شركة العين للتوزيع
Al Ain Distribution Company

Standard Operating Procedure
Substation Batteries

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Al Ain Distribution Company

Issued by:

HSE Management System Representative

Effective Date: 10 / 01 / 2019

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1.0 Intent

1.1 This Standard Operating Procedure (SOP) defines the general rules and good practices required for working on substation batteries.

1.2 This SOP is a supplement to the AADC System Safety Rules (SSR).

1.3 Where work is conducted on substation batteries, work shall be assessed, planned and suitable protective measures shall be established to control the risk and the appropriate safety document shall be issued thereby abiding by the AADC SSR.

1.4 This procedure has been developed in line with the OSHAD CoP 15.0 Electrical Safety and AADC SSR

1.5 This SOP is applicable to all AADC staff and contractor workers.

2.0 Principles

2.1 The main hazards to persons working on battery systems are possible explosions due to high concentrations of Hydrogen. Arcing can result from short circuits and can cause burns. Burns can also occur as a result of coming into contact with electrolyte used in the batteries.

2.2 Work on substation batteries shall be planned. When required, a risk assessment shall be completed for this task.

2.3 Persons required to work on substation or generator batteries shall be competent and be aware of the potential risks and emergency procedure.

3.0 Definitions

For the purposes of this document the following definition applies:

Term	Definition
AP / CP	Authorized Person / Competent Person
Bulging	A sign of excessive internal heat generation
Cell	An electrochemical device, composed of positive and negative plates and electrolyte
Electrolyte	A chemical compound which is dissolved in certain solvents, usually acid or lead with water and conduct an electric current.

WI	Work Instruction

4.0 Responsibilities

The respective Section Manager is responsible to distribute this procedure to all involved parties and monitor the implementation. Added responsibilities:

Role	Working on substation batteries
Authorized Person / Supervisor	• Coordinate and plan the work activity with Competent Person (CP). • Ensure that persons conducting the work on substation batteries are trained and competent to do so. • Ensure that the activity is supervised and that help is at hand. • Ensure that all required PPE and emergency equipment is available and worn / used as required.
Competent Person / Workers	• Conduct an onsite tool box talk / safety briefing. • All inspection and maintenance work shall be conducted according to this SOP and assuring compliance to the Authorized Person (AP) instructions and guidance. • Safety document shall be received where appropriate. • Ensure accompany person is aware of the risks associated with substation batteries.

5.0 Procedure

5.1 Planning and Assessment

5.1.1 All work shall have a valid written work instruction, issued in advance, to the person undertaking the task.

5.1.2 All live working activities must be carried out with accompanied Competent Person.

5.1.3 Only Competent Person shall perform work that has been assessed and appointed to do.

5.1.4 Only insulating and insulated tools shall be used.

5.1.5 Competent Person shall conduct onsite tool box talk / safety briefing as described in section 5.2.1. If any high risk is revealed during the safety briefing, then this must be made known to the Authorized Person.

5.1.6 The Authorized Person shall periodically monitor the work and ensure that all workers are working according to the work instruction (WI) and including wearing of the appropriate PPE.

5.2 Tool Box Talk / Safety Briefing

5.2.1 On-site Tool box talk shall be undertaken to review the risks for each location of work.

Tool box talk / safety briefing topics
Is there safe access and egress at worksite available?
Is the worksite adequately ventilated, spaced and illuminated?
Are batteries circuit identified?
Are all role players authorized / competent persons for this specific task?
Is there a work instruction and or method statement available?
Is there any naked flame or hot work?
When applicable, can the safe distance or insulating sheet and mat be maintained while working with or near exposed equipment?
Is portable eye wash bottle / sufficient supply of water available at eyewash station?
Is all the required approved PPE worn as identified in Appendix -7.2?

5.3 Inspection of Batteries

5.3.1 Required PPE

- Clothing Cat -II
- Safety Helmet
- Safety Shoes
- Chemical gloves
- Safety goggles

A battery under charge releases gases that are flammable, in poorly ventilated places or confined space the atmosphere may become dangerous and explosive. All activities which may cause ignition or sparks must be strictly avoided. Before entering a battery room, it must be verified that the extraction fan is working and that the room is well ventilated.

5.3.2 Battery Checks

- Are all batteries are secured, identified and accessible?
- Is there any evidence of bulging on battery casings?
- Is there any Leaking of electrolyte? Any cracks or white stains on battery cases?
- Any signs of corrosion on terminals?
- Any evidence of overheating of battery cables?
- Are all wiring terminations and inter-cell connections securely tightened and fastened?
- Are batteries are clean and clear of objects that could cause a short circuit from foreign objects?

