Engineering System Integrity
Electrical Network Safety Rules

Engineering Procedure
Electrical Distribution Unit

Electrical Distribution Network Management

PR D 78401

Isolation and Energisation of Low Voltage Equipment

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Transport Sydney Trains

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Document control

Version	Date	Author/ Prin. Eng.	Summary of change
1.0	28 July 2015	Chris Leung	First issue as a Sydney Trains document, rebranded from previous RailCorp SMS-06-EN-0574 V1.2
1.1	3 July 2018	Chris Leung	3 Yearly Review
1.2	19 February 2019	Nick Loveday	Updated PR D 78401 "Approved by" to Associate Director Electrical Distribution Unit
1.3	1 February 2022	ENSR Project Team	Reviewed as part of the ENSR Project.

Summary of changes from previous version

Summary of change	Section
Minor grammatical updates	All
Updated reference documents	All

Table of Contents

1 Purpose and scope

This procedure describes the procedures applicable to the isolation and energisation of Transport Asset Holding Entity of New South Wales (TAHE) Low Voltage (LV) Distribution Equipment.

This procedure sets down the precautions that shall be taken by all persons intending to carry out any work near or on/within LV equipment and the procedures required to make the LV equipment safe for work.

This procedure should be read conjunction with procedures:

- *RL D 79802 Electrical Distribution Network Management*
- *PR D 78102 Electrical Hazards and Warnings*
- *PR D 78108 Pre-Work Hazard Assessment for Work on Power Poles with Live Exposed Equipment*.

Work on LV electrical installations is outside the scope of this procedure, and is covered by *D2013/80873 Work on Low Voltage Installations*.

NOTE

In the case of work on LV, the requirements of any local system for isolation and lockout shall be understood, and any conflicts with this procedure resolved prior to work proceeding.

2 Definitions

Refer to the **Electrical Safety Definitions** page available on the **RailSafe** site.

3 General

All work near or on/within exposed LV equipment shall be carried out in accordance with *PR D 78700 Working around Electrical Equipment*.

When supply is to be removed for work near or on/within LV equipment, the equipment shall be isolated, proved dead and where required a Low Voltage Access Permit (refer to *PR D 78503 Low Voltage Access Permits*) issued, before any work commences.

Where another Network Operator's services have to be isolated for the work, an Operating Agreement shall be received from the Network Operator concerned, for the work near its services.

Prior to removing supply, the appropriately Authorised Person (refer to *PR D 78701 Personnel Certifications – Electrical*) carrying out the switching to remove supply shall ensure that all affected parties have been advised of the commencement and duration times of the proposed interruption to supply.

All communication with ICON Electrical shall be carried out in accordance with *NGE 204 Network Operations* and *NPR 721 Spoken and written communication*.

WARNING

Signalling supplies shall not be interrupted or restored without the prior knowledge and agreement of ICON Electrical.

4 Isolation of Low Voltage Equipment

4.1 General

Low voltage equipment shall be isolated from **all** sources of supply by providing at least one break in each active conductor through which the equipment could be made live from these sources.

Breaks shall be provided by:

- Opening a circuit breaker, or
- Removing fuses, or
- Opening isolating switches, or
- Disconnecting conductors.

Devices operating in a control circuit, such as an emergency stop or limit switch, are not to be used as the sole means of providing isolation.

The devices providing isolating breaks shall be DANGER Tagged as described in *PR D 78104 Securing Systems for Electrical Equipment* and where practicable locked open.

When an isolating device can also be operated by remote control, the remote control shall be rendered inoperative, and the means of ensuring that it remains inoperative DANGER Tagged.

WARNING

An isolating device with a DANGER Tag attached shall not be operated.

Isolation of an installation or apparatus shall not to be achieved by a remote control device alone.

4.2 Isolation by the Operation of High Voltage Switches

High voltage (HV) equipment shall be operated in accordance with *PR D 78201 Removal and Restoration of High Voltage Supply*.

When the isolation of LV equipment is achieved by the operation of a switch on the HV side of a transformer, and the LV neutral of the transformer will not be disconnected from earth, HV earths and a Substation Access Permit are not required. (Refer to *PR D 78500 Electrical Permits*).

High voltage earths and a Substation Access Permit are not required for an unearthed LV system with an earthed screen within the transformer.

If the LV neutral is to be disconnected from earth, earths are to be placed on the high voltage side, and a Substation Access Permit shall be issued to ensure that the earths are not removed until work is completed.

4.3 Isolation by the Breaking of Connections

When isolation of LV equipment is achieved by the breaking of connections, the active conductors shall be disconnected first, followed by the neutral conductor and the earth conductor last. Disconnected conductors are to be secured in a position which will prevent possible contact with any live terminals or apparatus.

