Safe Work Instruction

Electrical Practices for Construction Work

DOCUMENT NO.	D2013/81208
WORK DESCRIPTION	To provide information about the hazards, controls and the safety requirements related to electrical work associated with electrical installations on construction and demolition sites. ***Note:*** *This SWI does not represent the sole technical requirements in relation to electrical practices for construction work and as such full compliance with the relevant standards and in particular identified clauses and WorkCover Code of Practice is required.*
REVIEW DATE	28/01/2024
RISK ASSESSMENT REF.	
SCOPE:	This SWI is applicable to all workers, employees or contractors, who carry out electrical work at construction or demolition workplaces owned, maintained or managed by Sydney Trains. "Construction work means any work carried out in connection with the construction, alteration, conversion, fitting-out, commissioning, renovation, repair, maintenance, refurbishment, demolition, decommissioning or dismantling of a structure." (Refer to WHS Regulation 2017 chapter 6 for full details.)
AUTHORISATIONS:	(List specific operator competency requirements, e.g. area induction, qualifications, certificates, WHS training, supervision. List who can approve that competency has been achieved)
HAZARDS:	• Electric shock • Electrocution • Fire • Property, infrastructure & asset damage/impact
SAFETY CONTROLS:	• Isolations • Battery operated equipment • LV rescue kit • Defibrillator • Permit system • Test for Dead • D2013/80874 PPE for Electrical Work as determined by Risk Assessment
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 referenced documents.
PRESTART REQUIREMENTS:	• Conduct a prestart safety check of equipment • Remove flammable ignition sources • Risk assessment • Prepare work area, equipment and/or operator

Prepared using SMS-06-TP-4317 v1.4, Custodian: Senior Safety Specialist Safety Systems; Approver: Director Safety and Standards; Issue date: 15/09/2020

INSTRUCTIONS:

Construction wiring, accessories and fittings

Installation and removal	All electrical work at construction sites shall comply with the relevant requirements of Sydney Trains SMS, ASA Engineering Standards, AS/NZS 3012 and the Safe Work Australia Codes of Practice. Construction work shall be managed by an Authorised Engineering Organisation accredited by TfNSW and performed in accordance with the relevant TfNSW standards published on the TfNSW Asset Standards Authority website. All maintenance and operation required on the Electrical Distribution System shall be managed directly by relevant Electrical representatives in Sydney Trains. Operation of the electrical network shall be coordinated with and managed by the Electrical System Operators at ICON, and maintenance shall be managed by Network Maintenance Division. All construction wiring shall be installed in a manner which will prevent personal injury and damage to property consistent with the requirements of AS/NZS 3012. Construction is performed by Authorised Engineering Organisations accredited by TfNSW Asset Standards Authority.
Electrical equipment near 1500 Volt DC Overhead Wiring Structures or Equipment	When working on or near 1500 Volt DC OHW structures or equipment, only use electric power tools that are: • battery operated, or • supplied from an isolating transformer, generator or inverter. This applies to electrical power tools and equipment to be used in the rail corridor, substation and section hut, including work on: • overhead wiring structures • rail, and rail connected equipment, (including trains standing on the rails).
Note:	*Refer to the **Network Rules** for additional requirements regarding the use of tools whilst undertaking activities in the Rail Corridor, eg. **NWT 308 Absolute Signal Blocking** and **NWT 310 Lookout Working**.*
Wiring for lift and service shafts	Wiring for lift and service shafts shall be in accordance with AS/NZS 3012. Wiring may be construction wiring or permanent wiring.
Residual Current Devices (RCDs)	RCDs, also known as Core Balance Earth Leakage Devices or Safety Switches shall comply with AS/NZS 3190, operate in all live (active and neutral) conductors and have a tripping current of 30mA or less.
Switchboards	AS/NZS 3012 has specific mandatory design, construction, location, mounting and installation requirements for construction supply switchboards. Isolate final sub circuits supplying power to outlets and equipment which are not required outside working hours at the end of work. Lock the main switchboard at the end of work each day.
Overload protection and marking	Overload protection of sub-mains and final sub-circuits shall be in accordance with AS/NZS 3012 clause 2.4.5. Distinguish construction wiring from permanent wiring by using different colour cable or affixing tape in accordance with AS/NZS 3012 clause 2.5.4.
Transportable structures	Construction wiring for transportable structures such as personnel and materials hoists, shall be supplied from a separate final sub circuit that originates at the main switchboard and is suitably identified. Other specific mandatory requirements are detailed in AS/NZS 3012 clause 2.9.
Lighting	Install adequate artificial lighting where natural light is not sufficient to provide sufficient lighting for the tasks being performed. Protect all light fittings from mechanical damage by way of wire guards or diffusers suitable for the fitting and location. Install battery back-up lighting of at least one hour capacity where lighting is required to provide safe access and egress in stairwells and passageways and for lighting in lift and service shafts. Lighting for lift and service shafts can be supplied by either construction wiring or permanent wiring and shall be fluorescent type, located either above or below the work area. Festoon lighting shall be used only in underground shafts, wells and tunnels. It shall be supplied at Extra Low Voltage (32VAC or less) and use non-removable fittings which are moulded to the cable. Light fittings installed in site sheds as permanent fixtures (other than lampholders) do not require additional mechanical protection. Recommended minimum lighting levels and other specific mandatory requirements are detailed in AS/NZS 3012 clause 2.7 and 2.8

