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Assistant Chief of Staff, Facilities, Marine Corps Base, Camp Lejeune
Assistant Chief of Staff, Manpower, Marine Corps Base, Camp Lejeune

HAZARDOUS MATERIAL DISPOSAL PROGRAM; LEGALLY MANDATED PERSONNEL TRAINING

Ref: (a) Resource Conservation and Recovery Act
(b) BO 6240.5
(c) MCO 5100.25

Encl: (1) Excerpts from NEESA Publication 15-007 of May 1985

1. The purpose of this memo is to initiate action to improve the effectiveness of the ongoing personnel training program for hazardous waste handlers and managers required by reference (a) and implemented within the Camp Lejeune complex by reference (b). The list of tables contained in the enclosure reflects the scope of training which cognizant authorities have developed to ensure compliance with reference (a). The Base training program is conducted by the Civilian Personnel Division pursuant to responsibilities assigned to the AC/S, Manpower by reference (b). While several good training sessions have been provided, the program lacks the continuity required to ensure compliance with the specific training requirements of reference (a). Additionally, the training requirements of military personnel involved in the subject program are not being met.

2. It is requested that AC/S, Manpower designate a point of contact to work with representatives of the Natural Resources and Environmental Affairs Division on resolving problems discussed above and to formalize the training program. The program must serve personnel of Marine Corps Base; Marine Corps Air Station, New River; Naval Hospital, and tenants thereof. Based on current knowledge of the subject program, approximately 200-300 people will need some level of formal training each year.

3. On a closely related matter, there exists an immediate need to provide a basic level of health and safety training to all personnel handling hazardous wastes. Reference (c) published how hazardous materials (HM) related safety and health-related technical data would be gathered, maintained and disseminated. The two main information sources are either Hazardous Material Information System (HMIS) microfiche generated by the Defense Logistics Agency (DLA), or hazardous material safety data sheets (HMSDS) generated by the manufacturer of HM.

4. It is requested that the Base Safety Manager develop and implement a training program on health and safety aspects of hazardous waste management equivalent to that outlined in the enclosure.

Subj: HAZARDOUS MATERIAL DISPOSAL PROGRAM; LEGALLY MANDATED PERSONNEL TRAINING

Training should stress how to use and interpret information on HMIS microfiche and HMSDS. Base environmental and fire protection personnel are available to assist with this training in those areas appropriate to their expertise and responsibilities.

5. Point of contact in this matter is Mr. Danny Sharpe, NREAD, extension 5003.

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FOREWORD

Federal law requires annual training for personnel who work at facilities that generate, treat, store, or dispose of hazardous waste (HW). This requirement is set forth in the Resource Conservation and Recovery Act (RCRA) of 1976 (40 CFR 265 Subpart B). OPNAVINST 5090.1 and MCO 11000.8B set naval policy by stating that Commanders/Commanding Officers of shore activities are responsible for training personnel involved in HW operations and that this training must meet federal RCRA and state requirements relative to the handling of HW.

This training program was developed so that activities could conduct their own HW handling courses on an ad hoc basis. It consists of 13 modules dealing with various aspects of HW management and satisfies the general RCRA training requirements.

This instructor's manual includes teaching instructions, suggested anecdotes and example scenarios that can be used by instructors to enhance the classes. The training program is provided in modules to allow activities to teach the entire course at one time or present the modules as individual seminars.

To assist activity personnel in teaching these modules, the Naval Energy and Environmental Support Activity (NEESA) will be presenting Train-the-Trainer courses. These courses will provide training to activity instructors. The courses will cover the material in the modules and assist in identifying site-specific training needs. For more information contact, Commanding Officer, Naval Energy and Environmental Support Activity, Code 112H, Port Hueneme, CA 93043.

