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# WHS-PRO-019

## Electrical Safety Procedure

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## PURPOSE

The purpose of this procedure is to ensure that all electrical equipment is maintained and operated safely which includes the requirements associated with the safe operation and maintenance of all electrical equipment.

## SCOPE

This procedure details the requirements associated with the safe operation and maintenance of all electrical equipment used on the organisation sites. These requirements shall be in accordance with:

- AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment
- AS/NZS 3012:2010: Electrical installations – Construction and demolition sites.

## REFERENCES

- AS/NZS 4801:2001 OH&S Management Systems – 4.4.6 Hazard Identification, Hazard/Risk Assessment and Control of Hazards
- WHS Regulation 2011 - Chapter 4 Hazardous Work, Part 4.7 General Electrical Safety in Workplaces and Energised Electrical Work
- Safe Work Australia - Code of Practice – Managing Electrical Risks in the Workplace
- AS/NZS 3760:2010: In-service Safety Inspection and Testing of Electrical Equipment
- AS/NZS 3000:2007: Electrical Installations – Wiring Rules
- AS/NZS 3012:2010: Electrical Installations – Construction and Demolition Sites
- AS/NZS 3010:2017: Electrical Installations – Generating Sets
- AS 2790:1989: Electricity Generating Sets – Transportable (Up to 25 kW)

## DEFINITIONS

### **Competent Person**

A 'competent' person is a term used to describe either a licensed electrician or a person who has been trained in the use of Residual Current Device (RCD) testers and Portable Appliance Testers (PAT).

### **Hostile Operating Environment**

A 'hostile operating environment' is a term used to describe an environment where electrical equipment is exposed to operating conditions that are likely to result in damage to the equipment or a reduction in its expected life span. This includes conditions that involve exposing the electrical equipment to moisture, heat, vibration, mechanical damage, corrosive chemicals and dust.

### **Manager**

For the purposes of this procedure, the term 'manager(s)' refers to either the Building and Site Services Manager, the Projects Manager, or the Volunteer Manager. The manager responsible will be dependent on the site on which the works are being undertaken.

## FORMS

### [Forms](#)

## ACTIONS AND RESPONSIBILITIES

### WHS Regulatory Requirements

- The WHS Regulations 2011 include specific duties for Sydney Harbour Federation Trust to manage the risks to health and safety associated with the safe operation and maintenance of all electrical equipment.
- The duties include:
  - a) Identifying and managing risks to health and safety associated with electrical risks
  - b) Ensuring unsafe electrical equipment is disconnected/isolated from its electricity supply, and not reconnected until it is repaired or tested and found to be safe or replaced
  - c) Ensure that electrical equipment is regularly inspected and tested by a competent person, and records of testing are kept
  - d) Electrical works must be performed by a trained and licenced electrician
  - e) Maintaining safe approach distances to overhead or underground electric lines

An overview of the Electrical Safety duties listed above is as follows.

### a) Identifying and Managing Risks

#### *General Electrical Requirements*

- All electrical equipment purchased and brought onto the organisation site shall comply with the relevant Australian Standards.
- Only qualified electrical trades persons shall work on electrical equipment and installations.
- All electrical wiring and equipment shall conform with and be maintained to Australian Standard AS 3000-2007, "Electrical Installations", "AS/NZS 3012:2010: Electrical installations – Construction and demolition sites" and other relevant standards, and statutory requirements.
- Ensure as far as reasonably practical that any electrical risk associated with the supply of electricity through a socket outlet is minimised by the use of an appropriate residual current device
- An adequate number of power outlets need to be provided for electrical needs of the area.
- The positioning of the outlets shall take into consideration the creation of trip hazards and ease of access. Where extra power outlets are required on a short term or occasional basis, portable multi-plug power outlets, with built in overload switch, may be used.
- Double adaptors shall not be permitted.
- Extension leads shall be used as a last resort. Where possible, a permanent power outlet is to be installed. Leads shall be kept as short as possible and shall have heavy duty sheathed insulation. They may be purchased commercially or made up by an electrician.
- On the basis that leads are mechanically protected/supported along their length
- All leads plugged into construction type boards shall pass through periodically made and insulated (Bushed) holes to the underside of the board (Refer switchboard construction)

#### *RCDs*

- All final sub-circuits of construction wiring must be protected at the switchboard where the sub-circuits originate by a residual current device (RCD), with a maximum rated residual current of 30mA, that operates in all live (active and neutral) conductors.

- All appliances, luminaries and other electrical equipment must be supplied from an RCD protected circuit that is fixed at the switchboard or incorporated into the socket-outlet or incorporated into a portable socket-outlet assembly.

### Socket Outlets

- Socket outlets must be rated at not less than 10A.
- Single-phase socket outlets must be individually controlled by a double-pole switch (active and neutral conductors are switched).