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Portable generating sets	Low voltage portable generators shall comply with the requirements of AS 2790 and be connected in accordance with AS/NZS 3010 and AS/NZS 3012. All generators connected to construction wiring or permanent wiring used during construction shall: • have over current protection, and • incorporate Residual Current Device protection (RCD) except when the permanent wiring is already protected by a RCD.
DC to AC inverters	Inverters produce an alternating current output (usually a nominal 240 V) from an extra low voltage direct current input (usually 12-24 V supplied by batteries). The output of most inverters will produce sufficient energy to deliver a fatal electric shock and, for some inverters under certain fault conditions, a hazardous voltage can be imposed on the supply battery terminals and/or exposed metal. Inverters used on construction and demolition sites shall comply with the requirements of AS/NZS 4763 and be used in accordance with AS/NZS 3012 clause 2.4.6.4.
Flexible cords and extension cords	
Transportable construction buildings supplied by flexible cords	Where transportable construction buildings are supplied via flexible cords the following requirements shall be met: • supply is not to be "cascaded" via flexible cords from one transportable building to another, and • the minimum cross sectional area and maximum length of flexible cords supplying transportable buildings shall be 2.5 mm2 and 15 metres respectively, and • each amenities building shall be connected to a final sub circuit protected by an RCD, and • flexible cords shall be suitably protected from mechanical damage. Other specific mandatory requirements are detailed in AS/NZS 3012 clause 2.9.
Extension cords and fittings	Plugs and sockets on power tools and extension cords shall be either moulded non re-wireable type or, if re-wireable type, fitted with a transparent cover so that the connections are visible and any damage can be detected. Extension cords shall be heavy duty sheathed type in accordance with AS/NZS 3199. Flexible cables shall comply with AS/NZS 5000. Maximum lengths of flexible cords and flexible cables shall be as per Table 1 of AS/NZS 3012. Maximum lengths are not to be increased by greater than 5 metres by the attachment of electrical equipment. Do **not** use cables intended for fixed wiring, such as flat Thermoplastic Sheathed cable, as flexible cords or cables. Do **not** use flexible cords in areas where they may be exposed to moisture or mechanical damage. Flexible cables shall be supported to run above work areas and passageways. or provided with protective mechanical covers if run on the ground In multi-level construction extension cords shall be run on the same level as the outlet or, if work is in the stairwell, up or down one level only. (Does not apply to falsework or lift and service shafts). Do **not** use double adaptors, piggy back plug/socket fittings. Flexible extension cords should not be used while in a coiled or reeled configuration. Electric Portable Outlet Devices (usually known as power boards) intended for household and light duty applications are not suitable for use in a construction environment. Any Portable Socket-Outlet Assembly (PSOA) used is to have: • an enclosure of impact resistant and durable material and be double insulated, • socket outlets which are suitably protected against mechanical and environmental damage, • a supply lead which is heavy duty sheathed type and maximum length 1.8 metres overload protection, and • RCD protection. Other specific mandatory requirements are detailed in AS/NZS 3012 clause 2.6.
	***Note** Particular requirements exist for use of electrical equipment in the 1500 Volt DC electrified area. Refer to the "Electrical equipment near 1500 Volt DC Overhead Wiring Structures or Equipment" section of this SWI.*

