U.S. Department of Energy

EH

EM

Handbook
for
Occupational Health and Safety
During
Hazardous Waste Activities

Office of Environment, Safety and Health
Office of Environmental Management

JUNE 1996

EXECUTIVE SUMMARY

This Handbook provides tools and guidance to establish and implement comprehensive, cost-effective, hazard-based worker health and safety programs that are an integral part of accomplishing work on time and within budget. This Handbook has been developed to assist Department of Energy (DOE) and contractor organizations in the integration and implementation of DOE rules and requirements and DOE-adopted Occupational Safety and Health Administration (OSHA) requirements. It is designed to incorporate lessons learned from field visits and provide descriptions of alternative approaches and options on how to implement a worker protection program effectively. During the development of the Handbook, input and comments were solicited from DOE field offices and contractors, labor representatives, and organizations outside the DOE complex through a series of meetings, field visits, and workshops.

The information in this Handbook provides project managers and health and safety professionals with the following benefits:

- A decision model for determining the applicability of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (the HAZWOPER Standard), to the broad spectrum of DOE hazardous waste activities;

- A systematic process for integrating the elements of the HAZWOPER Standard with other OSHA, DOE, and DOE-adopted nuclear and nonnuclear rules and requirements to maximize both worker protection and compliance in performing hazardous waste activities;

- A framework that enables a cost-effective and hazard-based approach to be applied to the safe conduct and control of hazardous waste activities;

- A multidisciplinary, team-based process to plan, evaluate, and conduct hazardous waste activities; and

- Field-tested, practical methods for controlling the worksite, controlling hazards, and preventing contamination while getting the work done.

Figure ES-1 outlines the major topics in the Handbook and their relationship to one another; a chapter is devoted to each topic on the figure. The Handbook provides a roadmap and useful tools for the project manager, from the process of planning and preparing work, to conducting work safely, to decontaminating personnel and equipment.

BACKGROUND: In cooperation with DOE field operations, the Offices of Environment, Safety and Health (EH) and Environmental Management (EM) have established a strategic partnership to define, develop, and implement occupational safety and health guidance to enhance worker protection and promote DOE hazardous waste-related activities.

SCOPE, APPLICATION, AND INTEGRATION: Hazardous waste operations and activities are evaluated to determine whether they fall under the HAZWOPER Standard—depending on whether the worksites are regulated and whether there is a possibility for worker exposure to health and safety hazards from the operations. Determining regulatory requirements is essential to planning work, establishing budgets, and identifying schedule requirements to conduct activities safely.

After it is determined whether a hazardous waste operation falls under the scope of HAZWOPER, a hazard-based approach to the implementation of the various elements (paragraphs) of the Standard must be developed. When the HAZWOPER Standard is implemented, OSHA stipulates that if there is overlap or conflict with another standard, the provision more protective of worker health and safety applies.

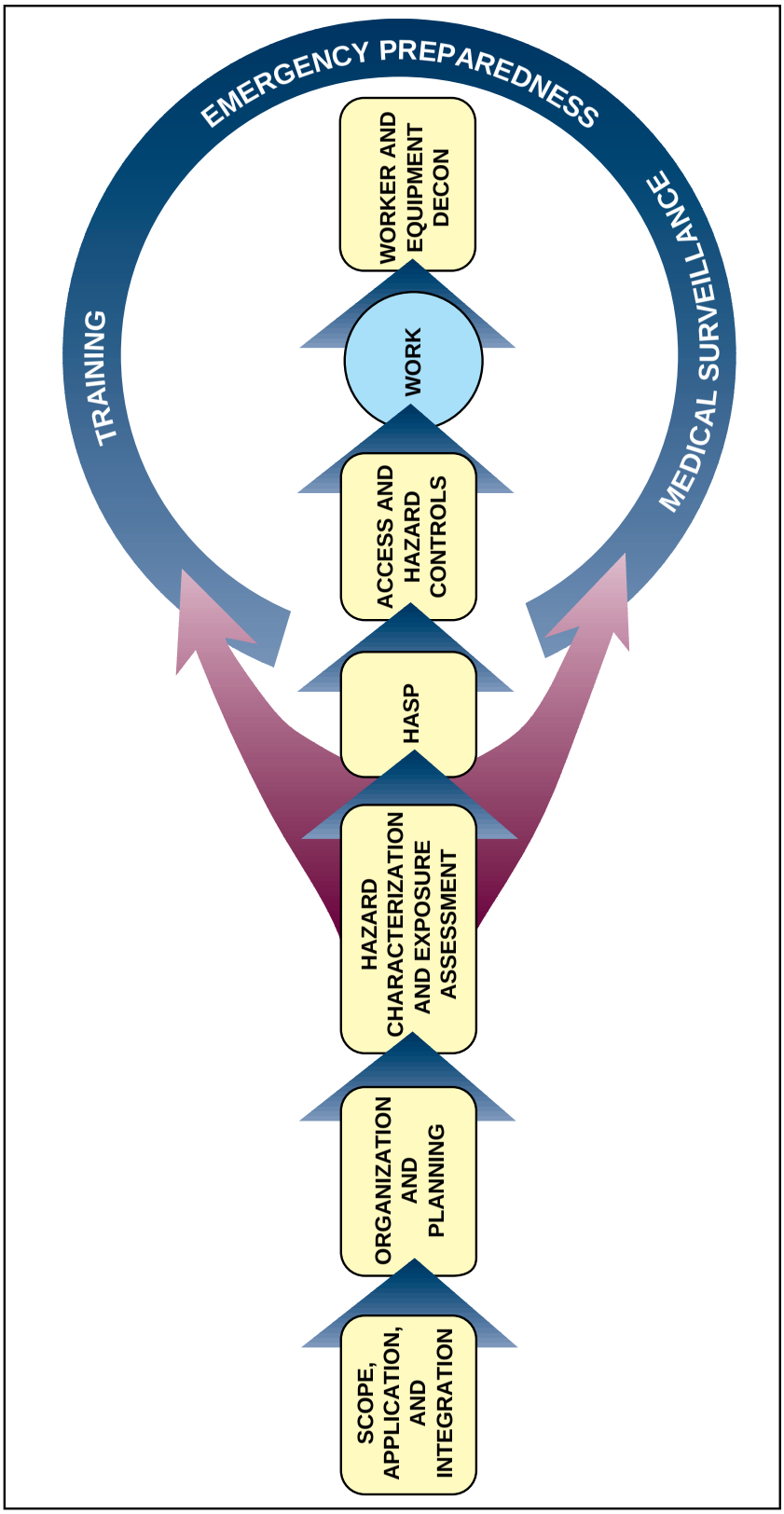

Figure ES-1. Organization of the Handbook

Chapter 2 provides the tools and steps necessary for the project manager and the multidisciplinary team to evaluate the scope and applicability of the HAZWOPER Standard and to integrate HAZWOPER with existing DOE rules and requirements using a risk- and hazard-based approach. It also provides guidance for activities that normally fall outside the scope, such as deactivation and decommissioning, but for which DOE has adopted an approach which uses the concepts and principles of HAZWOPER as a framework.

ORGANIZATION AND PLANNING: Establishing an effective multidisciplinary project team for hazardous waste activities promotes comprehensive work planning to avoid unsafe operations and work stoppages. The project team is composed of line managers and supervisors, health and safety professionals, site worker representatives, and engineers and other field personnel. Project teams encourage the incorporation of health and safety principles into the day-to-day jobs and tasks of all workers, which allows work to be done safely, on time, and within budget.

Although the details of planning for hazardous waste activities are as varied and unique as the operations themselves, Chapter 3 identifies certain concepts related to worker protection that are common to all projects:

- Identification of applicable regulations, Orders, and guidelines as documented through the standards/requirements identification documents (S/RIDs) or the necessary and sufficient process;
- Determination of integrated strategies for developing and implementing plans and procedures;
- Consideration of environmental, safety, and health concerns;
- Characterization of hazards at each worksite to determine hazard categories, types, and potentials and to develop a hazard-based compliance strategy;
- Development of a work plan, a site-specific health and safety plan (HASP) (including job hazard analyses), and work controls that focus on tasks and hazards identified in the work plan;
- Identification and organization of required resources, including personnel, equipment, funding, and facilities; and
- Implementation of daily planning and work control processes.

TRAINING: Training is the heart of any HAZWOPER program. It enables the workers to recognize health and safety hazards, and to prevent accidents and injuries. As a result, training increases productivity and can improve worker morale. However, training requirements can represent more than 50 percent of the cost of HAZWOPER implementation at some DOE sites. A comprehensive, integrated health and safety training program is key to providing a cost-effective means of meeting those requirements; DOE recommends the use of a "systematic approach to training," where the content and rigor of training are commensurate with the potential hazards, exposures, and work requirements.

Chapter 4 provides the project manager with guidance for implementing the training requirements in the HAZWOPER Standard as well as for integrating the requirements of other pertinent OSHA Standards and DOE rules and requirements. It also provides proposals to address two issues: course reciprocity (an organization's acceptance of course work completed at another organization); and equivalency (determining what previous experience, education, or training, or all three, will meet the requirements of a given course).

HAZARD CHARACTERIZATION AND EXPOSURE ASSESSMENT: Hazard characterization and exposure assessment are the key to determining the breadth of the health and safety program and associated cost and impact. Hazard characterization and exposure assessment provide the information needed by the project manager to identify and plan how to control worksite hazards and minimize HAZWOPER applicability. Hazard characterization and exposure assessment involve the identification of the location, magnitude, and nature of any radiological or hazardous agents, safety hazards, and exposures at the worksite.

Chapter 5 discusses the regulatory framework and analytical tools to make this assessment including job safety analysis and job hazard analysis; safety analysis reports; process hazard analysis; and job, task, and hazard analysis. This chapter also provides a hazard characterization and exposure assessment strategy to assist the project manager in the successful conduct of these activities.

DEVELOPMENT OF A SITE-SPECIFIC HEALTH AND SAFETY PLAN: A HASP is required before work begins and integrates the existing site health and safety program with the HAZWOPER worksite-specific worker protection requirements. The HASP delineates health and safety hazards, controls, and requirements for individual activities. In addition to guidelines for preparing a HASP, Chapter 6 provides an example of a HASP. This chapter also offers two approaches for developing a HASP for a worksite containing both radiological and nonradiological hazards.

It is important to remember that the provisions of an approved and signed HASP are part of the authorization basis and are enforceable as an extension of the HAZWOPER Standard.

ACCESS AND HAZARD CONTROLS: Controlling worker access to hazards limits the applicability of the HAZWOPER Standard and the scope of required worker protection programs. Protection of worker health and safety during DOE hazardous waste activities is accomplished through the application of a hierarchy of access and hazard control methods. The first option to consider in implementing control of worker access to hazards is the use of engineering controls to remove or isolate the hazard. The next option is the use of administrative controls, and finally, personal protective equipment (PPE) can be used as a supplement to the two preferred methods.

Chapter 7 provides tools and guidance for the selection and implementation of engineering, administrative, and PPE controls, and demonstrates how to integrate radiological and nonradiological hazard controls, pointing out that site control concepts specified in 29 CFR 1910.120, 10 CFR 835, and the *Draft DOE Radiological Control Technical Standard* are compatible and consistent, differing only in nomenclature.

WORKER AND EQUIPMENT DECONTAMINATION: Efficient worker and equipment decontamination programs are critical to expedite worker egress, minimize the generation of costly hazardous waste, and minimize equipment replacement. Before work can begin, contamination control and decontamination programs for workers and equipment are documented in the HASP; communicated to site workers; and implemented in areas where there is a possibility for exposure to chemical, biological, or radiological hazards. Chapter 8 discusses the overall decontamination strategy, including decontamination methods, and provides guidance for integrating nuclear and nonnuclear requirements into the decontamination process.

MEDICAL SURVEILLANCE PROGRAMS: Managers at worksites with hazardous waste activities are required to implement systems to assess, monitor, and maintain records concerning employee health in order to minimize adverse health effects on the workforce. Chapter 9 outlines the medical examinations required for hazardous waste activities workers and provides an example of how to document physical requirements, working conditions, required protective equipment, and special qualifications for all positions.

EMERGENCY PREPAREDNESS AND RESPONSE: Emergency preparedness must be established for the protection of the workforce and public before work can begin or be allowed to continue. Requirements for emergency management programs at DOE facilities are detailed in the DOE 5500 series of Orders, particularly in DOE 5500.3A, "Planning and Preparedness for Operational Emergencies" for existing contracts. These Orders have been superseded by DOE O 151.1, "Comprehensive Emergency Management System," and the supplemental information provided in the Office of Nonproliferation and National Security's (NN) *Emergency Management Guide* for new contracts. While the HAZWOPER Standard and the DOE 5500 series of Orders are complementary, differences do exist. DOE focuses on a management system for emergency planning and response, whereas OSHA focuses on worker and responder safety. Chapter 10 discusses these differences and offers guidance on integrating the requirements; it also provides an introduction to the DOE *Emergency Management Guide*.

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INTRODUCTION

1.1 BACKGROUND

The Department of Energy's (DOE) Environmental Management (EM) program was created in 1989 to manage the cleanup of the legacy of 50 years of nuclear weapons production and research at over 130 sites in 33 States and Puerto Rico (see Figure 1-1). These sites comprise a combined area of approximately 3,300 square miles. The Department faces the task of addressing nearly 10,000 individual remediation challenges throughout the DOE complex. In addition, over 7,000 contaminated Department-owned buildings are no longer needed and require monitoring until they can be safely dismantled. Almost one million cubic meters of radioactive waste and materials require safe management until treatment and disposal facilities are available.

Workers involved with the cleanup of DOE's facilities will face safety hazards from conventional construction operations as well as risks from fires and explosions, and health threats associated with exposures to toxic chemicals. In addition to all of the usual risks encountered in hazardous waste work, workers will confront high-level radioactive and mixed waste unique to DOE.

In February 1993, the Office of Technology Assessment (OTA) published its report, *HAZARDS AHEAD: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex*. The report found that DOE's major weaknesses included:

- The failure to establish an institutional culture that honors protection of the environment, safety, and health; and
- The need to develop effective health and safety policies and programs for cleanup.

DOE's management agreed with this assessment and is currently taking steps to correct these deficiencies. To address the concerns brought forth in the OTA Report and to ensure a safe and healthful work environment, EM and the Office of Environment, Safety and Health (EH) formed a strategic alliance. This strategic alliance is designed to provide guidance and performance expectations for the full range of EM activities and for the integration of requirements to increase cost-efficiency and effectiveness. By coupling the health and safety expertise of EH with the nationally critical mission EM is

Occupational Safety and Health Administration Regulations and DOE Orders

Although the Department of Labor's Occupational Safety and Health Administration (OSHA) regulations are not legally enforceable at DOE facilities, DOE has adopted OSHA's Health and Safety Standards (29 CFR 1910 and 29 CFR 1926) in DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees." 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER Standard), contains comprehensive provisions to protect workers engaged in hazardous waste remediation and management, and emergency response operations. For the purposes of this Handbook, the term "HAZWOPER" refers to 29 CFR 1910.120, 29 CFR 1926.65, and their amendments. Numerous other DOE Orders set forth specific requirements on safety and health programs, industrial hygiene, construction safety, occupational medicine, and nuclear safety.

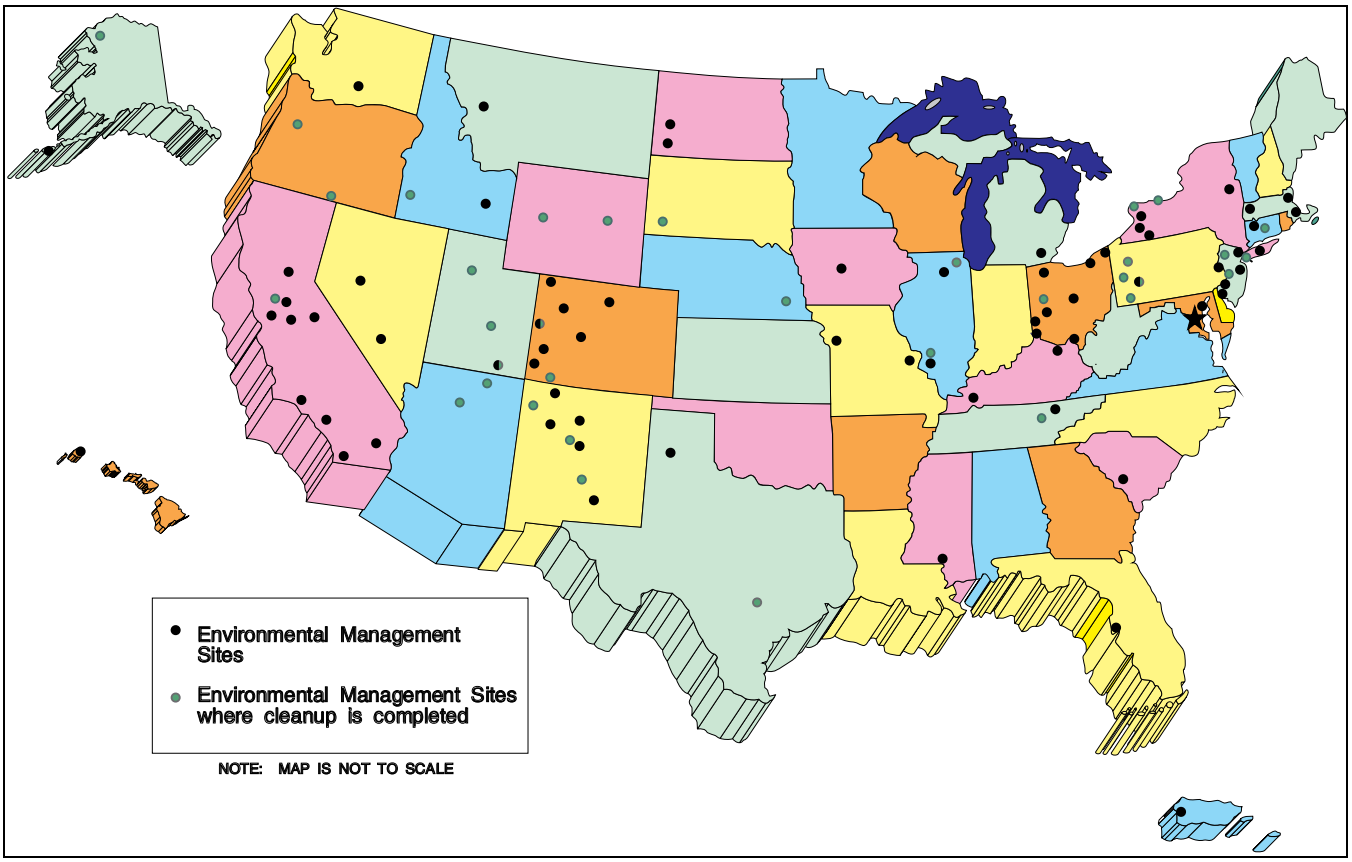


Figure 1-1. Location of Environmental Management Sites

undertaking, DOE will accelerate the development of an operational culture where worker health and safety is an integral part of day-to-day work. In addition, DOE is drawing on industry experience to create an integrated, comprehensive, and standards-based program to protect workers involved in hazardous waste activities. As part of this initiative, a series of occupational safety and health guidance documents have been developed. These products include:

- *Management Perspectives on Worker Protection During DOE Hazardous Waste Activities*, which is aimed at managers whose sites or facilities have been designated for hazardous waste activities and which provides a broad overview of health and safety requirements;

- *Working Safely During DOE Hazardous Waste Activities*, which is aimed at workers and provides ways to minimize radiological, safety, chemical, biological, and natural hazards and reinforces health and safety and radiological training; and

- *Handbook for Occupational Health and Safety During Hazardous Waste Activities* (this Handbook).

This Handbook addresses four key areas cited in the OTA report as critical to DOE's successful long-term management of cleanup of its hazardous waste sites: (1) improving characterization data (Chapter 5); (2) improving contracting practices (Chapter 3); (3) implementing OSHA worker protection standards (Chapters 2 and 3); and (4) providing for active, informed worker participation (Chapters 3 and 4). In addition, the Handbook discusses some aspects of HAZWOPER implementation that the OTA report referred to as "controversial": (1) provisions for dividing sites into work zones (Chapter 7); (2) methods for monitoring worker exposure and determining acceptable exposure levels (Chapter 5); criteria for workers' inclusion in medical surveillance programs and the minimum number of hours of training (Chapters 4 and 9); adequacy of emergency response programs (Chapter 10); and the content of medical surveillance programs (Chapter 9).

Lastly, DOE's management-level commitment to and accountability for worker health and safety are emphasized in Chapter 3 and are evident throughout the Handbook. This Handbook is intended to provide technical guidance, recommendations, and alternative approaches for achieving effective worker protection during hazardous waste activities without creating new requirements. It is unique because it provides guidance for certain challenges specific to the DOE environment, such as:

- Remedial actions involving radiological hazards as well as chemical, flammable, explosive, industrial, and construction-related hazards.
- Activities neither explicitly identified nor necessarily intended to fall within the scope of the HAZWOPER Standard such as deactivation and decommissioning. (Note: Decommissioning consists of decontamination and dismantlement, which is known as D&D. Certain DOE decommissioning activities involving hazardous waste are covered by the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] and fall under HAZWOPER. Please refer to Chapter 2 of this Handbook.)
- The need to implement DOE Orders and other requirements while integrating OSHA approaches and requirements.
- Remediations at large, active reservations.
- Transitional activities from operation to remediation.

1.2 PURPOSE AND OBJECTIVES

This Handbook discusses approaches and strategies to achieve compliance with 29 CFR 1910.120. Moreover, it discusses strategies to integrate DOE rules and requirements with HAZWOPER, such as DOE Orders regarding construction health and safety, industrial hygiene, nuclear safety, and radiological protection; the *Draft DOE Radiological Control Technical Standard* (formerly known as the DOE RadCon Manual); and various DOE limited standards.

The objectives of this Handbook are to provide guidance to:

- Prevent and reduce worker injury and illness;
- Determine the scope and application of the HAZWOPER Standard;
- Implement DOE hazardous waste-related requirements through enhancements of existing programs;
- Clarify HAZWOPER scope and applicability to activities that may not be specifically defined within the scope of the HAZWOPER Standard;
- Promote consistency in health and safety programs for hazardous waste activities;
- Encourage a high standard for health and safety in concert with optimum productivity, cost-effectiveness, and efficiency; and
- Share successful and effective approaches that have been implemented across the DOE complex.

> A key purpose of this Handbook is to encourage the establishment of health and safety programs that use hazard-based judgments to promote efficiency, productivity, and cost-effectiveness in concert with enhanced worker protection.

1.3 SCOPE

This Handbook addresses the variety of hazardous waste activities conducted within the DOE complex and the specific activities and types of worksites that fall within the scope of the HAZWOPER Standard, including the following:

- Uncontrolled hazardous waste site cleanups, including EPA National Priorities List (NPL) or state priority list sites; voluntary or government-required cleanups; and initial investigations to determine the absence or presence of hazardous wastes or substances;
- Resource Conservation and Recovery Act (RCRA) corrective action cleanup sites;
- RCRA treatment, storage, and disposal (TSD) facilities; and
- Emergency response operations involving the release (or substantial threat of release) of hazardous wastes and substances.

Deactivation and Decommissioning

Deactivation is the process of placing a facility in a safe and stable condition that is protective of workers, the public, and the environment until decommissioning is completed. Decommissioning includes those activities that take place after a facility has been deactivated and placed in an ongoing surveillance and maintenance program.

Decommissioning can include decontamination and dismantlement.

- Decontamination is the removal of radioactive or hazardous contamination.
- Dismantlement involves the disassembly or demolition and removal of structures, systems, or components of a facility.

Decommissioning (D&D) proceeds to remediation.

It also provides guidance for other types of DOE activities that may involve hazards similar to those found in the cases cited above, many of which have been the subject of debate concerning applicability of traditional hazardous waste approaches, including the following:

- Deactivation and certain D&D activities that do not fall under CERCLA;
- Surveillance and maintenance;
- Non-RCRA-permitted TSDs;
- Construction;
- Laboratory activities;
- Research and development (R&D) activities; and
- Satellite accumulation sites.

1.4 THE HAZARD-BASED APPROACH

Remedial actions and associated activities at hazardous waste sites can range from low-risk, short-term to high-risk, full-scale, long-term remediation activities. Deactivation and D&D actions can range from stabilization of multiple hazards at a site or facility containing radioactive or chemical contamination, or both, to routine asbestos entire abatement in a non-industrial structure. Strategies include programs that meet compliance objectives, protect workers, and make certain that productivity and cost-effectiveness are maintained. The content and extent of health and safety-related programs should be proportionate to the types and degrees of hazards and risks associated with specific projects. This Handbook implements the objective of a hazard-based approach by providing:

- A systematic process for integrating the elements of the HAZWOPER Standard with other OSHA, DOE, and DOE-adopted nuclear and nonnuclear rules, requirements, and guidance to maximize both worker protection and compliance in performing hazardous waste activities;

- A multidisciplinary team-based process to plan, organize, evaluate, and conduct hazardous waste activities;

- A training philosophy that considers HAZWOPER applicability, nature of the work, level of hazard, and roles and responsibilities in training program design;

- An approach to the development of the worksite health and safety plan (HASP) and the associated work control system that is commensurate with the expected risks to the worker and the public; and

- An access and hazard control strategy based on a hierarchical application of engineering controls, administrative controls, and use of personal protective equipment (PPE).

Integrating DOE Orders With HAZWOPER

Integrating DOE Orders with HAZWOPER is essential for conducting hazardous waste activities. DOE classifies its facilities and sites based on radiological and hazardous material inventories. Safety Analysis Reports (SARs) are developed in accordance with DOE 5480.23, "Nuclear Safety Analysis Reports." This Order requires an evaluation of hazards (associated with the radiological and hazardous materials inventories) to the general public, the workers, and the environment. Other Orders and requirements address such topics as radiation limits to the public and the workers. The *Draft DOE Radiological Control Technical Standard* provides non-mandatory guidance for radiological health and safety. DOE Orders are currently enforceable through contracts with the management and operating (M&O) contractors that operate the Department's facilities. The nuclear safety Orders are in the process of being issued as rules in response to the Price-Anderson Act Amendments so that they are directly enforceable on the contractors and provide for both civil and criminal penalties.

1.5 DOCUMENT ORGANIZATION AND AUDIENCE

This Handbook has been written for those who plan and conduct DOE hazardous waste-related activities. It is designed to serve as a bridge between management and the health and safety community—that is, between hazardous waste project managers, field team leaders, supervisors, and project planners; and site safety and health officers (SSHOs), HAZWOPER coordinators, and other health and safety professionals. The intent of the Handbook is to serve as a benchmark for hazardous waste activities within DOE and to foster common understanding and focus among DOE and contractor personnel.

This Handbook is organized into nine technical chapters which parallel the process to be used in the organization, planning, and implementation of hazardous waste activities. This organization is depicted in Figure ES-1.

Topics to the left and top of the graphic represent critical management and planning functions that occur prior to initiation of hazardous waste activities and operations. These include:

- Determining the scope and application of the HAZWOPER Standard and providing a basis for the integration of the various DOE rules and requirements (Chapter 2);

- Establishing organizational structures, creating a multidisciplinary project team, and initiating critical planning functions (Chapter 3);

- Determining training requirements and implementing a comprehensive training program that integrates existing training activities (Chapter 4);

- Characterizing worksite hazards and assessing worker exposures to provide a basis for determining worker health and safety requirements (Chapter 5); and

- Preparing a worksite HASP and establishing work control systems (Chapter 6).

Topics to the right and bottom of the graphic represent key operational activities that are necessary to support the conduct of safe and cost-effective hazardous waste activities. These include:

- Implementing an access and hazard control strategy that incorporates the necessary blend of engineering controls, administrative controls, and use of PPE to support worker protection and cost-effective hazardous waste operations (Chapter 7);
- Providing appropriate technologies and systems to support worker and equipment decontamination activities and minimize contamination of clean areas (Chapter 8);
- Establishing a comprehensive medical surveillance program that monitors worker activities and exposures and provides for timely indication of the effectiveness of access and hazard controls (Chapter 9); and
- Initiating an effective emergency preparedness program which serves to minimize any impact to the worker, the public, and the environment (Chapter 10).

1.6 REFERENCES

29 CFR 1910.120 and 1926.65, "Hazardous Waste Operations and Emergency Response"

DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"

DOE 5480.4, "Environmental Protection, Safety, and Health Protection Standards"

DOE 5480.23, "Nuclear Safety Analysis Reports"

DOE/EH-0227P, OSHA Training Requirements for Hazardous Waste Operations

DOE-STD-1098-96, *Draft DOE Radiological Control Technical Standard*

DOE/EH/EM, *Management Perspectives on Worker Protection During DOE Hazardous Waste Activities*

DOE/EH/EM, *Working Safely During DOE Hazardous Waste Activities*

Office of Technology Assessment, *HAZARDS AHEAD: Managing Cleanup Worker Health and Safety at the Nuclear Weapons Complex, OTA-BP-O-85, February 1993*

T W O

SCOPE, APPLICATION, AND INTEGRATION

2.1 BACKGROUND

Integrating relevant Occupational Safety and Health Administration (OSHA) and Department of Energy (DOE) rules, requirements, and guidance and corresponding documentation is key to planning and conducting a safe and healthful hazardous waste project. A compliance strategy that uses a risk- and hazard-based approach to implement numerous rules and requirements can prevent duplication. Thus, a comprehensive, cost-effective program to protect worker health and safety becomes an integral part of the project.

2.2 THE HEALTH AND SAFETY UMBRELLA

Figure 2-1 provides a conceptual framework for understanding the relationship of a broad spectrum of environmental management activities and health and safety standards of practice. Within this framework, environmental management is a dynamic process that generally progresses from deactivation to remediation. Deactivation results in a stabilized facility. Surveillance and maintenance (S&M), an intermediate step in this process, allows required systems to operate until the facility is decommissioned. Decommissioning, which consists of decontamination and dismantlement (D&D), proceeds to remediation.

Process Safety

The process safety code of management practices (which has been developed by leading private-sector chemical manufacturers and is sometimes called "Responsible Care®") refers to management practices that integrate process safety information, hazard and operability studies (HAZOPS), health and safety plans, management of change, operating procedures, safe work practices, training, mechanical integrity of critical equipment, pre-startup safety reviews, emergency response and control, investigation of incidents, and management system audits.

Application of the provisions of the appropriate rule or requirement depends on the specific facility or site, its hazards, and the possibility for worker exposure to these hazards. As Figure 2-1 illustrates, the OSHA "Hazardous Waste Operations and Emergency Response" (HAZWOPER) Standard is the dominant set of regulatory requirements that govern worker protection during hazardous waste remediation. At the other end of the continuum, DOE operational safety rules and requirements and the process safety code of management practices are relevant to operational facilities undergoing deactivation. Only hazardous waste management and hazardous material emergency response functions fall under the scope of the HAZWOPER Standard at DOE operational facilities. Operational safety standards of practice and OSHA HAZWOPER are compatible and complement each other throughout the progression from deactivation and decommissioning into remediation. All activities are governed by DOE and DOE-adopted nuclear and nonnuclear rules and requirements, as illustrated by the "umbrella" (e.g., the OSHA Confined-Space-Entry Standard applies to any confined-space entry, whether it is performed at an operational facility or during hazardous waste remediation).

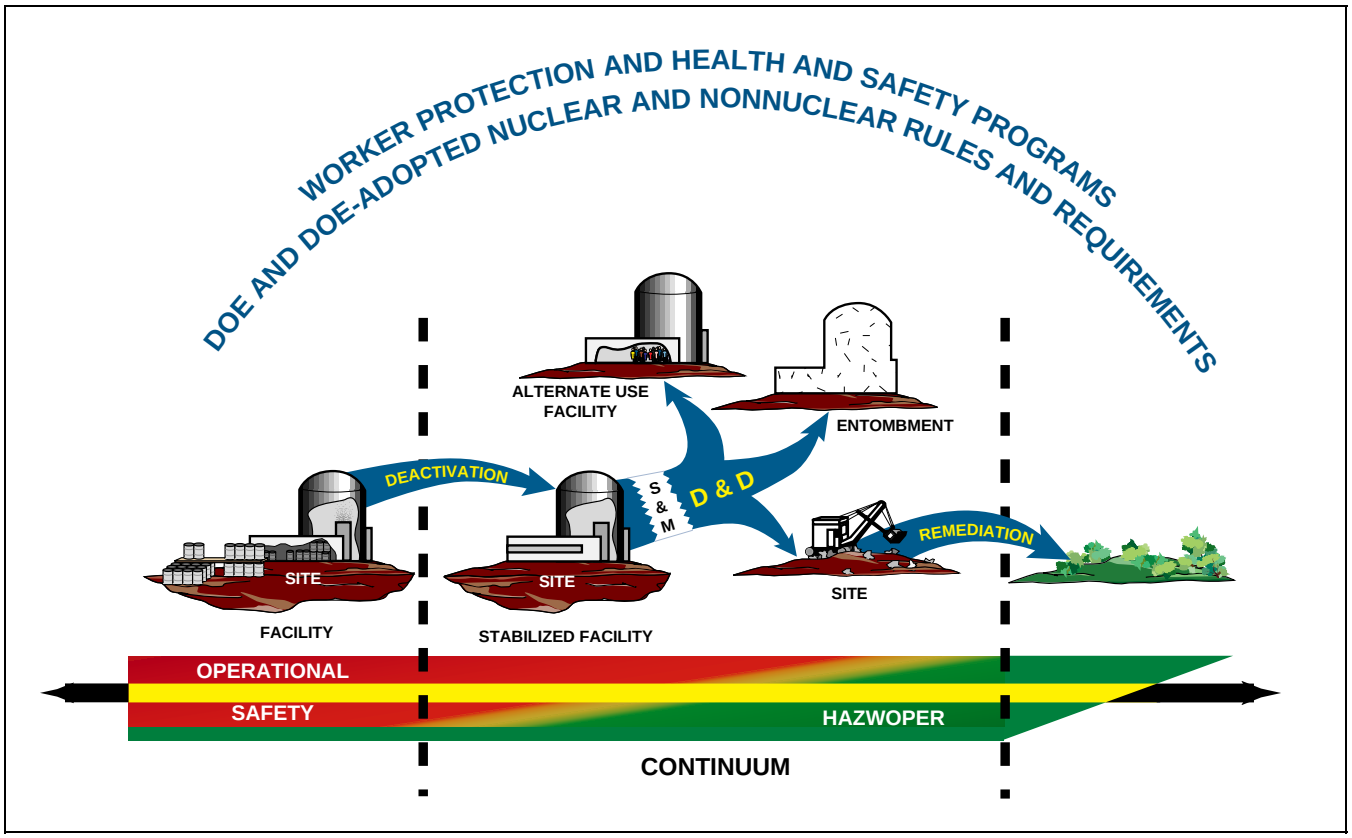


Figure 2-1. The Health and Safety Umbrella

2.3 DOES THE OPERATION FALL UNDER HAZWOPER?

Operations and activities conducted at individual worksites and locations are evaluated to determine if they fall under the HAZWOPER Standard based on an understanding of the scope of the standard as stated in 29 CFR 1910.120 (a) and the possibility for worker exposure to safety and health hazards from hazardous waste operations. Determining coverage under 29 CFR 1910.120 (a) is simplified through use of a model (Figure 2-2) and two implied questions. The answer to each question must be "yes" for the operation or activity to fall under HAZWOPER.

1 Is the actual *worksite or location* a required cleanup of an uncontrolled hazardous waste site, including initial investigation of areas of known or suspected contamination to determine the presence or absence of hazardous substances; a Resource Conservation and Recovery Act (RCRA) corrective action cleanup site; a voluntary cleanup of a government-recognized uncontrolled hazardous waste site; a RCRA treatment, storage, and disposal (TSD) facility with operations that involve hazardous wastes or substances; or an emergency response operation involving the release (or substantial threat of release) of hazardous wastes or substances?

- If the project is at a worksite or location that is a cleanup of an Environmental Protection Agency (EPA) National Priorities List (NPL) or State priority list site—or within a RCRA-regulated TSD facility, the answer to this question is "yes." (The answer would also be "yes" for voluntary or government-required cleanups or initial investigations to determine the absence or presence of hazardous wastes or substances.)

- If the project is a corrective action involving cleanup at a RCRA TSD facility where releases to the environment involving hazardous wastes and substances have occurred, the answer is "yes."

- If a facility or site does not meet the criteria to be placed on a priority site list, cleanup is still covered under the HAZWOPER Standard if uncontrolled hazardous wastes or substances are present or suspected of being present. For these types of worksites the answer is "yes."

- Certain DOE decommissioning activities involving hazardous waste are covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and fall under HAZWOPER as a result of a policy on decommissioning DOE facilities that went into effect on May 22, 1995. See text box below.

2 Does the activity pose a reasonable *possibility for exposure* or does the activity *inherently expose* workers to hazardous wastes or substances, or to health and safety hazards from a hazardous waste operation?

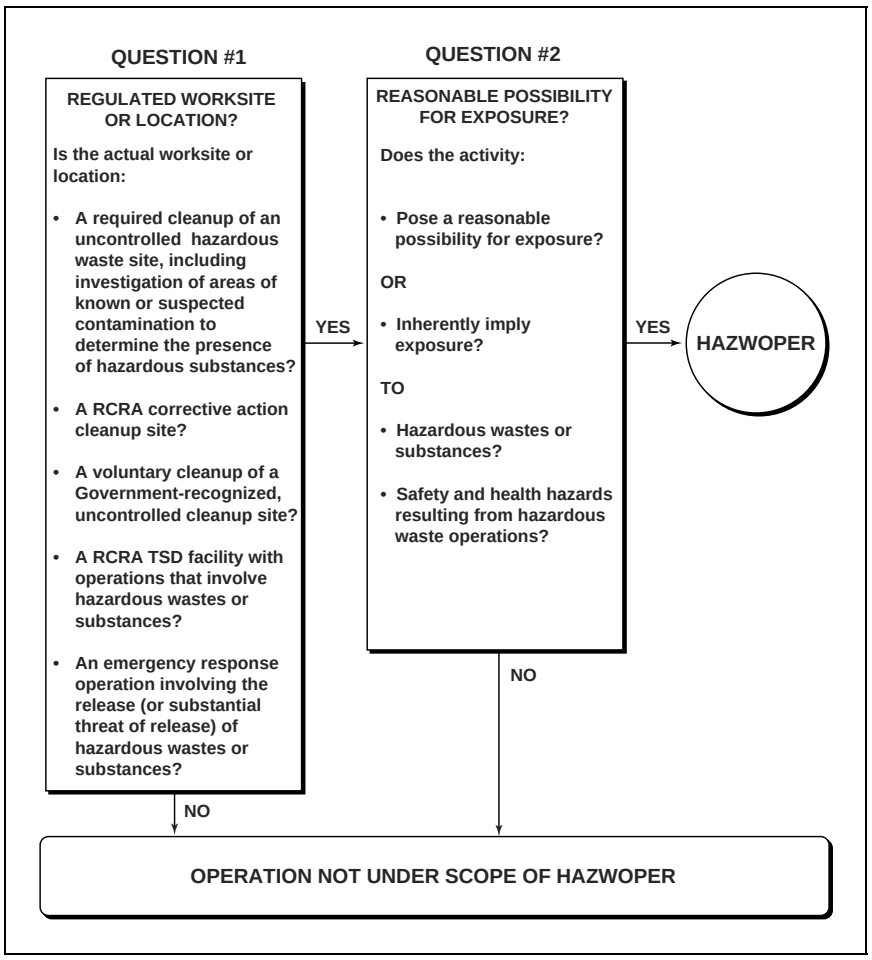


Figure 2-2. Determining OSHA HAZWOPER Scope

- HAZWOPER applies only where exposure to hazardous wastes and substances or to health and safety hazards resulting from a hazardous waste operation is likely. This can be determined by analysis of monitoring data, by hazard characterization or hazard analysis and exposure assessment by a competent person, or by limiting access. If there is exposure or a reasonable possibility for exposure, the answer to this question is "yes."

- Some activities are inherently covered by the OSHA HAZWOPER Standard. Emergency response usually means that contaminants exist in quantities that pose a hazard. Emergency responders thus have a reasonable possibility for exposure. Hazardous waste management likewise implies HAZWOPER coverage.

Policy on Decommissioning DOE Facilities Falling Under CERCLA

In May 1995, DOE and EPA agreed on a policy for the conduct of DOE decommissioning projects consistent with CERCLA requirements. This policy stipulates that DOE and EPA determine when CERCLA response authority is used to decommission DOE facilities. The "Policy on Decommissioning Department of Energy Facilities Under CERCLA," and the document that describes the application of this policy are contained in DOE-EM-0246, "Decommissioning Resource Manual."

When decommissioning activities are determined to fall under the scope of CERCLA, HAZWOPER also applies if there is a reasonable possibility for employee exposure to hazardous wastes or substances, or to health and safety hazards from a hazardous waste operation associated with those decommissioning activities.

For these activities, the answer to this question is "yes." (Note: Read Example 2-5 before answering this question with a "yes" for emergency response and waste management activities.)

EXPOSURE IN RELATION TO SCOPE

A conceptual understanding that relates exposure to regulatory scope simplifies answering the above questions. When determining the scope of the HAZWOPER Standard, exposure has two elements—the presence of a hazard and worker access to the hazard (see Figure 2-3). For example, contaminated areas of a hazardous waste site potentially pose health hazards. For exposure to occur, workers must have access to the hazard (e.g., they work in contaminated areas). Under normal circumstances, workers who are prevented from entering contaminated areas (by using access controls—see Chapter 7) are not exposed and do not fall under the standard, provided that they are not exposed to safety hazards resulting from the hazardous waste operation (see Examples 2-1 and 2-2). Conversely, workers in contaminated areas are covered because they have access to health hazards and could be exposed.

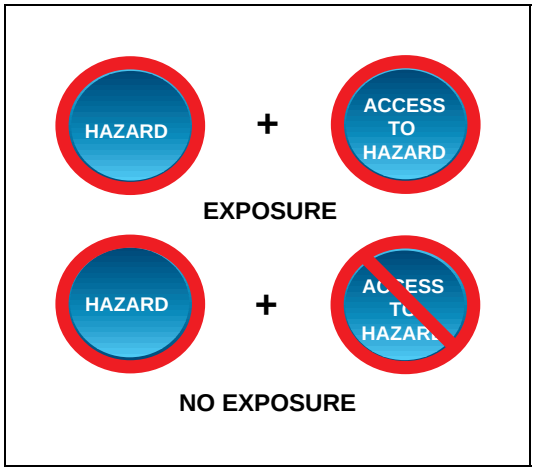


Figure 2-3. The Two Elements of Exposure

Safety hazards are treated in the same manner. Workers who work in trenches in clean areas of the site would be covered by the OSHA Trenching Standard. Workers who work in trenches in contaminated areas would fall under both the OSHA Trenching and HAZWOPER Standards. Workers who do not work in trenches fall under the HAZWOPER Standard only when working in contaminated areas and would not be covered by either standard when working solely in clean areas, provided they are not exposed to safety hazards resulting from hazardous waste operations.

Truck drivers at the Oak Ridge K-25 Plant haul clean clay fill to a clean fill area within the exclusion zone of a hazardous waste operation. The drivers are under instructions not to leave their trucks, and they are prevented from driving through contaminated areas. Monitoring data indicate that these workers have no reasonable possibility for exposure to hazardous wastes or substances. Thus, the hauling operation is not covered by OSHA HAZWOPER since the truck drivers are not exposed to hazardous wastes or substances. The truck drivers are exposed to safety hazards which are a result of the hauling operation, not the hazardous waste operation. The truck drivers must successfully complete appropriate training (e.g., the site-specific briefing, General Employee Training, and defensive driving training), but no core HAZWOPER training is required. The procedures truck drivers follow are documented in the Health and Safety Plan (HASP). A competent person should periodically monitor the hauling operation to verify that the workers continue to have no reasonable possibility for exposure.

Example 2-1

Utility workers service an electrical box located in an exclusion zone. Hazard characterization and exposure assessment performed by a competent person show that the area surrounding the box and an access corridor leading to the box can be cleaned such that the utility workers can work in the area and transit the corridor without possible exposure to hazardous wastes and substances. The work can be carried out as a normal maintenance operation. The area and corridor are free of safety hazards arising from hazardous waste operations. The work does not fall under the OSHA HAZWOPER Standard. In essence, the area and corridor constitute a temporary support zone. Since the work involves electrical utilities, it would fall under the most protective standard of practice (e.g., the OSHA Electrical Standard). Administrative controls such as HAZWOPER-trained escorts are used to make certain that the utility workers are not exposed to any hazards from the hazardous waste operation. The procedures to be followed are documented in the HASP.

Example 2-2

This type of analysis excludes many routine activities from the jurisdiction of the OSHA HAZWOPER Standard while continuing to provide adequate and appropriate worker protection. The HAZWOPER Standard does not cover clerical or support personnel, workers at the perimeter of a hazardous waste worksite, or workers engaged in construction activities in uncontaminated areas, provided they are not exposed or possibly exposed

to hazards resulting from hazardous waste operations. These workers would fall under the scope of other appropriate standards of practice that are more protective of health and safety.

INTERPRETATION OF SCOPE

Examples illustrating interpretation of the scope of the HAZWOPER Standard are found throughout this document. Such interpretations are permissible because HAZWOPER is a performance-based standard. OSHA provides guidance on interpretation, including numerous examples, in its publication *OSHA HAZWOPER Interpretive Quips* (known as the *HAZWOPER IQs*). The IQs are policy statements abstracted from official OSHA letters of interpretation. OSHA is clear that the IQs represent guidance and that decisions regarding scope should be supported by hazard characterization and exposure assessment (see Chapter 5) and should be made by a competent person (e.g., health and safety professional).

2.4 APPLICATION OF THE OSHA HAZWOPER STANDARD

Once the decision is made that an operation falls under the HAZWOPER Standard, the appropriate paragraphs of the standard are applied to specific activities. Paragraphs (b) through (o) apply to environmental remediation and corrective actions, paragraph (p) applies to RCRA-regulated TSD facilities, and paragraph (q) applies to certain emergency responses to releases (or threats of releases) of hazardous wastes or substances, without regard to location. The colored boxes in Figure 2-4 depict the HAZWOPER Standard programmatic requirements for cleanup as they relate to medical surveillance (blue), training (green), standard operating procedures (yellow), and the site-specific HASP (red).

Scope and Application

It is important to differentiate between scope and application of a standard of practice. *Scope* determines whether an operation or location is "covered" or "governed" by the standard. *Application* determines which portions (e.g., paragraphs) of the standard apply to the particular operation or location.

When the applicability of the HAZWOPER Standard is being determined, OSHA stipulates that if there is conflict or overlap with another standard, the provision more protective of worker health and safety applies (see Examples 2-3 and 2-4); for example, in considering workers in contaminated areas of the site who work on scaffolds, the OSHA Scaffolding Standards are more protective than is the HAZWOPER Standard for safety

An environmental remediation planned at an NPL-listed site falls within the scope of the OSHA HAZWOPER Standard. The worksite includes an abandoned building that has been slated for renovation for use as a storage facility for later operations. The building contains concrete walls with lead-based paint covering them. The building also contains large quantities of friable asbestos, in the ceiling insulation and pipe wrappings. There are no other hazardous substances or wastes present in the buildings.

