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DOE-STD-5503-94
December 1994

DOE STANDARD

EM HEALTH AND SAFETY PLAN GUIDELINES

U.S. Department of Energy
Washington, D.C. 20585

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act *(also known as Superfund)*
CFR	Code of Federal Regulations
CPR	Cardio Pulmonary Resuscitation
CRC	Contamination Reduction Corridor
CRZ	Contamination Reduction Zone
DHHS	Department of Health and Human Services
DOE	Department of Energy
DOT	Department of Transportation
EAP	Emergency Action Plan
EKG	Electrocardiogram
EPA	Environmental Protection Agency
ER	Environmental Restoration
ERP	Emergency Response Plan
HASP	Health and Safety Plan
HAZMAT	Hazardous Material
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
IDLH	Immediately Dangerous to Life or Health
LEL/LFL	Lower Explosive Limit/Lower Flammable Limit
M&O Contractor	Management and Operations Contractor
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration
NCP	National Oil and hazardous Substances Pollution Contingency Plan
NIEHS	National Institute of Environmental Health Sciences
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
OU	Operable Unit
PC	Protective Clothing
PEL	Permissible Exposure Limits
PPE	Personal Protection Equipment

RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limits
S&H Officer	Safety and Health Officer
SARA	Superfund Amendments and Reauthorization Act
SCBA	Self-Contained Breathing Apparatus
SSHO	Site Safety and Health Officer
SOP	Standard Operating Procedure
SOSG	Standard Operating Safety Guide
SSO	Site Safety Office
TLV	Threshold Limit Values
TLV-STEL	Threshold Limit Value-Short-Term Exposure Limit
TLV-TWA	Threshold Limit Value-Time-Weighted Average
TSD	Treatment, Storage and Disposal
UEL/UFL	Upper Explosive Limit/Upper Flammable Limit
USCG	United States Coast Guard

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INTRODUCTION

These guidelines have been developed by a working group consisting of both field and headquarters personnel to provide new direction to the EM-40 program in the preparation of site-specific Health and Safety Plans (HASPs). While based on the minimum requirements of 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER), and DOE orders, these guidelines have been developed with the express purpose of implementing a high quality safety and health program. These EM-40 HASP Guidelines are a "living document" to be modified and updated as new regulations and other requirements are issued. Guiding the development of this document has been the principle that an effective and high-quality HASP must provide:

- A clear chain of command for safety and health activities,
- Accountability for safety and health performance,
- Well defined headquarters expectations regarding safety and health,
- Well defined task and operational hazards/risks,
- Comprehensive hazard prevention and control methods, and
- Recordkeeping requirements to track program progress.

As this document was developed the working group applied the following assumptions:

- It is a generic document to be adapted on a site-by-site basis,
- An adequate site characterization and comprehensive workplan exists at each field site,
- Operations analysis and risk identification methods are adequate,
- A written site safety and health program exists as required in 29 CFR 1910.120 (b),
- Written site Standard Operating Procedures exist, and
- Site specific information is available.

Each chapter of these guidelines represents an element listed in 29 CFR 1910.120(b)(4)(ii) for a HASP. The first chapter, Regulatory Framework, provides direction on what should be included in a site-specific HASP. 29 CFR 1910.120(b)(4) has been issued as the minimum criteria, and starting point. In several instances this guidance goes beyond this requirement. In addition to the requirements of 29 CFR 1910.120(b)(4) the guidance is based on good industry practice, Environmental Protection Agency recommendations, specific DOE need (radiation protection), and DOE orders and directives. Chapters 2 through 14 provide guidance on how to meet the requirements specified in Chapter 1.

Each chapter provides detailed information on a particular component of a site-specific HASP. When utilizing this guidance to prepare site-specific HASPs, the preparer of the HASP should be able to provide appropriate documentation on how decisions were made relative to the relevant sections of the guidance. In some cases, the requirements of different sections overlap. The preparer of a site-specific HASP need not repeat overlapping information but should indicate by reference where the information is located.

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1.0. REGULATORY FRAMEWORK

1.1. BACKGROUND

In the 1986 amendments to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Congress tasked the Administrators of the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA), the Secretary of the Department of Transportation (DOT), and the Director of the National Institute for Occupational Safety and Health (NIOSH) to modify the National Contingency Plan (NCP) (40 CFR 300) to provide for protection of health and safety of employees involved in response actions. To satisfy this directive, standards requiring the development of a site-specific health and safety plan (HASP) were established by OSHA in 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER), and incorporated into the NCP (40 CFR 300.150). Additionally, the NCP requires compliance with standards and regulations of the *Occupational Safety and Health Act*, including such standards as *Construction Safety* (29 CFR 1926) and *General Industry Standards* (29 CFR 1910), where applicable. DOE Orders 5480.1B and 5483.1A require compliance with these standards.

This guidance document is intended to assist in the preparation of site-specific HASPs that will meet or exceed the requirements of 29 CFR 1910.120.

This chapter summarizes the regulatory framework upon which the site-specific HASPs for EM-40 facilities will be based. It is the intent of this chapter to provide clear, concise direction regarding compliance with 29 CFR 1910.120(b)(4)(ii) as applied to EM-40 facilities.

Some sections of this chapter describe techniques or modifications that are not specifically included in the HAZWOPER standard. EM-40 has adopted these additions, based on industry practice, perceived operational weaknesses, other occupational safety and health standards, or other considerations. If an existing HASP at any EM-40 site meets or exceeds the requirements of this chapter, no modifications to that HASP are necessary. Unless otherwise noted, the information requirements shall be included in at least one section and references made in other sections, as necessary.

1.2. SITE-SPECIFIC HASP REQUIREMENTS

1.2.1. Introduction

The site-specific HASP should include an introduction to the plan. The main purpose of the introduction is to describe the site the HASP will encompass and its applicability to operations. In developing this description the preparer should include:

- A brief description,
- Background information (e.g., site history, prior site activities),

- Known site contamination,
- Synopsis of site characterization, and
- Site operations to be performed.

While all of the following sections should be included in the HASP, a site may determine that a portion of a section does not apply (e.g., cold temperature extremes for a tropical climate). If a portion of a section is not applicable, it may not need to be addressed, but an explanation of non-applicability should be provided.

1.2.2. Key Personnel

The HAZWOPER standard does not require a listing of key personnel in the site-specific HASP. However, due to the importance of this list of individuals to the overall safety and health effort at a hazardous waste site, a listing of key personnel shall be included in the site-specific HASP for EM-40 sites. The DOE Project Manager, as well as key personnel, shall be identified at the DOE, contractor and subcontractor level.

It is an accepted practice that the number of key personnel shall be kept to a minimum. However, the key personnel responsibilities must be assigned and accounted for at any hazardous waste site. Both of these concerns may be accomplished, at the discretion of the Project Manager, by assigning one person to several positions.

At a minimum, the key personnel section to be included in the site-specific HASP shall identify the:

- Overall Project Manager,
- Site Safety and Health Officer (SSHO),
- Additional Safety and Health Personnel,
- Field Team Leader,
- Command Post Supervisor,
- Emergency Response Coordinator,
- Decontamination Station Officer,
- Security Officer, and
- Specialty Team Personnel.

More specific information regarding Key Personnel is contained in Chapter 2.

1.2.3. Hazard Assessment

The HAZWOPER standard does not give specific guidance as to the methodology to be used to meet the requirements of 29 CFR 1910.120(b)(4)(ii)(A). For the purpose of the EM-40 site-specific HASP the hazard assessment approach identified below shall be used.

Hazard assessment is a methodology used to identify inherent or potential hazards which may be encountered in the work environment associated with accomplishing a job. At a minimum, the hazard assessment shall include the following steps:

- Identification of an operation or job to be assessed,
- Break down of the job or operation,
- Identification of the hazards associated with each task, and
- Determination of the necessary controls for the hazards.

Other more detailed hazard assessment procedures are also acceptable. More specific information on the hazard assessment process is contained in Chapter 3.

1.2.4. Training

In 29 CFR 1910.120(e) different levels of training are required, depending on the task to be performed. Training for EM-40 employees and contractors at EM-40 hazardous waste sites exceeds these requirements, as specified by the EM memorandum in Appendix D.
The training program (40 hour offsite and 3 day onsite supervision), at a minimum, shall address:

- Key personnel responsible for site safety and health;
- Safety, health and other hazards present on site;
- Use of Personal Protective Equipment (PPE);
- Safe work practices and site Standard Operating Procedures (SOPs);
- Safe use of onsite engineering controls and equipment;
- Medical surveillance program requirements, including signs/symptoms of overexposure;
- Site decontamination procedures;
- Site emergency response/action plan;
- Confined space entry procedures; and
- Site spill containment program/procedures.

Management and supervisors, as identified in the Key Personnel section, will receive an additional 8 hours of training as specified in 29 CFR 1910.120(e)(4).

Additionally, 29 CFR 1910.120 (b)(4)(iii) specifies that a pre-entry briefing be given to each site worker, manager, supervisor and/or any other individual associated with the site. Documentation of these briefings shall be maintained at the site command post.

Additional information on training requirements is contained in Chapter 4 and Appendix C.

1.2.5. Personal Protective Equipment (PPE)

Careful selection and use of PPE is essential to protect the health and safety of workers. The purpose of PPE is to shield or isolate workers from the chemical, physical, radiological, and biological hazards that may be encountered at the site.

The PPE program contained in the site-specific HASP shall, at a minimum, address:

- PPE selection based on site hazards;
- PPE use and limitations;
- Work mission duration;
- Maintenance and storage;
- Decontamination and disposal;
- Training and proper fitting;
- Donning and doffing procedures;
- Inspection procedures prior to, during, and after use;
- Effectiveness evaluation procedures; and
- Limitations due to temperature extremes, and other appropriate medical and physical concerns.

Additional information on PPE is contained in Chapter 5.

1.2.6. Temperature Extremes

Limitations due to temperature extremes often result in the necessity to modify work schedules, work hours or otherwise reduce the time employees shall spend in chemically protective clothing. Chapter 6 is devoted to hazards relating to temperature extremes; it provides guidance on how to make these determinations and evaluate the potential for temperature related disorders or conditions. Chapter 7 provides guidance on medical surveillance procedures. The temperature extreme program, should, at a minimum address:

- Identification of potential hazards early in the planning phase of the development and operation of required contingency plans.
- Proper monitoring of worker physiology.
- Implementation of preventive measures and Standard Operating Procedures (SOPs) early in the operations so that sound worker practices are developed and followed.
- Proper initial training of workers to recognize the symptoms of temperature extreme related disorders or conditions in themselves and their fellow workers.
- Implementation of a "buddy system", and
- Proper acclimatization of all workers to new or changing work conditions.

Additional information on temperature extremes can be found in Chapter 6.

1.2.7. Medical Surveillance

Medical Surveillance of workers at hazardous waste sites is necessary to protect the health of the worker, establish fitness for duty, and ensure documentation of exposure to hazardous materials.

The elements of the medical surveillance program contained in the site-specific HASP shall, at a minimum, address:

- Employees covered by the program,
- Frequency of medical exams/consultations,
- Content of medical exams/consultations,
- Information provided to the physician,
- Physician's written opinion, and
- Recordkeeping requirements.

More specific information regarding medical surveillance is contained in Chapter 7.

1.2.8. Exposure Monitoring and Air Sampling

The monitoring component of the site-specific HASP shall be based on all chemical, physical and radiological hazards identified in the site characterization. At a minimum, it shall address:

- Sampling strategy and schedule for personal monitoring (breathing zone), air monitoring (level of protection) and environmental sampling (offsite migration),
- Instrumentation and equipment to be used,
- Calibration and maintenance of instruments and equipment, and
- QA/QC procedures and analytical methods.

More specific information on exposure monitoring and air sampling is contained in Chapter 8.

1.2.9. Site Control

The site control program is used to control movement of people and equipment in order to minimize worker exposure to hazardous substances.

The site control measures program contained in the site-specific HASP shall, at a minimum, include:

- Site map,
- Site work zones,
- Definition and use of the "buddy system",
- Site communication procedures, including emergency procedures,

- Safe work practices and/or SOPs, and
- Location of nearest medical assistance.

Additional information on site control is contained in Chapter 9.

1.2.10. Decontamination

29 CFR 1910.120(k) does not contain specific procedural development requirements in the area of decontamination. The working group has adopted the methodology presented in the U. S. Environmental Protection Agency (EPA) document titled "Standard Operating Safety Guide" (SOSG). The SOSG establishes the decontamination layout and required procedures based on the level of PPE used at the site.

The decontamination elements contained in the site-specific HASP shall, at a minimum, include:

- Training;
- Location and layout of decontamination stations and areas;
- Decontamination methods;
- Required decontamination equipment;
- SOPs to minimize worker contact with contaminants during decontamination;
- SOPs for decontamination line personnel; and
- Procedures for collection, storage and disposal of clothing, equipment and any other materials that have not been completely decontaminated.

Additional information on decontamination is contained in Chapter 10.

1.2.11. Emergency Response/Contingency Plan

The site management must develop and implement an Emergency Response Plan (ERP) in accordance with requirements of 29 CFR 1910.120(l), if the employees at an EM-40 site are expected to respond to emergencies at that site.

The ERP to be included in the site-specific HASP shall, at a minimum, address:

- Pre-emergency planning;
- Personnel roles, responsibilities, and lines of communication;
- Emergency recognition, preparedness drills, and follow-up procedures;
- Safe distances and places of refuge;
- Site security and control;
- Evacuation routes and procedures;
- Decontamination procedures that are not covered in the site-specific HASP;
- Emergency medical treatment and first aid;
- Emergency alerting and response procedures;

- Critique of response and prevention procedures;
- PPE and emergency equipment;
- Site topography and layout;
- Incident reporting procedures;
- List of local emergency response contacts; and
- Potential worst case weather by season.

Additional information regarding the ERP is contained in Chapter 11.

1.2.12. Emergency Action Plan

If employees are expected to evacuate the site and not participate in emergency response activities, the site must have an Emergency Action Plan (EAP) in accordance with requirements of 29 CFR 1910.38(a).

The EAP to be included in the site-specific HASP shall, at a minimum, address:

- Emergency escape procedures and route assignments;
- Procedures to be followed by personnel who stay behind to conduct critical operations before they evacuate;
- Procedures to account for all employees after evacuation;
- Rescue and medical duties for assigned personnel;
- Names and phone numbers of personnel and organizations to be contacted for further information;
- Description of the alarm procedures used to alert personnel of emergency and evacuation situations;
- EAP training requirements and methods to evaluate employee knowledge of the plan, and
- Procedures and frequency for rehearsal, review, and update of the plan.

Additional information regarding the Emergency Action Plan is contained in Chapter 12.

1.2.13. Confined Space Entry

The confined space entry procedures for the EM-40 HASP Guidelines are derived from 29 CFR 1910.146, *American National Standards Institute (ANSI) Recommendation Z117.1-1989,* and applicable DOE orders.

The confined space entry program portion of the site-specific HASP shall, at a minimum, address:

- Personnel duties and responsibilities;
- Identification, posting and evaluation of confined spaces on site;
- Hazard controls (engineering, administrative and PPE);

- Entry permit contents, requirements, and approval;
- Entry procedures;
- Lockout/tagout requirements and procedures;
- Additional safeguards and emergency procedures; and
- Training requirements.

Additional information regarding confined space entry is contained in Chapter 13.

1.2.14. Spill Containment

The spill containment program provides procedures to contain and isolate the entire volume of a hazardous substance spill and minimizes worker exposure to hazardous substance spills.

The spill containment program to be included in the site-specific HASP shall, at a minimum, address:

- Initial spill actions and response,
- Spill cleanup procedures,
- Organization of the response team, and
- Post-incident review and evaluation.

Additional information on spill containment is contained in Chapter 14.

1.3. REFERENCES

1. *U.S. EPA 1984 Standard Operating Safety Guides*. Office of Emergency and Remedial Response, Hazardous Response Support Division, Edison, N.J. November, 1984.

2. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

3. 29 CFR 1910.146, *Permit Required Confined Spaces.*

4. American National Standards Institute (ANSI) Recommendation Z117.1-1989, *Safety Requirements of Confined Spaces.*

5. 29 CFR 1910.38, *Employee Emergency Plans and Fire Prevention Plans.*

6. Whitfield, P., *EM-40 Hazardous Materials Training Program*, memorandum of February 3, 1994.

7. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, October 1985 (Four-Agency Document).

8. DOE Order 5480.1B, *Environment, Safety, and Health Program for Department of Energy Operations*.

9. DOE Order 5483.1A, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor Operated (GOCO) Facilities*.

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2.0. KEY PERSONNEL

2.1. BACKGROUND

This chapter provides guidance to assist in the preparation of the Key Personnel portion of the site-specific HASP. In this section, the HASP should:

- Identify an individual who has the authority to direct all activities;
- Identify the other personnel needed for the project and assign their general functions and responsibilities;
- Show lines of authority, responsibility, and means of contact; and
- Identify the interface with the response community.

2.2. ORGANIZATIONAL STRUCTURE

The HASP should specifically identify the names and organizational relationships among the DOE, contractor, and subcontractor key personnel, such as the Project Manager, Field Team Leader, and Site Safety and Health Officer (SSHO). Designated alternates for the key personnel, responsibilities, lines of authority, methods of communication, and an organizational structure should be identified. If specific key job responsibilities listed in this chapter are not needed, or more than one function is to be performed by a person, those responsibilities should be addressed in the HASP.

During the first stages of planning, an organizational structure that supports the overall objectives of the project should be developed. An explanation of the structure including the chain of command and overall responsibilities of supervisors and employees in carrying out the health and safety program should be included in the HASP. An organizational chart should be developed depicting the structure and identifying all key personnel and other onsite and offsite personnel (see Figure 2-1). The chart should be placed in a central location, and included in the HASP. At a minimum, the organizational chart should include the Project Manager, the SSHO, the Field Team Leader, the Command Post Supervisor, the Decontamination Station Officer(s), site security, and the specialty team. In addition, it is recommended that a list of DOE and contractor personnel and a list of offsite organizations (see Figure 2-2) to be contacted in the event of an emergency be included with the organizational chart.

As the project progresses, it may be necessary to modify some organizational aspects, such as personnel responsibilities and authorities, so that individual tasks can be performed as efficiently and safely as possible. Any changes to the overall organizational structure should be recorded in the appropriate sections of the HASP that are developed for individual phases or tasks. These specific changes should be communicated to all parties involved.

FIGURE 2-1

Example of a Health and Safety Plan (HASP) Organizational Structure

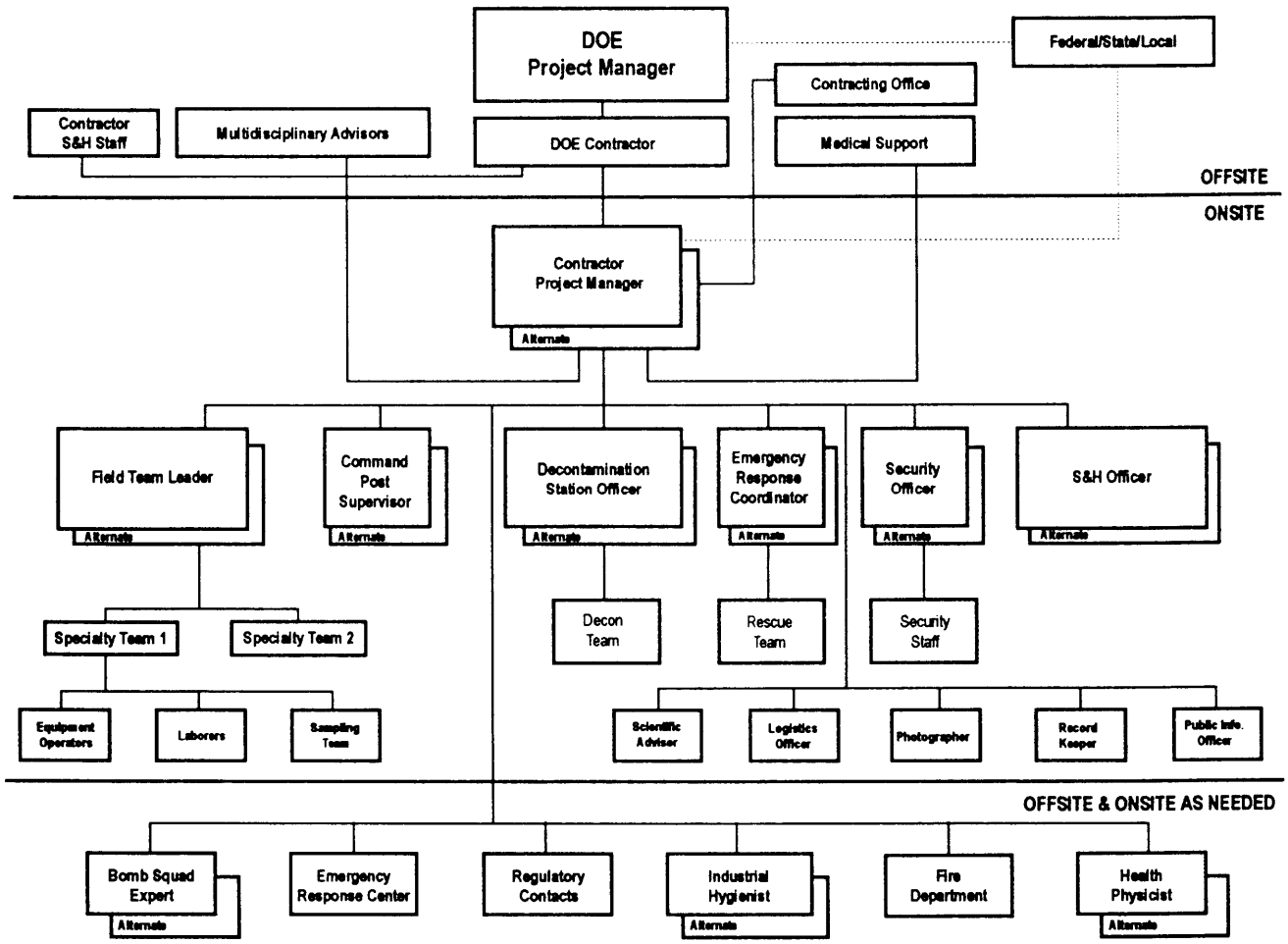

FIGURE 2-2

Emergency Contact Personnel Names and Phone Numbers
Example Chart

Organization	Contact	Telephone
Ambulance:		
Local Police:		
Fire:		
State Police:		
Hospital (Primary)		
Hospital (Secondary)		
Poison Control Center:		
Regional EPA:		
EPA Emergency Response Team:		908-321-6660
State Authority:		
National Response Center:		800-424-8802
Center for Disease Control:		404-488-4100
Chemtrec:		800-424-9555
Site Emergency Operations Center:		
DOE Emergency Operations Center (National Center):		202-896-8100

2.3. ONSITE ESSENTIAL PERSONNEL

2.3.1. Project Manager

The name and position of the individual who has the authority to direct all activities should be identified (i.e., Project Manager, Project Team Leader, or Site Supervisor). A designated alternate for this position should be identified by name. A general description including areas of responsibility (i.e., assumes total control over site activities, authority to direct response operations) should be provided for the Project Manager who should be considered an "onsite essential" person. The specific responsibilities of the Project Manager should be stated. These responsibilities should include, but are not limited to:

- Management of the project;
- Preparation of the work plan, preparation of the HASP, and designation of the field team;
- Designation of an individual within each project to act as the confined space coordinator;
- Identification of work-site confined spaces;
- Designation of an individual to act as the medical program administrator;
- Access permission for visitors, new hires, etc., and coordinates activities with appropriate officials;
- Confirmation of each team member's suitability for work based on employees training and physician's recommendation;
- Briefing field teams on their specific assignments;
- Coordination with the SSHO on safety and health requirements;
- Preparation of the final report and support files on the response activities;
- Liaison with public officials; and
- Maintenance of a daily site log.

2.3.2. Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) should be identified by name for each DOE, contractor, and subcontractor organization. A designated alternate for each SSHO should be identified by name. A DOE point of contact, if appropriate, should also be identified. A general description of duties, including lines of authority (i.e., stop work authority) should be provided. The SSHO should be an "onsite essential" person. The specific responsibilities of the SSHO should include, but are not limited to:

- Managing the safety and health program for the site;
- Periodically inspecting protective clothing and equipment;
- Monitoring and evaluating HASP implementation;
- Monitoring protective clothing and equipment to ensure that they are properly stored and maintained;
- Monitoring entry and exit to the exclusion zone;

- Verifying each team member's suitability for work based on employee's training and physician's recommendation;
- Monitoring the work parties for signs of stress, such as cold exposure, heat stress, and fatigue;
- Advising medical personnel of potential exposures and consequences;
- Participating in the preparation and implementation of the HASP;
- Conducting periodic inspections to verify if the HASP is being properly implemented;
- Verifying that the "buddy" system is being implemented;
- Knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department;
- Notifying local public emergency officials when necessary; and
- Coordinating emergency medical care.

2.3.3. Safety and Health Personnel

Names and responsibilities of other personnel that have safety and health duties should be listed. These should include, but are not limited to:

- Construction safety experts,
- Safety specialists/technicians,
- Health physicists, and
- Industrial Hygienists.

2.3.4. Field Team Leader

The individual who is responsible for field team operations and safety should be identified by name. In some cases, the Field Team Leader may also be the same person as the Project Manager and may be a member of the specialty team. A designated alternate for the should be identified by name. A DOE point of contact, if appropriate, should also be identified. A general description, including areas of responsibility (i.e., responsible for field team operations and safety) should be provided for the Field Team Leader, who should be considered an "onsite essential" person. The specific responsibilities of the Field Team Leader should be stated. These responsibilities include, but are not limited to:

- Managing field operations;
- Executing the work plan and schedule;
- Enforcing safety procedures;
- Coordinating with the SSHO in determining protection levels;
- Enforcing site control;
- Documenting field activities, including sample collection; and
- Serving as liaison with public officials where there is no Public Affairs official designated.

2.3.5. Command Post Supervisor

The individual who is responsible for communications and emergency assistance should be identified by name. In some cases, the Command Post Supervisor may be the same person as the Field Team Leader. A designated alternate should be identified by name. A DOE point of contact, if appropriate, should also be identified. A general description, including areas of responsibility (i.e., responsible for communications and emergency assistance) should be provided for the Command Post Supervisor, who should be considered an "onsite essential" person. The specific responsibilities of the Command Post Supervisor should be stated. These responsibilities should include, but are not limited to:

- Notifying emergency response personnel by telephone or radio in the event of an emergency;
- Assisting the SSHO in rescue operations, if necessary;
- Maintaining a log of communication and site activities;
- Assisting other field team members in the clean areas, as needed; and
- Maintaining line-of-sight and communication contact with the work parties via walkie-talkies, signal horns, or other means.

2.3.6. Emergency Response Coordinator

The individual who has the authority to direct, control, and evaluate site emergency response/emergency activities should be identified. A designated alternate should be identified by name. A DOE point of contact, if appropriate, should be identified. The Emergency Response Coordinator should be considered an "on-site essential" person. A general description including areas of authority and responsibilities should be provided. These responsibilities should include, but are not limited to:

- Developing, implementing, and updating the emergency response/emergency action plan;
- Conducting rehearsals, employee training, evaluations of responses/actions; and
- Assuring the evacuation, emergency treatment, emergency transport of site personnel and notifying emergency response units and the appropriate management staff.

2.3.7. Decontamination Station Officer

The individual who is responsible for decontamination procedures, equipment, and supplies should be identified by name. In some cases, the Decontamination Station Officer may be the same person as the Field Team Leader. A designated alternate should be identified by name. A DOE point of contact, if appropriate, should also be identified. A general description, including areas of responsibility (i.e., responsible for decontamination procedures, equipment, and supplies) should be provided for the Decontamination Station Officer, who should be considered an "onsite essential" person. The specific responsibilities of the Decontamination Station Officer should be stated. These responsibilities should include, but are not limited to, the following:

- Setting up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on site;
- Controlling the decontamination of all equipment, personnel, and samples from the contaminated areas;
- Assisting in the disposal of contaminated clothing and materials;
- Ensuring all required equipment is available and in working order; and
- Providing for collection, storage and disposal of waste.

2.3.8. Security Officer

The individual who is responsible for managing site security should be identified by name. A designated alternate and DOE point of contact, if appropriate, should be identified by name. A general description, including areas of responsibility (i.e., maintains site security) should be provided for the Security Officer, who should be considered an "onsite essential" person. Specific responsibilities of the Security Officer should be stated. These responsibilities should include, but are not limited to:

- Conducting routine area patrols,
- Controlling facility access and egress,
- Assisting with communication during an emergency,
- Securing accident/incident scenes, and
- Maintaining a log of site access and egress.

2.3.9. Specialty Teams

Specialty Teams, consisting of field team members (e.g., to include rescue teams for retrieving personnel from dangerous situations, and sampling teams for obtaining samples of potentially hazardous materials) who complete the onsite tasks required to fulfill the work plan, should be identified. A general description, including areas of responsibility and stopwork authority (i.e., any or all of the field team may be in the Specialty Team and should consist of at least two people) should be provided. Specialty Team personnel should be considered "onsite essential" personnel. Specific responsibilities of the Specialty Teams should be stated. These responsibilities should include, but are not limited to:

- Safely completing the onsite tasks required to fulfill the work plan,
- Complying with HASP, and
- Notifying the SSHO or supervisor of unsafe or potentially unsafe conditions.

2.4. OPTIONAL PERSONNEL (onsite or offsite as needed)

2.4.1. Industrial Hygienist

The employee who is trained to anticipate, recognize, evaluate and control environmental factors or stresses in the workplace, should be identified by name. A qualified and designated alternate for the Industrial Hygienist should be identified by name.

Specific responsibilities of the Industrial Hygienist should be provided. The responsibilities should include, but are not limited to:

- Conducting health hazard assessments,
- Providing advice on adequate health protection, and
- Conducting tests to determine worker exposures to hazardous substances.

2.4.2. Fire Fighters

The means of contacting the Fire Department should be provided in the document, and this information should be conspicuously posted at locations throughout the site. Responsibilities of the fire department should be stated. These responsibilities include, but are not limited to:

- Having Emergency Medical Technicians on response teams,
- Responding to fires that occur on site, and
- Standing by for response to potential fires and performing rescues.

2.4.3. Health Physicist

The individual who is trained in radiation physics (effects, and protection) should be identified by name. A designated alternate for the Health Physicist should be identified by name. Specific responsibilities of the Health Physicist, such as evaluating radiation health hazards and recommending appropriate action, should be stated.

2.4.4. Scientific Advisor

The advisor that guides the Project Manager in technical or scientific matters should be named. A general description should be provided for the Scientific Advisor (i.e, reports to the Project Manager, may be located on site or off site). The specific responsibilities of the Scientific Advisor should be stated. These responsibilities include, but are not limited to:

- Providing advice for field monitoring,
- Sample collection, and
- Remedial plans.

2.4.5. Logistics Officer

The employee who oversees all logistics for the operation should be named. A general description should be provided for the Logistics Officer (i.e., reports to the Project Manger, may be located on site or off site). The specific responsibilities of the Logistics Officer should be stated. These responsibilities include, but are not limited to the planning and mobilization of the facilities, materials, and personnel required for the response.

2.4.6. Photographer

The employee who is responsible for all site photography should be named. A general description should be provided for the Photographer (i.e., reports to the Project Manager, may be located on site or off site). The specific responsibilities of the Photographer should be stated. These responsibilities include, but are not limited to, providing photographs of site conditions and archiving photographs.

2.4.7. Recordkeeper

The employee who oversees all recordkeeping for the operation should be named. A general description should be provided for the Recordkeeper (i.e, reports to the Project Manager, may be located on site or off site.) The specific responsibilities of the Recordkeeper should be stated. These responsibilities include, but are not limited to, maintaining the official records of site activities.

2.4.8. Public Information Officer

The employee who oversees the release of public information should be named. A general description should be provided for the Public Information Officer (i.e., reports to the Project Manager, may be located on site or off site.) The specific responsibilities of the Public Information Officer should be stated.

2.4.9. Multidisciplinary Advisors

The list and general description of multidisciplinary advisors should be provided. This list includes representatives from upper level management and onsite management, field team members, and technical experts. Specific responsibilities should also be stated. These responsibilities include, but are not limited to, providing advice on the design of the work plan and the HASP.

2.4.10. Medical Support

The general description of the types of medical support personnel required should be provided, such as consulting physicians, medical personnel at local hospitals and clinics, and ambulance

personnel. The specific responsibilities of medical support personnel should be stated. These include:

- Being familiar with the types of materials on site, the potential for worker exposures and recommending the medical program for the site;
- Providing emergency treatment and decontamination procedures for the specific type of exposures that may occur at the site; and
- Providing emergency treatment procedures appropriate to the onsite hazards.

