NIOSH Worker Bulletin

HAZARDOUS WASTE SITES AND HAZARDOUS SUBSTANCE EMERGENCIES

U.S. Department of Health and Human Services
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

DHHS (NIOSH) Publication No. 83-100

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

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WORKER BULLETIN

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This bulletin is a joint project of four agencies, completed in accordance with a Memorandum of Understanding and funded under Interagency Agreement AD-75-F2A091 between EPA and DHHS.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health
Division of Standards Development and Technology Transfer

Cincinnati, Ohio 45226
December 1982

PREFACE

This bulletin was developed in accordance with a Memorandum of Understanding between the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), the U.S. Coast Guard (USCG), and the U.S. Environmental Protection Agency (EPA). These four agencies recognized the urgent need for disseminating additional occupational safety and health information to hazardous waste workers during the present national effort to clean up abandoned hazardous waste sites and deal with hazardous substance emergencies pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA-Superfund).

Thousands of workers will be involved in the task of correcting the existing environmental problems and potential emergencies resulting from many years of inadequate storage and disposal of the nation's hazardous waste. These workers must be properly protected.

All workers have a right to a safe and healthful workplace. Each may obtain a copy of occupational safety and health standards, regulations, and requirements for their work. Workers may also request a workplace evaluation by NIOSH to see if safety and health hazards exist, and file safety and health complaints with OSHA or other agencies. Workers have the right to remain anonymous in these requests. Workers may not be fired or be discriminated against because they have made complaints about unsafe or unhealthful working conditions to their employers, their unions, OSHA, or any other safety or health agency; have been involved in any proceedings under the Occupational Safety and Health Act (OSH Act); or have exercised any other right under the OSH Act such as refusing to work when confronted with a hazard that is imminently dangerous. If workers have been fired or discriminated against for these reasons, in order to obtain help they must file discrimination complaints with OSHA within 30 days of the firing or other discrimination. (See the telephone directory under the "United States Government, Department of Labor, Occupational Safety and Health Administration" for OSHA listings.)

This bulletin provides preliminary guidance to protect the health of hazardous waste workers. As new technology is developed, and additional experience is gained in disposing of hazardous waste, follow-up publications will be developed.

DISCLAIMER

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health or other participating agencies.

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INTRODUCTION

You are involved in the handling, storage, and disposal of some of the millions of tons of hazardous wastes produced each year in the United States. You may also be involved in responding to hazardous substance emergencies. In the past, a large quantity of hazardous waste was stored or disposed of in an unsafe condition at unsafe locations. Many of these dump sites have been abandoned and present a potential danger to human health and/or the environment. Removal or treatment of the improperly stored or discarded waste with subsequent disposal at an approved site will help correct past problems.

Work situations such as these require that you enter potentially hazardous environments. It is therefore important that you be adequately trained to recognize and deal with hazardous situations which may arise. Often you may be required to wear special clothing or equipment to protect your personal safety and health. Many hazardous chemicals cannot readily be detected with your eyes or nose alone. Special equipment must be used to determine the presence of these substances. This bulletin will familiarize you with the potential hazards you may face and will address precautions which must be taken in order to work as safely as possible. It is not intended to be your only source of information or to take the place of hazardous waste safety training.

THE HAZARDS YOU FACE

Some of the hazards you may encounter at the work-site include:

- —Toxic (poisonous) substances
- —Explosive materials
- —Corrosive materials
- —Heat or cold stress
- —Air in the work area, such as in a tank or ditch, that is deficient in oxygen
- —Cancer-causing agents
- —Flammable materials
- —Excessive noise
- —Biologically active materials such as bacteria and viruses
- —Radioactive materials
- —Accidents resulting in physical harm

The amount of risk varies with the type and degree of exposure to these hazards. Exposure can result in any of the following:

- —Asphyxiation
- —Cancer
- —Damage to liver, kidneys, nerve cells, etc.
- —Skin diseases
- —Eye injuries
- —Poisoning
- —Infertility
- —Harmful effects to the unborn child
- —Loss of limbs
- —Loss of hearing

WAYS YOU CAN BE EXPOSED TO WASTE HAZARDS

The routes of exposure include:

Inhalation — Breathing contaminated air.

Skin — Contact with harmful liquids, gases, solids, or contaminated clothing, equipment, medications, cosmetics, etc.

