Working with Sealed Batteries

Document no.	Work description
SMS-06-SW-1359	This Safe Work Instruction (SWI) outlines the safe work practices for working with sealed batteries, including installation, removal and the performance of maintenance work.
	Scope This document is not applicable to batteries that are of the unsealed type.
Review date 11/06/2012	**References** • OHS Act 2000 • OHS Regulation 2001 • ESAA Guide to Electrical Safety Systems • AS/NZS 3000 Electrical Installations (known as the Australian/New Zealand wiring rules) • National Code of Practice for Manual Handling [NOHSC: 2005 (1990)] • Manual Handling Resource WorkCover NSW 2004 • SMS-06-GD-0268 Working Around Electrical Equipment • SMS-06-GD-0001 Guide to Manual Handling • SMS-06-GD-0240 Working At Heights • SMS-06-SW-0298 Electrical Practices for Construction Work • SMS-06-SW-0276 Work on Low Voltage Installations • SMS-06-SW-0269 Electric Shock Protocol

Responsible supervisor *Insert name in BLOCK letters*	PPE and precautions	Competencies or qualifications	Licences or permits required
LINE MANAGER	• Safety Boots • Safety glasses or face shields • Acid-resistant gloves (PVC or Rubber) • Protective aprons	• Rail Industry Safety Induction (RISI) • OHS Construction Induction Training Card • Electronic/Electrical Trade Certificate	N/A

Tools and equipment required

- Hand tools (insulated)
- Mechanical aids (eg. trolley)

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.

General	Batteries require care in installation and maintenance. Unsafe installation or maintenance procedures can cause severe injury, such as muscular strain (back injuries), electrical shock or burns, acid burns, and fire can result if proper safety precautions are not followed.

Maintenance	The following safety procedure should be followed for performing maintenance work, along with the control measures for safe handling and use (as mentioned above): 1. Disconnect all power to battery before attempting to perform maintenance work (via battery circuit breakers, battery isolators, etc); **review the section on "electrical shock" before performing this action (page 3).** 2. General maintenance of the battery means keeping the battery and surrounding area clean and dry. 3. Conduct a visual inspection of the battery. 4. Re torque the battery connections. A loose connection can reduce battery standby time and cause battery fires. **Review the section on "electrical shock" before performing this action (page 3).** 5. Keep battery connectors clean, greased and tight; **review the section on "hazardous substances" before performing this action (page 3).** 6. Do not use organic solvents or other than recommended chemical cleaners on battery; **review the section on "hazardous substances" before performing this action (page 3).**

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Removal/ Replacement	The following safety procedure should be followed for the removal of batteries, along with the control measures for safe handling and use (as mentioned above): 1. Disconnect all power to battery before attempting to remove (via battery circuit breakers, battery isolators, etc); **review the section on "electrical shock" before performing this action (page 3).** 2. To reduce the risk of short circuiting to the enclosure (rack/cabinet), disconnect the terminal leads to the battery as per the following instructions: A. For positive earth systems (i.e. -48V) positive first then negative. B. For negative earth systems (i.e. +12V) negative first then positive. 3. Gently lift the battery from the rack/cabinet. Do not drop; **review the section on "manual handling" before performing this action (page 3).** 4. Install replacement battery as per the Installation Instructions.

Installation	The following safety procedure should be followed during installation, along with the control measures for safe handling and use (as mentioned above): 1. Transporting and lifting battery; **review the section on "manual handling" before performing this action (page 3).** 2. Check all batteries for visible defects such as cracked containers, loose terminal posts, or other unrepairable problems. Batteries with these defects must be replaced. 3. Ensure that support structures (racks, cabinets) are connected to the ground system in accordance with applicable codes. 4. Disconnect all power to battery before attempting to remove (via battery circuit breakers, battery isolators, etc); **review the section on "electrical shock" before performing this action (page 3).** 5. Determine the location of the positive and negative terminals of the battery with respect to the rack location. 6. Gently position the battery on the rack/cabinet. Do not drop. 7. Follow the electrical connection instructions carefully and review thoroughly before working on the battery. 8. To reduce the risk of short circuiting to the enclosure (rack/cabinet), connect the terminal leads to the battery as per the following instructions: A. For positive earth systems (i.e. -48V) negative first then positive. B. For negative earthing systems (i.e. +12V) positive first then negative. 9. Apply lock washer. Torque the terminal bolts or nuts. Do not over torque. **Review the section on "hazardous substances" before performing this action (page 3).** 10. Attach the cable with cable-ties to the wall or the rack so that the weight of the cable is not on the battery terminal. If using a stiff cable, pre-bend the cable so no "spring" force is placed on the battery terminals. Failure to support the cable weight could result in a premature battery failure and loss of battery integrity. 11. When installing cable ties make sure that they are trimmed flush to prevent risk of personal damage (cuts). 12. Verify correct polarity before connecting power. 13. Restore power to battery.