2.4.11. Bomb Squad Expert

The general description of this function should be provided (i.e., reports to the Project Manager when requested to perform site-related functions). The specific responsibilities of the Bomb Squad Expert should be stated (e.g., providing advice on methods of handling explosive materials and assisting in safely detonating or disposing of explosive materials).

2.5. COMMUNICATIONS

The site-specific HASP should identify the location of and describe the use of all communication equipment that could be utilized in an emergency situation (e.g., telephones, radios, PA systems). The HASP should identify how key personnel and optional personnel can be contacted including work phone, home phone, radio, etc. Examples are provided in Tables 2-1 and 2-2.

TABLE 2-1

Onsite Essential or Key Personnel

Position	Name and Organization	Radio or Pager	Phone Numbers (H) & (W)	Alternate	Radio or Pager	Phone Numbers (H) & (W)	DOE Point of Contact	Radio or Pager	Phone Numbers (H) & (W)
DOE Project Manager									
Contractor Project Manager									
Safety & Health Officer									
Field Team Leader									
Command Post Supervisor									
Decon. Station Officer									
Emergency Response Coordinator									
Specialty Team									
Security Officer									
Other (as appropriate)									

TABLE 2-2

Optional Personnel

Position	Name and Organization	Phone Numbers (H) & (W)	Alternate	Phone Numbers (H) & (W)
Multidisciplinary Advisor				
Medical Support Personnel				
Bomb Squad Expert				
Emergency Response Center Personnel				
Regulatory Specialist				
Medical Support Personnel				
Contractor S&H Staff				
Industrial Hygienist				
Fire Fighter				
Health Physicist				
Scientific Advisor				
Logistics Officer				
Photographer				
Recordkeeper				
Public Information Officer				

2.6. OTHER SOURCES OF ASSISTANCE

Procedures for contacting the Emergency Response Center should be established and identified. A general description for contacting the communications personnel other than the Emergency Response Center, such as Civil Defense organizations, local radio and television stations, and local emergency service networks, should also be provided. A protocol for contacting the organizations stated above should be established and stated. The specific responsibilities of the Emergency Response Center include providing communication with the public in the event of an emergency and providing communication links for mutual aid.

Other organizations such as Chemtrec, EPA, and the NRC may provide additional assistance and should be identified. An overview of the services and information available from these organizations should be provided. Services that may be available include providing advice on properties of materials, contaminant control materials, dangers of chemical mixtures that may

result from site activities, and providing immediate advice to those at the scene of a chemical or radiological emergency.

2.7. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

2. Department of Health and Human Services (DHHS) (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA*, 1985 (Four-Agency Document).

3. EPA 9285.8-01, *Health and Safety Plan (HASP) User's Guide*, Office of Emergency and Remedial Response, USEPA, 1992 (and ERT Health and Safety Plan Planner, Ver. 3.0C, 1993).

4. EPA/540/G-89/010, *Health and Safety Audit Guidelines*, SARA Title I, Section 126, Office of Emergency and Remedial Response, USEPA, 1989.

5. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides, Chapter 8*, Office of Emergency and Remedial Response, USEPA, 1992.

3.0. HAZARD ASSESSMENT

3.1. BACKGROUND

The overall objectives of the Hazard Assessment chapter are to provide guidance on:

- The development of site-specific procedures designed to effectively identify, assess, and control site hazards;
- The identification of all onsite operations, jobs and related tasks that are hazardous due to their inherent characteristics;
- The development of a system for assessing the safety and health hazards identified at the site;
- The identification and use of engineering and administrative controls, and Personal Protective Equipment (PPE) to minimize worker exposure to site hazards; and
- The establishment of site-specific hazard control evaluation activities.

Hazards at EM-40 sites pose a multitude of safety and health concerns. The hazards are a function of the nature of the site and the work being performed. Examples of such hazards include, but are not limited to:

- Chemical exposure (irritation, organ/tissue damage, and central nervous system depression);
- Radioactive exposure (tissue damage or cancer);
- Safety/Construction hazards (fire and explosion, excavating/trenching, electrical hazards, and slip/trip/fall);
- Machinery (rotating, crushing, digging and drilling);
- Transportation (accidents, spills);
- Biological hazards (poisonous plants, animals, snakes, insects, and pathogens);
- Physical hazards (noise, eyes, feet, head, oxygen deficiency, temperature extreme stress-heat stress/cold exposure);
- Weather (ice/mud/flooding, high winds, tornados, hurricanes, electrical storms);
- Confined spaces (oxygen deficiencies, chemical exposure hazards);
- Ergonomic/Repetitive motion (back injuries, carpal tunnel syndrome);
- Asbestos (asbestosis, mesothelioma);
- Material handling (storage, housekeeping).

Due to the nature of a hazardous waste site, these hazards may be severe, and may occur in a large variety of forms and locations. Their recognition and evaluation is necessary for planning and managing operations at a site.

Hazard assessment, the process of identifying and evaluating the hazards associated with operational activities, can be divided into four broad, interacting categories or elements:

- Selection of the operation or job to be assessed,
- Breakdown of the operation or job into constituent tasks,
- Identification of hazards associated with each task, and
- Determination of the necessary hazard controls.

To effectively manage hazardous activities and substances, and to assure worker safety and health, site personnel should understand the processes to be used to develop each of these elements. As new hazards in the workplace are identified and assessed, hazard controls should be implemented, and as improved hazard abatement methodologies and hazard controls are identified, as appropriate, they should be implemented.

Once the hazard assessment is completed, all significant identified hazards should be controlled as quickly as reasonably feasible.

3.2. HAZARD IDENTIFICATION

Management (DOE and contractor) should provide for the identification of and have an understanding of the occupational safety and health hazards associated with their programs. This will enable them to make effective and efficient decisions related to facilities, processes, procedures, and the allocation of resources to protect the safety and health of workers.

The hazard identification section should contain the process(es) to be used to identify all actual and potential hazards which exist at the site. The comprehensive workplan, as required by 29 CFR 1910.120(b), and site characterization should be used as a basis for the identification. Determining present safety and health hazards is important (critical) to the overall evaluation of remedial action sites. Therefore, each hazard associated with activities to be conducted at these sites should be identified to ascertain the physical, safety, construction, chemical, radiological, and other properties which may result in causing harm. These inherent properties establish the anticipated problems associated with the activity.

Evaluation and identification of hazards should take place:

- Initially, during the site characterization;
- Immediately after initial site entry. The assessment should be a more detailed "real time" evaluation and used to further define existing site hazards and aid in the selection of appropriate engineering and administrative controls and PPE;
- Prior to changes in jobs, tasks, and/or processes;
- As required by changing site conditions; and
- Continually, as appropriate.

Additionally, DOE and contractors should conduct routine compliance inspections of their worksites and subcontractor worksites to identify new or previously overlooked OSH hazards or failures to control known hazards.

3.2.1. Hazards List

A list of hazards should be developed which describes:

- Safety hazards associated with the site's operations (e.g., equipment, processes);
- Hazardous substances, radiological hazards, and other health hazards, involved or expected at the site; and
- Anticipated exposure levels for each job/task.

This list, which uses the information contained in the site characterization and comprehensive workplan, should identify everything that has the potential for causing injury or illness to workers.

3.2.1.1. Operations

The hazards list should contain a description of operations, including items such as:

- Type of equipment,
- Activities conducted near hazards, and
- Type and nature of material.

The intent is not to fully describe systems operations nor to provide an operating manual but to give an overview in relation to hazards, operational events that may "trigger" them, and the controls that may be needed. Adequate details necessary for later identification of hazards, as well as the reasonableness of controls, should be presented.

Part of the description of the site's operations may involve determining where these operations are located or performed. Site location may have a strong bearing on the possible impacts a hazard may have, events that might lead to the actual realization of impacts, or the nature of controls that may be implemented.

3.2.1.2. Hazardous substances, radiological hazards, and other health hazards

All suspected hazardous substances that may cause injury/illness or that are Immediately Dangerous to Life or Health (IDLH), or other health hazards that may cause death or serious harm, should be identified and included in the hazards list. To help identify hazardous materials which should be considered, the following criteria may be used:

- Quantity of the hazardous material;
- Type, nature, and form of the hazardous materials (e.g., radioactive, toxicological, chemical, liquid, or solid);
- Location of the material;
- Conditions under which the material is processed, handled, or stored (e.g. temperature, pressure, handling systems); and
- Specific hazards associated with the material.

3.2.1.3. Job/Task

Each job and related task should be analyzed to determine the hazards that may be present. For example: Trenching (job) may require the operation of machinery (task). In addition to the obvious hazards associated with trenching (e.g., cave-ins), the hazards associated with operation of the machinery should be assessed. The information obtained from the assessment of site operations and the identification of hazardous substances should be considered when analyzing the various tasks at the site. Jobs and their related tasks should form the basis for documenting the information obtained during the hazard assessment (see section 3.5).

3.3. EXAMPLES OF HAZARD ASSESSMENT METHODS

Many techniques are available in the literature for performing hazard assessments. A list of several methods that can be used for the assessment of identified hazards and subsequent assignment of risk significance are contained in Appendix E.

3.4. HAZARD CONTROL

The most efficient way to protect workers from workplace hazards is to first remove obvious hazards that can be eliminated without significant effort. Within the scope of clean-up activities, this can sometimes be difficult, since the objective of these activities is the actual removal of hazards.

Hazards should be controlled by the following hierarchy of methods:

- Engineering controls;
- Work practices and administrative controls, except where prohibited by standards, orders or regulations; and
- PPE.

Often, physical hazards discovered through preliminary evaluations and site/facility walkthroughs can be eliminated without significant effort or cost. These hazards should be removed to the extent possible before actual work at the site begins. Examples of ways to eliminate physical hazards associated with the site include:

- Removing of unnecessary debris;
- Guarding exposed electrical wiring, or sharp or protruding objects;
- Securing objects near elevated surfaces and combustible materials; and
- Eliminating slippery surfaces, dangerous flooring, and uneven terrain.

Hazards that cannot be readily eliminated should be properly controlled through engineering and/or administrative means. The primary objective of these controls is to reduce worker exposure to safe levels, thereby avoiding the need for PPE.

3.4.1. Engineering Controls

Hazards subject to engineering controls generally include those which present a high potential for illness or injury to workers. These hazards present levels of concern in the following areas:

- Frequency of hazard (i.e., how often such a hazard is likely to occur at the work site);
- Effect of hazard (i.e., whether exposure to such a hazard would result in an injury or illness);
- Extent of injury or illness resulting from the hazard; and
- Range of effect of the hazard.

Engineering controls, such as radiation shielding, are intended to address major hazards and are the preferred control method. These controls consist primarily of systems which are necessary to reduce worker exposure and prevent propagation of contaminants to "clean" areas. Other examples of engineered controls include process enclosures maintained at negative pressure with High Efficiency Particulate Air (HEPA)-filtered ventilation and surface water drainage systems.

Protection of the public though engineered controls should also take into consideration the safety and health of workers. For example, when designing or selecting systems for mitigating dispersal of contaminants to outside areas, attention should also be given to effects on workers within the contaminated zone. Area enclosures can concentrate airborne contaminants if not properly ventilated.

3.4.2. Administrative Controls

The purpose of administrative controls is to encourage safe work practices. This is first accomplished by controlling the movement of personnel within hazardous areas. Establishment and demarkation of exclusion areas and physical access controls will prevent workers from unnecessarily entering hazardous areas. These controls should also include operating procedures and training programs which address safety precautions to be followed by workers when working in hazardous areas. Workers should be certified for the particular equipment they are operating. It should be noted that some standards prohibit the use of administrative controls as a means for controlling a hazard.

3.4.3. Personal Protective Equipment (PPE)

PPE is a common method used in hazard control. Therefore, an entire chapter has been devoted to this topic. Please refer to Chapter 5 for further guidance on this subject.

3.5. HAZARD ASSESSMENT DOCUMENTATION FORMAT

The information obtained during the Hazard Assessment should be documented in a manner that readily identifies: the hazards associated with the task, and the controls required to safely carry out the task. Table 3-1 provides a sample format for documenting the findings of a hazard assessment. In the sample, the job has been broken down into the various tasks (e.g., set up equipment, install ladder in tank) required to complete the job. Each hazard associated with a given task has been identified, and the required control measures are specified.

TABLE 3-1

Sample Hazard Assessment: Cleaning the Inside Surface of a Chemical/Radioactive Contaminated Tank – Top Manhole Entry

Step	Hazard	Controls
1. Select and train operators.	Operator respiratory or heart problems; other physical limitation. Untrained operator; failure to perform task.	Examination by industrial physician for suitability to work. Train operators. Dry run. (Reference: National Institute for Occupational Safety and Health (NIOSH) Doc. #80-406)
2. Empty Tank	Gas or liquid in tank. Improper valve line-up.	Approved written operating procedures. Empty tank through existing piping.
3. Assess conditions: determine what is in the tank, what process is going on in the tank, and what hazards these pose.	Explosive gas. Improper oxygen level. Chemical exposure. Gas, dust, vapor: irritant toxic Liquid: irritant toxic corrosive Solid: irritant corrosive Radiological exposure, ingestion, contact. NOTE: This column should contain <u>specific</u> information about the material to be encountered, i.e., chemical/radioactive material name, quantity, anticipated length of exposure, etc.	Obtain work permit signed by safety and maintenance supervisors. Test air by qualified person. Ventilate to 19.5% - 23.5% oxygen and less than 10% LEL of any flammable gas. Steaming inside of tank, flushing and draining, then ventilating, as previously described, may be required. Provide appropriate respiratory equipment - SCBA or air line respirator. Provide protective clothing for head, eyes, body and feet. Provide parachute harness and lifeline. (Reference: OSHA standards 1910.106, 1926.100, 1926.21(b)(6); NIOSH Doc. #80-406) Tanks should be cleaned from outside if possible. Provide PPE as stated in RADCON Manual. ALARA

TABLE 3-1

Sample Hazard Assessment: Cleaning the Inside Surface of a Chemical/Radioactive Contaminated Tank – Top Manhole Entry

Step	Hazard	Controls
4. Stage equipment.	Slips/trips/falls. Heavy equipment operations.	Provide ladders, harness, railings. (OSHA CFR 1910) Trained equipment operators.
5. Set up equipment.	Electrical hazards, motors not locked out and tagged. Heavy equipment operations. Trip or fall.	Arrange hoses, cords, lines and equipment in orderly fashion, with room to maneuver safely. Use ground-fault circuit interrupter. Have lockout and tag procedures. Install blanks in flanges in piping to tank. (Isolate tank.) Follow hoisting and rigging requirements. Use mechanical-handling equipment. Provide guardrails around work positions at tank top. Provide lighting for tank (Class 1, Div. 1).
6. Prepare to enter tank.	Gas or liquid in tank.	Review emergency procedures. Training. Open tank. Contamination control. Perform a check of job site by industrial hygienist or safety professional. Test atmosphere in tank by qualified person (long probe).

TABLE 3-1

Sample Hazard Assessment: Cleaning the Inside Surface of a Chemical/Radioactive Contaminated Tank – Top Manhole Entry

Step	Hazard	Controls
7. Enter tank.	Gas or liquid in tank. Explosive gas. Improper oxygen level. Chemical exposure. Gas, dust, vapor: irritant toxic Liquid: irritant toxic corrosive Solid: irritant corrosive Radiological exposure,ingestion, contact. Exposure to hazardous atmosphere. Tripping hazard. NOTE: This column should contain specific information about the material to be encountered (e.g., chemical/radioactive material name, quantity, anticipated length of exposure).	Provide personal protective equipment for conditions found. (Reference: RADCON Manual, NIOSH Doc. #80-406; OSHA CFR 1910.134) Provide outside helper to watch, instruct and guide operator entering tank, with capability to lift operator from tank in emergency.
8. Clean tank.	Chemical/radiological exposure internal and external. Heat Stress. Failure of life support. Exhaustion. Reaction of chemicals/radioactive material, causing mist or expulsion of air contaminant.	Provide protective clothing and equipment for all operators and helpers. Provide exhaust ventilation (contamination control). Provide air supply to interior of tank. Continuous monitoring of air in tank for radioactivity and oxygen concentration. Replace operator or provide rest periods. Provide means of communication to get help, if needed. Provide two-man standby for any emergency.

TABLE 3-1

Sample Hazard Assessment: Cleaning the Inside Surface of a Chemical/Radioactive Contaminated Tank – Top Manhole Entry

Step	Hazard	Controls
9. Cleanup/ Decontamination.	Handling of equipment, causing injury. Spread of Contamination.	Dry run. Follow Decon procedures in RADCON Manual. Use material-handling equipment.

3.6. REFERENCES

1. 29 CFR 1910, *Occupational Safety and Health Standards.*

2. 29 CFR 1926, *Safety and Health Regulations for Construction***.**

3. *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,* Latest Edition.

4. DOE Order 5480.1B, *Environment, Safety, and Health Program for Department of Energy Operations*.

5. DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards.*

6. DOE Order 5480.9, *Construction Safety and Health Program*.

7. DOE Order 5481.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements.*

8. *NIOSH/OSHA Pocket Guide to Chemical Hazards,* NIOSH Publication #90-117, 1985.

9. *OSHA Chemical Information Manual,* ACGIH Publication #0881, 1988.

10. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, October 1985 (Four-Agency Document).

11. DOE Order 5480.19, *Conduct of Operations.*

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4.0. TRAINING REQUIREMENTS

4.1. BACKGROUND

The Training Requirements portion of the HASP should cover OSHA training regulations and training requirements in applicable DOE Orders for personnel working, auditing, touring, and visiting DOE hazardous waste sites under the cognizance of EM-40. Activities addressed under these requirements include:

- Environmental Restoration (ER) activities regulated under RCRA corrective action authority and/or CERCLA;
- Treatment, Storage, and Disposal (TSD) activities regulated under RCRA; and
- Hazardous substance release response activities under Section 303 of the *Superfund Amendments and Reauthorization Act* (SARA) of 1986 (*Emergency Planning and Community Right-to-Know Act of 1986*, 42 U.S.C. 11003).

Applicable DOE Orders and OSHA regulations should be consulted to ensure full compliance with all training requirements. However, in some cases, training beyond the requirements of OSHA is required for certain EM-40 employees and contractor employees (see Appendix D).

The Training chapter has two main objectives. One is to provide the minimum training requirements (in compliance with 29 CFR 1910.120, DOE Orders, and applicable federal, state, and local codes and standards) for personnel engaged in the activities listed above. The second is to recommend personnel not to participate in field activities until appropriately trained.

4.2. GENERAL

DOE Order 5480.4 *Environmental Protection, Safety, and Health Protection Standards*, and 5483.1A *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities*, require both DOE employees and contractors at DOE-owned contractor-operated facilities to comply with OSHA standards established in 29 CFR 1910.120. The 29 CFR 1910.120 standards provide regulations to ensure the safety of employees involved in hazardous waste operations. Subsections (e) and (p) of 29 CFR 1910.120 specify training requirements for all employees who may be exposed to safety or health hazards at ER sites and RCRA TSD sites respectively. Subsection (q) specifies training requirements for employees who participate in emergency responses to hazardous substance releases. This chapter provides the specific training required for EM-40 employees and contractor employees involved in these types of operations.

EM-40 has adopted, and in some cases exceeded, OSHA training standards for its employees and contractor employees. All general employees working at ER sites, RCRA TSD sites, and those responding to hazardous substance releases should receive a minimum of 40 hours of initial safety and health training and further should receive a minimum of three days (24 hours) of

appropriately-supervised field (hands-on) experience. EM-40 employees and contractors at the Headquarters, Field Program, Project Manager, and Supervisor levels are also required to have 40 hours of training. Site supervisors and managers involved in or associated with site-related activities are required to have the same training and certifications as hazardous waste workers. In addition, site management personnel are required to have 8 hours of supervisory training. Training requirements for Visitors/Non-Workers who may require access to ER sites and RCRA TSD sites are also addressed in this chapter and in Appendix C.

OSHA does not currently certify or accredit training programs. However, a January 26, 1990, Notice of Proposed Rulemaking addresses accreditation of 29 CFR 1910.120 training programs for employees covered by 29 CFR 1910.120. It does not address accreditation of training programs for employees engaged in emergency response activities. Until this proposed regulation becomes a final rule, employers should assess the adequacy of training programs based on training criteria addressed in 29 CFR 1910.120(e)(2).

Training documentation should be maintained in accordance with DOE Order 5480.20 and DOE Order 1324.2A and applicable OSHA Standards.

4.3. TRAINING REQUIREMENTS FOR PERSONNEL AT ER SITES

Training requirements for DOE employees and contractor employees are summarized in Table 4-1. Personnel should be prohibited from participating in field activities until appropriately trained.

The terms "installation," "facility," and "site" are defined in the Glossary, (Appendix A), and graphically depicted in Figure 4-1. Some facilities may contain a number of individual sites which, in turn, can be linked through a facility-wide integrator site.

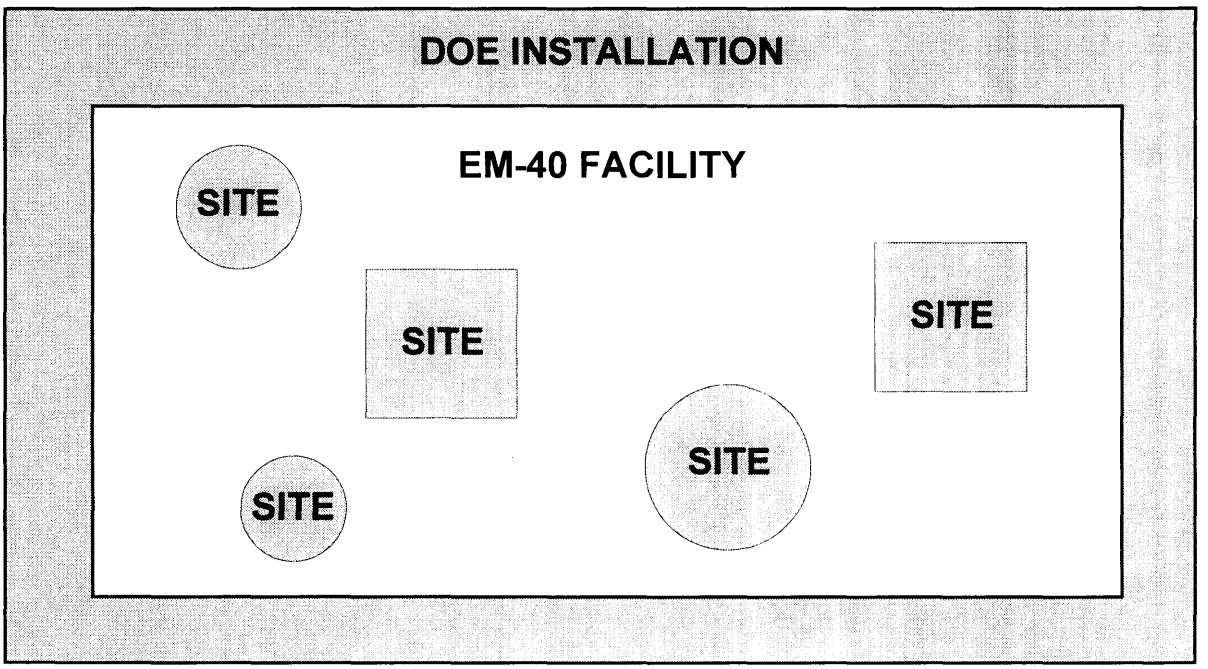
4.4. TRAINING REQUIREMENTS FOR PERSONNEL AT RCRA TSD SITES

The training requirements for personnel at RCRA TSD sites are summarized in Table 4-2. Personnel should be prohibited from participating in RCRA TSD sites activities until appropriate training has been received.

4.5. TRAINING REQUIREMENTS FOR PERSONNEL CONDUCTING EMERGENCY RESPONSES TO HAZARDOUS SUBSTANCE RELEASES

Table 4-3 summarizes the minimum training requirements for personnel conducting emergency responses to hazardous substance releases.

FIGURE 4-1
EM-40 Definitions and Graphic Depictions of Installation, Facility, and Site



INSTALLATION: Any DOE Property (i.e., "inside the fence.")

EM-40 FACILITY: Any DOE installation or portion of an installation operated, funded or otherwise controlled by EM-40.

SITE: An area where physical work is being performed, including TSD Operations, where the potential of exposure to contaminants exists, which requires the use of chemical protective clothing and/or radiological protective clothing and/or respirators.

TABLE 4-1
Minimum Training Requirements for Personnel Engaged at EM-40 Sites

◆ - Training Required

Operational Personnel	Minimum Training Requirement							
	40-Hrs Initial Safety and Health and 24-Hrs Supervised Field Experience	8-Hrs Supervisor	Site Specific	8-Hrs Annual Refresher	Emergency Response and Periodic Rehearsal	Hazard Communication	Radiological Worker (if applicable)	Lead and Asbestos Abatement (if applicable)
EM-40 Employees	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Project Manager (PM)	◆ [2]	◆	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Field Supervisor (FS)	◆ [2]	◆	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Site Safety and Health Officer (SSHO)	◆ [2]	◆	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Industrial Hygienist (IH)	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Health Physicist (HP)	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Command Post Supervisor	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Site Emergency Response Coordinator	◆ [2]	◆	◆	◆	◆	◆	◆	◆

TABLE 4.1 (Cont.)
Minimum Training Requirements for Personnel Engaged at EM-40 Sites

◆ - Training Required

Operational Personnel	Minimum Training Requirement							
	40-Hrs Initial Safety and Health and 24-Hrs Supervised Field Experience	8-Hrs Supervisor	Site Specific	8-Hrs Annual Refresher	Emergency Response and Periodic Rehearsal	Hazard Communication	Radiological Worker (if applicable)	Lead and Asbestos Abatement (if applicable)
EM-40 Contractor or Subcontractor Site Decontamination Station Officer	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Site Security Officer	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor Optional Personnel Onsite/Offsite As Needed	◆ [1, 2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor General Site Workers	◆ [2]	◆ [4]	◆	◆	◆	◆	◆	◆
EM-40 Visitors/Non-Workers Who Enter the Site	◆ [3]		◆	◆		◆	◆	◆

1 Optional Personnel may include Scientific Advisor, Logistics Officer, etc. (see section 2.4).

2 This training is required for all EM-40 employees and EM-40 contractors, regardless of length of stay on site or site exposure levels. (See Appendix D.)

3 This training is required for all visitors/non-workers who enter an exclusion/decontamination zone or other areas where Level A, B, or C PPE is required. This training is not required for visitors/non-workers who only enter areas where either Level D or no PPE is required. (See Appendix D.)

4 The supervisor training is required for these individuals only if they act in a supervisory capacity or are the designated alternate for a supervisory position.

TABLE 4-2
Minimum Training Requirements for Personnel Engaged at RCRA TSD Sites

◆ - Training Required

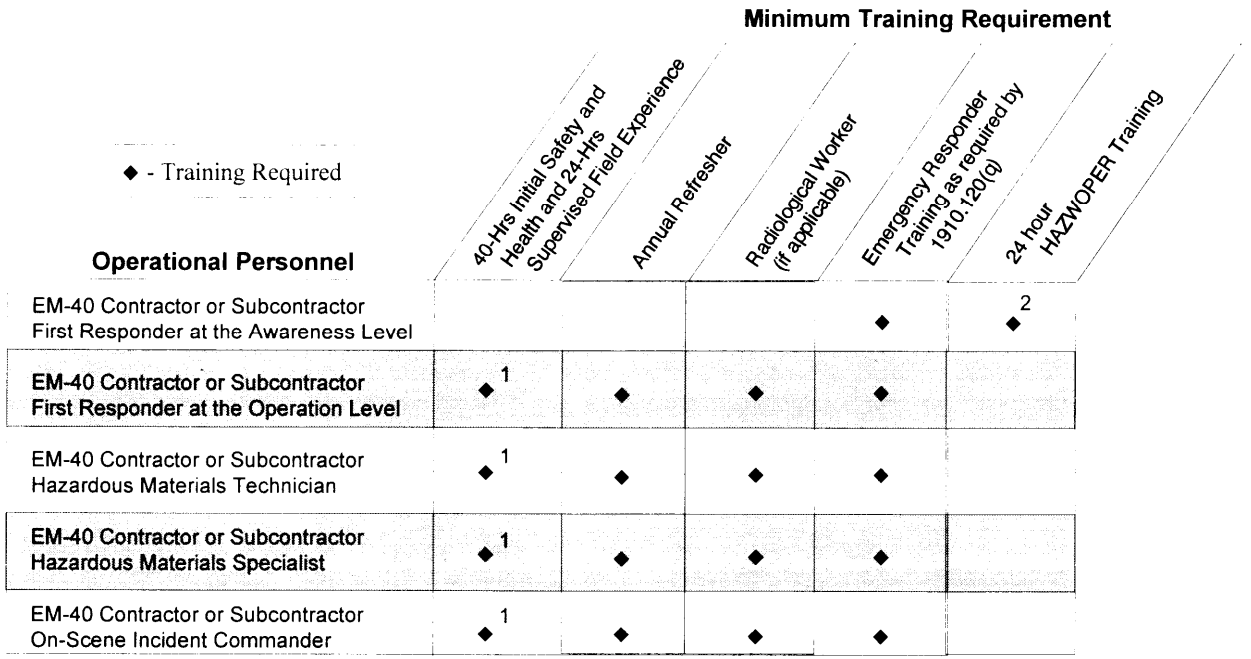
Operational Personnel	Minimum Training Requirement: 40-Hrs Initial Safety and Health and 24-Hrs Supervised Field Experience	8-Hrs Supervisor	Facility Specific	8-Hrs Annual Refresher	Emergency Response and Periodic Rehearsal	Hazard Communication	Radiological Worker (if applicable)
EM-40 On-site Employees	◆ [1]	◆ [3]	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor TSD Manager	◆ [1]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor TSD Safety and Health Officer	◆ [1]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor TSD Designated Emergency Response Person	◆ [1]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor TSD Command Post Supervisor or TSD Emergency Coordinator	◆ [1]	◆	◆	◆	◆	◆	◆
EM-40 Contractor or Subcontractor TSD Operators	◆ [1]	◆ [3]	◆	◆	◆	◆	◆
EM-40 Visitors/Non-Workers Who Enter the TSD	◆ [2]		◆	◆			◆

[1] This training is required for all EM-40 employees and EM-40 contractors (See Appendix D)

[2] This training is required for all visitors/non-workers who enter the TSD site where Levels A, B, or C PPE is required This training is not required for visitors/non-workers who only enter the TSD site where either Level D or no PPE is required. (See Appendlx D.)

[3] The supervisor training is required for these Individuals only if they act in a supervisory capacity or are the designated alternate for a supervisory position.

TABLE 4-3
Minimum Training Requirements for Personnel Engaged in EM-40 Emergency Responses at Hazardous Substance Releases



[1] This training requirement, which exceeds the OSHA requirements at all levels, must be met by all EM-40 employees and contractor employees engaged in emergency responses to hazardous substance releases.

[2] EM-40 employees or contractors classified as First Responders at the Awareness Level will have 24 hours of HAZWOPER training. First Responders at the Awareness Level take no action beyond notifying appropriate authorities of the release. (See Appendix D.)

4.6. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

2. 29 CFR 1910.1200, *Hazard Communication*.

3. 40 CFR 264.16, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - Personnel Training*.

4. 40 CFR 265.16, *Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities - Personnel Training*.

5. 40 CFR 300.150, *National Oil and Hazardous Substances Pollution Contingency Plan - Worker Health and Safety*.

6. 55 FR 2776, Notice of Proposed Rulemaking, *Accreditation of Training Programs for Hazardous Waste Operations* (29 CFR 1910.121), January 26, 1990.

7. DOE Order 3790.1B, *Federal Employees Occupational Safety and Health Program*.

8. DOE Order 5000.3B, *Occurrence Reporting and Processing of Operations Information*.

9. DOE Order 1324.2A, *Records Disposition*.

10. DOE Order 5480.4, *Environmental Protection Safety, and Health Protection Standards.*

11. DOE 5480.20, *Personnel Selection, Qualifications, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities*, February 20, 1991.

12. DOE Order 5480.11, *Radiation Protection for Occupational Workers.*

13. DOE Order 5483.1A, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities.*

14. DOE EH-0227P, *OSHA Training Requirements for Hazardous Waste Operations*, Office of Environmental, Safety and Health, USDOE, 1991.

15. DOE EH-0256T, USDOE *Radiological Control Manual*, Office of Environmental, Safety and Health, USDOE, 1992.

16. DOE Memorandum from EH-40 to Under Secretary dated January 5, 1993, *Implementation of Section 3131 of the National Defense Authorization Act for Fiscal Years 1992 and 1993*, Public Law 102-190, (discusses the NIEHS hazardous materials training program).

17. DOE Memorandum from EM-40 to distribution dated February 3, 1994, *Hazardous Materials Training Program.*

18. DOE Memorandum from EM-40 to EM-42, EM-43, EM-44, and EM-45 dated June 10, 1993, *Hazardous Materials Training Program*.