The reverse of this disconnection procedure shall be followed for reconnection on restoration of supply.

4.4 Isolation of Back Feeds or Alternative Feeding

Where isolation has been effected by the opening of HV or LV switches, it is essential to check the possibility of back feed or feeding from other energy sources such as back-up power supplies, Uninterruptible Power Supplies (UPS), solar grid inverters and capacitors. Where the circuit configuration warrants, the possibility of induced voltages being present shall also be considered.

WARNING

Pay special attention to illumination control circuits, changeover contactors and transfer switches, etc. Ensure that these are isolated, if necessary.

5 Securing of the Isolation Points

5.1 Additional LV specific requirements

When a Low Voltage Access Permit has not been issued:

i. The DANGER Tag shall only be removed by the person who attached it, or

ii. The DANGER Tag shall only be removed by an Authorised Person who has completed the LV switching operations competency standard unit (CSU) (refer to PR D 78701) who shall ensure that it is safe to do so, or

iii. When the DANGER Tag is not removed by the person who attached it, the authority to remove it shall first be obtained from one of the following persons:

- the person who affixed the DANGER Tag, or
- the recognised relief of the person who affixed the DANGER Tag, or
- the Controlling Officer of the person who affixed the DANGER Tag.

Refer to PR D 78104 Section 4 DANGER Tags and Special Locks for further information on DANGER tags.

6 Proving Dead of Low Voltage Equipment

Low voltage equipment that has been isolated electrically shall be proved dead by a voltage-testing device to confirm that the equipment is dead. Such a device could be:

- contact type voltage tester, or
- a non-contact LV voltage detector as per *PR D 78402 Work on the Low Voltage Distribution System* Section 5 Live Work.

WARNING

The use of testers that detect an electric field surrounding an energised conductor are not suitable for cables that are surrounded by a metallic screen, cables carrying direct current and in similar circumstances.
(AS/NZS 4836 clause 3.2.5)

Before the proving dead of a LV aerial line, any oxide coating shall first be removed from the point at which the test equipment is to be applied. During this process the LV aerial line must be assumed live, accordingly live low voltage work methods utilising, as a minimum, insulated tools, gloves and protective eye protection shall be used while removing any coating and proving dead.

WARNING

Each exposed part shall be treated as energised until it is isolated and determined not to be energised.

"All electrical conductors and parts, including neutral and earthing conductors, shall be treated as energised until proven de-energised.

*** TEST BEFORE YOU TOUCH *"**

"Any voltage tests used to prove de-energisation shall be conducted in the following sequence:

i. Test the voltage tester on a known voltage source for correct operation.
ii. Test between all conductors and a known earth.
iii. Test between all conductors.
iv. Retest the voltage tester on a known voltage source for correct operation."

(AS/NZS 4836 clause 3.2.5)

7 Energising Low Voltage Equipment

Before LV equipment is energised, the appropriately Authorised Person carrying out the switching shall:

a. Ensure that the equipment is inspected, tested if required and is safe to be energised, (when an Electrical Permit is issued, the Authorised Person cancelling the Electrical Permit is responsible for this).

   If connections have been disturbed then tests shall include:

   - Insulation resistance, and
   - Phase rotation (where applicable), and
   - Voltage check (where applicable), and
   - Correct connection and continuity of the neutral.

b. Ensure that the relevant Electrical Permits, if issued, have been cancelled.

c. Where applicable advise other Network Operators:

   - that their Operating Agreement(s) have been signed off
   - that their supply may be restored as far as Sydney Trains is concerned, and
   - when the Operating Agreement(s) is associated with a Working High Voltage Instruction (WHVI) inform ICON Electrical that the Operating Agreement has been signed off.

d. Check that there are no DANGER Tags attached to the switches to be operated.

e. When appropriate, notify the affected parties that supply is about to be restored.

8 Reference documents

AS/NZS 4836 Safe working on or near low-voltage electrical installations and equipment

D2013/80873 Work on Low Voltage Installations

NGE 204 Network Operations

NPR 721 Spoken and written communication

PR D 78102 Electrical Hazards and Warnings

PR D 78104 Securing Systems for Electrical Equipment

PR D 78108 Pre-Work Hazard Assessment for Work on Power Poles with Live Exposed Equipment

PR D 78201 Removal and Restoration of High Voltage Supply

PR D 78500 Electrical Permits

PR D 78503 Low Voltage Access Permits

PR D 78700 Working around Electrical Equipment

PR D 78701 Personnel Certifications – Electrical

RL D 79802 Network Management