Ingestion — Eating or drinking of contaminated food, water, or medications. (REMEMBER: FOOD AND CIGARETTES CAN BE CONTAMINATED BY YOUR GLOVES, EQUIPMENT, OR UNWASHED HANDS.)

Exposure can result from any of the following:

—Lack of qualified personnel and/or the proper equipment to evaluate hazards and define the levels of protection needed.

—Improper selection of or insufficient training in the maintenance and use of personal protective equipment (such as respirators, special clothing, or safety glasses) before entering a work site.

—Failure to follow instructions or wear prescribed protective equipment.

—Failure or lack of engineering controls such as shields or drum handling equipment.

—Unexpected hazards at the work site.

—Insufficient time to put on protective equipment in an emergency.

—Inadequate emergency procedures and/or protective equipment.

—Walking unnecessarily through puddles or into vapor mists, etc.

—Failure to decontaminate immediately after splashes or spills occur.

WORK SAFELY

Special equipment, special training, and special precautions are required in hazardous waste work. Follow your employer's standard operating procedures (SOPs) and your supervisor's instructions. Use your own senses of sight, hearing, smell, and touch—and stay alert. Many things you encounter may be entirely new or different to you and may require procedures that you have not used on other jobs.

Remember that common sense is based upon experience and training. Different problems may be encountered every day. If you don't understand and haven't been trained, ask for instructions.

Some things to remain aware of at the work site include:

— Any weather changes. For example, when it gets hot or the air is calm, chemical concentrations in the air can increase. This may require additional protection.
— Wind direction. For example, avoid dust and vapors by working upwind if possible.
— Odors that may indicate the presence of chemicals.
— The location of someone who can help if an emergency arises.
— Your employer's SOPs, which you should follow for any necessary decontamination procedures, including cleaning and storing or disposing of contaminated equipment and clothing. You can expose your family or friends to toxic substances by carrying contaminants on your clothing, shoes, tools, etc.
— Washing your hands BEFORE eating, drinking, smoking, or using the restroom.
— Showering and changing into clean clothes and depositing your work clothes in the proper area before leaving the work site.
— Keeping food, drinks, smoking materials, and personal care items in clean areas only.
— Heavy equipment operating near you.
— The proper handling of drums and other equipment so as to prevent personal injury.
— The need for proper personal protection equipment and its limitations.
— Emergency procedures and the evacuation signal.
— Where and how to exit from every area.

PERSONAL PROTECTIVE EQUIPMENT

Different types of protective equipment will be required depending on the substances to be handled, the existing conditions, and the particular situation. Personal protective equipment includes a variety of special suits, hard hats, goggles, face shields, aprons, boots, gloves, and respirators. Each is designed to protect you from certain hazards. It is important for you to know the ADVANTAGES AND LIMITATIONS of all the equipment you may use or need. Use this equipment as instructed and follow all written procedures.

PROTECTIVE CLOTHING

Protective clothing is used to shield you from fire, toxic chemicals, and/or corrosive materials. Such clothing includes splash suits, fully encapsulating suits, chemical-resistant clothing, and fire-resistant clothing. Some clothing is designed to allow you to work in hazardous environments by completely enclosing the body, while other clothing is designed only to protect specific portions of the body.

Fire-resistant clothing is not generally designed to provide a high level of protection against chemical exposure. Therefore, additional precautions should be taken where exposure to both chemicals and fire may occur.

Proper clothing to insulate against cold should be worn under protective clothing in winter. Proper rest and cool-down periods, with replacement of body fluids and salts, should be provided when protective clothing is worn during summer or in hot conditions.

SPLASH SUITS AND ASSOCIATED CLOTHING

Splash suits and associated splash protection clothing are worn to keep hazardous materials from touching the body. Such clothing may include: gloves, boots, aprons, goggles, jackets, leggings, hoods, and coveralls made of chemically resistant materials, which can be composed of anything from treated paper to specially formulated rubber. Different combinations of this type of protective clothing can provide the level of protection necessary for each situation. Follow instructions of your supervisor regarding splash protection. Know where the emergency eye wash and showers are located and how to use them. Learn the procedures to properly decontaminate your reusable protective clothing. IMMEDIATELY GET DECONTAMINATED IF HAZARDOUS MATERIALS SPILL OR SPLASH ON YOU.

