DEPARTMENT OF THE NAVY
SPACE AND NAVAL WARFARE SYSTEMS COMMAND
WASHINGTON, D.C. 20363-5100

SPAWARINST 4110.1
SPAWAR 00F
12 December 1990

SPAWAR INSTRUCTION 4110.1

From: Commander, Space and Naval Warfare Systems Command

Subj: HAZARDOUS MATERIALS CONTROL AND MANAGEMENT FOR THE SPACE AND NAVAL WARFARE SYSTEMS COMMAND HEADQUARTERS AND FIELD ACTIVITIES

Ref: (a) OPNAVINST 4110.2, Hazardous Material Control and Management
(b) 29 CFR 1910.1200 and 1910.120, OSHA Standards for Hazard Communication, Hazardous Waste Operations and Emergency Response
(c) OPNAVINST 5090.1A, Environmental Management
(d) Federal Standard 313C, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
(e) 29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories
(f) MIL-STD-129K Marking for Shipment and Storage

Encl: (1) Requirements for Statement of Work and Specifications Concerning Hazardous Material and Hazardous Waste Minimization
(2) Federal Supply Classes of Potentially Hazardous Material
(3) Hazardous Materials Inventory Form (Sample)/Shelf Life Management
(4) Lithium Battery Hazards and Procedures
(5) Mercury Health Hazards and Procedures
(6) Polychlorinated Biphenyl (PCB) Hazards
(7) Other Hazardous Materials Associated with Electronics Repair
(8) Hazardous Materials Compatibility Ashore

1. Purpose. To assign actions per references (a) and (b) for life-cycle control of hazardous material acquired by the Commander, Space and Naval Warfare Systems Command (COMSPAWARSYSCOM) headquarters and field activities, for internal use or use by the fleet.

2. Cancellation. SPAWARINST 5100.9C enclosure (11). The remainder of SPAWARINST 5100.9C continues in force until revised.

3. Applicability. This directive applies to all SPAWAR organizations and activities involved in the planning, procurement, acquisition, storage, distribution, requisition, use or other disposition of hazardous material (HM) and resultant hazardous wastes (HW) as specified in reference (a).

4. Definitions

a. Terms. See reference (a).

b. Abbreviations.

HM	Hazardous material
HAZMIN	Hazardous waste minimization
HW	Hazardous waste

EHM	Excess hazardous material
HMC&M	Hazardous materials control and management
MSDS	Material Safety Data Sheet

5. Background. Reference (a) requires all Navy commands and activities to implement hazardous materials control and hazardous waste minimization. This includes compliance with Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), DOD, state and local regulations in the purchasing, use, storage of HM and disposal of HW and EHM. Federal employees may be held personally and criminally liable for violation of the laws regulating these materials. Actions involve management at all levels and all personnel concerned with each phase of acquisition of systems, components, parts or materials as well as research, test, evaluation, fabrication, operation and disposition. The CNO goal is fifty percent reduction by weight of HW by the end of CY-92. The baseline is HW reported in the CY-87 activity annual reports required by reference (c). Any purchase of hazardous materials for current or future use in the fleet must be minimized by elimination or substitution with safer materials, or by using materials that can be recycled or that can be safely disposed.

6. Policy. COMSPAWARSYSCOM reaffirms and supports the HM control policy of reference (a).

7. Action. Table 1 provides a summary of assigned actions and responsibilities which are further defined as follows:

a. SPAWAR headquarters shall:

(1) DIRECTOR OF NAVY LABORATORIES (SPAWAR 005)

(a) SPAWAR 005-3 shall be the COMSPAWARSYSCOM focal point for HMC&M and HAZMIN. This division will:

1 Establish program goals for SPAWAR activities.

2 Provide oversight to:

a Ensure implementation of the hazardous materials control program of reference (a).

b Determine basic SPAWAR processes and procedures that generate HW.

c Initiate Research and Development (R&D) for process improvement and material substitution, if warranted.

d Ensure implementation of HAZMIN techniques.

e Ensure that less hazardous materials are substituted for presently used hazardous materials wherever possible.

f Provide assistance as requested for review of SPAWAR contractual documents that may involve ordering or fleet/depot use of hazardous materials to ensure the least hazardous materials are ordered within the

ACTION	IN-HOUSE USE HEADQUARTERS	FLEET SUPPORT SYSTEM ACQUISITION	SPAWAR ACTIVITIES
SPAWAR 02		HM CLAUSE IN CONTRACTS	
SPAWAR 003		HM ACQUISITION POLICY (HM LOGISTICS POLICY, HM SUPPLY, TRANSPORT & SYSTEM SAFETY POLICY)	
SPAWAR 005	HM/HAZMIN POLICY/TECHNICAL DIRECTION AND ADVISORY ASSISTANCE	TECHNICAL DIRECTION AND ADVISORY ASSISTANCE FOR HM/ HAZMIN (SPAWARINST 4110.1 PARA 7A(1)) AND ENVIRONMENT (SPAWARINST 5090.1)	POLICY/TECHNICAL DIRECTION AND OVERSIGHT FOR HM/HAZMIN (SPAWARINST 4110.1) AND ENVIRONMENT (SPAWARINST 5090.1)
SPAWAR 08-5	"IN-HOUSE" HM CONTROL. "IN-HOUSE" HM PURCHASE/HW DISPOSAL AS APPROVED BY 005-3.		
SPAWAR 00C	LEGAL ASSISTANCE AND REVIEW OF CONTRACTUAL DOCUMENTS.	LEGAL ASSISTANCE AND REVIEW OF CONTRACTUAL DOCUMENTS.	LEGAL ASSISTANCE AND REVIEW OF CONTRACTUAL DOCUMENTS
PD/PM		HM/HAZMIN CONTROL AND APPROVAL.	HM/HAZMIN CONTROL IN TASK ASSIGNMENTS
ACTIVITY COs		HM/HAZMIN CONTROL AND APPROVAL OR DELEGATE RESPONSIBILITY.	HM/HAZMIN CONTROL AND MANAGEMENT PER SPAWARINST 4110.1 SPAWARINST 5090.1

TABLE 1. SUMMARY OF HM/HAZMIN ACTIONS AND RESPONSIBILITIES

constraints of operational readiness. Ensure that new processes, process changes, facilities, weapons systems and materials are evaluated and the usage of hazardous materials is kept to the absolute minimum necessary for mission requirements.

g Act as principal point of contact for all SPAWAR activity HM managers.

3 Review activities' HAZMIN projects per reference (c).

4 Assist the Command with planning, programming and budgeting funds through normal channels for HAZMIN projects which are not funded through the Defense Environmental Restoration Act (DERA).

5 Be responsible for hazardous waste control policy. Monitor Command progress in achieving specific HAZMIN goals for each activity subject to Resource Conservation and Recovery Act (RCRA) regulation.

6 Maintain the SPAWAR hazardous materials information system of material safety data sheets (MSDS) and ensure hazardous materials training information is communicated per reference (b).

7 Assist Commander, Naval Supply Systems Command (COMNAVSUPSYSCOM) in developing and maintaining a centralized list of authorized HM or approved less hazardous substitutes.

(2) SPAWAR 08-5. SPAWAR 08-5 shall assist in headquarters "in-house" HM control.

(a) SPAWAR 08-5 shall submit all requests for office needs that specify materials in the federal supply classes of enclosure (2) to SPAWAR 005-3 for hazardous materials and HAZMIN review and approval. Contractual documents which involve the acquisition of hazardous materials shall include a hazardous materials clause requiring the vendor to supply MSDS and hazardous materials labeling. Once the materials and MSDS are received, a copy of the MSDS shall be forwarded to the user and to SPAWAR 005-3.

(b) SPAWAR 08-5 shall conduct an annual headquarters "in-house" hazardous materials inventory using the form of enclosure (3) and submit this inventory to SPAWAR 005-3 to consolidate the SPAWAR headquarters "in-house" "authorized HM use list."

(3) SPAWAR 003. SPAWAR 003 shall ensure that the Command's acquisition, logistics and technical management policies are consistent with the requirements of reference (a).

(4) SPAWAR 02. SPAWAR 02 shall ensure that applicable Requests for Proposals (RFPs) and contracts include appropriate clauses concerning hazardous materials when an equipment procurement is identified by the technical codes to have a potential for use of hazardous materials. A copy of any MSDS received by SPAWAR 02 shall be forwarded to the program manager and to SPAWAR 005-3.

(5) SPAWAR 00C. SPAWAR 00C shall provide legal assistance review to ensure contractual compliance with all pertinent statutes and regulations for both headquarters and field activities.

