

HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE – REFRESHER LEVEL

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HAZWOPER REFRESHER AGENDA

| | |
|--|-------------|
| I. Introduction and class objectives | 8:00-8:15 |
| II. Regulatory Guidelines | 8:15-8:45 |
| III. Personal Protective Equipment | 8:45-9:30 |
| IV. Respiratory Protection | 9:30-10:00 |
| BREAK | 10:00-10:15 |
| V. Hazmat incident video and discussion | 10:15-10:40 |
| VI. "In the Know" interactive activity | 10:40-11:00 |
| VII. Decontamination | 11:00-11:45 |
| VIII. Decon video and discussion | 11:45-12:15 |
| Lunch | 12:15-1:15 |
| IX. Site Characterization | 1:15-1:45 |
| X. Health and Safety Plans | 1:45-2:45 |
| BREAK | 2:45-3:00 |
| XI. Toxicology video and discussion | 3:00-3:15 |
| XII. Physical and Chemical characteristics | 3:15-3:40 |
| XIII. Group scenario practice-includes simulation video, breaking into groups, group discussion | 3:40-5:00 |
| DISMISS | 5:00 |

HAZWOPER REFRESHER OBJECTIVES

You will learn:

- Review of the basic skills and knowledge acquired from the IER/TER courses;
- Equipment use;
- Emergency response techniques;
- Use of various levels of personal protective equipment.

Hazardous Waste Operations and Emergency Response Refresher:

Follow up activities

- Conducted site-specific initial Hazwoper training at my worksite.
- Wrote, updated, or revised our site-specific written applicable plans/programs:
 - Emergency response plan
 - Safety and health program
 - Spill control procedures
 - Decontamination plan
 - Respiratory protection plan
 - Personal protective equipment program
 - Hazard communication program
 - Fire prevention program
 - Bloodborne pathogens program
 - Permit required confined space program

Activity Plan

| | Activity | Other people involved | Target Deadline |
|--------------------------|----------|-----------------------|-----------------|
| <input type="checkbox"/> | | | |

How Prepared is Your Company for a Disaster?

In 1991, Edwin Zebroski did a study of four major disasters: Three-Mile Island, Bhopal, Chernobyl, and the Challenger Shuttle. All four have been investigated thoroughly and impartially, and each was well documented. As a result of the study, Zebroski identified 11 negative attributes that were common to all four disasters.

Do you see your organization defined in the following criteria? If your answer for an item is "Yes! Absolutely," write a score of 0. If your answer is "No. Definitely not," write a score of 10. If your answer falls somewhere in the middle, write a score between 1 and 9 to indicate how closely the item fits your organization.

1. There is a fuzziness as to whom is responsible for what throughout the organization.
Score _____
2. Mindset that success is routine, everything is "A-OK," "We are good."
Score _____
3. Belief that rule compliance is enough to ensure safety. ("If we're in compliance, we're safe.")
Score _____
4. Team-player concept with dissent not allowed; no whistle-blowers
Score _____
5. Experience from other facilities not processed systemically for application of lessons learned. ("We didn't learn from similar experiences at other facilities.")
Score _____
6. Lessons that are learned are disregarded, rather than built into the system.
Score _____
7. Safety is subordinate to other performance goals in production, schedule, quality, etc.
Score _____

8. Emergency procedures, plans, training, and regular drills for severe events are lacking.
Score _____
9. Design and operating features are allowed even though recognized elsewhere as hazardous.
Score _____
10. Project and risk management techniques are available but not used.
Score _____
11. Organization has undefined responsibility, authority, and accountability for recognizing and integrating safety.
Score _____

Total Score _____

To calculate your average score, divide your total score by the number of items (11). If you scores are low (0-5) for several items, your organization needs to change the way it approaches safety - and change quickly.

1

¹ Source: "Safety Accountability with Dan Petersen," a new video series from Core Media Training Solutions; (800537-8352. Reprinted from Industrial Safety & Hygiene News, September 1999.

HAZWOPER REFRESHER NOTES

Hazardous Waste Operations and Emergency Response-- Refresher

29 CFR 1910.120

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Objectives

Review of the following subjects:

- Regulations
- PPE
- Respiratory Protection
- Decontamination
- Containment
- Site Characterization
- Health and Safety Plan

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Initial Training

- Routine site employees
 - 40 hours off site, 3 days on site under an experienced supervisor, 8 hour refresher
- Routine site employees with minimal exposure (no respirator/under PEL)
 - 24 hours off site, 1 day on site, 8 hour refresher
- Non-routine site employees
 - 24 hours off site, 1 day on site, 8 hour refresher

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REGULATORY GUIDELINES

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HAZWOPER STANDARD

- Published on March 6, 1989 and became effective March 6, 1990
- incorporated into the construction standards as 29 CFR 1926.65 on June 30, 1993
- EPA adopted the standard on June 23, 1989 for public employees in states where federal OSHA has enforcement authority.

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Intergrated Standards

- 29 CFR 1910.1200. the Hazard Communication Standard
- 29 CFR 1910.38(a) Employee Emergency Plans and Fire Prevention Plans
- 29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories

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Plus . . .

- 29 CFR 1910.119, Process Safety Management for Highly Hazardous Chemicals
- 29 CFR 1910.1030, Occupational Exposure to Bloodborne Pathogens
- 29 CFR 1910.146, Permit-Required Confined Spaces
- 29 CFR 1910.156, Fire brigades

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RCRA

Resource Conservation and Recovery Act

- Passed in 1976
- Protect human health and environment.
- Reduce waste, conserve energy & natural resources
- Reduce or eliminate the generation of hazardous waste

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CERCLA

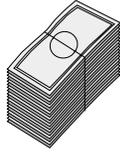
The Comprehensive Environmental Response Compensation and Liability Act

- Passed in 1980
- Normally referred to as "Superfund"

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Superfund



- No standards or permits
- Holds companies financially liable
- Financed by companies that do business with hazardous substances.
- Pay now or pay later!
 - Government can do the clean-up and bill you later.

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SARA Title III

- Superfund Amendments and Reauthorization Act title III
- Emergency Planning and Community Right-to-Know Act of 1986
- Requires states and local jurisdictions to develop emergency response plans
- Facilities must share information about the hazardous substances they have on site with the LEPC

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ICP

- The National Response Team's Integrated Contingency Plan Guidance
- Published in the Federal Register on June 5, 1996
- Meets requirements of multiple federal agency regulations with a single plan

NRT website at www.nrt.org

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What's Hazardous Mean?

- **Ignitability**
- **Corrosive**
- **Reactive or explosive**
- **Toxicity**

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Ignitability

- Liquids with a flash point less than 140 °F (RCRA definition)
- Non-liquids with potential to spontaneously combust
- DOT-ignitable compressed gases
- DOT oxidizers

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Corrosivity

- Aqueous solutions with a pH less than or equal to 2; or greater than or equal to 12.5
- Liquids that corrode steel at the rate of greater than 0.25 inches/year

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Reactivity

- Normally unstable
- Reacts violently with water
- Forms explosive mixtures with water
- Produces toxic gases when mixed with water
- Capable of detonation if struck or heated; or under STP
- DOT explosive

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Toxicity

Modes and Routes of Entry

- | • <u>Mode</u> | • <u>Route</u> |
|---------------|------------------|
| Inhalation | Respiratory |
| Ingestion | Gastrointestinal |
| Injection | Skin |
| Absorption | Skin |

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Factors of Toxicity

- Time & Frequency (TWA, STEL)
- Route by which exposure occurs
- Physical & chemical form of the substance
- Dose delivered

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Fire & Explosive Characteristics Sources of Ignition

- Cigarettes
- Welding
- Grinding / Cutting
- Unprotected electrical equipment
- Open flames
- Hot surfaces
- Static electricity
- Oxidizing chemicals

Physical Hazards at a Site

- _____
- _____
- Traffic
- _____
- Illumination
- Radiation
- Electrical hazards
- _____
- Contamination control
- _____
- Excavations
- Animals/Vectors

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Personal Protective Equipment



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Purpose of a PPE Program

- ☞ To protect the wearer from safety and health hazards
- ☞ To prevent injury to the wearer from incorrect use/or malfunction of the PPE.

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Hazards of PPE

- _____
- Physical and psychological stress
- Impaired vision
- _____
- Difficult to communicate

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The PPE Program

- Hazard identification
- Medical monitoring
- Environmental surveillance
- Selection, use, decontamination guidelines
- Training



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Program Success

- ☞ Review program at least annually
- ☞ Perform a frequent review of chemical & physical hazards to ensure proper PPE is being worn (upgrade or downgrade accordingly).

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Types of PPE

- Fully-encapsulating suits
- Non-encapsulating suits
- Aprons, leggings, & sleeve protectors
- Gloves
- Boots
- Safety glasses, face shields

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More types of PPE . . .

- Firefighters' protective clothing
- Proximity or approach garments
- Blast and fragmentation suits
- Cooling garments

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Chemical-Protective Clothing

Chemical-protective clothing is available in a variety of materials that offer a range of protection against different chemicals.

Ideally, the chosen material resists permeation, degradation, and penetration.

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Selection Criteria Resource

“Guidelines for the selection of CPC”

Provides a matrix of clothing material recommendations for approximately 300 chemicals. Based on :

- Evaluation of permeation and degradation data from independent tests
- Vendor literature
- Raw materials suppliers.

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BE AWARE - No materials protect against all chemicals and combinations of chemicals, and no currently available material is an effective barrier to any prolonged chemical exposure.

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Permeation

Permeation rates and breakthrough time may vary depending on a number of factors.

Name those Factors!



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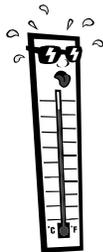
Factors influencing Permeation

- Clothing material type and thickness
- Manufacturing method
- Concentration of hazardous substances
- Temperature & Humidity
- Solubility of the chemical in the clothing material

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Purchasing Proper PPE

- Durability & Flexibility
- Temperature effects
- Ease of decontamination
- Compatibility with other equipment
- Public concerns (**color**)



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Level A

☞ Worn when the highest level of respiratory, skin, and eye protection is needed.

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Level A components

- Minimally
 - SCBA or SAR w/escape respirator
 - Totally encapsulated suit
 - Gloves, inner
 - Gloves, outer
 - Boots, steel toe and chemical protective
 - Communications

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Level B

☞ Highest level of respiratory protection is needed but hazardous material exposure to the few unprotected areas of body is unlikely.

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Level B Components

- SCBA or SAR w/escape respirator
- Chemical protective overalls/long sleeved jackets or coveralls
- Gloves, inner
- Gloves, outer
- Boots, steel toe -chemical protective
- Duct tape
- Communications

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Level C

- ☐ Types of airborne substances is known
- ☐ The concentrations measured
- ☐ The criteria for using air-purifying respirators are met.

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Level C Components

- Full facepiece air-purifying respirator
- Emergency escape respirator (optional)
- Coveralls
- Gloves, inner & outer
- Duct tape
- Boots, steel toe and chemical protective

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Level D

- Worn on sites where respiratory or skin hazards are NOT present. It is primarily a work uniform providing minimal protection
- Coveralls
- Safety boots
- Safety glasses with sideshields
- Hard hat

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Personnel may be required to upgrade or downgrade their level of protection if site hazards warrant.

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Reasons to Upgrade

- Known or suspected presence of dermal hazards
- Occurrence or likely occurrence of gas or vapor emission.
- Change in work task that will increase contact or potential contact with hazardous materials.
- Request of the individual performing the task.

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Reasons to Downgrade

- New information indicating that the situation is less hazardous than was originally thought.
- Change in site conditions that decreases the hazard.
- Change in work task that will reduce contact with hazardous materials.

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Before an incident . . Wear Your PPE

- Allows the user to become familiar with the equipment in a non-hazardous situation.
- Instills confidence in the user in the use of his/her equipment.
- Makes the user aware of the limitations and capabilities of the equipment.

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Plus . .

- Increases the efficiency of operations performed by workers wearing PPE
- May increase the protective efficiency of PPE use
- Reduces the expense of PPE maintenance

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PPE Inspection

- Inspection and operational testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use or training and prior to maintenance.
- Periodic inspection of stored equipment.

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PPE Storage

Clothing and respirators must be stored properly to prevent damage or malfunction due to exposure to:

- ☐ Dust
- ☐ Moisture
- ☐ Sunlight and extreme temperatures
- ☐ Damaging chemicals
- ☐ Impact

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Heat Stress Factors



- Lack of physical fitness
- Lack of acclimatization
- _____
- Dehydration
- Obesity
- _____
- Infection
- Sunburn
- Chronic disease

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Heat-related Illnesses

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

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Precautions

Implement a work/rest regimen based on the following:

- ☐ Anticipated work rate
- ☐ Ambient temperature and other environmental factors
- ☐ Type of protective ensemble
- ☐ Individual worker characteristics and fitness

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Cold Stress Factors

- Very low temperatures/High humidity
- High winds
- Inadequate clothing
- wet and cold objects
- specific drugs and medicine
- Old age
- Poor physical health

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Cold-related Disorders

- Hypothermia
- Blood vessel abnormalities
- Frostbite
- Frostnip
- Trench Foot

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Prevention

- Rest/drink breaks w/warming areas
- Cover metal handles with insulating material
- Do not use unprotected metal seats
- Provide warm clothing
- Allow workers to be acclimatized
- Minimize sitting or standing still for long periods

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Respiratory Protection 29 CFR 1910.134

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Air Contaminants

- ☞ Any substances that are not a normal components of breathing air (oxygen, nitrogen, etc..)
- ☞ The respiratory threat posed by contaminants is a function of the actual contaminant and its concentration in the air.

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Types Of Respiratory Protection

- Air-purifying
- Atmosphere-supplying
 - Includes supplied air and SCBA

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Air-purifying

- ☞ Half - Mask - covers the mouth and nose and fits under the chin of the wearer.
- ☞ Full - Facepiece - covers the wearer from the hairline to below the chin. Provides the greatest protection to the wearer from exposure to hazardous materials as well as eye protection.

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Cartridges

Under the new respiratory protection standard, cartridges must be changed according to:

- A NIOSH certified end-of-service life indicator; or
- Use a change schedule (manufacturer's recommendations)

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PAPR

- Powered Air Purifying Respirators - This device uses a blower to pass contaminated air through an element that removes the contaminants and supplies purified air to the wearer. The element may be a particulate filter, gas/vapor cartridge, or a combination filter and cartridge.

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Atmosphere - Supplying Respirators

- SCBA
 - Self-contained Breathing Apparatus
- SAR
 - Supplied-air respirator

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Supplied Air Respirators SAR

- Deliver breathing air through a supply hose connected to the wearer's facepiece or enclosure.
- Air line respirators can not be used in IDLH atmospheres, unless used in conjunction with an escape respirator.

