Primary and Secondary Battery Operations

1985

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ACCIDENT PREVENTION IN PRIMARY AND SECONDARY BATTERY OPERATIONS

A SAFETY SUPPORT KIT

Industrial Safety Fact Sheet

SUBJECT: Accident Prevention in Battery Operations

1. The National Safety Council estimates that the value of goods and services each worker must produce to offset the cost of work injuries is $350. Work injuries in the United States cost more than $37.3 billion in 1985. More than 13 percent or 9 million injuries per year are incurred in industrial places, according to the National Health Interview Survey.

2. Injuries, death, and disability are results of accidents. Costs combined with worker pain, disability, and loss of life emphasize the importance of accident prevention in all levels of industrial maintenance operations.

3. Accidents from battery transportation, charging, and disposal are numerous and may occur at any level from organizational through GS/DS maintenance operations. Most accidents are caused by improper lifting, heat or spark battery ignition and explosion during vehicle maintenance, charging and disposal, improper procedures and occasional material failure.

4. Use of protective equipment, proper training, use of technical manuals, compliance with safety and OSHA requirements, teamwork, and individual awareness are necessary to minimize unnecessary disabling injury.

5. Good judgment and proper supervision are instrumental in accident prevention. Incidences of exposure to lead and chemicals used in battery operations, blindness, burns, and death can be avoided by controlling hazardous conditions, by proper education, and by following the rules. No one can prevent accidents like you can.

TAILGATE SESSIONS

SHORT SAFETY BRIEFINGS FOR EQUIPMENT OPERATORS AND PERSONNEL SERVICING BATTERIES

Tailgate Sessions

Short Safety Briefings for Vehicle/Equipment Operators and Battery Maintenance Personnel

What is a tailgate session? Tailgate sessions got their name from employees sitting on the tailgate of a truck while receiving a short safety briefing for an upcoming job.

The use of this type training for maintenance personnel has obvious advantages:

. It shows safe performance is one of the work standards.

. It allows sharing of safety information about upcoming jobs.

. It can be done with minimal planning during nonpeak work hours.

. It shows supervisory support of safe activities.

. It can be keyed to specific individuals or work groups without requiring entire unit participation.

. It lends authenticity to the safety program by keying on the job at hand and therefore avoids generalization.

. It raises safety awareness level of personnel.

Implementation

. Identify topics that are pertinent to the unit's maintenance activities (see list of additional tailgate topics for recommendations).

. Develop hip-pocket tailgate sessions on selected topics.

. Distribute tailgate sessions to supervisors and discuss when and where they are to be used (sessions are included in this kit).

. Have individuals from the command group or element occasionally conduct tailgate sessions to reiterate and reinforce their concern for safety.

. Continually revise and update the tailgate sessions to ensure applicability.

TAILGATE SESSION #1
OPERATOR/CREW MAINTENANCE OF LEAD-ACID BATTERIES

FACT: Improper procedures performed by the operator/crew involving batteries can cause severe burns and injury.

1. Do not smoke, have open flames, or make sparks around vehicle batteries. If battery is gassing it can explode.

2. Never strike battery terminals with metallic tools which can contribute to dangerous sparks.

3. Equipment operators/crew personnel may assist in battery cleaning operations as required by applicable PMCS, but actual removal and replacement MUST be accomplished by organizational mechanic as stated in TM 9-6140-200-14, para 2-2. The only exception to this rule is when the operator is DIRECTLY supervised by the organizational mechanic as allowed in AR 750-1, para 4-5.

4. Operators should check the electrolyte and must notify organizational maintenance if level is low. Organizational maintenance is allowed to add distilled water only to batteries.

5. Inspect terminals, clamps, cables, and battery holddown for corrosion. If corroded, have organizational maintenance clean and coat them with metal surface protection.

6. Make sure vent holes in the vent caps are open to prevent dangerous buildup of gases. Ensure that caps are screwed on tightly and that rubber gaskets are in place.