(6) All Systems Acquisition Directorates

(a) Hazardous materials contained within the system or used in maintenance must be approved by the Program Manager. Include statements similar to those in enclosure (1) in all specifications and statements of work where the possibility exists that a product may contain hazardous material or undergo maintenance using hazardous materials as defined in reference (d) and enclosure (2). Inspection and acceptance criteria shall include inspection for material safety data sheets and hazardous materials labelling per references (b) and (f). System safety and environmental assessment tasks must include identification, evaluation, and use of least hazardous substitute materials when available to meet the Navy HAZMIN goal of 50 percent HW reduction by weight by the end of CY-92 and shall also include an economic impact analysis when HM is used. Requests to include hazardous materials not already on the Navy's "Ships Hazardous Materials List" (SHML) must be forwarded to COMNAVSUPSYSCOM (SUP-0623H) via SPAWAR 005-3 and be accompanied by a justification statement. The following conditions must be met on the justification statement: a valid requirement exists; a complete MSDS is or will be locally available to the user; non-hazardous or less hazardous substitutes are not adequate; the MSDS for the required material is entered or in process of being entered into the Defense Logistics Agency (DLA) Hazardous Material Information System (HMIS) after the National Stock Number (NSN) is identified. Order of precedence for any proposed use of hazardous materials is:

1 Provide non-hazardous substitute.

2 Provide recyclable hazardous material.

3 Where hazardous material cannot be recycled, use materials that result in hazardous waste that can be treated to reduce its volume or to reduce it to a non-hazardous state.

(b) Incorporate into system research and development programs the necessary investigations and research studies for effects of materials on safety, environmental protection, health hazards and the associated risk assessments targeted at HM reduction/HW minimization.

(c) Ensure elements of reference (a) and compliance with its provisions are reviewed and included in negotiating or starting operation of government-owned contractor-operated (GOCO) and other facilities.

(d) Produce an economic impact analysis for hazardous materials introduced into the supply system. This analysis shall include the cost of hazardous waste disposal and user training.

(e) Meet the effective implementation dates of paragraph 9 of reference (a) for incorporating HMC&M compliance into System Acquisition and Integrated Logistics Support (ILS) plans. In summary these are the dates for System Acquisitions to comply:

1 Systems in milestone 0 as of the date of this instruction - All applicable actions of reference (a) are effective immediately.

2 For systems in milestones I, II, and III as of the date of this instruction, program managers shall develop plans for HMC&M implementation/substitution with less hazardous or recyclable material in all phases of their systems life cycle including depot level maintenance. If review of their systems shows no hazardous material exists, there is no requirement to produce a separate HMC&M plan; however, a memo must be provided to SPAWAR 005-3 indicating that a detailed review was conducted and no hazardous material as defined in enclosure (2) was found. Submit all HMC&M plans to CNO (OP-04) via SPAWAR 005-3 immediately.

3 Existing Systems and Equipment - Immediately develop plans to ensure provisions of reference (a) are fully implemented by 20 June 1992. By 20 January 1991, review systems/equipments and planned maintenance systems (PMS)/maintenance requirement cards (MRC) to determine the presence of hazardous materials. For each HM identified, determine feasibility of a safer or recyclable substitute by 20 January 1992. Initiate use of safer substitutes/recyclable materials by 20 January 1993. Ensure that hazardous materials information from the vendor's MSDS is incorporated in all applicable technical manuals, procedures and maintenance requirement cards.

b. SPAWAR activities shall implement reference (a) within the same schedule required for SPAWAR headquarters and shall accomplish the following:

(1) Assignment of responsibilities. Appoint a HM Manager, HAZMIN Manager and a HM Control Committee. The HAZMIN Manager may be a separate assignee or a collateral duty for the HM or Environmental Manager. HM Control Committee members shall represent each department which has a HM use or responsibility. Typical assignments of responsibility are:

(a) Generic hazard communication (HAZCOMM) training - HM Manager or Occupational Safety and Health (OSH) office.

(b) Specific HAZCOMM training - Workplace supervisor.

(c) HM/HAZMIN policy for local use and contractors on base or supplying material to the fleet - HM/HAZMIN Manager in conjunction with the Environmental Manager and HM Control Committee. Project Manager and Systems Safety Division shall be assigned responsibilities for HM to be supplied to the fleet similar to the responsibilities for headquarters Program Managers in paragraph 7a(6).

(d) HMC&M program plan to be disseminated to all employees - HM Manager in conjunction with HM Control Committee.

(e) Annual HM inventory - Workplace supervisors in response to the HM Manager and in conjunction with the HM Control Committee. Inventory should include the information recommended by enclosure (3).

(f) HM authorized use list - HM Manager in conjunction with the HM Control Committee.

(g) Annual justification for retaining HM in current inventory and on authorized use list - Workplace supervisor.

(h) Labeling of HM and HW containers - Manufacturer, supply, receiving, shipping, workplace supervisors in conjunction with the OSH office and HM Manager. All containers of hazardous materials, including pipes, shall be labeled. Original containers shall contain the chemical or common name of the product, the manufacturer's name, address and emergency phone number, health and physical effects of the product.

(i) MSDS - Manufacturer and Supply Department. HM Manager or OSH office will maintain a central library of all MSDS. Receiving will ensure that all incoming HM is accompanied by an MSDS and one copy is forwarded to the HM Manager with original copy to the user. HM received without an MSDS must be reported to the HM Manager before forwarding the material to the user.

(j) HM/HW storage - Workplace supervisor with advice from HM Manager and Environmental Manager.

(k) HM acquisition controls - Contracts/supply in conjunction with the HM/HAZMIN Manager, HM Control Committee, OSH office, Environmental Manager and Systems Safety Division.

(l) HM and EHM distribution - Supply/Chemistry Division in conjunction with the HAZMIN Manager.

(m) Emergency response planning - First responder, fire, rescue and emergency spill cleanup services in conjunction with the OSH office, Environmental Manager, HM Manager and HM Control Committee.

(n) HM workplace engineering, ventilation and operational controls - Workplace supervisors/Facilities Manager/Industrial Hygienist/OSH office.

(o) Workplace inspections for HM control - OSH office.

(p) Personal Protective Equipment for HM users - Workplace supervisor in conjunction with the OSH office.

(q) HW controls - Environmental Manager in conjunction with the HM Manager and HM Control Committee and OSH office for compliance with 29CFR 1910.120.

(r) HM/HW transport - Transportation Division in conjunction with the Environmental and HM Managers.

(2) HM developed "in-house." Hazardous materials control of products developed "in-house" must begin with preparation of an MSDS using OSHA Form 174.

(a) Any HM product which is transported to another area "on or off base" is considered to be a developed product and must be accompanied by an MSDS for materials which would fit the federal supply classes of reference (d) and a Hazardous Component Safety Data Sheet for explosives.

(b) If the HM is not in production, an interim MSDS must be prepared by the originator of the product using best available data. For

example an MSDS from another product with similar chemical structure or properties of the individual materials which are in a physical mixture could be utilized to prepare the MSDS on the new product.

(c) Once the product is ready for extensive use or production, the final MSDS must be prepared. Prior to completing the final MSDS, the product must be tested and analyzed to determine its physical and chemical properties, biological effects, personnel protection and emergency response requirements. Preparation of the final MSDS shall be under the auspices of an occupational health physician and certified industrial hygienist and coordinated with the Bureau of Medicine and Surgery (BUMED) and their designated lead agent, the Naval Environmental Health Center (NAVENVIRHLTHCEN).

(d) Copies of all MSDS', both interim and final, shall be sent to SPAWAR 005-3 and NAVENVIRHLTHCEN.

(3) Activities with chemical laboratories shall implement the requirements of reference (e). A chemical hygiene plan shall be implemented and a chemical hygiene officer assigned. The ideal candidate for chemical hygiene officer would be either the resident BUMED Industrial Hygienist or a senior chemist. The chemical hygiene officer should also be a member of the activity's hazardous materials control committee.

(4) Forward implementing instructions together with the name and phone number of the HM and HAZMIN Managers to SPAWAR 005-3 within 120 days of the date of this instruction.

(5) Activities are encouraged to consolidate their HMC&M responsibilities with those of other local activities when mutually agreeable provided each participating activity exercises adequate oversight.

c. <u>All supervisors and employees at SPAWAR headquarters and activities shall</u>:

(1) Review the ordering, use or storage of hazardous materials/hazardous waste under their cognizance and determine whether safer substitutes or recycling can be utilized. A statement shall accompany their hazardous materials inventory which certifies that this review has been completed.