For asbestos removal, the provisions of the OSHA Asbestos Standard are more protective of worker health and safety than are the more general provisions of the OSHA HAZWOPER Standard. The HASP therefore provides that the asbestos removal tasks conducted inside the building will be performed in full accord with the OSHA Asbestos Standard and not HAZWOPER.

After the asbestos has been removed, the lead-based paint will be removed. Again, the provisions of the OSHA Standard for lead removal are more protective of worker health and safety than are the more general provisions of the OSHA HAZWOPER Standard. Therefore, the removal of the lead-based paint inside the building will be performed in full compliance with the OSHA Lead Standard, and not HAZWOPER.

Example 2-3

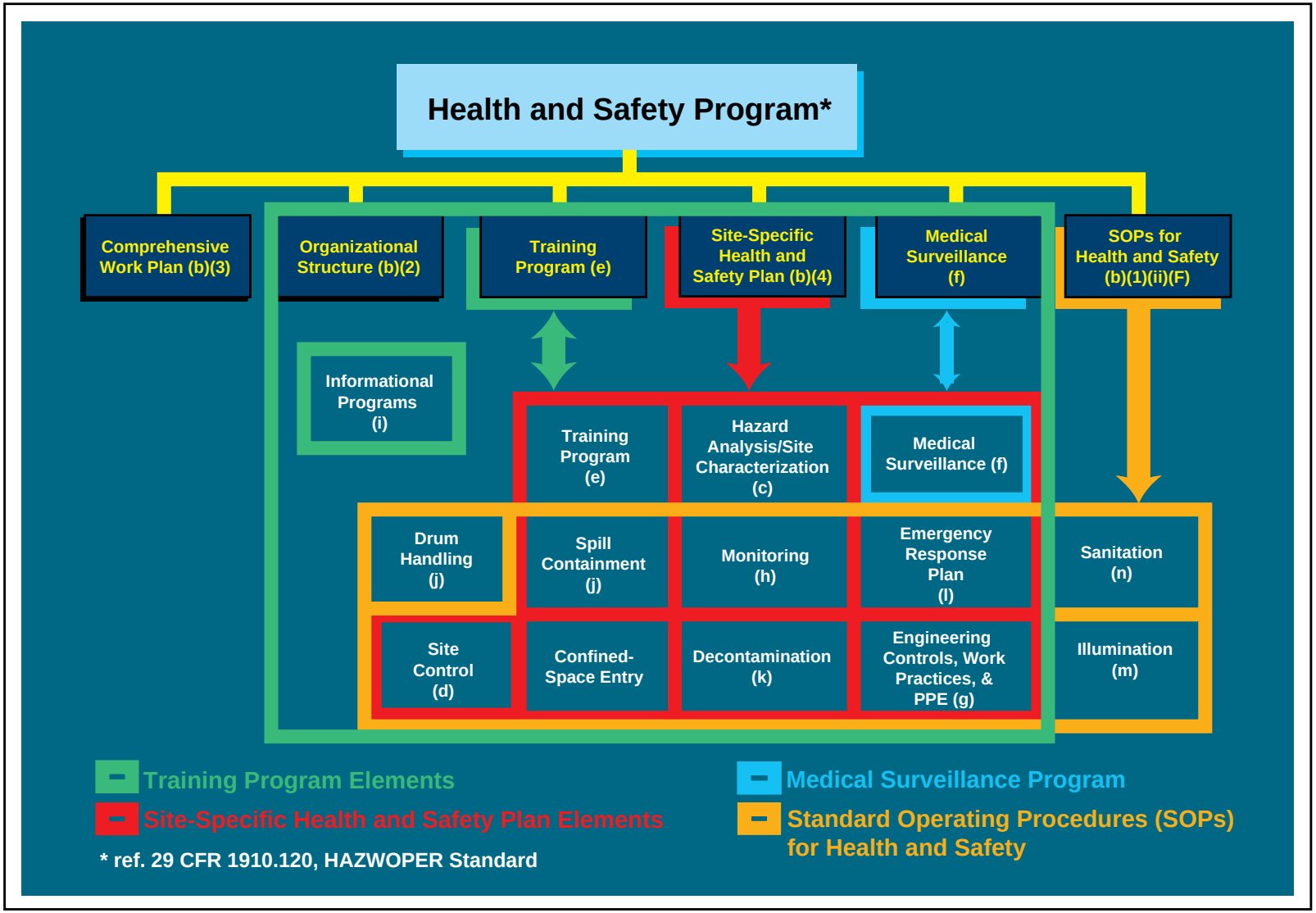


Figure 2-4. Health and Safety Program for Hazardous Waste Site Cleanup

hazards resulting from working on scaffolds. The HAZWOPER Standard is more protective for health hazards resulting from the contamination. The applicable provisions of both standards would apply to the work.

A RCRA TSD facility consists of tank farms and waste-water treatment plants handling low-level radiological waste water. The tank farms with uncontrolled environmental releases undergo corrective actions. Do paragraphs (b) through (o) of OSHA HAZWOPER apply to the entire facility? Does paragraph (p) apply to the part of the TSD not undergoing corrective action? Would paragraphs (b) through (o) apply to routine decontamination of the TSD? Paragraphs (b) through (o) apply only to the portions undergoing remediation. If normal operations are not affected by the uncontrolled releases, paragraph (p) would apply to those unaffected areas. Defining decontamination activities using established controls for normal operation places these activities under 29 CFR 1910.120 (p). For example, decontamination of the Evaporator Facility at Hanford is controlled by standard operating procedures, safe work permits, and as-needed task instructions as part of the overall health and safety program. Similarly, routine maintenance or replacement of process lines in the waste-water treatment facility would be work covered under paragraph (p). Remediation efforts to clean up leaks at the tank farms are covered under paragraphs (b) through (o).

Example 2-4

2.5 APPLICATION OF HAZWOPER TO OTHER DOE ACTIVITIES

Certain activities conducted by DOE normally fall outside the scope of the HAZWOPER Standard. For these activities, DOE has adopted an approach that uses HAZWOPER concepts and principles as a framework, not as a rigid standard for the planning and conduct of these activities. Table 2-1 summarizes some considerations when determining the application of OSHA HAZWOPER as a framework for projects not strictly regulated by the standard. The following procedure can be used to apply HAZWOPER to these types of projects:

Use HAZWOPER concepts and principles as a framework for:

- Deactivation
- Certain D&D activities that do not fall under CERCLA
- S&M activities
- Non-RCRA-permitted TSDs
- Construction
- Laboratory activities
- Research and development (R&D) activities
- Satellite accumulation sites

- ***Determine whether OSHA HAZWOPER needs to be strictly applied*** or whether applying its concepts or principles would suffice. This determination should be made by health and safety professionals responsible for hazardous waste activities.
- ***Apply all elements of HAZWOPER to environmental remediations involving radioactive wastes and materials.*** (Note: OSHA treats radiological and nonradiological environmental remediation activities similarly.)
- ***Develop a work plan*** identifying jobs and tasks that require hazard analyses.
- ***Integrate hazard analyses to identify worker hazards and to provide a basis for specification of job and task hazard controls.*** DOE-EM-STD-5502-94, "Hazard Baseline Documentation," provides a decision logic with quantitative criteria for classifying different types of facilities and activities based on DOE-STD-1027-92. The HAZWOPER Standard requires baseline, task-based, periodic, and other types of hazard analyses. Chapter 5, "Hazard Characterization and Exposure Assessment," provides guidance on conducting hazard analyses using the OSHA HAZWOPER job, task, and hazard analysis (JTHA) approach.

Table 2-1. Considerations When Applying OSHA HAZWOPER to Other DOE Activities

Activity	Considerations When Applying HAZWOPER
Deactivation and certain D&D, including S&M	Deactivation and S&M activities (except for some waste management and emergency response activities) are generally not within the scope of the HAZWOPER Standard. Certain D&D activities that do not fall under CERCLA likewise do not fall under HAZWOPER. Even where the HAZWOPER Standard is not applicable, DOE requires a HASP in accordance with DOE-EM-STD-5502-94. In this case, activities are listed in the HASP as separate tasks, and job controls are specified by a hazard-based approach. S&M can involve confined-space entry, exposure to radiological and other health hazards during maintenance activities (e.g., changeout of HEPA filters), entry into radiologically controlled areas, and a variety of occupational safety hazards. When these hazards do not involve hazardous waste activities, worker protection is provided through the existing health and safety program.
Non-RCRA-Permitted TSDs	Non-RCRA-permitted TSDs, and waste treatment activities not covered by RCRA (e.g., waste-water treatment facilities permitted under the Clean Water Act) are not covered by HAZWOPER, except for emergency response and some limited waste management operations. Specific HAZWOPER elements are assimilated into the existing health and safety program based on hazard analyses. Worker protection requirements are met through existing health and safety and radiological protection programs.
Construction	If there is a reasonable possibility that hazardous wastes or substances could be encountered during intrusive operations, HAZWOPER applicability is determined during the project's planning stage, based on hazard analyses and the possibility for exposure. Construction health and safety measures stipulated in DOE O 440.1 are incorporated in the HASP.
Laboratory and R&D Activities	Bench-scale laboratory and R&D activities must comply with the OSHA Laboratory Standard (29 CFR 1910.1450). R&D activities involving pilot- or full-scale field operations must comply with the HAZWOPER Standard when there is reasonable possibility for worker exposure to hazardous wastes or substances.
Satellite Accumulation Sites and Non-TSD Waste Management Activities	OSHA allows conditional exemptions for small-quantity generators (i.e., those that accumulate less than 100 kilograms per calendar month) and full exemptions for storage areas housing hazardous waste for 90 days or less. With proper documentation, these do not fall under HAZWOPER. However, EPA stipulates that 90-day generators require their employees to be trained to participate in emergency response activities. An emergency response plan or emergency evacuation plan is also required for each site. Emergency response provisions of paragraph (p) are applicable, depending on employee responsibilities in responding to spills.

- ***Establish a health and safety organization and program*,** as outlined in 29 CFR 1910.120 (b), that applies pertinent elements of the HAZWOPER Standard. For some facilities and activities, this will represent enhancements to existing health and safety organizations and programs.

- ***Develop a hazard-based, site-specific HASP*.** (Chapter 6, "Development of a Site-Specific Health and Safety Plan," provides guidance on how to enhance existing programs and procedures to apply to activities not explicitly within the scope of the HAZWOPER Standard.)

OSHA has clarified the HAZWOPER Standard's application to some waste management and emergency response activities. For example, drum-handling and similar tasks that are controlled by operational safety procedures and that occur within a building's envelope are generally not covered. Likewise, small, localized spills (e.g., from a 5-gallon pail) that are readily controlled by workers normally assigned to the operation are generally not covered. However, large, uncontrolled spills or removals of drums that occur outside the building's envelope are covered.

Example 2-5

- ***Assign a Site Safety and Health Officer (SSHO) to implement the health and safety program and plan.*** (Chapter 3, "Organization and Planning," describes the role and responsibilities of SSHOs.)

- ***Provide appropriate training and medical monitoring*** based on a needs analysis.

2.6 INTEGRATION OF KEY DOE REQUIREMENTS WITH HAZWOPER ACTIVITIES

Hazardous waste activities are subject to a myriad of DOE and DOE-adopted nuclear and nonnuclear rules and requirements (see Section 2.7, "References" and discussion below) that vary in focus and scope. It is important to understand the family of applicable rules and requirements, determine compatibilities, and develop an integrated approach to hazard analyses and health and safety planning. The key objectives of integration involve using a multidisciplinary team approach to accomplish the following:

- Optimize worker health and safety by focusing on those hazard analysis elements that apply to jobs and tasks.

- Minimize duplication of effort in the development of overall hazard baseline documents that identify and specify controls for radiological and nonradiological hazards (e.g., coordinate hazard analyses required for safety analysis reports (SARs), Basis for Interim Operations (BIO), Auditable Safety Analysis (ASA), Unreviewed Safety Questions (USQs), construction project safety and health plans, and HAZWOPER-required HASPs).

- Use work control systems as a vehicle for enhanced communication and cooperation between nuclear and nonnuclear personnel to develop documents at the job- and task-specific level in a timely and cost-effective manner.

Multidisciplinary Team Approach

"HAZWOPER worksites are subject to the same rules and requirements as other operating or construction sites, where DOE requires classification and documentation of an authorized safety basis. Engaging a multidisciplinary team in the early phases of the project to address health and safety issues achieves integration and reduces duplication."

THE MULTIDISCIPLINARY TEAM APPROACH TO PLANNING IS DISCUSSED IN CHAPTER 3.

WORK CONTROL SYSTEM

Health and safety planning and implementation emphasize jobs and tasks. Many DOE sites have an established work control system (WCS) that is focused at the job and task level. Workers are familiar with the WCS and understand its content because each work-task package, which includes checklists and permits, is a normal part of daily work. Hundreds of cleanup activities are task-oriented (rather than process-oriented) with

short duration, and the WCS is a practical vehicle for managing and conducting these activities. The WCS supports the HASP by providing a mechanism to accomplish the following:

- Integrate the hazard analyses;
- Evaluate proposed tasks to verify that the authorized safety basis for operations is not violated; and
- Promote integrated participation by workers, managers, and health and safety professionals.

Detailed discussions of the WCS are found in Chapter 3, "Organization and Planning," and Chapter 6, "Development of a Site-Specific Health and Safety Plan."

ORDERS AND STANDARDS FOR IMPLEMENTATION OF HEALTH AND SAFETY REQUIREMENTS

Orders. Section 2.7 lists a number of rules and requirements that govern DOE hazardous waste work. The principal DOE Orders for implementing health and safety requirements at HAZWOPER sites are as follows:

- DOE 5480.21, 5480.22, and 5480.23, which address nuclear facility hazard classification safety analyses and controls; and
- DOE O 440.1, which provides for application of all OSHA standards (including 29 CFR 1910 and 29 CFR 1926) to DOE activities; establishes industrial hygiene program requirements for DOE activities; and addresses construction-related issues, including HAZWOPER activities and D&D.

Because DOE manages many activities as construction projects (e.g., deactivation, decommissioning, and remediation), the construction-related requirements of DOE O 440.1 have special applicability. Elements of DOE O 440.1 (e.g., training and hazard analysis and control) parallel those found in the HAZWOPER Standard and provide opportunities for information-sharing and for minimizing duplication.

Standards. DOE-STD-1027-92 prescribes the types, formats, and levels of hazard analyses and documentation required for an operation to proceed. These documents establish the health and safety parameters for the operation and provide the "authorized safety basis" for its conduct. Two other DOE limited standards have particular importance for DOE hazardous waste activities: DOE-EM-STD-5502-94 and DOE-EM-STD-5503-94. DOE-EM-STD-5502-94 describes hazard analysis requirements and processes for facilities (defined as activities, projects, and physical facilities) and discusses the integration of hazard analysis processes. DOE-EM-STD-5502-94 applies to all life-cycle stages of an EM facility including construction, operations, deactivation, decommissioning, D&D, removal, disposal, and remediation. It allows for the grouping of activities into "facilities" for the purposes of health and safety documentation development and, together with other relevant DOE requirements, provides a technical basis for protecting public and worker health and safety. DOE-EM-STD-5502-94 defines four classes of facilities (nuclear, nonnuclear, radiological, and other industrial facilities), the thresholds for facility hazard classification, and the applicable health and safety hazard identification, controls, and documentation. It also prescribes the development of site-specific HASPs for facilities conducting hazardous waste activities. DOE-EM-STD-5503-94 provides guidance on the development of HASPs for remedial actions at uncontrolled hazardous waste sites. In addition, DOE-STD-3009-94 provides guidance on hazard analysis and health and safety documentation for facilities and operations with higher hazard classifications, including some environmental restoration and waste management operations.

HAZARD ANALYSIS

Historically, the SAR process has not addressed hazards associated with specific jobs and tasks; rather, it has stressed operational facility and public protection issues. DOE-STD-3009-94 provides guidance on systematic hazard analyses for higher hazard nonreactor nuclear facilities. It prescribes a safety analysis process that focuses on risks to workers and a team approach to hazard analysis and control. The HASP emphasizes worker protection at the job and task level, and it is the governing document that identifies, evaluates, controls, and communicates hazards to workers. The SAR hazard analysis is considered in the preparation of the HASP, with relevant insights and information extracted and applied to worker job and task hazard analysis.

Sometimes multiple levels of analysis are necessary—for example, when the restoration process involves worker and public health and safety issues (see Example 2-6).

As stated in DOE-STD-1027-92:

> "...radiological facilities shall develop an auditable (defendable) safety analysis (similar to SAR but with reduced content and requirements). An auditable safety analysis (ASA):
>
> - Provides systematic identification of hazards within a given DOE operation; and
> - Describes and analyzes the adequacy of measures taken to eliminate, control, or mitigate identified hazards.
>
> Radiological facilities with hazardous waste activities require the development and maintenance of a HASP. The HASP process shall incorporate the results of, or document the ASA which may be integrated into the task analysis..."

Caution: Hazard analyses, for a variety of hazard baseline documents, are frequently developed by different groups within DOE and contractor organizations. There is the real risk that these groups may not communicate, causing inconsistencies in assumptions affecting worker health and safety. A USQ or "USQ-like" process, as discussed in DOE-EM-STD-5502-94, DOE 5480.21, and DOE 5480.23, provides a mechanism to deal with these inconsistencies, but a team approach can foster communication and alleviate the risk. (See the discussion of the USQ process below.)

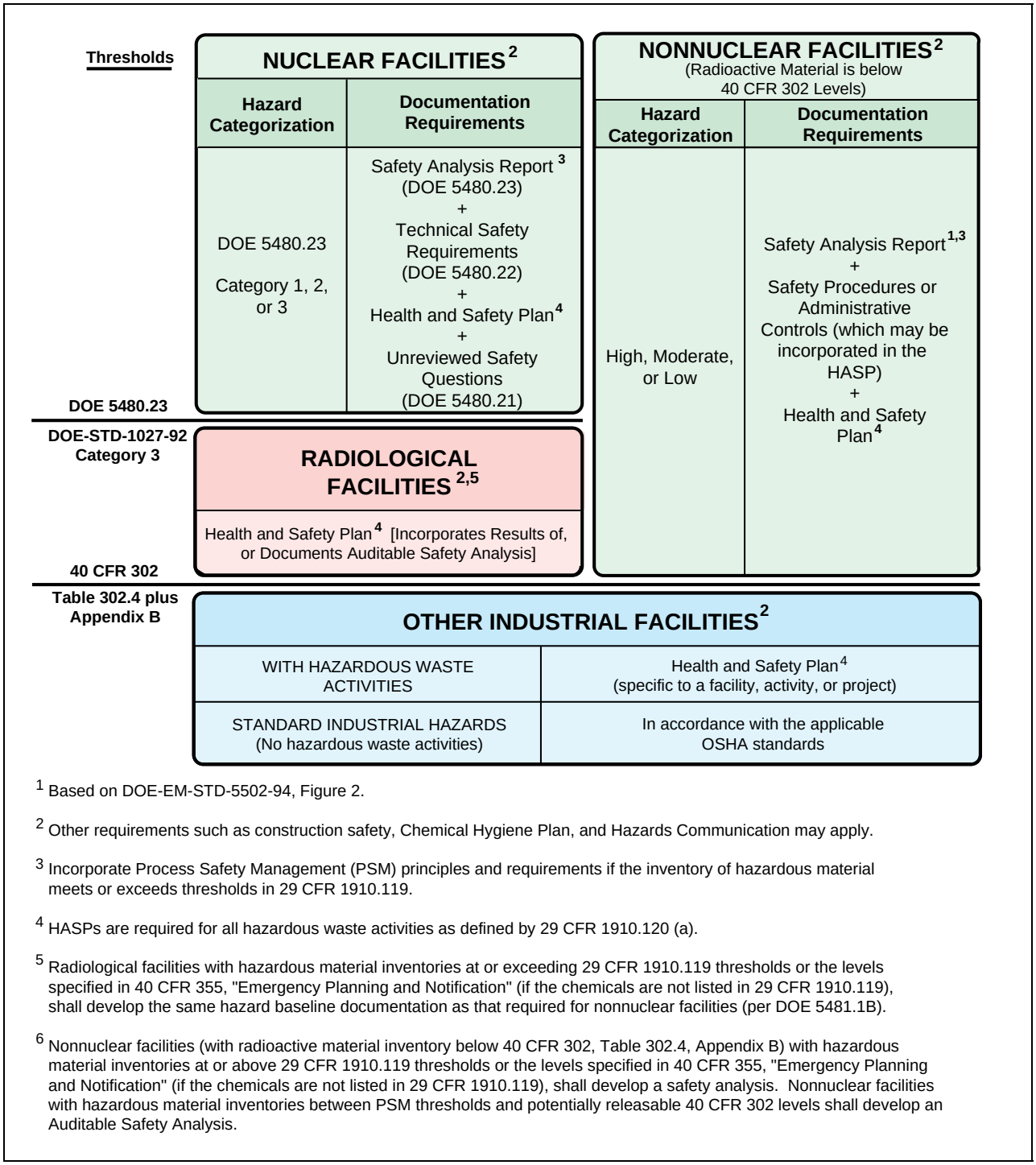
Many hazardous waste facilities and activities in the DOE complex are expected to be classified as "radiological," "low hazard non-nuclear," or "industrial." For these classes, the dominant hazards during environmental restoration will be to the workers; the HASP will generally be sufficient to control hazards in terms of worker health and safety. However, there are a number of surplus nuclear facilities and activities that are in the high and medium hazard classes which are now (or soon will be) under DOE's EM program. These facilities and activities contain plutonium and uranium inventories and a large volume of hazardous chemicals left over from the production and operational phases, including production and R&D reactors, and chemical processing plants. Examples include the N-Reactor, high level waste tank farms, and the PUREX plant at the Hanford Reservation. Restoration activities at these locations may involve significant hazards to the public as well as to workers and will require that any SAR considerations be carefully integrated throughout the work planning process.

Example 2-6

CLASSIFICATION OF HAZARDOUS WASTE ACTIVITY AND FACILITY

DOE has established a hazard-based approach to rank its facilities and activities that establishes levels of documentation, review, and approval based on radiological and chemical inventories that are thresholds. Each threshold requires a specific level of hazard analysis and corresponding documentation that details the authorization basis for the facility and activity (i.e., "those aspects of the facility design basis and operational requirements relied upon by DOE to authorize operation..." [DOE-EM-STD-5502-94, Section 3.1]). The four major groupings of facilities and activities are nuclear, radiological, nonnuclear, and industrial (see Figure 2-5). A facility or activity can be further categorized within a grouping.

DOE-EM-STD-5502-94 provides a decision logic with quantitative criteria for classifying different types of facilities and activities based on DOE-STD-1027-92. Additional requirements for, and guidance on, this process are available in a number of other documents including DOE-STD-3009-94, 10 CFR 830, DOE 5480.23, DOE 5480.22, and DOE 5480.21 (see Examples 2-7, 2-8, and 2-9). (Note: These standards refer to hazardous waste activities as "facilities or activities.")



[1] Based on DOE-EM-STD-5502-94, Figure 2.

[2] Other requirements such as construction safety, Chemical Hygiene Plan, and Hazards Communication may apply.

[3] Incorporate Process Safety Management (PSM) principles and requirements if the inventory of hazardous material meets or exceeds thresholds in 29 CFR 1910.119.

[4] HASPs are required for all hazardous waste activities as defined by 29 CFR 1910.120 (a).

[5] Radiological facilities with hazardous material inventories at or exceeding 29 CFR 1910.119 thresholds or the levels specified in 40 CFR 355, "Emergency Planning and Notification" (if the chemicals are not listed in 29 CFR 1910.119), shall develop the same hazard baseline documentation as that required for nonnuclear facilities (per DOE 5481.1B).

[6] Nonnuclear facilities (with radioactive material inventory below 40 CFR 302, Table 302.4, Appendix B) with hazardous material inventories at or above 29 CFR 1910.119 thresholds or the levels specified in 40 CFR 355, "Emergency Planning and Notification" (if the chemicals are not listed in 29 CFR 1910.119), shall develop a safety analysis. Nonnuclear facilities with hazardous material inventories between PSM thresholds and potentially releasable 40 CFR 302 levels shall develop an Auditable Safety Analysis.

Figure 2-5. Illustrating the Relationship Among the Different Classes of EM Facilities[1]

Drums have been recovered with highly radioactive mixed waste and are in a storage facility. The facility thresholds exceed those defined in DOE-STD-1027-92, "Hazard Characterization and Accident Analysis Techniques for Compliance with DOE Order 5480.23," and will require a SAR developed in accordance with the requirements of DOE 5480.23 and guidance provided in DOE-STD-3009-94 for nonreactor nuclear facility SARs. The SAR hazard analysis will focus on the inventory of radioactive and hazardous materials that may be in the drums and on protecting the public, workers, and the environment from their release. The hazard analysis developed for the SAR should be performed by a multidisciplinary team using an approach similar to that defined for process hazard analysis in the OSHA standard for process safety management (29 CFR 1910.119).

For consistency, cost-savings, and to avoid duplication of effort, the SAR hazard analysis should be used and/or integrated into other hazard baseline documents such as the site-specific HASP. Similarly, the hazard identification and analysis information and HASP, prepared during the planning process for the initial characterization phase, may be used in preparation of the SAR. Specifically, in some cases this information may be used as input to the hazard analysis component of the SAR.

Example 2-7

Work is being planned for a worksite with buried drums of highly radioactive mixed waste identified as potentially being above the thresholds identified in DOE-STD-1027-92. This nonfacility nuclear operation would require the development of a Basis for Interim Operations (BIO) prepared in accordance with DOE-STD-3011-94, "Guidance for the Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans." The hazard analysis developed for the BIO will satisfy the safety analysis requirements of DOE 5480.23 and should be prepared by a multidisciplinary team. This information may also be used or integrated into other hazard baseline documents, such as the project HASP. The hazard identification and analysis information and HASP, prepared during the planning process for the initial hazard characterization phase for this operation, should be considered in preparation of the BIO. This information may provide valuable input into the hazard analysis component of the BIO.

Example 2-8

Contaminated soil is being removed in preparation for a construction project. Preliminary site characterization and hazard analysis have shown that the soil is radioactive below the thresholds for the Category 3 designation of DOE-STD-1027-92, but above those described in 40 CFR 302, Appendix B, "Designation, Reportable Quantities, and Notification." The project has, therefore, been classified as a radiological operation requiring development of an ASA and HASP as prescribed in DOE-EM-STD-5502-94. The ASA provides for the identification and control of hazards associated with radiological operations and may be used in, or integrated into, the project's site-specific HASP. The HASP prescribed by the EM Limited Standard must be developed in accordance with 29 CFR 1926.65 for this hazardous waste construction project. The project must also meet requirements of DOE O 440.1 and other relevant OSHA standards and DOE rules and requirements. The hazard analysis prepared for any of these purposes should be developed by a multidisciplinary team of personnel and used as input, wherever possible, in fulfilling similar provisions of each of these mandates.

Example 2-9

Hazardous waste activities with radiological material inventories exceeding threshold quantities specified in DOE-STD-1027-92 are categorized as "nuclear facilities or activities." "Radiological facilities or activities" have inventories below threshold quantities specified in DOE-STD-1027-92. "Nonnuclear facilities or activities" (which have only chemical inventories) have radiological materials below levels specified in 40 CFR 302. (Note: Hazard analysis requirements in 29 CFR 1910.119 and DOE O 440.1 may also apply to nonnuclear facilities.) If facilities or activities have radiological and hazardous chemical inventories below the thresholds specified in 40 CFR 302, they are classified as "other industrial facilities." Table 2-2 describes the relationship between facility classifications, hazard levels, and required documentation.

Table 2-2. Strategy for Integration of Requirements

General Category	Facility or Activity	Focus Area	Document	Type of Analysis
Hazardous Waste Operations with Radiological, Chemical, and Industrial Safety Hazards	Nuclear	Operational and Public Safety	SAR[1,2]	Hazard Analysis
		Worker Protection	HASP[3]	Hazard Characterization and Exposure Assessment
	Radiological	Worker Protection	HASP with ASA[4]	Hazard Analysis and Hazard Characterization and Exposure Assessment[5]
Hazardous Waste Operations with Chemical and Industrial Safety Hazards	Nonnuclear with Chemical Materials > PSM	Operational and Public Safety	Safety Analysis[2]	Hazard Analysis
		Worker Protection	HASP	Hazard Characterization and Exposure Assessment[5]
	Nonnuclear with Chemical Materials > 40 CFR 302	Worker Protection	HASP with ASA[4]	Hazard Characterization and Exposure Assessment[5]
Hazardous Waste Operations with Industrial Safety Hazards	Industrial	Worker Protection	HASP	Hazard Characterization and Exposure Assessment[5]

(1) Required by DOE 5480.23.

(2) Incorporate chemical safety principles and requirements if inventory meets or exceeds thresholds in 29 CFR 1910.119.

(3) Required by 29 CFR 1910.120.

(4) Auditable Safety Analysis (ASA) and its integration with the HASP are described in DOE-EM-STD-5502-94.

(5) As discussed in Chapter 5, hazard characterization and exposure assessment include worker exposure to all chemical, physical, and biological hazards in JTHA.

Facility and activity authorization is documented such that personnel understand the requirements. For some facilities, the Price-Anderson Amendments Act of 1988 has established civil and criminal penalties for failure to operate in accordance with the authorization basis. Hazardous waste activities managers need to anticipate how discovery of previously unforeseen hazards might impact either the authorization basis or the HASP. New hazards information is considered and addressed to the greatest extent possible in the documentation maintenance process.

UNREVIEWED SAFETY QUESTIONS

The USQ process verifies that potential changes or previously unanticipated hazards are screened to determine whether they are within the existing authorization basis, thus allowing changes to be made without additional approval (if within established parameters). If the change in conditions exceeds or would exceed the parameters of the authorization basis, then approval (based on the approval authority of the relevant hazard identification and control document) will be required before operations can commence. Since hazardous waste cleanup operations are dynamic in nature, it is prudent to establish a quick-response mechanism (e.g., a USQ screening and approval team) during these activities. Of course, HASPs must be immediately updated to reflect any changes in conditions, activities, and associated hazards. In these cases, document control is essential to ensure that only the most current version of a HASP is available and in use at the site.

OPPORTUNITIES FOR INTEGRATION

Some commonalities of health and safety documentation basis requirements of OSHA HAZWOPER, the SAR, and other DOE-specific safety processes provide an opportunity for information integration and sharing that minimizes duplication of effort in documentation development. Both the SAR and the HASP require a systematic approach to identify hazards through a hazard analysis process and documentation of applicable hazard controls. As previously discussed, the SAR stresses nuclear safety and operational and public protection issues, whereas the HASP focuses on worker protection at the job and task level. The mutual sharing of the identified hazards covered by both the SAR and the HASP, their associated control measures, and their respective documentation requirements allow the documentation developed in support of the SAR to be considered, referred to, or used when preparing a HASP. For example, a HASP may have been prepared for a project that later needs a SAR. The information developed for that HASP may provide valuable input for use in the preparation of the SAR.

2.7 REFERENCES

10 CFR 830, "Nuclear Safety Requirements"

10 CFR 835, "Occupational Radiation Protection"

29 CFR 1910, "Occupational Safety and Health Standards for General Industry"

29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals"

29 CFR 1910.120 and 1926.65, "Hazardous Waste Operations and Emergency Response"

29 CFR 1910.1450, "Occupational Exposure to Hazardous Chemicals in Laboratories"

29 CFR 1926, "Safety and Health Regulations for Construction"

40 CFR 302, "Designation of Reportable Quantities and Notification"

40 CFR 355, "Emergency Planning and Notification"

DOE N 441.1, "Radiological Protection for DOE Activities"

DOE O 151.1, "Comprehensive Emergency Management System"

DOE O 225.1, "Accident Investigations"

DOE O 231.1, "Environment, Safety, and Health Reporting"

DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"

DOE O 460.1, "Packaging and Transportation Safety"

DOE O 460.2, "Departmental Materials Transportation and Packaging Management"

DOE 3790.1B, Chapter VIII, "Federal Employee Occupational Medical Program"

DOE 5480.21, "Unreviewed Safety Questions"

DOE 5480.22, "Technical Safety Requirements"

DOE 5480.23, "Nuclear Safety Analysis Reports"

DOE 5480.24, "Radioactive Waste Management"

DOE 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements" [except for portions canceled by DOE O 225.1 and O 231.1]

DOE 5610.1, "Packaging and Transportation of Nuclear Explosives, Nuclear Components, and Special Assemblies"

DOE 5700.6C, "Quality Assurance"

DOE 5820.2A, "Radioactive Waste Management"

DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE 5480.23"

DOE-STD-1082-94, DOE Standard - "Preparation, Review, and Approval of Implementation Plans for Nuclear Safety Requirements"

DOE-STD-3009-94, "Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Report (Area SAFT)"

DOE-STD-3011-94, DOE Standard - "Guidance for the Preparation of DOE 5480.22 (TSR) and DOE 5480.23 (SAR) Implementation Plans"

DOE-EM-STD-5502-94, "Hazard Baseline Documentation"

DOE-EM-STD-5503-94, "DOE Limited Standard EM Health and Safety Plan Guidelines"

U.S. Department of Energy/U.S. Environmental Protection Agency Interagency Agreement, "Policy on Decommissioning Department of Energy Facilities Under CERCLA," May 22, 1995

U.S. Department of Energy Environmental Restoration Program "Decommissioning Implementation Guide," May 22, 1995

DOE-EM-0246, "Decommissioning Resource Manual"

THREE

ORGANIZATION AND PLANNING

3.1 BACKGROUND

Effective organizational structures and comprehensive work planning are vital for conducting project activities safely and efficiently at hazardous waste sites. A multidisciplinary project team of line managers, supervisors, health and safety professionals, engineers, and worker representatives allows these structures and work plans to be defined and implemented for hazardous waste activities. Organization and planning requirements are established in paragraph (b) of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (HAZWOPER).

At a minimum, an effective and well-organized structure for hazardous waste activities accomplishes the following:

- Establishes overall and specific organizational roles and responsibilities of different functions and disciplines;
- Provides health and safety planning at the worksite, project, and job and task levels;
- Integrates workers from different technical disciplines into project teams;
- Fosters worker participation in multidisciplinary teams involved in planning and project design, development of work control processes, and project implementation;
- Verifies that each project team has sufficient technical resources and depth to complete the project or task in a safe manner;
- Defines individual roles, responsibilities, accountabilities, and interfaces within the project team with matrixed personnel and organizations, and between contractors and subcontractors;
- Demonstrates management's commitment to a safe work environment;
- Facilitates the incorporation of lessons learned into work control processes;
- Allows completion of work in a safe and cost-effective manner within budget and schedule; and
- Recognizes and coordinates with the existing emergency response community.

Good Planning Is Good Business

There are legal, moral, and financial responsibilities associated with conducting hazardous waste activities. The magnitude and importance of these obligations demand a proactive, deliberate, and comprehensive approach to planning. Successful conduct of hazardous waste activities requires the integrated application of knowledge and experience by line managers, supervisors, health and safety professionals, engineers, and site workers. An effective management system uses multidisciplinary teams to coordinate and implement work controls.

3.2 COMMITMENT TO A SAFE WORK ENVIRONMENT

An effective health and safety program begins with a management commitment to achieve excellence in worker protection consistent with successful completion of work without work stoppage due to safety concerns. Senior management is responsible for instilling this commitment at all levels and encouraging workers to accept safety as an integral part of the work. Enhanced worker protection is a natural result of this type of commitment.

Such goals cannot be realized without (1) establishing accountability for health and safety within the project team, (2) orienting the health and safety organization toward collaboration and finding solutions while avoiding confrontation, and (3) relying on teamwork to integrate health and safety and line functions for the planning and conduct of work. To be effective, health and safety planning must be intrinsic to mission, and health and safety excellence must be a primary mission objective.

3.3 GENERAL PROJECT MANAGEMENT

OVERALL ROLES AND RESPONSIBILITIES

The Department of Energy (DOE) has ultimate responsibility for the establishment and verification of programs involving hazardous waste and related activities are carried out in a manner that protects the health and safety of its workers and the public. However, every worker is responsible for sharing in the commitment to a safe workplace. Specific health and safety responsibilities assigned to Environmental Management (EM) Headquarters and field organizations are discussed in DOE/EM-0182, *Handbook on Roles and Responsibilities for Environmental Management* (July 1994).

Contractor organizations are responsible for managing and conducting hazardous waste activities and for performing their work in accordance with applicable laws, regulations, contract provisions, and DOE rules and requirements. These are typically compiled and presented in the standards/requirements identification document (S/RID) or utilized in the necessary and sufficient process. Given that multiple contractor and subcontractor organizations are involved in each hazardous waste activity, senior management must address any misunderstandings concerning specific operational or health- and safety-related responsibilities and accountabilities that may cause problems in the daily administration of health and safety programs.

DOE's Responsibilities and Authorities

DOE's responsibilities and authorities include establishing a Departmental policy for health and safety; setting standards and requirements; requiring employees and contractors to comply with existing laws, regulations, and standards; reviewing contractor operations and programs to determine compliance status; and requiring corrective actions to remedy identified deficiencies.

Responsibilities and authorities for conducting work need to be stipulated in the contractual arrangements between the various parties involved. To provide DOE and contractor procurement and contracting organizations with a clear understanding of the multifaceted nature of EM programs, each request for proposal should include a scope of work that contains specific information about (1) overall project management responsibilities and authorities, (2) how subcontractors will be managed, and (3) the hierarchy of health and safety plans and programs.

Health and safety issues and worker protection requirements are integrated into project specifications, bid packages, contracts, and other appropriate project documentation and submittals. Health and safety representatives should be included during planning discussions and meetings. Workplace health and safety reviews should be periodically performed by health and safety professionals to verify the adequacy of hazard controls, and conducted with first-line supervisors and workers, focusing on reinforcing management controls to achieve safe work activities.

CONTRACTOR INTERACTION

Successful management of a project includes anticipating organizational issues between contractors and subcontractors and resolving those issues before work begins. Coordination and interaction between contractor organizations with responsibilities at the same worksite are best stipulated in contracts, memorandums of understanding, and contractor interface agreements. Once this relationship has been formalized, it is communicated to all affected contractors and subcontractors. DOE workers and visitors to the site also abide by established requirements.

Development of effective interorganizational strategies for health and safety plans (HASPs) is particularly crucial (see Chapter 6). Each contractor and subcontractor is responsible for its own workers, and provides a level of oversight to meet health and safety requirements. Consistent with DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees," however, the contractor with primary responsibility for the worksite establishes the minimum requirements. Other contractors and subcontractors should meet or exceed these requirements, as appropriate, based on the nature of their tasks and associated hazards. The contractor with primary responsibility controls access to the worksite and verifies that subcontractors fulfill their health and safety duties and responsibilities.

CONTRACTOR OVERSIGHT AND WORK CONTROL

In many cases, several prime contractors have responsibility for various hazardous waste activities and worksites at a DOE site. Prime contractors include the management and operating (M&O) contractor, the construction contractor, the environmental remediation management contractor (ERMC), and site characterization and remedial design contractors. DOE has oversight responsibility for all prime contractors. In some cases, the M&O contractor also has oversight responsibility; in others, the M&O contractor is contractually excluded from an oversight role. It is prudent to state these relationships in contractual agreements and communicate them to all affected parties.

When one contractor performs an intrusive activity that increases the hazard level for all workers at a worksite, that information should be communicated to other contractors to permit them to plan and control their activities accordingly. When the M&O contractor has oversight responsibility for other prime contractors, the M&O contractor is to make certain that other contractors observe the performance standard established for the worksite and that activities are appropriately coordinated among various contractors and subcontractors. If the M&O contractor does not have oversight authority, the DOE field office assumes that function.

When two or more prime contractors conduct activities at the same worksite, it is prudent that a common basis for health and safety rules and controls be established.

The contractor responsible for controlling access to a worksite should not allow access to persons who do not meet established site requirements.

Within the DOE field office, multiple oversight organizations may be assigned to manage contractor activities—for instance, the M&O contractor and the ERMC at a site may report to a different group. Accordingly, it is possible for a hazardous waste worksite to have more than one "owner" within the DOE field office. Whatever the arrangement, oversight authority needs to be clearly designated and well communicated.

The following actions encourage coordination and consistency among contractors:

- Prime contractors should develop interface agreements to provide a basis for understanding and coordinating their respective activities, as well as for reviewing and commenting on documents such as work plans or HASPs (see Table 3-1).
- During the project planning, affected prime contractors should have an opportunity to provide input and resolve differences. For instance, if an ERMC is planning a project at a worksite where the M&O contractor is working, the M&O contractor should participate in the planning.
- "Cross-cut" committees are encouraged to allow prime contractors to standardize or normalize such essential elements as procedures, permit systems, and training (see Table 3-1).

To ensure that all contractors and subcontractors maintain a minimum level of safety performance, DOE field office organizations need to establish a uniform "floor" of criteria.

Table 3-1. Useful Organizational Concepts for Hazardous Waste Operations

	HAZWOPER COORDINATOR	HAZWOPER COMMITTEES	HAZWOPER PLANNING AND REVIEW TEAMS	"CROSS-CUT" COMMITTEES	CONTRACTOR INTERFACE AGREEMENTS
DESCRIPTION	At large DOE sites where significant hazardous waste activities are conducted, establishing the position of HAZWOPER coordinator has proven effective in facilitating the development and implementation of health and safety initiatives. The HAZWOPER coordinator could be part of the site's overall ES&H organization and should report to a senior manager.	DOE sites with significant hazardous waste activities are encouraged to establish HAZWOPER committees. The existence of these committees can benefit both contractor and DOE field office organizations.	A number of DOE sites have formulated special multidisciplinary teams or committees to provide health and safety evaluation and to support project teams from initial design through completion of operations.	"Cross-cut" committees are generally found at large, complex sites or at sites where the activities of multiple independent contractors may require coordination and integration.	At DOE sites with more than one prime contractor, clear lines of authority should be formally established and specific responsibilities disseminated. Health and safety-related contractor interface agreements have been successfully used at DOE HAZWOPER sites to define and document organizational relationships and responsibilities.
ROLES AND RESPONSIBILITIES	Develops and implements sitewide programs, procedures, criteria, and performance standards for hazardous waste activities Participates in work planning, establishes health and safety rules and requirements, and develops the HASP Determines the applicability of the OSHA HAZWOPER Standard (i.e., whether HAZWOPER principles should be strictly applied; see Chapter 2) Establishes a hazard-based approach for various projects and worksites Assigns qualified SSHOs to various projects and worksites Provides oversight for hazardous waste activities Coordinates the activities and approaches of various contractors and subcontractors Chairs or participates in various HAZWOPER committees At Oak Ridge Reservation, the HAZWOPER coordinator position was used to establish and implement a HAZWOPER health and safety program. The coordinators for the three Oak Ridge sites (Oak Ridge National Laboratory, Y-12 Plant, and K-25 Site) interact through an overall HAZWOPER committee.	HAZWOPER committees at DOE field offices facilitate the following functions: • Promote consistency between the various DOE management and oversight organizations in interpreting and implementing the HAZWOPER Standard • Establish expectations and criteria for contractors, projects, and activities • Verify that DOE organizations responsible for worksites with multiple contractors establish consistent performance standards • Coordinate approaches to various projects and worksites • Coordinate oversight of various DOE organizations to reduce redundancy and contradictions • Facilitate contractor interface agreements • Provide timely review and approval of work plans and HASPs • Resolve contractor or project concerns and conflicts between DOE field office organizations • Coordinate and facilitate outside oversight for hazardous waste activities HAZWOPER committees established by contractor organizations facilitate the following functions: • Provide development, review, and approval of HAZWOPER health and safety programs, procedures, permits, and other criteria • Establish performance standards, criteria, and consistency within the contractor organization • Support or advise the HAZWOPER coordinator and senior management • Resolve issues with sitewide implications • Facilitate contractor interface agreements • Provide a forum to discuss current issues, new projects, and new Orders or standards and to develop recommended approaches • Interface with DOE HAZWOPER committee • Coordinate and facilitate outside oversight for hazardous waste activities HAZWOPER committees should include representatives from line management (e.g., emergency response, waste management, construction, maintenance), project design and engineering, health and safety, environmental compliance, industrial hygiene, health physics, labor, and others as warranted.	Provide oversight throughout the life of a project Promote membership of individuals who are cross-trained in multiple technical disciplines; provide increased benefit/cost Encourage members to seek each other's help when providing health and safety reviews and carrying out their support functions At Oak Ridge National Laboratory, the Safety and Health Evaluation Support Team consists of representatives from the site's engineering and design group, plus health and safety professionals, environmental specialists, construction personnel, waste management specialists, representatives from unions, and technical specialists. Aside from participating in the selection of health and safety requirements to be included in contracts, the committee reviews contracts, design packages, work packages, and other documents for issues related to health and safety.	Standardize safe work permits, site-specific exposure controls (e.g., work-rest regimens for heat stress), and definitions and interpretations (e.g., what constitutes a permit-required confined space) Promote consistency of training requirements and course approvals, radiation work permits, lockout/tagout mechanisms, and equipment (e.g., emergency escape respirators) At the Idaho National Engineering Laboratory, these committees have been used to "cut" across organizational lines to integrate elements of multiple health and safety programs. These cross-cut committees consist of health and safety representatives from several prime contractors at the INEL site. At DOE sites with more than one prime contractor, clear lines of authority should be formally established and specific responsibilities disseminated. Health and safety-related contractor interface agreements have been successfully used at DOE HAZWOPER sites to define and document organization relationships and responsibilities.	Coordinate worksite activities for multiple independent contractors Establish responsibilities for fire safety and emergency preparedness, area security, and site access Report occurrences involving employees, facilities, or equipment from more than one company Facilitate the implementation and oversight of ES&H program issues Provide operational support (e.g., regarding utilities, excavations, lockout/tagout requirements) Identify mechanisms for ongoing intercontractor communication and problem-solving

- Project management and oversight organizations at each DOE field office should establish a structure to coordinate and integrate their HAZWOPER activities. Establishing a HAZWOPER committee at the DOE field office to participate in planning and overseeing such projects serves this purpose. Whatever the method selected, activities at a given worksite should be controlled consistently, regardless of the number and types of contractors involved.

3.4 PROJECT TEAM ORGANIZATION

The size of the multidisciplinary team is dependent on the particular task to be performed and the hazards to be encountered; a full complement of disciplines is not required for every project or task. During the early stages of planning, an organization chart is developed to define the project's structure; to identify key individuals and their alternates, roles and responsibilities, and other onsite and offsite resources; to show lines of authority, responsibility, and communication; and to identify interfaces with the emergency response community. For projects of longer duration, the chart is placed in a central location, included in the HASP, and updated as necessary.