7. Batteries will not be removed from equipment battery box containers for cleaning purposes at a time other than scheduled equipment service or battery replacement requirement.

TAILGATE SESSION #2
BATTERY-SLAVING OPERATIONS (LEAD-ACID ONLY)

FACT: Improper vehicle-slaving/jump-starting operations can damage equipment and cause severe injury.

1. Park tracked vehicles at least 4 or 5 feet apart during slaving operations and never in head-to-head position. Injury can occur if either tank jumps ahead.

2. Read the TMs and be sure that personnel are trained in proper slaving operations. Improper procedures in connection and disconnection can cause the battery to explode.

3. Never connect the black cable (negative) to the negative post of the dead battery. It should be connected to the frame or other prescribed grounding points to prevent injury. Be sure the point used is far enough away from the battery so that a spark cannot cause battery explosion.

4. Keep jumper cables away from the engine fan and drive belts.

5. Never smoke around any battery operation including slaving operations.

TAILGATE SESSION #3
ORGANIZATIONAL MAINTENANCE OF LEAD-ACID BATTERIES

FACT: Improper procedures and handling of lead-acid batteries during organizational maintenance can cause bodily injury.

1. Organizational maintenance is authorized to add distilled water only to lead-acid batteries. Battery testing and charging will only be accomplished at facilities meeting OSHA standards.

2. Proper clothing, aprons, gloves, and goggles will be worn whenever performing battery servicing operations.

3. When removing a battery from a vehicle, note the location of the positive terminal so that the replacement battery can be installed in the same position to avoid the danger of reversing the polarity and exploding the battery.

4. When charging batteries on vehicles carrying flammable liquids, remove the battery to meet 50-foot spark and flame restrictions.

5. Personnel should be trained in proper procedures, use of equipment, first aid, emergency actions, protective equipment, and hazards of battery storage, handling, and organizational maintenance.

6. Nickel-cadmium batteries and lead-acid batteries should never be stored even temporarily in close proximity or transported together. Tools and cleaning equipment used on one battery type should not be used on the other type.

7. When in doubt, refer to applicable TMs to perform required operations. Do not rely upon memory. Forgetting one important step can cause an unnecessary accident.

TAILGATE SESSION #4
INTERMEDIATE DIRECT SUPPORT/GENERAL SUPPORT (DS/GS) MAINTENANCE
OF LEAD-ACID BATTERIES

FACT: Improper procedures and failure to take every safety precaution when handling, charging, storing, and repairing of lead-acid batteries can lead to severe injury or death.

1. The DS/GS battery facilities must be in compliance with applicable OSHA standards.

2. Personnel should be thoroughly trained in battery maintenance procedures, first aid, protective equipment, and precautions and hazards of battery maintenance operations.

3. Nickel-cadmium batteries should never be serviced, stored, or transported with lead-acid batteries.

4. Personal protective equipment should be maintained in good service and used. Deluge shower, eyewash, and ventilation should be working and tested.

5. Leading operations should be performed in a separate room from other operations. An exhaust hood should be present and, to avoid explosion, personnel should never pour molten lead into a wet or damp mold.

6. Smoking and spark-producing procedures have no place in battery shops. Care must be taken to be sure this rule is enforced. Be sure all electrical equipment is grounded and in good repair.

7. Turn off the charger before disturbing the connections between batteries while charging. Avoid striking the battery with any metallic tool, and clothing/footwear should be appropriate to minimize static electrical discharge. Doublecheck battery hookups to prevent reverse polarity.

8. Do not rely upon memory when performing battery operations. Use the TMs and manuals to ensure proper procedures.

9. Always pour acid into water when mixing electrolyte, never the reverse.

TAILGATE SESSION #5
OPERATOR MAINTENANCE OF NICKEL-CADMIUM BATTERIES

FACT: Improper procedures involving the use and care of nickel-cadmium batteries can result in severe personal injury.

