

Engineering Procedure  
Electrical Distribution Unit

PR D 78101

# General Requirements for Electrical Work

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# Procedure

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## Document control

Version	Date	Author/ Prin. Eng.	Summary of change
1.0	16 May 2016	Wayne Halls	First issue as a Sydney Trains document, rebranded from previous RailCorp SMS-06-EN-0552 V1.0

## Summary of changes from previous version

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## 1. Purpose and scope

This procedure describes the statutory and general requirements and procedures for electrical work carried out by personnel engaged by Sydney Trains.

## 2. Statutory requirements

Work on or near electrical equipment, shall be carried out in accordance with the:

- Rail Safety National Law National regulation 2012
- NSW Electricity Supply Act 1995 and NSW Electricity Supply (Safety & Network Management) Regulation 2014,
- NSW Electricity (Consumer Safety) Act 2004 and NSW Electricity (Consumer Safety) Regulation 2015,
- NSW Work Health and Safety (WHS) Act 2011 and NSW Work Health and Safety Regulation 2011.

For a description of the process by which Sydney Trains complies with "electrical safety" legislation, refer to Appendix A.

The relevant instructions and associated documents identified in *PR D 78000 Electrical Network Safety Rules (ENSR)* are designed to assist personnel in discharging their obligations under the various legislations.

Sydney Trains electrical discipline employees and contractors who carry out rail safety work on electrical equipment owned or maintained by Sydney Trains shall:

- comply with the applicable requirements of the ENSR, and
- *SMS-06-GD-0268 Working around Electrical Equipment*, and
- be examined and certified in their knowledge of the ENSR, and applicable SMS documents, Safe Work Method Statements and Safe Work Instructions relevant to their Authorisation in accordance with the guide *PR D 78701 Personnel Certifications - Electrical*.

### 3. Special exception from working to the ENSR

The requirements for Sydney Trains acceptance of any procedure for electrical work that differs from those in the ENSR shall be submitted for review at least 20 days prior to the planned work and shall include;

- A document that describes why the requirements of the ENSR's cannot be met;
  - Describes the proposed deviations from the ENSR safety assurance documents
  - Provides analysis of the proposed work demonstrating that the risks are mitigated So Far As Is Reasonably Practical (SFAIRP).
  - Endorsed by the AEO undertaking the work and the TFNSW business unit manager responsible for the contracted AEO.
- Detailed Safe Work Method Statement or statements to carry out the work that provides and is equivalent to, or higher level of safety than the ENSR
- Endorsed in writing by the General Manager SEQR for the Maintenance Directorate
- Endorsed in writing by the Director SEQR for Sydney Trains.
- Approved by the Electrical Manager, Engineering and Safety Integrity (Sydney Trains)

### 4. Emergencies involving danger to human life

In the event of danger to human life, a person may take any appropriate action as necessary to prevent or mitigate this danger.



**Warning**

*The rescuer must be particularly careful to not become a casualty also; a dead or injured rescuer cannot rescue anyone!*

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**NOTE**

The "Guide for Emergency Services Access to the Rail Corridor" details:

- major hazards that could be encountered in the Rail Corridor,
  - procedures to be used before and whilst in the Rail Corridor, e.g. all personnel must be briefed on the dangers involved in entering the Rail Corridor.
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## 5. Reporting dangerous conditions and practices

When a person working on electrical equipment finds an abnormal condition that is unsafe, steps shall be taken to guard the equipment until made safe.

When a person observes a dangerous condition or work practice in connection with the work, the details shall be immediately reported to their supervisor and the Infrastructure Control Electrical (ICON) on phone (02) 9379 4911. The supervisor shall record the details and, in conjunction with ICON, take appropriate remedial action.

The photographs below display the dangerous condition of “stock piled earth” which breaches the required minimum Safe Approach Distance (SAD) and thus should be immediately reported to ICON.



## 6. Safety first

At all times and in all workplaces, workers have a duty to take reasonable care of their own health and safety while at work and also to take reasonable care so that their conduct does not adversely affect the health and safety of other persons at the workplace.

As most accidents result from lack of care by the worker injured or by some other person, workers are cautioned not to allow familiarity with the work to give rise to carelessness.

