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FERNALD

Environmental Management Project

SITE WORKER TRAINING

Study Guide

Revision 2, February 1996

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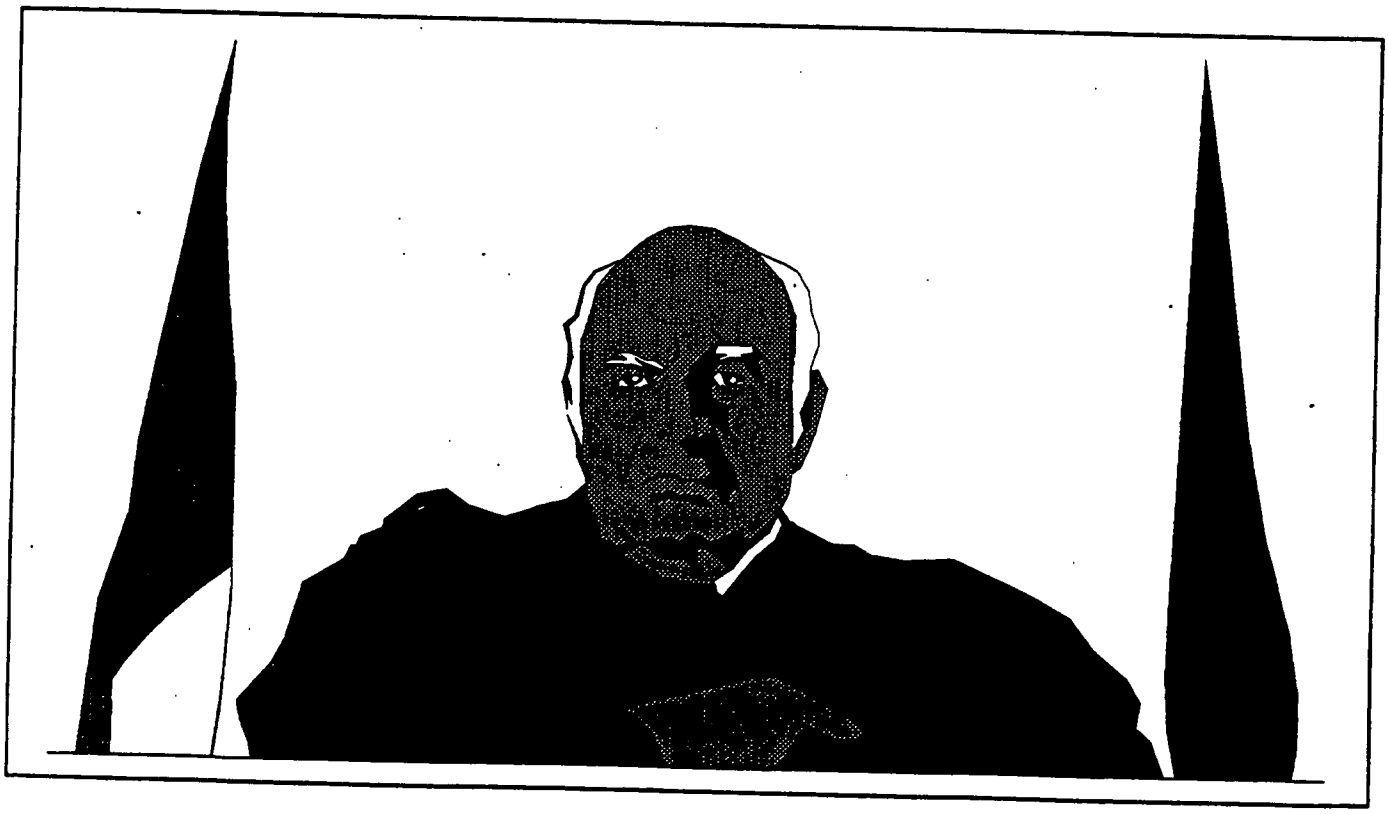
MODULE I

SITE AND REGULATORY OVERVIEW



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MODULE I OBJECTIVES

FERNALD SITE HISTORY LESSON OBJECTIVES

Introduction, there are not any objectives.

REGULATIONS AND REGULATORY AGENCIES LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize basic regulatory agencies having jurisdiction over the FEMP and basic regulatory terminology used by those agencies and the FEMP.

ENABLING OBJECTIVES

EO1 Identify the major government agencies affecting operations at the FEMP

EO2 Identify the basic content and purpose of the following laws an commitments:

a. The Atomic Energy Act
b. The Resource Conservation and Recovery Act
c. The Comprehensive Environmental Response and Compensatio Liabilities Act
d. The Superfund Amendments and Reauthorization Act
e. The Occupational Safety and Health Act
f. The Toxic Substance Control Act
g. The Federal Facilities Compliance Agreement

EO3 Explain the "Cradle to Grave" philosophy associated with RCRA and th means by which it is accomplished.

EO4 Define the term Hazardous Waste Management Unit.

EO5 State the usual method by which a HWMU is identified at the FEMP.

EO6 Define the term Satellite Accumulation Area.

EO7 Define the following terms:

a. solid waste
b. hazardous waste
c. mixed waste

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FERNALD SITE HISTORY

FERNALD SITE HISTORY

The Feed Materials Production Center (FMPC) was a Department of Energy (DOE) owned facility, which for nearly forty years produced high-quality uranium metals for both the US Military Nuclear Weapons and Nuclear Power Programs. The DOE suspended production at the FMPC in 1989, and formally ceased production in 1991. Although production activities have ended, the Fernald Site continues to examine airborne and waterborne pathways to the environment. Such pathways could be routes that contaminants on site could take to the surrounding environment due to former production and current remedial operations.

Today, the Fernald Site focuses extensively on environmental remediation. Site personnel closely investigate and monitor the site and surrounding environmental areas, while developing and implementing remedial technologies for those areas.

The former FMPC is now known as the Fernald Environmental Management Project (FEMP). The Fernald Environmental Restoration and Management Corporation (FERMCO), which is the prime contractor to the DOE for the FEMP, has committed to a new mission for the site regarding present and future activities:

"Together DOE and FERMCO are committed to protecting human health and the environment through a safe, least cost, earliest, final cleanup of the Fernald Site within applicable DOE orders, regulations and commitments and in a manner which addresses stakeholder concerns."

ACCESSING THE SITE

Security

To gain access to the site each person must request access from security through their hiring manager or sub-contractor site coordinator. To gain a security badge, each person must complete a minimum core of site access training.

Training

In order to prepare personnel for work at the FEMP, extensive training is required by both law and site policies. This training consists of many different general and specific courses. Your supervisor and training coordinator will be able to appraise you of your specific training needs. Minimum access training requirements are a starting point. Access training consists of initial training, refresher training, and retraining.

Initial Training

OSHA, USEPA, Ohio EPA, and DOT all require training to be conducted for any person or persons that handle hazardous wastes. For workers at the FEMP, the most important training rules are derived from OSHA regulations 29 CFR Part 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER). Paragraph (e) of Part 1910.120 specifies HAZWOPER Training Requirements.

Basically, there are three categories of workers:

- General Site Worker
- Occasional Site Worker
- Non-hazardous Site Worker

Personnel working at a site requiring HAZWOPER training are required to receive such training commensurate with their work assignment. The amount of training received (in hours) is dependent upon the category of the worker.

For General Site Workers, 40 hours of training is required to be presented covering the following topics:

- Names of personnel and alternates responsible for site safety and health.
- Safety, health and other hazards present on-site.
- Use of PPE
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on-site.

- Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards.

- Any applicable safety and health plan.

The 40-hour General Site Worker training requirements are met by the following training courses:

- General Employee Training (4-hours)

- Site Worker Training (12-hours)

- Radiological Worker II Training (20-hours)

- Respirator Training (4-hours)

For Occasional Site Workers, 24-hours of training on the same topics as a General Site Worker are required. The 24-hour training requirements are met by the following training courses:

- General Employee Training (4-hours)

- Site Worker Training (12-hours)

- Radiological Worker I Training (8-hours)

In addition to classroom training, the supervisor of an employee is required to conduct field training in accordance with the employee access category. For Occasional Site Workers, the field training is one-day (8-hours) in duration. For General Site Workers, the field training is three-days (24-hours) in duration. This field training consists of the following at a minimum:

- Area safety equipment

- Area rules and regulations

- Communications equipment

- Rally Points

- Hazard prevention

- Housekeeping policy
- Health and Safety Plan review
- Engineering and Administrative Controls
- Hazard Recognition
- MSDS Location
- Procedures

For Non-Hazardous Site Workers, only General Employee Training is required to become aware of general site policies, procedures, and applicable safety and health rights and responsibilities necessary to obtain access to non-hazardous locations.

Refresher Training

Each year, refresher training is conducted, and must be composed of a total of 8-hours, covering a selection of topics from the General Site Worker and Occasional Site Worker curricula.

Retraining

According to the DOE Radiological Control Manual, biennial (every 2-years) retraining is required for radiological workers which is composed of 8-hours of training.

DOT Training

Those persons involved in the transportation of hazardous materials over public roads must receive additional training. That individual must have their commercial drivers license endorsed to allow that person to transport hazardous materials.

USEPA and Ohio EPA Training

The OSHA has taken the lead in developing the training requirements outlined above. The USEPA recognizes those training requirements. Ohio EPA does not have a federally approved job safety plan, so the OSHA requirements above apply to Hazardous Waste Site workers in Ohio.

REGULATIONS AND REGULATORY AGENCIES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize basic regulatory agencies having jurisdiction over the FEMP and basic regulatory terminology used by those agencies and the FEMP.

ENABLING OBJECTIVES

EO1 Identify the major government agencies affecting operations at the FEMP.

EO2 Identify the basic content and purpose of the following laws and commitments:

a. The Atomic Energy Act
b. The Resource Conservation and Recovery Act
c. The Comprehensive Environmental Response and Compensation Liabilities Act
d. The Superfund Amendments and Reauthorization Act
e. The Occupational Safety and Health Act
f. The Toxic Substance Control Act
g. The Federal Facilities Compliance Agreement

EO3 Explain the "Cradle to Grave" philosophy associated with RCRA and the means by which it is accomplished.

EO4 Define the term Hazardous Waste Management Unit.

EO5 State the usual method by which a HWMU is identified at the FEMP.

EO6 Define the term Satellite Accumulation Area.

EO7 Define the following terms:

a. solid waste
b. hazardous waste
c. mixed waste

INTRODUCTION

In order to successfully achieve the present mission of the Fernald Site or Fernald Environmental Management Project (FEMP), compliance with the various regulatory drivers is essential. This section of your study guide is designed to indoctrinate you with the regulatory drivers and agencies which directly affect the cleanup operations at the FEMP.

During the course of Site Worker Training, we will discus many processes and technologies for site cleanup, but please note that our highest priority is ensuring worker safety as well as compliance with the federal and state environmental regulations.

GOVERNMENT AGENCIES

EO1 Identify the major government agencies affecting operations at the FEMP.

Several federal and state regulatory agencies have rules in place that impacts work at the FEMP. Each of the following paragraphs identify those agencies and each agency's basic mission. The FEMP is responsible for meeting the requirements of all of these agencies.

The Department of Energy (DOE)

The Department of Energy is the owner of the FEMP and has contracted FERMCO to manage the cleanup operations. The DOE is the primary contractor for any regulatory matters and conducts negotiations to seek agreements with other agencies. The DOE has specific authority over the safe handling, storage, and accountability for nuclear materials.

The United States Environmental Protection Agency (USEPA)

The U.S. EPA responsibilities are directed toward protection of our environment. They enforce regulations regarding topics such as release of hazardous materials, storage and handling of hazardous materials, disposal of waste, and planning for emergencies.

Ohio Environmental Protection Agency (OEPA)

The OEPA is the primary agency that issues permits, reviews compliance reports, inspects facilities and operations, and oversees compliance with applicable regulations at the FEMP.

The Occupational Safety and Health Administration (OSHA)

The Occupational Safety and Health Administration is responsible for enforcing regulations designed to protect workers in the work place. These regulations govern safe work practices, guarding of machinery, design of facilities and other safety issues related to the work place. FERMCO has committed to align work practices at the FEMP to OSHA 1910 and 1926 standards, however, the FEMP is not under the regulatory authority of OSHA.

The Department of Transportation (DOT)

The Department of Transportation is responsible for ensuring the safety of our roadways and sets requirements regarding the use of public highways for shipment of hazardous materials. All shipments of hazardous materials to and from the FEMP must comply with these requirements.

REGULATIONS AND COMMITMENTS

EO2 Identify the basic content and purpose of the following laws and commitments:

a. The Atomic Energy Act
b. The Resource Conservation and Recovery Act
c. The Comprehensive Environmental Response and Compensation Liabilities Act
d. The Superfund Amendments and Reauthorization Act
e. The Occupational Safety and Health Act
f. The Toxic Substance Control Act
g. The Federal Facilities Compliance Agreement

As the operators of the FEMP, we must comply with the requirements of all the following federal, state, and local regulations. Each of the following paragraphs provide a basic explanation of each of the major laws and agreements that have an impact on operations at the FEMP.

The Atomic Energy Act (AEA)

The purpose of the Atomic Energy Act is to: "Assure the proper management of source, special nuclear, and by-product materials".

- Source materials are composed of Uranium or Thorium or any combination of Uranium or Thorium in any chemical or physical form (not including source materials).

- Special Nuclear Materials include: Plutonium, Uranium enriched in the isotopes of 233 or 235, or any other material containing these materials, not including source materials.

- By-product materials are materials made radioactive by exposure to radiation resulting from the production of Special Nuclear Materials, or processes that use Special Nuclear Materials.

The Resource Conservation and Recovery Act (RCRA)

The Resource Conservation and Recovery Act (RCRA) of 1976, as revised by the Hazardous and Solid Waste Amendments (HSWA) of 1984, provides the legislative mandate for a nationwide program to protect human health and the environment from the risks of improper management of hazardous and solid wastes. The goals of the act are to: ensure adequate and safe management of hazardous waste from generation to disposal (cradle to grave concept); ensure adequate and safe management and disposal capacity for solid wastes; and prevent and detect leakage from underground storage tanks (USTs).

Emphasis will be placed on taking action to prevent and reduce risks at closed and closing land disposal facilities. Emphasis in the corrective action program will continue to be on implementation of facility stabilization and long term remediation. To assist states in assuming implementation of the corrective action program, resources are being provided to facilitate development of comprehensive state groundwater protection plans. In the enforcement program, the focus on pollution and waste minimization in inspection targeting and in enforcement settlements will continue.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 charges the USEPA with the responsibility of providing emergency response for hazardous substances released into the environment and the remediation of inactive hazardous waste sites. The EPA will respond to releases of hazardous substances by either compelling potentially responsible parties (PRPs) to undertake the response action, or by Early or Long-term response actions. While the EPA has the primary responsibility for implementing the program, the it works closely with a variety of other federal agencies and the states to carry out the program.

Early Actions or Removal Actions, taken at both National Priorities List (NPL) sites and non-NPL sites, are generally short-term responses taken to abate an emergency or immediate threats posed by the uncontrolled release of hazardous substances. Long-term response actions, which include Remedial Actions, are taken at NPL sites only; they implement remedies to achieve final cleanup goals instead of, or in addition to, removal actions.

The Federal Facilities Enforcement Program will provide support for oversight of CERCLA Section 120 agreements with federal agencies to conduct cleanup of environmental contamination at federally owned facilities and ensure that federal agencies meet and comply with all environmental standards required by CERCLA.

The Superfund Amendments and Reauthorization Act (SARA)

The Emergency Planning and Community Right-To-Know Act, Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, establishes a framework for addressing risks posed by hazardous chemicals present in communities. This program provides for development of state and local response plans to prevent releases, or protect and inform the public in the event of a chemical release emergency.

The Occupational Safety and Health Act (OSHA)

The purpose of the Occupational Safety and Health Act was to set minimum acceptable safety standards for the work place and provide for reporting of unsafe work practices within the work place.

OSHA guarantees the employee protection from retribution for reporting or filing complaints regarding unsafe work practices or conditions.

The Toxic Substance Control Act (TSCA)

The Toxic Substance Control Act (TSCA) is designed to protect human health and the environment from unreasonable risks arising from the manufacture, processing, distribution, use or disposal of new or existing chemical substances. The enforcement program depends increasingly upon the assistance of state agencies which conduct compliance monitoring inspections for PCBs and asbestos under the terms of cooperative enforcement agreements. Thirty-five states currently participate in the TSCA cooperative agreement program. State enforcement programs emphasize compliance monitoring of existing chemical control rules, particularly those for asbestos and PCBs. States may only conduct inspections. Enforcement actions must be issued by Regions because no state has "equivalent" state authority as mandated by TSCA.

The Clean Air Act (CAA)

The Clean Air Act (CAA) authorizes a nationwide program to reduce air pollution through air quality planning, regulation, enforcement, and research. in November 1990, the President signed the Clean Air Act Amendments of 1990 (CAAA), which expanded requirements and capabilities to clean the nations air. In implementing the Act, USEPA will use not only traditional approaches for controlling air pollution, but will also strive to harness the power of the marketplace, encourage local initiatives, and emphasize pollution prevention. Since 1990, USEPA has proposed or finalized rules that will remove three quarters of the 57 billion pounds of air pollutant reduction mandated by the Act. In addition to carrying out the CAAA, USEPA will expand its efforts to analyze and address indoor air quality problems.

The primary mechanism provided by the Clean Air Act to achieve clean air standards are state implementation and federal rules and guidance. In 1994 USEPA will help states develop expanded, more stringent state implementation plans that will further reduce pollutant emissions from both stationary and mobile sources. The Agency will issue guidance for state control strategy demonstrations, providing states with technical aid and guidance for instituting or enhancing mobile and stationary source pollution controls, and encourage the use of market-based approaches where appropriate.

The Clean Water Act (CWA)

The fundamental philosophy behind the 1994 water quality program is an ecosystem-based, risk-targeted approach to pollution prevention and control. This approach consists of a continued focus on our existing, and expanding, statutory responsibilities for traditional pollution sources, and an increased emphasis on our most significant non-traditional unaddressed pollution source, wet weather runoff (storm water, non-point source [NPS] and combined sewer overflows [CSOs]).

Over the past two decades the water program has made great strides in improving the nation's water quality, a success which can be attributed to nationwide regulations limiting point source discharges from industrial and municipal facilities. Through legislation such as the Water Quality Act of 1987, which amended the Clean Water Act, USEPA responsibilities continue to grow. The CWA ratified existing programs such as technology-based and water quality-based effluent limits for point source dischargers, and providing new tools, such as mandatory permits to control sewage sludge contamination, administrative penalties to streamline enforcement actions, and the State Revolving Fund program, which authorized funds for municipal waste water treatment.

The Safe Drinking Water Act (SDWA)

The 1986 Amendments to the Safe Drinking Water Act (SDWA) mandated dramatic changes in nationwide safeguards for drinking water and established new Federal enforcement responsibility in the event of state inaction. The amendments require regulation of a specified list of priority contaminants, tripling the number of contaminants previously regulated. The amendments also require control of 25 more contaminants every three years.

As of 1994, USEPA will have promulgated regulations controlling 86 contaminants. Because these regulations will prevent over 5400 cancer cases and over 200,000 non-cancer cases of disease each year, the ability of the states to adopt and implement these regulations is critical. To ensure effective implementation, and to bolster their state/federal partnership, USEPA is taking action on four major fronts: increasing state grants; supporting state capacity building efforts (including development and implementation of a Drinking Water State Revolving Fund); setting priorities; and advocating and supporting aggressive implementation and timely enforcement.

USEPA maintained its efforts in Sole Source Aquifer (SSA) designations. The Agency continued to review projects financially assisted be the federal government on or near designated SSAs.

USEPA Statutory Authorities to Regulate Radiation Exposure

The USEPA program to protect the public health and environment from adverse effects of radiation exposure is derived from several statutes including: the Indoor Radon Abatement Act; the new Clean Air Act Amendments of 1990; the Atomic Energy Act; the Public Health Service Act; the Uranium Mill Tailings Radiation Control Act; the Marine Protection, Research, and Sanctuaries Act; and the Superfund Amendments and Reauthorization Act. These Acts authorize a wide range of regulatory, assessment, assistance, and research activities. The Agency also performs oversight functions for programs with enforcement authority vested in other agencies.

USEPA's radiation program has four major objectives:

- Reduce adverse health effects and environmental impacts from radiation exposure through a program of standards and guidelines.
- Assess and quantify existing and emerging radiation problems and their potential impact.
- Respond to issues of serious public concern.
- Maintain the capability to respond to emergencies and to aid development and testing of federal, state, and local plans for emergency response.

USEPA will continue to provide coordination, oversight, technical, and laboratory support among regional and headquarters offices to ensure that radioactively contaminated federal facilities are cleaned up to acceptable risk levels consistent with the requirements of the federal facility agreements.

The Federal Facilities Compliance Agreement (FFCA)

This agreement was signed by the Department of Energy and the US Environmental Protection Agency in 1986 and was designed to assure the Feed Materials Production Center complies with RCRA, CERCLA, the Clean Water Act, and Clean Air Act.

CERCLA

We have looked previously at the intent of CERCLA. What triggered the FEMP into the CERCLA program? In 1989 the FEMP was put on the **National Priorities List (NPL)** by the USEPA because of threatened releases to the environment and the aquifer. The DOE and US EPA signed the **Consent Agreement in 1990** which is an expansion of the **Federal Facilities Compliance Agreement (FFCA)**. The Amended Consent Agreement of 1991 was signed which modified the 1990 Consent Agreement.

CERCLA Definitions

Remedial Investigation (RI) - the process used to determine the nature and extent of the problem presented by the threatened release.

Feasibility Study (FS) - the process to develop and evaluate options for remedial actions. The remedial investigation and the feasibility study are collectively referred to as the "RI/FS".

Remedial Action - an action that is consistent with the final remedy following a formal examination of the nature and extent of the release, or threat of release, assessment of the risk, and selections of the final remedy based on an evaluation of possible alternatives (RI/FS process).

Removal Action - any necessary action to abate an immediate threat to health and the environment, including actions necessary to monitor, access, or evaluate the threat.

CERCLA ACTIVITIES AT THE FEMP

As a result of the various activities in support of DOE's Nuclear Weapons Program at the FEMP, many areas of the site pose a threat to the environment and human health. FERMCO's mission is to remove or minimize this threat according to the requirements of the law. The following are examples of the hazardous situations and conditions which will require cleanup.

Much of the activity you will observe at the FEMP is driven and defined by CERCLA and RCRA. In order to more effectively manage these cleanup activities the FEMP has been divided into five section's called Operable Units (OUs). Projects within these units direct the cleanup and disposal of the associated wastes.

OU1 - Waste Pit Area
OU2 - Other Waste Pits
OU3 - Production Area
OU4 - Silos 1-4
OU5 - Environmental Media

OU1 Waste Pit Area

OU1, the Waste Pit Areas, consist of Waste Pits 1, 2, 3, 4, 5, and 6; the Burn Pit (used for the disposal of burned waste); the Clearwell (a settling basin for surface water runoff); miscellaneous structures and facilities such as berms, liners, concrete pads, underground piping, utilities, railroad tracks, fencing; and soil within the OU1 boundary.

OU1 is located in the northwest quadrant of the Fernald site (west of the former production area) and covers approximately 37 acres. Paddy's Run, an intermittent tributary of the Great Miami River, runs along the west side of the Fernald property between OU1 and the site boundary.

Two types of disposal methods were generally used in placing wastes into the waste pits:

- a "wet" system for slurries where the wastes were pumped to the pit
- "dry" back-fill type operations

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The six waste pits, built between 1952 - 1959, were used for storing low-level radioactive wastes generated by the various chemical and metallurgical processes used at the facility for uranium production operations. No waste has been placed in the pits since the mid-1980s.

Waste Pits 1, 2, and 3 are covered with soil. Waste Pit 4 is covered with bentonite clay and a synthetic cover. Waste Pits 5 and 6 are lined with synthetic membranes and have a water cover. The pits range in size from that of a baseball diamond to a football field and vary in depth from 13 to 30 feet. It is estimated that the pits contain approximately 473,000 cubic yards of waste.

OU2 Other Waste Units

OU2 includes the solid waste landfill, lime sludge ponds, inactive flyash disposal area, active flyash pile, and the southfield area. These areas were used to dispose flyash from the boiler plant, spent lime from water treatment activities, sanitary waste, and construction rubble from past operations at the FEMP. While uranium is the primary contaminant, investigations are in progress to determine the status of other hazardous wastes which may be present in OU2.

The Solid Waste Landfill is located on a 1.5 acre tract in the northeast corner of the waste storage area. The landfill was operated from 1954 to 1986 and received about 19,600 cubic yards of cafeteria wastes, rubbish, and other wastes from non-process areas. In addition, construction rubble and soil contaminated with asbestos and radionuclides may have been disposed of in the landfill.

The unlined North and South Lime Sludge Ponds are in the southeastern corner of the waste storage area. The North Pond, with a total lime sludge residue volume of 7,200 cubic yards, is partially covered with water and receives spent lime sludges from water treatment operations, the neutralization of the boiler plant blowdown, and coal pile storm water runoff. The South Pond, with a total lime sludge volume of 15,300 cubic yards, is dry and inactive.

The Inactive Flyash Disposal Area is located about 2,000 feet southwest of the former production area. Flyash at the FEMP is composed of approximately 70% bottom ash and 30% flyash. An estimated 78,500 cubic yards of flyash, and building rubble (concrete, gravel, asphalt, and steel rebar) were disposed in this area until the mid-1960s. The Active Flyash Pile is an uncovered storage area just east of the South Field Disposal Area, with an estimated volume of 59,000 cubic yards. Flyash from the coal-fired boiler plant is disposed of in this area. Elevated uranium levels were found in both of these disposal areas, which is typical of ash from coal-fired furnaces and boilers.

The South Field Disposal Area is reported to have been used as a disposal site for construction rubble that may have contained low levels of radioactivity. The South Field Disposal Area covers approximately 11 acres with a volume of 109,000 cubic yards of waste.

OU3 Former Production Area

OU3, the former production area and production-associated facilities, is one of the largest and most complex of the Fernald site OUs, largely due to the wide variety of former processing and support facilities located within this 136 acre area. When the mission at the FEMP was production of high-purity uranium metal for U.S. defense programs and the processing of thorium to support other DOE programs, large quantities of radioactive materials and some hazardous chemicals were used in the various plants involved in the process.

The primary radiological contaminant is uranium. Uranium contamination is the main focal point of building, equipment, and support facility cleanup.

Several cleanup alternatives have been identified for OU3. All of these options include regular maintenance and monitoring. Much of the cleanup work involves the disposal of inventoried waste materials in either an on-site or an off-site facility, removal and decontamination of buildings and equipment, and disposal of remaining contaminated materials in approved, engineered facilities either at the FEMP or off-site. A major emphasis will be placed on the recycling and recovery of building materials and equipment to minimize waste disposal requirements.

OU4 Silos 1-4

OU4 includes four above-ground storage silos. Silos 1 and 2 contain approximately 9,700 tons of radium-bearing radioactive waste dating back to 1940. A third silo contains dried uranium-bearing radioactive wastes; the fourth silo is empty. Environmental concerns associated with the silos include radon air emissions and below-surface soil contamination due to leaching of contaminants into the soil.

Several Cleanup alternatives have been identified for OU4. The alternatives include:

- Stabilizing and capping the waste in place
- Removing and stabilizing/treating the waste with disposal in an engineered facility on Fernald site property
- Removing and stabilizing/treating the waste and shipping it to an approved off-site disposal facility.

OU5 Environmental Media

OU5 encompasses the environmental media at Fernald and surrounding areas that could be impacted by the facility.