(2) Submit all purchase orders on hazardous materials (as defined in enclosure (2)):

(a) To the local HM/HAZMIN Manager for HM and HAZMIN review and approval of materials used "in-house."

(b) To the Program Manager for HM and HAZMIN review and approval of materials to be used in the fleet.

A written justification for the necessity of purchasing the type, container size and quantity of material together with a listing of other less hazardous or recyclable potential substitutes that were considered (give reasons why

these substitutes cannot be used) will be submitted along with the purchase order.

(3) Ensure that an MSDS is present and available to the employee in the workplace for each hazardous material.

(4) Ensure that all personnel who could routinely in the course of their duties be exposed to HM/HW are provided with information and training on the hazardous chemicals in their work area at the time of initial assignment and whenever a new hazard is introduced. The DOD approved visuals for this training are available from each activity/headquarters Safety or HM Manager. The video portion may be ordered from DOD/Navy audiovisual libraries under the following title:

The Federal Hazard Communication Training Program Parts 1 & 2.
Standard Audiovisual Part Identification Number - 505215 DN

The training manuals to accompany the video training are available through publication channels under the following titles:

DOD Publication No. 6050.5-W. Department of Defense Federal Hazard Communication Training Program. Student's Workbook.

DOD Publication No. 6050.5-G-1. Department of Defense Federal Hazard Communication Training Program. Trainer's Guide.

8. Enclosures (4) through (7) are provided to assist in identifying and controlling certain hazardous materials often encountered in acquisitions under SPAWAR cognizance.

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REQUIREMENTS FOR STATEMENT OF WORK AND SPECIFICATIONS CONCERNING

HAZARDOUS MATERIAL AND HAZARDOUS WASTE MINIMIZATION

1. Statement of work requirements to be included with system safety requirements:

Any hazardous material as defined in FED-STD-313C which may be used in, supplied with or required in support of the supplied product must be approved by the procuring activity. Prior to approval, provide a material safety data sheet (OSHA Form 174) and written justification that shows the necessity for the type, container size and quantity of hazardous material (or material that results in hazardous waste) together with a listing of less hazardous potential substitutes that were considered and the reasons why these substitutes cannot be used. Order of precedence for acceptance shall be:

a. Non-hazardous material.
b. Material that is recyclable.
c. Material that results in hazardous waste that can be treated to reduce it to a non-hazardous state.

Pertinent data and precautions from the material safety data sheets must be provided in all associated manuals and documentation delivered with this product.

2. Specification requirements:

Hazardous material and hazardous waste minimization. Any use of potentially hazardous material with the supplied products must be approved by the procuring activity. Typical classes of materials that may contain hazardous ingredients are defined in Federal Standard 313C. All hazardous materials containers must be labeled in accordance with MIL-STD-129K, the Occupational Safety and Health Administration Standard, Code of Federal Regulations Title 29 Part 1910.1200, and applicable Environmental Protection Agency and Department of Transportation requirements. Parts containing hazardous materials (for example, beryllium oxide insulators) must also be labelled.

3. Contract Data Requirements List (CDRL):

Use Data Item Description (DID) DI-SAFT-80106, Occupational Health Hazard Assessment Report to submit the justification for use of a hazardous material as defined in FED-STD-313C. The material safety data sheets (OSHA Form 174) for the hazardous materials must be included with the data item submittal. This data submittal shall include written justification that shows the necessity for the type, container size and quantity of hazardous material (or material that results in hazardous waste) together with a listing of less hazardous potential substitutes that were considered and the reasons why these substitutes cannot be used. Order of precedence for acceptance shall be:

a. Non-hazardous material.
b. Material that is recyclable.
c. Material that results in hazardous waste that can be treated to reduce it to a non-hazardous state.

4. Requirements for Planned Maintenance:

In planned maintenance, any materials which are hazardous shall be noted as such in the list of tools for maintenance and in accordance with the Material Safety Data Sheets (MSDS).

a. When hazardous material is required in a maintenance procedure, the appropriate hazardous materials group of the OPNAV Hazardous Materials Users Guide (HMUG) shall be referenced in the list of tools, materials, parts and test equipment (TMPTE) block of the maintenance requirement card (MRC). The section of the HMUG which is referenced shall correspond to the requirements of the MSDS or multiple MSDS if more than one manufacturer and formulation of the product exists.

b. If additional TMPTE items such as chemical goggles, respirators, etc. are required by the MSDS, add these items to the MRC TMPTE block. If additional important safety information from the MSDS is not in the HMUG this additional information must be added to the safety precautions and procedures sections of the MRC.

c. When changing an existing MRC to comply with this requirement, submit a technical feedback report to the Naval Sea Support Center Atlantic or Naval Sea Support Center Pacific indicating the changes made by the work center or command and requesting MRC update.

d. For new MRCs and during MRC revisions for maintenance procedures that may require use of hazardous materials, the following preliminary statement or equivalent wording shall be added to the safety precautions and statements on the MRC, "Use of hazardous materials is required to accomplish this maintenance requirement. Refer to Standard PMS Materials Identification Guide (SPMIG) for OPNAV Hazardous Materials Users Guide (HMUG) category and the additional safety requirements for the specified hazardous materials."

FEDERAL SUPPLY CLASSES OF POTENTIALLY HAZARDOUS MATERIAL

APPENDIX A - Identification of Hazardous Items by Federal Supply Class(FSC)

10. FSC identification of hazardous items. Any FSC could contain a hazardous item. The listings in table I and table II are not intended to be inclusive listings of all hazardous items, but to identify the major classes which contain hazardous items and provide examples of hazardous items in other classes.

10.1 FSC's in which most items are hazardous. An MSDS shall be submitted for all items in the FSC's listed in table I.

Table I - MSDS required for all items.

FSC	TITLE
6810	Chemicals
6820	Dyes
6830	Gases: Compressed and liquefied
6840	Pest Control Agents and Disinfectants
6850	Miscellaneous Chemical Specialties
7930	Cleaning and Polishing Compounds and Preparations
8010	Paints, Dopes, Varnishes, and Related Products
8030	Preservative and Sealing Compounds
8040	Adhesives
9110	Fuels, Solid
9130	Liquid Propellants and Fuels, Petroleum Base
9135	Liquid Propellant Fuels and Oxidizers, Chemical Base
9140	Fuel Oils
9150	Oils and Greases: Cutting, Lubricating, and Hydraulic
9160	Miscellaneous Waxes, Oils and Fats

10.2 Other FSC's. An MSDS shall be submitted for the hazardous items (as defined in paragraph 3.3) in FSC's not listed in table I. Some examples of hazardous items in other FSC's are listed in table II.

Table II - Examples of hazardous items in other FSC's.

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
1370	Pyrotechnics	Warning fusee, fire starter
1375	Demolition Materials	Explosive devices
1560	Airframe Structural Components	Radioactive materials
1630	Airframe Wheel and Brake System	Items containing asbestos
2240	Locomotive and Rail Car Accessories	Items containing asbestos
2520	Vehicular Power Transmission Components	Items containing asbestos
2530	Vehicular Brake Steering, Axle, Wheel, and Track Components	Items containing asbestos
2540	Vehicular Furniture and Accessories	Items containing asbestos
2640	Tire Rebuilding and Tire and Tube Repair Materials	Items containing flammable or toxic compounds
3433	Gas Welding, Heat Cutting, and Metalizing Equipment	Compressed gases
3439	Miscellaneous Welding, Soldering, and Brazing Supplies and Accessories	Hazardous items such as cleaners, acids, flux and supplies containing or producing hazardous fumes

ENCLOSURE(2)

Table II (continued)

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
3610	Printing, Duplicating, and Bookbinding Equip.	Flammable or toxic lithographic solutions
3655	Gas Generating and Dispensing Systems, Fixed or Mobile	Those items producing hazardous fumes
3680	Foundry Machinery, Related Equipment and Supplies	Flammable or toxic casting compounds
4210	Fire Fighting Equipment	Extinguishing agents, repair and refill kits containing hazardous chemicals
4240	Safety and Rescue Equipment	Those items that release oxygen, or contain compressed gases or initiating charges
5330	Packing and Gasket Material	Asbestos material, lead caulking
5340	Misc. Hardware Equipment	Strapping and sealing kits containing hazardous chemicals
5350	Abrasive Material	Dust producing items which may produce a hazardous waste
5430	Storage Tanks	Repair kits containing hazardous chemicals
5610	Mineral Construction Materials, Bulk	Hazardous items such as cutback asphalt, deck and floor covering, deck and surface underlay compounds, sealing compounds, flight deck compounds
5640	Wallboard Building Paper, and Thermal Insulation Materials	Asbestos cloth having loose fibers or flyings that may become airborne, and materials containing formaldehyde

