

Electrical Equipment – Selection, Inspection and Testing

Document no.	Work description
D2013/80871	<p>This SWI provides details regarding the selection, in-service safety inspection and testing of single and poly phase low voltage equipment, connected to the electrical supply by either a flexible cord, flexible cable or connecting device.</p>
	<p>Scope</p> <p>The scope of this SWI includes:</p> <ol style="list-style-type: none"> 1) Electrical equipment requirements, i.e. selection requirements. 2) In-service inspection and testing of low voltage single phase (230V) and polyphase (400V) electrical equipment that is:- <ul style="list-style-type: none"> • connected to the electrical supply by a flexible cable and/or connecting device where the cable and or equipment is moved for use, restocking, cleaning or maintenance, or • connected to the electrical supply by a flexible cable and/or connecting device where the cable is flexed during use, or • portable, moveable or transportable and connected to the electrical supply by a flexible cable and/or connecting device. 3) “Residual current devices (RCDs) except those within the scope of AS/NZS 3003” (AS/NZS 3760 clause 1.1 Scope) 4) Portable inverters that generate or produce low voltage. 5) The requirements for supply to transportable buildings, including site sheds or caravans. <p>Note:</p> <p>Equipment does not require in-service inspections or tests if it is:</p> <ul style="list-style-type: none"> • equipment other than prescribed by AS/NZS 3760 clause 1.1.1, or • equipment installed in accordance with AS/NZS 3760 clause 1.1.2, or • “equipment which would need to be dismantled to perform the inspection and tests” (AS/NZS 3760 clause 1.1.3), or • “RCDs within the scope of AS/NZS 3003” (AS/NZS 3760 clause 1.1.5), or • “fixed equipment (except RCDs) or stationary equipment connected to wiring that forms part of the electrical installation and hence falls within the scope of AS/NZS 3000”, (AS/NZS 3760 clause 1.1.6) or • is a medical device as defined in AS/NZS 3551 (AS/NZS 3760 clause 1.1.7), or • “portable generators within the scope of AS/NZS 3010” (AS/NZS 3760 clause 1.1.8), or • fixed, stationary or permanently located portable equipment, <ul style="list-style-type: none"> - NOT open to abuse and - NOT located in a hostile environment and - NOT moved for use, restocking, cleaning or maintenance and - if connected to supply by a flexible cord, the flexible cord is NOT subjected to flexing in normal use. <p>(Fixed equipment, hostile environment, portable equipment and stationary equipment are defined in AS/NZS 3760 clauses 1.4.8, 1.4.12, 1.4.16 and 1.4.20 respectively.)</p> <p>This SWI does not cover electrical equipment used at construction sites. In such cases refer to D2013/81208 Electrical Practices for Construction Work.</p>

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Review date 23/03/2021	References <ul style="list-style-type: none"> AS 4509 series Stand-alone power systems AS/NZS 3000:2007 Wiring Rules AS/NZS 3001:2008 Electrical installations - Transportable structures and vehicles including their site supplies AS/NZS 3010:2017 Electrical installations – Generating sets AS/NZS 3190:2016 Approval and test specification – Residual current devices (current-operated earth-leakage devices) AS/NZS 3199:2007 Approval and test specifications - Cord extension sets AS/NZS 3760:2010 In-service safety inspection and testing of electrical equipment AS/NZS 5762:2011 In-service safety inspection and testing – Repaired electrical equipment Fact Sheet - Microwave Ovens and Health (Australian Radiation Protection and Nuclear Safety Agency) Regulatory Compliance Mark D2013/81208 Electrical Practices for Construction Work SMS-16-GD-3106 Guide to Plant, Equipment and Workplace Inspections SafeWork NSW Guidance Note – Electrical Inspection & Testing SafeWork NSW Safety Alert - Electrical Safety Work Health and Safety Regulation 2017 	
PPE and precautions	Competencies or qualifications	Licences or permits required
<u>D2013/80874 PPE for Electrical Work</u>	Refer to Personnel Certification section of this document	N/A
Tools and equipment required		
<ul style="list-style-type: none"> portable appliance tester insulation resistance tester RCD tester Multimeter (with a low ohms range) SMS-06-FM-4279 Electrical Equipment Environment Assessment SMS-06-FM-0278 Electrical Equipment Inspection and Test Record 		



Warning

Severe injury or death results if a conducting path is formed allowing electric current to pass through the body. Read this SWI in conjunction with supporting SMS documents and standards.