5.4 Maintenance of Batteries

5.4.1 Required PPE

- Clothing Cat -II
- Safety Helmet / face shield
- Safety Shoes
- LV Rubber gloves (00 Class)
- Chemical gloves
- Work Gloves
- Safety goggles
- Protective suit (Over Clothing)

5.4.2 Isolate the batteries from source of charger by wearing insulating gloves, shoes and face shield.

5.4.3 Identify positive and negative terminals of batteries and ensure suitable separation to avoid short circuiting.

5.4.4 Insulating caps / tape shall be used on terminals to avoid contact.

Only insulating and fully insulated tools shall be used when working on batteries to prevent any short circuit as this will cause considerable arcing and cause serious burns. The approved tools list is identified in Appendix - 7.1.

5.4.5 If corrosion exists on battery terminals, remove corrosion with an insulated wire brush, avoiding contact with other polarity terminal. Add a thin layer of petroleum jelly before reconnecting.

5.4.6 Tightening of jumper must be with insulated torque wrench as per manufactures instructions. If battery cables are damaged caused from overheating they should be replaced.

5.4.7 On completion of battery maintenance, switch on the charger and ensure that it is operating correctly by testing using an approved multi-meter (AVO meter).

5.4.8 Testing equipment leads shall be connected securely and shall not be left unattended during measuring voltage.

If required to check specific gravity of cell, separate tools should be used for testing of specific gravity of Lead acid and Nickle Cadmium batteries to avoid chemical reaction

5.5 Cleaning of Spilled Electrolyte

5.5.1 Required PPE

- Clothing Cat –II
- Safety Shoes
- Safety Helmet
- Chemical Gloves
- Safety goggles
- Protective Suit (Over Clothing)
- Gas Mask

5.5.2 To clean spilled electrolyte in the battery room:

- Barricade the spilled area and eliminate potential sources of ignition;
- Use Spill Kit by wearing protective suit, googles, chemical gloves and gas mask to avoid electrolyte skin contact and inhalation;
- Absorbent materials shall be used to clean up the spill. Contaminated material and rags should be properly stored in non-leaking containers and seal tightly for disposal.
- Removal and disposal of contaminated material shall be according to AADC Environment Management Plan (EMP).

5.6 Handling (moving / replacing) of battery

5.6.1 Required PPE

- Clothing Cat -II
- Safety helmet
- Safety Shoes
- Work Gloves
- Chemical Gloves
- Protective Suit (Over Clothing)

5.6.2 Isolate the battery bank from source of supply and disconnect the positive and negative terminals jumper of damaged cell and cap with insulating material to avoid short circuiting.

5.6.3 Get your body as close as possible and bend your knees slightly before lifting – use correct lifting procedure.

5.6.4 Do not lift a heavy battery alone; ask for assistance for other from the accompany person and / or use mechanical lifting equipment.

5.6.5 When handling batteries, care should be taken to avoid spillage of electrolyte. The battery should be kept in an upright position and the vent caps should be closed tight.

Competent Person should be aware of the dangers of electrolyte, both acid and alkaline. If any part of the body is exposed to electrolyte the required treatment is to wash / flood the affected part of body and then continue to rinse with clean water.

5.7 Emergency Planning and Rescue

5.7.1 Develop an emergency response plan when required and ensure that it is available prior to commencing task.

5.7.2 The Competent Person and or accompanying person shall be trained as First Aider according to available risks.

6.0 References

6.1 OSHAD SF CoP 15.0 Electrical Safety – Version 3.0, July 2016

6.2 OSHAD SF Element 2 – Risk Management – Version 3.0, March 2016

6.3 AADC system Safety Rule

6.4 AADC Emergency Management and Response Procedure

7.0 Appendices

7.1 Appendix - Approved Tools and Instrument list for Substation Batteries

7.2 Appendix - Approved PPE List for Substation Batteries

7.1 Appendix- Approved Tools and Instrument List for Substation Batteries

Sr. No	Tools & Instruments	Standard/Specification
1	Multi meter (voltmeter)	BS EN 61010, 61243-3
2	Hydrometer	ISO 649, BS 718
3	Insulating Barricade Tape	PVC
4	Insulating measuring rule	PVC
5	Insulated Torque wrench	Minimum rating 1,000 volts
6	Insulated pliers	Minimum rating 1,000 volts
7	Insulated screwdriver	Minimum rating 1,000 volts
8	Insulated socket ratchet wrench	Minimum rating 1,000 volts

7.2 Appendix- Approved PPE List for Substation Batteries

Sr. No	Personal Protective Equipment	Standard/Specification
1	Arc rated clothing CAT -II	ASTM F 1506
2	Safety Helmet	EN 397
3	Safety Shoes	ASTM F2412-1, ASTM 2413-11
4	LV Rubber gloves	EN60903 class 00
5	Work Gloves	EN 388, EN374
6	Chemical Gloves	EN388, EN374
7	Safety googles	EN166
8	Protective Suit	EN 533,EN14116,EN531, EN11612
9	Gas mask	EN 405