ENCLOSURE(2)

Table II (continued)

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
5680	Misc. Construction Material	Repair kits containing hazardous chemicals
5820	Radio and Television Communication Equipment, except Airborne	Those circuit cooler items containing gases that are regulated as hazardous to the earth's ozone layer
5835	Sound Recording and Reproducing Equipment	Those recording tape cleaners containing hazardous cleaning fluids or packaged in pressurized containers
5910	Capacitors	Those items containing Polychlorinated Biphenyls (PCBs)
5915	Filters and Networks	Those items containing Polychlorinated Biphenyls (PCBs)
5920	Fuses and Lighting Arresters	Those items containing radioactive materials
5925	Circuit Breakers	Those items containing radioactive materials
5930	Switches	Those items containing radioactive materials
5935	Connectors, Electrical	Those kits containing flammable chemicals
5950	Coils and Transformers	Those items containing Polychlorinated Biphenyls (PCBs)
5960	Electron Tubes and Associated Hardware	Those tubes containing radioactive isotopes and requiring warning labels and magnetron tubes that require special precautions when being prepared for air shipment

ENCLOSURE(2)

Table II (continued)

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
5965	Headsets, Handsets, Microphones, and Speakers	Those items containing magnetic materials
5970	Electrical Insulators and Insulating Materials	Those items containing flammable solvents
5975	Electrical Hardware and Supplies	Those items containing asbestos
5985	Antennas, Waveguide, and Related Equipment	Those kits containing flammable chemicals
5999	Miscellaneous Electrical and Oxide Electronic Compounds	Those contact plates containing Beryllium
6135	Batteries, Primary	Lithium and mercury batteries and alkaline (with electrolyte)
6140	Batteries, Secondary	Those wet or moist items containing lead-acid, nickel-cadmium, corrosive or other hazardous compounds
6220	Electric Vehicular Lights and Fixtures	Those items containing mercury
6230	Electric Portable and Hand Lighting Equipment	Those items containing wet batteries
6240	Electric Lamps	Those items containing mercury
6260	Nonelectrical Lighting Fixtures	Those items containing mercury or radioactive materials

ENCLOSURE(2)

Table II (continued)

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
6350	Miscellaneous Alarm, Signal, and Security Detection Systems	Those items containing wet batteries or radioactive materials.
6505	Drugs, Biologicals, and Official Reagents	Hazardous items as defined in paragraph 3.3.
6508	Medicated Cosmetics and Toiletries	Hazardous items as defined in paragraph 3.3.
6510	Surgical Dressing Materials	Items containing flammable solvents
6520	Dental Instruments, Equipment, and Supplies	Items containing flammable solvents, mercury or asbestos
6525	X-ray Equipment and Supplies: Medical, Dental, Veterinary	Items containing hazardous chemicals, solvents or radioactive materials
6545	Replenishable Field Medical Sets, Kits, Outfits	Items containing hazardous chemicals
6550	In Vitro Diagnostic Substances, Reagents	Items containing hazardous chemicals
6605	Navigational Instruments	Radioactive materials
6625	Electrical and Electronic Properties Measuring and Testing Instruments	Those items containing radioactive materials
6640	Laboratory Equipment and Supplies	Items containing flammable compounds, mercury or asbestos
6665	Hazard-Detecting Instruments	Test kits and repair kit reagents containing hazardous chemicals

ENCLOSURE(2)

Table II (continued)

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
6675	Drafting, Surveying and Mapping Instruments	Items with hazardous chemicals
6685	Pressure, Temperature, and Humidity Measuring and Controlling Instruments	Items containing mercury or compressed gases
6740	Photographic Developing and Finishing Equipment	Those items containing radioactive compounds
6750	Photographic Supplies	Items containing hazardous chemicals, solvents, thinners and cements
6780	Photographic Sets, Kits, and Outfits	Items containing hazardous chemicals, solvents, thinners and cement
7360	Sets, Kits, and Outfits: Food Preparation and Serving	Items containing compressed gases such as fire extinguishers
7510	Office Supplies	Hazardous items such as solvents, thinners, cleaning fluids, flammable inks and varnishes
7530	Stationary and Record Forms	Items containing hazardous chemicals or chemicals which off-gas
8405	Outerwear, Men's	Those maintenance kits containing flammable solvents
8410	Outerwear, Woman's	Those maintenance kits containing flammable solvents
8415	Clothing, Special Purpose	Those maintenance kits containing flammable solvents
8465	Individual Equipment	Those maintenance kits containing flammable solvents

ENCLOSURE(2)

Table II (continued)

FSC	TITLE	EXAMPLES OF HAZARDOUS ITEMS
8510	Perfumes, Toilet Preparations, and Powders	Shipping containers, and pressurized containers with flammable or nonflammable propellants
8520	Toilet Soap, Shaving Preparations, and Dentifrices	Shipping containers, pressurized containers with flammable or nonflammable propellants
8720	Fertilizers	Items containing herbicides and/or insecticides, or that are hazardous because of their composition
9330	Plastic Fabricated Materials	Items containing flammable solvents or toxic materials such as isocyanates
9620	Mineral, Natural, Synthetic	Asbestos, mica, silica, other hazardous chemicals
9630	Additive Metal Materials and Alloys	Various hazardous chemicals
9390	Miscellaneous Fabricated Nonmetallic Materials	Those items containing flammable solvents or asbestos
9920	Smokers' Articles and Matches	Lighter fuel and matches.
9930	Memorials; Cemeterial and Mortuary Equipment and Supplies	Those items containing formaldehyde or its solutions

ENCLOSURE(2)

HAZARDOUS MATERIALS INVENTORY FORM

CHEMICAL/ COMMON NAME	MSDS Y/N?	MSDS#	STOCK#	MANUFACTURER NAME	BLDG	ROOM	COG CODE	QUANTITY	UNIT OF ISSUE	SHELF LIFE DATE	STORAGE COMPATIBILITY CODE

SHELF-LIFE MANAGEMENT

Ref: (a) DOD 4140.27-M, Shelf-Life Item Management Manual
(b) NAVSUP Publication 437, Operating Procedures Manual MILSTRIP/MILSTRAP
(c) NAVSUP Publication 4105, List of Items Requiring Special Handling (LIRSH)
(d) NAVSUPINST 4410.52B, Shelf-Life Item Identification, Mangement and Control

1. Procedures for extending (updating) shelf-life items are as follows:

a. Ascertain if the item is a shelf-life item. Many items will carry a marking on the container with the date of manufacture and retest date. This in itself does not automatically make it a shelf-life item. Reference (a) provides additional details.

b. Consult references (b) and (c); if the item is a shelf-life item, the List of Items Requiring Special Handling (LIRSH) will show a shelf life code and a shelf-life action code. The LIRSH will also give a definition of these codes. Example: "MUU" is a Type I shelf-life item.

c. Items that are extended (updated) are still to be issued first. All material is issued by manufactured date, cure date or assembly date, as applicable (oldest first). Reference (d) provides additional details.

2. Per reference (a), "Type I" shelf-life items cannot be extended.

a. Only "Type I" shelf-life items are required to be downgraded from "A" to "B" to "C" to "H" condition in accordance with reference (a).

b. Six months before expiration date, the "Type I" item should be inspected. If the material and container are still in good condition, place it in "B" condition with appropriate shelf-life update sticker affixed to the item.

c. Three months before expiration date, inspect the item again and if in good condition, place the material in "C" condition in accordance with reference (a).

d. At time of expiration date, place material in "H" condition and dispose following the proper disposal procedures. See reference (a).

3. "Type II" shelf-life can be be extended.

a. "Type II" shelf-life items can be extended (updated) repeatedly after testing or restorative action has been taken in accordance with reference (a).

b. "Type II" shelf-life items should be extended (updated) six months before date of expiration and placed in stock according to manufactured date, cure date or assembly date, not shelf-life date. This will allow the oldest material to be issued first. See reference (d).

c. When "Type II" shelf-life items are received, it is the receiver's responsibility to extend the shelf life data on all the units within the carton. The issuing activity will only affix an updated extended shelf-life sticker on the outside of the carton or on each side of a full pallet. See reference (d) for more details.

d. If the LIRSH, reference (b), identifies an item with a number in the shelf-life code, the item is "Type II" and can be repeatedly updated. The following is an example:

(1) For an item that has a "T6" shelf-life action code, "T" means test. This is not a laboratory test, but a common sense visual test, e.g. check the container condition for deep pitted rust in the seams, overly bent or dented appearance, leaking or swelling, and normal material consistency, i.e. liquid still liquified and solid still solid. Reference (b) provides additional details.