19. DOE Memorandum from EM-40 to Distribution dated August 30, 1993, *Hazardous Materials Training Program.*

20. EPA/540/G-89/010, *Health and Safety Audit Guidelines*, SARA Title I, Section 126, Office of Emergency and Remedial Response, USEPA, 1989.

21. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides*, Office of Emergency and Remedial Response, USEPA, 1992.

22. NIEHS Memorandum addressing DOE adoption of OSHA standards for training EM-40 employees and EM-40 contractor employees and supervisors, NIEHS, Research Triangle Park, NC, February 12, 1993.

23. Department of Health and Human Services (DHHS) (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

24. OSHA 2254 (Revised), *Training Requirements in OSHA Standards and Training Guidelines*, OSHA, 1992.

25. *Superfund Amendments and Reauthorization Act of 1986 (SARA)*, Section 126, (Pub.L. 99-499).

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5.0. PERSONAL PROTECTIVE EQUIPMENT

5.1. BACKGROUND

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, radiological, and biological hazards that may be encountered at a hazardous waste site when engineering and other controls are not feasible or cannot provide adequate protection. Careful selection and use of adequate PPE should protect the health of EM-40 employees.

No single combination of PPE is capable of protecting against all hazards. Therefore, PPE should be used in conjunction with, not in place of, other protective methods, such as engineering controls and safe work practices. A written PPE program, as required by 29 CFR 1910.120(g)(5) should be in place at all EM-40 hazardous waste sites. The effectiveness of the PPE program should be evaluated regularly. The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, impaired vision, reduced mobility, and distorted communication. In general, the higher the level of PPE protection, the greater are the risks associated with use of PPE. For any given situation, PPE should be selected to provide an adequate level of protection. Over-protection as well as under-protection can be hazardous and should be avoided.

The overall objectives of this chapter are:

- To describe the PPE program that will provide EM-40 hazardous waste site workers with protection from chemical, physical, biological and radiological hazards;
- To comply with applicable DOE and regulatory requirements; and
- To establish the selection, use, upgrade/downgrade, and training requirements for the PPE program.

5.2. GENERAL PROVISIONS

Personal protective equipment should be utilized when:

- It is not possible and/or feasible to implement engineering controls and work practices that will ensure the safety and health of workers;
- It is necessary to reduce and maintain employee exposure to below the permissible exposure limits (PELs) in 29 CFR 1910, Subparts G and Z, and/or below the threshold limit values (TLVs) established by the American Conference of Governmental Industrial Hygienists (ACGIH); or in the absence of PELs or TLVs, below the recommended exposure limits published in the National Institute for Occupational Safety and Health (NIOSH) publication, *NIOSH Recommendations for Occupational Health Standards* dated 1992;

- Handling radiological materials with removable contamination in excess of levels established in the DOE *Radiological Control Manual*, or manuals implementing these requirements, or when working in radiologically controlled areas in which PPE requirements have been established; or
- Existing or potential physical and/or biological hazards pose a threat to worker safety and health.

Required PPE should be discussed with site workers prior to the start of work. Employees should be trained and have passed a baseline medical examination for the use of prescribed PPE. The HASP should implement a written PPE program containing operating procedures that comply with the applicable requirements of 29 CFR 1910.120, DOE 5480.4, and the DOE *Radiological Control Manual*. If such a written PPE program consistent with those requirements is not already in place, written procedures and requirements for the use of PPE should be included in the HASP.

5.3. SELECTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

Selection of PPE, based on requirements of 29 CFR 1910 and applicable DOE Orders, is key to protecting the safety and health of site personnel. This should be done by qualified and knowledgeable professionals to insure that selected PPE protects workers from site-specific hazards posed by their task and work zone.

The use, maintenance and disposal of radiological PPE is governed by the DOE *Radiological Control Manual*.

Selection of the most appropriate level of protection and combinations of respiratory protection and protective clothing will depend on:

- Level of knowledge of onsite chemical and radiological hazards;
- Properties such as toxicity, radioactivity, route of exposure, and matrix of the contaminants known or suspected of being present;
- Type and measured concentrations of the contaminants that are known or suspected of being present;
- Potential for exposure to contaminants in air, liquids, soils, or by direct contact with hazardous materials;
- Physical hazards;
- Climatic conditions; and
- Biological hazards.

Based on the evaluation of potential hazards that will vary with individual field activities, PPE should be selected for specific tasks and work areas (e.g., Exclusion Zone, Contamination Reduction Zone). The specific PPE required for each work area and/or task should be

determined and listed by a qualified (preferably certified) industrial hygienist in consultation with a qualified (preferably certified) health physicist.

The industrial hygienist, in coordination with the health physicist, should provide a listing of the chemicals/radioactive materials and corresponding types and/or characteristics of protective clothing (e.g., material or brand name). This list should be referred to when hazardous materials may be encountered to determine appropriate chemical/radiological resistant PPE. The industrial hygienist should specify the type of cartridges to be used and the frequency with which the cartridges should be changed, along with information on any limitations or restrictions for use, when air-purifying respirators are determined to be appropriate.

Personal protective equipment is divided into two broad categories; respiratory protective equipment and personal protective clothing. Both of these categories are incorporated into the four levels of protection (Levels A, B, C, and D), based on the potential severity of the hazard. The following sections provide detail and explanation of those categories. Modifications to these levels should be made under the direction of the Site Safety and Health Officer (SSHO) in consultation with a qualified industrial hygienist and/or health physicist. Such modifications are routinely employed during site work activity to maximize efficiency and to meet site-specific needs without compromising worker safety and health. The SSHO and Project Manager should make the final determination on the appropriate level of PPE.

Respiratory protective gear and protective clothing should compliment one another. Section 5.5.1. provides guidelines for determining appropriate PPE.

5.4. LEVELS OF PPE

The specific levels of PPE and necessary components for each level have been divided into four categories according to the degree of protection afforded. General guidelines for use are:

Level A: Worn when the highest level of respiratory, skin, and eye protection is needed.

Level B: Worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is needed.

Level C: Worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.

Level D: Refers to work conducted without respiratory protection. This level should be used only when the atmosphere contains no known or suspected airborne chemical or radiological contaminants and oxygen concentrations are between 19.5%, and 23%.

The following section describes the elements of the basic levels of protective equipment.

5.4.1. Level A PPE

5.4.1.1. Respiratory Protection

Level A respiratory protection is positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator (with escape bottle for immediately dangerous to life or health (IDLH) or potential IDLH atmosphere).

5.4.1.2. Protective Clothing

Protective clothing provides maximum skin protection. It is used when the potential exists for splash or immersion by chemicals and/or radiologically contaminated liquids, or for exposure to vapors, fumes, gases, or particulates that are harmful to skin or capable of being absorbed through the skin. This class of protection is acceptable for radiological work activities categorized as "High" involving pressurized or large volume liquids, or closed system breach (see DOE *Radiological Control Manual*). Level A protective clothing includes:

- Totally encapsulating non-permeable, chemical-resistant suit;
- Coveralls inner suit;
- Modest clothing under coveralls (e.g., shorts and T-shirt/long underwear);
- Disposable gloves and boot covers (worn over fully encapsulating suit);
- Boots, chemical-resistant, steel toe and shank (depending on suit construction, worn over or under suit boot);
- Hard hat (under suit); and
- Hearing protection (as needed).

5.4.1.3. Other Protective Apparatus

Other protective apparatus which may be used includes:

- Cooling unit/system,
- 2-way radio communications,
- Cold weather gear/clothing, and
- Protection from biological hazards/pests.

5.4.2. Level B PPE

5.4.2.1. Respiratory Protection

Level B respiratory protection is positive pressure, full face-piece self-contained breathing apparatus (SCBA), or a positive pressure supplied air respirator (with escape bottle for immediately dangerous to life or health (IDLH) or potential IDLH atmosphere).

5.4.2.2. Protective Clothing

Level B protective clothing provides a high level of skin protection. It is used when the potential exists for contact with chemicals and/or radiologically contaminated liquids that could saturate/penetrate cloth coveralls (e.g., immersion or inundation of contaminants). Also, potential vapors, fumes, gases, or dusts containing levels of chemicals harmful to skin or capable of being absorbed through the skin are not anticipated. This class of protection is acceptable for radiological work activities categorized as "High" involving pressurized or large volume liquids, or closed system breach (see DOE *Radiological Control Manual*). Level B protective clothing includes:

- Hooded one-piece non-permeable, chemical resistant outer suit;
- Coveralls inner suit(s);
- Modest clothing under coveralls (e.g., shorts and T-shirt/long underwear);
- Outer chemical resistant work gloves (rated for contaminants) taped to outer suit;
- Inner gloves of light weight PVC or latex rubber taped to inner suit (cotton liners optional);
- Chemical resistant steel-toe boots taped to inner suit;
- Disposable outer boot covers (booties) taped to outer suit;
- Hard hat (as needed); and
- Hearing protection (as needed).

5.4.2.3. Other Protective Apparatus

Other protective apparatus which may be used includes:

- Cooling unit/system,
- Cold weather gear/clothing, and
- Protection from biological hazards/pests.

5.4.3. Level C PPE

5.4.3.1. Respiratory Protection

Level C respiratory protection includes an air-purifying respirator, full-face or half-mask, cartridge- or canister-equipped (MSHA/NIOSH approved).

5.4.3.2. Protective Clothing

Level C protective clothing provides a moderate level of skin protection. It is used when the potential exists for contact with chemicals and/or radiologically contaminated materials, but when protection from liquids (chemical and/or radioactive) is not required. It is used when potential vapors, fumes, gases, or dusts are not suspected of containing levels of chemicals

harmful to skin or capable of being absorbed through the skin. This class of protective clothing is appropriate for most routine radiological work activities (see DOE *Radiological Control Manual*). Level C protective clothing includes:

- Coveralls (*Radiological Control Manual*),
- Modest clothing under coveralls (e.g., shorts and T-shirt/long underwear),
- Rubber/chemical resistant outer gloves rated for contaminant,
- Inner gloves of light weight PVC or latex rubber,
- Safety glasses or safety goggles (not required with full face respirator),
- Face-shield if splash hazard exists (not required with full face respirator),
- Steel-toe rubber boots,
- Outer disposable booties,
- Hood may be required for radiological work. (See DOE *Radiological Control Manual*),
- Hard hat (as needed), and
- Hearing protection (as needed).

5.4.3.3. Other Protective Apparatus

Other Level C protective apparatus which may be used includes:

- Cooling unit/system,
- Cold weather gear/clothing, and
- Protection from biological hazards/pests.

5.4.4. Level D PPE

5.4.4.1. Respiratory Protection

There is no Level D PPE required for respiratory protection due to the nature of the hazard.

5.4.4.2. Protective Clothing

Level D protective clothing provides a low level of skin protection. It is used when there is no potential for contact with hazardous levels of chemicals or radiological contamination. This level should not be worn in the Exclusion Zone or the Contamination Reduction Zone. Oversight personnel not in zoned areas, as well as site visitors, may be required to wear Level D modified PPE.

Level D protective clothing includes:

- Coveralls,
- Modest clothing under coveralls,
- Work gloves where appropriate,

- PVC or latex rubber surgical/light weight gloves when sampling or handling any potentially contaminated surface or item,
- Safety glasses or safety goggles,
- Steel-toe rubber boots where wet decontamination methods are required or steel-toe leather boots and outer boot covers, and
- Hard hat.

5.4.4.3. Other Protective Apparatus

Other Level D protective apparatus which may be used include:

- Cold weather gear/clothing,
- Protection from biological-hazards/pests, and
- Hearing protection.

5.5. USE OF PPE

Written site operating procedures for the use of PPE should include:

- Training;
- Establishing work mission duration;
- Personal use factors;
- Fit testing;
- Donning and doffing;
- In-use monitoring of personnel/equipment;
- Inspection before, during, and after use;
- Storage and maintenance;
- Upgrading/downgrading of PPE; and
- Decontamination and disposal.

These procedures should be referenced and/or included in the HASP.

No changes to the specified levels of protection should be made without the approval of the SSHO and the Project Manager. A list of approval steps for upgrade/downgrade of PPE should be included that specifically include the SSHO and Project Manager as key to the approval process.

5.5.1. PPE Selection Process

Sequential steps to facilitate the selection of PPE for hazardous waste site operations are:

1. Identify work area and job-specific hazard potential (e.g. chemical, radiological, physical, mechanical),

2. Determine type of exposure for the work areas and specific work activities,

3. Determine level of respiratory protection for the work areas and specific work activities (see Section 5.4),

3a. Select the respirator cartridge(s) for Level C,

4. Determine level of protective clothing for the work areas and specific work activities (see Section 5.4),

4a. Evaluate the chemical resistant characteristics needed for the potential exposures and select clothing with the appropriate protection factor,

5. Evaluate potential physical hazards associated with the work areas and specific work activities (e.g., walking/working surfaces, electrical installations/lines, noise exposure) and select PPE to mitigate identified hazards,

6. Consider climatic conditions and select PPE to accommodate the conditions (e.g., cooling units, insulated clothing/footwear),

7. Evaluate potential biological hazards (e.g., snakes, insects) and select PPE to mitigate identified hazards, and

8. Evaluate type and level of work (e.g. heavy, moderate, light) and select PPE for the work,

9. Evaluate PPE for both chemical and radiological hazards when mixed waste is involved.

Table 5-1 presents the level of protection required for respiratory PPE, based on specific hazards. Table 5-2 presents the level of PPE based on specific hazards for selection of protective clothing.

TABLE 5-1

Respiratory PPE Selection

Hazard	Level of Protection
Immediately Dangerous to Life or Health. Gaseous and/or Particulate. Radioactive and/or Chemical.	A, B
Not Immediately Dangerous to Life or Health. Particulate. Radioactive and/or Chemical.	C High efficiency respirator cartridge.
Not Immediately Dangerous to Life or Health. Gases or Vapors. Radioactive and/or Chemical.	C Respirator cartridge rated for isotope or chemical concentration.
Not Immediately Dangerous to Life or Health. Gaseous and/or particulate. Radioactive and/or Chemical.	C Combination chemical and high efficiency respirator cartridge.

TABLE 5-2

Clothing PPE Selection

Hazard	Level of Protection
Potential for skin contact with substances with a high degree of hazard to the skin. High potential for splash, immersion, or exposure to unexpected vapors, gases, fumes or dusts that are harmful to, or readily absorbed by the skin. High levels of radiological contamination.*	A
Potential for contact with wet, contaminated surfaces/material that can saturate cloth. Vapors or gases do not contain a high level of chemicals harmful to, or readily absorbed by, the skin. Moderate levels radiological contamination.*	B
Atmospheric contaminants, liquid splashes or other direct contact will not adversely affect, or be absorbed by exposed skin. Low levels of radiological contamination.*	C
No anticipated immersion, splashes, or potential for unexpected contact with hazardous levels of any chemicals or radiological contamination.	D

* Protective clothing for high, moderate and low radiological contamination roughly corresponds to Levels A, B, C, and D PPE. However, this may be modified by level of activity and isotope. The appropriate selection should be made using the DOE *Radiological Control Manual*.

5.6. REFERENCES

1. 29 CFR 1910, Subpart G, *Occupational Health and Environmental Contro*l.

2. 29 CFR 1910, Subpart Z, *Toxic and Hazardous Substances.*

3. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

4. 29 CFR 1910.132, *Eye and Face Protection*.

5. 29 CFR 1910.134, *Respiratory Protection*.

6. 29 CFR 1910.135, *Occupational Head Protection*.

7. 29 CFR 1910.136, *Occupational Foot Protection.*

8. 29 CFR 1910.137, *Electrical Protective Devices*.

9. American Conference of Governmental Industrial Hygienist (ACGIH), *Threshold Limit Values for Chemical and Physical Agents and Biological Indice*s, Current edition.

10. American National Standards Institute (ANSI) Z 41.1, *Safety Toe Footwear*, Current edition.

11. ANSI Z 87.1, *Eye and Face Protection*, Current edition.

12. ANSI Z 88.2, *Standard Practices for Respiratory Protection*, Current edition.

13. ANSI Z 88.6, *Physical Qualifications for Respirator U*se, Current edition.

14. ANSI Z 89.1, *Safety Requirements for Industrial Head Protecti*on, Current edition.

15. National Institute for Occupational Safety and Health (NIOSH), *Recommendations for Occupational Health Standards*, 1986.

16. DOE *Radiological Control Manual*.

6.0. TEMPERATURE EXTREME DISORDERS OR CONDITIONS

6.1. BACKGROUND

The primary objective of this section on Temperature Extreme Disorders or Conditions is to provide the guidance necessary for protection of contractors/employees from the occurrence of temperature extreme related disorders or conditions. Other objectives are to:

- Provide a description of the overall temperature extreme related disorders or conditions program,
- Integrate the program with other elements of the HASP, and
- Provide guidance on the proper training levels necessary for operational workers and supervisors.

The added burden of PPE required for hazardous waste operations in a temperature extreme condition increases the potential for worker disorders or conditions that can result in injury or illness. Disorders or conditions associated with work conducted in temperature extreme conditions can be controlled through proper planning and effective monitoring of personnel. Factors that could affect a worker's ability to function in extreme temperatures include, but are not limited to:

- Physical fitness,
- Acclimatization,
- Age,
- Obesity,
- Alcohol consumption,
- Drug use,
- Infections, and
- Disease.

An effective temperature extreme program is a requirement and should be integrated with other elements of the HASP. Pre-existing health conditions of workers, for example, can be identified in the medical surveillance program (see Chapter 7). It is necessary to be aware of the potential occurrence of heat or cold related disorders or conditions in confined space entry or emergency response operations.

A temperature extreme disorders prevention program should be developed and included in the site-specific HASP. The following elements should be addressed in the program:

- Identification of potential hazards early in the planning phase of the development and operation of required contingency plans,
- Proper monitoring of worker physiology,

- Implementation of preventive measures and Standard Operating Procedures (SOPs) early in the operations so that sound work practices are developed and followed,
- Proper initial training of workers to recognize the symptoms of temperature extreme related disorders or conditions in themselves and their fellow workers,
- Implementation of a "buddy system", and
- Proper acclimatization of all workers to new or changing work conditions.

6.2. HEAT STRESS

Increased physical demands on workers occur as a result of increased air temperature and humidity. Wearing PPE also increases the demands on workers, due to:

- Added weight of the equipment,
- Reduced visibility,
- Reduced mobility,
- Loss of the body's natural cooling processes,
- Increased energy consumption by the body, and
- Lack of sufficient fluid replenishment.

Other factors that influence the occurrence of heat related disorders or conditions include environmental conditions, clothing, workload, and the individual characteristics of workers. Workers should be pre-screened prior to beginning operations. Once baseline values are obtained, they can be used to effectively assess the health of workers during and immediately after operations (e.g., pulse, blood pressure, body temperature, body weight).

Because of the variability of these factors and the compounding effect that each may have on an individual's health, a physiological monitoring program should be established.

6.2.1. Monitoring

Personnel who are not required to wear PPE are not immune to the potential hazards of heat related disorders or conditions and should be included in the monitoring program.

The guidance for workers wearing permeable clothing is specified in the current version of the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If actual clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, changes should be made to the monitoring requirements and work rest period to account for these differences. Table 6-1 provides the suggested frequency of physiological monitoring for fit and acclimatized workers.

The ACGIH TLV guide contains a separate table for workers wearing semipermeable and impermeable encapsulating clothing. In these situations, refer to this table.

TABLE 6-1

Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers

Adjusted Temperature Calculation	Normal Work Clothing	Impermeable Clothing
90° F (32.2° C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° - 90.0° F (30.8° - 32.2° C)	After each 60 minutes of work	After each 30 minutes of work
82.5° - 87.5° F (28.1° - 30.8° C)	After each 90 minutes of work	After each 60 minutes of work
77.5° - 82.5° F (25.3° - 28.1° C)	After each 120 minutes of work	After each 90 minutes of work
72.5° - 77.5° F (22.5° - 25.3° C)	After each 150 minutes of work	After each 120 minutes of work

The following parameters should be used when monitoring workers:

- Heart rate - Count the radial pulse as early as possible in the rest period to ensure a more accurate reading. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period at the same length. If, at the end of the following work period, the heart rate still exceeds 110 beats per minute, shorten the work period again by one-third.

- Oral Temperature - The utilization of oral temperature applies to the time immediately after the worker leaves the contamination reduction zone. Using a clinical thermometer, take the temperature for three minutes. If the oral temperature exceeds 99.6° F (37.6° C), shorten the next work cycle by one-third, without a change to the rest period. If the oral temperature still exceeds 99.6° F (37.6° C) at the end of the following work period, shorten the next work cycle by one-third. Do not permit a worker to perform duties requiring a semipermeable or impermeable garment if the oral temperature exceeds 100.6° F (38.1° C).

- Ear Canal Readings - Ear canal readings are a valid method to monitor the temperature of workers who remain in the contamination reduction zone.

- Body Water Loss - Measure body weight to see if enough fluids are being consumed to prevent dehydration.

6.2.2. Training

Worker training is an essential element of an effective temperature extreme program. Workers who are able to identify the symptoms of early heat stress will be able to prevent heat related disorders or conditions and possible death to themselves and their fellow workers. Workers should be trained to identify the following symptoms:

- Heat Rash - Caused by continuous exposure to heat or humid air. Can be recognized by the occurrence of small red pimples on the skin. Typically found in sensitive areas of the body where the potential for rubbing can occur (e.g., underarm, groin area).

- Heat Cramps - Caused by heavy sweating and inadequate electrolyte replacement. Signs to look for include muscle spasms and pain in the extremities, such as hands and feet, and in the abdomen.

- Heat Exhaustion - Caused by increased stress on various parts of the body, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs to look for include:

    - Pale, cool, moist skin;
    - Heavy sweating;
    - Dizziness;
    - Nausea; and
    - Fainting.

- Heat Stroke - This is the most serious of all temperature related disorders or conditions since temperature regulation fails and the body temperature rises to critical levels. Immediate action should be taken to cool the body before serious injury or death occurs. Competent medical help should be obtained. Signs to look for include:

    - Red, hot, usually dry skin;
    - Lack of or reduced perspiration;
    - Nausea;
    - Dizziness and confusion; and
    - In extreme situations, coma.

6.3. COLD EXPOSURE

Exposure to cold temperatures increases the likelihood and potential for worker disorders or conditions that could result in injury or illness. Extreme low temperatures may not be the only element necessary to create the potential for cold exposure disorders or conditions; strong wind accompanied by cold temperatures can lead to these types of disorders or conditions.

The windchill factor is the cooling effect of any combination of temperature and wind velocity or air movement. The windchill index (Table 6-2) should be consulted when planning for exposure to low temperatures and wind. The windchill index does not take into account the specific part of the body exposed to cold, the level of activity which affects body heat production, or the amount of clothing being worn.

TABLE 6-2

Windchill Index

Wind Speed in mph	ACTUAL THERMOMETER READING (F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	EQUIVALENT TEMPERATURE (F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Over 40 mph (little added effect)	**LITTLE DANGER** (for properly clothed person)				**INCREASING DANGER** (Danger from freezing of exposed flesh)			**GREAT DANGER**		

The human body senses "cold" as a result of both the air temperature and the wind velocity. Cooling of exposed flesh increases rapidly as the wind velocity goes up. Frostbite can occur at relatively mild temperatures if wind penetrates the body insulation. For example, when the actual air temperature of the wind is 40° F (4.4° C) and the velocity is 30 mph (48 km/h), the exposed skin would perceive this situation as an equivalent still air temperature of 13° F (-11° C).

The generally recognized cold disorders or conditions are frostbite and hypothermia. Contributing factors to these disorders or conditions are:

- Exposure to humidity,
- High winds,
- Contact with wetness,

- Inadequate clothing, and
- Poor worker health.

The physical conditions that effect cold exposure disorders or conditions are the same as those associated with heat disorders or conditions, such as physical fitness, alcohol or drug use, and disease.

6.3.1. Control Measures

The presence of dead air space between the warm body and clothing and the outside air is essential. Many layers of relatively light clothing with an outer shell of windproof material maintains body temperature much better than a single heavy outer garment worn over ordinary indoor clothing. The more air cells each clothing layer has, the more efficient it insulates against body heat loss. Clothing also needs to allow some venting of perspiration. In addition to adequate clothing, whenever possible, full use should be made of windbreaks and heat tents.

Table 6-3 gives the recommended time limits for working in various low temperature ranges.

TABLE 6-3

Maximum Daily Time Limits for Exposure at Low Temperatures

Temperature Range		Maximum Daily Exposure
Celsius	*Fahrenheit*	
0 to -18	30 to 0	No limit, providing that the person is properly clothed.
-18 to -34	0 to -30	Total work time: 4 hours. Alternate 1 hour in and 1 hour out of the low-temperature area.
-34 to -57	-30 to -70	Two periods of 30 minutes each at least 4 hours apart. Total low temperature work time allowed is 1 hour.
-57 to -73	-70 to -100	Maximum permissible work time is 5 minutes during an 8-hour working day. At these extreme temperatures, completely enclosed headgear, equipped with a breathing tube running under the clothing and down the leg to preheat the air, is recommended.

6.3.2. Physiological Monitoring

Early recognition of the symptoms of cold exposure stress is essential in preventing serious or permanent disorders or conditions. Workers and managers involved in cold weather operations should be adequately trained to recognize the following conditions and related symptoms:

- Hypothermia - The first symptoms of this condition are uncontrollable shivering and the sensation of cold, irregular heart beat, weakened pulse, and change in blood pressure. Severe shaking of rigid muscles may be caused by a burst of body energy and changes in the body's chemistry. Vague or slow, slurred speech, memory lapses, incoherence, and drowsiness are some of the additional symptoms. Symptoms noticed before complete collapse are cool skin, slow and irregular breathing, low blood pressure, apparent exhaustion, and fatigue even after rest.

  As the core body temperature drops, the victim may become listless and confused, and may make little or no attempt to keep warm. Pain in the extremities can be the first warning of dangerous exposure to cold. If the body core temperature drops to about 85° F, a significant and dangerous drop in the blood pressure, pulse rate, and respiration can occur. In extreme cases, death will occur.

- Frostbite - Frostbite can occur, in absence of hypothermia, when the extremities do not receive sufficient heat from central body stores. This can occur because of inadequate circulation and/or insulation. Frostbite occurs when there is freezing of fluids around the cells of the body tissues due to extremely low temperatures. Damage may result, including loss of tissue around the areas of the nose, cheeks, ears, fingers, and toes. This damage can be serious enough to require amputation or result in permanent loss of movement.

The potential for both heat and cold related disorders or conditions can occur in many common situations. Cold early morning temperatures can give way to warm daily temperatures, resulting in heavy perspiration within protective clothing. As temperatures cool again in the evening, the potential for cold related disorders or conditions can occur. Managers should be aware of the potential for this occurrence and should monitor workers accordingly.

6.4. PREVENTION

Preventive measures are the best approach to avoiding the types of disorders or conditions associated with temperature extreme conditions. Many of the measures are similar for both heat and cold extremes. Proper training and preventive measures are critical in temperature extreme conditions to avert illness, injury and potential loss of worker productivity.

The following steps are recommended for ensuring/protecting workers involved in temperature extreme conditions:

- Closely monitor and modify/adjust work/rest worker schedules;
- Maintain proper worker body fluids in both cold and hot weather by:
  - Maintaining drinking water temperature at 50° to 60° F (10° to 15.6°C),
  - Urging workers to drink 16 ounces of fluid before beginning work, and
  - Urging workers to drink at least 4 ounces of water every 15 to 20 minutes at each monitoring break (1 to 1.6 gallons of water a day is recommended);
- Weigh workers before and after each work session to determine if fluid intake/replenishment is adequate;
- Encourage workers to maintain an optimal level of physical fitness;
- Encourage workers to maintain normal/constant weight (significant weight loss can be a strong indication of physical problems);
- Advise workers that heavy alcohol intake may significantly increase their risk of heat stroke (i.e., dehydration);
- Use cooling/heating devices that aid in natural body heat exchange, such as:
  - Heating or cooling tents,
  - Showers or hoses, and
  - Cooling vests, jackets, or suits.

6.4.1. Physiological Monitoring

The worker's ability to physiologically adjust to work under temperature extreme conditions affects his/her ability to perform work. Acclimatized workers have lower heart rates and body temperatures, sweat more profusely than unacclimatized workers, and are, therefore, better able to function in these specific working conditions. Managers need to be aware of the importance of acclimatizing workers before they can be added to a regular work schedule. Although the phenomenon of acclimatization is an important consideration for heat stress, it has not been recognized for cold stress. The added burden of PPE may increase the time to acclimatize workers.

Acclimatization can occur within a few days. NIOSH recommends a progressive, 6-day acclimatization period for workers before allowing them to perform a full work load. Under this regimen, the first day of work should be conducted using only 50% of the anticipated workload and exposure time. This level should be increased 10% each day for the following 5 days.

Managers need to be aware that workers can lose their acclimatization, and that the work regimen will need to be adjusted to accommodate these changes. Managers may determine that other factors impact the acclimatization period, including the use of PPE and the relative fitness of workers.

6.5. INTEGRATION WITH OTHER ELEMENTS OF THE HASP

The area of temperature extreme disorders or conditions impacts other areas of the HASP. Temperature extreme considerations should be integrated with other concerns, such as personnel protective equipment (PPE) early in the planning phase of any operation, and proper contingency planning should be undertaken. Integrated areas should include:

- Monitoring,
- Medical surveillance,
- Emergency response,
- Confined space entry,
- Buddy systems,
- Decontamination of personnel, and
- Site characterization operations.

The potential hazards associated with temperature extreme conditions can cause problems for even the best designed work plan, and the potential for worker injury or death is always present. Changes in ambient air temperatures, humidity, wind, and precipitation, can change a typical operation into an immediate health hazard to workers. It may require logistical requirements to supplement normal operations, including requirements such as increased water supply, on-call medical personnel, and the ability for injured-worker retrieval teams to enter exclusionary zones.

6.6. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

2. DHHS (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activitie*s, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

3. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides, Chapter 8*, Office of Emergency and Remedial Response, USEPA, 1992.

4. American Conference of Governmental Industrial Hygienist (ACGIH), *Threshold Limit Values for Chemical and Physical Agents and Biological Indices*, Current edition.

5. Ramsey, J.D. 1976. NIOSH, *Standards Advisory Committee on Heat Stress - Recommended Standard for Work in Hot Environments*. Appendix C in Standards for Occupational Exposure to Hot Environments, proceedings of symposium, Cincinnati, OH.

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7.0. MEDICAL SURVEILLANCE

7.1. BACKGROUND

The Medical Surveillance Program is a regulatory requirement designed to ensure that the health of employees working on hazardous waste sites is, at a minimum, monitored and documented before, during, and at termination of work on the site.

The medical surveillance requirements have been derived from numerous sources, including the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* (also referred to as the Four-Agency Document NIOSH/OSHA/USCG/EPA, 1985), DOE Order 5480.8A, *Contractor Occupational Medical Program*, and generally accepted work practices. For sites that contain mixed wastes, DOE orders and standards should be consulted for radiological requirements. These requirements should be incorporated into the medical surveillance program. The medical surveillance program requirements include:

- Baseline or pre-assignment examination,
- Periodic monitoring,
- Examination after illness or injury,
- Termination examination, and
- Maintenance of medical records.

Medical surveillance programs are designed to:

- Establish the baseline medical condition of employees and fitness for duty,
- Determine the ability to work while wearing protective equipment,
- Track the physiological conditions of employees on an established schedule and at termination of the project or employment, and
- Ensure documentation of employee exposure and medical conditions is provided and maintained as a part of the employee's medical record.