"Environmental media" includes groundwater, surface water, soils, sediments, air, vegetation, and wildlife throughout the Fernald site and surrounding areas. The groundwater includes the Great Miami Buried Valley Aquifer, a source of water in the vicinity of Fernald, and pockets of "perched" water trapped in clay layers above the aquifer at several locations on-site.

Surface waters include the Great Miami River, Paddy's Run, and the Fernald site's storm sewer out-fall ditch. Sediments in OU5 include solid materials carried in storm water runoff or plant discharges of treated waste waters to surface waterways or drainage ditches. Soils on and off-site boundaries are also being investigated for possible contamination due to past discharges and air emissions.

RCRA

As discussed earlier in this lesson, RCRA serves to protect the health and safety of the public from risks associated with the improper management of hazardous wastes. There are several concepts associated with RCRA that need to be explored.

Cradle to Grave

EO3 Explain the "Cradle to Grave" philosophy associated with RCRA and the means by which it is accomplished.

The concept of cradle to grave is applied when a hazardous material is initially produced, transported to a user, used, and then disposed of as waste. This phrase is actually referring to the comprehensive approach to the handling of hazardous material from point of generation to final disposal as a waste form.

RCRA requires those persons who generate hazardous wastes to handle waste properly and prepare manifests for off-site treatment, recycling, or disposal facilities. Persons who transport hazardous wastes are required to comply with manifesting, labeling, and delivery requirements, as well as Department of Transportation requirements. Owners and operators of treatment, storage, and disposal (TSD) facilities must comply with performance standards, including minimum treatment technologies, groundwater monitoring, and the land disposal restrictions.

- Generator - any person, by site, whose act or process produces hazardous wastes or whose act first causes hazardous waste to become subject to regulation.

- Transporters - the companies which transport the hazardous waste.

- Treatment, Storage, and Disposal Facilities (TSD) these facilities treat, store, or dispose of hazardous waste.

  The FEMP is classified as a storage facility because it stores the hazardous waste on-site more than 90 days. At the FEMP hazardous waste is stored with the intention of possible shipment to a permanent TSD facility.

HAZARDOUS WASTE MANAGEMENT UNITS (HWMUs)

EO4 Define the term Hazardous Waste Management Unit.

A contiguous area of land on or in which hazardous waste is placed, or the largest area in which there is a significant likelihood of mixing hazardous waste constituents in the same area.

HWMUs are established because of the materials in the area, and the nature of the activities in that area. The material contained is hazardous waste, and the activities are those involving the storing and handling of hazardous waste.

Examples of hazardous waste management units include a surface impoundment, a landfill cell, an incinerator, a tank and its associated piping and underlying containment system and a container storage area.

A container alone does not constitute a HWMU. The HWMU includes the containers and the land or pad upon which they are placed.

ENTRY INTO A HWMU

Controlled entry is required at all times. Contact Facility Owner prior to entering the HWMU. HWMUs are identified by barriers and warning signs that serve to identify and isolate the HWMU area. The chains and signs help warn personnel of the HWMU boundaries in order for them to maintain appropriate distances from the hazards, unless required by a specific task to be closer.

EO5 State the usual method by which a HWMU is identified at the FEMP.

The following barriers and signs are used to identify and mark the boundaries of an HWMU:

- Yellow chain barricades, painted stripes, or signs on buildings around the HWMU.
- Signs must be positioned so they are legible at 25 feet from any approach.

Mandatory signs are:

- "DANGER Unauthorized Personnel Keep Out" or its equivalent must be posted. The FEMP has received approval to substitute "DANGER Authorized Personnel Only" for this sign.
- "DANGER No Smoking, Matches, or Open Flame" sign or its equivalent is required at various HWMUs.

Other signs include:

- Contact Facility Owner Prior to Entry sign
- Training Requirements sign

HWMU RESPONSIBILITIES

Manager/Supervisor Responsibilities (Partial List)

- Ensuring site specific training is provided.
- Keeping employees informed through periodic safety meetings.
- Providing operators/inspectors with the required Personal Protective Equipment (PPE).
- Providing, reviewing, and ensuring compliance with applicable Material Safety Data Sheets.

Facility Owner Responsibilities (Partial List)

- Ensuring authorized container storage configurations, aisle spacing, waste segregation, and other building requirements are maintained.
- Ensuring that safety warning signs and applicable HWMU signs are posted.

Individual Responsibilities (partial list)

- Becoming knowledgeable of the health and safety concerns at or near any HWMU.
- Stopping work if it is being done in an unsafe manner or results in an unsafe condition.
- Staying informed by attendance to applicable training and periodic safety meetings.
- Complying with all applicable Material Safety Data Sheets.
- Becoming familiar with emergency procedure as they relate to a HWMU.
- Reading and complying with the applicable Health and Safety Plan.

SATELLITE ACCUMULATION AREA (SAA)

EO6 Define the term Satellite Accumulation Area.

An on-site area where waste is accumulated near the point of where the waste is generated. These areas are under the control of supervisors of the process generating the waste. An example is the maintenance garage where oil is changed on-site, oil is stored in the garage SAA.

WASTE

EO7 Define the following terms:

a. Solid Waste
b. Hazardous Waste
c. Mixed Waste

Solid Waste

According to USEPA a solid waste is any discarded material including solid, liquid, gas, or sludge that is not excluded by regulation or variance.

According to Ohio EPA (OEPA) a solid waste "means such unwanted residual solid or semisolid material that results from industrial, commercial, agricultural, and community operations, excluding earth or material from construction, mining, or demolition operations..."

Hazardous Waste

If material meets the definition of a solid waste, then that material can be considered to be a hazardous waste if it:

- Is listed by the OEPA or USEPA as a hazardous waste

- Exhibits any of the following four characteristics (OEPA and USEPA)
  - Ignitable
  - Corrosive
  - Reactive
  - Toxic
- Is mixed with or derived from or contains a listed waste.
- Does not fit within any enumerated exceptions, exemptions, or variances.

According to USEPA a Hazardous Waste is a solid waste, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

- Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
- Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Generally, OEPA defines a hazardous waste as "a solid waste that must be treated, stored, transported, and disposed of in accordance with applicable requirements under Subtitle C of RCRA." OEPA has specific lists which pertain to hazardous waste. Any material which is on those lists or exhibit characteristics of materials on those lists are considered hazardous materials.

Mixed Waste

A mixture of hazardous and radioactive wastes.

For Radioactive Mixed Wastes:

- Hazardous waste component regulated by the EPA.
- Radioactive component regulated under the Atomic Energy Act (AEA) by the DOE at DOE facilities.

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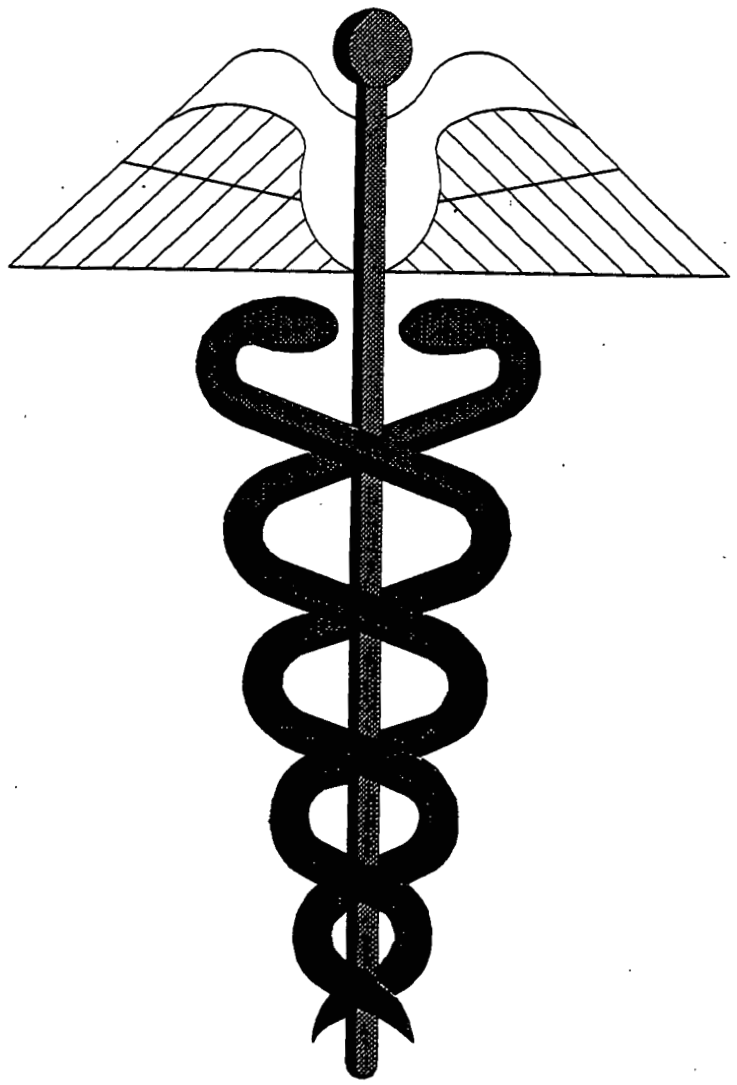
MODULE II

OCCUPATIONAL SAFETY PROGRAM



MODULE II OBJECTIVES

OCCUPATIONAL SAFETY AND HEALTH PROGRAM OVERVIEW LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic requirements of the Safety and Health Program.

ENABLING OBJECTIVES

EO1 State the purpose of the Safety and Health (S&H) Program.

EO2 State the S&H responsibilities of Occupational Safety and Health personnel.

EO3 State the S&H responsibilities of Supervisors and Employees.

INDUSTRIAL HYGIENE OVERVIEW LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the duties and responsibilities of the Industrial Hygiene Section.

ENABLING OBJECTIVES

EO1 State the purpose of the Industrial Hygiene Section.

EO2 Identify the major hazard categories which are addressed by the science of industrial hygiene.

OCCUPATIONAL SAFETY AND HEALTH PROGRAM OVERVIEW

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic requirements of the Safety and Health Program.

ENABLING OBJECTIVES

EO1 State the purpose of the Safety and Health (S&H) Program.

EO2 State the S&H responsibilities of Occupational Safety and Health personnel.

EO3 State the S&H responsibilities of Supervisors and Employees.

INTRODUCTION

EO1 State the purpose of the Safety and Health (S&H) Program.

To establish health and safety requirements and monitor the work site for health hazards, FERMCO established the Safety and Health Division. **The purpose of the Safety and Health Division is to prevent or minimize injuries, occupational illnesses, unwarranted property losses, and mitigation of unplanned environmental releases.**

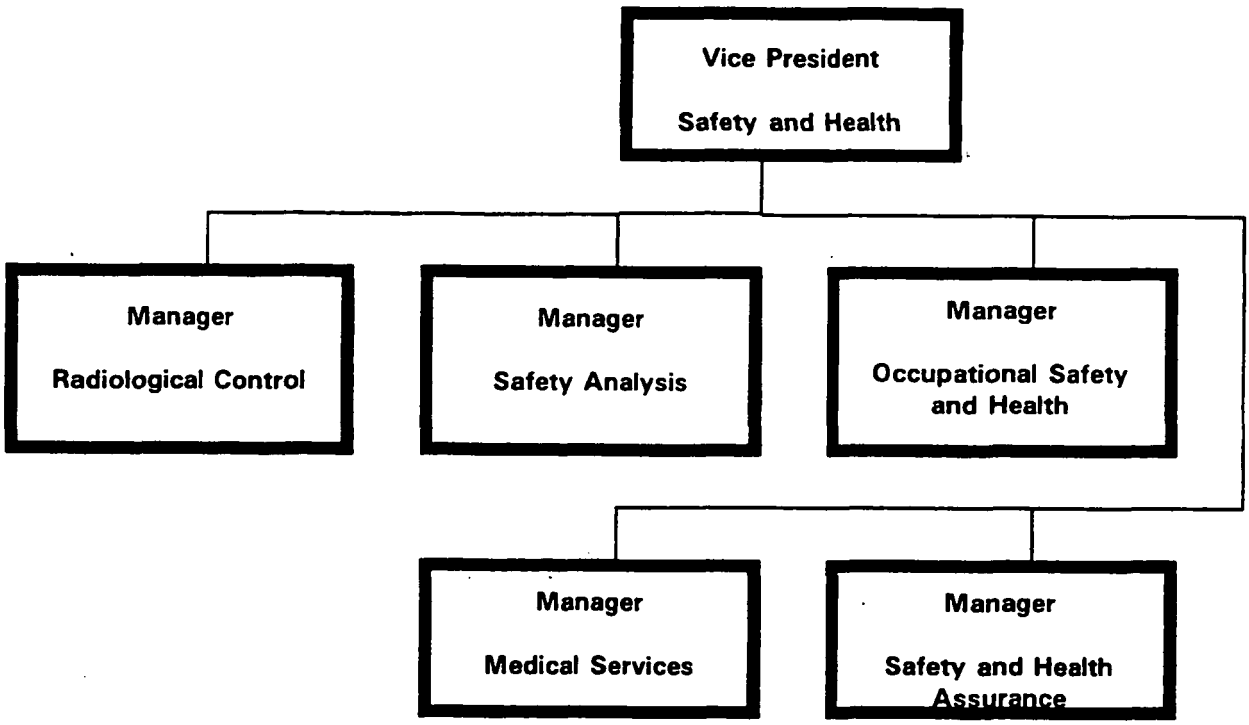
We are all responsible for maintaining a safe work place.

SAFETY AND HEALTH PROGRAM ORGANIZATION

Safety and Health Organization

Management has assumed leadership by having the Safety and Health (S&H) Division develop a program plan to prevent or minimize injuries, occupational illnesses, unwarranted property losses, and mitigation of unplanned environmental releases during environmental restoration and waste management activities. It complies with all safety and health regulations.

The Vice President of the Safety and Health Division reports directly to the President of FERMCO. The Vice President of S&H is designated as the Site Safety Officer under the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard Site Safety Plan.



Occupational Safety and Health is further subdivided into:

- Industrial Hygiene
- Construction Safety
- Fire Protection Engineering and Emergency Response Team
- OS&H Technical Support
- Remedial Support Operations (RSO) Safety

RESPONSIBILITIES

Occupational Safety and Health Team

EO2 State the S&H responsibilities of Occupational Safety and Health personnel.

Occupational safety and health personnel are responsible for:

- Identifying, evaluating, and mitigating hazards in the work place.
- Working in the planning stages to integrate safety and worker protection into the work process.
- Providing support for the Safety First Work Group activities.
- Monitoring and surveillance to ensure safety and human health.
- Providing design and material reviews to ensure safe construction and operations.

EO3 State the S&H responsibilities of Supervisors and Employees.

Employee's Supervisor

- Accepts the responsibility and accounts for the safety performance of the employees under his or her direction.
- Assigns jobs to personnel that are qualified.
- Meets with personnel on a regular basis to ensure that all facets of the Occupational Safety and Health Program are understood and followed.
- Ensures that employees have the proper tools, equipment, and PPE to perform the job and that the tools and equipment are properly used.

- Conducts inspections of the work areas to ensure that health and safety requirements are complied with.

- Reports, documents, and investigates all accidents/incidents.

Individual Employee

The individual is responsible for performing the work safely and reports unsafe acts or conditions to his or her supervisor. In addition the employee is responsible for:

- Stopping work if an unsafe condition is observed.

- Making suggestions for improving safety in the operations or work environments.

- Participating in safety training.

- Following procedures, safety rules, Health and Safety Plans, and work permits.

MEDICAL EVALUATIONS

One method of ensuring the health and safety of workers is to place workers on a medical surveillance program in accordance with their work activities. For personnel involved in Hazardous Wastes Operations and Emergency Response (HAZWOPER), medical surveillance is mandatory in accordance with the HAZWOPER Standard (29 CFR Part 1910.120), and the results of those surveillances are available to the employee in accordance with the OSHA Medical Records Standard (29 CFR Part 1910.20).

Medical Services

The FEMP has a Medical Services Department that provides medical examinations, administers medical treatment, and maintains employee medical records.

Health examinations are administered to provide initial and continual medical assessment. Routine examinations are performed at regular intervals throughout employment. These examinations are based on worker exposure to site hazards.

There are three basic divisions of site workers, including:

- General Site Workers
- Occasional Site Workers
- Non-Hazardous Site Workers

Categories of Medical Exams

Baseline	Performed for job assignment involving exposure to hazardous substances.
Repeat	Performed periodically while in continued employment.
Qualification	To qualify employees for specific assignments for which specific standards exist, for example, respirator wearers.
Special Evaluations	Performed in response to contractor management's request to determine employee fitness for duty.
Retiree	Performed on FERMCO retirees on a voluntary basis.

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INDUSTRIAL HYGIENE OVERVIEW

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the duties and responsibilities of the Industrial Hygiene Section.

ENABLING OBJECTIVES

EO1 State the purpose of the Industrial Hygiene Section.

EO2 Identify the major hazard categories which are addressed by the science of industrial hygiene.

INTRODUCTION

The Industrial Hygiene Section is part of the Occupational Safety and Health Division and is responsible for specific portions of S&H Plans. Industrial Hygiene is the science of anticipating and controlling occupational health hazards due to work activities. At the FEMP, personnel from the medical department in conjunction with industrial hygienists and industrial hygiene technicians provide workers with a broad spectrum of guidance to ensure a healthy work place.

INDUSTRIAL HYGIENE SECTION

EO1 State the purpose of the Industrial Hygiene Section.

The purpose of the Industrial Hygiene Section is to establish and implement control measures for all potential health hazards associated with FEMP operations. The Industrial Hygiene Section implements this philosophy through an established goal of reducing health hazards.

INDUSTRIAL HYGIENE SECTION PROGRAMS

Health Hazard Control The anticipation, identification, evaluation, and control of Chemical, Blood-borne, Biological, Physical, and Ergonomic health hazards.

Hazard Communication Providing an awareness of the various hazardous materials found on-site in conjunction with their associated hazards.

Hearing Conservation

Preventing occupational noise exposures by monitoring noise emission sources, posting noise hazard areas, determines noise abatement controls, selects proper hearing protection devices, provides training in the use and care of hearing protectors.

Laboratory Chemical Hygiene Plan — Protecting laboratory workers from health hazards associated with hazardous chemicals in their work area.

Respiratory Protection — Selects proper respiratory protection, provides respiratory protection training, and conducts respiratory qualitative and quantitative fit testing.

Carcinogen Control — Identifies and tracks carcinogenic hazards, recommends administrative, engineering, and personal protective equipment controls.

Confined Space Entry — Performs atmospheric testing, recommends personal protective equipment, completes the work permit.

Drinking Water, Eating, and Sanitation Facilities — Conducts periodic audits to ensure compliance with State of Ohio Department of Health requirements.

Decontamination — Determines the methods to be used in decontaminating, levels of personal protection, containment and disposal procedures.

Heat and Cold Stress — Conducts area and personal temperature monitoring, recommends engineering and administrative controls such as adequate break areas and work-rest limitations.

Hazardous Waste Operations — Assists in the development of Health and Safety Plans.

Lead Worker Protection — Issues permits, recommends PPE, performs monitoring.

Asbestos Worker Protection — Performs identification sampling, issues permits, recommends PPE, performs monitoring.

HAZARD CATEGORIES

EO2 Identify the major hazard categories which are addressed by the science of industrial hygiene.

The major categories of hazards addressed by the science of industrial hygiene are:

Chemical Hazards

Many potential occupational health hazards arise due to the inhalation of chemical agents in the form of vapors, gases, dusts, fumes, and mists. In addition, skin contact with chemicals may contribute to occupational illness. Chemicals may act on the human body over a wide range of effects from mild irritation to death.

Physical Hazards

In addition to tripping and falling hazards, the work environment may contain high levels of electromagnetic radiation (both ionizing and non-ionizing), hazardous noise, vibration, temperature extremes, and pressure variations. The body reacts to these stresses using self protective mechanisms. When these protective mechanisms fail, the body is damaged. Sometimes that damage cannot be repaired.

Biological Hazards

Biological hazards cover a wide spectrum of hazards from snakes, rodents, bees, and wasps to molds, fungi, and bacterial contamination, to pathogenically contaminated body fluids (blood borne pathogens). Some persons are extremely reactive to insect bites and stings, while others may react negatively to exposure to plant material.

Ergonomic Hazards

Ergonomics is the study of doing work. The human body is a miracle combination of common tools including the lever and fulcrum (pivot). Our arms, legs, back, fingers, and other body parts can be equated to those tools. These "tools" can be over-stressed, resulting in physical injury. It does not necessarily take overexertion to stress the human body, but merely improper positioning when performing work activities. Ergonomic hazards are combinations of work repetition and common stresses that results in injury. Contributing to the stress are improperly designed tools and work areas.

INDUSTRIAL HYGIENIST AND TECHNICIAN

An Industrial Hygienist is an occupational health professional that is responsible for promoting a healthy work place. The Industrial Hygienist in conjunction with Industrial Hygiene Technicians in the field perform the following functions:

- Conduct health hazard assessments during work planning process
- Advise on adequate health protection to control exposures
- Conduct monitoring tests to determine worker exposures to hazardous substances
- Provide exposure data to medical for evaluation in conjunction with employee physical health

The Industrial Hygiene Technician is an extension of the function of the Industrial Hygienist. The technicians perform field monitoring and work protection functions. The technician serves as an interface point between the worker and the Industrial Hygiene Section, to support the Industrial Hygiene Programs previously discussed.

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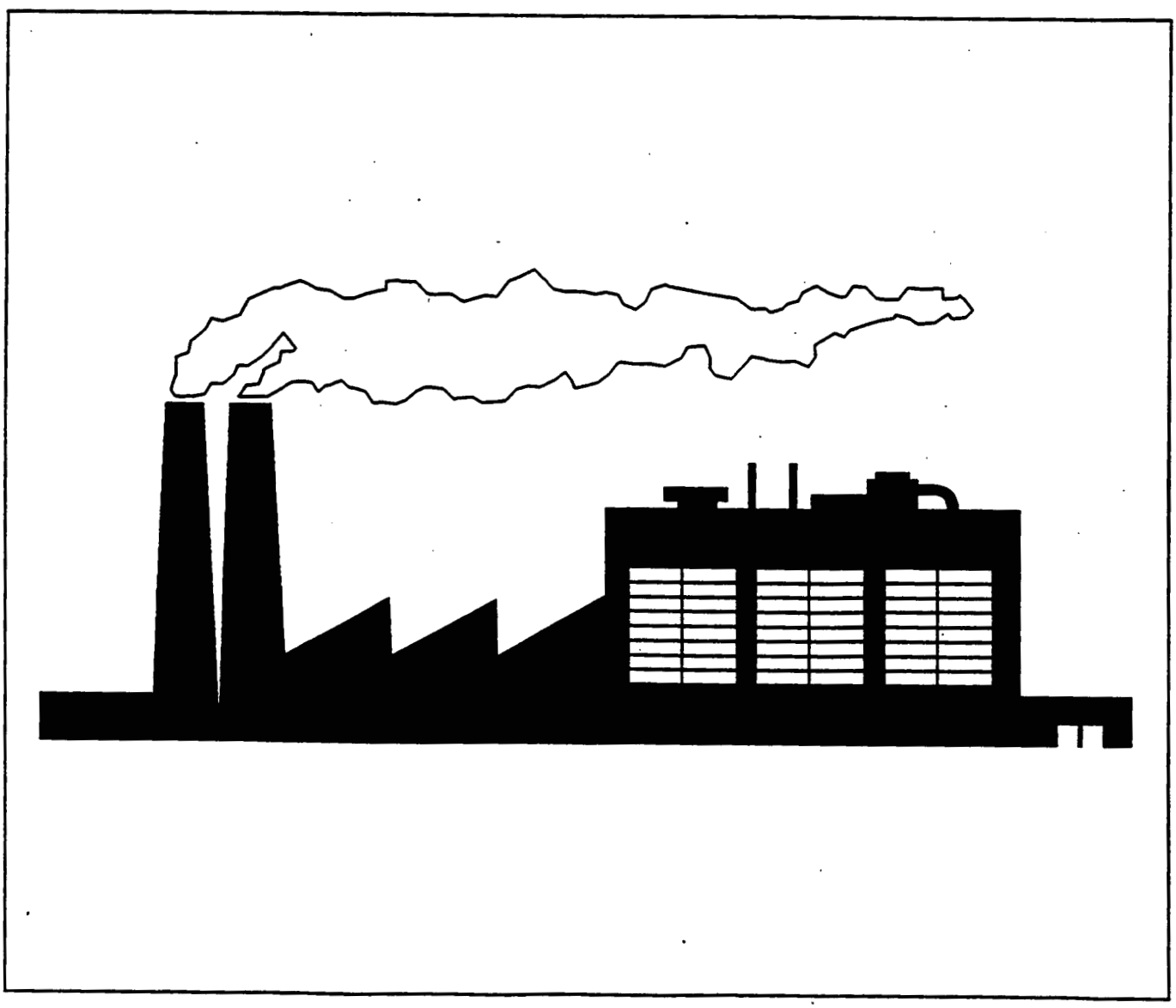
MODULE III

HEALTH HAZARDS IN THE WORK PLACE



MODULE III OBJECTIVES

TOXICOLOGY LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic mechanism by which toxic materials affect the human body.

ENABLING OBJECTIVES

EO1 State the purpose of the field of toxicology.

EO2 Define the following terms:

a. toxicity
b. hazard

EO3 List the factors that determine the degree of a hazard.

EO4 State the potential routes for a substance to gain entry to the body.

EO5 Define the following terms:

a. acute
b. chronic

ASBESTOS LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the hazards of asbestos and methods of preventing asbestos exposure.

ENABLING OBJECTIVES

EO1 Identify materials in which asbestos may be found at the FEMP.

EO2 State the two conditions in which asbestos containing materials may be found.

EO3 State the potential health hazards associated with asbestos.

CONFINED SPACES LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the hazards of confined spaces.

ENABLING OBJECTIVES

EO1 List the characteristics that define a confined space.

EO2 Identify examples of confined spaces located at the FEMP.

TEMPERATURE EXTREMES LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the hazards of working in hot and cold environments and protection against heat and cold stress.

ENABLING OBJECTIVES

EO1 Identify the environmental factors which influence the body's ability to regulate it's temperature.

EO2 Identify the factors which affect an individual's susceptibility to heat or cold injury.

EO3 State the primary types of heat and cold related injuries.

EO4 Identify the symptoms associated with the various forms of heat or cold related injuries.

EO5 Identify the appropriate response to signs of a heat or cold related injury.

EO6 Identify the major methods of preventing heat or cold related injuries.

EO7 State the methods used at the FEMP to monitor heat or cold stress in the work place.

NOISE EXPOSURE LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize hazardous noise and methods of preventing hazardous noise exposure.

ENABLING OBJECTIVES

EO1 **State the FEMP's limit for noise.**

EO2 **List the categories of noises found in industrial settings.**

EO3 **State the "General Rule of Thumb" for determining if you are in a hazardous noise environment.**

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TOXICOLOGY AND CHEMICAL HAZARDS

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic mechanism by which toxic materials affect the human body.

ENABLING OBJECTIVES

EO1 State the purpose of the field of toxicology.

EO2 Define the following terms:

a. toxicity
b. hazard

EO3 List the factors that determine the degree of a hazard.

EO4 State the potential routes for a substance to gain entry to the body.

EO5 Define the following terms:

a. acute
b. chronic

INTRODUCTION

EO1 State the purpose of the field of toxicology.

The purpose of the field of **TOXICOLOGY** is to study the effects of chemicals on living organisms. In other words, how an exposure to a given chemical affects your health.

Each day, everyone is exposed to a variety of substances. Although most present **NO** health hazard under ordinary circumstances, all have the potential for being harmful at very high concentrations.

