

Safe Working Practices:

SWP- 03 Battery Handling & Maintenance

Before undertaking any type of work you must carry out an assessment of the task to be undertaken. This will include the equipment to be worked on, the task itself, Personal Protective Equipment requirements, the work area and environment, plus the tools and equipment required to carry out the job safely. Consult your team leader if you are not satisfied the job can be carried out in a safe manner.

Lithium Ion batteries are also subject to special considerations detailed in SWP-43

HANDLING

- 1.0 Motive Power batteries are heavy, so adequate mechanical handling systems must be used. Care must be taken to prevent the spillage of the sulphuric acid electrolyte and that the cells are not physically damaged.
- 1.1 Keep the batteries upright when lifting. Holes into which lifting hooks should be located are provided in the battery container.
- 1.2 Lifting chains/hooks should be attached to the lifting beam in such a way as to avoid squeezing the battery container and thereby crushing the cell boxes.
- 1.3 Ensure that the lifting equipment does not short out the cell terminals and connectors.
- 1.4 This can be avoided by covering the top of the battery with a thick insulating material, such as polythene sheeting, which should be removed after the handling operation.
- 1.5 The same level of care should be adopted when handling “smaller” starter type batteries. If they are being transported in a technician’s vehicle they must be suitably stowed to prevent incident.

REPAIR/MAINTENANCE

- 2.0 TMHUK does not allow its technicians to carry out battery repairs. The supplying manufacturer will carry out all such repairs.
- 2.2 TMHUK technicians are instructed in the routine maintenance of batteries, and are expected to undertake the day to day maintenance tasks in accordance with those instructions.
- 2.3 Fully charge batteries before adding water, only distilled or de-ionized water should be used. Only add water to discharged or partially charged batteries if the plates are exposed. In this case, add just enough water to cover the plates and then charge the batteries and continue with the topping up procedure. To prevent oxidisation of the cell links and terminals, lightly cover them with petroleum jelly or terminal protector.
Ensure where batteries are interchanged for multiple shift working, that they are rotated in order with a suitable rest period after charging if practicable.

REMOVAL/REFITTING OF BATTERIES

- 3.0 Refer to instructions and guidance given in the relevant Service Manual and Operators Manual.

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- 3.1 Always observe good manual handling technique. See SWP "Manual Handling".

PERSONAL CARE/PROTECTION

- 4.0 Lead acid batteries contain dilute sulphuric acid electrolyte which is poisonous and corrosive. It will cause burns or irritation if it comes into contact with skin or eyes.
- 4.1 Always determine the position of the nearest first aid station/kit before starting work. There should be a fresh water supply nearby or alternative adequate eye wash facilities.
- 4.2 Because technicians do not "repair" batteries or use sulphuric acid, additional personal protective equipment other than that already supplied by the company, is not required. Overalls, goggles, gloves and the industrial safety shoes provided are the minimum requirement.
- 4.3 Battery Maintenance Specialists, because they are exclusively employed on battery care, should always wear the specifically acid resistant PPE provided by the company, ie. overalls, apron, gloves, face/eye protection and shoes.
- 4.4 Good working practices and personal hygiene standards should be maintained at all times. Wash hands frequently and always before eating, drinking, smoking, and before using the toilet. Change contaminated clothing immediately. Wash any contaminated underlying skin with soap and water.

SPILLAGE/CONTAMINATION

- 5.0 If acid is spilled on the floor eg. the battery is knocked over, neutralise as quickly as possible, using an alkali such as lime, crushed lime stone, soda ash, sodium carbonate, sodium bicarbonate or dilute ammonia. If none of these are available use dry sand or vermiculite. Containerise in acid resistant vessels and dispose of via an appropriately licensed waste carrier/disposer. DO NOT FLUSH TO DRAINS.
- 5.1 Wash contaminated clothing as soon as possible.
- 5.2 If acid comes into contact with the skin, wash immediately with plenty of clean water.
- 5.3 If acid splashes into the eye, immediately flood the eye with copious quantities of water; then seek medical advice at once.
- 5.4 If ingested drink copious amounts of water or milk of magnesia. Do not induce vomiting, seek medical advice at once
- 5.5 If vapour/acid fumes are inhaled move to fresh air, keep warm and at rest, seek medical advice at once.

