TECHNICAL BULLETIN

BATTERY DISPOSITION AND DISPOSAL

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HEADQUARTERS, DEPARTMENT OF THE ARMY

1 OCTOBER 1996

WARNINGS for Fire Control/Suppression

DO NOT use water to extinguish a battery fire if a shock hazard exists due to high voltage electrical equipment in the immediate vicinity (greater than 30 volts, alternat-ing current (ac) or direct current (dc)).

Halon fire extinguishers **SHALL NOT** be used to combat fires involving batteries.

WARNING for Packaging

DO NOT package any battery if it is hot/warm. Package batteries only when they are cool to the touch.

WARNINGS for LEAD-ACID BATTERIES

DO NOT use metal or galvanized equipment when draining electrolyte from Lead-Acid batteries.

DO NOT use water on fires involving sulfuric acid (H2SO4) battery electrolyte. H2SO4 is highly reactive and can react with finely divided combustible materials *(e.g., sawdust) on contact.*

WARNINGS for LITHIUM BATTERIES

Lithium-Sulfur Dioxide (Li-SO2) batteries contain pressurized sulfur dioxide (SO2) gas. The gas has a pungent odor and is highly toxic. The battery **MUST NOT** be abused in any way which may cause the battery to rupture.

Lithiurn-Thionyl Chloride (Li-SOCI2) batteries contain liquid thionyl chloride (SOC12), which fumes upon exposure to air. The vapor is highly toxic, and the battery **MUST NOT** be abused in any way which may cause the battery to rupture.

IMMEDIATELY turn off the equipment if battery or battery compartment shows signs of overheating or becomes hot to the touch. Allow the battery to cool (at least 60 min-utes) before removing it.

If you hear a hissing sound (battery venting), or smell irritating gas, **IMMEDIATELY** Turn Off the equipment, and **LEAVE** the area until any smell or signs of leaking gas have been cleared from the area.

First Aid WARNING for Caustic Electrolyte

DO NOT try to neutralize caustic electrolyte with vinegar or any other acidic solutions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of cool water.

WARNING for THERMAL BATTERIES

When activated, Thermal battery temperatures can exceed 500° F.

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Technical Bulletin

HEADQUARTERS
DEPARTMENT OF THE ARMY

No. 43-0134

Washington, DC, 1 October 1996

BATTERY DISPOSITION AND DISPOSAL

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this bulletin. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-P-MM-T, Fort Monmouth, New Jersey 07703-5007. The fax number is 908-532-3421, DSN 992-3421. You may also e-mail your recommendations to AMSEL-LC-LEO-PUBS-CHG@cecom3.monmouth.army.mil In either case a reply will be furnished direct to you.

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* This manual supercedes TB 43-0134, dated 31 July 1993.

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To ensure receiving this publication, and future changes, order it through your local publications officer/clerk by following the procedures in DA PAM 25-30 and DA Pam 310-10. DA Form 12 subscription data for this publication appears on the last page of this manual under the heading “DISTRIBUTION.”

CHAPTER 1
INTRODUCTION

1-1. Purpose and Scope

This Technical Bulletin (TB) establishes general procedures for disposition and disposal of damaged, defective, depleted (spent) or unserviceable batteries. This TB applies to batteries managed by the US Army Communications-Electronics Command (CECOM), designated in the Army Master Data File (AMDF) with a Source of Supply of B 16 for CECOM. These batteries are listed in Table 2-1. Questions concerning disposition and disposal procedures for batteries not procured by CECOM should be referred directly to the appropriate procuring Agency, Service or Command. This TB does not apply to the air shipment of unserviceable batteries for disposition. Refer to Air Force Regulation 71-4 and TM 38-250, "Preparing Hazardous Materials For Military Air Shipment." Refer to SB 11-6 for serviceable batteries.

1-2. How to Use this TB

a. General requirements for disposition and disposal of all batteries are covered in chapter 2. These include solid waste characterization, hazardous characteristics, handling, fire protection, storage, and transportation. Personal protective equipment and first aid are covered in chapter 3. Battery profiles are contained in chapter 4.

b. Publications referenced in this TB are listed in Appendix A, along with their sources. General reference materials are also cited. Terminology and abbreviations are defined in Appendix B.

1-3. General Requirements

a. The principal purpose of this TB is to provide solid waste characterization guidance under Resource Conservation and Recovery Act (RCRA) regulations. The guidance and procedures in this TB are consistent with US Environmental Protection Agency (EPA) and US Department of Transportation (DOT) regulations and Department of Defense (DoD) policy. This TB will aid in complying with environmental solid waste requirements. Information about state environmental regulations reflects the requirements in effect at the time of publication. Readers must ensure compliance with state regulations in effect when disposing of batteries. This TB does not supersede or take precedence over any regulations or other official directives. If there is a conflict between this TB and regulations or DoD directives, you must follow appropriate regulations and directives.

b. Foreign, state and local regulations may be more stringent than the procedures in this TB. It is necessary to coordinate with appropriate officials at your installation/activity to ensure that disposition and disposal actions comply with all existing regulations and policies. Refer to *e.* below.

c. In accordance with DoD Directive 6050.16, DoD Policy for Establishing and Implementing Environmental Standards at Overseas Installations, the US Air Force (USAF) has been given the lead as the local DoD Executive Agent and has the responsibility for establishing guidance/standards for the disposal of hazardous materials/waste at OCONUS (outside of continental United States) installations. Refer to *e.* (2) below.

d. The local Installation/Unit Environmental Office/Officer (IEO) MUST coordinate with the local servicing Defense Reutilization and Marketing Office (DRMO) and advise all affected units regarding local procedures for management of batteries as hazardous material (HM) and/or hazardous waste (HW). Manifesting under Title 40, Code of Federal Regulations (CFR), Part 262.20 may be required. The requirements for manifesting will be in accordance with federal, state and local regulations. When affected units are at a remote site, the IEO will coordinate with the remote site environmental official to ensure proper management of batteries.

e. Coordinate all disposition and disposal of batteries with:

(1) Local Installation Environmental Office (IEO) to ensure conformance with environmental regulations. Refer to Appendix E for state points of contact (POCs).

(2) Local environmental DoD Executive Agent (Do-DEA) through your local IEO to ensure conformance with environmental regulations at OCONUS locations. Refer to Appendix E for DoDEA POCs.

(3) Local servicing Defense Reutilization and Marketing Office (DRMO) to ensure conformance with DoD disposition/disposal policies.

(4) Local Installation Transportation Office (ITO) to ensure conformance with transportation regulations.

(5) Supporting Safety Office/Officer (SO) and/or Indus-trial Hygienist (IH)/Preventive Medicine Office/Officer (PMO) to ensure safe handling, and for coordination of personal protective equipment (PPE), when recommended.

1-4. Reporting Product Quality Deficiencies

Battery deficiencies where safety is not the primary concern should be reported to: Commander, US Army CECOM, ATTN: AMSEL-LC-ED-CFO, Fort Monmouth, NJ 07703-5000 on a Product Quality Deficiency Report
(PQDR), SF 368. Save the battery(ies) if possible. Your activity will be contacted with disposition instructions by CECOM.

1-5. Reporting Safety Incidents

a. Safety incidents involving batteries, where the battery has bulged, leaked, vented or ruptured, or if personal injury or equipment damage resulted from a battery deficiency or malfunction, NMUST be reported to the CECOM Safety Office, Fort Monmouth, New Jersey. See paragraph (para) 1-7 for safety support.

b. File a PQDR in accordance with para 1-4.

c. Save battery samples for analysis, until disposition instructions are provided by CECOM.

1-6. Reporting Errors and Recommending improvements

Readers are encouraged to submit beneficial suggestions on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to:

Commander,
US Army CECOM
ATTN: AMSEL-LC-LEO-P-MM-T
Fort Monmouth, New Jersey 07703-5007

Copy furnish suggestions regarding this TB to Safety/Environmental support at the address shown opposite.

1-7. Technical Support

To obtain further information and guidance, contact the appropriate support activity at the CECOM National Inventory Control Point (NICP). The mailing address is:

Commander,
US Army CECOM
ATTN: (as shown opposite)
Fort Monmouth, New Jersey 07703-5000.

CECOM NICP Points of Contact

Safety/Environmental Support

ATTN: AMSEL-SF-REE
Voice:
DSN 987-3112 or Commercial (908) 427-3112
Datafax:
DSN 992-6403 or Commercial (908) 532-6403
MILNET Address:
amsel-sf@ monmouth.army.mil
Message Address:
CDR CECOM FT MONMOUTH NJ//AMSEL-SF-REE//

Engineering and Systems Management Support

ATTN: AMSEL-LC-PR-PS
Voice:
DSN 992-1910 or Commercial (908) 532-1910
Datafax:
DSN 992-8940 or Commercial (908) 532-8940
MILNET Address:
amsel-lc-pr-ps @ monmouth.army.mil
Message Address:
CDR CECOM FT MONMOUTH NJ//AMSEL-LC-PR-PS//

Logistical support

Contact your local Logistics Assistance Office.

CHAPTER 2
DISPOSITION AND DISPOSAL

CAUTION

Personal protective equipment (PPE) MUST be used when handling batteries that show signs of leaking, bulging, swelling, or deformity. See Chapter 3 for PPE.
Batteries which have been abused or mishandled may be hazardous even though they are otherwise characterized as non-hazardous for disposal purposes.

2-1. Solid Waste Characterization of Batteries

Battery classes are shown in Table 2-1 by chemical composition, type numbers, and solid waste (SW) classification. The classification relates to how the various classes of batteries, by chemical composition, are characterized for disposal. Batteries classified as hazardous waste (HW) under the federal Resource Conservation and Recovery Act (RCRA) administered by the US Environmental Protection Agency (EPA) or under state regulation should be disposed of through your local servicing Defense Reutilization and Marketing Office (DRMO) or via local contract. See paragraph (para) 2-7.

a. Batteries that do not exceed regulatory criteria as established in Title 40, Code of Federal Regulation (CFR), Part 261, Subpart C of RCRA regulations are classified as nonhazardous solid waste (NHSW). These batteries may be disposed with general refuse.

b. Batteries which exceed regulatory criteria may be hazardous waste (HW). Batteries which are defined as HW are identified by US Environmental Protection Agency (EPA) HW number (HW#) for disposal. Batteries are not a listed waste in accordance with EPA's RCRA regulations. All states are required to enforce RCRA regulations. In states without additional requirements, federal and state requirements and classifications will be similar.

c. States may have more stringent regulations. Refer to Appendix E for a summary of state regulations and points of contact In addition to RCRA requirements, Alaska (AK), California (CA), Minnesota (MN), Rhode Island (RI) and Washington (WA) utilize bioassay to characterize the solid waste as HW.

d. Local activities *(e.g.,* county landfill) may not allow the disposal of certain classes of non-hazardous batteries. In some localities these batteries may be disposed as solid waste, *e.g.,* industrial waste. Therefore, coordination of disposal with the Installation/Unit Environmental Office/Officer (IEO) is essential to ensure regulatory compliance.

e. The SW characterization of battery classes in Table 2-1 provides information on how to characterize batteries as SW for disposal. If battery disposition is through the local servicing DRMO, the DRMO will determine if the batteries will be recycled or disposed through other means. Therefore, when battery disposition is through the DRMO, the DRMO determines whether the batteries will be handled as HW, HM or as unregulated solid waste. Contact your local IEO and DRMO prior to turn-in of these batteries to determine how they will be received and managed.

2-2. Hazardous Characteristics

Refer to individual battery profiles in Chapter 4 for specific information and requirements for each battery.

2-3. Handling

a. Hot/warm battery(ies) may vent or rupture. DO NOT handle hot or warm batteries. Wait until they are cool to the touch.

b. Inspect batteries for obvious physical damage or defect prior to use. DO NOT use defective batteries.

c. If batteries show signs of leakage, PROTECT YOUR HANDS with gloves. If you must handle batteries that are hot or warm, eye, face, hand and respiratory protection is required. Refer to Chapter 3 for PPE.

d. DO NOT heat, incinerate, crush, puncture, or mutilate batteries. Exercise care in handling batteries and container(s) of batteries to prevent damage.

e. DO NOT charge any primary (non-rechargeable) bat-tery. *f* DO NOT disassemble any battery unless authorized by the battery Technical Manual ™.

g. DO NOT short circuit batteries.

h. DO NOT bypass an internal fuse, or replace fuse with one of a different rating.

i. DO NOT over-discharge batteries. Remove the battery(ies) from equipment immediately after they fail to operate the equipment.

j. If equipment uses two or more batteries, ALWAYS replace batteries in complete sets. Use batteries from the same manufacturer with the same or similar date code. Store batteries in sets.

k. DO NOT store batteries in equipment for longer than 30 days when not in use.

l. USE ONLY the correct batteries authorized by the equipment TM.

m. DO NOT use any battery which does not easily fit into the battery compartment of the equipment

Table 2-1. Solid Waste Characterization of CECOM Managed Batteries for Disposal

CAUTION

Refer to individual battery profiles in Chapter 4 for additional required information. RCRA and State bioassay solid waste classifications are independent.

1. Coordinate with local Installation/Unit Environmental Office/Officer to ensure conformance with federal, state and local environmental regulations.
2. Dispose of hazardous material and waste through the local servicing DRMO or via local contract. See para 2-7.

Battery Class	Type Number	Solid Waste Classification RCRA Class/ EPA HW Number	States with bioassayl
Alkaline (ALK)	BA-3000 Series	NHSW	HW
Carbon-Zinc	BA-2 through	NHSW	HW
(LeClanche) (LCE)	BA-471 (except BA-245), BA-500 Series & BA-800 Series		
Lead-Acid (LA)[2]	BB-XXX	HW (D002, D008)	HW
Lithium-Manganese Dioxide	BA-5372/U	NHSW	HW
($Li-MnO_2$)	& BA-5516/U		
Lithium-Sulfur Dioxide	BA-5567/U	NHSW	NHSW
($Li-S0_2$)			
Lithium-Sulfur Dioxide	BA-5000 Series		
($Li-SO_2$)	(except BA-5372/U, BA-5516/U & BA-5567/U)		
Completely Discharged:		NHSW	NHSW
Not Completely Discharged:		HW (D01, D003)	HW
Lithium-Thionyl Chloride	BA-6000 Series		
($Li-SOC1_2$)			
Completely Discharged:			
Not Completely Discharged:		HW (DO01, D003 & D007)	HW
Magnesium (MG)	BA4000 Series		
Discharged ($\leq$ 50% charge remaining)		NHSW	NHSW
Not Discharged (> 50% charge remaining)		HW (D007)	HW
Mercury (HG)[2]	BA-1000 Series		HW (D009)HW
Nickel-Cadmium (NI-CD)[2]	BBXXX	HW (D002, D006)	HW
Silver (AG)[2]	BA-245/U, BA-2245/U, BA-XXXX, & BB-22B/U	HW (D009, D011)	HW
Thermal (THR)	BA-605/U, BA-617/U, BA-61 8/U & BA-630/U	HW (D007)HW	

Notes:

1. AK, CA, MN, RI and WA utilize bioassay to characte rize hazardous waste in addition to EPA's RCRA requirements.
2. These batteries should be considered candidates for recycling.

EPA HW NUMBER	HW CHARACTERISTIC	EPA HW NUMBER	HW CHARACTERISTIC
D001	Ignitability	D007	Chromium
D002	Corrosivity	D008	Lead
D003	Reactivity	D009	Mercury
D006	Cadmium	D011	Silver

2-4. Fire Control/Suppression

Fire suppression equipment, approved by the local Fire Department (FD) for the type and quantity of batteries stored, MUST be provided by the activity storing batteries.

WARNING

DO NOT use water to extinguish a battery fire if a shock hazard exists due to high voltage electrical equipment in the immediate vicinity (greater than 30 volts, alternating current or direct current.

Halon fire extinguishers **SHALL NOT** be used to combat fires involving batteries.

DO NOT use water on fires involving sulfuric acid (H2SO4) battery electrolyte.
H2SO4 is highly reactive and can react with finely divided combustible materials
(e.g., sawdust) on contact.

a. A carbon dioxide (CO2) extinguisher, such as NSN 4210-0202-7858, 10-B:C, Source of Supply (SOS): S9C, or equivalent, is recommended for battery storage areas. This is a good general purpose extinguisher for all types of battery fires. It will not extinguish burning lithium metal; however, it will cool the battery mass and may prevent other batteries from venting.

b. A dry chemical extinguisher, such as 4210-0-775-0127, 10-B:C, SOS: GSA, or equivalent, is recommended for flammable liquids and gases. This is a general purpose extinguisher and for all types of battery fires.

c. An approved Class-D fire extinguisher, such as NSN 4210-01-303-3999, SOS: S9C, or equivalent, such as Lith-X, is recommended for Lithium battery storage areas.

2-5. Storage

a. General.

(1) An activity storing batteries MUST provide fire suppression equipment. The storage areas and equipment MUST be approved by the local FD. A point of contact to the local FD must also be provided.

(2) Batteries should be kept cool and dry, and away from open flame, heat and combustibles, in well ventilated areas with temperatures not to exceed 130° F (54° C). (Refrigeration is not necessary.)

(3) Protect batteries against being damaged, crushed, punctured or short circuited.

(4) DO NOT smoke or eat in battery storage areas.

(5) Store batteries separately from other hazardous material.

(6) Open flame devices shall be used only under proper supervision and with adequate safeguards.

b. Special Requirements:

(1) DO NOT accumulate NHSW batteries. Dispose of them as generated.

(2) Batteries being collected for turn-in to the DRMO SHALL NOT be stored more than 90 days.

2-6. Transportation

Shipments of batteries within the United States over public roads MUST be in accordance with federal DOT requirements (Title 49 CFR, Part 172.101 Hazardous Materials Table (HMT)) when the batteries are listed in the HMT. The regulation includes packaging, marking and labeling requirements. Transportation from OCONUS locations to CONUS is governed by international regulations. The International Maritime Organization (IMO) “International Maritime Dangerous Goods (IMDG) Code” must be used for vessel movement. The provisions of the International Civil Aviation Organization (ICAO), “Technical Instructions for the Safe Transport of Dangerous Goods by Air, “ must be used for commercial airlift. Air Force Regulation 71-4 and TM 38250, “Preparing Hazardous Materials for Military Air Shipment, “ should be used for military airlift. Consult your Installation Transportation Office (ITO) to ensure compliance with all applicable transportation regulations.

WARNING

DO NOT package any battery if it is hot or warm. Package batteries only when they are cool to the touch.

CAUTION

DO NOT mix hazardous and non-hazard-ous solid waste in the same package.

a. Packaging Requirements. Title 49, CFR Parts 173.24 and 173.24a require that packaging be designed and constructed to control contents under conditions normally incident to transportation. For batteries listed in the HMT, use packaging as specified by federal transportation regulations *(i.e.,* 49 CFR). Original packaging materials, when suitable for re-use, may be saved for subsequent packaging and shipping. Packaging materials are listed in Appendix D. In addition, the following requirements apply:

(1) It should be noted that not all batteries are regulated under federal hazardous material transportation regulations *(i.e.,* the HMT, 49 CFR 172.101). However, if a battery is shipped as hazardous waste (HW), it is regulated under the HMT as an “environmentally hazardous substance.”

