

Electrical Equipment – Selection, Inspection and Testing

Document no.	Work description
SMS-06-SW-0274	Selection, in-service safety inspection and testing of: <ul style="list-style-type: none"> • single and poly phase low voltage equipment designed to be connected using a flexible power supply cord and plug • single and poly phase low voltage equipment which is withdrawable or moveable, and is connected to fixed wiring via flexible cable connected to terminals • cord extension sets • electrical portable outlet devices • cord-connected portable residual current devices • portable isolation transformers.
Review date 12/04/10	

Scope

This SWI does not cover electrical equipment used at construction sites. For the relevant instructions, refer to [SMS-06-SW-0298 Electrical Practices for Construction Work](#).

This SWI covers the in-service inspection and testing of low voltage single (240V) and polyphase (415V) electrical equipment that is:-

- moveable from position and supplied by flexible cable terminated at fixed wiring and moved for use, restocking, cleaning or maintenance, or
- supplied by flexible cable terminated at fixed wiring where the cable is flexed during use, or
- moveable from position and supplied by flexible cable and plug and socket, or
- portable and supplied by flexible cable and plug and socket, or
- transportable and supplied by flexible cable and plug and socket.

The requirements for supply to portable buildings, including site sheds or caravans, are also included.

Equipment does not generally require in-service inspections if it is:

- supplied by flexible cable which is terminated at fixed wiring, and
- NOT flexed during use, and
- the equipment is not moved for use, restocking, cleaning or maintenance.

However, the manufacturer's instructions in relation to inspections and testing are to be followed and an assessment performed to determine that the equipment is not operating in a hostile environment. Where such equipment is operated in a hostile environment, in-service inspections are to be conducted in accordance with Table 4.

References

- WorkCover NSW Guidance Note - Electrical Equipment Risk Assessment
- AS/NZS 3000 Wiring Rules
- AS/NZS 3190 Earth Leakage Device Approval and Test Specification
- AS/NZS 3199 Approval and test specifications for cord extension sets
- AS/NZS 3760 In-service safety inspection and testing of electrical equipment
- AS/NZS 5762 In-service safety inspection and testing - Repaired electrical equipment
- [Fact Sheet 12 - Radiation Emissions From Microwave Ovens](#) Aust Radiation Protection and Nuclear Safety Agency
- [SMS-06-GD-0268 Work Around Electrical Equipment](#)

Responsible supervisor <i>Insert name in BLOCK letters</i>	PPE and precautions	Competencies or qualifications	Licences or permits required
	N/A	Refer to Table 4	N/A

Tools and equipment required

- portable appliance tester
- insulation resistance tester
- RCD tester
- multimeter
- [SMS-06-FM-0279 Electrical Equipment Assessment](#)
- [SMS-06-FM-0278 Electrical Equipment Inspection and Test Record](#)

IF CONTROL MEASURES ARE NOT SUITABLE AND MAJOR CHANGES ARE NEEDED, CONDUCT A RISK ASSESSMENT AND DEVELOP NEW CONTROLS ACCORDING TO SMS-06-PR-0104 WORKPLACE RISK MANAGEMENT.

