Engineering Procedure
Electrical Distribution Unit

PR D 78403

Work on Live Low Voltage Equipment

Version 1.1

Date in Force: 20 February 2019

Procedure

Transport Sydney Trains

NSW GOVERNMENT

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Version	Date	Author/ Prin. Eng.	Summary of change
1.0	18 May 2016	Chris Leung	First issue as a Sydney Trains document, rebranded from previous RailCorp SMS-06-EN-0590 V1.2
1.1	20 February 2019	Nick Loveday	Updated PR D 78403 "Approved by" to Associate Director Electrical Distribution Unit

Summary of changes from previous version

Summary of change	Section

Table of Contents

1. Purpose and scope

This document describes the procedures to be followed whilst carrying out work on live low voltage (LV) equipment, including LV electrical installations. The scope of this document includes climbing through exposed LV aerial mains to work above.

2. Legislation

2.1. Electrical Installation

An electrical installation is specifically defined in Part 1 Clause 3 of the Electrical (Consumer Safety) Act 2004 (see Appendix B of this document). Within the rail electrical system, a low voltage electrical installation is any fixed low voltage wiring and equipment used for the conveyance, control, and use of electricity within a particular location. The 1500VDC rail traction system, rail signalling system, and high voltage installations are not classed as electrical installations.

2.2. Workplace Health and Safety

The Work Health and Safety Act 2011 (NSW) and Work Health and Safety Regulation 2011 (NSW) place specific risk control obligations upon owners and controllers of premises, properties, and establishments concerning the practice of working on or near energised electrical installations. In particular, where such owners / controllers engage the services of electrical workers, then it cannot be expected or required that the electrical worker(s) carry out work on installations that are energised. The owner / controller shall either ensure that the work can be carried out following the de-energisation of the installation, or, where it is necessary in the interests of health and safety (e.g., life-saving equipment) that the electrical work is carried out while the installation is energised, a full risk assessment is carried out by a person(s) appropriately qualified to do so.

Further guidance on the workplace health and safety obligations for work on energised installations is provided in Clauses 147 to 161 of the Work Health and Safety Regulation 2011 (NSW) (refer Appendix C of this document).

2.3. Work on Live LV Equipment (including Installations)

As defined in the Electricity Supply Act 1995 (NSW), Sydney Trains is a network operator (i.e. an electricity distributor / supply authority). Division 4 of the Workplace Health and Safety Regulation 2011 (NSW) describes the requirements for carrying out work on energised electrical equipment. Clause 152 of this Regulation outlines that Division 4 is not applicable to a supply authority working on equipment controlled or operated by the authority to generate, transform, transmit or supply electricity. Therefore live work on Sydney Trains' LV electrical equipment for the distribution of electricity is allowed provided that the associated hazards are identified and controlled to ensure that it is safe to do so.

Work on live LV installations is permitted, subject to compliance with Clause 157 of the Work Health and Safety Regulation 2011, as described in section 2.2 above. More details on this aspect are addressed in section 7 of this document.

3. Work that shall not be carried out live

Supply shall be removed before work is to be performed which involves:

(a) The connection between the main neutral and the earthing system being removed, or,

(b) A neutral conductor, which is carrying load current, becoming discontinuous.

If work involves the earth conductor becoming discontinuous, for a portion of the installation, supply shall be removed from that portion of the installation.

4. Hazards relating to live work

Persons working on or near energised exposed LV electrical equipment or installations should be aware that a fault current may be many times the rated current for short times during fault conditions. If a fault current occurs, severe burns and flash burns to the face, eyes or other parts of the body are likely.

When performing work on or near exposed energised LV equipment or an installation there is a risk of injury from:

- electric shock
- burns from radiant energy
- burns from hot gas / plasma
- burns and other injuries from air pressure wave / blast

When work is carried out live, care shall be taken to prevent:

(a) inadvertent contact with live parts, and

(b) short circuits and other arcing faults.

5. Hazard controls for work on or near exposed energised LV equipment, including installations

Work under isolated condition is always the first option to be considered. Work on live LV equipment or installation should only be considered if it is necessary to do so in the interests of safety and the risk of harm would be greater if the circuits and apparatus were de-energised before work.

5.1. Planning

Before commencing work on exposed energised LV conductors, a written assessment of the associated risks shall be made in consultation with the persons proposing to do the work.

The work has been approved by the relevant electrical discipline manager (TSS Level 1 Manager or above).