W. L. Nelson

W. L. NELSON, LCDR, CEC, USN
Environmental Officer
Naval Energy and Environmental Support Activity

LIST OF TABLES

III. HEALTH AND ENVIRONMENTAL EFFECTS

A. Instructor Preparation

1. Read the entire unit and be thoroughly familiar with the objectives and examples used to illustrate the objectives.

2. Preview the videotape used in this chapter.

3. Arrange for a guest speaker (optional): An ideal guest speaker for this chapter is the installation industrial hygienist or safety officer. A guest speaker can substitute for the film "What You Don't Know Can Hurt You." The speaker should be asked to briefly describe the theory and application of toxicological indicators such as TLV, LD50, etc.

B Overview of the Chapter

1. This chapter introduces the student to specific ways in which hazardous wastes may affect human health and (to a lesser extent) the environment. It is important that the instructor emphasize that the effects discussed here occur as a result of exposure and that the student can prevent them by eliminating or minimizing exposures by wearing protective equipment as instructed and following safe handling practices.

2. Approximate time required for this chapter: 1 hour.

3. Equipment and materials needed: videotape player; videotape: "What You Don't Know Can Hurt You"; ITS Corporation; and the handout, NIOSH/OSHA Worker Bulletin 83-100, "Hazardous Waste Sites and Hazardous Waste Emergencies".

C. Notes for the Instructor

NOTE 1: References - the installation Hazardous Waste Management Plan may provide specific personal protective equipment lists.

NOTE 2: Suggested techniques: the instructor should avoid generalizations about chemicals and note that while there are classification systems, each chemical behaves uniquely. References to specific chemicals and whether they are "toxic" or "nontoxic" should also be avoided unless the instructor is knowledgeable in the chemical. One point which might be made is that almost any "chemical" can be dangerous in excess, and use as examples: prolonged skin contact with water or ingestion of excessive salt or sugar. This enables the instructor to establish the concept of TLV without reference to specific chemicals. Students frequently ask whether specific chemicals they handle are "toxic"; in general these questions should be referred to the installation industrial hygienist or other health professional. Continue to emphasize that regardless of the level of risk posed by a chemical, minimizing or eliminating exposure is the best method of lowering that risk.

NOTE 3: While discussing various levels of exposure, the instructor should note that the effects of exposure, particularly chronic exposure, are unknown for many chemicals.

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MODULE III

HEALTH AND ENVIRONMENTAL EFFECTS

I. LEARNING OUTCOMES DESIRED.

At the completion of this unit of instruction, you should be able to:

A. Identify the potential harm, to both the environment and human health, from exposure to certain hazardous wastes.

B. Recognize and avoid potential health hazards when dealing with hazardous wastes.

C. Understand the consequences of environmental damage.

II. INTRODUCTION

Determining the effects of hazardous substances on the environment is often a difficult task because of the diversity and complexity of the environment. However, we often find that the environmental effects caused by the improper management of hazardous wastes are extremely detrimental because of natures's interrelationships. Acute health effects may be easier to observe. People who work directly with hazardous substances may become involved with both environmental and health problems. Problems can result from spills and fires which can provide a direct path for the hazardous substance to enter the environment.

Handling hazardous wastes can provide many opportunities for direct exposure to the handler. Depending on the type of waste and amount of exposure, the handler could experience either severe immediate problems or problems that appear years later. The prudent thing to remember when handling chemicals of any type is to eliminate any and all unnecessary exposure. No matter how toxic a substance is, it will cause no harm to either people or the environment if there is no exposure to that substance. Proper respect for hazardous substances, which leads to proper handling, storage and disposal, can prevent exposure. Again, no exposure, no problem.

III. TOXICITY

This term generally refers to substances which cause damage to the structure or function of the body once they enter it. In order to ensure the safety of persons handling toxic and hazardous substances, all means of exposure to these substances must be protected against and minimized.

A. Toxicity can be subdivided on the basis of duration of exposure:

1. Acute exposure refers to short-term exposure of seconds, minutes, or hours.

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NOTE 4: One example of chronic exposure is the inhalation of certain types of asbestos fibers which causes few immediate symptoms but which may result in respiratory problems many years after exposure.