The organization chart identifies key positions within the project team including the project manager, site safety and health officer (SSHO), field team leader, and worker representatives. In addition, the command post supervisor, emergency response coordinator, decontamination station officer, and workers responsible for site security, radiological control, and other specialized positions are identified. A list of DOE and contractor workers and a list of offsite organizations to be contacted in the event of an emergency are also included. A clear work control process is also established to integrate the efforts of health and safety, health physics, and line management in evaluating planned activities, identifying hazards, and determining appropriate controls.

Selecting the SSHO

Oak Ridge employs three levels of SSHO qualifications. A "Level 1" SSHO is used at a site where Level D personal protective equipment (PPE) is necessary; a "Level 2" SSHO is assigned when Level C PPE is required; and a "Level 3" SSHO is used at Levels A and B PPE worksites. Descriptions of the qualifications for the three SSHO levels are provided in Figure 3-1.

It is customary, but not required, for the SSHO to be a health and safety professional. Depending on the nature of the hazards and activities, the SSHO may be an industrial hygienist, safety specialist, health physicist, engineer, health and safety technician, or even a worker with sufficient and appropriate experience and training to fulfill the established responsibilities of the SSHO (e.g., to recognize and control hazards). Selection of the SSHO is based on skills and experience proportionate to the hazards and difficulties of the job. Additional support staff can be matrixed to support the SSHO in the technical safety disciplines in accordance with project size and the nature of hazards encountered.

Table 3-2 provides an example of the functions and responsibilities of the project manager, field team leader, SSHO, and radiological control manager (RCM).

OTHER ONSITE ROLES AND RESPONSIBILITIES

Other key onsite roles and responsibilities assigned to members of the project team include the following:

Specialty duties are assigned to teams formed for specific tasks or responding to unusual circumstances (e.g., waste characterization, confined-space rescue, and asbestos and lead abatement). These teams are formed, as necessary, on a permanent or temporary basis. In many cases, special training, drills and exercises, and development of safe work plans are needed to prepare team members to conduct work safely and effectively.

HAZWOPER LEVEL 1 SSHO. Indicated at sites with minimal hazards where Level D personal protective equipment (PPE) is required. Minimum qualifications include the following:

- High school education;
- Work experience on projects of similar size and stature or HAZWOPER SSHO training;
- Ability to implement and verify that project activities comply with the HASP; and
- Current 40-hour, 8-hour refresher (if 40-hour training has expired), and 8-hour HAZWOPER training for supervisors.

HAZWOPER LEVEL 2 SSHO. Indicated at sites requiring the use of Level C PPE. Minimum qualifications include the following:

- Associate's degree or the equivalent in industrial hygiene, health physics, industrial safety, or other related field (work experience can be substituted if the amount and type correspond appropriately to project needs and are approved by the health physics coordinator as appropriate);
- One year of health and safety work experience in hazardous waste activities, including HASP implementation;
- Proficient in use of monitoring instruments, as warranted; and
- Current 40-hour, 8-hour refresher (if 40-hour training has expired), and 8-hour HAZWOPER training for supervisors.

HAZWOPER LEVEL 3 SSHO. Indicated at sites requiring the use of Level B PPE or higher. Minimum qualifications include the following:

- Certification or eligibility for certification in industrial hygiene, safety, health physics, or related field (can substitute work experience if amount and type correspond appropriately to project requirements and are approved by the health physics coordinator as appropriate);
- Two years of health and safety field experience, including hazardous waste operations, or equivalent, and demonstrated ability to implement HASP;
- Proficient in use of monitoring instruments, as warranted; and
- Current 40-hour, 8-hour refresher (if 40-hour training has expired), and 8-hour HAZWOPER training for supervisors.

In addition, any SSHO designated to provide first aid or cardiopulmonary resuscitation must meet the collateral-duty provision of 29 CFR 1910.1030, "Bloodborne Pathogens."

NOTE: Prerequisites that fall outside the hazardous and radiological area need to be integrated into the qualifications listed above (e.g., worker safety hazards involved in trenching or use of cranes).

Figure 3-1. Example Qualifications for Site Safety and Health Officers at Oak Ridge

Table 3-2. Example - Some Functions and Responsibilities for Key Project Personnel at Oak Ridge

Project Manager	Field Team Leader	Site Safety and Health Officer (SSHO)	Radiological Control Manager (RCM)
Has overall responsibility for directing hazardous waste activity Plans and manages the conduct of the project Designates and leads project team Directs HASP development and technical review and oversees implementation Prepares and implements work plan Implements access and hazard controls Prepares reports and maintains project records Coordinates with DOE and public officials; establishes and maintains liaison with community leaders	Has responsibility for leading and conducting activities at worksite and is stationed onsite Implements work plan and maintains schedules Coordinates with SSHO and RCM on matters related to work control, hazard analysis, and hazard control implementation Oversees implementation of HASP requirements Controls access to the worksite Provides worksite hazard communication, site-specific briefings, and field training to personnel at the worksite Works closely with the SSHO and RCM to verify that project planning has been adequate and that work is conducted safely Jointly, with SSHO, verifies team member readiness for work such as training and medical surveillance. [NOTE: For smaller projects, field team leader and project manager may be the same person.]	As team leader, has responsibility for implementation of HASP and is stationed onsite and in immediate area of hazardous waste activities Verifies effectiveness and compliance with HASP requirements Verifies that project planning focuses on health and safety Participates in work control process and conducts hazard analyses Specifies and supports implementation of hazard controls Selects and verifies effectiveness of PPE and verifies that PPE is properly stored and maintained Ensures monitoring of entry and exit of worksite; participates in access control Jointly, with field team leader, verifies team member readiness for work such as training and medical surveillance Advises medical staff of hazards and exposures Arranges monitoring of exposures and stressors Conducts field training at worksite Supports emergency action and response Verifies that the "buddy system" is properly implemented and used	As team leader, has responsibility for developing and implementing radiological control measures; verifies effectiveness and compliance with requirements May serve onsite or offsite, depending on need Serves as part of the SSHO support team Has overall responsibilities (similar to those of the SSHO) for radiological protection issues [NOTE: For smaller, predominantly radiological projects, may serve as the SSHO with support from other health and safety professionals.]

Decontamination of workers and equipment is conducted to remove and deactivate hazardous contaminants. Responsibility for this task is assigned to the project team's decontamination officer or to the shift supervisor, RCM, SSHO, or designated staff member.

Communications and emergency assistance functions include maintaining communication with work parties, assisting support zone activities, notifying emergency responders, and assisting with emergencies. A separate position (e.g., command post supervisor) is established, or these functions are assigned to a supervisor, the field team leader, or another project team member with appropriate knowledge and experience.

Emergency response planning and coordination are necessary to evaluate, direct, and control emergency response and other emergency activities. The decision to include an emergency response coordinator on the project team or to rely on the DOE site's emergency response team depends on (1) whether hazardous waste workers respond to an emergency; or (2) whether they evacuate the worksite during an emergency and contact the emergency response center. Whichever approach is used, emergency response coordination includes developing the emergency response portion of the HASP; conducting rehearsals, worker training, and drills; evaluating response actions; and providing for worksite evacuation, emergency treatment and transport of site workers, and notification of emergency units and appropriate management staff. If an emergency response coordinator is not a separate position on the project team, these responsibilities are divided among the SSHO, the field team leader, and DOE's overall emergency response coordinator.

Security issues involving access controls are line management responsibilities (e.g., field team leader and supervisors), with SSHO participation. The nature of a project may warrant assigning a member of the site security staff to the project team. Key duties of the security officer include conducting routine area patrols, controlling facility access and egress, assisting with communication during an emergency, securing accident/incident scenes, and maintaining a log of access and egress to the worksite.

TEAM INTEGRATION

Successful project teams are those in which line managers, health and safety personnel, and workers collaborate to plan and conduct work, and are organized along the following guidelines:

- The broader environment, safety, and health (ES&H) organization provides specialty support as needed (e.g., industrial hygiene, health physics, toxicology, training, fire protection, and emergency response).

- When radiological hazards are present, occupational safety and health (OSH) and radiological protection should work together to integrate hazard evaluation and the specification of controls. This goal can be achieved within the project team through close interaction between OSH and radiological protection subteams or by placing both subteams under SSHO leadership.

- For some DOE projects or worksites, depending on the nature of the hazards present, a health physicist or other health and safety professional is responsible for integrating approaches and resolving issues related to radiological protection, industrial hygiene, and occupational safety (e.g., specification and inspection of protective clothing and respiratory protection, establishment of work zones). This individual facilitates multidisciplinary discussions on issues of mutual concern and determines which suggested approach is most likely to be acceptable for controlling all hazards.

In the past, various organizational concepts or approaches have been successfully used at DOE hazardous waste sites. The examples provided in Table 3-1 illustrate several proven approaches for meeting the special needs of specific sites.

3.5 CONSIDERING WORKER PROTECTION DURING DESIGN AND PLANNING

Integrating health and safety planning with project design fosters teamwork between project, line, and health and safety management and encourages ownership by all parties. This type of interaction allows health and safety issues to surface and be addressed before the project is bid or the contract awarded. This process minimizes the effect of unanticipated issues during the project's mobilization phase, thereby preventing

extensive delays, costly change orders, and ineffective and inefficient retrofitting of health and safety approaches. The planning and design process produces distinct criteria for establishing the performance standard for plans and programs such as those specified by the HAZWOPER Standard and DOE rules and requirements. An understanding of these considerations by the multidisciplinary design and planning team aids in the subsequent preparation of required plans (see Figure 3-2). Examples of multidisciplinary planning teams include the Safety and Health Evaluation Support Team (SHEST) at Oak Ridge National Laboratory and the Cross-Cut Committee at Idaho National Engineering Laboratory (see Table 3-1).

The approach used to plan a project varies. However, establishing a multidisciplinary team to conduct the following planning principles related to health and safety program development is recommended:

- Stage a project, including transitioning the worksite to cleanup activities and phasing cleanup activities;
- Evaluate hazard characterization and exposure assessment information and gather additional information, as required;
- Determine applicability of HAZWOPER or other health and safety performance standards, or both, as well as content requirements and criteria for the health and safety program and the HASP;
- Determine the scope of hazardous waste activities and select remedial action technologies, techniques, and processes, using worker safety as a primary consideration during the selection and design process;
- Establish criteria for health and safety and worker protection and requirements for bid packages, contracts, specifications, work plans, and the health and safety program or HASP;
- Prepare a HASP and safety analysis report (SAR), if required, indicating engineering controls, administrative controls, and use of PPE; obtain DOE approval for Category 1, 2, and 3 SARs or SAR revisions; and develop or modify technical safety requirements (TSRs);
- Determine contractor submittals required to address health and safety and worker protection criteria and requirements;
- Define organizational structure and responsibilities;
- Set procedures for communications between contractors, site representatives, regulatory agencies, DOE, and others;
- Identify cleanup criteria and establish permissible exposure and action limits;
- Identify approval, monitoring, oversight, and worksite release procedures;
- Outline the schedule, phasing requirements, and project milestones, with protection for workers and co-located populations as a key consideration; and
- Dedicate resources and identify procurement mechanisms.

Figure 3-2. Planning Principles

3.6 HAZARD-BASED PLANNING

Hazard characterization and exposure assessment (Chapter 5) and access and hazard controls (Chapter 7) are the most important aspects of a hazard-based health and safety planning process.

Hazard-Based Planning Approach

The degree of hazard dictates the performance standard specified in various control plans; the content, detail, and formality of review and approval of these plans are based on risk and hazard potential. Using this approach, levels of risk or methods to rank risk (degree) are standardized. In general, a "hazard-based" approach refers to a process in which the level of planning and analysis, the documentation, and the actions necessary to comply with identified requirements and needs are commensurate with hazards relative to worker protection, health and safety, and safeguards and security.

Consequently, it is imperative to exercise professional judgment when planning hazardous waste activities and to document hazard-based decisions. 29 CFR 1910.120 is a hazard-based performance standard that emphasizes hazard analyses at all stages and encourages the development of programs commensurate with risk for each worksite. For example, for a given activity, professional judgment is used to decide whether a comprehensive HASP or a scaled-down 2- or 3-page version is required for activities with little possibility to cause significant exposure.

3.7 DEVELOPMENT OF PROGRAMS AND PLANS

Once the project design and hazard identification and controls have been established, project planning focuses on developing work plans and worker protection programs and plans. Several key documents that are developed during the planning phase of the project can be used to focus and direct the compliance strategy, to form the health and safety program/plan, and to establish work controls. These documents are usually developed after contract award and before mobilization. During project design, the basis and criteria for documents to be included in the design package are established.

Key Planning Documents

Key planning documents are considered prestart submittals and include the comprehensive work plan, decommissioning plan, health and safety program and/or HASP, radiological control program (if applicable and not already built into the health and safety program and HASP), emergency plan, and work control system (including the access and hazard controls that are identified in the HASP).

To be successful, all members of the project team should participate in the preparation and review of these plans. In addition, a schedule of the review and approval process for these plans needs to be established, accepted by all reviewers, and distributed before release of the first draft; reviewers should meet an established schedule for review and submission of comments. A distinction between "review" and "approval" authority needs to be made. (Chapter 6 provides guidance on review and approval of HASPs.)

Once adopted, plans are to be periodically reviewed and evaluated for effectiveness and cost/benefit. If the scope of work or the worksite hazards change significantly or if lessons learned indicate, the plans are to be promptly modified and revised. (See Chapter 6 for guidance on the HASP modification process.)

COMPREHENSIVE WORK PLAN

A comprehensive work plan is required by 29 CFR 1910.120 (b)(3). It is based on information gathered during the design phase of a project and provides details on the scope of work and associated tasks, the resources required to complete the project, and the schedule. The comprehensive work plan contains the following elements:

- Identification of anticipated cleanup activities and standard operating procedures; if standard operating procedures are provided elsewhere, they are referenced and not repeated;
- Defined work tasks and objectives, and identification of methods for accomplishing tasks and objectives;
- Personnel requirements for implementing the work plan;
- Training requirements and implementation of required informational programs per 29 CFR 1910.120 (i);
- Provisions for implementation of the medical services program; and
- Specialized equipment or services (e.g., drilling equipment, heavy equipment operators) or both.

DEACTIVATION AND DECOMMISSIONING PLAN

Deactivation and decommissioning plans are similar to comprehensive work plans and are prepared for deactivation and decommissioning projects. Policy and guidance on the conduct of decommissioning activities that fall under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA) and HAZWOPER, is provided by the DOE/EPA Interagency Agreement, "Policy on Decommissioning Department of Energy Facilities Under CERCLA" and the accompanying "DOE Environmental Restoration Program Decommissioning Implementation Guide" issued in May 1995. The Office of Nuclear Material and Facility Stabilization (EM-60) has published the DOE policy and guidance on deactivation in their "Material Stabilization and Facility Deactivation Project Policies and Supplementary Information" document. In addition, DOE 5820.2A, "Radioactive Waste Management," defines the content of a decontamination and dismantlement (D&D) plan (see Table 3-3). Key phases that begin before the start of decommissioning include transition, project preparation, environmental review, deactivation planning, and engineering.

HEALTH AND SAFETY PROGRAM AND THE HASP

Hazardous waste activities at DOE worksites are to comply with the health and safety program. The HASP for hazardous waste activities generally focuses and specifies the appropriate elements of the site's existing health and safety program to the task at hand. The existing programs are thoroughly reviewed to identify those elements meeting the needs of the planned hazardous waste activity. Program elements and procedures are supplemented with worksite-specific detail and tailored to meet special or unique aspects of the hazardous waste activity on an as-needed basis.

RADIOLOGICAL CONTROL PLAN

Radiological protection program requirements have been established in 10 CFR 835 and its associated implementation guidance, and in DOE N 441.1, "Radiological Protection for DOE Activities." Contractual obligations to comply with additional requirements as stipulated in DOE Orders that have been canceled remain in effect until the contract is modified to delete reference to the requirements in the canceled Orders (this includes the DOE RadCon Manual, which has been reissued as the *Draft DOE Radiological Control Technical Standard,* DOE-STD-1098-96.)

Chapter 3 of the *Draft DOE Radiological Control Technical Standard* provides guidance for the design and planning processes for the conduct of operations in radiologically controlled work areas. The primary goals of planning hazardous waste work activities in radiologically controlled areas are to provide for worker health and safety and to maintain radiation exposures as low as reasonably achievable (ALARA).

Development of a site-specific radiological control program is based on the requirements of 10 CFR 835, DOE N 441.1, and recommendations found in the *Draft DOE Radiological Control Technical Standard*, including those for engineering controls and dose-reduction and contamination-reduction methods that may be used during maintenance and modification operations. Radiological work permits (RWPs) provide the planning and work control mechanism for routine tasks. Each RWP contains a summary of radiological conditions and work-area entry requirements, including those for PPE and worker training, as well as anticipated worker exposure during specific work activities.

The radiological protection program/radiological work permit (RPP/RWP) process is similar in purpose to that of a health and safety program and HASP, and provides the basis for controlling both the worksite and its activities, including the conduct of pre-job briefings. The two parallel sets of planning and work control documents are coordinated—either in a single document incorporating radiological issues and requirements with those of the health and safety program and the HASP, or in two parallel documents implemented through a coordinated effort between line management, health and safety, and radiological protection workers (see Chapter 6).

EMERGENCY PLAN

Additional planning requirements are detailed in 29 CFR 1910.120 (q), which covers hazardous substances released or substantial threat of release at any location; paragraph (p), which addresses treatment, storage,

and disposal (TSD) activities or facilities; and paragraph (l), which addresses remedial actions. Whether intended for uncontrolled hazardous waste sites or TSD activities or facilities, health and safety planning must provide for emergency action and response relative to a particular facility or worksite. At a TSD facility, the emergency action and response plan developed for the worksite must be a part of the HASP or the health and safety program. (Chapter 6 summarizes emergency action and response plan content for HASPs; Chapter 10 provides guidance on emergency preparedness and response.)

Table 3-3. Elements of a Deactivation and Decommissioning Plan

I. Introduction
- Facility characteristics
- Estimated costs
- Controls and audits
- Scope and objectives
- Schedule
- Key responsibilities

II. Facility History, Characterization, and Status
- Historical operations
- Inaccessible systems
- Maps, drawings, photographs
- Safety analysis and review
- Past spills/releases/accidents
- Hazard/contamination (locations)
- Hazards/contamination (types and amounts)
- Risk assessment (DOE 5480.23, "Nuclear Safety Analysis Reports")

III. Alternative Selection
- Preferred alternative
- Other alternatives considered

IV. Decommissioning Activities
- Objectives
- ES&H controls
- Major activities
- Associated accidents/exposures

V. Program Management
- Organization and responsibilities (e.g., quality assurance, procedures, training, change control, physical security)
- Cost (e.g., estimates and details, available funding/mechanisms)
- Schedule (e.g., milestones, interrelated timelines)

VI. Worker and Environmental Protection
- Health physics program
- Health and safety program
- ALARA practices
- Environmental protection

VII. Waste Management
- Projections of volumes, contaminant levels, and classifications
- Procedures, processes, and systems for handling, storage, and disposal
- Effect on work procedures
- Storage locations, controls, and timetables

VIII. Final Survey Plan
- Final survey methods
- Ongoing requirements
- Release criteria
- Remaining contamination levels

Coordination with the existing response community is important in developing the emergency response plan. A national response organization was established by a congressionally mandated National Contingency Plan to implement procedures for coordinating response to releases of hazardous substances into the environment. This National Contingency Plan establishes response teams composed of representatives of Federal agencies and State and local governments. The EPA-designated official responsible for coordinating Federal activities related to site cleanup is an important contact for hazardous waste site personnel.

WORK CONTROL

The work control system is an essential planning tool for implementing health and safety and operational controls for DOE hazardous waste activities. Information in the site health and safety program is more broadly based than the HASP, which is a work control document that defines worksite- and task-specific health and safety controls. The HASP includes the process for applying job- or task-specific work controls that are narrowly focused on specific daily activities. (Further information on the work control system and associated documentation is provided in Section 6.5.)

3.8 IDENTIFYING REQUIRED RESOURCES

The planning process also involves careful analysis of the need for and timing of resources to carry out hazardous waste activities. Resources include the following:

- Qualified personnel to fill staffing requirements and assignments;
- Equipment, facilities, supplies, tools, and utility services (e.g., PPE, sampling equipment, instrumentation, water, electricity, sewage treatment); and
- Outside support services (e.g., medical surveillance; laboratory analyses; training; emergency response to accidents, injuries, fires, and hazardous materials incidents; technical experts).

Adequate resources are fundamental to good health and safety practice and to performing the job properly to completion. Many mishaps have been traced to improperly trained workers, lack of adequate tools, or requirements for personnel to work excessive hours or at unfamiliar jobs because of inadequate staffing. The multidisciplinary team approach to identifying required resources efficiently balances, identifies, and coordinates necessary assets.

3.9 LESSONS LEARNED

The size and diversity of the DOE complex give rise to a wide range of health and safety hazards. Most environmental restoration activities that would reduce the numbers of these hazards are in the initial stages of development and implementation. Accordingly, individual sites need to document and disseminate information that could enhance their hazard recognition and mitigation. Such information is used to prevent recurrences of identified problems, to publicize good practices and innovative approaches to problem-solving, and to perform work more safely and efficiently.

Within DOE, the term "lesson learned" has been defined in DOE-SAD-TMP-23-94, "Lessons Learned Technical Standard," as a "good work practice or innovative approach that is captured and shared to promote application. It may also be an adverse work practice or experience that is captured and shared to avoid recurrence." The term is used by DOE, as well as by other Federal and private-sector institutions, to describe the following:

- Work processes or health and safety issues that could affect multiple programs or projects;
- Significant experiences (both positive and negative) that could result in changes to management practices or the conduct of operations; and
- Lessons, problems, discussions, or potential solutions that appear in searchable data bases.

Lessons Learned

Lessons learned information provides a valuable tool for managing health and safety programs at hazardous waste sites. Such information addresses conditions to be avoided or commendable practices with the potential for wide-ranging application. Effective identification of lessons learned requires an awareness of emerging practices, programs, and technologies related to hazardous waste activities.

The Lessons Learned Standard provides protocol requirements for the electronic dissemination of lessons learned. The DOE Lessons Learned Information Services uses the Internet to exchange information. Published lessons learned may be accessed from ES&H Technical Information Services (TIS). The Universal Resource Locator (URL) is: gopher://dewey.tis.inel,gov: 2010/11%2F%2E11 by using either Gopher Clients or World Wide Web Browsers. Local users provide TIS with their URLs, and they are added here for convenience.

DOE Lessons Learned Alerts are being distributed using an automated electronic mail list server to provide an expeditious means to share information. Contact Los Alamos National Laboratory at 505-667-0598 for subscription information. Both types of information can be used to improve performance in such areas as production.

3.10 REFERENCES

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response"

29 CFR 1910.1030, "Bloodborne Pathogens"

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan"

DOE 5820.2A, "Radioactive Waste Management"

DOE 5480.23, "Nuclear Safety Analysis Reports"

DOE-STD-1098-96, *Draft DOE Radiological Control Technical Standard*

DOE/EM-0054-SAD, "Health and Safety Plan (HASP) Guidelines," February 1994

DOE/EM-0182, *Handbook on Roles and Responsibilities for Environmental Management*

DOE/EM-STD-5503-94, "DOE Limited Standard EM Health and Safety Plan Guidelines"

DOE-SAD-TMP-23-94, "Lessons Learned Technical Standard"

DOE (EM-60), "Material Stabilization and Facility Deactivation Project Policies and Supplemental Information"

U.S. Department of Energy/U.S. Environmental Protection Agency Interagency Agreement, "Policy on Decommissioning Department of Energy Facilities Under CERCLA," May 22, 1995

U.S. Department of Energy Environmental Restoration Program "Decommissioning Implementation Guide," May 22, 1995

DOE/EM-0246, "Decommissioning Resource Manual"

FOUR

TRAINING

4.1 BACKGROUND

Training related to 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (the HAZWOPER Standard), has a major impact at Department of Energy (DOE) sites. As training is one of the keys to worker safety, it represents a significant portion of the cost of implementation of the HAZWOPER Standard at some DOE sites.

This chapter provides the project manager with guidance for implementing training requirements in the HAZWOPER Standard as well as integrating them with requirements in other pertinent Occupational Safety and Health Administration (OSHA) Standards and applicable DOE rules and requirements. Together, these requirements provide the basis for the hazardous waste activity training program, which includes the following elements (see Figure 4-1):

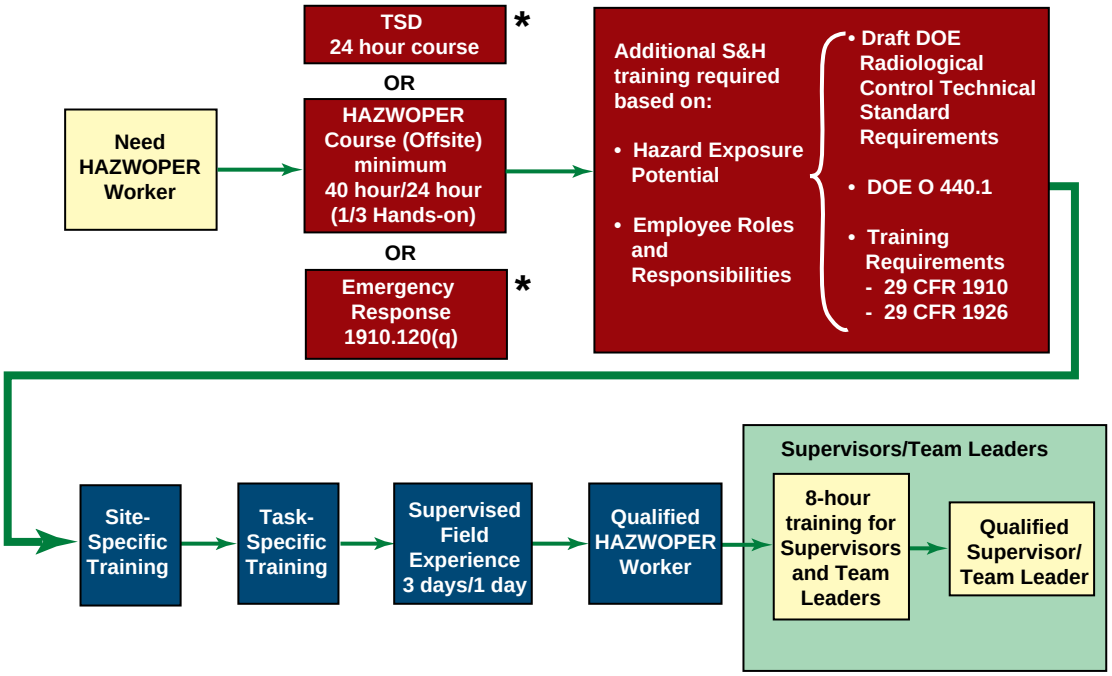
- Standardized learning objectives for the mandated 40-, 24-, and 8-hour courses (the 40- and 24-hour courses are often referred to as "HAZWOPER training");
- Standardized learning objectives for the mandated emergency response training;
- Course reciprocity and equivalency;
- Instructor and trainer qualifications;
- Student testing and evaluation;
- Recordkeeping requirements; and
- Needs analysis.

Value of HAZWOPER Training

- Helps to minimize accidents and injuries;
- Enables workers to recognize health and safety hazards;
- Promotes safe avoidance or escape from emergencies;
- Prepares workers or offsite personnel to respond to and control emergencies;
- Improves worker morale;
- Increases productivity;
- Reduces worker's compensation costs; and
- Facilitates OSHA compliance.

Required training under the HAZWOPER Standard reflects competency as well as the number of hours of instruction. Depending on the nature of the work, the hazards and possibility of worker exposures, and the roles and responsibilities of individual workers, additional training is likely to be required. See Tables 4-1 and 4-2.

An innovative and properly managed training program results in significant cost savings. In fiscal year 1994, the Oak Ridge Y-12 Plant used a well-documented equivalency approach (see Section 4.4) to emergency response training for firefighters to save over $25,000. Likewise, the Oak Ridge National Laboratory (ORNL) saved over $150,000 by using computer-based training and interactive video disks, equivalencies, and standardized procedures.



* Supervised field experience and 8-hour supervisor training not required

Figure 4-1. Site Worker Training Flow Diagram

4.2 TRAINING APPROACHES

A comprehensive, integrated health and safety training program is a key element in providing a cost-effective means of meeting the training requirements in the HAZWOPER Standard. It must cover all applicable OSHA and DOE requirements for personnel at DOE hazardous waste sites including workers, supervisors, managers, and visitors. For a HAZWOPER site or a deactivation and decontamination and dismantlement (D&D) site, the health and safety plan (HASP) and program define site-specific training requirements for each activity or task.

Essential Elements of An Occupational Safety and Health (OSH) Training Program

- Needs Analysis
- Training Administration
- Learning Objectives Development
- Training Lesson Plan Development and Maintenance
- Instructor Qualification
- Training Evaluation and Assessment
- Communication of Changes in Site-Specific Processes, Conditions, Hazards, and Materials
- Training Plan
- Training Requirements and Exemptions
- Regular Refresher Training
- Instructional Method Selection
- Tracking and Reporting System
- Remedial or Skills Enhancement Training or Both

Table 4-1. HAZWOPER (See Chapter 2) Training Categories

	General Site Worker (40-hour)	General Site Worker (24-hour)	Occasional Site Worker	Treatment, Storage, and Disposal (TSD) Worker	Emergency Response Training	Personnel in Support Zone	Visitors
Applicability	Personnel covered under the scope of HAZWOPER who are exposed to hazardous wastes or substances or safety and health hazards from hazardous waste operations	Personnel covered under the scope of HAZWOPER who regularly work in monitored and fully characterized areas with potential exposures below the published permissible exposure limits (PELs)	Personnel covered under the scope of HAZWOPER who are periodically onsite for specific and limited tasks and who are unlikely to encounter exposures over the published PELs	Personnel covered under the scope of HAZWOPER working at TSD facilities	Personnel covered under the scope of HAZWOPER working at uncontrolled hazardous waste worksites (29 CFR 1910.120 [e]), at TSD facilities permitted by the Resource Conservation and Recovery Act (RCRA) (29 CFR 1910.120 [p]), or who are responsible for responding to hazardous material incidents (29 CFR 1910.120 [q])	Personnel covered under the scope of HAZWOPER working in the support zone who do not enter the exclusion zone or contamination reduction zone	Non-essential personnel who are observing the worksite for a short duration (i.e., less than 8 hours) who are not exposed to safety and health hazards
Required Training	40-hour HAZWOPER training 3 days of supervised field experience Worksite-specific training Task-specific training General employee Training (GET)	24-hour HAZWOPER training 1 day of supervised field experience (recommended) Worksite-specific training Task-specific training GET	24-hour HAZWOPER training 1 day of supervised field experience An escort can substitute for the requirement for supervised field experience for short-duration tasks (i.e., less than 1 day) Worksite-specific training, as applicable Task-specific training, as applicable GET, as applicable	24-hour TSD training 1 day of supervised field experience (recommended) Worksite-specific training Task-specific training GET	For hazardous waste worksites, read 29 CFR 1910.120 (l) and for TSDs, read 29 CFR 1910.120 (p)(8) For (q) only, see Appendix 4-B First responder awareness level First responder operations level Hazardous materials technician Hazardous materials specialists On-scene incident commander Skilled support personnel Specialist employee	GET Emergency plan training Other safety and health training based on potential hazards, and exposures such as ergonomics, noise, etc.	Site-specific hazard communication training; visitors are escorted by trained personnel at all times

Table 4-2. Supplemental Training for HAZWOPER Activities

	Safety and Health Training	Worksite-Specific Training	Task-Specific Training	Supervised Field Experience	Training for Team Leaders, Supervisors, and Managers	Refresher Training
Basis	The need for additional safety and health training is based on the following: • Actual and potential hazards at a particular site • Actual and potential exposures incurred by individual employees • Roles and responsibilities of individual employees • Other applicable training requirements	Personnel must complete worksite-specific training before assuming their duties at the worksite.	Personnel must complete task-specific training before assuming their duties at the worksite. Content and scope of training must be based on the following: • Requirements and procedures to control work-place hazards, including emer-gency response • Level of actual and potential exposure to hazards • DOE safety and health requirements	Personnel must complete supervised field experience requirements based on the following: • HAZWOPER training category • Roles and responsibilities of individual employees	Onsite supervisors and managers directly responsible for personnel engaged in HAZWOPER activities must complete the same level of training as that required for their subordinates. Onsite supervisors and managers must complete at least 8 hours of additional specialized training.**	General site workers, occasional workers, TSD workers, supervisors, and managers must complete annual refresher training as follows: • Within 30 days of its due date • When returning to HAZWOPER activities within 1-3* years of initial training [Note: If more than 3 years have passed, initial training must be repeated.]

*For employees who have not performed hazardous waste work for more than 1 year, training beyond that provided in an 8-hour refresher might be needed. The employer makes a determination of training need based upon job hazards, employee roles and responsibilities, and employee's training retention (based upon observation, testing, and so forth).

**Does not apply to supervisors and managers of TSD workers.

DOE recommends the use of a "systematic approach to training," in which the content and rigor of training are commensurate with the potential hazards, exposures, worker roles and responsibilities, and requirements (see Figure 4-2). Numerous DOE Orders and guidance documents discuss the systematic approach to training in greater detail (e.g., the training accreditation program [TAP] manuals, the *OSHTRIG Manual*, and the draft *Occupational Safety and Health Training Program Management Guide* DOE/EH-0422).

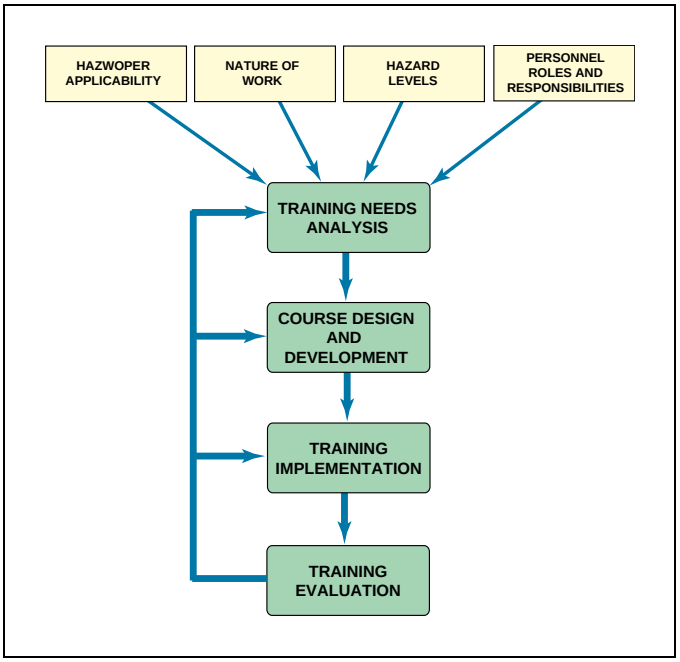


Figure 4-2. Systematic Approach to Training

Training for other activities such as deactivation and D&D may not fall within the strict scope of the HAZWOPER Standard. In many cases, however, applying HAZWOPER principles according to a hazard-based approach would add value to these activities (see Example 4-1). These activities often involve hazard-abatement processes, such as chemical lab-packing; asbestos, lead, mercury, or beryllium abatement; and radiological decontamination. Safety hazards may also involve, but are not limited to, issues related to construction safety, confined-space entry, lockout/tagout, hoisting and rigging, and use of elevated platforms or forklifts. Training requirements should be based on the hazards of the activity.

Training requirements are minimized by controlling exposure (or access) to hazardous wastes or substances. For example, an aisle through a hazardous waste site can be cleaned for an electrician who repairs equipment used in the exclusion zone. As long as there is no reasonable possibility of exposure to health or safety hazards associated with HAZWOPER waste operations, HAZWOPER training is not required for the electrician. Other safety training, such as in electrical safety, however, would be required. An escort for the electrician would be required. Refer to example 2-2 in Chapter 2.

Example 4-1

Once the appropriate training requirements are defined, they are identified in the HASP and safety and health program. Training informs workers about task-specific hazards and helps them develop the capability to recognize and control those hazards.

4.3 GENERAL TRAINING REQUIREMENTS AND GUIDELINES

The HAZWOPER Standard paragraphs (e) and (p) specify training requirements for employees who may be exposed to health and safety hazards at cleanup sites and Resource Conservation and Recovery Act of 1976 (RCRA) TSD facilities, respectively. Paragraph (q) specifies training requirements for employees who participate in emergency responses at locations other than cleanup sites and RCRA TSD facilities.

29 CFR 1910.121, "OSHA Accreditation of Training Programs for Hazardous Waste Operations" (proposed) and the nonmandatory Appendix E to the HAZWOPER Standard, "Suggested Training Curriculum Guidelines," are recommended for DOE-wide implementation. A compilation of combined curricula from the HAZWOPER Standard for accrediting training courses (29 CFR 1910.121); 29 CFR 1910.120, Appendix E (nonmandatory); and DOE-EM-STD-5503-94, "Environmental Management (EM) Health and Safety Plan Guidelines," is presented in Table 4-3.

Table 4-3. Combined EM Health and Safety Plan Guidelines and HAZWOPER 29 CFR 1910.120 and 29 CFR 1910.121 (Proposed) Training Curricula

TOPIC	40-hr	24-hr	16-hr	TSD 24-hr	TOPIC	40-hr	24-hr	16-hr	TSD 24-hr
HAZWOPER elements and safety program	●	●		●	Risks from handling radioactive wastes	●		●	
Effects of chemical exposures	●	●	●	●	Handling of shock-sensitive wastes	●		●	
Effects of biological and radiological exposures	●		†	●	Laboratory waste pack handling	●		●	
Fire and explosion hazards	●	●		●	Container sampling and safeguards	●		●	
General safety hazards	●	●	●	●	Procedures for shipping and transport	●		●	
Confined space, tank, and vault hazards	●		†	●	Decontamination program and procedures	●	●	●	●
Persons responsible for site health and safety	●		●		Emergency response and first aid	●	●		●
Health and safety hazards	●	†	†		Safe illumination levels	●		●	
PPE program and use of PPE	●	●		○	Site sanitation procedures and equipment	●		●	
Work practices for risk reduction	●	●		●	Review HAZWOPER appendixes	●		●	●
Engineering controls, risk reduction	●	●		●	Overview of hazard communication standard	●		●	●
Medical surveillance program	●	●		●	Use of reference materials	●	●	●	●
Site Health and Safety Plan	●	●			Toxicology principles and biological monitoring	●		●	●
Use of monitoring equipment	●	●			Employee rights and responsibilities	●		●	R
Site informational program	●		●		Hands-on exercises and demonstrations	●	●	†	●
Drum and container handling/spill containment	●		●	S	Final examination	●	●	●	●
Material handling equipment	●		●	●	Employee training program				●

† - Areas not required by 29 CFR 1910.121 (proposed), but needed to ensure 100 percent coverage from 24-hour course to 16-hour supplemental course;
○ - Overview; **S** - Spill containment; **R** - Resource Conservation and Recovery Act

the Worksite-specific scenarios and hands-on use of equipment should be included as much as possible in HAZWOPER training (recommended minimum of one-third of course hours). Worksite-specific examples should be used in all courses. Likewise, any discussion of hazards includes site-specific hazards. Special consideration is warranted for providing practical, hands-on training for emergency responders; emergency response training typically involves practice drills and demonstrations. The state fire marshal or authority having jurisdiction should be consulted to make certain that HAZWOPER and DOE training requirements for emergency response encompass any State- or community-specific training requirements.

HAZWOPER Training Certification

Initial HAZWOPER training certification depends on two criteria: (1) the successful completion of a 40- or 24-hour training course; and (2) completion of the specified level of supervised field experience. The employer is responsible for ensuring that both requirements are met before **final** certification is granted.

4.4 SPECIFIC TRAINING GUIDELINES

NEEDS ANALYSIS

Prior to beginning any training activity, exact training needs are identified. Training needs vary based on hazards, potential exposures, work requirements, roles and responsibilities, job descriptions, and compliance requirements. Job hazard analyses, task-to-training matrices, and employee surveys are some of the tools used in determining specific training needs.

INSTRUCTOR/TRAINER QUALIFICATION

Instructors providing training need to be qualified in their area(s) of instruction, based on documented experience, successful completion of a "train-the-trainer" program, and an evaluation of instructional competence. Instructors should maintain professional competency by participating in continuing education or professional development programs or by successfully completing periodic instructor refresher courses and competency reviews.

In the area of emergency response, competent or qualified Fire Service Instructor means an individual has met the requirements identified in the National Fire Protection Association (NFPA) Standard 1041-92: "Fire Service Professional Qualification."

RECIPROCITY

Reciprocity is one organization's acceptance of course work completed for another organization as satisfying its training requirements.

DOE's reciprocity process has two phases. The first phase is reciprocity for courses taken after the publication of this Handbook, and the second phase is reciprocity for courses taken before its publication.

Phase One. All future HAZWOPER training should meet or exceed the learning objectives as established in Appendix 4-A of this chapter. Emergency response training under 29 CFR 1910.120 (q) should meet or exceed the objectives as established in Appendix 4-B and guidelines of this chapter. The certificate should clearly state that the course has met the objectives as stated in the appendix. The training is then acceptable throughout the DOE complex.

Phase Two. Current (i.e., within the past year) 24- or 40-hour core and 8-hour refresher training should be accepted across the DOE complex. If the training is not current (i.e., the training is more than a year old), the employee completes the required 8 hours of refresher training.

- If an employee has not worked at a hazardous waste worksite within the last year, but had completed a 24- or 40-hour core training course before that time, the employee, with the approval of the employer and training provider, has only to complete the required 8-hour refresher course prior to engaging in hazardous waste activities.

- For employees not involved in hazardous waste work for more than 1 year, training beyond that provided in an 8-hour refresher course might be needed. The employer and the training provider should make a determination of training need based upon job hazards and employee roles and responsibilities.

- If an employee has not performed hazardous waste activities and has not received any refresher training in over 3 years, he or she should repeat the appropriate 40 to 24-hour core course.

- A current certificate for a course from DOE-sponsored National Institute of Environmental Health Sciences (NIEHS) grantees should be accepted across the DOE complex as meeting the training requirement.

In all cases the employee receives the appropriate worksite-specific training and any additional OSH training dependent on the specific jobs and tasks that the employee performs, the anticipated hazards, and possible exposures.

EQUIVALENCY

Equivalency is the determination that previous experience, education, or training is equivalent to a given training course. For example, 29 CFR 1910.120 (e)(9) contains a conditional exemption from the 40-hour training requirement for workers who are already experienced in safety and health aspects of hazardous waste worksite work. Each employer should develop an equivalency process which ensures that the necessary knowledge, skills, abilities, and competencies established by the learning objectives of Appendix 4-A of this chapter are met. If an employer believes that an employee has sufficient prior experience to meet some or all of the HAZWOPER training requirements, the employer documents the basis for this belief (see Examples 4-2, 4-3, and 4-4).

Reciprocity and Equivalency

At Oak Ridge, Lockheed Martin Energy Systems (LMES — formerly Martin Marietta Energy Systems) and the International Union of Operating Engineers (IUOE) jointly reviewed previously documented training of LMES employees. The learning objectives of the previous training were compared to the learning objectives of the IUOE 40-hour HAZWOPER course. The LMES and IUOE review concluded that the training equaled 16 hours of the IUOE 40-hour course. An additional 24 hours of HAZWOPER training was given to the LMES employees and they were given a 40-hour certificate. This is an acceptable equivalency methodology and under the reciprocity process described in this chapter the 40-hour certificate is acceptable across the DOE complex.

Example 4-2

The equivalency process can use, but is not limited to, the elements below:

- A review and comparison of previously documented training and experience to determine whether the training meets or exceeds the learning objectives in Appendix 4-A of this chapter. If the learning objectives are met, a training certificate is issued. If partial equivalency is met, the employee receives additional training so that all the learning objectives are met. Once the objectives are met, a certificate indicating completion of classroom training is issued.

- A written and a performance test can be administered that tests the employee's abilities relative to the learning objectives in Appendix 4-A.

- An interview of the employee and previous employers and training providers to determine adequate level of knowledge and experience relative to the learning objectives in Appendix 4-A.

- Previously documented education, experience, and training can be temporarily accepted. The employee's work performance could then be observed. If observation indicates that the employee's previous experience, education, and training are adequate, equivalency is met and a training certificate issued. If observations indicate otherwise, the employee receives additional training (to include the 24- and 40-hour core courses as warranted).

At the Savannah River Site (SRS), the training academy teaches the standard U.S. Environmental Protection Agency's 40-hour hazardous materials (HAZMAT) course, supplemented with worksite-specific hazard training. A new employee at SRS who has recently received the standard EPA 40-hour HAZMAT course would receive equivalency for the general course and be required to take only the worksite- and hazard-specific portion developed by SRS. The EPA 40-hour HAZMAT course and other HAZMAT courses approved by State or Federal agencies would be acceptable at all other DOE sites. In the past, these courses have not been considered equivalent to training given by DOE sites, nor have they been accepted in a reciprocal manner. When a worker moves from worksite to worksite, worksite-specific training is added to the core courses.

Example 4-3

At the Hanford Site, a half-hour satellite course on regulations provided to Westinghouse Hanford Company personnel was considered as equivalent to the regulations component of a standard HAZWOPER course. This decision resulted in a savings of over $350,000 over a 2-year period.

Example 4-4

Once equivalency is established by one DOE contractor, the equivalency is acceptable across the DOE complex. In all cases, the employee receives the appropriate site-specific training and any additional occupational safety and health training, depending on the specific jobs and tasks that the employee performs, the anticipated hazards, and possible exposures.

PROGRAM AND COURSE EVALUATIONS

Training programs and courses should be monitored and revisions made by training or environment, safety, and health professionals as a result of comments provided by students, instructors, and supervisors. Training should also reflect changes in policies, procedures, site characterizations, job requirements, lessons learned, and regulatory requirements. Adjustments are made as a result of analyzing work experiences at similar sites and based on accepted good practices. (See Section 4.5 for a list of reference materials for use in conducting training evaluations.)

SUPERVISED FIELD EXPERIENCE

General site workers who attend the 40-hour course must have a minimum of 3 days of supervised field experience under the direct supervision of a trained, experienced supervisor or team leader prior to being qualified to work unaccompanied at a hazardous waste site. Workers who receive the 24-hour course are required to have 1 day of supervised field experience. If an employee changes tasks and the work is significantly different, all or part of the supervised field experience may need to be repeated, even on the same hazardous waste worksite.

The primary intent of supervised field experience is for employees to be observed by their supervisor or team leader during the course of their workday to ensure they are working in a safe and healthful manner. These 1- or 3-day observation periods allow the supervisor or team leader to observe the worker applying proper techniques, and to emphasize site-specific hazards and special working conditions. The observation period includes some on-the-job training as a reinforcement of previous training received.

Any designated, trained (8-hour HAZWOPER supervisor course as a minimum), and experienced individual responsible for the safety of an employee (such as team leaders or crew leaders) may perform the function of a "supervisor" in providing the "supervised field experience" required by the HAZWOPER Standard.