TOXICITY AND HAZARD

EO2 Define the following terms:

a. toxicity
b. hazard

A distinction must be made between toxicity and hazard. **TOXICITY** is the ability of a substance to produce an unwanted effect when the substance has been introduced at a significant concentration within a specific area of the body. **HAZARD** is the likelihood that a substance can produce its toxic effect under given circumstance.

Once a toxic material is taken into the body there are many factors affecting the degree of hazard.

EO3 List the factors that determine the degree of a hazard.

Route of Entry	How a substance is introduced into the body.
Dosage	The quantity of a given substance introduced into the body.
Physiological State	Fatigue, illness and alcohol impairment.
Environmental Variables	Conditions in which a given substance is being introduced.

ROUTES OF ENTRY

EO4 State the potential routes for a substance to gain entry to the body.

For a toxic substance to be hazardous, it must penetrate the outer barrier of the body and enter to affect living cells and tissues. The following are the four primary routes of entry into the body for toxic materials:

Inhalation Breathing in a substance. (Most significant route of entry.)

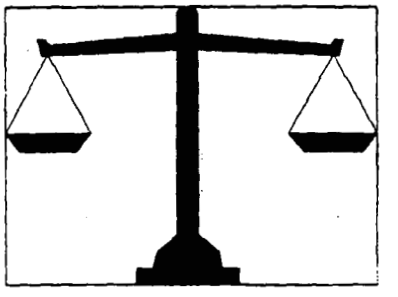
Absorption Penetration across the intact skin barrier.

Ingestion Swallowing the substance either directly or indirectly. An example of indirect swallowing would be substances that migrate from the upper respiratory tract back to the pharynx (part that joins respiratory tract and esophagus) where it can be swallowed.

Injection Entry through open wound.

DOSE-RESPONSE

All toxicological considerations are based on the Dose - Response Relationship.



THE DOSE - RESPONSE RELATIONSHIP is the correlation between the amount of exposure to a given substance and the effect on the body.

It is important to understand that each individual will respond differently to a given dose of a substance.

Laboratory studies on animals are conducted to determine a substance's dose-response relationship. The studies performed are primarily to establish what is called a Lethal Dose 50 (LD_{50}).

Lethal Dose 50 (LD_{50})

A calculated dose of a substance which is expected to cause the death of 50% of an entire defined experimental animal population. It is determined from the exposure to the substance by any route other than inhalation.

NOTE: This calculated dose is for all routes of entry with the **EXCEPTION** of inhalation. When considering inhalation, **Lethal Concentration 50 (LC_{50})** study factors have been established.

Lethal Concentration 50 (LC_{50})

A calculated concentration of a substance in air, exposure to which for a specified length of time is expected to cause the death of 50% of an entire defined experimental animal population.

DOSE EFFECTS

EO5 Define the following terms:

a. acute
b. chronic

When toxic materials are taken into the body, the substances will produce their toxic effects in accordance with the dose-response relationship. The toxic effect of a substance can be divided into two distinguishable exposure effects.

- **Acute**
- **Chronic**

Acute Exposure Effects - Are effects which involve a short-term exposure to high concentrations of a given substance which results in an immediate response (within 24-hours).

Acute exposure effects are typically sudden and severe and are usually a result from an unplanned accident or event.

An example is inhaling high concentrations of carbon monoxide or swallowing a large quantity of a cyanide compound. The result would be an immediate biological systemic response.

Chronic Exposure Effects - are effects which involve repetitive or continuous exposure to low concentrations of a harmful substance over a long period of time.

Chronic exposures usually result in delayed responses.

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ASBESTOS

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the hazards of asbestos and methods of preventing asbestos exposure.

ENABLING OBJECTIVES

EO1 Identify materials in which asbestos may be found at the FEMP.

EO2 State the two conditions in which asbestos containing materials may be found.

EO3 State the potential health hazards associated with asbestos.

INTRODUCTION

Asbestos is a naturally occurring mineral retrieved from mines within the countries of Canada and South Africa.

Asbestos is useful because it has specific qualities:

- Asbestos has very good heat insulating properties.
- Asbestos is durable and provides excellent chemical resistance.
- Asbestos applications have been used in over 3,000 different products.
- Asbestos-containing materials are not comprised of 100 percent raw asbestos. Normally only a small percentage of asbestos is blended with other materials, such as vinyl, cement, or dry wall compound.

COMMON USES OF ASBESTOS

EO1 Identify materials in which asbestos may be found at the FEMP.

Asbestos has been manufactured into a variety of products. Older installations using these products should be suspected of containing asbestos unless proven otherwise. In its manufactured state, this material is not hazardous. It is when the material is allowed to separate into smaller particles enabling airborne contamination that the material becomes hazardous. The following are examples of asbestos containing materials found at the FEMP:

- Transite Wall Material
- Vinyl Floor Tile
- Pipe Insulation
- Ventilation Ducts
- Boiler Insulation
- Valve Packing and Flange Gaskets
- Wire Insulation
- Brake Shoes and Disk Pads

CONDITIONS OF ASBESTOS

EO2 State the two conditions in which asbestos containing materials may be found.

FRIABLE Can be crumbled, pulverized or reduced to powder by light pressure between fingers, when dry.

NON-FRIABLE Intact and undisturbed asbestos-containing materials in which the asbestos fibers cannot be released to the atmosphere.

ASBESTOS HEALTH HAZARDS

EO3 State the potential health hazards associated with asbestos.

Exposure to airborne asbestos fibers above allowable limits can lead to elevated rates of lung cancer, asbestosis, and mesothelioma, all of which are debilitating and can be fatal illnesses.

ASBESTOS SURVEILLANCE

The FEMP has established a committee for managing on-site asbestos-containing materials. To help determine the locations and conditions for on-site asbestos-containing materials, the asbestos committee contracted a comprehensive surveillance study.

This comprehensive study consisted of:

- Bulk Sampling
- Sample Analysis
- Labeling Sampled Areas
- Labeling those areas in which Asbestos-Containing Materials presence was confirmed

Industrial Hygiene regularly performs asbestos surveillance by bulk material and air sampling.

ASBESTOS RESPONSE

EVACUATE THE AREA AND IMMEDIATELY NOTIFY YOUR SUPERVISOR IF YOU:

- Find Friable Asbestos-Containing Materials
- Discover a white powdery-type substance near or under a suspected Asbestos-Containing Material.

If your duties require you to enter a friable asbestos area additional training will be required.

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CONFINED SPACES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the hazards of confined spaces.

ENABLING OBJECTIVES

EO1 List the characteristics that define a confined space.

EO2 Identify examples of confined spaces located at the FEMP.

INTRODUCTION

Confined spaces present many hazards to workers and have contributed to injury and fatality in many different work places. A confined space is not always evident, leading to a false sense of worker security.

CONFINED SPACE CHARACTERISTICS

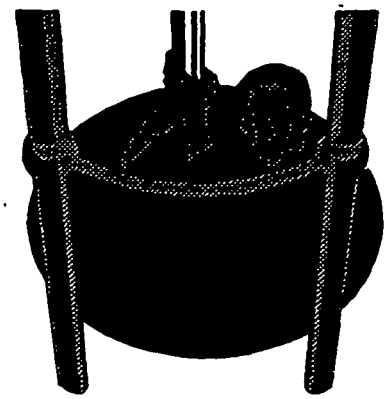
EO1 List the characteristics that define a confined space.

A space must have all the following characteristics to be considered a Confined Space.

- Limited or restricted means for entry or exit.
- Large enough and so configured that a worker can bodily enter the space and perform assigned work.
- Not designed for continuous employee occupancy.

CONFINED SPACE EXAMPLES

EO2 Identify examples of confined spaces located at the FEMP.



- Manholes
  - ▸ Electrical
  - ▸ Sewage
  - ▸ Telephone
- Storage Tanks and Vessels
- Furnace Enclosures/Boiler Units
- Dust Collectors
- Silos
- Pits, Ditches, and excavations may be a confined space under certain circumstances.

PREREQUISITES FOR CONFINED SPACE ENTRY

Evaluation and Permit

All Confined Spaces must be evaluated and a confined spaces permit issued prior to entry. If the space does not contain or have the potential to contain any hazard capable of causing death, serious physical harm, or of preventing self-rescue, it is a Non-Permit Space. Entry will then be allowed without a Confined Space Entry Permit. Otherwise it will be a Permit Space requiring a Confined Space Entry Permit to be issued prior to entry.

WHEN DOES CONFINED SPACE ENTRY OCCUR?

When any part of an individual's body breaks the plane of a confined space opening.

Training

The required Confined Space Classroom and Practical Training as specified in 29 CFR 1910.146 must be successfully completed prior to an employee entering into a Permit Required Confined Space.

Procedures

Emergency Procedures are required in the event something goes wrong which warrants an emergency rescue of the individual(s) within the confined space. **Never** attempt a rescue on your own.

In the event of an emergency, summon the Fernald Emergency Response Team by contacting:

- Radio the Assistant Emergency Duty Officer (AEDO), Call Number 202.
- Telephone Security Control at Extension 6511.
- Pull the Fire Alarm Box.

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TEMPERATURE EXTREMES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the hazards of working in hot and cold environments and protection against heat and cold stress.

ENABLING OBJECTIVES

EO1 Identify the environmental factors which influence the body's ability to regulate it's temperature.

EO2 Identify the factors which affect an individual's susceptibility to heat or cold injury.

EO3 State the primary types of heat and cold related injuries.

EO4 Identify the symptoms associated with the various forms of heat or cold related injuries.

EO5 Identify the appropriate response to signs of a heat or cold related injury.

EO6 Identify the major methods of preventing heat or cold related injuries.

EO7 State the methods used at the FEMP to monitor heat or cold stress in the work place.

INTRODUCTION

The human body is said to be the most adaptable organism on earth. Humans can adapt to a wide range of environmental conditions. Temperature extremes are a focus of industrial hygiene because the human body can react adversely when the body is not given time to adapt or the conditions are too extreme.

In the field of industrial hygiene, we are concerned with **HEAT STRESS** and **COLD STRESS** and the conditions that workers are exposed to temperature extremes. The temperature extreme coupled with physical labor can produce a situation harmful to workers.

HEAT STRESS

Heat stress is a major hazard, especially for workers wearing protective clothing. The same protective materials that shield the body from chemical exposure also limit the dissipation of body heat and moisture. Personal protective clothing can, therefore, create a hazardous condition.

Heat stress can occur very rapidly within as little as 15 minutes. It can pose as great a danger to worker health as chemical exposure.

In its early stages, heat stress can cause rashes, cramps, discomfort and drowsiness, resulting in impaired functional ability that threatens the safety of both the individual and other workers. Continued heat stress can lead to heat stroke and death.

COLD STRESS

As with heat stress, the human body seeks to regulate body temperature over a very narrow range of **core body temperature**. The result of cold stress is dehydration, loss of circulation to extremities, and subsequent tissue damage (frost bite). Cold stress is induced when the core body temperature falls below 97°F. In order to protect all parts of the body, methods of control must be implemented to prevent any single exposure to cold which would cause the core body temperature to fall below 95°F. Since heat always transfers from hot to cold, a low air temperature results in the body giving up heat.

THERMOREGULATION

The body has a mechanism that acts as a thermostat to regulate the body's core temperature. Body tissues and body systems react to the change in body temperature to regulate the core body temperature over a very narrow range. On an increase in core body temperature, veins dilate (open up), capillaries expand closer to the skin surface, skin pores open, and the heart and lungs increase their function to maintain blood pressure. This action allows blood in the core of the body to flow more rapidly over a larger surface area, closer to the surface of the skin. Increased circulation, dilated blood vessels, increased respiration, and perspiration all function in unison to lower blood pressure.

The opposite is true regarding a decrease in core body temperature. When the body temperature decreases, blood vessels constrict, circulatory and respiratory function decreases to lower blood pressure, pores close, and thus body heat is conserved.

EO1 Identify the environmental factors which influence the body's ability to regulate it's temperature.

There are environmental factors which affect the rate at which heat is gained or lost from the body.

The amount and speed of heat gain or loss depends on:

- The temperature of the air and surrounding objects.
- Air movement (winds or fans).
- Humidity (amount of moisture in air).

By taking into account these factors, an equivalent temperature may be determined. The equivalent temperature for a hot environment is called Wet Bulb Globe Temperature and the equivalent temperature for a cold environment is called Wind Chill.

In addition, the effect of personal protective equipment must be considered. Wearing personal protective equipment increases the potential of developing heat stress, or delays the on-set of cold stress. Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount and the type of equipment worn. Because of the effects of PPE, equipment is carefully evaluated for its potential for increasing heat stress or delaying cold stress during the selection process.

INDIVIDUAL SUSCEPTIBILITY

EO2 Identify the factors which affect an individual's susceptibility to heat or cold injury.

The incidence of heat stress depends on a variety of factors. These factors include:

- physical condition
- level of acclimatization
- age

- gender
- weight
- alcohol and drug use

Because of this variability, all workers in areas with a potential for causing heat or cold stress are closely supervised.

EO3 State the primary types of heat and cold related injuries.

EO4 Identify the symptoms associated with the various forms of heat or cold related injuries.

EO5 Identify the appropriate response to signs of a heat or cold related injury.

HEAT RELATED INJURIES

There are four kinds of adverse reactions to heat stress that we will discuss:

- **Heat Rash**
- **Heat Cramps**
- **Heat Exhaustion**
- **Heat Stroke**

Heat Rash

Heat Rash is the least severe heat stress disorder.

Symptoms

This is sometimes known as "prickly heat" and consists of profuse tiny raised red vesicles (blister-like eruptions) on affected areas with pricking sensations during the heat exposure.

Cause

Unrelieved exposure to humid heat with skin continuously wet with un-evaporated sweat leads to plugging of sweat gland ducts with retention of sweat and an inflammatory reaction.

Treatment/Prevention

Treatment consists of application of mild drying lotions, skin cleanliness to prevent infection. Prevention includes the use of under garments that "wicks" moisture away from the skin, leaving the skin relatively dry.

Heat Cramps

Heat cramps are heat injuries that are second in severity level. Heat cramps are often the first signals that the body is having trouble with the heat.

Symptoms

Heat cramps are painful spasms of muscles in the arms, legs, and abdomen used during work. Think of them as a warning of a possible heat-related emergency.

Cause

Heat Cramps are caused by a loss of water from the muscle cell along with a drop in the levels of electrolytes (salts and minerals) in the muscle.

Treatment/Prevention

To care for heat cramps, have the victim rest in a cool place. Give cool water or a commercial sports drink. Rest and fluids are usually all the person needs to recover from heat cramps. Lightly stretch the muscle and gently massage the area. The victim should NOT take salt tablets or salt water. Salt intake can exaggerate the loss of other needed electrolytes. regular consumption of fluids while in a hot environment can prevent the on-set of heat cramps.

Heat Exhaustion

Heat exhaustion is a very serious condition that occurs from increased stress on various organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration.

Symptoms

- Pale, cool, moist skin
- Heavy sweating
- Dizziness
- Nausea
- Fainting

Cause

Sustained exertion in heat, lack of acclimatization, and failure to replace water lost in sweat can lead to this condition.

Treatment/Prevention

Treatment for heat exhaustion includes the following:

- remove victim to a cooler environment
- allow individual to rest in a reclining position
- orally administer fluids

- keep at rest until fluid balance restored

Prevention for heat exhaustion includes the following:

- Acclimatization
- Measured work intervals
- Supplemental cooling
- Increased fluid intake

Heat Stroke

Heat stroke is the most serious reaction to heat stress. Heat stroke is a condition that is immediately life threatening.

Symptoms

- Red, hot, usually dry skin
- Lack of or reduced perspiration
- Nausea
- Dizziness and confusion
- Strong, rapid pulse
- Coma

Cause

Heat Stroke is caused by sustained exertion in heat by unacclimatized workers, lack of physical fitness and obesity, recent alcohol intake, dehydration, individual susceptibility, and chronic cardiovascular disease. For some unknown reason there is a failure of the body's thermoregulatory mechanism, which leads to loss of evaporative cooling and an uncontrolled rise in core body temperature.

When the thermoregulatory mechanism fails, the body temperature rises to critical levels. IMMEDIATE ACTION must be taken to cool the body before serious injury or death occurs.

Treatment/Prevention

THIS IS A MEDICAL EMERGENCY. YOU MUST GET THE VICTIM MEDICAL ATTENTION IMMEDIATELY!

Heat Stroke is treated by immediate and rapid cooling by immersion in cool water, when possible, with massage or by wrapping in a wet sheet with vigorous fanning with cool, dry air.

COLD RELATED INJURIES

EO3 State the primary types of heat and cold related injuries.

EO4 Identify the symptoms associated with the various forms of heat or cold related injuries.

EO5 Identify the appropriate response to signs of a heat or cold related injury.

There are two basic cold related injuries, referred to as either **Localized Injuries** or **Generalized Injuries**. Examples of localized injuries include:

- Frostbite
- Frostnip
- Chilblain and Trench Foot

The main example of a generalized injury is **Hypothermia**. All of these cold related injuries can range from simple discomfort, to very serious conditions that can lead to death if untreated. If any cold injury is to be termed the most serious, it would have to be Hypothermia.

Hypothermia

Hypothermia begins when the core body temperature deviates from its normal range. The visible symptoms of hypothermia depend on how low the body temperature is. The first symptoms that occur include:

- Uncontrolled shivering
- Sensation of cold
- Reduced heart rate, at times irregular
- Pulse weakens
- Blood pressure varies

As hypothermia progresses through further reductions in core body temperature, severe shaking can develop due to uncontrollable burst of energy (shiver reflex) to counteract localized effects of cold. Some other symptoms of a worsening condition of hypothermia include:

- Vague or slowed speech
- Memory lapses
- Drowsiness and incoherence

The next stages of hypothermia are most critical. At this stage, the victim becomes listless and confused. All efforts to keep warm will cease, exaggerating the situation. Pain in the extremities is usually the first sign that the danger level is being approached, but the combination of symptoms will lead the victim to ignoring the most pronounced symptoms. When the victim lapses to inactivity, unconsciousness is not very far away. At a core body temperature of 85°F, serious injuries can result from the drastic reduction in metabolic rate. Prolonged exposure in this condition results in death.

Frostbite

Frostbite can occur with or without hypothermia. Frostbite is a condition that develops when the extremities do not receive enough heat from the core body. Extremities are almost exclusively heated by blood. One of the first body reactions to cold is constriction of blood supply to preserve core body temperature. This exaggerates the onset of frostbite.

Frostbite can have a range of severity levels up to tissue destruction (necrosis). In the extreme conditions up to necrosis, infections can set in, and gangrene develops. In the most serious conditions, the limb will require amputation to prevent poisoning of the body. Less serious effects includes outer tissue loss and finger nail and toenail loss.

Frostbite results when the skin reaches freezing point (approximately 30°F). The damage to the tissue is directly related to the depth of tissue freezing, and the treatment received.

Factors affecting the onset of frostbite include air temperature, contact with frozen surfaces, and air movement. As the wind chill factor increases, frostbite can happen a lot quicker.

There are three basic degrees of frostbite:

- First Degree occurs when there is tissue freezing without blistering or peeling.
- Second Degree where there is tissue freezing with blistering and peeling.
- Third Degree where surface skin is destroyed with possible destruction of deeper tissue.

There are four basic symptoms of frostbite:

- Skin changes color in stages
  - white or grayish-yellow
  - Reddish-violet
  - Black as tissue dies

- Pain felt at first and then subsides
- Skin may blister
- Numbness, usually the first symptom of frostbite.

Frostbite usually progresses un-noticed until someone else observes the symptoms.

Frostnip

Frostnip is caused by short or long term exposure of uncovered surfaces to a cold wind. Frostnip is identified by the exposed area turning white. Frostnip is prevented by covering all exposed skin areas.

Chilblain or Trench Foot

Chilblain is the same as trench foot, except it applies to parts of the body other than the feet. Chilblain is caused by continuous long term exposure to cold without freezing of tissues, combined with persistent dampness or immersion in water. Undergarments damp with perspiration can result in this condition. Foot exposure to surface water is another source.

Prevention of chilblain is a matter of maintaining a dry skin surface. Undergarments constructed of a synthetic fiber that draws perspiration away from the skin is ideal for physical activities in a cold environment. Use of cotton or other natural fibers is not advised for physical labor in cold weather, because natural fibers will become saturated and loose the ability to draw moisture away from the skin.

EO6 Identify the major methods of preventing heat or cold related injuries.

GENERAL HEAT INJURY PREVENTION

Acclimatization

Acclimatization of workers using a breaking-in schedule (usually 5-7 days) allows the body to adapt to the additional stress of heat.

Drinking Water

Provide ample drinking water to be available at all times and to be taken frequently during the day. The quantity of water consumed by workers should be directly related to the amount of heat stress. Establish a regular break schedule in the work activities for workers to take water.

Breaks

Utilize cool and/or shaded break areas when possible.

Monitor the Job Site

The job sites are monitored for temperature, humidity, and air movement by a thermometer called the **Wet Bulb Globe Thermometer**.

As a rule, individuals are not monitored with personal monitoring equipment. However, if the individual or the supervisor deems it necessary, an individual can be monitored with an instrument that measures heart rate, which will sound an alarm if the rate becomes too rapid.

Work Schedule

Use an appropriate work/break schedule commensurate with amount of heat stress and work load.

Provide Supplemental Cooling

Cooling of workers can be accomplished by use of ice vests or vortex generators used in conjunction with supplied air that will separate cool air from warm air.

GENERAL COLD INJURY PREVENTION

Work attire is one of the best methods of preventing cold related injuries. For extremities, wear waterproof boots and insulated socks. Do not wear more than one pair of socks unless the socks were designed to be layered. Keep boots or shoes treated to preserve the waterproof integrity.

Clothing should be layered. Typical layers are the undergarment composed of synthetic fibers. These undergarments could cover the major portion of the whole body. A second layer would be the insulating layer. Again, synthetic fiber is best to draw moisture away from the undergarments. The insulating layer can be composed of more than one layer, dependent upon the weather condition and the amount of physical activity. It is best to be able to change the number of layers to adjust physical comfort. The outer layer is a shell, which at the very least is wind resistant. This layer should also act as a vapor barrier to prevent the loss moisture. The outer layer can also serve to keep dampness out to prevent saturation of the insulating layers. During periods of inactivity, an outer insulating covering can be added to guard against chills.

The key is to dress for comfort, and alter dress according to comfort. This is possible when you are not in a hazardous environment where attire is prescribed by the work permit. It must be stressed that you cannot change the PPE requirements based upon individual comfort without having such a change approved.

Another prevention to cold related injuries is knowing your own limits, and recognizing that acclimatization applies to cold as well as hot environments. A few tips to help preserve body heat in a cold environment:

- Take the time to become accustom to the cold.
- Avoid direct contact with cold surfaces with either uncovered skin or thinly covered skin.
- Maintain body water balance by drinking plenty of water.
- If clothing becomes moist next to the skin, change into dry clothes immediately.
- If you become chilled, move to a warm environment until the chills have subsided. Change into dry clothing.
- Do not ignore your extremities. If feet or hands are painfully cold, get to a warm environment. If extremities are numb, medical attention may be necessary if pain persist after warming.
- When outside in cold and windy extremes, keep skin surfaces covered. Wear face covering and goggles.

- Safety Performance Requirement 12-9 (RM-0021), "Working in Cold Environments," provides direction for the safety professionals to oversee workers in such environments. Follow F&S, IH, and RC's instructions.

MONITORING FOR HEAT AND COLD STRESS

EO7 State the methods used at the FEMP to monitor heat or cold stress in the work place.

Industrial Hygiene Technicians monitor the work place for heat and cold stress as it is needed. As previously seen, heat and cold stress is a combination of many factors. Direct measurement involves deriving an effective temperature based on the environmental variables of humidity, air movement, and direct sun light.

For heat stress, the effective temperature is called **Wet Bulb Globe Temperature**. The Wet Bulb Globe Temperature is taken with an instrument called the **Wet Bulb Globe Thermometer**.

The **Wet Bulb Globe Temperature (WGBT) Index** is used in heat stress evaluations because it is easy to determine and has the sanction of the American Conference of Governmental Industrial Hygienists (ACGIH) and the National Institute for Occupational Safety and Health (NIOSH).

When the temperature reaches 80 to 85 degrees F, the supervisor will call Industrial Hygiene. An IH Technician will determine the protective measures needed to guard against heat stress.

For **Cold Stress**, the measurement taken is called the **Wind Chill Index**. Wind Chill is the ambient temperature corrected for air movement. In cold environments, radiant heat from the sun is less of a factor and is not considered in the Wind Chill Index. Measurement of wind chill is performed by comparing the measured temperature and wind velocity. In areas of higher air movement, the Wind Chill Factor will be lower than the ambient temperature.

NOISE EXPOSURE

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize hazardous noise and methods of preventing hazardous noise exposure.

ENABLING OBJECTIVES

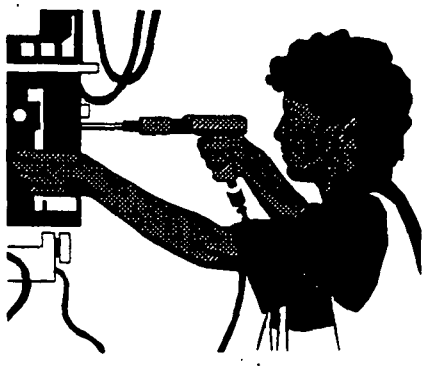
EO1 State the FEMP's limit for noise.

EO2 List the categories of noises found in industrial settings.

EO3 State the "General Rule of Thumb" for determining if you are in a hazardous noise environment.

INTRODUCTION

Since Fernald is an industrial site, the potential for an exposure to hazardous noise exists. It is important for the worker to be able to protect themselves due to the operations being conducted at the FEMP. Hazardous noise related operations may be found in:



- Building Construction/Demolition
- Heavy Equipment
- Carpentry
- Sand Blasting
- Well Drilling
- Localized construction using electric and air powered hand tools

NOISE LIMITS

EO1 State the FEMP's limit for noise.

The OSHA definition of hazardous noise is any sound emissions greater than 90 decibels on the A-Scale (dBA).

The DOE adopted standard or limit for noise is 85 dBA.

The FEMP noise limit for evaluation and control is 85 dBA.

CATEGORIES OF NOISE

EO2 List the categories of noises found in industrial settings.

Continuous Noise

Noise environment in which an employee is continually exposed during a work week. The majority of industrial operations fit into this noise classification.

Intermittent Noise

Sound emissions which are not continuous, but having intervals in between, such as the use of power tools (saws, drills, and lathes).

Impact Noise

A "Sharp Burst" of sound such as hammering or pounding.

HAZARDOUS NOISE IDENTIFICATION

Hazardous noise environments are routinely identified by Industrial Hygiene through **surveillance**.

Hazardous noise environments will be posted by signs and the wearing of hearing protection is **mandatory**.

A General "Rule of Thumb"

EO3 State the "General Rule of Thumb" for determining if you are in a hazardous noise environment.

If at a distance within three (3) feet of an operation or location, you are required to shout to be understood, the operation/location should be considered within or causing a hazardous noise environment.

So What Do I Do?

- Notify your supervisor that you suspect hazardous noise emissions.
- The supervisor will contact Industrial Hygiene for a noise evaluation.

HAZARDOUS NOISE CONTROLS

Minimization of the noise source is the best method for control. Noise source minimization includes:

- Complete isolation by relocating to another area, room, outdoors etc.
- Install sound absorbing barriers
- Substitute equipment with less hazardous noise producing equipment
- Worker use of PPE

HEARING CONSERVATION PROGRAM

In an effort to **CONTROL** noise-induced hearing loss, all employees **"ROUTINELY"** exposed to hazardous noise will be monitored through the Hearing Conservation Program.