NOTE 5: While discussing each of the routes of entry by which chemicals may enter the body, it is helpful to point out the types of protective equipment that are designed to protect against exposure and how misuse of that equipment can result in unexpected exposure. Protective equipment as discussed in the next section may then be better appreciated.

NOTE 6: The effects of exposure may vary depending on the route of entry even for the same chemical. For instance many chlorinated solvents are much more dangerous to human health when inhaled than when ingested. Thus the level and type of protective equipment needed to eliminate exposures varies with the chemical and the expected route of entry.

NOTE 7: Unless a guest speaker is used in lieu of the videotape, show the videotape "What You Don't Know Can Hurt You" at the end of Section III. The tape running time is 25-30 minutes and presents excellent coverage of the basics of toxicology including definitions (LD_{50}, TLVs, types of diseases, etc.), and general safety guidelines to avoid toxicological problems. Introduce the film by explaining that it describes measures of toxicity and provides general safety precautions to avoid exposures. (If this information is covered by a guest speaker, the film may be deleted.)

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2. Subacute exposure refers to exposure between acute and chronic, duration up to about 90-days.

3. Chronic exposure is of long duration. It refers to prolonged or repeated exposure to substances which are inhaled or absorbed into the body.

B. The following information provides some insight into the manner by which harmful substances may enter the body. These routes of entry are: inhalation, skin absorption, ingestion, and eye contact.

1. Inhalation - The respiratory system has the largest amount of surface area ($35m^2$) available to come in contact with external contaminates. Breathing a gas, vapor, mist, fumes or dust (chemicals may be trapped on particles) is the most common form of accidental exposure. Inhalation affects the linings of the air passages of the nose, throat, and lungs, and usually results in an irritation and may cause burns. There may also be absorption of the chemical from the lungs to the bloodstream. The blood then distributes the chemical throughout the body tissue and can cause cancer, emphysema, and asphyxiation.

2. Skin Absorption - The skin has a surface area of $2m^2$ and is easily exposed. Skin exposure to hazardous substances may result in skin irritation or penetration. The most common skin irritation is dermatitis (chronic swelling, redness, itching of the skin) in which the chemicals do not enter the blood. Some chemicals have the capacity to penetrate the unbroken skin and are picked up by the bloodstream and distributed throughout the body, for example: carbon tetrachloride, chlordane, and PCBs. Sharp objects contaminated with harmful chemicals may pierce the skin, injecting the substance through the skin into the body. Skin penetration is probably the second most common accidental means of entry of chemicals into the body.

3. Ingestion - Toxic amounts of hazardous wastes can be carried to the mouth by hand when drinking, eating, smoking, chewing on pencils, or chewing on eyeglasses. If the food we eat or the liquids we drink are contaminated with hazardous substances, they may enter the bloodstream along with the digested food.

4. Eye Contact - The eye may be harmed by chemicals in solid, liquid or vapor form. Irritant effects vary in degree from mild to severe. Most chemicals have the ability to injure the eye to some degree through surface contact or absorption, and damage may be irreversible within a matter of seconds.

IV. HEALTH EFFECTS.

A primary concern is whether or not the chemicals a worker is exposed to in the workplace causes the workers health to be damaged. Science is often years behind in determining health effects. Thus, it is important to take care when dealing with hazardous substances even if there is no currently identified health effect.

NOTE 8: Introduce paragraph V by explaining that there are more than 500,000 known chemicals of which more than 45,000 are being manufactured (not counting mixtures and formulations). Since it is clearly impossible to describe each of these, many classification systems have been developed which place chemicals in groups based on hazard. One such classification system is the US Department of Transportation Hazard Class system. Remind students that chemicals are classed by DOT based upon DOT's perception of their worst hazards in transportation. Many chemicals exhibit more than one hazard. The following scenario based on an actual event will help reinforce this statement.