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Emergency Signals



Verbal communication while wearing respirators is difficult because talking is muffled and distorted by the face mask. A set of hand signals known to all personnel is essential for working together safely.

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Equipment Selection

- **Respirator Decision Logic** is to ensure technical accuracy and uniformity in the selection of respirators and to provide necessary criteria to support the selection.
- NIOSH Decision Logic 1-800-35NIOSH

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Warning Properties

- ☐ Includes odor, eye irritation, and respiratory irritation. Warning properties relying on human senses are not foolproof.
- ☐ Provides some indication to the wearer of possible sorbent exhaustion or of poor facepiece fit or other respirator malfunction.

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IDLH

“ Immediately dangerous to life and health”

- Conditions that pose an immediate threat to life or health
- Conditions that pose an immediate threat of severe exposure to contaminants

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In establishing the IDLH concentration the following factors are considered:

- 1) Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum exposure time for escape.
- 2) Severe eye or respiratory irritation or other reactions that would prevent escape without injury.

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Fit Testing

- Fit tested with same make, model, style, and size of respirator to be used
- Qualitative
- Quantitative

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Respiratory Protection Program

- Procedures for selecting respirators
- Medical evaluations of employees wearing respirators
- Fit testing procedures
- Procedures for proper use in routine and foreseeable emergencies

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Additional program requirements . .

☐ Procedures & schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, & maintaining respirators

☐ Procedures to ensure adequate air quality, quantity, & flow of breathing air for atmosphere-supplying respirators

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Plus . . .

- ☐ Training of respiratory hazards
- ☐ Training on proper use of respirators including donning, doffing, limitations, & maintenance
- ☐ Procedures for regularly evaluating the effectiveness of the program

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DECONTAMINATION

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Definition . . .

The process of removing or neutralizing contaminants that have accumulated on personnel and equipment.

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Multiple Purposes

- Protect workers from hazardous substances
- Protects all site personnel by minimizing the transfer of harmful materials into clean areas

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Plus . .



- It helps prevent mixing of incompatible chemicals.
- It protects the community by preventing uncontrolled transportation of contaminants from the site.

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Decontamination Plan

A decontamination plan should be developed (as part of the Site Safety Plan) and set up before any personnel or equipment enters hazardous or potentially hazardous areas.

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Guidelines

- Extent and type of hazard expected
- Flammable/explosive potential
- Meteorological conditions
- Topography
- Level of protection selected
- Availability of supplies and equipment

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Components of a Plan

- Number and layout of decontamination stations.
- Decontamination equipment needed.
- Appropriate decontamination methods
- Procedures to prevent contamination of clean areas.

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Additional plan components

- Methods and procedures to minimize worker contact with contaminants.
- Disposal methods of clothing and equipment that are not completely decontaminated.
- Ability of Decon Plan to be revised.

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Prevent Contamination

- ☐ Stress work practices that minimize contact with hazardous substances.
- ☐ Use remote sampling, handling, and container-opening techniques.
- ☐ Protect monitoring and sampling instruments by bagging.
- ☐ Cover equipment and tools with a strippable coating which can be removed during decontamination.

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Additional methods to prevent contamination:

- ☐ Wear disposable outer garments and use disposable equipment where appropriate.
- ☐ Encase the source of contaminants with plastic sheeting or overpacks.
- ☐ Walk upwind of contamination, if possible
- ☐ Establish **Contamination Reduction Corridor** upwind, if possible

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Preventing contamination . .

- ☐ Tape all junctures to prevent contaminants from running inside gloves, boots and jackets.
- ☐ Check PPE to ensure no cuts or punctures exist that could expose workers to wastes.
- ☐ Understand breakthrough times of cartridges and PPE.
- ☐ Leave exclusion zone in ample time of air depletion in SCBA.

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Decontamination Methods

- Physical
- Chemical

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Physical Removal

- Brushing & scraping
- Wiping
- Low pressure air
- Heat (autoclave)

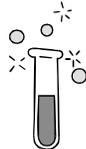


Follow with wash/rinse process

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Chemical Removal

- Dissolving contaminants
- Use of surfactants
- Neutralizing contaminants
- Solidification
- Disinfection/sterilization



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Factors to Consider

- Cost, availability, and ease of implementation
- Is the decontamination method effective for the specific substance present?
- Does the method itself pose any health or safety hazard?

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Effectiveness of Decontamination

- Visual inspection
- Wipe sampling
- Cleaning solution analysis
- Monitoring devices
- Ultraviolet light (refined oils & solvents)

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Decon Concerns

- Be incompatible with the hazardous substance being removed.
- Be incompatible with the clothing or equipment being decontaminated.
- Pose a direct health hazard to workers.
- Result in slips, trips and falls.

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☞ Decon stations should be separated physically to prevent cross contamination and should be arranged to decrease contamination.

☞ Separate flow patterns and stations should be provided to isolate workers from different contamination zones with incompatible wastes.

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☞ Entry and exit points should be conspicuously marked;



☞ Divide the Contamination Reduction Zone into a clean side and a dirty side

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- Emergency Decontamination
 - level of decon based on severity of incident

- Partial Decontamination
 - heat/rest regimen
 - pick-up/drop off of tools
 - respirator change out

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Recommended Equipment

- Drop cloth of plastic to place heavily contaminated equipment and outer protective clothing
- Collection of containers for storing disposable clothing or equipment, and heavily contaminated PPE.



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Additional equipment -

- Lined box with absorbents for wiping or rinsing off gross contaminants and liquid contaminants.
- Large galvanized tubs, stock tanks, or children's wading pools to hold wash and rinse solutions.

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Additional equipment -

- Wash solutions selected to wash off and reduce the hazards associated with the contaminants.
- Rinse solutions
- Long handled, soft bristled brushes
- Paper or cloth towels for drying

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Additional equipment -

- Lockers and cabinets for storage
- Metal or plastic cans or drums for contaminated wash and rinse solutions.
- Plastic sheeting, sealed pans with drains, or other appropriate methods for containing and collecting contaminated wash and rinse solutions spilled during decontamination.

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Additional equipment -

- Shower facilities for full body wash or at a minimum, personal wash sinks.
- Soap or wash solution, wash cloths, and towels for personnel.

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All decon equipment must be completely decontaminated and/or disposed of properly. Buckets, brushes, clothing, tools, and other contaminated equipment should be collected, placed in containers and labeled.

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Spill Control



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Control Methods

- Containment
 - Restrict material to its original container
- Confinement
 - Limit the physical size of the area of release

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Containment Methods

- Plugging
- Patching
- Overpacks

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Confinement Methods

- Diking
- Dams
- Diversion
- Retention
- Floating booms

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Site Characterization



Phases of Site Characterization

- Offsite Characterization
 - Onsite Survey
 - On going Characterization
- (Site Characterization is continuous process)
- (Site Characterization at least 1st phase, must be completed before S&H Plan)

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Offsite Characterization

Look for:



- Potential Confined Space Entry
- Potential Explosive\Flammable Situations
- Extremely Hazardous Material

Obtaining Information

- Two Methods

Interviews\Record Review



Perimeter Reconnaissance

Interview\Records

- Site Location
- Current & past activity
- Length of Activity
- Access to site
- Release Pathway
- Hazardous material involved
- Purchasing records
- MSDS'S

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Onsite Survey

- Types of Containers or Storage System
- Condition of Containers & Storage System
- Physical Condition Of Material
- Determine Potential Pathways
- Collect Sample

Onsite Survey continued....

- Indicators of Potential Hazardous Exposure
- Safety Hazards
- Identify reactive, incompatible, flammable, corrosive material, etc.
- Naturally Occurring hazards (animals, poison plant, etc.)
- Note labels, tags, markings, etc.

Employer's Requirements

THE 14 STEPS



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Step 1: Safety & Health Program

- Organizational Structure
- Comprehensive Work Plan
- Site specific HASP
- Training Plan
- Medical Surveillance Program
- Standard Operating Procedures

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Step 2: Site Characterization & Analysis

- Site location and size
- Description of job activities
- Duration of planned activities
- Site topography and accessibility by air and road
- Hazards expected on site
- Pathways of hazardous material flow
- Availability of local emergency responders

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Step 3: Site Control

- Site map
- Site work zones
- "Buddy" system
- Site communications
- Standard Operating Procedures
- Availability of medical assistance

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Step 4: Employee Training

- Names of personnel and alternatives responsible for site safety and health
- Safety and health hazards on site
- Use of PPE
- Work practices to minimize risks of hazards
- Safe use on engineering controls
- Medical surveillance requirements

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Step 5: Medical Surveillance

- Employees who are or have been exposed to hazardous substances at or above the PEL.
- Employees who wear a respirator for 30 days or more per year.
- Members of hazardous materials teams
- Required prior to assignment, annually, at termination, & if needed

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Step 6: Engineering Controls, Work Practices, PPE

- Applying engineering controls such as ventilation.
- Applying administrative controls such as avoiding or minimizing exposure
- Levels of protective clothing

06/13/2001

HAZWOPER REFRESHER NOTES

Step 7: Monitoring

- Initially to identify hazardous conditions
- Moving to different portions of site
- Finding new contaminants
- Initiating a different operation
- Handling leaking containers
- Working in areas with obvious liquid contamination

06/13/2001

Monitoring Equipment Considerations

- Potential contaminant
- Hazards Present
- Portability
- Ease of Use
- Intrinsically Safe
- Reliability
- Calibration

Commonly used Direct Reading Instruments

- Combustible Gas Meter
- Oxygen Meter
- Photo Ionization Meter
- Flame Ionization Meter
- Colorimetric or Detector Tubes
- pH Meter or Paper
- Radiation Meter

HAZWOPER REFRESHER NOTES

Step 8: Informational Programs

- Developed within the safety and health program.
- Informs employees, contractors and subcontractors of the nature, level, and likely extent of exposure during cleanup operations.

06/13/2001

Step 9: Handling Drums & Containers

- Inspect containers prior to handling
- Unlabeled drums are considered hazardous until positive identification is complete
- Materials must be on hand where spills, leaks, or ruptures could occur.
- Drums that will rupture if moved must be placed in a secondary container.
- Not allowed to stand on or work from a container

06/13/2001

Step 10: Decontamination

- Decon procedure developed and communicated to employees prior to starting work
- Decon area must be set up where employees exit the exclusion zone
- Decon personnel must wear correct PPE

06/13/2001

HAZWOPER REFRESHER NOTES

Step 11: Emergency Response Plan

- Emergency recognition and prevention
- Safe distances and refuge
- Site security and control
- Evacuation routes and procedures
- Emergency medical treatment, emergency decon, emergency alerting, and emergency equipment.
- Requires rehearsal and review

06/13/2001

Exception

- Employees are evacuated and are not permitted to assist in handling the emergency
- Employer provides an emergency-action plan (CFR 1910.38(a))

06/13/2001

Step 12: Illumination

- Provide adequate lighting
- Levels provided in Table H-120 in the standard, section m.

06/13/2001

HAZWOPER REFRESHER NOTES

Step 13: Sanitation at temporary workplaces

- Potable drinking water available on site
- Toilet facilities (see Table H-120.2 for quantity required)
- Washing facilities
- Shower facilities and change rooms if on site for more than 6 months.

06/13/2001

Step 14: New Technology Programs

Employers required to review and evaluate new products and technologies such as

- foams, absorbents, neutralizers
- drum handling equipment

06/13/2001

Emergency Responders



06/13/2001

HAZWOPER REFRESHER NOTES

Elements of an ERP

- Pre-emergency planning & coordinate with outside parties
- Personnel roles, lines of authority, training, & communication
- Emergency recognition and prevention
- Safe distances and places of refuge
- Site security and control

06/13/2001

Plus...

- Evacuation routes and procedures
- Decontamination
- Emergency medical treatment and first aid
- Emergency alerting and response procedures
- Critique of response and follow-up
- PPE and emergency equipment

06/13/2001

OSHA Regulations (Standards - 29 CFR)
Hazardous waste operations and emergency response. - 1910.120

- **Standard Number:** 1910.120
 - **Standard Title:** Hazardous waste operations and emergency response.
 - **SubPart Number:** H
 - **SubPart Title:** Hazardous Materials
 - **Applicable Standard:** Applicable Standard:
-

(a) Scope, application, and definitions. -

(a)(1) Scope. This section covers the following operations, unless the employer can demonstrate that the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety or health hazards:

(a)(1)(i) Clean-up operations required by a governmental body, whether Federal, state local or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained;

(a)(1)(ii) Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq);

(a)(1)(iii) Voluntary clean-up operations at sites recognized by Federal, state, local or other governmental bodies as uncontrolled hazardous waste sites;

(a)(1)(iv) Operations involving hazardous waste that are conducted at treatment, storage, disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA; or by agencies under agreement with U.S.E.P.A. to implement RCRA regulations; and

(a)(1)(v)

Emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

(a)(2)

Application.

(a)(2)(i)

All requirements of Part 1910 and Part 1926 of Title 29 of the Code of Federal Regulations apply pursuant to their terms to hazardous waste and emergency response operations whether covered by this section or not. If there is a conflict or overlap, the provision more protective of employee safety and health shall apply without regard to 29 CFR 1910.5(c)(1).

(a)(2)(ii)

Hazardous substance clean-up operations within the scope of paragraphs (a)(1)(i) through (a)(1)(iii) of this section must comply with all paragraphs of this section except paragraphs (p) and (q).

(a)(2)(iii)

Operations within the scope of paragraph (a)(1)(iv) of this section must comply only with the requirements of paragraph (p) of this section.

Notes and Exceptions:

(a)(2)(iii)(A)

All provisions of paragraph (p) of this section cover any treatment, storage or disposal (TSD) operation regulated by 40 CFR parts 264 and 265 or by state law authorized under RCRA, and required to have a permit or interim status from EPA pursuant to 40 CFR 270.1 or from a state agency pursuant to RCRA.

(a)(2)(iii)(B)

Employers who are not required to have a permit or interim status because they are conditionally exempt small quantity generators under 40 CFR 261.5 or are generators who qualify under 40 CFR 262.34 for exemptions from regulation under 40 CFR 262.34 for exemptions from regulation under 40 CFR parts 264, 265, and 270 (“excepted employers”) are not covered by paragraphs (p)(1) through (p)(7) of this section. Excepted employers who are required by the EPA or state agency to have their employees engage in emergency response or who direct their employees to engage in emergency response are covered by paragraph (p)(8) of this section, and cannot be exempted by (p)(8)(i) of this section.