Workers must keep their mind focussed on the work, particularly when:

- operating electrical equipment,
- working on, near or in the vicinity of live equipment,
- working near cables, cable pits or cable chambers, or
- when working aloft.

If for any reason:

- an Authorised Person, or
- any person in the work party, or
- a Manager directly associated with the work who has currency of knowledge about the project, people, processes, tasks, hazards and work site conditions,

considers that the work cannot be done or completed in a safe manner, then the work shall not be commenced or the work shall stop as the case may be. Arrangements shall then be made for the work to be carried out in a safe manner.

## 7. Clothing and footwear

Refer to instruction *D2013/80874 PPE* for Electrical Work for appropriate clothing and footwear in general.

Additional protective clothing is needed, depending on the prospective fault level and the distances of the worker from the fault, as required by the Energy Network Association (ENA) NENS 09 National Guideline.

The wearing or carrying of personal metal effects such as chains, watch bands, bracelets, body piercing jewellery, exposed metal zips, rings, keys and tools may constitute a danger when working on or near live equipment. Unless the risk assessment identifies otherwise, such items shall be removed prior to any electrical work being performed on or near live electrical equipment.

Unless the risk assessment identifies otherwise, an occupational protective helmet shall be worn at all times within the boundary of all substations and section huts.



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### **NOTE**

*Where more than one layer of clothing is worn, at least one of the layers, preferably the external layer, shall comply with the minimum requirements identified in paragraph 2 above. (Refer *D2013/80874 PPE for Electrical Work*)*

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## 8. High-visibility clothing

Wearing of high-visibility clothing is mandatory when working within the railway corridor, and at those locations where it is necessary to draw the attention of vehicular and pedestrian traffic, eg when undertaking traffic management.

When working inside substation yards or buildings, including section huts, the wearing of high-visibility clothing is subject to the outcome of risk assessment, instead of being mandatory. In conducting a risk assessment, factors to be considered include but are not limited to the following:

- nature of work and the duration of stay,
- ambient conditions, particularly working at night and low light conditions,
- whether the substation (and section hut) has been declared as a construction site, with frequent vehicular traffic movement,
- number of people working and their nature of work, eg moving long objects, and
- whether access to the rail corridor is readily available, eg by opening a door inside the substation or section hut.

## 9. Personal Protective Equipment for operating work

In addition to the PPE requirements of sections 7 and 8, an occupational protective helmet shall be worn for operating work, unless remote operation or other control measures are applied to control the risk.

An occupational protective helmet shall be worn when carrying out the following switching operations and related work:

- opening or closing of circuit breakers or isolators of any type or voltage rating that are mounted aloft,
- operating of any fuse or link that is mounted aloft, and through the use of an insulated operating stick, or
- applying or removing earths from aerial lines, or
- applying or removing rail connections from 1500V DC Volt Overhead Wiring.

In addition, the effects of fault currents may be especially dangerous when undertaking switching operations (for any voltage) on equipment without full arc containment. Under such circumstances, safety eye protection shall be worn and appropriate face protection i.e. a full face arc shield, shall be considered prior to switching.

## 10. Pre-work briefings and supervision

### 10.1. Pre-work briefing

- Before starting any work around electrical equipment, all persons involved in the work shall:
- be instructed in the SWMS/SWI for the task being performed, as per *SMS-06-OP-3043 Managing Risks Using Safe Work Practices*, and
- participate in a pre-work brief covering the task to be performed.

Pre-work briefings for working around electrical equipment shall, as a minimum, include:

- all live parts being clearly pointed out to all workers,
- advice about the voltage and Safe Approach Distance (SAD) applicable to the work,
- a clear explanation of the reasons for the SAD,
- the controls to be used to make sure the SAD is not encroached,
- the duties of a Safety Observer and the method the observer will use to communicate with other workers, and
- the emergency procedures in place, including procedures in the event of contact with a live conductor.



