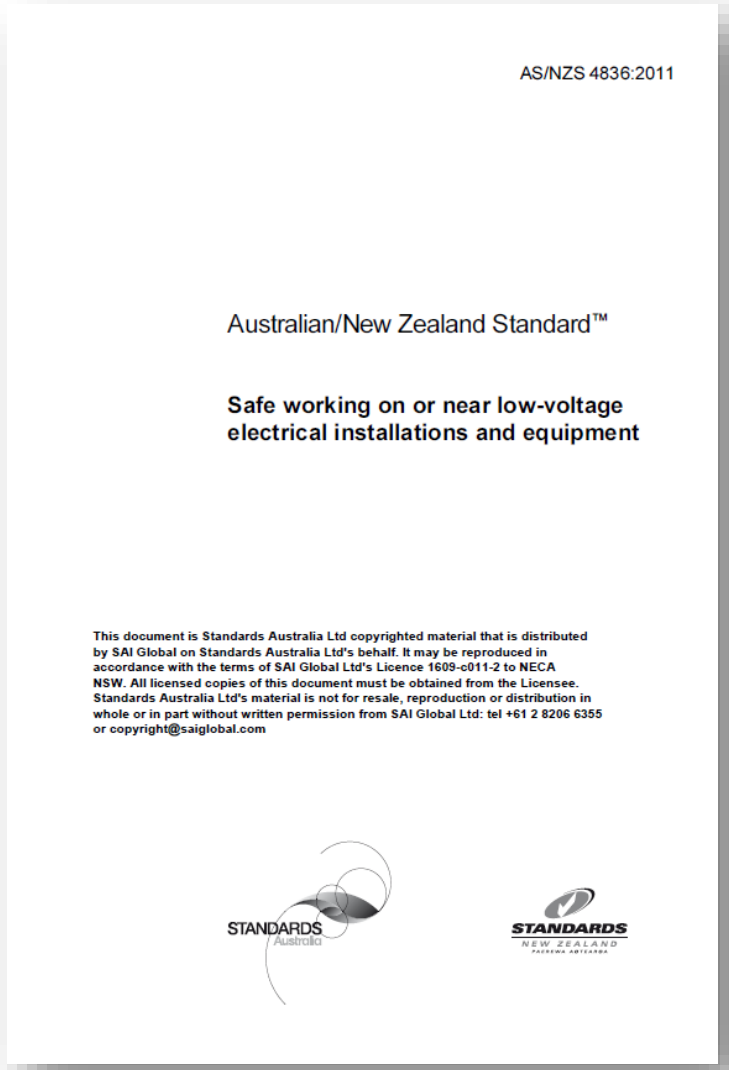
national electrical and communications association