During a flight of an all-cargo aircraft several years ago, the cockpit crew noticed an odor in the plane. Upon investigation they found that several cans of paint labeled "Flammable" were leaking onboard the aircraft. Since the cans were labeled flammable the crew took immediate precautions to reduce the chances of a fire. They shut down all oxygen systems and most of the electrical systems; and made an emergency landing. Upon landing, the aircraft did not move off the runaway so the airport mobilized emergency equipment. The cabin crew were found unconscious. A subsequent investigation found that the paint cans had contained methyl ethyl ketone (MEK) which in addition to being flammable is also a strong narcotic. When the crew shutdown oxygen and ventilation systems in the plane, the MEK built up in the air in the plane in a concentration high enough to render the crew unconscious. This is not an unusual example. Many chemicals exhibit more than one hazard.

NOTE 9: The instructor should also point out that the hazards exhibited by a chemical can change as a result of the way in which it is used or misused. The following is an example.

During a routine cleaning of a salt pot bath (used to clean metal parts prior to electroplating) containing molten sodium nitrite, a small fire broke out which was routinely put out with water. Unfortunately the water spray contacted some of the waste sodium nitrite causing a chemical reaction to occur which resulted in the formation of hydrated sodium nitrite. While sodium nitrite is not explosive, hydrated sodium nitrite is very unstable and can easily be detonated. The day after the waste sodium nitrite had been drummed for disposal, an employee walked by the drum and tapped it. The drum immediately blew up, killing the employee. Only an extensive investigation revealed why supposedly non-explosive sodium nitrite had in fact exploded.

Under conditions of identical exposure to potentially harmful substances, there is often marked variability in the manner in which individuals respond. These responses may range from the discomfort of an itch to violent attacks of asthma or swelling of membranes, thereby closing off breathing passages

Some toxic substances are retained in the body for long periods of time and are excreted very slowly, if at all. The levels of the chemical in the body are increased as a function of duration of exposure. Examples of chemicals which the body retains include such heavy metals as mercury and lead. Upon repeated or continuous exposure, these substances can reach levels resulting in illness or even death. Bodily process changes associated with long-term subacute exposure are often irreparable.

Previous damage or injury to such key organs as the liver, kidney, lungs, and brain can change the way exposure to toxic substances affect individuals. The liver and kidney function to screen and scavenge many toxic substances from general circulation and to excrete them from the body. Impairment of these functions allow potentially dangerous buildups to occur and may lead to further damage to these vital organs. Similarly, previous lung damage enhances the likelihood of further damage from inhaled toxic substances and may reduce the effectiveness of the lungs as a route of excretion. Extreme care should be taken when working around hazardous wastes if you have had an injury or illness involving any vital organ.

V. HEALTH AND ENVIRONMENTAL EFFECTS ASSOCIATED WITH THE DEPARTMENT OF TRANSPORTATION (DOT) HAZARD CLASSES

DOT Hazard Class	Most Probable Health and Environmental Effects
Explosives	Physical damage
Compressed gases	Toxicity Explosions and fires Damage from rocketing cylinders BLEVE
Flammable liquid	Fire Explosion Toxicity
Flammable solid	Fire
Combustible liquid	Fire Toxicity
Organic Peroxides	Severe fire hazard Severe damage to tissue
Oxidizing material	Fire (Makes fires more difficult to extinguish) Severe damage to tissue

NOTE 10: ORM-A, ORM-B, ORM-C and ORM-E substances are those which DOT believes do not pose a major hazard in transportation. Remember that DOT does not address chronic exposure because they assume that a material will be in transportation only a short period of time.

NOTE 11: In addition to the specific toxicity hazards which some chemicals are known to cause, some individuals may have individual sensitivities to certain chemicals. These allergic reactions are difficult to predict but do occur. Therefore handlers should immediately report all adverse effects.