(a)(2)(iii)(C)

If an area is used primarily for treatment, storage or disposal, any emergency response operations in that area shall comply with paragraph (p) (8) of this section. In other areas not used primarily for treatment, storage, or disposal, any emergency

response operations shall comply with paragraph (q) of this section. Compliance with the requirements of paragraph (q) of this section shall be deemed to be in compliance with the requirements of paragraph (p)(8) of this section.

(a)(2)(iv)

Emergency response operations for releases of, or substantial threats of releases of, hazardous substances which are not covered by paragraphs (a)(1)(i) through (a)(1)(iv) of this section must only comply with the requirements of paragraph (q) of this section.

(a)(3)

Definitions -

“Buddy system” means a system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

“Clean-up operation” means an operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.

“Decontamination” means the removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.

“Emergency response” or “responding to emergencies” means a response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual aid groups, local fire departments, etc.) to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered to be emergency responses within the scope of this standard. Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses.

“Facility” means (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.

“Hazardous materials response (HAZMAT) team” means an organized group of employees, designated by the employer, who are expected to perform work to handle and control actual or potential leaks or spills of hazardous substances requiring possible close approach to the substance. The team members perform responses to releases or potential releases of hazardous substances for the purpose of control or stabilization of the incident. A HAZMAT team is not a fire brigade nor is a typical fire brigade a HAZMAT team. A HAZMAT team, however, may be a separate component of a fire brigade or fire department.

“Hazardous substance” means any substance designated or listed under (A) through (D) of this definition, exposure to which results or may result in adverse effects on the health or safety of employees:

[A] Any substance defined under section 101(14) of CERCLA;

[B] Any biologic agent and other disease causing agent which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring.

[C] Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR 172.101 and appendices; and

[D] Hazardous waste as herein defined.

“Hazardous waste” means -

[A] A waste or combination of wastes as defined in 40 CFR 261.3, or

[B] Those substances defined as hazardous wastes in 49 CFR 171.8.

“Hazardous waste operation” means any operation conducted within the scope of this standard.

“Hazardous waste site” or “Site” means any facility or location within the scope of this standard at which hazardous waste operations take place.

“Health hazard” means a chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term “health hazard” includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the

hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. It also includes stress due to temperature extremes. Further definition of the terms used above can be found in Appendix A to 29 CFR 1910.1200.

“IDLH” or “Immediately dangerous to life or health” means an atmospheric concentration of any toxic, corrosive or asphyxiant substance that poses an immediate threat to life or would interfere with an individual's ability to escape from a dangerous atmosphere.

“Oxygen deficiency” means that concentration of oxygen by volume below which atmosphere supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen by volume is less than 19.5 percent oxygen.

“Permissible exposure limit” means the exposure, inhalation or dermal permissible exposure limit specified in 29 CFR Part 1910, Subparts G and Z.

“Published exposure level” means the exposure limits published in “NIOSH Recommendations for Occupational Health Standards” dated 1986, which is incorporated by reference as specified in Sec. 1910.6, or if none is specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication “Threshold Limit Values and Biological Exposure Indices for 1987 - 88” dated 1987, which is incorporated by reference as specified in Sec. 1910.6.

“Post emergency response” means that portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If post emergency response is performed by an employer's own employees who were part of the initial emergency response, it is considered to be part of the initial response and not post emergency response. However, if a group of an employer's own employees, separate from the group providing initial response, performs the clean-up operation, then the separate group of employees would be considered to be performing post-emergency response and subject to paragraph (q)(11) of this section.

“Qualified person” means a person with specific training, knowledge and experience in the area for which the person has the responsibility and the authority to control.

“Site safety and health supervisor (or official)” means the individual located on a hazardous waste site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

“Small quantity generator” means a generator of hazardous wastes who in any calendar month generates no more than 1,000 kilograms (2,205) pounds of hazardous waste in that month.

“Uncontrolled hazardous waste site” means an area identified as an uncontrolled hazardous waste site by a governmental body, whether Federal, state, local or other where an accumulation of hazardous substances creates a threat to the health and safety of individuals or the environment or both. Some sites are found on public lands such as those created by former municipal, county or state landfills where illegal or poorly managed waste disposal has taken place. Other sites are found on private property, often belonging to generators or former generators of hazardous substance wastes. Examples of such sites include, but are not limited to, surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at TSD sites are not covered by this definition.

(b)

Safety and health program.

NOTE TO (b): Safety and health programs developed and implemented to meet other federal, state, or local regulations are considered acceptable in meeting this requirement if they cover or are modified to cover the topics required in this paragraph. An additional or separate safety and health program is not required by this paragraph.

(b)(1)

General.

(b)(1)(i)

Employers shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations.

(b)(1)(ii)

The written safety and health program shall incorporate the following:

(b)(1)(ii)(A)

An organizational structure;

(b)(1)(ii)(B)

A comprehensive workplan;

(b)(1)(ii)(C)

A site-specific safety and health plan which need not repeat the employer's standard operating procedures required in paragraph (b)(1)(ii)(F) of this section;

(b)(1)(ii)(D)

The safety and health training program;

(b)(1)(ii)(E)

The medical surveillance program;

(b)(1)(ii)(F)

The employer's standard operating procedures for safety and health; and

(b)(1)(ii)(G)

Any necessary interface between general program and site specific activities.

(b)(1)(iii)

Site excavation. Site excavations created during initial site preparation or during hazardous waste operations shall be shored or sloped as appropriate to prevent accidental collapse in accordance with Subpart P of 29 CFR Part 1926.

(b)(1)(iv)

Contractors and sub-contractors. An employer who retains contractor or sub-contractor services for work in hazardous waste operations shall inform those contractors, sub-contractors, or their representatives of the site emergency response procedures and any potential fire, explosion, health, safety or other hazards of the hazardous waste operation that have been identified by the employer's information program.

(b)(1)(v)

Program availability. The written safety and health program shall be made available to any contractor or subcontractor or their representative who will be involved with the hazardous waste operation; to employees; to employee designated representatives; to OSHA personnel, and to personnel of other Federal, state, or local agencies with regulatory authority over the site.

(b)(2)

Organizational structure part of the site program. -

(b)(2)(i)

The organizational structure part of the program shall establish the specific chain of command and specify the overall responsibilities of supervisors and employees. It shall include, at a minimum, the following elements:

(b)(2)(i)(A)

A general supervisor who has the responsibility and authority to direct all hazardous waste operations.

(b)(2)(i)(B)

A site safety and health supervisor who has the responsibility and authority to develop and implement the site safety and health plan and verify compliance.

(b)(2)(i)(C)

All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.

(b)(2)(i)(D)

The lines of authority, responsibility, and communication.

(b)(2)(ii)

The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.

(b)(3)

Comprehensive workplan part of the site program. The comprehensive workplan part of the program shall address the tasks and objectives of the site operations and the logistics and resources required to reach those tasks and objectives.

(b)(3)(i)

The comprehensive workplan shall define anticipated clean-up activities as well as normal operating procedures which need not repeat the employer's procedures available elsewhere.

(b)(3)(ii)

The comprehensive workplan shall define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.

(b)(3)(iii)

The comprehensive workplan shall establish personnel requirements for implementing the plan.

(b)(3)(iv)

The comprehensive workplan shall provide for the implementation of the training required in paragraph (e) of this section.

(b)(3)(v)

The comprehensive workplan shall provide for the implementation of the required informational programs required in paragraph (i) of this section.

(b)(3)(vi)

The comprehensive workplan shall provide for the implementation of the medical surveillance program described in paragraph (f) if this section.

(b)(4)

Site-specific safety and health plan part of the program. -

(b)(4)(i)

General. The site safety and health plan, which must be kept on site, shall address the safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection.

(b)(4)(ii)

Elements. The site safety and health plan, as a minimum, shall address the following:

(b)(4)(ii)(A)

A safety and health risk or hazard analysis for each site task and operation found in the workplan.

(b)(4)(ii)(B)

Employee training assignments to assure compliance with paragraph (e) of this section.

(b)(4)(ii)(C)

Personal protective equipment to be used by employees for each of the site tasks and operations being conducted as required by the personal protective equipment program in paragraph (g)(5) of this section.

(b)(4)(ii)(D)

Medical surveillance requirements in accordance with the program in paragraph (f) of this section.

(b)(4)(ii)(E)

Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.

(b)(4)(ii)(F)

Site control measures in accordance with the site control program required in paragraph (d) of this section.

(b)(4)(ii)(G)

Decontamination procedures in accordance with paragraph (k) of this section.

(b)(4)(ii)(H)

An emergency response plan meeting the requirements of paragraph (l) of this section for safe and effective responses to emergencies, including the necessary PPE and other equipment.

(b)(4)(ii)(I)

Confined space entry procedures.

(b)(4)(ii)(J)

A spill containment program meeting the requirements of paragraph (j) of this section.

(b)(4)(iii)

Pre-entry briefing. The site specific safety and health plan shall provide for pre-entry briefings to be held prior to initiating any site activity, and at such other times as

necessary to ensure that employees are apprised of the site safety and health plan and that this plan is being followed. The information and data obtained from site characterization and analysis work required in paragraph (c) of this section shall be used to prepare and update the site safety and health plan.

(b)(4)(iv)

Effectiveness of site safety and health plan. Inspections shall be conducted by the site safety and health supervisor or, in the absence of that individual, another individual who is knowledgeable in occupational safety and health, acting on behalf of the employer as necessary to determine the effectiveness of the site safety and health plan. Any deficiencies in the effectiveness of the site safety and health plan shall be corrected by the employer.

(c)

Site characterization and analysis -

(c)(1)

General. Hazardous waste sites shall be evaluated in accordance with this paragraph to identify specific site hazards and to determine the appropriate safety and health control procedures needed to protect employees from the identified hazards.

(c)(2)

Preliminary evaluation. A preliminary evaluation of a site's characteristics shall be performed prior to site entry by a qualified person in order to aid in the selection of appropriate employee protection methods prior to site entry. Immediately after initial site entry, a more detailed evaluation of the site's specific characteristics shall be performed by a qualified person in order to further identify existing site hazards and to further aid in the selection of the appropriate engineering controls and personal protective equipment for the tasks to be performed.

(c)(3)

Hazard identification. All suspected conditions that may pose inhalation or skin absorption hazards that are immediately dangerous to life or health (IDLH) or other conditions that may cause death or serious harm shall be identified during the preliminary survey and evaluated during the detailed survey. Examples of such hazards include, but are not limited to, confined space entry, potentially explosive or flammable situations, visible vapor clouds, or areas where biological indicators such as dead animals or vegetation are located.

(c)(4)

Required information. The following information to the extent available shall be obtained by the employer prior to allowing employees to enter a site:

(c)(4)(i)

Location and approximate size of the site.

(c)(4)(ii)

Description of the response activity and/or the job task to be performed.

(c)(4)(iii)

Duration of the planned employee activity.

(c)(4)(iv)

Site topography and accessibility by air and roads.

(c)(4)(v)

Safety and health hazards expected at the site.

(c)(4)(vi)

Pathways for hazardous substance dispersion.

(c)(4)(vii)

Present status and capabilities of emergency response teams that would provide assistance to on-site employees at the time of an emergency.

(c)(4)(viii)

Hazardous substances and health hazards involved or expected at the site and their chemical and physical properties.

(c)(5)

Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements:

(c)(5)(i)

Based upon the results of the preliminary site evaluation, an ensemble of PPE shall be selected and used during initial site entry which will provide protection to a level of exposure below permissible exposure limits and published exposure levels for known or suspected hazardous substances and health hazards and which will provide protection against other known and suspected hazards identified during the preliminary site evaluation. If there is no permissible exposure limit or published exposure level, the employer may use other published studies and information as a guide to appropriate personal protective equipment.

(c)(5)(ii)

If positive-pressure self-contained breathing apparatus is not used as part of the entry ensemble, and if respiratory protection is warranted by the potential hazards identified during the preliminary site evaluation, an escape self-contained breathing apparatus of at least five minute's duration shall be carried by employees during initial site entry.

(c)(5)(iii)

If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site an ensemble providing equivalent to Level B PPE shall be provided as minimum protection, and direct reading instruments shall be used as appropriate for identifying IDLH conditions. (See Appendix B for guidelines on Level B protective equipment.)

(c)(5)(iv)

Once the hazards of the site have been identified, the appropriate PPE shall be selected and used in accordance with paragraph (g) of this section.

(c)(6)

Monitoring. The following monitoring shall be conducted during initial site entry when the site evaluation produces information which shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient reasonably to eliminate these possible conditions:

(c)(6)(i)

Monitoring with direct reading instruments for hazardous levels of ionizing radiation.

(c)(6)(ii)

Monitoring the air with appropriate direct reading test equipment for (i.e., combustible gas meters, detector tubes) for IDLH and other conditions that may cause death or serious harm (combustible or explosive atmospheres, oxygen deficiency, toxic substances.)

(c)(6)(iii)

Visually observing for signs of actual or potential IDLH or other dangerous conditions.

(c)(6)(iv)

An ongoing air monitoring program in accordance with paragraph (h) of this section shall be implemented after site characterization has determined the site is safe for the start-up of operations.

(c)(7)

Risk identification. Once the presence and concentrations of specific hazardous substances and health hazards have been established, the risks associated with these substances shall be identified. Employees who will be working on the site shall be informed of any risks that have been identified. In situations covered by the Hazard Communication Standard, 29 CFR 1910.1200, training required by that standard need not be duplicated.

NOTE TO (c)(7). - Risks to consider include, but are not limited to:

[a] Exposures exceeding the permissible exposure limits and published exposure levels.

[b] IDLH Concentrations.

[c] Potential Skin Absorption and Irritation Sources.

[d] Potential Eye Irritation Sources.

[e] Explosion Sensitivity and Flammability Ranges.

[f] Oxygen deficiency.

(c)(8)

Employee notification. Any information concerning the chemical, physical, and toxicologic properties of each substance known or expected to be present on site that is available to the employer and relevant to the duties an employee is expected to perform shall be made available to the affected employees prior to the commencement of their work activities. The employer may utilize information developed for the hazard communication standard for this purpose.

(d)

Site control.-

(d)(1)

General. Appropriate site control procedures shall be implemented to control employee exposure to hazardous substances before clean-up work begins.

(d)(2)

Site control program. A site control program for protecting employees which is part of the employer's site safety and health program required in paragraph (b) of this section shall be developed during the planning stages of a hazardous waste clean-up operation and modified as necessary as new information becomes available.

(d)(3)

Elements of the site control program. The site control program shall, as a minimum, include: A site map; site work zones; the use of a "buddy system"; site communications including alerting means for emergencies; the standard operating procedures or safe work practices; and, identification of the nearest medical assistance. Where these requirements are covered elsewhere they need not be repeated.