1. Operator daily maintenance checks and services are limited to making sure the battery case, cover, and top of the cells are kept clean and free of potassium carbonate deposits. Refer to appropriate TMs for safe performance of each task.

2. Do not smoke in the area of nickel-cadmium batteries. Be sure personnel are trained in the proper first aid when exposed to corrosive materials.

3. Never clean batteries with solvents, acids, or any other chemical cleaner. Only use nylon brushes to clean interconnectors. Never use a wire brush or any static- or spark-producing tool. DO NOT disassemble the battery; clean deposits from only those parts that can be reached without disassembly.

4. If using compressed air to clean battery deposits, be sure to wear goggles.

5. Inform personnel of the dangers of nickel-cadmium batteries when in the near proximity of lead-acid battery fumes/equipment. The same cleaning brushes, gloves, and tools should never be used on both types of batteries.

TAILGATE SESSION #6
ORGANIZATIONAL MAINTENANCE OF NICKEL-CADMIUM BATTERIES

FACT: Improper handling of batteries during organizational maintenance can cause severe injury.

1. Organizational repair of nickel-cadmium batteries is limited to replacement of fillercaps, tightening terminal screws, replacement of O-ring seals, replacement of connector dust caps, and relief valves on applicable battery types. Consult proper TM for limits and procedures allowed on organizational maintenance level.

2. If APU or vehicle generator system is used to charge the battery, allow the battery to sit at least 30 minutes before checking the electrolyte level. If electrolyte is low, evacuate the battery to DS maintenance. NEVER will organizational maintenance personnel add to or remove distilled water or electrolyte from the battery (TM 11-6140-203-14-3, para 4-9(e)).

3. The same tools/cleaning equipment used on lead-acid batteries will not be used on nickel-cadmium batteries. All tools used will be of the type to prevent sparks or short-circuits.

4. All personnel handling batteries should wear protective equipment suitable to the equipment being used and the procedure being performed. Be sure personnel are trained in proper procedures and first aid and have access to eyewashes and deluge showers/similar water source.

5. When performing terminal screw torquing procedures be extremely careful. Bodily injury and equipment damage can occur if the wrench accidentally causes a short-circuit.

6. Never store nickel-cadmium batteries in the near proximity of lead-acid batteries.

7. Take every precaution to avoid short-circuiting terminals or connectors and while handling battery parts during organizational maintenance. When in doubt, consult the applicable TMs. A small mistake can be dangerous.

TAILGATE SESSION #7
INTERMEDIATE DIRECT SUPPORT/INTERMEDIATE GENERAL SUPPORT
OF NICKEL-CADMIUM BATTERIES

FACT: Improper handling, storage, and maintenance of nickel-cadmium batteries can cause severe personal injury.

1. Battery shop should meet required OSHA standards; and personnel should be thoroughly trained in battery maintenance procedures, emergency action, personal protective equipment, and potential hazards present in the job.

2. Smoking, ungrounded or poorly maintained electrical equipment, spark-producing procedures, and clothing conducive to static electricity should never be allowed in battery maintenance operations. Personal protective equipment should be present and used.

3. Eyewashes, deluge showers, fire extinguishers, and ventilation should be checked to ensure they are in good working order.

4. Lead-acid batteries should never be stored, repaired, or transported with nickel-cadmium batteries. Sulfuric acid should never be added to nickel-cadmium batteries.

5. Always doublecheck connections to ensure proper charging polarity, and never adjust connectors without first turning off the charger. Do not charge cells of different capacities together.

6. Always allow a charged battery to sit at least 30 minutes and no more than 2 hours before checking electrolyte level, which will allow fumes to ventilate and will prevent maintenance personnel from adding more electrolyte than is needed. Overfilling the cell could cause spewing of electrolyte when the battery is brought to a full charge.

7. When in doubt, consult the TMs for proper procedures. Do not rely upon memory or use "shortcuts." Forgetting a simple procedure or safety precaution can cause unnecessary injury.