(2) Batteries must be provided with an effective means of preventing external short circuits. When single cell *(e.g.,* BA-5567/U) or multi-cell batteries with exposed connectors are packaged, they must be protected against external short circuiting by taping the exposed contacts or by placement in a small individual plastic bag or cardboard box, which is sealed with a non-conductive non-metallic closure, such as tape.

(3) The batteries must be adequately protected and securely packaged in a strong fiberboard or wooden box, a fiber or metal drum, or palletized, in accordance with DOT regulations, to withstand conditions normal to shipment.

(4) When single or multi-cell batteries are packed and then overpacked in another container, all free space should be taken up by using suitable packing materials (such as Vermiculite, Absorbent grade, Hazardous Material, NSN 5640-01-324-2664, SOS: GSA, Advice Code 2B) which are non-conductive and non-combustible.

(1) Packaging Damaged Batteries:

(a) Damaged batteries should not be packaged with undamaged batteries.

(b) Damaged batteries with cells that have ruptured, or otherwise have sharp edges, should first be placed in a fiberboard container which is sealed by non-conductive non-metallic means. This container should then be overpacked in another container and sealed by non-conductive non-metallic means. All free space between boxes should be taken up by using suitable non-combustible packaging materials. The overpacking should be able to contain any leakage from the batteries.

b. Marking Requirements. The HMT specifies marking requirements for listed hazardous materials. In addition, marking and labeling of the top and sides of the package should be in accordance with MIL-STD 129.

(1) General rules:

(a) When shipping hazardous batteries which are listed in the HMT, use the item's proper shipping name as listed in the HMT. If the batteries are not listed in the HMT, use their technical name.

(b) When shipping hazardous waste, use the word "Waste" as a part of the proper shipping name, or mark the container as follows:

"HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

Generator's Name and Address_____

Manifest Document Number_____

(c) Markings must be durable, in English, and printed on or affixed to container, plastic sheeting, or on a hang tag.

(d) Markings must be in a contrasting color to the packaging materials, and must not be obscured.

(e) The names and addresses of the consignor and the consignee must be marked on the container.

(f) The container must be marked for proper orientation with directional arrows on two sides, if applicable (e.g., for a battery with a vent/filler cap).

(g) Proper shipping name from the HMT must be in-cluded.

(h) Proper United Nations identification number (UNID) from the HMT must be included.-

(i) If shipping name contains "N.O.S., " then the technical name must be provided by the shipper. In addition, the National Stock Number (NSN) and type number may be provided by the shipper:

(2) Examples:

For a lithium battery listed in the HMT, which is being shipped as HW:

"Waste, lithium battery
UN3090"
6135-01-036-3495, BA-5590/U - Optional

For a mercury battery not listed in the HMT, which is being shipped as HW:

"Waste, environmentally hazardous substances, solid, n.o.s.
UN3077
Mercury battery"
6135-00-125-5265, BA-1030/U - Optional

For a nickel-admium battery with vent/filler caps listed in the HMT, which is being shipped as hazardous material:

"Battery, wet, filled with alkali
UN2795"
Nickel-cadmium battery, vented - Optionallectric storage, 8
6140-0(635-3394, BB-403/U - Optional

c. Labeling. For batteries listed in the HMT, labeling must be in accordance with HMT requirements.

(a) The label must be printed or affixed near the proper shipping name.

(b) Hazardous warning labels are PROHIBITED on packages that DO NOT contain hazardous materials.

d. Shipment of batteries may require shipping papers and/ or manifesting of hazardous waste for disposal. Coordinate with your local ITO for shipping paper requirements, and your local IEO if manifesting of hazardous waste is required.

(a) Shipping papers are required for shipment of hazardous material on public roads and highways.

(b) A manifest is required for shipment of HW on public roads and highways.

2-7. Disposition and Disposal

CAUTION

DO NOT accumulate or store waste bat-teries for disposal for more than 90 days.

In accordance with DoD Consolidated Hazardous Material/Hazardous Waste Disposal Guidance, batteries designated in Table 2-1 as HW for disposal may be disposed of via the local servicing DRMO. In addition, HW may be disposed via local contract Disposal of HW via local contract must be

coordinated with and approved by HQDA, Office of the Directorate of Environmental Programs (ENVR-E), prior to finalization and signature of the local contract. All disposition/disposal actions NIUST BE in accordance with federal, state and local regulations and requirements. Coordinate all actions with the local lEO to ensure proper management of waste batteries.

a. Disposal of Non-hazardous Solid Waste (NHSW). Batteries classified as NHSW in Table 2-1 may be disposed with general refuse.

(1) DO NOT accumulate waste batteries. Good practice dictates that waste materials be disposed on a regular basis. Dispose of small quantities (ess than 150 lbs.) of unserviceable or depleted NHSW batteries with general waste/refuse, as generated.

(2) Disposition/disposal of a large quantity (150 lbs. And over) of unserviceable or depleted NHSW batteries, or any quantity of damaged NHSW batteries, may be through the local servicing DRMO, or via local contract, as unregulated waste.

b. Disposition and Disposal of Hazardous Material (HM) and Hazardous Waste (HW). For any turn-in of HM or HW, a Material Safety Data Sheet (MSDS) and/or Hazardous Waste Profile Sheet (HWPS) (DRMS Form 1930, see appendix G) is required. If a MSDS is required, contact your local supporting SO or IEO. Data required to complete the HWPS is in chapter 4 and appendix H. See para 1-7 for NICP Safety/ Environmental support.

(1) A MSDS is required for turn-in of HM.

(2) A HWPS is required for turn-in of HW. Data from this TB may be used in completion of the HWPS; list this TB as a reference if it is a source for technical data. In addition, a MSDS or laboratory analysis may be required.

(3) If batteries or battery electrolyte for disposal are to be managed as HW, and you must transfer/transport the batteries off your installation, you are required to manifest these waste batteries under Title 40 CFR Part 262 regulations. Consult your local IEO for guidance about manifest requirements.

(4) Batteries designated in Table 2-1 as HW for disposal, and battery electrolyte from vented LA or NI-CD batteries, may be disposed via the local servicing DRMO, or via local contract.

c. Recycling:

(1) Some batteries identified as HW in Table 2-1 *(e.g.,* HG batteries, BA-1000 series) may be recycled under RCRA regulations, and therefore managed as HM.

(2) Recycling and/or reclamation is the recommended option for disposition of batteries in lieu of disposal. Lead acid, mercury, nickel-cadmium and silver batteries should be considered for recycling or reclamation based on federal and state requirements.

d. Transfer to the Defense Reltilization and Marketing Office: The DRMO will accept accountability provided that the batteries are properly marked, labeled, packaged and turned in with appropriate documentation. The DRMO will accept physical custody depending upon the availability of conforming, or most nearly conforming, storage areas. The disposing activity must tmrn in the material (batteries) with an accompanying Disposal Turn-in Document (DTID (DD Form 1348-1)), and provide a HWPS or MSDS for the item(s) as required.

e. For additional information on the disposal of HW, beyond the scope of this handbook, refer to Technical Guide (TG) No. 126, “Waste Disposal Instructions.” TG No. 126 can be obtained from your local IEO or PMO, or contact USAEHA, Waste Disposal Engineering Division at DSN 584-3651 or commercial (410) 671-3651.

CHAPTER 3
SAFETY AND CONTROL MEASURES

3-1. Introduction

a. Personal protective equipment (PPE) MUST be used when handling batteries that show signs of leaking, bulging, swelling or deformity, or handling corrosive electrolyte.

b. If PPE is recommended, coordination is REQUIRED with the supporting Safety Office/Officer (SO), Industrial Hygienist (IH) or Preventive Medicine Office/Officer (PMO). Appropriate PPE is listed in the applicable battery technical manual ™ and in DA Pam 385-3, Protective Clothing and Equipment.

3-2. Personal Protective Equipment

CAUTION

All Personal Protective Equipment (PPE) MUST meet applicable ANSI or NIOSH/MSHA requirements, or equivalent.

a. Hands.

(1) For chemical protection when handling corrosive electrolyte, use the following gloves, or equivalent.

Gloves, Rubber Industrial, Type 1

National Stock Number (NSN)	Source of Supply (SOS)	Size
8415-0266-8673	S9T[1]	12
8415-0266-8675	S9T	11
8415-00-2668677	S9T	10
8415-266-8679	S9T	9

(2) For electrical protection use the following gloves, or equivalent, rated at 1000 v:

Gloves, Electrical Worker, Type 1, Class 0

National Stock Number (NSN)	Source of Supply (SOS)	Size
8415-01-158-9453	S9T[1]	9
84154)-01-158-9455	S9T	10
8415-01-158-9457	S9T	11

(3) For thermal protection use heat protective gloves, NSN 8415-01-092-3910, SOS: S9T[1], or equivalent.

b. Face and Eyes. Eye protection must meet requirements of ANSI Z87.1.

(1) Use the following face shield, or equivalent: NSN 4240-0202-9473, SOS: S9G[2]. An alternative face shield is NSN 4240-0 542-2048, SOS: GFO3.

(2) Use chemical splash safety goggles, or equivalent: NSN 4240-01-292-2818, SOS: GFO.

c. Body. Use the following full body apron, or equivalent: NSN 841540-082-6108, SOS: S9T.

d. Feet. Use the following boots, or equivalent. These hard-top boots are chemical and electrical resistant.

Firemans Boot, 131/2 Inches High, Non-insulated, Black

National Stock Number (NSN)	Source of Supply (SOS)	Size
84304)0753-5935	S9T1	5
843O0--753-5936	S9T	6
843O0{0 753-5937	S9T	7
8430)753-5938	S9T	8
8430-00-753-5939	S9T	9
8430-753-5940	S9T	10
8430-753-5941	S9T	11
8430-40-753-5942	S9T	12
8430-00-753-5943	S9T	13
8430-00-753-5944	S9T	14
8430-00-753-5945	S9T	15

e. Respirator Properly fitted air purifying respirator, with NIOSH/MSHA certified cartridge for organic vapors/acid gases, or equivalent, is recommended. Respirator use should follow an approved program including medical surveillance, testing for proper fit, and training. Ensure a proper fit by coordination with the supporting SO, IH or PMO. SOS: S9G2 or may be obtained through your local procurement system. This is a Paperless Ordering Placement System (POPS) item. Refer to Table 3-1.

1. S9T: Defense Personnel Support Center, Philadelphia, PA 19101; DSN 444 3042 or commercial (215) 737-3042.
2. S9G: Defense General Supply Center, Richmond, VA 23297; DSN 695-5717 or commercial (804) 279-5717.
3. GFO: GSA General Product Commodity Center, 819 Taylor St., Fort Worth, TX 76102 at commercial (817) 334-2051 or (800) 659-6557.

Table 3-1. National Stock Numbers for Respirators

Type/ Manufacturer	Small	Medium	Large
Wilson Premier 6000	4240-268-6636	4240-01-269-6637	4240-01-269-4169
3M Easi-Air	4240-01-246-5401[1]		4240-01-246-5404[1]
MSA Comfo II	4240-01-248-8066	4240-01-248-8065	4240-01-234-8068
Full Facepiece:			
Wilson Premier 6000		4240-01-268-6634[2]	
3M Easi-Air		4240-01-301-3200[2]	
MSA Ultra-Twin	4240-01-248-8052	4240-01-248-8050	4240-01-248-8053
Cartridges, Organic Vapor/Acid Gas/HEPA:			
Wilson Premier 6000		4240-11-272-4759[3]	
3M Easi-Air [4]		4240-01-240-4661[5] (filter)	
		4240-01-246-5411 [5] (filter)	
		4240-01-235-0823[6] (retainer)	
MSA		4240-01-266-1077[3]	

Notes:

1. Mask provided in small/medium and medium/large sizes.
2. Mask provided in one size.
3. Cartridges available in 6/unit pack.
4. Must order all three items.
5. Cartridges available in 10/unit pack.
6. Retainers available in 20/unit pack.

3-3. Ancillary Equipment

a. Flashlight. An explosion proof flashlight such as NSN 623(0-0299-3035 or equivalent is required. SOS: GSA.

b. Emergency Shower and Eye Wash. All emergency eyewashes/showers must meet the requirements of ANSI Z358. 1. An approved emergency shower and eye wash station must be available, where recommended. Emergency eyewashes/showers are required to be flushed weekly for three (3) minutes. In addition, a source of FRESH water should be close at hand before attempting any service to vented Lead-Acid or vented Nickel-Cadmium batteries. Obtain through local procurement

3-4. First Aid

WARNING

DO NOT try to neutralize caustic electrolyte with vinegar or any other acidic solutions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of cool water.

a. Skin. If battery contents or electrolyte are spilled and come in contact with the skin, IIIMEDIATELY flush the affected area for at least 15 minutes with clean WATER and seek medical attention promptly.

b. Eyes. If battery contents or electrolyte come in contact with the eyes, IMMEDIATELY flush the affected area for at least 15 minutes with clean WATER and have someone else summon medical attention for you. Personnel must be trained in how to assist individuals in the vital first flushing of the eyes, in the event of eye contact. Such assistance is necessary for effective irrigation, as the eyelids go into spasm and remain shut, making it difficult for a person to flush the eyes without assistance.

CHAPTER 4
BATTERY PROFILES

4-1. Introduction

a. This chapter is a ready reference for specific guidance for each class of battery listed in Table 2-1. Handling, fire suppression, storage, transportation and disposition requirements in chapter 2 apply to all classes of batteries. This TB is intended to provide useful information in a convenient format; IT DOES NOT REPLACE federal or state environmental or transportation regulations or DoD policies.

b. Coordination with all installation/facility personnel, as required under paragraph (para) 1-3 e, is essential for your safety and the protection of the environment. Installation/facility personnel will assist you in ensuring compliance with requirements under federal, state and local regulations.

4-2. Alkaline (ALK) Batteries

Alkaline batteries are primary (non-rechargeable) batteries.

a. Chemical characterization

(1) Anode: Zinc (Zn).

(2) Cathode: Manganese dioxide (MnO2).

(3) Electrolyte: Aqueous solution of potassium hydroxide (KOH).

(4) The battery cell contains caustic KOH electrolyte, which may leak if the battery is abused. KOH is a strong alkali similar to caustic soda (sodium hydroxide (NaOH)). Serious chemical burns can result if electrolyte comes into contact with the skin or eyes. If the battery electrolyte gets into your eyes, it can cause severe damage and/or blindness.

b. type number. BA-3000 series.

c. Solid waste characterization.

(1) Under federal RCRA: Non-hazardous solid waste (NHSW).

(2) Bioassay findings: Hazardous waste (HW) in states which utilize bioassay characterization criteria for HW identification. Presently AK, CA, MN, RI and WA utilize this criteria.

d. Handling. See para 2-3.

e. Fire control/suppression. A carbon dioxide (C02) fire extinguisher is recommended. See para 2-4.

f. *Storage.* See para 2-5.

CAUTION

Depleted batteries may continue to vent hydrogen gas after use, and if stored at high temperatures above 1300 F.

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. Not regulated under Title 49 CFR, Part 172.101 Hazardous Materials Table (HMT).

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7.

(1) Dispose of ALK batteries as NHSW in accordance with RCRA regulations. These batteries may be disposed with general refuse.

(2) In states with bioassay requirements, ALK batteries are classified as HW, and disposition/disposal may be through your local servicing Defense Reutilization and Marketing Office (DRMO), or via local contract.

4-3. Carbon-Zinc (LeClanche (LCE)) Batteries

LeClanche batteries are primary (non-rechargeable) batteries.

a. Chemical characterization.

(1) Anode: Zinc (Zn).

(2) Cathode: Manganese dioxide (MnO2).

(3) Electrolyte: Aqueous solution of ammonium chlo-ride (NH4CI) and zinc chloride (ZnC12).

b. Type number. BA-2 through BA-471 series (except BA-245, 259 & 380); BA-500 series; BA-800 series.

c. Solid waste characterization.

(1) Under federal RCRA: NHSW.

(2) Bioassay findings: HW in states which utilize bioassay characterization criteria for HW identification. Presently AK, CA, MN, RI and WA utilize this criteria.

d. Handling. See para 2-3.

Fire control/suppression. A C02 fire extinguisher is recommended. See para 2-4.

f. Storage. See para 2-5.

CAUTION

Depleted batteries may continue to vent hydrogen gas after use, and if stored at high temperatures above 130° F.

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. Not regulated under Title 49 CFR, Part 172.101 HMT.

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7.

(1) Dispose of LCE batteries as NHSW in accordance with RCRA regulations. These batteries may be disposed with general refuse.

(2) In states with bioassay requirements, LCE batteries are classified as HW, and disposition/disposal may be through your local servicing DRMO or via local contract.

4-4. Lead-acid (LA) Batteries

Lead-acid batteries are secondary (rechargeable) batteries. There are two kinds of LA batteries: sealed batteries without vent-filler caps, and vented batteries with vent-filler caps for servicing the battery.

a. Chemical characterization

(1) Anode: Lead (Pb).

(2) Cathode: Lead dioxide (PbO2).

(3) Electrolyte: Aqueous solution of sulfuric acid (H2SO4).

(4) The battery cell contains 60 to 75 percent Pb and PbO2 by weight. The battery cell contains an acidic electrolyte solution of between 28.3% and *50.5%* H_2SO_4 by weight. The electrolyte is a strong oxidizing agent and can cause severe skin burns or irritation upon contact. If acid gets into your eyes, it can cause severe damage and/or blindness. Repeated or prolonged exposure to low concentrations of H_2SO_4 fumes or mist will cause tooth erosion and irritation of the mucous membranes, eyes and upper respiratory tract. Contact lenses should not be worn and smoking should be prohibited in areas where $_{H2SO4}$ is stored or handled.

(5) Pb and Pb salts are toxic and hazardous materials. It is recommended to turn-in LA batteries wet. If you must drain the battery, the H2SO4 electrolyte MUST be tested for Pb prior to disposal. If Pb is below the RCRA regulatory limit (5.0 mg/L), then the electrolyte may be disposed in accordance with TG No. 126 with the concurrence of the IEO and the affected waste water treatment authority.

b. Type number BB-XXX.

c. Solid waste characterization.

(1) Under federal RCRA: HW with a US Environmental Protection Agency (EPA) HW number (EPA HW#) of D008 for Pb.

(2) Bioassay findings: Not tested. Presumed to be toxic based on Pb content.

d. Handling. See para 2-3.

WARNING

DO NOT use metal or galvanized equipment when draining electrolyte from Lead-Acid batteries.

DO NOT use finely divided combustible materials *(e.g.,* sawdust) to absorb an H_2SO_4 spill. H_2SO_4 is highly reactive and can react with finely divided combustible materials on contact.

(1) DO NOT attempt to drain electrolyte from sealed secondary batteries.

(2) DO NOT drain electrolyte from vented secondary batteries unless authorized.

(3) If H2S04 electrolyte spills or leaks, DO NOT touch spilled material. Stop the leak if you can do it without risk. Spread sand or other noncombustible material, then flush area with water. Notify the local SO and IEO.

(4) If battery contents or electrolyte come in contact with the skin, IMMEDIATELY flush the affected area for at least 15 minutes with clean WATER and seek medical attention promptly.

e. Fire control/suppression.