The Hearing Conservation Program consists of:

- Employee Training and Awareness Program

- Baseline Audiometric Testing

  To compare with future annual audiometric test results to identify significant threshold shifts, and/or pre-existing hearing loss.

- Periodic Audiometric Testing

  Ensure no significant hearing loss has occurred since the baseline test or last periodic test. Periodic audiometric testing is performed during the employee's physical examination. Not all employees receive an annual physical. The audiometric test may be declined by the employee.

- Monitoring records and audiometric test results will be retained and are available for review by employees upon request.

While working at the FEMP, continuous efforts are made by Health and Safety personnel to identify and control hazardous noise emissions. However, **YOU** are the key for eliminating such hazards. Hearing plays a vital role in your life. Once impaired, it remains in that state forever.

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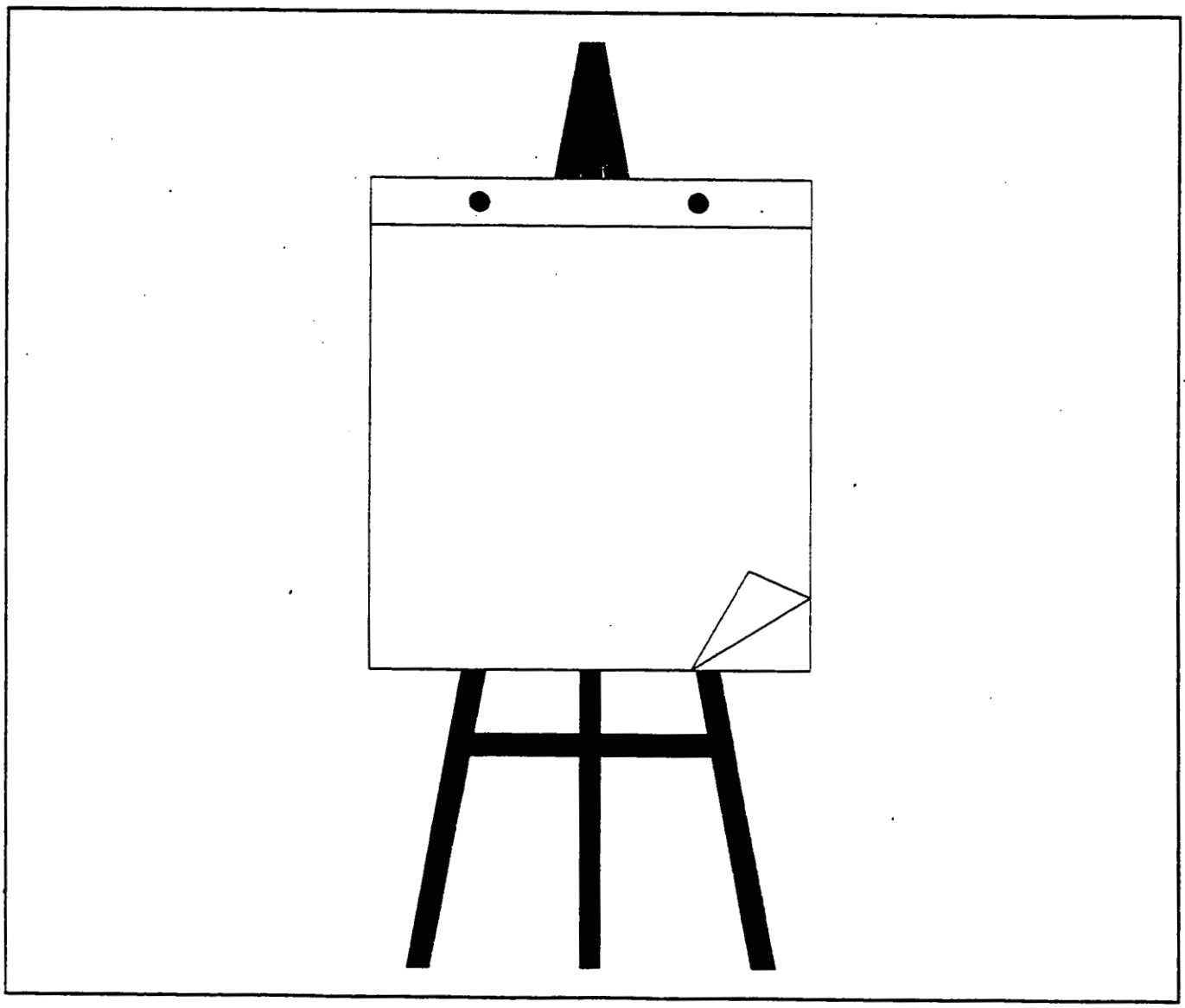
MODULE IV

IDENTIFICATION OF HEALTH HAZARDS



MODULE IV OBJECTIVES

AIR MONITORING OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basics of the FEMP air monitoring program.

ENABLING OBJECTIVES

EO1 **State the purposes for hazardous waste site air monitoring.**

EO2 **State examples of direct reading instruments.**

EO3 **State examples of laboratory analysis.**

HAZARD RECOGNITION AND HAZARD COMMUNICATION OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to identify basic chemical and physical hazards, and the method of communicating those hazards to the work force.

ENABLING OBJECTIVES

EO1 **Relate each color in the safety color code system to the safety condition.**

EO2 **Identify the agency responsible for labeling requirements for chemicals entering the work place.**

EO3 **State the purpose of the MSDS.**

EO4 **State the basic information found on the MSDS.**

JOB COVERAGE

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize how individual tasks and projects are covered from a work control standpoint at the FEMP.

ENABLING OBJECTIVES

EO1 **State the reasons for industrial hygiene inspections of the job-site.**

EO2 **State the major categories of controls available for industrial hygiene hazards in the work place.**

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AIR MONITORING

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basics of the FEMP air monitoring program.

ENABLING OBJECTIVES

EO1 State the purposes for hazardous waste site air monitoring.

EO2 State examples of direct reading instruments.

EO3 State examples of laboratory analysis.

INTRODUCTION

Air monitoring is conducted because airborne contaminants can present a significant threat to worker health and safety. Thus, identification of contaminants through air monitoring is an essential component of a health and safety program at a hazardous waste site.

PURPOSE OF AIR MONITORING

EO1 State the purposes for hazardous waste site air monitoring.

Air Monitoring is conducted as part of an overall protection program to ensure the health and safety of the workers is maintained. The air monitoring program serves to:

- Identify and quantify airborne contaminants to determine the level of hazard and worker protection required.
- Determine "HOT ZONE" (exclusion zone) boundaries.
- Assess occupational exposures to hazardous materials.
- Ensure the effectiveness of control measures.

- Evaluate hazardous material clean-up operations for successful completion.
- Evaluate employee overall health and wellness during annual medical surveillance.

CATEGORIES OF HAZARDOUS WASTE SITE MONITORING

Depending on-site conditions and project goals categories of site monitoring include:

- Personal Monitoring
- General Area Monitoring
- Perimeter Monitoring

Personal Monitoring

Personal monitoring consists of breathing zone air samples taken over a predetermined time period. In other words, sampling the same air mass that a worker is breathing. The Industrial Hygiene Section determines the sampling strategy based upon established directives and the scope of work to be performed. Sampling will usually be performed based on the "Worst Case Scenario" or the high-risk worker(s) closest to the contaminant source. This Worst Case Scenario is based on the rationale that exposure varies with distance. If workers nearest to the source are not receiving significant exposures, then in all probability, all other workers are not going to experience significant exposures as well. However, this may not be the case in all instances. It must be understood that exposures to a given substance affects each person differently, **but all exposures will be kept within limits.**

General Area and Perimeter Monitoring

Fixed-location monitoring at the "fence line," or commonly referred to as the "perimeter" of the FEMP, is performed. Perimeter monitoring is also performed within smaller areas inside the former process area. Perimeter monitoring identifies contaminant migration outside the Exclusion Zone and the potential affect on unprotected workers in the Support Zone. This enables Industrial Hygiene to evaluate the integrity of the clean areas which should remain free from contamination.

NOTE: It is important to remember that multi-substance environments associated with the FEMP pose significant challenges to accurately and safely assess airborne contaminants. Be conscious of your surroundings, if you have any questions regarding a specific operational environment, notify your supervisor. Your supervisor will contact Industrial Hygiene if necessary.

IDENTIFYING AIRBORNE CONTAMINANTS

There are **TWO** principal approaches for identifying and/or quantifying airborne contaminants at the FEMP:

- **Direct Reading Instruments**
- **Laboratory Analysis through Air Sampling**

On the majority of operations, the FEMP Industrial Hygiene Section performs both approaches.

Direct Reading Instruments

- Provide immediate information at the time of sampling, enabling rapid decision making.
- Capable of detecting Airborne Contaminant levels as low as one (1) part per million (ppm).

An example of 1 ppm would be placing one million single dollar bills within a given area (representing air), and then removing just one bill and placing it beside the stack (representing contaminant). A 1 ppm concentration may not seem like very much, but many hazardous materials can pose significant health hazards at these low levels over a period of time. An example would be "Chlorine" in concentrations of 0.5 ppm which is used at the FEMP Water Treatment Plant.

Initially, direct reading instruments are used to make immediate decisions in the field. These decisions are based on added "SAFETY FACTORS" (usually 50%), for ensuring a sound margin of safety.

Direct reading instruments were initially developed as early warning devices for use in industrial environments, where a leak or an accident could release a high concentration of a known chemical into the environment.

EO2 State examples of direct reading instruments.

Direct reading instruments must be operated by qualified personnel familiar with specific operation of the instrument. If you are required to use direct reading instruments, you will receive specialized training.

Direct Reading Instruments at the FEMP

HNU PHOTOIONIZATION DETECTOR which detects organic gases and vapors. Operates on the principal of ultraviolet light which ionizes the sample being drawn through the detector's probe.

COMBUSTIBLE GAS INDICATOR which measures the lower explosive limit (LEL) of flammable gases and vapors in the air. Operates on the principal of a combustion chamber containing a filament that ignites the flammable gas or vapor.

OXYGEN INDICATOR which measures the percentage of oxygen within a given environment.

COLORMETRIC INDICATOR TUBES which are used to measure specific and/or groups of gas or vapors. These devices consists of a glass tube containing an indicating chemical, which will change color if a particular contaminant is present.

RADIOLOGICAL SURVEY METERS of various types are used for measuring fixed, surface, and airborne concentrations of alpha, beta, and gamma emitting radionuclides (contamination monitors). Other types of instruments indicate the energy of the ionizing radiation, yielding information regarding the radiation dose rate or exposure rate (dose rate survey meters).

Advantages of Direct Reading Instruments

- PORTABILITY - Easy to carry, handle, and use.
- ACCURACY - Indicated levels routinely represent the level of hazard concentration.
- RELIABILITY - May be used under various conditions.
- DECISION LOGIC - Determining appropriate protective measures.

Disadvantages of Direct Reading Instruments

- Detect only specific classes of chemicals.
- Not designed to detect airborne concentrations below 1.0 part per million.
- False readings are possible

LABORATORY ANALYSIS

To accurately detect concentrations well below 1.0 ppm, laboratory analysis is conducted using various sampling strategies. Such sampling consists of using passive dosimeters or calibrated airflow pumps in conjunction with various types of sampling media. Air sampling may be accomplished on a wide variety of airborne substances. Upon completing the sampling period, the sample media is forwarded to a certified laboratory for analysis. The analytical results may be used to determine FUTURE levels of protection as the operation progresses or in similar operations down the road. Laboratory analysis results are the type used and retained as employees personal exposure records.

EO3 State examples of laboratory analysis.

TYPES OF LABORATORY ANALYSIS SAMPLING

Grab-bag Sampling

Typically used for gas sampling. A sample of air from the suspected area is collected for later analysis.

Filter Cassette Sampling

Typically used for particulate and aerosol sampling. The contaminant is trapped on a filter paper from air being drawn through the sample cassette, for later analysis.

Charcoal Tube Sampling

Typically used for organic vapor sampling. The contaminant is trapped in a charcoal section from air being drawn through the tube, for later analysis.

Advantages of Air Monitoring Laboratory Analysis:

- Provides a valid and defensible level of accuracy in determining employee exposure concentrations.
- May be used to determine "FUTURE" levels of protection in similar operations.

Disadvantages of Air Monitoring Laboratory Analysis:

- There is lag time between taking the air sample, and actually receiving the analysis results.
- Cost of analysis

HAZARD RECOGNITION AND HAZARD COMMUNICATION

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to identify basic chemical and physical hazards, and the method of communicating those hazards to the work force.

ENABLING OBJECTIVES

EO1 Relate each color in the safety color code system to the safety condition.

EO2 Identify the agency responsible for labeling requirements for chemicals entering the work place.

EO3 State the purpose of the MSDS.

EO4 State the basic information found on the MSDS.

INTRODUCTION

About 32 million workers are potentially exposed to one or more chemical hazards. There are an estimated 575,000 existing chemical products, and hundreds of new ones being introduced annually. This poses a serious problem for exposed workers and their employers.

Chemicals may cause or contribute to many serious health effects such as heart ailments, kidney and lung damage, sterility, burns, and rashes. Some chemicals may also be safety hazards and have the potential to cause fires, explosions, and other serious accidents.

In addition to chemical hazards, recognition of other hazards is also required. Hazard recognition involves identifying POTENTIAL hazards, and eliminating the hazards or shielding workers from the hazard.

HAZARD RECOGNITION

Safety Color Code System

EO1 Relate each color in the safety color code system to the safety condition.

The simple use of color to identify hazards and safety control equipment is another example of an administrative control. The most common colors used for this purpose include: red, orange, yellow, and green, but other colors can be used for special types of hazards.

Red is used for:

- Emergency Stop Bars or Buttons on equipment such as milling machines, lathes, power saws, grinders, etc.
- Fire Protection Equipment and Apparatus
- Safety cans or other portable containers of flammable liquids

Orange is used for:

Designating dangerous parts of machines or energized equipment. Examples include presses and shears.

Yellow is used for:

Designating caution and for marking physical hazards such as stumbling, falling, and tripping.

Green is used for:

Safety equipment such as safety showers, eyewash stations, and location of first aid equipment.

Physical Hazard Recognition

Recognition of basic physical hazards can be approached from a common sense standpoint. The key method of physical hazard recognition is the individual workers employing a **questioning attitude** and **self-checking** their own activities and the activities of co-workers.

There is not any one definitive checklist to determine all physical hazards. Each work area requires individual workers to be aware of their surrounding areas and to **"WALK YOUR SPACE."**

REGULATORY ASPECTS OF WORK PLACE CHEMICALS

EO2 Identify the agency responsible for labeling requirements for chemicals entering the work place.

Because of the seriousness of these safety and health problems, and because many employers and employees know little about them, **OSHA** has issued a rule called the "Hazard Communication Standard." The basic goal of the standard is to be sure employers and employees know about the work hazards and how to protect themselves. This should help to reduce the incidence of chemical source injury or illness.

The Hazard Communication Standard establishes uniform requirements to make sure that the hazards of all chemicals imported into, produced, or used in U.S. work places are evaluated, and that this information is transmitted to affected employers and employees working in or around those chemicals.

HAZARD COMMUNICATION STANDARD (29 CFR 1910.1200)

The Hazard Communication Standard ensures that all employers receive the information they need to inform and train their employees properly and to design and put in place employee protection programs. It also provides necessary hazard information to employees so they can participate in and support work place protective measures.

OSHA has developed a number of publications and materials to help employers and employees develop and implement effective hazard communication programs. A single free copy of any of these materials can be obtained from the area OSHA office or the OSHA Publications Office, Room N3101, Washington, DC 20210, (202) 523-9667.

The standard requires a downward flow of information, which means that producers or importers of hazardous chemicals are responsible for generating and distributing the information, whereas the users of the chemical must obtain the information and transmit it to their employees. In general, it works like this:

Who:	What:
Chemical Manufacturers and Importers	Determine the hazards of each product
Chemical Manufacturers, Importers, and Distributors	Communicate the hazard information and associated protective measures downstream to customers through labels and MSDSs
Employers	Identify and list hazardous chemicals in the work place
	Obtain MSDSs and labels for each hazardous chemical
	Develop and implement a written hazard communication program, including labels, MSDSs, and employee training, based on the list of chemicals, MSDSs, and label information
	Communicate hazard information to their employees through labels, MSDSs, and formal training
Employees	Read, Understand, and comply with MSDSs and Labels

Chemical manufacturers and importers must convey the hazard information they learn from their evaluations to downstream employers by means of labels on containers and Material Safety Data Sheets (MSDSs). In addition, all covered employers must have a written hazard communication program to get this information to their employees through labels, MSDSs, and training.

WRITTEN HAZARD COMMUNICATION PROGRAM

Employers must develop, implement and maintain at the work place, a written comprehensive hazard communication program that includes provisions for container labeling, availability of MSDSs, and an employee training program. It must also include a list of the hazardous chemicals in the work place, the means by which the employer will inform workers of the hazards of non-routine work activities, and the hazards in unlabeled process piping. The written hazard communications program need not be lengthy or complicated, but must include the required information.

HAZARDOUS CHEMICAL LABELS

Under the OSHA regulations, all hazardous chemicals must be labeled with information that permits you to determine the hazard of the product. These labels must not be removed. If material is transferred to a smaller use container, that smaller container must also be labeled.

The label includes at a minimum:

- Name of the product
- Name, address, and phone number of the manufacturer or supplier
- Hazards of the product, protective equipment or measures to protect the user, and emergency first aid information.

The information may be presented in the form of a sign, symbol, or written word. Key warning phrases that are frequently used on labels are:

Caution: Must be used with care as you are at some risk.

Warning: Presents more risk than one with a caution label. Use product with special care.

Danger: Most severe rating. Product presents a serious threat.

LABELING SYSTEMS

It is important to understand the different systems which are used to identify hazardous materials. Identification information is included on labels fixed to small containers (drums, packages, boxes) and placards fixed to large containers (trailers, rail cars, tanks).

There are several different systems; one or more may be used at the FEMP by contract personnel or by companies which supply raw materials. Some of these systems are described on the following pages.

National Fire Protection Association (NFPA) - 704M System

This system may be used on storage vessels and containers. The NFPA label can be used on all hazardous materials. This label is diamond-shaped and color-coded in 4 small diamonds. It is also number-coded (0-4) in the red, blue, and yellow diamonds. The higher the number within a diamond, the more severe that color coded hazard (see Figure 1). The Special Information (white) section may contain symbols that give more information about the chemical (see Figure 2).

NFPA - 704M System

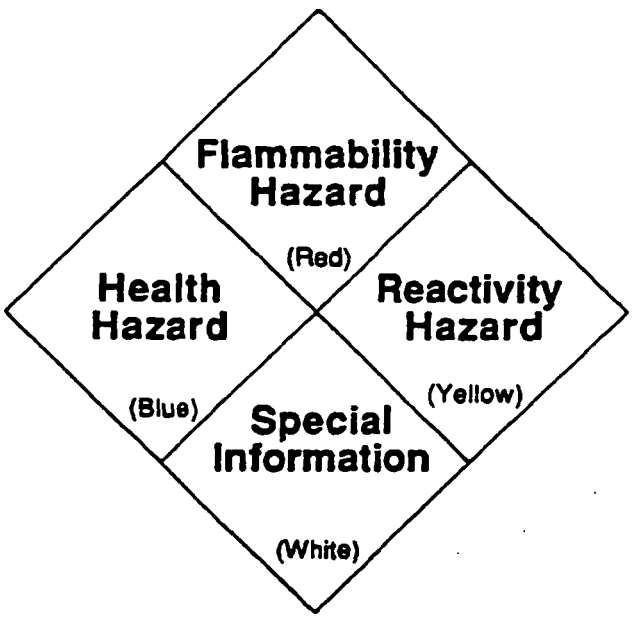

Figure 1

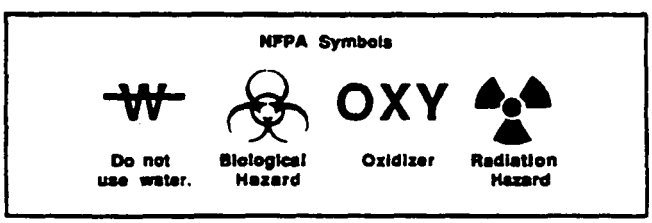

Figure 2

HMIS Label

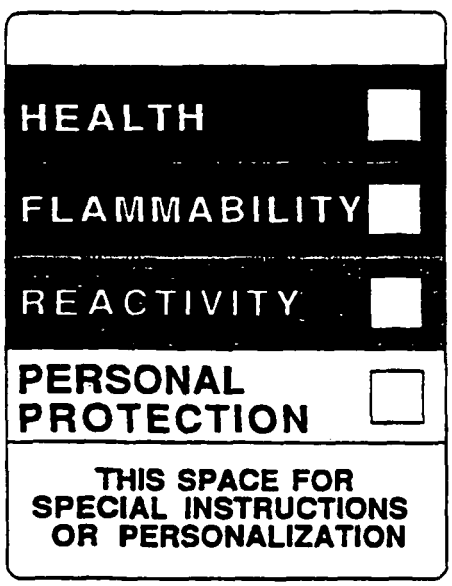

Figure 3

Hazardous Material Identification System (HMIS)

The HMIS label is rectangular, color-coded, number-coded, and letter-coded (see Figure 3).

Department of Transportation System (DOT)

DOT labels and placards are diamond-shaped, color-coded, word-coded, symbol-coded, and number-coded. The DOT label is used for hazardous materials or products containing hazardous materials that are shipped across state lines. These labels are in addition to those required by the OSHA regulation.

This example would be red with white symbols except for the black 4-digit number. This placard tells you that the substance is flammable (the flame and the red background), a flammable liquid (the UN Class number 3), and acetone (the 4-digit number 1090). The four-digit number is associated with a specific chemical (see Figure 4).

DOT Placard for Acetone

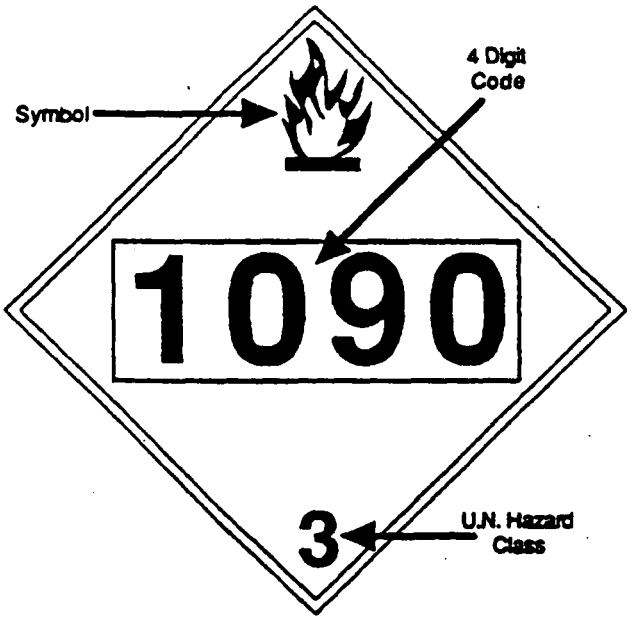

Figure 4

Hazardous Waste Label

The hazardous waste label is a marking required by the EPA and is normally seen when wastes are being transported as required by 40 CFR 262.32. The label can be any color or size (see Figure 5).

The information on the label includes:

- Generator's name and address
- DOT proper shipping name
- EPA identification number

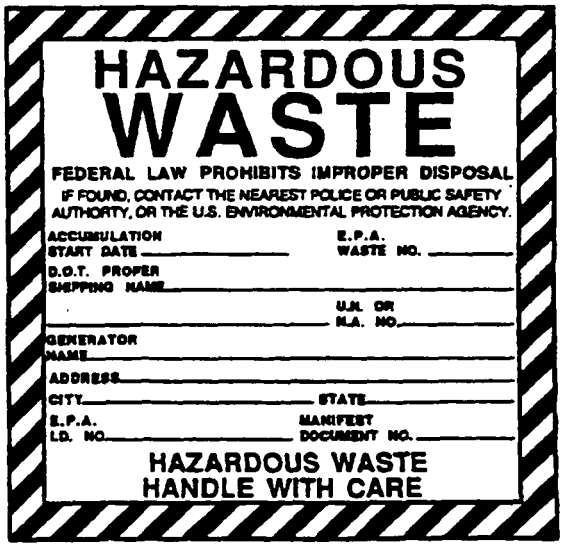

Figure 5

MATERIAL SAFETY DATA SHEETS

EO3 State the purpose of the MSDS.

The Material Safety Data Sheet, or MSDS, must provide information regarding the chemical and physical characteristics of the material, known or suspected acute or chronic health effects, exposure limits, carcinogen data (if applicable), precautionary measures, emergency and first aid procedures, and the identity of the organization preparing the MSDS. **As stated earlier in this lesson, the MSDS ensures that there is a downward flow of important chemical information from the manufacturer or importer to the ultimate user.**

Copies of the MSDSs for hazardous chemicals in a given work place must be readily accessible to employees in that area. As a source of detailed information on hazards, they must be located close to workers and readily accessible to them during all work-shifts.

MSDS Content

EO4 State the basic information found on the MSDS.

The following areas will be addressed on a specific MSDS. If a category does not apply to a specific chemical. then the category will be marked as not applicable.

I. Identity of Source.

II. Identity of Material

1. Common name
2. Scientific or chemical name
3. Trade name and abbreviation
4. Chemical formula
5. CAS reference number
6. DOT freight classification

III. List of Hazardous Ingredients

1. Exception of trade secret information
2. Availability of trade secret information

IV. Physical and Chemical Characteristics

1. Boiling Point
2. Specific Gravity
3. Vapor Pressure
4. Percent Volatile
5. Vapor Density
6. Evaporation Rate
7. Solubility
8. Appearance and Odor

V. Fire and Explosion Information

1. Conditions which could result in fire or explosion
2. Appropriate extinguishing agents
3. Approved fire fighting methods

VI. Physical Hazards

1. Materials that are incompatible
2. Conditions to avoid

VII. Health Hazards

1. Signs and symptoms of overexposure
2. Effects of acute and chronic exposure
3. Routes of entry
4. Medical conditions aggravated by exposure
5. Listing as a carcinogen or potential carcinogen
6. Occupational Exposure Limits

VIII. Special Protection Information

1. Personal Protective Equipment
2. Safe Handling Requirements
3. Engineering Controls

IX. Special Precautions

1. Special Handling and Storage Requirements
2. Spill and Leak Procedures

OCCUPATIONAL EXPOSURE LIMITS

Occupational Exposure Limits are set based on available data regarding the effects of chemicals (and other stresses) on the human body. Limits are prescribed by OSHA in the form of **Permissible Exposure Limits (PELs)**. Besides PELs, other limitations may apply, based upon recommendations from the National Institute of Occupational Safety and Health (NIOSH) or the American Conference of Governmental Industrial Hygienists (ACGIH). ACGIH recommendations are expressed as Threshold Limit Values (TLVs). There are three types of TLVs, based on a time weighted average, ceiling value, or short term exposure limit.

TLV-TWA

Threshold Limit Value Time Weighted Average is the average concentration in air of a vapor, gas, mist, fume, or dust that most workers can be exposed to during an 8 hr/day, 40 hr/week, work-shift.

TLV-C

Threshold Limit Value Ceiling is the concentration that should not be exceeded during any part of the working exposure.

TLV-STEL

Threshold Limit Value, Short-Term Exposure Limit, usually a 15-minute TWA, is the concentration to which workers can be exposed without suffering from:

- Irritation
- Chronic or irreversible tissue damage
- Necrosis - which is the "death" of a tissue

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JOB COVERAGE

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize how individual tasks and projects are covered from a work control standpoint at the FEMP.