STUDENT TESTING

Within the DOE complex, proficiency is evaluated and documented by means of written examinations and performance tests. Written examinations and performance tests evaluate knowledge and skills developed during the course of training and are based on specified learning objectives. Achievement is demonstrated by a score of at least 80 percent on the written test and successful completion of the pass/fail performance test. All testing methods are to be designed to measure the student's mastery of the learning objectives, not as a mechanism to prevent employment. Alternative or temporary types of testing (e.g., oral and visual testing, simulation, and team testing) can be used to supplement written examinations and performance tests.

Each DOE and contractor organization should have a program to assist employees who do not pass written examinations or performance tests. Instructors should work individually with students who fail performance tests to correct deficiencies, enabling these students to achieve a competency level sufficient to pass the test.

Oral tests (i.e., those in which written examinations are read out loud) may be administered to individuals who do not possess sufficient reading or writing skills to complete standardized written examinations. However, such individuals should receive supplemental training to enhance reading and writing skills to a level that permits them to read and understand hazard warning signs, use equipment, and so forth.

INSTRUCTOR EVALUATIONS

Instructors are evaluated annually by an appropriate person. These evaluations include observing an instructor's delivery, reviewing those observations with the instructor, and analyzing instructor and class evaluations completed by students during the previous year.

RECORDKEEPING REQUIREMENTS

Each student who satisfactorily completes a training course receives a formal notification that includes the following information: student name, course title, course date, a statement verifying completion of the course, name and address of the training provider, an individual identification number for the training certificate, and a list of the PPE levels (i.e., Level A, B, C, or D) used by the student. Training providers maintain records listing the course dates, names of attendees, names of students who successfully complete each course, course learning objectives or course identifier, and the number of the training certificate issued to each successful student. These records are maintained for a minimum of 5 years and are available to students on request subject to appropriate processing fees. Supervised field experience is documented in a similar fashion.

EMERGENCY RESPONSE TRAINING

The HAZWOPER Standard permits DOE to determine the level of response to an emergency, which can include either handling the entire response in-house or completely evacuating the area and turning responsibility over to one or more outside emergency response organizations. There are five general categories of emergency response personnel who respond to specific types of emergencies:

- Hazardous waste cleanup site workers who respond to emergencies in addition to their normal duties at the site they are assigned to, as specified in 29 CFR 1910.120 (l) and (e).

- TSD facility workers who respond to emergencies in addition to their normal duties at the facility they are assigned to, as specified in 29 CFR 1910.120 (p).

- Onsite collateral-duty emergency responders who respond to limited emergencies on an as -needed basis within a defined work area, as specified in 29 CFR 1910.120 (q).

- Onsite emergency responders who respond to emergencies regardless of type or location on a full-time basis, as specified in 29 CFR 1910.120 (q).

- Offsite emergency responders who respond to emergencies on a full-time basis regardless of type or location of the emergency, as specified in 29 CFR 1910.120 (q). Offsite responders do not fall under the scope of this Handbook.

The latter three categories above include all responders not covered by 29 CFR 1910.120 (l) and (p). The last category includes local firefighters and HAZMAT teams.

Under HAZWOPER, DOE contractor employees working at a hazardous waste cleanup site who also perform emergency response are trained to 29 CFR 1910.120 (e) and (l) criteria. Similarly, employees working at a TSD facility who also perform emergency response are trained to 29 CFR 1910.120 (p) criteria. But if DOE elects to evacuate the employees and designate a full-time, onsite emergency response organization with the responsibility for responding, an emergency action plan (EAP) is developed and the employees are trained in accordance with OSHA's Emergency and Fire Prevention Plan Standard, 29 CFR 1910.38. At a minimum, the onsite emergency response organization is trained in accordance with 29 CFR 1910.120 (q) criteria. DOE may elect to designate an offsite organization (such as a local HAZMAT team) with the responsibility for emergency response. State training requirements and standards such as NFPA 472 may apply in addition to HAZWOPER requirements. Outside emergency responders are not under the scope of this Handbook.

Example 4-5

HAZWOPER establishes five categories of training requirements based on the duties performed by emergency responders (Table 4-4). OSHA determined that job responsibilities define training requirements but that training does not define job responsibilities. Thus, if responders have not been trained in a specific task and informed that they will perform the task during response, they are not permitted to perform the task regardless of their training level.

Cleanup Site and TSD Facility Workers. Hazardous waste cleanup site and TSD facility workers who respond to emergencies in addition to their normal duties at the site to which they are assigned may need worksite-specific emergency response training that supplements the required 24-hour or 40-hour HAZWOPER training. (Refer to Appendix 4-A.) The training is dependent on the worker's roles and responsibilities and the hazards they are likely to encounter. Such training may be outlined in the HASP for special work situations (e.g., confined-space rescue, excavation rescue, elevated-work rescue, and so forth). Hazardous waste workers are required to rehearse the site emergency response plan annually, while TSD facility workers rehearse the response plan regularly.

Five Key Levels of Emergency Response Training. Under HAZWOPER, onsite emergency responders, onsite collateral-duty emergency responders, and offsite emergency responders are trained to one or more of five levels of competency depending on the type of response they perform as specified in 29 CFR 1910.120 (q). Beyond these five key levels, there are two specialized categories of emergency responders: skilled support personnel and specialist employees.

The five levels are:

- First responder awareness level
- First responder operations level
- Hazardous materials technician

Appendix 4-B outlines the learning objectives for the five levels of DOE emergency responders. The objectives and length of training meet HAZWOPER training requirements for emergency response operations.

- Hazardous materials specialist
- On-Scene Incident Commander

Table 4-4. HAZWOPER Categories and Training Requirements for Emergency Responders

Category	Training Criteria	Definition	Initial Training	Refresher Training
Hazardous Waste Cleanup Site Workers Who Respond To Emergencies	29 CFR 1910.120 (e) 29 CFR 1910.120 (l)	Individual working at a hazardous waste cleanup site who responds to emergencies in addition to normally assigned duties.	Appendix 4-A and additional training.	Rehearse emergency plan in annual 8-hour refresher training.
Treatment, Storage, and Disposal (TSD) Facility Workers Who Respond To Emergencies	29 CFR 1910.120 (p)	Individual working in a TSD facility who responds to emergencies in addition to normally assigned duties.	Appendix 4-A and additional training.	Rehearse emergency plan in annual 8-hour refresher training.
Onsite Collateral-Duty Emergency Responder	29 CFR 1910.120 (q)	Individual within a work area who is trained to respond to limited emergencies on an as-needed basis. Not a full-time responder.	Appendix 4-B.	Practice and drills as necessary.
Onsite Emergency Responder	29 CFR 1910.120 (q)	Full-time emergency responder on a DOE site who responds to emergencies at the site.	Appendix 4-B.	Practice and drills as necessary.
Offsite Emergency Responder	29 CFR 1910.120 (q) or State mandate*	Personnel from outside a DOE site who respond to an emergency on the DOE site. Includes local firefighters, HAZMAT teams, and so forth.	State-prescribed training.	Practice and drills as necessary.

* State and local employees are not necessarily covered under the Occupational Safety and Health Act, HAZWOPER, or other OSHA regulations, but are often covered by State safety and health regulations.

Each level is based on the skills needed to perform at that particular level and the hazards likely to be encountered. A detailed description of the levels and suggested learning objectives for each are given in Appendix 4-B. Additional competency criteria and guidelines are provided by 29 CFR 1910.120, Appendix E and NFPA standards. Guidelines to support and assist State, Tribal, and local entities in training emergency response personnel have been developed by the Federal Emergency Management Agency (FEMA) in *Guidelines for Public Sector Hazardous Materials Training*, March 1994.

Onsite Collateral-Duty Emergency Responders. Onsite collateral-duty emergency responders are not trained to be full-time emergency responders. They are assigned to limited emergency response duties within their work area. Duties could include response to controlling or cleaning up spills and releases at a particular area of a TSD facility or cleanup worksite but not duties assigned to a full-time emergency response unit. Collateral-duty responders are required to meet the requirements of 29 CFR 1910.120 (q) as outlined in Appendix 4-B.

Onsite Emergency Responders. Larger DOE sites maintain their own full-time fire departments, emergency response teams, and HAZMAT teams when unique hazards are present. Minimum training requirements are specified in 29 CFR 1910.120 (q) and outlined in Appendix 4-B. Because of the wide variety of hazards that they may encounter, these personnel undergo extensive additional training and drills. Such training often exceeds the minimum required by HAZWOPER and the learning objectives specified in Appendix 4-B.

Offsite Emergency Responders. Offsite emergency responders include local fire departments, emergency response teams, and HAZMAT teams. They are trained to respond to a wide variety of hazardous releases, spills, and other emergencies, and usually receive extensive training and hands-on practice that exceeds HAZWOPER requirements, such as criteria specified in NFPA Standard 472, "Standard for Professional Competence of Responders to Hazardous Materials Incidents" and other State criteria.

Skilled Support Personnel. Skilled support personnel may be needed to assist onsite and offsite emergency response personnel. These individuals are skilled in the operation of certain equipment, such as earth-moving or digging equipment, and are needed temporarily to perform immediate emergency support work. Skilled support personnel are not required to be pre-trained but are provided an initial briefing at the site prior to their participation in an emergency response (see Appendix 4-B).

Specialist Employees. Specialist employees, in the course of their regular jobs, work with and are trained in the hazards of specific hazardous substances and may be called upon to provide specialized technical advice or assistance. Such employees should receive training or demonstrate competency in their area of specialization on an annual basis (see Appendix 4-B).

Refresher Training. Refresher training for emergency responders, as specified in 29 CFR 1910.120 (q), should incorporate lessons learned from the previous year, information about any process or facility changes, emergency response experiences from DOE and the private sector, and detailed review of any incidents that have occurred at the site or facility. Hands-on performance-based training and periodic emergency response drills are recommended. 29 CFR 1910.120, Appendix E, "Training Curriculum Guidelines," provides guidelines.

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APPENDIX 4-A
MODEL CONSOLIDATED LEARNING OBJECTIVES

Note: These student learning objectives for the core courses are minimums and are not intended to provide the sum total of required safety and health training to participants. Additional courses are likely to be required for workers at hazardous waste sites, depending on the nature of their work, the hazards they are or may be exposed to, and their roles and responsibilities. Special training may be required for handling shock-sensitive wastes; for shipping and transportation; for laboratory waste-pack handling; and for exposure to radiation hazards. At the end of the core course, the instructor should evaluate the student as to the completion of these objectives. Performance-based evaluation is encouraged. The 40-hour course should include at least one-third of the time in "hands-on" exercises.

40-Hour and 24-Hour Core Hazardous Waste Operations Course Learning Objectives

(1) HAZWOPER elements and safety program (40,24W,24T)

Describe:

- The HAZWOPER Standard (29 CFR 1910.120/1926.65) and the three main applications of the Standard (hazardous waste site, TSD, emergency response).

Identify:

- Applicable paragraphs of 29 CFR 1910.120;
- Primary elements of an employer's effective OSH program; and
- Responsible personnel in TSD operations.

(2) Effects of chemical exposures (40,24W,24T,16)

Describe:

- Sources of chemical hazards;
- Signs and symptoms of exposure to hazardous substances; and
- Various chemicals that may have different effects on the body.

Identify:

- Four routes of entry into the body.

Explain:

- Acute and chronic effects of chemical exposure.

(3) Effects of biological & radiological exposures (40,24T,16)

Describe:

- Biological and radiological hazards;
- Sources of biological and radiological hazards; and
- Probable effects from exposure to biological hazards.

Explain:

- Acute and chronic effects of radiological exposure; and
- Four routes of entry for contaminants into the body.

(4) Fire and explosion hazards (40,24W,24T)

Identify:

- Local fire and explosion hazards; and
- Components of the fire triangle and provide examples of each component.

Define and explain:

- Flashpoint, flammable/combustible limits, chemical incompatibility, and catalyst.

(5) General safety hazards (40,24W,24T,16)

Describe:

- General safety hazards, including noise;
- Construction hazards, where applicable;
- Electrical hazards;
- Powered equipment hazards;
- Walking hazards;
- Heat stress and cold stress hazards; and
- The responsibility of employers and employees to identify and control these general safety hazards.

(6) Confined space, tank, and vault hazards (40,24T,16)

Define:

- A confined space.

Identify:

- Requirements and general precautions for confined space work;
- The primary hazards associated with confined spaces; and
- The ways a confined space presents hazardous occupational conditions.

(7) Persons responsible for site safety and health (40,16)

Describe:

- Positions (or their equivalents) and their alternates who are responsible for safety and health at the site.

(8) (Specific) health and safety hazards
(40,24W,16)

Identify:
- Significant site hazards in the HASP but not covered under General safety hazards, Fire and explosion hazards, Effects of chemical exposures, or Effects of biological and radiological exposure.

(9) PPE program and use of PPE for full protection (40,16)

Identify:
- Elements of a personal protective equipment (PPE) program; and
- Four levels of PPE as prescribed by OSHA.

Explain:
- Selection criteria of PPE and their protective limitations; and
- Methods of inspection, use, maintenance, repair, and storage of PPE.

Demonstrate:
- Correct method for inspecting, maintaining, donning, and removing of an appropriate level of protection, based on a scenario provided by the instructor.

(10) PPE program and use of PPE
(24W,24T)

Identify:
- The elements of PPE program;
- Requirements for the four levels of PPE as prescribed by the OSHA Standard; and
- Three atmospheric hazards requiring respiratory protection.
  (additionally for 24T)
- The selection criteria of chemical protective clothing based on its protective limitations;
- The methods of inspection, use, maintenance and repair, and storage of PPE;
- Atmospheric hazards requiring respiratory protection;
- Approved fit tests for respirator wearers; and
- Limitations of air-purifying respirators (APRs) and their associated cartridges.

(11) Work practices for risk reduction
(40,24W,24T)

Describe:
- Principles of as low as reasonably achievable (ALARA); and
- Work practices used to reduce exposures to hazards, including applicable SOPs relating to operations/construction.

(12) Engineering controls, risk reduction
(40,24W,24T)

Describe:
- The concept of hierarchy of hazard controls;
- Applicable hazard controls and equipment;
- How to determine whether required hazard controls are in use; and
- Relevant new hazard control technology or procedures.

List:
- At least three examples (each) of engineering and administrative controls.

(13) Medical surveillance program
(40,24W,24T)

Describe:
- The basic elements of a medical surveillance program;
- The signs and symptoms of overexposure to hazardous substances;
- Availability of, and a method for, obtaining medical records;
- Rights of employees as patients in terms of confidentiality, access to records, and reporting of examination results; and
- Responsibilities of employees to report incidents, accidents, and illnesses.

(14) Site health and safety plan (HASP)
(40,24W)

Identify:
- Known and potential hazards at worksites.

Describe:
- Key elements of a complete site HASP;
- Methods to contact personnel, and alternates, responsible for site health and safety; and
- The right and responsibility of employees to have access to, and input to change, the site HASP.

Explain:
- Purpose of the site HASP.

(15) Use of monitoring equipment
(40,24W)

Identify:
- Different types of monitoring instruments; and
- General limitations of field-monitoring instruments.

Explain:
- Purposes of monitoring instruments; and
- Factors involved in proper selection and use of monitoring instruments.

Demonstrate:
- Operation of applicable monitoring equipment in accordance with the appropriate procedures and instrument technical manuals.

(16) Site informational program (40,16)

Describe:
- Employer responsibilities to communicate likely exposure(s) to hazards encountered at a waste site; and
- Methods used for that communication.

(17) Drum and container handling/spill containment (40,24T,16)

Identify:
- Potential hazards of drum handling (equipment specifically to be addressed in site-specific training); and
- Safe spill handling practices.

(18) Material handling equipment
(40,24T,16)

Identify:
- Examples of local material handling equipment; and
- Hazards and limitations of specific handling equipment.

(19) Risks from handling radioactive wastes (40,16)

Identify:
- The following for each of the four types of ionizing radiation: physical characteristics, range/shielding, and biological hazard(s);
- The units used to measure radiation and contamination;
- The colors and symbols used on radiological postings, signs, and labels, and;
- The need to notify supervisor if employee does not have specialized radiation training.

Define:
- Ionizing radiation and radioactive contamination.

(20) Handling of shock-sensitive wastes
(40,16)

Describe:
- Situations when shock-sensitive wastes may be encountered and need for special training.

(21) Laboratory waste pack handling procedures (40,16)

Explain:
- Hazards of lab packs.

Describe:
- Situations when lab packs are, or may be, encountered and need for special training.

(22) Container sampling (40,16)

Identify:
- Why an unknown material must be sampled and characterized;
- Steps and precautions when taking samples from drums, tanks, or other containers;
- Hazards associated with obtaining samples from various containers;
- Hazards associated with obtaining samples from bulk containers; and
- Steps and precautions when taking samples from bulk containers.

(23) Procedures for shipping and transport (40,16)

Identify:

- Requirements of labels, markings, and placards.

(24) Decontamination program and procedures (40,24W,24T,16)

Identify:

- Work practices for contamination avoidance;
- Methods of decontamination;
- Primary ways to determine the effectiveness of decontamination;
- Limits to the effectiveness of decontamination; and
- Emergency decontamination procedures.

Demonstrate:

- Student can perform decontamination processes for personnel and equipment.

(25) Emergency response plan and first aid (40,24W,24T)

Explain:

- The purpose for emergency planning;
- Primary elements of an emergency plan;
- Worker responsibilities based on level of training;
- Methods to notify workers of emergency conditions;
- Emergency medical treatment and first aid components of the emergency plan;
- Components of the emergency plan for control and containment of hazardous substance spills; and
- Worker limitations based on level of training.

(26) Safe illumination levels (40,16)

Describe:

- The need for adequate lighting levels for working safely.

(27) Site sanitation procedures and equipment (40,16)

Describe:

- The need for adequate sanitation facilities.

(28) Review HAZWOPER appendixes (40,24T,16)

Identify:

- The applicable appendixes to 29 CFR 1910.120.

(29) Overview of hazard communication standard (40,24T,16)

Explain:

- The OSHA requirements for a hazard communication program.

Demonstrate:

- Given Material Safety Data Sheet (MSDS), identify health hazards information and protective measures.

(30) Use of reference materials (40,24W,24T,16)

Identify:

- Advantages of using reference materials;
- Common sources of reference providing additional health and safety information (can include the National Institute for Occupational Safety and Health (NIOSH) Pocket Guide, DOT Handbook, Emergency Response (ER) Guide, 4-Agency Manual, and CHRIS Manual); and
- Personnel resources who can answer questions and/or issues regarding HAZWOPER.

(31) Toxicology principles and biological monitoring (40,24T,16)

Explain:

- The principles of toxicology and biological monitoring.

(32) Employee rights and responsibilities (40,24T,16)

List:

- The rights and responsibilities given to the employee by the Occupational Safety and Health Act of 1970 as well as DOE policies and the steps necessary to exercise these rights and fulfill these responsibilities;
- Responsibilities of the employer under the Occupational Safety and Health Act of 1970 as well as DOE policies;
- The steps you may take if you believe you have been prevented from exercising your rights under OSHA and DOE policies and procedures; and
- The steps you may take if you believe you have been punished for exercising your rights under OSHA and DOE policies and procedures.

(33) "Hands-on" exercises and student demonstrations (40,24T,16)

Demonstrate:

- PPE usage, especially respirators;
- Drum and container handling;
- Use of monitoring equipment;
- Decontamination procedures;
- Use of hazard communication tools (e.g., labels, MSDSs);
- Actions in an emergency scenario; and
- Use of reference materials.

(34) Employee training program (24T)

Identify:

- Elements of the hazardous waste operations training program; and
- Personnel responsible for the training program.

(35) Site simulations (24W)

Demonstrate:

- Use of hazard communication tools;
- Elementary decontamination; and
- PPE usage.

40 = 40-hour initial hazardous waste operation core training

24W = 24-hour initial hazardous waste operation core training

16 = 16-hours of additional training to supplement 24-hour initial hazardous waste operation core training to equal 40-hour core training

24T = 24-hour initial treatment, storage, and disposal (TSD) core training

8-Hour Refresher – Hazardous Waste Operations Course Learning Objectives

(1) Topics in the 40-hour program including lessons learned

Identify:

- Lessons learned from recent incidents involving hazardous waste operations;
- Methods or work practices used to reduce exposures to hazards;
- Key elements of emergency response plans and procedures; and
- Confined spaces and decontamination practices.

Demonstrate:

- Use of information sources.

(2) Update on the 40-hour course

Identify:

- Recent discoveries regarding effects of exposure to hazardous substances;
- Engineering controls that reduce exposure to hazardous substances; and
- Methods, techniques, and equipment for handling materials.

(3) Pertinent regulations

Identify:

- Recent changes to EPA standards;
- Recent changes to OSHA standards;
- Recent changes to DOE standards; and
- Recent changes to other relevant requirements.

(4) Additional subject areas

Identify:

- New subjects pertaining to hazardous waste operations; and
- Worksite specific standard operating procedures, if readily available.

(5) Personal protective equipment (PPE) and decontamination

Identify:

- Use of PPE; and
- Equipment and procedures for decontamination operations.

Demonstrate or Review (or Both):

- The methods for selecting, inspecting, donning, and removing PPE, based on a scenario provided by the instructor. This shall be accomplished such that the required level of protection is achieved and there is no spread of hazardous material to any undesired location.

Note: Employers at TSD facilities need to ensure that 8-hour refresher training addresses the hazards of the particular TSD site. Therefore, the learning objectives for TSD sites may differ from those stated above.

8-Hour Supervisor/Management – Hazardous Waste Operations Course Learning Objectives

(1) Demonstrate working knowledge of:

- Employees Safety and Health Program including Construction;
- Hazardous waste and material training requirements;
- Employer's Personal Protective Equipment Program;
- Employer's spill containment program;
- Employer's Decontamination Program; and
- Employer's health hazard monitoring procedures and techniques.

(2) Demonstrate the ability to apply and interpret:

- A HASP; and
- Levels of protection (based on changing hazards).

(3) Recognize legal liabilities and accountabilities.

Identify techniques for effective:

- Worker qualifications;
- Site control; and
- Supervised field experience.

(4) Demonstrate working knowledge and management of hazardous wastes and their disposal.

- Applicable regulations and procedures;
- Training requirements PPE;
- Methods, techniques, and requirements for segregation, labeling, storing, and transportation of hazardous substances; and
- Decontamination.

(5) Demonstrate working knowledge of required notifications in the event of a hazardous substance release:

- To company officials;
- Local authorities;
- State authorities; and
- Federal authorities.

(6) Demonstrate working knowledge of emergency program and procedures applicable to the job function:

- Communications;
- Mitigation procedures;
- Procedures to protect personnel;
- Procedures for decontaminating; and
- Procedures for area restoration.

Recognize lessons learned from recent incidents and case studies applicable to hazardous waste operations.

APPENDIX 4-B
MODEL LEARNING OBJECTIVES FOR HAZWOPER EMERGENCY RESPONSE

FIRST RESPONDER AWARENESS LEVEL

The minimum training time for the awareness level responder is dependent on the time needed to recognize the emergency, initiate the required notifications, and establish initial site security control. 1910.120 (q)(6)(I) defines first responders as individuals who are likely to witness or discover a hazardous waste or substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release.

(1) Hazards and associated risks

Define and List:

- Known hazardous substances and risks.

Describe:

- Potential hazardous substance release scenarios; and
- Process for hazardous substance recognition and assessment.

(2) Emergency response

Explain:

- Emergency recognition;
- Process for site security and control during a hazardous substance release;
- Evacuation routes and procedures;
- Emergency alerting and response procedures; and
- Safe distances and place of refuge.

FIRST RESPONDER OPERATIONS LEVEL

The minimum time requirement for training for operations level is 8 hours. Additional specialized training may be required (e.g., confined space entry, excavation rescue, and other local, State, or Tribal requirements). 1910.120 (q)(6)(ii) defines first responder operations level as individuals who respond to releases or potential releases of a hazardous waste or substance as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures.

Note: Before training at this level begins, the trainee should demonstrate competency in the learning objectives at the first responder awareness level.

(1) Emergency response plan (ERP)

Describe:

- How the first responder awareness level fits into the ERP.

Explain:

- Personnel roles, lines of authority, and communications;
- Emergency medical treatment and first aid;
- Integration of local or State emergency plans with the employer's emergency response plan;
- Elements of emergency response addressed by SARA Title III plans, but not in the employer's response plan;
- How to recognize the need for and procure additional resources; and
- The protocols for initiating emergency rescue and medical response.

(2) Transportation-related emergencies

(Limited to transportation accidents)

Describe:

- How to use the U.S. Department of Transportation's Emergency Response Guidebook;
- How to identify the DOT hazard classes and divisions of hazardous materials;
- Facility and transportation markings and colors that indicate hazardous materials;
- Information available to emergency response personnel shipping labels and documents; and
- The significance of the terms Type A, Type B, and special forms as they relate to hazardous materials packaging.

List:

- Common examples of materials in each hazard class or division.

(3) Hazard and risk assessment

List:

- Methods to complete basic hazard and risk assessment for each known hazardous substance.

Explain:
- Basic hazardous materials terminology;
- Material behavior characteristics;
- Outside sources of information on hazards and risk assessment (e.g., MSDSs, CHEMTREC, National Response Center); and
- Protocols for defensive actions and evacuation.

(4) Personal protective equipment (PPE)
List:
- Available PPE at the applicable facility**.**

Describe:
- How to properly select appropriate PPE; and
- How to properly don and doff appropriate PPE for the hazardous material response scenarios identified for the applicable facility.

(5) Defensive control techniques
List:
- Available defensive actions.

Explain:
- How to perform the various basic (defensive) control, containment, or confinement operations or all three.

Describe:
- Safety precautions to be observed when conducting defensive operations during approach or work in the endangered area or both;
- Methods to monitor and evaluate health and safety issues involving response personnel; and
- Communication methods for keeping the incident command structure apprised of actions being taken by personnel in the endangered area.

Decontamination
List:
- The types and location of equipment used during basic decontamination activities**.**

Explain:
- How to implement basic decontamination procedures.

Describe:
- Protocols for various methods of basic personnel decontamination and how medical considerations may impact those protocols.

(7) Operating procedures
List:
- Applicable standard operating procedures.

Explain:
- How standard operating procedures are initiated and used during an emergency response;
- How to implement termination procedures; and
- The role of the operations level during hazardous materials incidents as specified in the applicable emergency response plan.

HAZARDOUS MATERIALS TECHNICIAN

The minimum time requirement of training for technician level is 24 hours, equal to the first responder operations level and in addition the time required to provide the student with the competency in the objectives listed above. The employer certifies these competencies. 1910.120 (q)(6)(iii) defines hazardous materials technicians as individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance.

Note: Before training at this level begins, the trainee should demonstrate competency in the learning objectives at the first responder operations level.

(1) Operating Procedures
Describe:
- How to implement the employer's emergency response plan;
- The role of the Hazardous Materials Technician; and
- How to function within an assigned role within the Incident Command System.

(2) Hazard and risk assessment
Explain:
- Advanced methods to complete hazard and risk assessments;
- How to classify, identify, and verify materials by using field survey instruments and equipment;
- Basic chemical and toxicological terminology and behavior;
- The use and limitations of applicable monitoring equipment (e.g., CO Meter, Colorimetric tubes); and
- Methods of identifying, establishing, and maintaining positive controls over the endangered and surrounding areas (e.g., hot, warm, and cold zones).

(3) Personal protective equipment
List:
- Available specialized chemical PPE.

Describe:
- How to properly select appropriate specialized chemical PPE;
- Protocol for downgrading PPE requirements based on monitoring results; and

- How to properly don and doff appropriate specialized chemical PPE.

(4) Control techniques

Explain:

- How to perform various advanced (offensive) control, containment, or confinement operations, or all three, within the capabilities of available resources and PPE.

Describe:

- Safety precautions to be observed when conducting defensive/offensive operations in the endangered area.

(5) Decontamination

List:

- All the available types and locations of decontamination equipment**.**

Describe:

- How to implement various decontamination procedures and the procedures to be used for different hazardous substances.

Explain:

- Protocols for methods of personnel decontamination and how medical considerations may impact those protocols.

(6) HAZARDOUS MATERIALS SPECIALIST

The minimum time requirement for training the hazardous materials specialist is 24 hours, equal to the technician level, plus the time needed to provide the student with competency in the objectives above. The employee certifies these competencies. Additional specialized training may be required (e.g., confined-space entry, excavation rescue, and other local, State, or Tribal requirements). 1910.120 (q)(6)(iv) defines hazardous materials specialists as individuals who respond with and provide support to hazardous materials technicians; however, those duties require a more directed or specific knowledge of the various substances. The hazardous materials specialist would also act as the site liaison with Federal, State, local, and other government authorities in regard to site activities.

Note: Before training at this level begins, the trainee should demonstrate competency in the learning objectives at the hazardous materials technician level.

(1) Operations procedures

Describe:

- How to implement the local ERP;
- The basics of the State emergency response plan; and
- The role of the hazardous materials specialist during hazardous materials incidents as specified in the applicable emergency response plan.

(2) Hazard and risk assessment

Explain:

- Aspects involved in completing in-depth hazard and risk assessment for each hazardous substance that could be potentially encountered;
- How to classify, identify, and verify known and unknown materials by using advanced survey instruments and equipment; and
- Demonstrate an understanding of chemical, radiological, and toxicological terminology and behavior.

(3) Personal protective equipment

List:

- Available specialized chemical PPE.

Describe:

- How to properly select appropriate specialized chemical PPE.

(4) Defensive control techniques

Explain:

- How to perform specialized control, containment, or confinement operations, or all three, within the capabilities of the available resources and PPE.

(5) Site safety and control plan

List:

- The topics to be covered in a site safety and control plan.

Describe:

- How the site safety and control plan is used to ensure worker health and safety at the event scene.

ON-SCENE INCIDENT COMMANDER

The minimum time requirement for training the on-scene incident commander is 24 hours. Additional specialized training may be required (e.g., other local, State, or Tribal requirements). 1910.120 (q)(6)(v) defines the on-scene incident commander as an individual who will assume control of the incident scene beyond the first responder awareness level. Note: Before training at this level begins, the trainee should demonstrate competency in the learning objectives at the first responder operations level.

(1) Operations procedures

Describe:

- How to implement the employer's emergency response plan;
- How to implement the employer's incident command system;
- How to implement the local emergency response plan;
- The basics of the State emergency response plan;
- The basics of the roles and responsibilities of the Federal Regional Response Team;
- The role of the on-scene incident commander;
- The process for limiting personnel access into the endangered area;
- Methods for implementing protective actions for personnel located within and outside the endangered area;
- The process for identifying and approving applicable PPE;
- How various emergency response organizations, on and off the event site, are integrated into a single incident command system; and
- The process for developing, approving, and releasing public information to offsite entities.

Explain:

- The emergency response organizational structure;
- The roles and responsibilities of offsite emergency response organizations as that response relates to the incident command system;
- Other resources that may be needed during a hazardous materials incident;
- The method for evaluating the progress of the planned response to ensure the response objectives are being met safely, effectively, and efficiently;
- Steps required to terminate the emergency phase of a hazardous materials incident;
- The procedure for conducting incident debriefings at a hazardous materials incident;
- The process for maintaining event logs and documentation developed during the hazardous waste incident; and
- The procedure for conducting an incident critique at the conclusion of the hazardous materials incident.

(2) Personal protective equipment

Explain:

- The hazards and risks associated with employees working in chemical PPE.

(3) Decontamination

Describe:

- The importance of decontamination procedures.

SKILLED SUPPORT PERSONNEL

There is no minimum training time for skilled support personnel. The training should be based on the responder being able to perform the required emergency actions in a safe and healthful manner. While individuals normally filling this type of position are not necessarily the employer's own employees, all personnel expected to respond during an emergency should receive the necessary level of training equal to their anticipated level of response. Skilled worker training consists of briefing and is normally provided at the event scene. 1910.120 (q)(4) defines skilled support personnel as individuals, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth-moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene. These individuals, while not required to be pre-trained prior to initiating an emergency response, must be provided an initial briefing at the site prior to their participation in any emergency response. This initial briefing should meet the following learning objectives:

- Demonstrate the ability to properly wear appropriate PPE.
- Describe the chemical hazards involved with the tasks to be performed.
- Describe the duties to be performed.
- Describe the safety and health precautions needed to ensure health and safety of the individual.

SPECIALIST EMPLOYEES

There is no minimum training time for the specialist employee. The training should be focused toward the need for the individual to be able to effectively interface and coordinate with the on-scene incident commander in providing technical expertise and advice. 1910.120 (q)(5) defines specialist employees as individuals, who in the course of their regular job duties, work with and are trained in hazards of specific hazardous wastes or substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge. These employees must receive training or demonstrate competency in the area of their specialization annually and should be trained to meet the following training objectives:

(1) Assistance to the On-Scene Incident Commander

Explain:

- The responsibilities for assisting the on-scene incident commander in planning, implementing, and evaluating responses to hazardous incidents involving their area of expertise.

Describe:

- The types of resources and information that may be required to support the on-scene incident commander in areas of their specific expertise.

(2) Operation procedures

Explain:

- The various support roles a specialist employee may be expected to provide (e.g., hazardous materials, packaging, safety, medical).

APPENDIX 4-C
SUMMARY OF TRAINING REQUIREMENTS FOR EMERGENCY RESPONSE PERSONNEL

Job Title	Definition	Training Requirements
Skilled Support Personnel	• Expert in the operation of equipment, not necessarily employees of the employer, and may perform temporary emergency work • Examples: crane or earth-moving equipment operators, or medical personnel whose typical duties do not include treating contaminated patients	• Must receive initial briefing at the site prior to participation in emergency response as required by 29 CFR 1910.120 (q)(4) • Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
Specialist Employees	• Employees outside immediate release area who assist on-scene incident commander • All activities coordinated through individual in charge of the incident command system • Examples: industrial hygienists or health physicists providing guidance on PPE selection	• Must meet requirements of 29 CFR 1910.120 (q)(5) • Demonstrated competencies listed in NFPA Standard 472—1992 for specialist categories C, B and A
First Responder Awareness Level	• Individuals likely to witness or discover a release and who are trained to initiate emergency response sequence • Example: security personnel	• Must meet requirements of 29 CFR 1910.120 (q)(6)(i) • Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
First Responder Operations Level	• Individuals who respond to releases in a defensive fashion and confine it from a distance • Example: firefighters, since they will respond to releases; and process operators, since they may take defensive actions from a safe distance	• A minimum of 8 hours of training or sufficient experience to demonstrate competency in areas listed in 29 CFR 1910.120 (q)(6)(ii)[1] • Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
HAZMAT Technician	• Responds to releases for purposes of stopping release • Process operators may take limited action in danger area if they: (1) have informed the incident command structure of the emergency, (2) have adequate PPE, (3) have adequate training in procedures they are to perform, and (4) employ the buddy system	• At least 24 hours of training equal to the first responder operations level and additional competency in areas listed in 29 CFR 1910.120 (q)(6)(iii)[2] • Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
HAZMAT Specialist	• Duties parallel HAZMAT Technician • Requires knowledge of substances to be contained	• Includes demonstrations and hands-on performance and proficiency • At least 24 hours of training equal to the HAZMAT technician level and additional competency in areas listed in 29 CFR 1910.120 (q)(6)(iv)[2]
On-Scene Incident Commander	• Oversees HAZMAT team and is knowledgeable in command and management • Does not necessarily have extensive knowledge of certain technical aspects	• A minimum of 24 hours of training equal to the first responder operations level and additional competency in areas listed in 29 CFR 1910.120 (q)(6)(v) • Demonstrate competencies listed in 29 CFR 1910.120, Appendix E

[1] California State Fire Marshal's Office and other States require 16 hours of training.

[2] The California Office of Emergency Services requires 160 and 240 hours of training for HAZMAT Technician and Specialists, respectively, for State certification. However, State certification for HAZMAT Technicians and Specialists is not required.

Note: It is important to determine State and local requirements in your jurisdiction.

F I V E

HAZARD CHARACTERIZATION AND EXPOSURE ASSESSMENT

5.1 BACKGROUND

In practical terms, hazard characterization and exposure assessment are the first two steps in the four-step medical surveillance process. The last two steps (medical monitoring and epidemiologic analysis) are discussed in Chapter 9, "Medical Surveillance." Hazard characterization and exposure assessment are "preventive" steps in the sense that if properly performed they may lessen the need for medical monitoring followup (see Figure 5-1).

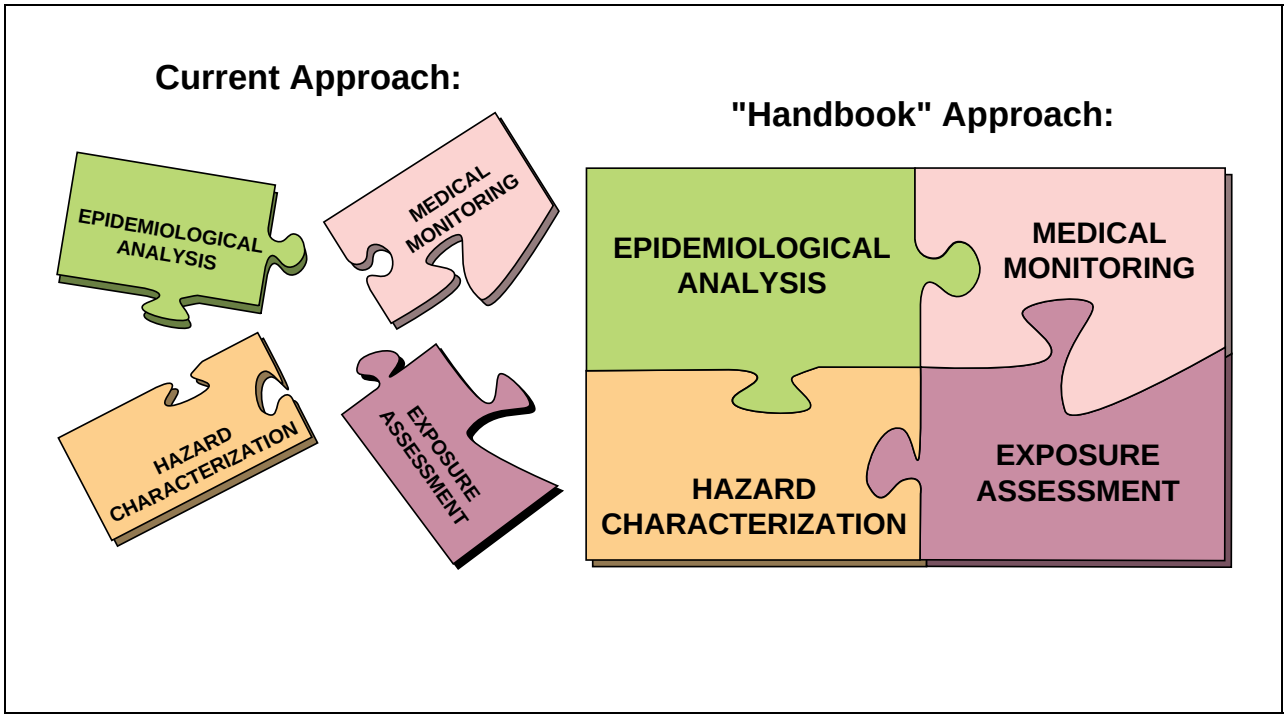

Figure 5-1. Medical Surveillance for Worker Protection

Hazard characterization and exposure assessment are core activities that integrate reliable and effective hazard analysis into work planning. They positively impact the work planning process and establish the access and hazard controls necessary to:

> *"Every aspect of the project's scope, schedule, and budget is affected by the results of the hazard characterization and exposure assessment."*

- Maintain worker health and safety and minimize or eliminate worker risk;
- Manage the scope and application of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (the HAZWOPER Standard); and

- Allow work to continue without interruption by reducing surprises and worker over-exposure that delay work.

As illustrated in Figure 5-2, hazard characterization and exposure assessment are integral to the process of work planning and job conduct. They use a multidisciplinary team composed of Department of Energy (DOE) management and contractors, health and safety professionals, and worker representatives to identify, evaluate, and develop control measures for all chemical, physical, and biological hazards at the worksite.

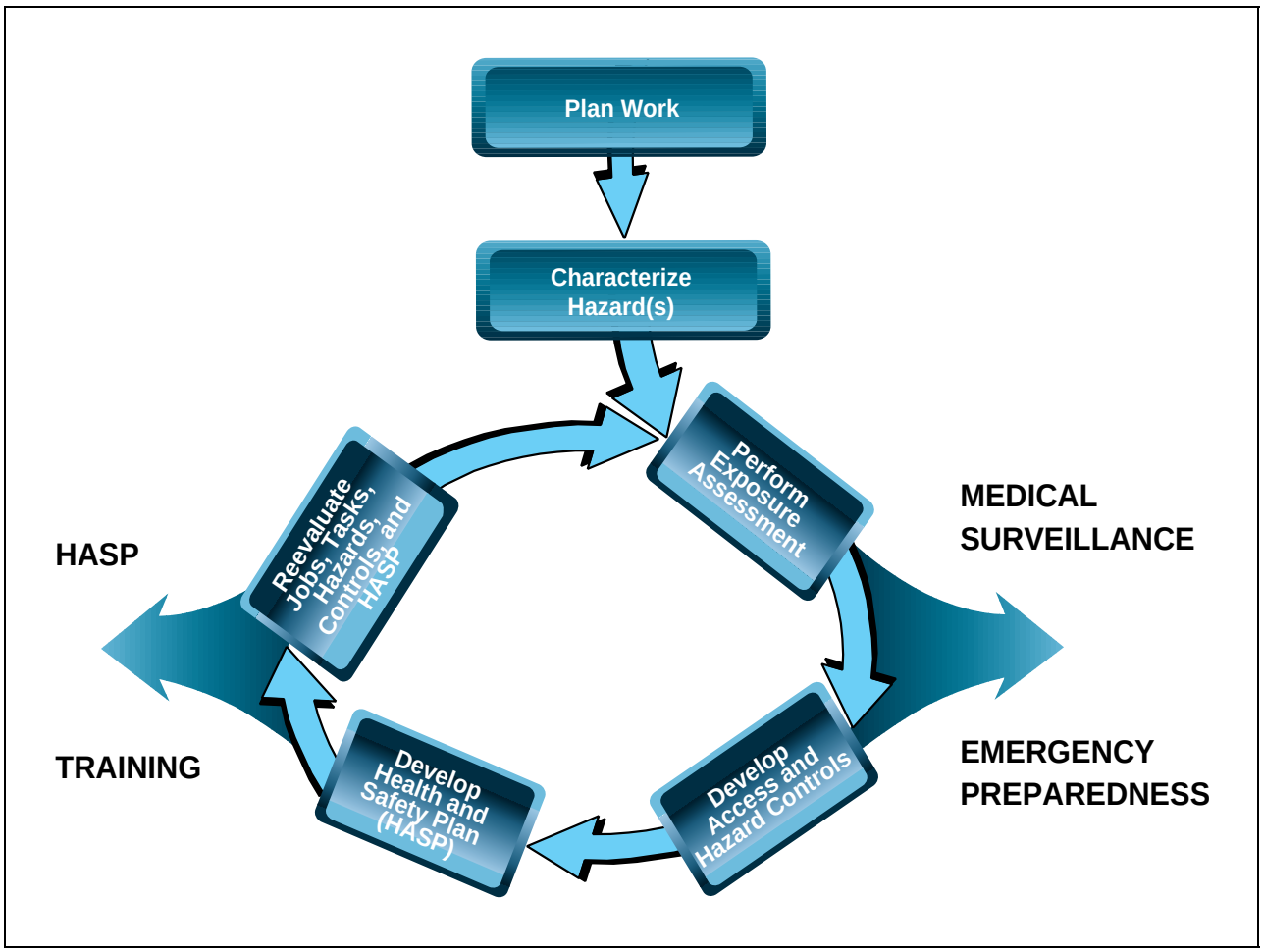

Figure 5-2. Hazard Characterization and Exposure Assessment Continuum

Hazard characterization uses job, task, and hazard analysis (JTHA) as its principal hazard analysis technique. JTHA involves examination of the hazards and exposure potential associated with a job or a task. It is an important step because it allows workers to be grouped so that risks and exposures experienced by any member of the group are representative of the group as a whole. Information about the nature of the workplace, the equipment and materials used, and the jobs and tasks to be performed is the basis of JTHA. To promote efficiency, the JTHA also uses information from all existing hazard analysis documentation, such as the safety analysis report (SAR), the process hazard analysis, the job safety analysis (JSA), and the job hazard analysis (JHA).

In the past, exposure assessment has used traditional industrial hygiene and health physics techniques to monitor and sample the workplace to detect the types and concentrations of potentially harmful substances. The multidisciplinary approach outlined here expands exposure assessment to include physical and biological hazards as well as chemical hazards. This approach is particularly applicable to highly dynamic workplaces such as hazardous waste cleanup sites where hazards are numerous and varied and exposures episodic.

Section 3162 of the 1993 Defense Appropriation Act requires DOE to establish occupational health programs to identify potential health hazards, characterize exposures, and medically monitor significantly exposed employees. The hazard characterization and exposure assessment steps discussed in this chapter and the medical monitoring and epidemiologic steps discussed in Chapter 9 meet these requirements.

5.2 MULTIDISCIPLINARY TEAM APPROACH

At the earliest work planning stages, the project manager establishes a multidisciplinary team to develop integrated hazard characterization and exposure assessment. It is essential that the team's roles and responsibilities, necessary project interfaces, and communication methods be carefully defined. The formation of this multidisciplinary team, which includes managers, health and safety professionals, professionals from other technical disciplines, and worker representatives, is essential for successful project execution since every aspect of the project's scope, schedule, and budget is affected by the results of the hazard characterization and exposure assessment.

ROLES AND RESPONSIBILITIES

The project manager is responsible for:

- Providing all available site characterization information and data to the team;
- Coordinating the team's activities and conducting periodic team meetings;
- Verifying that all alternative hazard analysis methods and risk scenarios have been considered;
- Making certain that the results of the hazard characterization and exposure assessment are incorporated in the HASP and work plans and that this information is disseminated to workers and other appropriate personnel; and
- Maintaining the appropriate documentation.

Hazard Characterization and Exposure Assessment Team

Representatives selected as appropriate from the following functional areas and technical disciplines can serve as team members:

- DOE project management
- Contractor management
- Project scientist, engineer, and planner
- Industrial hygienist
- Health physicist
- Toxicologist
- Occupational health physician and nurse
- Other health care providers
- Nuclear safety engineer
- Environmental engineer
- Industrial safety engineer
- Site safety and health officer
- Worker representative

The function of the hazard characterization and exposure assessment team is to:

- Determine the applicability of regulatory requirements;
- Assist in gathering and interpreting site characterization information and data;
- Provide input to the work planning process;
- Develop a single integrated and comprehensive hazard analysis;
- Perform job and task breakdowns and review engineering drawings, process flow diagrams, and operational procedures to identify the possibility for worker exposure to hazards;
- Incorporate worker knowledge and insights of past jobs and tasks and their hazards into the hazard analysis;

Coordinating the Team's Efforts

Using a multidisciplinary team to conduct hazard characterization and exposure assessment is a relatively new approach within the complex, one that has been shown to be effective in addressing the unique combination of hazards that exist within DOE. Coordinating the characterization and assessment team's efforts is crucial so that all health and safety concerns are addressed. Especially important is the integration of occupational health physicians and nurses with industrial hygiene and industrial and nuclear safety specialists so that exposure assessment data "follow the worker."