(e)

Training. -

(e)(1)

General.

(e)(1)(i)

All employees working on site (such as but not limited to equipment operators, general laborers and others) exposed to hazardous substances, health hazards, or safety hazards and their supervisors and management responsible for the site shall receive training meeting the requirements of this paragraph before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they shall receive review training as specified in this paragraph.

(e)(1)(ii)

Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility.

(e)(2)

Elements to be covered. The training shall thoroughly cover the following:

(e)(2)(i)

Names of personnel and alternates responsible for site safety and health;

(e)(2)(ii)

Safety, health and other hazards present on the site;

(e)(2)(iii)

Use of PPE;

(e)(2)(iv)

Work practices by which the employee can minimize risks from hazards;

(e)(2)(v)

Safe use of engineering controls and equipment on the site;

(e)(2)(vi)

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

(e)(2)(vii)

The contents of paragraphs (G) through (J) of the site safety and health plan set forth in paragraph (b)(4)(ii) of this section.

(e)(3)

Initial training.

(e)(3)(i)

General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor.

(e)(3)(ii)

Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

(e)(3)(iii)

Workers regularly on site who work in areas which have been monitored and fully characterized indicating that exposures are under permissible exposure limits and published exposure limits where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

(e)(3)(iv)

Workers with 24 hours of training who are covered by paragraphs (e)(3)(ii) and (e)(3)(iii) of this section, and who become general site workers or who are required to wear respirators, shall have the additional 16 hours and two days of training necessary to total the training specified in paragraph (e)(3)(i).

(e)(4)

Management and supervisor training. On-site management and supervisors directly responsible for or who supervise employees engaged in hazardous waste operations shall receive 40 hours initial and three days of supervised field experience (the training may be reduced to 24 hours and one day if the only area of their responsibility is employees covered by paragraphs (e)(3)(ii) and (e)(3)(iii) and at least eight additional hours of specialized training at the time of job assignment on such topics as, but no limited to, the employer's safety and health program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

(e)(5)

Qualifications for trainers. Trainers shall be qualified to instruct employees about the subject matter that is being presented in training. Such trainers shall have

satisfactorily completed a training program for teaching the subjects they are expected to teach, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. Instructors shall demonstrate competent instructional skills and knowledge of the applicable subject matter.

(e)(6)

Training certification. Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs (e)(1) through (e)(4) of this section shall be certified by their instructor or the head instructor and trained supervisor as having completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified or who does not meet the requirements of paragraph (e)(9) of this section shall be prohibited from engaging in hazardous waste operations.

(e)(7)

Emergency response. Employees who are engaged in responding to hazardous emergency situations at hazardous waste clean-up sites that may expose them to hazardous substances shall be trained in how to respond to such expected emergencies.

(e)(8)

Refresher training. Employees specified in paragraph (e)(1) of this section, and managers and supervisors specified in paragraph (e)(4) of this section, shall receive eight hours of refresher training annually on the items specified in paragraph (e)(2) and/or (e)(4) of this section, any critique of incidents that have occurred in the past year that can serve as training examples of related work, and other relevant topics.

(e)(9)

Equivalent training. Employers who can show by documentation or certification that an employee's work experience and/or training has resulted in training equivalent to that training required in paragraphs (e)(1) through (e)(4) of this section shall not be required to provide the initial training requirements of those paragraphs to such employees and shall provide a copy of the certification or documentation to the employee upon request. However, certified employees or employees with equivalent training new to a site shall receive appropriate, site specific training before site entry and have appropriate supervised field experience at the new site. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site experience.

(f)

Medical surveillance -

(f)(1)

General. Employees engaged in operations specified in paragraphs (a)(1)(i) through (a)(1)(iv) of this section and not covered by (a)(2)(iii) exceptions and employers of

employees specified in paragraph (q)(9) shall institute a medical surveillance program in accordance with this paragraph.

(f)(2)

Employees covered. The medical surveillance program shall be instituted by the employer for the following employees:

(f)(2)(i)

All employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;

(f)(2)(ii)

All employees who wear a respirator for 30 days or more a year or as required by 1910.134;

(f)(2)(iii)

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

(f)(2)(iv)

Members of HAZMAT teams.

(f)(3)

Frequency of medical examinations and consultations. Medical examinations and consultations shall be made available by the employer to each employee covered under paragraph (f)(2) of this section on the following schedules:

(f)(3)(i)

For employees covered under paragraphs (f)(2)(i), (f)(2)(ii), and (f)(2)(iv);

(f)(3)(i)(A)

Prior to assignment;

(f)(3)(i)(B)

At least once every twelve months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate;

(f)(3)(i)(C)

At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last six months.

(f)(3)(i)(D)

As soon as possible upon notification by an employee that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limits or published exposure levels in an emergency situation;

(f)(3)(i)(E)

At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

(f)(3)(ii)

For employees covered under paragraph (f)(2)(iii) and for all employees including of employers covered by paragraph (a)(1)(iv) who may have been injured, received a health impairment, developed signs or symptoms which may have resulted from exposure to hazardous substances resulting from an emergency incident, or exposed during an emergency incident to hazardous substances at concentrations above the permissible exposure limits or the published exposure levels without the necessary personal protective equipment being used:

(f)(3)(ii)(A)

As soon as possible following the emergency incident or development of signs or symptoms;

(f)(3)(ii)(B)

At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.

(f)(4)

Content of medical examinations and consultations.

(f)(4)(i)

Medical examinations required by paragraph (f)(3) of this section shall include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

(f)(4)(ii)

The content of medical examinations or consultations made available to employees pursuant to paragraph (f) shall be determined by the attending physician. The guidelines in the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (See Appendix D, reference # 10) should be consulted.

(f)(5)

Examination by a physician and costs. All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

(f)(6)

Information provided to the physician. The employer shall provide one copy of this standard and its appendices to the attending physician and in addition the following for each employee:

(f)(6)(i)

A description of the employee's duties as they relate to the employee's exposures,

(f)(6)(ii)

The employee's exposure levels or anticipated exposure levels.

(f)(6)(iii)

A description of any personal protective equipment used or to be used.

(f)(6)(iv)

Information from previous medical examinations of the employee which is not readily available to the examining physician.

(f)(6)(v)

Information required by 1910.134.

(f)(7)

Physician's written opinion.

(f)(7)(i)

The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician containing the following:

(f)(7)(i)(A)

The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use.

(f)(7)(i)(B)

The physician's recommended limitations upon the employees assigned work.

(f)(7)(i)(C)

The results of the medical examination and tests if requested by the employee.

(f)(7)(i)(D)

A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions which require further examination or treatment.

(f)(7)(ii)

The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure.

(f)(8)

Recordkeeping.

(f)(8)(i)

An accurate record of the medical surveillance required by paragraph (f) of this section shall be retained. This record shall be retained for the period specified and meet the criteria of 29 CFR 1910.20.

(f)(8)(ii)

The record required in paragraph (f)(8)(i) of this section shall include at least the following information:

(f)(8)(ii)(A)

The name and social security number of the employee;

(f)(8)(ii)(B)

Physicians' written opinions, recommended limitations and results of examinations and tests;

(f)(8)(ii)(C)

Any employee medical complaints related to exposure to hazardous substances;

(f)(8)(ii)(D)

A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

(g)

Engineering controls, work practices, and personal protective equipment for employee protection. Engineering controls, work practices and PPE for substances regulated in Subpart Z. (i) Engineering controls, work practices, personal protective equipment, or a combination of these shall be implemented in accordance with this paragraph to protect employees from exposure to hazardous substances and safety and health hazards.

(g)(1)

Engineering controls, work practices and PPE for substances regulated in Subparts G and Z.

(g)(1)(i)

Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by 29 CFR Part 1910, to the extent required by Subpart Z, except to the extent that such controls and practices are not feasible.

NOTE TO (g)(1)(i): Engineering controls which may be feasible include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment. Work practices which may be feasible are removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards.

(g)(1)(ii)

Whenever engineering controls and work practices are not feasible, or not required, any reasonable combination of engineering controls, work practices and PPE shall be used to reduce and maintain to or below the permissible exposure limits or dose limits for substances regulated by 29 CFR Part 1910, Subpart Z.

(g)(1)(iii)

The employer shall not implement a schedule of employee rotation as a means of compliance with permissible exposure limits or dose limits except when there is no other feasible way of complying with the airborne or dermal dose limits for ionizing radiation.

(g)(2)

Engineering controls, work practices, and PPE for substances not regulated in Subparts G and Z. An appropriate combination of engineering controls, work practices, and personal protective equipment shall be used to reduce and maintain employee exposure to or below published exposure levels for hazardous substances and health hazards not regulated by 29 CFR Part 1910, Subparts G and Z. The employer may use the published literature and MSDS as a guide in making the employer's determination as to what level of protection the employer believes is appropriate for hazardous substances and health hazards for which there is no permissible exposure limit or published exposure limit.

(g)(3)

Personal protective equipment selection.

(g)(3)(i)

Personal protective equipment (PPE) shall be selected and used which will protect employees from the hazards and potential hazards they are likely to encounter as identified during the site characterization and analysis.

(g)(3)(ii)

Personal protective equipment selection shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of

the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site.

(g)(3)(iii)

Positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply shall be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(g)(3)(iv)

Totally-encapsulating chemical protective suits (protection equivalent to Level A protection as recommended in Appendix B) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

(g)(3)(v)

The level of protection provided by PPE selection shall be increased when additional information or site conditions show that increased protection is necessary to reduce employee exposures below permissible exposure limits and published exposure levels for hazardous substances and health hazards. (See Appendix B for guidance on selecting PPE ensembles.)

NOTE TO (g)(3): The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in hazardous exposures to employees.

(g)(3)(vi)

Personal protective equipment shall be selected and used to meet the requirements of 29 CFR Part 1910, Subpart I, and additional requirements specified in this section.

(g)(4)

Totally-encapsulating chemical protective suits.

(g)(4)(i)

Totally-encapsulating suits shall protect employees from the particular hazards which are identified during site characterization and analysis.

(g)(4)(ii)

Totally-encapsulating suits shall be capable of maintaining positive air pressure. (See Appendix A for a test method which may be used to evaluate this requirement.)

(g)(4)(iii)

Totally-encapsulating suits shall be capable of preventing inward test gas leakage of more than 0.5 percent. (See Appendix A for a test method which may be used to evaluate this requirement.)

(g)(5)

Personal protective equipment (PPE) program. A personal protective equipment program, which is part of the employer's safety and health program required in paragraph (b) of this section or required in paragraph (p)(1) of this section and which is also a part of the site-specific safety and health plan shall be established. The PPE program shall address the elements listed below. When elements, such as donning and doffing procedures, are provided by the manufacturer of a piece of equipment and are attached to the plan, they need not be rewritten into the plan as long as they adequately address the procedure or element.

(g)(5)(i)

PPE selection based upon site hazards,

(g)(5)(ii)

PPE use and limitations of the equipment,

(g)(5)(iii)

Work mission duration,

(g)(5)(iv)

PPE maintenance and storage,

(g)(5)(v)

PPE decontamination and disposal,

(g)(5)(vi)

PPE training and proper fitting,

(g)(5)(vii)

PPE donning and doffing procedures,

(g)(5)(viii)

PPE inspection procedures prior to, during, and after use,

(g)(5)(ix)

Evaluation of the effectiveness of the PPE program, and

(g)(5)(x)

Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

(h)

Monitoring. -

(h)(1)

General.

(h)(1)(i)

Monitoring shall be performed in accordance with this paragraph where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits, for hazardous substances.

(h)(1)(ii)

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection needed on site.

(h)(2)

Initial entry. Upon initial entry, representative air monitoring shall be conducted to identify any IDLH condition, exposure over permissible exposure limits or published exposure levels, exposure over a radioactive material's dose limits or other dangerous condition such as the presence of flammable atmospheres, oxygen-deficient environments.

(h)(3)

Periodic monitoring. Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

(h)(3)(i)

When work begins on a different portion of the site.

(h)(3)(ii)

When contaminants other than those previously identified are being handled.

(h)(3)(iii)

When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling.)

(h)(3)(iv)

When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon.)

(h)(4)

Monitoring of high-risk employees. After the actual clean-up phase of any hazardous waste operation commences; for example, when soil, surface water or containers are moved or disturbed; the employer shall monitor those employees likely to have the

highest exposures to those hazardous substances and health hazards likely to be present above permissible exposure limits or published exposure levels by using personal sampling frequently enough to characterize employee exposures. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated in the first sentence of this paragraph. If the employees likely to have the highest exposure are over permissible exposure limits or published exposure limits, then monitoring shall continue to determine all employees likely to be above those limits. The employer may utilize a representative sampling approach by documenting that the employees and chemicals chosen for monitoring are based on the criteria stated above.

NOTE TO (h): It is not required to monitor employees engaged in site characterization operations covered by paragraph (c) of this section.

(i)

Informational programs. Employers shall develop and implement a program which is part of the employer's safety and health program required in paragraph (b) of this section to inform employees, contractors, and subcontractors (or their representative) actually engaged in hazardous waste operations of the nature, level and degree of exposure likely as a result of participation in such hazardous waste operations. Employees, contractors and subcontractors working outside of the operations part of a site are not covered by this standard.

(j)

Handling drums and containers -

(j)(1)

General.

(j)(1)(i)

Hazardous substances and contaminated, liquids and other residues shall be handled, transported, labeled, and disposed of in accordance with this paragraph.

(j)(1)(ii)

Drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain.

(j)(1)(iii)

When practical, drums and containers shall be inspected and their integrity shall be assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (i.e., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile, etc.) shall be moved to an accessible location and inspected prior to further handling.

(j)(1)(iv)

Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

(j)(1)(v)

Site operations shall be organized to minimize the amount of drum or container movement.

(j)(1)(vi)

Prior to movement of drums or containers, all employees exposed to the transfer operation shall be warned of the potential hazards associated with the contents of the drums or containers.

(j)(1)(vii)

U.S. Department of Transportation specified salvage drums or containers and suitable quantities of proper absorbent shall be kept available and used in areas where spills, leaks, or ruptures may occur.

(j)(1)(viii)

Where major spills may occur, a spill containment program, which is part of the employer's safety and health program required in paragraph (b) of this section, shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

(j)(1)(ix)

Drums and containers that cannot be moved without rupture, leakage, or spillage shall be emptied into a sound container using a device classified for the material being transferred.

(j)(1)(x)

A ground-penetrating system or other type of detection system or device shall be used to estimate the location and depth of buried drums or containers.

(j)(1)(xi)

Soil or covering material shall be removed with caution to prevent drum or container rupture.