**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 related SWIs.

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Background	<p>Persons using electrical equipment are exposed to the risk of electric shock or burns from faulty electrical equipment. For information about electrical hazards, refer to SMS-06-GD-0268 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 appropriate intervals (See Table 2).</p>																		
Electrical equipment requirements	<p>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.</p> <p>Unqualified employees are to not attempt to repair electrical items. All electrical repairs or alterations are to be carried out by a licensed person.</p> <p>Where practicable, electrical equipment is to be switched off when premises are unattended.</p> <p>Areas around electrical switchboards are to be kept clear for a distance of at least one metre.</p>																		
Residual Current Devices (RCDs)	<p>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 safety switches are not permanently installed.</p> <p>All final sub circuits within sheds or caravans are to be protected with a RCD.</p>																		
Extension cords and power boards, etc.	<p>Wherever practicable, sufficient power outlets are to be installed to supply all electrical equipment without the use of power boards or double adaptors.</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>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>Approved power boards with an overload cut out are preferred over double adaptors or piggy back plugs - sufficient power outlets are preferred over power boards.</p> <p>These extension cords are to:</p> <ul style="list-style-type: none"> • have transparent or moulded plugs and sockets, with recessed type sockets • be positioned in a way that they cannot become damaged, wet or become a trip hazard. <p>All extension leads, 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>The maximum length of a 240 volt extension set is shown in Table 1.</p> <p>Table 1 Maximum length of flexible cord</p> <table border="1"> <thead> <tr> <th>Cord extension set rating (amps)</th> <th>Conductor area (sq mm)</th> <th>Maximum length of flexible cord (metres)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">10</td> <td>1.0</td> <td>25</td> </tr> <tr> <td>1.5</td> <td>32</td> </tr> <tr> <td rowspan="2">15</td> <td>1.5</td> <td>25</td> </tr> <tr> <td>2.5</td> <td>40</td> </tr> <tr> <td rowspan="2">20</td> <td>2.5</td> <td>30</td> </tr> <tr> <td>4.0</td> <td>40</td> </tr> </tbody> </table> <p>The maximum length of 240 volt extension cords is not to be increased by more than 5 meters by the attachment of electrical equipment.</p>	Cord extension set rating (amps)	Conductor area (sq mm)	Maximum length of flexible cord (metres)	10	1.0	25	1.5	32	15	1.5	25	2.5	40	20	2.5	30	4.0	40
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Electrical equipment requirements cont	Generators	All generators connected to permanent wiring are to: <ul style="list-style-type: none"> have over current protection incorporate Residual Current Device protection (RCD) except when the permanent wiring is already protected by a RCD.
	Supplies to portable buildings	The electrical connections to all portable buildings are to: <ul style="list-style-type: none"> be direct from a switchboard or generator not have flexible cords more than 15m long provide protection from mechanical damage for flexible cords if used be protected by a RCD.
	Electrical equipment near 1500 Volt DC electrified lines	To prevent 1500 volt DC entering the low voltage earthing system via earthed electrical equipment used near the 1500 Volt DC electrified lines equipment are to be: <ul style="list-style-type: none"> double insulated battery operated, or supplied from an isolating transformer or generator. This applies to electrical equipment that is to be used in the 1500 volt DC electrified area on: <ul style="list-style-type: none"> rail rail connected equipment, (including trains standing on the rails) overhead wiring structures.

Electrical equipment assessment	Electrical equipment is to be assessed to determine: <ul style="list-style-type: none"> whether In-service inspection and testing is required the interval of inspection and testing. Results of the assessment are to be recorded on SMS-06-FM-0279 Electrical Equipment Environment Assessment .
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Hired electrical equipment	All hired electrical equipment is to be inspected, tested and tagged at the supplier's premises prior to use. Electrical equipment should not be accepted for hire if it does not have a current inspection tag at the commencement of hire. Line Managers are to make sure that any hired electrical equipment which requires In-service inspection and testing is inspected and tested.
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Inspection and testing	Line Managers are to make sure that: <ul style="list-style-type: none"> All employees who use electrical equipment are instructed in conducting daily before use checks of the equipment. Management systems are in place to make sure that, where required, in-service inspection and testing of equipment is carried out and recorded. Management systems are to include audits to make sure that In-service inspection and testing are being undertaken as required.
Procedure	Inspection and testing is to be carried out in accordance with AS/NZS 3760 and, where required, repaired in accordance with AS/NZS 5762.
Frequency	Electrical equipment is to be tested and inspected: <ul style="list-style-type: none"> when a site shed is relocated (test all electrical appliances within site shed/office) before return to service after repair when any damage is observed or equipment is suspected of being faulty routinely, based on risk assessment (see Table 2 of this document). 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. The equipment details are to be entered into the Inspection and Test Record and a risk assessment performed by a competent person to determine the appropriate in-service inspection intervals for the equipment. A tag setting out the date of introduction to the workplace and the first scheduled inspection is to be affixed to the equipment.