WARNING

DO NOT use water on fires involving H_2SO_4. H2SO4 is highly reactive and can react with finely divided combustible ma-terials (e.g. sawdust) on contact. Small fires may be extinguished with a dry chemical extinguisher approved by the local fire department. A $C0_2$ fire extinguisher is recommended. See para 2-4.

f. Storage. See para 2-5.

CAUTION

Batteries should be protected from freez-ing. Battery electrolyte should NOT be drained from a vented LA battery, unless the battery cannot be protected from freezing. Refer to Table 4-1 for freezing points. Refer to Appendix C for instruc-tions if batteries need to be drained.

Table 4-1. Freezing Points of Solutions of Pure Sulfuric Acid

Specific Gravity	Freezing Points ^{o}C	^{o}F
1.000	0.0	+32.0
1.050	-3.3	+26.0
1.100	-7.7	+18.0
1.150	-15.0	+5.0
1.200	-27.0	-17.0
1.250	-52.0	-61.0
1.300	-70.0	-95.0

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. In accordance with Title 49 CFR, Part 172.101 HMT, Hazard Class 8, and 49 CFR, Part 173.159.

(1) Packaging: For vented LA batteries with vent-filler caps:

(a) Batteries must be protected against short circuits.

(b) Batteries may be either packaged in boxes or se-cured to pallets. Drum(s) are NOT approved.

(c) Requirements for packaging batteries in boxes:

1. AH batteries, vent-filler caps and terminals of batteries MUST be protected against physical damage and short circuiting.

2. Vent-filler caps should be taped in place, and the vent holes sealed with the same tape.

3. In order to protect packaging, place battery(ies) in a plastic bag to control any residue or battery electrolyte leakage and seal the bag(s) with a nonmetallic closure (tape).

4. Place bagged batteries in a DOT Specification 4C1, 4C2, 4D or 4F wooden, or 4G fiberboard box(es). DO NOT overfill boxes. Batteries should fit snugly in the boxes. An inside top clearance of at least ½ inch above the battery terminals and/or vent-filler caps must be provided, with reinforcement to prevent them from being crushed. Any empty spaces inside the boxes should be filled with suitable noncombustible absorbent packing materials.

(d) Requirements for palletizing batteries:

1. Batteries which are placed on pallets must be securely fastened using non-metallic strapping.

2. Height of the palletized unit (including batteries, strapping and pallet) must not exceed 1 ½ times the width of the pallet, and may not contain less than one complete layer or more than two layers of batteries per unit.

3. The palletized unit must be able to support twice its own weight without damage to batteries, pallet or strapping.

4. Battery terminals must not be relied upon to support any weight from batteries or units stacked above them.

5. Package and stack vented batteries in an upright position. DO NOT stack batteries on their sides, in order to prevent unintentional draining.

6. If the palletized batteries cannot be protected from exposure to the weather (rain, snow, etc.), the unit must be protected with plastic sheeting. Refer to SB 38-100.

(e) Packaging for sealed LA batteries: In accordance with Title 49 CFR, Part 173.159(d), sealed LA batteries without vent-filler caps MUST be protected against short circuits and securely packaged.

(2) Marking and labeling:

(a) For vented LA batteries with vent-filler caps, proper shipping name: Batteries, wet, filled with acid; Hazard Class: 8; UN Identification Number (UNID): UN2794; Packing Group: III; label in accordance with 49 CFR, Part 172.442: CORROSIVE label. See figure 4-1.

(b). For sealed LA batteries without vent-filler caps, proper shipping name: Batteries, wet, non-spillable; Hazard Class: 8; UNID: UN2800; Packing Group: III; label in accordance with Title 49 CFR, Part 172.442: CORROSIVE label. See figure 4-1.

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7.

(1) Dispose of LA batteries as HW under federal RCRA regulations. Disposition may be through your local servicing DRMO or via local contract. The EPA HW# is D008 for Pb.

Figure 4-1. CORROSIVE label

(2) LA batteries may be recycled under provisions of Title 40, CFR, Part 266.80. Many states ban land disposal and regulate recycling of LA batteries. Recycling is recommended; see appendix E.

(3) In states with bioassay requirements, LA batteries are classified as HW, and disposition/disposal may be through your local servicing DRMO or via local contract.

4-5. Lithium-Manganese Dioxide (Li-MnO2) Batteries

Li-MnO2 batteries are primary (non-rechargeable) batteries. The cell has a solid cathode of manganese dioxide (MnO2). BA-5372/U has two cells/battery, each containing approximately 0.14 grams (g) of lithium (Li). BA-5516/U has nine cells, each containing approximately 0.49 g of Li.

a. Chemical characterization.

(1) Anode: Lithium (Li).

(2) Cathode: Manganese dioxide (MnO2).

(3) Electrolyte: Organic solvent (propylene carbonate and 1, 2 dimethoxyethane) solution of lithium perchlorate (LiCI0O4).

b. Type number BA-5372/U and BA-5516/U

c. Solid waste characterization.

(1) Under federal RCRA: NHSW.

(2) Bioassay findings: HW in states which utilize bioassay characterization criteria for HW identification. Presently AK, CA, MN, RI and WA utilize this criteria.

d. Handling. See para 2-3.

e. Fire control/suppression.

WARNING

Halon fire extinguishers SHALL NOT be used to combat fires involving Li-MnO2 batteries.

A C02 or an approved Class-D fire extinguisher is recommended. See para 2-4.u

f. Storage. See para 2-5.

g. Transportation requirements. See para 26 for packaging, marking and labeling requirements.

(1) BA-5372/U is not regulated under Title 49 CFR, Part 172.101 HMT; see 49 CFR, Part 173.185(i).

(2). BA-5516/U1 multi-cell Li-MnO2 batteries MUST be shipped for disposal in accordance with Title 49 CFR, Part 172.101 HMT and 49 CFR, Part 173.1850).

(a) Packaging: All CECOM procured batteries meet the requirements of 49 CFR, Part 173.1850)(1) *(i.e.,* cells contain less than 12.0 grams of Li). They may be shipped for disposal by motor vehicle only. When packaged, batteries MUST be protected from external short circuits and packaged in a strong outer packaging.

(b) Marking and labeling: Proper shipping name: Lithium battery, ; Hazard Class: 9; UNID: UN3090; Packing Group: II; label in accordance with 49 CFR, Part 172.446: CLASS 9 label; see figure 4-2.

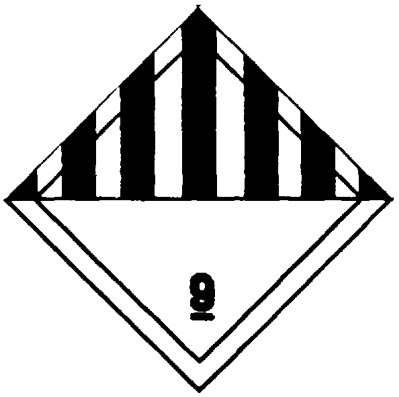

Figure 4-2. Class 9 label

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7 for general requirements.

(1) Dispose of Li-MnO2 batteries as NHSW, in accordance with RCRA regulations. These batteries may be disposed with general refuse.

(2) In states with bioassay requirements, Li-MnO2 batteries are classified as HW, and disposition/disposal may be through your local servicing DRMO or via local contract.

4-6. Lithium-Sulfur Dioxide (Li-S02) Battery, BA-5567/U

BA-5567/U is a primary (non-rechargeable) battery. The battery has one cell with 0.35 grams of lithium (Li)/cell. The cell has a liquid cathode of sulfur dioxide (SO2).

a. Chemical characterization Since 1980, CECOM has only procured "balanced cell" Li-SO2 batteries.

(1) Anode: Lithium (Li).

(2) Cathode: Sulfur dioxide (SO2).

(3) Electrolyte: Organic solvent (acetonitrile (CH3CN)) solution with lithium bromide (LiBr).

WARNING

Li-SO2 batteries contain pressurized $_{SO2}$ gas. The gas has a pungent odor, and is highly toxic. The battery **MUST NOT** be abused in any way which may cause the battery to rupture.

IMMEDIATELY turn off the equipment if battery or battery compartment shows signs of overheating or becomes hot to the touch. Allow the battery to cool (at least 60 minutes) before removing it. If you hear a hissing sound (battery vent-ing), or smell irritating gas, **IMMEDIATELY** Turn Off the equipment, and **LEAVE** the area until any smell or signs of leaking gas have been cleared from the area.

(4) *S02* gas has a sharp suffocating odor and is a corrosive and poisonous material. It may irritate the eyes, nose, throat, and upper respiratory tract. Personnel can detect S02 at I part per million (ppm) concentration, and concentrations above 10 ppm are dangerous.

(5) NEVER test Li-S02 batteries for capacity with a conventional test set not specifically designed to test these batteries.

b. Type number. BA-5567/U.

c. Solid waste characterization.

(1) Under federal RCRA: NHSW.

(2) Bioassay findings: Not tested. Based on testing of multi-cell Li-S02 batteries, not HW under this criteria.

d. Handling. See para 2-3.

e. Fire control/suppression. See para 2-4.

WARNING

Halon fire extinguishers SHALL NOT be used to combat fires involving Li-SO2 batteries.

(3) If Li-SO2 batteries are involved in or near fire, the principal concerns are to prevent its spread and minimize cell venting. Flood the burning materials with water. This will cool the batteries, control the combustion of surrounding flammables and reduce the hazards of gaseous SO2, in case of venting, by removing some of the gas from the air.

(4) C02 extinguishers will not extinguish burning Li metal, but will extinguish other combustible materials within or near the battery.

(5) Use of an approved Class-D fire extinguisher, such as Lith-X, for Li metal fires, is recommended. *f Storage.* See para 2-5. Storage shall be in a dry, well ventilated, sprinkler protected facility, if available. A non-combustible building or structure without sprinklers will be the second choice. A combustible storage facility may be used temporarily if neither of the above types are available. Other hazardous materials shall be stored separately. A Class-D fire extinguisher should be available in storage areas, when sprinkler protected facilities are not available.

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. BA-5567/U is not regulated under Title 49 CFR, Part 172.101 HMT; see 49 CFR, Part 173.185(i).

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7.

(1) Dispose of BA-5567/U batteries as NHSW, in accordance with RCRA regulations. These batteries may be disposed with general refuse.

(2) These batteries are classified as NHSW in states which utilize bioassay to characterize solid wastes.

4-7. Lithium-Sulfur Dioxide (Li-SO2) Batteries, Multi-cell

Multi-cell Li-SO2 batteries are primary (non-rechargeable) batteries. These multi-cell batteries have two or more cells (up to ten cells depending on configuration). The cell has a liquid cathode of sulfur dioxide (SO2), with up to 2.8 grams of lithium (Li)/cell. There are two types of batteries presently available without a Complete Discharge Device (CDD), and with a CDD. The CDD is built into most multi-cell Li-S02 batteries produced after January 1989. Batteries with a built-in CDD can be identified by a label over the switch instructing users to "Push" the switch prior to disposal.

a. Chemical characterization. Since 1980, CECOM has only procured "balanced cell" Li-SO2 batteries.

(1) Anode: Lithium (Li).

(2) Cathode: Sulfur dioxide (S02).

(3) Electrolyte: Organic solvent (acetonitrile (CH3CN)) solution with lithium bromide (LiBr).

WARNING

Li-SO2 batteries contain pressurized SO2 gas. The gas has a pungent odor, and is highly toxic. The battery **MUST NOT** be abused in any way which may cause the battery to rupture.

IMMEDIATELY turn off the equipment if battery or battery compartment shows signs of overheating or becomes hot to the touch. Allow the battery to cool (at least 60 minutes) before removing it. If you hear a hissing sound (battery vent-ing), or smell irritating gas, **IMMEDIATELY** Turn Off the equipment, and **LEAVE** the area until any smell or signs of leaking gas have been cleared from the area.

(1) S02 gas has a sharp suffocating odor and is a corrosive and poisonous material. It may irritate the eyes, nose, throat, and upper respiratory tract. Personnel can detect SO2 at 1 part per million (ppm) concentration, and concentrations above 10 ppm are dangerous.

(2) NEVER test Li-S02 batteries for capacity with a conventional test set not specifically designed to test these batteries. Battery Test Set TS-4403A/U is authorized for testing BA-5588/U, BA-5590/U and BA-5598/U in accordance with your locally established Standard Operating Procedures (SOP) based on Technical Assistance Gram (TAG) #002-95. This TAG may be obtained from your local CECOM Logistics Assistance Representative (LAR) or the CECOM Safety Office, see para 1-7.

b. Type number. BA-5000 series (except BA-5372/U, BA-5516/U and BA-5567/U).

c. Solid waste characterization.

(1) With a CDD: multi-cell Li-S02 batteries with CDD can be completely discharged by activating the CDD after final use. After the CDD is activated the battery MUST be stored for five days to eliminate its reactivity.

(a) Under federal RCRA: NHSW.

(b) Bioassay findings: NHSW in states which utilize bioassay characterization for HW identification. Presently AK, CA, MN, RI and WA utilize this criteria.

(2) Without a CDD: LiS02 batteries without CDD CAN NOT be completely discharged during use. After final use, these batteries are still characterized as reactive.

(a) Under federal RCRA: HW with an EPA HW numbers D01 for ignitable and D003 for reactive.

(b) Bioassay findings: Not tested, and presumed NHSW based on findings of batteries with CDD. Although these batteries did not fail this criteria, they are still considered HW for disposal because they are characterized as reactive HW under RCRA regulations.

d. Handling. See para 2-3.

e. Fire control/suppression. See para 24. A Li-S02 battery does not catch fire easily. Typically, lithium (Li) metal is less than two percent of total battery weight. If it does catch fire, it will probably burn out in less than five minutes. A battery heated by a fire will probably vent toxic and corrosive SO2 gas.

WARNING

Halon fire extinguishers SHALL NOT be used to combat fires involving Li-SO2 batteries.

(1) If Li-SO2 batteries are involved in or near fire, the principal concerns are to prevent its spread and minimize cell venting. Flood the burning materials with water. This will cool the batteries, control the combustion of surrounding flammables, and reduce the hazards of gaseous S02, in case of venting, by removing some of the gas from the air.

(2) C02 extinguishers will not extinguish burning Li metal, but will extinguish other combustible materials within or near the battery.

(3) Use of an approved Class-D fire extinguisher, such as Lith-X, for Li metal fires, is recommended.

f. Storage. See para 2-5. Storage shall be in a dry, well ventilated, sprinkler protected facility, if available. A non-combustible building or structure without sprinklers will be the second choice. A combustible storage facility may be used temporarily if neither of the above types is available. Other hazardous materials shall be stored separately from the batteries. A Class-D fire extinguisher should be available in storage areas when sprinkler protected facilities are not available.

g. Transportation requirements. See para 26 for packaging, marking and labeling requirements. All multi-cell Li-SO2 batteries MUST be shipped for disposal in accordance with Title 49 CFR, Part 172.101 HMT and 49 CFR, Part 173.1850).

(1) Packaging: All CECOM procured batteries meet the requirements of 49 CFR, Part 173.1850)(1) *(i.e.,* cells contain less than 12.0 grams of Li). They may be shipped for disposal by motor vehicle only. When packaged, batteries MUST be protected from external short circuits, and packaged in a strong outer packaging.

(2) Marking and labeling: Proper shipping name: Lithi- um battery; Hazard Class: 9; UNID: UN3090; Packing Group: II; label in accordance with 49 CFR, Part 172.446: CLASS 9 label; see label at Figure 4-2. CDD dis-charged Li-SO2 batteries are not regulated under 49 CFR, Part 172.101 HMT, see 49 CFR, Part 173.185 (1).

h. Disposition and disposal: DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7. Deactivated Li-SO2 batteries which have been

completely discharged with a CDD can be disposed with general refuse/trash. These batteries, (except BA-555671U) have a manual switch which engages a CDD. Most Li-S02 batteries procured after January 1989 have a CDD. The device MUST be activated and the battery stored for at least five days before it can be disposed with general refuse/trash.

(1) Li-SO2 Batteries with CDD.

CAUTION

Li-SO2 batteries (except BA-5567/U) MUST NOT be disposed with general re-fuse/trash, unless the batteries have been completely discharged.

(a) A battery with a CDD can be identified by a re-movable label over the manual switch which reads:

ATTENTION
BEFORE DISPOSAL
REMOVE THIS LABEL AND
PUSH SWITCH

and an information card inside the plastic bag containing the Li-S02 battery which reads:

ATTENTION

THIS BATTERY HAS A DISCHARGE SWITCH. AFTER THE BATTERY IS USED AND THIS SWITCH IS PUSHED, THE BAT-TERY MAY BE DISPOSED AS NORMAL TRASH. BEFORE DISPOSAL REMOVE ATTENTION LABEL, PUSH SWITCH. IF OP-ERATIONALLY POSSIBLE, WAIT FIVE DAYS, THEN DISCARD BATTERY.

or

ATTENTION

THIS BATTERY HAS A DISCHARGE SWITCH IN ORDER TO MAKE IT NON-REACTIVE. AFTER FINAL USE REMOVE THE ATTENTION LABEL COVERING THE SWITCH, PUSH SWITCH, AND STORE BATTERY FOR FIVE DAYS. COORDINATE DISPOSAL WITH YOUR LOCAL ENVIRON-MENTAL OFFICE/OFFICER. STATE/LOCAL REGULATIONS WILL CONTROL DIS-POSAL IN YOUR AREA.

CAUTION

If Li-SO2 batteries show signs of damage prior to discharge with the built-in CDD, complete deactivation can not be en-sured. If the battery shows evidence of overheating during discharge (too hot to hold, melted plastic case, vented cell, etc.) complete discharge cannot be en-sured. Such Li-SO2 batteries MUST BE disposed as HW.

(b) For Li-S02 batteries with a CDD the following procedure MUST be followed to eliminate the battery's reactivity in order to permit disposal with general refuse as NHSW in accordance with federal RCRA regulations. **ONLY** authorized personnel MAY activate the battery CDD
prior to disposal. Your installation should establish an SOP for Li-S02 battery deactivation, disposition, and disposal based on Technical Assistance Gram (TAG) 95-002, see Appendix I.

WARNING

Multi-cell Li-SO2 batteries may vent dur-ing complete discharge.

DO NOT pack batteries in a box, barrel or drum during discharge with built-in CDD.

If you hear a hissing sound (battery vent-ing), or smell irritating gas, **IMMEDIATELY** Turn Off the equipment, and **LEAVE** the area until any smell or signs of leaking gas have been cleared from the area.

CAUTION

Li-SO2 batteries will get warm/hot during discharge with a built-in CDD, and the battery jacket may deform.

1. After the battery is no longer operational, remove the attention label over the CDD and push the switch. Using a grease pencil or permanent marker, mark the date the CDD was activated on the battery.

2. Store the battery for at least five days (but not longer than 90 days) in an approved lithium battery storage area During discharge with a built-in CDD, the batteries **MUST NOT** be packed in a box, barrel or drum, or tightly stacked. Provide a minimum of two (2) inches between batteries.

