel that may be earthed) should be broken by one or more of the following methods:
  - Insulating barriers, covers or mats
  - Insulating tools
  - insulating gloves
- (k) when work is left unfinished, the workplace is to be left in a safe state for access by others.
- (l) ensure the equipment is returned to service in its original state or that changes made have been approved.

#### **4.4.29 High Voltage Electrical Precautions – HVIA Manual**

Work in switchyards relating to High Voltage access is to be done in accordance with the HVIA Manual. Workers required to prepare HV isolation sheets, isolate HV equipment in switchyards, and or perform high voltage electrical work are to be trained in accordance with the HVIA Manual.

Persons required to enter switchyards, that are not doing electrical work, are to obtain an Access Permit and where necessary make arrangements to notify the owner of the switchyard of their presence and the work to be performed.

A register is to be kept of persons with HVIA training by the Site PTW Administrator or person with delegated authority from the Site Manager. High voltage work performed on other areas of the site is to be in accordance with the requirements of the CS Energy PTW Manual.

## 4.5 Supervising Electrical Work

Supervision of electrical work entails supervising the way in which electrical work is performed. Team leaders and work crew supervisors must hold an electrical work licence if they directly supervise electrical work. Team Leaders/Supervisors who are not licensed electrical workers can prioritise work but cannot directly supervise the manner in which electrical work is to be performed.

Electrical apprentices and trainees must be supervised when performing electrical work by a licensed electrical worker.

Electrical engineers are permitted to supervise electrical work where the work is part of their practice as an electrical engineer and can only perform electrical work of a commissioning or fault finding nature.

## 4.6 Testing / Return to Service

If an item of electrical equipment has a serious defect, a licensed electrical worker is not to connect the equipment to a source of electricity for use for its intended purpose.

### 4.6.1 Testing of Electrical Equipment after Electrical Work

Where electrical work is performed on electrical equipment, which includes appliances, the equipment must be tested prior to connecting it to a source of electricity to ensure it is in a state of readiness for reconnection and for use for its intended purpose.

The testing of electrical equipment must be directed at ensuring that the electrical equipment, to the extent it is affected by the electrical work, is electrically safe, as well as ensuring those other personnel not involved in the testing are electrically safe.

A test certificate shall be completed for electrical work by the electrical worker and presented to the OIC before surrender of the PTW. Where the work is a modification or new installed electrical equipment, the test certificate shall be reviewed by the Contractors Licence endorsee (qualified person) prior to surrender of the PTW. A test certificate in accordance with Section 4.6.2 is to be maintained by CS Energy as the licensed electrical contractor for a period not less than 5 years after it was provided or after the testing was undertaken.

Where electrical work is performed on high voltage electrical installations or within hazardous area electrical installations an “accredited auditor” must inspect the work to confirm that the installation is tested, is in accordance with the wiring rules and is electrically safe.

### 4.6.2 Certificate of Testing and Safety

Test certificates are to include at least the following:

- name and address of the person for whom the work was performed,
- the electrical equipment tested,
- the day the electrical equipment was tested, and
- the number of the electrical contractor licence under which the electrical equipment was tested.

**Note:** Refer also to CS Energy procedure for Maintenance and Testing of Entity Works, electrical installations and electrical equipment.

The certificate must certify that the electrical equipment, to the extent it is affected by the electrical work, is electrically safe.

### 4.6.3 Electrical Safety Equipment Maintenance and Use

Maintenance, use and testing requirements for safety equipment and testing instruments used in the performance of electrical work is addressed specifically in CS Energy's Maintenance of Electrical Safety Equipment and Clothing (PPE) Procedure. This procedure should be referred to for specific usage, inspection, testing and maintenance requirements.

## 5.0 Electrical Incident or Event

### 5.1 Response and Reporting Requirements

The scene of a serious electrical incident or dangerous electrical event is not to be interfered with unless permission is granted by an Inspector from the Electrical Safety Office or similar statutory authority, or a Police Officer.

Persons who witness a serious electrical incident or dangerous electrical event may move equipment/items or interfere with the scene if it is necessary to save a life or relieve suffering, or to prevent further injury to a person or property damage.

In the event of a serious electrical incident or dangerous electrical event, the incident is to be reported as soon as possible to the Health and Safety Advisor.

The Health and Safety Advisor, on behalf of CS Energy is to give notice of the incident or event to the Electrical Safety Office via the *Workplace Health and Safety Queensland – Incident/Record Report Form*. This is to be undertaken within 24 hours of the incident or event occurring or from the time the incident or event was discovered.

If the incident or event is a serious electrical incident in which a person is killed however, this notification is to be undertaken as soon as possible via any means of communication. The Police must also be contacted immediately following the incident.