The work is carried out in accordance with a Safe Work Method Statement for the work. Generally the Safe Work Method Statement should stipulate not less than two layers of control against each hazard identified. For example:

(a) contact with live parts – insulated tools (1st level of control) and insulating gloves (2nd level of control);

(b) flash – temporary shrouds over earthed metal (1st level of control), and flash resistant clothing and eye/face protection (2nd level of control).

5.2. Personnel and competence

The persons doing the work shall be appropriately qualified, trained and instructed in safe working practices for the particular task, including the proper use of test equipment, tools, accessories and personal protective equipment.

The only exception to this is a person undergoing training who may be permitted to undertake work on live LV electrical equipment provided that person has been assessed to be competent to perform similar work under dead conditions.

The person doing the work is under the direct/constant supervision of another person who is competent in:

(a) The particular task being undertaken; and

(b) Releasing a person from live LV electrical equipment; and

(c) Cardio-pulmonary resuscitation (CPR).

5.3. Tools, equipment and personal protective equipment

Appropriate test equipment, tools and accessories, provided to the persons doing the work, shall be properly used, well maintained, and shall be inspected or checked to be in sound serviceable conditions prior to use.

Appropriate clothing and personal protective equipment (PPE) shall be properly worn and used by the persons doing the work. The appropriate Sydney Trains issued PPE shall be used unless the risk assessment indicates otherwise. Refer to Section 11 and 15 of *PR D 78101 General Requirements for Electrical Work* for the minimum protective clothing requirements and D2013/80874 PPE for Electrical work.

Appropriate PPE may include but is not limited to:

(a) Flame-retardant/flash resistant clothing including long trousers, and a long sleeve shirt buttoned close to the neck and at the wrist.

(b) Insulating gloves (compliant and used in accordance with AS 2225 Insulating gloves for electrical purposes).

(c) Over-gloves to protect the insulating gloves from cuts abrasions and heat.

(d) Suitable footwear.

(e) Eye and face protection.

Portable ladders with metal or metal reinforced stiles shall not be used for work on or near live LV equipment or installations.

5.4. Preparation for incident response

The LV Rescue Kit shall be available and ready for immediate use at the work sites as described in *D2013/80870 Rescue from Live Low Voltage (Including Rescue Kit Care*).

The isolation point of the relevant electrical supply has been clearly identified and is able to be reached and operated quickly without any need to negotiate or remove obstacles.

5.5. Organisation of work area

The work area shall be clear of obstructions to enable an unhindered entry and exit. Unauthorised persons shall be prevented from entering the work area by the use of signage, barriers, or both. All work on energised conductors shall be done from ground level or a stable work platform approved for that use.

5.6. Work methods

Precautions shall be taken, or procedures put in place, to prevent the possibility of simultaneous contact with conductors at different voltages. Connections should be neither made nor broken under load.

6. Working on live Low Voltage (LV) aerial lines

In addition to the preceding sections, the following sections apply to work on aerial lines which form part of a:

(a) LV distribution system; or

(b) LV installation.

6.1. Personnel

All work on LV aerial lines shall be carried out by an Authorised Overhead Traction Worker or a Qualified Electrician who is also an Authorised Overhead Worker. (Refer *PR D 78701 Personnel Certifications – Electrical*) In addition, the person doing the work is attended by another person who shall also be competent in rescuing a person from a pole, structure or elevating work platform. In the case of live work, a safety observer who is competent to perform the live work, and in releasing a person from live LV electrical apparatus, shall be present.

6.2. Preparation

Prior to work commencing, a Hazard Assessment shall be carried out in accordance with procedure *PR D 78108 Pre-Work Hazard Assessment for Work on Power Poles with Live Exposed Equipment*.

When work is carried out aloft on live LV equipment using a ladder or elevating work platform, a rescue kit shall be placed open and ready for immediate use, at the base of each pole or structure. Prior to commencing work, a visual check of the kit shall be made to ensure that all items are present and that the rescue rope is clipped to the rescue strap. Check also that the rescue rope grab device is attached to the safety rope, if it is used for attached climbing.

All insulating covers, mats, etc. shall be thoroughly checked to be in good order prior to commencing work.

6.3. Conditions for work

A person shall not work on live LV exposed aerial lines unless:

(a) The conductors have been identified as LV, and

(b) The work is carried out in accordance with an approved live LV work procedure, and

(c) A clearance of 0.5m is maintained from any exposed LV conductor, except the one being worked on, and from any earthed metal, and

(d) Suitable insulating material (refer section 6.5 below), barriers or covers (refer section 6.6 below) are used to prevent inadvertent contact with other live exposed conductors or earth, and

(e) The work can be completed in accordance with section 6.4 below.