3. After five days the batteries can be classified as NHSW and disposed with general waste/refuse, as generated. Avoid storing these batteries any longer than the prescribed five day period to minimize unnecessary storage.

4. After the batteries have cooled to the touch, and if they have **NOT** vented during discharge, the batteries can be classified as NHSW. They may be disposed with general waste/refuse.

5. If a battery vents during discharge, it **MUST BE** disposed as HW, see para (2) below.

6. Batteries **MUST NOT** be packaged/boxed for shipment until they are cool to the touch.

(c) These batteries are classified as NHSW in states which use bioassay to characterize solid wastes.

(2) Li-SO2 battery without CDD:

(a) Depleted batteries which have **NOT** been completely discharged with a CDD, and damaged or unserviceable multi-cell Li-S2 batteries, may be disposed through your local servicing DRMO or via local The contract. The EPA
HW#'s are DOOI for ignitable and D003 for reactive.

user MUST certify on the DTID (DD Form 1348-1) that the batteries are "balanced cell batteries." See para 4-7 a.

(b) These batteries are classified as NHSW in states that utilize bioassay to characterize solid wastes. However, they MUST be disposed as HW, because the battery's reactivity exceeds regulatory limits.

4-8. Lithium-Thionyl Chloride (Li-SOCI2) Batteries, Multi-cell

Multi-cell Li-SOC12 batteries are primary (non-rechargeable) batteries. These multi-cell batteries have two or more cells (up to eight cells depending on configuration). The cell has a liquid cathode of thionyl chloride (SOC12), with up to 4.7 grams of lithium (Li)/cell. There are two types of batteries presently available: with a Complete Discharge Device (CDD), and without a CDD. Batteries with a built-in CDD can easily be identified by an attention label over the switch instructing users to "Push" the switch prior to disposal.

a. Chemical characterization.

(1) Anode: Lithium (Li).

(2) Cathode: Thionyl chloride (SOC12).

(3) Electrolyte: Non-aqueous thionyl chloride (SOC12) solution containing lithium aluminum chloride (LiAIC14) salt.

WARNING

Li-SOCI2 batteries contain liquid SOCI2, which fumes upon exposure to air. The vapor is highly toxic, and the battery MUST NOT be abused in any way which may cause the battery to rupture. IMMEDIATELY turn off the equipment if battery or battery compartment shows signs of overheating or becomes hot to the touch. Allow the battery to cool (at least 60 minutes) before removing it. If you hear a hissing sound (battery venting), or smell irritating vapor, IMMEDIATELY Turn Off the equipment, and LEAVE the area until any smell or signs of leaking gas have been cleared from the area.

(4) SOC12 vapor has a sharp suffocating odor and is a corrosive and poisonous material. It may irritate the eyes, nose, throat, and upper respiratory tract. Personnel can detect SOC12 at I part per million (ppm) concentration, and concentrations above 10 ppm are dangerous.

(5) NEVER test Li-SOC12 batteries for capacity with a conventional test set not specifically designed to test these batteries.

b. Type number. BA-6000 series.

c. Solid waste characterization.

(1) With CDD: Li-SOC12 batteries with CDD can be completely discharged by activating the CDD after final use.

(a) Under federal RCRA: HW with an EPA HW# of D007 for chromium.

(b) Bioassay findings: HW in states which utilize bioassay characterization for HW identification. Presently AK, CA, MN, RI and WA utilize this criteria.

(2) Without CDD: Li-SOCI2 batteries without CDD can NOT be completely discharged by your equipment. After final use these batteries are still reactive.

(a) Under Federal RCRA: HW with EPA HW#'s of DOO1 for ignitable, D003 for reactive and D007 for chromium.

(b) Bioassay findings: HW in states which utilize bioassay characterization for HW identification. Presently AK, CA, MN, RI and WA utilize this criteria.

d. Handling. See para 2-3.

e. Fire control/suppression. See para 2-4. A Li-SOC12 battery does not catch fire easily. Typically, lithium (Li) metal is less than two percent of total battery weight. If it should catch fire, it will probably burn out in less than five minutes. A battery heated in a fire will probably vent toxic and corrosive SOC12 vapors.

WARNING

Halon fire extinguishers SHALL NOT be used to combat fires involving Li-SOC12 batteries.

(1) In the event that Li-SOCI2 batteries are involved in or near fire, the principal concerns are to prevent its spread and minimize cell venting. Flood the burning materials with water. This will cool the batteries, control the combustion of surrounding flammables, and reduce the hazards of gaseous SOC12, in case of venting, by removing some of the vapor from the air.

(2) CO_2 extinguishers will not extinguish burning Li metal, but will extinguish other combustible materials within or near the battery.

(3) Use of an approved Class-D fire extinguisher, such as Lith-X, for Li metal fires, is recommended.

f. Storage. See para 2-5. Storage shall be in a sprinkler protected facility, if available. A noncombustible building or structure without sprinklers will be the second choice. A combustible storage facility may be used temporarily if neither of the above types are available at the time storage is required. Other hazardous materials shall be appropriately segregated from the batteries. A class-D fire extinguisher should be available in storage areas, when sprinkler protected facilities are not available.

g. Transportation requirements. See para 26 for packaging, marking and labeling requirements. All multi-cell Li-SOCI2 batteries MUST be shipped for disposal in accordance with Title 49 CFR, Part 172.101 HMT and 49 CFR, Part I73.1850).

(1) Packaging: All CECOM procured batteries meet the requirements of 49 CFR, Part 173.1850)(1) *(i.e.,* cells contain less than 12.0 grams of Li). They may be shipped for disposal by motor vehicle only. When packaged, batteries MUST be protected from external short circuits, and packaged in a strong outer packaging.

(2) Marking and labeling: Proper shipping name: Lithium battery; Hazard Class: 9; UNID: UN3090; Packing Group: II; label in accordance with 49 CFR, Part 172.446: CLASS 9 label; see Figure 4-2. CDD discharged Li-SOC12 batteries are not regulated under 49 CFR, Part 172.101 HMT, see 49 CFR, Part 173.185 (1)

However, they may be shipped for disposal as HW: "Waste, environmentally hazardous substances, n.o.s., UN3077, Lithium Thionyl Chloride Battery."

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7 for general requirements. All depleted Li-SOC12 batteries which have been completely discharged with a CDD, and those without a CDD, may be disposed through the local servicing DRMO or via local contract. Most Li-SOC12 batteries have a CDD. If the battery has a CDD, it MUST be actuated and the battery stored for at least five days, before it can be shipped for disposal.

CAUTION

Li-SOCI2 batteries MUST be disposed as Hazardous Waste.

(1) Li-SOC12 batteries with CDD:

The following procedure is required for all Li-SOC12 batteries containing a CDD in order to eliminate reactivity prior to

disposal through the local servicing DRMO as HW identified with an EPA HW# of D007 for chromium. ONLY authorized personnel MAY activate the battery CDD prior to disposal. Your installation should establish an SOP for Li-SOC12 battery deactivation, disposition, and disposal.

(a) A battery with a CDD can be identified by a re-movable label over the manual switch which reads:

ATTENTION

Before Disposal

Remove this Label and Push Switch

and an information card inside the plastic bag containing the LiSOCI2 battery which reads:

ATTENTION

THIS BATTERY HAS A DISCHARGE SWITCH. AFTER THE BATTERY IS USED AND THIS SWITCH IS PUSHED, THE BAT-TERY MAY BE DISPOSED AS NORMAL TRASH. BEFORE DISPOSAL REMOVE ATTENTION LABEL, PUSH SWITCH. IFOP-ERATIONALLY POSSIBLE, WAIT FIVE DAYS, THEN DISCARD BATTERY.

or

ATTENTION

THIS BATTERY HAS A DISCHARGE SWITCH IN ORDER TO MAKE IT NON-REACTIVE. AFTER FINAL USE REMOVE THE ATTENTION LABEL COVERING THE SWITCH, PUSH SWITCH, AND STORE BATTERY FOR FIVE DAYS. COORDINATE DISPOSAL WITH YOUR LOCAL ENVIRON-MENTAL OFFICE/OFFICER. STATE/LOCAL REGULATIONS WILL CONTROL DIS-POSAL IN YOUR AREA.

WARNING

DO NOT pack batteries in a box, barrel or drum during discharge with built-in CDD. If you hear a hissing sound (battery vent-ing), or smell irritating vapor, **IMMEDIATELY** Turn Off the equipment, and **LEAVE** the area until any smell or signs of leaking gas have been cleared from the area.

CAUTION

Li-SOCI batteries will get hot/warm during discharge with a built-in CDD. The jacket may deform.

(b) After the battery is no longer operational, remove the attention label over the CDD and push the switch. Using a grease pencil or permanent marker, mark the date the CDD was activated on the battery.

(c) Store the battery for at least five days (but not longer than 90 days) in an approved lithium battery storage area. During discharge with a built-in CDD, the batteries MUST NOT be packed in a box, barrel or drum, or tightly stacked. Provide a minimum of two (2) inches between batteries. After five days, the battery is not reactive in accordance with RCRA requirements.

(d) Avoid storing these batteries longer than the prescribed five day period to minimize unnecessary storage.

(e) Batteries MUST NOT be packaged/boxed for ship-ment until they are cool to the touch.

(f) In states with bioassay requirements, multi-cell Li-SOC12 batteries are classified as HW, and disposition/dispos-

al may be through your local servicing DRMO or via local contract in states with this requirement. (2) L.i-SOC12 batteries without CDD: multi-cell Li-SOC12 batteries without a CDD are reactive.

(a) These batteries may be disposed as HW through your local servicing DRMO or via local contract with EPA HW#'s of DOO1 for ignitable, D003 for reactive and D07 for chromium.

(b) In states with bioassay requirements, multi-cell Li-SOC12 batteries are classified as 11W for disposal.

4-9. Magnesium (MG) Batteries

MG battery is a multi-cell primary (non-rechargeable) battery. The cell has a solid cathode of manganese dioxide (MnO2). CECOM presently manages BA-4386/U and BA4840/U batteries only.

a. Chemical characterization.

(1) Anode: Magnesium (Mg).

(2) Cathode: Manganese dioxide (MnO2).

(3) Electrolyte: Aqueous solution of magnesium bromide (MgBr2) or magnesium perchlorate (MgCIO4).

b. Type number. BA-4000 series.

c. Solid waste characterization.

(1) Under federal RCRA:

(a) Partially discharged MG batteries which have greater than *50%* remaining charge are HW with an EPA HW# of D007 for chromium.

(b) MG batteries with 50% or less remaining charge are NHSW. The disposing activity must test MG batteries as described below to ensure that they are properly discharged prior to declaration as NHSW.

(c) Test BA-4386/U MG batteries using Battery Test Set AN/PSM-13 with adapter U-410/PSM-13 in accordance with TM 11-6625-823-15. Batteries with less than 8 hours of useful life remaining may be disposed as NHSW.

(d) BA-4840/U MG battery cannot be tested. Dispose as HW with an EPA HW# of D007 for Chromium.

(2) Bioassay findings: NHSW in states which utilize bioassay characterization criteria for HW identification, unless they exceed the regulatory limit for chromium *(i.e.,* eight hours or more of remaining use-life).

d. Handling. See para 2-3.

e. Fire control/suppression. A CO2 fire extinguisher is recommended. See para 2-4.

f: *Storage.* See para 2-5.

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. Not regulated under Title 49 CFR, Part 172.101 HIMT.

CAUTION

Depleted MG batteries continue to gen-erate
H2 gas after use.

(1) DO NOT seal batteries in gas tight plastic bag(s), drum(s), or any non-vented container.

(2) When over-packing damaged batteries, double packaging and absorbent packaging materials should be relied upon for containment.

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7.

(1) Dispose of MG batteries with less than eight hours of use-life remaining as NHSW in accordance with RCRA regulations. The batteries must be tested and certified by the disposing activity to have less than 8 hours of useful life remaining; see c (1) (c) above. These batteries may be disposed with general refuse.

(2) Partially discharged MG batteries may be disposed as HIW through your local servicing DRMO or via local contract with an EPA HW# of D007 for chromium.

(3) Under state bioassay requirements, MG batteries are classified as NHSW. However, they MUST be disposed as HW through your local servicing DRMO, or via local contract, if the battery's chromium content exceeds the regulatory limit *(i.e.,* eight hours or more of remaining useful life).

4-10. Mercury (HG) Batteries

HG battery is a primary (non-rechargeable) battery. The battery has one or more cells depending on configuration.

a. Chemical characterization.

(1) Anode: Zinc (Zn).

(2) Cathode: Mercuric oxide (HgO).

(3) Electrolyte: Aqueous solution of potassium hydroxide (KOH) or sodium hydroxide (NaOH).

(4) The cell has a solid cathode of mercuric oxide (HgO) and contains 20 to 50 percent mercury (Hg) and HgO by weight. The battery cell contains caustic KOH or NaOH electrolyte, which may leak if the battery is abused. Chemically, KOH and NaOH (caustic soda) are strong alkalis. Serious chemical burns can result if the electrolyte comes into contact with skin or eyes. If the battery electrolyte gets into your eyes, it can cause severe damage and/or blindness.

(5) Hg and Hg salts are toxic and hazardous materials for disposal.

b. Type number. BA-1000 series.

c. Solid waste characterization.

(1) Under federal RCRA: HW with an EPA HW# of D009 for mercury (Hg).

(2) Bioassay findings: Not tested. Presumed to be toxic based on Hg content.

d. Handling. See para 2-3.

e. Fire control/suppression. A C02 fire extinguisher is recommended. See para 2-4.

f. Storage. See para 2-5.

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. Not regulated under Title 49 CFR, Part 172.101 HMT.

CAUTION

Depleted HG batteries continue to generate H2 gas after use.

(1) DO NOT seal batteries in gas tight plastic bag(s), drum(s), or any non-vented container.

(2) When over-packing damaged batteries, double pack-aging and absorbent packaging materials should be relied upon for containment.

h. Disposition and Disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. Re-cycling is recommended. See para 2-7.

(1) HG batteries may be disposed through your local servicing DRMO or via local contract with an EPA HW# of D009 for Hg.

(2) In states with bioassay requirements, based on Hg content, these batteries should be considered HW, and disposition/disposal may be through your servicing DRMO or via local contract.

4-11. Nickel-Cadmium (NI-CD) Batteries

NI-CD batteries are secondary (rechargeable) batteries. There are two kinds of NI-CD batteries: sealed batteries without vent-filler caps, and vented batteries with vent-filler caps in order to service the battery.

a. Chemical characterization

(1) Anode: Cadmium (Cd).

(2) Cathode: Nickel oxyhydroxide (NiOOH).

(3) Electrolyte: Aqueous solution of potassium hydroxide (KOH).

WARNING

DO NOT try to neutralize caustic electro-lyte with vinegar or any other acidic solu-tions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of water.

(4) The battery cell typically contains 13 to 15 percent Cd, and 20 to 30 percent nickel by weight. The battery cell typically contains a caustic electrolyte solution composed of 31% KOH by weight. Chemically, KOH is a strong alkali similar to caustic soda. Serious chemical burns can result if this electrolyte comes into contact with the skin or eyes. If the battery electrolyte gets into your eyes, it can cause severe damage and/or blindness.

(5) Cd and Cd salts are toxic and hazardous materials. It is recommended to turn-in NI-CD batteries wet. If you must drain the battery, the KOH electrolyte MUST be tested for Cd prior to disposal. If Cd is below the RCRA regulatory limit (1.0 mgIL), then the electrolyte may be disposed in accordance with TG No. 126 with the concurrence of the IEO and the affected waste water treatment authority.

b. Type number. BB-XXX.

c. Solid waste characterization.

(1) Under federal RCRA: HW with an EPA HW number of D006 for Cd.

(2) Bioassay findings: Not tested. Presumed to be toxic based on Cd and nickel (Ni) content.

d. Handling. See para 2-3.

WARNING

DO NOT try to neutralize caustic electrolyte with vinegar or any other acidic solutions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of water.

(1) DO NOT attempt to drain electrolyte from sealed secondary batteries.

(2) DO NOT drain electrolyte from vented secondary batteries unless authorized.

(3) If battery contents or electrolyte are spilled and come in contact with the skin, **IMMEDIATELY** flush the affected area for at least 15 minutes with clean **WATER** and seek medical attention promptly.

e. Fire control/suppression A C02 fire extinguisher is recommended. See para 2-4. *f Storage.* See para 2-5.

(1) Given reasonable protection, vented NI-CD batteries should not freeze. Avoid temperatures of less than -40 F or greater than 130 F.

(2) If KOH electrolyte spills or leaks, DO NOT touch spilled material. Stop leak if you can do it without risk. Take up with sand, or other noncombustible material, then flush area with water. Notify the local SO and IEO.

g. Transportation requirements. See para 2-6 for packaging, marking and labeling requirements. In accordance with Title 49 CFR, Part 172.101 HMT, Hazard Class 8, and 49 CFR, Part 173.159.

(1) Packaging for vented NI-CD batteries with vent-filler caps:

(a) Vented NI-CD batteries, and the cells contained therein, should be fully discharged, prior to shipment, with Equalization Discharge Fixture, NSN 6110 - 014-6225, in accordance with procedures in the battery TM.

(b) Must be protected against short circuits.

(c) Batteries may be either packaged in boxes or se-cured to pallets. Drum(s) are NOT approved.

(d) Requirements for packaging batteries in boxes

1. All batteries, vent-filler caps and terminals of bat teries MUST be protected against physical damage and shot circuiting.

2. The vent/filler caps of vented battery cells should be taped in place, and the vent holes sealed with the same tape.

3. In order to protect packaging, place battery(ies) in a plastic bag to control any residue or battery electrolyte leakage, and seal the bag(s) with a nonmetallic closure such as tape.

4. Place bagged batteries in a DOT Specification 4C , 4C2, 4D or 4F wooden, or 4G fiberboard box(es). DO NOT overfill boxes. Batteries should fit snugly in the boxes An inside top clearance of at least ½ inch above the battery terminals and/or vent/filler caps must be provided, with reinforcement to prevent them from being crushed. Any empty spaces inside the boxes should be filled with suitable absorbent, non-combustible packing materials.

(e) Requirements for palletizing batteries:

1. Batteries which are placed on pallets must be securely fastened by non-metallic strapping.

2. Height of the palletized unit (batteries, strapping, and pallet) must not exceed 1 ½ times the width of the pal-let, and may not contain less than one complete layer or mot than two layers of batteries per unit.

3. The completed unit must be able to support twice its own weight without damage to the batteries, pallet or strapping.

4. Battery terminals must not be relied upon to sup port any weight from batteries or units stacked above them.

5. Package and stack vented batteries in an upright position. DO NOT stack batteries on their sides, in order to prevent unintentional draining.

6. If the palletized batteries cannot be protected from exposure to the weather (rain, snow, etc.), the unit must be , protected with plastic sheeting. Refer to SB 38-100.

(2) In accordance with Title 49 CFR, Part 173.159(d), packaging for sealed NI-CD batteries without vent-filler caps are exempt from requirements provided they meet the test requirements of this para, protected against short circuits and securely packaged.

(3) Marking and labeling: See para 26 *b.*

(a) For vented NI-CD batteries with vent-filler caps: proper shipping name: Battery, wet, filled with alkali; Hazard Class: 8; UNID: UN2795; Packing Group: III; label in accordance with 49 CFR, Part 172.442: CORROSIVE label; see figure 4-1.

