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## Objective

To outline basic techniques and safety precautions for fault finding on low voltage electrical equipment.

## Scope

This procedure applies to electrical fault finding practices undertaken as part of maintenance tasks performed on low voltage circuits across all SCL operated and/or maintained sites. If the work involves altering the integrity of the equipment then it is not covered by this procedure. If the integrity of the equipment is to be altered, then a plant isolation permit or a live electrical maintenance work control guide under the guidance of a plant access permit will be required.

## Functional Flowchart

## Definitions

**Authorised Electrical Person:** A person who has the technical knowledge and experience to do work that involves contact with or being near to the electrical part and has been approved by the person in control of the electrical part to do work that involves contact with or being near to the electrical part.

**Competent:** Means having acquired the knowledge and skills enabling that person to perform the task required, in a safe and effective manner.

**Flame Retardant Clothing:** Means clothing that has properties, which suppress or delay the combustion or propagation of flame.

**High Current Plant:** High current plant is any electrical plant or equipment where the prospective fault current is 1000 Amperes or greater.

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- + + **Extra Low Voltage:** Means voltage of 50V or less AC RMS, or 120V or less ripple-free DC “(QLD Electrical Act 2002 Schedule 2)”.

- + **Low Voltage:** Voltage exceeding 50 volts AC or 120 volts ripple-free DC but not exceeding 1000 volts AC or 1500 volts ripple-free DC.

- + **Person In Control:** The person who is in control of the electrical equipment at a particular location. For SCL this is the Site manager.

**PPE:** Personal protective equipment

**PPE Zone:** The area totalling 500mm in any direction from live Exposed parts within which an authorised person has approval to perform work using PPE control measures.

**Safety Observer – Electrical:** A person who has been trained and authorised to perform the duties of a Safety Observer – Electrical.

**Standard Test FINGER:** A device used to determine minimum clearances around electrical parts as per the dimensions set out in the IEC Standard 61010.

## Responsibilities

OH&S Systems Manager will:

- Maintain the currency and accuracy of the Electrical Safety Corporate Standard reflective of legislative and corporate change

Station/Site Manager will:

- Monitor the implementation of the Electrical Safety Corporate Standard.
- Allocate responsibilities and resources to ensure site-specific practices/procedures are developed to satisfy the Corporate Standard.

Employee will:

- Comply at all times with the requirements specified within this Corporate Standard for Electrical Safety.
- Comply with any site-specific procedures.

## Actions

### 1. Safety Precautions

In the interests of electrical safety, fault finding when possible must be undertaken on de-energised plant rather than energised plant. If this is not possible however, implementation of additional hazard controls will be necessary before commencing work.

#### 1.1 General

- (i) Only authorised electrical persons are to perform faultfinding tasks on plant.
- (ii) Only approved test instruments that have current test and calibration status are to be used.

Note: Refer to PRO-SCL-H&S-1925 - Testing to Prove De-energised for specific information regarding the maintenance and safe use of test instruments.

- (iii) Only insulated hand tools may be used.
- (iv) Whilst fault finding, care is to be taken not to do any of the following:
  - Leave bridges connected to safety or control interlocks
  - Inadvertently initiate equipment operation that may or will impact on the safety of the work party or others
  - Inadvertently energise equipment that may or will impact on the safety of the work party or others
  - Force contactors or interlocks
  - Force software interlocks.

### 1.2 Additional Requirements for Fault Finding on Energised Plant

- (i) Current plant drawings must be used to identify isolation points in the event of an emergency.
- (ii) Only authorised electrical persons are to perform faultfinding tasks on live plant.
- (iii) A Safety Observer - Electrical must be present and observing the work for the entire duration of the job.
- (iv) A low voltage rescue kit must be located within the immediate vicinity of the activity.
- (v) Prior to the commencement of fault finding on energised plant, the worker is to remove all jewellery and metal objects that are in contact with the skin.
- (vi) The use of insulating mats for working on conductive surfaces must be considered and implemented as deemed necessary.
- (vii) The use of insulating barriers or covers over live parts if there is potential to contact them during the fault finding process is to be considered and implemented as deemed necessary.
- (viii) Assess equipment to be accessed to determine if there are any live exposed parts. Exposed parts are any terminal, connection, conductor or electrical part that can be contacted with a standard test finger. If it is determined that there are no exposed parts, testing on energised parts can be performed with the use of an approved meter using insulating gloves only.
- (ix) If the equipment to be worked on has live exposed parts, then apart from the minimal site-specific PPE, the following PPE requirements apply.
  - For low voltage:
    - If the person performing the testing has any part of their body within the PPE zone of an energised exposed part, they are to wear the following PPE:
      - Insulating gloves rated to the highest expected voltage applicable for the task
      - Face shield
      - Flame retardant clothing covering the full body, arms and legs.
  - **For high fault current extra low voltage plant:**
    - The worker and **safety observer** are to wear
      - **Flame retardant clothing** covering the full body, arms and legs
      - Face shield