- Develop access and hazard controls for all phases of the project; and
- Assist in preparation and revision of the HASP and work plans.

5.3 REGULATORY FRAMEWORK AND HAZARD ANALYSIS TOOLS

A number of DOE Orders and DOE-adopted regulations require hazard characterization and exposure assessment when workers are exposed to hazards. Some have requirements for various types of hazard analyses which can be used as tools for performing hazard characterization and exposure assessment.

Many of the regulations are very prescriptive regarding the type of characterization and assessment required for specific jobs and tasks. For example, the HAZWOPER Standard requires exposure assessment at initial site entry during site characterization and analysis (29 CFR 1910.120 [c][6]) and during operations (29 CFR 1910.120 [h]). The site-specific HASP required in 29 CFR 1910.120 (b)(4) includes exposure assessment requirements for individual jobs and tasks. 29 CFR 1910.1000 and other specific OSHA standards require air monitoring for individual substances (e.g., lead, cadmium, asbestos) when exposure exceeds certain action levels.

DOE O 440.1 requires that contractors prepare hazard analyses that evaluate the work associated with each phase of a construction project, identify all foreseeable hazards to which workers may be exposed, and specify planned protective measures. For each construction operation presenting hazards not experienced in previous project operations or for work performed by a different subcontractor, the construction contractor prepares this hazard analysis, which is approved prior to, and authorizes, commencement of the affected work.

The four important hazard analysis tools that are used in the hazard characterization and exposure assessment process are described in the following DOE Orders and adopted regulations:

- DOE 5480.19 requires integration of health and safety issues in JSAs and JHAs as part of conduct of operations;
- DOE 4700.1 and DOE 5480.23 describe the timing, content, format, and approval procedures for SARs, including criteria for determining the level of reporting required based on facility functions and potential accident risks; and
- 29 CFR 1910.119 and DOE-STD-3009-93 require a process hazard analysis for processes and operational facilities.

Because of the importance of the information in the JSA, JHA, SAR, and process hazard analysis to hazard characterization and exposure assessment, each is discussed in detail below.

JOB SAFETY ANALYSIS AND JOB HAZARD ANALYSIS

The JSA and JHA are job- and task-specific hazard analyses. They differ, however, in that the JSA is a more general type of analysis; the JHA is task specific and applies to the activity being planned and conducted in a specific area and time. Quick completion time with limited resource allocation makes JSAs a widely used tool that satisfies a large portion of the hazard analysis tasks at a site or facility. They are equally appropriate for dynamic activities like construction and for static activities like maintenance.

JSAs and JHAs

For many job- and task-based hazards, the hazard analysis begins with a simple JSA or JHA. For general trenching operations, the JSA would identify and specify controls for: (a) general excavation hazards; (b) noise and general safety hazards associated with heavy machinery; and (c) potential for nitrogen dioxide accumulation in the trenches from diesel emissions. For an individual trenching operation, the JHA would identify unique hazards and control measures for that specific trenching operation (e.g., traffic control requirements which would vary depending on the location of the trench). If the hazards are poorly understood or operational facility safety hazards are required to be analyzed, additional or more complex hazard analysis techniques are employed.

The JSA and JHA separate jobs and tasks, identify and evaluate both health and safety hazards, and specify minimum hazard control requirements. The JSA for a DOE operation is often a longstanding document based on categories of operations. JSAs and JHAs are kept on record for reference such that they do not have to be reevaluated every time an operation is conducted.

SAFETY ANALYSIS REPORTS

SARs identify all materials-related hazards and potential accidents associated with a facility's process systems, components, equipment, or structures; and establish design and operational means to mitigate these hazards and potential accidents. The SAR does not preclude nonradiation sources of hazards, and tends to focus on operational safety and public protection issues, but with some recent emphasis on worker health and safety. SARs provide DOE with safety information with which to plan and budget safety programs and to assess the safety implications of in-service experience and proposed modifications. They are a risk management tool that defines the final basis for safety and risk acceptance for operational facilities. SARs identify the dominant contributors to the risk of the facility so that these vulnerabilities can be better managed.

SARs

Information and data available from the SAR include:

- Applicable statutes, rules, regulations, and departmental orders;
- Site characteristics and facility description, including design of principal structures, processes, components, and engineered safety systems;
- Hazard analysis and classification of the facility and principal health and safety criteria;
- Hazardous material protection programs;
- Analysis of normal, abnormal, and accident conditions, including design basis accidents, assessment of risks, consideration of natural and human-made external events; and
- Assessment of contributory and causal events, mechanisms, and phenomena, including evaluation of the need for an analysis of beyond-design-basis accidents.

PROCESS HAZARD ANALYSIS

The second comprehensive approach used in predictive hazard analysis is process hazard analysis. A process hazard analysis is a detailed study of a process to systematically identify every possible hazard and potential accident scenario. Process hazard analysis is directed toward analyzing potential causes and consequences of catastrophic events such as fires, explosions, and major spills and releases of toxic or flammable chemicals. As is the case

with the SAR hazard analysis, process hazard analyses focus on processes, components, and engineered safety systems. A process hazard analysis is performed on processes covered by the chemical thresholds of 29 CFR 1910.119, OSHA's chemical process safety management regulation. DOE-STD-3009-93 is consistent with the OSHA approach. The chemical industry has expanded the hazard analysis techniques beyond the minimum OSHA requirements through innovative approaches such as the process safety code of management practices and Responsible Care®.

SARs and Process Hazard Analyses

SARs and process hazard analyses use several common analytical tools to identify hazards:

- Change analysis
- Fault tree analysis (FTA)
- What-if analysis
- Checklist analysis
- "What-if" checklist analysis
- Failure modes and effects analysis (FMEA)
- Hazard and operability studies (HAZOPS)
- Phase hazard analysis

5.4 HAZARD CHARACTERIZATION AND EXPOSURE ASSESSMENT STRATEGY

The interrelationship of the elements of the hazard characterization and exposure assessment strategy (EAS) is illustrated in Figure 5-3. The EAS is the conceptual scheme used to develop and implement an appropriate methodology for an overall worksite occupational exposure assessment. The EAS is used to develop an exposure assessment plan (EAP) or contribute to other documentation such as the HASP, the safe work permit (SWP), or the radiological work permit (RWP).

According to the American Industrial Hygiene Association (AIHA), the goals of the EAS are to:

- Assess exposures of all workers to all hazardous chemical, physical, and biological agents to determine the priority for response to further assess or to control workplace hazards;
- Gather qualitative and quantitative information to determine the acceptability, unacceptability, or uncertainty of worker exposures;
- Perform exposure monitoring to evaluate uncertain exposures, collect baseline data, perform compliance monitoring, assess the adequacy of control measures, and research the harmful effects of workplace exposures;
- Develop controls to correct unacceptable worker exposures; and
- Document assessments, decision making, outcomes, and the recommendations of exposure assessment programs.

The core hazard analysis technique used in hazard characterization and exposure assessment, JTHA, is described in Element 1. JTHA is the principal hazard analysis technique described in DOE's *Draft Occupational Health Hazard Exposure Assessment Handbook for Hazardous Waste Activities*.

The hazard characterization and exposure assessment team considers all health and safety hazards including those introduced to the site by remediation or stabilization technologies and equipment as well as those already present. The site map developed as part of the access and hazard control strategy and the HASP are used to denote where jobs and tasks are to be performed in relation to the locations of hazards and possible worker exposures.

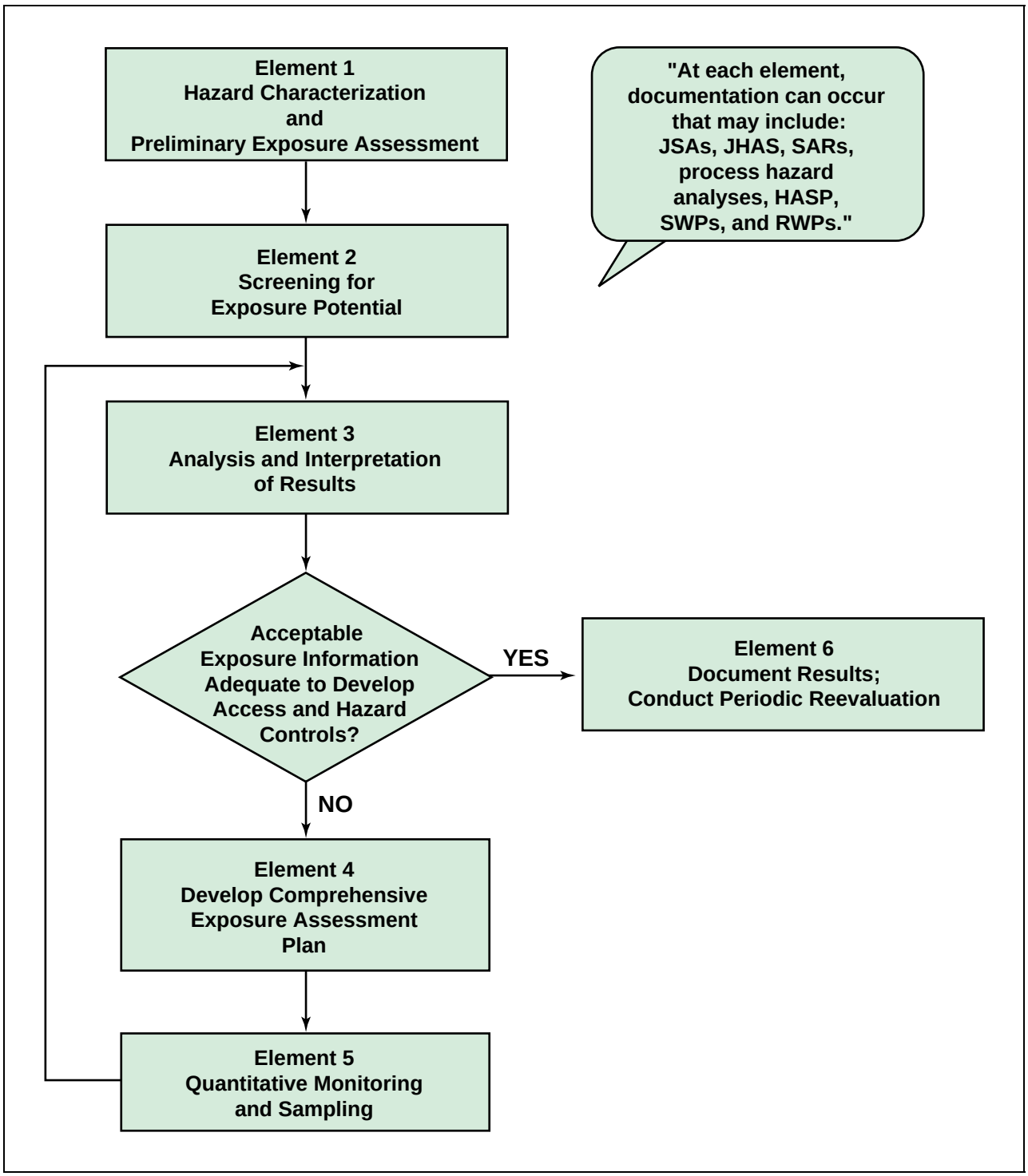

Figure 5-3. Hazard Characterization and Exposure Assessment Strategy

ELEMENT 1: HAZARD CHARACTERIZATION AND PRELIMINARY EXPOSURE ASSESSMENT

Hazard characterization consists of collecting, organizing, and analyzing the following information:

- *Site characterization information and data* from: site maps; air, soil, and water sampling data; material safety data sheets (MSDSs) and site inventories; accident, exposure, injury, and illness records; and interviews, inspections, and walkthroughs.

- *Hazard analysis and job and task information* from: JSAs, JHAs, SARs, and process hazard analyses; historical standard operating procedures or facility operating manuals; interviews with current and previous workers; and engineering designs and as-built drawings.

JTHA is the principal hazard analysis approach that meets the "job- and task-based" hazard analysis and control elements of the HAZWOPER Standard. It is a proactive and preventive methodology that provides a qualitative understanding of the relative possibility for worker exposure to hazards, linked to specific jobs and tasks. JTHA can support and be integrated with JSAs, JHAs, SARs, and process hazard analyses in the overall access and hazard control and health and safety planning process. JTHA is also used to aid in the identification of employee training requirements.

JTHA involves analysis of work in relation to hazard, risk, and possibility for worker exposure, which includes (1) identification of hazards; (2) identification of which jobs and tasks are associated with the hazards; and (3) identification of which jobs and tasks are directly associated with or linked to hazardous exposures. JTHA requires a review and observation of both routine and nonroutine jobs and tasks performed either by individuals or groups of individuals.

JTHA

JTHA asks, "Who will perform the work?" (the workers), "What is to be done?" (the job), "How is it to be done?" (the task); and "What are the associated hazards?" (the hazard). If a predominating or significant hazard is associated with the job, then hazard characterization and exposure assessment and access and hazard controls are focused at the job level without needing to analyze individual tasks. If the hazard or exposure potential is poorly understood or is believed to be associated with a task, then a more detailed or task-based analysis is required. In essence, JTHA integrates JSAs and JHAs, which focus on jobs and tasks, respectively.

The outcome of this element is to link hazards and their locations with specific jobs and tasks and to estimate possible worker exposures from the hazards.

When assessing the potential exposures, it is often efficient to assign workers to groups based on jobs and tasks that share common determinants of exposure (i.e., same or similar job functions and exposure conditions). Workers are assigned to similar exposure groups using information gathered during the hazard characterization. Methods should be documented to verify the validity of worker groups and worker exposure data. In practice, worker groups may contain one individual or many people with similar exposures.

ELEMENT 2: SCREENING FOR EXPOSURE POTENTIAL

Element 1 is a document review which essentially is a qualitative or preliminary hazard characterization and exposure assessment that may be sufficient to develop safe work plans and permits, or RWPs. Development of access and hazard controls and ultimately the HASP, for work associated with the ongoing project, generally requires that the characterization and assessment team visit the worksite to confirm the information and data collected in Element 1 and to perform screening measurements to substantiate exposure potential. These measurements are used to determine the possibility of hazardous exposures and to establish the scope of the comprehensive EAP that may be developed as part of the HASP.

The information from Element 1 is also used as a basis for (1) selection of personal protective equipment (PPE) for the initial site survey and (2) development of a preliminary HASP for initial site entry. In addition to the information obtained from Element 1, selection of PPE is also governed by the nature of the initial site activities to be performed. Level B protection is generally the minimum level recommended by EPA for initial site entry until worksite hazards and the most appropriate level of protection have been verified. The preliminary HASP documents procedures to protect the health and safety of the initial entry team. Probable worksite conditions should be the basis for establishing monitoring and investigation priorities. The initial entry team should consist

of two-person teams who will enter the worksite and two outside support persons who are wearing PPE and are prepared to enter the worksite in an emergency.

Screening Measurements and Diagnostic Monitoring and Sampling. Screening measurements are made in realtime using direct reading instruments (DRIs) and on an integrated basis using air sampling pumps and collection media for both chemical and radiological exposures. These measurements help to quantify:

- Point-source emissions and exposure groups; and
- Possible exposures and exposure ranges for specific jobs and tasks.

The early application of both DRI and sampling methodology may reduce the scope of Element 5, Quantitative Monitoring and Sampling.

Visual Observations and Checklists. Inspections and walkthroughs are an important component of Element 2; they serve to identify physical and biological hazards as well as to subjectively confirm health hazard information. Comprehensive checklists (such as the EM Managers Guide for Safety and Health Walkthrough) facilitate conducting inspections and walkthroughs.

DRIs and Sampling Instruments and Methodology

Descriptions of instruments and methodology for air monitoring and sampling at hazardous waste operations can be found in:

EPA Office of Emergency and Remedial Response, *Standard Operating Safety Guides,* National Technical Information Service (NTIS) Publication 9285.1-03.

Ness, Shirley A., *Air Monitoring for Toxic Exposures -- An Integrated Approach,* Van Nostrand Reinhold.

Lioy, Paul J. et al., *Air Sampling Instruments,* American Conference of Governmental Industrial Hygienists.

DOE Office of Worker Health and Safety, *Draft Occupational Health Hazard Exposure Assessment Handbook for Hazardous Waste Activities.*

ELEMENT 3: ANALYSIS AND INTERPRETATION OF RESULTS

As depicted in Table 5-1 and Figure 5-3, in many cases the results from Element 2 are sufficient to assess exposure and develop access and hazard controls for the HASP, SWP, or RWP. The hazard characterization and exposure assessment does not proceed beyond this element. The results are documented in the HASP, SWP, or RWP. Periodic reevaluations need to be performed (Element 6), especially if work or site conditions change.

Table 5-1. Example Analysis and Interpretation Outcomes

If . . .	Then . . .
1. Monitoring and sampling results indicate exposures are not above established exposure limits. 2. Radiation dose rates are near 10^{-6} rem or background. 3. Radionuclides are below free release limits (DOE 5480.5). 4. No safety hazards are present.	1. Health, safety, and radiological hazards do not pose the possibility for worker over-exposure. 2. The work does not require additional hazard characterization and exposure assessment. 3. Incorporate rationale for this decision into appropriate documentation (e.g., HASP, SWP, or RWP). 4. Conduct periodic reevaluation.
1. Monitoring and sampling results indicate exposures are above established exposure limits. 2. Radiation dose rates are above 10^{-6} rem or background. 3. Radionuclides are above free release limits (DOE 5480.5). 4. Safety hazards are present.	1. Worker exposures are potentially hazardous. 2. Proceed to Elements 4 and 5. Develop comprehensive exposure assessment plan (EAP), conduct quantitative monitoring and sampling, and analyze and interpret data. 3. Develop appropriate access and hazard controls and incorporate into the HASP, SWP, or RWP. 4. Conduct periodic reevaluation.

In other cases, the data collected from Element 2 indicate that a more comprehensive and quantitative exposure assessment plan (Element 4) is required. In either case, the outcome of Element 3 is a careful analysis and interpretation of Elements 1 and 2 with clear indication of the adequacy of the data and the need to proceed to Element 4.

ELEMENT 4: DEVELOP COMPREHENSIVE EXPOSURE ASSESSMENT PLAN

If the screening data indicate that comprehensive quantitative monitoring and sampling are needed, an EAP should be developed. The EAP includes the four questions of the JTHA (Who will perform the work? What is to be done? How is it to be done? What are the hazards?) and the quantitative monitoring and sampling that are to be done. The monitoring and sampling methodology is similar to that of Element 2, but quantitative and more comprehensive. Coordination with occupational medicine specialists may be required. The EAP should be incorporated into the HASP.

Sampling programs should specify AIHA-accredited laboratories, validated sampling and analytical methods, and appropriate occupational exposure limits (OELs). The criteria should identify the minimum number of samples and length of sampling period to characterize worker groups. Monitoring programs must also determine the need for specific sampling recommendations or random selection of workers and sample time periods. Workers are often stratified into exposure groups before individuals are randomly selected for monitoring.

ELEMENT 5: QUANTITATIVE MONITORING AND SAMPLING

Quantitative measurements are performed to characterize the magnitude and variability of worker exposures that cannot be adequately assessed using the information from Elements 1 and 2. Quantitative monitoring and sampling establish baseline data, document regulatory compliance, and inform management and workers of exposures.

Clear, concise records of monitoring and sampling are maintained to include the model and serial numbers of all equipment used, calibration data, and site conditions.

Typically, professional judgment is used to arrange workers in similar exposure groups and to interpret the monitoring results. Monitoring and sampling results are compared to OELs with appropriate averaging times and clear statistical definitions of over-exposure based on toxicological determinants. Interpretation of all results should be made by a competent person. The results of exposure monitoring may apply to other workers, depending on the exposure determinants and overall uncertainty of the sampling and analytical methodology.

Element 5 will likely continue throughout the course of the project. The scope of Element 5 will vary as the work progresses and will follow a hazard-based approach. For high-risk work with high exposure potential, a greater amount of monitoring and sampling is required, with a larger percentage of workers in the representative population. As the exposure potential decreases, the extent of monitoring and sampling can be relaxed, and the percentage of workers in the population can be reduced. The outcome of Element 5 should be the careful specification of access and hazard controls consistent with maintaining worker health and safety.

ELEMENT 6: DOCUMENT RESULTS; CONDUCT PERIODIC REEVALUATION

Throughout a project, data are obtained from both qualitative and quantitative exposure assessment, and the results are analyzed and interpreted. Ultimately, the hazard characterization and exposure assessment process will reach a point where the access and hazard controls are sufficient to maintain worker health and safety. If the exposures of individual workers or a group of workers are documented as acceptable, based on qualitative and quantitative exposure assessment, additional monitoring and sampling may not be necessary. If new hazards are introduced, or there is a significant change in the hazard potential, a reevaluation should be conducted as soon as possible after the change occurs.

Reevaluation involves reexamining the operation, using some or all of the elements of the EAS, and exercising professional judgment. Even if there is no significant change in the operation, periodic reevaluation is needed

to ensure that the exposures do not change over time. The frequency of reevaluation should be based on the length of the entire hazardous waste activity and the type of hazards which have been encountered in the past or might be encountered in the future. Foremost, the level of exposure may determine the frequency of reevaluation. In addition, reevaluation may be triggered by the introduction of new hazardous materials, modification of workplace controls, changes in process conditions or work practices, or new toxicological information or regulatory standards.

Construction or Mobile Workers. Exposure assessment for construction workers is of great concern because of their high degree of mobility between DOE sites and facilities. For this reason, occupational health physicians and nurses should be involved in the EAS when these types of workers are involved. The need for periodic reevaluation increases as a function of the number of additional construction or mobile workers.

5.5 DOCUMENTATION

Proper documentation and control of documents facilitate accurate communication, ensure the quality of the information collected, provide the basis for safety decisions, support decisions in emergency situations, and substantiate possible legal actions. Information obtained from the hazard characterization and exposure assessment process should be initially recorded in one or more of the following forms:

- Logbooks;
- Field data records;
- Instrument print-outs;
- Photographs;
- Sample labels;
- Chain-of-custody forms; and
- Analytical records.

Ultimately, documentation appears or is referenced in the HASP, SWP, or RWP. All documents should be controlled and accounted for when the project is completed. Document control should be the responsibility of a member of the project team. Field personnel should record all worksite activities and observations in a field logbook; entries should be made during or immediately following a task.

DOE has developed a job- and task-code system to facilitate correlation between data collected and workers, jobs, and tasks. This system appears in the DOE Office of Worker Health and Safety, *Draft Occupational Health Hazard Exposure Assessment Handbook for Hazardous Waste Activities*. Information on the chemical, physical, and biological properties of each hazard known or expected to occur at the worksite should also be documented.

5.6 REFERENCES

29 CFR 1910, "Occupational Safety and Health Standards for General Industry"

29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemicals"

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response"

29 CFR 1926, "Safety and Health Regulations for Construction"

DOE 5480.19, "Conduct of Operations Requirements for DOE Facilities"

DOE 5480.23, "Nuclear Safety Analysis Reports"

DOE-STD-3009-93, "Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Report (Area SAFT)"

DOE-ID (76-45/19 SSDC-19), "Job Safety Analysis by Division of Operational and Environmental Safety"

DOE Office of Worker Health and Safety, *Draft Occupational Health Hazard Exposure Assessment Handbook for Hazardous Waste Activities*

Draft DOE/EH Guideline, "Preliminary Guide for Conformance with OSHA's Rule for Process Safety Management of Highly Hazardous Chemicals"

ACGIH, "Threshold Limit Values for Chemical Substances and Physical Agents, and Biological Exposure Indices"

American Conference of Governmental Industrial Hygienists (ACGIH), "Documentation of the Threshold Limit Values and Biological Exposures Indices"

American Industrial Hygiene Association, "A Strategy for Occupational Exposure Assessment"

EPA Office of Emergency and Remedial Response, *Standard Operating Safety Guides,* National Technical Information Service (NTIS) Publication 9285.1-03

Leidel, N.A., K.A. Busch and J.R. Lynch. National Institute for Occupational Safety and Health (NIOSH) Publ. 77-173, *Occupational Exposure Sampling Strategy Manual*

Lioy, Paul J. et al., *Air Sampling Instruments,* American Conference of Governmental Industrial Hygienists

Ness, Shirley A., *Air Monitoring for Toxic Exposures -- An Integrated Approach,* Van Nostrand Reinhold

OSHA, *Field Operations Manual*

Section 3162 of the 1993 Defense Appropriation Act

U.S. Department of Labor Mine Safety and Health Administration (MSHA) Instruction Guide 32 C, "Job Safety Analysis Development by National Mine Health and Safety Academy"

SIX

DEVELOPMENT OF A SITE-SPECIFIC HEALTH AND SAFETY PLAN

6.1 BACKGROUND

HASP Enforcement

For a hazardous waste site, worksite controls established in the HASP become enforceable as extensions of the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. Therefore, it is essential that everyone at the worksite be aware of the contents of the HASP.

A properly developed and implemented site-specific health and safety plan (HASP) provides the basis for protection of hazardous waste workers, visitors, and the public. The HASP defines health and safety hazards, controls, and requirements for individual activities at the worksite and provides a formal mechanism for identifying and controlling health and safety elements of worksite operations before field work begins.

In general, the access and hazard control strategies incorporated into a HASP are determined by such factors as the size and characteristics of the site hazards, planned tasks, adjacent occupancy, and other hazardous and nonhazardous activities being conducted near the worksite. Hazard evaluation and control strategies are established during the planning stage of a project and modified (i.e., intensified or relaxed) on the basis of hazard analysis data and other hazard information throughout the life of the project. By using well-documented hazard characterization data, a reasonable, hazard-based approach for protecting worker health and safety is established in the HASP. Figure 6-1 illustrates the central role of the HASP in the conduct of hazardous waste activities.

6.2 DOE HASP REQUIREMENTS

In addition to 29 CFR 1910.120 (the HAZWOPER Standard), several Department of Energy (DOE) documents provide requirements and guidance for the preparation and implementation of HASPs, including the following:

The HASP is the unifying structure for conducting work safely at a HAZWOPER site. It integrates the treatment of all site- and task-related hazards and controls to form a complete picture of hazards and controls at the site and task level.

- DOE-EM-STD-5503-94, "Environmental Management (EM) Health and Safety Plan Guidelines" (also known as the "EM Model HASP"), provides detailed guidance for HASP development. As a limited standard, the EM Model HASP addresses remediation efforts at uncontrolled hazardous waste sites. Because hazardous waste activities vary from simple, short-duration projects to full-scale remedial action efforts involving multiple hazards, a hazard-based approach is applied when developing a HASP. Depending on project size, associated tasks, and potential hazards, HASPs can range from a few pages to the comprehensive document described in the EM Model HASP. (See Section 6.4 for further information on the hazard-based approach to HASP development.) While not all requirements in the EM Model HASP may be applicable, their inclusion or exclusion must be documented as specified in the HAZWOPER Standard and the EM Model HASP.

Figure 6-1. The HASP Wheel

- DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees," requires that written project safety and health plans be developed for any construction project valued at over $2,000—regardless of whether hazardous wastes are involved. Such plans identify key personnel and their duties, address health and safety orientation, and describe how requirements for hazard identification and control and other provisions are implemented. The format and content of these plans are not prescribed. Based on the worksite's hazards, the inclusion of additional elements may be appropriate. A HASP developed for a HAZWOPER project is designed to address all relevant requirements prescribed by the Order and can be used to fulfill the requirement for a project safety and health plan.

- DOE-EM-STD-5502-94, "Hazard Baseline Documentation," provides a decision process for evaluating and classifying facilities as nuclear, radiological, or nonradiological based on quantities of hazardous and radiological materials present and for implementing the hazard analysis processes that form the basis for safety analysis reports (SARs), auditable safety analyses (ASAs), and HASPs. The term "facilities" as used in this limited standard refers to activities and projects, as well as to physical structures. Therefore, for remediation efforts, DOE-EM-STD-5502-94 includes uncontrolled hazardous waste sites and facilities in which deactivation, as well as decontamination and dismantlement (D&D) activities are underway.

6.3 RADIOLOGICAL AND NONRADIOLOGICAL APPLICATIONS

Cleanup of uncontrolled radioactive waste sites is covered by the HAZWOPER Standard.

The HAZWOPER Standard applies to radiological and nonradiological health and safety hazards. Accordingly, when an individual worksite includes both radiological and nonradiological hazards, the HASP is to address both. The HASP supplements the DOE site's health and safety program by providing site-specific and pertinent information, requirements, and strategies for each task at the worksite. This relationship is comparable to that between the site's radiological protection program (RPP) and worksite-specific radiological work permits (RWPs). The RPP documents the overall program, whereas the RWP details worksite safety information and requirements. (Note: The RPP/RWP process also provides radiological input to a HASP.)

The elements of a HASP—as defined by EM standards and the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.120 (b)(4)(ii)—are illustrated in Table 6-1, which indicates the applicability of similar requirements and guidelines for the RPP and RWPs (as defined by 10 CFR 835 and the *Draft DOE Radiological Control Technical Standard*). As the table indicates, the requirements, guidelines, and contents of these documents are essentially the same.

Two approaches are used to develop a HASP for activities involving radiological and nonradiological hazards:

- The preferred approach is to prepare the HASP according to the requirements of the HAZWOPER Standard incorporating information and processes related to radiological hazards and the RWP, as appropriate; and

- Alternately, two parallel documents (one each for radiological and nonradiological hazards) can be prepared and integrated by the site safety and health officer (SSHO) in association with a multidisciplinary team of health and safety professionals.

6.4 GUIDELINES FOR PREPARING A HASP

A HASP is neither a comprehensive health and safety program nor a lengthy, all-encompassing document. A HASP applies to the worksite and is prepared in concise, to-the-point terms. Language requiring interpretation is to be avoided. For example, "Use Level B personal protective equipment (PPE) when conducting activities with significant respiratory hazards" would be preferable rewritten as "Level B PPE is required in work zone XXX when conducting activities Y and Z." The HASP builds on and enhances existing health and safety program components. In describing PPE, generic descriptions of Levels A, B, C, and D are to be avoided. Instead, define each level for the specific area or activity in question. Figure 6-2 outlines typical questions regarding HASP development.

Table 6-1. HAZWOPER Requirements Versus DOE Radiological Control Requirements and Guidelines

EM Model HASP Element	RPP/RWP Coverage for Radiological Hazards (10 CFR 835 and DOE Radiological Control Technical Standard I)
KEY PERSONNEL	YES (Chapter 1)
HAZARD ANALYSIS	YES (Chapter 3, Chapter 5, Articles 751-754)
TRAINING	YES (Chapter 6)
PERSONAL PROTECTIVE EQUIPMENT	YES (Chapter 3, Articles 464, 535-537)
TEMPERATURE EXTREMES	Yes (Articles 342, 534)
MEDICAL SURVEILLANCE	YES (Articles 532, 522-523, Appendix 2C)
AIR MONITORING	YES (AIR AND SURFACE) (Articles 222, 223, 514, 551-564)
SITE CONTROL	YES (Chapters 2-3)
DECONTAMINATION	YES (Appendixes 3C and 3D, Articles 221, 411, 462-464)
EMERGENCY RESPONSE	YES (Appendix 2A, Articles 346, 541-543)
EMERGENCY ACTION PLAN[(a)]	NO
CONFINED-SPACE ENTRY	NO (Article 373)
SPILL CONTAINMENT	YES (Articles 128, 346)

[(a)] Applicable when employees are expected to evacuate a worksite rather than to participate in emergency response activities.

GENERAL GUIDELINES

A HASP includes worker health and safety program information, guidance, and alternatives. The following general guidelines apply to preparing a HASP:

The HASP quickly answers the questions "What hazards are present?" and "How is the task to be performed safely?"

- Each worksite is to be addressed by only one HASP with copies maintained at the worksite in a readily accessible location. A HASP should be developed prior to conduct of a preliminary worksite assessment. Information from this preliminary assessment can be used to modify the HASP so that subsequent worksite activities can proceed safely. In general, the HASP is based on hazard analyses and should be updated periodically to reflect changing worksite conditions and activities as the project progresses.

- The document is to be concise and user friendly. The HASP is meant to be a quick reference by both supervisors and workers to identify hazards and hazard control requirements for individual areas or activities at a worksite. Workers are to be able to read the HASP to learn what hazards will be encountered and what controls are in place to mitigate them.

- Only those elements of the HAZWOPER Standard that are applicable to the hazards present are to be addressed. However, the rationale for excluding individual HAZWOPER elements is to be stated clearly and concisely.

Does each hazardous waste worksite require a separate HASP, or can one HASP cover multiple worksites?	The approach used depends on conditions at the worksite. Where worksites are similar and activities are phased together, one HASP is preferred. In general, however, worksites have enough differences to require separate HASPs. One D&D HASP is unlikely to apply to all D&D actions, nor will one HASP for hazardous waste cleanup apply to all associated work actions. On the other hand, constructing a single HASP template for various types of activities (e.g., D&D, uncontrolled waste site cleanup, radiological cleanups, and mixed waste cleanup) is generally more cost-effective. The template can then be tailored to the specific conditions and activities at individual worksites. It is also possible to construct an "umbrella" HASP with basic requirements and guidance that are applicable to several different worksites, thereby streamlining the preparation process by drawing on common conditions. This approach might be appropriate for a tank farm operation comprising individual farms or tanks having distinct hazards and operations, for a grouping of similar facilities undergoing deactivation followed by D&D, or for well-sampling activities.
Should a HASP be developed for a project that focuses solely on radiological remediation?	The HAZWOPER Standard applies to radiological as well as chemical hazards. Further, remediating radiological hazards requires consideration of other potential occupational safety and health hazards. For a strictly radiological remediation project, the RPP/RWP process can serve as a major part of the HASP.
Why isn't the existing health and safety program enough? Why is a HASP needed?	The sitewide health and safety program typically includes many procedures (e.g., lockout/tagout, hearing conservation) which are referenced in the HASP and applied to the hazardous waste worksite. The HASP focuses the overall program down to the worksite level and identifies specific tasks, job- and task-based hazards, exposure-monitoring requirements, hazard controls, and approaches and requirements necessary to protect workers. An overall health and safety program simply does not have the specificity necessary to meet all HASP requirements for a given hazardous waste activity. The objective and purpose of a HASP for conducting hazardous waste activities parallel those of an RWP for remediating radiological hazards.

Figure 6-2. Typical Questions About HASPs

- Not all existing procedures or program elements of the overall health and safety program need be incorporated into the HASP. For example, if noise is a hazard, the HASP need not contain the entire hearing conservation program. Procedures already established elsewhere are to be referenced, as appropriate. In addition, if a confined-space-entry procedure is in place for a major DOE site, the HASP could reference that procedure, identify confined spaces at the worksite to which the procedure applies, and provide appropriate implementation information (e.g., conditions to be monitored, evaluation of the space, issuance of an entry permit). If special operational procedures apply to the worksite, they are appended to the HASP.

- Not all required tasks and hazards can be predicted while a HASP is being developed. The HASP describes the ongoing hazard analysis and work control process, defines the means of identifying job- or task-based requirements and controls, and discusses ways to inform workers about requirements derived

from ongoing job or task hazard analyses. Work planning and control processes include the use of job hazard analyses (JHAs), job safety analyses (JSAs), RWPs, safe work plans, safe work permits, work packages, or procedures.

- The HASP addresses radiological, chemical, physical, safety, and biological hazards. It provides a basis for integrating health and safety and radiological protection issues by referencing existing health and safety and radiological protection programs and procedures.

An effective HASP identifies implementable controls that limit access or exposure to hazards and hazardous conditions. Engineering controls are the most preferable, followed by administrative controls; PPE should be specified only when no other practicable means of controlling exposure are available.

- Hazardous waste operations often include tasks and activities that are conducted on a periodic basis, are of very short duration, are transient in nature, or otherwise pose little hazard. Developing a brief HASP template (e.g., "fill in the blank"), a permit, or a checklist system that includes essential HAZWOPER-type information may suffice for these types of operations. Appendix 6 is a checklist to assist in collecting data necessary for HASP development.

HASP GUIDELINES FOR DEACTIVATION AND D&D ACTIVITIES

Deactivation and D&D activities differ somewhat from classical cleanup operations at hazardous waste sites. Radiological D&D is often the major activity, but abatement of various nonradiological hazards (e.g., asbestos, lead, beryllium, mercury, process chemicals) can also occur. These circumstances require appropriate adjustments to the HASP throughout the life cycle of the project.

As discussed in Chapter 2, a HASP is required by DOE-EM-STD-5503-94 for all DOE deactivation and D&D operations. Some form of a HASP and hazard analysis is required for all DOE-sponsored hazardous waste activities. The intent of a deactivation and D&D HASP is to specify and communicate controls for the hazards identified. The format and content address only those HAZWOPER-prescribed HASP elements pertinent to the project (see Figure 6-3).

A hazardous waste operations permit (HWOP) developed at Hanford is used to record task-specific information for short-term or transient operations. Similarly, Oak Ridge National Laboratory uses a HASP checklist to document low-risk, short-duration types of activities.

Although some latitude and flexibility in developing a deactivation and D&D HASP are allowed, the plan should accomplish the following:

- Identify and describe the hazards associated with individual projects and tasks;
- Identify the applicable elements of the HAZWOPER Standard, while providing a rationale for concluding that other elements do not apply; and
- Incorporate applicable provisions of the HAZWOPER Standard using a hazard-based approach, radiological controls as appropriate, and controls based on other OSHA standards (e.g., lead or asbestos).

Worksite Control: Worksite control for a D&D project is based on radiological hazards, asbestos abatement, or simple access restrictions. The HASP defines site controls, but the control mechanisms themselves may differ from worksite to worksite based on the hazards present.

Training: Various types and levels of training may be necessary for these projects. For a single-hazard project (e.g., beryllium, asbestos, or lead abatement), the 40-hour HAZWOPER course may not be relevant; hazard-specific training might suffice. For a multihazard project, 40-hour HAZWOPER training may be warranted, as well as additional training to address specific hazards or relevant OSHA standards. The HASP specifies the training required, and HAZWOPER training may not be part of that requirement.

Medical Surveillance: Specification of medical surveillance activities in the HASP, beyond normal DOE requirements for fitness for duty, depends on the hazards present at the worksite.

Other Requirements: The HASP may include an approach that stresses standards or requirements other than HAZWOPER if those requirements more effectively address existing hazards. Examples include OSHA's asbestos, lead, confined-space-entry, lockout/tagout, and hazard communication standards as well as the site-specific RPP.

Figure 6-3. Example - Application of EM HASP Elements to Deactivation and D&D Activities

Deactivation and D&D activities are often controlled under the requirements of an RPP and RWPs for individual worksites. Site control, dosimetry, frisking and decontamination, and PPE for radiological hazards are defined in these documents. However, occupational safety and health (OSH) issues are typically not addressed by RPPs and RWPs. Accordingly, it is necessary to develop one or more types of HASPs to address both radiological control and OSH. (Figure 6-4 outlines two options to resolve this problem.)

Option 1: A HASP that incorporates and integrates information about all health and safety, radiological, and nonradiological hazards and controls into a single document can be developed using the HAZWOPER format. Site-specific elements of the RPP and RWP can be incorporated into the HASP. As shown in Table 6-1, the elements of HASPs and RPPs/RWPs are similar, thereby enabling integration of radiological and nonradiological issues.

This approach results in the development of a unified plan that facilitates an integrated effort by managers, workers, health and safety personnel, and health physicists. Such an approach identifies information that describes nonradiological health and safety hazards and results in a streamlined document. This is especially true for D&D operations with their wide variety of potential chemical hazards (e.g., asbestos, lead, beryllium, polychlorinated biphenyl [PCB] transformers, mercury). This approach may require modification of an existing RPP/RWP.

Option 2: A HASP complementing the RPP/RWP can be developed to cover nonradiological health and safety issues. Two documents (RPP/RWP and HASP) would exist and would be cross-referenced, thereby avoiding duplication of effort. These two documents would need to be consistent with each other in terms of overall approach and implementation. Managers, workers, health and safety personnel, and health physicists would need to be aware of all applicable requirements and work together to apply all requirements relevant to the worksite.

Figure 6-4. Options for Preparing a HASP

HASP GUIDELINES FOR CONSTRUCTION AND DISMANTLEMENT

Construction and dismantlement activities normally fall outside the scope of HAZWOPER and therefore do not often require a HASP. Construction and dismantlement activities are managed according to DOE O 440.1. Dismantlement involves a variety of abatement or decontamination activities (e.g., asbestos or lead abatement, removal of PCB transformers or capacitors, cleanup of pigeon droppings or other biological hazards, small-scale radiological decontaminations). A facility may be deactivated and dismantled without going through a formal D&D process.

A dismantlement safety and health plan includes the following key elements:

- Identification of hazards;
- Identification of applicable HAZWOPER HASP elements;
- Determination of radiological controls and other applicable OSHA standards (e.g., asbestos, lead, noise, and electrical hazards); and
- Description and communication of hazards and specification of controls.

Since dismantlement is considered to be a construction activity, DOE O 440.1 requires that a project safety and health plan be developed. Chapter 2 of this Handbook indicates that HAZWOPER provisions may need to be applied to dismantlement when performed under CERCLA. However, even where HAZWOPER is not mandated, the application of HAZWOPER "principles" through implementation of 29 CFR 1910.120 (b) is recommended. Although the project safety and health plan for construction need not follow HAZWOPER requirements, using a format similar to a HASP makes planning more efficient and consistent. Developing a HASP that serves as a project safety and health plan may be preferable for many dismantlement projects.

Many existing sitewide health and safety procedures or program elements are directly applicable to dismantlement (e.g., procedures for asbestos abatement or lockout/tagout). To supplement and implement generic procedures, the HASP describes application of procedures through the planning, organization, and work control systems.

HASP GUIDELINES FOR RADIOLOGICAL CLEANUP

For radiological cleanup projects, the HASP could be developed according to the HAZWOPER format, or it could consist of a compilation of documents to address identified hazards and HAZWOPER-prescribed HASP elements. Each pertinent element of a HASP will need to be addressed.

For example, for radiological cleanup projects, the RPP/RWP is essentially a HASP that addresses radiological health hazards. An abbreviated HASP can be developed as an umbrella document that references these RPP/RWP requirements and guidelines.

OSH hazards are also encountered during radiological cleanup operations. These hazards are related to the tasks being performed and to the condition of the individual facility or worksite. The HASP developed to address these hazards incorporates and integrates both radiological control and health and safety issues. Alternately, RPP/RWP requirements address radiological control issues, and nonradiological health and safety issues could be addressed in a HASP or in a set of procedures and program elements meeting HASP content requirements. Issues that need to be considered as appropriate include work controls, construction safety, JHA, noise, hazard communication, electrical safety, confined-space entry, hoisting and rigging, trenching and shoring, excavation safety, and motorized equipment.

6.5 REVIEW, APPROVAL, AND MODIFICATION OF THE HASP

The following information describes the HASP review, approval, and modification process.

HASP REVIEW AND APPROVAL

The review and approval process varies from project to project. Reviews are hazard-based and allow participation by all interested or affected persons or organizations, including site workers, although a project may be permitted to proceed before all subsequent comments are resolved.

The approval process is to be timely and efficient, occurring at the line management or supervisory level having direct authority and responsibility. Approval of a HASP is granted by those persons or organizations in contractor line management who must agree on its content and requirements before work begins.

HASP MODIFICATION

The discovery of unanticipated hazards or contamination during hazardous waste activities is not unusual. Strategies and contingency plans should be established to deal with each situation efficiently, effectively, and safely. When modifications to the scope of the original project or HASP are required, a formal process to reevaluate, modify, and revise the HASP is to be implemented. Depending on the nature of the change, the hazard, and the type of facility, the review and approval process for modifications could be addressed informally by project staff and worker representatives. The modification process should include the following actions:

Examples of unanticipated situations might include conducting intrusive activities that were not initially anticipated or encountering a serious hazard that was not expected (e.g., discovering a mercury hazard when only a radiological remediation was anticipated). New tasks and hazards are evaluated before conducting any unanticipated activity (aside from stabilizing an unexpected situation).

- The SSHO documents modifications (e.g., in a logbook) and states the basis for each change;
- Modifications are specified and posted at the worksite;
- Line management (at the supervisor level) and workers are briefed on each modification;
- A mechanism is established to inform other shifts, alternate SSHOs, the HAZWOPER coordinator, and other personnel who might enter the worksite or review the action; and
- If a field modification becomes permanent, the HASP is promptly revised; until the revision is complete, work can continue under the temporary modification as posted.

HASP AND WORK CONTROLS

Development of the comprehensive work plan or job package requires close consultation and cooperation between the various project team members. The field team leader, worker representatives, and the SSHO perform a preoperational review and walkthrough of the work area and work activity. The project manager or designee prepares a work instruction to be reviewed and approved by all concerned personnel (e.g., health and safety, industrial hygiene, and radiological control). Work does not proceed without a properly approved work control or similar authorization documentation.

Work controls are used to control the conduct of work at the worksite. The work control system is integrated with the HASP to conduct work in a safe and healthful manner. The HASP describes hazards and controls related to tasks identified in the work plan, providing a mechanism to evaluate these issues throughout the life cycle of the project. Work controls are developed jointly by line managers, worker representatives, and safety and health professionals. The safety analysis, hazard analysis, and work permit elements are particularly important in specifying hazards and controls for specific tasks. These mechanisms can also be used to modify HASP conditions or requirements for short-duration tasks. The work control system includes, but is not limited to, the following:

- **Work packages or instructions.** Work packages or instructions are to be developed and approved jointly by line management, worker representatives, and health and safety professionals. Health and safety controls and requirements include use of engineering controls, administrative controls, and PPE. Examples of controls that might be specified include electrical safety considerations, lockout/tagout requirements, fall protection measures, welding and cutting instructions (e.g., requirements for hot work permits), materials handling practices, and hazardous materials considerations.

  References and supplemental documents for work instructions may include detailed standard operating procedures, safe work permits, RWPs, JHAs, and exposure assessment plans.

- **Job safety and job hazard analyses.** Processes developed to analyze health and safety hazards are generally referred to as job hazard analyses or job safety analyses. JHAs are prepared by multidisciplinary

teams and are different from baseline hazard assessments as described in SARs in that they focus on tasks at the worker level, whereas SARs usually focus on facility and process hazards. The HASP incorporates worksite-specific JHA findings and identifies requirements, including routine monitoring. As job and task hazards warrant, hazard analyses become part of the daily routine of the SSHO and the staff involved in field activities.

- **Safe work plans, procedures, and permits.** Safe work plans, procedures, and permits are forms of work controls that are specified in the HASP for specific tasks. Safe work procedures are often prepared for recurring tasks while safe work permits are used for control of short term or special tasks. A safe work plan differs from a safe work permit in that the plan is a detailed document and includes work practices and procedures, whereas the permit is typically a standardized form. The need for a safe work plan is based on hazard.