ENABLING OBJECTIVES

EO1 State the reasons for industrial hygiene inspections of the job-site.

EO2 State the major categories of controls available for industrial hygiene hazards in the work place.

INTRODUCTION

Work generates hazards, and as previously states, the Occupational Physician, Industrial Hygienist, and Industrial Hygiene Technician work in concert to protect workers from those hazards.

PURPOSE OF INDUSTRIAL HYGIENE INSPECTIONS

EO1 State the reasons for industrial hygiene inspections of the job-site.

The purpose of Industrial Hygiene inspections is to allow Industrial Hygiene to identify, evaluate, and recommend work control measures by:

- **Familiarizing** themselves with the operation.
- **Identifying** potential health hazards associated with the operation.
- **Evaluating** the health hazard concentrations posed from a given operation. This is performed by collecting air samples for asbestos abatement, welding fumes, dusts, gases, vapors, or mists using sampling media and direct reading instruments.
- **Monitoring** employee exposure levels by conducting personal breathing zone air sampling using appropriate sampling media and/or direct reading instruments.

- **Factoring** the quantity and duration of exposure by calculating the air sampling results with the actual time of exposure. Then comparing the results to determine compliance with established OSHA permissible exposure limits (PELs).

- **Determining** adequate Engineering, Administrative, and PPE Controls.

Workers must adhere to requirements set forth by work documents and instructions. Deviation from those instructions could result in serious worker harm.

CATEGORIES OF INDUSTRIAL HYGIENE CONTROL

EO2 State the major categories of controls available to control industrial hygiene hazards in the work place.

The following is a listing of the categories of controls, and how each typically applies in day-to-day operations.

Engineering Controls

- Mechanical Exhaust Ventilation Systems

  Mechanical ventilation is either part of the facility as designed, or a temporary measure for a particular operation. Temporary installations are used to control the local quality of the air that is breathed. Mechanical ventilation can be used in conjunction with other control methods to provide maximum reasonable protection. An example would be a ventilated containment, tank, or enclosure.

- Laboratory Hoods

  Laboratory hoods are examples of containments, typically used to remove volatile or toxic fumes. Used in conjunction with Laboratory Hoods are ventilation systems and fire protection systems.

- Noise Suppression

  The typical application of noise suppression is a barrier between the noise source and workers. Selection of the medium will depend upon the intensity and frequency of the noise. Maintenance activities such as balancing, adjusting, and tuning equipment also contribute toward noise suppression.

- Supplemental Illumination

  Work conditions with inadequate light may increase worker stress and the possibility of accident due to the hazard being unseen. The type of lighting is selected based upon conditions, and if positioned improperly may produce other hazards including vision saturation (seeing spots), radiant heat, and ultraviolet light exposure.

- Berms around tanks or tank farms

  This control provides additional structural integrity and allows leakage to be contained and removed.

- Liners for Storm Water Retention Basins

  This control prevents leakage from basins into the ground, and absorption of contaminants in the structure of the basin.

- Physical barriers such as walls, rooms, and hot cells

  This control acts as a containment and along with air locks will function with the building ventilation system.

Administrative Controls

- Project Specific Health and Safety Plans and Requirements Matrices

  The health and safety plans are guidance documents and give rise to hazard analysis and applicable controls.

- Standard Operating Procedures

  Procedures provide detailed steps to performing routine operations.

- Time Limitations for Temperature Extremes

  Stay Time is an effective control method for a number of hazards in addition to temperature extremes. Stay time can also be used as a control method for noise exposure, ionizing radiation exposure, confined space activities, and elevated work activities.

- Employee Training Programs

  Hazards exist that are not normally thought of as hazards. Participation in safety training enhances employee awareness, and thus reduces the risk of injury by the mechanism of prevention.

- Permits

  A controlling administrative document for the work which provides a specific description of the task. To support the task, the permit(s) provide information regarding work **conditions**, work **limitations**, and work **requirements**.

- Barricades, Signs, Labels, and Postings

  Postings, signs, labels, and barricades are used as an extension of the worker notification and right to know requirements, and provide a visual warning of work hazards.

  There are four basic types of barricades:

  Permanent Hazard Barricades using gates and permanent signs and tags to mark the hazard.

  Temporary Hazard Barricades composed of yellow and black tape, flagging, or disposable fences.

  Warning Barricades are used to call attention to a hazard but afford no physical protection.

  Protection Barricades provide physical protection from falling as well as warning. Generally made from wooden 2" x 4" material.

  Signs, Labels, Tags, and Posters employed include:

  - Asbestos Containing Material Labels
  - Safety Posters
  - Lockout/Tagout
  - Hearing Protection Signs

- Safety Glasses Signs
- Radiological Postings and Labels

- Safety Incentive Programs

  Rewarding safe work with recognition and prizes. Recognition includes the Safety First Program and the Safety Award Program.

Personal Protective Equipment

- Respiratory Protection

  Respiratory protection is used to reduce the exposure of airborne contaminants in the breathed air, thus protecting workers from those hazards. Respiratory protection is not normally a first choice in control method before engineering and administrative controls.

- Coveralls

  Coveralls and other protective clothing are basic protection from work hazards to the body. Unless specifically designed, coveralls do not fully isolate the worker from the hazard. Coveralls simply increase the amount of time that it takes for contaminants to reach the skin.

- Hearing Protection

  Hearing protection is the basic element of personal protection against noise exposure. Use of hearing protection provides a reasonable amount of protection against audio frequencies if properly used. Used in conjunction with other noise suppression methods, hearing protection serves to conserve worker hearing.

- Safety Glasses

  Safety glasses aid in protection of the eyes against a wide range of hazards. As the hazards increase, safety glasses may be supplemented with face shields, goggles, and other types of eye protection.

- Gloves, Aprons, and Boots

  These barriers provide an additional layer of protection against hazards. Boots allow good traction and protection from physical hazards. Gloves separate the hazards from the hand according to glove materials and design. Aprons are available to protect from a wide variety of hazards including chemicals, welding, and grinding.

- Hard Hats

  Basic protection of the head. There are two basic types of hard hats. One type is the classical hard hat and the other is the "bump cap."

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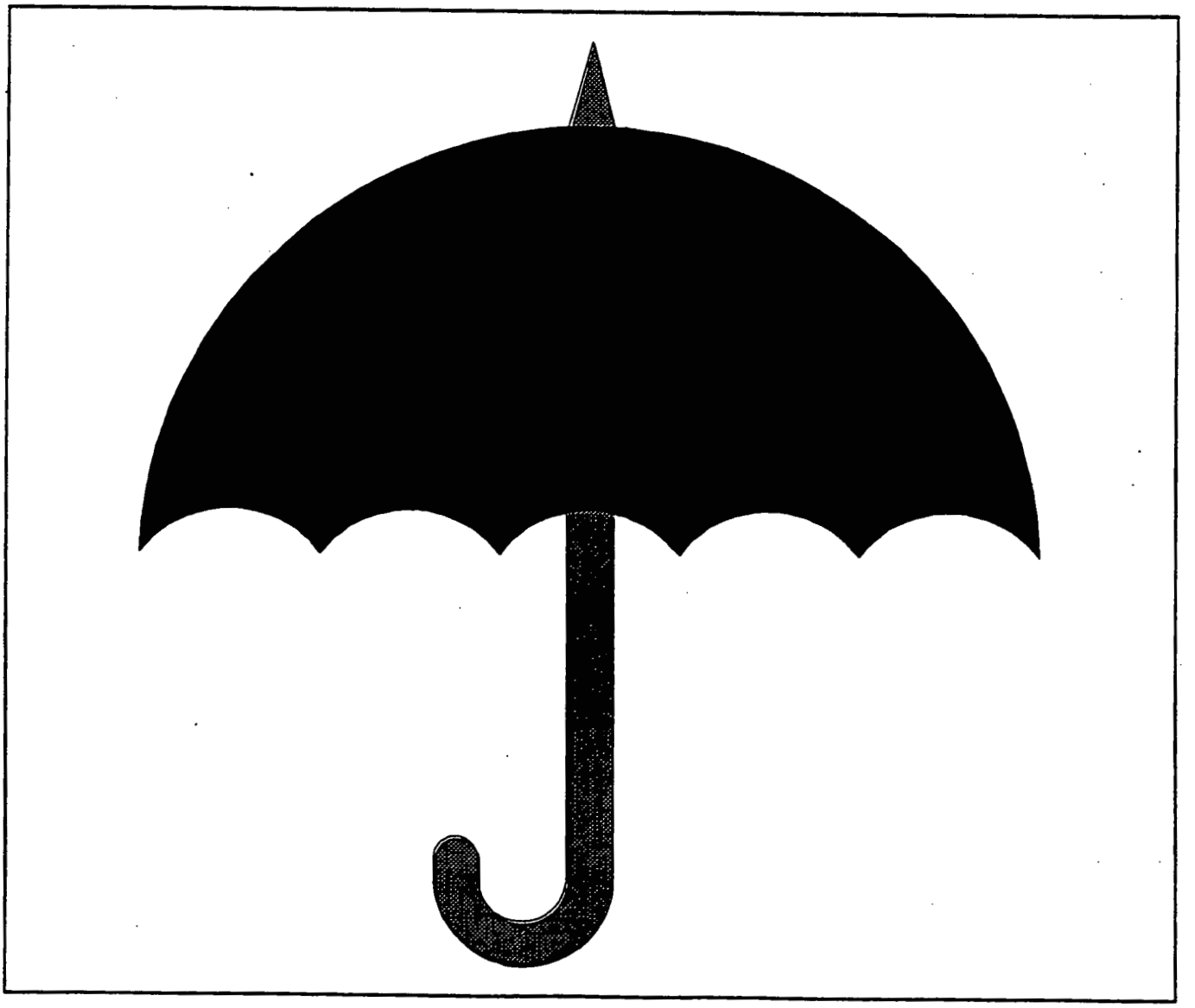
MODULE V

PROTECTION AGAINST HEALTH HAZARDS



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MODULE V OBJECTIVES

WORK PERMITS AS AN ADMINISTRATIVE CONTROL LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the proper use of a work permit as an administrative control.

ENABLING OBJECTIVES

EO1 State the purpose of a work permit.

EO2 Describe the proper use of a work permit.

EO3 Identify the basic information found on the FERMCO Work Permit.

EO4 State the responsibility of each worker regarding adherence to procedures, permits, policies, and practices.

ENGINEERING CONTROLS LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize basic engineering controls used at the FEMP.

ENABLING OBJECTIVES

EO1 State examples of engineering controls implemented to reduce hazards in the work place.

EO2 State each employees responsibility regarding the use and maintenance of engineering controls.

PERSONAL PROTECTIVE EQUIPMENT LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the proper use and care of basic personal protective equipment used at the FEMP.

ENABLING OBJECTIVES

EO1 State the purpose of Personal Protective Equipment (PPE).

EO2 State the criteria which must be considered when selecting PPE.

EO3 Identify the various types of PPE.

EO4 State the two basic types of respiratory protective equipment.

EO5 State the four levels of Chemical Protective Clothing.

EO6 State the type or level of PPE required based upon a given set of job-site conditions.

EO7 State the circumstances which require the re-evaluation of PPE requirements.

DECONTAMINATION LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic methods of decontamination used at the FEMP.

ENABLING OBJECTIVES

EO1 **List the two major types of contamination.**

EO2 **Identify methods of preventing or controlling the spread of contamination.**

EO3 **Identify the purpose of decontamination.**

EO4 **Identify the three categories of decontamination.**

EO5 **Identify methods which can be used to determine the effectiveness of decontamination.**

WORK PERMITS AS AN ADMINISTRATIVE CONTROL

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the proper use of a work permit as an administrative control.

ENABLING OBJECTIVES

EO1 State the purpose of a work permit.

EO2 Describe the proper use of a work permit.

EO3 Identify the basic information found on the FERMCO Work Permit.

EO4 State the responsibility of each worker regarding adherence to procedures, permits, policies, and practices.

INTRODUCTION

In previous lessons, administrative controls were discussed from a programmatic view. Procedures are the most evident administrative control that the worker deals with on a daily basis. This lesson will focus on one specific type of administrative control, which is that of the work permit.

WORK PERMITS

Purpose

EO1 State the purpose of a work permit.

The purpose of a work permit is to provide written authorization to perform work and to control work activities involving one or more hazards or potential hazards. Work permits contain a wealth of information designed to inform workers of the conditions in the area, ensure a pre-job evaluation has been made, and establish safe work requirements. Work permits are developed based upon process knowledge, area surveys and monitoring, previous work performed, and the nature of work to be performed.

At the FEMP, there is a single document which serves as a controlling document for most work. That document is the FERMCO Work Permit. The supervisor in charge of the work to be performed is required to submit a FERMCO Work Permit to a centralized permit group. The FERMCO Work Permit acts as the first step in the work initiation process. Other permits will be generated. There are a total of seven permits which could be generated as the result of the FERMCO Work Permit.

These seven permits are:

- Outage Permit

  These permits are issued to allow interruptions of facility services including, but not limited to: electricity, telephone/communications, roads, sewer/drainage, etc. This permit ensures that appropriate actions are taken to accommodate other operations conducted during the outage.

- Penetration Permit

  These permits are issued when a barrier such as a floor or wall is penetrated. An example would be performing a "core bore" into concrete to install a conduit. This permit ensures that appropriate actions are taken so as not to disturb other services which may pass through or on the other side of the barrier.

- Open Flame/Welding Permit

  These permits are issued for any work involving open flame, spark generation, or use of torch cutting devices. The permit ensures appropriate precautions are taken before the work begins, while the work is in progress, and following completion of the work in the interest of fire safety.

- Confined Space Permit

  These permits are issued prior to entry into a known permit required confined space. These permits assure that personnel are properly protected while working in such environments. The permit ensures proper monitoring before and during the work, and attendant personnel are present while the work is in progress.

- Asbestos Permit

  These permits are initiated when a task involves asbestos. The permits ensure appropriate actions are taken to protect workers from the hazard and that waste which is generated is properly disposed.

- Chemical/Hazardous Material Permit

  These permits are issued for any non-routine work involving hazardous waste/chemical operations. They ensure Ohio EPA, USEPA, and OSHA standards are practiced and samples collected during the operation to prevent exposing personnel to chemicals and hazardous materials above the Permissible Exposure Limits (PELs).

- Radiological Work Permit

  Radiological Work Permits (RWP) are the documents that authorize workers to perform radiological activities and describes the work to be done. These permits are obtained for any work performed in Radiological Areas as required. The purpose of an RWP is to provide a mechanism by which proper radiological controls can be prescribed by Radiological Safety.

Work Permit Use

EO2 Describe the proper use of a work permit.

Prior to performing any job requiring a work permit your supervisor will review the permit with you (pre-job briefing) to ensure you understand the hazards associated with the work and the safety precautions and controls required during the performance of the work.

You will be required to sign the work permit. Your signature indicates you understand the hazards and safety controls required by the permit and will comply with those requirements.

You will be required to sign the work permit. Your signature indicates you understand the hazards and safety controls required by the permit and will comply with those requirements.

FERMCO Work Permit Information

EO3 Identify the basic information found on a FERMCO Work Permit.

The FERMCO Work Permit is a two-page document (see page 117 and 118) which serves to ensure that required safety controls are in place prior to work commencement. **Section A** of the FERMCO Work Permit contains background information. Information found in this section includes:

- **Location** of work to be performed
- Exact **description of work** to be performed
- **Supervisor in charge** of work (single point of contact)

Section B of the FERMCO Work Permit identifies **other permits required** to be in place prior to work start. These permits are used to allow work control over specific work hazards.

Section C of the FERMCO Work Permit specifies **general safety precautions** determined by the supervisor in charge of the work, and augmented by other safety controls established by specific hazard permits. General safety precautions are divided into six areas:

- Preliminary
- Energy Control
- Accident Prevention
- Area Isolated
- Other Controls
- Egress/Fall Protection

The second page of the FERMCO Work Permit conveys the **Required Personal Protective Equipment** for the permitted task. **PPE Requirements** are conveyed on the FERMCO Work Permit to ensure that:

- All required PPE is used
- All hazards are addressed
- PPE for one hazard does not interfere with PPE for another hazard

The PPE page is divided into sections:

- Head Protection
- Protective Clothing
- Respirator
- Cartridge
- Other
- Special Safety Instructions

The **Special Safety Instructions** ensure that workers understand specific limitations regarding PPE use. Since the PPE requirements may cover up to eight permits, three safety and health groups are responsible for determining PPE and Special Instructions. Industrial Hygiene, Radiological Controls, and Fire & Safety have responsibility for specifying PPE Requirements and Special Instructions. The Special Safety Instructions are itemized with the responsible individual requiring that PPE or instruction identifying which S&H group is responsible for that instruction. Approval of PPE is performed concurrently by Radiological Controls and Occupational Safety and Health (IH and F&S). **Once the PPE requirements are approved, workers may not deviate from those requirements.**

ADHERENCE TO PROCEDURES

EO4 State the responsibility of each worker regarding adherence to procedures, permits, policies, and practices.

Verbatim compliance with procedures, permits, policies, and practices is mandatory for all workers. **It is each worker's responsibility to maintain their activities within this guideline.** When a procedure, permit, policy, or practice is not performing its intended purpose, it is the responsibility of the person having concern over this to bring the matter up to their supervisor, or the S&H personnel providing oversight over the work.

In the matter of PPE and Permits, if a worker feels that additional PPE is or is not required, that person should consult S&H personnel. Personnel may not under any circumstances alter permit or PPE requirements. Failure to adhere to permit and PPE requirements can place the individual in immediate jeopardy and result in other personnel being placed in a similar situation. **From a safety standpoint the consequences to the worker or workers is very severe.**

DURING RADIOLOGICAL WORKER I OR RADIOLOGICAL WORKER II TRAINING YOU WILL PARTICIPATE IN AN EXERCISE INVOLVING THE PROPER USE OF THE FERMCO WORK PERMIT AND A RADIOLOGICAL WORK PERMIT.

FERMCO WORK PERMIT

WORK PERMIT NUMBER:

SECTION A - BACKGROUND INFORMATION *(Completed by Supervisor-In-Charge)*

MMIC NUMBER:	JOB START DATE:	ESTIMATED COMPLETION DATE:
CONSTRUCTION WORK ORDER NUMBER:	COMPANY:	EXACT LOCATION:
EXACT DESCRIPTION OF WORK:		
SUPERVISOR-IN-CHARGE NAME:	BADGE NUMBER:	PHONE/RADIO NUMBER:
PROJECT ENGINEER/CONSTRUCTION COORDINATOR:	BADGE NUMBER:	PHONE/RADIO NUMBER:

SECTION B - TYPES OF PERMITS REQUIRED *(Completed by Supervisor-In-Charge)*

☐ OUTAGE	☐ PENETRATION	☐ ASBESTOS (posted)	☐ CHEM/HAZ MATERIAL (posted)
☐ CONFINED SPACE (posted)	☐ OPEN FLAME/WELDED (posted)	☐ HAZARDOUS WORK (posted)	☐ RADIOLOGICAL (posted)

SECTION C - GENERAL PRECAUTIONS *(Completed by Supervisor-In-Charge)*

PRELIMINARY	REQ'D.	DNA	AREA ISOLATED	REQ'D.	DNA
1. Check for Utilities	☐	☐	20. Area barricades	☐	☐
2. Health & Safety Plan	☐	☐	21. Signs (PPE)	☐	☐
3. Work Plan	☐	☐	22. Signs (Warning)	☐	☐
4. Working surface safe for load (espec. roof wk)	☐	☐	23.	☐	☐
5.	☐	☐	24.	☐	☐
ENERGY CONTROL (Lock & Tag)			**OTHER CONTROLS**		
6. Electrical	☐	☐	25. Exhaust Ventilation	☐	☐
7. Chemical	☐	☐	26. Supplied Air Ventilation	☐	☐
8. Mechanical	☐	☐	27. GFC	☐	☐
9. Other (Steam, etc.)	☐	☐	28. Screen/Shield	☐	☐
10. Specific Equipment Plan Required	☐	☐	29. Non-Sparking Tool	☐	☐
11.	☐	☐	30. Intrinsically Safe Equipment	☐	☐
ACCIDENT PREVENTION	☐	☐	31.	☐	☐
12. Fire Extinguisher	☐	☐	**EGRESS/FALL PROTECTION**		
13. Safety Shower Operable & Less Than 100 ft.	☐	☐	32. Ladder	☐	☐
14. Eye Wash Operable & Less Than 100 ft.	☐	☐	33. Scaffolds/Railings	☐	☐
15. Protection	☐	☐	34. High Lift Platform	☐	☐
16. Communications	☐	☐	35. Safety Belt	☐	☐
17. Magnetic Survey for Buried Utilities/Objects	☐	☐	36. Safety Harness	☐	☐
18.	☐	☐	37. Safety Line	☐	☐
19.	☐	☐	38. Tripod/Retrieval System	☐	☐

SUPERVISOR-IN-CHARGE:	BADGE NUMBER:	DATE:

WORK TASK REVIEWED, APPROVAL TO PERFORM WORK

FACILITY OWNER:	BADGE NUMBER:	DATE:

NO.	DISTRIBUTION OF COPIES
1	Post at Job *(ES&H Copy)*
2	Supervisor-In-Charge
3	ES&H Field Copy

IN CASE OF EMERGENCY: CALL "CONTROL" BY RADIO PHONE 6511, OR USE NEAREST FIRE ALARM BOX

PERMIT TERMINATION (WORK COMPLETED/JOB CONDITIONS HAVE CHANGED)

SUPERVISOR-IN-CHARGE SIGNATURE:	DATE:

FERMCO WORK PERMIT PPE REQUIREMENTS

WORK PERMIT NUMBER	Page: 2 of

HEAD PROTECTION ☐ None	☐ Surgeon's Cap ☒ Anti-C Hood ☐ Goggles	☐ Face Shield ☐ Welding Goggles ☐ Hard Hat	☐ Safety Glasses ☐ Other _____ ☐ Other
GLOVES ☐ None	☐ Cotton ☐ Nitrile ☐ Vinyl Liner	☐ Leather Palm ☐ Vitron ☐ Rubber	☐ Neoprene ☐ Other _____ ☐ Other
PROTECTIVE CLOTHING ☐ Double set PPE* ☐ None *Requires IH Concurrence	☐ Production Coveralls ☐ Smock ☐ Paper Coveralls ☐ Tyvek Coveralls ☐ Cloth Coveralls	☐ Saranex Coveralls ☐ Taped Openings ☐ Acid Splash Suit ☐ Fire Retardant ☐ Rubber Shoecovers	☐ Disposable Shoecovers ☐ Safety Shoes ☐ Other _____ ☐ Other _____ ☐ Other _____
RESPIRATOR ☐ None	☐ Half Mask APR ☐ Full Face APR ☐ Powered APR ☐ Continuous Flow Airline	☐ Belt Mounted Half Mask APR ☐ Air Line Half Mask ☐ Air Line w /Escape ☐ Pressure Demand Airline	☐ Air Line w /Dual Flow ☐ Hooded Airline ☐ SCBA ☐ Other
CARTRIDGE ☐ None	☐ HEPA ☐ HF Canister ☐ Ammonia	☐ Organic/HEPA Comb. ☐ Organic Vapor ☐ Acid Gas	☐ Mercury ☐ Ammonia/HEPA ☐ Other
OTHER ☐ None	☐ Ear Plugs ☐ Ear Muffs	☐ Cool Vest ☐ Other _____	☐ Other _____ ☐ Other _____

Special Safety Instructions:	RESPONSIBLE DEPARTMENT	
	Item No.	(IH, RC, and/or F&S)

NO.	DISTRIBUTION OF COPIES
1.	POST AT JOB
2.	RADIOLOGICAL CONTROL
3.	OS&H

RADIOLOGICAL CONTROL SIGNATURE:	DATE:
OS&H SIGNATURE:	DATE:

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ENGINEERING CONTROLS

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize basic engineering controls used at the FEMP.

ENABLING OBJECTIVES

EO1 State examples of engineering controls implemented to reduce hazards in the work place.

EO2 State each employees responsibility regarding the use and maintenance of engineering controls.

INTRODUCTION

Engineering controls take on a number of forms ranging from simple barriers to complex building designs for specific purposes. The use of engineering controls is dictated by a number of factors such as:

- Cost
- Benefit of protection
- Generation of other hazard risks

Engineering controls are best implemented during the design phase of a facility. Engineering controls may also be retro-fitted into an existing facility, but usually at a higher cost. In this lesson we will look at engineering controls that may be implemented in order to make operations safer.

EXAMPLES OF APPLICATION OF ENGINEERING CONTROLS

EO1 State examples of engineering controls implemented to reduce hazards in the work place.

Some examples of engineering controls that we looked at earlier included:

- Barriers
- Ventilation
- Shielding
- Equipment Design

During the design phase of a facility, engineering controls may be integrated into the process. Engineering design of a facility can address:

- Human factors (person/machine interface)
  - ▸ Minimize repetitive motion
  - ▸ Reduce unnecessary motion
  - ▸ Reduce complacency
- Area or worker isolation
  - ▸ Isolate function from workers
  - ▸ Isolate control of function from process (remote control)

- Physical barriers
  - Work cells
  - Containments
  - Compartmentalizing work
  - Walls and other barriers
- Backups
  - What if main process or protection fails?
  - Remote control shutdown of critical process which allows immediate evacuation and shutdown removed from risks.
- Indoor Air Quality
  - HVAC design and capacity
  - Airflow of work area
- Hazards from other operations incidental to main process
  - Process steam line supplying heating steam to process. The barrier or insulation around steam pipe to reduce heat radiation and possibility of personnel burns. If high energy steam line, a barrier to protect workers should line break.
  - Production line and material handling facility located under same roof would introduce risks of material handling to process workers. Barrier to separate discrete duties would minimize risks.
- Automatic controls (separation of workers from risk)
  - Automatic controls minimizes human errors by removing person from normal production loop, allowing workers to monitor automatic process.
  - Using robotics to perform a drum pallet stacking operation, instead of using worker controlled machines or manual operations.

- Suppression of hazards
  - ▸ Fire protection systems constitute suppression
  - ▸ Local ventilation also provides suppression
- Substitution of less hazardous processes
  - ▸ Use of steam cleaning versus organic solvents
  - ▸ Use of synthetic abrasives instead of silicate materials
  - ▸ Use of synthetic insulative materials instead of asbestos

EMPLOYEE RESPONSIBILITY

EO2 State each employees responsibility regarding the use and maintenance of engineering controls.

When engineering controls are implemented, **each employee is responsible for operating the equipment or performing the function as designed.** Circumventing engineering controls to make an operation more convenient introduces the worker and other unaware workers to significant harm. If the operation or equipment is not functioning as designed, **the employee must notify their supervisor and S&H personnel** monitoring the work so the work may be stopped and protective actions can be implemented.

PERSONAL PROTECTIVE EQUIPMENT

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the proper use and care of basic personal protective equipment used at the FEMP.

ENABLING OBJECTIVES

EO1 State the purpose of Personal Protective Equipment (PPE).

EO2 State the criteria which must be considered when selecting PPE.

EO3 Identify the various types of PPE.

EO4 State the two basic types of respiratory protective equipment.

EO5 State the four levels of Chemical Protective Clothing.

EO6 State the type or level of PPE required based upon a given set of job-site conditions.

EO7 State the circumstances which require the re-evaluation of PPE requirements.

INTRODUCTION

Personal Protective Equipment is designed to provide a limited user barrier between the worker and the hazard. The PPE Ensemble required for a particular task is a system of protection. Alteration, substitution, or damage to any part of the ensemble can result in the entire ensemble being ineffective protection. PPE at the FEMP ranges from Basic Protection to Chemical Protective Clothing ensembles to the highly specialized equipment used by fire fighters and rescue squads.