A record and commensurate investigation report in relation to serious electrical incidents or dangerous events are to be documented and maintained for a period of not less than 3 years when:

- the incident involves an electric shock the following is to be undertaken: the casualty is to be immediately rendered first aid; and
- the casualty is to be transported by ambulance to a medical provider for further treatment and monitoring.

## 6.0 Training and Authorisation

For specific isolation and electrical related activities, CS Energy Power Station sites are to have a training, authorisation and competency system that authorises personnel for the following functions: Permit to Work Officer (PTWO), Senior Permit to Work Officer (SPTWO), High Voltage Switching Officer, High Voltage Switching Assistant, Electrical Worker, Authorised Person, Safety Observer – General, Safety Observer – Electrical. Authorisation is to be based on the site criteria and is to include the following competencies: rescue from live switchgear, HVIA training, licensed electrical worker, electrical engineer, electrical technician, authorised persons, safety observer – general, safety observer – electrical, site-specific plant training modules and permit to work modules.

Authorisation may be restricted as determined by the Site PTW Administrator, person with delegated authority or Site Manager. The PTW Administrator or person with delegated authority for each site is to maintain a register of CS Energy Authorized Persons and approve contractor employees for the role of Authorized Person and Safety Observer.

The approval to act in these roles is to be based on evidence that the worker has adequate training to perform the role and work they perform on site. Approval will be granted as a condition in the PTW Application and the details are to be recorded in the site register.

Personnel who are authorised for a particular electrical function are to undertake refresher training as required by their licensing conditions or as per the training course specifications.

Workers required to work on high voltage equipment or in hazardous areas are to be trained to meet the required competencies for the type of work or work area.

Electrical workers and contractors are to provide evidence of their competencies prior to getting authorisation to access electrical equipment, obtain Permits to Work, act as safety observers and be authorised persons for work in proximity to exposed, energised electrical conductors. Electrical contractors must also provide evidence of the “qualified persons” capacity to sign test and compliance certificates.

## **7.0 Electrical Contractor Licence**

Each Power Station Site Manager is to maintain a current electrical contractor licence to conduct business or contract an undertaking that includes the performance of electrical work and to ensure that one or more qualified persons are nominated as part of the electrical contractor licence. *Refer to Clause 3.5 for information on the “qualified persons” responsibilities.*

## **8.0 Legislative and CS Energy References**

QLD – Electrical Safety Act 2002

QLD – Electrical Safety Regulation 2002

QLD – Code of Practice – Working Near Exposed Live Parts 2002

QLD – Code of Practice – Electrical Work 2002

CS Energy – PTW Manual

CS Energy – Excavation Procedure

CS Energy – Maintenance and Testing of Entity Works, Electrical Installations and Electrical Equipment procedure

CS Energy – Maintenance of Electrical Safety Equipment and Clothing (PPE) Procedure

CS Energy – Form S1869 - Live Electrical Work Checklist

ESAA – NENS 03 - 2003 National Guidelines for safe access to electrical and mechanical apparatus.

Standards Australia – AS 4836:2001 Safe Working on low voltage electrical installations

Powerlink – HVIA Manual

## **9.0 Associated Electrical Safety Documentation**

To provide the reader with additional information as referred to within this procedure; the following documentation has been attached. This includes:

Attachment 1 – Exclusion Zone Details; and

Attachment 2 – Electrical Safety Guideline

Form S1885 Live Electrical High Voltage Work Checklist

## 10.0 Definitions

### Authorised Person

For an electrical part, means a person who:

- has enough technical knowledge and experience to do work that involves contact with, or being near to, the electrical part; and
- has been approved by CS Energy's Site PTW Administrator to do work that involves contact with, or being near to, electrical parts.

### Authorised Zone

For an electrical part is related to the safe approach distance that an authorised person can approach the item as stated in Attachment 1 to this procedure and Schedule 2 of the Electrical Safety Regulations.

### Competent Person

Means a person who has acquired, through training, qualifications, experience or a combination of these, the knowledge and skill enabling the person to inspect and test electrical equipment.

### Dangerous Electrical Event

Is any of the following:

- the coming into existence of circumstances in which a person is not electrically safe, if:
  - the circumstances involve high voltage electrical equipment; and
  - despite the coming into existence of the circumstances, the person does not receive a shock or injury;
- the coming into existence of the following circumstances:
  - if a person had been at a particular place at a particular time, the person would not have been electrically safe,
  - the person would not have been safe because of circumstances involving high voltage electrical equipment,
  - an event that involves electrical equipment and in which significant property damage is caused directly by electricity or originates from electricity,
  - the performance of electrical work by a person not authorised under an electrical work licence to perform the work,
  - the performance of electrical work by a person if, as a result of the performance of the work, a person or property is not electrically safe,
  - the discovery by a licensed electrical worker of electrical equipment that has not been marked as required under the Electrical Safety Act 2002.