REMEMBER: ACCIDENTS ALWAYS HAPPEN TO THE "OTHER GUY." TO EVERYONE ELSE, YOU ARE THE OTHER GUY. NO ONE CAN PREVENT ACCIDENTS LIKE YOU CAN.

List of Additional Tailgate Topics

Inspection of Lifting Devices IAW TB 43-0142

Submitting DA Form 2028 on TM

Submitting QDR/EIR On Equipment and Tools

Unit SOP Requirements (DA Pam 750-35)

First Aid

Necessity for Inspection of Components

Fire Prevention

When and When Not To Improvise

Using TMs--How to Get, Use, Change (DA Pam 25-30)

Ground Guides In and Around Motor Pool, Track Park, and Maintenance Shop

Prejob Checks

After-Job Checklists

How to Inspect Tools

Protective Equipment

Material Hazards

BATTERY SHOP OPERATIONS

1. Are all battery shop personnel properly trained in the hazards, procedures, and precautions as they relate to the safe handling and maintenance of batteries? (TM 9-6140-200-14, Appendix E)

2. Is the battery shop large enough to service, charge, and repair batteries? (TM 9-6140-200-14, para 4-1)

3. Are battery repairs performed in a room separated from the charging room? (TM 9-6140-200-14, para 4-1)

4. Are battery operations performed in an approved designated shop or area? (29 CFR 1910.178(g)(1))

5. Is smoking prohibited in battery shops and are no smoking signs posted? (TM 9-6140-200-14, para 2-2; 29 CFR 1910.178(g)(10))

6. Is there an approved SOP posted in the battery shop? (TM 9-6140-200-14, para 4-2)

7. Are nickel-cadmium batteries serviced in separate facilities from lead-acid batteries? (TM 9-6140-200-14, para 4-1)

8. Is all electrical equipment explosive- or vapor-proof type? Is all electrical equipment grounded? (TM 9-6140-200-14)

9. Is the battery shop provided with an adequate ventilation system for exhaustion of hydrogen? (29 CFR 1910.178(g)(2))

10. Is the ventilation system on a separate switch or interlocked with the charging system to ensure positive ventilation?

11. Are battery caps in place and battery cap vents open when batteries are being charged? (TM 9-6140-200-14, para 4-5)

12. Are battery post terminal connections checked for proper polarity prior to charging? (TM 9-6140-200-14, para 4-5)

13. Is the battery charger turned off before disturbing battery terminal connections? (TM 9-6140-200-14, para 4-5)

14. Are batteries being charged all of the same voltage? (TM 9-6140-200-14, para 4-5)

15. Are the battery manufacturer's instructions followed? (TM 9-6140-200-14, para 4-5)

16. Are deluge showers and emergency eyewashes furnished in the battery shop? (29 CFR 1910.151(c))

17. Is protective clothing; i.e., face shield/chemical goggles, safety shoes, gloves, and aprons, provided and worn? (TM 9-6140-200-14; 29 CFR 1910.132(a))

18. Is there an approved fire extinguisher located in the battery shop? (29 CFR 1910.155)

19. Is the facility equipped with adequate provisions for flushing and neutralizing acid spillage? Is soda ash available for neutralization? (29 CFR 1910.178(g)(2))

20. Are terminal straps or built-in carrying handles used when handling batteries? (TM 9-6140-200-14)

21. Is distilled water ONLY used to fill batteries? (TM 9-6140-200-14, para 3-7)

22. When mixing electrolyte, is the acid always poured into the water? (29 CFR 1910.178(g)(7))

23. Are tools and other metallic objects kept away from the top of uncovered batteries to prevent short circuits? (TM 9-6140-200-14, Appendix E)

24. Are battery repairs restricted to repairing cracks in the top of the battery case and rebuilding battery posts? (TM 9-6140-200-14, para 4-3)