Background	<p>Electrical equipment is designed and manufactured to safety standards that provide a high level of protection against electric shock, mechanical injury or a source of ignition. Consequently persons using faulty, substandard, electrical equipment are exposed to the risk of electric shock, burns or mechanical injury. Faulty equipment could also become a source of ignition leading to the spread of fire. Thus, in-service inspections and tests are scheduled at regular intervals to verify the integrity of the equipment and the utilisation of the equipment, in a given environment does not introduce a hazard.</p> <p>For information about electrical hazards associated with working around electrical equipment and the procedures for making sure that minimum safe approach distances (SAD) to electrical equipment are not infringed refer to PR D 78700 Working around Electrical Equipment.</p> <p>Line Managers are to make sure that all electrical equipment which requires in-service safety inspection and testing are inspected and tested at the appropriate interval.</p>
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Electrical equipment selection

Electrical equipment of the type captured in the scope of this SWI shall only be selected or accepted for use if it is marked with the Regulatory Compliance Mark (RCM) and the Supplier or Manufacturer is registered in the national RCM registration database.



The RCM mark

Electrical equipment requirements

When an electrical fault is detected, the item is to be immediately withdrawn from service, quarantined and a tag labelled CAUTION - DO NOT OPERATE affixed to the item. The nature of the fault (or suspected fault) is to be stated on the tag.

Unqualified employees are to not attempt to repair electrical items. All electrical repairs or alterations are to be carried out by a Qualified Electrician in accordance with the requirements set by the Department of Fair Trading NSW or returned to the manufacturer or their Agent for repair or alteration.

Where practicable, electrical equipment is to be switched off when premises are unattended.

Areas around electrical switchboards are to be kept clear for a distance of at least one metre.

Residual Current Devices (RCDs)

Where practicable, RCDs are to be installed at switchboards or alternatively in individual power outlets where protection of all outlets on a final sub circuit is not required. It may also be appropriate to provide portable RCD units where RCD's are not permanently installed.

All final sub circuits within portable buildings, including site sheds or caravans are to be protected with a RCD.

RCD's are to be installed in accordance with AS/NZS 3000.

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	<p>Power outlets, Extension cords and power boards, etc.</p>	<p>Wherever practicable, sufficient power outlets are to be installed in accordance with AS/NZS 3000 to supply all electrical equipment without the use of power boards, double adaptors or extension cords.</p> <p>Electrical equipment having a power consumption of 2000 Watts or greater, such as many electric heaters, should be plugged directly into an individual power outlet.</p> <p>Approved power boards (look for the RCM mark) have an overload cut out and are preferred over the use of double adaptors or piggy back plugs. Piggyback arrangements of double adaptors are not to be used as the circuit can become overloaded and live pins can be exposed creating a hazardous situation.</p> <p>Double adaptors are not to be used within workplaces except in office situations supplying low wattage equipment, e.g. computer equipment.</p> <p>Extension cords are:</p> <ul style="list-style-type: none"> • to be commercially manufactured, obtained from a commercial outlet and Approved by a Government Regulator or accredited equivalent (look for the RCM mark), • NOT to be made up from component parts but rather integrally moulded, • to have transparent or moulded plugs and sockets, with recessed type sockets and partially insulated live pins, • be positioned in a way that they cannot become damaged, wet or become a trip hazard. <p>All extension cords, other than those in offices, are to be heavy-duty type conforming to AS/NZS 3199, and be protected by a residual current device (RCD) at the power outlet from which it is supplied.</p>
<p>Electrical equipment requirements (cont.)</p>	<p>Generator sets & Stand-alone power systems</p>	<p>All generator sets and stand-alone power systems connected to permanent wiring are to:</p> <ul style="list-style-type: none"> • comply with the appropriate Australian Standard (look for the RCM mark), • have over current protection, • incorporate Residual Current Device protection and • be installed in accordance with AS/NZS 3000.
	<p>Supplies to transportable buildings</p>	<p>The electrical connections to all transportable buildings are to:</p> <ul style="list-style-type: none"> • be direct from a switchboard, portable generator set or stand-alone power system, • not have flexible cords more than 15m long, • provide protection from mechanical damage for flexible cords if used, • be protected by a RCD, and • be installed in accordance with AS/NZS 3001.
	<p>Electrical tools and equipment used near 1500 Volt DC OHW structures and equipment</p>	<p>When working on or near 1500 Volt DC OHW structures or equipment, only use electric power tools and equipment that are:</p> <ul style="list-style-type: none"> • battery operated, or • supplied from an isolating transformer, generator set or standalone power system. <p>This applies to all electric power tools and equipment to be used in the rail corridor, substation, substation and section hut, including work on:</p> <ul style="list-style-type: none"> • overhead wiring structures, • rail, and • rail connected equipment, (including trains standing on the rails).