(j)(1)(xii)

Fire extinguishing equipment meeting the requirements of 29 CFR Part 1910, Subpart L, shall be on hand and ready for use to control incipient fires.

(j)(2)

Opening drums and containers. The following procedures shall be followed in areas where drums or containers are being opened:

(j)(2)(i)

Where an airline respirator system is used, connections to the source of air supply shall be protected from contamination and the entire system shall be protected from physical damage.

(j)(2)(ii)

Employees not actually involved in opening drums or containers shall be kept a safe distance from the drums or containers being opened.

(j)(2)(iii)

If employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation shall be placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion.

(j)(2)(iv)

Controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment shall be located behind the explosion-resistant barrier.

(j)(2)(v)

When there is a reasonable possibility of flammable atmospheres being present, material handling equipment and hand tools shall be of the type to prevent sources of ignition.

(j)(2)(vi)

Drums and containers shall be opened in such a manner that excess interior pressure will be safely relieved. If pressure cannot be relieved from a remote location, appropriate shielding shall be placed between the employee and the drums or containers to reduce the risk of employee injury.

(j)(2)(vii)

Employees shall not stand upon or work from drums or containers.

(j)(3)

Material handling equipment. Material handling equipment used to transfer drums and containers shall be selected, positioned and operated to minimize sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

(j)(4)

Radioactive wastes. Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.

(j)(5)

Shock sensitive wastes. As a minimum, the following special precautions shall be taken when drums and containers containing or suspected of containing shock-sensitive wastes are handled:

(j)(5)(i)

All non-essential employees shall be evacuated from the area of transfer.

(j)(5)(ii)

Material handling equipment shall be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers.

(j)(5)(iii)

An employee alarm system capable of being perceived above surrounding light and noise conditions shall be used to signal the commencement and completion of explosive waste handling activities.

(j)(5)(iv)

Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) shall be maintained between the employee-in-charge of the immediate handling area and both the site safety and health supervisor and the command post until such time as the handling operation is completed. Communication equipment or methods that could cause shock sensitive materials to explode shall not be used.

(j)(5)(v)

Drums and containers under pressure, as evidenced by bulging or swelling, shall not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.

(j)(5)(vi)

Drums and containers containing packaged laboratory wastes shall be considered to contain shock-sensitive or explosive materials until they have been characterized.

Caution: Shipping of shock sensitive wastes may be prohibited under U.S. Department of Transportation regulations. Employers and their shippers should refer to 49 CFR 173.21 and 173.50.

(j)(6)

Laboratory waste packs. In addition to the requirements of paragraph (j)(5) of this section, the following precautions shall be taken, as a minimum, in handling laboratory waste packs (lab packs):

(j)(6)(i)

Lab packs shall be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.

(j)(6)(ii)

If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.

(j)(7)

Sampling of drum and container contents. Sampling of containers and drums shall be done in accordance with a sampling procedure which is part of the site safety and health plan developed for and available to employees and others at the specific worksite.

(j)(8)

Shipping and transport.

(j)(8)(i)

Drums and containers shall be identified and classified prior to packaging for shipment.

(j)(8)(ii)

Drum or container staging areas shall be kept to the minimum number necessary to safely identify and classify materials and prepare them for transport.

(j)(8)(iii)

Staging areas shall be provided with adequate access and egress routes.

(j)(8)(iv)

Bulking of hazardous wastes shall be permitted only after a thorough characterization of the materials has been completed.

(j)(9)

Tank and vault procedures.

(j)(9)(i)

Tanks and vaults containing hazardous substances shall be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault.

(j)(9)(ii)

Appropriate tank or vault entry procedures as described in the employer's safety and health plan shall be followed whenever employees must enter a tank or vault.

(k)

Decontamination -

(k)(1)

General. Procedures for all phases of decontamination shall be developed and implemented in accordance with this paragraph.

(k)(2)

Decontamination procedures.

(k)(2)(i)

A decontamination procedure shall be developed, communicated to employees and implemented before any employees or equipment may enter areas on site where potential for exposure to hazardous substances exists.

(k)(2)(ii)

Standard operating procedures shall be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.

(k)(2)(iii)

All employees leaving a contaminated area shall be appropriately decontaminated; all contaminated clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated.

(k)(2)(iv)

Decontamination procedures shall be monitored by the site safety and health supervisor to determine their effectiveness. When such procedures are found to be ineffective, appropriate steps shall be taken to correct any deficiencies.

(k)(3)

Location. Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

(k)(4)

Equipment and solvents. All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.

(k)(5)

Personal protective clothing and equipment.

(k)(5)(i)

Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness.

(k)(5)(ii)

Employees whose non-impermeable clothing becomes wetted with hazardous substances shall immediately remove that clothing and proceed to shower. The clothing shall be disposed of or decontaminated before it is removed from the work zone.

- (k)(6)**

Unauthorized employees shall not remove protective clothing or equipment from change rooms.
- (k)(7)**

Commercial laundries or cleaning establishments. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures to hazardous substances.
- (k)(8)**

Showers and change rooms. Where the decontamination procedure indicates a need for regular showers and change rooms outside of a contaminated area, they shall be provided and meet the requirements of 29 CFR 1910.141. If temperature conditions prevent the effective use of water, then other effective means for cleansing shall be provided and used.
- (l)**

Emergency response by employees at uncontrolled hazardous waste sites -
- (l)(1)**

Emergency response plan.
- (l)(1)(i)**

An emergency response plan shall be developed and implemented by all employers within the scope of paragraphs (a)(1)(i) through (ii) of this section. section to handle anticipated emergencies prior to the commencement of hazardous waste operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, OSHA personnel and other governmental agencies with relevant responsibilities.
- (l)(1)(ii)**

Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.
- (l)(2)**

Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following:
- (l)(2)(i)**

Pre-emergency planning.
- (l)(2)(ii)**

Personnel roles, lines of authority, training, and communication.

- (1)(2)(iii)**
Emergency recognition and prevention.
- (1)(2)(iv)**
Safe distances and places of refuge.
- (1)(2)(v)**
Site security and control.
- (1)(2)(vi)**
Evacuation routes and procedures.
- (1)(2)(vii)**
Decontamination procedures which are not covered by the site safety and health plan.
- (1)(2)(viii)**
Emergency medical treatment and first aid.
- (1)(2)(ix)**
Emergency alerting and response procedures.
- (1)(2)(x)**
Critique of response and follow-up.
- (1)(2)(xi)**
PPE and emergency equipment.
- (1)(3)**
Procedures for handling emergency incidents.
 - (1)(3)(i)**
In addition to the elements for the emergency response plan required in paragraph (1)(2) of this section, the following elements shall be included for emergency response plans:
 - (1)(3)(i)(A)**
Site topography, layout, and prevailing weather conditions.
 - (1)(3)(i)(B)**
Procedures for reporting incidents to local, state, and federal governmental agencies.
 - (1)(3)(ii)**
The emergency response plan shall be a separate section of the Site Safety and Health Plan.

(l)(3)(iii)

The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.

(l)(3)(iv)

The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.

(l)(3)(v)

The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(l)(3)(vi)

An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation, to stop work activities if necessary, to lower background noise in order to speed communication, and to begin emergency procedures.

(l)(3)(vii)

Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

(m)

Illumination. Areas accessible to employees shall be lighted to not less than the minimum illumination intensities listed in the following Table H-120.1 while any work is in progress:

TABLE H-120.1. - MINIMUM ILLUMINATION INTENSITIES IN FOOT-CANDLES

| Foot-candles | Area or operations |
|--------------|---|
| 5 | General site areas. |
| 3 | Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas. |
| 5 | Indoors: warehouses, corridors, hallways, and exitways. |
| 5 | Tunnels, shafts, and general underground work areas; (Exception: minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling. Mine Safety and Health Administration approved cap lights shall be acceptable for use in the tunnel heading. |
| 10 | General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms. |
| 30 | First aid stations, infirmaries, and offices. |

(n) Sanitation at temporary workplaces –

(n)(1) Potable water.

(n)(1)(i) An adequate supply of potable water shall be provided on the site.

(n)(1)(ii) Portable containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Water shall not be dipped from containers.

(n)(1)(iii) Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose.

(n)(1)(iv) Where single service cups (to be used but once) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.

(n)(2) Nonpotable water.

(n)(2)(i) Outlets for nonpotable water, such as water for firefighting purposes shall be identified to indicate clearly that the water is unsafe and is not to be used for drinking, washing, or cooking purposes.

(n)(2)(ii) There shall be no cross-connection, open or potential, between a system furnishing potable water and a system furnishing nonpotable water.

(n)(3) Toilets facilities.

(n)(3)(i) Toilets shall be provided for employees according to Table H-120.2.

TABLE H-120.2. - TOILET FACILITIES

| Number of employees | Minimum number of facilities |
|-----------------------------------|--|
| 20 or fewer..... | One. |
| More than 20, fewer than 200..... | One toilet seat and 1 urinal per 40 employees. |
| More than 200..... | One toilet seat and 1 urinal per 50 employees. |

(n)(3)(ii)

Under temporary field conditions, provisions shall be made to assure not less than one toilet facility is available.

(n)(3)(iii)

Hazardous waste sites, not provided with a sanitary sewer, shall be provided with the following toilet facilities unless prohibited by local codes:

(n)(3)(iii)(A)

Chemical toilets;

(n)(3)(iii)(B)

Recirculating toilets;

(n)(3)(iii)(C)

Combustion toilets; or

(n)(3)(iii)(D)

Flush toilets.

(n)(3)(iv)

The requirements of this paragraph for sanitation facilities shall not apply to mobile crews having transportation readily available to nearby toilet facilities.

(n)(3)(v)

Doors entering toilet facilities shall be provided with entrance locks controlled from inside the facility.

(n)(4)

Food handling. All food service facilities and operations for employees shall meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located.

(n)(5)

Temporary sleeping quarters. When temporary sleeping quarters are provided, they shall be heated, ventilated, and lighted.

(n)(6)

Washing facilities. The employer shall provide adequate washing facilities for employees engaged in operations where hazardous substances may be harmful to employees. Such facilities shall be in near proximity to the worksite; in areas where exposures are below permissible exposure limits and which are under the controls of the employer; and shall be so equipped as to enable employees to remove hazardous substances from themselves.

(n)(7)

Showers and change rooms. When hazardous waste clean-up or removal operations commence on a site and the duration of the work will require six months or greater time to complete, the employer shall provide showers and change rooms for all employees exposed to hazardous substances and health hazards involved in hazardous waste clean-up or removal operations.

(n)(7)(i)

Showers shall be provided and shall meet the requirements of 29 CFR 1910.141(d)(3).

(n)(7)(ii)

Change rooms shall be provided and shall meet the requirements of 29 CFR 1910.141(e). Change rooms shall consist of two separate change areas separated by the shower area required in paragraph (n)(7)(i) of this section. One change area, with an exit leading off the worksite, shall provide employees with an area where they can put on, remove and store work clothing and personal protective equipment.

(n)(7)(iii)

Showers and change rooms shall be located in areas where exposures are below the permissible exposure limits and published exposure levels. If this cannot be accomplished, then a ventilation system shall be provided that will supply air that is below the permissible exposure limits and published exposure levels.

(n)(7)(iv)

Employers shall assure that employees shower at the end of their work shift and when leaving the hazardous waste site.

(o)

New technology programs.

(o)(1)

The employer shall develop and implement procedures for the introduction of effective new technologies and equipment developed for the improved protection of employees working with hazardous waste clean-up operations, and the same shall be implemented as part of the site safety and health program to assure that employee protection is being maintained.

(o)(2)

New technologies, equipment or control measures available to the industry, such as the use of foams, absorbents, absorbents, neutralizers, or other means to suppress the level of air contaminants while excavating the site or for spill control, shall be evaluated by employers or their representatives. Such an evaluation shall be done to determine the effectiveness of the new methods, materials, or equipment before implementing their use on a large scale for enhancing employee protection. Information and data from manufacturers or suppliers may be used as part of the

employer's evaluation effort. Such evaluations shall be made available to OSHA upon request.

(p) Certain Operations Conducted Under the Resource Conservation and Recovery Act of 1976 (RCRA). Employers conducting operations at treatment, storage and disposal (TSD) facilities specified in paragraph (a)(1)(iv) of this section shall provide and implement the programs specified in this paragraph. See the “Notes and Exceptions” to paragraph (a)(2)(iii) of this section for employers not covered.

(p)(1) Safety and health program. The employer shall develop and implement a written safety and health program for employees involved in hazardous waste operations that shall be available for inspection by employees, their representatives and OSHA personnel. The program shall be designed to identify, evaluate and control safety and health hazards in their facilities for the purpose of employee protection, to provide for emergency response meeting the requirements of paragraph (p)(8) of this section and to address as appropriate site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures and uses of new technologies.

(p)(2) Hazard communication program. The employer shall implement a hazard communication program meeting the requirements of 29 CFR 1910.1200 as part of the employer's safety and program.

NOTE TO 1910.120 - The exemption for hazardous waste provided in 1910.1200 is applicable to this section.

(p)(3) Medical surveillance program. The employer shall develop and implement a medical surveillance program meeting the requirements of paragraph (f) of this section.

(p)(4) Decontamination program. The employer shall develop and implement a decontamination procedure meeting the requirements of paragraph (k) of this section.

(p)(5) New technology program. The employer shall develop and implement procedures meeting the requirements of paragraph (o) of this section for introducing new and innovative equipment into the workplace.

(p)(6) Material handling program. Where employees will be handling drums or containers, the employer shall develop and implement procedures meeting the requirements of paragraphs (j)(1)(ii) through (viii) and (xi) of this section, as well as (j)(3) and (j)(8) of this section prior to starting such work.

(p)(7)

Training program -

(p)(7)(i)

New employees. The employer shall develop and implement a training program which is part of the employer's safety and health program, for employees exposed to health hazards or hazardous substances at TSD operations to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training shall be for 24 hours and refresher training shall be for eight hours annually. Employees who have received the initial training required by this paragraph shall be given a written certificate attesting that they have successfully completed the necessary training.

(p)(7)(ii)

Current employees. Employers who can show by an employee's previous work experience and/or training that the employee has had training equivalent to the initial training required by this paragraph, shall be considered as meeting the initial training requirements of this paragraph as to that employee. Equivalent training includes the training that existing employees might have already received from actual site work experience. Current employees shall receive eight hours of refresher training annually.

(p)(7)(iii)

Trainers. Trainers who teach initial training shall have satisfactorily completed a training course for teaching the subjects they are expected to teach or they shall have the academic credentials and instruction experience necessary to demonstrate a good command of the subject matter of the courses and competent instructional skills.