NOTE 12: At the end of paragraph V, the students should be given the handout "Hazardous Waste Sites and Hazardous Waste Emergencies."

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DOT Hazard Class	Most Probable Health and Environmental Effects
Poisons	Toxicity
Irritating material	Irritation
Corrosive material	Severe damage to tissue
Etiologic agents	Disease
Radioactive material	High levels: Radiation burns and death Low levels: Possible contributor to cancer, birth defects, genetic mutations
Other regulated material	
ORM-A (toxics not included in other hazard class--pesticides)	Toxicity
ORM-E (includes many hazardous wastes, PCBs, various pesticides)	Toxicity

VI. LONG-RANGE IMPACTS.

Over the past few years, the public has been told that some of the chemicals and forms of radiation that they are exposed to in the workplace and in the general environment may cause such health problems as cancer, birth defects, genetic mutations, and sterility. As a result, there is public interest in how organizations manage these types of substances. There is also a growing concern by the people in the work force about the substances they are directly exposed to. Many people believe that, if they are exposed to a substance which will cause them harm they will be aware of it immediately. Many of the accidents which happen to people follow this format. However, in the case of carcinogens and mutagens, there may be as much as a decade or two between exposure and the time when the individual develops the symptoms. This time lag makes it extremely difficult to determine a cause-and-effect relationship.

A. <u>Carcinogens--defined as substances which cause the development of a malignant tumor</u> in man or experimental animals some time after exposure. Even though cancer's causes are not well understood, it is widely believed that environmental and workplace exposure can contribute to it. An example of a long-term carcinogen is cigarette smoking which has been shown to cause lung cancer but usually years after a person begins smoking.

NOTE 13: In discussing long range health problems associated with workplace exposure to chemicals, the instructor should emphasize that there is still a lot of missing information. The best way for a handler to prevent these problems in the absence of scientific information is to eliminate exposures.

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B. Mutagens. The term mutagen generally refers to a chemical or form of radiation that causes changes in the genetic structure of cells. Mutagens are chemicals or forms of radiation which increase the frequency of mutations. In man, there are two general areas of concern:

1. Reproductive cells (egg and sperm cells). If a mutation occurs in a reproductive cell, then the genetic information possessed by the parents will not be accurately passed along. The new individual would either not survive, or would develop using this inaccurate genetic information. Human disorders such as hemophilia and mongolism are well-known examples of genetic mutations.

2. Body cells. If a mutation occurs in body cells, future generations are not jeopardized. The results of reproduction of body cells are new body cells. For example, certain skin cells produce new skin cells. The mutation in a skin cell would result in future skin cells being abnormal. This may manifest itself as a cancer.

   (a) Scientists disagree as to whether chemicals cause mutations in people. But, it is clear that chemical mutagens cause genetic changes in human tissue cultures in the same way they cause genetic changes in experimental microorganism.

   (b) There is also a relationship between carcinogens and mutagens. Carcinogens are a type of mutagens, but not all mutagens are carcinogens.

C. Teratogen. A substance which causes a developing fetus, which has been exposed, to be deformed. This happens without harming the mother. The result is the birth of a deformed child. Some of the best known examples of this type of problem are the thalidomide and mercury problems in England.

D. Biological magnification. Persistent hazardous chemicals remain in the environment for long periods of time. These chemicals may be absorbed into the tissue of various organisms and be passed along in the food chain. The introduction of a small quantity of some hazardous chemical into a lower level of the food chain can cause significant harm due to biomagnification. This process occurs when chemicals bioaccumulate in low level organisms. When biomagnification occurs, a higher concentration of the chemical is found in an animal at the top of the food chain then was present in the organism lower on the chain. The human food chain is involved just as any other.

Almost everyone has heard of PCBs, the substance used in some electrical transformers and other electrical equipment. PCBs accumulate in the food chain as described above and have been found in the fat tissue of practically all humans tested. Since the regulation of PCB, studies have shown a definite decrease in the PCBs found in humans.