FULLY ENCAPSULATING SUITS

Fully encapsulating suits are usually worn to protect the body against exposure to airborne concentrations of highly toxic or corrosive chemicals. (Atmosphere-supplying respirators MUST be worn with these suits.) "Fully encapsulating" does not necessarily mean "fully protective." Different suits will be required for different situations because no suit is resistant to all chemicals.

Due to the specialized nature of this equipment, its use requires special training and experience, including plans for rescue and escape from the suits themselves, should this become necessary.

RESPIRATORS

Respirators protect you from breathing hazardous airborne contaminants. They must be properly selected, fitted, and maintained. Most important, you must know their proper uses and limitations. If the contaminants in your work environment require you to wear a respirator, WEAR IT. The alternatives are not worth the risk. Exposure to high concentrations of a toxic substance, even for a short time, can cause serious injury or death. Exposure to low concentrations of certain toxic substances can cause permanent damage to the lungs, liver, kidneys, or other organs. Work environments can be fatal if the oxygen content of the air is too low.

Different respiratory protection is required for different situations. Consequently, a number of different types of respirators are available. The selection of the proper respirator must be based on an evaluation of the hazard present, including a determination of the concentration and form of the contaminant and/or lack of sufficient oxygen to sustain life.

There are two basic categories of respirators: Air-purifying respirators and atmosphere-supplying respirators.

AIR-PURIFYING RESPIRATORS

Air-purifying respirators are designed to remove specific contaminants from the air before you inhale them. WARNING: Some contaminants cannot be removed by air-purifying respirators. Air-purifying respirators are NOT to be used in situations which are immediately dangerous to life or health (IDLH) or when the contaminants are unknown. Proper selection of an air-purifying respirator depends on:
—The contaminant to be removed from the air.
—The concentration of that contaminant.
—The efficiency of the respirator against that contaminant.
—The warning property(ies) of that contaminant.

There are two types of air-purifying respirators:
—Filtering purifiers to remove dusts, mists, and fumes.
—Sorbent purifiers to remove gases and vapors.

For each type of respirator, there is a variety of air-purifying filters, cartridges, or canisters. Each is designed to protect against specific contaminants. Cartridges are small and are usually attached directly to the facepiece. They are designed to protect against low concentrations of contaminants. Canisters are larger and are usually connected to the facepiece with a breathing tube. Canisters are designed to protect against higher concentrations of contaminants. The contaminants and their expected concentrations must be known before a decision can be made as to the type of facepiece to use and which cartridge or canister is required. You must never use the wrong cartridge or canister or use one type of cartridge on one side of your facepiece and a different type on the other side. Be sure batteries are charged on powered air-purifiers.

The cartridge or canister should be replaced at least once per day to prevent saturation of the filter or sorbent materials. More frequent changes may be necessary. Air-purifying respirators should only be used against contaminants with "warning properties" (odor, irritation, etc.). If you become aware of these, your cartridge may no longer be removing the contaminants. You should immediately go to a clean area to check your respirator and replace the cartridge or canister if necessary. Your supervisor should give you specific instructions.

Cartridges and canisters are color-coded for their specific use. Typical cartridge color codes are indicated below:

Atmospheric Contaminants	Assigned Color
Acid gas	White
Organic vapors	Black
Ammonia gas	Green
Acid gases and organic vapors	Yellow
Radioactive materials and highly toxic particulates, except tritium and the inert gases	Purple (Magenta)
Pesticides	Chartreuse

Particulates (dusts, fumes, mists, or smokes) in combination with any of the above gases.

Canister color for the contaminant is designated above with a ½" grey stripe completely around the canister near the top.

READ THE WORDING ON THE LABEL

ATMOSPHERE-SUPPLYING RESPIRATORS

Atmosphere-supplying respirators supply air to the facepiece from an uncontaminated (clean) air source. These respirators come in two basic types:

—Air-line respirator, which provides clean air to your face mask through a connecting hose from a large tank of compressed air or an air compressor located in a clean area.

—Self-contained breathing apparatus (SCBA), which provides clean air to your facepiece from an air cylinder carried on your back. These respirators are used in the positive-pressure mode during situations which are immediately dangerous to life or health (IDLH) or in unknown atmospheres. Additional special training is required for their proper use and maintenance. Since this air supply is portable, it has only limited capacity, depending upon particular breathing requirements. A warning signal is given when approximately 5 minutes of air remain. When the warning signal sounds, you should stop work and leave the contaminated area immediately. Proceed to a clean area to obtain a full cylinder. Keep your supervisor and buddy informed.