(2) The second position of the shelf-life action code is "6" which is a code for the number of months the item can be extended. (It does not mean extend six months and retest). Consulting the LIRSH, the shelf-life code "6" means the shelf-life can be extended for 24 months (two years).

(3) Hence the procedure for this example is as follows. Six months prior to expiration date, inspect items. The items inspected have a "T6" shelf-life action code. Follow the common sense steps in accordance with references (b) and (c):

(a) Inspect the container ensuring it will hold up for the extended time frame.

(b) Check the contents to ensure they have not degraded, i.e. uniform liquid, no cracks in solid, or whatever characteristics should be expected of the product.

(c) Since the second position of the shelf-life action code is a "6", add 24 months from the last day of the month that the material is inspected.

(d) Annotate the shelf-life update sticker with the date manufactured, the inspection date and the new expiration date.

EXAMPLE: Date Manufactured 6/30/87
Inspection Date 1/30/89
Retest/Expiration date 1/30/91

(e) This item is still two years old; it should be stored and issued by manufacture date, cure date or assembly date as applicable (oldest date to be issued first regardless of shelf-life extension date). See reference (d).

LITHIUM BATTERY HAZARDS AND PROCEDURES

1. Background. Batteries using lithium anodes have been known to explode, causing serious injuries and fatalities. These accidents have prompted an intensive Navy program to ensure the safe design storage and use of lithium batteries. The Naval Sea Systems Command was designated as the technical authority for lithium battery safety. NAVSEA Technical Manual S9310-AQ-SAF-010 was issued to provide requirements for design, test and evaluation, use, storage and disposal of lithium batteries.

2. Action.

a. Lithium batteries shall not be used in equipment unless they have been reviewed, tested and approved in accordance with NAVSEA Technical Manual S9310-AQ-SAF-010 and approved by the NAVSEA Safety Division (SEA 666). In addition, any lithium battery proposed for use on board submarines must also be approved by NAVSEA PMS 393. Copies of all lithium battery safety approvals shall be forwarded to SPAWAR 005-3.

b. All acquisition contracts for battery powered equipment must specifically state that lithium batteries shall not be used without the specific authorization of the procuring activity.

MERCURY HEALTH HAZARDS AND PROCEDURES

1. Background. Mercury in almost any form poses a health hazard, particularly when the vapors of mercury and unstable mercury compounds are inhaled, ingested or come in direct contact with the skin. Because mercury is a health hazard, its use must be kept under strict control. All electronic equipment, associated test equipment, materials, finishes, circuit boards and other components should be free of mercury and unstable mercury compounds. Control of the habitable environment must include monitoring of mercury contamination caused by mercury spills and any unusual situations where contamination is suspected. It is the policy of COMSPAWARSYSCOM that the requirements of NAVSEAINST 5100.3 series shall be implemented in all matters relating to mercury. NAVSEA 07E is the Navy assigned technical authority for control of mercury health hazards.

2. Action

a. Any contracts involving the procurement of equipment shall specify that no mercury or unstable mercury compounds will be used in the manufacture or test of equipment intended for use aboard surface ships, submarines, aircraft, enclosed areas at shore stations and other confined spaces unless specifically approved by the procuring activity. Exclusion of mercury and permission for mercury clauses are to be included in the contract documents. These clauses shall be quoted from the most current version of NAVSEAINST 5100.3B. Approval for use of mercury bearing products such as mercury batteries aboard submarines must be obtained from NAVSEA (SEA-07E) via SPAWAR 005-3.

b. All SPAWAR activities responsible for the maintenance, installation, repair and test of communications or electronic equipment intended for use aboard surface ships, submarines, other confined spaces shall develop procedures for control of mercury, and unstable mercury compounds in shop areas for the purpose of preventing contamination of that equipment. Special preventative precautions must be exercised if mercury is used as an integral part of test equipment (for example, mercury manometers and mercury contact cups).

c. All SPAWAR activities which use or store mercury must develop plans and procedures for reporting and cleaning up mercury spills and testing to determine contamination of equipment. These plans shall be submitted to SPAWAR 005-3. Spill reporting shall be done in accordance with the environmental protection requirements of OPNAVINST 5090.1.

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POLYCHLORINATED BIPHENYL (PCB) HAZARDS

1. Background

a. Polychlorinated biphenyls (PCBs) are synthetic oils having excellent dielectric and low flammability properties. They have been used extensively as dielectric fluids in capacitors, transformers and filters and in hydraulic fluids, heat transfer fluids, plasticizers, adhesives and dust control agents. PCBs released into the environment do not breakdown unless exposed to high temperatures. Instead, they bioaccumulate in the food chain, that is, they accumulate in the tissues of living organisms and as one organism feeds on another, progressively greater concentrations occur as the food chain progresses upward toward man. PCBs, or their breakdown products, may cause, among other things, reproductive failures, gastric disorders, skin lesions, and tumors in laboratory animals. Studies of workers exposed to PCBs have shown a number of symptoms and adverse effects including chloracne, digestive disturbances, jaundice, impotence, throat and respiratory irritations and severe headaches. Because of growing concern over these adverse effects, regulations were passed banning the manufacture and future use after 1 January 1977 under Title 40 Code of Federal Regulations, Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions. 40 CFR 761 further issued labeling requirements and disposal restrictions for PCBs and equipment containing PCBs.

b. Monsanto Corporation was the principal manufacturer of PCBs in the United States. They began production of PCBs in 1929; in 1977 production was voluntarily terminated because of the widespread environmental concerns about PCBs. Monsanto Corporation sold PCBs under the trade name "Askarel." Companies who used PCBs in the manufacture of transformers and capacitors and for other uses often used other trade names: Arochlor, Pydraul, Therminol, Pyrochlor, Santotherm, Pyralene, Pyranol, Inerteen, Asbestol, Chlorextol, Diachlor, Dykanol, Elemex, Hyvol, No-Flamol, Saf-T-Kuhl, Arochlor B, Chlorinol, Chlorphen, Eucarel.

2. Discussion. 40 CFR 761 allows capacitors and other electronic equipment with PCBs manufactured before 1977 to be used for their useful lives. Additionally, capacitors and filters containing less than three pounds of PCBs need not be disposed of in any special way. All capacitors having more than three pounds of PCBs must be labeled and disposed of as required by 40 CFR 761. PCB weight can be estimated using the following formulas:

a. Oil filled capacitors occupying the volume of approximately two bricks may be large enough to have more than three pounds of PCBs. A more precise estimate is given by:

PCB weight in oz. = total vol. of capacitor in cubic inches x 0.27 oz.

b. Filters contain both capacitors and coils. The following formula provides an estimate of the PCB weight in the filters:

PCB weight = total weight x 0.30.

c. Capacitors for use at less than 2000 volts need not be labeled until taken out of service prior to disposal. Capacitors for use at more than 2000 volts must be labeled while still in service. Disposal must be accomplished as required in 40 CFR 761. Transformers in electronic equipment usually do not contain PCBs. External power transformers supplying the equipment may have PCBs. Their labeling and disposal are the responsibility of the Public Works Lead Activity (PWLA). To date, the only equipment containing more than three pounds of PCBs that has been reported by SPAWAR project managers as being under SPAWAR cognizance is as follows:

(1) AN/URC-85 radio set (ref. design. 1A1A5C2-C9) contains General Electric Part No. 45F272FB capacitor.

(2) Shielded room-Filtron FSR 202, FSR 1201E RF filters. (Filtron states that all models designated FSR-X, FSR-W and FCB prior to 1977 have PCBs).

(3) The oils in Balun transformers used with shore communications antennas and the oils in shore transmitter muliticouplers, all of which are associated with low frequency transmitting sites, require testing to determine PCB content.

3. Action. All addressees shall inspect all equipment under their cognizance for PCBs and shall determine if their PCB capacitors or filters contain more than three pounds of PCBs. They shall ensure that all safety, labeling and disposal requirements are met.

a. Any parts under SPAWAR cognizance found to contain PCBs shall be reported to SPAWAR 005-3.

b. If it is not certain whether equipment or bulk containers holding more than three pounds of oil manufactured before 1977 actually contain PCBs, addressees shall provide the manufacturer's name, part number, and NSN (if possible) of each part to SPAWAR 005-3 for determination of PCB content. In the meantime, they shall assume that the parts contain PCBs and handle them accordingly. Testing for PCBs can also be arranged for by contacting the PWLA or Navy Regional Medical Center.