Safe Working On or Near Low-Voltage Equipment

By Owen Leslie

Safety Resources for Electricians

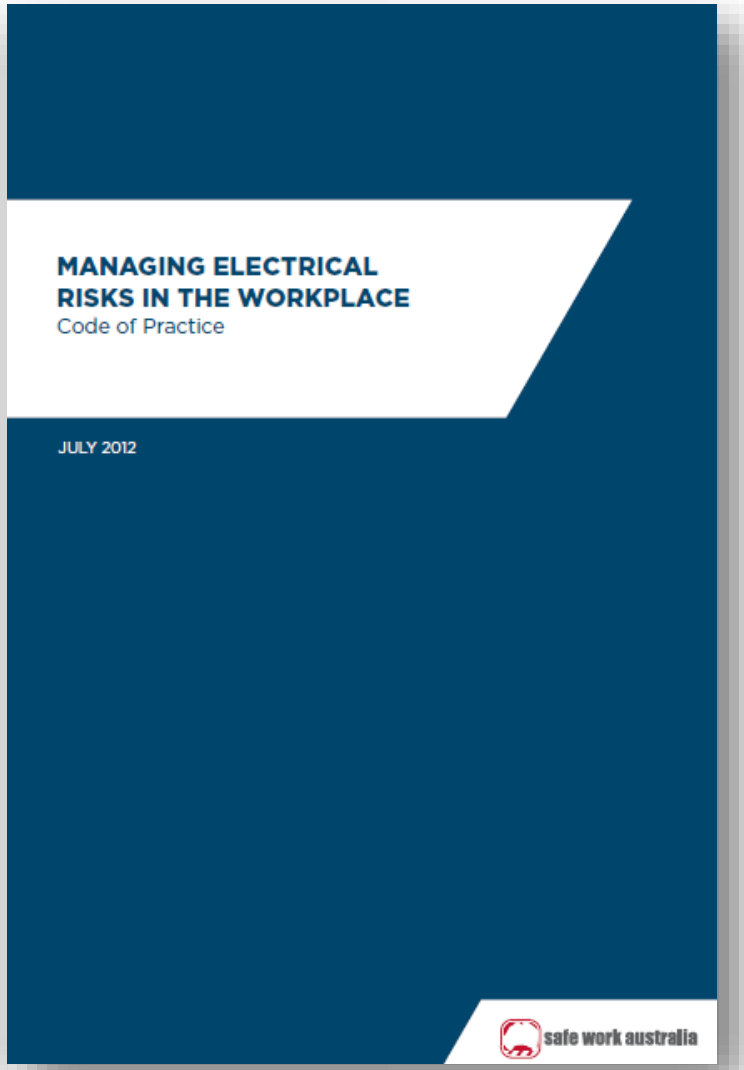

AS/NZS 4836:2011

Australian/New Zealand Standard™

Safe working on or near low-voltage electrical installations and equipment

STANDARDS Australia

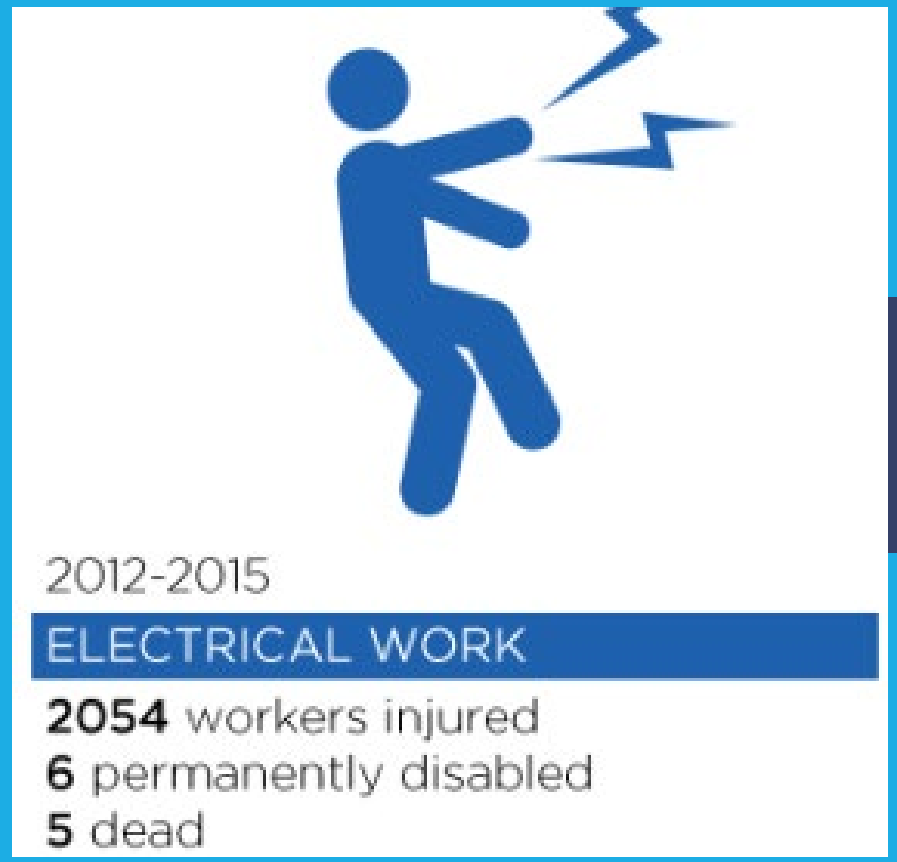
STANDARDS NEW ZEALAND


MANAGING ELECTRICAL RISKS IN THE WORKPLACE

Code of Practice

JULY 2012

safe work australia



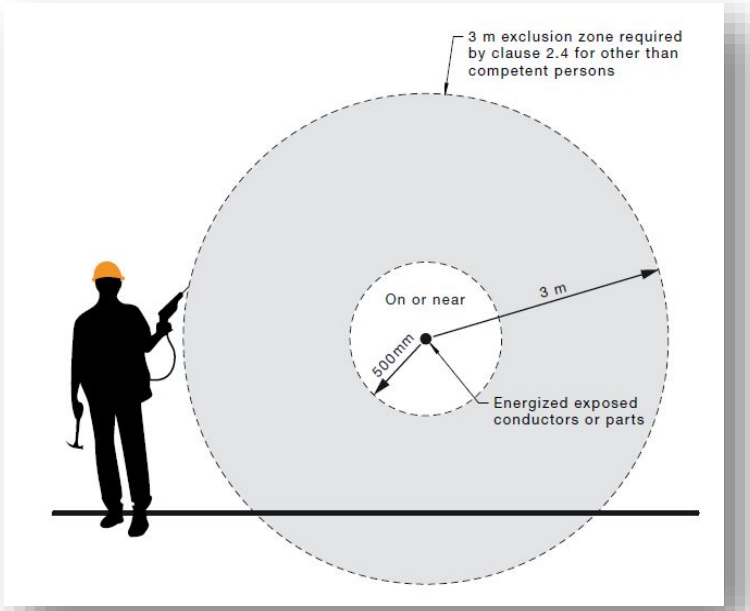
Electrical work

- All electrical work could hurt someone. The biggest dangers are shock, arc flashes and arc blasts, which can reach a temperature of 19,000°C – hotter than the surface of the sun.
- Almost any job around energised equipment could end in tragedy. Protect your workers, don’t take short cuts and never assume an electrical system is safe.

Energised Work

- On or Near
- Energised Work
- Live Work

All of these carry the same meaning



AS/NZS 4836:2011 (Safe working on Electrical Installations) defines ‘on or near’ as: A situation where an electrical worker is working on or near exposed energised conductors or live conductive parts and there is a reasonable possibility that the electrical worker’s body, or any conducting medium the electrical worker may be carrying or touching during the course of the work, may come closer to the exposed energised conductors or live conductive parts than 500 mm.

The term ‘on or near exposed energised conductors or live conductive parts’ does not apply if the uninsulated and energised part is safely and securely shielded by design or segregated and protected with barricades or insulated shrouding or insulating material to prevent inadvertent or direct contact.

Energised Work

Model WHS Regulation clause 157 - A person conducting a business or undertaking must ensure that electrical work on energised electrical equipment is not carried out unless:

- it is necessary in the interests of health and safety that the electrical work is carried out on the equipment while the equipment is energised, for Example. It may be necessary that life-saving equipment remain energised and operating while electrical work is carried out on the equipment
- it is necessary that the electrical equipment to be worked on is energised in order for the work to be carried out properly
- it is necessary for the purposes of testing to ensure the equipment is de-energised
- there is no reasonable alternative means of carrying out the work.