(b) For sealed NI-CD batteries without vent-filler caps: proper shipping name: Battery, wet, non-spillable;
Hazard Class: 8; UNID: UN2800; Packing Group: III; label in accordance with Title 40 CFR, Part 172.442: COR-ROSIVE label; see figure 4-1.

h. Disposition and disposal. DO NOT accumulate and store waste batteries for disposal for more than 90 days. Re-cycling is recommended. See para 2-7.

(1) NI-CD batteries may be disposed as HW through your local servicing DRMO, or via local contract, with an EPA HW# of D006 for Cd.

(2) In states with bioassay requirements, based on cadmium and nickel content, these batteries should be considered HW, and disposition may be through your local servicing DRMO or via local contract.

4-12. Silver (AG) Batteries

a. Primary (non-rechargeable) batteries containing silver (Ag).

(1) Chemical characterization.

(a) BA-245/U and BA-2245/U:

1. Anode: Zinc (Zn).

2. Cathode: Silver chloride (AgC1).

3. Electrolyte: Aqueous solution of lithium chloride (LiC1) or zinc chloride (ZnCI2) and zinc sulfate (ZnSO4).

4. BA-245/U and BA-2245/U have sealed cells containing a mild acid which may leak if the battery is abused. A typical cell contains 20 to 30 percent AgC1 by weight. Serious chemical burns can result if this electrolyte comes into contact with the skin or eyes. If the battery electrolyte gets into your eyes, it can cause severe damage and/or blindness.

5. Ag and Ag salts are toxic and hazardous materials for disposal.

(b) BA-472( )/U, BA-485/U, and BA-486( )/IU:

1. Anode: Zinc (Zn).

2. Cathode: Silver oxide (Ag20O).

3. Electrolyte: Aqueous solution of potassium hydroxide (KOH).

WARNING

DO NOT try to neutralize caustic electrolyte with vinegar or any other acidic solutions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of water.

4. BA-472( )/U, BA-485/U and BA-486( )/U have sealed cells containing caustic KOH electrolyte and may leak if the battery is abused. Chemically KOH is a strong alkali. Serious chemical burns can result if the electrolyte comes into contact with skin or eyes. If the battery electrolyte gets into your eyes, it can cause severe damage and/or blindness.

5. Ag and Ag oxides are toxic and hazardous materials for disposal.

(2) Type number: BA-245fU, BA-472( )/U, BA-485/U, BA-486( )/U, and BA-2245/U.

(3) Solid waste characterization.

(a) Under federal RCRA: HW with EPA HW# s D009 for mercury (Hg) and DO11 for silver (Ag).

(b) Bioassay findings: Not tested. Presumed to be toxic based on Ag content.

(4) Handling: See para 2-3.

(5) Fire control/suppression: A C02 fire extinguisher is recommended. See para 2-4.

(6) Storage: See para 2-5.

(7) Transportation requirements: See para 26 for pack-aging, marking and labeling requirements. Not regulated under Title 49 CFR, Part 172.101 HMT.

(8) Disposition and Disposal: DO NOT accumulate and store waste batteries for disposal for more than 90 days. Re-cycling is recommended. See para 2-7.

(a) AG batteries may be disposed through your local servicing DRMO, or via local contract, with an EPA HW# of DOll1 for Ag.

(b) In states with bioassay requirements, based on Ag content, these batteries should be considered HW, and disposition/disposal may be through your servicing DRMO or via local contract

b. Secondary (rechargeable) batteries containing Ag (BB-622B/U):

(1) Chemical characterization:

(a) Anode: Zinc (Zn).

(b) Cathode: Silver oxide (Ag20).

(c) Electrolyte: Aqueous solution of potassium hydroxide (KOH).

WARNING

DO NOT try to neutralize caustic electrolyte with vinegar or any other acidic solutions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of water.

(d) A battery cell typically contains 20 to 30 percent Ag20 by weight. The battery cell typically contains a caustic electrolyte solution. Chemically, KOH is a strong alkali similar to caustic soda. Serious chemical burns can result if this electrolyte comes into contact with the skin or eyes. If the battery electrolyte gets into your eyes, it can cause severe damage and/or blindness.

(e) Ag and Ag oxides are toxic and hazardous materials for disposal. It is recommended to turn in AG batteries wet. If you must drain the battery, the KOH electrolyte MUST be tested for Ag prior to disposal. If Ag is below the RCRA regulatory limit (5.0 mg/L), then the electrolyte may be disposed in accordance with TG No. 126 with the concurrence of the IEO and the affected waste water treatment authority.

(2) Type number: BB-622B/U.

(3) Solid waste characterization.

(a) Under federal RCRA: HW with an EPA HW#'s D009 for mercury (Hg) and DO11 for Ag.

(b) Bioassay findings: Not tested. Presumed to be toxic based on Ag content.

(4) Handling: See para 2-3.

WARNING

DO NOT try to neutralize caustic electrolyte with vinegar or any other acidic solutions. Neutralization will do more harm than good, as it will trap caustic under the skin, preventing it from coming out. Flush with copious amounts of water.

(a) DO NOT drain electrolyte from vented secondary batteries unless authorized.

(b) If battery contents or electrolyte are spilled and come in contact with the skin, IMMEDIATELY flush the affected area for at least 15 minutes with clean WATER and seek medical attention promptly.

(5) Fire control/suppression: A C02 fire extinguisher is recommended. See para 24.

(6) Storage: See para 2-5.

(a) Given reasonable protection, vented AG batteries should not freeze. Avoid temperatures of less than minus
40 F or greater than 130 E

(b) If KOH electrolyte spills or leaks, DO NOT touch spilled material. Stop leak if you can do it without risk. Take up with sand, or other noncombustible material, then flush area with water. Notify the local SO and IEO.

(7) Transportation requirements: See para 26 for pack-aging, marking and labeling requirements. In accordance with Title 49 CFR, Part 172.101 HMT, Hazard Class 8, and 49 CFR, Part 173.159.

(a) Packaging for vented AG batteries with vent-filler caps:

1. Batteries must be protected against short circuits.

2. Batteries may be either packaged in boxes or se-cured to pallets. Drum(s) are NOT approved.

3. Requirements for packaging batteries in boxes

a. All batteries, vent-filler caps and terminals of batteries MUST be protected against physical damage and short circuiting.

b. The vent-filler caps of vented battery cells should be taped in place, and the vent holes sealed with the same tape.

c. In order to protect packaging, place battery(ies) in a plastic bag to control any residue or battery electrolyte leakage, and seal the bag(s) with a nonmetallic closure such as tape.

d. Place bagged batteries in a DOT Specification 4C1, 4C2, 4D or 4F wooden, or 4G fiberboard box(es). DO NOT overfill boxes. Batteries should fit snugly in the boxes. An inside top clearance of at least ½ inch above the battery terminals and/or vent/filler caps must be provided, with reinforcement to prevent them from being crushed. Any empty spaces inside the boxes should be filled with suitable absorbent, non-combustible packing materials.

4. Requirements for palletizing batteries:

a. Batteries which are placed on pallets must be securely fastened by non-metallic strapping.

b. Height of the palletized unit (including batteries, strapping and pallet) must not exceed 1 ½ times the width of the pallet, and may not contain less than one complete layer or more than two layers of batteries per unit.

c. The completed unit must be able to support twice its own weight without damage to the batteries, pallet or strapping.

d. Battery terminals must not be relied upon to sup-port any weight from batteries or units stacked above them.

e. Package and stack vented batteries in an upright position. DO NOT stack batteries on their sides, in order to prevent unintentional draining.

5. If the palletized batteries cannot be protected from exposure to the weather (rain, snow, etc.), the unit must be protected with plastic sheeting. Refer to SB 38-100.

(b) Marking and labeling: For vented AG batteries with vent-filler caps: proper shipping name: Battery, wet, filled with alkali; Hazard Class: 8; UNID: UN2795; Packing Group: III; label in accordance with 49 CFR, Part 172.442: CORROSIVE label; see figure 4-1.

(8) Disposition and disposal: DO NOT accumulate and store waste batteries for disposal for more than 90 days. Re-cycling is recommended. See para 2-7.

(a) AG batteries may be disposed as HW through your local servicing DRMO, or via local contract, with an EPA HW# of DO11 for Ag.

(b) In states with bioassay requirements, based on silver content, these batteries should be considered HW, and disposition may be through your local servicing DRMO or via local contract.

4-13. Thermal (THR) Batteries

WARNING

When activated, THR battery temperatures can exceed 500° F.

THR batteries are primary (non-rechargeable) batteries. The battery contains an inorganic salt electrolyte that is a nonconductive solid at ambient temperatures, and a pyrotechnic mixture sufficient to melt the electrolyte. The battery is activated by an electrical squib or mechanical striker which activates a primer, which in turn ignites the pyrotechnic and melts the salt electrolyte.

a. Chemical characterization.

(1) Anode: Calcium (Ca).

(2) Cathode: Calcium chromate (CaCrO4).

(3) Electrolyte: Solid lithium chloride (LiC1) and potassium chloride (KCI).

b. Type number

(1) BAOS5/U, mechanical.

(2) BA-617/U, mechanical.

(3) BA-18/U (data unavailable).

(4) BA-630/U, electrical.

c. Solid waste characterization.

(1) Under federal RCRA: HW with an EPA HW# of D007 for chromium.

(2) Bioassay findings: Not tested. Presumed to be toxic based on chromium content

(3) NOTE on turn-in documentation that these batteries may contain ASBESTOS.

d. Handling. See para 2-3.

e. Fire control/suppression.

WARNING

Halon fire extinguishers SHALL NOT be used to combat fires involving THR batteries.

A C02 fire extinguisher is recommended. See para 2-4.

f. Storage. See para 2-5.

g. Transportation requirements.

See para 2- for packaging, marking and labeling requirements. Not regulated under Title 49 CFR, Part 172.101 HMT. THR batteries MUST be deactivated prior to shipping for disposal. See Appendix F for deactivation of THR batteries.

h. Disposition and Disposal DO NOT accumulate and store waste batteries for disposal for more than 90 days. See para 2-7. THR batteries MUST be deactivated prior to disposition and disposal.

(1) Dispose THR batteries as HW in accordance with RCRA regulations. Disposition may be through the local servicing DRMO, or via local contract, with an EPA HW# of D007 for chromium.

(2) THR batteries have not been tested under bioassay requirements. Disposition may be through the local servicing DRMO, or via local contract, due to chromium content.

Appendix A
References

A-1. References

a. Department of the Army (DA) Pam 385-3, Protective Clothing and Equipment, 3 May 1976.

b. Department of Defense (DoD) Manual 4160.21-M, Defense Utilization and Disposal Manual.

c. DOD Consolidated Hazardous Material/Hazardous Waste Disposal Guidance, June 1981.

d. U.S. Department of Transportation (DOT) P5800.X, "Hazardous Materials Emergency Response Guidebook."

e. General Services Administration (GSA) Supply Catalog, Office Products, Industrial Products, Tools, Furniture.

f. Message, DRMS-HT, HQ Defense Reltilization and Marketing Service, DTG 141855Z May 1986, Subject: Turn-in Procedure for Disposition of Batteries.

g. Sax, I.E., "Dangerous Properties of Industrial Materials, " 7th Ed., Van Nostrand Reinhold Company, New York 1989.

h. Supply Bulletin (SB) 11-6, FSC Class 6135, Primary Battery Supply Data.

i. SB 11-30, FSC 6135, Primary Battery Management Data, 17 May 1982.

j. SB 38-100, Preservation, Packaging, Packing and Mark-ing Materials, Supplies, and Equipment Used by the Army, March 1978.

k. Technical Manual (TM) 11-6140-200-15, C1, 30 Aug 62, Operator, Organizational, Field and Depot Maintenance Manual, Battery, Storage BB- 401/U.

l. TM 11-6140-200-15P, C2, 13 Feb 61, Repair Parts and Special Tools List and Maintenance Allocation Chart for Storage Battery, BB-401/U.

m. TM 11-6140-203-14-1, 14 Oct 80, Operator's, Organizational, Direct Support, and General Support Maintenance Manual, Aircraft and Nonaircraft Nickel-Cadmium Batteries (General).

n. TM 11-6140-203-14-2, C1, 28 Dec 83, Operator and Organizational, Direct Support, and General Support Maintenance Manual, Aircraft Nickel-Cadmium Batteries. TM 11-6140-203-14-3, 7 Nov 79, Operator's, Organizational, Direct Support, and General Support Maintenance Manual, Nonaircraft Nickel-Cadmium Batteries.

o. TM 11-6140-203-14-4&P, 6 Jan 83, Operator's Organizational, Direct Support, and General Support Maintenance (Including Repair Parts and Special Tool Lists) for Nickel-Cadmium Battery, BB-693A/U (NSN 6140-01-072-3123).

p. TM 11-6140-203-20P-3, C1, 7 Oct 77, Organizational Maintenance Repair Parts and Special Tools Lists for Non-aircraft Nickel-Cadmium Batteries BB-422/ (NSN 6140-0()789-2118) BB-651/UIH6(V) (NSN 6140-0(-935-5265) BB-429/U (NSN 6140-0-996-3746) BB-501/U (NSN 6140--(-13440850) BB-693/U (NSN 6140862-2979) BB-651/U (NSN 6140 0037-7344).

q. TM 11-6140-203-30P-2, 5 Mar 84, Direct Support, Maintenance Repair Parts and Special Tools List for Aircraft Nickel-Cadmium Batteries BB-432/A (NSN 614O(M0-753-2249), BB-432A/A (NSN 6140-01-072-3125) BB-432B/A (NSN 6140-01-134-2277), BB 433/A (NSN 6140753-2251) BB-433A/A (NSN 6140-1-046-1116), BB-434/A (NSN 6140-0753-2252) BB-476/A (NSN 6140-01-061-2818), BB-41/A (NSN 6140-00-930-5130) BB-649/A (NSN 61404)(0980-0025), BB449A/A (NSN 6140-01-068-8572) BB-667/A (NSN 6140 0075-5574), BB-676/A (NSN 6140-00-228-8447) BB-678/A (NSN 6140() -179-8382), BB-678A/A (NSN 6140-01-150-538 1) BB-708/U (NSN 6140-01-032-4285), and BB-716/A (NSN 6140-01-089-8134).

r. TM 11-6140-203-34P-3, C1, 18 Jun 79, Direct Sup-port and General Maintenance Repair Parts and Special Tools Lists (Including Depot Maintenance Repair Parts and Special Tools) for Nonaircraft Nickel-Cadmium Batteries BB-422/U (NSN 6140-0-789-2118) BB-651/UIH6(V)
(NSN 6140(-935-5265) BB-429/U (NSN
6140--0(996-3746) BB-501/U (NSN 6140 0(1344)-0850)
BB-693/U (NSN 6140{)-862-2979) BB-651/U (NSN
6140-01-037-7344).

s. Title 40, Code of Federal Regulations (CFR), Parts 260-266.

t. Title 49, CFR, Parts 172 and 173.

u. US Army Environmental Hygiene Agency (USAEHA)
Technical Guide (TG) No. 126, Waste Disposal Instructions.

v. Vinal, G.W., "Storage Batteries, A General Treatise on the Physics and Chemistry of Secondary Batteries and their Engineering Applications, " 4th Ed., John Wiley & Sons, Inc., London, 1962.

w. DoD Directive No. 6050.16, ASD(P&L), 20 September 1991, Subject: DoD Policy for Establishing and Implement-ing Environmental Standards at Overseas Installations.

x. Supplement, DASD (Environmental), 25 October 1991,
Subject: DoD Policy for Establishing and Implementing Environmental Standards at Overseas Installations (DoD Directive 6050.16).

y. Attewell, A. *et. al.,* "Handbook of Batteries and Fuel Cells, " D. Linden, Ed., McGraw-Hill Publishing Co., New York, 1984.

z. ANSI Z 41-1991, "Safety-Toe Footwear, NA, " American National Standards Institute (ANSI), New York, NY.

aa. ANSI Z87.1-1989, "Occupational and Educational Eye and Face Protection, Practice for, " ANSI, New York, NY.

ab. ANSI Z358.1-1990, "Emergency Eyewash and Shower Equipment, " ANSI, New York, NY.

ac. Report, USAEHA, 21 November 1983, Subject: Hazardous Waste Special Study No. 37-26-0310-84, Evaluation of Magnesium Batteries, USA CECOM, Ft. Monmouth NJ, 5 January - 6 June 1983; National Technical Information Service (NTIS) # AD-A280757.

Ad. Report, USAEHA, 7 February 1985, Subject: Hazardous Waste Study No. 37-26-0427-85, Evaluation of Lithium Sulfur Dioxide Batteries, USA CECOM and US Army Electronic Research and Development Command, Ft. Monmouth NJ, 1 May - 1 October 1984; NTIS # AD-A280758.

ae. Report, US Army Medical Bioengineering Research & Development Laboratory, March 1986, Subject: Technical Report 8507, Safety And Health Hazards Of Disposal Of Lithium Thionyl Chloride Batteries In Sanitary Landfills.

Af. Report, USAEHA, 28 March 1988, Subject: Hazardous Waste Study No. 37-26-0115-88, Evaluation of Thermal Batteries For Hazardous Waste Characteristics, USA CE-COM, Ft. Monmouth NJ, October -December 1987; NTIS # AD-A280706.

ag. Report, Martin Marietta Energy Systems Inc., contract DE-AC05-84OR21400, December 1991, Subject: Final Re-port: Toxicity Study of Selected Military Batteries.

Ah. AFR 71-4 (TM 38-250), "Preparing Hazardous Materials For Military Air Shipment."

ai. International Civil Aviation Organization (ICAO), "Technical Instructions for the Safe Transport of Dangerous Goods by Air."

aj. International Maritime Organization (IMO), International Maritime Dangerous Goods Code."

ak. DRMS-M 6050.1, "Environmental Compliance for the DRMS Hazardous Property Program."

al. TB 5-4200-200-10, HQDA, 1 September 1989, Subject: Hand Portable Fire Extinguishers Approved For Army Users.

am. MIL-STD-129L, DoD, 15 October 1990, Military Standard Marking for Shipment and Storage.

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ar. Technical Assistance Gram (TAG) 002-95, 19 January 1995, US Army Communications-Electronics Command, Subject: Operational Guidelines for Testing, Disposition and Disposal of Lithium-Sulfur Dioxide Batteries.