(p)(8)

Emergency response program -

(p)(8)(i)

Emergency response plan. An emergency response plan shall be developed and implemented by all employers. Such plans need not duplicate any of the subjects fully addressed in the employer's contingency planning required by permits, such as those issued by the U.S. Environmental Protection Agency, provided that the contingency plan is made part of the emergency response plan. The emergency response plan shall be a written portion of the employers safety and health program required in paragraph (p)(1) of this section. Employers who will evacuate their employees from the worksite location when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of paragraph (p)(8) if they provide an emergency action plan complying with section 1910.38(a) of this part.

(p)(8)(ii)

Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following areas to the extent that they are not addressed in any specific program required in this paragraph:

(p)(8)(ii)(A)

Pre-emergency planning and coordination with outside parties.

(p)(8)(ii)(B)

Personnel roles, lines of authority, training, and communication.

(p)(8)(ii)(C)

Emergency recognition and prevention.

(p)(8)(ii)(D)

Safe distances and places of refuge.

(p)(8)(ii)(E)

Site security and control.

(p)(8)(ii)(F)

Evacuation routes and procedures.

(p)(8)(ii)(G)

Decontamination procedures.

(p)(8)(ii)(H)

Emergency medical treatment and first aid.

(p)(8)(ii)(I)

Emergency alerting and response procedures.

(p)(8)(ii)(J)

Critique of response and follow-up.

(p)(8)(ii)(K)

PPE and emergency equipment.

(p)(8)(iii)

Training.

(p)(8)(iii)(A)

Training for emergency response employees shall be completed before they are called upon to perform in real emergencies. Such training shall include the elements of the emergency response plan, standard operating procedures the employer has established

for the job, the personal protective equipment to be worn and procedures for handling emergency incidents.

Exception #1: an employer need not train all employees to the degree specified if the employer divides the work force in a manner such that a sufficient number of employees who have responsibility to control emergencies have the training specified, and all other employees, who may first respond to an emergency incident, have sufficient awareness training to recognize that an emergency response situation exists and that they are instructed in that case to summon the fully trained employees and not attempt control activities for which they are not trained.

Exception #2: An employer need not train all employees to the degree specified if arrangements have been made in advance for an outside fully-trained emergency response team to respond in a reasonable period and all employees, who may come to the incident first, have sufficient awareness training to recognize that an emergency response situation exists and they have been instructed to call the designated outside fully-trained emergency response team for assistance.

(p)(8)(iii)(B)

Employee members of TSD facility emergency response organizations shall be trained to a level of competence in the recognition of health and safety hazards to protect themselves and other employees. This would include training in the methods used to minimize the risk from safety and health hazards; in the safe use of control equipment; in the selection and use of appropriate personal protective equipment; in the safe operating procedures to be used at the incident scene; in the techniques of coordination with other employees to minimize risks; in the appropriate response to over exposure from health hazards or injury to themselves and other employees; and in the recognition of subsequent symptoms which may result from over exposures.

(p)(8)(iii)(C)

The employer shall certify that each covered employee has attended and successfully completed the training required in paragraph (p)(8)(iii) of this section, or shall certify the employee's competency for certification of training shall be recorded and maintained by the employer.

(p)(8)(iv)

Procedures for handling emergency incidents.

(p)(8)(iv)(A)

In addition to the elements for the emergency response plan required in paragraph (p)(8)(ii) of this section, the following elements shall be included for emergency response plans to the extent that they do not repeat any information already contained in the emergency response plan:

(p)(8)(iv)(A)(1)

Site topography, layout, and prevailing weather conditions.

(p)(8)(iv)(A)(2)

Procedures for reporting incidents to local, state, and federal governmental agencies.

(p)(8)(iv)(B)

The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.

(p)(8)(iv)(C)

The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.

(p)(8)(iv)(D)

The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.

(p)(8)(iv)(E)

An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation, to stop work activities if necessary, to lower background noise in order to speed communication; and to begin emergency procedures.

(p)(8)(iv)(F)

Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.

(q)

Emergency response program to hazardous substance releases. This paragraph covers employers whose employees are engaged in emergency response no matter where it occurs except that it does not cover employees engaged in operations specified in paragraphs (a)(1)(i) through (a)(1)(iv) of this section. Those emergency response organizations who have developed and implemented programs equivalent to this paragraph for handling releases of hazardous substances pursuant to section 303 of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. 11003) shall be deemed to have met the requirements of this paragraph.

(q)(1)

Emergency response plan. An emergency response plan shall be developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, OSHA personnel. Employers who will evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.

- (q)(2)**
Elements of an emergency response plan. The employer shall develop an emergency response plan for emergencies which shall address, as a minimum, the following areas to the extent that they are not addressed in any specific program required in this paragraph:
- (q)(2)(i)**
Pre-emergency planning and coordination with outside parties..
- (q)(2)(ii)**
Personnel roles, lines of authority, training, and communication.
- (q)(2)(iii)**
Emergency recognition and prevention.
- (q)(2)(iv)**
Safe distances and places of refuge.
- (q)(2)(v)**
Site security and control.
- (q)(2)(vi)**
Evacuation routes and procedures.
- (q)(2)(vii)**
Decontamination.
- (q)(2)(viii)**
Emergency medical treatment and first aid.
- (q)(2)(ix)**
Emergency alerting and response procedures.
- (q)(2)(x)**
Critique of response and follow-up.
- (q)(2)(xi)**
PPE and emergency equipment.
- (q)(2)(xii)**
Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency response plan to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the employer and employee's use.

(q)(3)

Procedures for handling emergency response.

(q)(3)(i)

The senior emergency response official responding to an emergency shall become the individual in charge of a site-specific Incident Command System (ICS). All emergency responders and their communications shall be coordinated and controlled through the individual in charge of the ICS assisted by the senior official present for each employer.

NOTE TO (q)(3)(i). - The “senior official” at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially it is the senior officer on the first-due piece of responding emergency apparatus to arrive on the incident scene. As more senior officers arrive (i.e. , battalion chief, fire chief, state law enforcement official, site coordinator, etc.) the position is passed up the line of authority which has been previously established.

(q)(3)(ii)

The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.

(q)(3)(iii)

Based on the hazardous substances and/or conditions present, the individual in charge of the ICS shall implement appropriate emergency operations, and assure that the personal protective equipment worn is appropriate for the hazards to be encountered. However, personal protective equipment shall meet, at a minimum, the criteria contained in 29 CFR 1910.156(e) when worn while performing fire fighting operations beyond the incipient stage for any incident.

(q)(3)(iv)

Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus while engaged in emergency response, until such time that the individual in charge of the ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposures to employees.

(q)(3)(v)

The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the buddy system in groups of two or more.

(q)(3)(vi)

Back-up personnel shall be standing by with equipment ready to provide assistance or rescue. Qualified basic life support personnel, as a minimum, shall also be standing by with medical equipment and transportation capability.

(q)(3)(vii)

The individual in charge of the ICS shall designate a safety officer, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand.

(q)(3)(viii)

When activities are judged by the safety officer to be an IDLH and/or to involve an imminent danger condition, the safety officer shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene.

(q)(3)(ix)

After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.

(q)(3)(x)

When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet U.S. Department of Transportation and National Institute for Occupational Safety and Health criteria.

(q)(4)

Skilled support personnel. Personnel, not necessarily an employer's own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer's own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this paragraph for the employer's regular employees. However, these personnel shall be given an initial briefing at the site prior to their participation in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.

(q)(5)

Specialist employees. Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, shall receive training or demonstrate competency in the area of their specialization annually.

(q)(6)

Training. Training shall be based on the duties and function to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders, those hired after the effective date of this standard, shall be conveyed to them through training before they are permitted to take part in actual emergency operations on an incident. Employees who participate, or are expected to participate, in emergency response, shall be given training in accordance with the following paragraphs:

(q)(6)(i)

First responder awareness level. First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond notifying the authorities of the release. First responders at the awareness level shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

(q)(6)(i)(A)

An understanding of what hazardous substances are, and the risks associated with them in an incident.

(q)(6)(i)(B)

An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.

(q)(6)(i)(C)

The ability to recognize the presence of hazardous substances in an emergency.

(q)(6)(i)(D)

The ability to identify the hazardous substances, if possible.

(q)(6)(i)(E)

An understanding of the role of the first responder awareness individual in the employer's emergency response plan including site security and control and the U.S. Department of Transportation's Emergency Response Guidebook.

(q)(6)(i)(F)

The ability to realize the need for additional resources, and to make appropriate notifications to the communication center.

(q)(6)(ii)

First responder operations level. First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:

(q)(6)(ii)(A)

Knowledge of the basic hazard and risk assessment techniques.

(q)(6)(ii)(B)

Know how to select and use proper personal protective equipment provided to the first responder operational level.

(q)(6)(ii)(C)

An understanding of basic hazardous materials terms.

(q)(6)(ii)(D)

Know how to perform basic control, containment and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit.

(q)(6)(ii)(E)

Know how to implement basic decontamination procedures.

(q)(6)(ii)(F)

An understanding of the relevant standard operating procedures and termination procedures.

(q)(6)(iii)

Hazardous materials technician. Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch or otherwise stop the release of a hazardous substance. Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

(q)(6)(iii)(A)

Know how to implement the employer's emergency response plan.

(q)(6)(iii)(B)

Know the classification, identification and verification of known and unknown materials by using field survey instruments and equipment.

(q)(6)(iii)(C)

Be able to function within an assigned role in the Incident Command System.

(q)(6)(iii)(D)

Know how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician.

(q)(6)(iii)(E)

Understand hazard and risk assessment techniques.

(q)(6)(iii)(F)

Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit.

(q)(6)(iii)(G)

Understand and implement decontamination procedures.

(q)(6)(iii)(H)

Understand termination procedures.

(q)(6)(iii)(I)

Understand basic chemical and toxicological terminology and behavior.

(q)(6)(iv)

Hazardous materials specialist. Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician, however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with Federal, state, local and other government authorities in regards to site activities. Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify:

(q)(6)(iv)(A)

Know how to implement the local emergency response plan.

(q)(6)(iv)(B)

Understand classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment.

(q)(6)(iv)(C)

Know the state emergency response plan.

(q)(6)(iv)(D)

Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist.

(q)(6)(iv)(E)

Understand in-depth hazard and risk techniques.

(q)(6)(iv)(F)

Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available.

(q)(6)(iv)(G)

Be able to determine and implement decontamination procedures.

(q)(6)(iv)(H)

Have the ability to develop a site safety and control plan.

(q)(6)(iv)(I)

Understand chemical, radiological and toxicological terminology and behavior.

(q)(6)(v)

On scene incident commander. Incident commanders, who will assume control of the incident scene beyond the first responder awareness level, shall receive at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

(q)(6)(v)(A)

Know and be able to implement the employer's incident command system.

(q)(6)(v)(B)

Know how to implement the employer's emergency response plan.

(q)(6)(v)(C)

Know and understand the hazards and risks associated with employees working in chemical protective clothing.

(q)(6)(v)(D)

Know how to implement the local emergency response plan.

(q)(6)(v)(E)

Know of the state emergency response plan and of the Federal Regional Response Team.

(q)(6)(v)(F)

Know and understand the importance of decontamination procedures.

(q)(7)

Trainers. Trainers who teach any of the above training subjects shall have satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the U.S. National Fire Academy, or they shall have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.

(q)(8)

Refresher training.

(q)(8)(i)

Those employees who are trained in accordance with paragraph (q)(6) of this section shall receive annual refresher training of sufficient content and duration to maintain their competencies, or shall demonstrate competency in those areas at least yearly.

(q)(8)(ii)

A statement shall be made of the training or competency, and if a statement of competency is made, the employer shall keep a record of the methodology used to demonstrate competency.

(q)(9)

Medical surveillance and consultation.

(q)(9)(i)

Members of an organized and designated HAZMAT team and hazardous materials specialist shall receive a baseline physical examination and be provided with medical surveillance as required in paragraph (f) of this section.

(q)(9)(ii)

Any emergency response employees who exhibit signs or symptoms which may have resulted from exposure to hazardous substances during the course of an emergency incident either immediately or subsequently, shall be provided with medical consultation as required in paragraph (f)(3)(ii) of this section.

(q)(10)

Chemical protective clothing. Chemical protective clothing and equipment to be used by organized and designated HAZMAT team members, or to be used by hazardous

materials specialists, shall meet the requirements of paragraphs (g)(3) through (5) of this section.

(q)(11)

Post-emergency response operations. Upon completion of the emergency response, if it is determined that it is necessary to remove hazardous substances, health hazards and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the employer conducting the clean-up shall comply with one of the following:

(q)(11)(i)

Meet all the requirements of paragraphs (b) through (o) of this section; or

(q)(11)(ii)

Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 29 CFR 1910.38(a); 1910.134; 1910.1200, and other appropriate safety and health training made necessary by the tasks that they are expected to be performed such as personal protective equipment and decontamination procedures. All equipment to be used in the performance of the clean-up work shall be in serviceable condition and shall have been inspected prior to use.

APPENDICES TO 1910.120 - HAZARDOUS WASTE OPERATIONS AND EMERGENCY

RESPONSE

NOTE: The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section. However paragraph 1910.120(g) makes mandatory in certain circumstances the use of Level A and Level B PPE protection.

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PHYSICAL HAZARDS

PERSONAL PROTECTIVE EQUIPMENT

BLOODBORNE PATHOGENS

HEAT STRESS

COLD EXPOSURE

CONFINED SPACE

ELECTRICAL SAFETY

RADIATION

ENERGY CONTROL

HANDLING DRUMS AND CONTAINERS

PERSONAL PROTECTIVE EQUIPMENT CHECKLIST

This personal protective equipment (PPE) safety checklist will help employees and supervisors follow minimal safety practices. This list is not meant to be comprehensive, or form part of any official self-assessment practice. Where appropriate, local safety offices and supervisors are encouraged to add to these checklists. Relevant references are noted after the questions.

RESPONSIBILITIES

- Is proper PPE provided, used, and maintained in a sanitary and reliable condition? 29 CFR 1910.132(a)
- Is PPE used to protect personnel against hazards after engineering and administrative controls have been applied?
- Do supervisors inform each employee of the hazards to which they might be exposed, the PPE required, and how to use and maintain PPE?
- Do supervisors ensure that PPE is readily available, clearly identified, used for the purpose intended, fits correctly, and is properly worn?
- Does the employee PPE not interfere with the task?
- Do employees ensure that the PPE is cleaned, repaired, stored, and disposed of as applicable?
- Do personnel who wear contact lenses notify their supervisors of this fact, and do supervisors know which employees wear contact lenses?