#### **NOTE**

*Line Managers and persons in charge of the work process shall make sure that workers do not start work until they have received the required instruction and pre-work briefing. (Refer to SMS-06-OP-3114 06.20 Pre-work Briefings.)*

## 10.2. Supervision

Persons in charge of the work party shall make sure that:

- (a) the work process is adequately controlled so that all persons, equipment, plant tools or material do not come within the prescribed minimum SADs of exposed electrical equipment, and
- (b) persons carrying out the work are warned to **not** allow any part of their body, clothes, tools or material they are using or carrying to come within the prescribed minimum SADs of exposed electrical equipment, and
- (c) persons carrying out the work understand the work process controls that have been put in place, and that they must not pass over or under any work area or access markers, safety fences, demarcation tape or other special barriers placed in connection with the work, and
- (d) give directions that shall ensure the work will be carried out correctly and safely, and
- (e) where applicable, ensure all Electrical Permits have been issued, and
- (f) ensure that all persons understand and comply with their responsibilities associated with work conducted under an Electrical Permit, and
- (g) ensure that equipment is isolated and all necessary DANGER Tags are attached in appropriate places, and
- (h) where applicable, ensure that the conditions for issuing the Electrical Permit have not changed prior to each shift commencing, and
- (i) ensure that the work has been properly completed, any necessary inspections and /or tests have been completed satisfactorily and the associated Electrical Permit has been signed off, before returning the equipment to service, and
- (j) warn all persons being supervised and ensure that they stay clear of the SADs before and after the equipment is energised or re-energised.

## 10.3. Supervision of inexperienced workers

A person who is supervising any work shall have regard to the level of training and experience of those in their charge. Increased levels of supervision are required for:

- trainees and apprentices – refer to section 5 of *PR D 78701 Personnel Certifications - Electrical* document for more detailed requirements for supervisions of persons undergoing training,
- Qualified Workers new to their appointed position, and
- workers who have little or no experience with the particular equipment being repaired or worked on.

## 11. Work around electrical equipment

The requirements for work around electrical equipment are covered in the guide *SMS-06-GD-0268 Working around Electrical Equipment*.



### **Warning**

*Persons shall treat all electrical equipment as live, unless:*

- *they have signed onto an Electrical Permit for that equipment, or*
- *another provision of the Electrical Network Safety Rules applies.*

## 12. Working alone near electrical equipment

No person is permitted to work alone near exposed high voltage equipment, exposed 1500 volt equipment, live low voltage equipment in substations, or live low voltage aerial lines, except where there is immediate risk to human life or property.

Where a person is required to work near exposed high voltage equipment, exposed 1500 volt equipment, live low voltage equipment in substations, or live low voltage aerial lines, they shall be accompanied by an appropriate person. The accompanying person shall be competent:

- in the particular task being undertaken, and
- to release a person from live electrical equipment, and
- in cardio-pulmonary resuscitation (CPR), and
- to implement control measures in an emergency, and
- able to use communication equipment in case of an emergency, and
- be located near or in the vicinity of the worker in order to be able to provide assistance in a timely manner.

For the purpose of the Sydney Trains ENSR, the activities described in the guide *SMS-06-GD-0268 Working around Electrical Equipment*, section 8.4 are not considered as "work near electrical equipment" **provided** they do not bring the Operator within the relevant electrical SADs and as such can be completed alone.

## 13. Operation of high voltage and 1500 volt equipment

Only appropriately Authorised Persons, as stipulated in the guide *PR D 78701 Personnel Certifications – Electrical*, are permitted to operate high voltage and 1500 volt equipment. The Authorised Person shall ensure that approval is obtained from ICON prior to carrying out any such operation except when a life-threatening situation exists.

Authorised Persons shall also confer and agree on the switching sequence required prior to switching being carried out. They shall consider relevant ICON instructions, relevant Local Instructions, and the requirements of the ENSR such as not operating off-load switches under load.

All verbal directives involved in the operation of electrical equipment, shall be repeated back by all parties and recorded in writing or checked against an existing authorised document, per *PR D 78103 Electrical Operational Communications and Records*

Refer to procedure *PR D 78105 DANGER Tags for Electrical Equipment* for the requirements and correct procedure for using DANGER Tags.

Special instructions apply, for 1500 volt switching operations, at Electric Vehicle Maintenance Centres and other specified locations.