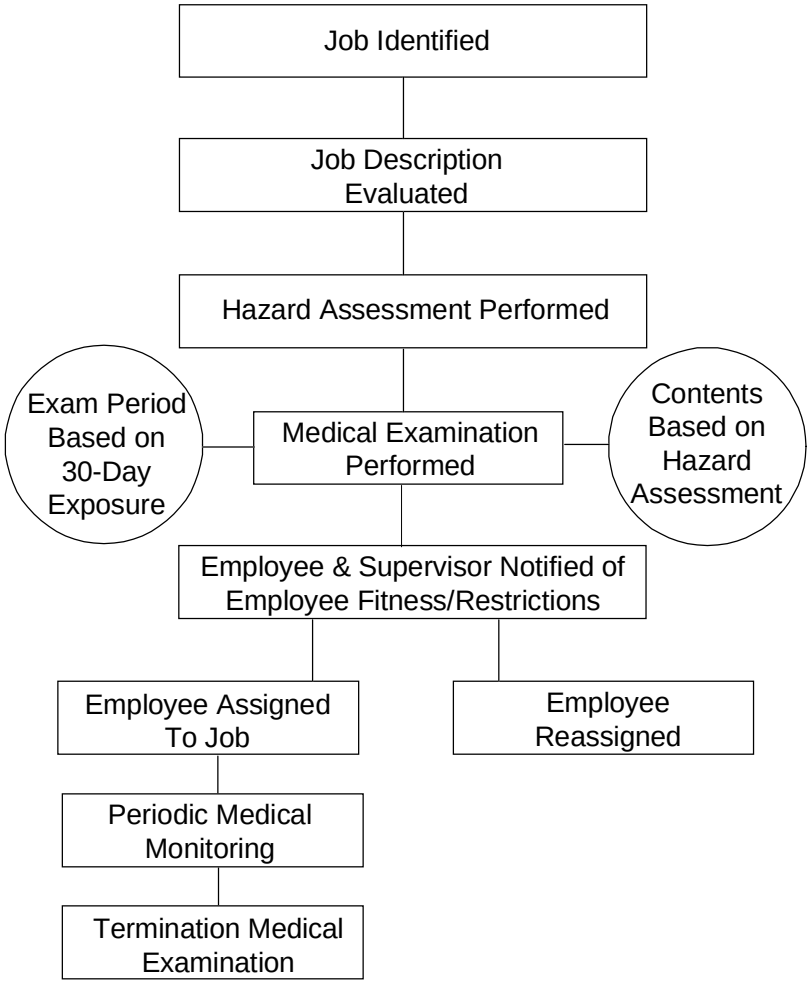
The overall objectives of the Medical Surveillance chapter are to identify:

- All personnel covered by the medical surveillance program;
- The decision-making needs of the personnel involved in the medical surveillance program;
- Pertinent details regarding the baseline, periodic, after-illness/injury, and termination examinations;
- Which medical records are to be maintained;
- The confidentiality of medical records.

The sequence of events associated with the medical surveillance process is shown in Figure 7-1.

FIGURE 7-1

Medical Surveillance Process



7.2. INFORMATION FOR THE MEDICAL PROGRAM

The Medical Program Administrator should be provided with the following information by the SSHO for technical evaluation by a physician prior to an employee examination:

- A tour of representative sites,
- All data related to expected or known employee exposure levels to hazardous and radiological substances,
- A description of Personal Protective Equipment (PPE) expected to be worn by the employee,

- A description of the duties expected to be performed by the employee,
- Available information from previous medical surveillance examinations, and
- Updated medical and occupational history.

For hazardous waste work, the following site employees should be included in the Medical Surveillance Program:

- All employees who are exposed to hazardous substances or health hazards above published exposure limits (e.g., OSHA PELs, ACGIH TLVs, NIOSH RELs) without regard to the use of respirators, for 30 days or more a year;
- All employees who wear a respirator for 30 days (or fractions of days) or more a year or as required by 29 CFR 1910.134;
- All employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
- Members of HAZMAT teams.

Each contractor should implement DOE Quality Assurance and Records Management requirements with respect to medical records and medical surveillance records. In addition, the physician(s) should document that they have a copy of the Occupational Safety and Health Administration regulations, 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*, and 29 CFR 1910.20, *Access to Employee Exposure and Medical Records.*

7.3. EXAMINATION CONTENT

Medical examinations should include a medical and work history with special emphasis on symptoms related to exposure to hazardous substances or radiological materials and their health effects, and on fitness for duty when conducting project tasks. The content of the medical examinations should be based on applicable laws, regulations, and known or potential exposure to contaminants. Where possible, the content should be determined by a licensed physician certified in Occupational Medicine by the American Board of Preventive Medicine. However, at a minimum, the physician making the determination should be knowledgeable and experienced in occupational medicine screening and surveillance. If no physician is on the staff of the employer, the content of the examination is determined by the Medical Program Administrator in concert with a contract physician.

An example of a matrix of medical examination by job task is shown in Table 7-1.

TABLE 7-1

Example of Periodic Examination Based on Job Task

	Medical and Work History	Physical Exam.	Pulmonary Function	X-ray	EKG	Eye Exam	Audiogram	Urinalysis	Blood Chemistry	Heavy Metals	Rad. Bioassay	Other
Project Mgmt.	X	X	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate
Data Collectors	X	X	X	as appropriate	X	X	X	X	X	X	as appropriate	as appropriate
Oversight	X	X	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate
Heavy Equipment Operator	X	X	X	as appropriate	X	X	X	X	X	X	as appropriate	as appropriate
Truck Driver	X	X	X	as appropriate	X	X	X	X	X	X	as appropriate	as appropriate
Front-end Loader or Backhoe Driver	X	X	X	as appropriate	X	X	X	X	X	X	as appropriate	as appropriate
Laborer	X	X	X	as appropriate	X	X	X	X	X	X	as appropriate	as appropriate
Other	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate	as appropriate

7.4. BASELINE (INITIAL) EXAMINATION

The employee should receive a baseline or initial medical examination based on an activity hazard assessment prior to being assigned to a hazardous or potentially hazardous activity (e.g., exposure to toxic substances or radiological materials, repetitive motion, heat/cold stress). The examination should include, at a minimum, the items listed below.

7.4.1. Baseline/Periodic Medical Examination Parameters

The baseline medical examination parameters are determined by the Medical Program Administrator or the physician, after review of the activity hazard assessment. However, at a minimum, the following should be included:

- Complete medical and work history,
- Physical examination,
- Pulmonary function test,
- Eye examination,
- EKG,
- Audiogram,
- Urinalysis,
- Blood chemistry,
- Heavy metal screen (as appropriate),
- Radiological bioassay (as appropriate), and
- Evaluation of stresses related to repetitive motion.

It may be beneficial to develop a table of hazardous substances expected at the work site, the target organs affected, the potential health effects, and the medical monitoring to be performed. An example is provided in Table 7-2. (The information in the table should be consistent with information in the hazard assessment.)

7.5. PERIODIC MEDICAL MONITORING

Employees working on hazardous waste sites, which may include chemical, physical and/or radiological hazards, should be provided with medical examinations every 12 months, unless the physician believes a shorter or longer duration is needed or required. The content of the examination is:

- Based on applicable laws and regulations,
- Determined by the physician,
- Designed to detect change from the baseline examination, and
- Designed to identify physiological changes.

Employee site-specific exposure data, parameters identified above, official dosimetry records, and a hazard assessment should be provided to the examining physician.

TABLE 7-2

Hazardous Substances Expected to be Encountered, the Target Organ, Potential Health Effects, and Recommended Medical Monitoring

Hazardous Substance	Target Organ	Potential Health Effects	Medical Monitoring
Hydrocarbons (specific hydrocarbons are identified here)			
Toluene	CNS, and skin	CNS depression, dermatitis	History of physical exam focusing on nervous system and changes in skin
Trichloroethene	Liver, CNS, kidneys, respiratory, skin	liver disease and kidney injury, dermatitis, CNS, depression, cancer, ventricular arrhythmias	History for pre-existing liver disease or decreased lung functions, measurement of liver enzymes and liver function, urine screen, physical exam focusing on nervous system, skin and respiratory system
Heavy Metals (specific heavy metals are identified here)			
Lead	kidney, blood, CNS, GI tract	renal system disfunction, general CNS impairment	urine screen, measurement of kidney function where relevant, CBC, history and physical exam focusing on CNS

TABLE 7-2

Hazardous Substances Expected to be Encountered, the Target Organ, Potential Health Effects, and Recommended Medical Monitoring

Hazardous Substance	Target Organ	Potential Health Effects	Medical Monitoring
Herbicides (specific herbicides are identified here)			
2,4-D	skin, PNs	chloracne, peripheral neuropathy	history and physical exam focusing on skin nervous system, urinalysis
Radionuclides (specific radionuclides are identified here)			
Plutonium	bone, lungs	lung cancer	history focusing on prior exposure to ionizing radiation, baseline bioassay and periodic bioassay monitoring

7.6. EXAMINATION AFTER ILLNESS OR INJURY

Follow-up examinations should be provided as soon as possible to the employee due to any of the following situations:

- Notification to the supervision, management, the Medical Program Administrator or physician that the employee has developed signs or symptoms indicating sensitivity or overexposure,
- Potential exposure above the permissible exposure limit or published exposure limit,
- Lost time illness of three working days or more,
- Any recordable injury to the employee, or
- Contamination incident.

In the case of injury or illness, the Site Safety and Health Officer (SSHO) or his/her designated alternate is responsible for notifying the Medical Program Administrator of the incident and the suspected substance involved. If the substance is unknown, it should be identified as such.

The examination will be carried out by a licensed occupational medical provider. The scope of the examination will be determined by the physician. The employee will not return to work until the physician certifies that the employee is fit to return to work, activity restrictions are identified, and documentation of fitness for duty is provided.

7.7. TERMINATION EXAMINATION

The employer should provide a termination medical examination when an employee is terminated or reassigned to an area or activity where the employee is not exposed to hazardous substances or radiological constituents. The termination examination content will be determined by the physician. If termination occurs within six months of a periodic examination, the physician may determine that an additional examination is not necessary. Documentation of the decision not to provide a termination examination, and its basis, should be provided in the medical file for the employee.

7.8. MAINTENANCE AND AVAILABILITY OF MEDICAL RECORDS

The employee should be notified of recommended limitations upon his/her assigned work. The physician should provide a written opinion to the records indicating that the employee has been informed of the results of the exam and of any medical conditions which require further examination or treatment. In addition, the following specific records should be maintained:

- Name and Social Security number of employee;
- Physician's written opinion, recommended limitations and results of exam;

- Employee medical complaints related to exposure to hazardous substances;
- Information provided to the physician from the employer (not standard or appendices); and
- Engineering controls, work practices and PPE for employee protection.

Personnel medical records and exposure monitoring records should be maintained according to DOE orders and the requirements of 29 CFR 1910.120 (f)(8) and 29 CFR 1910.20. Access to medical records should be consistent with the requirements of 29 CFR 1910.20. The employee medical records will be held in confidence by the employer to the extent permitted by law.

7.9. REFERENCES

1. 29 CFR 1910.20, *Access to Employee Exposure and Medical Records.*

2. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*.

3. 29 CFR 1910.134, *Respiratory Protection*.

4. 29 CFR 1910.1000, Subpart Z, *Toxic and Hazardous Substances*.

5. American Conference of Governmental Industrial Hygienists (ACGIH), *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, Current edition.

6. DHHS (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

7. DOE N 5480.6, U.S. DOE *Radiological Control Manual*.

8. DOE Order 3790.1B, *Federal Employee Occupation Safety and Health Program*.

9. DOE Order 5000.3A, *Occurrence Reporting and Processing of Operations Information*.

10. DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards.*

11. DOE Order 5480.8A, *Contractor Occupational Medical Program.*

12. DOE Order 5480.10, *Contractor Industrial Hygiene Program.*

13. DOE Order 5480.11, *Radiation Protection for Occupational Workers.*

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8.0. EXPOSURE MONITORING/AIR SAMPLING

8.1. BACKGROUND

Hazardous waste activities generate the potential for employee exposure to, and/or off-site migration of, hazardous concentrations of airborne substances. This section provides the general HASP guidance for the exposure monitoring/air sampling program and specific activities that should take place during hazardous waste activities.

The overall objectives of the exposure monitoring/air sampling section are:

- Describe the overall exposure monitoring and air sampling program by providing general information about the purpose of the exposure monitoring and air sampling program, regulatory requirements, and guidance documents; and
- Identify the different components of the exposure monitoring/air sampling program, including personnel qualifications, air contaminants, instrumentation, worker exposure, level of protection, and offsite, perimeter, and meteorological monitoring, quality assurance/quality control, and recordkeeping.

The objectives of exposure monitoring/air sampling are to accurately determine:

- Exposure levels for site workers,
- Work areas generating the most significant airborne contaminants,
- Whether migration is occurring, and
- Whether modified levels of protection or engineering controls are required.

This section of the HASP should be prepared in accordance with guidelines contained in the EPA *Standard Operating Safety Guides,* June 1992; EPA, Office of Emergency and Remedial Response, *Air Surveillance for Hazardous Materials*; and the NIOSH *Manual of Analytical Methods* (latest edition).

8.2. GENERAL GUIDANCE

An exposure monitoring/air sampling program should be prepared and implemented to identify and quantify airborne levels of potentially hazardous substances. Appropriate direct-reading (i.e., real time) air monitoring and time-integrated (e.g., 8 hour time-weighted average, 15 minute short term exposure limit) air sampling should be conducted in accordance with applicable regulations (e.g., OSHA, EPA, State, NRC). Both direct-reading and time-integrated sampling should be used to test for the presence of air contaminants. Compounds which are found by time-integrated sampling, but are not detected by direct reading air monitors, may warrant modification of both the monitoring program and the levels of protection.

Work area air monitoring within the Exclusion Zone should be conducted to determine if pre-established action levels are being exceeded. If the action levels are being exceeded, additional, appropriate controls should be implemented or workers should upgrade PPE to the appropriate level of protection. Worker exposure monitoring with time-integrated sampling should be conducted during the clean-up phase and where otherwise appropriate to accurately assess worker exposure to specific chemicals.

A combination of offsite, perimeter, and work area samples should be used to assess the release of air contaminants. While the primary objective of work area air monitoring is to assist in protecting onsite personnel from airborne contaminants, these data can also be used to assess the potential for detectable offsite emissions. Upwind and downwind offsite and perimeter monitoring should be conducted. Air contaminant levels should be established upwind around the site perimeter in order to define the reference point or baseline to which downwind monitoring data can be compared. Comparisons of air monitoring data with these reference data may indicate areas which generate air contaminant levels above established action levels. When action levels are exceeded, appropriate actions should be taken, such as, increasing engineering controls or making community notifications.

As appropriate, air samples should be taken according to the requirements of 10 CFR 20.103(a)(3), *Exposure of Individuals to Concentrations of Radioactive Materials in Air in Restricted Areas,* and *DOE's Radiological Control Manual* (latest edition) to identify the radioactive isotopes and corresponding radiation types (alpha, beta, gamma) in the workplace atmosphere and at the perimeter of the site. The principles of ALARA (as low as reasonably achievable) should be utilized to assure worker and public protection from atmospheric emissions.

8.2.1. Personnel Qualifications

The exposure monitoring/air sampling program should be developed by an industrial hygienist, preferably one who is certified by the American Board of Industrial Hygiene, or otherwise board eligible, or who has a minimum of three years experience in developing such programs for hazardous waste sites. In addition, where exposures to radioactive materials are anticipated, a health physicist, preferably one who is certified by the American Board of Health Physics, or otherwise board eligible, or who has a minimum of three years relevant experience, should assist in the development of the exposure monitoring/air sampling program.

Staff should be experienced in implementing an air monitoring program for the type of activities to be conducted. The staff should also be experienced in implementing an air monitoring program designed to evaluate worker exposure to airborne contaminants. The Site Safety and Health Officer (SSHO) should be responsible for implementing the exposure monitoring/air sampling program, and all activities should be conducted under the direction of the SSHO. Other air monitoring staff may include air monitoring specialists and field technicians. The air monitoring staff should be provided site-specific training regarding the site-specific air sampling,

monitoring, instrumentation, sample shipping procedures, and other duties assigned by the SSHO. The responsibilities for each staff position and the minimum requirements for the SSHO and other air monitoring staff should be developed and presented in tables similar to those shown in Table 8-1.

TABLE 8-1

Framework for Presenting Staff Responsibilities

Position	Number	Qualifications	Responsibilities
SSHO	2 (including alternates)	(training, education, experience)	1.
			2.
			3.
Field Technicians			1.
			2.
			3.

8.3. AIR CONTAMINANTS

The air contaminants to be monitored/sampled and the locations and frequency of monitoring should be specified. The following should be included as appropriate, depending on site-specific conditions:

- Classes of chemicals,
- Specific contaminants for individual identification and analysis,
- Oxygen content,
- Flammable atmospheres,
- Total and respirable dust,
- Specific radioisotopes and corresponding types of radiation, and
- Noise.

A table should be provided which summarizes the contaminants to be monitored, key chemical, radiological, physical, and toxicological properties for each contaminant, and the frequency/schedule for monitoring each contaminant. An example is provided in Table 8-2. A table of pre-established action levels for each contaminant, corresponding actions to be taken when action levels are exceeded, and the basis for choosing an action level should be developed.

An example is shown in Table 8-3. In addition, written justification and a rationale for the action level and actions identified should be available for review.

TABLE 8-2

Air Contaminants - Summary of Properties and Frequency of Monitoring

Air Contaminant:	
Physical Properties	
Chemical Properties	
Toxicological Properties	
Type of Sampling (e.g., direct-reading at perimeter, time-integrated worker exposure)	
Frequency	
Locations	

TABLE 8-3

Air Contaminants - Action Levels

Air Contaminant:		
Action Level	**Action**	**Basis For Action Level**
Air Contaminant:		
Action Level	**Action**	**Basis For Action Level**

8.4. METHODS AND INSTRUMENTATION

Air monitoring specialists should be responsible for operating air monitoring instruments under the supervision of the SSHO. These individuals should be required to demonstrate proficiency in

the use, care, limitations, and operating characteristics of air monitoring instruments. These individuals should also be responsible for the maintenance and calibration of all air monitoring equipment.

Calibrations should be in accordance with methods indicated in NIOSH's *Manual of Analytical Methods* (latest edition), EPA methods, and/or methods recommended by the equipment manufacturer. Maintenance of instruments should be in accordance with methods recommended by the equipment manufacturer or by the SSHO.

The EPA methods to be used for ambient air monitoring should be specified, as well as the use of NIOSH methods for worker exposure monitoring/sampling. The use of analytical laboratories accredited by EPA and/or the American Industrial Hygiene Association (AIHA), should be specified. Samples collected using NIOSH methods should be analyzed only by laboratories currently accredited by the AIHA. When radiological samples are to be analyzed, laboratories with appropriate accreditation should be used.

The following sections discuss in more detail the detection principle, limitations, and features of instruments which should be utilized during environmental restoration projects. For selection of all instruments, a number of factors should be considered such as:

- Accuracy,
- Mobility,
- Potential interferences on performance,
- Alarms,
- Remote sensing,
- Battery life,
- Calibration required,
- Explosion proofing, and
- Sampling range.

8.4.1. Direct-Reading Monitoring Instruments

Unlike time-integrated sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments (the term direct-reading is used synonymously for the term real-time) provide information at the time of sampling, thus enabling rapid decision-making. Data obtained from direct-reading monitors can often be used to assure proper selection of personnel protection equipment, engineering controls and work practices. The instruments can often provide the trained and experienced user the capability to determine if site personnel are potentially exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

Direct-reading monitors can be useful in identifying oxygen deficient atmospheres, IDLH conditions, toxic levels of airborne contaminants, flammable atmospheres, and radioactive

hazards. Periodic monitoring of airborne levels with real-time monitors is critical, especially before and during new work activities.

Where appropriate, screening with direct-reading instruments for ionizing radiation should be conducted prior to and during site activities. Where appropriate, the type of radioactive isotopes present should also be identified to assure that action levels, worker exposure and environmental standards are not exceeded.

A summary of direct-reading instruments to be used and their specific operating parameters should be developed. An example is provided in Table 8-4.

TABLE 8-4

Direct-Reading Instruments for Site XX

Instrument:
Number Provided at Site:
Contaminant Monitored:
Application:
Detection Method:
General Care/Maintenance:
Typical Operating Time:

8.4.2. Time-Integrated Sampling Instruments

Time-integrated sampling for chemical and radiation hazards should be performed prior to and during site activities. The equipment and collection media to monitor each hazard should be specified. Time-integrated sampling may include pumps, collection media (MCE filters, AA filters, sorbent tubes), and badge-type passive samplers.

8.5. WORKER EXPOSURE MONITORING

The sampling strategy chosen to assess worker exposure through time-integrated sampling and the sampling results should be documented. Sections 8.11 through 8.14 contain additional guidance on documentation and recordkeeping. Personal monitoring samples for both radioactive isotopes and chemicals should be collected in the worker's breathing zone. Representative sampling of those employees with the greatest risk of exposure is required in accordance with 1910.120(h)(4). The sampling strategy should be documented and changed as

appropriate if the operation or tasks change or if exposures potentially increase. Changes to the sampling strategy should also be documented. Monitoring/sampling of employees in all work zones (Exclusion Zone, Contamination Reduction Zone, and Support Zone) should be included.

All employees working within a radiologically controlled area should receive appropriate dosimetry monitoring for radiation exposure according to the requirements of DOE's *Radiological Control Manual* or 10 CFR 20, Subpart F, *Surveys and Monitoring*. The monitoring program should include information on the record keeping of employee's exposure to external radiation according to the requirements of DOE's *Radiological Control Manual, Determination of Prior Occupational Dose*. Each employee's radiation exposure history should be reviewed, according to the requirements of DOE's *Radiological Control Manual*, for compliance with exposure standards prior to allowing the employee access to a radiologically controlled area. The employee's exposure history should be continuously documented and available for the employee's review.

8.6. LEVEL OF PROTECTION MONITORING

When and how often monitoring/sampling should be performed to assess the level of protection should be specified. Frequencies and durations should be specified for all of the following:

- Upon initial entry,
- When new operations begin,
- When work begins on a different portion of the site,
- When different contaminants are being handled,
- When working in areas with obvious liquid contamination, and
- When entering or working in confined spaces.

The use of direct-reading and time-integrated monitoring should be considered to assure that airborne concentrations of contaminants do not exceed the protection factors of the PPE in use.

Standard industrial hygiene practice dictates that the background levels be taken to accurately determine the levels of exposure resulting from site activities. The following monitoring should be conducted during:

- Initial site entry when the site evaluation shows the potential for ionizing radiation;
- IDLH conditions; or
- When the site is not adequately characterized to eliminate these possible conditions:
  - Monitoring with direct-reading instruments for ionizing radiation;
  - Monitoring with direct-reading instruments for IDLH and other conditions (e.g., combustible, explosive, oxygen deficient, toxic substances) that may cause death or serious injury; and/or
  - Visual observations for signs of actual or potential IDLH or other dangerous conditions.

8.7. OFFSITE MONITORING

Locations of offsite monitoring stations should be determined in the field by the SSHO. In general, at least three stations (one upwind and two downwind) should be used at pre-established distances, in accordance with the predominant wind directions recorded at the site. Monitoring at downwind locations should be conducted a minimum of once each workday following the establishment of ambient background levels. Ambient background levels should be established at the upwind offsite monitoring station. The mean value of three separate readings should be recorded as the ambient background level.

8.8. PERIMETER MONITORING

Perimeter monitoring is intended to detect any migration of pollutants outside of the Exclusion Zone. Both direct-reading and time-integrated monitoring/sampling should be considered.

8.9. METEOROLOGICAL MONITORING

Accurate information on temperature, precipitation, wind speed, and wind direction should be provided by existing site resources or a portable meteorological station. Data obtained should be used to aid in determining the daily monitoring strategy (e.g., determining sampling locations).

8.10. QUALITY ASSURANCE/QUALITY CONTROL

Procedures should be developed in accordance with DOE Order 5700.6C, *Quality Assurance*, and EPA requirements for quality assurance/quality control of samples and sample results from equipment calibration through the sample collection, sample shipment, and reporting of sample results should be specified. The procedures should include:

- Sample packaging and shipping,
- Chain of custody,
- Record keeping,
- Quality review checks of sampling data and calculations,
- Data corrections,
- Field sample blanks, and
- Sample duplicates.

8.11. RECORD KEEPING

An important aspect of any data generation is accurate record keeping. The air monitoring staff should be responsible for the completeness and storage of all records. Forms used to record pertinent data should contain the information specified in the following sections. When any

personal samples are taken, worker name and social security number should be added to these forms.

8.12. TIME-INTEGRATED SAMPLING DATA

The following information, at a minimum, should be specified in time-integrated sampling data forms:

- Site Location/Date,
- Work Area/Operation Name,
- NIOSH Method Used,
- Air Flow Calibration Record,
- Instrument Calibration Record,
- Temperature, Pressure, Humidity,
- Area/Sampling Location Diagram,
- Area Sample Description/Location,
- Sampling Data,
- Pump I.D.,
- Flow Rate,
- Sample Filter/Tube Number,
- Pump On/Off (Time),
- Volume Air Collected (Liters),
- Sample Submission Number,
- Laboratory Sample Number,
- Analyte Results (mg/m^3, ppm, or f/cc),
- Field Notes,
- Description of Operation and Complaints/Symptoms,
- Chemicals/Materials/Equipment in Use,
- Engineering/Administrative Controls in Effect,
- Personal Protective Equipment in Use,
- Sampling Observations/Comments,
- AIHA Accredited Laboratory Name,
- Laboratory Location,
- Chemist/Industrial Hygienist Name,
- Principal Air Monitor, and
- Reviewer.

8.13. DIRECT-READING AIR MONITORING DATA

The following information, at a minimum, should be specified in direct-reading air monitoring data forms:

- Site Location/Date;

- Work Process/Operation Name;
- Instrument Used - type, manufacturer, model, I.D.;
- Instrument Calibration Record;
- Sample Location - description, diagram;
- Sampling Conditions - temperature, humidity, pressure;
- Interferences;
- Direct Reading Data - time, reading (units);
- Field Notes;
- Principal Air Monitor Name; and
- Reviewer.

8.14. FINAL REPORT

A final report document should be prepared by the SSHO and should be submitted as part of the site records. This document should contain the following information:

- Chain of Custody,
- Laboratory Results (raw data),
- Calculated Results (air contaminant concentrations),
- Meteorological Data,
- Daily Log,
- Air Sampling and Monitoring Forms, and
- Equipment Calibration and Maintenance Records.

8.15. REFERENCES

1. 10 CFR 20, *Standards for Protection Against Radiation*.

2. 29 CFR 1910, *Occupational Safety and Health Standards.*

3. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

4. 29 CFR 1910.1000, *Air Contaminants*.

5. 29 CFR 1926, *Safety and Health Regulations for Construction*.

6. American Conference of Governmental Industrial Hygienist (ACGIH), *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, Current edition.

7. DHHS (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

8. DOE EH-0256T, U.S. DOE *Radiological Control Manual*, Office of Environmental, Safety and Health, USDOE, 1992.

9. DOE Order 5480.4, *Environmental Protection Safety, and Health Protection Standards.*

10. DOE Order 5480.9, *Construction Project Safety and Health Management*.

11. DOE Order 5480.10, *Contractor Industrial Hygiene Program*.

12. DOE Order 5482.1B, *Environment, Safety and Health Appraisal Program.*

13. DOE Order 5483.1A, *Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities*.

14. DOE Order 5700.6C, *Quality Assurance.*

15. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides*, Office of Emergency and Remedial Response, USEPA, 1992.

16. EPA-600-4-84-041, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*, USEPA, Most recent edition for each method.

17. ICAO Regulations for shipment of hazardous materials on international air cargo transport planes (supersedes DOT regulations when using air transport).

18. NIOSH Publication No. 84-100, *NIOSH Manual of Analytical Methods* (1984, Supplements 1985, 1987, 1988, and 1990).

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9.0. SITE CONTROL

9.1. BACKGROUND

The site control program at hazardous waste sites is used to control the activities and movement of people and equipment in order to minimize the potential for worker exposure to hazardous substances. The provisions of 29 CFR 1910.120(d) require that an appropriate site control program be developed prior to the implementation of cleanup operations.

The site control program should be established during the planning stages of a hazardous waste operation. It should be modified as new information becomes available. The appropriate sequence for implementing site control measures should be determined on a site-specific basis. It may be necessary to implement several measures concurrently. Care should be taken to ensure that the posting requirements of the *DOE Radiological Control Manual* are properly addressed and that procedures are implemented. For the purpose of this chapter, a Radiological Area will generally equate to an Exclusion Zone, a Radiological Buffer Area will generally equate to a Contamination Reduction Zone, and a Controlled Area will generally equate to a Support Zone. This equivalency is identified in Table 9-1.

TABLE 9-1

General Equivalency of Work Zones

RAD Contamination Areas *(DOE Radiological Control Manual)*	**Hazardous Substance Contamination Zones**
Controlled Area	Support Zone
Radiological Buffer Area	Contamination Reduction Zone
Radiological Area	Exclusion Zone

The overall objective of the site control component of the HASP is to specify procedures to minimize employee exposure and protect the public from hazardous substances and to prevent unauthorized access to the site.

Procedures to meet the objectives of the site control program should include the following:

- Coordination with site management in the establishment of site boundaries,
- Development of a map of the hazardous sites which represents a central source of information about the site,
- Establishment of work zones to prevent unauthorized personnel from entering controlled zones,

- Reducing accidental spread of hazardous substances from equipment in the contaminated area(s) by workers,
- Confining work activities to the appropriate areas,
- Facilitating the location and evacuation of personnel in case of an emergency,
- Establishment of the "buddy system",
- Establishment of appropriate communication systems,
- Implementation of worker safety procedures, and
- Identification of the nearest medical facilities.

9.2. DEVELOPMENT OF THE SITE MAP

The purpose of the site map is to assist site personnel in planning and organizing response activities. Site maps should be updated during the course of site operations to reflect:

- New information, such as information gained after initial site entry or from subsequent sampling and analysis activities; and
- Changes in site conditions, including changes resulting from accidents, ongoing site operations, hazards not previously identified, new materials introduced on site, unauthorized entry or vandalism, and weather conditions.

The site map should be developed prior to the initial site entry using information obtained during the preliminary evaluation. The map should include:

- Prevailing wind direction;
- Site drainage points;
- All natural and man-made topographic features including the location of buildings, containers, impoundments, pits, ponds, and tanks;
- Location of specific work zones including radiological and non-radiological postings;
- Any other site features;
- Locations of all potential hazards that were identified through the interview/records research;
- The perimeter reconnaissance;
- The initial onsite survey should be plotted on the site map;
- Observed and suspected hazards;
- Onsite and offsite air and soil sampling results; and
- Potential exposure pathways.

9.3. ESTABLISHMENT OF WORK ZONES

One of the basic elements of an effective site control program is the delineation of work zones at the site. The purpose of establishing work zones is to:

- Reduce the accidental spread of hazardous substances by workers or equipment from the contaminated areas to the clean areas;
- Confine work activities to the appropriate areas, thereby minimizing the likelihood of accidental exposures;
- Facilitate the location and evacuation of personnel in case of an emergency; and
- Prevent unauthorized personnel from entering controlled areas.

When establishing the work zones at a site, the site map can provide a useful format for compiling the relevant data. In the absence of sampling results, site maps can provide essential information on potential and suspected hazards and potential exposure pathways.

Although a site may be divided into as many zones as necessary to ensure minimal employee exposure to hazardous substances, the three most frequently identified zones are the Exclusion Zone (or "hot zone"), the Contamination Reduction Zone, and the Support Zone (or "clean zone"). Movement of personnel and equipment between these zones should be minimized and restricted to specific access control points to prevent cross-contamination.

9.3.1. The Exclusion Zone

The Exclusion Zone is the area where contamination is either known or expected to occur and where the greatest potential for exposure exists. The outer boundary of the Exclusion Zone, called the Hotline, separates the area of contamination from the Contamination Reduction Zone. The Hotline should initially be established by visually surveying the site and determining the extent of hazardous substances, discoloration, or any drainage, leachate, or spilled material present. Other factors to consider in establishing the Hotline include:

- Providing sufficient space to protect personnel outside the Exclusion Zone from potential fire or explosion,
- Allowing an adequate area within which to conduct site operations, and
- Reducing the potential for contaminant migration.

The Hotline should be physically secured (e.g., using chains, fences, or ropes) or clearly marked (e.g., using lines, placards, hazard tape, and/or signs). During subsequent site operations, the boundary may be modified and adjusted as more information becomes available. In addition, the Exclusion Zone may also be subdivided into different areas of contamination based on the known or expected type and degree of hazards or the incompatibility of waste streams. If the Exclusion Zone is subdivided in this manner, additional demarcations (e.g., "Hazards Present" or "Protection Required") may be necessary. For sites where radiological contamination exists, procedures for establishing and posting of radiological zones should be developed and included in this chapter. Procedures should be in accordance with the *DOE Radiological Control Manual*.

Access to and from the Exclusion Zone should be restricted to Access Control Points at the Hotline. Access Control Points are used to regulate the flow of personnel and equipment into

and out of the contaminated area and to verify that site control procedures are followed. Separate entrances and exits should be established to separate personnel and equipment movement into and out of the Exclusion Zone.

All persons who enter the Exclusion Zone should wear the appropriate level of Personal Protective Equipment (PPE) for the degree and types of hazards present (see Chapter 5). If the Exclusion Zone is subdivided, different levels of PPE may be appropriate. Each subdivision of the Exclusion Zone should be clearly marked to identify the hazards and the required level of PPE.

9.3.2. The Contamination Reduction Zone

The Contamination Reduction Zone is the area in which decontamination procedures take place. It is the transition area between the Exclusion Zone and the Support Zone. The purpose of the Contamination Reduction Zone is to reduce the possibility that the Support Zone will become contaminated or affected by the site hazards.