OTHER HAZARDOUS MATERIALS ASSOCIATED WITH ELECTRONICS REPAIR

1. Background. Many other hazardous materials exist in addition to the lithium batteries, mercury and PCBs discussed in previous enclosures. Some are an immediate hazard, others may only become potentially hazardous after long continued use. Types of hazardous materials that may be encountered in use or maintenance of electrical and electronic equipment are briefly discussed in this enclosure.

2. Solvents and Cleaning Agents. It is the policy of COMSPAWARSYSCOM that the least hazardous cleaning agent that will accomplish the task is to be used in every circumstance, especially where the same agent is used repeatedly over a long period of time. Acid based cleaning solutions may be the most hazardous cleaner. Soap and water are probably the least hazardous agents. The common practice is to use something in between these two extremes. For example, nonflammable, inert organic solvents often seem to be more effective than soap and water. The order of priority is as follows:

a. Detergents - least toxic but may leave a residue or corrode electrical contacts.

b. Inert organic solvents

(1) Trichlorotrifluoroethane (Freon 113) - CNO message 272020Z Sep 85 forbids use of trichlorotrifluoroethane unless no safer substitute can be found. It may be used safely in small quantities from a safety can or small spray can for spot cleaning in a well ventilated area. Open containers of Freon 113 may vaporize and cause suffocation by displacing breathable air or could cause heart arrythmia. As little as one half cup of Freon 113 if completely vaporized in a 27 cubic meter room will reach the hazardous threshold limit value (TLV) of 1000 parts per million (ppm). If large quantities of freon are required and safe substitutes cannot be found, an industrial hygienist must be consulted and special controls must be instituted. Typical controls may include:

(a) Conduct operations outdoors.

(b) Provide forced air ventilation.

(c) Use air line respirator.

(d) Use approved safety containers for freon and keep covered as much as possible.

(e) In case of spills of freon, evacuate the area immediately and use forced air ventilation to purge the space. Obtain emergency services from the Hazardous Spill Coordinator Industrial Hygienist and fire department rescue squad.

In accordance with SECNAVINST 5090.5 of 20 November 1989 and OPNAVINST 5090.2 of 22 January 1990 concerning the management of ozone depleting substances, purchase and use of Freon 113 are banned. However, existing stocks of Freon 113 may be used until they are depleted.

(2) (1,1,1) Trichloroethane - While this solvent is widely used as a contact cleaner and sold as a nonflammable "safety solvent," it has a threshold limit value of 300 ppm and is more toxic than trichlorotrifluoroethane. If used in an unventilated area it can cause unconsciousness and death or long term health effects. This solvent may also be used in small quantities from safety cans or spray cans for spot cleaning in well ventilated areas. If more than small quantities are to be used, such as in cleaning vats, the operation shall be evaluated by an industrial hygienist. Typical controls and emergency spills cleanup would be the same as those instituted for the use of freon.

(3) Carbon Tetrachloride and Trichloroethylene - Forbidden for general use in the Navy.

c. Acid cleaning solutions - Phenol (carbolic acid), chromic acid and other similar cleaning compounds shall only be used after it has been determined that no other cleaning compound is available to perform the same quality task. All uses of these compounds shall be evaluated by an industrial hygienist and appropriate safety, health and environmental controls shall be initiated.

3. Beryllium

a. Beryllium dust, either as the metal or as its oxide, is highly toxic. It can cause beryllicosis of the lungs and dermatitis. Beryllium oxide (beryllia), a white ceramic material identical in appearance to aluminum oxide (alumina), is widely used in electronic equipment, because it has the very desirable properties of being both an electrical insulator and a good conductor of heat. Mounting pads for power transistors and other electronic components that generate heat are often made of beryllia. It is often used for the fins and other heat dissipative elements of high power microwave tubes and for the insulators of high power transmitting antennas. Beryllium, the metal, is also a good conductor of heat, very light, and strong. It is less likely to be encountered in ordinary electronic equipment, but has been used for antennas in missile nose cones and similiar specialized circumstances. It is also used as an alloy in springs and clips.

b. In practice only the dust of beryllium and its oxide are hazardous. Solid blocks of these materials are not a significant hazard. Extreme precautions must be taken only when machining them, or otherwise working them. Before undertaking any such grinding, machining or cutting operations on the white ceramic insulating materials commonly found in electronic equipment be certain that the material is not beryllia.

c. If it is absolutely necessary to undertake drilling, cutting, grinding, grit blasting or acid cleaning of materials containing beryllium or beryllia the operations shall be done only by individuals with the proper training and after review of the operation by an industrial hygienist. Clean up of beryllium or beryllia dust shall be by wet methods to eliminate the possibility of making the dust airborne. Broken parts should be disassembled under water. Skin and eyes should be thoroughly washed after exposure to beryllium or beryllia dust, or any beryllium containing compounds. Disposal shall be done only by authorized personnel.

d. All contracts for equipment or material that may contain beryllium shall require that each beryllium containing part be marked with a warning that it contains beryllium or beryllium compounds.

4. Cadmium. Cadmium is widely used in electroplating, in some solders, and in alkaline batteries. Cadmium-plated screws and equipment racks are commonly specified for use in corrosive atmospheres such as those encountered aboard ship. When vaporized through heating (such as welding) or burning (through incineration or accidental fires), cadmium can be the source of deadly vapors. In addition to the inhalation danger, there is the problem of the absorption of particles of cadmium through a body wound or cut. If it is absolutely necessary to weld cadmium plated parts, self-contained breathing apparatus, or an air line, with a face mask shall be used by the welder and others who could breathe the vapors. Welding may be conducted only with the approval of the cognizant industrial hygienist.

5. Waveguide Gases. The use of either freon or sulfur hexafluoride as a dielectric medium to pressurize waveguide systems permits increasing the power handling capability of the systems. Neither gas in small quantities in a well ventilated room is particularly hazardous by itself. However, in the event of arc-over or breakdown, both gases are subject to decomposition. Freon (trichlorotrifluoroethane), a material already discussed in the section on solvents and cleaning agents, breaks down into phosgene, a highly toxic gas. Sulfur hexafluoride in its pure state is virtually inert and nontoxic, except as a suffocant. However, its breakdown products are several toxic gases, including fluorine. These toxic gases may not irritate the skin, are colorless, and cannot be detected by odor, but will cause extreme lung irritation and hemorrhaging.

6. Aerosol Cans

a. Some of the aerosols used in electronics include TV tuner cleaners and lubricants, insulating sprays, compressed air dusters, corrosion inhibitors, degreasers, circuit coolers, and magnetic tape head cleaners. In addition; paints, lacquers and a whole range of products from cleaning agents to emergency medical agents, and even food, come in aerosol cans.

b. There are two distinct types of hazards from aerosol cans. First, the contents may be hazardous. Second, the package itself may be hazardous.

c. It is normally not possible to directly inspect the contents of aerosol cans before using them. Therefore, the labels should be read and appropriate precautions taken, depending on the nature of the contents listed. Two other problems may arise with the contents. Because the materials are expelled as a fine spray of droplets or dust, they may be flammable under circumstances which one would not ordinarily expect. Also, toxic materials, which would ordinarily not be expected to be airborne, may be inhaled, ingested, irritate the eyes, or drift into areas where they are not wanted. The spray should be directed away from the face, and adequate ventilation used. The contents include both the material being sprayed and the propellant. The propellant may be highly flammable, even though the material being sprayed is not. Never spray the contents of an aerosol can near any open flame or any other potential source of ignition. Smoking shall be prohibited when aerosol cans are in use.

d. Keep aerosol cans away from any source of heat. Under sufficient heat they may explode with disastrous, possibly fatal consequences. The contents may be totally inert and yet explode violently due to pressure build up.

e. On hot days don't leave them in a car or truck, and even on cooler days it is best not to leave them in a car trunk. It also means keeping them away from direct sunlight, hot water pipes, soldering irons and torches, and incinerators.