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Defective equipment	Any equipment which appears or is tested as defective shall be: • quarantined to prevent use until inspected, tested and repaired as necessary, and • tagged with a CAUTION - DO NOT OPERATE tag (as per SMS-06-OP-3046 Energy Lock-Out - Tag-Out that states the apparent fault or defect Line Managers shall make sure that a supply of tags to be affixed to non-compliant equipment is kept on site to allow persons to mark equipment suspected of being faulty. Where defective equipment is not (or cannot) be repaired at the time of the in service inspection it shall be tagged with a "CAUTION – DO NOT OPERATE" tag pending repair by a qualified or competent person. Repairs shall be carried out in accordance with AS/NZS 5762. Details of repairs carried out shall be recorded in the register and the item fitted with an inspection tag. If the equipment is not to be repaired it shall be disposed of and recorded as disposed in the register.
Warning	*Do **not** remove the **"CAUTION - DO NOT OPERATE"** tag until the item has been repaired and retested or destroyed.*
Inspection and testing	
Components of the electrical installations of construction sites and demolition sites	Construction wiring, switchboards, RCDs, transportable structures, shall be inspected and tested in accordance with AS/NZS 3012 section 3, in particular clauses 3.1, 3.2, 3.4, 3.5, 3.8 and 3.10 where applicable. Portable generators and inverters shall be inspected and tested in accordance with AS/NZS 3012 section 3, in particular clause 3.1, 3.2, 3.7, 3.8 3.9 and 3.10 where applicable.
Electrical equipment, such as power tools, flexible cords & portable socket outlets etc	<u>Pre-use and user inspection</u> Electrical equipment is designed and manufactured to standards and specifications which take into account the environment in which the equipment will operate. When used and maintained in accordance with the recommendations of the manufacturer electrical equipment will perform its intended function safely and not create risks to the operator. However, there is always, the possibility of damage occurring, particularly when equipment is used in a construction environment. Construction environments create an increased risk of exposure to mechanical damage, moisture and misuse. Frequent transportation of equipment in toolboxes and site boxes also increases the risk of damage occurring. This damage may occur at any time during the intervals between in-service inspections (refer to the In-service inspection and testing section) and can usually be detected by way of user inspections. The supply lead and plug is the most likely part of portable equipment to become damaged and create a risk. Where damage which can create a risk of shock has occurred it is usually obvious and can be detected by way of a quick visual inspection prior to using the equipment and after an incident which may have resulted in damage - such as dropping a heavy object on an extension cord. For this reason, Line Managers shall make sure that employees are instructed in how to detect obvious defects in leads and equipment and this instruction shall be reinforced in toolbox talks and pre work briefs
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Records (Applicable to Components of the electrical installations of construction sites and demolition sites and electrical equipment)	Results may be stored utilising the SMS-06-FM-0278 Electrical Equipment Inspection and Test Record form or any other report/document/register format in compliance with AS/NZS 3760 clause 2.4 and 2.5, accepted and approved by the GM SEQR, Engineering & Maintenance. Results shall be retained as part of the site specific safety management plan where such is in place and maintained on site. Where a Site Specific Safety Management Plan is not in place the records shall be maintained in the workplace safety folder. Details to be recorded are: • date of inspection and testing • unique plant identifying number • results of the inspection and test • details of any repair work carried out • licence number (or training identifying number if not licensed) of the person who conducted the inspection and test. Records of inspections and tests for equipment owned or hired by Sydney Trains shall be recorded in the Plant Register database. This may be the sole record provided access to the database is available at the worksite or the location where the equipment is based. Records of inspections and tests for equipment owned or hired by contractors shall be provided to the relevant Sydney Trains representative (for a Sydney Trains managed worksite) or the principal contractor for inclusion in site records where a site specific safety management plan is in place. For worksites not covered by a site specific safety management plan, inspection records maintained by the owner of the equipment need not be sighted provided equipment tags are fitted and current.
CLEAN UP/ **SHUT DOWN PROCEDURES:**	• SMS-06-GD-0268 Working around Electrical Equipment (RailSafe) • PR D 78101 General Requirements for Electrical Work • SMS-06-OP-3046 Energy Lock-Out - Tag-Out • D2013/80873 Work on Low Voltage Installations • SMS-06-FM-4399 Plant and Equipment Isolation Plan • SMS-06-OP-3043 Managing Risks Using Safe Work Practices
EMERGENCY PROCEDURES:	• SMS-06-OP-3046 Energy Lock-Out - Tag-Out • SMS-06-FM-4399 Plant and Equipment Isolation Plan • D2013/80869 Electric Shock Protocol • D2013/80870 Rescue from Live Low Voltage Equipment (Including Rescue Kit Care)
FURTHER INFORMATION:	• AS 2790 - 1989 Electricity generating sets - Transportable (up to 25 kW) • AS/NZS 3000:2007 Electrical Installations (known as the Australian/New Zealand wiring rules) • AS/NZS 3010:2005 Electrical Installations – Generating sets • AS/NZS 3012:2010 Electrical installations - Construction and demolition sites • AS/NZS 3190:2011 Approval and test specification RCD's (current-operated earth-leakage devices) • AS/NZS 3199:2007 Approval and test specification – Cord extension sets • AS/NZS 4763:2011 Safety of portable Inverters • AS/NZS 5000 (various parts) Electrical cables – Polymeric insulated • AS/NZS 5762:2011 In-service safety inspection and testing - Repaired electrical equipment • SP E 70954 Sydney Trains Network Management Plan Chapter 2 – Customer Installation Safety • Safe Work Australia "Construction Work" Code of Practice July 2012 • Safe Work Australia "Managing Electrical Risks in the Workplace" Code of Practice July 2012 • SMS-06-GD-0268 Working around Electrical Equipment (RailSafe) • PR D 78101 General Requirements for Electrical Work (RailSafe) • SMS-06-OP-3046 Energy Lock-Out - Tag-Out • D2013/80869 Electric Shock Protocol • D2013/80870 Rescue from Live Low Voltage Equipment (Including Rescue Kit Care) • D2013/80873 Work on Low Voltage Installations • D2013/80874 PPE for Electrical Work • Work Health and Safety Act 2011 • Work Health and Safety Regulation 2017

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