The Contamination Control Line marks the boundary between the Contamination Reduction Zone and the Support Zone and separates the clean areas of the site from those areas used to decontaminate workers and equipment. Access Control Points between the Contamination Reduction Zone and the Support Zone should be established to ensure workers entering the Contamination Reduction Zone are wearing the proper PPE and that workers exiting the Contamination Reduction Zone to the Support Zone remove or decontaminate all potentially contaminated PPE.

9.3.3. The Support Zone

The Support Zone is the uncontaminated area where workers are unlikely to be exposed to hazardous substances or dangerous conditions. Because the Support Zone is free from contamination, personnel working within it may wear normal work clothes. Any potentially contaminated clothing, equipment, and samples (outer containers) should remain inside the Contamination Reduction Zone or the Exclusion Zone.

Designation of the Support Zone should be based on all available site characterization data and should be located upwind from the Exclusion Zone. The Support Zone should be in an area that is known to be free of elevated (i.e., higher than background) concentrations of hazardous substances.

9.4. USING THE BUDDY SYSTEM

When carrying out activities in the Exclusion Zone, workers should use the "buddy system" to ensure that rapid assistance can be provided in the event of an emergency. The "buddy system" is an approach used to organize workgroups so that each worker is designated to be observed by

at least one other worker. During initial site entry, it may be appropriate to utilize a "buddy system" in which additional workers are assigned to provide safety backup.

The Field Team Leader, who is responsible for enforcing the "buddy system", should implement the system at the Access Control Point for workers entering the Exclusion Zone.

As part of the buddy system, workers should remain in close proximity and maintain visual contact with each other to provide assistance in the event of an emergency. Should an emergency situation arise, workers should use prearranged communication signals agreed upon prior to entering the contaminated area. The responsibilities of workers utilizing the buddy system include:

- Providing his or her partner with assistance,
- Observing his or her partner for signs of chemical or heat exposure,
- Periodically checking the integrity of his or her partner's PPE, and
- Notifying the Project Manager or other site personnel if emergency assistance is needed.

Workers should not rely entirely on the "buddy system" to ensure that help will be provided in the event of an emergency. To augment this system, workers in contaminated areas should remain in line-of-sight or direct communication contact with the command post or Field Team Leader at all times.

9.5. COMMUNICATION NETWORK AND PROCEDURES

Communication systems should be established for both internal and external communication. Internal communication refers to communication among workers operating in the Exclusion Zone or Contamination Reduction Zone, or between the Command Post and those workers. Routine checking for proper operation should be addressed.

An internal communication system may be established using standard communication devices such as radio, noisemakers, or visual signals. Verbal communication can be difficult as a result of onsite background noise and the use of PPE. Therefore, pre-arranged commands and audio or visual cues should be developed prior to entering the Exclusion Zone. A secondary set of non-verbal signals should be established for use when communication devices fail or when emergency situations occur.

External communication refers to communication between onsite and offsite personnel. An external communication system should be maintained in order to:

- Coordinate emergency response efforts with offsite responders,
- Report progress or problems to management, and
- Maintain contact with essential offsite personnel.

The primary means of external communication are telephone and radio.

9.6. WORKER SAFETY PROCEDURES

As part of the site control plan, procedures should be established to ensure worker safety. Worker safety procedures include preparation of the site for response activities, engineering controls and safe work practices, and Standard Operating Procedures (SOPs). Worker safety procedures should be prepared in advance of conducting onsite response operations and should be available at the site command post.

Engineering controls and safe work practices should be implemented to reduce and maintain employee exposure levels at or below the permissible exposure limits (PELs) and published exposure limits for those hazardous substances at the site. If engineering controls and safe work practices are insufficient to adequately protect against exposure, PPE should be used to protect employees against possible exposure to hazardous substances.

9.7. MEDICAL ASSISTANCE

As part of the site control program, the Project Manager should assure that the identification and location of the nearest medical facilities where response personnel can receive assistance in the event of an emergency are posted. Information such as the names, phone numbers, addresses, and procedures for contacting the facilities should be maintained. This information should be posted conspicuously throughout the site, as well as near telephones or other external communication devices.

9.8. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response (HAZWOPER)*.

2. Department of Health and Human Services (DHHS) (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

3. EPA Publication No. 9285.1-03, *Standard Operating Safety Guide*s, Chapter 4, Office of Emergency and Remedial Response, USEPA, 1992.

4. EPA 9285.8-01, *Health and Safety Plan (HASP) User's Guide*, Chapter 8, Office of Emergency and Remedial Response, USEPA, 1992 (and ERT Health and Safety Plan Planner, Ver. 3.0C, 1993).

10.0. DECONTAMINATION

10.1. BACKGROUND

Decontamination involves physically removing contaminants from personnel and equipment and/or chemically converting them into innocuous substances. The extent of decontamination depends on a number of factors, the most important of which is the types of contaminants involved. The more harmful the contaminant, the more extensive and thorough the decontamination. The combination of decontamination, correct donning of protective clothing, and zoning of site work areas, minimizes cross-contamination from the protective clothing to wearer, from equipment to personnel, and from one area to another. Only general guidance can be given on methods and techniques for decontamination. The exact procedure is determined by evaluating a number of factors specific to the incident and/or site. The site should refer to the DOE *Radiological Control Manual* for detailed radiological decontamination requirements.

The requirements and procedures need to be addressed and implemented for both chemical and radiological contamination. For the purpose of this document, a Radiological Area should generally equate to an Exclusion Zone, a Radiological Buffer Area should generally equate to a Contamination Reduction Zone, and a Controlled Area generally equates to a Support Zone (see Table 9-1). Contamination of personnel, equipment and/or material can occur from both a radiological and hazardous material. When decontamination is required in such areas, procedures should be developed which will accommodate both contamination types and minimize the amount of mixed waste.

The overall objectives of the Decontamination chapter are to:

- Determine and implement the decontamination methods for personnel and equipment that are effective for the specific hazardous/radioactive substance(s) present,
- Ensure the decontamination procedure itself does not pose any additional safety or health hazards,
- Provide pertinent information on the locations and layouts of decontamination stations and equipment,
- Establish procedures for the collection, storage and disposal of clothing and equipment that has not been completely decontaminated, and
- Provide for the periodic evaluation of the plan against the existing site hazards.

10.2. GENERAL CONSIDERATION

The HASP should specify the level of decontamination necessary for personnel and equipment at the site. The decontamination plan for personnel and equipment is based on the assumption that all personnel and equipment leaving the Exclusion Zone/Radiological Area (area of potential contamination) are grossly contaminated. The plan includes a system for washing, and rinsing, at least once, all of the mechanical and protective equipment until they are decontaminated. If

clothing or equipment is contaminated with both radiological and hazardous material and this process is used, mixed waste may be generated. Special precautions should be taken to ensure this waste is properly handled, treated, stored and disposed.

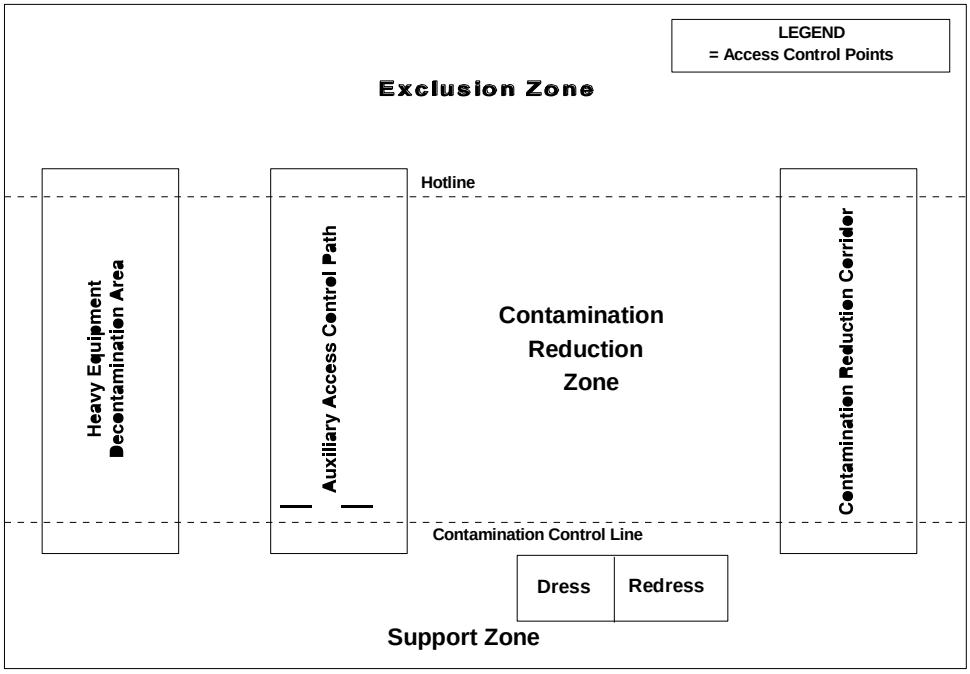
10.3. LOCATION AND LAYOUT

An area within the Contamination Reduction Zone/Radiological Buffer Area is normally designated the Contamination Reduction Corridor (CRC). The CRC controls access into and out of the Exclusion Zone/Radiological Area and confines personnel decontamination activities to a limited area. A separate CRC should be established for equipment. Figure 10-1 provides a graphical depiction of an example layout of CRCs in relation to work zones.

FIGURE 10-1

Example Layout of Contamination Reduction Corridors

Professional judgment should be exercised in determining how the CRC should be organized and what decontaminants should be used. Factors that should be considered include:



- The extent and type of the expected hazard,
- Meteorological conditions (wind direction),
- Topography,
- Levels of protection selected, and
- Availability of equipment and supplies.

The size of the corridor depends on:

- The wind direction (corridor needs to remain upwind),
- Number of stations in the decontamination procedure,
- The overall dimension of work control zones (i.e., Exclusion Zone, Contamination Reduction Zone, Support Zone), and
- The amount of space available at the site.

A corridor of 75 feet by 15 feet should be adequate for the most extensive decontamination. Whenever possible, it should be a straight path.

The CRC boundaries should be conspicuously marked, with entry and exit restricted. The far end is the Hotline--the boundary between the Exclusion Zone and the Contamination Reduction Zone. Personnel and equipment exiting the Exclusion Zone should go through the designated CRC. Anyone in the CRC should be wearing the appropriate level of protection designated for the decontamination crew.

Protective clothing, respirators, monitoring equipment, sampling supplies, and other equipment should be maintained in the support area outside of the CRC. Personnel don their protective equipment away from the CRC and enter the Exclusion Zone through a separate access control point at the Hotline. Appendix F recommends the decontamination layouts, procedures, and equipment needed for PPE Levels A through C.

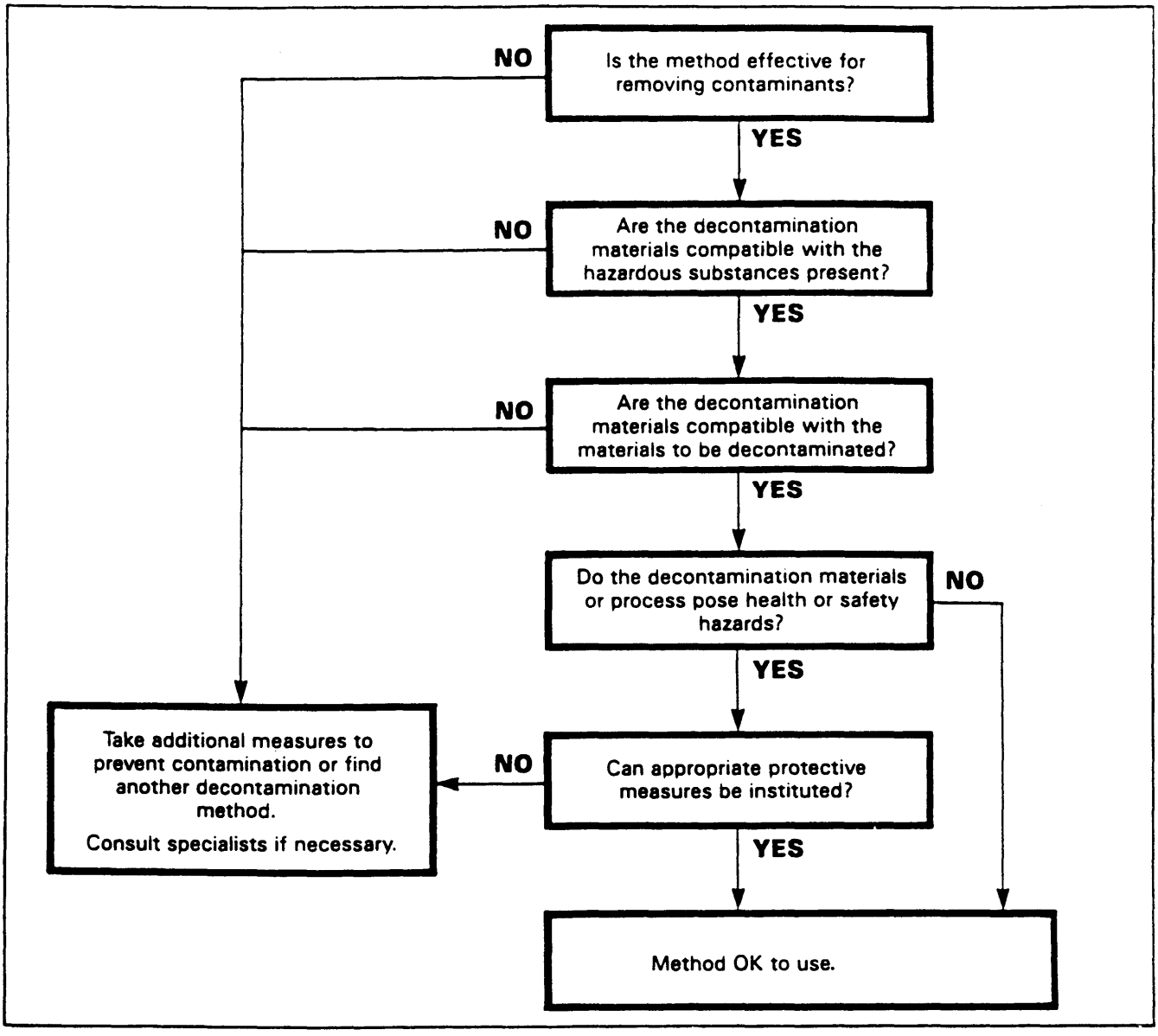
10.4. DETERMINING DECONTAMINATION METHODS

The need for, and extent of decontamination depends upon the reason for an employee leaving the Exclusion Zone/Radiological Area. A worker leaving the Exclusion Zone/Radiological Area to pick up or drop off tools or instruments and immediately returning may not require full decontamination. A worker leaving to get a new air cylinder or change a respirator or canisters, however, would require some degree of decontamination. The time required for personnel decontamination should be ascertained and incorporated into the scheduling of site activities. Individuals departing the CRC to the Support Zone should be thoroughly decontaminated. Personnel wearing a self-contained breathing apparatus should leave the work area with sufficient air to walk to the CRC and go through decontamination.

A flow chart for evaluating safety and health aspects of a decontamination method is depicted in Figure 10-2. Once decontamination procedures have been established, all personnel requiring decontamination should be given precise instructions and should practice moving through the decontamination line.

FIGURE 10-2

Decision Aid for Evaluating Health and Safety Aspects of Decontamination Methods



The type of decontamination equipment, materials, and supplies are generally selected on the basis of availability, the ease of decontamination, and disposability. Most equipment and supplies can be easily procured. Some commonly used articles are:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
- Buckets of water or garden sprayers for rinsing;
- Large galvanized wash tubs, stock tanks, or children's wading pools for washing and rinsing solutions;
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
- Metal or plastic cans or drums for the temporary storage of contaminated liquids; and
- Paper or cloth towels for drying protective clothing and equipment.

Heavy equipment such as bulldozers, trucks, backhoes, and drilling equipment are difficult to decontaminate. Decontamination Pad design and construction should reflect consideration for overspray and pad strength durability to accommodate heavy equipment decontamination. The methodology generally employed involves washing the equipment on a sloped concrete or plastic covered pad with a soapy water solution followed by a thorough water rinse. The wash and rinse solutions are applied through the use of a high pressure spray unit. Particular attention should be given to tires, scoop, and other components which directly contact the contaminated areas. Wipe tests should be employed to determine the effectiveness of the decontamination procedure.

Protective equipment, sampling tools, and other equipment are usually decontaminated by scrubbing with detergent water using a soft-bristle brush followed by rinsing with a copious quantity of water. While this process may not be fully effective in removing some contaminants (in some cases, the contaminants may react with water), it is a relatively safe option compared to the use of a decontaminating solution. The contaminant should be identified before a decontamination chemical is used, as reactions of the chemical with unidentified substances or mixtures could be hazardous or more difficult to dispose. A decontamination solution should be selected based on the recommendations of an experienced chemist.

10.5. STANDARD OPERATING PROCEDURES TO MINIMIZE WORKER CONTACT

The minimization of worker contact with contaminants during decontamination actually starts with Standard Operating Procedures (SOPs). Site workers who use general safe work practices are less likely to be contaminated than site workers who do not use these practices. Workers can take steps to minimize their exposure during decontamination through using contact minimization techniques such as:

- Remote handling,
- An outer layer of disposable clothing,
- Encasing tools/equipment in plastic, and.
- General safe work practices.

The HASP should incorporate all of the appropriate contact minimization techniques addressed in the site-specific decontamination plan.

Once workers reach the decontamination line, they should strictly adhere to proper doffing procedures. This includes minimizing contact (grabbing, holding, touching, etc.) between contaminated site workers and decontamination line workers.

10.6. COLLECTION, STORAGE AND DISPOSAL PROCEDURES

All items (including clothing, equipment, liquids) used in the decontamination procedure that cannot be completely decontaminated should be considered radioactive, hazardous, or mixed waste, as appropriate. Clothing and equipment should be collected, treated, stored, and disposed of based on the type and level of contamination according to applicable Federal, state and local regulations. Drainage and/or collection systems for contaminated liquids should be established and approved containers should be used. Wash water should be collected for proper disposal. Procedures to contain contaminated water or decontamination fluids (i.e., collection of contaminated runoff, containment of overspray) should be developed and included as part of the decontamination plan. Waste minimization should be a consideration, secondary only to worker safety and health protection requirements, when designing the decontamination procedure.

10.7. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

2. DHHS (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Chapter 10 and Appendix B, Section I, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

3. DOE *Radiological Control Manual*, Chapter 3, Part 7, "Construction and Restoration Projects," June 1992.

4. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides*, Chapter 9, Office of Emergency and Remedial Response, USEPA, 1992.

5. EPA 9285.8-01, *Health and Safety Plan (HASP) User's Guide*, Chapter 9, Office of Emergency and Remedial Response, USEPA, 1992 (and ERT Health and Safety Plan Planner, Ver. 3.0C, 1993).

6. *Resource Conservation and Recovery Act* (RCRA), 42 U.S.C. 6901.

7. *Toxic Substances Control Act* (TSCA) 15 U.S.C. 2601.

11.0. EMERGENCY RESPONSE/CONTINGENCY PLAN

11.1. BACKGROUND

The site-specific Emergency Response/Contingency Plan, also referred to as Emergency Response Plan (ERP), should be designed as a separate section of the HASP and should be compatible and integrated with the disaster, fire, and emergency response plans of local, state, and Federal agencies. Where applicable, the plan should be coordinated with other DOE elements at the installation. The purpose of the ERP is to protect workers in emergency situations resulting from the release of all types of hazardous substances, including Extremely Hazardous Substances, CERCLA hazardous substances, RCRA hazardous wastes, and any substance listed by the U.S. Department of Transportation as a hazardous material. The requirements for an ERP at hazardous waste sites are codified in 29 CFR 1910.120. The ERP should be developed and implemented prior to beginning site operations. Hazardous waste site operations should not begin until the ERP is in place.

Sites with RCRA permitted treatment, storage, and disposal facilities for hazardous waste, having the required contingency plan meeting the requirements of their permit, would not need to duplicate the same planning elements. Those items of the ERP that are properly addressed in the permit contingency plan may be substituted into the ERP required by 29 CFR 1910.120.

The objective of this chapter is to describe the minimum required elements of the ERP, which are as follows:

- Pre-emergency planning;
- Personnel roles, lines of authority, and communication;
- Emergency recognition and prevention;
- Safe distances and places of refuge;
- Site security and control;
- Evacuation routes and procedures;
- Decontamination procedures;
- Emergency medical treatment/first aid;
- Emergency alerting and response procedures;
- Critique of response and follow-up;
- PPE and emergency equipment; and
- Procedures for reporting incidents to local, state, and Federal governmental agencies.

Elements identified above may require data that has already been created and documented in other chapters of the HASP (i.e., site characterizations, hazard assessments, maps, transportation routes, etc.). Copies of this documentation should be incorporated into the ERP.

11.2. PRE-EMERGENCY PLANNING

The objective of pre-emergency planning is to be prepared to safely respond to anticipated emergencies prior to commencement of hazardous waste operations. Additionally, 29 CFR 1910.120(1)(3)(B)(iii) establishes pre-planning to ensure that the ERP is compatible and integrated with the disaster, fire, and/or emergency response plans of local, state, and Federal agencies.

To ensure the complete integration of emergency response activities with outside organizations, this section of the ERP should include the following:

- An explanation of the relationship between site organizations and local governmental response agencies (e.g., host, county, state);
- A list of all emergency plans affecting the site;
- A description of the relationship between this plan and other plans affecting the site;
- A description of the ways in which all ERPs are integrated with local response plans;
- A description of the function and responsibilities of all local response organizations at the site (e.g., public and private sectors, volunteer organizations, and charitable organizations); and
- A listing of all mutual agreements and other arrangements for sharing data and response resources.

The following technical items should be considered during pre-planning and included in this section of the ERP:

- Scenarios for potential credible accidents which may take place during site operations or along transportation routes;
- Operations at the site that possess hazardous substances/activities and the transportation routes along which these substances should move;
- Other facilities/activities which may contribute to the overall site risk;
- Site topography, layout, and prevailing weather conditions;
- Potential off-site impacts [e.g., special populations (infants, the aged) and sensitive institutions (hospitals, schools, daycare center)]; and
- ERP rehearsals and drills.

The ERP should be reviewed and revised on a regular basis.or as necessary, by the Site Safety and Health Officer (SSHO). This will ensure the plan is adequate and consistent with prevailing site conditions.

11.3. PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

This section of the ERP, used in conjunction with Chapter 2, Key Personnel, should identify and define the roles of all personnel, organizations, and teams, both onsite and offsite, who will

participate in emergency response. Local, state, and Federal response organizations with oversight responsibility should be identified and an explanation included for integration and coordination into a single, workable response plan. Depending upon the nature and scope of the emergency, the size of the site, and the number of personnel, emergency response may require small or large teams, or several interacting teams. In all cases, the organizational structure should:

- Show a clear chain-of-command,
- Ensure every person knows his/her position and authority,
- Be flexible enough to handle multiple emergencies, and
- Clearly identify specific roles and responsibilities.

11.3.1. Facility Emergency Coordinator

The Facility Emergency Coordinator assumes primary responsibility for responding to and coordinating emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area and evacuation of adjacent residents. The Facility Emergency Coordinator is additionally responsible for implementing corrective measures, notification of appropriate authorities, and completion of follow-up reports. The SSHO may be called upon to act on the behalf of the Facility Emergency Coordinator, and direct responses to any medical emergency. Individual contractor organizations are responsible for assisting the Facility Emergency Coordinator and/or SSHO in his/her mission within the parameters of their scope of work. These positions should be considered mandatory and alternate(s) should be specified.

11.3.2. Emergency Contacts

A contact list should be developed for notification. This list should be updated continually and made available to all emergency response personnel and site employees (see example list in Table 11-1).

11.3.3. Reporting

Reporting requirements vary depending upon the type and severity of the accident/incident. Procedures should be developed for reporting accidents/incidents that occur at EM sites. These procedures are found in the DOE 5000 Series Orders, and include notification requirements within DOE, and to other Federal, state, and local organizations.

TABLE 11-1

Emergency Contacts and Phone Numbers

Organization	Contact	Telephone
Ambulance:		
Police:		
Fire:		
State Police:		
Hospital 1:		
Hospital 2:		
Poison Control Center:		
Regional EPA:		
EPA Emergency Response Team: State Authority:		908-321-6660
National Response Center:		800-424-8802
Center for Disease Control:		404-488-4100
Chemtrec:		800-424-9555
Site Emergency Operations Center:		
DOE Emergency Operations Center (National Center):		202-896-8100

11.3.4. Emergency Communications

Communications systems to be used for internal and external communications during an emergency should be described including types and combinations of systems, their use, and back-up systems.

An internal network of communications should be developed to alert workers to danger, convey safety information, and maintain site control. Any effective system or combination of systems may be employed. External communications systems and procedures should be clear and accessible to all workers. All personnel should be familiar with the protocol for communication systems.

11.4. EMERGENCY RECOGNITION AND PREVENTION

A system to alert personnel to potentially hazardous situations should be established. Site briefings should be held as necessary to brief all employees of new developments, tasks, and hazards associated with work at the site. These briefings should include:

- Tasks to be performed;
- Specific chemical and physical hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals;
- Transportation routes along which hazardous substances move;
- Additional hazards as a direct result of site activities, as well as prevention and control techniques/mechanisms; and
- Emergency procedures.

Personnel should be familiar with techniques of hazard recognition from pre-assignment training and site-specific briefings.

Personnel should also be knowledgeable of the fire hazards associated with the materials and processes to which they are exposed. Details on fire prevention planning are provided in Chapter 12, of this guidance document.

11.5. SAFE DISTANCES AND PLACES OF REFUGE

The requirements for determining safe distances and places of refuge at a specific site should be established. This section should consider the amount and type of substance(s) at the site as well as the potential impact on workers and the public. Safe distances should be estimated based on emergency scenarios developed during the pre-planning phase. Actual safe distances can only be established at the time of an emergency, based on a combination of site-specific and incident-specific factors. Some factors that may need to be considered are:

- The toxicological/radiological properties of the substance,
- The physical state of the substance,
- The quantity and rate of release,
- The method of release,
- The atmospheric conditions, and
- Local topography.

Onsite refuges should be identified and provided with proper equipment for localized emergencies not requiring site evacuation. Examples of equipment a refuge might contain are:

- Water for decontamination,
- Communications network with site emergency operations center,
- Emergency personal protection equipment,
- First-aid supplies,
- Required special monitoring devices, and
- Fire extinguisher.

11.6. SITE SECURITY AND CONTROL

In an emergency, the Facility Emergency Coordinator should ascertain who is on site, and control the entry of personnel into hazardous areas. In an emergency, as in daily work activities, the site should be divided into three areas: Exclusion Zone, Contamination Reduction Zone, and Support Zone. Only necessary rescue and response personnel should be allowed into the Exclusion Zone. A personal locator system should be used to locate all personnel on site. Checkpoints (or a series of checkpoints) should be established through which all personnel entering or exiting the emergency site should pass. Checkpoint information should include:

- Name (affiliation),
- Time of entry/exit,
- Zones or areas to be entered,
- Tasks to be performed, and
- Protective equipment worn and air time remaining.

11.7. EVACUATION ROUTES/PROCEDURES

Primary and alternate routes should be established for evacuating victims and endangered personnel. Routes should be directed from the Exclusion Zone, through an upwind Contamination Reduction Corridor to a Support Zone, then to an offsite location.

The following guidelines should be used to assist in establishing safe emergency evacuation routes and developing procedures for their use:

- Place evacuation routes predominately upwind from the Exclusion Zone;
- Run evacuation routes through the Contamination Reduction Zone;
- Consider the accessibility of potential routes;
- Develop two or more routes, separate from each other;
- Clearly mark all evacuation routes;
- Check clearances of access ports, crawlspaces, hatches, manholes, tunnels, etc., to ensure personnel wearing PPE can get through; and
- Establish a routine for ensuring all evacuation routes are kept clear.

A map should be provided which depicts evacuation routes for the site and immediate area. Assembly areas and safe distances in the event of a major incident should also be included. This information should be included in the overall training program.

11.8. DECONTAMINATION PROCEDURES

This section specifically addresses decontamination procedures necessary in emergency response situations. If the general Decontamination section of the HASP adequately addresses emergency response decontamination, that section may be reproduced and inserted into the ERP section of the HASP. Additional emergency decontamination procedures should be developed if appropriate.

The following items should be considered when developing emergency decontamination procedures:

- Decontamination of ill or injured personnel,
- Reporting of all injuries and illnesses to the Project Manager,
- Protection of emergency medical personnel,
- Decontamination and/or disposal of contaminated protection equipment and contaminated solutions,
- Providing specific decontamination procedures to a clinic or hospital treating ill or injured personnel, and
- Decontamination of emergency equipment.

11.9. EMERGENCY MEDICAL TREATMENT/FIRST AID

In emergencies, toxic exposures and hazardous situations that cause injuries and illnesses will vary from site to site. Medical treatment may range from bandaging of minor cuts and abrasions to life-saving techniques. In many cases, essential medical help may not be immediately available. For this reason, it is vital to train onsite emergency personnel in on-the-spot treatment techniques, to establish and maintain telephone contact with medical experts (e.g., physicians, toxicologists), and to establish liaisons with local hospitals and ambulance services. When designing this program, the following should be included:

- Training of personnel in emergency treatment such as first aid and CPR,
- Establishing liaison with local medical personnel,
- Informing and educating local medical personnel about site-specific hazards, and
- Establishing onsite emergency first-aid stations.

11.10. EMERGENCY ALERTING/RESPONSE PROCEDURES

Requirements should be established for developing procedures which alert onsite personnel to the emergency, activate the onsite emergency response team, and establish the actions to be taken by emergency response personnel. Procedures contained in this section should comply with requirements for employee alarm systems as specified at 29 CFR 1910.165. If physically impaired individuals are employed at the site, alternate alarm methods may be necessary.

11.10.1. Notification

When notifying onsite emergency response personnel, all available information on the incident should be provided. This may include:

- Location,
- Time of occurrence,
- Description of incident (including contaminants involved),
- Injuries or fatalities,
- Extent of damage,
- Actions taken, and
- Identified response needs.

11.10.2. Evaluation of the Situation

As quickly as possible, available information about the incident and emergency response capabilities should be evaluated by the Facility Emergency Coordinator and the Emergency Response Team. The following information should be determined, to the extent possible:

What happened:

- Type of incident;
- Cause of incident;
- Extent of chemical release and transport; and
- Extent of damage to structures, equipment, and terrain.

Casualties:

- Victims (number, location, and condition);
- Treatment required; and
- Missing personnel.

What could happen?

- Types of chemicals on site;
- Potential for fire, explosion, and release of hazardous substances;
- Location of all personnel on site relative to hazardous areas; and
- Potential for danger to offsite population or environment.

What can be done?

- Equipment and personnel resources needed for victim rescue and hazard mitigation;
- Number of uninjured personnel available for response;
- Resources available on site;
- Resources available from outside groups and agencies;
- Time for outside resources to reach the site; and
- Hazards involved in rescue and response.

11.10.3. Rescue/Response Action

Based on the available information, the type of action required should be determined and the necessary steps implemented. Some actions may be done concurrently. No one should attempt emergency response or rescue until back-up personnel and evacuation routes have been identified. Rescue/response actions include:

- Enforce the buddy system;
- At all times, retain personnel in the Exclusion Zone in line-of-sight or communications contact with the Command Post Supervisor or designee;
- Locate all victims and assess their condition;
- Determine resources needed for stabilization and transport;
- Assess existing and potential hazards to site personnel and to the offsite population;
- Allocate onsite personnel and equipment to rescue and incident response operations;
- Contact the needed offsite personnel or facilities, such as the ambulance, fire department, and police;
- Bring the hazardous situation under complete or temporary control, and use measures to prevent the spread of the emergency;
- Remove or assist victims from the area;
- Use established procedures to decontaminate uninjured personnel in the Contamination Reduction Zone, or if the emergency makes this area unsafe, establish a new decontamination area at an appropriate distance;
- Administer any medical procedures that are necessary to stabilize victims before moving;
- Stabilize or permanently fix the hazardous condition, and attend to the cause of the emergency and anything damaged or endangered by the emergency;
- Take measures to minimize contamination of the victims, transport vehicle(s) and ambulance and hospital personnel; and
- Move site personnel to a safe distance upwind of the incident, monitor the incident for significant changes, and take additional actions to protect personnel, if necessary.

11.11. CRITIQUE OF RESPONSE AND FOLLOW-UP

11.11.1. Critique

Review the incident and revise all aspects of the ERP according to new site conditions and lessons learned from the emergency response. When reviewing the information, consider typical questions such as:

- What caused the emergency?
- Was it preventable? If so, how?
- Were procedures for prevention of the emergency adequate? If not, how can they be improved?
- Were all phases of the response adequate? How could it have been improved?
- How did the incident affect the site profile? How were other site cleanup activities affected?
- Was the public safety protected?