25. Are battery posts repaired in accordance with approved procedures? (TM 9-6140-200-14, para 4-3b)

26. Are battery post molds checked for dryness prior to pouring molten lead? (TM 9-6140-200-14, para 4-3(7))

27. Are battery shop personnel included in a medical monitoring program? (TM 9-6140-200-14)

28. Are battery shop operations surveyed by an industrial hygiene specialist for lead concentration and other aspects of the operation for good industrial hygiene practices? (TM 9-6140-200-14, Appendix E)

29. Are windows and doors locked when the battery shop is unattended?

Additional Checks for Charging Operations
Using the 3KW Generator Set and Distribution Panel

1. Are battery maintenance personnel properly trained and is generator operator properly licensed? (AR 600-8 and TB 600-1)

2. Is smoking prohibited and is operation performed at least 50 feet from flammable liquids and vehicles? (TM 9-6140-200-14, para 3-10)

3. Do facilities have required OSHA equipment such as eyewashes, deluge shower, water hose, fire extinguisher, etc.?

4. Are charging operations performed in an open area with proper air circulation? (TM 9-6140-200-14, para 3-10)

5. Are battery caps installed and slightly loose with battery cap vents open to prevent pressure buildup? (TM 9-6140-200-14, para 3-10(c))

6. Is protective equipment present and used when performing required procedures?

7. Are charging terminals connected to proper battery terminals?

8. Are charging cables connected and in place and all circuit breakers and power switches in the off position prior to starting the generator? (TM 9-6140-200-14, para 3-10c)

9. Are batteries with cracked cases, damaged posts, or needing electrolyte sent to DS maintenance? (TM 9-6140-200-14, para 3-11)

10. Is there sufficient ventilation around the generator engine and the battery and are PMCS checks performed on the generator and distribution panel? (TM 9-6140-200-14, para 3-10(a)(2))

11. Are batteries removed from vehicles only by authorized organizational mechanics? (TM 9-6140-200-14, para 2-2)

Materials and Supplies Listed in TM 9-6140-200-14, Operator's Organizational, Direct Support and General Support Maintenance of Lead-Acid Batteries

Because of the number of materials used within the Army, it is not possible to list all of them. Items having a Federal Stock Number (FSN) can be located on the DOD Hazardous Materials Microfiche in order to evaluate hazards, storage, and personal protective equipment requirements. If the material does not meet the description on the microfiche, is omitted from the microfiche, or is a local purchase item, hazardous materials safety data sheets should be obtained from the procurement source or the manufacturer.

Additionally, safety data sheets should be obtained on all chemicals used in the operation IAW 29 CFR 1910.1200, and all workers are to have access to these sheets. Employers should provide employees with information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area, IAW 29 CFR 1910.1200.

Guidance for Local SOP for Battery Shop

The following procedure contains pertinent details for safe operations in charging and servicing batteries. Each battery shop will operate in accordance with the local internal and external SOP as developed and enforced by the command office concerned.

NAME OF OFFICE

STANDING OPERATING PROCEDURE NO._____ DATE _____

Battery Charging and Servicing

1. Purpose. To establish safe operating procedures and assign responsibilities to cover battery cleaning, servicing, and charging.

2. Applicability. This procedure applies to the charging and servicing of lead-acid storage batteries associated with work operations at building _____.

3. Responsibility: The immediate supervisor is responsible for:

a. Application and enforcement of this procedure.

b. Ensuring that only qualified personnel are permitted to engage in the operations.

c. Ensuring that the building leader is thoroughly briefed and is responsible for ensuring that only qualified personnel are permitted to engage in the operations.

d. Ensuring that employees are provided information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area, IAW 29 CFR 1910.1200.

4. Location of operations. Building _____.

5. Personnel limits: The number of personnel permitted to engage in charging operations will be restricted to the minimum required to perform the job in a safe and efficient manner.

6. Material limits. The number of batteries and amount of electrolyte will be limited to the number and quantity needed to perform a safe and efficient operation.