7. Batteries and Electrolytes

a. The principal hazards from primary batteries such as lithium batteries and mercury batteries have already been discussed in enclosures (4) and (5). Ordinary primary batteries such as alkaline cells and zinc/carbon dry cells also use corrosive electrolytes and leaking batteries shall be disposed of and any contamination flushed from the clothing and skin with water. Primary batteries shall never be recharged. Secondary (rechargeable) batteries have two principal hazards. They may evolve explosive gases and their electrolytes can be extremely corrosive. This section addresses mainly lead-acid and nickel-cadmium batteries.

b. Lead-acid storage batteries use sulfuric acid and their battery gases (mainly hydrogen) are explosive. Other rechargeable batteries, such as nickel-cadmium, use corrosive electrolytes and may evolve explosive gas. When charging batteries, follow the manufacturer's safety precautions. Charging rates may be critical. Thermal run-away with resultant explosion may occur if nickel-cadmium cells are charged too rapidly and too high a charging rate for lead-acid batteries may also result in excessive hydrogen and heat with resultant explosion. For lead acid-batteries, some manufacturers may require that you remove vent caps. Keep all flames and sparks away to prevent ignition. On batteries equipped with flame arrester caps, do not remove the vent caps. When removing a battery from a circuit, make sure the power switch is turned off. Otherwise, the spark created when the battery is disconnected may be enough to ignite the battery gases. When a battery must be discarded, do not incinerate it. Even if an explosion does not occur, toxic fumes may be released during burning. Disposal must be through the Public Works or Defense Reutilization and Marketing Office (DRMO). Keep heat away from batteries in general, even during normal use and storage. Do not short batteries. They may explode, generate explosive gases or leak corrosive materials.

c. Where batteries are maintained, provide eye and face protection, protective aprons and gloves, deluge showers, eyewash stations, ventilation, prohibit smoking, and install fire extinguishers. Design of battery rooms shall be in accordance with NFPA standards.

d. Battery charging installations shall be in areas designated for that purpose. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from moving vehicles, for adequate ventilation and dispersal of fumes from gassing batteries. Material handling equipment such as a conveyor or overhead hoist shall be provided for handling batteries for fork-lift truck or other large batteries. Reinstalled batteries shall be properly positioned and secured.

A carboy tilter or siphon shall be provided for handling electrolyte. When mixing electrolyte, acid shall be poured into water; water shall not be poured into acid. When charging batteries on vehicles, vehicle shall be properly positioned and brake applied before charging. Care shall be taken to assure that vent caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat. Smoking shall be prohibited in the charging area. Precautions shall be taken to prevent open flames, sparks or electric arcs in battery charging areas. Tools and other metallic objects shall be kept away from the top of uncovered batteries.

8. Radioluminescent Materials

a. Paints and markers that glow in the dark can increase visibility at night. Radioluminescent materials are often used for this purpose. Usually, an alpha emitting radioactive material is combined with a phosphor. The alpha particles have such a short range that they ordinarily present no hazard. However, of the various radioactive materials which have been used as alpha emitters, the element radium is now specifically prohibited. It is a heavy metal, similiar to lead, which is preferentially absorbed by the bones, leading to cancer and other health problems. At one time radium-based luminescent paints were widely used on dial faces and indicators to make them visible at night. A limited amount of this equipment may still be in use. If you believe that you have equipment containing radium, contact your local radiological safety officer, or the safety office, for instructions concerning verification and disposal.

b. When disposing of any equipment containing any radioactive material exercise care. Do not break glass envelopes, or otherwise compromise the integrity of enclosures, thus releasing the radioactive compounds. Consult your local radiological safety office for the correct disposal procedures.

9. Cryogenic and Liquid Gases

a. Cryogenic and liquid gases commonly encountered include liquid nitrogen, oxygen, hydrogen, helium, methane (LNG, or liquified natural gas), propane and butane. There are many others. All are materials which would be gases at room temperature and atmospheric pressure. Some gases require both high pressure and low temperature for liquification. Some require only low temperatures while others, such as propane and butane, can be liquified at room temperature under moderate or even very slight pressure. Butane is often used in disposable cigarette lighters.

b. Cryogenics are used in many ways. Certain electronic components require cooling to liquid nitrogen or even liquid helium temperatures for their proper operation. Such devices include superconducting quantum interference devices (SQUIDs) for the detection of weak magnetic fields and radio signals, photodetectors, parametric amplifiers and masers, as well as many others. Liquid nitrogen may also be used simply as an efficient coolant for devices operating at room temperature. Liquid oxygen and hydrogen are an efficient method of storing fuel and oxydizer for fuel cells and rocket engines in space craft. Many industrial processes use cryogenics. LNG, propane and butane are widely used as fuels.

c. Cryogenic systems are unforgiving of mistreatment. If cryogenic liquids are released in large quantities the consequences can be severe, or even catastrophic. They usually have temperatures below minus 100 degrees fahrenheit, substantially below the temperature of any material they may contact. Their release results in immediate flash vaporization and rapid boiling producing copious quantities of vapor. The immediate consequence of a spill or leak can range from local chilling to a violent explosion. An explosion may occur even with totally inert gases due to flash vaporization in a closed chamber. Many materials, even the high carbon steel in supports for tanks, undergo drastic changes in their properties when supercooled. They may become brittle and break or otherwise fail compounding the catastrophe. If the cryogenic liquids are flammable, a further blast and fire may ensue. The principal hazard of the noncryogenic liquid gases like propane and butane is their extreme volatility and potential for fire and blast.

d. Even if no blast or fire occurs, the hazards to personnel can be great. The hazards include low temperatures, toxicity and air displacement. For example, during a routine transfer of liquid hydrogen from a tank truck, it is reported that a leak occurred spraying liquid hydrogen over the personnel causing frostbite and freezing their feet to the truck. In this case, the personnel were wearing protective clothing. Flash vaporization in an enclosed area can lead to suffocation even if the gases are not toxic and no cryogenic liquids actually touch the involved personnel.

e. Only properly trained personnel with approved personal protective equipment shall handle cryogenic and liquid gases.

10. Coolants

a. The following potential hazard associated with the use of ethylene gylcol coolant is to be noted. Silver plated wire or tin-lead solder coated wires impressed with a DC potential can react chemically with glycol solutions to produce flammable gases and ignition of these gases. To avoid this problem when the glycol and water solution cannot be replaced with a more suitable coolant, a 60/40 glycol and water solution with cathodic type corrosion inhibitors plus a silver chelating agent should be used, in the following concentration:

Sodium mercaptobenzothiazole (NaMBT) 1% by weight
Benzotriazole (BZT) 0.5% by weight

b. This particular mixture has been tested and found effective in precluding the ignition reactions on both silver and tin-lead up to 24 VDC. Any other mixture should be tested to verify effectiveness. Wires that are terminated on connectors by soldering and impressed with a 100 volt potential (AC or DC) must be protected with a dielectric potting compound to reduce the hazards of glycol and water induced fires. At this potential there is no single cure-all to eliminate ignition hazards.

c. Compressed gases such as carbon dioxide and nitrogen are sometimes used as coolants. These gases can displace air and cause suffocation. Adequate ventilation shall always be provided when these gases are used.

d. The Compressed Gas Association standards, OSHA standards and specific Material Safety Data Sheets will provide guidance concerning hazards associated with the handling and use of compressed gases.

11. Electron Tubes - Cathode ray tubes, power amplifier tubes, and some special purpose tubes may be hazardous if broken. These hazards may be due to (1) implosion and (2) resultant dispersion of hazardous materials such as beryllium oxide or radioactive material. Cathode ray tubes and other tubes that may contain hazardous materials when ready for disposal shall be packaged in their original shipping configuration and returned to the local hazardous materials disposal office which may return them to the manufacturer or to the Defense Reutilization and Marketing Office (DRMO) for disposal or rehabilitation. Radioactive tubes shall be disposed of via the Radiation Safety Office. Tubes operating in excess of 10 kilovolts may also produce hazardous X-radiation and if so, must have X-radiation shields in place to reduce the radiation to safe levels in accordance with Code of Federal Regulations, 21 CFR. Technical manuals and maintenance procedures shall address any potential hazards regarding use, maintenance or disposal of tubes. Tubes containing hazardous materials shall be so marked.

HAZARDOUS MATERIALS COMPATIBILITY ASHORE

1. For additional details refer to:

   a. OSHA Standards 29 CFR Part 1910

   b. NFPA 30, Flammable and Combustible Liquids Code

   c. NFPA 43A, Code for the Storage of Liquid and Solid Oxidizing Materials

   d. NFPA 43C, Code for the Storage of Gaseous Oxidizing Materials

   e. NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals

   f. NFPA 49, Hazardous Chemicals Data

2. The attached table is provided as a guide to assist in segregating hazardous materials into compatible storage. Details concerning specific materials with multiple storage categories must be resolved by local officials using the guidance of the NFPA and other recognized standards.