RESPIRATOR USAGE

A qualified person should be available at the work site to identify safety and health hazards, establish the proper level of respiratory protection for you, and assist in the selection and fitting of your respirator.

Beards and certain facial hair are not permitted because they may affect the acceptable seating and sealing of the respirator, allowing contaminated air to seep in. Be sure to have your respirator properly fitted.

The temple pieces of regular eyeglasses can interfere with the proper fit of full-facepiece respirators. Special glasses can be fitted inside this type of facepiece for workers requiring corrective lenses. Safety glasses or regular glasses with goggles can be used with other facepieces. Contact lenses are not permitted with any type of respirator. Respirators may not work properly due to exposures to extreme heat/cold or after repeated use. Therefore, frequent maintenance checks should be performed. Daily care and maintenance of the respirator, including proper storage in a clean area, should be a regular part of the operation. Your supervisor will advise you of your responsibilities.

In general, wearing a respirator places an additional stress on your body. Your pre-employment physical examination should determine whether you are physically capable of handling this additional stress. Your ongoing medical monitoring program should determine if continued respirator use has adversely affected you.

MECHANICAL EQUIPMENT SAFETY

When handling containers or removing contaminated soils, etc., a variety of types and sizes of mechanical equipment may be used. It is important to be continually aware of this equipment around you. Operators may be unable to see personnel working near their equipment. Be aware of objects and obstacles overhead at all times. When working around heavy equipment:

—Never walk under suspended loads.
—Never walk in front or back of moving heavy equipment.
—Always be aware of heavy equipment location.
—Always wear a hard hat and proper foot protection.
—Do not operate any heavy equipment unless you are fully qualified and authorized to do so.
—Be aware that equipment can be a source of ignition for flammable or explosive materials.

Heavy equipment is not the only potential hazard during material handling. Numerous smaller items such as pumps, compressors, generators, portable lights, drums, trucks, and hand tools are very common at hazardous waste sites. If not properly operated, these items can pose as serious a hazard as larger equipment. Some points to remember:

—Be sure all machine guards are in place.

—Use equipment at their recommended speeds and only for the jobs they were designed to do.

—Always keep loose clothing away from moving parts.

—Never pump flammable material with gasoline or electric pumps, use only hand or air-powered diaphragm pumps and be sure to ground your equipment and bond the containers.

—Use only nonsparking tools and be sure to ground equipment and containers when working in a flammable atmosphere or transferring flammable liquids.

—Be aware of the types of fittings on pumps and hoses. For example, acid and caustic will rapidly corrode aluminum.

—Check fluid levels (oil, fuel) periodically. Never add fuel to equipment while it is running.

HEAT STRESS

The stress of working in a hot environment can cause a variety of strains on the body, including heat exhaustion or heat stroke; the latter can be fatal. Personal protective equipment can significantly increase heat stress. You should learn to recognize the symptoms of heat stress in yourself and co-workers and take necessary actions when they occur. Your employer should provide instructions on ways to reduce or prevent heat stress, including frequent rest cycles to cool down and replace the body fluids and salts lost through perspiration. Some of the symptoms which indicate heat exhaustion are:

—Clammy skin
—Light-headedness
—Slurred speech
—Rapid pulse
—Weakness, fatigue
—Confusion
—Fainting
—Nausea (vomiting)

If these conditions are noted, take the following actions in the order given:

—Take the victim to a cooler and uncontaminated area.
—Remove protective clothing.
—Give water to drink, if conscious.
—Allow to rest.

Symptoms that indicate heat stroke include:

—Staggering gait
—Hot skin, temperature rise (yet may feel chilled)
—Incoherent, delerious
—Mental confusion
—Convulsions
—Unconsciousness

If heat stroke conditions are noted, take the following actions in the order given:

—Take victim to a cooler and uncontaminated area.
—Remove protective clothing.
—Give water to drink, if conscious.
—Cool the victim with water, cold compresses, and/or rapid fanning.
—Transport the victim to a medical facility for further cooling and monitoring of body functions. HEAT STROKE IS A MEDICAL EMERGENCY.