### Direct Contact

Means a person, operating plant or vehicle and any attached gear touches a conductive object or an electrical part.

### Electrical Contractor Licence

Is a licence issued by the Electrical Safety Office authorising a person to perform electrical work as part of a business or undertaking.

### Electric Line

Is a wire or conductor or associated equipment used for transmitting, transforming, or supplying electricity at a voltage greater than extra low voltage.

## **Electrical Engineer**

Means a person who is a registered professional engineer under the Queensland Professional Engineers Act 2002 and who is registered in the division of electrical engineering under that Act, or a person who holds a qualification in electrical engineering granted by a tertiary education institution that entitles the person to be admitted to the Institution of Engineers

## **Electrical equipment**

Is any apparatus, appliance, cable, conductor, fitting, insulator, material, meter or wire:

- used for controlling, generating, supplying, transforming or transmitting electricity at a voltage greater than extra low voltage;
- operated by electricity at a voltage greater than extra low voltage; or
- that is, or that forms part of, a cathodic protection system.

## **Electrical Equipment Work**

Is electrical work other than electrical installation work or electric line work.

## **Electrical Installation**

Is a group of items of electrical equipment, if:

- all the items are permanently electrically connected together;
- the items do not include items that are works of an electricity entity; and
- electricity can be supplied to the group from the works of an electricity entity or from a generating source.

## **Electrical Installation Work**

Is electrical work associated with an electrical installation, but does not include the following electrical work:

- testing, repairing or maintaining electrical equipment included in the electrical installation; or
- electric line work associated with the electrical installation.

## **Electrical Isolation**

An isolation requires an interruption of the path(s) of energy supply to the equipment such that the equipment can't be energised from the energy supply without tampering with the isolation. An isolation is deemed to be initiated if any energisation, or switching surge will not cross the isolation point and the isolation point is fitted with a locking device (or other precautions taken to stop the device being accidentally closed) and accompanying danger tag. Isolation of remote controls via software logic alone is not acceptable.

## **Electrical Part**

Means an exposed part, or an overhead insulated electric line.

## **Electrical Work**

Is the manufacturing, constructing, installing, testing, maintaining, repairing, altering, removing or replacing of electrical equipment.

**Note:** The following matters are not 'electrical work':

- installing or removing electrical equipment by connecting it to electricity, or disconnecting it from electricity, by a plug and socket outlet,
- repairing or replacing non-electrical components of electrical equipment,
- replacing a component forming part of electrical equipment if the electrical equipment has been designed so that the component is readily and safely able to be replaced by a person without electrical knowledge or skill,
- assembling, making, modifying or repairing electrical equipment in a workplace registered under the Workplace Health and Safety Act 1995, if that is the principal

manufacturing process at the workplace, and arrangements are in place, and are detailed in written for, for ensuring that:

- the work is done safely and competently; and
- the equipment is tested to ensure compliance with the relevant standards,
- building, under the supervision of an electricity entity, an overhead electric line on structures that do not already carry an energised overhead electric line,
- building or repairing ducts, conduits, troughs (channels) where electrical wiring will be or is installed, if:
  - the channels are not intended to be earthed;
  - wiring installed in the channels is not energised;
  - the work is done under the supervision of a person licensed to perform electrical installation work;
  - laying, cutting or sealing underground cables that are part of the works of an electricity entity before the initial connections of the cables to an electricity source;
  - recovering underground cables that are part of the works of an electricity entity after disconnection from an electricity source;
  - altering, repairing, maintaining or recovering an overhead electric line that is part of the works of an electricity entity, if the work is performed under the entity's supervision and:
    - if the line is not on supports supporting another electric line – the line has been isolated from an electricity source so that the closure of a switch cannot energise the section of the line where work is being done; or
    - if the line is on supports supporting another electric line – both lines have been isolated from an electricity source so that the closure of a switch cannot energise the section of the line where the work is being done or an adjacent section of the other line,
- work performed by a person on electrical equipment if:
  - the electrical equipment is not energised;
  - the work is prescribed under a regulation for this paragraph; and
  - it is necessary for the person to perform the work to meet the eligibility requirements for an electrical work licence.

### **Electrical Work Licence**

Is a licence issued by the Electrical Safety Office authorising an individual to perform electrical work.

### **Exclusion Zone**

For a person for an electrical part, or for operating plant or a vehicle for an electrical part, means the distance from the part stated for the person, plant or vehicle in *Attachment 2*.

### **Extra Low Voltage**

Means voltage of 50V or less AC RMS, or 120V or less ripple-free DC.