11.11.2. Maintaining Readiness

Before normal site activities are resumed, personnel should be fully prepared and equipped to handle another emergency. Also, equipment and supplies should be restocked, damaged equipment should be repaired or replaced, and equipment should be cleaned and refueled for future use. A regular schedule should be established for testing and inspecting emergency equipment and systems.

11.12. PPE AND EMERGENCY EQUIPMENT

An up-to-date list of all emergency equipment should be maintained. Personal Protective Equipment (PPE) should be selected, sized, fitted, maintained and used in accordance with the PPE section of the site-specific HASP. Additionally, PPE training should be conducted as specified in the HASP training section. Individuals should receive required PPE training prior to being allowed to perform work on site. A map that shows the location of emergency equipment should be made readily available to all personnel.

Specific procedures for the maintenance, fueling, parking, and availability of regular equipment, which doubles as emergency equipment, should be developed. Adoption of the following work procedures should be considered:

- Refuel all heavy equipment once the tanks have been lowered to one-half to one-quarter tank;
- Require equipment repairs to take place upon discovery;
- Park similar pieces of heavy equipment (e.g., bulldozers, trucks, forklifts) in separate locations, and do not use them at the same location at the same time;

- Inspect all emergency equipment at each shift change; and
- Ensure all equipment operators are thoroughly briefed on the procedures and requirements for relinquishing vehicles to emergency response personnel.

The basic emergency equipment and supplies, shown in Table 11-2, should be made available at the site, as required.

TABLE 11-2

Emergency Equipment and Supplies

Personal Protection	Medical	Response Equipment
• Escape SCBA or SCBA, which can be brought to the victim to replace or supplement his or her SCBA • PPE and clothing specialized for known site hazards	• Air splints • Antiseptics • Blankets • Decontamination solutions appropriate for onsite chemical hazards • Emergency eye wash • Emergency showers or wash stations • Fist aid kits • Ice • Reference books containing basic first-aid procedures and information on treatment of specific chemical injuries • Resuscitator • Safety harness • Stretchers • Water, in portable containers • Wire basket litter (stokes litter) which can be used to carry a victim in bad weather and on difficult terrain, allows easy decontamination of the victim, and is itself easy to decontaminate	• Fire-fighting equipment and supplies • Spill-containment equipment, such as absorbents and oil booms • Special hazardous-use tools such as remote pneumatic impact wrenches, nonsparking wrenches and picks • Containers to hold contaminated materials including overpacks • Communication equipment such as public, site, and mobile phones, two-way radios • Sampling equipment including air monitors, such as Combustible Gas Indicators, Photoionization Detectors

Special equipment should be obtained depending upon the specific types of emergencies which may occur, and the capabilities of response personnel. When determining the type and quantities of special equipment, the following factors should be considered:

- The number and qualifications of response personnel;
- The worst case emergency scenario;
- Type of hazards, mitigation, containment, and protective measures;
- Capabilities and response times of offsite response personnel; and
- Number of possible victims.

11.13. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

2. 29 CFR 1910.165, *Employee Alarm Systems.*

3. 29 CFR 1910.1000, *Air Contaminants*.

4. DHHS (NIOSH) Publication No. 85-115, *Occupational Safety, and Health Guidance Manual for Hazardous Waste Site Activities,* NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

5. DOE 5483.XX, *Occupational Safety and Health Program for DOE Contractor Employees (Draft).*

6. DOE Order 5000.3B, *Occurrence Reporting and Processing of Operations Information*.

7. DOE 5500.1B, *Emergency Management System*.

8. DOE 5500.2B, *Emergency Categories, Classes, and Notification and Reporting Requirements.*

9. DOE 5500.3A, *Planning and Preparedness for Operational Emergencies*.

10. DOE 5500, 4A, *Public Affairs Policy and Planning Requirements for Emergencies*.

11. DOE 5500.5A, *Public Affairs Policy and Planning Requirements for a Fuel Supply Disruption Emergency*.

12. DOE 5500.6B, *Shutdown of Departmental Operations Upon Failure by Congress to Enact Appropriations.*

13. DOE 5500.7B, *Emergency Operating Records Protection Program*.

14. DOE 5500.8A, *Energy Emergency Planning and Managemen*t.

15. DOE 5500.9A, *Emergency Planning, Preparedness, and Response to Continuity of Government Emergencies.*

16. DOE 5500.10, *Emergency Readiness Assurance Program*.

17. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides*, Office of Emergency and Remedial Response, US EPA, 1992.

18. NFPA, *Hazardous Materials Emergency Response Handbook*, 1992.

12.0. EMERGENCY ACTION PLAN

12.1. BACKGROUND

Not all EM-40 sites have the organizational capability for responding to emergencies. Most organizations at EM-40 sites should, in fact, evacuate employees and only perform such activities as emergency shut-down or first aid/CPR. Therefore, it is not necessary for these sites to prepare an emergency response plan. Instead, these sites should prepare an Emergency Action Plan (EAP) that meets the requirements of 29 CFR 1910.38(a).

The EAP should describe those actions to be taken to assure safety from fire, hurricanes, blizzards, toxic chemical releases, floods, and other emergencies. The Plan should be totally integrated and coordinated with the landlord's emergency response plan, and should contain, at a minimum, the following elements:

- Emergency escape procedures, and emergency escape route assignments;
- Procedures to ensure that all contractors on site coordinate their EAPs to prevent conflicts and confusion;
- Procedures to be followed by personnel who stay behind to conduct critical operations (i.e., shutdown) before they evacuate;
- Procedures to account for all employees after emergency evacuation has been completed;
- Rescue and medical duties (first aid, CPR, etc.) for those individuals who are to perform them;
- Methods for reporting fires and other emergencies;
- Names and phone numbers of personnel and organizations to be contacted for further information or explanation of duties under the Plan;
- Alarm system to be used to alert personnel to the emergency/evacuation;
- Training each employee should receive in order to effectively carry out the requirements of the EAP, and the methods for evaluating employee knowledge of the plan;
- Fire prevention plan; and
- Procedures for the review and update of the Plan (e.g., schedule, rehearsal).

12.2. EMERGENCY ESCAPE ROUTE ASSIGNMENT

This section of the EAP should contain the information necessary for the safe, orderly evacuation of site employees. The contents of this section should focus on the procedures for evacuation and the establishment of emergency escape routes. Primary and alternate routes to be used for the evacuation of personnel should be established.
The following guidelines should be used in establishing safe emergency evacuation routes:

- Routes should be directed from the Exclusion Zone, through an upwind Contamination Reduction Zone to a Support Zone, and from the Support Zone to an offsite location, should conditions require a general site evacuation;

- Place direct evacuation routes predominately upwind from the Exclusion Zone. In some cases, as at very large sites, some exits may be placed in the downwind fenceline. Workers should be informed during training that they are not safe until they have reached the designated safety area;
- Establish evacuation routes through the Contamination Reduction Zone. This should allow a mechanism for accountability of all personnel, even if there is not enough time to process evacuees through decontamination;
- Consider the accessibility of potential routes. Obstructions such as locked gates, trenches, pits, drums, tanks, and other barriers should be considered, as well as the additional time and equipment needed to maneuver around or through them;
- Develop two or more routes, separate from each other, which lead to safe areas. Ensure that routes do not overlap or intersect;
- Mark routes as "safe" or "not safe" on a daily basis, depending on wind direction and other conditions at the site; and
- Mark all evacuation routes. No unsafe routes should be used for evacuation (e.g., low ground, streams, trenches).

Consider mobility limitations for personnel wearing PPE and other emergency equipment including:

- Develop procedures to use ladders and other material to traverse hazardous terrain (e.g., ditches, heights, trenches); and
- Check clearances of access ports, crawlspaces, hatches, manholes, tunnels, to ensure personnel wearing protective equipment can get through.

A routine should be established for ensuring all evacuation routes are kept clear. In the event of an emergency which necessitates an evacuation of the site, a procedure similar to the one below should be used.

- Make evacuation alarm notification supplemented by the use of hand held radios. All personnel should evacuate upwind of any activities along established "safe" evacuation routes. Proceed to the predetermined location so that all personnel can be accounted for; and
- Ensure that personnel proceed to the closest exit with their buddy, and proceed to the safe distance area associated with the evacuation route. Personnel should remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

A map should be provided which depicts evacuation routes for the site and immediate area. In the event of a major incident, assembly areas and safe distances should also be indicated on the map.

12.3. PROCEDURES FOR CRITICAL OPERATIONS PERSONNEL

Procedures should be developed which clearly identify critical operations, critical operations personnel, and actions required of those personnel performing critical operations during site evacuation. This section should contain:

- A listing of all critical operations, the personnel assigned to perform them, and the procedure for updating the listing;
- A description of any additional training requirements for designated personnel;
- A step-by-step procedure to complete the critical tasks;
- Estimated time required for the employee to complete the assigned critical tasks;
- Procedures for delayed evacuation (if different from normal evacuation procedures),
- Procedures for reporting to the designated safe area; and
- Procedures for emergency communications during the conduct of critical tasks and delayed evacuation.

12.4. PROCEDURES TO ACCOUNT FOR ALL EMPLOYEES

Procedures should be developed which account for all personnel immediately following an evacuation. These procedures should:

- Contain the requirements to account for and report the number of personnel evacuated,
- Provide a means for notifying the SSHO and emergency personnel when employees are missing, and
- Include procedures for accounting for personnel performing critical operations.

12.5. RESCUE AND MEDICAL DUTIES

Personnel may need to perform life saving CPR or emergency first aid prior to the arrival of the local emergency personnel (e.g., fire, medical, rescue teams). This section of the EAP should describe the actions to be taken by site personnel with first aid/CPR responsibilities. At a minimum, this section should contain:

- A current listing of all personnel with first aid/CPR duties,
- Training requirements for personnel with first aid/CPR duties,
- Description of conditions under which employees perform first aid/CPR,
- Description of medical and rescue duties taken until the arrival of the emergency response personnel,

- Procedures for notifying emergency personnel, and
- Procedures for reporting the incident to the appropriate personnel.

12.6. REPORTING FIRES AND OTHER EMERGENCIES

All personnel at the site should be knowledgeable regarding the means by which emergencies are reported. This section of the EAP should contain the information needed for personnel to report fires and other emergencies at the site. At a minimum, this section should contain:

- A description and location of communications equipment available at the site for emergency reporting,
- Procedures for the use of site communications equipment,
- Procedures for reporting the emergency, and
- Complete listing of emergency telephone numbers, radio frequencies, emergency signals, etc.

12.7. EAP CONTACT PERSONNEL

A list of primary and alternate key personnel should be developed which identifies individuals and organizations with the expertise to explain and provide technical information on the use of the EAP. These personnel/organizations, and applicable alternates, should be listed by name, title, and telephone number. This list should be continually updated and made available to all employees and visitors. Additionally, the list should include the names and addresses of site safety personnel and their alternates (e.g., Project Manager, SSHO).

12.8. EMERGENCY/EVACUATION ALARM SYSTEM

This section should contain a complete description of all alarms and signals (and related back-up systems) to notify personnel of an emergency. All applicable alarms and signals (e.g., evacuation, radiation, take cover, standard alert), as well as, the actions to be taken in the event the alarm is sounded should be fully explained. Alarm systems and back-up systems should be in compliance with 29 CFR 1910.165.

12.9. EAP TRAINING REQUIREMENTS

Each employee at the site should be properly trained in all aspects of the EAP. Additionally, critical operations personnel or those personnel with first aid/CPR responsibilities should receive additional training necessary to effectively carry out their duties. This training should be conducted and documented in accordance with the training section of the site-specific HASP.The following items in this section of the EAP should be performed and documented:

- Designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees,
- Identify critical operations and designate and train a sufficient number of persons to conduct those operations,

- Train all personnel working at the site in evacuation and other required emergency procedures, as applicable,
- Provide a listing of all required training to be completed prior to beginning work, and
- Coordinate unique training requirements with the SSHO and provide a description of all required training not covered by the training section of the HASP.

All personnel should receive required training prior to beginning work at the site. The methods for evaluating personnel competency in carrying out the requirements of the EAP should be reviewed with each individual covered by the Plan at the following times:

- Initially, when the plan is developed,
- Upon initial assignment,
- Whenever the employee's responsibilities or designated actions under the plan change, and
- Whenever the plan is changed.

12.10. FIRE PREVENTION PLAN

This section should contain procedures that reduce the vulnerability of the workplace to fire. Fire prevention plan requirements are specified by OSHA in 29 CFR 1910.38 and include discussions of housekeeping, training and maintenance. The plan should be updated as hazards change. In addition to the categories listed above, the plan should include:

- A list of the major workplace fire hazards,
- Names or titles of personnel responsible for the control of workplace hazards,
- List of types of fire protection equipment or systems and the hazards they control, and
- Pre-fire planning in coordination with the local emergency response services to familiarize them with workplace process hazards.

The fire prevention plan discussion satisfies part of the administrative requirements of an overall Fire Protection Program as outlined in DOE Order 5480.7A, *Fire Protection*. This section of the HASP should ensure that all requirements of DOE 5480.7A are followed or integrated into the HASP.

12.10.1. Housekeeping

Procedures should be developed to control accumulations of material and residues so that they are not the source of a fire emergency. Fire prevention housekeeping plans include:

- Proper handling, storage and control procedures for flammable and combustible waste materials;
- List of potential ignition sources (e.g., welding) and their control procedures; and
- Housekeeping procedures that maintain the means of egress free of obstructions.

12.10.2. Training

Personnel should be informed of the fire hazards associated with the materials and processes to which they are exposed. Personnel should be trained on response procedures for fires. For example, in addition to evacuation, personnel may be expected to use fire extinguishing equipment and/or activate manual alarms.

12.10.3. Maintenance

Proper maintenance, inspection and testing of fire protection equipment and systems are key to eliminating or controlling fire development. Equipment should be maintained according to manufacturers' specifications. In addition, National Fire Protection Association (NFPA) 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection System* and other NFPA codes covering the particular equipment or device should be consulted. Whether maintenance is performed in-house or contracted, the individuals performing the work should be properly trained. Names or titles of personnel responsible for maintenance should be kept on file. Maintenance, inspection and testing procedures apply to:

- Equipment installed to detect fuel leaks, control heating, and control pressurized systems (e.g., flame arresters on furnaces, high temperature/pressure switches on dip tanks);
- Portable extinguishers, automatic sprinkler systems and fixed extinguishing systems (e.g., sprinkler control valves, fire pumps);
- Detection systems for smoke, heat, or flame;
- Fire alarm and annunciation systems; and
- Emergency back up systems and the equipment they support.

12.11. PROCEDURES FOR THE REVIEW AND UPDATE OF THE EAP

This section should contain the procedures to review and update the EAP. As a minimum, this section should describe procedures for:

- The periodic review/update of the plan;
- Training employees on the latest changes to the plan; and
- Coordinating and integrating the latest version of the EAP with the HASP, site emergency response organizations, and the host ERP (if applicable).

12.12. REFERENCES

1. 29 CFR 1910.38, *Employee Emergency Plans and Fire Prevention Hazards*.

2. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

3. 29 CFR 1910.165, *Employee Alarm Systems*.

4. DOE Order 5000.3B, *Occurrence Reporting and Processing of Operations Information*.

5. National Fire Protection Association (NFPA) 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.

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13.0. CONFINED SPACE ENTRY

13.1. BACKGROUND

A confined space is defined as any location that has limited openings for entry and egress, is not intended for continuous employee occupancy, and is so enclosed that natural ventilation may not reduce air contaminants to levels below the threshold limit value (TLV). Examples of confined spaces include: manholes, stacks, pipes, storage tanks, trailers, tank cars, pits, sumps, hoppers, and bins. Entry into confined spaces without the proper precautions could result in injury and/or impairment or death due to:

- An atmosphere that is flammable or explosive,
- Lack of sufficient oxygen to support life,
- Contact with or inhalation of toxic materials, or
- General safety or work area hazards such as steam or high pressure materials.

The overall objectives of this chapter are to provide the minimum safety requirements to be followed while entering, exiting and working in confined spaces during environmental restoration work. This chapter provides pertinent details on the following:

- Duties and responsibilities,
- Identification and evaluation,
- Hazard assessment,
- Hazard controls,
- Entry permits,
- Entry procedures,
- Opening a confined space,
- Atmospheric testing,
- Isolation and lockout/tagout safeguards,
- Ingress/egress safeguards,
- Warning signs and symbols,
- Training, and
- Emergency response.

13.2. DUTIES AND RESPONSIBILITIES

13.2.1. Project Manager

The Project Manager should assign an individual within each project to act as the project Confined Space Coordinator. This individual should be responsible for implementing the confined space program in accordance with this chapter.

13.2.2. Confined Space Coordinator

The Confined Space Coordinator should be responsible for implementing the confined space program and should:

- Ensure that a list of confined spaces is maintained,
- Ensure that cancelled permits are reviewed for lessons learned,
- Ensure training of personnel is conducted,
- Ensure coordination with outside responders,
- Ensure equipment is in compliance with standards, and
- Maintain a master inventory of identified confined spaces.

13.2.3. Field Team Leader

The Field Team Leader in charge of any confined space work should:

- Ensure requirements for entry have been completed before entry is authorized;
- Ensure confined space monitoring is performed by personnel qualified and trained in confined space entry procedures;
- Ensure a list of monitoring equipment and personnel qualified to operate the equipment is maintained by the Safety and Occupational Health Office;
- Ensure that the rescue team has simulated a rescue in a confined space within the past twelve months;
- Know the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of exposure;
- Fill out a permit;
- Determine the entry requirements;
- Require a permit review and signature from the authorized entry supervisor;
- Notify all involved employees of the permit requirements;
- Post the permit in a conspicuous location near the job;
- Renew the permit or have it reissued as needed (a new permit is required every shift);
- Determine the number of attendants required to perform the work;
- Ensure the attendant knows how to communicate with the entrants and how to obtain assistance;
- Post any required barriers and signs;
- Remain alert to changing conditions that might affect the conditions of the permits, (i.e., require additional atmospheric monitoring or changes in personal protective equipment);
- Change and reissue the permit, or issue a new permit as necessary;
- Ensure periodic atmospheric monitoring is done according to permit requirements;

- Ensure that personnel doing the work and all support personnel adhere to permit requirements;
- Ensure the permit is canceled when the work is done; and
- Ensure the confined space is safely closed and all workers are cleared from the area.

13.2.4. Entry Supervisors

An Entry Supervisor is a qualified person authorized to approve confined space entry permits. This person should be responsible for:

- Determining if conditions are acceptable for entry,
- Authorizing entry and overseeing entry operations,
- Terminating entry procedures as required,
- Serving as an attendant, as long as the person is trained and equipped appropriately for that role,
- Ensuring measures are in place to keep unauthorized personnel clear of the area,
- Checking the work at least twice a shift to verify and document permit requirements are being observed (more frequent checks should be made if operations or conditions are anticipated that could affect permit requirements),
- Ensuring that necessary information on chemical hazards is kept at the work site for the employees or rescue team,
- Ensuring a rescue team is available and instructed in their rescue duties (e.g., an onsite team or a prearranged outside rescue service), and
- Ensuring at least one member of the rescue team has current certification in first aid and CPR.

13.2.5. Employees Entering Confined Space

Employees who are granted permission to enter a confined space should:

- Read and observe the entry permit requirements;
- Stay alert to the hazards that could be encountered in a confined space;
- Use the protective equipment required by the permit;
- Immediately exit the confined space when:
  - Ordered to do so by the attendant,
  - Automatic alarms sound,
  - They perceive they are in danger, or
  - They notice physiological stresses or changes in themselves or co-workers (e.g., dizziness, blurred vision, shortness of breath).

13.2.6. Attendant

The Attendant should be stationed outside the work space and should:

- Be knowledgeable of, and be able to recognize potential confined space hazards;
- Maintain a sign-in/sign-out log with a count of all persons in the confined space and ensure all entrants sign in/sign-out;
- Monitor surrounding activities to ensure the safety of personnel;
- Maintain effective and continuous communication with personnel during confined space entry, work and exit;
- Order personnel to evacuate the confined space if he/she:
  - Observes a condition which is not allowed on the entry permit;
  - Notices the entrants acting strangely, possibly as a result of exposure to hazardous substances;
  - Notices a situation outside the confined space which could endanger personnel;
  - Notices within the confined space a hazard which has not been previously recognized or taken into consideration;
  - Must leave his/her work station; or
  - Must focus attention on the rescue of personnel in some other confined space that he/she is monitoring;
- Immediately summon the Rescue Team if crew rescue becomes necessary; and
- Keep unauthorized persons out of the confined space, order them out, or notify authorized personnel of the unauthorized entry.

13.2.7. Rescue Team

The Rescue Team members should:

- Complete a training drill using mannequins or personnel in a simulation of the confined space prior to the issuance of an entry permit for any confined space and at least annually thereafter;
- Respond immediately to rescue calls from the Attendant or any other person recognizing a need for rescue from the confined space;
- In addition to emergency response training, receive the same training as that required of the authorized entrants; and
- Have current certification in first-aid and CPR.

13.3. IDENTIFICATION AND EVALUATION

The Project Manager should ensure a survey is conducted of the work site to identify confined spaces. This survey can be partially completed from initial and continuing site characterizations, as well as other available data (e.g. blueprints, job safety analysis). The purpose of the survey is to develop an inventory of those locations and/or equipment that meet the definition of a

confined space. This information should be communicated to personnel and appropriate procedures developed prior to entry. The initial surveys should include air monitoring to determine the air quality in the confined spaces. The following situations should be evaluated by competent personnel:

- Flammable or explosive potential,
- Oxygen deficiency, and
- Presence of toxic and corrosive material.

13.3.1. Hazard Re-Evaluation

The Project Manager should ensure the identification and re-evaluation of the hazards based on possible changes in activities, and/or other physical or environmental conditions, which could adversely affect work. A master inventory of confined spaces should be maintained. Any change in designation of a confined space will be routed through the Site Safety and Health Officer (SSHO) for review, prior to the change being made.

13.4. HAZARD ASSESSMENT

A hazard assessment should be completed prior to any entry into a confined space. The hazard assessment should identify the sequence of work to be performed in the confined space, the specific hazards known or anticipated, and the control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level. No entry should be permitted until the hazard assessment has been reviewed and discussed by all persons engaged in the activity. Personnel who enter confined spaces should be informed of known or potential hazards associated with the confined spaces to be entered.

13.5. HAZARD CONTROLS

Hazard controls include changes in the work processes and/or working environment with the objective of:

- Controlling the health hazards either by eliminating the responsible agents,
- Reducing health hazards below harmful levels, and
- Preventing the contaminants from coming into contact with the workers.

The following order of precedence should be followed in reducing confined space risks:

- Engineering controls, such as ventilation to limit exposure to hazards;
- Work practice controls, such as wetting of hazardous dusts, frequent cleaning; and
- Use of PPE, such as air purifying or supplied-air respirators.

13.5.1. Engineering Controls

Engineering controls are those controls which eliminate or reduce the hazard through implementation of sound engineering practices.

Ventilation is one of the most common engineering controls used in confined spaces. When ventilation is used to remove atmospheric contaminants from the confined space, the space should be ventilated until the atmosphere is within the acceptable ranges. Ventilation should be maintained during the occupancy if there is a potential for the atmospheric conditions to move out of the acceptable range. When ventilation is not possible or feasible, alternate protective measures or methods to remove air contaminants and protect occupants should be determined by the qualified person prior to authorizing entry. Conditions regarding continuous forced air ventilation should be used as follows:

- Employees should not enter the space until the forced air ventilation has eliminated any hazardous atmosphere,
- Forced air ventilation should be so directed as to ventilate the immediate areas where an employee is or will be present within the space,
- Continuous ventilation is maintained until all employees have left the space, and
- Air supply for forced air ventilation should be from a clean source.

13.5.2. Work Practice (Administrative) Controls

Work practice (administrative) controls are those controls which eliminate or reduce the hazard through changes in the work practice (e.g., rotating workers, reducing the amount of worker exposure, housekeeping). Confined spaces should be cleaned/decontaminated of hazardous materials to the extent feasible before entry. Cleaning/decontamination should be the preferred method of reducing exposure to hazardous materials. Where this is not practicable, PPE should be worn by the entry personnel to provide appropriate protection against the hazards which may be present.

13.5.3. Personal Protective Equipment (PPE)

If the hazard cannot be eliminated or reduced to a safe level through engineering and/or work practice controls, PPE should be used. A qualified person should determine PPE needed by all personnel entering the confined space, including rescue teams. PPE which meet the specifications of applicable standards should be selected in accordance with the requirements of the job to be performed.

13.6. ENTRY PERMITS

The Confined Space Entry Permit is the major tool in assuring safety during entry in confined spaces with known hazards or with unknown or potentially hazardous atmospheres. The entry

permit process guides the supervisor and workers through a systematic evaluation of the space to be entered. The permit should be used to establish appropriate conditions. Before each entry into a confined space, an entry permit will be completed by a qualified person and the contents communicated to all employees involved in the operation and conspicuously posted near the work location. A standard entry permit should be used for all entries.

13.6.1. Key Elements for Entry Permits

A standard entry permit should contain the following items:

- Permit space to be entered;
- Purpose of the entry;
- Date of the permit and the authorized duration of the entry permit,
- Name of authorized entrants within the permit space;
- Means of identifying authorized entrants inside the permit space, e.g., rosters or tracking systems;
- Personnel, by name, currently serving as attendants,
- Individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry,
- Hazards of the permit space to be entered,
- Measures used to isolate the permit space and to eliminate or control permit space hazards before entry, e.g., lockout or tagout of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces;
- Acceptable entry conditions,
- Results of initial and periodic tests performed, accompanied by the names or initials of the testers and by an indication of when the tests were performed;
- Rescue and emergency services that can be summoned and the means, (e.g., equipment to use, phone numbers to call) for summoning those services,
- Communication procedures used by authorized entrants and attendants to maintain contact during the entry,
- Equipment to be provided for compliance with this section, (e.g., PPE, testing, communications, alarm systems, and rescue);
- Other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; and
- Additional permits, such as for hot work, that have been issued to authorize work in the permit space.

Appendix D of 29 CFR 1910.146 provides an example permit containing these items.

A permit is only valid for one shift. For a permit to be renewed, several conditions should be met before each re-entry into the confined space. First, atmospheric testing should be conducted and the results should be within acceptable limits. If atmospheric test results are not within acceptable limits, precautions to protect entrants against the hazards should be addressed on the

permit and should be in place. Second, a qualified person should verify that all precautions and other measures called for on the permit are still in effect. Finally only operations or work originally approved on the permit should be conducted in the confined space.

A new permit should be issued or the original permit reissued whenever changing work conditions or work activities introduce new hazards into the confined space. The employer should retain each cancelled entry permit for at least one year to facilitate the review of the confined space entry program. Any problems encountered during an entry operation should be noted on the pertinent permit so that appropriate revisions to the confined space permit program can be made.

13.7. ENTRY PROCEDURES

Whenever entry into a confined space is needed, either an Entry Supervisor or the person in charge of the job may initiate entry procedures, including the completion of a confined space entry permit. Entry into a confined space should follow the standard entry procedure.

The following are requirements for standard entry:

- Training to establish personnel proficiency in the duties required,
- Atmospheric testing for entry, and
- Atmospheric monitoring during the entry.

Before an employee enters the space, the internal atmosphere should be tested with a calibrated, direct-reading instrument. If a hazardous atmosphere is detected during entry:

- The space should be evaluated to determine how the hazardous atmosphere developed, and
- Measures should be implemented to protect employees before any subsequent entry takes place.

Personnel should be prohibited from entering hazardous atmospheres without wearing proper respiratory equipment as determined by qualified entry supervisors. The entire confined space entry permit should be completed for a standard entry. Entry should be allowed only when all requirements of the permit are met and it is reviewed and signed by an Entry Supervisor.

13.8. OPENING A CONFINED SPACE

Any conditions making it unsafe to remove an entrance cover should be eliminated before the cover is removed. When entrance covers are removed, the opening should be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent anyone from falling through the opening. This barrier or cover should protect each employee working in the space

from foreign objects entering the space. If it is in a traffic area, adequate barriers should be erected.

13.9. ATMOSPHERIC TESTING

Atmospheric test data is needed prior to entry into any confined space. Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable conditions exist for entry into that space. If a person must go into the space to obtain the needed data, then Standard Confined Space Entry Procedures should be followed (i.e., rescue team, attendant, entry supervisor). Before entry into a confined space, a qualified person should conduct testing for hazardous atmospheres. The internal atmosphere should be tested with a calibrated, direct-reading instrument for the following, in the order given:

- Oxygen content,
- Flammable gases and vapors, and
- Potential toxic air contaminants.

Testing equipment used in specialty areas should be listed or approved for use in such areas. This listing or approval should be from nationally recognized testing laboratories such as Underwriters Laboratories or Factory Mutual Systems.

13.9.1. Evaluation Testing

The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity The analysis should identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data and development of the entry procedure should be done by, or reviewed by, a technically qualified professional (e.g., OSHA consultation service, certified industrial hygienist, registered safety engineer, certified safety professional).

13.9.2. Verification Testing

A confined space which may contain a hazardous atmosphere should be tested for residues of all identified or suspected contaminants. The evaluation testing should permit specified equipment to determine that residual concentrations at the time of testing and entry are within acceptable limits. Results of testing (i.e., actual concentration) should be recorded on the permit. The atmosphere should be periodically retested to verify that atmospheric conditions remain within acceptable entry parameters. Initial testing of atmospheric conditions and subsequent tests after a job has been stopped should be done with the ventilation systems shut down. If the confined space is vacated for any period of time, the atmosphere of the confined space should be retested before re-entry is permitted. Further testing should be conducted with ventilation systems turned

on to ensure the contaminants are removed and that the ventilation system is not causing a hazardous condition.

13.9.3. Acceptable Limits

The atmosphere of the confined spaces should be considered within acceptable limits whenever the following conditions are maintained:

- Oxygen - 19.5% to 23.5%,
- Flammability - less than 10% of the Lower Flammable Limit (LFL), and
- Toxicity - less than recognized ACGIH exposure limits or other published exposure levels (e.g. OSHA PELs, NIOSH RELs).

Whenever testing of the atmosphere indicates levels of oxygen, flammability, or toxicity that are not within acceptable limits, entry should be prohibited until appropriate controls are implemented. If the source of the contaminant cannot be determined, precautions should be adequate to deal with the worst possible condition in the confined space. If there is the possibility that the confined space atmosphere can become unacceptable while the work is in progress, the atmosphere should be constantly monitored and procedures and equipment should be provided to allow the employees to quickly and safely exit the confined space.

13.10. ISOLATION AND LOCKOUT/TAGOUT SAFEGUARDS

All energy sources which are potentially hazardous to confined space entrants should be secured, relieved, disconnected and/or restrained before personnel are permitted to enter the confined space. Equipment systems or processes should be locked out or tagged out or both per 29 CFR 1910.147 and ANSI Z244.1-1982, *Lockout/Tagout of Energy Sources* prior to permitting entry into the confined space. The current lockout/tagout program being used at the site should be used as guidance. In confined spaces where complete isolation is not possible, provisions should be made for as rigorous an isolation as practical. Special precautions should be taken when entering double walled, jacketed, or internally insulated confined spaces that may discharge hazardous material through the vessel's internal wall.

Where there is a need to test, position or activate equipment by temporarily removing the lock or tag or both, a procedure should be developed and implemented to control hazards to the occupants. Any removal of locks, tags, or other protective measures should be done in accordance with ANSI Z244.1-1982.

13.11. INGRESS/EGRESS SAFEGUARDS

Means for safe entry and exit should be provided for confined spaces. Each entry and exit point should be evaluated to determine the most effective methods and equipment to be utilized to enable employees to safely enter and exit the confined space.

Appropriate retrieval equipment or methods should be used whenever a person enters a confined space. Use of retrieval equipment may be waived by the designated qualified persons if use of the equipment increases the overall risks of entry or does not contribute to the rescue. A mechanical device should be available to retrieve personnel from vertical type confined spaces greater than five feet in depth.

13.12. WARNING SIGNS AND SYMBOLS

All confined spaces that could be inadvertently entered should have signs identifying them as confined spaces. Signs should be maintained in a legible condition. The signs should contain a warning that a permit is required before entry. Accesses to all confined spaces should be prominently marked.

13.13. TRAINING

The employer should provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of their duties in confined spaces. Training should be provided to each affected employee:

- Before the employee is first assigned duties under this section,
- Before there is a change in assigned duties,
- Whenever there is a change in permit space operations that presents a hazard for which an employee has not been trained, and
- Whenever the employer has reason to believe either that there are deviations from the permit space entry procedures required in this section or that there are inadequacies in the employee's knowledge or use of these procedures.