PURPOSE OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

EO1 State the purpose of Personal Protective Equipment (PPE).

Personal Protective Equipment (PPE) **shields or isolates** individuals from chemical, physical, and biological hazards that may be encountered during work.

Personnel must wear protective equipment when activities involve:

- known or suspected atmospheric contamination
- vapors, gases, or particulates may be generated by site activities
- direct contact with skin-affecting substances
- exposures to physical agents (noise, heat) may occur

Selection and use of clothing and equipment should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing.

Use of PPE is required by OSHA as a hazardous waste site and EPA as a Superfund Site.

SELECTION OF PPE

EO2 State the criteria which must be considered when selecting PPE.

No single combination of protective equipment and clothing is capable of protecting against all hazards. PPE must be used in concert with other protective methods.

Workers should be aware that PPE can, itself, create worker hazards such as heat stress, physical and psychological stress, impaired vision, mobility, and communication.

For any given situation, equipment and clothing should be selected that provides an adequate level of protection. Over-protection as well as under-protection can be hazardous and should be avoided.

Considerations for PPE selection are:

- Nature and type of hazard present
- Physical and chemical properties of the hazard
- Physiological effects on body
- Actual concentration of toxic material
- Immediately Dangerous to Life and Health (IDLH)
- Warning properties of the hazard
- Initial monitoring information
- Characteristics of the operations or process
- Work area characteristics and location
- Respirator Characteristics, Capabilities, and Limitations
- Respirator Protection Factor (PF)

PRIOR TO USING A RESPIRATOR, YOU WILL BE REQUIRED TO COMPLETE A RESPIRATOR TRAINING PROGRAM AND BE MEDICALLY QUALIFIED. A DETERMINATION WILL BE MADE THAT AN ADEQUATE FACE TO FACE PIECE SEAL CAN BE ACHIEVED FOR EACH TYPE OF RESPIRATOR THAT YOU MAY USE.

TYPES OF PPE

EO3 Identify the various types of PPE.

Some types of PPE include:

- Respiratory Protective Equipment
- Chemical Protective Clothing
- Eye Protection
- Hearing Protection
- Back Supports
- Knee Pads
- Hard Hats
- Safety Shoes
- Fall Protection Belts and Harnesses

RESPIRATORY PROTECTION EQUIPMENT

Respiratory protective devices consist of a face piece connected to either an air source or an air-purifying device.

EO4 State the two basic types of respiratory protective equipment.

There are **TWO** basic types:

- Air-Purifying Respirators (APR)
- Supplied-Air Respirators (SAR)

Air-Purifying Respirators (APRs)

APRs remove contaminants by the use of purifying elements contained in a canister or cartridge. Particulate APRs employ mechanical filter elements. Gas/vapor APRs use chemical absorbent, adsorbents, and chemical reactions.

Supplied-Air Respirators (SARs)

SARs consist of face piece, air line (max. 300 feet), air delivered under pressure from compressor, or a bank of compressed air cylinders. SARs are capable of supplying Grade D breathing air. The system will usually be accompanied by a five minute bottle used for escape.

The Self Contained Breathing Apparatus (SCBA) is considered an supplied-air respirator. The SCBA consists of a high pressure aluminum or steel air cylinder (2200-4500 psi), regulator(s), harness, and face piece. The package weight is approximately 40 pounds, depending on manufacturer. An SCBA allows a duration between 20 minutes to 60 minutes. Use time depends upon a number of factors, including: cylinder size, condition of user, and nature of the work performed.

CHEMICAL PROTECTIVE CLOTHING (CPC)

CPC is available in a variety of materials which offers a range of protection against different chemicals. The clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of site specific and task specific conditions.

The purpose of CPC is to place a barrier between the individual and the hazardous environment.

Performance requirements of CPC includes:

- Chemical resistance
- Durability
- Flexibility
- Temperature resistance
- Service life

- Ability to be cleaned
- Design
  - ► fully encapsulating versus multiple pieces
  - ► compatibility with respiratory equipment
- Size
- Cost

CPC can be reusable or one-use only in design. The highest level of CPC that is reusable can cost in excess of $1000.00, while a one-use suit can cost less than $50.00. This price does not include any other part of the ensemble.

LEVELS OF CPC

EO5 State the four levels of Chemical Protective Clothing.

CPC is divided into four levels according to the extent of protection that each level offers.

Levels A, B, C, and D are the designations provided.

Personnel wear CPC when activities involve:

- known or suspected atmospheric contamination which is a skin hazard
- vapors, gases, or particulates that may be generated by site activities
- direct contact with skin-affecting substances
- exposures to physical agents (noise, heat) may occur

The four levels of protection match the expected hazards. There is a logical step progression for CPCs and respiratory protection.

LEVEL OF PROTECTION NEEDED	CHEMICAL PROTECTIVE CLOTHING	RESPIRATORY PROTECTION
A	FULLY ENCAPSULATING AIR SUIT (FEAS)	SUPPLIED-AIR RESPIRATOR (SAR)
B	SPLASH SUIT	SAR
C	SPLASH SUIT	AIR-PURIFYING RESPIRATOR (APR)
D	NONE (UNIFORM)	NONE

Level of protection and equipment to use will be indicated in the Project Specific Health and Safety Plan or work permits.

CPC SELECTION CRITERIA

EO6 State the type or level of PPE required based upon a given set of job-site conditions.

Level A

The chemical substance has not been identified or has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on:

- High concentrations (actual or suspected) of atmospheric vapors, gases, or particulates.
- Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible.

Recommended Equipment

- Pressure-demand, full-face piece SCBA or pressure-demand supplied-air respirator with escape SCBA.
- Fully encapsulating, chemical resistant suit.
- Inner/outer chemical resistant gloves.
- Chemical resistant safety boots/shoes.
- Two-way radio communications.

Optional Equipment

- Cooling unit
- Coveralls
- Long cotton underwear
- Hard Hat
- Disposable gloves and boot covers

Protection Provided

Level A offers the highest available level of respiratory, skin, and eye protection.

Limiting Criteria

The fully encapsulating suit material must be compatible with the substances involved.

Level B

The type and atmospheric concentration of substances have been identified and requires the same highest level of respiratory protection as Level A, but less skin protection. This involves atmospheres with IDLH concentration of specific substances that do not represent a severe skin hazard.

Recommended Equipment

- Pressure-demand, full-face piece SCBA, pressure-demand supplied-air respirator with escape SCBA
- Chemical resistant clothing
- Inner/outer chemical resistant gloves
- Hard Hat
- Two-way radio communication

Optional Equipment

- Coveralls
- Disposable boot covers
- Face shield
- Long cotton underwear

Protection Provided

Level B offers the same level of respiratory protection but less skin protection than Level A.

Limiting Criteria

Level B is used only when the vapor or gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the skin.

Level B is used only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates. Work also does not have the risk of splashes of materials that will affect exposed skin.

Level C

The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin.

- The types of air contaminants have been identified, concentrations measured, and a cartridge/canister is available that can remove the contaminant.
- All criteria for the use of air-purifying respirators are met.

Recommended Equipment

- Air-purifying respirator, full-face piece cartridge/canister equipped (MSHA/NIOSH approved)
- Chemical resistant clothing (coverall; hooded, one-piece or two-piece chemical splash suit; chemical resistant hood and apron; disposable chemical resistant coveralls)
- Gloves inner/outer, chemical resistant
- Boots (outer), chemical resistant, steel toe and shank
- Hard hat
- Two-way radio communications

Optional Equipment

- Coveralls
- Long cotton underwear
- Boot covers (outer), chem-resistant (disposable)
- Face shield

Protection Provided

Level C offers the same level of skin protection as Level B, but a lower level of respiratory protection.

Limiting Criteria

The atmospheric concentration of chemicals must not exceed IDLH levels, and the atmosphere must contain at least 19.5 percent oxygen if the cause of the oxygen deficiency is known or 20.9 percent if the cause of the deficiency is not known (ANSI Z88.2-1990).

Level D

Level D CPC is appropriate when the:

- Atmosphere contains no known hazard, and
- Work functions preclude splashes, immersion or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Recommended Equipment

- Coveralls
- Boots/shoes, leather or chemical resistant, steel toe and shank
- Safety Glasses
- Hard Hat

Optional Equipment

- Gloves
- Escape mask
- Face shield

Protection Provided

Level D should be worn only as a work uniform. It provides minimal skin protection against chemical hazards and no respiratory protection.

PPE RE-EVALUATION

EO7 State the circumstances which require the re-evaluation of PPE requirements.

In situations where the type of chemical, concentration, and possibility of contact are not known, the appropriate level of protection must be selected based on professional experience and judgement until the hazards can be better identified.

The level of protection provided by PPE selection must be re-evaluated based upon any significant change in site conditions. When a significant change occurs, the hazards should be reassessed.

Some indicators of the need for reassessment are:

- **Commencement of a new work phase** such as the start of drum sampling or work that begins on a different portion of the site.
- **Change in job tasks** during a work phase.
- **Change of season/weather.**
- **Contaminants other than those previously identified** are being handled.
- **Change in ambient levels of contaminants.**
- **Change in work scope** that affects the degrees of contact with contaminants.

All of the requirements for PPE for each task will be detailed in the Task/Project Specific Health & Safety Plan.

DECONTAMINATION

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic methods of decontamination used at the FEMP.

ENABLING OBJECTIVES

EO1 List the two major types of contamination.

EO2 Identify methods of preventing or controlling the spread of contamination.

EO3 Identify the purpose of decontamination.

EO4 Identify the three categories of decontamination.

EO5 Identify methods which can be used to determine the effectiveness of decontamination.

INTRODUCTION

Decontamination serves as a method of protection against health hazards by the removal of some or all of the health hazards. Evaluation to determine if decontamination would be effective must be performed on a case-by-case basis, applying the conditions to a cost/benefit analysis. Decontamination is mostly an Administrative Control, but it has elements of engineering controls and PPE controls.

CONTAMINATION

Contamination is material that is located in an unwanted place. Within the context of this lesson, it is chemicals or hazardous materials in an unwanted or uncontrolled location. By being in an uncontrolled location, the material may be spread out introducing the hazard to other work areas.

Types of Contamination

EO1 List the two major types of contamination.

SURFACE CONTAMINATION

Contamination which is on the surface and may or may not be easy to detect and remove (Surface may refer to skin surface, PPE surface, equipment and material surfaces.)

PERMEATED CONTAMINATION

Contamination which goes through or into the surface. Permeated contamination may be difficult or impossible to detect and remove. Contamination of this type may also continue to permeate causing unexpected exposure on the other side of the barrier (ie. permeate the surface of PPE).

Major Factors Affecting Permeation

- Contact Time

  The greater the contact time the greater possibility of permeation.

- Concentration or physical state of the chemical

  Molecules diffuse from an area of a high concentration an area of a low concentration. The greater the concentrations the greater the rate of permeation. Gases, vapors and low-viscosity liquids or solids are examples of material that may have a high permeation potential.

- Temperature increase generally increases permeation, which is based upon the volatility of the chemical.

- Permeation ability can be affected by physical characteristics, such as the size of the contaminant molecule and pore space of the surface. Permeation increases as the molecule gets smaller and the surface pores get larger.

Contamination Spread Prevention

EO2 Identify methods of preventing or controlling the spread of contamination.

The work plan or operating procedure establishes practices which promote minimizing contact with waste and thus potential for contamination by:

- Use of remote sampling, handling, and container opening techniques where possible.
- Protection of monitoring and sampling instruments by covering equipment.
- Wearing disposable outer garments and use of disposable equipment where appropriate.
- Covering equipment and tools with a coating or plastic sheeting which can be removed when appropriate.
- Placing a leaking container in a larger container (over-pack)
- Establishing PPE donning and doffing procedures.

It is very important that proper dress techniques for specific job situations be understood by team members. Also, inspection of individuals prior to area entry to assure proper dress must be done.

DECONTAMINATION PURPOSE

EO3 Identify the purpose of decontamination.

The purpose of decontamination is to remove or neutralize contaminants that have accumulated on personnel and equipment and thus protect workers from contact with the contaminant once they return to street clothes.

This process must be designed to protect workers from hazardous substances which may contaminate:

- Protective clothing
- Respiratory equipment
- Tools
- Vehicles
- Other site equipment

Careful, well-designed decontamination protects site personnel by minimizing transfer of harmful materials into clean areas.

DECONTAMINATION PLANNING

The Decontamination Plan needs to be set up before any personnel or equipment enters areas where potential exposure to hazardous substances exist. A Decontamination Plan Outline contains:

- Number and layout of Decontamination stations
- Decontamination equipment needed
- Decontamination Methods
- Contamination Control (Procedures)
- PPE removal procedures (minimize worker contact)
- Disposal methods of contaminated clothing/material

DECONTAMINATION METHODS

EO4 Identify the three categories of decontamination.

The three primary categories of decontamination methods are:

- Physical Removal
- Chemical Removal
- Combination Methods

Examples of each decontamination method are provided below.

PHYSICAL REMOVAL	
Loose Contaminants	Dusts and vapors clinging to equipment and workers may be removed by wiping or vacuuming.
Adhering Contaminants	Adhesive qualities vary greatly with specific contaminants and the temperature. Adhering contaminants may require physical removal by scraping, brushing, or wiping.
CHEMICAL REMOVAL	
Solvents	Chemical removal of surface contaminants can be accomplished by dissolving the contaminants in a solvent that is chemically compatible with equipment being cleaned. Four (4) types of solvents are commonly used in chemical removal • Water • Dilute acids • Dilute bases • Organic solvents
Surfactants	Enhance physical cleaning methods by reducing adhesion forces between the contaminants and surface to be cleaned. Household detergents most common surfactant.
Solidification	Solidifying liquid or gel contaminants. Mechanisms of Solidification • Moisture removal • Chemical reactions • Freezing
Disinfection/Sterilization	Chemical disinfectants are practical means of inactivating infectious agents. Sterilization techniques are generally impractical for large equipment and PPE.
COMBINATION METHOD	Combining more than one method of decontamination can increase the effectiveness of the operation.

DECONTAMINATION EFFECTIVENESS

EO5 Identify methods which can be used to determine the effectiveness of decontamination.

Measurement of how effective decontamination efforts have been is an important aspect of maintaining the work place free of contaminants. The following are examples of the common methods used to determine the effectiveness of such efforts.

Visual Observation	There is no reliable visual test to immediately determine effectiveness of decontamination for chemicals.
Natural Light	Discoloration, stains, corrosive effects, visible dirt may indicate contaminants not removed.
Ultraviolet Light	Some contaminants will fluoresce under UV light. UV light can present hazard to skin and eyes.
Wipe Sampling	Wipe testing provides after-the-fact information on the effectiveness of decontamination. Both inner/outer surfaces of PPE or other equipment should be tested. This would be used generally to prove that the protection strategy and decontamination process is working effectively as designed.
Cleaning Solution Analysis	Analyze cleaning solutions after use. Contaminants in final rinse indicate further cleaning is needed.
Direct Monitoring	Using Direct Reading Instruments such as a frisker or personnel monitor to determine effectiveness.

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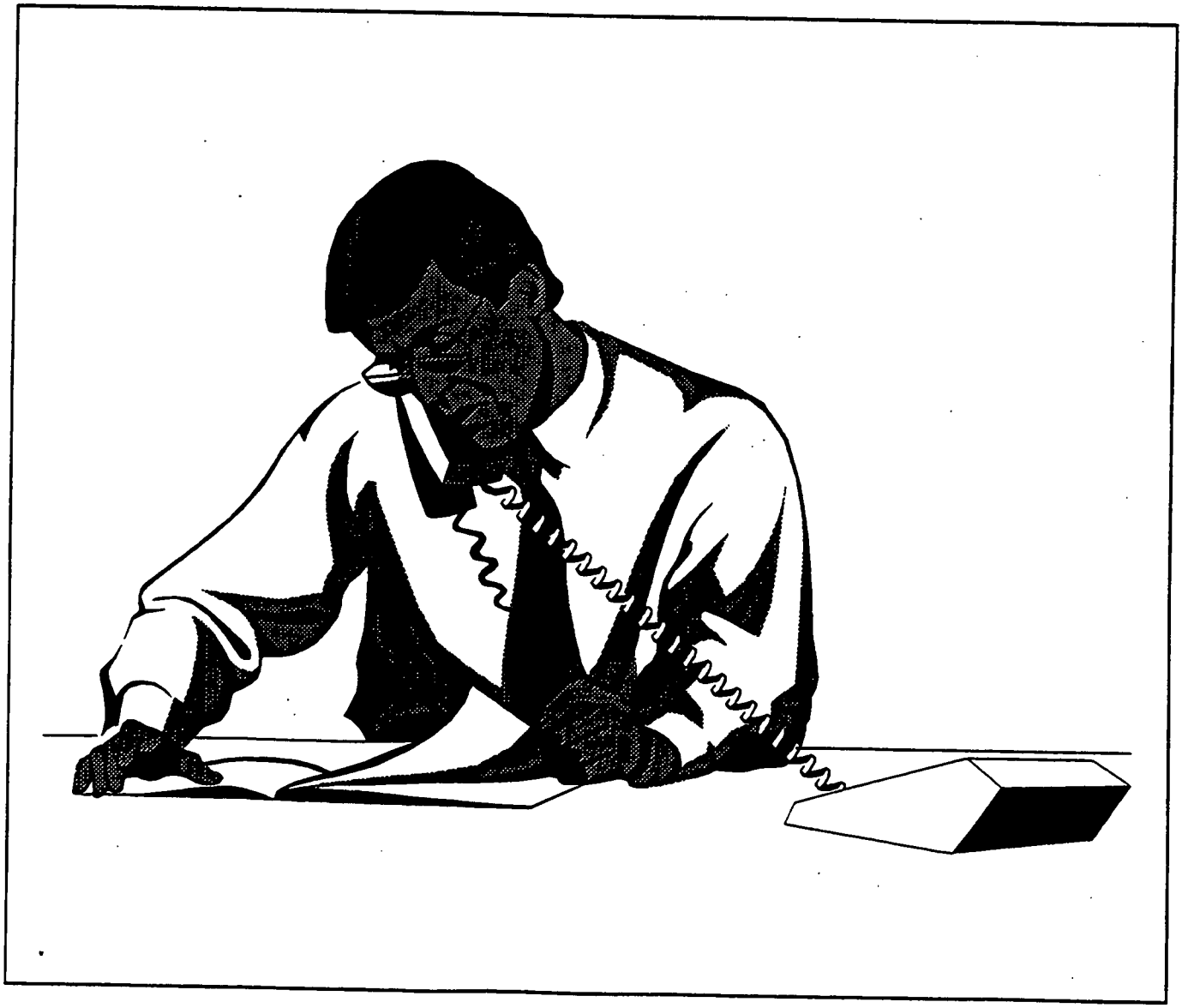
MODULE VI

WORK MANAGEMENT PROGRAMS



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MODULE VI OBJECTIVES

MANAGEMENT AND HANDLING OF CONTAINERS LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the methods of container accountability and management used at the FEMP.

ENABLING OBJECTIVES

EO1 **Describe examples of problems with drums and containers which would make them unacceptable at the FEMP.**

EO2 **Identify the FEMP Color Coding System.**

SAFETY PLANS LESSON OBJECTIVES

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic content of Project Specific Health and Safety Plans and Project Specific Health and Safety Requirements Matrices.

ENABLING OBJECTIVES

EO1 **State the purpose of the Project Specific Health and Safety Plan and Requirements Matrix.**

EO2 **Identify the elements of the Project Specific Health and Safety Plan and Requirements Matrix.**

MANAGEMENT AND HANDLING OF CONTAINERS

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the methods of container accountability and management used at the FEMP.

ENABLING OBJECTIVES

EO1 Describe examples of problems with drums and containers which would make them unacceptable at the FEMP.

EO2 Identify the FEMP Color Coding System.

INTRODUCTION

The management and safe handling of containers at the FEMP is an essential part of day-to-day operations. It is important that this process is performed in accordance with regulations and good safety practices; however, you are given this training to develop an awareness of hazards in your work environment. Please note this training will not qualify you in the movement and handling of containers at the FEMP.

REGULATING AGENCIES

Statutes, implementing regulations and orders which apply to the management and safe handling of drums are administered through the following governmental agencies:

- Occupational Safety and Health Administration
- Department of Energy
- U.S. Environmental Protection Agency
- Ohio Environmental Protection Agency
- Department of Transportation

Occupational Safety and Health Administration

Title 29 of the Code of Federal Regulations Parts 1910 and 1926 has rules pertaining to the:

- Storing, containing, and handling chemicals and containers.
- Proper use of equipment used for handling materials.

US Department of Energy

The Atomic Energy Act has provisions pertaining to:

Proper management of fissile material through spacing restrictions that maintain safe operating conditions by reducing the possibility of interaction between uranium-bearing materials. (Nuclear Criticality Safety)

United States Environmental Protection Agency (USEPA)

Title 40 of the Code of Federal Regulations Parts 264 and 265 has provisions pertaining to:

- Type of container
- Maintenance of container
- Design and maintenance of storage area
- Contingency Plan
- Frequency of Inspection

Title 40 of the Code of Federal Regulations Part 262 has provisions pertaining to:

- Obtaining USEPA Identification Number
- Manifests
- Pre-transport Requirement
- Record Keeping and Reporting

Ohio Environmental Protection Agency

The Ohio Environmental Protection Agency is organized under the state department of health. Ohio EPA regulations closely mirror the federal drum management standards. Ohio has been authorized by the USEPA to develop its own program and enforce its regulations.

United States Department of Transportation

Title 49 of the Code of Federal Regulations Parts 171 through 178 has\provisions pertaining to the procedures and requirements for shipment of hazardous wastes containers using various modes of transportation.

STORAGE AREA CONSIDERATIONS

Hazardous Waste Storage Areas

FEMP requirements for storage areas serve to meet the regulatory driver requirements. The following are requirements for Hazardous Waste Storage Areas:

- Maintain proper aisle spacing
- Stock spill kit and fire control equipment in area
- Arrange containers so the labels can be seen and condition be checked
- Store waste on an impervious base to prevent waste and water seepage through soil
- Floor should be sloped and/or containers should be stacked on pallets
- Separate incompatible waste
- Prevent run-on (of storm water) and protect containers from the weather
- Inspect at least weekly

Unacceptable Conditions

EO1 Describe examples of problems with drums and containers which would make them unacceptable at the FEMP.

As a non-drum handler, stay aware of your surroundings and be on the look out for any of the following problems with containers in your work spaces. Whenever you encounter any of these circumstances report the condition immediately to your supervisor.

- Deterioration such as:
  - corrosion
  - rust, holes, dents
  - leaks
- Signs of drum pressure such as:
  - swelling
  - bulging
- Unlabelled drums

FEMP COLOR CODE AND LOT MARKING

Management of fissile materials at the FEMP is directed by the DOE through the Atomic Energy Act. These nuclear safety requirements of fissile materials at the FEMP, for the most part, are accomplished through strict identification and spacing requirements.

Lot Marking

Lot marking accomplishes the identification requirements of hazardous waste. Used in conjunction with the Color Coding System, Lot Marking provides a means for the control and accountability of nuclear materials which is required by the DOE. This same system used for the identification of nuclear materials is now being applied to the identification of hazardous waste.

The FEMP Lot Marking System is used for the following:

- Identification of nuclear materials
- Identification of hazardous waste

Color Coding System

EO2 Identify the FEMP Color Coding System.

Criticality is a nuclear reaction resulting in the fissioning of material. When that nuclear reaction is self-sustaining, it is said to be CRITICAL.

The FEMP Color Coding System plays a two fold purpose.

- Satisfying the criticality spacing restriction requirements of nuclear materials by reducing the possibility of interaction between uranium-bearing materials.
- Means of indicating the contents of a container so that a site worker can easily recognize a potentially hazardous situation.

Collectively, the system ensures safe transport and storage of uranium bearing materials by reducing the possibility of intermixing enrichments.

There are three basic colors used for painting the body of containers at the FEMP:

Black Drums	Black drums are used for depleted, normal, and enriched uranium with a corresponding enrichment stripe. Black drums are also used to contain non-nuclear materials.
Red Drums	All solid red drums are used only for restricted enriched uranium.
White Drums	White drums are used to package waste materials to be shipped off-site or Thorium bearing materials.

The following table provides a more detailed combination of color codes and container markings for various types materials:

ENRICHMENT	CONTAINER	STRIPE	MARKINGS
Depleted	Black	Green	White
Natural (Normal)	Black	Yellow	White
Enriched, Unrestricted	Black	Red	White
Enriched, Restricted	Red	None	White
Declared Waste	White	None	Black
Thorium	White or Black	Blue	Black or White

SAFETY PLANS

TERMINAL OBJECTIVE

Upon completion of this section in Site Worker Training, each participant will be able to recognize the basic content of Project Specific Health and Safety Plans and Project Specific Health and Safety Requirements Matrices.

ENABLING OBJECTIVES

EO1 State the purpose of the Project Specific Health and Safety Plan and Requirements Matrix.

EO2 Identify the elements of the Project Specific Health and Safety Plan and Requirements Matrix.

INTRODUCTION

Prior to FEMP personnel beginning a specific project work plan involving removal action requirements and/or activities involving soil disturbance, a comprehensive evaluation outlining the specific safety and health requirements must be performed. The results of this evaluation are then used to develop what is called a Project Specific Health and Safety Plan (PSHSP).

A Project Specific Health and Safety Requirements Matrix (PSHSRM) is an attachment to the PSHSP that separates the project into key tasks. Primary hazards and the suggested mitigation is then identified for each task.

These documents will be reviewed by all applicable personnel during a "Pre-Entry Briefing" prior to initiating the project.

Each worker will be required to sign, date, and enter their assigned badge number on an Acknowledgment Form which will remain attached to the plan.

PURPOSE

EO1 State the purpose of the Project Specific Health and Safety Plan and Requirements Matrix.

The purpose of the Project Specific Health and Safety Plan and Requirements Matrix is to identify the health and safety hazards posed during each phase of the project and include the requirements and procedures for employee protection.

CONTENTS

EO2 Identify the elements of the Project Specific Health and Safety Plan and Requirements Matrix.

The contents of a PSHSP should address the following:

- The SAFETY and HEALTH RISKS to include HAZARD ANALYSES associated with each task and/or operation listed in the project work plan.
- Employee TRAINING ASSIGNMENTS to assure completion of the following elements:
  - Names of personnel responsible for project's safety and health to include alternate responsible personnel.
  - Health, safety, or other potential health hazards posed from the project.
  - Proper use of personal protective equipment.
  - Established work practices which will minimize worker risks from health and safety hazards.
  - Safe use of engineering controls and equipment.
  - Medical surveillance requirements which include recognition of the signs and symptoms indicating a possible overexposure.

- Specific Training on project operations warranting:
  - Decontamination
  - Emergency Response
  - Confined Space Entry
  - Spill Containment
- Personal Protective Equipment required for use during each phase of the project.
- Medical Surveillance Requirements for those workers who:
  - Either are, or may be exposed to hazardous substances or health hazards at or above the permissible exposure limit (PEL).
  - Workers who are required to wear respiratory protection for 30 days or more a year.
  - Become injured
  - Develop signs or symptoms of illness due to possible overexposure involving hazardous substances or, health hazards from an emergency response or hazardous waste operations.
- Members of the Hazardous Materials Team, known on the FEMP as the Emergency Response Team (ERT).
- Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques.
- Project Control Measures listing the following:
  - Project Area Map
  - Identified Work Zones (i.e. Exclusion Zone, Contamination Reduction Corridor, Access Control Points, and Support Zone)
  - Use of the "Buddy System"

- Communications in the event of an emergency.
- Standard Operating Procedures for Safe Work Practices.
- Identifying the nearest medical facility for providing assistance in the event of an emergency. The FEMP has an on-site emergency medical treatment facility in conjunction with trained emergency response technicians.
- Decontamination Procedures for all phases of the project will be established consisting of:
  - A decontamination procedure developed and communicated to the workers prior to beginning the project.
  - Developing standard operating procedures to minimize employee contact with hazardous substances.
  - Workers departing the project exclusion zone area shall be decontaminated if necessary; all contaminated clothing and equipment leaving the area shall be appropriately disposed of or decontaminated.
  - Health and Safety monitoring decontamination procedures to determine the effectiveness.
- Illumination Requirements
- Showers and Changing Rooms outside the contamination area shall be provided in accordance with 29 CFR 1910.141.
- An Emergency Response Plan will be developed to assure safe and effective emergency responses.
- The plan will outline Confined Space Procedures.
- A Spill Containment Program shall be implemented in order to contain and isolate the entire volume of hazardous substances.