HAZARDOUS MATERIALS COMPATIBILITY ASHORE

TABLE 1
(SEE NOTES ON USE OF THESE TABLES)

HAZARDOUS MATERIALS CLASS	COMPATIBILITY NUMBER														
	FLAMMABLE GASES	INERT GASES	FLAMMABLE OR COMBUSTIBLE LIQUIDS	FLAMMABLE SOLIDS	FLAMMABLE SOLIDS, SPONTANEOUSLY COMBUSTIBLE	FLAMMABLE SOLIDS, DANGEROUS WHEN WET	OXIDIZERS	ORGANIC PEROXIDES	POISONS A	POISONS B	RADIOACTIVE MATERIAL	CORROSIVES, INORGANIC ACIDS	CORROSIVES, ORGANIC ACIDS	CORROSIVES, STRONG BASES	OTHER REGULATED MATERIAL (ORM) (NOTE B)
FLAMMABLE GASES	--	0	2	1	2	1	3	4	2	2	2	1	1	1	
INERT GASES	0	--	2	0	1	0	0	2	0	0	1	0	0	0	
FLAMMABLE OR COMBUSTIBLE LIQUIDS	2	2	--	2	2	2	2	3	2	2	2	1	1	1	
FLAMMABLE SOLIDS	1	0	2	--	1	1	2	2	2	2	2	1	1	1	
FLAMMABLE SOLID, SPONTANEOUSLY COMBUSTIBLE	2	1	2	1	--	1	2	2	2	2	2	1	1	1	
FLAMMABLE SOLIDS, DANGEROUS WHEN WET	1	0	2	1	1	--	2	2	2	2	2	1	1	1	
OXIDIZERS	3	0	2	2	2	2	--	2	1	1	1	2	2	2	
ORGANIC PEROXIDES	4	2	3	2	2	2	2	--	2	1	2	2	2	2	
POISONS A	2	0	2	2	2	2	1	2	--	0	1	1	1	1	
POISONS B	2	0	2	2	2	2	1	1	0	--	0	1	1	1	
RADIOACTIVE MATERIAL	2	1	2	2	2	2	1	2	1	0	--	2	2	2	
CORROSIVES, INORGANIC ACIDS	1	0	1	1	1	1	2	2	1	1	2	--	3	3	
CORROSIVES, ORGANIC ACIDS	1	0	1	1	1	1	2	2	1	1	2	3	--	3	
CORROSIVES, STRONG BASES	1	0	1	1	1	1	2	2	1	1	2	3	3	--	
OTHER REGULATED MATERIAL (ORM) (NOTE B)															

TABLE II
HAZARDOUS MATERIAL SEGREGATION/SEPARATION

STORAGE COMPATIBILITY NUMBER	SEPARATION REQUIREMENTS (NOTE C))
	1 TEN FEET MINIMUM HORIZONTAL SEPARATION 2 SEPARATED BY LIQUID AND FIRE RESISTANT WALL. 3 SEPARATED BY A COMPLETE INTERVENING CELL WITH LIQUID AND FIRE RESISTANT WALLS. 4 SEPARATE ORGANIC PEROXIDES AND FLAMMABLE GASES BY A COMPLETE CELL FOR AMMUNITION AND EXPLOSIVES, OP-5 APPLIES 0 SEPARATION NOT REQUIRED

NOTE A: FIRST FIND THE COMPATIBILITY NUMBER IN TABLE 1. THEN OBTAIN THE SEPARATION REQUIREMENTS FROM TABLE II
B: ORM MATERIAL MAY REQUIRE SPECIAL STORAGE REQUIREMENTS BASED UPON THE CHEMICAL CHARACTERISTICS OF THE MATERIAL
C: MAINTAIN THREE FEET CLEARANCE BETWEEN STORED MATERIALS AND FIRE DOOR.

Additional Notes

1. For flammable liquid storage see NFPA 30 and 29 CFR Part 1910.106.

2. Oxidizers include nitrates (for example, sodium nitrate, potassium nitrate, ammonium nitrate, cellulose nitrate), nitrites, inorganic peroxides (for example, hydrogen peroxide, barium peroxide, sodium, potassium and strontium peroxides) chlorates, chlorites, dichromates, hypochlorites, perchlorates, permanganates, persulfates, nitric acid and perchloric acid. See NFPA 43A for detailed storage requirements.

3. Organic peroxides have the properties of both oxidizers and combustibles and with solutions the possibility exists of forming sensitive crystals in cold weather. They may be liquid such as t-butyl perbenzoate or solid such as benzoyl peroxide. Many organic peroxides can be decomposed by heat, shock, or friction. Some like methyl ethyl ketone peroxide or ether peroxides are detonable. They must be stored by themselves away from sources of heat. Peroxide-forming chemicals such as ether and methyl ethyl ketone must be stored in airtight containers in a dark, cool and dry place. All peroxide forming chemicals must be properly disposed before the date of expected peroxide formation. These chemicals must be labeled with the date received, date opened and disposal date. See NFPA 43B for detailed storage requirements.

4. Poisons Class A as defined by 49 CFR Part 173.326 are extremely dangerous poisons or liquids of such a nature that a very small amount of the gas, or vapor of the liquid, mixed with air is dangerous to life. Typical poisons in this class are: Arsine, bromacetone, cyanogen, cyanogen chloride with less than 0.9 percent water, diphosgene, ethyldichlorarsine, hydrocyanic acid exceeding five percent strength, methyldichlorarsine, nitrogen peroxide, phosgene, nitrogen tetroxide-nitric oxide mixture containing up to 33.2 percent weight nitric oxide, organic phosphate, organic phosphate compound, or orgnic phosphorus compound mixed with compressed gas, parathion and compressed gas mixture, phosphine and mustard gas.

5. Poisons Class B as defined by 49 CFR Part 173.344 are those substances, liquid or solid (including pastes) other than Class A poisons or irritating materials which are known to be so toxic to man as to afford a hazard to health during transportation, or which in the absence of adequate data are presumed to be toxic to man because laboratory data show that oral ingestion of 50 milligrams, inhalation of two milligrams per liter or skin absorption in continuous contact with 200 milligrams per kilogram of body weight can produce death within 48 hours in half or more of a group of ten white rats weighing from 200 to 300 grams.

6. Corrosives are chemicals which have a destructive effect on tissue and react with metals. Many corrosives are not compatible with other corrosives. *Containers of corrosives should be stored in trays large enough to contain* spillage or leakage. Corrosives include:

a. Acids

(1) Inorganic acids - they may also be oxidizers and must not be stored with any other chemicals. Typical inorganic acids include hydrochloric acid, nitric acid, perchloric acid, hydrofluoric acid and sulfuric acid.

(2) Organic acids - hazards vary (toxic, flammable, oxidizer, explosive). Do not store with inorganic acids, combustibles or other chemicals. Typical organic acids are carbolic, hydrocyanic, acrylic, methacrylic, peracetic, picric and concentrated acetic acid.

b. Bases - These will also react with water and acids to release heat and ignite combustibles. Store separately from all other chemicals. Typical strong bases include sodium hydroxide, potassium hydroxide, ammonium hydroxide and other hydroxides.

c. Halogens - Fluorine, Chlorine, bromine and iodine are non-combustible but will support combustion of certain substances. Turpentine, phosphorus and finely divided metals ignite spontaneously in the presence of halogens. Fluorine and chlorine cylinders should be stored in noncombustible, well ventilated, isolated storage areas away from heat and materials with which they may react.

Additional Information on hazardous materials may be obtained directly from the manufacturers and the following sources:

HMIX computer bulletin board - 1-800-874-2884

Federal Emergency Management Agency
Technological Hazards Division
State and Local Programs and Support Directorate
500 C Street, SW
Washington, DC 20472
Phone: (202) 646-4751

Department of Transportation
Research and Special Programs Administration
Office of Hazardous Materials Transportation
400 7th Street, SW
Washington, DC
Phone: (202) 366-4448

CHEMTREC (For immediate advice at the scene of a chemical emergency)
1-800-424-9300
(202) 483-7616

Material Safety Data Sheets for National Stock Numbered hazardous materials are available in the DOD Hazardous Materials Information System (HMIS) on microfiche or electronic media compact disk (CD) for use with computer CD-ROM players. To obtain the subscription service for these microfiche or CDs send a letter request via COMSPAWARSYSCOM (SPAWAR 005-37) to:

Commander, Naval Supply Systems Command
SUP 083
Washington, DC 20376-5000
Phone: (703) 746-4320

Material Safety Data Sheets are also available from commercial subscription services. SPAWAR 005-37 and each activity HMC&M manager should have a listing of these services.