A-2. Publication Sources

a. For A-1 *a:*

US Army AG Publications Center
2800 Eastern Boulevard
Baltimore, MD 21220
Telephone: DSN 584-2533 or Commercial (301) 671-2533

b. For A-1 *d:*

US Department of Transportation
Office of Hazardous Material Transportation/DHM 51
Research and Special Programs Administration
400 7th Street, SW Washington, DC 20590
Telephone: Commercial (202) 366-2301

c. For A-1 *e:*

GSA Centralized Mailing Lists Services
P.O. Box 17077
819 Taylor Street
Fort Worth, TX 76102-0077
Telephone: DSN 739-7369 or Commercial (817) 334-5212

d. For A-i *h* through j:

US Army Publications Distribution Center, St. Louis
1655 Woodson Road
St. Louis, MO 63114
Telephone: DSN 693-7305 or Commercial (314) 263-7305.

e. For A-1 *t* and u:

Superintendent of Documents
US Government Printing Office
Washington, DC 20402
Telephone: Commercial (202) 783-3238

f. For A-I v:

Commander,
US Army Center for Health Promotion and
Waste Management
ATTN: MCHB-DE-HM
Aberdeen Proving Ground, MD 21010-5422
Telephone: DSN 584-3651 or Commercial (410) 671-3651

g. For A-1 *aa* through A-1 ab:

American National Standards Institute Sales Department
1430 Broadway
New York, NY 10018
Telephone: Commercial (212) 642-4900

h. For ac, ad, af, ap and aq:

National Technical Information Service 5285 Port Royal Rd.
Springfield, VA 22161
Telephone: Commercial 1-800-553-9847 or (703) 4874650

i. For ar:

Contact: CECOM LAR or CECOM Safety Office (See para 1-7.)

Appendix B
Explanation of Terms

Section I. GLOSSARY

B-1. Purpose

To explain and define terms as used in the context of this technical bulletin.

B-2. Definitions

a. Balanced Cell. A battery cell so designed, that during discharge, its reactive constituents (anode and cathode) are depleted in a quantitatively even manner.

b. Battery. A portable power supply unit made up of one or more cells with all necessary connectors, fusing, wiring, and jacket to provide power to an end article application.

c. Bioassay. Chemically independent test used by some states to characterize solid waste as hazardous waste.

d. Cell. The smallest power producing unit of a battery.

e. Conforming Storage. Storage which meets acceptable standards for the material being stored. Your local servicing Defense Reutilization and Marketing Office (DRMO) may take accountability, but not physical custody unless they can provide adequate and safe storage.

f. Consignee. The person or activity receiving a shipment of hazardous material (batteries) for disposition and disposal, e.g., the local DRMO.

g. Consignor. The person or activity shipping the material (batteries) to the local DRMO, for disposition and disposal.

h. Damaged. A cell or battery which is broken, bulged, cracked, split, etc., to the degree that one or more cells or the case have lost physical integrity and the cell contents may leak, or have leaked out.

i. *Defective.* Any battery other than depleted, which will not operate its assigned equipment, provided the equipment is not responsible for this lack of operation.

j. Depleted Any battery which has been used to the end of its duty cycle *(i.e.,* to its cut-off or end of life voltage).

k. Disposal. Burying, crushing, destroying, burning, incinerating, or discarding into the general refuse/trash.

l. Disposition. The transfer of unserviceable battery(ies) or electrolyte to the local servicing DRMO for disposal. The DRMO has the option to recycle this transferred material.

m. Dry Cell. A cell in which the electrolyte is not free flowing.

n. Duty Cycle Discharge. A battery discharged to the point where it will no longer operate its intended equipment.

o. Electrolyte. The electrically conductive fluid or paste contents of a cell.

p. EPA Hazardous Waste Number. A number assigned to a particular hazardous waste under Resource Conservation and Recovery Act regulations.

q. Hazardous Material. A substance or material containing a substance, which has beep determined by the Secretary of Transportation to be capable of health, safety, and/or hazardous property when transported in commerce, and which has been so designated.

r. Hazardous Material Table (HMT). Table (Title 49, Code of Federal Regulations, Part 172.101) which lists materials which are considered hazardous during transportation. Materials listed in this HMT are regulated under US Department of Transportation regulations.

s. Hazardous Waste. A waste that is listed or exhibits any of the characteristics as defined in accordance with existing federal *(i.e.,* Title 40 CFR, Part 261, subpart C or D), state or local regulations.

t. Non-hazardous Solid Waste. A solid waste which is not a hazardous waste.

u. Primary battery. A non-rechargeable battery.

v. Recycled Material. Material that is reutilized, instead of being disposed as waste. IAW federal and state regulations material may be recycled, thereby removing potentially hazardous material from the waste steam so that it may be re-used. The process is regulated under Title 40 CFR Parts 264, 265, 266, 268 and 270.

w. Resource Conservation and Recovery Act. Federal law, enacted under Title 40, Code of Federal Regulations, which protects the environment by regulating the disposal and re-cycling of potentially hazardous wastes.

x. Sealed battery. A battery without vent/filler caps.

y. Secondary battery. A rechargeable battery.

z. Serviceable battery. A battery which can be used for its original intended purpose.

aa. Solid Waste. A material which is normally considered as trash, refuse or garbage, which is not a waste defined as a hazardous waste; see *r,* above. It may be solid or liquid.

ab. Spent. See “depleted.”

ac. Unserviceable battery. A battery which is damaged, defective, depleted, spent, or has exceeded its shelf life.

ad. Vented battery. A battery with vent/filler cap(s). Typically contains wet cells which may be serviced by adding electrolyte or water.

ae. Waste. Material determined to no longer have economic value or useful purpose.

Af. Wet cell. A cell with a fluid electrolyte.

Section II. Abbreviations

ac	alternating current
AMDF	Army Master Data File
ANSI	American National Standards Institute
Ag	silver
AG	Silver, as in Silver battery
ALK	Alkaline, as in Alkaline battery
c	carbon
C	Centigrade
CDD	Complete Discharge Device
CFR	Code of Federal Regulations
Cd	cadmium
CONUS	continental United States
CO_2	carbon dioxide
Cr	chromium
cu. ft.	cubic feet
DA	US Department of the Army
DA Pam	US Department of the Army Pamphlet
Datafax	Facsimile machine
dc	direct current
DoD	US Department of Defense
DoDEA	DoD Executive Agent
DOT	US Department of Transportation
DRMO	Defense Reutilization and Marketing Office
DRMS	Defense Reutilization and Marketing Service
EPA	US Environmental Protection Agency
EPA HW#	USEPA Hazardous Waste Number
EOD	explosive ordnance disposal
F	Fahrenheit
FD	Fire Department
Gal.	Gallon
GSA	General Services Administration
>	greater than
≥	greater than or equal to
H2	hydrogen
Hg	mercury
HG	Mercury, as in Mercury battery
HM	hazardous material
HMT	Hazardous Material Table
HW	hazardous waste
HWPS	Hazardous Waste Profile Sheet
$H2S_{O4}$	sulfuric acid
IAW	in accordance with
ICAO	International Civil Aviation Organization
IEO	Installation/Unit Environmental Office/Officer
IH	Industrial Hygienist
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
ITO	Installation Transportation Office
KOH	potassium hydroxide
L	liter
LA	Lead-Acid, as in Lead-Acid battery
lbs.	pounds
LCE	LeClanche, as in LeClanche battery
<	less than
LC50%	lethal concentration 50%
Li	lithium
LIN	line item number
$Li\text{-}Mn0_2$	Lithium-Manganese Dioxide, as in Lithium-Manganese Dioxide battery
$Li\text{-}S0_2$	Lithium-Sulfur Dioxide, as in Lithium-Sulfur Dioxide battery
$Li\text{-}SOCl_2$	Lithium-Thionyl Chloride, as in Lithium-Thionyl Chloride battery
mg	milligram
Mg	magnesium
MG	Magnesium, as in Magnesium battery
$Mg(OH)_2$	magnesium hydroxide
Mn	manganese
MnO2	manganese dioxide
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NHSW	non-hazardous solid waste
NIOSH	National Institute of Occupational Safety and Health
Ni	nickel
NI-CD	Nickel-Cadmium, as in Nickel-Cadmium battery
NICP	National Inventory Control Point
n.o.s.	not otherwise specified
NSN	national stock number
°	degree
OCONUS	outside continental United States
OD	open detonation
Pam	Pamphlet
para	paragraph
Pb	lead
%	percent
PMO	Preventive Medicine Office/Officer
PPE	personal protective equipment
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
SB	Supply Bulletin
SO	Safety Office/Officer
SO2	sulfur dioxide
SOC12	thionyl chloride
SOS	source of supply
SW	solid waste
TB	Technical Bulletin
TCLP	Toxic Characteristic Leaching Procedure
THR	Thermal, as in Thermal battery
TM	Technical Manual
UNID	United Nations Identification Number
w/	with
w/o	without
Zn	zinc

Appendix C
Procedures for Draining Vented Lead-Acid Batteries and Disposition of Drained Sulfuric Acid Electrolyte

C-1. Purpose

To establish procedures for the draining of vented Lead-Acid (LA) batteries and the disposition of drained sulfuric acid (H_2SO_4) electrolyte, through the local servicing Defense Reutilization and Marketing Office (DRMO). DO NOT drain batteries unless:

a. Batteries are damaged, or

b. Batteries cannot be protected from freezing.

C-2. Application

This procedure applies to Army procured vented Lead-Acid batteries, described in this technical bulletin (TB), which cannot be protected from freezing. Refer to paragraph (para) *4-4f* and Table 4-1 for guidance.

C-3. Safety and Control Measures

a. Refer to Chapter 3 for required Personal Protective Equipment (PPE).

b. Battery electrolyte should be stored in a cool, dry, well ventilated area and protected from freezing or excessive heat (greater than 130° F). If the local servicing DRMO cannot provide adequate storage, the user MUST provide protected storage to prevent the electrolyte from freezing.

C-4. Procedure

Packaging and shipping instructions contained herein are consistent with US Department of Transportation (DOT) and US Environmental Protection Agency (EPA) regulations, and Department of Defense (DoD) guidance.

a. Transfer of electrolyte to local servicing DRMO is controlled by DoD guidance. Coordinate packaging and shipping with your local Installation Environmental Office (IEO), Installation Transportation Office (ITO), and local servicing DRMO.

WARNING

DO NOT use metal or galvanized equipment when draining electrolyte from LA batteries.

CAUTION

Personnel **MUST** wear PPE while drain-ing vented batteries. Refer to chapter 3.

b. Draining:

(1) Drain batteries into a plastic bucket, and transfer the spent electrolyte into a DOT specification 34 plastic drum, or any other DOT approved drum for H_2SO_4. See table C-1 for equipment.

(2) The exterior of all drained batteries should be rinsed with water to remove acid residue. Use care and avoid splashing. Allow exteriors to dry. The exteriors of all batteries must be completely dry prior to packaging.

(3) The vent/filler caps should be replaced and taped in place after draining, and the vent holes sealed with the same tape.

Item	NSN	SOS
Pail, 12 qt., plastic	7240-00-943-7105	GO1
Funnel, ½ gal., plastic	7240-00-404-9795	GO
Drum	8110-01-150-677’	S9G2
Tape, elec., ¾ in.	5970-00-644-3167	GO

C-5. Transportation Requirements

a. For LA battery casings, refer to para 4-4 g for packaging of drained battery casings for disposition to the local servicing DRMO.

b. For spent electrolyte, in accordance with Title 49, CFR Part 172.101 HMT, Hazard Class 8, and Part 173.154:

(1) Packaging. in accordance with 49 CFR Part 173.154; see paragraph 26a, Chapter 2 of this TB.

(2) Marking: See paragraph 2-6 b. Proper shipping name: Battery fluid, acid; UNID: UN 2796; label IAW 49 CFR Part 172.442: CORROSIVE label. See Figure 4-1.

C-6. Disposition and Transportation

a. Coordinate and obtain guidance regarding this tum-in from the local servicing DRMO and ITO. Battery electrolyte may be turned in to the DRMO for disposition, or may be disposed via local contract (see para 2-7). A Disposal Turn-in Document (DD Form 1348-1), and a Hazardous Waste Profile Sheet (DRMS Form 1930) or Material Safety Data Sheet are required by the servicing DRMO.

b. The DRMO will accept accountability, provided the materials are properly identified, packaged, and marked, and will accept physical custody depending upon the availability of conforming storage areas.

Notes:

1. G 0: General Services Administration, 819 Taylor St., Fort Worth, TX 76102 at Commercial (817) 334-2051.
2. S9G: Defense General Supply Center, Richmond, VA 23297; DSN 6954490 or Commercial (804) 2794490.

Appendix D
Packaging Materials

D-1. Barrier Material (Plastic Sheeting)

Refer to barrier material, waterproof in SB 38-100.

D-2. Boxes

a. Fiberboard box. DOT Specification 12B fiberboard box, type CF or SF, class weather-resistant, Federal Specification PPP-B-636. Reference class 8115, entitled "Box, Shipping, " cited in General Services Administration (GSA) Supply Catalog, Office Products, Industrial Products, Tools, Furniture.

b. Wooden bo. DOT Specification 15D wooden box (see chart below), Federal Specification PPP-B-621 or PPP-B-585. Reference box, wood, cited in SB 38-100.

DOT Volume Specification 15D:

National Stock Number (NSN)	Volume Cu. Ft.	Source of Supply (SOS)
8115-01-019-1633	3.7	G 0
8115-01-024-5961	7.9	G 0
8115-01-025-1669	30.6	G O

D-3. Drums

a. Fiber Drum. DOT Specification 21C or 21P fiber drum, Federal Specification PPP-D-723 (see chart below)

National Stock Number (NSN)	Capacity al.	Source of Supply (SOS)
8110-(132-9600	55	S9G
8110-)802-1211	15	S9G
811000-802-1215	45	S9G

b. Metal drum. DOT Specification 5B, 17C, 17E, and 17H, Drums, Steel; Federal Specification PPP-P-704, type 1, class 4 and 11; PPP-D-705, type V, PPP-D-729, type IV, PPP-D-736; PPP-P-704, type II, class 8; and Military Specifications MIL-D-6054 (see chart below)

National Stock Number (NSN)	Ca acity 8al.	Source of Supply (SOS)
8110(4 30-7779	30	S9G
81100-030-7780	55	S9G
8110 0{}082-2623	77	S9G
8110 -082-2625	27	S9G
811 0082-2626	57	S9G
811000-082-2629	45	S9G
8110)(118-5765	80	S9G
811O04254-5713	6	S9G
8110-254-5714	7	S9G
8110(254-5716	12	G 0
811 (}254-5717	16	G O
8110 254-5722	4	G 0
8110-24X82-2520	5	S9G
8110 O292-9783	55	S9G
8110(M3666809	30	S9G
8110-0{431-8670	3	S9G
811(00{}597-2353	55	S9G
8110-00-753-4643	19	G 0
8110(U820-0854	28	S9G
8110823-8121	55	S9G
811(0-861728	30	S9G
8110-48807074	58	S9G

D-4. Label

"CORROSIVE MATERIAL LABEL, " NSN 7540 (X118-0611, Standard Form 416, SOS is G 0. To be discontinued. Use until deleted.

D-5. Pallet

Refer to pallet, cited in SB 38-100.

D-6. Plastic Bag

Refer to class 8105, entitled "Waste receptacle, " cited in General Services Administration (GSA) Supply Catalog, Office Products, Industrial Products, Tools, Furniture.

D-7. Tape

Use electrical tape, ¾ inch wide, NSN 5970643167, SOS: GSA, or equivalent.

Appendix E
POINTS OF CONTACT

E-1. State Directory

NOTE

The following information is based on a survey completed 30 September 1991.

AL Solid Waste Section (205) 271-7770
State regulations ban disposal of Lead-Acid (LA) batteries.

AK1 Hazardous and Solid Waste Section (907) 465-2671
State Hazardous Waste (HW) characterization requirements include bioassay.

AR Division of Solid Waste (501) 570-2858
State regulations ban disposal of LA batteries.

AZ Solid Waste Unit (602) 257-2155
State regulates recycling; bans disposal of LA batteries.

CA2 Alternative Technology Division (916) 324-5807
State HW characterization requirements include bioassay. State bans disposal of LA batteries.

CO Waste Management (303) 331-4400
State regulates recycling of LA batteries.

CT Bureau of Waste Management (203) 566-5217
State regulates recycling and bans disposal of LA batteries.

DC Pesticide and Hazardous Waste Branch (202) 404-1167
None.

DE Waste Management Section (302) 739-3689
None.

FL Solid Waste Section (904) 922-6104
State regulations ban disposal of LA batteries.

GA Hazardous Waste Technical Assistance Program (404) 894-3806
State regulates recycling of LA batteries.

HI Solid and Hazardous Waste Branch (808) 543-8226
State regulates recycling and bans disposal of LA batteries.

IA Waste Management Authority (515)281-5145
None.

ID Hazardous Materials Bureau (208) 334-5879
None.

IL Environmental Protection Agency (217) 782-6762
State regulates recycling and bans disposal of LA batteries.

IN Compliance Section (317) 232-4417
State regulations ban disposal of LA batteries.

KS Solid Waste Section (913) 296-1590
None.

KY Solid Waste Section (502) 564-6716
State regulates recycling and bans disposal of LA batteries.

LA Hazardous Waste Enforcement Section (504)765-0355
State regulations ban disposal of LA batteries.

MA Solid Waste Management Division (617) 292-5980
State regulations ban disposal of LA batteries.

ME Solid Waste Division (207) 582-8740
State regulates recycling and bans disposal of LA batteries.

MD Hazardous Waste Program (301) 631-3343
None.

MI Waste Management Division (517) 373-2730
State regulates recycling and bans disposal of LA batteries.

MN3 Pollution Control Agency (612) 643-3470
State HW characterization requirements include bioassay. State regulates recycling and bans disposal of LA batteries.

MO Waste Management Program (314) 751-3176
State regulates recycling and bans disposal of LA batteries.

MS Office Of Pollution Control (601)961-5171
None.

MT Solid and Hazardous Waste Bureau (406) 444-1430
None.

NC Hazardous Waste Section (919) 733-2178
State regulates recycling and bans disposal of LA batteries.

ND Division of Waste Management (701) 221-5166
State regulations ban disposal of LA batteries.

NE Waste Recovery Section (402) 471-210
None.

NH Waste Management Division (603) 271-2942
State regulations ban disposal of LA batteries.

NJ Office Of Recycling (609) 530-8593
State regulates recycling and disposal of batteries.

NM Hazardous and Radiological Waste Bureau (505) 827-2929
None.

NV Bureau of Waste Management (702) 687-5872
None.

---

1. HW criteria includes acute toxicity.
2. HW criteria includes acute oral, dermal, inhalation and aquatic toxicity.
3. HW criteria includes acute oral, dermal, inhalation and aquatic toxicity

NY Determination and Compliance Section (518) 457-6858
None.

OH Division of Solid and Hazardous Waste Management (614) 644 2956
None.

OK Hazardous Waste Management Service (405) 271-5338
None.

OR Hazardous Waste Reduction and Technical Assistance (503)229-5913
State regulates recycling and bans disposal of LA batteries.

PA Waste Determination Section (717) 787-7381
State regulates recycling and bans disposal of LA batteries.

PR Land Pollution Control Department (809) 767-8118
None.

RI4 Division of Air and Hazardous Material (401) 277-2797
State HW characterization requirements include bioassay.

SC Waste Assessment Section (803) 734-5000
State regulates batteries as a special waste (SPW), and batteries must be disposed of in accordance with SPW regulations.

SD Division of Environmental Regulation (605) 773-3153
State regulates LA batteries as SPW, and LA batteries must be disposed of in accordance with SPW regulations.

TN Division of Solid Waste Management (615) 741-3424
State regulations ban disposal of LA.