## 2. Generic Process For Fault Finding On Or Near Live Conductors

### 2.1 Before starting and during work:

- Safety barriers/signs are to be placed to prevent other persons entering the vicinity of exposed live parts or exposed conductive parts that could become live during testing;
- Consultation with respect to the job scope and activities is to be undertaken with co-workers who are assisting in the fault finding process;
- Identify all isolation points for the work being undertaken in the event of an emergency;

## Fault Finding on Low Voltage Electrical Equipment

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          - A Safety Observer – Electrical is to be present and observing the work for the entire duration of the job.
          - Identify exposed conductive parts that could become live whilst using test instruments.
          - Use isolation barriers to isolate all workers from contact with exposed conductive parts that could become live during testing.
          - Conduct periodic reviews of the situation to ensure no new hazards are created during the process.
  - 2.2 Ensure that test equipment selected is appropriate for the task and has been set to the correct operating range.
  - 2.3 If leaving the worksite before completion of the job, ensure the following occurs so that the work area or plant cannot become a hazard for others:
    - All live conductors have been insulated to prevent contact with other equipment or persons.
    - Relevant persons have been informed about the status of the work.
    - Precautions have been taken to prevent equipment becoming energised.
    - The worksite has been left in a safe state to allow access by others.
  - 2.4 When the faultfinding work is completed, circuits and equipment is to be restored to their original state or if changes have been made are to be approved by an RPE Electrical. For example, covers replaced and accessories and equipment properly secured.
3. Common Hazards
- 3.1 When fault finding, it is extremely important to identify all sources of electricity supply as well as other hazards likely to be encountered during the fault-finding task. The following list of examples is also to be considered during the identification process:
- Voltages between phases
  - Voltages between phases and earth
  - Voltages across undischarged capacitors
  - Voltages on disconnected conductors – particularly neutral conductors
  - Multiple supply sources
  - Voltages between live exposed conductors and the surrounding environment including metalwork, damp situations, other conductive surfaces and persons nearby
  - Electrical testing or operating equipment with open enclosures in hazardous areas
  - Lower voltages – for example **extra low voltage** may be hazardous in a cramped situation with dampness, heat or water on the floor, especially when the worker is lying on the floor
  - In installations or systems where MEN (Multiple earthed neutral) system is used, the rise in the earth potential in an installation due to a high impedance return path to the distribution neutral
  - Damp conditions
  - De-energised circuits becoming re-energised
  - Induced voltages
  - Installations or systems where unauthorised/undocumented modifications have been made
  - Deterioration of the insulation covering a conductor.

## Communication Plan

At a minimum, this procedure and any subsequent updates are communicated via email to the entire corporation. Additional communication may be coordinated by the procedure owner to relevant staff.

This procedure is available electronically in Hummingbird.

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### ++ Review

- + This procedure will be reviewed every two years.

### + Links and References

- + QLD Electrical Safety Regulations 2002
- + VIC Code of Practice – Safe Electrical Work 1997
- + WA Electricity (Licensing) Regulations 1991
- + SA Electricity (General) Regulations 1997
- + NSW Electricity Safety (Electrical Installations) Regulation 1998
- + TAS Electricity Industry Safety and Administration Regulations 1999
- + NT Electricity Reform Act 2000
- + ACT Electricity Safety Act 1971
- + AS/NZS 3000:2000 Wiring Rules
- + AS/NZS 4836:2001 Safe working on low voltage electrical installations

[HB# 560793: Electrical Testing to Prove De-energised Requirements](#)

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