HEAD PROTECTION

- Do employees wear safety hats when required? 29 CFR 1926.100
- Are safety hats with any defects or damage immediately removed from service?
- Are personnel who work around chains, belts, rotating devices, suction devices, and blowers required to cover long hair?

EYE AND FACE PROTECTION

- Is protective eye and face equipment required and provided where there is a reasonable probability of injury that can be prevented by such equipment? 29 CFR 1910.153 (a)(1), 29 CFR 1926.102
- Does the facility provide proper eye and face protection for the work to be performed? 29 CFR 1910.133 (a)(1)
- If needed, do employees use eye and face protection? 29 CFR 1910.133 (a)(1); 29 CFR 1926.102

- Does eye protection meet the following minimum requirements? 29 CFR 1910.133 (a)(2)(ii) through (vii)
- Provide adequate protection against the particular hazards for which they are designed. Fit snugly and not unduly interfere with the movements of the wearer. Look durable, clean, and in good repair.
- Are employees provided with goggles or spectacles of one of the following methods when their vision requires corrective lenses or spectacles? 29 CFR 1910.133 (a)(3)(i) through (iii)
- Spectacles whose protective lenses provide optical correction
- Safety goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.
- Safety goggles that incorporate corrective lenses mounted behind the protective lens.
- Is eye protection distinctly marked to identify the manufacturer? 29 CFR 1910.133 (a)(4)
- Does eye protection meet the requirements of ANSI Z87.1 - 1968?
29 CFR 1910.133 (a)(6); 29 CFR 1926.102 (a)(2)(a)
- Are face shields used as primary eye and face protection in areas where splashing or dust, rather than impact resistance, is the problem?
- Is it prohibited for personnel to wear contact lenses when the work environment exposes the individual to toxic or chemical fumes and vapors, splash hazards, intense heat, molten metal, or highly particulate atmospheres?
- Is it prohibited for employees who work on or near energized electrical circuits or in flammable/ explosive atmospheres to wear conductive frame eye/ face protection?

HAND PROTECTION

- Is proper hand protection required for employees whose work may involve hand injury or impairment? 29 CFR 1926.28
Exception: Hand protection shall not be required where there is a danger of the hand protection becoming caught in moving machinery or materials.
- Are sleeves worn outside glove gauntlets when caustic substances are being poured?

FOOT AND LEG PROTECTION

- Is protective footwear provided and worn when needed? ANSI 241-1983

- Are requirements for protective footwear determined by supervision with assistance from safety?
- Are conductive shoes provided to protect employees against the buildup of static electricity?
- Are electrical-hazard safety shoes provided for employees exposed to electrical hazards?
- Are spark-resistant shoes provided in working areas for explosive storage, petroleum tank cleaning, etc.?

Note: These shoes should not be worn outside the work area since they are not general-purpose footwear.

LIGHT REFLECTIVE PRODUCTS

- Are traffic directors and others exposed to vehicular traffic equipped with reflective vests or light-reflective clothing?

CRYOGENICS HANDLING

- Are employees exposed to cryogenics provided with and do they use required protective clothing?

SAFETY BELTS, LIFELINES, AND LANYARDS

- Are lifelines, safety belts, and lanyards used only for their intended purpose? ANSI A10.14-1975, 29 CFR 1926.104(a)
- Are lifelines secured above the point of operation to an anchorage or structural member capable of supporting a minimum dead weight of 5,400 pounds (2,455 kilograms)? 29 CFR 1926.104(b)
- Are lifelines that are subjected to cutting or abrasion a minimum of 7/8-inch (2.2-centimeter) wire core manila rope? 29 CFR 1926.104(c)
- Are safety belt lanyards a minimum of 0.5-inch (1.27-centimeter) nylon, or equivalent, with a maximum length to provide for a fall of no greater than 6 feet (1.8 meters)? 29 CFR 1926.104(d)
- Does the cushion part of the body belt meet the following conditions? 29 CFR 1926.959(b)(2)

Contain no exposed rivets on the inside;

Be at least 3 inches (7.6 centimeters) in width;

Be at least 5/32 inch (0.39 centimeter) thick, if made of leather; and

Have pocket tabs that extended at least 1.5 inches (3.8 centimeters) down and three 3 inches (7.6 centimeters) back of the inside of circle of each D ring for riveting on pliers or tool pockets. On shifting D belts this measurement for pocket tabs shall be taken when the D ring section is centered.

This material was copied from the Department of Energy website, <http://www.doe.gov>

Key:

ANSI = American National Standards Institute

29 CFR = Code of Federal Regulations Title 29

BLOODBORNE PATHOGENS

A worker at a hazardous waste site could be exposed to bloodborne pathogens either by assisting with victims or due to the nature of the waste. The following bullets provide basic guidelines for complying with OSHA requirements for a bloodborne pathogens program. More information regarding bloodborne pathogens can be obtained from a review of literature and attending courses such as the one offered by the Division of Safety and Hygiene.

- Observation of universal precautions to prevent contact with blood or other potentially infectious materials.
- Engineering and work practice controls to eliminate or minimize employee exposure such as remote handling devices and hand-washing facilities.
- Personal protective equipment that is accessible, maintained, and replaced if needed.
- Housekeeping practices, including laundry and disposal of regulated waste.
- Hepatitis B vaccination program and post-exposure evaluation and follow-up.
- Communication of hazards to employees. Use of hazard labels and signs.
- Training and education of employees.
- Medical record keeping.

TEMPERATURE EXTREME DISORDERS

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.

The next few pages of this section will discuss cold stress and heat stress.

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.

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. The table on the next page 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 that table.

**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.

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.

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.

ACCLIMATIZATION

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 workload. 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.

Apparent Temperature Chart

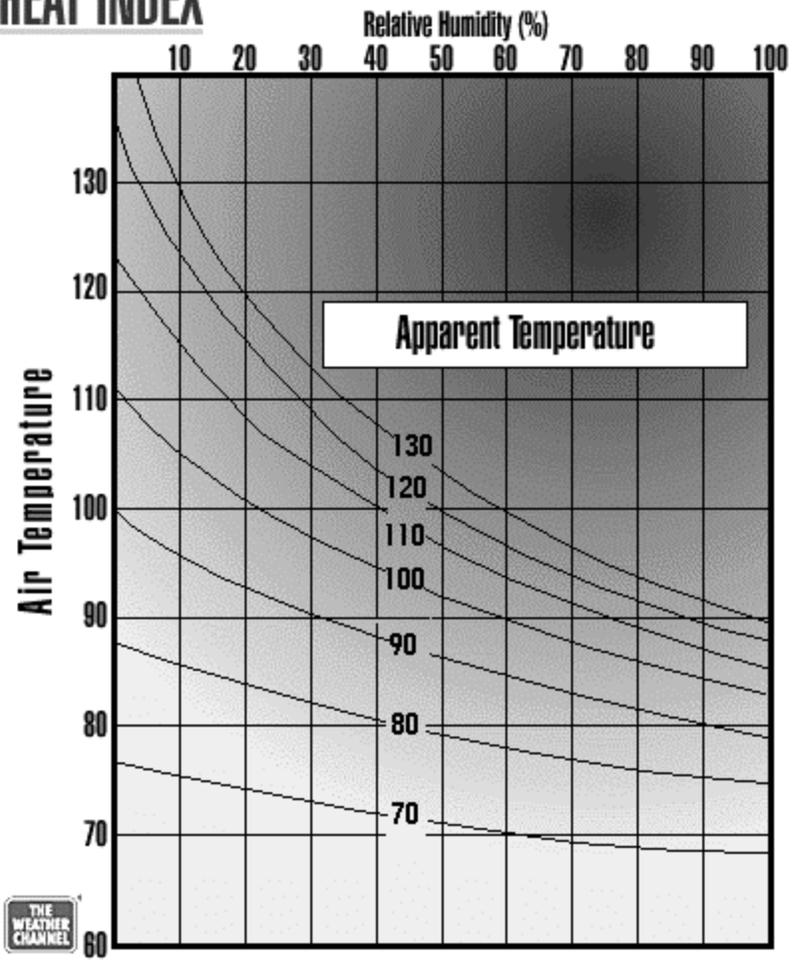
RELATIVE HUMIDITY %

| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| 120 | 108 | 112 | 117 | 124 | 131 | | | | | | | | | | | | | | | | | |
| 119 | 107 | 111 | 116 | 122 | 128 | | | | | | | | | | | | | | | | | |
| 118 | 106 | 110 | 114 | 120 | 126 | | | | | | | | | | | | | | | | | |
| 117 | 105 | 109 | 113 | 118 | 124 | | | | | | | | | | | | | | | | | |
| 116 | 105 | 108 | 112 | 117 | 122 | 130 | | | | | | | | | | | | | | | | |
| 115 | 104 | 107 | 110 | 116 | 120 | 128 | | | | | | | | | | | | | | | | |
| 114 | 103 | 106 | 109 | 115 | 119 | 126 | | | | | | | | | | | | | | | | |
| 113 | 102 | 105 | 108 | 113 | 117 | 124 | 130 | | | | | | | | | | | | | | | |
| 112 | 101 | 104 | 107 | 111 | 116 | 122 | 128 | | | | | | | | | | | | | | | |
| 111 | 100 | 103 | 106 | 109 | 114 | 119 | 126 | | | | | | | | | | | | | | | |
| 110 | 99 | 102 | 105 | 108 | 112 | 117 | 123 | 130 | | | | | | | | | | | | | | |
| 109 | 98 | 101 | 104 | 107 | 110 | 116 | 120 | 127 | | | | | | | | | | | | | | |
| 108 | 98 | 100 | 103 | 106 | 109 | 114 | 116 | 124 | 131 | | | | | | | | | | | | | |
| 107 | 97 | 99 | 102 | 105 | 108 | 112 | 117 | 121 | 128 | | | | | | | | | | | | | |
| 106 | 96 | 99 | 101 | 104 | 107 | 110 | 115 | 119 | 125 | | | | | | | | | | | | | |
| 105 | 95 | 98 | 100 | 102 | 105 | 108 | 113 | 117 | 122 | 130 | | | | | | | | | | | | |
| 104 | 94 | 97 | 99 | 101 | 105 | 107 | 111 | 115 | 120 | 127 | | | | | | | | | | | | |
| 103 | 93 | 96 | 98 | 100 | 103 | 106 | 109 | 113 | 117 | 124 | 130 | | | | | | | | | | | |
| 102 | 93 | 95 | 97 | 99 | 101 | 105 | 107 | 110 | 115 | 120 | 126 | | | | | | | | | | | |
| 101 | 92 | 94 | 96 | 98 | 100 | 103 | 106 | 108 | 112 | 117 | 123 | 130 | | | | | | | | | | |
| 100 | 91 | 93 | 95 | 97 | 98 | 102 | 104 | 107 | 110 | 115 | 120 | 126 | 132 | | | | | | | | | |
| 99 | 90 | 92 | 94 | 96 | 97 | 100 | 102 | 105 | 108 | 112 | 117 | 122 | 128 | | | | | | | | | |
| 98 | 89 | 91 | 92 | 95 | 96 | 98 | 101 | 103 | 106 | 109 | 113 | 119 | 124 | 130 | | | | | | | | |
| 97 | 88 | 90 | 91 | 93 | 95 | 97 | 99 | 101 | 104 | 107 | 110 | 115 | 120 | 126 | 131 | | | | | | | |
| 96 | 87 | 89 | 90 | 92 | 94 | 96 | 97 | 100 | 102 | 105 | 108 | 112 | 116 | 122 | 128 | | | | | | | |
| 95 | 86 | 88 | 89 | 91 | 93 | 95 | 96 | 98 | 100 | 104 | 106 | 109 | 113 | 119 | 124 | 130 | | | | | | |
| 94 | 85 | 87 | 89 | 90 | 92 | 94 | 95 | 97 | 99 | 102 | 104 | 107 | 110 | 115 | 119 | 126 | 130 | | | | | |
| 93 | 85 | 86 | 88 | 89 | 91 | 93 | 94 | 95 | 97 | 99 | 102 | 104 | 107 | 112 | 116 | 121 | 125 | 131 | | | | |
| 92 | 84 | 85 | 87 | 88 | 89 | 91 | 92 | 94 | 96 | 97 | 100 | 102 | 105 | 108 | 112 | 117 | 121 | 127 | 130 | | | |
| 91 | 83 | 85 | 86 | 87 | 88 | 89 | 91 | 92 | 94 | 96 | 98 | 100 | 102 | 106 | 108 | 114 | 117 | 121 | 125 | 130 | | |
| 90 | 82 | 84 | 85 | 86 | 87 | 88 | 90 | 91 | 92 | 95 | 97 | 98 | 100 | 103 | 106 | 110 | 114 | 117 | 121 | 125 | 130 | |
| 89 | 81 | 83 | 74 | 85 | 86 | 87 | 88 | 90 | 91 | 92 | 95 | 86 | 98 | 100 | 103 | 106 | 110 | 114 | 117 | 120 | 125 | |
| 88 | 80 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 92 | 94 | 96 | 98 | 100 | 102 | 106 | 110 | 113 | 117 | 120 | |
| 87 | 79 | 80 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 82 | 94 | 96 | 97 | 100 | 102 | 106 | 109 | 112 | 116 | |
| 86 | 78 | 79 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 92 | 94 | 96 | 97 | 99 | 102 | 105 | 108 | 111 | |
| 85 | 77 | 78 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 87 | 89 | 90 | 92 | 94 | 96 | 97 | 100 | 102 | 105 | 108 | |
| 84 | 76 | 77 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 86 | 88 | 89 | 90 | 92 | 94 | 96 | 97 | 99 | 101 | 105 | |
| 83 | 75 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 83 | 84 | 85 | 86 | 87 | 88 | 90 | 92 | 93 | 95 | 97 | 98 | 101 | |
| 82 | 74 | 76 | 77 | 78 | 79 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 92 | 94 | 96 | 98 | |
| 81 | 73 | 74 | 75 | 76 | 77 | 78 | 78 | 79 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 88 | 90 | 92 | |
| 80 | 73 | 74 | 75 | 76 | 77 | 78 | 78 | 79 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 88 | 90 | 92 | |
| 79 | 72 | 73 | 74 | 75 | 76 | 77 | 77 | 78 | 78 | 79 | 80 | 80 | 81 | 82 | 82 | 84 | 84 | 86 | 86 | 87 | 89 | |
| 78 | 72 | 72 | 73 | 74 | 75 | 76 | 76 | 77 | 77 | 78 | 78 | 79 | 79 | 80 | 80 | 82 | 82 | 93 | 84 | 85 | 87 | |
| 77 | 71 | 71 | 72 | 73 | 73 | 74 | 75 | 76 | 76 | 77 | 77 | 78 | 78 | 78 | 79 | 80 | 80 | 81 | 82 | 83 | 84 | |
| 76 | 70 | 70 | 71 | 72 | 72 | 73 | 74 | 75 | 75 | 76 | 76 | 77 | 77 | 77 | 78 | 78 | 78 | 79 | 80 | 81 | 82 | |
| 75 | 69 | 70 | 70 | 71 | 71 | 72 | 73 | 74 | 74 | 75 | 75 | 76 | 76 | 76 | 77 | 77 | 77 | 78 | 78 | 79 | 80 | |
| 74 | 68 | 69 | 69 | 70 | 70 | 71 | 72 | 72 | 73 | 73 | 74 | 75 | 75 | 75 | 76 | 76 | 76 | 77 | 77 | 77 | 78 | |
| 73 | 67 | 68 | 68 | 69 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | 74 | 74 | 74 | 75 | 75 | 76 | 76 | 76 | 77 | |
| 72 | 66 | 67 | 67 | 68 | 68 | 69 | 69 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | 73 | 73 | 74 | 75 | 75 | 75 | |
| 71 | 66 | 66 | 66 | 67 | 67 | 68 | 68 | 69 | 69 | 70 | 70 | 70 | 71 | 71 | 72 | 72 | 72 | 73 | 73 | 73 | 73 | |
| 70 | 65 | 65 | 66 | 66 | 67 | 67 | 68 | 68 | 68 | 69 | 69 | 69 | 70 | 70 | 70 | 71 | 71 | 72 | 72 | 73 | 73 | |

| Danger Category | Apparent Temperature | Heat Syndrome |
|-----------------------|----------------------|---|
| IV Extreme Danger | Greater Than 130 | Heat stroke or sun stroke imminent |
| III Danger | 105 - 130 | Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible w/ prolonged exposure & physical activity |
| II Extreme Caution | 90 - 105 | Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible w/ prolonged exposure & physical activity |
| I Caution | 80 - 90 | Fatigue possible w/ prolonged exposure & physical activity |

AIR TEMPERATURE (°F)

HEAT INDEX



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 wind-chill factor is the cooling effect of any combination of temperature and wind velocity or air movement. The wind-chill index should be consulted when planning for exposure to low temperatures and wind. The wind-chill 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.