Refer to the Nitric Acid Tank Car and Area Removal Action Project Specific Health and Safety Plan, dated March 1993, beginning at the end of this lesson.

The contents of a PSHSRM should be developed at the same time as the PSHSP and contain the following information:

- Key tasks
- Recognized primary hazards
- Suggested mitigations for each hazard
- Written in concise terms that are easily understood by the personnel performing the work
- Use a horizontal format, much like an expanded JSA

Refer to the PSHSRM on Page 190 after the Nitric Acid Tank Car PSHSP.

Training you have received during General Employee Training, Site Worker Training, and Radiological Worker Training fit together to form a complete picture of just how important Safety Plans are in protecting you and your co-worker's safety and health.

When being assigned to a new or existing project, carefully read and understand the applicable Safety Plan for that particular project.

Ask questions concerning those areas not fully understood. Most importantly, WALK YOUR SPACE and develop SAFETY as an "ATTITUDE." A safe step is a productive step!

SAMPLE PROJECT SPECIFIC HEALTH AND SAFETY PLAN

The following text was taken from the Nitric Acid Tank Car and Area Removal Action Task Project Specific Health and Safety Plan, dated March 1993. The information contained within is verbatim, however the text was reformatted to conform to the style of this training document. Other than the signature cover page and the table of contents, all text is in-tact (including old telephone numbers) and complete. The outline format of current PSHSPs is slightly different due to procedural changes, yet the basic information is the same.

1.0 SCOPE OF WORK

This Health and Safety Plan (HASP) is to be used during the Nitric Acid Tank Car and Area removal action. Compliance with this plan is required of all personnel who enter the Exclusion or Contamination Reduction Zone associated with this project.

All persons associated with this removal action will be required to read this health and safety plan. Upon reading, the person must sign an acknowledgement log stating they have read and understand the conditions of this plan (Attachment A). The acknowledgement log will be controlled by the removal site supervisor. Visitors who will not be performing any work-like activities will be briefed on the contents of this Health and Safety Plan. The escort shall remain with the visitor at all times when in the vicinity of the exclusion zone.

1.1 TASK

A detailed description of tasks can be found in the Removal Action Work Plan. The tasks associated with this removal action include the following:

- Site preparation and contents sampling
- Tank car contents removal
- Treatment, characterization, and disposal of contents
- Decontamination and disposal of tank car
- Collection and analysis of soil samples

1.2 REGULATIONS AND GUIDELINES

All activities conducted during the Nitric Acid Tank Car and Area removal action at the FEMP shall be in compliance with the provisions and requirements of the following documents:

- U.S. Department of Labor OSHA Standards, 29 CFR (Code of Federal Regulations) Part 1910 and 1926, specifically 1910.120 - "Hazardous Waste Operations and Emergency Response."

- FEMP (Fernald Environmental Management Project) Comprehensive Environmental Safety and Health Program, Fernald Environmental Remediation Management Corporation, ESH-1-1000, February 15, 1993.

- FMPC Site Health and Safety Plan, Westinghouse Materials Company of Ohio, June 1990.

2.0 ORGANIZATION AND RESPONSIBILITIES

The project organization is typically contractor-dependent. For the purposes of this plan, generic project organization is described. The removal staff's HASP organization should correspond to the organization presented in this section.

As a hazardous waste site cleanup project progresses, it may be necessary to modify some organizational aspects of the project, such as personnel responsibilities, so that individual tasks can be performed as efficiently and safely as possible. Any changes to the overall organizational structure must be recorded in the HASP and communicated to all parties involved in the work being performed.

2.1 PROJECT MANAGER

The project manager is responsible for the overall operation of the Nitric Acid Tank Car and Area removal action. The project manager will act as the contact person with the Fernald Environmental Restoration Management Corporation (FERMCO).

2.2 REMOVAL SITE SUPERVISOR

The removal site supervisor is responsible for the overall safe operation of personnel, and will ensure that the health and safety officer (HSO) is present during all activities indicated in Section 1.1. The removal site supervisor will interact and coordinate the project and schedule with FEMP site organizations.

2.3 CONSTRUCTION SAFETY MANAGER

The construction safety manager (CSM) is responsible for completing and overseeing the implementation of HASP. The CSM is responsible for selecting the HSO and overseeing that individual's site performance.

2.4 HEALTH AND SAFETY OFFICER

The HSO will be representative of the organization assigned responsibility for the removal action and is responsible for implementing HASP. This individual is responsible for radiation monitoring, air monitoring of chemicals and fumes, maintaining the Contamination Reduction Zone, overseeing construction safety, and conducting initial safety training.

2.5 DIRECTORY OF RELEVANT CONTACT ORGANIZATIONS

Title	Location	Tele.
Construction Safety and Health	Bldg.53	9060
Industrial Hygiene	Bldg.53	6211
Industrial Safety	Bldg.53	8604
Fire Protection/Emergency Response	Bldg.53	6802
Radiological Control	Bldg.53	6985
Medical Services	Bldg.53	6217
Emergency		6511
Assistant Emergency Duty Officer		6431

3.0 SITE HISTORY

The FEMP is owned by the U.S. Department of Energy (DOE) and was operated from 1952 until 1989 for the processing of high purity uranium metal. In 1989, facility production operations were placed on standby to focus on environmental remediation. The facility was formally shut down in 1991. At present, remaining work forces at the facility are focused solely on the implementation of environmental restoration-related initiatives.

The facility is a 1,050-acre parcel located in southwestern Ohio. In November 1989, the FEMP was placed on the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) National Priorities List (NPL) as a result of concerns related to past and potential releases of hazardous substances to the environment. Consistent with Section 120 of CERCLA, the DOE and U.S. Environmental Protection Agency (EPA) jointly signed a consent agreement in March 1990 establishing a schedule for the implementation of a site-wide remedial investigation (RI)/feasibility study (FS) and a series of removal actions at the FEMP. This agreement was amended in September 1991. This Removal Action Work Plan has been developed consistent with the terms of the Amended Consent Agreement.

During the period that the FEMP was producing uranium metal, nitric acid was an important process chemical used in the formation of urinal nitrate hexahydrate (UNH) solution which, through chemical transformation into uranium oxide intermediates and subsequent hydrofluorination, was used to make green salt (UF_4). Green salt, in turn, was used to produce uranium metal by a thermal reduction process with magnesium. Nitric acid was also used throughout the FEMP production area for acid cleaning and/or metal pickling operations. From 1975 until 1991, more than 56 million pounds of concentrated (55 to 60 percent, 12 N) nitric acid was purchased.

During peak production periods it was necessary to store some of the nitric acid in large portable storage containers. Tank Car DODX17135 proved to be an efficient means for temporary storage, as it could provide 100,000 pounds of transportable storage capacity for concentrated nitric acid. The car was kept on a rail siding and was not normally moved until either its contents or available storage capacity were needed elsewhere on the site. Following acid transfers, the car was transported back to the siding.

Visual inspection of the Tank Car indicated that there is a relatively small amount of liquid remaining in the tank. Although the quantity of material in the tank is small, it is not sufficiently empty to preclude the hazardous waste determination. A visual inspection of the car on February 15, 1991 indicated that between 50 and 100 gallons of material remained in the container of greater than 110 gallons can contain no more than 0.3% by weight of its capacity and still be considered "empty." Based on an estimate made via visual inspection, the quantity of material in the Tank Car exceeds this limit. The material in the Tank Car is not unused acid nor is it intended for future production or laboratory use.

The nitric acid residue in the Tank Car is considered a solid waste because it was discarded by abandonment (40 C.F.R. 261.2[b][3] and O.A.C. 3745-51-02[B][3]). Consequently, the Tank Car used to store waste is a solid waste management unit. Analysis of the residues contained in the Tank Car indicated a pH of less than one. Therefore, the acid exhibits the hazardous waste characteristic of corrosivity, and is a hazardous waste (40 C.F.R.) 261[a][1] and O.A.C. 3745 52-22-[A][1].

The Nitric Acid Tank Car (No. DODX17135), the soil beneath it, and that portion of Track #2 where the car currently resides, have been determined to be a hazardous waste management unit (HWMU) (40 C.F.R. 260.10 and O.A.C. 3745-50-10-[A][42]. This determination was made because discarded nitric acid has been stored in the car in excess of 90 days, and the acid has the hazardous waste characteristic of corrosivity (EPA Hazardous Waste Number D002).

4.0 HAZARD ASSESSMENT

This section has been prepared in accordance with Occupational Safety and Health Administration (OSHA) 29 C.F.R. 1910.120 and the Feed Materials Production Center (FMPC) Site Health and Safety Plan. All work with materials shall employ the ALARA (as low as reasonably achievable) concept for either chemical or radiological exposures. A summary of potential hazards associated with each of the individual tasks is presented in Table 4-1.

4.1 CHEMICAL HAZARDS

4.1.1 Nitric Acid

Nitric acid is the primary contaminant of concern. Because the liquid is considered a waste, additional chemical constituents may be present in the liquid. The liquid will be sampled as part of the removal action to identify any additional constituents.

The pH of the liquid is below one. Nitric acid is severely corrosive, and though not flammable, it is a strong oxidizer that can react with combustible materials to cause fires. Contact with the liquid may occur during sampling, pump out, or cleaning operations.

Health effects as a result of exposure to nitric acid are related to the corrosivity of the liquid or vapors. Severe irritation of the skin, eyes, or mucous membranes can occur. Inhalation may result in irritation of the upper respiratory tract, pneumonitis, or bronchitis. No chronic effects are associated with nitric acid.

4.1.2 Nitrogen Dioxide

When nitric acid is heated or exposed to metals, nitrogen dioxide is dependent on the time and the level of exposure. Contact with vapors is irritating to the eyes, nose, throat and wet skin. The discomfort or slight pain occurring at exposure may go unnoticed. Serious results may not be felt until hours or days after exposure, even though heavy damage may have occurred.

The cyanosis and pulmonary edema resulting from damaged lung tissue becomes disabling and can be fatal, especially if not promptly treated after exposure.

4.2 RADIATION HAZARDS

Total uranium content in the liquid is 1,400 pCi/l. The Removal Site Evaluation (Attachment 1 to the Nitric Acid Tank Car and Area Removal Action Work Plan and Closure Plan Information and Data Package) determined that radiological hazards associated with the Tank Car and contents were negligible.

The Radiation Control Technician will perform radiation surveys of the work area to ensure the personal protective equipment (PPE) requirements of this HASP are proper for the tasks to be performed. PPE requirements based on the radiation survey will be specified on the Radiation Work Permit posted at the work site.

Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion, or absorption shall immediately be reported to the removal site supervisor. The supervisor shall immediately report the circumstance of possible radioactive material intake to the Radiological Control Section for evaluation. The involved employee(s) shall report to the Urine Sampling Station at the end of the shift to submit a follow-up urine sample. Employees are responsible for complying with additional requirements as specified by the Radiological Control Section.

Table 4-1. Chemical and toxicological characteristics of Nitric Acid Tank Car materials.

Compounds	CAS#	ACGIH TLV	OSHA PEL	Routes of Exposure	Toxic Properties	Target Organs	Chemical Properties
Nitrogen Dioxide	10102-44-0	3ppm STEL 5ppm	STEL 1ppm	Inhalation Ingestion Skin/Eye Contact	Cough, mucoid frothy sputum, dyspnea; chest pain; pulmonary edema, cyanosis, tachypnea, tachycardia; eye irritation	Respiratory system, cardiovascular system	Pungent, acrid odor; yellowish-brown gas BP:70°F VP:720mm
Nitric Acid	7697-37-2	2ppm STEL 4ppm	2ppm STEL 4ppm IDLH 100 ppm	Inhalation Ingestion Skin/Eye Contact	Irritate eyes, mucous membranes skin; delayed pulmonary edema, pneumonitis, bronchitis, dental erosion	Eyes, Resp. system skin teeth	Acrid odor yellow-clean fuming liquid. BP:181° VP:48mm

BP - Boiling point (degrees Fahrenheit)
CAS - Chemical Abstract Service Registry
mg/m^3 - Milligrams per cubic meter
Pel - Permissible Exposure Limit
ppm - Parts per million
TLV - Threshold Limit Value
VP - Vapor Pressure

4.3 PHYSICAL HAZARDS

In addition to the chemical and radiological hazards previously described, a variety of physical hazards will be present similar to those associated with any removal project of this nature. These physical hazards are due to poor housekeeping, motor vehicle operation, heavy equipment operation, the use of power and hand tools, steam cleaning, hot cutting, and handling and storage of fuels. These hazards are not unique and are generally familiar to most industrial workers. They will be covered in site-specific training and, if necessary, during daily safety briefings.

Table 4-2 presents an overview of the activity-specific hazards associated with the proposed activities.

4.3.1 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps, and generators. Suspected high-noise operations will be evaluated to determine if protective measures are warranted. Employees with noise exposures exceeding 85 DBA for any period of time will require hearing protection.

4.3.2 Fire or Explosion

The potential for a fire or explosion to occur is minimal. Materials incompatible with nitric acid will be limited within the Exclusion Zone. During hot cutting of tank with an acetylene torch, the cylinders and supply lines will be in line with FERMCO procedures. Hot cutting of the tank will be considered as a last option for the final disposition of the Tank Car.

4.3.3 Steam Cleaning

Steam cleaning of the inside of the tank may yield nitric acid mists. Operators involved in this activity shall be required to wear Level B protection to afford proper face, body and respiratory protection.

4.3.4 Lifting

Lifting is the most common task associated with low back pain. Many of the injuries do not result from a single incident, but develop over a period of time. This type of injury may result from repetitive lifting. Personnel should know their lifting limits and the object to be lifted should be limited by factors such as; the route and distance to be traveled, the amount of time required and the center of gravity necessary to handle the load safely.

4.3.5 Slips, Trips and Falls

Always walk where you have a firm footing, taking short steps in slippery places. Avoid carrying anything bulky that will obstruct vision. Look for falling, slipping and tripping hazards, such as cluttered traffic areas, unguarded openings and manholes, unsteady or snow-and-ice-covered platforms, loose materials underfoot, tools hidden in the grass, and slippery, wet, oily or worn walkways. Climbing over equipment/railings to get to other items and falling off/down steep slopes can cause serious and sometimes fatal accidents.

4.3.6 Heavy Equipment

Minimize the number of personnel working around heavy equipment. All mobile equipment shall be supplied with an electronic back-up alarm. All operators will be qualified to operate their machine. Equipment will be inspected at the beginning of each shift by the equipment operator, prior to use, and the inspection results will be recorded on a daily check sheet to ensure all safety equipment and devices are fully operational.

Prior to moving the nitric acid tank car, the removal site supervisor shall ensure that the rail tracks have been inspected for possible defects along the route of travel. The rail car and any other equipment required to move the rail car shall also be inspected prior to movement to verify there are no defects present which may affect the movement of the rail car. Any defects which may be present must be corrected before moving the tank car.

4.3.7 Fall Protection

Since some of the tasks for this project entails work in elevated locations, a positive means of preventing falls will be provided and used. This can be accomplished using appropriate barricades, safety harnesses, lanyards, scaffolding, etc. NOTE: Safety belts are not permitted.

4.4 HEAT/COLD STRESS

Heat stress may affect personnel with or without protective clothing when working in high, ambient temperatures. Plenty of water, rest breaks and careful attention by the supervisor are used as control measures. When ambient temperatures exceed 80°F, the Industrial Hygiene Technicians shall be contacted to review and/or add control measures to minimize heat stress.

Task activities may be conducted when temperatures could present a potential cold stress hazard. Personnel shall become aware of symptoms in other field members as well. The removal site supervisor shall review cold stress at regularly scheduled task briefings, with particular emphasis on the work/warmup regime.

During cold weather, special care should be taken to dress appropriately for anticipated weather conditions. Attention will be given specially to the hands and feet so as to prevent frostbite.

4.5 NATURAL OCCURRENCE (WEATHER)

Outside work will be stopped if lightning, heavy or persistent rain, or other adverse weather conditions are in the area. This includes any weather conditions whose impact is judged to be detrimental by the HSO or the removal site supervisor.

Table 4-2. Activity Specific Hazards.

Activity	Radiation	Chemical	Noise	Heat/Cold Stress	Physical
Site Preparation and contents sampling	Yes	Yes	No	Yes	Yes
Tank Car Contents Removal	Yes	Yes	No	Yes	Yes
Treat, characterize and dispose contents	Yes	Yes	Yes	Yes	Yes
Decontaminate and dispose Tank Car	Yes	Yes	Yes	Yes	Yes
Collect and analyze soil samples	Yes	Yes	No	Yes	Yes

5.0 ACCIDENT PREVENTION

5.1 RESPONSIBLE INDIVIDUALS

All individuals on-site are expected to conduct themselves and act in a manner which minimizes the potential for accidents. All on-site health and safety personnel, supervisory and management personnel, and crew foremen shall ensure that individuals under their direct supervision are aware of the standard operating procedures and are implementing these procedures in a safe manner. Violations of established health and safety requirements may result in disciplinary actions up to and including dismissal.

5.2 PERSONNEL RESTRICTIONS

The items listed below are rules and restrictions to be followed by all on-site individuals and any visitors:

- Horseplay of any kind will not be tolerated.
- The personal protective equipment specified by the HSO and the HASP shall be worn by personnel.
- Eating, drinking, chewing tobacco or gum, smoking, and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the Exclusion and Contamination Reduction Zones.
- All lighters, matches, cigarettes and other forms of tobacco shall remain in the support zone.
- Individuals shall not be allowed to wear contact lenses while conducting on-site work operations in the Exclusion Zone or Contamination Reduction Zone.
- Individuals shall not be allowed to wear jewelry while conducting on-site work operations in the Exclusion Zone or Contamination Reduction Zone.
- Facial hair (beards, long sideburns or mustaches) interfering with a satisfactory fit of the mask-to-face seal is not allowed on personnel who may be required to wear respiratory protection of any kind.

- Any individual taking prescribed drugs shall inform the HSO of the type of medication. The HSO will review the matter with FERMCO Medical, who will decide if the employee can safely work on-site while taking the medication.

- Each individual shall notify support personnel before entering the Exclusion Zone, and must comply with the buddy system which will always be used for Exclusion Zone operations.

- All accidents, no matter how minor, must be reported immediately to the removal site supervisor and to FERMCO Medical.

5.3 FIRE PREVENTION AND PROTECTION

In order to minimize the potential for fires and their impact, proper fire prevention and protection procedures are necessary.

5.3.1 Fire Prevention

The following list includes some of the most often cited fire prevention rules, but is not intended to be all-inclusive:

- No smoking is allowed in the Exclusion Zone or the Contamination Reduction Zone.

- All sources of ignition are prohibited within a 50 foot radius of substances or operations which constitute a fire hazard. These operations or areas shall be posted with signs indicating: NO SMOKING OR OPEN FLAMES.

- All tanks, containers, and pumping equipment, whether portable or stationary, will be Underwriters Laboratory (UL) or Factory Mutual (FM) approved if they are being used for the storage or transfer of flammable and/or combustible liquids. These storage containers will also meet all applicable OSHA regulations.

- Equipment requiring flammable liquid fuel shall be shut down during refueling, servicing, or maintenance. This requirement may be waived for diesel-powered machinery serviced by a closed system provided that there are attachments to prevent spillage.

5.3.2 Fire Protection

Personnel involved in the Nitric Acid Tank Car and Area removal action are directed to use a fire extinguisher to provide a means of egress for escape from a fire situation or to extinguish fires in the incipient stage only. Several of the most common fire extinguisher requirements are addressed as follows:

- Portable fire extinguisher shall be provided where necessary, inspected, and maintained in accordance with National Fire Protection Association (NFPA) Regulation #10, Portable Fire Extinguisher.
- Fire extinguisher shall be conveniently placed, distinctly marked, and maintained in a fully charged and operable condition.
- All heavy machinery must be equipped with at least one dry chemical or carbon dioxide fire extinguisher having a minimum UL rating of 5-B:C.
- Fire extinguisher will be supplied in storage areas according to the hazards present.

If a fire or explosion should occur, the appropriate emergency response guidelines outlined in Section 12.0 shall be followed.

5.4 CONTAMINATION AND EXPOSURE PREVENTION

All handling of contaminated materials shall be handled as ALARA. On-site personnel have the potential to become contaminated in various ways, such as:

- Being splashed with liquids during sampling or handling operations.
- Contacting contaminated liquids or solids.
- Walking through contaminated liquids or solids.
- Contacting contaminated equipment or machinery.

All on-site personnel shall be aware of areas where contact with contaminated materials may occur. Exposures to hazardous or contaminated materials can be kept to a minimum by strict adherence to the recommended personal protective equipment and decontamination procedures.

As much care as reasonably possible will be used to prevent contamination of small equipment. Sampling and monitoring instrumentation shall not be set on contaminated surfaces. Care will also be taken to minimize contamination of monitoring instrumentation.

5.5 HOUSEKEEPING

Good housekeeping practices can reduce the potential for fire and accidents. This list includes some of the most pertinent requirements, but may not be all-inclusive:

- Tools, materials, extension cords, debris, and other items shall be properly stored and used to decrease the risk of tripping, falling, or other related hazards.
- Tools, materials, and equipment used overhead and subject to falling shall be properly secured.
- All construction areas and storage sites shall remain free from the accumulation of combustible materials. A procedure will be established for routine cleanup.
- Incompatible materials will be segregated.
- All spills of flammable or combustible liquids and the contaminated areas must be cleaned and containerized immediately.
- Work will not be allowed in untidy areas until the situation has been remedied.
- The site manager will inspect the work area daily for adequate housekeeping, record unsatisfactory findings or situations on the daily inspection report, and see that these areas are cleaned accordingly.

5.6 SAFETY MEETINGS

Initial Health and Safety Meetings. Before initiation of work operations at the site, the removal site supervisor and/or HSO will provide a health and safety briefing to all personnel present. This presentation will address the material in this HASP and any other pertinent information (previous experience has shown that this training generally requires one to two hours, depending upon the level of experience of the personnel being trained). This is addressed in more detail in Section 10.0.

Daily Safety Briefings. Before entering the Exclusion Zone each day, a short health and safety briefing will be conducted by the removal site supervisor to address the day's activities. It shall serve to notify individuals of any deficiencies requiring change or correction. It will emphasize the specific concerns associated with planned work activities. Items covered in each meeting will be documented.

5.7 ACCIDENT INVESTIGATION AND REPORTING

All accidents or injuries, however slight, resulting from on-site work activities must be reported to the removal site supervisor. Once informed, the removal site supervisor is required to complete an Accident/Incident Report and submit it to the HSO within the shift the accident occurred. If necessary, the HSO will report to the site to conduct an inspection and investigation.

5.8 WORK/REST REGIMEN

The proposed work/rest regimen will be dependent on weather conditions encountered and the level of personal protective equipment used by on-site personnel. the Nitric Acid Tank Car and Area removal action may be conducted during any of the seasons, therefore, work conditions will vary significantly in regard to weather. When ambient temperatures exceed 80°F, Industrial Hygiene shall be contacted.

The HSO, removal site supervisor, health and safety technicians and buddies will be watching the employees at all times for any potential symptoms of heat stress or any unusual behavior. These measures should help prevent occurrence of any heat stress illnesses.

5.9 BUDDY SYSTEM

Workers shall comply with the buddy system on-site, meaning that they shall enter the Exclusion Zone in groups of at least two (2) when wearing personal protective equipment. No entry will be made into the Exclusion Zone when an atmosphere exists that is immediately dangerous to life and health (IDLH). Although this situation is not anticipated, if crew members are located in the Exclusion Zone when an IDLH atmosphere is detected, they will immediately evacuate the area.

5.10 GENERAL CONSTRUCTION SAFETY HAZARDS

A variety of physical hazards will be present similar to those associated with any large construction project. Some of those hazards are as follows:

- Equipment Inspections: All vehicles in use shall be visually checked at the beginning of each shift with each operator responsible for inspecting their assigned vehicle.

- Temporary Electrical: Only qualified electricians shall perform work on energized electrical equipment. All installations shall conform with the National Electrical Safety Code. All electrical wiring and equipment shall be of a type listed with UL or FM for the specific application. Ground fault interrupters will be used in all electrical circuits for portable electric tools.

- Power and Hand Tools: All hand tools shall be in good repair and used only for the purpose for which they were designed. Power tools shall be inspected and determined to be in safe operating condition as frequently as needed. Powered tools shall be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle. In the alternative, double-insulated tools may be used if they carry a label that indicates the tool is indeed double insulated.

Only trained equipment operators are allowed to operate heavy machinery on-site. The number of personnel in the vicinity of heavy equipment operations and in contaminated areas shall be kept to a minimum. Those individuals not directly involved in work operations will be required to maintain a 30-foot distance so as to not interfere. All heavy equipment shall be properly maintained in a safe operating condition and be equipped with an audible back-up alarm. These hazards and procedures are not unique and are generally familiar to most industrial workers. They will be covered in the site-specific and daily safety briefings.

5.11 LOCK-OUT/TAG-OUT

Maintenance personnel sometimes perform work on machinery or components that normally operate under high voltages, tension or extreme pressure. Work to be performed on such equipment can cause severe trauma and sometimes death if those forces are not relieved and locked out. Equipment to be worked on should first be put into a Zero Mechanical State.

This may be as simple as unplugging an appliance, lowering a bucket to the ground or taking the key to a backhoe. Some types of maintenance may require disconnecting and blanking feed pipes, physically locking the electrical supply off, and taking active means to supply fresh air, as in confined space entries. Typical lockout procedures include the following steps:

1) Notify the operator and others that work is to be done.

2) Post signs at all control locations that the equipment is being repaired.

3) Place your lock on the electrical box, control lever, etc., and tag it.

4) Block mechanisms, if appropriate.

5) Once work is completed, have supervisor inspect before returning to service.

Lock-out/tag-out will be conducted according to FEMP procedures.

5.12 CONFINED SPACE ENTRY

During the removal action, no confined space work is anticipated. If, during the course of work, it becomes necessary to enter a confined space (such as the Tank Car), then the requirements of SPR 5-13, "Confined Space Entry" will be followed.

6.0 MONITORING

Monitoring shall be conducted for nitric acid and nitrogen dioxide during activities which involve the potential exposure to nitric acid liquid. Monitoring shall be conducted on materials and personnel as detailed in Section 3.3 of the plan and as summarized in the following section. The action levels are identified in Table 6-1.

6.1 AIR MONITORING FOR CHEMICALS

Air monitoring for nitric acid using calorimetric tubes will be performed during all phases of liquid handling. The range of the calorimetric tubes is 1 to 50 ppm. Monitoring will occur during operations which the HSO deems as potential sources of exposure. The number of samples taken during an operation shall be determined by the HSO and shall be based upon the operation and engineering controls present.

Air monitoring for nitrogen dioxide using calorimetric tubes or real-time monitoring instruments will be performed during all phases of liquid handling. The range for calorimetric tubes is 0.5 to 25 ppm. Two instruments are available for real-time monitoring of nitrogen dioxide: Metrosonics or Dräger alarming NO_2 reach IDLH concentrations.