### Portable Socket Outlet Assemblies (PSOA)

- Must comply with AS/NZS 3190 and be of class H (should be marked with these requirements)
- Must have an overload protective device, RCD and plugs intended for connection of low-voltage socket-outlet
- Flexible cable feeding the PSOA must be the heavy duty sheathed type not longer than 2m
- Be fitted with a clear plug



### Auxiliary Socket Outlet

- Assemblies (ASOP) must be:
  - or robust construction to withstand mechanical damage
  - located at a height of 1.2 to two metres above the floor level and be securely mounted to a fixed structure or a structure designed for that purpose
  - supplied by an RCD protected circuit at the switchboard it originates from
  - provided by a clearly marked 'isolating switch' that controls the incoming supply. Incoming supply cable must have a minimum cross sectional area of 4mm<sup>2</sup>
  - provided by means to relieve strain on plug and socket outlets of flexible cables.



### Cord Extension Sets (Commonly Known as Extension Leads)

- A flexible cord must be the heavy duty sheathed type (not green in colour) and each conductor in the flexible cord must be no less than 1mm/sq in cross-sectional area.
- The plug and socket on either side of a cord extension set must be compliant with the relevant standard for their construction.
- The maximum length of a flexible cord, for a given conductor cross-sectional area, must comply with Table 2 below.
- A cord extension set must not be joined so that the total length of any combination exceeds the relevant maximum value specified in the Table below. Where approved joints are made and may be exposed to a "Hostile" environment, threaded couplings shall be used.
- With the exception of vertical risers, an extension lead shall be supported along its length to avoid mechanical damage or being subjected to a moist/wet environment



**Table 1: (Maximum lengths of flexible cords and flexible cables) as per AS/NZS 3012: 2010  
Electrical installations – construction and demolition sites.**

<b>Table 1: Maximum length of most commonly used single phase cord extension set</b>		
Current rating (A)	Conductor size (mm <sup>2</sup> )	Maximum length (metres)
10	1.0	25
	1.5	35
15/16	1.5	25
	2.5	40
20	2.5	30
	4.0	50

**Note:** Lengths quoted for flexible cords are taken from AS/NZS 3199 and are based on a voltage drop of 5% of 230V at rated current for the conductor size.

### **Generators and Inverters**

- Low voltage generators (complying with AS 2790) must be connected in accordance with AS/NZS 3010.
- Generators and inverters providing electrical supply via permanently connected RCDs must have a maximum tripping current of 30mA
- Isolated winding generators and isolated inverters must only be used to supply a separated circuit for electrical equipment installed in accordance with AS/NZS 3000: 2007 Wiring rules, and each winding must supply not more than one item of Class I (earthed conductive parts) electrical equipment.

**Note:** Electrical portable outlets devices (EPODS), for example domestic type power boards, double adaptors and three pin plug adaptors (piggyback), are not allowed on construction and demolition sites.

## **b) Unsafe Electrical Equipment and Isolation of Energy Sources**

### **Unsafe Electrical Equipment**

- Managers shall ensure employees (if competent to do so) undertake a check of the physical condition of the electrical equipment, including the lead and plug connections, prior to commencing use.
- Ensure that electrical equipment is out of service if in doubt as to safety, including at any time during use
- Unsafe electrical equipment shall be disconnected or isolated from its electricity supply. It shall not be reconnected unless it is repaired by a competent person or tests by a competent person have confirmed it is safe to use.
- Alternatively, it could be replaced or permanently removed from use.
- Unsafe electrical equipment should be labelled indicating it is unsafe and shall not be used. This is to prevent inadvertent use before the electrical equipment can be tested, repaired or replaced.

### ***Isolation of Energy Sources***

- Managers shall ensure all personnel working on the site have in place Isolation, Safety Tagging and lock out procedures which are developed as required under the NSW Code of Practice – Managing electrical risks in the workplace

### ***Isolating Switches/Main Switches***

- Each switchboard must be provided with one marked isolating switch which, if switched off, will interrupt supply to all final sub-circuits and sub-mains originating from the switchboard, including socket outlets mounted on the switchboard.
- The switchboard must be provided with a means to prevent electrical equipment from being inadvertently energized while undertaking work on electrical installations (provision for fitting a padlock or located within a lockable space or enclosure).
- Main switchboard isolating switches must be marked 'MAIN SWITCH' and the distribution board isolating switches must be marked 'DISTRIBUTION BOARD ISOLATING SWITCH'.