### **Fault Finding (live)**

Means work performed by electrical workers, engineers or electrical technicians to determine the causes of electrical faults in electrical equipment or installations – this may require work on energised equipment where there is no alternative to performing the fault finding other than by energised means.

### **High Voltage**

Means voltage greater 1000V AC RMS or 1500 ripple free DC.

### **Live Work**

Means electrical work performed in circumstances in which some or all of the electrical equipment the subject of the electrical work is energised.

**Low Voltage**

Means voltage greater than 50V AC RMS or 120V ripple free DC but not more than 1000V AC RMS or 1500V ripple-free DC.

**Operator Earth**

Operator earths are earths applied under the authority of an isolation, are to be placed at a location(s) that, in the event of unintentional re-energisation, will cause the work area to be de-energised by the operation of protection equipment - they may be a designated earth switch or a portable earthing device connected to a permanent earthing point.

**Operating Plant**

Means plant being operated for its intended purpose, unless the operation of the plant cannot materially affect the distance between the plant and any electrical part in relation to which there is a defined exclusion zone.

**Safety Observer - Electrical**

In relation to the observing of the performance of electrical work, means a person:

- who is competent to help with the electrical work;
- who is competent to rescue the person performing the electrical work and to provide resuscitation; and
- whose competency in relation to resuscitation has been assessed in the last 6 months.

**Safety Observer - General**

In relation to the observing of the performance of work in an authorised zone, means a person:

- who is competent to observe the work;
- who is competent to rescue the person performing the work and to provide resuscitation; and
- whose competency in relation to resuscitation has been assessed in the last 6 months.

**Serious electrical incident**

Is an incident involving electrical equipment if, in the incident:

- a person is killed by electricity, or
- a person receives a shock or injury from electricity, and is treated for the shock or injury by or under the supervision of a doctor, or
- a person receives a shock or injury from electricity at high voltage, whether or not the person is treated for the shock or injury by or under the supervision of a doctor.

**Supervise Electrical Work**

Means supervise the way the electrical work is performed. Supervision of electrical work entails instructions in the way electrical work is to be completed. Any person supervising electrical work must hold an Electrical Work Licence or be an Electrical Engineer.

**Works**

Works of an electricity entity means the electrical equipment, and electric line associated equipment, controlled or operated by the entity to generate, transform, transmit or supply electricity.

## Attachment 1 – Exclusion Zone Details

### Exclusion Zone

The exclusion zone for a person for an electrical part, or for operating plant or a vehicle for an electrical part means the distance from the part stated for the person, plant or vehicle in the following table.

For applying the following table the information listed below, applies:

- The definition of direct contact for a person, operating plant or a vehicle must be considered.
- Where operating plant is used without a safety observer or another safe system, the person (be they authorised or instructed) is to be taken as being an untrained person, unless:
  - the operating plant is fitted with a device capable of stopping the operation of the plant immediately when the plant is at the exclusion zone for an authorised/instructed person for the electrical part and checks are undertaken to ensure that this device is operating properly and set for at least the correct exclusion zone distances,
  - there is in place a safe system of work for the use of the operating plant, and this system provides for persons and property, the same or greater level of electrical safety than the level of electrical safety that could be provided with a safety observer, and
  - the safe system of work has been developed in consultation with persons who are broadly representative of industrial organisations of employees whose members commonly operate plant of the plant's type.
- A vehicle does not include reference to an aircraft, or a vehicle that is operating plant.

Nominal phase to phase voltage (kV) (Exposed unless otherwise specified)	Untrained Persons			Authorised Persons (AP)			Operation / Driving of vehicle
	Untrained Persons	Operation of Mobile Plant	Operation / Driving of Vehicle	Authorised Persons (AP)	Operation of operating plant, with safety observer or another safe system		
					Un-insulated	Insulated	
Insulated low voltage with consultation & insulation verified by AP	No contact	1000	300	Contact allowable	-	Contact allowable	No contact
Low voltage (LV) with consultation	1000	3000	600	AP – insulated contact only	1000	Contact allowable	600
Low voltage (LV) without consultation	3000						
>LV & up to 33 with consultation	2000						
>LV & up to 33 without consultation	3000	6000	900	700	1200	700	700
>33 & up to 50			2100	750	1300	750	750
>50 & up to 66			1000	1400	1000	1000	1000
>66 & up to 110			1200	1800			1200
>110 & up to 132			1800	2400			1800
>132 & up to 220	4500	6000	2900	2300	3000		2300
>220 & up to 275	5000		3400	3000	3700		3000
>275 & up to 330	6000		8000	4400	3300	4000	
>330 & up to 400				3900	4600		3900
>400 & up to 500							
<b>Nominal Pole to Earth DC Voltage (kV)</b>							
+/- 25	3000	3000	900	700	1200	700	700
+/- 85	3000		2100	1000	1800	1000	1000
+/- 150	3000			1200			1200
+/- 270	4500	6000	2900	1800	2400		1800
+/- 350	5000			2500	3200		2500
+/- 400	6000			3400	2900	3600	