## 14. Entry to substations

Persons shall not enter a substation unless they are:

- Authorised for Entry, or
- an Authorised Person (Substations), or
- accompanied and supervised by an Authorised Person (Substations) who will be responsible for their safety (see Note), or
- An Authorised Traction Operator (entry only into the 1500V link area or 1500V switch area), or
- An Authorised Officer (Mains) who is authorised to operate 1500V switches (entry only into the 1500V link area or 1500V switch area)



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### NOTE

*A reference to being Authorised for an electrical function is a reference to being certified for that function as stipulated under the respective parts of section 9 of PR D 78701 Personnel Certifications – Electrical Authorisations.*

*The Authorised Person (Substations) shall not admit more unauthorised persons than can be adequately supervised, having due regard to the persons being admitted and the hazards present.*

*Even though an Authorised Attendant is an Authorised Person (Substations), only those specifically authorised in writing may supervise others inside substations.*

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## 15. Entrances and exits NOT to be obstructed

Except for brief periods of inspection, the entry and exit to a substation, cable chamber, cable tunnel, an electrically safe work area or confined space shall not be obstructed.

## 16. Precautions when leaving work unfinished

All workers have a responsibility to ensure that the work they are performing does not present a health and safety risk to others at the workplace. This also means leaving the workplace in a safe state for access by others.

Means of making the workplace safe should include the following:

- ensuring that live parts are properly enclosed, exposed conductors terminated and, where necessary, provided with mechanical protection,
- physically securing cables,
- tagging and taping-off cables,
- where appropriate, informing relevant parties that the work is not complete,
- taking any necessary precaution to ensure that equipment associated with the work cannot become energised, and
- ensuring that switchboards are clearly and correctly labelled in relation to their status,

ICON and the Territory Electrical Engineer shall be informed when any work is unfinished and the work party is to leave the workplace.

## **17. Precautions to be undertaken when lightning is imminent**

Refer to Appendix B for the appropriate precautions to be undertaken when working outdoors and lightning is imminent.

If it is essential to work on the OHW at a time when there is an increased risk due to lightning, all conductors and metallic parts at the worksite shall be bonded together. Under such circumstances, if working on the OHW at a:

- structure, the OHW shall be connected to rail and to that structure, or
- mid track insulator, both sides of the mid track insulator shall be bonded together and connected to rail.

## 18. References

ENA NENS 09 – 2014 National Guidelines for the Selection, Use and Maintenance of Personal Protective Equipment for Electrical Arc Hazards'

Guide for Emergency Services Access to the Rail Corridor

NSW Electricity Industry Safety Steering Committee ISSC14 'Guide to Electrical Workers' Safety Equipment' (October 2010)