TX Bureau of Solid Waste Management (512)458-7271
State regulates recycling and bans disposal of LA batteries.

UT Bureau of Solid and Hazardous Waste (801)538-6170
None.

VA Department of Waste Management (804) 225-2667
None.

VT Division of Hazardous Materials (802) 244-8702
State regulations ban disposal of batteries classified as HW.

WA5 Hazardous Waste Section (206) 459-6322
State HW characterization requirements include bioassay. State regulates recycling of LA batteries.

WI Bureau of Solid and Hazardous Waste Management (608) 266-2111
State regulates recycling of LA batteries. Recyclable materials managed as HW.

WV Pollution Prevention (304) 348-4000
State regulations ban disposal of LA batteries.

WY Solid Waste Program (307) 777-7752
State regulates recycling and bans disposal of LA batteries.

E-2. DoD Executive Agency Directory

Following is the latest worldwide directory of DoD Executive Agents for environmental matters.

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4. HW criteria includes acute oral toxicity, and known carcinogens, suspected human carcinogens, and teratogens.
5. HW criteria includes acute oral, dermal, inhalation and aquatic t oxicity, and known and suspected carcinogens.

TABLE E-3

DoD Executive Agent Directory for Environmental Matters

COUNTRY	EXECUTIVE AGENT	POC	OFFICE	ADDRESS	TEL/DSN/FAX
Andreos Islands Antigua Bermuda Cuba Iceland	CINCLANFLT	Mr. Marvin Barnes	CINCLANFLT (N4652)	1562 Mitscher Ave. Suite 250 Norfolk, VA 23551-2487	(804) 444-1499 DSN 564-1499 (804) 445-1034
Ascension Is- lands Greenland	Air Force Space Command	Ms. Danette Taylor dtaylor@spacecom.af.mil	HQ, AF Space Command, AFSPC-CEV	150 Vanderburg St. Suite 1106 Peterson AFB, CO	(719) 554-3902 DSN 692-3902 (719) 554-5658/2562
Azores	Air Mobility Command	Mr. Russell Shannon shannon@cemai- lacc.af.mil	HQ ACC/CEVCM	129 Andrews St. Suite 102 Langely AFB, VA 23665	(804) 764-3668 DSN 574-3688 (804) 764-8033
Bahrain Djlboutl Kenya Qatar UAS	USCENTCOM COMUSNAVCENT//N44//	CDR Larry Macias	NAVCENT, Force Civil Engineer	Cdr, USAVCENT (N-44), FPO AE 09501-6008	011-973-724-026 318-439-4026 318-439-4475
Belgium Germany The Netherlands	CINC US Army European Command	Jennifer Leonard leonard(heidelser- emeis.army.mil	HQ USAREUR,	HQ, USAREUR ATM: AEAEN-ENVR APO AE 09014	06221-57-7328 370-8125-7699
Diego Garcia,	USPACOM	Ms. Erlinda Corpus	PSC 466	U.S. Naval Support Facility, Diego Garcia PSC 466, Box 5, FPO AP 954640006	DSN 370-4509 DSN 370-4542
Egypt Oman	USCENTCOM alcex@hqcentaf.af.mil USCENTAF SHAW AFB SC/AI-CEX//II	CPT Tim Fuller	CENTAF, Requirements and Environmental Engineering	USCENTAF/A1-CEX 524 Shaw Drive Shaw AFB, SC 29152-5029	(803) 668-3249 DSN 965-3249 (803) 668-3861
Greece Italy Spain	CINCNAVEUR cnen76(Pnotslnavy.mii	Mr. Andrew Kissell	CINCUSNAVElJR/N7	PSC 802, Box 8, FPO AE 09499	011-4471-514-4653 DSN 235-4653 01 14471-4094585
Honduras Panama	Commander, US Army, South soen%soen(usarso-lanl.army.mjl	COL Donald llalzwarth oholzwarth%soen@ usarso-lanl.armny.mll	Deputy Chief of Staff, Engineer-US Army South	US Army South ATTN: SOEN-M (COL Holzwarth). APO AA 34004-5000	011-507-87-5417 (313) 287-5417 (313) 287-3019
Japan				HQ, US Forces Japan APO AP 96358	DSN 225-4709 DSN 2254705

Figure E-3

DoD Executive Agent Directory for Environmental Matters

COUNTRY	**EXECUTIVE**	POC	OFFICE	ADDRESS	TEL/DSN/FAX
Jordan Kuwait Saudi Arabia	USCENTCOM collinsrftmcphson-embl.army.mil CDRUSARCENT-CDRU-SATHIRD FT MCPHER-SON GA//AFRD-EN//	Mr. Jim Fletcher	ARCENT, Environmental Division	HQ ARCENT AFRD-EN-E APO AE 09014	(404)752-3481 DSN 572-3481 (404) 752-3375
Korea	USPACOM	COL J. Richard Capica	Assistant Chief of Staff. Engineer	HQ US Forces Korea Unit #5237 ATN: FKEN APO AP 96205-0010	DSN 7236385 DSN 7236088
Turkey United Kingdom	Air Force .ce@546 polusaf eaf.mil	COL Robert Peters	CEV	HQ Air Force EuropetCEV Unit 3050 Box 10 APO AE 09094	011-49-6371-476381 314-480-6482 011-496371-43368

Appendix F
Deactivation of Thermal (THR) Batteries

F-1. Purpose

To provide a method to ensure the deactivation of CECOM managed THR batteries prior to disposition and disposal.

F-2. Equipment

The materials, equipment and tools listed below are suggested to facilitate the required deactivation prior to any disposition and disposal actions. Any other suitable equivalent items are acceptable.

a. Necessary hand tools are contained in tool kit TK-101, NSN 5180-(0645178.

b. Any 24 vdc power supply capable of supplying five amps is adequate, *e.g.,* two automotive type batteries in series, jeep ignition system, etc.

c. Concrete block, brick or other fireproof material.

d. Wire, uninsulated, 16 AWG or larger, as needed.

e. 12 foot wire, insulated twin lead, 18 AWG or larger.

f. 10 foot lanyards, parachute cord or twine.

g. Heat protective gloves, NSN 8415-01-092-3910, SOS: S9T.

h. Two small alligator clips with insulating sleeves (nipple) on clips, NSN 5999-00-8574914, insulating nipple, NSN 5975-00-763 442.

i. Two battery clips, NSN 5999-00-0144)433.

F-3. Deactivation Methods

a. Mark battery with masking tape. Discoloration of the tape will show that the battery has been fired.

WARNING

When activated, THR battery temperatures can exceed 500 F.

b. Place the battery on a safe heat-resistant surface. DO NOT hold or touch the battery during activation (firing).

c. Deactivation.

(1) Mechanical firing of BA-605/U and BA-617/U:

(a) Inspect the unit to determine if the safety cotter pin (fig. F-l) and the firing pin are in place. If both pins are missing, check to see if the striker arm is resting on the primer cap. If both the safety pin and firing pin are missing from the unit, the battery has already been activated.

(b) If both the cotter pin and stainless steel wire pin are still in place, the unit has NOT been activated. Handle these batteries with care to avoid accidental activation.

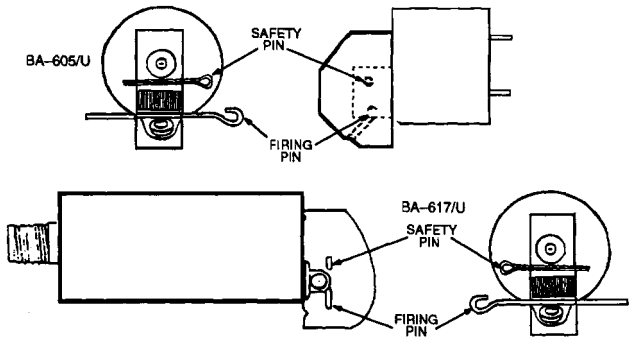

Figure F-1. Safety and firing pins, BA-605/U and BA-617/U

(c) Perform the following steps to render the mechanically fired thermal batteries safe:

1. Place the THR battery on a concrete block or other fireproof material as shown in figure F-2. Secure each battery with two pieces of 16 AWG gauge or larger uninsulated wire. Copper, steel baling wire or other uninsulated wire may be used for this purpose.
2. Attach 10 foot lengths of cord to the safety cotter pin and the stainless steel wire firing pin.
3. Straighten any bends or crimps in the cotter pin or the firing pin. DO NOT activate the battery yet.
4. Move all personnel at least 10 feet away.
5. Pull out the safety cotter pin using its lanyard.
6. Pull out the firing pin using its lanyard.
7. Let the battery cool for at least one hour before removing it from its secured position.

(d) Repeat steps 1 through 7 for the quantity of batteries on hand. If sufficient materials are available, multiple battery activations may be done.

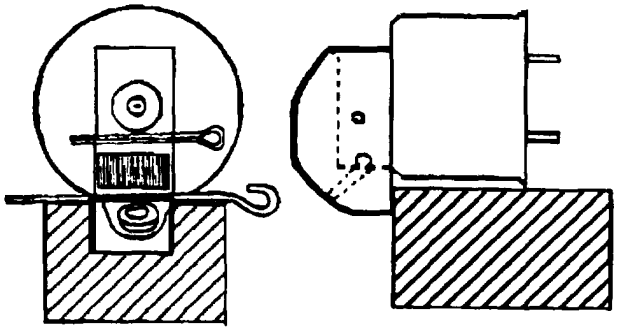

Figure F-2. BA-605/U or BA-617/U secured to block before firing

(2) Electrical Firing of BA-629/U and BA-630/U:

(a) To fire the battery, an electrical current must be applied to pins J and K (the two centrally located pins) of the battery connector. See figure F-3.

(b) Connect a switched power supply to pins J and K as indicated in figure F-3. Fire the battery by closing the switch for no more than three (3) seconds.

F-4. Alternative Deactivation Methods

If unserviceable thermal batteries, when fired, do not heat up or if it cannot be determined whether the battery has been fired, the following procedures are suggested:

a. Thermal Treatment. Thermally treat the batteries in order to ignite the pyrotechnic within the battery. Perform this treatment in pans to prevent any ground contamination and to facilitate collection of the residue. This procedure is thermal treatment of hazardous waste (Title 40, Parts 260 and 270) and requires a permit. Coordinate with and obtain concurrence from your local Installation Environmental Coordinator (IEO) for the installation or facility before conduct-ing this procedure.

b. Explosive Ordnance Disposal (EOD). This method is by open detonation (OD) in accordance with AMC Regula-tion 755-8. Request assistance for this action from the local servicing EOD Control Center or EOD Activity. The EOD team will ascertain whether it is appropriate for them to conduct this procedure.

F-5. Disposition

The deactivated battery should be disposed via the servicing DRMO, or via local contract; see paragraph 2-7. Activities MUST certify that THR batteries have been deactivated prior to disposition and disposal actions. If the user does not know or cannot demonstrate that the battery has been deactivated, it must be assumed that the battery still contains “live” pyrotechnic material.

WARNING

DO NOT package any battery if it is hot/warm. Only package batteries when they are cool to the touch.

a. After firing, allow the deactivated battery to completely cool down before packaging (at least one hour), and ship for disposition and disposal. Coordination with the local Installation Transportation Office (ITO) is recommended to ensure compliance with local packaging and transportation regulations.

b. Deactivated THR batteries and THR batteries contain chromates and are classified as hazardous waste (HW) with an EPA HW number of D007 for chromium.

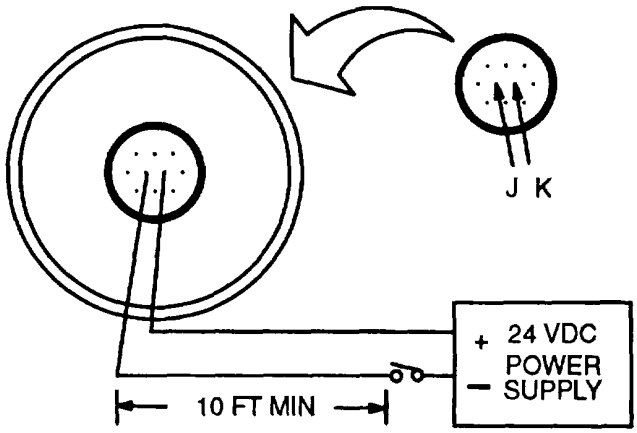

Figure F-3. Wiring diagram for firing BA-629/U and BA-630/U

Appendix G
HAZARDOUS WASTE PROFILE SHEET
(DRMS Form 1930)

A sample Hazardous Waste Profile Sheet, DRMS Form 1930, is provided for informational purposes only. The form is available locally. G-1

HAZARDOUS WASTE PROFILE SHEET

PART I

A. GENERAL INFORMATION

WASTE PROFILE NO. _____

1. GENERATOR NAME

2. FACILITY ADDRESS

5. ZIP CODE

3. GENERATOR USEPA ID

4. GENERATOR STATE ID

6. TECHNICAL CONTACT

7. TITLE

PHONE ( )

B. 1 NAME OF WASTE _____

2 USEPA/or/STATE WASTE CODE(S) _____

3 PROCESS GENERATING WASTE _____

4 PROJECTED ANNUAL VOLUME/UNITS _____ / _____ 5. MODE OF COLLECTION _____

6. IS THIS WASTE A DIOXIN LISTED WASTE AS DEFINED IN 40 CFR 261.31 (e.g., F020, F021, F022, F023, F026, F027, OR F028)? ☐ YES ☐ NO

7. IS THIS WASTE RESTRICTED FROM LAND DISPOSAL (40 CFR 268)? ☐ YES ☐ NO
HAS AN EXEMPTION BEEN GRANTED? ☐ YES ☐ NO
DOES THE WASTE MEET APPLICABLE TREATMENT STANDARDS? ☐ YES ☐ NO REFERENCE STANDARDS _____

PART II

1. MATERIAL CHARACTERIZATION
(OPTIONAL-NOT REQUIRED DATA)

COLOR _____

DENSITY _____ BTU/LB _____

TOTAL SOLIDS _____ ASH CONTENT _____

LAYERING ☐ MULTILAYERED ☐ BILAYERED ☐ SINGLE PHASE

2. RCRA CHARACTERISTICS

PHYSICAL STATE: ☐ SOLID ☐ LIQUID ☐ SEMI-SOLID ☐ GAS ☐ OTHER

TREATMENT GROUP: ☐ WASTEWATER ☐ NON-WASTEWATER

☐ IGNITABLE (D001)
FLASH POINT (F) _____
☐ HIGH TOC (> 10%)
☐ LOW TOC (< 10%)

☐ REACTIVE (D003)
☐ WATER REACTIVE
☐ CYANIDE REACTIVE
☐ SULFIDE REACTIVE

☐ CORROSIVE (D002)
pH _____
☐ CORRODES STEEL

☐ TOXICITY CHARACTERISTIC
(SEE REVERSE FOR LISTING)

3. CHEMICAL COMPOSITION (ppm or mg/L)

COPPER _____ PHENOLICS _____
NICKEL _____ TOTAL HALOGENS _____
ZINC _____ VOLATILE ORGANICS _____
CHROMIUM-HEX _____ PCBs _____
(OTHER) _____

NOTE: EXPLOSIVES, SHOCK SENSITIVE, PYROPHORIC, RADIOACTIVE, AND ETIOLOGICAL WASTE NORMALLY ARE NOT ACCEPTED BY THE DRMO.

4. MATERIAL COMPOSITION

COMPONENT	CONCENTRATION	RANGE

TOTAL _____ 100%

5. SHIPPING INFORMATION

DOT HAZARDOUS MATERIAL? ☐ YES ☐ NO

PROPER SHIPPING NAME _____

HAZARD CLASS _____ U.N. or N.A. NO. _____

ADDITIONAL DESCRIPTION _____

METHOD OF SHIPMENT ☐ BULK ☐ DRUM ☐ OTHER: _____

CERCLA REPORTABLE QUANTITY (RQ) _____

EMERGENCY RESPONSE GUIDE PAGE

DOT PUBLICATION 5800.4 PAGE NO. _____ EDITION (YR) _____

SPECIAL HANDLING INFORMATION _____

6. GENERATOR CERTIFICATION

BASIS FOR INFORMATION

☐ CHEMICAL ANALYSIS *(ATTACH TEST RESULTS)*

☐ USER KNOWLEDGE *(ATTACH SUPPORTING DOCUMENTS - Explain how and why these documents comply with RCRA requirements)* _____

I, _____ *(Print or Type Name)*, HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN THIS AND ALL ATTACHED DOCUMENTS IS TO THE BEST OF MY KNOWLEDGE AN ACCURATE REPRESENTATION OF THE WASTE TURNED IN TO THE DRMO. ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.

SIGNATURE OF GENERATOR'S REPRESENTATIVE

DATE

DRMS Form 1930
Oct 90

TOXICITY CHARACTERISTIC LIST

EFFECTIVE 25 SEP 90 - LARGE QUANTITY GENERATORS
29 MAR 91 - SMALL QUANTITY GENERATORS

CONTAMINANT	EPA HW No.	(mg/L)	CONTAMINANT	EPA HW No.	(mg/L)
☐ ARSENIC	D004		☐ HEXACHLORO-1,3,-BUTADIENE	D033	
☐ BARIUM	D005		☐ HEXACHLOROETHANE	D034	
☐ BENZENE	D018		☐ LEAD	D008	
☐ CADMIUM	D006		☐ LINDANE	D013	
☐ CARBON TETRACHLORIDE	D019		☐ MERCURY	D009	
☐ CHLORDANE	D020		☐ METHOXYCHLOR	D014	
☐ CHLOROBENZENE	D021		☐ METHYL ETHYL KETONE	D035	
☐ CHLOROFORM	D022		☐ NITROBENZENE	D036	
☐ CHROMIUM	D007		☐ PENTACHLOROPHENOL	D037	
☐ O-CRESOL	D023		☐ PYRIDINE	D038	
☐ M-CRESOL	D024		☐ SELENIUM	D010	
☐ P CRESOL	D025		☐ SILVER	D011	
☐ CRESOL	D026		☐ TETRACHLOROETHYLENE	D039	
☐ 2,4-D	D016		☐ TOXOPHENE	D015	
☐ 1,4-DICHLOROBENZENE	D027		☐ TRICHLOROETHYLENE	D040	
☐ 1,2-DICHLOROETHANE	D028		☐ 2,4,5-TRICHLOROPHENOL	D041	
☐ 1,1 DICHLOROETHYLENE	D029		☐ 2,4,6-TRICHLOROPHENOL	D042	
☐ 2,4-DINITROTOLUENE	D030		☐ 2,4,5-TP (SILVEX)	D017	
☐ ENDRIN	D012		☐ VINYL CHLORIDE	D043	
☐ HEPTACHLOR (AND ITS HYDROXIDE)	D031				
☐ HEXACHLOROBENZENE	D032				

PART III
FOR DEMO USE ONLY
DEMO VERIFICATION

1. DATE VERIFIED _____

2. RESULTS ☐ *ATTACHED*

pH _____ FLASH POINT _____ SPECIFIC GRAVITY _____ HALIDES (TOX) _____

REACTIVITY: WATER REACTIVITY _____ CYANIDES _____ SULFIDES _____

TCLP _____

INSTRUCTIONS FOR DRMS FORM 1930

PART I

A. GENERAL INFORMATION

1. GENERATOR NAME - Enter the name of the generating facility.
2. FACILITY ADDRESS - Enter the street address of the generating facility.
3. GENERATOR USEPA ID - Enter the 12-character alpha-numeric descriptor issued by the USEPA to the facility generating the waste.
4. GENERATOR STATE ID - Enter the descriptor issued by the state to the facility generating the waste (if applicable).
5. ZIP CODE - Enter the generating facility's five or nine digit zip code.
6. TECHNICAL CONTACT - Enter the name of a person who will answer technical questions about the waste.
7. TITLE - Enter technical contact's title.
8. PHONE - Enter technical contact's telephone number.