*Reference Document: Appendix B - Code of Practice – Working Near Exposed Live Parts – Electrical Safety Act and Regulations.*

## Attachment 2 – Electrical Safety Guideline

### CS ENERGY – ELECTRICAL SAFETY GUIDELINE – ISOLATIONS

Task Description	Activity	Legislative Requirement	CSE position
<b>OWN ISOLATIONS</b> (eg. operating circuit breaker or pulling fuse as an isolation prior to changing lights)	<ul style="list-style-type: none"> <li>- Isolating electrical non-essential equipment only.</li> <li>- Integrity of circuit is not altered.</li> </ul>	<ul style="list-style-type: none"> <li>- The isolation is NOT electrical work - ESA S18 (2)</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker with PTW training. Danger tag and lock to be used and electrical worker to test de-energised.</li> </ul>
<b>OPERATOR STANDBY ISOLATIONS</b>	<ul style="list-style-type: none"> <li>- Isolation for electrical work without full permit to work</li> <li>- Integrity of circuit is not altered.</li> </ul>	<ul style="list-style-type: none"> <li>- Danger tag required for isolation point.</li> <li>- No lock required</li> <li>- Operator to remain at isolation point for the duration of the work ESR S20 (2) (b)</li> </ul>	<ul style="list-style-type: none"> <li>- PTW officer with PTW training.</li> <li>- Licensed electrical worker to ensure tag in place and test de-energised.</li> <li>- Danger tag to be used</li> </ul>
<b>LOW VOLTAGE</b> (For AC 50V to 1000V For DC 120V to 1500V) ESA Schedule 2  <b>PERFORM ISOLATION - no exposed live parts - integrity of electrical equipment not altered</b> (eg. operating circuit breaker, pulling fuse)	<ul style="list-style-type: none"> <li>- For NON electrical work to be performed on plant</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work – ESA S18 (2)(c)</li> <li>- PTW System</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer and Electrical Safety Awareness training</li> </ul>
	<ul style="list-style-type: none"> <li>- For electrical work to be performed on plant</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work – ESA S18 (2)(c)</li> <li>- PTW System</li> <li>- Licensed electrical worker to ensure tags and locks in place and test de-energised - ESR S20 (2)(3)</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Electrical Safety Awareness training</li> <li>- Licensed electrical worker to ensure tags and locks in place, and test de-energised.</li> </ul>
<b>LOW VOLTAGE</b> (For AC 50V to 1000V For DC 120V to 1500V) ESA Schedule 2  <b>PERFORM ISOLATION – within authorised zone - integrity of electrical equipment not altered</b> (e.g. operating circuit breaker, pulling fuse).	<ul style="list-style-type: none"> <li>- For NON electrical work to be performed on plant</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work - ESA S18 (2)(c)</li> <li>- Must be Authorised Person – ESR S59, ESR S64 (1)(a)(b)(c), ESR Sch2</li> <li>- Must have Safety Observer– ESR S62 (3)(b)</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Authorised Person training</li> <li>- Safety Observer - General with Authorised Person training.</li> </ul>
	<ul style="list-style-type: none"> <li>- For electrical work to be performed on plant</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work - ESA S18 (2)(c)</li> <li>- Must be Authorised Person – ESR S59</li> <li>- Must have Safety Observer</li> <li>- Licensed electrical worker to ensure tags, locks in place and test de-energised</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Authorised Person training</li> <li>- Safety Observer - General with Authorised Person training.</li> <li>- Licensed electrical worker to ensure tags, locks in place and test de-energised prior to doing work</li> </ul>