  The safe work plan specifies controls for the hazards identified in the JHA. Examples of work operations for which the development of a safe work plan or permit is warranted include identifying and removing waste drums or lab packs; handling explosive or reactive wastes; entering areas with atmospheres that are potentially explosive, oxygen deficient, or of immediate danger to life or health; and conducting abatement activities in areas contaminated by asbestos, lead, beryllium, or mercury.

  A safe work plan or permit typically includes requirements for PPE (e.g., respirators), exposure monitoring strategies, action to be taken based on monitoring results, engineering and work practice controls used to reduce potential worker exposures, special medical monitoring requirements, hazard communication strategies, SSHO coverage, and specific worker training requirements (e.g., pre-job training in specific hazards and controls).

Safe Work Permits

A safe work permit (SWP) is an operations document. It identifies the work team—including worker representatives, health and safety personnel, and health physics team members—and it integrates safety requirements with work team responsibilities. It also provides standard operating procedures for use during the conduct of work. The need for an SWP decreases as implementation of the health and safety program or HASP matures. The SWP is used while a modified or newly developed health and safety program or HASP is being implemented or when a project enters new phases.

An RWP is a special form of SWP specifying controls for radiological work.

- **Pre-job briefings and task-specific training**. Pre-job briefings and task-specific training are essential elements of work control; they serve as one means of communicating work issues and controls to site workers. This function takes a variety of forms, including safety meetings "tailgate" meetings, "tool-box" meetings, on-the-job-training, formal classroom training, procedure walkdowns, or task-specific briefings at the worksite. The HASP documents the type of briefings used for specific activities.

- **Design and readiness reviews.** Design and readiness reviews are used to ensure that a task or process has been considered thoroughly and that all anticipated hazards are appropriately addressed. The type and level of hazard dictate the extent of review required. Large projects such as a new waste processing facility usually require a formal operational readiness review whereas a small task such as filling a waste drum requires no more than an equipment inspection and procedure or work permit review. Line management, in conjunction with the multidisciplinary team, determines and documents the level of design and readiness review required for specific tasks that are not documented in the HASP.

- **Surveillance, inspection, exposure assessment, monitoring, support, and verification by the SSHO and health physicists.** The HASP (or safe work permits and plans) documents required inspection and monitoring functions necessary for surveillance, inspection, exposure assessment, medical monitoring, support, and verification by health and safety professionals. The frequency of surveillance and inspection activities will be dependent upon the severity of the risk, regulatory requirements, operation and

maintenance requirements, expected lifetime of materials and equipment, and previous field and laboratory experience. These activities are most effective when the following guidelines are observed:

- Develop a checklist for each worksite;
- Review results with supervisors and workers;
- Reexamine identified problems to verify correction; and
- Document all activities and followup actions, and retain records until worksite activities are complete and for as long as required by regulatory agencies.

6.6 REFERENCES

29 CFR 1910.146, "Permit Required Confined Spaces"

DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"

DOE-STD-1098-96, *Draft DOE Radiological Control Technical Standard*

DOE-EM-STD-5502-94, "Hazard Baseline Documentation"

DOE-EM-STD-5503-94, "EM Health and Safety Plan Guidelines"

ANSI Recommendation Z117.1-1989

APPENDIX 6

CHECKLIST FOR HAZARDOUS WASTE ACTIVITY HEALTH AND SAFETY PLANNING

☐ PROJECT NAME, LOCATION, FACILITY NAME, AND NUMBER

_____

_____

_____

_____

_____

☐ PROJECT OBJECTIVES (include duration of project)

	Site Prep		Scoping Study		UST Removal		Soil Sampling
	Drum Sampling		Soil Gas Sampling		GW Sample		Spill Response
	Drilling		Construction		Soil Removal		Remediation
	Site Characterization		Other (specify):				

☐ SITE DESCRIPTION, HISTORY, AND DISPOSAL PRACTICES (include also: size, topography, and site map.)

_____

_____

☐ KEY PERSONNEL, JOB TITLE, AND TRAINING REQUIREMENTS

Include all supervisors and employees and include job titles:

Name and Job Title	Training	Medical Exam	PPE	Other Information

Use the following codes to identify the training and other requirements:

Training (list date and type):

1. 40 hr HAZWOPER
2. 24 hr HAZWOPER
3. 8 hr Supervisor
4. 3 day OJT
5. 1 day OJT
6. 8 hr Refresher
7. Radiological Worker Training
8. First Aid and CPR Training
9. OTHER (Specify):

Medical Clearance:

1. HAZWOPER Medical Exam
2. Bioassay
3. Whole Body Count
4. Chest Count
5. OTHER (Specify):

PPE:

1. Level A
2. Level B
3. Level C
4. Level D

Other:

1. Hearing Protection and Noise Control
2. Read Safety Plan and Attend Pre-Job Mtg.
3. OTHER (Specify):

☐ HAZARDOUS MATERIALS SUMMARY

	Acids		Cyanides		Laboratory Waste		Oily Wastes		Radiological		Other
	Aluminum		Dyes/Inks		Metals		Paint Pigments		Sludges		
	Asbestos		Fly Ash		Non-Halogenated Solvents		Pesticides		Solids		
	Caustics		Halogenated Solvents		Oils		Phenols		Solvents		

☐ FIRE AND EXPLOSION POTENTIAL

	High		Medium		Low		Unknown		Other

Include Rationale and Justification (i.e., LEL measurements, flash point, etc.)

☐ WASTE TYPES, WASTE CHARACTERISTICS, HAZARDS OF CONCERN, AND KNOWN CONTAMINANTS (Describe each and provide monitoring results and controls)

Waste Types:

	Liquid		Solid		Sludge		Gas		Other (specify):		Unknown

Waste Characteristics (Physical/Chemical Properties - include references):

	Chemical		Toxic		Corrosive		Reactive		Shock Sensitive		Volatile		Flammable			
	Biological		Radiological (RWP#)				Other (specify):						Unknown			

Hazards of Concern:

	Biological		Cutting/Welding		Explosive/Flammable		Noise		Sanitation
	Cold Stress		Electrical		Heat Stress		Overhead Hazards		Subsidence
	Confined Space Entry		Excavation		Heavy Equipment		Pinch Points		

Known Contaminants (list all, include references - i.e., MSDSs):

Contaminants	Ionization Potential	PEL/TLV	IDLH	Warning	Symptoms or Effects	Immediate First Aid

The following abbreviations may be used to complete the table:

As = Asphyxiation
NAV = Not Available
NA = Not Applicable

CA = Carcinogens
Con = Confusion
D = Dizziness
Fat = Fatigue
Hal = Hallucinations
In = Inflammation
IR = Irritation
N = Nausea
OT = Other
V = Vomiting

FA = Get to Fresh Air
IrW = Irrigate with Water
MA = Medical Aid
NE = None Established
U = Unknown
WS = Wash with Soap

☐ PERSONAL PROTECTIVE EQUIPMENT

Job Task	Work Zone/Location	PPE Level

List the level letter and number corresponding to the requirement:

Level (A)
Respiratory Protection
Totally encapsulating chemical protective suit
Coveralls*
Long underwear*
Gloves - chem. resistant:
outer
inner
Boots, chem. resistant w/steel toe & shank
Hardhat*
Disposable protective suit, gloves, and boots*

Level (B)
Respiratory Protection
Hooded chem. resistant clothing
Coveralls*
Gloves, chem. resistant:
outer
inner
Boots, chem. resistant w/steel toe & shank
Boot covers, outer chem. resistant
Hardhat*
Face shield*

Level (C)
Respiratory Protection
Hooded chem. resistant clothing
Coveralls*
Gloves, chem. resistant:
outer
inner
Boots, chem. resistant w/steel toe & shank
Boot covers, outer chem. resistant
Hardhat*
Escape Mask*
Face shield*

Level (D)
Coveralls
Gloves
Boots/shoes, chem. resistant w/steel toe & shank
Boot covers, outer chem. resistant
Safety glasses or chem. splash goggles
Hardhat*
Escape Mask*
Face shield*

* Where applicable

☐ ACCESS AND HAZARD CONTROLS

Controls include Engineering, Administrative and PPE. The table below is a summary of common controls.

☐ **Toxic Materials**: Protective clothing, respirators, gloves, decontamination, direct monitoring, personal monitoring, continuous monitoring.	☐ **Heat Stress**: Periodic work monitoring. Adjust work/rest regimen according to WBGT. Minimize clothing when possible. Drink cool water regularly. Discuss signs and symptoms of heat stress. Work during cooler part of day.
☐ **Heavy Equipment and Machinery**: Safety features and devices in place and functioning. Warning signs in place as required. Flagger assigned where necessary. Proper rigging used. Guards in place. Swing radius roped off and marked.	☐ **Subsidence**: Underground anomalies located by ground penetrating radar. Areas located and posted. Load test where appropriate. Personnel notified of hazard areas.
☐ **Cold Stress**: Wear layered, insulated clothing. Monitor temperature periodically. Take breaks in warm areas where possible. Discuss symptoms and signs of cold stress.	☐ **Walking Working Surfaces**: Carry out daily house keeping efforts. Keep walkways and work areas clear. Designate walkways and emergency routes where necessary. Flag or post problem areas. Provide slip-resistant surfaces.
☐ **Excavation**: Shoring and sloping per OSHA requirements. Access in and out of excavation. Spoils 2 feet back from edge. Monitoring if confined space. Rope excavation if unattended.	☐ **Explosives and Flammables**: Proper containers used. Non-sparking tools. Grounding/bonding used. HAZMAT team notified of location of materials. Fire extinguisher. Qualified person in charge.

☐ **Emergency Equipment**: Two forms of communication. Emergency numbers posted. Emergency Plan covered. Emergency first-aid kits. Stretcher, fire exit.	☐ **Cutting and Welding**: Fire watch per OSHA requirements. Combustibles covered or moved. Fire extinguisher available. Person trained in extinguisher use. Eye protection available and used. Leathers or PPE (eye, face, respirator as required).
☐ **Pinch Points**: Ensure guards are in place. Brief site personnel on location of potential pinch points. Identify and post areas where guarding is not appropriate or feasible.	☐ **Overhead Hazards**: Work not permitted under a suspended load. Use tag lines to handle loads. Secure loose overhead objects. Discuss dangerous parts of work. Wear head protection when required. Post head protection areas.
☐ **Electrical**: Lock and tag where required. GFCIs used in/outside wet locations. Insulating materials and clothing (gloves, mats, and so forth) when required.	☐ **Noise**: Hearing protection provided and worn. Signs posted. Hearing conservation training. Monitoring.
☐ **Confined-Space Entry**: Ventilation, access controls, illumination, monitoring. Permits monitoring.	☐ **Sanitation**: Portable toilets onsite when necessary. Potable water/disposable cups. Wash water and soap.

☐ SITE WORK ZONES AND DECONTAMINATION

Site control will be established by initiating the following work zones as noted on the attached site map:

1. Support Zone
2. Contamination Reduction Zone
3. Exclusion Zone
4. Control Zone
5. Other

Also include entry points and location of emergency equipment as well as a map showing the route to the nearest medical facility.

List all personnel, sampling equipment, and heavy equipment decontamination.

_____

_____

_____

Develop and include a waste disposal plan for hazardous waste generated during decontamination.

☐ MONITORING EQUIPMENT AND ACTION LEVELS

Job or Task To Be Monitored	Type of Instrument	Monitoring Frequency	Action Level	Specific Action(s)

Where appropriate, list the letter or number corresponding to the instrument or monitoring frequency in spaces above:

A. Biological Monitoring (Type)
B. Combustible Gas/Oxygen (CG/LEL/02)
C. Detector Tubes (list type and expiration)
D. Dust Monitor (Type)
E. Flame Ionization (FID)
F. Gas Chromatography (GC)
G. Heat Stress
H. Infrared (IR)
I. Noise
J. Personal Exposure Monitoring (Type)
K. Photoionization (PID)
L. Radiation Surveys, See RWP No.
M. Visual Observation
N. Other

1. Monitoring not required
2. Hourly
3. 15 minute intervals (STELs)
4. Continuous
5. 8 hour TWA
6. As determined by SSHO

☐ COMMUNICATION

List communication system to be used for each task and work zone.

Task	Work Zone	Communication Method	Special Instructions

1. Hand signals 2. 2-way radios 3. Horns 4. Emergency Alarms 5. Others_____

☐ EMERGENCY RESPONSE PLAN AND PROCEDURES

Emergency Contacts

Fire: _____

All Emergencies: _____

Facility Manager: _____

Project Manager: _____

Site Safety and Health Officer (SSHO): _____

Personal Injury: _____

Fire Department: _____

Security/Police: _____

Chemical Exposure: _____

Industrial Hygiene: _____

Safety: _____

Health Physics: _____

Spill Control Plan

Contacts: _____

Containment Kit Location: _____

Other Equipment: _____

Actions To Be Taken: _____

Medical Facilities

Location: _____

Phone: _____

☐ **EMERGENCY EQUIPMENT (include location of the equipment)**

	First Aid Kit		PPE		Decon Equipment
	Fire Extinguisher		Radio/Phone		Wind Indicator
	Breathing Air		Eye Wash		Signal Device
	Signs (specify):				
	Other (specify):				

☐ **Develop and include an Emergency Action Plan if employees will NOT assist in handling emergency:**

1. Emergency escape procedures
2. Procedures for critical employees who must temporarily remain
3. Procedures to account for all employees
4. Rescue medical procedures
5. Means of reporting all emergencies
6. Contacts for further help

☐ **Develop as a separate section of the HASP an Emergency Response Plan and Emergency Incident Procedures if employers WILL assist in emergencies:**

Emergency Response Plan Elements:

1. Pre-emergency planning
2. Personnel roles, lines of authority and communications
3. Emergency recognition and prevention
4. Safe distances and refuge
5. Site security and control
6. Evacuation routes and procedures
7. Decontamination procedures not covered elsewhere
8. Emergency medical treatment and first aid
9. Emergency alerting and response procedures
10. Critique of response
11. PPE and emergency equipment

Emergency Incident Procedures:

1. Site topography, layout, weather
2. Procedures for reporting to governmental agencies
3. Integrated with fire, disaster plans
4. Rehearsed as part of training program
5. Periodic review
6. Alarm system

☐ **CONFINED SPACE**

Include, if applicable, confined-space-entry procedures as outlined in 29 CFR 1910.146.

☐ **SPILL CONTAINMENT**

Spill containment program describing how hazardous spills will be contained and isolated.

☐ **REQUIRE PREENTRY BRIEFINGS PRIOR TO INITIATING ANY SITE ACTIVITIES**

☐ **USE SITE CHARACTERIZATION AND MONITORING DATA TO UPDATE HASP**

☐ **REVIEW HASP PERIODICALLY, FOR EFFECTIVENESS**

SEVEN

ACCESS AND HAZARD CONTROLS

7.1 BACKGROUND

Access and hazard controls eliminate or control worker exposure to hazards, facilitate work activities, and prevent site access by unauthorized personnel. Specific control measures are developed early in the planning stages of the project, specified in the health and safety plan (HASP), and modified based on new information as the project progresses. The "tool box" of access and hazard controls includes the following hierarchical site control measures (see Figure 7-1):

Engineering controls;
Administrative controls; and
Personal protective equipment (PPE).

> "Access controls can be effectively used to manage the scope and application of the Hazardous Waste and Emergency Response (HAZWOPER) Standard and are easily applied to hazardous waste projects."

Engineering controls are considered first and preclude worker exposure by removing or isolating the hazard. Administrative controls are considered second and eliminate or control exposure by (1) managing worker access to hazards or (2) establishing safe work procedures. Whenever engineering or administrative controls are not feasible, PPE to control the degree of worker exposure and allow direct access to hazardous operations or locations is used. Table 7-1 provides examples and advantages and disadvantages of common access and hazard controls, which are discussed in greater detail in the text that follows.

It is recommended that the multidisciplinary team (see Chapter 3), which includes workers, develop the access and hazard control strategy for each hazardous waste operation and activity. Hazardous waste projects are conducted optimally by applying a combination of control measures. The degree of control necessary depends on the site characteristics and size, the actual and potential hazards, the nature of the work, the adjacent occupancy, and the surrounding community (see Figure 7-2). Site controls maintain worker protection consistent with cost-effectiveness and efficiency in completing work. Site control strategies applicable to both radiological and hazardous waste operations are to be integrated. Site control concepts specified in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (the HAZWOPER Standard); 10 CFR 835; and the *Draft DOE Radiological Control Technical Standard* are compatible and consistent, differing only in nomenclature.

7.2 USING ACCESS AND HAZARD CONTROLS TO MANAGE SCOPE

As discussed in Chapter 2, worker exposure to hazards resulting from hazardous waste operations is one criterion for determining whether an operation or location falls under the regulatory scope of HAZWOPER. When determining regulatory scope, exposure has two elements—the presence of a hazard and worker access to the hazard. Either eliminating the hazard or worker access to the hazard often means that an operation or location does not fall under HAZWOPER.

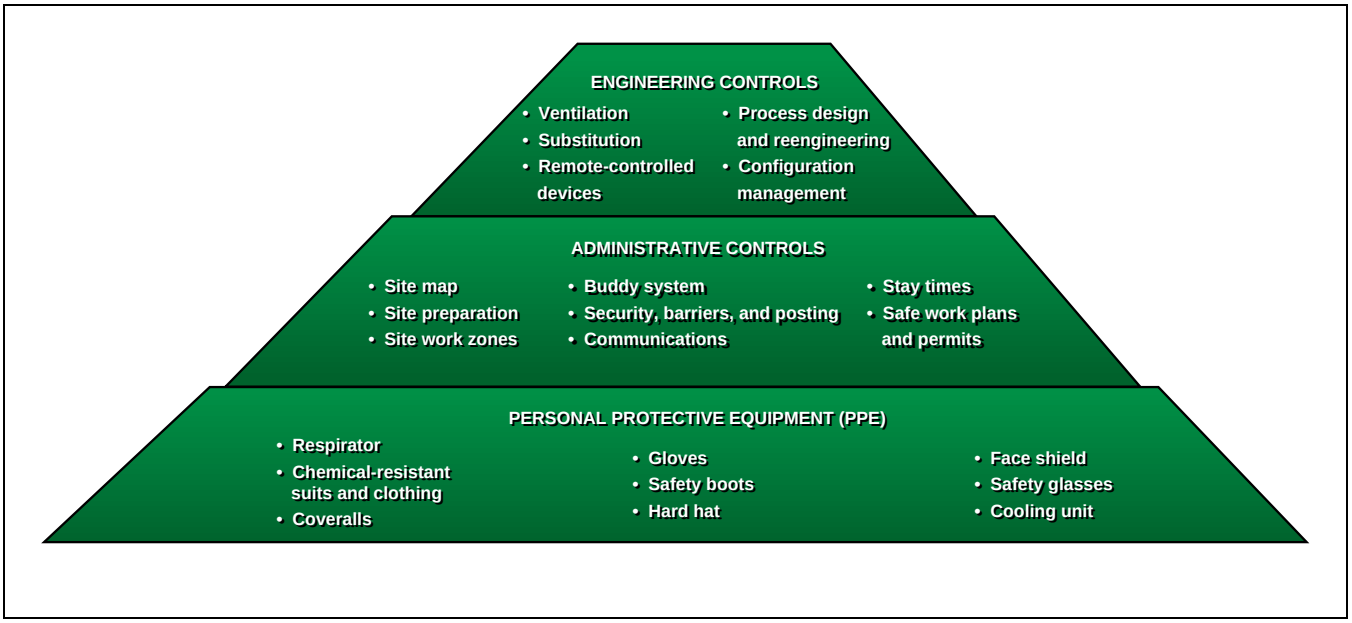

Figure 7-1. Hazard Control Hierarchy

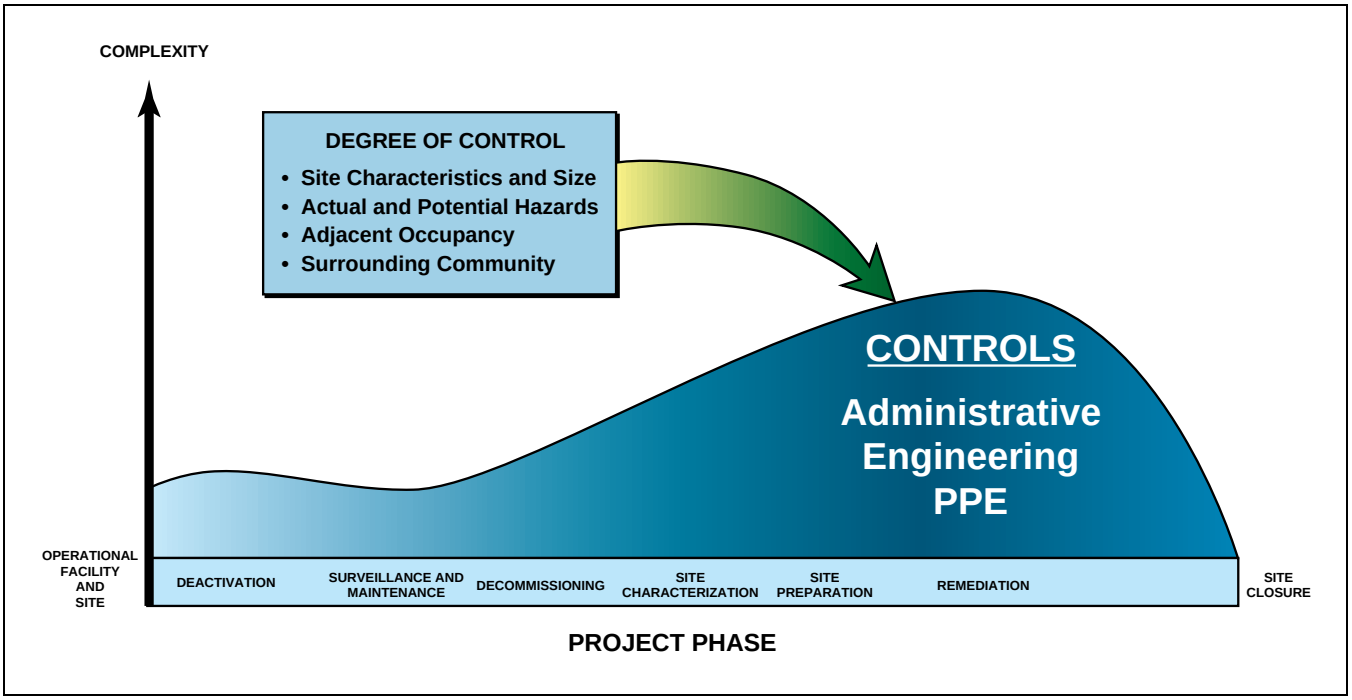

Figure 7-2. Access and Hazard Control Complexity

Engineering controls remove or isolate the hazard. While engineering controls can generally be readily applied to deactivation and decommissioning projects, they are difficult to apply to most hazardous waste projects since removal of hazardous waste is almost always an "after-the-fact" proposition. Using engineering controls to manage the scope and application of HAZWOPER is usually limited to localized areas and tasks as illustrated by Example 2-2 (Chapter 2). Access controls effectively manage the scope and application of HAZWOPER and are easily applied to hazardous waste projects (see Examples 2-1 and 2-4 in Chapter 2). PPE cannot be used to manage scope; workers who wear PPE fall under the HAZWOPER Standard when involved with hazardous waste work. Example 7-2 illustrates using a combination of controls to maintain worker safety consistent with optimizing the scope of HAZWOPER.

Table 7-1. Summary of Access and Hazard Control Measures

Control	Examples	Potential Advantages	Potential Disadvantages
Engineering • Precludes worker exposure by removing or isolating the hazard	• Ventilation • Substitution • Remote-controlled devices • Process design and reengineering • Configuration management	• Most protective of worker health and safety • Limits scope and application of health and safety standards • Reduces specialized training requirements • Does not require frequent professional health and safety coverage • Eliminates PPE use • Expedites work by reducing delays from decreased worker efficiency	• May be costly • Requires time to implement • Permanent solution that may be impractical for hazardous waste activities
Administrative • Eliminates or controls worker exposure by (1) managing access to hazards or (2) establishing safe work procedures	• Site map and site preparation • Site work zones • Stay times • Buddy system • Security, barriers, and posting • Communications • Safe work plans and permits (including radiological work permits [RWPs])	• Limits scope and application of health and safety standards • Reduces specialized training requirements • Eliminates PPE use • Expedites work by reducing delays from decreased worker efficiency • Standardizes and optimizes work procedures	• May impose additional health and safety requirements • Requires professional health and safety coverage
Personal Protective Equipment • Controls degree of worker exposure	• Respiratory protection • Protective clothing • Head, eye, hand, and foot protection • Additional protection (e.g., hearing)	• Workers have direct access to worksite and hazard • Expedites quick entry and response	• Increases worker exposure to hazard • Reduces worker efficiency • Requires professional health and safety coverage • Requires specialized training and certifications • Generates waste

7.3 ENGINEERING CONTROLS

Engineering controls preclude worker exposure by removing or isolating the hazard and should be considered first. A cost benefit analysis determines the advisability of selecting engineering controls. Table 7-1 lists some trade-offs when considering engineering controls.

VENTILATION

Ventilation is either local or general in nature and controls exposure by exhausting or supplying air. Local ventilation directs air movement; general ventilation dilutes the air. Ventilation generally has limited use in uncontrolled hazardous waste work, but there are some applications. Fans can be used to direct contaminants away from drilling operations, which may reduce or eliminate the need for respiratory protection. A particularly good application is to air rotary drilling, which tends to blow contaminants out of the borehole and into the air; fans can then significantly reduce worker exposure. Confined-space entry nearly always requires some form of exhaust ventilation to control explosive and toxic hazards. Lastly, a specialized application is the use of pressurized cabs or control booths on heavy equipment, which can help reduce heat and cold stress as well as exposure to contaminants.

SUBSTITUTION

Example 7-1 is an excellent illustration of applied engineering controls. Substitution replaces a hazard with a less hazardous alternative.

REMOTE-CONTROLLED DEVICES

Devices that are controlled remotely have been increasingly applied to hazardous waste work. Common techniques include use of pneumatically operated impact wrenches to open drum bungs and hydraulic and pneumatic piercers for penetrating drum tops. Remote monitoring well sampling devices can dramatically reduce the need for respiratory protection during well development and sampling.

PROCESS DESIGN AND REENGINEERING

The greatest application of process design and reengineering is to operational facilities undergoing deactivation and surveillance and maintenance. The earlier that safety is considered in the design process, the less it costs to implement and the greater the chance for *inherent safety* (i.e., the potential dangers have been removed). However, for existing facilities, safety considerations are manifested *extrinsically* (e.g., safety is added with devices such as alarms and interlocks and practices such as equipment redundancy).

Less Hazardous <> More Hazardous

Health
Neutral cleaners <> Acidic cleaners
Neutral cleaners <> Alkaline cleaners
Water-based cleaners <> Solvent cleaners
Water <> Organic solvents
Nonchlorinated solvents <> Chlorinated solvents
Ozonation <> Chlorinated solvents
Scabbling <> Solvent or sandblasting
Water-based paints <> Lead-based paints
Water-based paints <> Oil-based paints
Bioremediation <> Soil excavation
Fiberglass insulation <> Asbestos insulation

Safety
Daylight operations <> Nighttime operations
Handcarts <> Hand carrying
Grounded electrical <> Ungrounded electrical
Safety cans <> Bottles
Safety glass <> Regular glass
Side-shield glasses <> Regular glasses
"Cherry-picker" <> Ladder

Example 7-1. Substitution

CONFIGURATION MANAGEMENT

Configuration management refers to designing the work area for maximum safety and efficiency. It should be carefully considered when installing engineering controls so that overall safety systems are not adversely impacted.

7.4 ADMINISTRATIVE CONTROLS

Administrative controls eliminate or control exposure by (1) managing worker access to hazards or (2) establishing safe work procedures. Table 7-1 lists some advantages and disadvantages of administrative controls. The sequence depicted in Example 7-2 can be used as a general framework for establishing administrative control measures.

SITE MAPS

Site maps are required by the HAZWOPER Standard and show site work zones; topographic features and predominant wind direction; buildings, tanks, impoundments, pits, ponds, and other structures; and the locations of specific safety, health, and radiological hazards. Overlays provide the necessary information without cluttering the map or making it illegible. Maps are posted at access control points and are updated to reflect changes in work scope, jobs and tasks, and new hazards.

- Compile a site map.
- Determine site preparation requirements.
- Define the site work zones.
- Determine stay times.
- Organize the buddy system.
- Establish decontamination procedures (see Chapter 8).
- Determine security, barrier, and posting requirements.
- Specify communications systems.
- Establish safe work plans and permits (including RWPs).

Example 7-2. Establishing Administrative Controls

SITE PREPARATION

Site preparation is crucial in establishing access and hazard controls and is carefully integrated with the work plan. It defines major access routes and patterns and involves applying engineering controls to remove or isolate hazards to reduce the need for administrative controls and PPE. The text box below outlines a strategy.

Site Preparation Strategy

- Plan traffic flow patterns to facilitate efficient operations.
- Design and construct roadways to provide ease of access and a sound roadbed for heavy equipment and vehicles.
- Design and construct loading docks, processing and staging areas, and operations and decontamination pads.

Apply controls to eliminate hazards in work areas:

- Eliminate ignition sources in flammable hazard areas.
- Remove or repair ungrounded electrical wiring and low overhead wiring that may entangle equipment.
- Remove sharp objects and debris, such as glass, nails, and torn metal, which could puncture PPE.
- Repair holes, loose steps or flooring, or unsecured railings, which can cause falls, slips, and trips.
- Secure unsecured objects on elevated surfaces (e.g., catwalks, rooftops, and scaffolding) which could fall.
- Remove weeds that obstruct visibility.
- Install skid-resistant strips on slippery surfaces.
- Provide adequate illumination.

SITE WORK ZONES

Site work zones are required by the HAZWOPER Standard. Hazardous waste sites are divided into as many or as few zones as needed to meet operational requirements and to protect worker health and safety. Work zones are designed to control access to actual and anticipated hazards. 10 CFR 835 is prescriptive in the types of work zones necessary to control radiological hazards and the 10 CFR 835 Implementation Guides and the *Draft DOE Radiological Control Technical Standard* provide guidance for their establishment; however, radiological work zones closely parallel and are compatible with hazardous waste work zones (see Table 7-2). Work zones integrate radiological and nonradiological protection requirements. Work zone positioning is based on hazard characterization and exposure assessment. Anticipated operations, potential releases, and the amount of contaminant dispersion are important for delineating these zones. Figure 7-3 illustrates the basic site work zones.

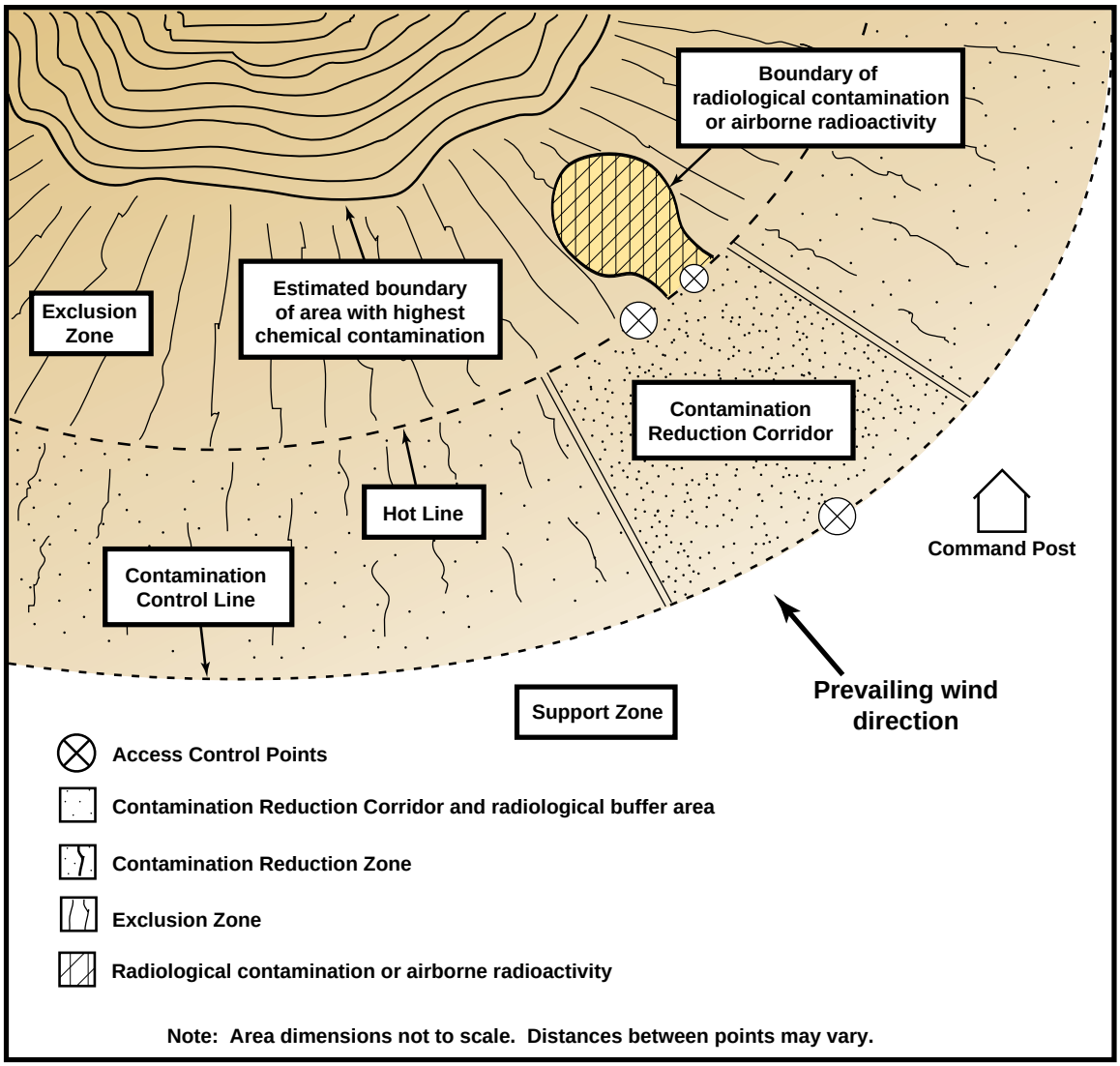

Figure 7-3. Site Work Zones

Table 7-2. HAZWOPER and Radiological Work Zones

HAZWOPER Term	Radiological Term
Contamination Control Line	Controlled Area Boundary
Exclusion Zone	Radiologically Controlled Area
Nonradiological (Chemical) Hazard Areas Within Exclusion Zone	Contamination Area or Radiation Area
Contamination Reduction Zone	Radiological Buffer Area

Exclusion Zone. The exclusion zone is where contamination is present and the highest possibility for worker exposure to hazardous waste occurs. The HASP specifies PPE requirements for work conducted within the exclusion zone. Without exception, workers who enter the exclusion zone wear specified PPE. The level of protection (see Section 7.6) may vary within the exclusion zone based on activity, stage of the operation, or location, which allows for flexibility in operations and resources. For instance, most of the exclusion zone, as defined by the "Hot Line" (the exclusion zone boundary—see the text box at right), might have a relatively low exposure potential that could be controlled by Level D PPE; an area undergoing subsurface remediation within the zone might be set apart and controlled by Level B PPE; and another area might contain surface chemical contamination and require Level C PPE. This is comparable to a radiological area within a controlled area containing several "radiation areas," "high radiation areas," "very high radiation areas," "contamination areas," "high contamination areas," or "airborne radioactivity areas."

Access control points are established at the Hot Line to regulate the flow of personnel and equipment into and out of the zone. Separate entrances and exits are provided for personnel and heavy equipment.

Establishing the "Hot Line"

- Visually survey the environs of the worksite.
- Determine the locations of the hazardous waste and substances; drainage, leachate, and spilled material; and visible discolorations.
- Evaluate the initial direct reading instrument survey data for the presence of combustible gases; organic and inorganic gases, particulates, or vapors; and ionizing radiation.
- Evaluate air, soil, and water sampling results.
- Consider the distances needed to prevent an explosion or fire from affecting personnel outside the exclusion zone.
- Consider the area necessary for site work to reduce the spread of contamination.
- Consider meteorological conditions and the potential for contaminants to be blown from the area.
- Secure the Hot Line using appropriate barriers and posting.
- Modify the Hot Line location, if necessary, as more information becomes available.

Contamination Reduction Zone/Corridor (CRZ/C). The CRZ/C is where decontamination (see Chapter 8) is conducted and is the entry and egress route between the exclusion and support zones. The CRZ/C reduces the probability that the clean area or support zone becomes contaminated or otherwise affected by site hazards by limiting the transfer of hazardous substances. This concept is analogous to the radiological buffer area. The contamination control line sets the boundary between the CRZ/C and the support zone and is comparable to the controlled area boundary designated for radiological controls. With the exception of decontamination workers, the CRZ/C is positioned and maintained in a condition that requires minimal use of PPE. While this is true, decontamination workers wear PPE appropriate to the hazard. The level of PPE required in the CRZ/C is specified in the HASP. The CRZ/C design must facilitate:

- Personnel and equipment decontamination (e.g., separate lines for workers and heavy equipment such as tractors, earth-moving equipment, and trucks);

- Emergency response functions (including transport of injured personnel, first-aid equipment, and containment equipment);
- Equipment resupply;
- Sample packaging and preparation for onsite or offsite laboratories;
- Location of worker temporary rest areas;
- Drainage of water and other liquids used in the decontamination process;
- Waste minimization; and
- Reduction or elimination of mixed waste production.

Establishing the CRZ/C and Buffer Zone

The CRZ/C's primary purpose is to keep the support zone free of contaminants and hazards. The size and location of the CRZ/C should be based on the stability of worksite conditions, the potential for dispersion of contaminants and for unexpected events, and the proximity of uninvolved workers and third parties. The CRZ/C boundaries are established based on hazard characterization and do not need to encircle the entire perimeter of the exclusion zone when work:

- Involves only Level D PPE and exposure to and disturbance of contaminants is unlikely;
- Is small scale or of limited duration (e.g., preliminary site investigation lasting only a few hours or days);
- Is remote and secured from peripheral occupancy and traffic;
- Is controlled according to 10 CFR 835 work zone criteria and guidance provided in the 10 CFR 835 Implementation Guides and the *Draft DOE Radiological Control Technical Standard* and does not involve inactive or secured contamination areas; and
- Does not involve the spread of radiological contamination.

Support Zone. The support zone is a clean area where administrative and support functions necessary to maintain effective operations within the exclusion zone and the CRZ/C are located. The support zone location should be based on six general criteria (see text box, right): accessibility, resources, visibility, prevailing wind direction, distance from exclusion zone, and type of work. Normal work clothes are appropriate for the support zone. PPE worn for the hazardous waste work remains in the CRZ/C, where it is decontaminated or packaged for transport and disposal or decontamination.

Location of the Support Zone

- Accessibility — close proximity to highways and railroad tracks; easy access for emergency vehicles; sufficient open space available; and favorable topography.
- Resources — ample roads, power, telephones, shelter, and water.
- Visibility — line of sight to exclusion and CRZ/C zones.
- Prevailing wind direction — upwind of the exclusion zone.
- Distance — as far as practical from the exclusion zone.
- Type of work.

Separate support zone facilities may not be needed where site facilities are readily available and near to the worksite, and if close communication is maintained. For multiple hazardous waste operations conducted in close proximity, it is possible to design one support zone to serve several operations. Depending on the scope of the project, a

properly equipped support zone may consist of a single trailer or may be composed of multiple facilities such as a command post, medical station, equipment and supply centers, field laboratory, and administrative areas.

Worker Comfort Areas. Worker comfort areas are located within site work zones to allow workers to take breaks and rest. These areas are designed to maintain the safety of workers and generally require special procedures for ingress and egress, personnel and air monitoring, potable water consumption, and restroom use.

Temporary Site Work Zones. Work zones may be temporary. The work is planned; the zones and containments are established; the work is conducted; and the zones are dismantled. As illustrated by Example 7-3, temporary work zones can be used to effectively manage regulatory scope. Area and personnel exposure monitoring is crucial in order to verify that zoning, containments, work practices, and procedures have been designed appropriately and maintain worker health and safety.

A plumber is needed inside an exclusion zone to repair a water pipe that has burst. There are three options:

Engineering controls: The entire exclusion zone is decontaminated (e.g., hazardous wastes and substances are removed) so that the plumber does not fall under the scope of HAZWOPER and require specialized training or PPE other than that required to safely repair the pipe. Depending on the actual work location, the work may fall under the scope of other health and safety standards of practice (e.g., the Confined-Space-Entry Standard if the work is in a confined space).

Engineering and administrative controls: A competent person determines that the immediate work area and an access corridor can be decontaminated such that there is no exposure to hazardous waste operations. Barriers to contaminated areas are established so that the plumber can transit the clean corridor and repair the pipe in the decontaminated area. In effect, the immediate work area and access corridor become a temporary support zone. No specialized HAZWOPER training or PPE would be required (other than that required to safely repair the pipe). The work may fall under the scope of other standards of practice.

PPE: After medical certification, respirator fit-testing, and specialized HAZWOPER training, as required by health and safety procedures established in the HASP, the plumber dons appropriate PPE, enters the exclusion zone, and repairs the pipe. The work may also fall under the scope of other standards of practice.

The health and safety of the plumber is maintained in all three options. Completely decontaminating the entire exclusion zone eliminates exposure to the hazardous waste or substances, but generally is impractical and costly. Decontaminating the immediate work area and establishing a clean corridor is probably the method of choice, but needs careful evaluation by a competent person. PPE use is also costly due to the need for medical certification and HAZWOPER training, but allows the work to proceed without delays. PPE also reduces worker efficiency and poses a hazard in itself. In all three options, the task may be covered by additional worker protection standards due to the nature and location of the work.

Example 7-3. Using Access and Hazard Controls to Manage Scope

STAY TIME

Stay time is the amount of time a worker is allowed in a hazardous area. Stay times are developed before work in hazardous and radiological areas begins and are a factor in determining the number of qualified workers, the total amount of time, and the cost to complete the work. A key factor in limiting work duration relates to PPE usage and includes air supply consumption, suit and ensemble permeation and penetration by chemical contaminants, ambient temperature ranges, coolant supply, visibility, and mobility. Total radiation exposure is also a consideration. For example, if radiation levels are 200 mrem/hour and exposure is to be limited to 100 mrem, workers can work in the area for only 30 minutes.

THE BUDDY SYSTEM

No one should enter a contaminated area or an exclusion zone without a "buddy" who is capable of:

- Providing the partner with assistance;

"One of the most important tenets for any type of work around hazardous materials is never work alone."

- Observing the partner for signs of adverse exposure to chemical, physical, or radiological hazards, and notifying the appropriate persons if emergency help is needed; and

- Periodically checking the integrity of safety systems and the partner's PPE and other safety equipment.

The HASP specifies tasks requiring the buddy system. Examples include:

- Exclusion zone or confined-space-entry;

- Entry into a high contamination area, very high contamination area, or high radiation area as defined in 10 CFR 835 and the *Draft DOE Radiological Control Technical Standard*;

- Performance of any task in any area requiring PPE greater than Level D; and

- Work in areas of significant hazards (e.g., work around highly energized circuits or in excavations).

The buddy system should be balanced against the need to maintain radiation or carcinogen exposures as low as reasonably achievable (ALARA), and the need to keep workers removed from hazards. Buddies should be positioned at some distance from the hazard to minimize their exposure while preserving communication and line-of-sight contact with the command post supervisor or designee. Buddies do not have to be positioned in the exclusion zone. Rather, they can be positioned in the CRZ/C, which facilitates compliance with the buddy system and reduces risk to the buddy, while still allowing access when the need arises. The buddy system alone may not be sufficient to ensure that help will be provided in an emergency. At all times, workers in the exclusion zone should be in line-of-sight contact or communications contact with the command post supervisor or backup person in the support zone.

The work authorization system (e.g., radiological work or safe work permits) and pre-job briefings are crucial for specifying application of the buddy system and designation of buddies. Work permits may also be used to specify mandatory participation by health physics personnel and health and safety professionals, either in the buddy system or in support and oversight of the work.

SECURITY, BARRIERS, AND POSTING

Security, barriers, and posting limit worker and third party access to the worksite and to site hazards and work zones. Security measures for hazardous waste activities exceed those required for general access and egress and prevent:

- Exposure of unauthorized, unprotected personnel to worksite hazards;

- Spread of contamination;

- Access by thieves, vandals, or persons seeking to abandon other wastes on the worksite; and

- Interference with safe working procedures.

Site security can be maintained during off-hours by assigning trained in-house technicians for surveillance, using security guards to patrol the worksite boundary, enlisting public agency enforcement (if the worksite presents a significant public health and safety risk), and securing equipment.

Security Measures

- Erect a fence or other barrier around the worksite.

- Have guards patrol the perimeter and post boundary signs, if the worksite cannot be fenced in.

- Establish a system to identify authorized entrants and to validate certifications and credentials. Make certain all entrants have a valid purpose for entering the site. Make certain visitors are accompanied.

- Assign enforcement authority for entry and exit control.

- Coordinate security procedures with any affected public enforcement agencies.

- Maintain security in the support zone and at access control points.

Barrier selection depends on the type of health and safety hazards posed by the worksite and ongoing work, the amount of traffic and occupancy near the site, and the duration and stability of operations. Chain-link fencing is the preferred means of securing the overall site or large work zones. Other types of fencing, stakes, rope, and tape lines may be used for delineating smaller sites or work zones. For indoor deactivation and decommissioning, the building in which the operations are conducted usually provides the principal physical barrier with interior space segregation and posting, although a perimeter fenceline is advisable. Specialized barriers are required for high radiation and very high radiation areas, as is containment for operations involving certain nonradiological operations (e.g., asbestos abatement). If existing structures do not adequately contain these hazards, temporary containments are used.

Physically identifying and posting site work zones and hazards are important elements of worksite hazard communication. Posting requirements are provided in the HAZWOPER Standard, other Occupational Safety and Health Administration (OSHA) standards (e.g., 1910.1000 series and 1910.1926), 10 CFR 835, and various Environmental Protection Agency (EPA) standards. Site work zones are to be clearly identified with signs at the entrance of each work zone. There are specific hazard posting requirements for radiation, confined spaces, asbestos, noise, polychlorinated biphenyls (PCBs), lead, carcinogens, and satellite accumulation areas for hazardous waste storage. Signs are to be securely affixed, resist adverse environmental conditions, and reflect changing conditions and hazards at the worksite.

Signs are spaced to ensure visibility upon approach to the boundary of a work zone or a hazard. At least one sign is to be visible on each side of the boundary and from each direction of approach. Work zone and hazard posting should:

- Identify all radiological and nonradiological hazards and other types of hazards sufficient to maintain worker recognition and safety;
- Be installed immediately after the work zones are established and the hazards are identified; and
- Be clear and minimize confusion when more than one radiological or hazardous condition is present.