NOTE 14: Medical researchers are only just beginning to understand "synergistic effects." However recent studies indicate that this may be a major cause of long range health problems stemming from chemical exposures. The instructor should point out that all humans are exposed to chemicals, not just in the workplace, but at home as well. For instance, dry cleaned clothes frequently contain residual trichloroethane, some plywood and pressed-board used in houses contains formaldehyde, cigarette smoke contains cyanide, permanent press clothing contains formaldehyde, glues used in furniture contain toluene and MEK, and toiletries contain a wide variety of chemicals (acetone in fingernail polish, nicotinic acid in mascara, etc.).

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E. Resistance to the effects of chemicals.

1. One of the reasons chemicals have not been completely successful in the fight against insect pests is the tremendous reproductive powers of insects coupled with a mechanism which allows for the development of resistance. If a lethal dose of an insecticide is administered to an entire insect population, most will die. However, a few individuals will survive because they have a natural ability to render the insecticide harmless. This natural ability very likely has its basis in the surviving insects' genetic characteristics. These surviving insects reestablish a population resistant to the pesticide. Pest controllers then respond by applying more pesticides. This time, a larger percentage of the population possesses the genetic characteristics allowing them to survive the effects of the pesticide, so less of them die. More pesticide is then applied. Eventually, the entire population will be completely immune to the effects of this specific chemical. The common housefly is a good example of this mechanism in operation. There are populations of the housefly which are now immune to the three most frequently used groups of chemical pesticides.

2. The resistance mechanism is observed in other applications. In the area of medicine, various baceteria which cause disease in humans are now resistant to some drugs used to control them. This requires the production of new drugs.

3. Resistance to the effects of chemicals can be either a negative result or a positive result. For example, the common housefly's resistance to pesticides is negative to humans trying to rid areas of flys but positive to the fly population. Human resistance to chemicals would be a positive result of contaminating a population, however, the price to pay for this resistancy is too high to be practical.

F. Synergistic effects. Determining the health and environmental effects of a chemical can be very challenging. An organism in today's environment is not exposed to just one chemical foreign to its metobalism but to hundreds or perhaps thousands. There are three possible results.

1. The effects of some of the potentially harmful chemicals may be lessened by the action of other chemicals in the mixture.

2. The individual effects of each chemical may be felt.

3. The effects of some chemicals may be magnified by the action of other chemicals. The first and last examples are described as synergistic effects--effects that are greater or less than the effects expected from the sum of the individual effects. This is an extremely complex area. Only a few synergistic effects have been studied. Examples include cigarette smoking and asbestos workers; cigarette smoking and alcohol drinking.

NOTE 15: When EPA first began regulating pollution, they set limits on chemicals which could be discharged into the environment. Increasingly, however, the agency is taking the position that there may not be a safe concentration level of many chemicals in the environment. In fact, the discharge limits are frequently being lowered to "detectable levels." Thus as chemists devise new ways to measure very low concentrations of chemicals, EPA lowers its acceptable discharge concentrations to those levels. Some chemicals (e.g., dioxin) are now "regulated" at the level of one part per billion, for instance.

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VII. ECOLOGY

Ecology is the study of the interrelationships of organisms to one another and to the environment.

A. To understand ecology--and the present dilemma that man has created for himself--one must first understand the concept of "ecosystem." An ecosystem is the total of all the living and nonliving parts that support a chain of life within a given area. The four primary links in the chain are:

1. Nonliving matter: the sunlight, water, oxygen, carbon dioxide, and other nutrients used by plants for their growth.

2. Plants: ranging in size from the microscopic plants that live in water (algae) up to the giant redwood trees. These organisms convert carbon dioxide and water, in a process called photosynthesis, into carbohydrates (food molecules) required by themselves and other organisms in the ecosystem.