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Electrical equipment assessment	<p>Electrical equipment is to be assessed to determine:</p> <ul style="list-style-type: none"> • whether In-service inspection and testing is required, and • the interval of inspection and testing. <p>Refer to the Note contained within the Scope section of this document for particular equipment that does NOT require inspections and tests as per this SWI. However an assessment is to be conducted and recorded on <u>SMS-06-FM-4279 Electrical Equipment Environment Assessment</u>.</p> <p>Refer to the Personnel Certification section of this document as to whom can perform an assessment.</p>
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Hired electrical equipment	<p>Electrical equipment should not be accepted for hire if it does not have a current inspection tag at the commencement of hire.</p> <p>Line Managers are to make sure that any hired electrical equipment which requires In-service inspection and testing is inspected and tested.</p>
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Inspection and testing	<p>New equipment purchased from a supplier need not be inspected or tested, however a before-use check is to be conducted by an appropriate person prior to introduction to the workplace to check that no damage has occurred in transit or during commissioning. The equipment details are to be entered into the <u>SMS-06-FM-4279 Electrical Equipment Inspection and Test Record</u>.</p> <p>Where required by this SWI, a tag setting out the date of introduction to the workplace and the first scheduled inspection is to be affixed to the equipment. (Refer AS/NZS 3760 clause 2.4.)</p> <p>Line Managers are to make sure that:</p> <ul style="list-style-type: none"> • All employees who use electrical equipment are instructed to conduct visual and physical inspections before use <i>“to detect obvious damage, wear or other conditions which might render it unsafe. Equipment shall not be dismantled to perform inspection and testing, nor tested to destruction.”</i> (AS/NZS 3760 clause 1.2.) Guidance to visual and physical checks is documented in AS/NZS 3760 clause 2.3.2 • Management systems are in place to make sure that, where required, in-service inspection and testing of equipment is carried out and recorded. <p>Management systems are to include audits to make sure that in-service inspection and testing are being undertaken as required. Refer <u>SMS-16-GD-3106 Guide to Plant, Equipment and Workplace Inspections</u>.</p> <table border="1" data-bbox="303 1400 1485 1471"> <tr> <td data-bbox="303 1400 566 1471">Procedure</td> <td data-bbox="566 1400 1485 1471">Inspection and testing is to be carried out in accordance with AS/NZS 3760.</td> </tr> </table>	Procedure	Inspection and testing is to be carried out in accordance with AS/NZS 3760.
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	Frequency	<p>Electrical equipment is to be tested and inspected:</p> <ul style="list-style-type: none"> when a site shed is relocated, test all electrical appliances within site shed/office, when any damage is observed or equipment is suspected of being faulty, and routinely, based on risk assessment. (Refer to the Electrical equipment assessment section of this SWI.) <p>Table 1 sets out the “Maximum intervals between inspections and tests for particular environments and/or equipment”.</p> <p>Table 2 sets out the “Maximum intervals between inspections and tests for specific equipment”.</p> <p>The shorter interval defined in either Table 1 or Table 2 is to be used as the interval between inspections and tests.</p> <p>However, inspection and testing intervals may be increased or reduced to that nominated in Table 1 or Table 2 based on risk assessment and inspection history. In such a case a risk assessment is to be performed by a competent person (refer Personnel Certification section of this document) to determine the appropriate in-service inspection intervals for the equipment. Factors to be considered in the risk assessment include:</p> <ul style="list-style-type: none"> whether the equipment is operating in a hostile environment, method and type of cord/cable and potential for friction and bending to cause damage to conductors, insulation and terminations, and how often the equipment is moved.
Equipment tagging and isolation	Inspection tags	Electrical equipment that has been inspected and tested and which has been found to be satisfactory is to be tagged as per AS/NZS 3760 clause 2.4.2
	Quarantine of defective items	<p>Items found to be defective are to be removed immediately from service and quarantined from use before repair.</p> <p>The person removing the item from service is to affix a CAUTION - DO NOT OPERATE tag to the item. The tag is to describe the defect of concern.</p>