Integration of Posting

Radiological and nonradiological work zone and hazard posting can be integrated or placed side-by-side. Integrated posting is the preferred approach at the following locations:

- Contamination control line and controlled area boundary;
- Access control points to the CRZ/C, the exclusion zone, and the radiation and contamination areas; and
- Interior areas at specific locations where radiological and nonradiological hazards coexist.

Integration of worksite posting enhances hazard communication and reduces cost. For example, an integrated posting at the CRZ/C boundary with the potential for radiological and mercury hazards would read "Caution, Radiological and Mercury Hazard Buffer Area." This integrated posting communicates the hazards and satisfies both 10 CFR 835 and HAZWOPER requirements. Additional guidance on these issues may be found in the 10 CFR 835 Implementation Guides and the *Draft DOE Radiological Control Technical Standard*.

COMMUNICATION

Communication at a hazardous waste operation is either internal or external. *Internal communication* is between workers at the various work zones and is used to:

- Alert workers to newly identified hazards or emergencies;
- Provide safety guidance, such as lessons learned or amount of air left;
- Monitor or confirm well-being or exposure, stress, or confusion; and
- Maintain site control and facilitate stop-work actions or worksite evacuation.

Verbal communication can be impeded by background noise from heavy equipment or by PPE. Thus, for effective communication, commands are prearranged and include both visual and verbal cues. A primary and back-up communication system is necessary; both should be checked daily. All communication devices must be spark-free. Communication equipment is coordinated with explosive experts if explosives are used at the site. Individual workers should be identified by names placed on their PPE, or by color-coding or numbers. Communication between heavy-equipment operators in enclosed cabs and workers on foot is critical.

Communication Techniques

- Establish hand signals or visual signals such as flags and lights for workers wearing respirators which interfere with voice communication.
- Use noise-amplifying devices such as megaphones, sirens, whistles, or air horns for small sites or operations.
- At large sites, use walkie-talkies or portable radios as the primary communication between buddies or workers and the command post.
- Use dedicated radio frequencies for emergencies.

External communication is between onsite and offsite personnel and is used to:

- Coordinate emergency response; and
- Maintain contact with outside personnel such as management.

Telephone and radio are the primary means of external communication. If telephone lines are not installed at a site, all team members must be made aware of the location of the nearest telephone. Where mobile telephones are not available or in use, correct change and necessary telephone numbers are to be readily available in the support zone.

SAFE WORK PLANS AND PERMITS

Safe work plans and permits should be developed by a multidisciplinary team, thoroughly evaluated prior to implementation, monitored during use, and modified as conditions change. Conducting work under safe work plans and permits with trained workers dramatically improves worker protection and timely completion of work activities. Written operating procedures are integrated with safe work and radiation plans and permits to identify where additional health and safety expertise is needed prior to the initiation of work.

Safe Work Plans

Safe work plans address both safety and operational needs. The plans identify the work team, assign responsibilities, discuss hazards, delineate special training, and prescribe health and safety requirements. The plans summarize operational procedures, define health and safety coverage, specify monitoring, and address other issues as required. For general hazardous waste work, a combination of the work plan and the HASP can be used, sometimes with modification, to provide safe work plans and/or permits.

The safe work permit defines health and safety hold points and delineates whether site safety and health officer (SSHO) coverage is required. Typical hold points include: monitoring air quality before entering an area; inspecting rigging equipment before conducting a lift; conducting a field briefing or providing special training before proceeding with a task or phase of a task; inspecting an engineering or administrative control and verifying its effectiveness before proceeding with work; and verifying isolation of an energy source (e.g., verifying electrical lockout). Radiation work is often conducted under RWPs, as specified in 10 CFR 835 and in the 10 CFR 835 Implementation Guides and the *Draft DOE Radiological Control Technical Standard*, which have similar types of hold points such as conducting monitoring and verifying and validating installations of temporary shielding. A generic work permit can often be used to extend the use of the safe work permit or RWP beyond a specific task.

The safe work plan supplements the HASP and is an extension of the safe work permit. It addresses hazardous tasks that require a higher standard of care. Activities that typically require a safe work plan are: beryllium decontamination; excavation of highly toxic soils, tanks, or drums; work in potentially explosive areas; or nontypical, one-time tasks in hazardous areas. Deactivation and decommissioning are particularly

amenable to safe work plans because they often involve specialized tasks conducted in a specific area for a defined time.

If not already incorporated into safe work plans and permits, standing orders are used to enforce safe procedures at a worksite and represent practices that must be followed as well as those that must not occur in contaminated areas. A separate set of standing orders should be developed for the CRZ/C and the Exclusion Zone if the hazards are sufficiently different. Example of standing orders include the following:

- No smoking, eating, drinking, or applying of cosmetics in this zone;
- No matches or lighters in this zone;
- Check in at the Access Control Point before you enter this zone; and
- Check out at the Access Control Point before you leave this zone.

7.5 COMPLEXITY OF ACCESS AND HAZARD CONTROLS

As illustrated in Figure 7-2, the site control strategy can become more complex as hazardous waste activities proceed through project milestones. Site control requirements may intensify during deactivation, decommissioning, and remedial phases and become less restrictive during surveillance and maintenance activities and as hazards are remediated and the worksite moves toward closure.

7.6 PERSONAL PROTECTIVE EQUIPMENT

PPE controls the degree of worker exposure. PPE is acceptable as a hazard control measure (1) when engineering or administrative controls are not feasible or do not totally eliminate the hazard, (2) while engineering controls are being developed, or (3) during emergencies. (Note: References listed at the end of this section provide additional and more detailed information on issues such as advantages and disadvantages of PPE, compatibility of various types of PPE with chemical hazards, respiratory protection factors, training and proper fitting, and consideration of work mission duration. Therefore, this information is not repeated here.)

The type of PPE and the material from which the PPE is made are to protect against the hazards present. Worksite managers should be aware that no single combination of protective equipment and clothing can guard against all hazards. Moreover, because every worksite is different and the degree of known or unknown hazards varies, the PPE ensemble required is likely to change as work progresses. For hazardous waste work, PPE is conveniently organized into *levels of protection* under a system originally developed by EPA. There are four levels: A, B, C, and D. Table 7-3 lists the PPE requirements by level. Although each level specifies a complete clothing ensemble, in practice the level of protection selected for a particular task is driven by the respiratory protection requirements; clothing is then matched to the dermal and safety hazards present. OSHA requires that PPE be selected based on three distinct tasks:

- Conduct a hazard characterization and exposure assessment (see Chapter 5) to identify (1) actual or potential hazards and (2) possible exposure routes;
- Organize and analyze the data and select PPE based on the type of hazard, the level of risk, and the seriousness of potential harm from each identified hazard; and
- Make certain that the PPE fits and that it protects against the hazards and periodically reassess the hazards and PPE selection.

Manufacturer's literature is often the best source of information for selecting PPE. However, there are some useful references for hazardous waste work:

- *Guidelines for the Selection of Chemical-Protective Clothing* by J.J. Johnson and A.D. Schwope et al., published by the American Conference of Governmental Industrial Hygienists;
- *Standard Operating Safety Guides*, published by the U.S. EPA Office of Emergency and Remedial Response; and
- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, published by National Institute for Occupational Safety and Health (NIOSH), OSHA, the U.S. Coast Guard, and U.S. EPA.

Table 7-3. Levels of Protection

LEVEL OF PROTECTION	PPE
A The highest respiratory, skin, and eye protection.	**Required:** • Pressure-demand full-facepiece self-contained breathing apparatus (SCBA) or supplied-air respirator (SAR) • Fully-encapsulating chemical-resistant suit • Inner chemical-resistant gloves • Chemical-resistant safety boots • Disposable glove and boot covers • Coveralls • Hard hat **Recommended:** • Long cotton underwear • Two-way radios • Cooling unit
B The same respiratory and eye protection as Level A, but less skin protection.	**Required:** • Pressure-demand full-facepiece SCBA or SAR • Chemical-resistant clothing • Inner and outer chemical-resistant gloves • Chemical-resistant safety boots • Disposable boot covers • Coveralls • Hard hat **Recommended:** • Long cotton underwear • Two-way radios • Cooling unit
C Hazard-based skin and eye protection, but less respiratory protection than Level B.	**Required:** • Full-facepiece air-purifying respirator (APR) • Chemical-resistant clothing • Inner and outer chemical-resistant gloves • Chemical-resistant safety boots • Disposable boot covers • Coveralls • Hard hat **Recommended:** • Long cotton underwear • Two-way radios
D No respiratory protection. Minimal skin protection.	**Required:** • Coveralls • Abrasion-resistant gloves • Safety boots • Disposable boot covers • Hard hat • Face shield (for flying-debris hazards) • Escape mask

For radiological activities, the *Draft DOE Radiological Control Technical Standard* provides guidance for worksite managers in determining what combination of PPE is to be used. The process is analogous to that used for nonradiological hazards. The radiological control organization is responsible for determining the PPE to be used for work performed under an RWP on a task-by-task basis. Articles 325 and 461 as well as Appendix 3C of the Technical Standard present guidelines for the selection of protective clothing, doffing procedures, and use of step-off pads for contamination control, and warns against the use of PPE beyond that authorized by the radiological control organization because excessive PPE can detract from work performance and be contrary to ALARA principles and waste minimization practices. This is analogous to best practice in nonradiological health and safety hazard control, which also discourages the over-prescription of PPE that can result in problems related to heat stress and worker inefficiency.

Although chemical and radiological PPE requirements are different, they can be applied simultaneously. In some situations where both types of hazards co-exist, chemical issues require the more restrictive level of protection; in others, radiological issues are more restrictive. Successful integration of PPE requirements for mixed wastes or for other combinations of chemical and radiological contaminants requires coordination between radiological and chemical safety professionals and workers. Whatever the circumstances, successfully addressing both types of hazards is essential. As an example, where particulate airborne chemical and radiological hazards exist, the more prescriptive provisions of the *Draft DOE Radiological Control Technical Standard* are followed as the protection specified will protect against both hazards. Where chemical vapors and airborne radiological hazards co-exist, the PPE is marked to ensure proper radiological surveys and decontamination of PPE.

UPGRADING OR DOWNGRADING LEVEL OF PROTECTION

The SSHO and the field team leader are responsible for upgrading or downgrading the level of protection based on provisions specified in the HASP. Clear criteria need to be established based on the guidance outlined in the text box at right.

There are implications of maintaining a higher level of protection than necessary, especially for respiratory protection. Additional requirements are imposed when respiratory protection is specified. The following are considerations in determining the advisability of maintaining a higher level of respiratory protection:

- Working in a respirator can cause unnecessary, potentially dangerous stress to workers;
- Use of respirators limits vision and mobility, particularly when operating heavy equipment;
- Over-reliance on respirators causes a false sense of security as the protection factor for respirators varies with workplace conditions; and
- Implementation of respirator programs is costly.

Upgrading and Downgrading PPE

Upgrading PPE

- Unstable or unpredictable worksite hazards or emissions
- Known or suspected presence of dermal hazards
- Occurrence or likely occurrence of gas or vapor emission
- Change in work task that increases the potential for contact with hazardous materials

Downgrading PPE

- New information that indicates a situation is less hazardous than originally thought
- Hazard assessment and monitoring data show low exposure levels
- Change in site conditions that decreases the hazard
- Change in work task that reduces contact with hazardous materials

If worksite hazards have been minimized through engineering and administrative controls, a management decision to use respirators necessitates implementation of requirements mandated by both 29 CFR 1910.134 and DOE O 440.1. These requirements and the nonmandatory guidance provided in the *Draft DOE Radiological Control Technical Standard* are entirely complementary, with one exception: the *Draft DOE Radiological Control Technical Standard* discourages use of half-facepiece air-purifying respirators. Special requirements for respiratory protection include:

- Preparing a written respiratory protection program, if no written program exists, and appending the new or existing program to the HASP;
- Medically evaluating, training, qualifying, and fit-testing workers for specific respirator types; and
- Checking 29 CFR 1910, Subpart Z, "Toxic and Hazardous Substances," for any special respiratory protection requirements (e.g., for asbestos, lead, or cadmium).

7.7 REFERENCES

10 CFR 20, Appendix A, "Protection Factors for Respirators"

10 CFR 835, "Occupational Radiation Protection"

20 CFR 1910.165, "Employee Alarm Systems"

29 CFR 1910, Subpart I, "Personal Protective Equipment"

29 CFR 1910, Subpart Z, "Toxic and Hazardous Substances,"

29 CFR 1926, "Safety and Health Regulations for Construction"

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan"

DOE 5400.5, "Radiation Protection of the Public and the Environment"

DOE 5480.4, "Environmental Protection, Safety and Health Protection Standards"

DOE O 231.1, CHANGE 001, "Environment, Safety, and Health Reporting"

DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"

ANSI Z88.2, "Practices for Respiratory Protection"

DOE/EH-0353P, *OSH Technical Reference Manual*

DOE-EM-STD-5503-94, "DOE Limited Standard EM Health and Safety Plan Guidelines"

DOE-STD-1098-96, *Draft DOE Radiological Control Technical Standard*

Forsberg, K. and Mansdorf, S.Z., "Quick Selection Guide to Chemical Protective Clothing"

Johnson, J.J., and Schwope, A.D., et al., *Guidelines for the Selection of Chemical Protective Clothing*

NIOSH/OSHA/USCG/US EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS Pub. No. 85-115

NIOSH, "Guide to Respiratory Protection"

EIGHT

WORKER AND EQUIPMENT DECONTAMINATION

8.1 BACKGROUND

Decontamination of workers and equipment as part of hazardous waste activities at Department of Energy (DOE) sites requires consideration of worker health and safety, project budget and schedule, generation of additional waste, and periodic equipment replacement. Thus, it is imperative for project managers to apply a systems-based philosophy in planning and conducting decontamination activities.

Anything that enters a radiological area, an airborne radioactivity area, or a hazardous waste exclusion zone is assumed to be contaminated. If not removed, contaminants eventually permeate the personal protective equipment (PPE), tools, instruments, and other equipment being used at the worksite and may be transferred into clean areas. Decontamination is the process of removing or neutralizing chemical, radiological, biological, or mixed waste contaminants (or all contaminants) that accumulate on personnel and equipment while work is being performed.

The time required for decontamination is to be incorporated into work plans and schedules. Contamination control and decontamination strategies and procedures are documented in the health and safety plan (HASP), communicated to workers, and implemented before workers enter areas where there is a potential for exposure to contaminants.

Appropriate procedures are developed and implemented to minimize contamination, to prevent its spread, and to decontaminate workers and equipment when they exit contamination areas. Contamination control and decontamination procedures depend on the type and source of contaminants, the level of contamination, and the severity of the hazards posed, as well as on the evaluation of worksite hazards and the job tasks to be performed. Contamination control and decontamination processes specified in the HASP are to be periodically evaluated for effectiveness and modified to correct deficiencies and address changing conditions and activities at the worksite.

> Contamination control and decontamination are crucial for protecting worker health and safety, the public, and the environment during DOE hazardous waste activities.

8.2 OVERALL DECONTAMINATION STRATEGY

Figure 8-1 outlines the decontamination strategy for workers and equipment. It includes documentation of the approach, decontamination methods, testing for decontamination effectiveness, location and configuration of the decontamination area, emergency decontamination procedures, identification of decontamination hazards, protection of decontamination workers, disposal methods, equipment decontamination, sanitation, and waste minimization.

DOCUMENTATION OF DECONTAMINATION APPROACH

Decontamination protocols are designed to remove hazardous substances from workers, their PPE, and other equipment exiting worksite contaminated areas (e.g., radiologically controlled area, exclusion zone). A protocol could be as simple as doffing PPE and placing it into appropriate containers for disposal or decontamination; each protocol specifies what personal hygiene practices (from simple handwashing through full onsite showering) are necessary, depending on the type and degree of the hazard. The HASP specifies the level of

EIGHT: WORKER AND EQUIPMENT DECONTAMINATION

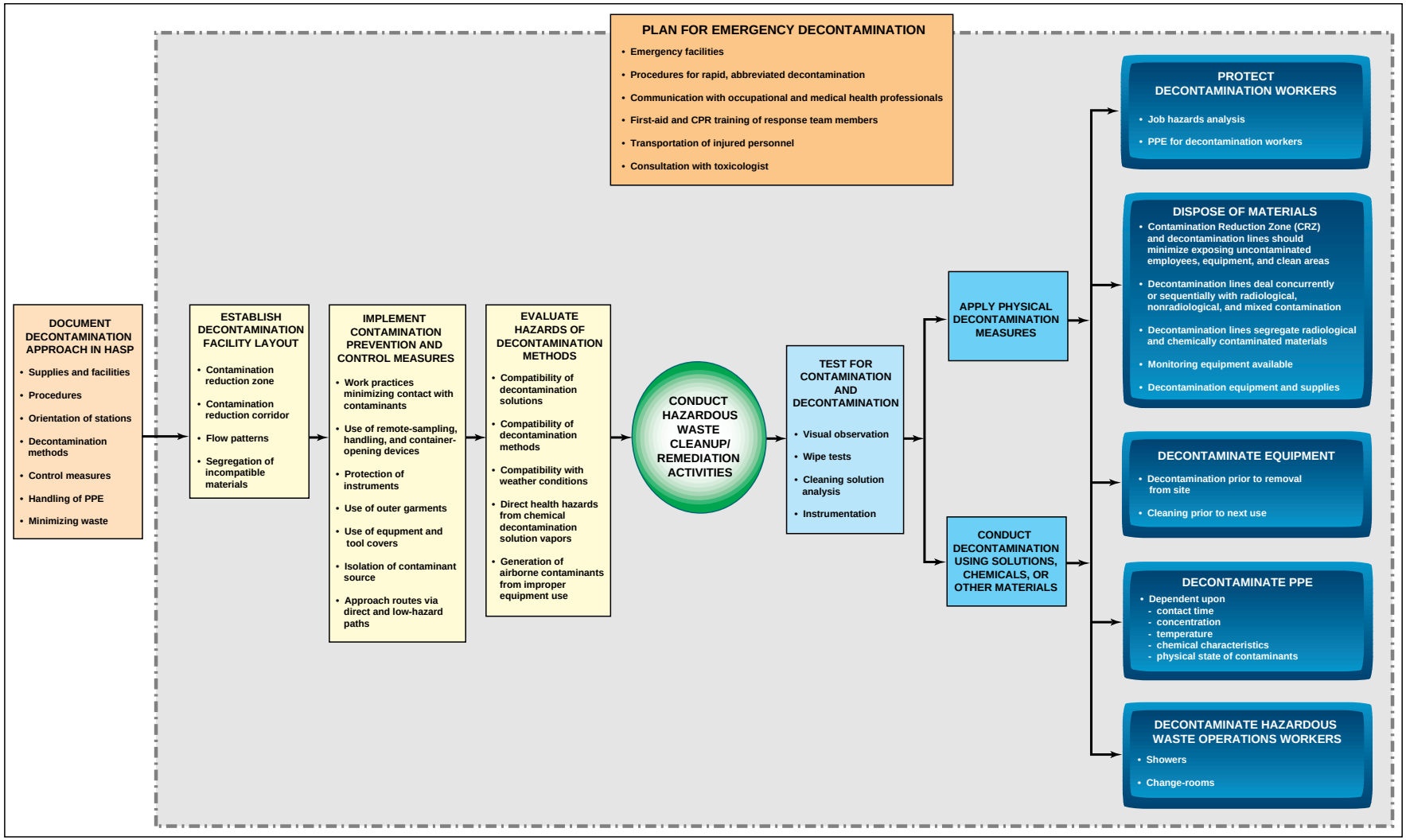

Figure 8-1. Overall Decontamination Strategy

decontamination necessary for workers and equipment at the worksite. Various methods of cleaning, neutralizing, or otherwise removing contaminants from workers, PPE, and other equipment are evaluated for use. Decisions concerning decontamination approaches should be based on the extent of worksite-specific hazards and activities. If not already specified in the HASP, all aspects of the decontamination approach and overall program should be documented in a decontamination plan. This plan should address:

- The number and layout of decontamination stations;
- Decontamination equipment needed;
- Appropriate decontamination methods;
- Procedures to prevent contamination of clean areas;
- Methods and procedures to minimize worker contact with contaminants during removal of PPE;
- Methods for disposing of clothing and equipment that are not completely decontaminated;
- Incompatible wastes requiring separate decontamination stations; and
- The target level of decontamination.

An essential part of the plan should address standard operating procedures (SOPs) for site operations that minimize contact with waste and thereby prevent the contamination of workers and equipment. Examples of such SOPs include:

- Work practices that minimize contact with hazardous substances;
- Use of remote sampling, handling, and container-opening techniques;
- Protection of monitoring and sampling instruments by bagging (openings can be made in the bags for sample ports and sensors that are required to physically contact worksite materials);
- Wearing disposable outer garments and using disposable equipment where appropriate;
- Covering equipment and tools with a strippable coating that can be removed during decontamination; and
- Encasing the source of contaminants with, for example, plastic sheeting or overpacks.

DECONTAMINATION METHODS

DOE worksites may contain radiological as well as mixed and traditional chemical or biological wastes or both. To prevent the further generation of mixed wastes, decontamination methods are carefully chosen and implemented. Contaminants can be deposited on the surface of or, in some instances, can permeate PPE and other equipment (see Figure 8-2). Most surface contamination is detected and removed by accepted decontamination practices. If, however, a contaminant has permeated the PPE (e.g., the fabric of coveralls), it may be difficult to detect and remove. When contaminants are allowed to remain in contact with materials (e.g., PPE, tools, instruments) for an extended period, those materials are particularly prone to permeation or degradation or both. The chemical and physical compatibility of decontamination solutions and methods with selected PPE is determined before use.

Contact time. The longer a contaminant is in contact with an object, the greater the probability and extent of permeation. Minimizing contact time is one of the most important objectives of a decontamination program.

Concentration. As concentrations of contaminants increase, the potential for permeation of PPE increases.

Temperature. Temperature increases generally increase the contaminant permeation rate.

Chemical characteristics. Permeation rates are dependent on the molecular or particulate size of the contaminant and on the pore space of the protective material. Chemical characteristics (e.g., polarity, vapor pressure, pH) of both the contaminant and the protective material determine permeability.

Physical state of contaminants. Gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids.

Figure 8-2. Major Factors Affecting Contaminant Permeation of PPE and Other Equipment

Decontamination by Physical Means. Some contaminants encountered are removed by physical means (e.g., washing, brushing, scraping, using sticky tape, rinsing, heating) that dislodge or displace the contaminant. Caution should be used, however, when selecting physical methods involving high pressure or heat since these methods can produce aerosols or cause burns. Weather conditions should be considered when choosing physical decontamination methods.

Contaminants that are physically removed fall into four major categories:

- *Loose Contaminants*. Dusts and aerosols that cling to equipment and workers or become trapped in small openings (e.g., in the weave of fabrics) can be removed with sticky tape, water, or a liquid rinse. Removal of electrostatically attached material is enhanced by coating clothing or equipment with antistatic solutions. Chemicals can be complexed (e.g., metals precipitation) and removed using specially designed vacuums equipped with high-efficiency particulate air (HEPA) filters and other system controls; asbestos fibers can be removed using similar devices. In some cases, elemental mercury can be removed using special mercury vacuums.

- *Adhering Contaminants*. Removal is often enhanced through methods such as solidification, freezing (e.g., with ice or dry ice), adsorption or absorption (e.g., with powdered lime or kitty litter), or melting with a low-energy heat source (e.g., hair dryer or heat lamp).

- *Adsorbed or Permeated Contaminants*. In some cases, contaminant removal is not possible and the PPE, tools, instruments, or other equipment has to be discarded as additional hazardous waste. Care in selecting PPE and in applying contamination prevention and control measures, along with timely and appropriate decontamination measures, often prevents this situation.

- *Volatile Liquids*. Volatile liquid contaminants can be removed from protective clothing or equipment by evaporation followed by a water rinse. Evaporation of volatile liquids can be enhanced by using steam jets. With any evaporation or vaporization process, care must be taken to prevent worker inhalation of vaporized chemicals.

Decontamination Using Solutions, Chemicals, and Other Materials. Physical removal of chemical or radiological contamination or both should always be followed by washing or rinsing. Steam (for equipment) or hot water with detergent is the preferred decontamination method. In some cases, it may be necessary to use a special solution or combination of solutions to decontaminate thoroughly. The site safety and health officer (SSHO) consults with health physicists, chemists, or toxicologists, or all three, for selection of the safest and most effective decontamination solutions for the specific contaminants. Cleaning solutions normally use one or more of the following methods:

- *Dissolving contaminants*. Chemical removal of surface contaminants can be accomplished by dissolving them in a solvent. The solvent must be chemically compatible with the equipment being cleaned. This is particularly important when decontaminating protective clothing constructed of organic materials that could be damaged or dissolved by organic solvents. Care must be taken in selecting, using, and disposing of any organic solvents that may be flammable or potentially toxic. Organic solvents include alcohol, ethers, ketones, aromatics, straight-chain alkanes, and common petroleum products. Halogenated solvents generally are incompatible with PPE and are toxic. They should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.

- *Surfactants*. Surfactants augment physical cleaning methods by reducing adhesion forces between contaminants and the surface being cleaned, and by preventing redeposition of the contaminants. Household detergents are among the most common surfactants. Some detergents can be used with organic solvents to improve the dissolving and dispersal of contaminants into the solvent.

- *Solidification*. Solidifying liquid or gel contaminants can enhance their physical removal. The mechanisms of solidification are (1) moisture removal through the use of adsorbents such as ground clay or powdered lime, (2) chemical reactions via polymerization catalysts and chemical reagents, and (3) freezing using ice water.

- *Rinsing*. Rinsing removes contaminants through dilution, physical attraction, and solubilization. Multiple rinses with clean solutions remove more contaminants than a single rinse with the same volume of solution. Continuous rinsing with large volumes of clean solutions will remove even more contaminants than multiple rinsings with a lesser total volume.

- *Disinfection/Sterilization*. Chemical disinfectants are a practical means of inactivating infectious agents. Standard sterilization techniques are generally impractical for large equipment and for PPE. For this reason, disposable PPE is recommended for use with infectious agents.

The SSHO consults with industrial health and safety chemists or toxicologists or both for selection of the safest and most effective decontamination solutions for the specific contaminants. Selection is influenced by health and safety hazards posed by the decontamination method, effectiveness of the decontamination method, ease of implementation, availability, and cost.

TESTING FOR DECONTAMINATION EFFECTIVENESS

The effectiveness of any decontamination method must be assessed at the beginning of a project and periodically throughout the conduct of the project. If contaminants are not being removed or are penetrating protective clothing, the decontamination program must be revised. Methods useful in assessing the effectiveness of decontamination include the following:

Visual Observation. Visual observation involves use of natural light and ultraviolet light. In natural light, discolorations, stains, corrosive effects, visible dirt, or alterations in clothing fabric may indicate that contaminants have not been removed. In ultraviolet light, certain contaminants (e.g., polycyclic aromatic hydrocarbons, which are common in many refined oils and solvent wastes) fluoresce and can be detected visually. Ultraviolet light can be used to observe contamination of skin, clothing, and equipment. A qualified health professional should be consulted prior to the use of this technique, since certain areas of the skin may fluoresce naturally and introduce uncertainty into the test. Also, use of ultraviolet light can increase the risk of skin cancer and eye damage.

Wipe Sampling. Wipe sampling involves swiping a dry or wet cloth, glass fiber filter paper, or swab over the surface of a potentially contaminated object and performing a laboratory analysis. Both the inner and outer surfaces of protective clothing should be tested to check for permeation. Skin can also be tested using this method.

Cleaning Solution Analysis. Analysis of contaminants left in cleaning (or final rinse) solutions may indicate that additional cleaning and rinsing are necessary.

Permeation Testing. Testing for the presence of permeated chemical contaminants requires that pieces of the protective garments be sent to a laboratory for analysis.

LOCATION AND CONFIGURATION OF DECONTAMINATION AREA

Decontamination for hazardous waste activities is conducted in the contamination reduction corridor (CRC) within a well-defined contamination reduction zone (CRZ) or radiological buffer area. The CRC is analogous to the entryway and decontamination passageway established for a radiologically controlled area, and the design concepts used are the same (see Chapter 7). Decontamination equipment, processes, and procedures vary, as do contamination reduction zones and corridors, depending on the presence of specific hazards and the size and complexity of the worksite and project. Modifications to the location and configuration of the decontamination area may be required to accommodate changing conditions (e.g., wind) at the worksite.

Location and Size of CRZ/C

The location and size of the Contamination Reduction Zone/Corridor (CRZ/C) for most DOE hazardous waste activities projects depends on the amount of space available at the worksite, the use of large equipment, the number of stations necessary for the decontamination procedure, and the overall dimensions of the work zones. For some activities, wind direction is an important consideration in selecting the best location and layout for the CRZ/C (i.e., they remain upwind of the contaminated areas of the worksite).

The number of decontamination stations and the sequence of steps to be followed during decontamination constitute the decontamination line and are clearly defined in the HASP. The proper selection and donning of PPE is of particular importance in preventing worker contamination during the decontamination process. Procedures for properly donning and doffing protective clothing are implemented before workers enter controlled areas. These procedures are detailed in the HASP, thereby preventing worker contamination and facilitating the safe decontamination of PPE as workers go through the decontamination process. For radiological decontamination, use of two step-off pads may be recommended (see the *Draft DOE Radiological Control Technical Standard*).

The following aspects should be considered in establishing the configuration of the CRZ/C:

- Outer, more heavily contaminated items (e.g., outer boots and gloves) should be decontaminated first, followed by decontamination and removal of inner, less contaminated items (e.g., jackets and pants);
- Each procedure should be performed at a separate station to prevent cross contamination;
- Stations should be physically separate and should be arranged in order of decreasing contamination, preferably in a straight line;
- Separate flow patterns and stations should be provided to isolate workers from different contamination zones containing incompatible wastes;
- Dressing stations for entry to the CRZ should be separate from redressing areas for exit from the CRZ; and
- Workers should always pass through doffing stations for respiratory protective equipment only after their garments are removed to maximize respiratory protection while decontaminating.

A worker who has inhaled **harmful levels of** chemical contaminants should be removed from the area and receive emergency medical treatment while he or she awaits treatment by a physician. If the contaminant is on the skin or in the eyes, immediate measures should be taken to remove and counteract its effects. First-aid treatment usually involves flooding the affected area with clean water for at least 15 minutes. For a few chemicals, however, water may cause more serious problems. The HASP should anticipate and contain procedures for dealing with such possibilities.

EMERGENCY DECONTAMINATION PROCEDURES

The multidisciplinary team plans for both routine and emergency decontamination and documents the plans in the HASP. To prevent the possibility of decontamination causing serious health effects or aggravating existing illnesses or injuries, methods are to be established for decontaminating workers with medical problems or injuries. When protective clothing is grossly contaminated, it is possible that contaminants can be transferred to either emergency medical personnel or the wearer. Unless severe medical problems have occurred simultaneously with gross contamination events, PPE is quickly washed off and carefully removed.

Lifesaving Care

Lifesaving care is to be instituted immediately without considering decontamination. Difficulty in breathing, cardiac arrest, arrhythmias, heatstroke, and severe bleeding must be treated as quickly as possible. In addressing life-threatening circumstances, the following actions are to be considered:

- Outer garments and PPE may be removed depending on injury, weather conditions, delays, interference with treatment, or aggravation of the problem. Respirators and backpack assemblies should be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away.
- If removal of contaminated garments will cause further injury, the individual should be wrapped in plastic, rubber, or blankets to prevent contamination of medical personnel and equipment. Contaminated garments should be removed at a medical facility, and carefully handled and contained to prevent or minimize cross-contamination.
- No attempt should be made to wash or rinse the victim at the worksite unless the individual is known to be contaminated with an extremely toxic or corrosive material that could cause further severe injury or loss of life. For minor medical problems or injuries, normal decontamination procedures are to be followed.

IDENTIFICATION OF DECONTAMINATION HAZARDS

Decontamination of PPE reduces exposures and protects worker health and safety. However, physical and chemical decontamination methods may themselves be hazardous. Methods that permeate, degrade, damage, or reduce PPE effectiveness are to be avoided. PPE, sampling instruments, tools, and other equipment are usually decontaminated by scrubbing with solutions of detergent and water, using soft-bristle brushes, followed by rinsing with water. Though this process may not remove all contaminants completely (or in a few cases, contaminants may react with water), it is safer than using harsh chemicals.

Potential decontamination hazards include, but are not limited to, the following:

- Incompatibility between decontaminating agents and contaminants;
- Incompatibility between decontaminating agents and clothing or equipment being decontaminated;
- Potential effects of inclement weather (e.g., using wet procedures during cold weather can cause both operational and maintenance problems);
- Potential effects of hazards on worker health and safety (e.g., vapors from chemical decontamination solutions may be hazardous on inhalation or contact with skin, or may be flammable); and
- Generation of airborne contaminants from improper use of equipment (e.g., jet sprayers, vacuum cleaners).

PROTECTION OF DECONTAMINATION WORKERS

For many operations, workers are assigned to assist in conducting decontamination of workers wearing Level A or B PPE during the decontamination process. Decontamination workers stationed at the front end of the decontamination line may require more protection from chemical and radiological contaminants than decontamination workers assigned to the latter stages of decontamination.

> Job, task, and hazard analysis is conducted and hazards associated with the decontamination process identified to determine appropriate types of PPE for decontamination workers. This information is incorporated in the HASP, the radiological work permit, or the safe work permit or plan.

In some cases, decontamination workers wear the same level of PPE as workers entering the radiologically controlled area or exclusion zone. In others, decontamination workers are sufficiently protected by wearing a lower level of PPE. Level D is not acceptable in the CRZ for decontamination line personnel. All decontamination workers must themselves be decontaminated before entering the support zone. Appropriate equipment and clothing for protecting decontamination workers are planned for by the multidisciplinary team, which includes workers and health professionals.

DISPOSAL METHODS

Before other operations begin, all materials used in the decontamination of workers and equipment are decontaminated and properly disposed of. Materials used for decontamination are regarded as hazardous, radioactive, or mixed waste until surveyed and released. Buckets, brushes, clothing, tools, and other contaminated equipment are collected and labeled appropriately. Yellow plastic wrapping material is used for packaging radioactively contaminated material. Yellow plastic sheets or bags are ***not*** to be used for nonradiological purposes. Care must be taken to avoid placing waste streams of incompatible contaminants together in the same container and to emphasize waste minimization methods whenever possible.

EQUIPMENT DECONTAMINATION

Although avoiding contamination is preferred, some equipment used in remedial actions or sampling becomes contaminated. These items are either properly decontaminated before being removed from the site or, in the case of drilling tools, thoroughly cleaned before the next use. Disposable plastic tarpaulins can be used to minimize the need for subsequent cleaning. Particular care must be given to such elements as tracks, tires, shovels, grapples, and scoops that come into direct contact with contaminants.

> The duration of and methodology selected for decontamination are determined by a thorough inspection of equipment, supplemented by frisking or a wipe test. All equipment parts are thoroughly cleaned. Air filters are to be considered highly contaminated, removed, and replaced before the equipment leaves the worksite. Porous items (e.g., wooden truck beds, cloth hoses, wooden handles) usually cannot be thoroughly cleaned and must be discarded.

Decontamination of vehicles and large pieces of equipment (e.g., pumps) is typically conducted on a wash-pad constructed so that cleaning solutions and wash-water are recycled or collected for later disposal. Similarly, equipment being dry-brushed or vacuumed with specially filtered vacuums is placed on a nonporous pad to facilitate containment and waste collection. Decontamination starts with the simplest methods likely to be effective (e.g., a general wet spraying to remove most of the contamination followed by scrubbing more difficult areas). By following procedures such as these, workers are able to minimize unnecessary contact with contaminated equipment.

Steam-cleaning and pressure-spraying using water mixed with a general-purpose, low-sudsing soap or detergent to improve wetting are the preferred methods for wet decontamination. Scrubbing with disposable or easily decontaminated brushes may be necessary to loosen materials. In most instances, hot water is more effective than cold. Flushing should be done under high pressure, taking care not to damage dials, gauges, wires, or hoses. Power-spraying is often more effective for such items as shovels, loaders, and scoops. Dry removal of contaminants can be accomplished through brushing, vacuum cleaning, vacuum blasting, and

sandblasting. Vacuum cleaning with high-efficiency filtered units mounted over 55-gallon recovery drums provides the best control mechanism for fugitive emissions.

Recommended equipment for decontamination of (1) personnel, (2) PPE, (3) heavy equipment, and (4) vehicles is identified in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*.

SANITATION

The concepts of sanitation and decontamination are sometimes confused. Sanitation is the promotion of general public health by controlling sewage, protecting the cleanliness of drinking water, and promoting personal hygiene. Decontamination involves eliminating or deactivating either radiological or nonradiological contaminants and preventing the migration of hazardous constituents outside the worksite boundaries.

Many hazardous waste activity worksites are temporary and are established at remote locations with limited sanitation facilities. For jobs lasting 6 months or longer, showers and two-stage change-rooms are provided in accordance with 29 CFR 1910.141 (d). These, of course, are designed to accommodate both genders, as necessary.

Access to emergency showers and eyewashes is part of the site-specific emergency response and medical first-aid programs, and is unrelated to sanitation or decontamination. Requirements for the availability and location of emergency showers and eyewashes are specified under 29 CFR 1910.151.

Decontamination is conducted either in the contamination reduction zone or the radiological buffer zone at the worksite, whereas sanitation functions are performed either in the support zone or outside the boundaries of the hazardous waste activities worksite after decontamination has been completed.

The HAZWOPER Standard requires employers to make certain that when showers are a necessary step in the decontamination process, "their employees shower at the end of their work shift and when leaving the hazardous waste site." Sanitation-related showers (unlike decontamination showers) are understood to be voluntary. Decontamination and emergency showers must be located close to the worksite. Sanitary showers may be located at some distance from the worksite.

WASTE MINIMIZATION

Although waste minimization is not explicitly part of the range of activities addressed in the HAZWOPER Standard, it nevertheless represents a management practice that supports worker and equipment decontamination. Waste minimization practices decrease project costs (through reduced storage and transportation requirements), reduce worker exposures, and decrease the overall infrastructure required for decontamination. In addition, DOE is committed to minimizing waste generated within DOE operations. This includes hazardous waste operations.

8.3 REFERENCES

10 CFR 71, "Packaging Radioactive Materials for Transport"

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response"

29 CFR 1910.141, "Sanitation"

29 CFR 1910.151, "Medical Services and First Aid"

40 CFR 243, 260-267, "EPA Guidelines for Solid Waste Storage and Collection"

40 CFR 761, "EPA Regulations on PCBs"

49 CFR 100-179 and 397, "DOT Hazardous Materials Regulations"

DOE O 231.1, "Environment, Safety, and Health Reporting"

DOE O 460.1, "Packaging and Transportation Safety" -- CHANGE 001

DOE O 460.2, "Departmental Materials Transportation and Packaging Management" -- CHANGE 001

DOE 5400.1, "General Environmental Protection Program"

DOE 5480.3, "Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes" [except for portions canceled by DOE O 231.1]

DOE 5820.2A, "Radioactive Waste Management"

DOE SEN-37-92, "Waste Minimization Crosscut Plan Implementation"

DOE-STD-1098-96, *Draft DOE Radiological Control Technical Standard*

NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*

NINE

MEDICAL SURVEILLANCE PROGRAMS

9.1 BACKGROUND

Both the Occupational Safety and Health Administration (OSHA) and the Department of Energy (DOE) require that hazardous waste workers be included in a medical surveillance program that meets the requirements of 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (the HAZWOPER Standard), and 29 CFR 1926.65. Depending on the hazards at the worksite, other medical surveillance requirements specified by OSHA; by DOE O 440.1; and by guidance provided in the *Draft DOE Contractor Occupational Medical Program Implementation Guide for Use with DOE O 440.1* and the *Draft DOE Radiological Control Technical Standard* may apply. Although a medical surveillance program is often limited to interaction between the occupational health physician and site workers, the complexity of hazards and requirements at HAZWOPER sites dictates use of a multidisciplinary team approach involving senior management, occupational health physicians and nurses, site workers, supervisors, and health and safety professionals to establish an effective medical surveillance program. The following discussion provides worksite and project managers with information related to the scope of medical surveillance programs for HAZWOPER activities, as well as the roles and responsibilities of the parties and disciplines involved. Substantive details on the technical content of the medical surveillance program are provided in documents listed in Section 9.10, "References."

9.2 PURPOSE

The ultimate purpose of any medical surveillance program is to protect worker health. Given the limitations of industrial hygiene monitoring data and the many hazards involved in hazardous waste activities, medical surveillance data may provide the only indication that worker exposure to toxic substances has occurred. Medical monitoring and surveillance programs enable occupational health professionals to (1) identify adverse health effects caused by exposure to hazardous substances and conditions and (2) collaborate with site workers, industrial hygienists, safety professionals, and line management in efforts to prevent exposures and protect workers. These goals are accomplished through a coordinated pursuit of two objectives:

Medical surveillance programs are designed to accomplish the following goals:

- Demonstrate that workers are fit to perform their jobs safely and reliably;
- Provide ongoing assurance that access and hazard controls limit worker exposure; and
- Comply with DOE rules and requirements and OSHA regulations adopted by DOE.

- Detection of preexisting diseases or medical conditions that place employees performing certain tasks at increased risk; and
- Control of individual workplace exposures in a manner that minimizes adverse health effects.

9.3 ROLES AND RESPONSIBILITIES

Site or project management, the occupational health physician, health and safety personnel, workers, and the radiological control organization are all involved in the multidisciplinary team approach to implementation of an effective medical surveillance program. Management is responsible for verifying that medical surveillance activities are included in project planning, budgeting a level of resources commensurate with the needs of the program, and responding to the concerns of the occupational health physician, the workers, and the health and safety staff.

Although OSHA standards and DOE and DOE-adopted rules and requirements establish the elements of a medical surveillance program, the occupational health physician is responsible for determining the content of medical surveillance examinations. The health and safety staff is responsible for providing all exposure monitoring data and other technical support needed by the physician to implement the program properly, and the radiological control organization is responsible for providing worker external and internal radiation exposure measurements and other technical support that may be necessary.

9.4 PROGRAM DESIGN AND REQUIREMENTS

Medical surveillance programs range from support contracts with local hospitals or physicians to full-scale onsite occupational health organizations that include physicians, nurses, and technicians who are employed by prime contractors. The option selected depends on the size of the project, the nature of the hazards involved, the capabilities of local facilities, and the resources available. Regardless of the option selected, worker occupational health records are to be provided to the site's occupational health physician, thereby facilitating the availability of, and access to, adequate medical care in the event of an emergency. Provisions that are consistent with Privacy Act requirements should be made to retain these records after completion of project activities.

A comprehensive medical surveillance program should be designed and implemented by an experienced occupational health physician or a qualified occupational health examiner with input provided by workers and industrial hygiene, health physics, and safety professionals. Examinations and procedures for all occupational medical monitoring are performed by or under the direction of a physician experienced in managing occupational health services.

OSHA regulations mandate that, unless a specific occupational safety and health standard provides a different time period, the employer must:

- Maintain and preserve medical records on exposed workers for 30 years after they leave employment;
- Make available to workers, their authorized representatives, and authorized OSHA representatives the results of medical testing and full medical records and analyses; and
- Maintain records of occupational injuries and illnesses and post an annual summary report.

General guidance for designing medical surveillance programs is found in the HAZWOPER Standard, and medical surveillance requirements for several specific substances are provided in 29 CFR Part 1910, "Occupational Safety and Health Standards," Subpart Z, "Toxic and Hazardous Substances." Whenever multiple standards affect worker health and safety, the more protective requirements must be followed. These determinations should be made by knowledgeable health and safety professionals. Occupational health physicians providing medical surveillance support for HAZWOPER sites are to be provided with copies of DOE O 440.1 and the HAZWOPER Standard.

An outline of the medical surveillance program, as approved by the occupational health staff, is incorporated in, or appended to, the site-specific health and safety plan (HASP). Modifications to the program should be based on the professional judgment of the occupational health physician, in consultation with the health and safety professionals, and on the hazards of the specific worksite.

At Oak Ridge Reservation, the management and operating (M&O) contractor has developed a 1-page form (see Figure 9-1) to document physical requirements, working conditions, required protective equipment, and special qualifications for all positions being filled by new employees or through job transfers. This effective mechanism is used to keep the medical department apprised of changing job hazards.

Changing working conditions that require modifications to medical surveillance activities can be communicated to the medical department by a supervisor through the health and safety organization and the personnel department, where records are maintained. DOE O 440.1 requires that occupational medical personnel "...coordinate with other safety and health professionals (industrial hygienists, health physicists, safety specialists/managers) to identify work-related or worksite hazards and their possible health risks to employees..." This should include regular visits to worksites and facilities by occupational medical physicians and selected medical staff to familiarize themselves with tasks and actual or potential hazards. Contractor management should require participation by medical personnel in "new materials and process review committees, safety committees, and other health-related meetings."

Existing respiratory protection or hearing conservation programs can be referenced and integrated, as appropriate, into the site-specific medical surveillance program after worksite hazards have been considered.

At some DOE sites, workers are provided a fitness-for-duty card indicating current medical status and the medical surveillance programs in which they participate.

The medical surveillance program must be reviewed regularly to ensure effectiveness. At least annually, the site safety and health officer (SSHO), in close cooperation with the occupational medical physician and the health and safety professional, should:

- Ascertain that each accident or illness was investigated promptly to determine the cause and make necessary changes in health and safety procedures;
- Evaluate specific medical testing to determine potential site exposures;
- Add or eliminate medical tests as indicated by current industrial hygiene and environmental data;
- Review potential exposures and the HASP to determine if additional testing is required;
- Review emergency treatment procedures and update list of emergency contacts; and
- Ensure timely employee access to records upon their request.