RISK OF SHORT CIRCUITING/EXPLOSION

- 6.0 Keep flames, lighted cigarettes and pipes away from batteries.
- 6.1 Do not carry out any welding, cutting or grinding processes near a battery. Remember that sparks from an angle grinder can travel in excess of 30 feet.

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- 6.2 If there is no alternative than to carry out "Hot Work" in the vicinity of a battery, then the cells should be vented by the lifting of the cell caps allowing the explosive gases to dissipate. Remember the Personal Care/Protection instructions particularly the wearing of goggles. Leave the cell caps lifted.
- 6.3 Cover the battery with a spark proof welders mat or a suitably dampened cover as a minimum requirement.
- 6.4 The chargers currently supplied by TMHUK are fitted with "switch on" delay devices preventing the operator plugging into a live circuit. However it is recommended that the user should always switch off the charger's circuit breaker before connecting or disconnecting the battery.
- 6.5 Ensure battery connections are secure before switching on, use only insulated tools.
- 6.6 A battery can be short circuited by simultaneously touching two or more of the cell terminals, inter-cell connectors, exposed battery cables or battery plug terminals with a tool or any other object capable of conducting electricity. If this happens the conductive object will:-
 - a) Become hot and cause burns and/or
 - b) Fiercely eject molten metal and sparks which could ignite any hydrogen present, resulting in an even greater explosion.

PRECAUTIONS

- 7.0 Before working with a battery, remove any metallic personal effects such as rings, watches, bracelets, necklaces etc. Remove anything that may fall from the pockets of clothing.
- 7.1 Always disconnect the leads and ventilate the cell caps before starting work upon or near a lead acid battery.
- 7.2 Always isolate the battery when working anywhere on the machine. If power is needed reconnect and disconnect immediately after use.
- 7.3 Always use insulated tools.
- 7.4 Do not place tools or any other object capable of conducting electricity on battery tops.
- 7.5 Always wear the PPE provided. See sections 4.2 & 4.3
- 7.6 Ensure the electrical circuit including battery leads and plugs are safe before disconnecting or re- connecting the battery.
- 7.7 Do not use metal vessels or jugs to store or dispense water.
- 7.8 Ensure all battery terminal covers/insulators are in place and undamaged.

CHARGING

- 8.0 **IT IS ESSENTIAL THAT ANY CHARGING AREA IS ADEQUATELY VENTILATED.**

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- 8.1 Technicians should not offer advice on charging room ventilation, if asked he should pass the request onto an SSM or Service Manager.
- 8.2 When on charge lead acid batteries generate gases (Hydrogen and Oxygen) that can form an explosive mixture. It is extremely important that the advice contained in this SWP should be observed when working on or near lead acid batteries.
- 8.3 There is a slight, "on charge" risk of toxic gases, arsine and stilbene being generated along with sulphuric acid in mist form. When adequate ventilation is provided in accordance with the manufacturer's recommendations, the risk is reduced to a point, where for all practicable purposes, it can be considered to have been eliminated.
- 8.4 Where possible working in charging areas should be avoided, however where there is no suitable alternative, proceed only in accordance with the instructions contained within this SWP

FIRE

- 9.0 In the event of a fire associated with batteries use extinguishers appropriate to the surrounding environment/risks. CO₂ extinguishers recommended. See SWP-09, "In Case of Fire".

DISPOSITION

- 10.0 On replacement, all displaced batteries must only be returned by an appropriately licensed waste carrier, unless alternative arrangements have been made with the battery supplier or other third party.
- 10.1 Customer owned batteries are normally replaced on an exchange basis, and disposition will be as the previous paragraph. Where this is not the case, disposition will be the responsibility of the customer.
- 10.2 Do not under any circumstance drain batteries or dispose of acid/electrolyte by tipping into drains or on wasteland.

CHILDREN AND YOUNG PERSONS

- 11.0 See Safety & Environmental Manual procedure "Employment of Young Persons" for precise definitions on children and young persons.
- 11.1 "Children" will not be allowed to work specifically with traction batteries. They may be allowed to observe such operations and work practices, but must take no active part, be kept at a safe distance and under the constant supervision of a competent person.
- 11.2 "Young Persons" may be allowed to work with batteries providing they do so in accordance with the above (see in particular section 4) and are under the constant supervision of a competent person.