Task Description	Activity	Legislative Requirement	CSE Position
<p><b>HIGH VOLTAGE</b> (For AC &gt;1000V For DC &gt; 1500V) ESA Schedule 2)</p> <p><b>PERFORM ISOLATION</b> <b>- no exposed live parts</b> - integrity of electrical equipment not altered</p> <p>(eg. operating circuit breaker, and isolators – rack out and rack in, place in isolated position, lock out and tag on carriage or shutters or by using manufacturers locking device)</p>	<ul style="list-style-type: none"> <li>- For NON electrical work to be performed on plant</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work – ESA S18 (2)(c)</li> <li>- PTW System</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Electrical Safety Awareness training.</li> </ul>
	<ul style="list-style-type: none"> <li>- For electrical work to be performed on plant (which requires earths)</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work – ESA S18 (2)(c)</li> <li>- PTW System</li> <li>- Licensed electrical worker to ensure tags and locks in place and test de-energised ESR S20 (2)(3)</li> <li>- Application of portable earths is electrical work - ESR S11</li> <li>- Closing of an “in-situ” earthing switch is not electrical work</li> <li>- Must be Authorised Person – ESR S59</li> <li>- Must have Safety Observer</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Electrical Safety Awareness training.</li> <li>- Licensed electrical worker to ensure tags and locks in place, test de-energised apply earths</li> </ul>
<p><b>HIGH VOLTAGE</b></p> <p><b>PERFORM ISOLATION</b> <b>– within authorised zone</b> <b>- integrity of electrical equipment not altered</b> (eg. operating circuit breaker, and isolators – rack out and rack in, place in isolated position, lock out and tag on carriage or shutters or by using manufacturers locking device)</p>	<ul style="list-style-type: none"> <li>- For NON electrical work to be performed on plant</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work – ESA S18 (2)(c)</li> <li>- PTW System</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Authorized Person training.</li> <li>- Safety Observer – General to have Authorized Person training</li> </ul>
	<ul style="list-style-type: none"> <li>- For electrical work to be performed on plant (which requires earths)</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is NOT electrical work – ESA S18 (2)(c)</li> <li>- PTW System</li> <li>- Licensed electrical worker to ensure tags, locks in place and test de-energised ESR S20 (2)(</li> <li>- Application of portable earths is electrical work ESR S11</li> <li>- Closing of an “in-situ” earthing switch is not electrical work</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer with Authorized Person training</li> <li>- Licensed electrical worker to ensure tags, locks in place, test de-energised apply earths</li> <li>- Safety Observer – General to have Authorized Person training</li> </ul>

<p><b>HIGH AND LOW VOLTAGE</b></p> <p><b>PERFORM ISOLATION</b></p> <p><b>- within authorised zone</b></p> <p><b>- integrity of electrical equipment is altered</b></p> <p>(integrity altered by eg. removing cable).</p>	<ul style="list-style-type: none"> <li>- For electrical and NON electrical work to be performed on plant</li> <li>- (Note: it is CSE Policy not to alter the integrity of high voltage electrical equipment to achieve an isolation – circuit breakers are to be utilised)</li> </ul>	<ul style="list-style-type: none"> <li>- Isolation is electrical work ESA S18</li> <li>- Licensed electrical worker to do the Isolation</li> <li>- Must be Authorised Person - ESR S59</li> <li>- Must have Safety Observer - ESR S59</li> <li>- Licensed electrical worker to ensure tags, locks in place and test de-energised - ESR S20 (2)</li> </ul>	<ul style="list-style-type: none"> <li>- PTW Officer /Licensed electrical worker to do the isolation and must be Authorised Person</li> <li>- PTW Officer to be HVIA trained for high voltage work</li> <li>- Safety Observer - electrical to have Authorized Person training</li> <li>- Safety Observer - electrical to be licensed electrical worker for high voltage</li> <li>- Licensed electrical worker to ensure tags, locks in place and test de-energised</li> </ul>
<p><b>PREPARATION OF ELECTRICAL ISOLATION SHEETS /SWITCHING SHEETS</b></p>	<ul style="list-style-type: none"> <li>- Preparing High Voltage isolation documentation for a single HV drive</li> </ul>	<ul style="list-style-type: none"> <li>- Not specified</li> </ul>	<ul style="list-style-type: none"> <li>- CSE Competent Person with PTWO training.</li> </ul>
	<ul style="list-style-type: none"> <li>- Preparing isolation documentation for High Voltage isolations other than a single drive</li> </ul>	<ul style="list-style-type: none"> <li>- Not specified</li> </ul>	<ul style="list-style-type: none"> <li>- CSE Competent Person with HVIA training.</li> </ul>

**CS ENERGY – ELECTRICAL SAFETY GUIDELINE – APPLICATION OF EARTHS**

<b>Task Description</b>	<b>Activity</b>	<b>Legislative Requirement</b>	<b>CSE Position</b>
<b>HIGH AND LOW VOLTAGE</b> (For AC >50V For DC > 120V)  <b>APPLICATION OF OPERATOR EARTHS</b> - including switchyards (application of earths performed in switchyards operated by other Entities must be done in accordance with their procedures)	- Operating an in-situ earth switch	- This is NOT electrical work - ESA S18 (2)(c)	- Person with electrical Switching Officers training (may not be a licensed electrical worker) - Safety Observer – General required for work in authorised zone
	- Installing and operating portable earthing device	- This is electrical work - Licensed electrical worker to do work – ESA S18 (1)	- Licensed electrical worker with electrical Switching Officers training for high voltage work or when altering integrity - Electrical Switching Officer to be HVIA trained for high voltage work - Safety Observer – General required for low voltage work in authorised zone - Safety Observer – Electrical required for altering integrity in authorised zone - Safety Observer – Electrical with licensed electrical worker skills required for high voltage work
<b>HIGH AND LOW VOLTAGE</b> (For AC >50V For DC > 120V)  <b>APPLICATION OF WORKING EARTHS</b>	- Applying working earths	- This is electrical work - ESA S18 (1) - Licensed electrical worker to do work - ESR S30 (1)	- Licensed electrical worker to do work - HVIA training required to apply the working earth for high voltage electrical equipment - Safety Observer – Electrical required for work in authorised zone - Safety Observer – Electrical to be licensed electrical worker for high voltage work