PR D 78000 Electrical Network Safety Rules

PR D 78102 Electrical Hazards and Warnings

PR D 78105 DANGER Tags for Electrical Equipment

SMS-06-GD-0268 Working around Electrical Equipment

SMS-06-OP-3043 Managing Risks Using Safe Work Practices

SMS-06-SW-0538 PPE for Electrical Work

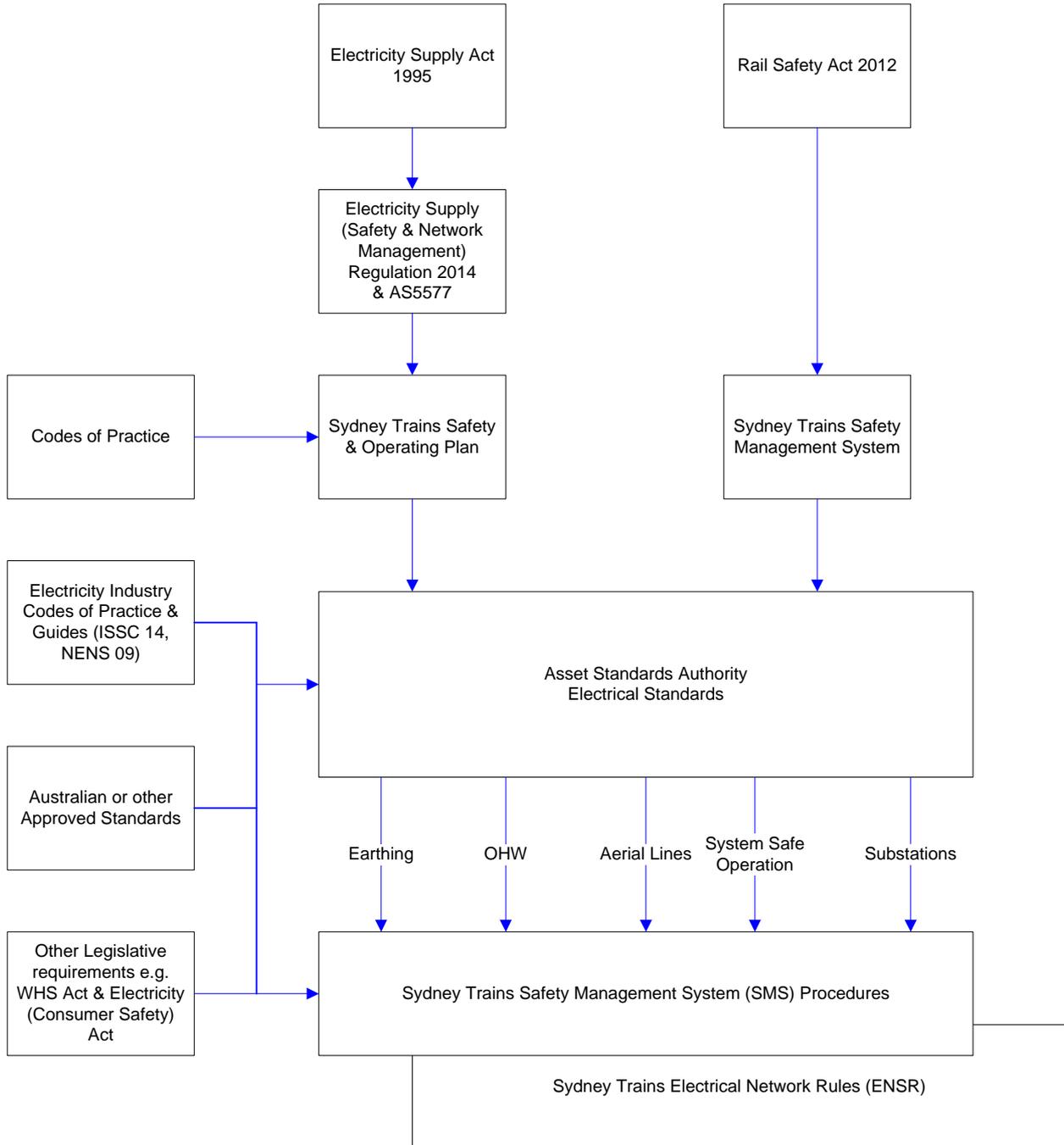
PR D 78701 Personnel Certifications - Electrical Authorisations

## 19. Appendices

Appendix A The process by which Sydney Trains complies with "electrical safety" legislation

Appendix B Stay Away from Lightning using the 30 / 30 Rule

## Appendix A The Process by which Sydney Trains Complies with "Electrical Safety" Legislation



## Appendix B Stay Away from Lightning Using the 30 / 30 Rule

1. If at risk, then 30/30 rule advises work to stop when the interval between hearing thunder and seeing lightning is less than 30 seconds.

2. Use a "flash to bang" (lightning to thunder) count of five seconds equals 1.6km (10=3.2km; 20=6.4km; 30=9.6km).  
Notify people via radio, siren or other means

3. Make decision to suspend activities, notify people and move to a safe location. A large permanent building or metal vehicle is best.

4. Avoid contact with any objects and other people.

**DO NOT!**

- Shelter under trees.  
*NB: If surrounded by trees, find a location outside the foliage, crouch and keep feet together.*
- Seek shelter in small sheds, pagodas, walkways etc with low unearthed metallic roofs supported on wooden or other electrically insulated material.
- Stay in open vehicles such as tractors without a metallic roof.
- Elevate your body above the surroundings.

5. Reassess the hazard.  
It's usually safe when thunder and lightning has not been observed for 30 minutes.

**Be conservative here.**

6. Inform people to resume activities.

See AS/NZS 1768:2007 Lightning Protection for additional information.