Safe Work Instruction

PPE for Electrical Work

Document no.	Work description
D2013/80874	PPE for Electrical Work

Scope

This SWI applies to persons performing tasks where there is a risk of exposure to arc flash, specifically those persons holding electrical certifications in accordance with PR D 78701 "Personal Certifications – Electrical" who are authorised:

- to enter or perform electrical work in substations;
- to operate three-position switches, switch pairs or links in the high-voltage or 1500VDC networks;
- install working earths or apply safety earths, or
- work on live low-voltage electrical installations.

The persons affected include employees and contractors of Sydney Trains, Transport for NSW and Authorised Engineering Organisations.

It does not apply to persons:

- working on de-energised electrical equipment (eg working with an Electrical Permit), or
- performing non-electrical work.

Review date

26/02/2022

References:

PR D 78100 Definitions and Conventions for Electrical Safety

PR D 78101 General Requirements for Electrical Work

SMS-06-GD-3323 Personal Protective Equipment

Compliance:

AS 2225:1994	Insulating gloves for electrical purposes
AS/NZS 1336:2014	Eye and face protection - Guidelines
AS/NZS 1337.1:2010	Personal eye protection – Eye and face protectors for occupational applications
AS/NZS 1801:1997	Occupational protective helmets
AS/NZS 2210.1:2010	Safety, protective and occupational footwear – Part 1 Guide to selection, care and use
AS/NZS 2210.3:2009	Occupational protective footwear – Part 3: Specification for safety footwear (ISO 20345:2004, MOD)
AS/NZS 4602.1:2011	High-visibility safety garments – Part 1: Garments for high risk applications
ENA NENS 09 – 2014	National Guideline for the Selection, Use and Maintenance of Personal Protective Equipment for Electrical Arc Hazards
IEC 61482-1-1:2009-05	Live working – Protective clothing against the thermal hazards of an electric arc – Part 1-1: Test methods – Method 1: Determination of the arc rating (ATPV or E_{BT50}) of flame resistant materials for clothing
ISO 14116:2015	Protective clothing – Protection against flame – Limited flame spread materials, material assemblies and clothing
ASTM F1891-12	Standard Specification for Arc and Flame Resistant Rainwear

PPE and precautions	Competencies or qualifications	Licences or permits required
Refer to details in this SWI	N/A	N/A

Tools and equipment required

N/A

Proper use

1. Arc-rated base garments comprising long-sleeved shirt and trousers must be worn for all electrical work.
2. Wear additional electrical PPE appropriate to the risk of arc-flash posed by the task, taking into consideration:
   - the possible fault level, and
   - the distance of the worker from energised equipment.

Activities where there is a risk of exposure to an arc above 4 cal/cm^2 includes

- operation of energised, exposed conductive electrical equipment in the high-voltage and 1500VDC networks;

- high-voltage substations;
- conducting tests on live padmount substations;
- substation/Section Hut 1500V link switches;
- operating or working on live LV knife switches, and
- opened LV Distribution Boards.

Additional arc protection is not required for operation of 1500V field switches due to the distance between the operator and the switch.

Warning
Metal items should not be worn or carried in the vicinity of live electrical equipment whilst performing electrical work. This includes:

- Portable electronic devices (mobile phones, tablets),
- Small metallic items such as coins, keys, pens, torch, screwdrivers, pliers or spanners,
- Metal items in clothing and shoes, including studs, exposed metal zips, belt buckles, eyelets;
- Personal items including watches, metal spectacle frames, rings, bracelets, chains, exposed metal body piercings etc.

Note
Shorts, T-shirts, short sleeved shirts and singlets are not acceptable clothing at any time. Do not wear clothing that has holes or tears that may allow an arc to enter the gap. Do not wear clothing that is extremely dirty or in poor condition.

Minimum PPE for Electrical Work

The minimum PPE to be worn for electrical work consists of:

a) Arc-rated **base garments** (detailed below) consisting of either a long-sleeved shirt with placket front and trousers, or one-piece coveralls (overalls), and

b) **Safety footwear** with toe protection and ankle support compliant to AS/NZS 2210.3 and maintained to AS/NZS 2210.1.

Notes

Thermal outer garments and/or rainwear may be worn over the base garments. Thermal outer garments (pullovers, jumpers) should have an outer layer that is flame retardant in accordance with ISO 14116 and have no flammable melting layers or components (e.g. no synthetic fabrics or plastic components). 100% woollen knitwear is recommended.

Rainwear must be flame retardant in accordance with ISO 14116 or ASTM F 1891 or equivalent.

These outer garments must not be relied on for protection against arcs.

Base Garments

Arc Flash Shirt

Arc Flash Trousers

Base garments must:

a) Be labelled stating the fabric or garment complies with NENS 09 – 2014 and that it is arc-rated not less than **4 cal/cm^2**;

b) Be labelled stating the fabric or garment has been tested in accordance with either IEC61482-1-1 or ASTM F1959;

c) Be constructed from arc-rated medium-weight, pre-shrunk natural fibres (such as 100% cotton or wool);

d) Be worn so that the body is covered from neck to wrist to ankle. Shirt, coat or jacket, and/or overalls must be fastened at both the wrist and neck area; and

e) Have non-metallic fasteners or have fasteners protected by a layer of the same material as that of the garment on both the top and undersides.

PPE for Electrical Work

Work in the rail corridor	The base garments should be suitable for work in the rail corridor in accordance with SMS-06-GD-3323 Personal Protective Equipment and PR D 78101 Clause 8. High-visibility clothing, i.e. orange with reflective markings, obviating the need to wear additional PPE over the base garments. PPE worn in the rail corridor must not include red or green colours.
Additional PPE  Arc Flash wet weather coat  Arc Flash wet weather trousers	Additional PPE that may be worn over or in combination with the base garments includes: a) Face shield with arc-rated hood and chin flap, switching jacket; wet weather coats/jackets and insulated gloves, to be worn when the hazard exceeds than **4 cal/cm^2** b) PPE for work in the rail corridor, including high-visibility clothing, hard hat, orange jacket with retro-reflective markings, eyewear and safety footwear in accordance with SMS-06-GD-3323 Personal Protective Equipment and PR D 78101 Section 8; c) Insulating gloves compliant to AS 2225 to be worn on both hands when undertaking live LV work, or when hazard assessment shows a need. Riggers gloves should be worn when there is a risk of cut or abrasions. d) Outer gloves are to be worn in addition to the insulating glove where cutting and tearing hazards exist.  face shield with arc-rated hood and chin flap  Insulated and Riggers Gloves
	Note The orange jacket must be suitable for electrical work, i.e. flame retardant in accordance with ISO 14116 and have no flammable melting layers, fasteners or components.
Maintenance & Replacement	PPE should be kept clean by washing or cleaning according to the manufacturer's instructions. Garments should be disposed of and replaced when they have deteriorated, damaged or have a limited life as indicated by the label or swing tags. The nominal life of the base garments is 50 machine washes, after which they should be disposed of and replaced.
Storage	Avoid storing PPE in proximity to chemicals known to fade or damage fabrics, such as bleach or chlorine. For longer life of reflective materials, store at room temperature.
Inspection	Inspect before use for excessive dirt, rips, fractures, tears, missing fasteners, or fading.
Additional controls	Nil

Prepared using SMS-06-TP-4317 v1.3, Custodian: Senior Safety Specialist Safety Systems; Approver: Director Safety and Standards; Issue date: 15/08/2017