Warning

Do not remove the “**CAUTION - DO NOT OPERATE**” tag until the item has been repaired and retested or destroyed.

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Inspection records	<p><u>Line Managers</u>, identified as being responsible for inspection and testing of electrical equipment, are to make sure that the results of routine inspections and tests (other than user inspections) are recorded. Records may be kept either on site, at the respective division office or with a third party provider.</p> <p>Records are to include:</p> <ul style="list-style-type: none"> the type and description of the item the plant or serial number the inspection or test date, a retest date the result of the inspection and test details of any repair work required or carried out identification of either the person or company/business who performed the inspection and test. Persons shall be identified by their name, personal certification whereas a company/business shall be identified by their ABN/ACN/ARBN, registered trademark or business number. <p>Results may be stored utilising the SMS-06-FM-0278 Electrical Equipment Inspection & Test Record form or any other report/document/register format in compliance with AS/NZS 3760 clause 2.4 & 2.5, and SMS-16-GD-3106 Guide to Plant, Equipment and Workplace Inspections.</p>
Cleaning equipment	<p>After disconnection from supply, which in the case of equipment connected via a flexible cord and plug means removing the plug from the socket outlet, equipment is to be cleaned only by wiping with soap and water or with a solvent approved by the manufacturer of that equipment.</p>
Storing equipment	<p>Electrical equipment is to be stored in a dry place, away from heat and direct sunlight.</p> <p>The equipment is to also to be protected from impact, contact with sharp implements, corrosive substances or other possible causes of damage.</p> <p>During storage, cords/cables are not to be put under excessive strain or pressure.</p>

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Personnel Certification	<p>Sydney Trains persons performing risk assessments on electrical equipment must hold an electrical engineering degree and be employed by Sydney Trains at a Level 5 or above, or hold a NSW Fair Trading:</p> <ul style="list-style-type: none"> Qualified Supervisor Certificate (Electrician) or Contractor Licence (Electrical - Q). <p>Sydney Trains persons performing in-service inspections and tests on electrical equipment shall hold a NSW Fair Trading:</p> <ul style="list-style-type: none"> Qualified Supervisor Certificate (Electrician) or Contractor Licence (Electrical - Q). <p>A Company/Business to be engaged to perform in-service inspections and tests on electrical equipment shall:</p> <ul style="list-style-type: none"> be registered with the Australian Securities and Investment Commission (ASIC). Search the National Names Index here: ASIC names search, and provide a current certificate of currency for Public and Product Liability insurance to the value of \$10M, and provide a current certificate of currency of Workers Compensation <p>Line Managers are to make sure that either the Sydney Trains staff or the external company required to perform risk assessments, inspection and /or testing activities on electrical equipment meet the particular requirements indicated above.</p> <p>Employees are to carry out their work in accordance with this instruction and seek guidance and / or supervision before attempting to carry out a task for which they have not demonstrated and maintained satisfactory competence.</p>
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Additional controls NIL

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Table 1 – Maximum Interval between inspection and tests for particular environments

Type of environment and/or equipment	Equipment including Class I equipment, Class II equipment, cord sets, cord extension sets and EPODs	Residual current devices (RCDs)			
		Push-button test – by user		Operating time and push-button test	
		Portable (c)	Fixed (d)	Portable (e)	Fixed (f)
(a)	(b)				
1 Factories, workshops, places of manufacture, assembly, maintenance or fabrication	6 months	Daily, or before every use, whichever is the longer	6 months	12 months	12 months
2 Environment where the equipment or supply cord is subject to flexing in normal use OR is open to abuse OR is in a hostile environment	12 months	3 months	6 months	12 months	12 months
3 Environment where the equipment or supply cord is NOT subject to flexing in normal use and is NOT open to abuse and is NOT in a hostile environment	5 years	3 months	6 months	2 years	2 years