7. Safety requirements. Industrial requirements include those below:

a. The charging rate will at all times be kept low enough to prevent boiling over of the contents of battery cells and the rapid generation of hydrogen gas. The battery manufacturer's recommended charging rate should be used.

b. The immediate charging area will be thoroughly ventilated for riddance of acid mists before the charging unit is put into operation. If acid vapors are prevalent despite this ventilation precaution, the operation will be suspended until the air has been cleared. Personnel will not remain in the area.

c. Addition of electrolyte to batteries is not permitted except in the battery room, building _____. Repairs to batteries will be done in building _____.

d. Smoking or the use of open flame or spark-producing device is restricted to approved and posted rooms and areas.

e. Care will be taken to prevent short-circuits while batteries are being handled or charged. Tools and loose metal objects will not be placed in such a position that they may fall on batteries. Wrenches and other tools must be carefully used to avoid short-circuits. A short-circuit may not only cause serious burns, but may also result in an explosion of accumulated hydrogen. All lights and electrical sockets should be sparkproof.

f. Charging units will be periodically checked during operation.

g. When applicable, surfaces supporting the batteries will be covered with baking soda to neutralize any acid spillage.

h. Rags contaminated by cleaning operations will be placed in covered metal containers and later disposed of by burning.

i. Safety-toed shoes will be worn during operations.

j. Nickel-cadmium and lead-acid batteries will not be stored, transported, or serviced in the same facility.

k. Chemical goggles, rubber gloves, and a rubber apron will be worn during battery handling and servicing.

8. Leading operations. New battery posts will be made in building _____.

a. The leading area will be thoroughly ventilated for riddance of lead fumes and lead dust. If lead fumes are prevalent despite this ventilation requirement, the leading operation will be suspended until the air has been cleared. Personnel will not remain in the area.

b. The melting and pouring of lead into battery post molds will be done on a workbench under an exhaust hood. Lead fumes must not be breathed.

c. Safety goggles, gloves, and an apron will be worn when pouring molten lead into dry molds. To prevent spattering of hot lead, do not pour molten lead into a wet or damp mold.

d. Clothes worn during leading operations will not be worn outside the battery shop. These clothes are not to be worn home or for other purposes.

e. Eating, drinking and smoking are prohibited in leading area.

f. Care will be taken to prevent dust-size particles of lead from sawing, melting, spattering, or being ingested (taken internally).

g. Safety controls on personnel include the following:

(1) A preplacement physical examination, including analysis for lead concentration in urine and blood.

(2) Periodic followup physical examinations (recommended every 6 months).

(3) Thorough training on all aspects of the job, including precautions and personal hygiene.

(4) Personal protective equipment requirements are: approved metal fume respirator, safety face shield, and work clothes that are worn only on this job and changed before leaving the leading area.

(5) Work stations are to be surveyed by an industrial specialist for the lead concentrations in the operator breathing zone and all other aspects of the operation for good industrial hygiene practices.

(6) The threshold limit value (TLV) for lead is 0.15 mg per cubic meter.

9. Personal protective clothing and equipment. These items include the following:

a. Industrial safety shoes.

b. Chemical goggles.

c. Rubber gloves.

d. Rubber apron.

10. First aid and fire fighting equipment.

a. Fire extinguisher.

b. Spray-type eyewash fountain.

c. Deluge shower.

11. Operating equipment. Reference paragraph 4-2 for this equipment.

12. Procedure. Battery charging, servicing, and repair will be done in accordance with TM 9-6140-200-14 and (list all other documents pertinent to your operation).

13. Ventilation. Open doors to secure ventilation, or turn on ventilation fan. After the charging area has been properly ventilated turn on the charging unit and adjust to the required charging rate (normally 10-15 amperes).

14. Posting. After this sample SOP has been developed and approved by concerned command offices, a copy will be prominently displayed at the operating site.

SUBMITTED BY: _____

RECOMMENDING APPROVAL: _____

APPROVED: _____