NOTE
With regard to telecommunications cables (Pay TV, telephone, etc.). The carrier wire, fittings and pole attachments are connected to the local distributor's LV neutral and are to be treated as an earthed neutral conductor. In some cases telecommunications carriers have used "king bolts" and the protruding end of the bolt is also to be treated as an earthed neutral.

6.4. Passing between conductors

A person is not permitted to pass between the conductors of live LV aerial lines at any point, where they are spaced less than 1.2m apart, unless the conductors are:

(a) Permanently insulated (refer section 6.5 below), or

(b) Temporarily covered with suitable insulating material (refer section 6.6).

The minimum distance for (a) and (b) above is of 1.0m in each direction from the point nearest to the person's body on each conductor.

6.5. Insulation

Care shall be taken to check that the insulation of permanently insulated conductors is in good condition and that there are no exposed connections on the conductor within the work area. In addition to the initial inspection, conducted as part of the Hazard Assessment, ongoing attention shall be given to this issue during the course of the work. Approved insulating covers and lengths of split insulating hose are provided to temporarily cover conductors. The work supervisor shall ensure that insulating covers are available, are in good condition and are used in the correct manner.

6.6. Application and removal of temporary covers on LV conductors.

The following procedure applies to the application, utilisation and removal of temporary covers (commonly known as 'tiger tails'):

(a) Prior to application, the temporary covers shall be inspected by an Authorised Person (Mains) (refer *PR D 78100 Definitions and Conventions for Electrical Safety*) to ensure the integrity of their insulation properties. If there is any doubt about the insulation properties, put aside for testing and use other temporary covers in good condition.

(b) The person applying or removing the temporary covers shall wear insulated gloves on both hands.

(c) Temporary covers shall be applied on one conductor at any time.

(d) Temporary covers are to be corrected immediately it is detected that the temporary cover has moved or been damaged.

(e) When used in conjunction with mobile plant, shall extend a minimum of five metres beyond the extremities of where the mobile plant will be operating.

(f) Care shall be exercised to ensure that no part of the body shall come within the minimum Safe Approach Distance of 0.5m from any conductor, except for hands wearing insulation gloves.

(g) On completion of the work, only one temporary cover shall be removed at any one time.

7. Working on live Low Voltage (LV) equipment or installations

Work may only be carried out live when the work can be performed safely and either:

(a) It is necessary to leave supply on to facilitate testing or fault finding, or

(b) The removal of supply will cause other safety risks.

Where authorised electrical workers are working live on a LV installation, the requirements of *D2013/80873 Work on Low Voltage Installations* and the WorkCover NSW Code of Practice for Low Voltage Electrical Work shall be followed.

Work can only be carried out on LV equipment/installation under live conditions by persons trained and authorised to work live as per *PR D 78701 Personnel Certifications – Electrical* with hazard controls as per *Clause 5. Hazard controls for work on or near exposed energised LV equipment, including installations* in this document.

8. References

AS/NZS 3000:2007 Australian/New Zealand Standard – Electrical installations (known as the Australian/New Zealand Wiring Rules)

Australian/New Zealand Standard AS/NZ 4836:2001 Safe Working on Low Voltage Electrical Installations

Energy Network Association NENS 09 document - “National Guidelines for the Selection, Use and Maintenance of Personal Protective Equipment for Electrical Hazards”.

NSW Electricity (Consumer Safety) Act 2004 – definition of “electrical installation”

NSW Industry Safety Steering Committee document ISSC14 Guide to electrical workers’ safety equipment

Work Health and Safety Regulation 2011 – Clause 157 “Electrical work on energised electrical equipment – when permitted”

PR D 78100 Definitions and Conventions for Electrical Safety

PR D 78101 General Requirements for Electrical Work

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

PR D 78401 Isolation and Energisation of Low Voltage Equipment

PR D 78402 Work on Low Voltage Distribution System

PR D 78108 FM 01 Pole Hazard Assessment

PR D 78700 Working around Electrical Equipment

D2013/80870 Rescue from Live Low Voltage (Including Rescue Kit Care)

D2013/80873 Work on Low Voltage Installations

D2013/80874 PPE for Electrical Work

PR D 78701 Personnel Certifications – Electrical

WorkCover Code of Practice ‘Work Near Overhead Power Lines’ issued in 2006

WorkCover Code of Practice ‘Low Voltage Electrical Work’ issued in 2007