## CS ENERGY – ELECTRICAL SAFETY GUIDELINE - TESTING

Task Description	Activity	Legislative Requirement	CSE Position
<b>HIGH AND LOW VOLTAGE</b> (For AC >50V For DC > 120V) <b>TESTING FOR DE-ENERGISED DURING ISOLATION - including switchyards</b> (testing for de-energised and switching performed in switchyards operated by other Entities must be done in accordance with their procedures).	- Test de-energised using portable test equipment.	- Can be done by Competent Person on Entity Works – ESA S25, ESR S57 (b)(c)	- Licensed electrical worker with electrical Switching Officers training - Licensed electrical worker to have HVIA training for high voltage work - Safety Observer – General required for work in authorised zone - Safety Observer – Electrical required when altering integrity in authorised zone - Safety Observer – Electrical with licensed electrical worker skills required for work on high voltage
	- Test de-energised using purpose built installed test devices.	- This is NOT electrical work - ESA S18 (2)(c) - Can be done by Competent Person - ESA S25, ESR S57 (b)(c)	- Person with electrical Switching Officers training (may not be an electrical worker) - Safety Observer – General required for work in authorised zone
<b>TEST TO PROVE DE-ENERGISED BEFORE COMENCING WORK</b> - no exposed live parts	- On Entity Works (integrity NOT altered) using electrical test instruments	- Competent person can do testing - ESA S25, ESR S57 (b)(c)	- Licensed electrical worker to do testing
	- On other than Entity Works – (integrity altered) using electrical test instruments	- This is electrical work - Licensed electrical worker to do testing - ESA S18 (1), ESR S59	- Licensed electrical worker to do testing
<b>TEST TO PROVE DE-ENERGISED BEFORE COMMENCING WORK – within authorised zone</b>	- On Entity Works (integrity NOT altered) using electrical test instruments	- Competent person can do testing. ESA S25, ESR S57 (b)(c) Must be Authorised Person - ESR S59 and must have Safety Observer- ESR S59	- Licensed electrical worker to do testing - Must be Authorised Person - Safety Observer – General required for work in authorised zone
	- On other than Entity Works – (integrity altered)	- This is electrical work - Licensed electrical worker to do testing ESA S18 (1), ESR S59 - Must be Authorised Person - ESR S59 - Must have Safety Observer - ESR S59	- Licensed electrical worker to do testing - Must be Authorised Person - Safety Observer – General required for work in authorised zone
<b>TESTING</b> (Commissioning / calibration testing, X&Y Protection) – not interfering with the integrity of the electrical equipment	- On Entity Works	- Competent person can perform the test. - ESA S25, ESR S57 (b)(c)	- Competent person can perform the commissioning and calibration tests. - If electrical work is done it must be done by a licensed electrical worker
	- On other than Entity Works	- Licensed electrical worker must perform the test - ESA S18 (1), ESR S59	- Licensed electrical worker must perform the test.