The training should establish employee proficiency in the duties required by this section and should introduce new or revised procedures, as necessary, for compliance with this section.

13.13.1. General Training

All employees who will enter confined spaces should be trained in entry procedures. Personnel responsible for supervising, planning, entering or participating in confined space entry and rescue should be adequately trained in their functional duties prior to any confined space entry. Training should include:

- Explanation of the general hazards associated with confined spaces;
- Discussion of specific confined space hazards associated with the facility, location or operation;
- Reason for, proper use, and limitations of PPE and other safety equipment required for entry into confined spaces;

- Explanation of permits and other procedural requirements for conducting a confined space entry;
- A clear understanding of what conditions would prohibit entry;
- How to respond to emergencies;
- Duties and responsibilities as a member of the confined space entry team; and
- Description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers, and method(s) for alerting attendants.

Refresher training should be conducted as needed to maintain employee competence in entry procedures and precautions.

13.13.2. Specific Training

13.13.2.1. Training for Atmospheric Monitoring Personnel

Training should include proper use of monitoring instruments such as:

- Proper use of the equipment;
- Knowledge of calibration;
- Knowledge of sampling strategies and techniques; and
- Knowledge of PELs, TLVs, LELs, UELs, etc.

13.13.2.2. Training For Attendants

Training should include the following:

- Procedures for summoning rescue or other emergency services, and
- Proper utilization of equipment used for communicating with entry and emergency/rescue personnel.

13.13.2.3. Training for Emergency Response Personnel

Training should include:

- Rescue plan and procedures developed for each type of confined space that are anticipated to be encountered,
- Use of emergency rescue equipment,
- First aid and CPR techniques, and
- Work location and confined space configuration to minimize response time.

13.13.2.4. Verification of Training

Periodic assessment of the effectiveness of employee training should be conducted by a qualified person. Training sessions should be repeated as often as necessary to maintain an acceptable level of personnel competence.

13.14. EMERGENCY RESPONSE

13.14.1. Emergency Response Plan

A plan of action should be written with provisions to conduct a timely rescue for individuals in a confined space should an emergency arise.

13.14.2. Retrieval Systems or Methods to Facilitate Non-entry Rescue

Retrieval systems should be used whenever an authorized person enters a permit space, unless the equipment increases the overall risk of entry or the equipment would not contribute to the rescue of the entrant. Retrieval systems should have a chest or full body harness and a retrieval line attached at the center of the back near shoulder level or above the head. If harnesses are not feasible or create a greater hazard, wristlets may be used in lieu of the harness. The retrieval line should be firmly fastened outside the space so that rescue can begin as soon as anyone is aware that retrieval is necessary. A mechanical device should be available to retrieve personnel from vertical confined spaces more than five feet deep.

13.15. REFERENCES

1. 29 CFR 1910.146, *Permit-required Confined Spaces*.

2. National Safety Council Data Sheet 12304-0704, *Confined Space Entry Control System for Research and Development Operations*.

3. American National Standard Institute (ANSI) Z117.1-1989, *Safety Requirements for Confined Spaces*.

4. DHHS (NIOSH) Publication No. 87-113, *Working With Confined Spaces*.

5. ANSI Z 244.1-1982, *Lockout/Tagout of Energy Sources*.

6. 29 CFR 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*.

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14.0. SPILL CONTAINMENT

14.1. BACKGROUND

The intent of this section of the HASP is to meet the requirements of 29 CFR 1910.120 (b)(4)(ii)(j). The spill containment program should address all hazardous substance spill scenarios that are likely to occur at the site. In addition, the spill containment program should also provide procedures to contain and isolate the entire volume of any hazardous substance spilled in the course of a transfer, accident, or onsite release.

The overall objectives of the Spill Containment chapter are to:

- Identify the minimum requirements of the spill containment program that may be relevant to the site and provide methods to contain and isolate the entire volume of any hazardous substance spilled in the course of a transfer, major spill, or an onsite release; and
- Provide information on the initial spill action, spill response evaluation and organization, and spill clean-up procedures.

14.2. PREPLANNING

In order to develop a successful spill containment program, an assessment should be conducted of the site conditions, current operations, and planned activities. The assessment should carefully examine all hazardous materials on site for where and how the materials are:

- Stored (e.g., location, type of container),
- Handled (e.g., processed, used, transferred), and
- Transported (e.g., mode, routes).

As part of the assessment, each area or activity should be analyzed for potential accidental releases or spills. Examples of situations that have potential for spill or release are:

- Bulging or corroded containers,
- Transfer line connections (e.g., leaking seals, misaligned connections),
- Metal fatigue of storage tanks,
- Leaking or inoperable valves, and
- Poor housekeeping (e.g., drums improperly staged).

Many potential spills can be avoided through application of proper engineering controls to hazards identified in the assessment. In areas where storage, handling, and transportation activities occur, preplanning to contain the largest volume of material that could be released in the area will minimize worker exposure. The containment measure should be appropriate to the hazardous material(s) identified and should be installed in the area or located nearby. The following examples are measures most frequently used:

- Absorbent materials, (e.g., pads, booms, powders);
- Salvage containers (e.g., overpack drums);
- Bermed, lined pads;
- Concrete pad and dike;
- Inflatable containment (e.g., "kiddie" pools, bladders); and
- Associated equipment (e.g., pumps, hoses, shovels, hoists).

Procedures should be developed to properly maintained and replace, as necessary, all spill containment equipment and fixtures.

14.3. REPORTING AND INITIAL PERSONNEL SAFETY

Upon discovery of a hazardous substance spill, personnel should be instructed to:

- Immediately summon help by notifying the Field Team Leader, the Site Safety and Health Officer (SSHO), and/or the Project Manager;
- Take action to ensure the safety of nearby personnel;
- Proceed to a safe location;
- If anyone is seriously injured, immediately contact emergency medical services; and
- Keep unauthorized personnel out of the area.

14.4. INITIAL SPILL ACTION

Factors that limit the employee's response at the site of a spill are:

- Level of training,
- Personal safety,
- Available personal protective equipment (PPE), and
- Knowledge of the substance.

Employees should limit their actions to:

- Shutting off equipment or pumps,
- Closing valves,
- Blocking drains within the path of the spill, and
- Using spill kit materials to dam or impede the flow of the spill.

Unauthorized persons should be excluded from the area.

14.5. SPILL RESPONSE EVALUATION

The identity and hazards of the spilled material should be determined before decisions regarding spill containment and control are made. The SSHO or Project Manager should evaluate the

hazards associated with the spill and decide whether project employees or external response organizations should conduct the cleanup. If the Project Manager determines that project response personnel cannot safely perform the spill cleanup, the Project Manager should notify and request the assistance of, the Emergency Response Coordinator, and the ERP should be activated.

14.6. ORGANIZING A SPILL RESPONSE

If the Project Manager determines that cleanup can be performed safely with project response personnel, the SSHO may act as the spill team leader and designate required procedures. Safety practices for small spill operations closely parallel procedures implemented during routine hazardous materials handling operations. Before work begins, the SSHO should conduct a hazard identification and assessment with response personnel. The following should be discussed and established:

- Levels of PPE and safety procedures,
- Safety and work zones,
- All steps of the response activities,
- Most effective procedures or methods for cleanup,
- Means of containment,
- Leak or spill control,
- Decontamination procedures, and
- Emergency decontamination.

14.7. SPILL CLEANUP PROCEDURES

After care of injured personnel, containment of the released hazardous material should be the next consideration to limit its effect on the safety of personnel, the public, and the environment. The SSHO should determine the methods of control which depend upon the nature and extent of the spill. Actions documented in Chapter 11, Emergency Response/Contingency Plan should also be consulted. Decontamination should be accomplished in accordance with Chapter 10, Decontamination and disposal of contaminated materials should meet all regulatory requirements.

14.8. POST INCIDENT FOLLOW-UP

The Project Manager or SSHO should implement necessary steps to ensure that the incident is properly documented and that spill response equipment is replenished. The Project Manager should direct the necessary corrective actions to prevent recurrence and evaluate the response.

14.9. REFERENCES

1. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response* (HAZWOPER).

2. EPA Publication No. 9285.1-03, *Standard Operating Safety Guides*, Chapter 10, Office of Emergency and Remedial Response, USEPA, 1992.

3. DHHS (NIOSH) Publication No. 85-115, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Chapter 11, NIOSH/OSHA/USCG/EPA, 1985 (Four-Agency Document).

4. UEFPC OU 3 RI Work Plan, p. 9-60, Y-12 Plant, *Environmental Restoration Program, Health and Safety Plan*, Rev. 0.

5. EPA 9285.8-01, *Health and Safety Plan (HASP) User's Guide*, Chapter 12, Office of Emergency and Remedial Response, USEPA, 1992 (and ERT Health and Safety Plan Planner, Ver. 3.0C, 1993).

APPENDIX A

HASP Glossary

Acceptable Entry: Those conditions that should exist in a confined space that allow entry and ensure that employees can safely work within and exit the space.

Access Control Point: An opening in the physical boundary between work zones which is used to regulate movement of personnel or equipment between the zones.

Acclimatization: A process that helps an employee adjust to work under extreme conditions (e.g., temperature, altitude).

Action Level: A contaminant concentration at which additional measures are implemented to protect the worker. The protective measures may include medical surveillance, training, and modification of the level of protection**.**

Activity Hazard Assessment (AHA): The process to identify and evaluate the operational activities and their associated hazards. The process includes implementing control measures to eliminate or reduce each hazard to an acceptable level.

Administrative Controls: Provisions related to the organization and management, procedures, recordkeeping, assessment, and reporting necessary to ensure safe operation of a facility.

Assessment: The evaluation or appraisal of a process, program, or activity to determine compliance with the relevant standard, DOE order, rule, code, regulation, or other appropriate criteria.

Attendant: The individual stationed outside a confined space who monitors the authorized entrants, controls access into the confined space, and is alert to any hazards that may arise.

Authorized Entrant: An employee who is authorized by the employer to enter a confined space.

Biological Hazards: Agents presenting hazard to the well-being of humans or other animals, either directly through infection or indirectly through disruption of the environment. Hazards include plant exposures (e.g., poison ivy and poison oak) and animal exposures (e.g., bee stings and snake bites).

Buddy System: A system for organizing employees into work groups in such a manner that each member of the work group is designated to be observed by at least one other member of the group at all times. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

Chemical Hazard: The exposure of employees to any regulated or non-regulated hazardous materials (solids, liquids, and gases; natural and man-made), with the potential for causing harm to people, the environment, or property when released.

Confined Space: An enclosed area that has one or more of the following characteristics:

- It is not intended for continuous occupancy,
- It has restricted entry and exit, and
- It may contain potential or known hazards.

Contamination Reduction Corridor: The area that controls access into and out of the Exclusion Zone/Radiological Area and where personnel decontamination activities take place.

Contamination Reduction Zone: The transition area between the Exclusion Zone and Support Zone. The area where decontamination procedures take place.

Controls: Changes in the work processes and/or working environment with the objective of controlling the hazards either by eliminating the responsible agents, or reducing them to levels believed not to be harmful to health, as well as by preventing exposure to workers.

Critical Operations: Those emergency operations necessary for the safe emergency shutdown of an operation, site, task, or piece of machinery.

Critical Operations Personnel: Those personnel identified in writing and trained to accomplish emergency shutdown operations. These personnel may be required to delay their own evacuation of the site during an emergency.

Emergency (Confined Space): Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the confined space that could endanger entrants.

Emergency (Site): A sudden and unexpected event, taking place on the site, and requiring urgent action for control or remediation in order to minimize the danger to workers, the public, the environment, or property.

Engineering Controls: Methods of controlling employee exposure to safety and health hazards by modifying the source of exposure or reducing the quantity of contaminants released into the work area. Examples include piping, containment, ventilation, filtration and shielding.

Engulfment: The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system, or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry Permit (Permit): The written document that allows and controls entry into a confined space. It is a systematic evaluation of the confined space; it describes purpose of entry, authorized personnel, hazards, work controls and equipment.

Entry Supervisor: The person (such as the employer, foreman, or crew chief) who determines if acceptable entry conditions are present at a confined space, authorizes entry, oversees entry operations, and terminates entries as required.

Exclusion Zone: A controlled area, located on the site, where contamination is either known or expected to occur and where the greatest potential for exposure exists. Also known as the "Hot Zone."

Facility: Any DOE installation or portion of an installation operated, funded, or otherwise controlled by EM-40.

Hazard: An act, condition, or phenomenon posing a source of actual or potential physical, chemical, radiological, or biological harm to a person.

Hazard Evaluation: A process to assess the severity, and likelihood of exposure to known, and/or potential occupational safety and health hazards, at or in the work environment.

Hazardous Atmosphere: An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a confined space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);
- Airborne combustible dust at a concentration that meets or exceeds its LFL; NOTE: This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less;
- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, *Occupational Health and Environmental Controls*, or in Subpart Z, Toxic and *Hazardous Substances*, of 29 CFR 1910, and which could result in employee exposure in excess of its dose or permissible exposure limit.

Hotline: The outer boundary of the Exclusion Zone. It separates the area of highest contamination from the Contamination Reduction Zone. It provides an adequate area in which to conduct site operations taking into account potential contaminant migration.

Hot Work: Work that produces arcs, sparks, flames, heat, or other sources of ignition.

Hot Work Permit: The employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately Dangerous to Life or Health (IDLH): Any condition or exposure that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects.

Inerting: The displacement of the atmosphere in a confined space by a non-combustible gas (such as nitrogen) to such an extent that the resulting atmosphere is non-combustible. This procedure produces an IDLH oxygen-deficient atmosphere. However, the procedure is used to isolate the space and control hazards before entry.

Installation: Any DOE property (i.e., "inside the fence.")

Isolation: The process by which a permit space is removed from service and is completely protected from release of energy and material into the space. Common methods of isolation are misaligning or removing sections of lines, pipes, or ducts; closing off or venting valves; providing lockout or tagout of all sources of energy; and disconnecting all mechanical linkages.

Job: The detailed steps required to carry out a task.

Key Personnel: Those personnel/organizations considered to be essential to ensure the safe operation of the facility, site, project, or task.

LEL/LFL and UEL/UFL: Lower explosive limit/lower flammable limit and upper explosive limit/upper flammable limit describe the explosion or combustion limits, respectively for flammable gas or vapor mixtures in air. For example, a concentration below the lower flammable limit is not sufficient to support combustion, and above the upper flammable limit the mixture is too "rich" to burn.

Line Breaking: The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Lockout/Tagout: A procedure for placing a lock/tag on the energy isolating device to indicate that the process system or equipment should not be operated.

Major Spill: The uncontrolled release of a hazardous substance into the environment to such a degree that operations personnel can not control or contain the spill, and that requires mobilization of emergency response personnel.

Onsite Essential Personnel: Those required personnel, available on the site, who by virtue of their position, responsibilities, and/or expertise, are considered essential to the overall safe operation of the site.

Oxygen Deficient Atmosphere: An atmosphere containing less than 19.5% oxygen by volume.

Oxygen Enriched Atmosphere: An atmosphere containing more than 23.5% oxygen by volume.

Permissible Exposure Limit (PEL): The employee's permitted exposure to any material listed in Table Z-1, Z-2, or Z-3 of OSHA Regulations found at 29 CFR 1910.1000, *Air Contaminants.*

Personal Protective Equipment (PPE): Clothing and equipment used to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered at a hazardous waste site. PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. PPE may also stand for personal protective clothing and equipment.

Physical Controls: Physical barriers put into place, which limit personnel exposure to hazards.

Physical Hazards: Those work-related sources of actual or potential danger (e.g., machinery, trip and fall, hoisting and rigging, shoring and trenching) to which employees may be exposed.

Project: A unique major effort within a program which has firmly scheduled beginning, intermediate, and ending date milestones; prescribed performance requirements; prescribed costs; and close management, planning, and control. A project is a basic building block within a program which is individually planned, approved, and managed. A project is not constrained to any specific element of the budget structure (e.g., operating expense or plant and capital equipment).

Project Manager: The individual who has authority to direct all site activities. The project manager has authority to direct site response and assures overall management of projects.

Qualified Person: A person who, by reason of training, education and experience, is knowledgeable in the operation to be performed and is competent to judge the hazards involved.

Radiological Hazard: A source of actual or potential danger to a person(s) which occurs or could occur because of exposure to radiation.

Recommended Exposure Limit: The NIOSH equivalent of OSHA PELs and ACGIH TLVs to be used in the absence of PELs and TLVs.

Rescue Service: Offsite personnel designated to rescue employees from permit spaces, or other hazardous areas when the onsite rescue team is not available.

Site: An area where physical work is being performed and where the potential of exposure to contaminants exists, requiring the use of chemical protective clothing and/or radiological protective clothing and/or respirators.

Site-Specific Training: Predefined training, unique to a particular site.

Spill: The uncontrolled release of a hazardous substance into the environment that onsite personnel are capable of containing. Distinguished from a major spill.

Standard Entry Procedure: A procedure for entry into confined spaces which utilizes the complete array of entry measures. It is characterized by use of trained personnel, atmospheric testing before and during entry, use of proper protective equipment, and completion of the entry permit.

Storage: The temporary placement of a hazardous material in a location which provides some protection to personnel or the environment.

Support Zone: Uncontaminated area where workers are unlikely to be exposed to hazardous substances or dangerous conditions.

Task: A well defined unit of work having an identifiable beginning and end with two or more elements. A task is a series of jobs performed in support of a particular project.

Threshold Limit Value (TLV): An exposure limit established by the American Conference of Governmental Industrial Hygienists (ACGIH) under which most people can work consistently for 8 hours a day, day after day, with no harmful effect.

Threshold Limit Value-Short-Term Exposure Limit (TLV-STEL): The concentration to which workers can be exposed continuously, for a short period of time, without suffering from irritation, chronic or irreversible tissue damage, or narcosis, provided that the daily TLV-TWA is not exceeded.

Threshold Limit Value-Time-Weighted Average (TLV-TWA): The time-weighted average concentration for a normal 8-hour workday and a 40-hour workweek to which nearly all workers may be repeatedly exposed, day after day, without adverse effects.

Toxic Atmosphere: An atmosphere containing a concentration of a substance above the published or otherwise known safe levels, such as the Threshold Limit Value, Permissible Exposure Limit, Recommended Exposure Limit, or the Immediately Dangerous to Life or Health level.

Work: The process of performing a defined task or activity; for example, research and development, operations, maintenance and repair, administration, software development and use, inspection, safeguards and security, data collection, and analysis.

Work Plan: That part of a comprehensive Site Health and Safety Program which addresses the tasks and objectives of site operations, including logistics and resources.

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APPENDIX B
CONCLUDING MATERIAL

Review Activity:

DOE	Field Offices
AD	AL
BPA	CH
CE	FN
DP	ID
EH	NV
EM	OR
ER	RL
FE	SF
GC	SR
IE	
IG	National Laboratories
NE	ANL
NS	BNL
RW	FNAL
SA	INEL
WAPA	LBL
	LANL
	LLNL
	NREL
	ORNL
	PNL
	SNL

Preparing Activity:
DOE-EM-20

Agent:

Project Number:
DOE-EM-STD-5503-94

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APPENDIX C

TABLE I
Minimum Training Requirements for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 employees directly involved in hazardous waste operations on a daily or occasional basis, such as supervising the work, supervising contractor employees and evaluating program outcome at the site.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Project Manager (PM) directly responsible for hazardous waste operation including employees at the site and has authority to direct response operations.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Field Supervisor (FS) who has the responsibility and authority to direct all hazardous waste operations and supervises employees engaged in hazardous waste operations at the site. This individual may be the same person as the Project Manager and may be a member of the work party.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Site Safety and Health Officer (SSHO) involved in taking total control over site activities. SSHO has authority to direct response operations and reports to upper level management.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Industrial Hygienist (IH) responsible for implementation of all aspects of Health and Safety Plan and verification of compliance with applicable safety and health requirements at the site. Tasks include enforcement of air monitoring tests to determine worker response to hazardous substances, advice on adequate health protection and evaluation of health hazard assessments at the site.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Health Physicist (HP) responsible for implementation of all aspects of radiation protection for workers at the site and verifies compliance with applicable federal regulations and DOE orders. Typical task includes evaluation of internal and external radiation health hazards and recommendation of appropriate action for workers at the site.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58 (k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Command Post Supervisor. In some cases, the Command Post Supervisor may be the same person as the Field Team Leader. The Command Post Supervisor is responsible for communications and emergency assistance and assists the SSHO in rescue operations, if necessary.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Site Emergency Response Coordinator responsible for implementing the emergency plan, whenever conditions at the site warrant such action. The Site Emergency Response Coordinator, who may be the same person as the Site Supervisor, conducts activities such as evacuation, emergency treatment, emergency transport of site personnel, as necessary, and notification of emergency response units and appropriate management staff. The Site Emergency Response Coordinator is certified in first aid/CPR by the American Red Cross or equivalent.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58 (k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Site Decontamination Station Officer responsible for implementing decontamination procedures for large and small equipment, supplies and personnel involved in clean-up activities including visitors. Typical tasks include set up of decontamination lines and decontamination solutions appropriate for the type of chemical contamination on site, and control of the decontamination of all equipment (small and large), personnel, and samples from the contaminated areas.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training. The Decontamination Station Officer need 8 hours Supervisor Training in the event this individual supervises other members in this operation.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c,DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58 (k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c,DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Site Security Officer responsible for managing site security. The specific responsibilities include, but are not limited to, the following: establishing routine area patrols, monitoring access and egress, and assisting with communication during an emergency.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58 (k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor optional personnel on site. Typical titles include Scientific Advisor (guides the Project Manager in scientific matters), Logistics Officer (plans and mobilizes the facilities, materials and personnel required for the response), Photographer (provides photographs of site conditions and archives photographs), Public Information Officer (releases information to the news media and the public concerning site activities) and Record Keeper (maintains the official records of site activities). See Chapter 2 for a list of optional personnel and corresponding responsibilities.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58 (k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 As-needed offsite personnel. EM-40 typical titles include Bomb Squad Experts (advise on methods of handling explosive materials), Fire fighters (respond to fires that occur on-site and perform rescue), Hazardous Chemical Experts (provide immediate advice to those at the scene of a chemical related emergency), and Toxicologists (advise on toxicological properties and health effects of chemicals on-site).	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58 (k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor general site workers (such as equipment operators and general laborers) engaged in hazardous substances removal and other activities such as field sampling, drilling, and installation of monitoring wells.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor workers on a site occasionally for a specific or limited task (such as, but not limited to, groundwater monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over OSHA permissible exposure limits (PELs) and published exposure limits.	29 CFR 1910.120(e)(3)(ii) requires minimum training requirements of 24 hours of instruction off-site and a minimum of one day of actual field experience for occasional clean-up workers. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(3), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor workers who work regularly on a site in areas which have been monitored and fully characterized indicating that exposures are under OSHA PELs and published exposure limits where respirators or other PPE are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing.	29 CFR 1910.120(e)(3)(iii) requires minimum training requirements of 24 hours of instruction off-site and a minimum of one day of actual field experience for occasional clean-up workers. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience	29 CFR 1910.120(e)(3), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training where applicable.	29 CFR 1910.120(e)(4), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(e)(7), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Lead and Asbestos Abatement Training, if applicable.	29 CFR 1910.1001(j)(5), 29 CFR 1926.58(k)(3), 29 CFR 1910.1025(l)(1) and (2), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Visitors/Non-Workers who enter an exclusion/decontamination zone or other areas where Level A or Level B personal protective equipment (PPE) is required. Visitors/Non-Workers are on the site only occasionally, for a specific or limited task such as observing work activities. PPE should be issued to all Visitors/Non-Workers, and they should be instructed on its proper use. All Visitors/Non-Workers should be escorted by trained personnel. Non-Workers are EM-40 employees and off-site personnel not directly involved with site hazardous waste operations.	EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(3), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Visitor/Non-Workers who enter an exclusion/decontamination zone or other areas where Level C (PPE) is required. Visitors/Non-Workers are on the site only occasionally, for a specific or limited task such as inspecting operations at the site. PPE should be issued to all Visitors/Non-Workers, and they should be instructed on its proper use. All Visitors/Non-Workers are EM-40 employees and Contractors not directly involved with site hazardous waste site operations.	OSHA requires a minimum training requirement of 24 hours of instruction off-site and a minimum of one day actual field experience for Visitors/Non-Workers. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(e)(3), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Site-Specific Training.	29 CFR 1910.120(e)(9), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(e)(8), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE I (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Visitor/Non-Workers who enter designated clean areas of the site where either Level D or no PPE is required for tasks such as observing activities in clean portions of the sites. PPE should be issued, when necessary, to all Visitors/Non-Workers, and they should be instructed on its proper use. All Visitors/Non-Workers should be escorted by trained personnel. Non-Workers are EM-40 employees and Contractors not directly involved with site hazardous waste operations.	Site-Specific Training.	DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE II
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 employees directly involved in TSD facilities operations on a daily or occasional basis, i.e., supervising contractor employees and evaluating program outcome.	29 CFR 1910.120(p)(7)(i) and (ii) require a minimum of 24 hours Initial Health and Safety Training, or equivalent instruction, for current employees. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(p)(7)(i) and (ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 requires a minimum of 8 hours Supervisor Training.	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Facility-Specific Training.	29 CFR 1910.120(p), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(p)(7)(i), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(p)(8)(iv), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE II (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor TSD Facility Manager (FM) responsible for operations such as handling drums or containers. The TSD FM is also responsible for supervising TSD employees and has authority to direct response operations.	29 CFR 1910.120(p)(7)(i) and (ii) require a minimum of 24 hours Initial Health and Safety Training, or equivalent instruction, for current employees. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(p)(7)(i) and (ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 requires a minimum of 8 hours Supervisor Training.	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Facility-Specific Training.	29 CFR 1910.120(p), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(p)(7)(ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(p)(8)(iv), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE II (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Facility Safety and Health Officer (FSHO) responsible for implementation of all aspects of Safety and Health Plan at the facility. The FSHO is also responsible for implementing the Emergency Response Plan whenever warranted at the facility. FSHO has authority to direct response operations and reports to upper level management.	29 CFR 1910.120(p)(7)(i) and (ii) require a minimum of 24 hours Initial Health and Safety Training, or equivalent instruction, for current employees. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(p)(7)(i) and (ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 requires a minimum of 8 hours Supervisor Training.	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Facility-Specific Training.	29 CFR 1910.120(p), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(p)(7)(ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(p)(8)(iv), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993

TABLE II (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Designated Emergency Response Person (DERP) certified in first aid/CPR by the American Red Cross, or equivalent. The DERP is assigned to the facility crew to provide first aid and CPR services and is on the facility whenever employees are working at the facility.	29 CFR 1910.120(p)(7)(i) and (ii) require a minimum of 24 hours Initial Health and Safety Training, or equivalent instruction, for current employees. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(p)(7)(i) and (ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 requires a minimum of 8 hours Supervisor Training.	DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Facility-Specific Training.	29 CFR 1910.120(p), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(p)(7)(ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(p)(8)(iv), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE II (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Facility Command Post Supervisor or Facility Emergency Coordinator (FEC) responsible for implementing the emergency plan, whenever conditions at the facility warrant such action. The FEC who may be the same person as the TSD Facility Manager conducts activities such as evacuation, emergency transport of facility personnel, as necessary, and notifies emergency response units and appropriate management staff.	29 CFR 1910.120(p)(7)(i) and (ii) require a minimum of 24 hours Initial Health and Safety Training, or equivalent instruction, for current employees. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(p)(7)(i) and (ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 requires a minimum of 8 hours Supervisor Training.	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Facility-Specific Training.	29 CFR 1910.120(p), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(p)(7)(ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	29 CFR 1910.120(p)(8)(iv), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	29 CFR 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE II (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor facility operators engaged in activities such as handling drums or containers, or operation of a treatment unit such as an incinerator or activated carbon adsorption system.	29 CFR 1910.120(p)(7)(i) and (ii) require a minimum of 24 hours Initial Health and Safety Training, or equivalent instruction, for current employees. However, EM-40 adoption of OSHA standards requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(p)(7)(i) and (ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 requires a minimum of 8 hours Supervisor Training where applicable.	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of Facility-Specific Training.	29 CFR 1910.120(p), DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Annual Refresher Training.	29 CFR 1910.120(p)(7)(ii), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Emergency Response and Periodic Rehearsal Training.	OSHA 1910.120(p)(8)(iv), DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Hazard Communication Training.	OSHA 1910.120, 29 CFR 1926.59
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

TABLE II (Continued)
Minimum Training Requirements
for Personnel Engaged at EM-40 RCRA TSD Sites

Operational Personnel	Training Requirement	Reference(s)
EM-40 Visitors/Non-Workers who enter the facility. PPE should be issued to all Visitors/Non-Workers, and they should be instructed on its proper use. All EM-40 employees and offsite personnel not directly involved with TSD facility operations, are Visitors/Non-Workers.	OSHA requires no minimum training for Visitors/Non-Workers who enter the facility. However, EM-40 requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.*	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Facility-Specific Training	DOE 1991, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	8 hours Annual Refresher Training.*	DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, and NIEHS 1993

* This training is required for all visitors/nonworkers who enter an exclusion/decontamination zone or other areas where Level A, B, or C PPE is required. This training is not required for visitors/non-workers who only enter areas where either Level D or no PPE is required. See memo from Mr. Pat Whitfield, EM-40 to EM-40 Offices, dated February 2, 1994.

TABLE III
Minimum Training Requirements for Personnel Engaged at Emergency Responses to Hazardous Substances Releases

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor First Responder (FR-AW) at the awareness level. This individual is likely to witness or discover a hazardous substance release. The FR-AW takes no action beyond notifying appropriate authorities of the release.	OSHA requires sufficient training to initiate an emergency response sequence by notifying the proper authorities of the release (or) has sufficient experience to objectively demonstrate competency in the areas listed in 1920.120(q)(6)(i).	29 CFR 1910.120(q)(6)(i), DOE 1994
EM-40 Contractor or Subcontractor First Responder (FR-OP) at the operation level. This individual responds to releases or potential releases of hazardous substances as part of the initial response at the site in order to mitigate the effects of these substances on human health and the environment.	OSHA requires a minimum of 8-hours of training to respond in a defensive manner without actually trying to stop the release; or sufficient experience to objectively demonstrate competency in the areas listed in 29 CFR 1920.120(q)(6)(i) and (ii) and competency certification by the employer are required. However, EM-40 requires a minimum of 40-hours Initial Health and Safety Training and 24-hours supervised field experience.	29 CFR 1910.120(q)(6)(ii), DOE 1994
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120 (e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires an annual refresher training, at a minimum.	29 CFR 1910.120(q)(8), DOE 1993b, DOE 1993c, DOE 1994, NIEHS 1993
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1993b, DOE 1993c, DOE 1994, NIEHS 1993

TABLE III (cont.)
Minimum Training Requirements for Personnel
Engaged at Emergency Responses to Hazardous Substances Releases

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Hazardous Materials Technician (HMT). This individual responds to a release or potential release for the purpose of preventing or stopping the release. The HMT approaches the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance.	OSHA requires a minimum of 24-hours of training equal to the FR operations level described in 1920.120(q)(6)(ii). In addition, competency in the areas listed in 1910.120(q)(6)(iii) and competency certification by the employer are required. However, EM-40 requires a minimum of 40-hours Initial Health and Safety Training and 24-hours supervised field experience.	29 CFR 1910.120(q)(6)(iii), DOE 1994
	EM-40 adoption of OSHA standards requires an annual refresher training.	29 CFR 1910.120(q)(8), DOE 1994
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1994

TABLE III (cont.)
Minimum Training Requirements for Personnel
Engaged at Emergency Responses to Hazardous Substances Releases

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor Hazardous Materials Specialists (HMS). This individual responds to and provides support for HMTs. This position requires a focused or specific knowledge of the various substances which may be present at the site or facility.	OSHA requires a minimum of 24 hours training equal to the HMT level. In addition, competency in the areas listed in 1910.120 (q)(6)(iv) and competency certification by the employer are necessary. However, EM-40 requires a minimum of 40 hours Initial Health and Safety Training and 24 hours supervised field experience.	29 CFR 1910.120(q)(6)(iv), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120 (e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires an annual refresher training.	29 CFR 1910.120 (q)(8), DOE 1994
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1994

TABLE III (cont.)
Minimum Training Requirements for Personnel
Engaged at Emergency Responses to Hazardous Substances Releases

Operational Personnel	Training Requirement	Reference(s)
EM-40 Contractor or Subcontractor On-Scene Incident Commander. This individual assumes responsibility for control of the incident scene beyond the FR awareness level.	OSHA requires a minimum of 24-hours training equal to the FR operations level described in 1910.120(q)(6)(ii). In addition, competency in the areas listed in 1910.120(q)(6)(iii) and certification by the employer are necessary. However, EM-40 requires a minimum of 40-hours Initial Health and Safety Training and 24-hours supervised field experience.	29 CFR 1910.120(q)(6)(v), DOE 1994
	EM-40 adoption of OSHA standards requires a minimum of 8 hours Supervisor Training.	29 CFR 1910.120 (e)(4), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	EM-40 adoption of OSHA standards requires an annual refresher training.	29 CFR 1910.120(q)(8), DOE 1993b, DOE 1993c, DOE 1994 and NIEHS 1993
	Radiological Worker Training, if applicable. For details, see DOE Radiological Control Manual (DOE/EH-0256T).	DOE Notice 5480.6, DOE 1992, DOE 1994

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APPENDIX D

EM-40 Hazardous Materials Training Program Memorandum

DOE F 1325.8
(8-89)
EFG (07-90)

United States Government — Department of Energy

memorandum

DATE: FEB 03 1994

REPLY TO ATTN OF: EM-43 (W. Wisenbaker, 3-8105)

SUBJECT: Hazardous Materials Training Program

TO: Distribution

The Office of Environmental Restoration (EM-40) Health and Safety Plan (HASP) Working Group is developing HASP guidelines for EM-40. Their discussions included interpretations of my attached memoranda, dated June 10, 1993, and August 30, 1993, concerning the hazardous materials training program for EM-40 employees and contractors. Based upon the Working Group's discussions, two points of clarification may be in order.