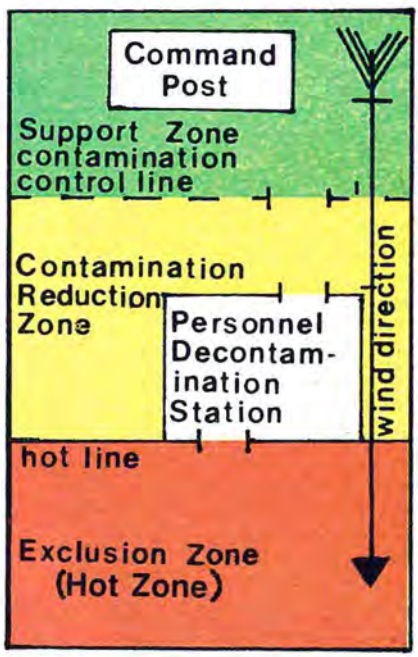
Additional information on heat-related problems can be found in most first aid books and in the DHHS (NIOSH) Publication Number 80-132, "Hot Environments."

CONTAMINATION/DECONTAMINATION

When working with hazardous wastes, it is important to establish and maintain "clean" areas at the site. Materials found in contaminated areas should be confined to specific "hot" zones whenever possible. Special decontamination zones and procedures should be used to help control the movement of hazardous materials from the "hot" zone.

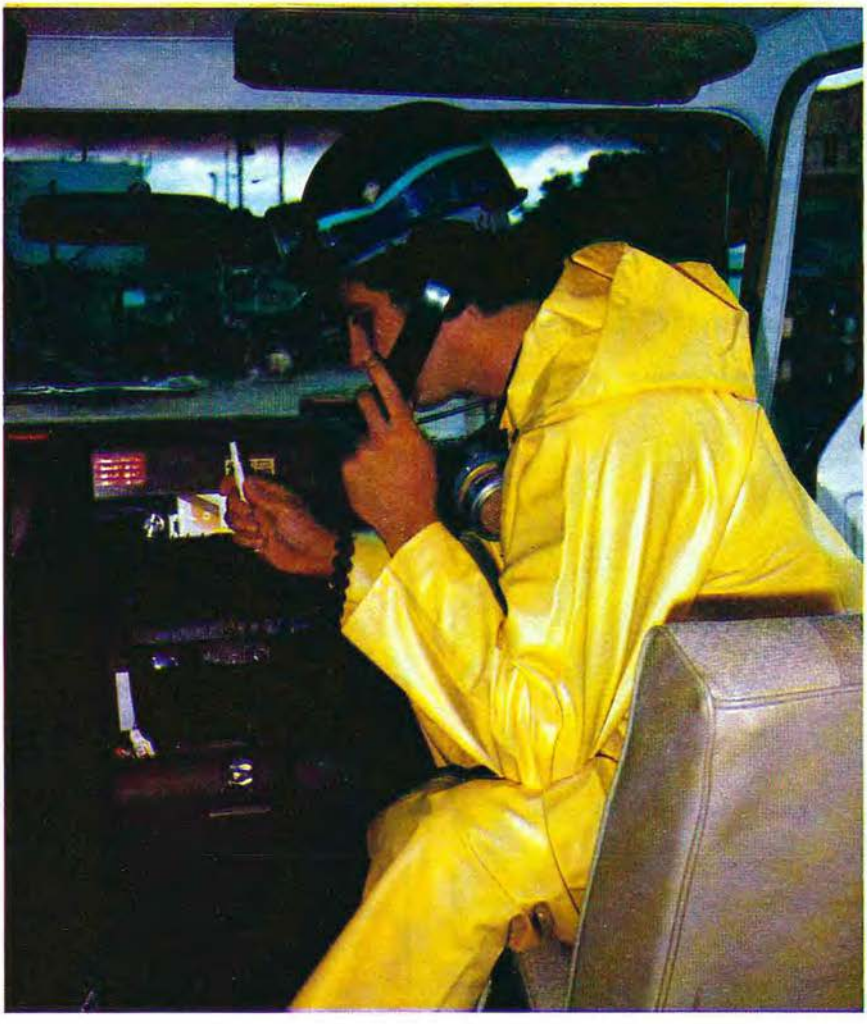
You should be familiar with all decontamination procedures at your work-site and follow them carefully. After removing contaminated clothing, you should shower, wash your hair, and change into clean clothing in an uncontaminated area. Contaminated clothing or equipment should not be taken home because they could expose others to hazardous materials. Your clothing, tools, and equipment should be decontaminated and stored or disposed of according to your employer's SOPs.