3. Consumers: those higher organism that feed on the producers. Herbivores, such as cows and sheep, are primary consumers. Carnivores, such as man and animals which feed upon the herbivores and are secondary consumers.

4. Decomposers: these tiny creatures, such as bacteria, fungi, and insects--close the circle of the ecosystem when they break down the dead producers and consumers and return their chemical compounds to the ecosystem for reuse by the plants.

B. Although growth and decay are going on simultaneously and continuously in an ecosystem, they tend to balance each other over the long run and thus the chain is said to be in equilibrium. Non-human environments have a remarkable resiliency; as many as 25 or even 50 percent of a certain fish or rodent population might be lost in a habitat during a plague or disaster, yet the species will recover its strength within a year or two. It is man-made interference, or pollution, that can deeply disturb the ecosystem and its equilibrium.

VIII. SUGGESTED REFERENCE MATERIAL

The health effects of a hazardous susbstance can be found in a number of references. The following is a listing of some of these references.

A. Material Safety Data Sheets (MSDS).

MSDSs are technical bulletins, generally two to four pages in length, which contain chemical information, such as chemical composition, chemical and physical characteristics, health and safety hazards, and precautions for safe handling and use. An example of a MSDS format is shown in Appendix A.

The MSDS was chosen by the Occupational Safety and Health Act (OSHA) to be the primary vehicle for providing specific, detailed information on the identities and hazards of the hazardous chemicals in a workplace. OSHA requires a MSDS for every hazardous chemical identified in the workplace. The MSDSs must be stored in a place accessible to the actual work area where employees may freely read or copy them.

Normally, MSDSs are completed by the manufacturer of the hazardous substance and provided to naval activities when the substance is procured through the supply system. If a chemical is being used in a workplace and the activity does not have the MSDS, there are many places to obtain a copy. The following list is some of the ways to obtain MSDSs.

1. Call the following:
   - Activity fire department
   - Activity Safety Officer
   - Activity Environmental Coordinator
   - Engineering Field Divisions (NAVFACENGCOM)
   - Naval Energy and Environmental Support Activity, Port Hueneme, CA
   - Hazardous Material Technical Center (HMTC)
   - Substance Manufacturer
   - Navy Environmental Health Center Norfolk, VA

2. Check:
   - Hazardous Material Information System (HMIS) See Section B.
   - Various microfiche and computer listings of MSDSs

B. The DOD Hazardous Material Information System (HMIS).

The DOD HMIS is a central system for the collection, maintenance, and dissemination of the data contained in the Material Safety Data Sheets and other sources of information. The information in the system can be used to help develop procedures to prevent mishaps in handling, storage, use, transportation, and disposal of hazardous material and waste. This system provides a mechanism by which information on hazardous materials can be collected, stored, updated, and made available to users in the field. Materials are listed according to their National Stock Number (NSN). Field personnel have access to the information through micofiche, usually located in Safety Offices at naval activities.

The Navy Energy and Environmental Support Activity (NAVENENVSA) has multiple sets of the HMIS microfiche.

Activities can attend a HMIS training course sponsored by the Navy Environmental and Preventive Medicine Units in Norfolk, VA, San Diego, CA, or Pearl Harbor, HI. Contact NAVENENVSA or the Navy Environmental Health Center in Norfolk, VA, for more information regarding this class.

C. NIOSH/OSHA Pocket Guide to Chemical Hazards.

This guide contains information on 380 hazardous chemicals including chemical names, formulas, synonyms, permissible exposure limits, chemical and physical properties, respiratory and personal protective equipment use recommendations, symptoms of overexposure, monitoring procedures, and procedures for emergency treatment.

This information is presented in tabular form containing many abbreviations. The definitions of these abbreviations are found in one of five tables in the front pages of the guide. This guide should be used as a quick reference for summary information on the various chemicals. Appendix B shows a typical entry for a given chemical.