First, the previous memoranda did not mean to suggest that each EM-40 employee and EM-40 contractor employee, irrespective of his or her job functions, must take the 40 hour Hazardous Waste Operations and Emergency Response (HAZWOPER) Training. Instead, the memoranda meant to include the following EM-40 employees and EM-40 contractors: Headquarters and field program/project managers and supervisors of hazardous waste work activities; first responders operations level; on-site hazardous waste site clean-up responders to on-site accidents; on-site hazardous waste site clean-up workers; persons who directly evaluate, inspect, or review on-site hazardous waste work; and any employee whose job functions require the 40 hour HAZWOPER training by the Department of Energy (DOE) Order 29 CFR 1910.120. The memoranda also meant that, even though there are some workers whose job functions normally require only 24 hour HAZWOPER training, they should instead receive the 40 hour training. For example, this would include Treatment, Storage, Disposal Facility workers or employees who only occasionally go directly on-site for a specific limited task. To the greatest extent possible, this 40 hour training should be taken under the auspices of the National Institute of Environmental Health Sciences grantee program because resources have already been allocated for this training.

Second, there are other EM-40 employees and EM-40 contractors who, by virtue of their job functions, may still require only 24 hour HAZWOPER training. Examples of these employees include on-site administrative support and clerical personnel; persons who are not exposed to on-site hazardous waste work activities; and persons who are not expected to be directly involved in any aspects of on-site hazardous waste work as defined in DOE Order 29 CFR 1910.120(e)(3)(iii). For these employees, the training may be taken from any appropriate source.

Please contact Mr. William Wisenbaker at (301) 903-8105 should you have any questions or require additional information.

R. P. Whitfield
Deputy Assistant Secretary
for Environmental Restoration

Attachments

cc:
J. Baublitz, EM-40
R. Scott, EM-20

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APPENDIX E

Other Sources of Hazard Assessment Methods

1. *Guidelines for Hazard Evaluation Procedure, Second Ed., with Worked Examples,* American Institute of Chemical Engineers, 1992.

2. *DOE Standard - Preparation Guide for U.S. Department of Energy Non-reactor Nuclear Facility Safety Analysis Reports.*

3. *DOE Standard - 1027-92,* on compliance with DOE 5480.23, Nuclear Safety Analysis Reports.

4. *Laboratory Integration and Prioritization System* (Lawrence Livermore National Laboratory, Sandia National Laboratories, and Los Alamos National Laboratory).

5. Office of Energy Research, ES&H Risked-Based Priority Model.

6. Draft DOE 5483.XX, *Occupational Safety and Health Program for DOE Operations,* with respect to the Risk Assessment Code Methodology, November 12, 1993.

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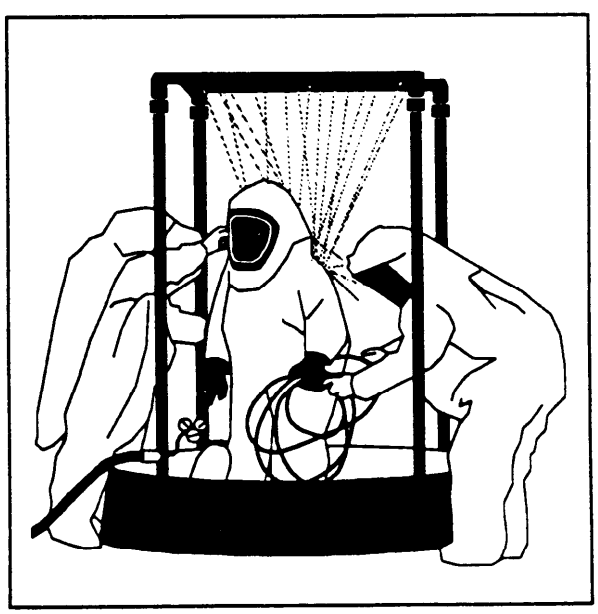
APPENDIX F

SAMPLE DECONTAMINATION LAYOUTS AND PROCEDURES FOR LEVELS OF PROTECTION A THROUGH C

The objective of these procedures is to minimize the risk of exposure to hazardous substances in the field. Protective equipment must be worn by personnel when response activities involve known or suspected hazardous substances. The procedures for decontaminating personnel upon leaving the contaminated area are discussed for personal protective equipment levels A through C. The procedures given are for the maximum and minimum amount of decontamination used for each level of protection.

The maximum decontamination procedures for all levels of protection consist of specific activities at 19 stations. Each station emphasizes an important aspect of decontamination. When establishing a decontamination line, each aspect should be incorporated separately or combined with other aspects into a procedure with fewer steps (such as the minimum decontamination procedures).
Decontamination lines are site-specific and vary depending on the types of contamination and work activities conducted on-site. When the decontamination line is no longer required, contamination wash and rinse solutions and contaminated articles must be contained and disposed of as hazardous wastes in compliance with State and Federal regulations.



APPENDIX F

Sample Decontamination Layouts and Procedures for Levels of Protection A through C

Equipment Needed to Perform Maximum Decontamination Measures for Levels A, B, and C

Station 1:
- a. Various Size Containers
- b. Plastic Liners
- c. Plastic Drop Cloths

Station 2:
- a: Containers (20-30 Gallons)
- b. Decon Solution or Detergent Water
- c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 3:
- a. Containers (20-30 Gallons
  OR
- b. Water
- c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 4:
- a. Containers (20-30 Gallons)
- b. Plastic Liners

Station 5:
- a. Containers (20-30 Gallons)
- b. Plastic Liners
- c. Bench or Stools

Station 6:
- a. Containers (20-30 Gallons)
- b. Plastic Liners

Station 7:
- a. Containers (20-30 Gallons)
- b. Decon Solution or Detergent Water
- c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 8:
- a. Containers (20-30 Gallons)
  OR
- b. Water
- c. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 9:
- a. Air Tanks or Face Masks and Cartridge Depending on Level
- b. Tape
- c. Boot Covers
- d. Gloves

Station 10:
- a: Containers (20-30 Gallons)
- b. Plastic Liners
- c. Bench or Stools
- d. Boot Jack

Station 11:
- a. Rack
- b. Drop Cloths
- c. Bench or Stools

Station 12:
- a. Table

Station 13:
- a. Basin or Bucket
- b. Decon Solution
- c. Small Table

Station 14:
- a. Water
- b. Basin on Bucket
- c. Small Table

Station 15:
- a. Containers (20-30 Gallons)
- b. Plastic Liners

Station 16:
- a. Containers (20-30 Gallons)
- b. Plastic Liners

Station 17:
- a. Containers (20-30 Gallons)
- b. Plastic Liners

Station 18:
- a. Water
- b. Soap
- c. Small Table
- d. Basin or Bucket
- e. Field Showers
- f. Towels

Station 19:
- a. Dressing Trailer is Needed in Inclement Weather
- b. Tables
- c. Chairs
- d. Lockers
- e. Cloths

Equipment Needed to Perform Minimum Decontamination Measures for Levels A, B, and C

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution
c. Rinse Water
d. 2-3 Long-Handled, Soft-Bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 4:
a. Air Tanks or Masks and Cartridges Depending Upon Level
b. Tape
c. Boot Covers
d. Gloves

Station 5:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

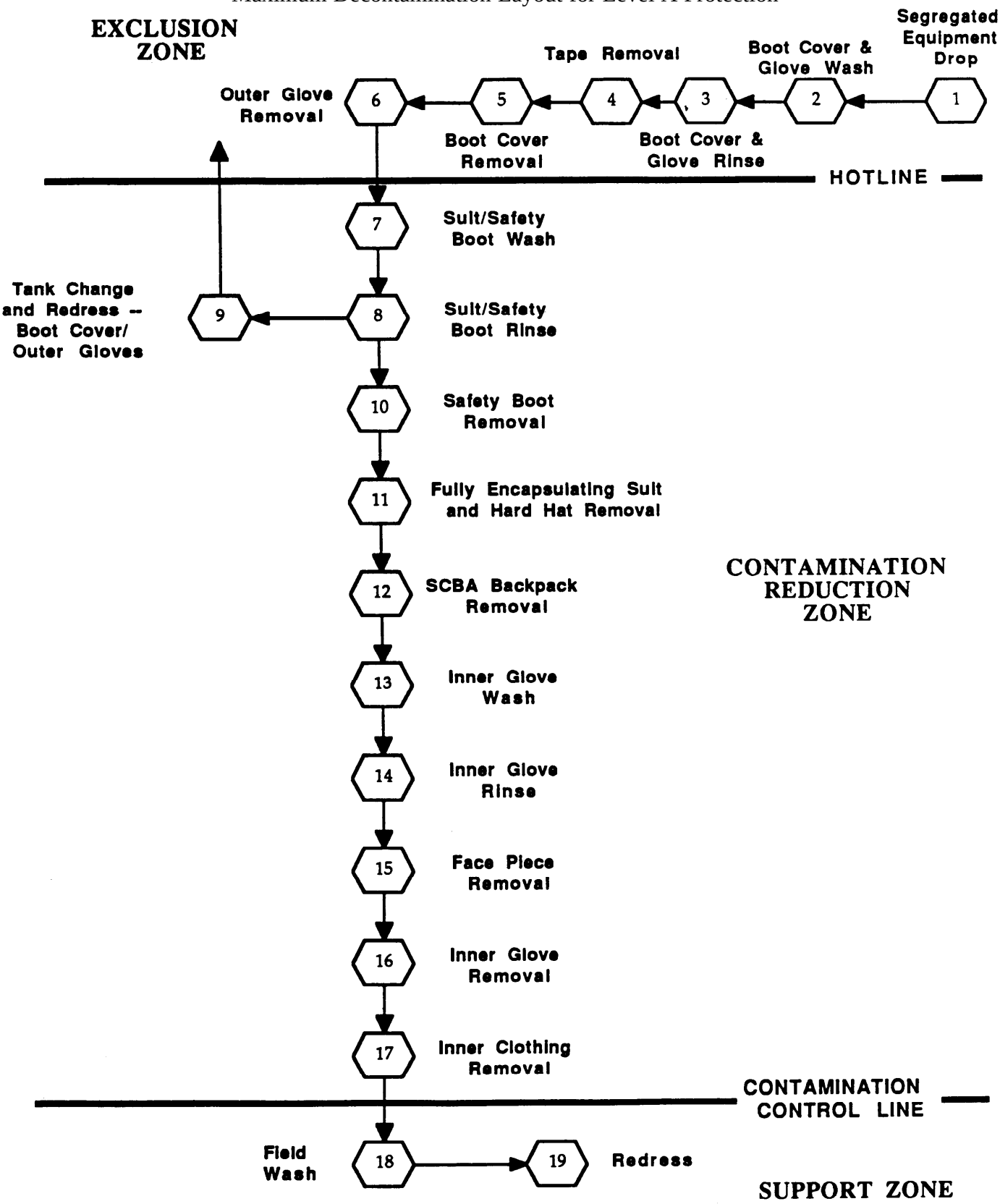
Station 6:
a. Plastic Sheets
b. Basin or Bucket
c. Soap and Towels
d. Bench or Stools

Station 7:
a. Water
b. Soap
c. Tables
d. Wash Basin or Bucket

Maximum Measures for Level A Decontamination

Station 1:	Segregated Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. During hot weather operations, a cool-down station may be set up within this area.
Station 2:	Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decon solution or detergent/water.
Station 3:	Boot Cover and Glove Rinse	Rinse off decon solution from station 2 using copious amounts of water.
Station 4:	Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5:	Boot Cover Removal	Remove boot covers and deposit in container with plastic liner.
Station 6:	Outer Glove Removal	Remove outer gloves and deposit in container with plastic liner.
Station 7:	Suit and Boot Wash	Wash encapsulating suit and boots using scrub brush and decon solution or detergent/water. Repeat as many times as necessary.
Station 8:	Suit and Boot	Rinse off decon solution using water. Repeat as many times as necessary.
Station 9:	Tank Change	If an air tank change is desired, this is the last step in the decontamination procedure. Air tank is exchanged, new outer gloves and boot covers are donned, and joints are taped. Worker returns to duty.
Station 10:	Safety Boot Removal	Remove safety boots and deposit in container with plastic liner.
Station 11:	Fully Encapsulating Suit and Hard Hat Removal	Fully encapsulated suit is removed with assistance of a helper and is laid out on a drop cloth or hung up. Hard hat is removed. Hot weather rest station may be set up within this area for personnel returning to site.
Station 12:	SCBA Backpack Removal	While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve and proceed to next station.
Station 13:	Inner Glove Wash	Wash with decon solution that will not harm the skin. Repeat as often as necessary.
Station 14:	Inner Glove Rinse	Rinse with water. Repeat as many times as necessary.
Station 15:	Face Piece Removal	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16:	Inner Glove Removal	Remove inner gloves and deposit in container with liner.
Station 17:	Inner Clothing Removal	Remove clothing and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 18:	Field Wash	Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19:	Redress	Put on clean clothes.

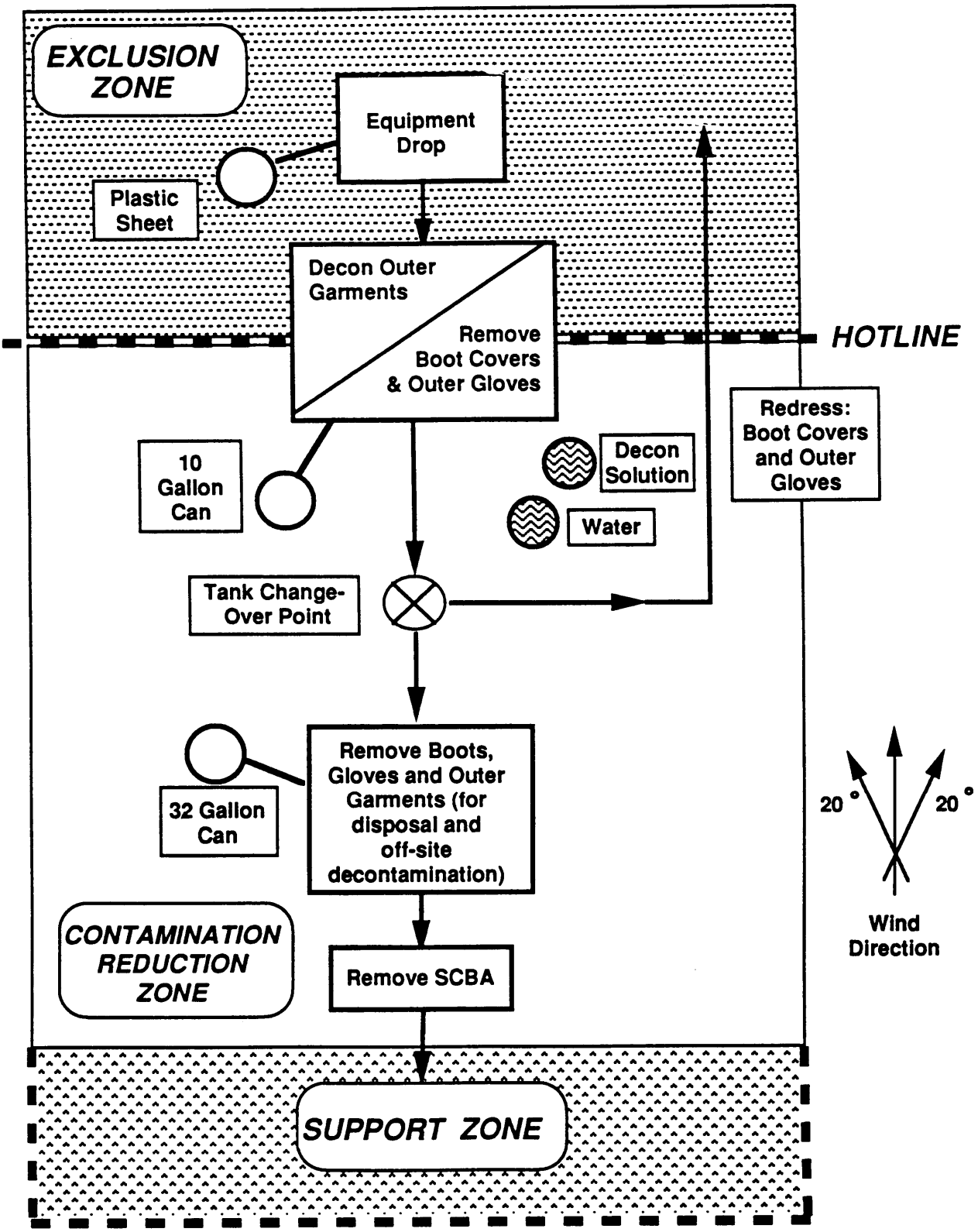
Maximum Decontamination Layout for Level A Protection



Minimum Measures for Level A Decontamination

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool-down stations may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves and fully-encapsulating suit with decon solution or detergent and water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5:	Boot, Gloves, and Outer Garment Removal	Boots, fully-encapsulating suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	SCBA backpack and facepieces are removed (avoid touching face with fingers). SCBA is deposited on plastic sheets.
Station 7:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

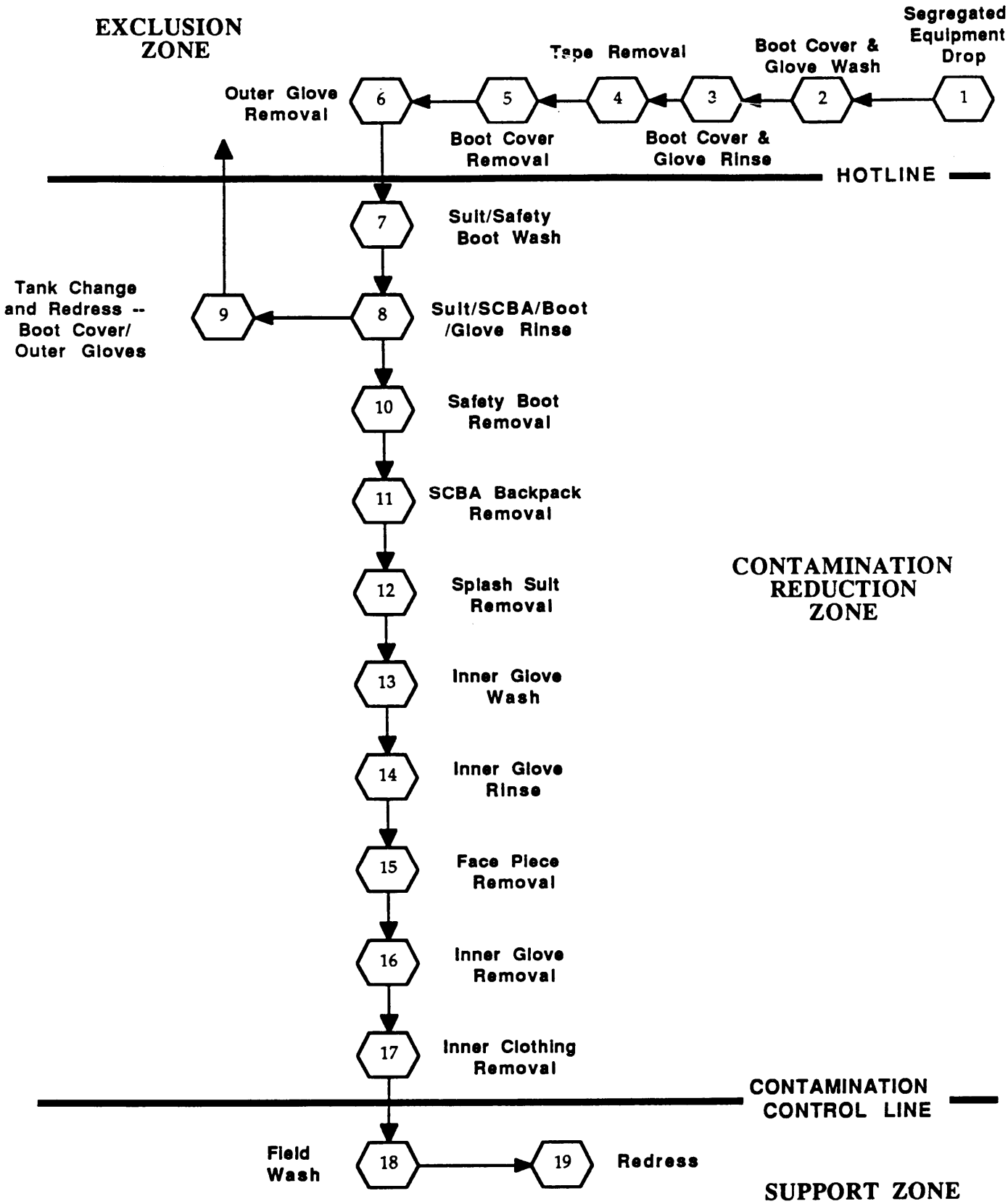
Minimum Decontamination Layout for Levels A & B Protection



Maximum Measures for Level B Decontamination

Station 1:	Segregated Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, cool-down stations may be set up within this area.
Station 2:	Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3:	Boot Cover and Glove Rinse	Rinse off decon solution from Station 2 using copious amounts of water.
Station 4:	Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5:	Boot Cover Removal	Remove boot covers and deposit in container with plastic liner.
Station 6:	Outer Glove Removal	Remove outer gloves and deposit in container with plastic liner.
Station 7:	Suit and Safety Boot Wash	Wash chemical-resistant splash suit, SCBA, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution. Wrap SCBA regulator (if belt mounted type) with plastic to keep out water. Wash backpack assembly with sponges or cloths.
Station 8:	Suit, SCBA, Boot, and Glove Rinse	Rinse off decon solution using copious amounts of water.
Station 9:	Tank Change	If worker leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer glove and boot covers are donned, joints are taped, and worker returns to duty.
Station 10:	Safety Boot Removal	Remove safety boots and deposit in container with plastic liner.
Station 11:	SCBA Backpack Removal	While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve.
Station 12:	Splash Suit Removal	With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 13:	Inner Glove Wash	Wash inner gloves with decon solution.
Station 14:	Inner Glove Rinse	Rinse inner gloves with water.
Station 15:	Face Piece Removal	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16:	Inner Glove Removal	Remove inner gloves and deposit in container with liner.
Station 17:	Inner Clothing Removal	Remove inner clothing. Place in container with liner. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants may have been transferred in removing the fully-encapsulating suit.
Station 18:	Field Wash	Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19:	Redress	Put on clean clothes.

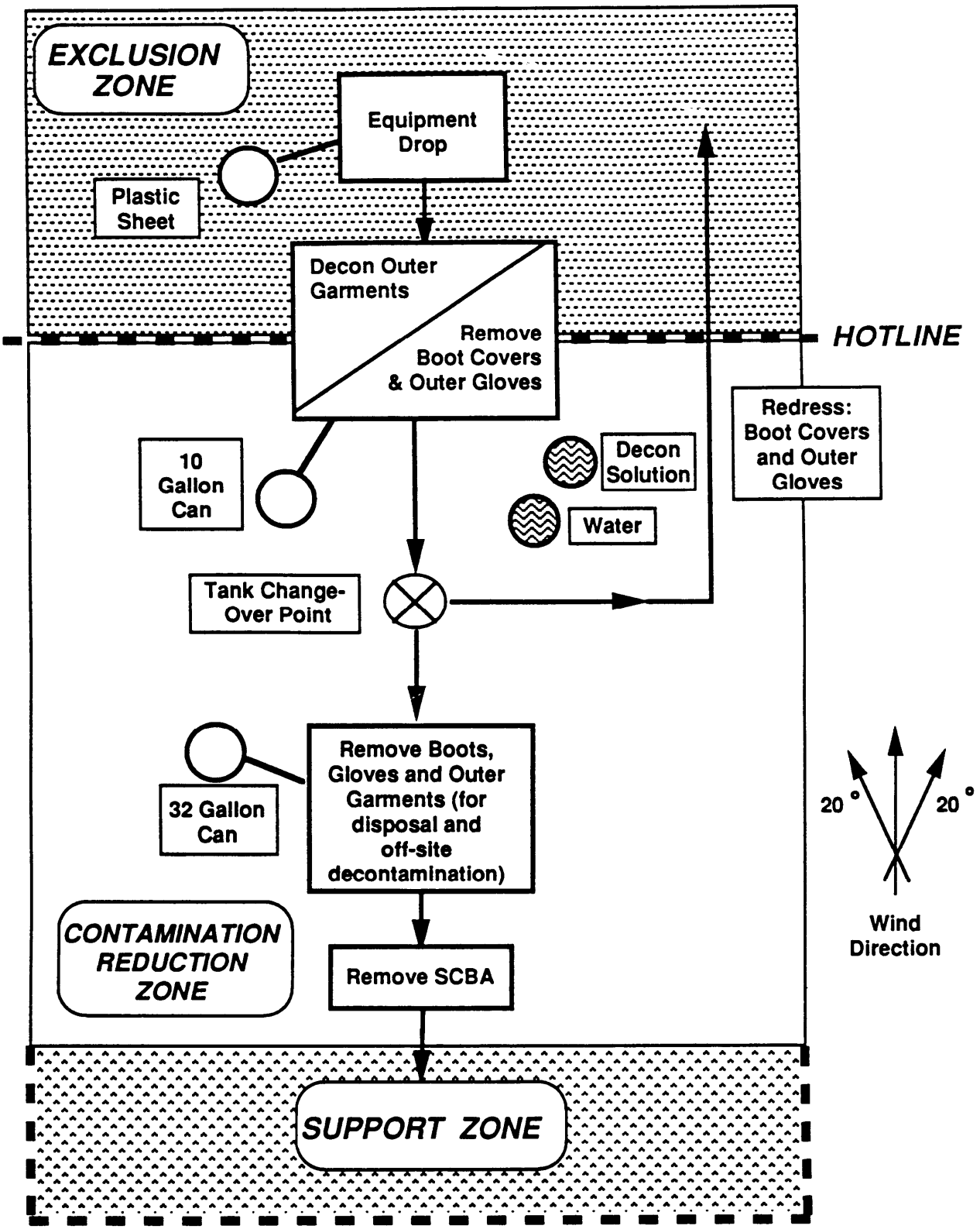
Maximum Decontamination Layout for Level B Protection



Minimum Measures for Level B Decontamination

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool-down station may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and chemical-resistant splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	If worker leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5:	Boot, Gloves, and Outer Garment Removal	Boots, chemical-resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	SCBA backpack and facepiece are removed. Avoid touching face with finger. SCBA is deposited on plastic sheets.
Station 7:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

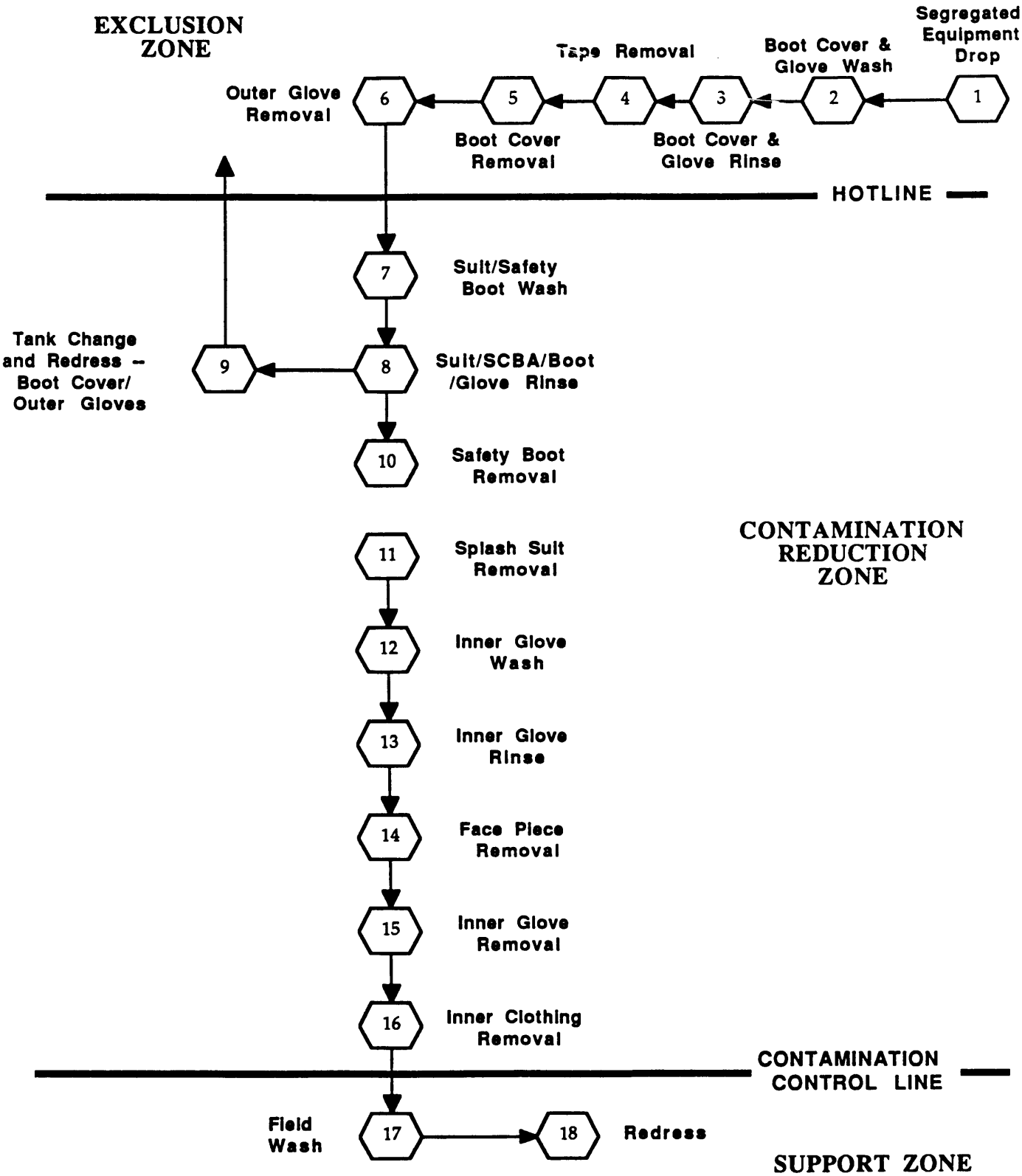
Minimum Decontamination Layout for Levels A & B Protection



Maximum Measures for Level C Decontamination

Station 1:	Segregated Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2:	Boot Cover and Glove Wash	Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3:	Boot Cover and Glove Rinse	Rinse off decon solution from Station 2 using copious amounts of water.
Station 4:	Tape Removal	Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5:	Boot Cover Removal	Remove boot covers and deposit in containers with plastic liner.
Station 6:	Outer Glove Removal	Remove outer gloves and deposit in container with plastic liner.
Station 7:	Suit and Boot Wash	Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.
Station 8:	Suit, Boot, and Glove Rinse	Rinse off decon solution using water. Repeat as many times as necessary.
Station 9:	Canister or Mask Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, and joints are taped. Worker returns to duty.
Station 10:	Safety Boot Removal	Remove safety boots and deposit in container with plastic liner.
Station 11:	Splash Suit Removal	With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station 12:	Inner Glove Removal	Wash inner gloves with decon solution.
Station 13:	Inner Glove Wash	Rinse inner gloves with water.
Station 14:	Face Piece Removal	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 15:	Inner Glove Removal	Remove inner gloves and deposit in lined container.
Station 16:	Inner Clothing Removal	Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a probability that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station 17:	Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 18:	Redress	Put on clean clothes.

Maximum Decontamination Layout for Level C Protection



Minimum Measures for Level C Decontamination

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask Change	If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	Boots, chemical-resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6:	Face Piece Removal	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Minimum Decontamination Layout for Level C Protection