9.5 WORKERS INCLUDED IN MEDICAL SURVEILLANCE PROGRAM

The HAZWOPER Standard and related DOE rules and requirements stipulate that employees involved in any of the following activities and who have a reasonable possibility of exposure to hazardous substances or health hazards at specified levels (see 1910.120 [f][2] must be included in a medical surveillance program:

- Voluntary cleanup operations, or those required by DOE or the Resource Conservation and Recovery Act (RCRA), or as otherwise defined by the HAZWOPER Standard;
- Treatment, storage, and disposal (TSD) operations, as defined by the HAZWOPER Standard;

PHYSICAL REQUIREMENTS AND WORKING CONDITIONS

UCN-16960
(6P 6-94)

(Attach job description if applicable)
(To be completed by the Supervisor and routed to the Site Staffing Office)

DATE

APPLICANT NAME	REQUISITION NO.	JOB TITLE: REQUISITIONED OR FUNCTIONAL	PAYROLL ☐ H ☐ M ☐ W
REQUISITIONING DIVISION NAME AND NO.		SITE LOCATION ☐ K-25 ☐ ORNL ☐ Y-12 ☐ PAD ☐ PORTS	

FOR EMPLOYEE TRANSFERS (To be completed by Site Staffing Office)

EMPLOYEE'S CURRENT JOB TITLE	DIVISION NAME AND NUMBER	BADGE NUMBER

EMPLOYEE'S CURRENT SITE LOCATION ☐ K-25 ☐ ORNL ☐ Y-12 ☐ PAD ☐ PORTS

PHYSICAL REQUIREMENTS	EF*	C*	F*	O*	N*	WORKING CONDITIONS	EF*	C*	F*	O*	N*
STANDING						EXTREME COLD					
WALKING						EXTREME HEAT					
SITTING						FREQUENT TEMPERATURE CHANGES					
LIFTING - MAX. WT.						HIGH HUMIDITY/DAMPNESS					
CARRYING - MAX. WT.						VERY DRY					
PUSHING - MAX. WT.						BAROMETRIC CHANGES					
PULLING - MAX. WT.						CONFINED SPACES					
CLIMBING						CONFINED SPACES (CRAMPED QTRS.)					
BALANCING						HEIGHTS					
STOOPING						NOISE - OVER 80 dB					
KNEELING						VIBRATION					
CROUCHING						MECHANICAL HAZARDS					
JUMPING						MOVING OBJECTS					
RUNNING						EXPOSURE TO BURNS					
TWISTING						EXPLOSIVES					
THROWING						OPERATE VEHICLE - HIGHWAY					
RAPID WORKING SPEED						OPERATE VEHICLE - CO. PROPERTY					
CRAWLING						WORKING WITH PEOPLE					
REACHING, HIGH, LOW, LEVEL						WORKING ALONE					
FINGER MOVEMENT						SOLVENTS					
SENSE OF TOUCH						FUMES					
SPEAKING CLEARLY						DUSTS					
HEARING - CONVERSATION						MISTS					
HEARING - HIGH ACUITY						GASES					
SEEING - NEAR						CHEMICALS (LIST)					
SEEING - FAR											
DEPTH PERCEPTION						OTHER (INDICATE)					
COLOR VISION											
OTHER						SPECIAL CERTIFICATION/QUALIFICATION	EF*	C*	F*	O*	N*
PROTECTIVE EQUIPMENT	EF*	C*	F*	O*	N*	ASBESTOS WORKER					
EYE PROTECTION						DOT DRIVER					
HEARING PROTECTION						LEAD WORKER					
HEAD COVERING						REACTOR OPERATOR					
ARMS, HANDS, FINGERS						SECURITY PERSONNEL					
LEGS, FEET, TOES						RESPIRATOR WEARER					
FULL BODY PROTECTION						HAZARDOUS MATERIAL WORKER					
SKIN PROTECTION						CARCINOGEN					
OTHER (INDICATE)						MOBILE EQUIPMENT OPERATOR					
						OTHER (INDICATE)					
KNOWN ALLERGENIC MTLS.	EF*	C*	F*	O*	N*						

CHECK 1 FOR EACH OF THE ABOVE: C* = CONSTANTLY F* = FREQUENTLY O* = OCCASIONALLY N* = NOT APPLICABLE

AFFIRMATIVE ACTION CONSIDERATIONS FOR DISABLED APPLICANT

EF* = ESSENTIAL FUNCTIONS: THE BASIC DUTIES THAT AN EMPLOYEE MUST BE ABLE TO PERFORM UNAIDED OR WITH THE ASSISTANCE OF REASONABLE ACCOMMODATION. INDICATE WHICH ESSENTIAL FUNCTIONS COULD BE ACCOMMODATED.

COMPLETED BY (NAME)	MAILING ADDRESS	TELEPHONE NO.

Figure 9-1. Example Physical Requirements and Working Conditions Document

- Operations at hazardous waste activities worksites for which use of a respirator due to potential radiological (as specified by Article 532 of the *Draft DOE Radiological Control Technical Standard*) or nonradiological exposure is recommended or required.

- Operations resulting in potential exposure to a regulated chemical or radiological agent, as prescribed by DOE and OSHA action levels, or to a blood-borne pathogen;

- Operations requiring use of a respirator for 30 days or more per year or resulting in an exposure that may be at or above an OSHA permissible exposure limit (PEL), or if there is no PEL, above the published exposure levels (whether or not a respirator is worn) (see an exception discussed in 29 CFR 1910.120[f][2]); and

- Hazardous waste or emergency response activities resulting in injury, illness, or signs or symptoms of possible overexposure to hazardous substances or health hazards from those activities.

The following employees must also be included in a medical surveillance program:

- Individuals who respond to emergencies involving hazardous wastes, including hazardous materials (HAZMAT) team members; and

- Any employee who exhibits signs or symptoms that may be the result of exposure to a hazardous substance.

9.6 FREQUENCY AND CONTENT OF MEDICAL EXAMINATIONS

Before commencing work, all employees required to participate in a medical surveillance program for hazardous waste activities must undergo a baseline examination (based on specific hazards identified during the preliminary hazard assessment). Periodic followups are required at the discretion of the attending physician.

Based on the professional judgment of the occupational health professional, more frequent examinations may be required when a worker changes jobs or tasks. DOE O 440.1 requires that a method be established for informing the medical department whenever an employee's position or duties change. To facilitate this process, a representative of the medical staff should be invited to attend management and worker briefings or meetings and must participate as a member of a worker protection team.

> Medical surveillance may need to address much more than the basic requirements in the HAZWOPER Standard. Based on the presence of such hazards as lead, asbestos, and carcinogens, special types of surveillance are required. The occupational health physician responsible for the medical surveillance program should work with the rest of the medical surveillance team to determine which forms of surveillance are applicable for activities at each worksite.

Medical examinations and consultations must be provided to the employee without cost, without loss of pay, and at a reasonable time and place. The content of the examination or consultation is determined by the occupational health professional, based on information provided by the health and safety staff. As indicated in Table 9-1, employees performing onsite hazardous waste operations or entering an exclusion zone or contamination reduction zone at a hazardous waste site are required to receive specific medical examinations at designated intervals.

9.7 INTERNAL DOSIMETRY PROGRAMS

Potential exposure to radiological hazards is a concern at nearly all DOE sites. Internal dosimetry programs are an integral part of the medical surveillance program, although this type of exposure data is not collected by occupational health physicians. This section summarizes internal dosimetry program requirements prescribed by 10 CFR 835 and the recommendations for implementation of those requirements in the 10 CFR 835

Implementation Guides and the *Draft DOE Radiological Control Technical Standard* as they relate to the HAZWOPER Standard.

Table 9-1. Required Medical Examinations for Hazardous Waste Activities Workers

TYPE OF EXAMINATION	WHEN CONDUCTED
Baseline	Before commencing duties at worksite.
Periodic	At least annually or biannually, as determined by the attending physician.*
Symptomatic or emergency	When exposure-related injury or illness occurs; or when exposure-related symptoms are observed.
Professional recommendation	Based on necessity, as determined by an occupational health professional.
Termination	At termination of employment; or on reassignment to an area where medical surveillance is not required.

*Applies when workers have 30 or more days of exposure above PELs or 30 days of respirator use.

10 CFR 835 and Article 521 of the *Draft DOE Radiological Control Technical Standard* refer to the requirement that the following individuals participate in an internal dosimetry or medical surveillance program or both:

- Radiological workers who are likely to receive intakes resulting in a committed effective dose equivalent of 100 mrem or more per year;
- Declared pregnant workers likely to receive intakes resulting in a dose equivalent to the embryo or fetus of 50 mrem or more during the gestation period;
- Occupationally exposed minors likely to receive intakes resulting in a committed effective dose equivalent of 50% of the applicable limits in a year (see 10 CFR 835.402 [c][3]); and
- Members of the public likely to receive intakes resulting in a committed effective dose equivalent of 50 mrem or more per year.

The *Draft DOE Radiological Control Technical Standard* recommends worker participation in followup bioassay monitoring whenever routine bioassay results indicate an intake during the current year of 100 mrem or more committed effective dose equivalent. Personnel whose routine duties involve potential exposure to surface or airborne contamination from radionuclides readily absorbed through the skin (e.g., tritium) should also be considered for participation in the bioassay program. Individual participants should submit bioassay samples (e.g., urine or fecal samples) and report for bioassay

Interpretations of bioassay results and subsequent dose assessments should include the following:

- Characterization of the radionuclide(s) involved (e.g., chemical and physical form);
- Bioassay results and the individual's exposure history;
- Exposure information (e.g., route of intake, time, and duration of exposure);
- Biological models used for dosimetry or radionuclides;
- Models to estimate intake and deposition and to assess dose; and
- Interdepartmental coordination between the radiological control and medical organizations for doses that may require medical intervention.

monitoring (e.g., whole-body and lung counts) at times and locations specified by the bioassay program. Bioassay and dose assessment results (expressed in rem or mrem) should be promptly reported to each participant.

9.8 EMERGENCY TREATMENT

Both emergency and acute, nonemergency medical treatment should be available at the worksite. As stipulated by DOE O 440.1, the physician responsible for the delivery of medical services is also responsible for the medical portion of the overall site emergency and disaster plan. The plan must be integrated with the overall site plan and with the surrounding community emergency and disaster plan. In addition, input from and review by the occupational medicine physician and health and safety personnel are invaluable for developing the medical and emergency preparedness portions of the HASP.

The HASP is to include a list of all potential hazards and their locations, personnel responsibilities, and actions to be taken in the event of an emergency. Emergency medical treatment should be integrated into the overall site emergency response program. (See Chapter 10, "Emergency Preparedness and Response," for further information.) Individual worksite managers should contact the site emergency preparedness group to verify that all potential emergency responders and care providers understand the hazards of the worksite and can be relied on to provide services, as needed. The following guidelines for establishing an emergency treatment program should be documented or referenced in the HASP:

- Train a team of site personnel in emergency first aid;
- Train personnel in emergency decontamination procedures in coordination with the emergency response plan;
- Designate roles and responsibilities;
- Establish an emergency/first-aid station onsite;
- Arrange for a 24-hour oncall physician;
- Establish an oncall team of medical specialists for emergency consultations;
- Develop a protocol for handling thermal stress and other potential health disorders;
- Make plans in advance for emergency transportation to and treatment at a nearby medical facility;
- Post names, numbers, addresses, and procedures for contacting oncall physicians, medical specialists, ambulance services, medical facilities, poison control, and fire and police services;
- Provide maps and directions to the nearest medical facility;
- Establish a radio communication system for emergency use; and
- Review emergency procedures daily with all site personnel at safety meetings before beginning the work shift.

Nonemergency medical care should be arranged for hazardous waste site personnel who are experiencing health effects resulting from an exposure to hazardous substances. Offsite medical care should ensure that any potential job-related symptoms or illnesses are evaluated in the context of the employee's exposure. Offsite medical personnel should investigate and treat non-job-related illnesses that may put the employee at risk because of task requirements.

9.9 APPLICATION OF MEDICAL SURVEILLANCE PROGRAM TO ACTIVITIES OUTSIDE HAZWOPER

For activities beyond those explicitly addressed by the HAZWOPER Standard and for activities where more than one regulation is relevant, it is DOE's policy to apply the regulation that is more protective of worker health and safety **and** to incorporate appropriate provisions into the medical surveillance program. Figure 9-2 is an example of how the medical monitoring requirements of the OSHA Lead Standard are integrated into the existing medical monitoring program using the HASP as the vehicle.

What regulations apply?
29 CFR 1910.1025, "Occupational Exposure to Lead in General Industry," and 29 CFR 1926.62, "Occupational Exposure to Lead in Construction."

Who is to be enrolled?
Construction jobs are often of short duration and, without sufficient protection, workers could be exposed to high concentrations of airborne lead during the period between sampling and receipt of the results. For these reasons, OSHA requires that the decision to enroll a worker in a special medical program addressing potential lead exposure depends on whether the worker is engaged in an OSHA-listed task—not on measured airborne exposure levels, which is the usual approach.

OSHA has established a hierarchy of three lists of tasks, the performance of which, in the presence of lead, triggers basic protective provisions before airborne lead monitoring. All three sets of tasks mandate initial medical surveillance consisting of blood sampling and analysis. The Construction Industry Lead Standard requires blood-sample analysis for any construction worker who is exposed to an airborne lead level greater the 30 $\mu g/m^3$, as an 8-hour time-weighted average for any single day in any period of 12 consecutive months. The General Industry Lead Standard imposes medical program requirements when an employee has the potential to be exposed above an action level for more than 30 days. OSHA's three sets of tasks differ mainly in the level of respiratory protection required for workers occupationally exposed to lead.

What are the requirements?
Workers engaged in any of the listed tasks require initial medical surveillance consisting of blood sampling and analysis. Protective measures (including graduated levels of respiratory protection and personal protective equipment (PPE) tied to the task grouping, change areas, hand-washing facilities, and training) must be provided to workers performing any of the listed tasks. It is not necessary to collect new monitoring data each time, since OSHA's analysis of previously collected exposure data already indicates that high exposure levels may be expected when these tasks are performed. Biological samples collected must be analyzed by an OSHA-approved laboratory, and results must have an accuracy of +/−15 percent or +/−6 micrograms per deciliter (µg/dl) blood.

What happens if biological monitoring results exceed the benchmark?
Medical removal and medical removal benefits must be provided under certain conditions. The General Industry Lead Standard and the Construction Industry Lead Standard contain slightly different provisions requiring the medical removal of an overexposed employee. The General Industry Lead Standard requires removal based on the average results of three blood tests in excess of 50 µg/dl. The Construction Industry Lead Standard, however, stipulates two triggers for medical removal. Medical removal is indicated if the employee is exposed at or above the airborne action level and in the event of either of the following: (1) if a periodic and followup blood-sampling test equals or exceeds 50 µg/dl, or (2) if a medical finding or opinion documents that the employee has a detected medical condition placing the employee's health at increased risk from exposure to lead. Close communication between the worksite project manager, health and safety professionals, the medical department, and the affected employee is particularly important in these situations.

What are medical removal benefits?
Provisions for medical removal benefits are a common element of many OSHA standards. The employer must maintain the employee's total normal earnings, seniority, and other rights and benefits to which he or she is entitled, including the right to resume his or her former job status, as stipulated by law. The employer may provide medical removal benefits on the condition that the employee participate in followup medical surveillance. According to both the Construction Industry Lead Standard and the General Industry Lead Standard, medical removal benefits must be provided by the employer.

Figure 9-2. Model Medical Surveillance Program Elements for Potential Exposure to Inorganic Lead During D&D

9.10 REFERENCES

29 CFR 1910 Subpart I, "Personal Protective Equipment"

29 CFR 1910.1025, "Occupational Exposure to Lead in General Industry"

29 CFR 1910.1030, "Bloodborne Pathogens"

29 CFR 1926, "Safety and Health Regulations for Construction"

29 CFR 1926.62, "Occupational Exposure to Lead in Construction"

DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"

DOE-STD-1098-96, *Draft DOE Radiological Control Technical Standard*

The Americans with Disabilities Act (ADA)(PL 101-336)

The National Defense Authorization Act of 1993 (PL 102-484), Section 3162

The Rehabilitation Act of 1973

Draft DOE Contractor Occupational Medical Program Implementation Guide for Use with DOE O 440.1

TEN

EMERGENCY PREPAREDNESS AND RESPONSE

10.1 BACKGROUND

The requirements specified in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response" (the HAZWOPER Standard), have challenged Department of Energy (DOE) sites to incorporate specific Occupational Safety and Health Administration (OSHA) emergency response program requirements into the existing DOE emergency management programs. HAZWOPER establishes minimum worker protection requirements for those employees involved in hazardous waste operations and emergency response. This chapter provides managers at DOE sites with summary guidance on emergency response requirements for compliance with the HAZWOPER Standard, other related regulations, and DOE policy. This chapter is based on the *DOE Emergency Management Guide*, specifically, the chapter on HAZWOPER emergency response requirements.

29 CFR 1910.120 (a)–(q) applies to employers who have employees engaged in, among other activities, emergency response to releases, or potential releases, of hazardous substances, regardless of location, "unless the employer can demonstrate that the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety or health hazards."

29 CFR 1910.120 (q) applies to organizations that respond to emergencies caused by the uncontrolled release of hazardous wastes or substances. Sites where emergency response operations take place, and that do not fall into any of the other categories listed in paragraphs (a)(1)(i) through (a)(1)(iv), must comply only with the requirements of paragraph (q) of HAZWOPER. In contrast, sites that have the possibility for hazardous waste activities under paragraphs (a)(1)(i) through (a)(1)(iv) must comply with multiple paragraphs of HAZWOPER.

To determine whether employees are required to be in compliance with the emergency response provisions of HAZWOPER (29 CFR 1910.120 [q]), the employer examines the functions of the employee to determine if the employee will be assigned a role or function as part of a response to a release of hazardous substances without regard to location. More directly, employees are not allowed to participate in any emergency response activity unless they are in compliance with the requirements of 29 CFR 1910.120 (q) (e.g., responders to the scene would be covered, but operators such as truck drivers are not covered unless they become actively involved in the response action).

Entire sites that do not establish their own emergency response capabilities and elect to evacuate all employees are required to develop an emergency action plan (EAP) in accordance with 29 CFR 1910.38, which is essentially an evacuation plan. Such sites should prepare and implement a memorandum of understanding (MOU) or memorandum of agreement (MOA) with the local fire department or hazardous materials (HAZMAT) response team to define the role of offsite responders, to address the need for offsite resources to support pre-incident planning, and to provide for the availability of adequate offsite response capabilities in an emergency.

Federal property management rules require facilities leased from the General Services Administration to prepare occupant emergency plans describing facility evacuation procedures and designating lead evacuation personnel for any emergency (e.g., fires, hazardous material spills, natural disasters).

10.2 EMERGENCIES AND EMERGENCY RESPONDERS

DOE's national emergency management system provides a framework for development, coordination, and direction of planning, preparedness, and readiness assurance activities for DOE field elements. HAZWOPER provides greater specificity in various areas of DOE's emergency management system. HAZWOPER is intended to provide for employee protection during initial site characterization and analysis, monitoring activities, materials handling activities, training, and emergency response. Nevertheless, the purposes of these programs are similar; both support planning for and mitigation of the impact of hazardous materials emergencies.

Under the HAZWOPER Standard, an "emergency" exists when a site experiences an occurrence that results in, or is likely to result in, an uncontrolled hazardous waste or substance release, causing a potential health or safety hazard that cannot be mitigated by personnel in the immediate work area where the release occurs. Trained responders from outside the immediate work area (which may include other site or facility response personnel, mutual aid groups, or the local fire department or HAZMAT team) are relied upon for response.

Under 29 CFR 1910.120 (a)(3), "Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel, are not considered to be emergency responses within the scope of (HAZWOPER)...responses to releases of hazardous substances where there is no potential health or safety hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses." Qualified personnel who are trained to clean up such incidental releases under the Hazard Communication Standard are not considered emergency responders (see Example 10-1).

A small quantity of sodium hypochlorite is spilled in a waste-water treatment process, and the maintenance engineer who is normally assigned to the immediate work area mops it up. This situation is not a HAZWOPER emergency. The engineer does not have to be trained to respond in accordance with HAZWOPER, although he would be expected to understand the hazards associated with sodium hypochlorite through hazard communication training and may need additional training under other standards. See also Example 2-1 in Chapter 2.

Example 10-1

Post-emergency response is defined under HAZWOPER as "that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and cleanup of the site has begun." Making this distinction is critical because, among other things, different training requirements and different exposure levels may apply depending on the phase of response. If post-emergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not post-emergency response (see Example 10-2).

A 55-gallon drum containing flammable liquid has been damaged during handling at a treatment, storage, and disposal (TSD) facility and is currently leaking its contents. A worker calls the DOE emergency response team, which then arrives to manage the spill. While the team is performing its duties, a truck arrives with collateral-duty responders and vacuum equipment to remove the spilled liquid. These collateral-duty workers and outside responders are considered to be part of the emergency response and must be trained accordingly (see Chapter 4). In contrast, if the emergency phase of the incident has been declared over, then the responders require training under other paragraphs of HAZWOPER (i.e., paragraphs [a]-[o]) under provisions established for post-emergency response activities.

Example 10-2

HAZWOPER mandates a more conservative threshold for emergency response (see Example 10-3) than an emergency defined in DOE O 151.1. A DOE site could experience a release requiring emergency response activities according to HAZWOPER without requiring declaration of an emergency under DOE Orders. DOE

> A release of chlorine gas above the immediately dangerous to life or health (IDLH) level and moving through a building is an emergency situation under HAZWOPER. This is unlike an incidental release since the IDLH level has been exceeded. However, depending on the circumstances, the release may not be sufficient to require the declaration of an emergency under DOE O 151.1. The DOE site manager needs to implement HAZWOPER and facility emergency response requirements.

Example 10-3

site personnel may be required to plan for and perform emergency response activities, thereby triggering compliance with HAZWOPER, in situations where the emergency management requirements of DOE Orders do not apply. Figure 10-1 depicts the relationship between hazard communication, HAZWOPER, and the DOE emergency management system. It illustrates DOE emergency management system terms in the context of the level of accident severity.

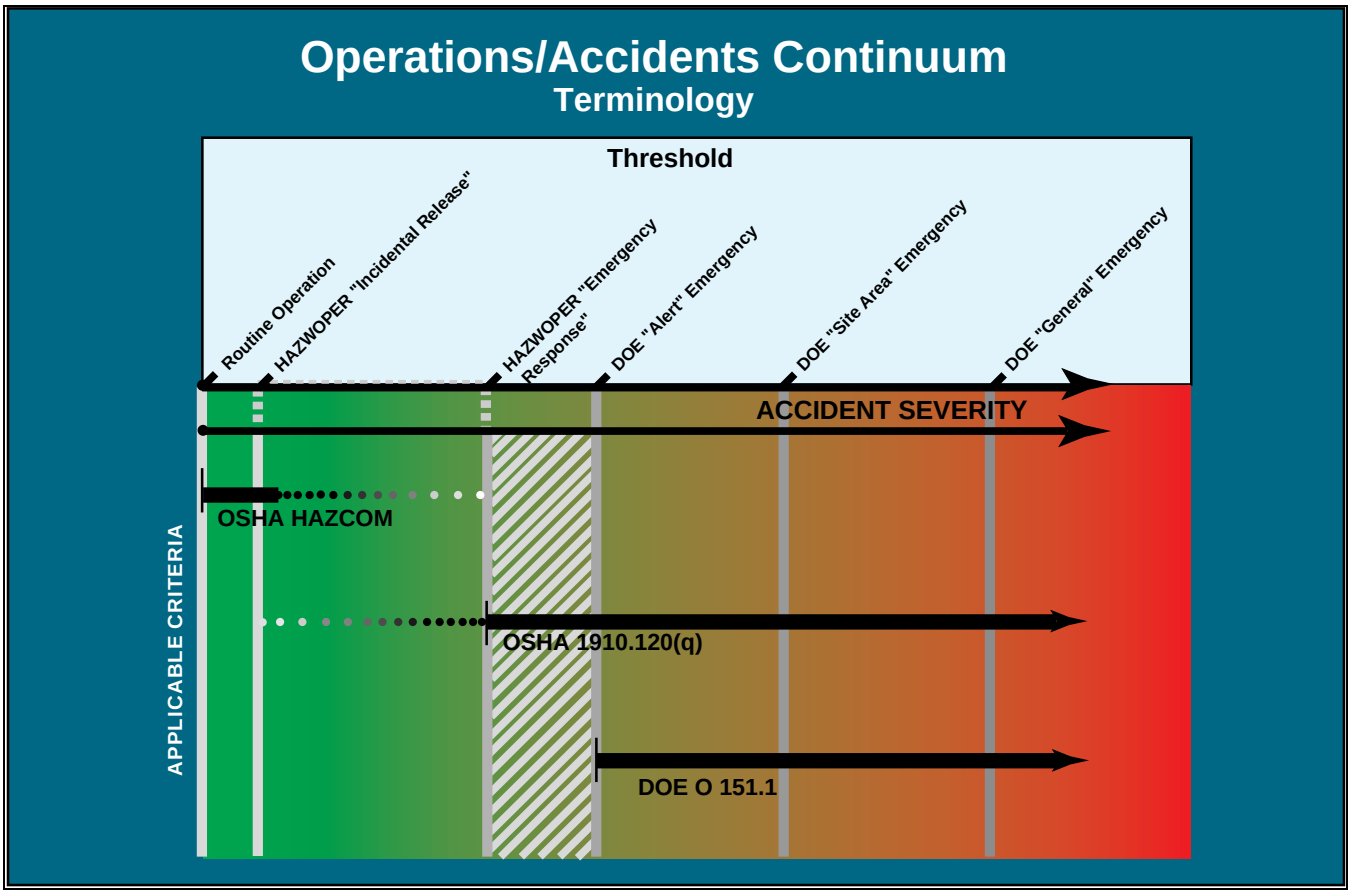

Figure 10-1. Relationship Between HAZWOPER and DOE's Emergency Management System

The OSHA instruction on HAZWOPER generally refers to emergency responders as "employees who respond to emergencies." This categorization includes "employees from outside the immediate release area or...other designated responders (e.g., mutual aid groups, local fire departments)" as well as "employees working in the immediate release area" to be designated as responders by the employer (see Example 10-4). For emergencies occurring at DOE sites, this definition may apply to members of the emergency response organization (ERO) responding to the emergency, certain other DOE personnel, and, potentially, public

Trained workers at the waste-water treatment facility on a DOE site are exchanging an empty 1-ton chlorine tank with a full one. A major leak occurs at the valve packing. The workers immediately evacuate the area and notify site authorities. In accordance with previously established procedures, the site emergency evacuation plan is activated, offsite emergency response forces are summoned and the incident command system initiated. In this scenario, the workers who had been exchanging the tank are not required to be trained as emergency responders under HAZWOPER. The offsite emergency response forces, however, require training and equipment in accordance with HAZWOPER and other applicable State or local criteria such as those promulgated by the National Fire Protection Association (NFPA).

Example 10-4

response personnel. All such individuals are to be covered by a HAZWOPER program. The requirements under HAZWOPER apply to onsite full-time, collateral, and offsite (e.g., public, volunteer) responders.

10.3 APPLICABILITY OF SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT

Title I of the Superfund Amendments and Reauthorization Act (SARA) required that regulations be issued to protect the health and safety of workers engaged in hazardous waste operations and emergency response. As a result of Executive Order 12196 (February 26, 1980), which required the Federal government to comply with Section 6 of OSHA, these standards apply to DOE. SARA Title I Section 126(f) requires the Environmental Protection Agency (EPA) to issue standards for public employees in non-OSHA-approved plan States. The rules adopted by OSHA (29 CFR 1910.120 and 29 CFR 1926.65) and EPA (40 CFR 311) are substantively identical. Twenty-seven States and the District of Columbia are non-OSHA-approved plan States. DOE employees and contractor personnel at DOE sites are required to comply with the HAZWOPER Standard. State and local government (and volunteer) responders in non-OSHA-approved plan States also comply with the same standard, as promulgated by EPA at 40 CFR 311. The federally-approved State OSHA plan indicates that occupational safety and health regulations apply to public-sector employees within these States.

Title III of SARA, known as the Emergency Planning and Community Right-To-Know Act (EPCRA), was a law enacted to improve State and local government capacity to respond to emergencies caused by accidental releases of extremely hazardous substances through enhanced emergency preparedness and to disseminate information to the public on hazardous chemicals made, used, or stored in their communities. It establishes requirements for industry regarding emergency planning and "community right-to-know" reporting on hazardous and toxic chemicals. This law builds on the EPA's Chemical Emergency Preparedness Program (CEEP). SARA Title III is intended to help communities access information and thus better deal with the presence of hazardous chemicals and releases of those chemicals into the environment. Through SARA, States and communities must work together with facilities to improve hazardous materials safety and protect public health. SARA has four major provisions or sections: emergency planning; emergency release notification; community right-to-know reporting requirements; and toxic chemical release inventory.

Emergency Planning (EPCRA Sections 301-303). SARA requires the governor of each State to designate a State emergency response commission (SERC). SERCs include public agencies related to the environment, natural resources, emergency services, public health, occupational safety, and transportation. The SERC must then have designated local emergency districts and an appointed local emergency planning committee (LEPC). The LEPC includes elected State and local officials; police; fire; civil defense and public health officials; and environmental, hospital, and transportation officials, as well as facility representatives. The LEPC requires the development of emergency response plans.

Emergency Release Notification (EPCRA Section 304). Facilities must notify the LEPC and consequently the SERC of any possible environmental release of specific chemicals. The specific chemicals referred to in SARA Title III are found on the Extremely Hazardous Substance List (40 CFR 355) and the Reportable Quantity List (the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Section 103 [a]). Emergency notification must include chemical name; identification of the chemical by list; estimation of quantity

released; time and duration of release; mode of release (air, water, or soil); known health risks associated with the emergency; applicable precaution; and name and phone number of a contact person. All emergency notifications require a written followup as soon as possible.

Community Right-To-Know Reporting Requirements (EPCRA Sections 311-312). According to EPCRA, facilities must provide either a material safety data sheet (MSDS) or a list of MSDS chemicals to the SERC, LEPC, and local fire department. If facilities choose to supply only a list, the list must include specific information including health hazards, fire hazards, reactivity hazards, and physical data for every chemical on the list. Furthermore, facilities must complete an emergency and hazardous chemical inventory. This inventory is to be submitted to the LEPC, SERC, and local fire department.

Toxic Chemical Release Inventory (EPCRA Section 313). The EPA has established an inventory of routine toxic chemicals which require emissions reporting. Facilities subject to Section 313 are required to submit a toxic chemical release inventory form or "Form R" for specified chemicals, which is completed on an annual basis and is submitted by July 1. Form R notifies public and governmental agencies about routine releases (releases that occur as a result of daily production use) and applies to facilities of 10 or more employees with standard industrial classification (SIC) codes 20 through 39 that manufacture, process, or otherwise use a toxic chemical in excess of specified threshold quantities.

The community HAZMAT emergency response plan can be a valuable source of information in developing site-specific emergency response plans and emergency action plans as required by HAZWOPER. This applies particularly to the need for coordination by DOE sites with offsite response personnel and agencies (e.g., mutual aid agreements and public alert mechanisms). EPA has provided guidance to communities and fire departments for identifying, acquiring, and maintaining HAZMAT response equipment and trained personnel appropriate for their locale.

10.4 EMERGENCY RESPONSE PROGRAM ELEMENTS

There are five emergency response program areas for which HAZWOPER provides more detailed guidance than do DOE Orders or the current *DOE Emergency Management Guide*; these program areas include documents, emergency response organization, emergency equipment and personal protective equipment (PPE), training, and medical surveillance. Hazard evaluation (the identification and assessment of hazards at the site) serves as the foundation for developing a HAZWOPER program, including emergency response program elements.

HAZARD EVALUATION

In complying with HAZWOPER, DOE sites should consider the full range of potential emergency situations based on all existing hazards, including hazards that may have been eliminated from analysis by screening criteria or thresholds in the *DOE Emergency Management Guide*, "Guidance on Hazard Assessments (HAG)." This document describes the identification of chemical hazards as the first step in the hazard assessment process and discusses screening levels and thresholds to eliminate the need to analyze insignificant hazards. The HAZWOPER Standard requires employers to determine the potential for an "emergency" and develop response procedures accordingly.

DOE does not expect that the comprehensive assessment process in the HAG will be necessary for hazards that were below the HAG screening criteria; however, sites will need to analyze these lower level hazards to ensure that site emergency planning addresses all situations that could necessitate an emergency response under HAZWOPER. There are various well-established methods for identifying and evaluating such hazards, each requiring different levels of site resources and personnel expertise. The most common methods, their applicability to specific hazardous operations, and the results they produce, are described in detail in the Center for Chemical Process Safety's *Guidelines for Hazard Evaluation Procedures*.

DOCUMENTS

There is considerable overlap between HAZWOPER and DOE O 151.1, "Comprehensive Emergency Management System," concerning required emergency plan documentation and planning elements. As a result, many of the HAZWOPER components are already an integral part of a DOE site's emergency management system. Note that the following specific terminology may not apply to DOE sites but the planning elements generally do.

Emergency Action Plan (EAP). An EAP is essentially an evacuation plan. DOE sites that intend to evacuate their employees from the danger area (and not allow any employees to participate in response operations), when a release requiring emergency response occurs, are required by OSHA to have an EAP, prior to commencement of operations, with the elements specified by 29 CFR 1910.38 (a) as shown below:

- Emergency escape procedures and emergency escape route assignments;
- Procedures to be followed by employees remaining to operate critical plant operations before they evacuate;
- Procedures to account for all employees after emergency evacuation has been completed;
- Rescue and medical duties for those who are to perform them;
- Preferred means of reporting fires and other emergencies;
- Names or regular job titles of persons or departments who can be contacted for additional information or explanation of duties under the plan; and
- Pre-incident planning, coordination, and notification procedures with outside parties as required by 29 CFR 1910.120.

Emergency Response Plan (ERP). An OSHA ERP is a written plan to prepare for and handle anticipated emergencies prior to commencement of hazardous waste operations or emergency response operations. If DOE facility employees are expected to respond to spills or releases that require an emergency response, OSHA requires the development of an ERP containing the elements outlined in 29 CFR 1910.120 (q)(2) and (l)(3)(iv) as shown below:

- Pre-incident planning and coordination with outside parties (e.g., local emergency response community);
- Pre-emergency planning prior to operation;
- Personnel roles, lines of authority, training, and communication;
- Emergency recognition, identification, and prevention;
- Safe distances and places of refuge;
- Site security and control;
- Evacuation routes and procedures;
- Decontamination;
- Emergency medical treatment and first aid;
- Emergency alerting and response procedures;
- Critique of response and followup;

- PPE and emergency equipment; and
- Conduct of periodic drills.

EMERGENCY RESPONSE ORGANIZATION

Development of procedures for handling emergency response, incident command protocols, and safety practices at the scene of a HAZMAT emergency is addressed in 29 CFR 1910.120 (q)(3). DOE Orders do not specifically address some of the requirements for on-scene emergency response included in the HAZWOPER Standard; the following emergency response organizational issues, while not specified in detail in DOE Orders, should be addressed:

- Coordination and control of emergency responder communications;
- Specific responsibilities with regard to use of engineering controls, hazardous substance handling procedures, and use of new technologies;
- Self-contained breathing apparatus (SCBA) use requirements;
- On-scene response, safety practice requirements, and safety official responsibilities;
- Incident commander role, such as implementing decontamination procedures;
- On-scene safety requirements for pre-briefings for personnel, instructions for wearing PPE and for response duties, and health and safety precautions for skilled support personnel; and
- Common terms (such as those proposed by the NFPA).

An incident command system (ICS) or incident management system (IMS) is an organized approach to effectively control and manage operations at an incident involving hazardous substances, regardless of size. Implementation of the ICS/IMS is required by the HAZWOPER Standard. An effective ICS/IMS will avoid confusion, improve safety, organize and coordinate actions, and facilitate effective management at the scene of an incident. The basic elements of an ICS and IMS include:

- Consolidated action plans;
- Modular organization;
- Incident commander;
- Unified command structure;
- Manageable span-of-control;
- Integrated communications;
- Pre-designated facilities; and
- Comprehensive resources management.

The individual in charge of the ICS/IMS (the incident commander) is the senior HAZMAT official responding to the incident. At DOE facilities, the on-scene incident commander should be designated as a key position within the emergency response organization reporting either to the facility emergency manager or site emergency director. The incident commander has full authority to carry out his or her responsibilities and priorities, which include protection of personnel, property, and the environment at the emergency scene. An ICS/IMS ensures that an incident commander is appointed and a system is established to address the practical aspects of on-scene response, responder safety, and return to normal operations.

When offsite emergency response groups are expected to provide primary or any backup support for a hazardous material emergency at a DOE facility, advance coordination with those groups regarding the ICS/IMS is needed. Site and offsite emergency response plans and procedures for on-scene incident response and command should be coordinated to make certain that it is understood who will be the individual in charge of on-scene incident response. At DOE facilities with limited onsite response resources, incident command may be assumed by an offsite response organization representative. Sites with trained and equipped responders will typically provide the on-scene incident commander with mutual aid responders reporting to this individual.

EMERGENCY EQUIPMENT AND PERSONAL PROTECTIVE EQUIPMENT

HAZWOPER requirements for PPE are more specific than the requirements in DOE Orders; however, there is no conflict between DOE and OSHA requirements. NFPA Standards 471 and 472 also provide additional guidance for PPE use. Areas of guidance in the HAZWOPER Standard not specified in DOE Orders include:

- **SCBA Use In Emergency Response.** 29 CFR 1910.120 (q)(3)(iv) requires that a positive-pressure SCBA be used "while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposure to employees." If the incident commander is limited in his or her ability to monitor and characterize the site (e.g., identify hazards), then positive-pressure SCBA is to be used.

- **Approved Cylinders.** Per 29 CFR 1910.120 (q)(3)(x), "approved SCBAs may be used with approved cylinders from other approved SCBAs provided such cylinders are of the same capacity and pressure rating."

- **Chemical Protective Clothing and Equipment.** Information gathered at the site characterization stage of an emergency response operation influences all other aspects of the response (e.g., delineation of contamination zones). Based on characterization of the emergency site, the incident commander is responsible for implementing appropriate emergency response operations and making certain that appropriate PPE is used, recognizing that turnout gear is not appropriate for chemical exposure emergencies.

  In a fire or thermal energy hazard, PPE worn by responders must meet, at a minimum, the criteria in 29 CFR 1910.156 (e), "Fire Brigade Standard," requiring turnout gear. In conditions where skin absorption of a hazardous substance may result in substantial possibility of immediate death, serious illness, or injury or impaired ability to escape, totally encapsulated chemical protective suits must be used.

  The incident commander should rely on visual observation of placards, labels, and manifests, as well as information from the plant. Obtaining air measurements with monitoring equipment for toxic concentrations of vapors, particulates, explosive potential, and the possibility of radiation exposure is important for determining the nature, degree, and extent of the hazards.

TRAINING

HAZWOPER training requirements for emergency responders are generally more specific than requirements found in DOE Orders; however, there is generally no conflict between DOE and HAZWOPER requirements. A specific discussion of the HAZWOPER requirements for emergency responders is included in Chapter 4, "Training," of this Handbook.

MEDICAL SURVEILLANCE

In the medical surveillance area, there is no conflict between the HAZWOPER Standard and DOE Orders; however, HAZWOPER presents more specific requirements with regard to medical surveillance of emergency response team members and provision by the physician of a written medical report to the individual. As cited in the OSHA instruction, if response activities involve infectious materials, the site is to comply with 29 CFR 1910.120 (q), and may also have to comply with 29 CFR 1910.1030, "Bloodborne Pathogens." If there is a conflict or overlap, the provision that is more protective of employee health and safety applies (see also NFPA Standard 1500, as appropriate).

Additional areas of guidance not specified in DOE Orders include medical surveillance of and consultation for emergency responders and emergency medical treatment, transport, and first aid.

Medical Surveillance of and Consultation for Emergency Responders. Members of a HAZMAT team are to receive baseline physical examinations to certify their physical ability to perform assigned duties, including the ability to work within the confines of PPE. They should be provided with medical surveillance annually and after a hazardous substance exposure. It is expected that participation as a HAZMAT emergency responder will be contingent on participation in a medical surveillance program. The employer is to furnish the employee with a copy of the physician's written opinion indicating medical results and whether the employee is capable of working with hazardous substances.

Any emergency response employee who exhibits signs or symptoms that may have resulted from exposure to hazardous substances during an emergency incident is to receive medical consultation. The responder's employer is to provide to the physician a description of the employee's duties as they relate to the individual's exposure, the responder's exposure level, a description of any PPE used, and information from previous medical examinations of the employee that is not readily available to the examining physician.

The responder is to be furnished a copy of a written opinion from the attending physician, including the physician's opinion on any detected medical conditions that would place the employee at increased risk, the physician's recommended limitations on the employee's assigned work, and the results of the medical examination and tests.

EMERGENCY MEDICAL TREATMENT, TRANSPORT, AND FIRST AID

As provided in the *DOE Emergency Management Guide*, "Guidance on Emergency Medical Support," site emergency response organizations should "develop and maintain MOAs or MOUs with local medical centers for treatment beyond site capability for injured, contaminated, or irradiated personnel." Facilities are expected to coordinate with hospitals or other medical care providers prior to emergencies in case victims need emergency transportation or decontamination services.

10.5 COMPARISON OF DOE ORDERS TO THE HAZWOPER STANDARD AND TO THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT

Appendix A of the *DOE Emergency Management Guide*, "Draft Guidance for HAZWOPER Emergency Response Requirements," presents a comprehensive "crosswalk" between DOE Emergency Management Orders and 29 CFR 1910.120. This comparison indicates differences and similarities between the DOE and OSHA approaches to regulating emergency management. DOE Orders are intended to institute a complex-wide emergency management system that is applied consistently from the facility and site level up through DOE Headquarters. HAZWOPER protects employees in the facility and those who enter the facility to respond to an emergency. The reader is referred to the aforementioned appendix for details of this comparison.

Similarly, Appendix B to the *DOE Emergency Management Guide*, "Draft Guidance for HAZWOPER Emergency Response Requirements," presents a "crosswalk" between DOE Emergency Management Orders and SARA Title III, also referred to as EPCRA. This comparison indicates differences and similarities between DOE and EPCRA emergency response methods and procedures. DOE Orders are intended to institute a complex-wide emergency management system applied consistently from the facility and site level up through DOE Headquarters. EPCRA protects public emergency responders and the community at large.

EPCRA requires States and local jurisdictions to develop emergency response plans. In addition, facilities, including DOE facilities, are to share information about the hazardous materials they have onsite with the community, usually provided by MSDSs. EPCRA directs the appointment of LEPCs. LEPCs are to develop a community emergency response plan that contains methods and procedures to be followed by facility owners, local emergency responders, and emergency medical personnel. Facilities, in turn, provide information to LEPCs that is necessary for developing and implementing these emergency plans. The reader is referred to the aforementioned Appendix B for details of this comparison.

10.6 EMERGENCY RESPONSE SELF-ASSESSMENT GUIDELINES

Emergency response self-assessment guidelines have been developed as an appendix to this Handbook to facilitate self-assessment to determine how well a facility or site has implemented the emergency response provisions of HAZWOPER. The guidance is consistent with the EPA's National Response Team (NRT) Integrated Contingency Plan (the "one" plan). The guidelines cover five major topics:

- Pre-assessment planning;
- Self-assessment training;
- Administrative requirements;
- Conducting the self-assessment; and
- Post-assessment activities.

> Performing an emergency response self-assessment is one of the best tools for strengthening a facility's or site's emergency response program. The *HAZWOPER Emergency Response Self-Assessment* guidelines developed as an appendix to this Handbook provide detailed procedures and checklists to facilitate self-assessment.

PRE-ASSESSMENT PLANNING

Pre-assessment planning includes:

- **Determining applicable regulations** using the decision tree included in the guidelines, and obtaining copies of all emergency response plans and procedures.
- **Contacting the facility or site,** including all organizations who have emergency response responsibilities, and planning and scheduling the self-assessment. Request a point of contact to represent management, and identify the technical resources needed to complete the self-assessment.
- **Contacting all outside organizations,** including regulatory agencies, who play a role in emergency response for the facility or site.
- **Developing a self-assessment management plan** to include major milestones and completion dates.

SELF-ASSESSMENT TRAINING

Training for the self-assessment team members is an important element and critical for a successful outcome of a self-assessment. Training should include the regulatory basis for the self-assessment; organization and roles and responsibilities; the information-gathering techniques to be used; and proper questioning and listening techniques.

ADMINISTRATIVE REQUIREMENTS

Administrative requirements include developing schedules correlating with management plan milestones and completion dates; conducting briefings for management and affected staff; and determining and managing potential impacts to facility or site schedules.

CONDUCTING THE SELF-ASSESSMENT

A two-step process is followed to complete a self-assessment:

- **Perform a regulatory crosswalk** so that the self-assessment team becomes thoroughly familiar with the regulations that affect the facility or site.

- **Use checklists to perform the self-assessment.** The emergency response self-assessment guidelines contain checklists that are used to determine compliance with regulations. Detailed documentation of all interviews, discussions, observations, and activities should be maintained. All information should be verified to ensure its accuracy and validity.

POST-ASSESSMENT ACTIVITIES

At the conclusion of the self-assessment, a report should be drafted that details the purpose and scope of the self-assessment; the participants; the schedule of activities; a list of needed improvements; and emergency response program strengths. Before the report is finalized, a review copy of the draft report should be provided to all key facility or site representatives who participated in the self-assessment. The facility or site should develop and commit to a corrective action plan.

10.7 REFERENCES

29 CFR 1910.38, "Employee Emergency Plans and Fire Protection Plans"

29 CFR 1910.1030, "Bloodborne Pathogens"

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response"

29 CFR 1910.156 (e), "Fire Brigade Standard"

40 CFR 311, "Worker Protection"

40 CFR 355, "Emergency Planning and Notification"

44 CFR 351, "Radiological Emergency Planning and Preparedness"

60 FR 33310, "Centers for Disease Control and Prevention (CDC) Recommendations for Civil Communities Near Chemical Weapons Depots: Guidelines for Medical Preparedness"

DOE G-420.1/B-O, "Implementation Guide for Use with DOE Orders 420.1 and 440.1, Fire Safety Program"

DOE O 151.1, "Comprehensive Emergency Management System"

DOE O 420.1, "Facility Safety"

DOE O 440.1, "Worker Protection Management for DOE Federal and Contractor Employees"

Environmental Protection Agency, *HAZMAT Team Planning Guidance*, EPA/540/G-90/003

Environmental Protection Agency, "The National Response Team's Integrated Contingency Plan Guidance," 61 FR 28642

"Guidance on DOE Emergency Exercise Evaluation Criteria," *Emergency Management Guide*, December 11, 1993

"Guidance on Drills and Exercises," *Emergency Management Guide*, December 11, 1991

"Guidance on Emergency Facilities and Equipment," *Emergency Management Guide*, August 16, 1993

"Guidance on Emergency Medical Support," *Emergency Management Guide*, June 26, 1992

"Guidance on Emergency Response Organization," *Emergency Management Guide*, August 16, 1993

"Guidance on Hazard Assessments," *Emergency Management Guide*, June 26, 1992

"Guidance for HAZWOPER Emergency Response Requirements," *Emergency Management Guide,* February 28, 1995

"Guidance on Standard Content and Format for Emergency Plans," *Emergency Management Guide*, December 11, 1991

Guidelines for Hazard Evaluation Procedures, Second Edition with Worked Examples. Center for Chemical Process Safety, American Institute of Chemical Engineers, 1992

HAZWOPER Interpretive Quips, Paragraph (q)—Emergency Response Operations, Occupational Safety and Health Administration

National Fire Protection Association Standard 471—1992, "Recommended Practice for Responding to Hazardous Materials Incidents"

National Fire Protection Association Standard 600, "Industrial Fire Brigades"

National Fire Protection Association Standard 1500, "Fire Department Occupational Health and Safety Program"

OSHA Instruction CPL 2-2.59: *Inspection Procedures for the Hazardous Waste Operations and Emergency Response Standard, 29 CFR 1910.120 (q)*