## **c) Electrical Equipment Inspection and Testing**

### ***Competency Requirements for those Carrying Out Inspection and Testing of Electrical Equipment***

- Inspection and testing can be carried out by a competent person (trained in use of RCD testers and Portable Appliance Testers PAT) or a licensed electrician.
- For example, a person carrying out testing under AS/NZS 3760:2010 shall be:
  - a licensed or registered electrician (whichever applies), or
  - a licensed electrical inspector, or
  - a person who has successfully completed a structured training course and been deemed competent in the use of a pass-fail type portable appliance tester and the visual inspection of electrical equipment.

### ***Inspecting and Testing Electrical Equipment***

- Inspecting and testing electrical equipment will assist in determining whether it is electrically safe.
- Regular visual inspection can identify obvious damage, wear or other conditions that might make electrical equipment unsafe.
- Many electrical defects are detectable by visual inspection.
- Regular testing can detect electrical faults and deterioration that cannot be detected by visual inspection.
- Electrical equipment that is connected by a plug and socket – in essence 'plug in' electrical equipment – that is used in a 'hostile operating environment' must be regularly inspected and tested by a competent person. If this equipment has not been regularly tested then it must not be used until it is tested.
- Ensure that residual current devices are tested regularly by a competent person.
- Brand-new equipment that is 'out of the box' does not need to be tested before being put into service unless there are reasonable grounds to believe it is electrically unsafe.
- As a general rule electrical equipment used in 'hostile operating environments' should be inspected and tested at least once every 12 months. More frequent testing will be required where plug-in equipment is exposed to increased risks of mechanical damage or electrical deterioration.

- All hire and plant equipment shall show evidence of in date testing
- In addition to regular testing, electrical equipment should also be tested:
  - after a repair or servicing that could affect the electrical safety of the equipment (i.e. undertaken by the person carrying out the repair or servicing before return to service)
  - before its first use if bought second-hand.

**Testing and Tagging**

- All electrical equipment of the plug-in type shall be inspected, tested and tagged in accordance with AS 3760. This includes single and three phase powered items.
- Records of inspection and testing of electrical equipment is required as detailed in the Regulation.
- Records of maintenance should be kept throughout the working life of the equipment. Records are to include at minimum:
  - The date of inspection and test
  - Clear identification of the equipment tested
  - The results of the test (whether the equipment passed or failed)
  - The identification of the person carrying out the testing and
  - The date retest is due
- Testing and Tagging is to be conducted for all equipment in the workplace accordance with the following Table.

**Table 2. Testing Intervals for Electrical Equipment**

Type of environment in which equipment is used	Interval between inspection and tests				
	Class of Equipment		Additional Testing for Portable RCDs		Cord extension sets
	Class 1 (protectively earthed)	Class 22 (Double Insulated)	Push Button Test (By User)	Test for Operation	
Factories, workshops and places of work of manufacturing, repair, assembly, maintenance or fabrication.	6 months	12 months	Daily, or before every use, whichever is the longer	12 months	6 months
Other commercial environments with no special protection e.g. Labs, tea rooms, office kitchens & health care establishments	12 months	12 months	3 months, or before every use, whichever is the longer	2 years	12 months
Office environment where equipment is not subject to constant flexing of the supply cord	5 Years	5 Years	3 months	2 years	5 years



Hire Equipment	Before each hire	Before each hire	Before each hire	Before each hire	Before each hire
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### Testing and Tagging – Construction, Demolition and hostile Sites

- AS/NZS 3012 standard sets out minimum requirements for the design, construction and testing of electrical installations that supply electricity to appliances and equipment on construction and demolition sites, and for the in-service testing of portable, transportable and fixed electrical equipment.
- Testing and Tagging is to be conducted for all equipment in accordance with the following Table.
- All hire and plant equipment shall show evidence of in date testing

**Table 3. Periodic verification intervals (AS/NZS 3012: Electrical installations – construction and demolition sites)**

Equipment class	Testing Intervals
Construction wiring, including switchboards	Inspected and tested at time of installation, then re-inspected every 6 months
Re-locatable structures, fixed and transportable equipment	6 months
<b>Portable equipment and flexible electrical cords (extension leads)</b>	<b>3 months</b>
<b>Equipment in amenities and site offices</b>	<b>3 months</b>
Portable RCDs– push button test	Before each use of equipment
Portable RCDs – operating time	3 months
Fixed RCDs – push button test	1 month
Fixed RCDs – operating time	12 months
Hire equipment	Upon introduction to service, then in accordance with the testing intervals appropriate to the equipment class.

