



Safety Precautions:

Before commencing installation, repair or inspection of a battery, the person carrying the work should remove all metallic objects such as rings, wrist watches, neck and wrist chains etc.

Wear protective clothing- rubber gloves and apron and full eye protection using goggles or visor.

Whenever connection or disconnection of batteries or cells is being undertaken, only insulated tools should be used.

Work on batteries should be done with the battery isolated whenever practical, no matter how low the system voltage. This precaution is of particular importance where batteries have a high stored energy.

Health & Safety:

When operating batteries, it should be noted that not only is there a universal electrical problem of shock or arc burn but three other special hazards:

- a) Chemical hazard:** Eye damage and chemical burns to the skin arising from contact with electrolyte (dilute sulphuric acid).
- b) Explosive hazard:** Explosion arising from accidental ignition of the hydrogen/ oxygen or hydrogen/ air mixture more associated with batteries when on charge.
- c) Burn hazard:** Burns to the skin can be caused by contact with metal which has been heated or melted by the application of an unintended electrical current due to the creation of an electrical short circuit e.g. non-insulated tool or other favorable materials bridging the poles of the cell or battery.

Chemical Hazard – Handling Procedures & Protective Clothing:

Protective clothing should be appropriate to the task being undertaken and chemical involved.

WASHING FACILITIES: The ease of access to copious amounts of water as a washing facility is important for rapid treatment of acid splashes to the skin.

EYE PROTECTION: All personnel working on filled batteries or adjacent to batteries undergoing charge should wear chemical resistant GOGGLES, FACE VISOR or SAFETY SPECTACLES.

Eye Wash facilities should be used by personnel in case acid splashes into the eyes.

RUBBER ELBOW LENGTH GAUNTLET STYLE GLOVES must be used.



Rubber gloves should be washed after use with soap and water and stored.

Where necessary SAFETY HELMET must be used as appropriate.

It is recommended that RUBBER FOOTWEAR be adopted whenever working on batteries.

PROTECTIVE CLOTHING must be manufactured from waterproof material.

N.B. It is particularly important that it be noted that clothing manufactured from synthetic fibers can generate static electricity and should under no circumstances be used as there is a high risk of explosion if working adjacent to batteries.

Explosive Hazard:

Ventilation must be provided in battery charging area, so as to ensure the rapid dispersal of hydrogen at the maximum rate of production during deliberate or inadvertent overcharging. The number of litres per hour produced under this condition may be estimated by:

- Maximum current in amperes x 0.42 x total number of cells being charged. Note that oxygen is produced at half this rate.
- Natural ventilation is most reliable and therefore preferable. The average hydrogen concentration within the battery room should not exceed 1% except near the cell vent plugs. When it is difficult to provide adequate natural ventilation, a properly designed forced ventilation system should be adopted being either automatic or manual control. (Six air changes per hour shall be the exhaust fan capacity.)
- Batteries give off an explosive oxy-hydrogen gas during charging and also, to a lesser degree, under other conditions, especially if the cells are knocked or shaken. It is, therefore, imperative that naked flames, cigarettes or sources of electrical sparks be kept away from the battery room.

Burn Hazard:

Accidents are best prevented by electrical isolation of the battery where practicable. Use insulated tools and spanners when working on or near batteries and remove metallic rings and watch bands.

Charge in a Ventilated Area; Avoid Sources of Ignition:

The immediate vicinity of the battery should be treated as a Zone 1 Flameproof Area, within reasonable and practical definition. The size of the zone depends on the amount of oxy-hydrogen that is to be produced by the battery or batteries and a degree of efficient natural or forced ventilation.

It is mandatory that there be a total ban on smoking and naked lights.



Explosions should be prevented by paying attention to the prevention of the generation or accumulation of hydrogen; sources of ignition should be eliminated where possible. The wearing of goggles and the provision of washing facilities is in most circumstances an important part of the safe system of work.

Recommendations:

The statutory & regulatory laws must be followed and this must be necessarily done. These regulations must be compiled with in addition to the detailed maintenance instructions and safety advice listed in this manual.