Must Do's

Must have a SWMS

Must complete a risk assessment specific to electrical hazards

Must be Licenced

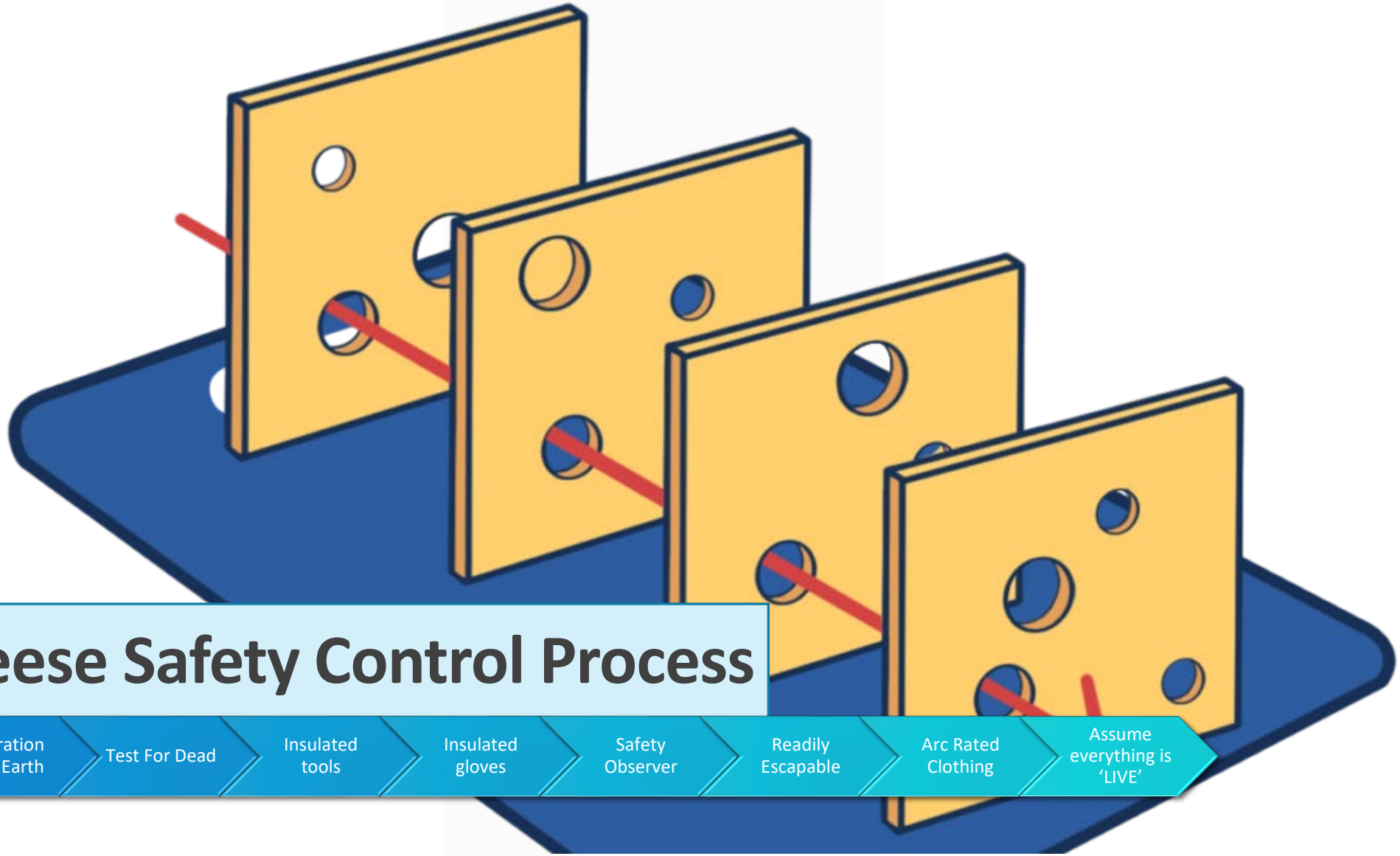
Must Do's

You must also ensure that:

- No-one can accidentally touch any part that is live and exposed

- All work is carried out with the proper tools, testing equipment and personal protective equipment

- A competent observer is present, if needed – e.g. an observer is not required for testing, or if a risk assessment suggests no serious risks.



Swiss Cheese Safety Control Process

RCD | Separation from Earth | Test For Dead | Insulated tools | Insulated gloves | Safety Observer | Readily Escapable | Arc Rated Clothing | Assume everything is 'LIVE'

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NSW GOVERNMENT

Incident Information Release

SAFEWORK NSW

7/11/2019

Electrical Fatality

23 October 2019

Incident overview

An electrician has sustained fatal injury from electrocution while servicing a 3-phase commercial dishwasher at a restaurant in Marrickville.