## d) Electrical Works Must be performed by a Trained and Licenced Electrician

### General Requirements

- Unless necessary for the work to be carried out, for equipment to be tested or there be no other reasonable means of carrying out work, it must be ensured that electrical work is not carried out on electrical equipment whilst it is energised, with a competent person having determined whether the equipment is energised or not
- Before electrical work commences on energised equipment:
  - A risk assessment must be conducted
  - The point where electrical equipment is disconnected or isolated from its supply should be clearly marked/labelled, clear of obstructions and operated quickly

- The person authorised the electrical work after consulting with the person with control of the workplace
- Ensure that only persons authorised enter the immediate area in which electrical work on energised equipment is taking place
- Ensure that electrical work on energised equipment is carried out by a competent person who has tools, testing equipment and personal protective equipment, and is in accordance with the Safe Work Method Statement (SWMS) prepared for the work
- Ensure that carrying out of construction work complies with AS/NZS 3012:2010

### **Temporary Supply**

- Construction wiring must be supplied from:
  - electricity distributor's main
  - existing switchboard in the permanent installation of the premises
  - low voltage generator complying with the principles of AS2790, which must be installed in accordance with AS 3010.
- Construction wiring must:
  - not be tied, bundled, or grouped with permanent wiring
  - not be fixed to free standing fences that have no fixed posts (or equivalent means of support)
  - protected against mechanical damage (medium or heavy duty or corrugated conduit of insulating material, armoured cable, flexible electrical hose)
  - marked and be readily distinguishable from permanent wiring by using iridescent yellow tape spaced at intervals not exceeding five metres and marked with the words 'construction wiring'
  - positioned to avoid crossing roadways or access ways where cranes, high loads or heavy machinery may travel. If this is not possible, an effective means to minimize the risk of vehicular contact with the overhead wiring system must be provided.

### **Switchboards Installed on Construction and Demolition Sites**

- Switchboard installation and location:
  - be installed in accordance with AS/NZS 3000: 2007 Wiring rules
  - be readily accessible and must be protected from damage during the course of the construction or demolition work
  - be mounted on a pole, post, wall, floor or other structure of stable and free standing design that takes into account any external forces that may be exerted on the switchboard
  - be marked with the source of the supply and where it originates from
  - multi-level buildings, be positioned in a manner that eliminates the need for flexible cords or cables to be run between floor levels.

### **Switchboard Construction**

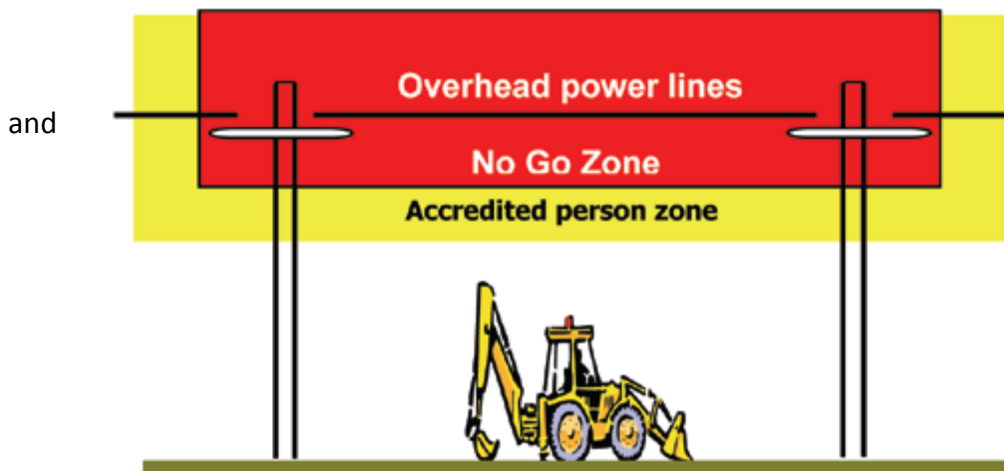
- Switchboards must be constructed of robust material capable of withstanding mechanical damage.
- The enclosure of the switchboard must have a minimum degree of protection of that is protected against access to hazardous parts with a finger and also protected against water spraying.
- Energized (live) parts must be effectively protected at all times against contact by workers.

- An insulated or covered tie bar must be provided for anchorage of flexible cords to prevent strain on the plugs and socket outlets.
- Switchboard doors must not be of the removable type (unless with a tool) and be fitted with a locking facility (for locking overnight or when not in use). They must also be fitted with means for retaining the door in the open position.
- Switchboards must have a cut out (not sharp to prevent cables being cut, i.e. by providing brushing or plastic hose around it) in the bottom plate to allow safe entry of electrical leads with the door closed. A label must be fixed to the switchboard stating 'KEEP CLOSED – RUN ALL LEADS THROUGH BOTTOM'.
- If more than one switchboard is located on a site, markings must be provided to distinguish one switchboard from another.
- Switchboards must be marked with an electric shock symbol and a danger sign (as per below) warning workers of the presence of energized or live parts within the switchboard.



#### e) Safe Approach Distances to Overhead or Underground Electric Lines

- Ensure as far as reasonably practical that no person, plant or thing comes within an unsafe distance of an overhead or underground electric line. If not reasonably practical, a risk



assessment must be conducted control measures must be

implemented.