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Inspection and testing cont	Frequency cont	<p>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 cable and potential for friction and bending to cause damage to conductors, insulation and terminations • how often the equipment is moved. <p>Inspection and testing intervals may be increased or reduced based on risk assessment and inspection history. Certain equipment within RailCorp has reduced interval requirements due to the operating conditions & environment.</p> <p>Table 2 sets out the requirements for routine inspection and tests for various environments.</p>						
Table 2 Maximum intervals between inspections and tests for particular environments <small>(See Notes)</small>								
Environment	Equipment class		Residual Current Devices (RCDs)				Cord sets and power boards	
	Class I	Class II	Push button test		Operating time and push button test			
			Portable	Fixed	Portable	Fixed		
Maintenance depots, fabrication, machine or maintenance workshops, presentation services depots, public areas of stations, use within trains	6 months	12 months	Daily or before use if used less often	6 months	12 months	12 months	6 months	
Office/facility cleaning	6 months	6 months	3 months	N/A	12 months		6 months	
Other locations, hostile environment or use factors	12 months	12 months	3 months	6 months	12 months	12 months	12 months	
Other locations, non-hostile environment	5 years	5 years	3 months	6 months	2 years	2 years	5 years	
<ol style="list-style-type: none"> 1. Class 1 Equipment - Protection by all accessible conductive parts connected to protective earthing conductor 2. Class II Equipment - Protection by double insulation 3. 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. 4. THESE ARE MAXIMUM INTERVALS. If inspections and tests (or daily before use inspections) show that particular defects are occurring on a regular basis: <ol style="list-style-type: none"> a) A review of work practices is to be undertaken to eliminate or control the cause (or effects) of the damage b) 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. . . 5. Where a manufacturer recommends inspection or test methods which exceed those set out in AS/NZS 3760, the manufacturers' recommendations are to be applied. 6. 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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Inspection and testing frequency cont

Table 3 Mandatory maximum inspection and test intervals for specific equipment

Equipment	Location	Maximum inspection and test intervals	Comments
Toasters, kettles, sandwich toasters, similar small non-fixed appliances	RailCorp meal rooms (other than construction sites)	12 months	
Microwave ovens	RailCorp 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 RailCorp (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 RailCorp (other than construction sites)	depending on environment see Table 2	
Office equipment – eg. photocopiers, printers computers, faxes	All RailCorp 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 2

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. The inspection tags are to show: <ul style="list-style-type: none">• the date of inspection and test• the date of the next scheduled inspection & test• the plant number or identifying number of the item inspected• licence number or competency identification and signature of the inspecting person.
	Quarantine of defective items	Items found to be defective are to be removed immediately from service and quarantined from use before repair. 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.
	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>Line Managers, 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 (SMS-06-FM-0278 Electrical Equipment Inspection & Test Record) may be kept either on site or at the respective division office.</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 date of the inspection and test • the result of the inspection and test • details of any repair work required or carried out • the inspecting person's name, licence number or competency identification and signature. 	
Cleaning equipment	Equipment is to be cleaned only by wiping with soap and water or with a solvent approved by the manufacturer of that equipment.	
Storing equipment	<p>Electrical equipment is to be stored in a dry place, away from heat and direct sunlight. The equipment is to also be protected from contact with sharp implements, corrosive substances or other possible causes of damage.</p> <p>During storage, cables are not to be put under excessive strain or pressure.</p>	
Competence and training	<p>Persons performing risk assessments and in-service inspections and tests on electrical equipment are to be appropriately qualified and competent as indicated in Table 4.</p> <p>Line Managers are to make sure that all staff required to perform risk assessments, inspect and /or test electrical equipment are competent in the required skills and hold the necessary qualifications set out in Table 4.</p> <p>Persons in training are to be supervised by a person competent in the skill being learned.</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>	
Table 4 Competency levels for risk assessments and in-service inspections and test		
Equipment type	Test equipment	Competency required
Moveable from position supplied by flexible cable terminated at fixed wiring	Discrete test & measurement instruments	Qualified Supervisor Certificate (Electrical) or Contractor Licence (Electrical) - Qualified
Moveable from position and supplied by flexible cable and plug and socket or Portable or transportable supplied by flexible cable and plug and socket	Portable appliance tester	<ul style="list-style-type: none"> • Attendance at a course relevant to the tester being used and relevant experience i.e. TAFE course No 9989 - Safety checking of electrical appliances • Holder of a Restricted Electrical Licence (Disconnect/Reconnect) and relevant experience • Holder of a Qualified Supervisor Certificate (Electrical) or Contractor Licence (Electrical) - Qualified
	Discrete test & measurement instruments	Holder of a Qualified Supervisor Certificate (Electrical) or Contractor Licence (Electrical) - Qualified

Additional controls