B.

1. NAME OF WASTE - Enter a name that is generally descriptive of this waste (e.g., paint sludge, PCB-contaminated dirt, cyanide plating waste)
2. USEPA/OR STATE WASTE CODE(s) - Indicate the appropriate state or USEPA Hazardous Waste Identification Number (e.g. D001 U119, etc.).
3. PROCESS GENERATING WASTE - List the specific process/operation or source that generates the waste (e.g. paint spray booth, PCB spill, metal plating operation).
4. PROJECTED ANNUAL VOLUME/UNITS - Enter the amount of this waste which will be generated annually. Use appropriate units to describe this volume (e.g. pounds).
5. MODE OF COLLECTION - Describe the method utilized to collect and store the waste stream (e.g., drums, tanks, ponds).
6. DIOXIN WASTE - Storage and disposal of Dioxin wastes require special attention. If this waste is a USEPA listed Dioxin waste, indicate "YES" and contact your DRMO representative.
7. LAND DISPOSAL RESTRICTIONS - Indicate if the waste has been prohibited from land disposal, has received an exemption under 268.8 or meets the applicable treatment standards.

PART II

1. MATERIAL CHARACTERIZATION (OPTIONAL - NOT REQUIRED DATA)

COLOR - Describe the color of the waste (e.g., blue, clear, varies).
DENSITY - Indicate the range. The specific gravity of water is 1.0. Most organics are less than 1.0. Chlorinated solvents, most inorganics and paint sludges are greater than 1.0.
BTU/LB - This entry is only required for property that may have potential for use as a fuel substitute.
ASH CONTENT - This entry only for used oil with recovery potential.
TOTAL SOLIDS - Content can be expressed as either a weight percentage or dry weight concentration (mg/kg).
LAYERING - Check all applicable boxes. Multi-layered means more than two layers (e.g., oil/water/sludge). Bi-layered means the waste is comprised of two layers which may or may not be of the same phase (e.g., oil/water, solvent/sludge). Single phased means the waste is homogenous.

2. RCRA CHARACTERISTICS (40CFR261)

PHYSICAL STATE - If the four boxes provided do not apply, a descriptive phrase may be entered after "Other".
TREATMENT GROUP - Check the box which applies to the correct treatment group.
IGNITABLE - Indicate if the waste is ignitable (D001) and list its liquid flash point obtained using the appropriate testing method (40CFR261.21). The flash point is important from a transportation standpoint (49CFR173.115). Also list if this waste is considered to be a HIGH TOC IGNITABLE (contains .GE. 10% total organic carbon) or a LOW TOC IGNITABLE (contains .LT. 10% TOC). Knowledge of high/low TOC is required due to Third Third Land Ban regulations. Solids with flammable potential should be identified in PART 3 (e.g., Pyrophoric, RCRA Reactive, other).
CORROSIVE - Indicate if the waste is corrosive (D002) and its pH for liquid or liquid portions of the waste. Also indicate if this waste corrodes steel (40CFR261.22). For solid or organic liquid wastes, indicate the pH of a 10% aqueous solution of the waste if applicable. Write "NA" for nonwater soluble materials (e.g., dismatled tanks, empty drums, gases).
REACTIVE - Indicate if the waste is reactive (D003) and if it is water reactive, cyanide reactive, or sulfide reactive (40CFR261.23).
TOXICITY CHARACTERISTIC - Check appropriate box and list contaminant level.

3. CHEMICAL COMPOSITION

Indicate if any of the listed chemical components (e.g., copper, nickel, phenols, PCBs etc.) are present in the waste and indicate the concentration level in ppm or mg/L.

OTHER - Indications of other hazardous characteristics must be included (e.g., explosives, radioactive, etiological, peroxide-forming, etc.).

NOTE: Explosives, shock sensitive, pyrophoric, radioactive, and etiological waste normally are not accepted by the DRMO for disposal.

4. MATERIAL COMPOSITION

Section 4 is necessary to determine if any listed wastes have been added to a characteristic waste in addition to the basic material makeup.

List all organic and/or inorganic components of the waste using **specific chemical names**. If trade names are used, attach Material Safety Data Sheets or other documents which adequately describe the composition of the waste. For each component, estimate the range (in percents) in which the component is present. In case of extreme pH (2 or less or 12.5 or greater) indicate specific acid or caustic species present. This list must include any hazardous components listed in PART II which exceed 10,000 ppm (1%). The total of the maximum values of the components must be greater than or equal to 100% including water, earth, etc.

5. SHIPPING INFORMATION

The presented information is not meant to constitute a standard USDOT certificate given by a shipper offering a package to a transporter.
If the information contained in this section is also given on a manifest at time of turn-in, a copy of that manifest will suffice.
Indicate if this waste is regulated by U.S. Department of Transportation (DOT) (49CFR172.01).
PROPER SHIPPING NAME - Enter the proper USDOT shipping name for this waste (49CFR172.101).
HAZARD CLASS - Enter the proper USDOT hazard class (49CFR172.101).
I.D.# Enter the proper USDOT Identification Number (49CFR172.101).
ADDITIONAL DESCRIPTION - Enter any additional shipping information required (e.g., "RQ," the names of Hazardous Substance Constituents as they would appear on the Uniform Hazardous Waste Manifest and the packaging) (49CFR172.203).
CERCLA/DOT REPORTABLE QUANTITY (RQ) - Enter the Reportable Quantity for this waste from 49CFR172.101 or 40CFR302.
EMERGENCY RESPONSE GUIDE PAGE - Indicate the appropriate guide page found in DOT Publication 5800.4 as required by 49CFR172.602.
SPECIAL HANDLING INFORMATION - Describe those hazards which you know or reasonably believe are or may be associated with short term or prolonged human exposure to this waste (29CFR1910.1200). If known, please identify any carcinogens present in this waste in excess of 0.1% (29CFR1910.1200(d)(4)). Attach relevant documents as a part of your response if appropriate. If documents are attached, identify those attachments. If you have a current Material Safety Data Sheet, it may be attached. Failure to make an entry in PART 5 is considered to be a representation that you neither know nor believe that there are any adverse human health effects associated with exposure to this waste. Also include in any additional information that will aid in the management of the waste.

6. GENERATOR CERTIFICATION

'CHEMICAL ANALYSIS' OR 'USER KNOWLEDGE' OR A COMBINATION OF BOTH IS MANDATORY AND SHOULD BE ATTACHED TO THE HAZARDOUS WASTE PROFILE SHEET. THIS IS USED AS SUPPORTING DOCUMENTATION TO THE WASTE PROFILE SHEET.
An authorized employee of the generator must sign and date this certification on the completed generator's Hazardous Waste Material Profile Sheet.
CHEMICAL ANALYSIS - Attach copy of analysis.
USER KNOWLEDGE - User knowledge is appropriate when it can be documented (e.g., in & out logs, published info, msds, process production info). There is room provided to explain 'what' and 'why' user knowledge is used in lieu of analysis. Attach all supporting documentation.

PART III

DRMO VERIFICATION

This section will be filled in by the appropriate DRMO personnel.

1. DATE VERIFIED - Enter date of last verification testing done on waste stream.
2. RESULTS - Enter results of verification testing or attach test results. If attached, please indicate so.

Appendix H
Battery Toxicity Data for Selected Military Batteries,

H-1. Purpose

To provide toxicity data for identification of hazardous waste characteristics associated with selected military batteries.

H-2. Method

The data from the source study represents findings from two basic analytical approaches.

a. Federal Regulations: Under federal regulations, 40 CFR Part 261, Appendix II-Method 1311 Toxic Characteristic Leaching Procedure (TCLP) was employed to determine toxicity in accordance with this federal regulation. This is a chemical dependant test. The specific chemical at or above its specified regulatory level must be present for the sample to be considered toxic under this criteria. Regulatory levels of target chemicals are reported in milligrams/liter (mg/L).

b. State Bioassay Regulations: Some states utilize a bioassay in addition to TCLP to identify hazardous wastes. Live organisms are exposed to concentrations of test materials in order to determine toxicity. Typically the method requires a ninety-six hour (96-h) $_{LC50}$ acute toxicity test be preformed on organisms at various concentrations of sample materials. The 96-h LC_{50} is that concentration of sample material, re-ported in mg/L, which kills fifty (50) percent of the test organisms after 96-hours of exposure. The standard used to gauge toxicity is a value of less than 500 mg/L. Material exhibiting a value of less than 500 mg/L is considered toxic under this method.

c. Batteries Sampled: A representative sample of six bat-tery classes procured under US Army Communications-Elec-tronics Command (USA CECOM) battery contracts were selected. Each sample consisted of seven subsamples (n=7) for each battery type. They are:

(1) Alkaline (ALK, BA-3517/U).
(2) Carbon-Zinc (LeClanche (LCE), BA-2/U).
(3) Magnesium (MG, BA-4386/U).
(4) Lithium-Manganese Dioxide (Li-MnO2, BA-5372/U).
(5) Lithium-Sulfur Dioxide (Li-S02, BA-5598/U).
(6) Lithium-Thionyl Chloride (Li-SOCI2, BA-6598/U).

d. Sample Conditioning:

(1) ALK, LCE, MG and Li-MnO2 batteries 50% discharged prior to testing to simulate field disposal field conditions.

(2) Li-SO2 and Li-SOC12 batteries are designed with a built-in complete discharge device (CDD). User's instruc-tions require complete discharge prior to disposal. Samples of these batteries were totally discharged prior to testing.

H-3. Findings

a. TCLP data.

Table H-I. Summary of TCLP Results by Battery Chemical Type

	Mean (mg/L)						
Battery Chemistry Type:	ALK	LCE	MG	Li-MnO2	Li-S02	Li-SOC12	TCLP Regulatory Limit (mg/L)
Constituent							
Arsenic	0.053	0.190	0.15	0.062	<0.050	0.10	5.0
Barium	<0.10	0.18	0.88	<0.10	<0.10	0.15	100.0
Cadmium	<0.0030	0.052	0.0033	<0.0030	0.017	<0.0030	1.0
Chromium	<0.010	0.010	9.12	0.012	<0.010	4.23	5.0
Lead	<0.050	0.186	<0.050	<0.050	<0.050	<0.050	5.0
Mercury	0.033	0.040	N/A4	N/A4	NIA4	N/A4	0.20
Selenium	<0.050	0.058	0.088	<0.050	<0.050	0.082	1.0
Silver	<0.010	0.036	<0.010	<0.010	<0.010	<0.010	5.0

Notes:

1. n=7 for each Battery Chemistry Type.
2. Mean value exceeds regulatory limit.
3. 95% confidence limit exceeds regulatory limit.
4. Lithium and Magnesium batteries do not contain mercury.

1. Report, Martin Marietta Energy Systems Inc., Contract DE-AC05-840R21400, January, 1992, Subject: Toxicity Study of Selected Military Batteries.

b. Bioassay data.

Table H-2. Summary of Bioassay Results by Battery Chemistry 96-h LC_{50} In mg/L

Battery	Fathead minnow	Ceriodaphnia
MG	22, 928	18, 067
Li-SO2	691	702
Li-MnO2	288	73
ALK	246	51
LCE	See belowl	See below1
Li-SOC12	See helow2	See below2

Notes:

1. Preliminary Ceriodaphnia 48-h LC_{50} test results indicate the battery would be classified as toxic (LC5o=289 mg/L).
2. Preliminary Ceriodaphnia 48-h LC_{50} test results indicate the battery would be classified as toxic (LC5o <2.5 mg/L).

H-4. Results

The results reported at Tables H-1 and H-2 indicate that:

a. Partially discharged MG and completely discharged Li-SOC12 batteries are hazardous waste under RCRA regulations because they exceed regulatory limits for chromium. They are classified with an EPA Hazardous Waste # of D007

b. ALK and Li-MnO2 batteries exhibited acute toxicity for two organisms (Table H-2), with values less than 500 mg/L, for each 96-h acute $_{LC50}$ toxicity test series. LCE and Li-SOC12 batteries exhibited toxicity during preliminary 48-hour acute LC_{50} toxicity testing, and no further testing was required.

H-5. Discussion

a. MG and Li-SOC12 batteries are hazardous waste under RCRA regulations. It must be remembered that this is a chemically dependent test. ALK, LCE, Li-MnO2 and Li-SOC12 batteries exhibited acute biotoxicity. Bioassay testing is chemically independent.

b. The philosophical difference between chemically de-pendent and chemically independent tests cannot be resolved here, and is beyond the scope of the TB. The tests provide two different measures of toxicity. Federal and State regulations must be met when disposing solid wastes. The characterization of batteries for waste disposal depends on the loca-tion of the installation and applicable regulations.

Appendix I
Operational Guidelines for Field Inspection and Disposition of Lithium-Sulfur Dioxide Batteries

NOTE

This appendix contains only a summary of the Technical Assistance Gram (TAG) for reference by safety managers ONLY. Installations MUST establish a Standard Operating Procedure (SOP) based on the TAG 002-95. This summary DOES NOT constitute the complete procedure to be followed when testing and/or discharging batteries. Refer to TAG 002-95 to ensure your safety and protection to the environment.

I-1. Purpose

This Technical Bulletin (TB) authorizes the use of TAG 002-95, 19 January 1995, U.S. Army Communications-Electronics Command, Subject: Operational Guidelines for Field Inspection and Disposition of Lithium-sulfur Dioxide Batteries. This TAG is available from your local CECOM Logistics Assistance Representative or the CECOM Safety office (see para 1-7).

I-2. Scope

Three types of Li-SO2 type batteries, BA-5588/U, BA-5590/U, and BA-5598/U can be tested with Battery Test Set TS-4403A/U. If the quantity of Li-S02 batteries justifies setting up a battery test facility, testing MUST BE performed in accordance with your locally established SOP based on TAG 002-95. Requirements apply to the safe handling of Li-SO2 bat-teries procured and managed by CECOM, Source of Supply B 16.

I-3. Safety and Control Measures

Coordinate use of personal protective equipment with your local safety and preventative medicine personnel. Refer to Chapter 3 for appropriate equipment. The following ANSI and/or NIOSH/MSHA approved personal protective gear is recommended when handling "leaking" Li-SO2 batteries that are venting sulfur dioxide (SO2) gas:

(1) Acid-gas purifying or supplied-air respirator,
(2) Face shield or chemical splash goggles, and
(3) Chemically resistant gloves.

I-4. General Requirements

WARNING

LITHIUM SULFUR DIOXIDE BATTERIES CONTAIN PRESSURIZED SULFUR DIOXIDE GAS. THIS GAS HAS A PUNGENT ODOR AND IS HIGHLY TOXIC. PERSONAL PROTECTIVE EQUIPMENT IS REQUIRED WHEN HANDLING DAMAGED AND/OR LEAKING BATTERIES.

NOTE

If the number of Li-SO2 batteries do not justify setting up a full battery test and discharge facility as described in TAG 002-95, batteries may be (1) shipped to the nearest battery test and discharge facility, or (2) discharged in a controlled manner prior to disposition and disposal, in accordance with instructions in this TB.

a. If the battery fails to operate your equipment it is "dead."

(1) If the battery was newly issued, file a Product Quality Deficiency Report, SF-368 as described in para 1-4.

(2) If it is damaged and unserviceable it should be disposed as hazardous waste (HW) in accordance with chapter 4 requirements.

b. If the battery is NOT dead, but upon visual inspection you find that:

(1) It can't be discharged it should be disposed as HW in accordance with chapter 4 requirements.

(2) You are unable to test the battery, or do not desire to test it, the battery should be discharged prior to disposition and disposal with its built-in complete discharge device (CDD). See para I-6 and chapter 4.

(3) If you believe the battery is serviceable for other purposes you may ship it to a test facility on your installation in accordance with your local SOP.

(4) When tested, if the battery is serviceable (> 30% remaining charge), then it may be used for other purposes such as classroom training.V

I-5. Discharge Requirements:

WARNING

Multi-cell Li-SO2 batteries may vent during complete discharge.-U

Lithium-Sulfur dioxide (Li-SO2) batteries contain pressurized sulfur dioxide (SO2) gas. The gas is highly toxic, and the battery **MUST NOT** be abused in any way which may cause the battery to rupture. **If** you hear a hissing sound *(i.e., battery* venting), or smell irritating gas, **LEAVE** the area. **DO NOT** return to the area until all signs of SO02 gas have been dissipated.

CAUTION

Li-SO2 batteries will get warm/hot during discharged with a built-in CDD, and the battery jacket may deform.

Li-SO2 batteries (except BA-5567/U) are HW for disposal and **MUST NOT** be disposed with general refuse/trash, unless the batteries have been completely discharged.

a. Li-SO2 batteries with a CDD may be discharged in accordance with para 4-7h(1). If the battery vents during discharge it **MUST BE** disposed as HW.

b. Li-S02 batteries without a CDD CAN NOT be discharged, and should be disposed as HW in accordance with para. *4-7h(2) of this TB.*

I-6. Disposition and Disposal Requirements:

a. Coordinate all disposition and disposal of batteries with your Installation Environmental Office/Officer prior to disposal.

b. When a Li-SO2 batteries is fully discharged, it may be classified as non-hazardous solid waste, and disposed in accordance with state and local regulations.

c. Batteries classified as HW should be disposed through your local servicing Defense Reutilization and Marketing Office.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army

Distribution:

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SOMETHING WRONG WITH THIS PUBLICATION?

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BE EXACT. . .PIN-POINT WHERE IT IS

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PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

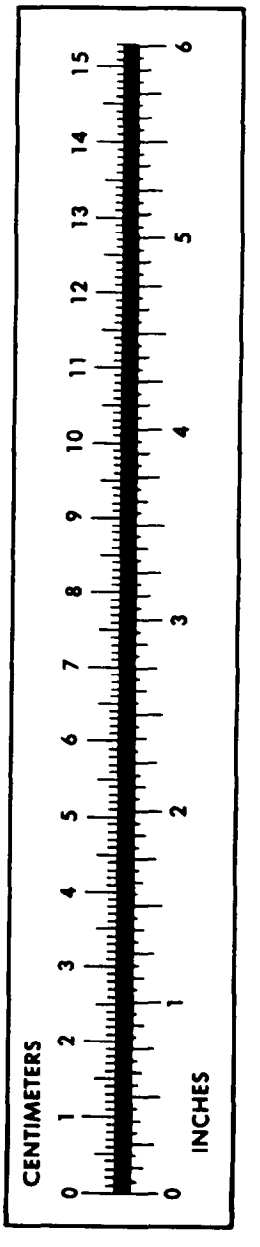
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



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