Photograph 1: The commercial dishwasher wiring and control area (3 phase supplied, covers removed)

The investigation

Conductive Path Separation

The conductive path between electrical workers and conductors and between electrical workers and earth (including building materials such as concrete and steel that may be earthed), or between electrical workers should be broken by one or more of the following methods:

- Insulating barriers, covers or mats
- Insulating tools
- Insulating gloves

Areas of reduced mobility

Care should be taken when working in areas of reduced mobility because of restriction of movement and the inability to readily escape from the area. Examples of areas of reduced mobility can be as follows:

- Restricted areas in and around switchboards
- Ceiling and roof spaces
- Spaces under floors
- Ladders, scaffolds or elevated work platforms.
- Trenches
- Pits or tunnels
- Confined spaces

An electrician has sustained fatal injury from electrocution while servicing a 3-phase commercial dishwasher at a restaurant in Marrickville

Use of tools, electrical equipment or plant with exposed conductive parts

- Conductive items such as tape measures, rules, reinforced tapes, ladders, elevating work platforms, scaffolding and guards on portable lamps, shall not be used or near exposed energised conductors or live conductive parts.
- NOTE: AS/NZS 1892 specifies requirements for fibreglass ladders.
- Insulated tools and equipment shall be of an approved type and shall be in good order, regularly maintained and tested where required. Tools and equipment shall not be used if any doubt exists that their insulation might not be adequate.

Conductive Items

Bracelets, rings, neck chains, exposed metal zips, watches and other conductive items shall not be worn while working on or near exposed energised conductors or live conductive parts. If worn, earplugs or earmuffs shall not be conductive.

PPE

PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment	Requirements
Eye protection	Eye protection without metal frames and complying with AS/NZS 1337 and selected in accordance with AS/NZS 1336.
Face shield	Face shield certified as rated at 10 cal/cm^2 protection.
Arc flash suit and hood	Arc flash suit and hood rated at a minimum of 40 cal/cm^2 protection.
Footwear	Shoes or boots complying with AS/NZS 2210.2 and selected and maintained in accordance with AS/NZS 2210.1.
Insulating gloves	Gloves complying with AS 2225 or an equivalent Standard and insulated to the highest potential voltage expected for the work being undertaken, and air tested each time prior to use.
Flame-resistant gloves	Gloves complying with AS/NZS 2161.4, e.g. gloves made from leather or other non-melting heat-resistant material.
Hearing protection	Ear plugs or muffs complying with AS 1270.
Protective clothing	Flame-retardant clothing covering the full body (including arms and legs) and not made from conductive material or containing metal threads.
Industrial fall-arrest systems and devices	Industrial fall-arrest systems and devices complying with AS/NZS 1891.4 and that have been checked and inspected each time before use with particular attention being paid to buckles, rings, hooks, clips and webbing.
Safety helmets	Headwear complying with AS/NZS 1801.
Respiratory protection	Respiratory protection complying with AS/NZS 1715 and AS/NZS 1716.

NOTES:

1 Regulatory authorities may have additional requirements for personal protective equipment.

2 Where insulated and flame-resistant gloves are worn together, they are to be matched in accordance with

Isolation Principles

Work shall not be carried out on or near de-energised exposed conductors and parts until an electrical worker has:

a) Positively identified the relevant electrical equipment and conductors, all their energy sources and the isolation points.

b) Isolated electrical equipment and conductors from all energy sources.

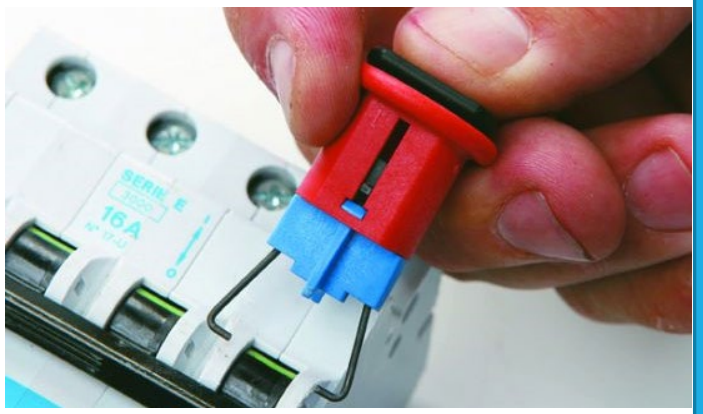
c) Secured the isolation.

d) Discharged, where necessary, any stored energy. E.g. capacitors.

e) Proved the de-energization of all relevant electrical equipment and conductors.

f) Identified the limits of the safe area of work.