Broken battery case or electrolyte leakage	The following safety procedure should be followed in the event of a broken battery case or electrolyte leakage: 1. Neutralize any electrolyte or exposed internal battery parts with soda ash (sodium bicarbonate) until fizzing stops; **review the section on "hazardous substances" before performing this action (page 3).** 2. Keep untrained personnel away from electrolyte and broken battery. 3. Place broken battery and clean-up materials in a plastic bag or non-metallic container. Dispose of clean-up materials as a hazardous waste. Ventilate area as hydrogen gas may be given off during neutralization. **Review the section on "Fire or explosion" before performing this action (page 3).**

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Control Measures for Safe Handling and Use

The following precautions apply to all sealed battery installation and maintenance work.

Manual handling	• Batteries are heavy. Serious injury can result from improper lifting or installation. • Use mechanical aids or team lifting to transport batteries long distances. • Second person required for the installation and removal/replacement of batteries. • Always use proper lifting techniques when handling batteries: A. Keep back straight, elbows in and bend at the knees. B. Perform all movements smoothly, in a controlled, balanced, comfortable position. C. Avoid sideways bending or twisting of the back. • Do not lift, carry, install or remove cells by lifting or pulling the terminal posts. Always lift batteries by the bottom or use the lifting handle. • Racks should have adequate access at the rear for technicians to work comfortably.
Electrical shock	• Disconnect all power before attempting to install, remove or perform maintenance work. • To avoid the possibility of short circuiting a battery ensure that: A. All tools are adequately insulated, B. All non insulated tools are covered with vinyl electrical tape C. Tape terminal lugs to avoid short circuiting D. Do not lay tools or metal parts on top of batteries. • Disconnect charging source prior to connecting or disconnecting battery terminals. • Measure terminal voltage to make sure power is isolated. • Do not short circuit battery cables. • Remove jewellery, rings, watches and any other metallic objects before working on batteries. • Be sure to discharge static electricity from tools and individual person by touching a grounded surface in the vicinity of the battery, but away from the cells. • Follow the electrical connection instructions carefully and review thoroughly before working on the battery. • Beware of what you are touching at all times. Remember, hazardous voltages are present.
Fire or explosion	• Keep sparks, flame, or any other ignition source (including smoking materials) away from batteries. • Ensure that there is access to a fire extinguisher and emergency communications device in the work area. • Provide adequate ventilation and follow recommended charging voltages.
Hazardous substances eg. Sulphuric acid, lead	• Because batteries used in telecommunications sites are either Sealed Gel or Sealed Lead-acid type, the electrolyte is immobilized. In the event of case rupture, no liquid acid will leak or run from the battery. However, if the internal components of the battery are touched or handled, contact with the acid will result. • Battery terminals/posts and related accessories contain lead and lead compounds, chemicals known to cause cancer and reproductive harm. • Wash hands thoroughly after working with batteries and before eating, drinking or smoking. • Do not handle batteries that have been dropped or where the container has been ruptured except while wearing rubber gloves. • PPE: Wear suitable protective clothing, Protective Gloves (PVC or Rubber) & Safety glasses with side-shields.
	 ***Warning*** Sulphuric acid can cause burns and serious injury if it comes in contact with your skin or eyes. In the event of contact with Sulphuric acid, flush thoroughly with water and seek medical attention immediately.

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