Electrolyte Chemicals:

Sulphuric acid (used in lead Acid Cells) (H_2SO_4)

Lead Acid batteries contain dilute sulphuric acid which is both poisonous and corrosive and can cause burns and irritation on contact with skin or eyes. In case of contact, flush immediately and thoroughly with clean water.

Obtain immediate medical attention whenever the eyes are affected.

ALWAYS WEAR PROTECTIVE CLOTHING AND PROTECT THE EYES IN PARTICULAR BY USING A FCAE VISOR OR GOGGLES OF THE RCOMMENDED TYPE.

Chemical Hazard Data:

To assist in the assessment of the potential hazard to health within the definition of the contract of substance hazardous to health, we offer for your consideration the following advice.

Product Name - Battery Acid

Chemical Name - Dilute Sulphuric Acid (H_2SO_4) ranging from Sp.Gr. 1.170 to 1.500.

Synonyms- Vitriol, dipping Acid, Hydrogen Sulphate, Spirit of Sulphur, Nordhausen Acid.

Description- A colorless, odourless clear liquid, highly acidic, giving exothermic reaction with water.

Toxic Effect- Corrosive; causes burns.

Human Toxicity- Solutions cause burns and permanent visual damage may occur. There is a risk of dermatitis as a result of industrial contact.

Ingestion- Corrosive to all body issues. Inhalation of Vapour from strong solutions may cause serious lung damage. Contact with eyes may result in loss of vision. Spray or mist will attack tooth enamel and may result in their loss.



First Aid:

Ingestion- If confined to the mouth, administer large quantities of water as a mouth wash whilst ensuring it is not swallowed.

If swallowed, dilute with approximately 250ml water. Do not induce vomiting. Arrange for immediate removal to hospital.

Inhalation- Remove the casualty from the source of danger. Loosen clothing. If the casualty is unconscious, place him/her in the recovery position. If the breathing has stopped, apply artificial respiration. Any individual who has been rendered unconscious should be seen by a doctor.

Eye Contact- Flood the splashed surface with large quantities of running water for 10 minutes or until all traces are removed. Remove all contaminated clothing whilst wearing protective gloves. If necessary seek medical attention.

Fire Hazard- Where battery acid is in contact with metals, smoking and naked lights should be prohibited because of the risk of Hydrogen evolution, a gas which in certain concentration is explosive.

Reactivity Data:

Sulphuric acid is highly reactive, especially with alkaline substances. The following chemicals in particular should be avoided.

Acetone in the presence of Nitric Acid, Acetonitrile, Bromine Pentafluoride, 2-Cyanopropane-2-OL, Cyclopentadiene, Metal Acetylides or Carbides, Metal Chlorates or Perchlorates, Nitramide, Nitric Acid in the presence of organic material, Nitro-toluene, Nitro- Benzene, Nitromethane, Permanganates and Phosphorous Trioxide.

Extreme caution should also be employed when adding any quantity of water.

Handling Precautions

Respiratory Protection:

Sulphuric Acid (air borne) has an occupational exposure standard (OES) of 1mg/m³ (8-hour time-weighted-average) therefore in the absence of adequate ventilation or in the presence of strong acid solutions a respirator should be worn.

Personal Protection:

Full protective clothing will be worn whilst handling battery acid. This will include goggles that afford total eye protection. An overall with long sleeves, button to the neck will be worn as well as long rubber gloves, a protective apron and suitable acid resistant rubber boots. Any contaminated clothing will be removed and washed before re-use.



Spillage:

In the event of spillage, wear the full protective clothing as outlined above. Spread Soda Ash liberally over the spillage and mop up, cautiously, with running water. Run this to waste with copious amounts of running water.

Waste Disposal:

Add in small quantities to a large, stirred excess of water, final concentration not greater than 2%. Neutralize with 5% Sodium Hydroxide Solution (Soda Ash washing soda). Run to waste with copious amount of water.

Note: - This information and recommendations contained herein are complete to the best of our knowledge, and no relevant known information has been omitted.



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