If spills or splashes occur while you are in a contaminated area, proceed immediately to the decontamination area and correct the problem. You may have to obtain clean protective clothing before returning to the contaminated area to continue your work.



EMERGENCY INFORMATION

It is important that a telephone or two-way radio be available, along with the necessary phone numbers for medical and other emergency services (for example, local rescue squad, fire and police departments). Emergency first aid equipment and medical personnel, or someone who knows how to provide emergency first aid, should always be present and readily available at the worksite. Instructions for the fastest route to the nearest hospital or medical facility should be available, along with necessary transportation equipment.



EMERGENCY PROCEDURES

Standard Operating Procedures (SOPs) should include plans for unexpected events such as accidents, fires, and explosions, etc.

If you know or suspect that you have been contaminated with a hazardous substance, TELL YOUR SUPERVISOR. You should know the general symptoms of over-exposure to toxic substances.

These include:
—Irritation of skin, eyes, nose, throat, or respiratory tract.
—Changes in complexion or skin discoloration.
—Headaches.
—Difficulty in breathing.
—Nausea.
—Dizziness or light-headedness.
—Excessive salivation (drooling).
—Lack of coordination.
—Blurred vision.
—Cramps and/or diarrhea.
—Changes in behavior patterns.

You should always know the location of emergency eyewash and shower facilities.

Before you enter, and periodically while you are working in confined spaces such as tanks or ditches, the air in the space should be tested by a qualified individual for oxygen content, explosive levels of gases, and contamination.

When you are wearing a respirator (SCBA) in an atmosphere which is immediately dangerous to life or health (IDLH), at least one additional person MUST be present with a similar respirator to help you in case of an emergency. Visual or verbal contact from a safe area must be maintained with those individuals at all times. Your employer should also have a plan to insure that everyone at the site will be protected from any likely incident and should have the necessary rescue equipment available in case of an emergency.

Understand the site emergency rescue procedures and know the locations of rescue equipment before the need arises. If you must rescue someone, use caution and the proper protective equipment. DO NOT BECOME A CASUALTY YOURSELF.

Move the affected person from the hazardous exposure if possible. Get help if you need it and follow emergency rescue procedures.

MEDICAL SURVEILLANCE PROGRAM

Medical surveillance is an important part of an occupational health and safety program. It is a way of keeping track of your health through the use of preplacement and periodic medical examinations and laboratory tests. This medical surveillance program will help your doctor to:

—Determine a base-line picture of your health against which future changes can be measured.

—Identify any underlying illnesses or conditions which might be aggravated by certain exposures or job activities.

—Recognize any abnormalities, toxic reactions, or other changes in your health—at the earliest opportunity—so that corrective measures can be taken.

The medical records developed as part of the medical surveillance program are important aids to your doctor should you develop health problems which may be associated with exposure to hazardous substances. When abnormal conditions are discovered early enough, appropriate action to correct these and/or prevent more serious conditions can usually be taken.

HEALTH AND SAFETY PROGRAM

The following 10 points summarize elements of a sample program for worker health and safety.

1—A proper identification and quantification of the materials to be handled.

2—A constant surveillance of the work environment (for example, a knowledge of weather conditions, contaminant levels, and fire/explosion potential).

3—The necessary protective equipment available and properly maintained (that is, both the personal protective equipment and the engineering equipment to provide protection from and/or isolation of the hazard).

4—An appropriate medical surveillance program, including a record of pre-employment conditions and work-related exposures.

5—A fire and spill emergency control plan.

6—A proper decontamination program (that is, a method of preventing unnecessary worker exposure and eliminating migration of contaminants from the site).

7—A comprehensive site work plan.

8—A communication/safety program which keeps track of everyone on-site and provides for medical, emergency, and/or community contacts.

9—A site security plan for properly designating and controlling access to and exit from contaminated, decontaminated, and safe areas.

10—A proper logistics plan (that is, appropriate arrangements for eating, sleeping, washing and drinking water, compressed air, etc.).

You CAN work safely at a hazardous waste site if you are informed of the hazards involved, receive the necessary training, follow the proper procedures and/or instructions, use the required personal protective equipment, and remain aware of the conditions or situations around you at all times.

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DHHS (NIOSH) Publication No. 83-100