Secure the Isolation



- Isolating devices shall be secured in the open position or zero energy state in such a manner as to prevent inadvertent operation of the isolator.

- The padlocks should be red in colour and should be uniquely keyed to prevent inadvertent removal by others. Each personal lock shall indelibly identify the person's name, company and contact details, and if required, the date of application.

- The use of a multi-lock device shall be employed where more than one person is required to attach a personal lock to an isolator.

Proving De-Energised

All electrical equipment and conductors shall be treated as energised, unless proven to be de-energised. Any voltage tests used to prove de-energization shall be conducted in the following sequence:

- Test the voltage tester on a known voltage source for correct operation.
- Test between all conductors and a known earth.
- Test between all conductors.
- Retest the voltage tester on a known voltage source for correct operation.

Only competent persons shall perform the tests

Arc Hazard Controls

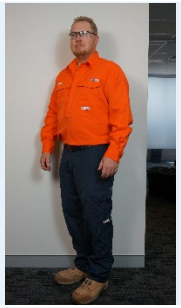
Equipment	Activities
1. Overhead mains	• Live work
2. Underground mains	• Isolating/Operating/Switching
3. Substations	• Earthing
4. Metering Equipment	• Testing and fault finding
5. Switchboards	• Inspection
6. Batteries	

Arcing faults may be experienced on high and low voltage mains and apparatus, and extra low voltage energy storage equipment such as batteries.

Arc Hazard Controls

- Estimating the Incident Energy - The incident energy, to which an individual may be exposed, should be estimated by one of the following methods,
- Calculations based on the formulae in Appendix B of ENA NENS-09.
- Calculations based on the IEEE 1584 Guide for Performing Arc-Flash Hazard Calculations, or;
- If minor switchboard, control panel or metering work, make an assumption about fault Levels
- To make this assumption of fault levels use the kA (kilo amps) rating of the main up stream circuit breaker in the switchboard or equipment that you are working on
- The value of the kA rating determines how much current the circuit breaker can withstand under fault conditions
- Line up your kA rating with the PPE table In NECA's SWMS and utilize the PPE as described. The hazard column in these steps will also provide an estimate of incident energy (Cal/cm2). This can be used to determine minimal Arc Thermal Performance Value (ATPV). Your ATPV value of your PPE needs to be greater than your estimated Cal/cm2

PPE Table

kA (kilo amps) rating	Hazard/Risk Category	Clothing / PPE Requirements	Minimum Arc Rating of PPE (cal/cm²)	
Up to 10KA	0	• Long Sleeve Shirt & Pants (natural fibres) • Safety Glasses or Goggles	0	
10KA to 20KA	HRC 1	• Arc Rated FR Shirt & FR Pants or FR Coverall • Arc Rated face shield with chin cup • Fire resistant gloves • Rubber Mat • ISSC 14 Electrical First Aid kit	4	
20KA to 40KA	HRC 2	• Arc Rated FR Shirt & FR Pants or FR Coverall • Arc Rated face shield with chin cup • Insulated gloves with leather or fire resistant outers Gloves • Safety Observer • LV Rescue Kit • ISSC 14 Electrical First Aid kit • Rubber Mat	8	

PPE Table

kA (kilo amps) rating	Hazard/Risk Category	Clothing / PPE Requirements	Minimum Arc Rating of PPE (cal/cm²)
40KA to 80KA	HRC 3	• layers of Arc Rated FR Shirt & FR Pants or FR Coverall and Arc Flash Suit that Meets Minimum Arc Rating • Hood ATPV min 25 Cal/cm² • Insulated gloves with leather or fire resistant outers Gloves • Safety Observer • Low Voltage Rescue Kit • ISSC 14 Electrical First Aid kit • Rubber Mat	25
80KA + or high voltage work	HRC 4	• layers of Arc Rated FR Shirt & FR Pants or FR Coverall and Arc Flash Suit that Meets Minimum Arc Rating • Hood ATPV min 40 Cal/cm² • Insulated gloves with leather or fire resistant outers Gloves • Safety Observer • LV Rescue Kit • ISSC 14 Electrical First Aid kit • Rubber Mat	40

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