## CS ENERGY – ELECTRICAL SAFETY GUIDELINE – PERFORMING WORK

Task Description	Activity	Legislative Requirement	CSE Position
<p>LOW VOLTAGE</p> <p><b>WORKING WITHIN AUTHORISED ZONE</b></p>	<ul style="list-style-type: none"> <li>- Electrical work, fault finding, near overhead power lines or within switchboards.</li> </ul>	<ul style="list-style-type: none"> <li>- This is electrical work.</li> <li>- Licensed electrical worker to perform work - ESR S30 (1)</li> <li>- Must be Authorised Person</li> <li>- Must have Safety Observer</li> <li>- ESA Schedule 2, S18 (1), ESR S61 (8) (b)</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker to perform work</li> <li>- Must be Authorised Person</li> <li>- Safety Observer- General required for work in authorised zone</li> <li>- Safety Observer - Electrical with licensed electrical worker skills required for live electrical work</li> </ul>
	<ul style="list-style-type: none"> <li>- Non electrical work working near overhead power lines or within switchboards</li> </ul>	<ul style="list-style-type: none"> <li>- This is NOT electrical work</li> <li>- Must be Authorised Person - ESR S59</li> <li>- Must have Safety Observer - ESA Schedule 2, ESR S61 (8) (b)</li> </ul>	<ul style="list-style-type: none"> <li>- Person doing the work must be an Authorised Person</li> <li>- Safety Observer – General required for work in authorised zone</li> <li>- Requirement to do work de-energised where reasonably practical</li> </ul>
	<ul style="list-style-type: none"> <li>- PPE required for flash over and burn protection</li> </ul>	<ul style="list-style-type: none"> <li>- Flame retardant clothing ESR S12 (2), S61 (6) &amp; (8), S64 (2) (b), AS 4836</li> </ul>	<ul style="list-style-type: none"> <li>- Flame retardant clothing</li> <li>- Proban coveralls</li> </ul>
<p>HIGH VOLTAGE (TESTING)</p> <p><b>WORKING WITHIN AUTHORISED ZONE</b></p> <p><i>(High voltage insulation testing, phasing out, DLA testing)</i></p>	<ul style="list-style-type: none"> <li>- “Working live” to do fault finding, equipment testing</li> </ul>	<ul style="list-style-type: none"> <li>- This is electrical work.</li> <li>- Licensed electrical worker to perform work - ESR S30 (1)</li> <li>- Must be Authorised Person - ESR S59</li> <li>- Must have Safety Observer - ESA Schedule 2, S18 (1), ESR S61 (8) (b)</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker to perform work – HVIA trained</li> <li>- Must be Authorised Person</li> <li>- Must have Safety Observer - Electrical with licensed electrical worker skills required for live electrical work</li> <li>- Must have HVIA trained Safety Observer – Electrical for all work in switchyards</li> <li>- Requirement to do work de-energised where reasonably practical– risk assessment required to prove why it is not possible</li> </ul>
<p>EXTRA LOW VOLTAGE</p> <p><b>WORK ON EXTRA LOW VOLTAGE</b></p>	<ul style="list-style-type: none"> <li>- “Working live” to do fault finding, equipment testing &lt; 50V AC or 120V DC</li> </ul>	<ul style="list-style-type: none"> <li>- This is NOT electrical work as it is defined as extra low voltage.</li> <li>- ESA Schedule 2, S18 (1)</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker can do the work</li> <li>- Electrical engineers or technical officers can perform work if they are considered “competent” by CSE</li> </ul>

Task Description	Activity	Legislative Requirement	CSE Position
<p>LOW VOLTAGE</p> <p><b>WORKING LIVE</b></p>	<ul style="list-style-type: none"> <li>- “Working live” to do fault finding, equipment testing</li> </ul>	<ul style="list-style-type: none"> <li>- This is electrical work.</li> <li>- Licensed electrical worker to perform work - ESR S30 (1)</li> <li>- Must have Safety Observer, ESA Schedule 2, S18 (1), ESR S61 (8) (b)</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker to perform work</li> <li>- Must be Authorised Person</li> <li>- Safety Observer – Electrical required for work in authorised zone</li> </ul>
<p>HIGH AND LOW VOLTAGE</p> <p><b>DOING ELECTRICAL WORK</b></p>	<ul style="list-style-type: none"> <li>- Electrical work – maintenance, repairs, electrical work for isolations, testing for de-energised</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker to perform work – ESA S18 (1), ESR S30 (1)</li> <li>- Can be Restricted electrical worker – ESR S30 (2)</li> <li>- Requirement to do work de-energised where reasonably practical – risk assessment required to prove why it is not possible</li> <li>- Test for de-energised before work commences</li> </ul>	<ul style="list-style-type: none"> <li>- Licensed electrical worker to do work on low voltage or in areas where there are no exposed parts</li> <li>- Licensed electrical worker with HVIA training to do work on high voltage</li> <li>- Safety Observer – General required for work in authorised zone (low voltage)</li> <li>- Safety Observer – Electrical required for work in authorised zone (high voltage)</li> </ul>
<p><b>DOING RESTRICTED ELECTRICAL WORK</b></p> <p><b>- Entity Works</b></p>	<ul style="list-style-type: none"> <li>- Electrical work – maintenance, repairs, electrical work for isolations, testing for de-energised in accordance with the license.</li> </ul>	<ul style="list-style-type: none"> <li>- Can be Restricted electrical worker for work &lt;1000V AC</li> <li>- ESR S30 (1)</li> </ul>	<ul style="list-style-type: none"> <li>- Restricted electrical worker to do electrical work in accordance with the license.</li> <li>- CSE will arrange isolations, test for de-energised and apply the portable earths if necessary.</li> </ul>