6.2 RADIATION

Radiological areas will be posted in accordance with the DOE Radiological Control Manual. The following is a brief summary of posting requirements based on uranium:

Contamination Area	> 1,000 dpm/100 cm^2 removable > 5,000 dpm/100 cm^2 fixed and removable
Airborne Radioactivity Area	> 2 x 10^{12} μCi/ml
Respirator Area	> 5 x 10^{12} μCi/ml
Radiation Area	> 5 mrem/hr

Monitoring is required for personnel and material leaving the Contamination Area. The limit for personnel contamination is 1000 disintegrations per minute, or the alarm level on the Hand/Foot monitors and the PCM-1B. Contact Radiological Control if this limit is reached for decontamination. Do not leave the area until told to do so by Radiological Control.

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Table 6-1. Action levels.

Instrument	Response	Action
LEVEL D EXCLUSION ZONES		
Nitrogen Dioxide Detector Tubes	Greater than 0.5 ppm	Upgrade to Level B; contact ES&H
Nitrogen Dioxide Metrosonic/Dräger Monitor	Greater than 0.5 ppm	Upgrade to Level B; contact ES&H
Nitric Acid Detector Tubes	Greater than 2 ppm	Upgrade to Level B; contact ES&H
Oxygen	Less than 20.5%	Withdraw from work area; contact ES&H
	Greater than 22.0%	Remove/shut off ignition sources & investigate for cause of excursion
LEVEL B EXCLUSION ZONE		
Oxygen	Less than 20.5%	Withdraw from work area; contact ES&H
	Greater than 22.0%	Remove/shut off ignition sources & investigate for cause of excursion
Nitrogen Dioxide Detector Tubes	Greater than 25 ppm	Withdraw from work area; contact ES&H
Nitrogen Dioxide Metrosonic/Dräger Monitor	Greater than 25 ppm	Withdraw from work area; contact ES&H
Nitric Acid Detector Tubes	Greater than 50 ppm	Withdraw from work area; contact ES&H

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 INTRODUCTION

The personal protective equipment and action levels established for this project are based on available data. As additional testing and monitoring information become available, the HSO, with approval of the appropriate Environmental Safety and Health (ES&H) section, may adjust the action levels and protective equipment accordingly. Initial protection levels for different work activities are identified in Table 7-1. These items may change to provide the best possible protection and safety factors for the work operations on-site.

7.2 UPGRADE AND DOWNGRADE

The HSO may upgrade or downgrade the levels of protection once approval from ES&H has been received. The change in level of protection shall be based on variations in site conditions relative to the initial hazard assessment. As information from real-time monitors becomes available, this information will be used to adjust levels of protection for specific work tasks.

The decision to upgrade the level of protection will be made by the HSO with approval of ES&H based upon the prevailing site conditions, including exposure, contamination, meteorological conditions and the site operation involved. Industrial Hygiene will be notified in the event that nitric acid exceeds 2 ppm in the air at any time or that nitrogen dioxide exceed 0.5 ppm in the air at any time.

A decision to downgrade from a level of protection published in this HASP as part of Table 6-1 is permitted, when recommended by HSO in consultation with the CSM, and approved by ES&H, when site conditions warrant such a downgrade. The removal site supervisor must be notified of the proposed change. Where the HSO has upgraded the level of protection due to prevailing site conditions, and site conditions return to the pare-upgrade state, the HSO is authorized to return to the previously published levels of protection upon notice to the removal site supervisor.

7.3 LEVELS OF PROTECTION

The following is a brief description of each level of protection. Since these levels are basic guidelines, it will be necessary to adjust the protection levels based on each specific operation or activity.

The basis for the levels of protection are OSHA 1910.120 Appendix B. Much of the work on-site will be conducted in Level D or D-modified protection provides sufficient protection against nitric acid and external radiation anticipated to be found during most Nitric Acid Tank Car and Area removal action activities.

Level B protection will be required for operations as listed in Table 7-1. Level B respiratory protection uses a full-face continuous-flow airline respirator or self-contained breathing apparatus, because no air purifying cartridge respirators are effective or approved for removing nitrogen dioxide.

The equipment required for the levels of protection (respiratory, skin and eye) are listed in Table 7.2.

Level D Operations

- Site preparation
- Collection and analysis of soil samples
- Heavy equipment operation

Level D Modified Operations

- Decontamination and disposal of Tank Car
- Decontamination of personnel and equipment

Level B Operations

- Contents sampling
- Removal of Tank Car contents
- Treatment, characterization, and disposal of contents

NOTE: The levels of protection for any particular operation may be modified based upon current information and conditions.

LEVEL OF PERSONAL PROTECTIVE EQUIPMENT PROTECTION	
D	Cotton coveralls Neoprene (or equally protective material) steel- toed boots Safety glasses Hard hat Gloves
D-MODIFIED	Cotton coveralls Acid-resistant splash suit (jacket and pants or one-piece coverall) Inner-surgical gloves Butyl rubber or neoprene gloves Neoprene steel-toed boots Hard hat Face shield and safety glasses Nuke booties (optional)
B	Cotton inner coveralls Full facepiece continuous-flow airline respirator, full facepiece airline respirator with escape air bottle or self-contained breathing apparatus Acid-resistant splash suit (jacket and pants or one-piece coverall) Inner-surgical gloves Butyl rubber or neoprene gloves Neoprene steel-toed boots Nuke booties (optional) Hard hat

8.0 SITE CONTROL

8.1 GENERAL ORGANIZATION

The work area will be divided into two specific areas. The area where the removal activity will be taking place will be the Exclusion Zone, which has the highest potential hazard due physical and chemical dangers. Access to the Exclusion Zone will be restricted to those individuals trained and approved to perform the removal action activities. The Exclusion Zone will be delineated using barrier tape or other easily recognizable devices with one common entrance/exit point. The Exclusion Zone will include the entire Tank Car and surrounding and any additional areas needed to temporarily store equipment or containers of waste. The Exclusion Zone boundaries may need to be expanded or altered to accommodate airborne hazards or other unforeseen circumstances that may arise during the project. If the Exclusion Zone is to be altered significantly, appropriate personnel will be consulted.

The second zone to be established will be the Contamination Reduction Zone. This area will be located immediately adjacent to the entrance/exit to the Exclusion Zone. This zone will also be delineated using barrier tape or other easily recognizable devices. This zone will be utilized for the removal of disposable protective clothing, including boots, gloves, tyvek suits, etc. and the decontamination of equipment utilized to perform this activity. Entrance to the Contamination Reduction Zone will be limited to one entrance/exit point, preferable on the upwind side of the removal action activities, and will be closely monitored and controlled by the field supervisor. Personnel may be needed in this zone to aid workers in decontamination activities upon their departure from the Exclusion Zone.

8.2 ILLUMINATION

Work activities involving the Tank Car and liquid contents will occur during daylight hours only.

9.0 DECONTAMINATION PROCEDURES

Necessary equipment for decontamination of chemical substances will be readily available in the area surrounding the Exclusion Zone. Decontamination reduces the threat of spread of contaminants to other on-site areas by the cleaning of equipment and personnel at the work site prior to departure from the area. It is advised at all times to reduce the amount of contact to contamination in the work areas where possible, thereby minimizing the degree of decontamination required. If necessary, personnel aiding in the decontamination of Exclusion Zone workers will be equipped with personal protective equipment to prevent the threat of contamination to themselves. Variation in decontamination procedures will be made at the discretion of the HSO.

The following procedures will be implemented for proper decontamination of equipment and personnel during these activities:

- Personnel enter decontamination area Exclusion Zone and drop tools, etc. on contaminated side of barrier tape or object. This equipment will be surveyed and then decontaminated, if necessary, for later use.

- Personnel remove protective clothing and place on contaminated side of barrier tape or object. This waste will later be placed into appropriate containers.

- Reusable materials will be wiped down with a liquid/detergent mixture on a sorbet pad. The generation of contaminated-free liquid will be kept to a minimum. The disposal of the sorbet pads will be included with contaminated solid waste.

10.0 TRAINING

All FERMCO and FERMCO subcontractor personnel assigned to the tasks will, as a minimum, meet the following Hazardous Waste Operations training requirements:

- 40-Hour OSHA 1910.120 Hazardous Waste Operations training.
- 8-Hour OSHA 1910.120 Hazardous Waste Operations annual refresher training*
- 8-Hour OSHA 1910.120 Hazardous Waste Supervisory training (if applicable)
- 24-Hour Hazardous Waste Operation supervised field experience
- FERMCO Radiation Safety**
- FERMCO Nuclear Criticality**
- FERMCO Respirator Training and Quantitative Fit Test or off-site equivalent approved by FERMCO Industrial Hygiene*
- FERMCO Portable Fire Extinguisher•
- FERMCO You and OSHA*
- FERMCO Site Orientation Video (required for non-FERMCO employees only)
- Orientation on the specific Material Safety Data Sheets related to this project.

• Each individual must attend, at a minimum on an annual basis

* Each individual must attend every two years

Visitors

Visitors entering the Plant 1 Pad area shall obtain the following prior to entry into the construction zones:

- Briefing on the Project Specific Health & Safety Plan
- Be escorted by a person who has all the required training for the area to be toured
- No visitors shall be permitted to enter an Exclusion Zone, Contaminated Area, or Airborne Radioactivity Area
- Shall view the FERMCO Site Orientation Video
- A Dosimeter badge

11.0 MEDICAL SURVEILLANCE

In accordance with 29 CFR 1910.120, personnel assigned to a FEMP project and performing actual tasks are required to participate in the FERMCO medical monitoring program. If examinations conducted by medical personnel other than FERMCO personnel are planned, the subcontractor must receive prior authorization from FERMCO Medical concerning the necessary protocols and providers.

Medical surveillance exams will be conducted based upon the following frequency or as determined appropriate by FERMCO Medical:

- Pre-assignment (baseline)
- Annual (within one year of previous physical)
- After incidents, potential exposures, or physician recommendation
- Exit (termination)

All individuals who are required to work in the process or controlled areas at the FEMP facility will be required to participate in the FEMP radiation in-vivo and bioassay surveillance programs. The radiation surveillance must be conducted according to the following frequency:

- Baseline (site work)
- Periodic
- Bi-monthly (60 days) for bioassay
  Yearly for in-vivo (whole body count)
- Following an incident
- Upon an individual's request
- Exit (end of project or termination)

All individuals required to wear respiratory protection must be medically approved. FERMCO OS&H shall validate the medical approval, the respirator fit test and issue a respirator fit test card.

11.1 REQUIRED MEDICAL RECORDS

The Medical Department will maintain all medical records as required by FERMCO policy.

12.0 CONTINGENCY PLANS

12.1 INCIDENTS OR INJURIES

Incidents or injuries involving potential intake of any hazardous substances shall be reported immediately to supervisor and the FERMCO Medical Section by the involved employee and an Incident Investigation Report completed by the involved employee.

12.2 PRE-EMERGENCY PLANNING

During the training and pre-work safety meetings, all employees involved in this task shall be trained and reminded of the provisions of the plant emergency procedure, alarm signals and communications, evacuation routes (See Figure 2) and emergency reporting. Proof of this training shall be obtained and maintained on-site.

12.3 LINES OF AUTHORITY

The supervisor in charge has the primary responsibility for the prevention of emergency conditions. In the event that an emergency does occur, the individual involved or observing the condition shall immediately notify a supervisor, the communications center (at 6511) or the FERMCO Assistant Emergency Duty Officer (AEDO). The AEDO is responsible for ensuring that corrective actions have been implemented, the appropriate personnel notified, and initial reports completed as required.

12.4 SPILL CONTAINMENT

Methods shall be employed to minimize the potential for and consequences of spills during the course of the project. All assigned workers shall be trained as appropriate in the existing procedures for handling spills connected with this project. Call 6511 for support of all spill incidents.

12.5 EVACUATION

In the event of an emergency which necessitates an evacuation of an exclusion area, the 3-3, 3-3 shall be sounded over the plant alarm system; a voice message will follow over the Emergency Message System and radios instructing employees to go to their designated Rally Point. Personnel shall immediately proceed to the Rally Point and participate in the accountability process. Personnel will follow instructions given by the Rally Point Coordinator. When an all-clear condition has been achieved, personnel will be released from the Rally Point.

12.6 EMERGENCY EQUIPMENT

The following safety equipment, locations to be identified at safety meetings, is available for employee usage:

- Fire extinguisher (required for flame cutting or welding)
- Manual fire alarm (locations: outside Bay #4 at KC-2 Warehouse, East Side Tank Farm office, west end of hallway in Building 12)
- Portable eye wash/safety shower (near on-going work)
- Permanent safety shower/eyewash station (several locations in Tank Farm)
- Two-way radio (supervisor equipment)
- Telephone (located in office at east end of KC-2, located in Tank Farm office
- Respirators (located in Bays 1 and 5 KC-2; located in Building 12 for Tank Farm)
- Emergency SCBA units (available from Fire Protection and Emergency Response
- Spill drums (near on-going work)
- Clean-up materials (near on-going work)
- Absorbent (near on-going work)

12.7 EMERGENCY NOTIFICATION

All emergencies shall be reported immediately. Emergencies can be reported by telephone dialing extension (ext.) 6511; by contacting the communications center via two-way radio; or by pulling manual fire alarm.

12.8 FIRE, EXPLOSION, OR MEDICAL EMERGENCY

In the event of a fire, explosion or medical emergency, the communication center shall be notified immediately by manual fire alarm, two-way radio, or by calling ext. 6511. The communication center operator will activate the emergency response team and dispatch them to the appropriate location. Personnel in the immediate area should evacuate to a safe position and await instructions if a hazardous condition exists.

12.9 ADDITIONAL INFORMATION

12.9.1 Hospitals

The FERMCO Medical Facility (Building 53) is the primary choice for on-site injuries. The FERMCO ambulance will transport the injured to the nearest hospital if necessary. FERMCO maintains an emergency response capability which includes an ambulance and Emergency Medical Technicians.

12.9.2 Emergency Telephone Numbers

AMBULANCE: ext. 6511
FIRE ext. 6511

Name	Work Number	Radio #
EMERGENCY RESPONSE	6511 or 6295	
Industrial Hygiene	6207	357
Radiation Control	6889	355
Fire Services	6235	303
Industrial Safety	8604	
Assistant Emergency Duty Officer (AEDO)	6431 or 6295	202
Security	6296	Control

13.0 RECORDKEEPING

A variety of logs, records and subsequent reports will be produced as the activities of this project progress. These documents will provide a record of the events occurring during the project and provide a reference for evaluating performance in the area of health and safety.

13.1 LOGBOOKS

Logbooks will be used to document important events as they occur. Some general procedures will pertain to the use of all logbooks. The following information will be recorded on each part of all logbooks.

- Initials of persons making entry
- Date
- Time of each entry (military time)
- Location

The logs will be signed at the end of each day or work shift by the removal site supervisor. All entries will be made in black ink. No pages will be removed from the log book and each page will be consecutively numbered.

13.2 RECORDS

A variety of records will be collected and organized to protect important information collected before and during site operations. Access to these records will be on a "need to know" basis.

13.2.1 Training Records

Records of proper training will be maintained for all personnel. All workers not trained by the contractor will be required to provide documentation of health and safety training for hazardous waste site operations meeting the requirements of 29 C.F.R. 1910.120. Workers who cannot provide sufficient documentation as determined by the HSO will be required to receive training prior to any on-site work.

A training record file will be established for each worker by the removal site supervisor and contain the following documents:

- Certificate of Approved Hazardous Waste Site Safety and Health Training
- Certificate of Site Specific Training
- Documentation of any special safety training (e.g., confined space entry)

- Certificates of refresher training (as appropriate)
- Documentation of 3-Day On-The-Job Supervision

13.2.2 Medical Records

Complete medical records will be maintained by FERMCO Medical Services. Some medical-related records will, however, be maintained on-site by the removal site supervisor. These will include:

- Qualification statement for hazardous waste site worker
- Qualification for respirator use
- Respirator fit test results
- Results of worker exposure monitoring

13.2.3 Personal Monitoring Records

The TLD and air monitoring results for worker exposure monitoring will be collected and placed in each person's site file. The monitoring results will be given to the employee in the form of a letter.

14.0 AMENDMENTS

The Project/Task Specific Health and Safety Plan is based on information available at the time of preparation. Unexpected conditions may arise which require reassessment of safety procedures. It is important that personnel protective measures be thoroughly assessed by the supervisor in charge and ES&H representative prior to and during the planned task activities. Unplanned activities and/or changes in the hazard status shall require a review of any required changes in this plan.

Changes in the anticipated hazard status or unplanned activities resulting from changes in the projected scope of work of this project are to be submitted and an amendment to this Health and Safety Plan. Amendments to this plan shall be approved by the CERCLA/RCRA Unit 3 Project Director, the CERCLA/RCRA Unit 3 Health and Safety Manager, and the Construction Safety Manager of ES&H prior to the implementation of the amendment.

Other changes to this plan shall be approved by the CERCLA/RCRA Unit 3 Project Director, their representative, and by the CERCLA/RCRA Unit 3 Health and Safety Manger or their representative, and these changes shall be noted on the original Health and Safety Plan posted at the work site.

ATTACHMENT A
ACKNOWLEDGEMENT FORM
PROJECT SPECIFIC HEALTH AND SAFETY PLAN
NITRIC ACID TANK CAR AND AREA REMOVAL ACTION

Signature	Date	Badge No.

HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS
1.0 GENERAL PROJECT MINIMUM REQUIREMENTS **NOTE: THESE GENERAL REQUIREMENTS APPLY TO ALL SECTIONS OF THE MATRIX**	Uranium contamination. General construction/ demolition hazards. Not all hazards are specified on this summary.	Thermoluminescent Dosimeter (TLD) Collect BZ samples for airborne radioactive materials for 25% of the workers if work is performed in a Contamination Area.	FERMCO issued clothing, steel toed safety shoes. Personal clothing is permitted, but only for inspections and observations in Controlled Areas. Subcontractor supplies hard hat, safety glasses w/rigid side shields. Entry into Contamination Areas require a minimum smock, shoe covers,	• Construction Rules/ Regulations • Site GET Training • Site Worker Training • Rad Worker II Training • 24 Hr. Supervised Field Experience • Outreach for supervisory personnel • Orientation on the PSHSP • Orientation on Project H&S Requirements Matrix. • Orientation on Project Specific MSDSs. • Respirator training
	Heat stress	Physiological Monitoring	Cool vests.	Safety meetings concerning signs and symptoms of heat stress.
	Cold stress		Dress appropriately for weather	Safety meetings concerning cold stress
	Noise	FERMCO Periodic Monitoring	Hearing protection required if noise level exceeds 85 dBA	

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
FERMCO must have proof of physical examination signed by a physician. Initial, annual, termination, and as required by FERMCO S&H. *In-vivo* exam (whole body count). Initial, every 60 days, incident, termination and special (i.e., per RWP) urinalysis.	Provide warning signs and safety fencing to establish construction area. One access control point for personnel entering Contamination Area. Read and sign PSHSP.	FERMCO Work Permit Radiation Work Permit (RWP)	Personnel and material monitoring required to exit Contamination Area and Controlled Areas. FERMCO supplied bags and containers for disposition of contaminated smocks, shoe covers, anti-Cs.
	Work/rest regimen. Cool room, including water. Contact IH when temperature rises above 80°F to review and/or add control measures.		
	Contact IH when temperature reaches 10° to review and/or add control measures.		

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS
2.0 Installation of Feed Ducts	Radiological contamination	Intermittent RCT coverage for excavation in Process Area (continuous in Contamination Area).	Tyvek, MarMac paper or launderable anti-Cs required for dry work in Contamination Areas. Water resistant anti-Cs required for wet work conditions in contamination areas. Full-face APR with magenta cartridges may be deemed necessary by	Respirator fit-test
	Excavation/ trenching hazards			Competent Person
	Volatile organic compounds in soil	FERMCO to provide initial real-time monitoring with photoionization detector (PID) to detect VOCs during soil excavation.		
	Nuisance dust	FERMCO Periodic Monitoring		
	Penetrate underground utilities			
	Possible Confined Space (trench >4 feet deep)	FERMCO conducts initial monitoring of confined space for hazardous atmosphere. FERMCO performs continuous monitoring based on results of initial		Confined Space Training required for entry into permit required confined space.
	Handling sharp objects		Leather palm gloves	

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
FERMCO must have proof of respirator medical certification for any worker required to wear a respirator.			
	Barricade open trenches. Local utility isolation and identification. Barricade swing radius of backhoe.	Penetration/ excavation permit for trenching work	
		Chemical/ hazardous work permit may be required.	
	Use wet methods to control dust as necessary.		
		Penetration	
Medical evaluation for suitability of entry into permit required confined space.		Confined space evaluation/ permit required prior to entry into trench >4 feet deep.	

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS
3.0 Install concrete pad for substation	Uranium contamination	Intermittent RCT coverage for excavation in Process Area (continuous in Contamination Area).	Tyvek, MarMac, paper, or launderable anti-Cs for dry work in Contamination Areas. Water resistant anti-Cs for wet work in	
	Uncured concrete (caustic lime) chemical burns to skin and eyes		Rubber gloves, rubber boots/cover goggles/face shield	
	Handling sharp objects		Leather palm gloves	
4.0 Install substation	Uranium contamination	FERMCO Periodic Monitoring at a minimum.	Tyvek, MarMac, paper, or launderable anti-Cs for dry work in Contamination Areas. Water resistant anti-Cs for wet work in	
	Improper Hoisting/ Rigging			Competent person to inspect cranes. Follow DOE Hoisting/ Rigging Manual.
	Wind			
	Overhead lines			
	Handling sharp objects		Leather palm gloves.	

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
	Portable eyewash required when pouring/handling uncured concrete		Concrete workers shall wash hands prior to breaks, lunch and end of shift.
	Barricade swing radius of equipment		
	Suspend work when winds exceed 25 mph.		
	No work within 10 feet of live wires. Add 1 inch for every 1 KV over 50		

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS
5.0 Install 13.2 Cable/ Redistribute power to Building 77 and 64/65	Uranium contamination	FERMCO Periodic Monitoring at a minimum.	Tyvek, MarMac, paper or launderable anti-Cs for dry work in contamination areas. Water resistant anti-Cs for dry work in contamination areas. Respiratory protection may be required by	
	Possible confined space (ex. manholes)	FERMCO conducts initial monitoring of confined space for hazardous atmosphere. FERMCO performs continuous monitoring based on results of initial monitoring.		Confined Space Training required for entry into permit required confined space.
	Energized/ pressurized utilities and systems			Site Energy Control Training

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

The requirements listed in Section 1.0 of this matrix apply to all activities addressed in this matrix.

MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
Medical evaluation for suitability for entry into permit required confined space.	Ventilation	Confined space evaluation/ permit required prior to entry	
	Verify isolation of utilities and systems. Isolation blankets Lockout/tagout		

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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6.0 Install Underground utilities (sanitary force main, potable water, and storm sewer)	Uranium contamination	Intermittent RCT coverage for excavation in Process Area (continuous in Contamination Area).	Tyvek, MarMac paper or launderable anti-Cs required for dry working Contamination Areas. Water resistant anti-Cs required for wet work conditions in contamination areas.	Respirator fit-test.
	Potential volatile organic compounds in soil	FERMCO to provide initial real-time monitoring with photoionization detector (PID) to detect VOCs during soil excavation.		
	Energized/ pressurized utilities and systems			Site Energy Control Training
	Penetrate underground utilities			
	Excavation/ trenching hazards			Competent person
	Handling sharp objects		Leather palm gloves	
	Possible hazardous chemical used to connect pipe	Air monitoring for possible hazardous chemical	PPE recommended on the MSDS	Hazardous Communication briefing on chemical to be used.

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PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
FERMCO must have proof of respirator medical certification for any worker required to wear a respirator.	Containment and/or localized HEPA ventilation or dust suppression methods pending conditions and scope of work.		
	Verify isolation of utilities and systems.		
	Mark/identify underground utilities	Penetration	
	Barricade open trenches. Barricade swing radius of backhoe.	Penetration/ excavation permit for trenching work	
As recommended on MSDS.	As recommended on MSDS.	Hazardous material/ chemical work permit may be required.	Wash hands before breaks and at end of day.

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PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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7.0 Trailer installation	Uranium contamination	Intermittent RCT coverage for excavation in Process Area (continuous in Contamination Area).	Tyvek, MarMac paper or launderable anti-Cs required for dry working Contamination Areas. Water resistant anti-Cs required for wet work conditions in contamination areas.	Respirator fit-test.
	Rigging			Competent person to inspect cranes. Follow DOE Hoisting/Rigging Manual
	Energized/ pressurized utilities and systems			Site Energy Control Training (SSOP-719)
	Penetrate underground utilities			
	Handling sharp objects		Leather palm gloves	
8.0 Redistribute power to trailers	Uranium contamination			
	Energized/ pressurized utilities and systems			Site Energy Control Training (SSOP-719)

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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FERMCO must have proof of respirator medical certification for any worker required to wear a respirator.			
	Barricade swing radius of equipment		
	Verify isolation of utilities and systems.		
		Penetration	
	Verify isolation of utilities and systems.		

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9.0 Relocation of Fire Panel	Uranium Contamination	Intermittent RCT coverage for work in Process Area (continuous in Contamination Area).	Tyvek, MarMac paper or launderable anti-Cs required for dry working Contamination Areas. Full-face APR with magenta cartridges if loose contamination is suspected behind the fire alarm panel.	Respirator fit-test.
	Energized/ pressurized utilities and systems			Site Energy Control Training (SSOP-719)
	Possible confined space (ex. manholes)	FERMCO conducts initial monitoring of confined space for hazardous atmosphere. FERMCO performs continuous monitoring based on results of initial monitoring.		Confined Space Training required for entry into permit required confined space.

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HEALTH AND SAFETY REQUIREMENTS MATRIX

PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
FERMCO must have proof of respirator medical certification for any worker required to wear a respirator.			
	Verify isolation of utilities and systems.		
Medical evaluation for suitability for entry into permit required confined space.	Ventilation	Confined space evaluation/ permit required prior to entry	

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PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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10.0 **Install Power Poles/Run Aerial Cables**	Uranium contamination	Intermittent RCT coverage for excavation in Process Area (continuous in Contamination Area).	Tyvek, MarMac paper or launderable anti-Cs required for dry working Contamination Areas. Water resistant anti-Cs required for wet work conditions in contamination areas.	
	Penetration of underground utilities			
	Handling sharp objects		Leather palm gloves	
	Elevated work		Safety harness for fall	
	Overhead lines			
	Wind			
	Injury from loss of control of lines			

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PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
		Penetration Permit	
	Fall protection required when working in elevated locations (>6 feet)	Hazardous work permit	
	No work within 10 feet of live wires. Add 0.4 inch for every 1 KV over 50 KV		
	No work if wind speed exceeds 25 mph.		
	All pulling lines and accessories must be inspected regularly and replaced if damaged. Do not exceed manufacturer's load rating. Do not permit employees directly under overhead operations or on crossarm while conductor		

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PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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11.0 Install conduit	Uranium contamination	Intermittent RCT coverage for excavation in Process Area (continuous in Contamination Area).	Tyvek, MarMac paper or launderable anti-Cs required for dry working Contamination Areas. Water resistant anti-Cs required for wet work conditions in Contamination areas.	
	Handling sharp objects		Leather palm gloves	
	Power tools	Inspect before each use		
	Noise		Hearing protection required if noise level >85 dBA	

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PROJECT: PLANT 9 UTILITY REDISTRIBUTION AND TRAILER INSTALLATION

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MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
	GFCI guards and safety devices		

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