D. Dangerous Properties of Industrial Materials, 5th Edition, N. Irving Sax, Van Nostrand Reinhold Company. 1979. This book is designed for quick retrieval of hazard information on about 13,000 common industrial and laboratory materials. The majority of the book is a section which contains information on specific chemicals. The data is this section is categorized as follows:

1. General information such as synonyms, description, formula, and the physical properties of the substance.

2. Hazard analyses including a toxic hazard rating; a fire hazard rating; an explosion hazard rating; and a disaster hazard rating, to give an idea of the hazards produced when the material becomes involved in disasters such as fire, explosion or flood.

3. Countermeasures, or the things to be done to reduce the adverse effects of using a given material. For example, shipping regulations, storage and handling procedures, first aid measures, firefighting measures, ventilation controls, and personnel protection.

The brief section on each chemical in this part of the book usually refers back to a previous section for further explanation. For example, under Nitric Acid, Countermeasures--Storage and Handling, the reader is referred back to Section 7. This section goes into detail on what to do when storing or handling Nitric Acid. Appendix C demonstrates this.

E. The Merck Index, 9th Edition, Merck and Co., Inc., Rahway, NJ. This reference book is an encyclopedia of 9856 chemicals, drugs, and biological substances. Information on the chemical structure, properties, use, and toxicity of these substances is provided. This reference also contains miscellaneous information tables. Appendix D shows a typical entry for a given chemical.

EXERCISE: MODULE III - HEALTH AND ENVIRONMENTAL EFFECTS

HEALTH EFFECTS REFERENCE EXERCISE

OBJECTIVE: Determine the possible health effects of a number of chemicals.

SITUATION: You have just been appointed environmental coordinator for your activity. It is your job to set up an environmental monitoring program. In order to know what to look for in regards to overexposure to hazardous wastes, you must find out the possible health effects of any hazardous materials used in your shop. To complete this exercise, you should have the references listed at the end of this module, or the equivalent.

REQUIRED TASK: Determine the possible health effects for 3 to 5 of the chemicals used at your installation by using the given references.

PROCEDURE:

1. Pick 3 to 5 hazardous chemicals that are used at your installation (or use the chemicals given to you by your instructor).

2. Using the text, along with the references listed at the end of module III, determine the possible health effects of the chemicals.

   Questions to be considered include:

   - What are the routes of entry?

   - What are the symptoms of overexposure?

   - What are the long term effects of overexposure?

   - How toxic is the chemical?

   - What are the initial first aid procedures?

INSTRUCTOR'S NOTES

Be sure to make adequate references available to complete this exercise. The applicable references are listed in Section III of the module. The best references for each of the questions asked in the exercise are listed below.

Routes of Entry - NIOSH/OSHA Pocket Guide

Symptoms of Overexposure - NIOSH/OSHA Pocket Guide

Long Term Effects - MSDS, SAX, Merck

Toxicity - NIOSH/OSHA Pocket Guide

First Aid Procedures - MSDS, NIOSH/OSHA Pocket Guide

Choose the chemicals to be investigated before the module is taught and develop answers for these chemicals by using the references. It is best to choose chemicals commonly used at the installation, but three examples are included here as alternates. MSDSs are also included for the examples and may be photocopied and handed out as references.

Chemical 1: Toluene

Routes of Entry: Inhalation, Skin Absorbtion, Ingestion, Skin or Eye Contact

Symptoms of Overexposure: Fatigue, Weakness, Dizziness, Headache, Dilated Pupils, Insomnia, Dermatitis, etc.

Long Term Effects: Anemia, Liver Damage, Kidney Damage

Toxicity: Threshold Limit Value (Permissible Exposure Limit) = 200 ppm
Immediately Dangerous to Life and Health (IDLH) at 2000 ppm

First Aid Procedures: Inhalation - remove to fresh air; Skin and Eyes - flush with water for 15 minutes; Ingestion - do not induce vomiting, see physician.