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Table 1 – Maximum Interval between inspections and tests for particular environments (continued)					
Type of environment and/or equipment	Equipment including Class I equipment, Class II equipment, cord sets, cord extension sets and EPODs	Residual current devices (RCDs)			
		Push-button test – by user		Operating time and push-button test	
(a)	(b)	Portable (c)	Fixed (d)	Portable (e)	Fixed (f)
4 Residential type areas of: hotels, residential institutions, motels, boarding houses, halls, hostels accommodation houses, and the like	2 years	6 months	6 months	2 years	2 years
5 Equipment used for commercial cleaning	6 months	Daily, or before every use, whichever is the longer	N/A	6 months	N/A
6 Hire equipment: Inspection Test and tag	Prior to hire	Including push-button test by hirer prior to hire		N/A	N/A
	3 months	N/A		3 months	12 months
7 Repaired, serviced and second-hand equipment	After repair or service which could affect electrical safety, or on reintroduction to service, refer to AS/NZS 5762.				

Notes:

- Table extracted from AS/NZS 3760 Table 4.
- Class I Equipment - Protection from electric shock via all exposed metal parts being connected to the protective earthing conductor.
- Class II Equipment - Protection from electric shock via by double insulation.
- EPOD means an electric portable outlet device, which are commonly referred to as a power board.
- For all equipment, follow manufacturers' recommendations for maintenance, servicing and/or inspections. If the manufacturer's intervals differ from those in the table use the shorter interval.
- THESE ARE MAXIMUM INTERVALS. If inspections and tests (or daily before use inspections) show that particular defects are occurring on a regular basis:
 - A review of work practices is to be undertaken to eliminate or control the cause (or effects) of the damage.
 - Where the cause cannot be eliminated shorter in-service inspection and testing intervals are to be applied together with other measures to control the risks of damage in use.
- Where a manufacturer recommends inspection or test methods which exceed those set out in AS/NZS 3760 and the equipment is not operated in a hostile environment, the manufacturers' recommendations are to be applied.
- For all equipment, pre use inspection by users and operators is to be included as a task step in relevant SWMS/SWIs. Users and operators are to be instructed in how to conduct a daily before use inspection of electrical equipment they are required to use and the means by which suspected faulty equipment is to be quarantined from service. Communicate information via SWMS/SWIs instruction, pre work briefs and toolbox talks.

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Table 2 Maximum intervals between inspections and test intervals for specific equipment

Equipment	Location	Maximum inspection and test intervals	Comments
Toasters, kettles, sandwich toasters, similar small non-fixed appliances	Sydney Trains meal rooms (other than construction sites)	12 months	These are usually domestic rather than commercial appliances. Use of domestic appliances in the workplace increases the risk of faults due to multiple users, increased frequency of use and lack of user care.
Microwave ovens	Sydney Trains meal rooms (other than construction sites)	12 months	Also check door fittings alignment, condition and door interlock. The Australian Radiation Protection and Nuclear Safety Agency advises routine testing of microwave leakage is not necessary for ovens in good condition and used correctly
Back pack type vacuum cleaners (both protectively earthed and double insulated)	All Sydney Trains (other than construction sites)	6 months	Supply leads are to be fitted with an RCD plug top. Operators are to be instructed in visual inspection of equipment and are to conduct such inspection at the start of the shift.
Powered hand tools	All Sydney Trains (other than construction sites)	Depending on environment see Table 1	This SWI does not cover electrical equipment used at construction sites, in such cases refer to D2013/81208 Electrical Practices for Construction Work .
Office equipment – e.g. photocopiers, printers computers, faxes	All Sydney Trains Office locations (other than construction sites)	5 years	Does not include portable items such as laptop computers that might be removed from the standard office environment. Such portable item and equipment located in a hostile environment such as a workshop is to be treated as per Table 1.

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