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.

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.

WIND-CHILL INDEX

ACTUAL THERMOMETER READING (°F)

| Wind Speed in mph | 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 | 67 | 27 | 16 | 6 | -5 | -15 | -25 | -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 (little added effect) | LITTLE DANGER (for properly clothed person) | | | | INCREASING DANGER | | | GREAT DANGER | | | |
| | | | | | (Danger from freezing of exposed flesh) | | | | | | |

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. |

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.

CONFINED SPACES / HAZARDS DETERMINATION

This information is introductory only. More detailed information on confined spaces can be obtained through the confined space course offered through OCOSH.

The following criteria was used to determine classification of spaces:

When evaluating a space, the space must meet all three of the following conditions:

1. The space is large enough and so configured that an employee can bodily enter and perform assigned work;
2. Has limited or restricted means for entry or exit;
3. Is not designed for continuous employee occupancy.

After a space has been declared a confined space, it may then be classified as a Permit or Non-Permit Confined Space.

A Permit-Required Confined Space (Permit Space) means a confined space that has one or more of the following characteristics:

1. Contains or has potential to contain a hazardous atmosphere;
2. Contains a material that has the potential for engulfing an entrant;
3. Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross section;
4. Contains any other recognized serious safety or health hazard.

A Non-Permit Confined Space means a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

Alternate entry procedures for entering a confined space may be used if the hazard presented in the space is atmospheric only.

A space may be reclassified if all non-atmospheric (physical) hazards have been eliminated without entry, i.e.: lockout/tagout for mechanical equipment.

THE ENTRY PERMIT

An Entry Permit Form shall be completed prior to each entry into a permit required confined space. This form is a means of verification to ensure that adequate measures have been taken prior to entry to make the space safe through the duration of the entry. Only trained personnel are permitted to authorize / complete an Entry Permit Form.

The completed Entry Permit Form will be posted as near as practical to the point of entry into the space.

Completed entry permit forms will be retained for 5 years, and will be reviewed annually by the facility safety coordinator.

EQUIPMENT

All equipment, to include monitoring, ventilation, communications, personal protective, retrieval, and tools needed to perform a safe entry shall be provided and maintained in good operating condition. Any equipment found to be defective or to have deteriorated will be repaired or replaced immediately.

Atmospheric monitoring equipment shall be calibrated and other equipment inspected prior to each use.

TRAINING

Employees responsible for supervising, planning, entering or participating in confined space entry shall be adequately trained prior to conducting any such activity. The training shall include:

1. An explanation of the general hazards associated with confined spaces
2. A discussion of specific confined space hazards associated with this facility.
3. An explanation of the permit system and other procedural requirements for conducting a confined space entry.
4. How to respond to emergencies.
5. Proper use and limitations of personal protective and other equipment that may be utilized for entry into confined spaces.
6. Discussion of the mode, symptoms, and consequences of exposure to toxic vapors / contaminants.
7. Proper use of atmospheric monitoring instruments.

Verification of training will be documented. This documentation will include the employee's name, the name of the trainer, and the date the training was conducted.

Refresher training will be conducted yearly. Retraining will be conducted immediately after deviations to the program are noted, or after it is determined that there have been changes that may affect the permit.

CONTRACTED SERVICES

Contractors that are to enter a permit or non-permit space shall be informed of the hazards associated with the space and will be required, as a minimum, to conform to the facility Confined Space Entry Program or requirements of OSHA 1910.1146 the permit required confined space standard.

At the conclusion of an entry into a permit confined space by a contractor, the contractor will be debriefed by management regarding the permit space program followed and any hazards confronted or created in the spaces during entry operations.

RESCUE

A retrieval system shall be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant.

In the event of an emergency involving an entrant, the attendant shall engage the retrieval system as soon as he / she becomes aware that rescue is necessary. The attendant is NOT to enter the permit required confined space. The attendant will obtain additional help by use of company radio.

If rescue does become necessary, the local fire / rescue department shall be utilized.

ELECTRICAL SAFETY

The following items provide basic guidelines for working around electricity. This information was obtained from booklets provided by American Electric Power. Visit their website at <http://www.aep.com> for more information.

- Before work begins on any job site, check the location of power lines and electrical facilities.
- There is a minimum safe distance of 10 feet around energized power facilities. This distance increases as voltages increase and as circumstances vary. Keep ladders, scaffolding and any type of long tool or equipment outside of that minimum safe distance.

| Line Voltage | Minimum Safe Distance |
|----------------------------|-----------------------|
| Up to 50,000 volts | 10 feet |
| 50,000 to 200,000 volts | 15 feet |
| 200,000 to 350,000 volts | 20 feet |
| 350,000 to 500,000 volts | 25 feet |
| 500,000 to 750,000 volts | 35 feet |
| 750,000 to 1,000,000 volts | 45 feet |

- Don't use metal ladders, metal extension handles or other metal equipment around power facilities. Use a clean, dry wood or fiberglass ladder if electric lines are anywhere in the area.
- Digging, trenching, or excavating without knowing where utility lines are buried could be fatal. Before you dig contact the electrical company to identify the location of buried cables for you.
- Be certain to maintain a safe clearance when the bed of a dump truck is raised.
- In crane operations, designate a worker responsible for signaling the crane operator when any part of the crane or its load approaches the safe distance limit. Do not allow anyone to touch a crane operating near a power line. The crane and the worker could become part of the path to ground.
- Immediately remove a tool or appliance from service if it causes shocks, smokes, emits strange odors, sparks or otherwise operates in a suspicious manner. Repair or replace a tool if the insulation is cracked or missing or if the plug is loose. Avoid dirt, oil and grime buildup on machinery or tools. This can cause them to overheat.
- The ground wire on a tool's power cord provides a safe path to ground in case of any type of short circuit. Never remove the third prong on a plug - - this is the ground wire.

DOSE STANDARDS AND METHODS FOR PROTECTION AGAINST RADIATION AND CONTAMINATION

This information was obtained from the nuclear regulatory website at <http://www.nrc.gov>

INTRODUCTION

This section discusses the NRC dose standards and the methods used to protect individuals from the harmful effects of radiation and contamination. The following methods are used to protect from radiation exposure:

- Minimize time
- Maximize distance to minimize dose
- Maximize distance
- Maximize shielding to minimize dose
- Temporary and installed shielding
- Shielding materials
- Common radiation signs and labels

NRC DOSE LIMITS

NRC dose limits (from 10 CFR Part 20) for members of the public:

- Less than 2 mrem in any one hour from external radiation sources in any unrestricted area.
- Less than 100 mrem in a calendar year from both external and internal sources of radiation in unrestricted and controlled areas.

The NRC limits all licensees in the handling and use of radioactive materials such that no member of the public will receive a radiation dose of 2 millirems in any hour from external radiation sources, or 100 millirems in a calendar year from both external and internal sources of radiation. Additionally, the NRC has provided design objectives for power reactor licensees to keep offsite releases as far below the 10 CFR Part 20 limits as is reasonably achievable. These guidelines can be found in 10 CFR Part 50. Permissible dose levels in unrestricted areas during radioactive material transport can be found in 10 CFR Part 71.

| Occupational Limits | |
|--|---------|
| Annual Limit | |
| Whole Body (sum of external and internal dose) | 5 Rem |
| Extremity | 50 Rem |
| Skin of Whole Body | 50 Rem |
| Maximum Exposed Organ (sum of external and internal dose) | 50 Rem |
| Eye | 15 Rem |
| Minor | 0.5 Rem |
| Declared Pregnant Woman has a limit of 0.5 Rem over the gestation period. | |
| Planned Special Exposure (PSE), an infrequent exposure for special, high-dose jobs, has a whole body limit of 5 Rem in a year, in addition to the above occupational limit, with a lifetime maximum of 25 Rem. | |

The NRC exposure limits shown above apply to all NRC licensees and are designed such that:

- No worker at a nuclear facility will receive an acute whole body radiation exposure sufficient to trigger the radiation syndrome.
- The risk of cancer (although not zero) will not be higher than the risk of cancer from other occupations.

Licensees are also required by 10 CFR Part 20 to keep radiation exposure as low as reasonably achievable (ALARA).

Note: The whole body and skin of the whole body includes all of the body except for the hands, wrists, forearms, elbows, knee, leg below the knee, feet, and ankles.

Now that the limits are known, how to protect the body from radiation will be discussed.

PROTECTION AGAINST EXTERNAL RADIATION SOURCES

The three protective measures are time, distance, and shielding. These protective measures are primarily utilized to reduce the dose from any external source of radiation. Time and distance are also applicable for reducing the intake of radioactive material (internal dose), although once the radioactive material is inside the body, little can be done to reduce the dose. However, the total dose (sum of internal and external exposure) should be minimized, since overall risk is proportional to the total dose. In some cases, this may mean accepting a small intake of radioactive material to save external dose. The important thing is to keep the total dose as low as reasonably achievable. Recall that the limits from whole body (5 Rem/year) and maximum exposed organ (50 Rem/year) apply to total dose.

DOSE RATE X TIME = DOSE, MINIMIZE EXPOSURE TIME TO MINIMIZE DOSE

The dose a person receives from external radiation is directly proportional to the length of time spent in a radiation field. Therefore, by minimizing the amount of time spent in a radiation field, the dose received can be minimized. Similarly, minimizing the time spent in an area with airborne radioactivity will minimize the internal dose, since the intake of radioactive material (that being inhaled) is directly proportional to the inhalation time (volume of air being breathed).

Minimize Time

Assuming a radiation field of 300 mrem/hr, an individual would receive a dose of:

- 75 mrem in 15 minutes
- 150 mrem in 30 minutes
- 300 mrem in 1 hour
- 600 mrem in 2 hours

Maximum Distance to Minimize Dose

Many radiation sources are "point sources" (appear to come from one spot some distance away). The radiation dose from these sources can be significantly reduced by applying the protective measure of distance. The dose a person receives from an external radiation source is inversely proportional to the square of the distance from the source ($1/d^2$). Therefore, if the dose rate at one foot is 100 mrem/hr, the dose rate at 10 feet would be $1/10^2$ of that (1 mrem/hr). Staying as far away as possible from a source of airborne radioactivity will minimize the intake of radioactivity, because the activity will disperse and become less concentrated (in most cases) as it moves away from the point of release.

Maximize Distance

By moving a few feet away from a nearby source of radiation, the dose rate can be significantly reduced. Therefore, a person performing a job can have a longer stay time to perform the needed task.

Maximize Shielding to Minimize Dose

Shielding is one of the most effective ways of reducing radiation exposure. This figure example shows that the installation of a one half-value layer (half-thickness) of will reduce

the dose rate by a factor of two at a set distance from the source of radiation. By locating the shielding as close as possible to the source, dose rates can be reduced in a large area, and thus reduce the dose to many workers (some of which, perhaps, could not reduce their exposure time or work further away from the source).

Temporary and Installed Shielding

The shielding use to reduce the dose rate may be temporary shielding or installed shielding. Temporary shielding can take the form of lead sheets, lead bricks, or bags filled with lead shot. This type of shielding can be placed near the source to reduce the levels in large areas, and can be shaped as necessary to provide the maximum shielding effective. Installed shielding is the use of installed plant components to reduce the dose rate. In the drawing above, the dose rate without shielding would be 300 mrem/hr. The installation of the temporary shielding reduces the dose rate to 3 mrem/hr. However, if the worker can perform the job from the far side of the pump, the dose rate can be reduced to 0.3 mrem/hr.

Relative Effectiveness of Various Shielding Materials

Materials differ in their ability to shield (absorb) radiation. To have the same gamma radiation exposure level at the outside of each material, it takes about twice as much iron as lead, about twice as much concrete as iron, and about three times as much water as concrete.

INTERNAL EXPOSURE CONTROL

$$1 \text{ ALI} = 2,000 \text{ DAC-hr} + 5 \text{ Rem}$$

Intakes of radioactivity are controlled by the Annual Limit on Intake (ALI), expressed in units of microcuries. The ALI is the primary limit for internal exposure control, and in the absence of any external radiation, a worker may intake one ALI in a year. One ALI equals 5 rem internal dose. Concentrations of radioactivity in air are limited by the Derived Air Concentrations (DACs), which are derived from the ALI. The DACs are derived assuming a worker breathes 1.2 cubic meters of air per hour for 2000 hours per year. Therefore: $\text{DAC (microcuries/ml)} = \frac{\text{ALI (microcuries)}}{2.4 \times 10^9 \text{ ml}}$

$$2.4 \times 10^9 \text{ ml}$$

If a worker breathes air containing radioactivity at a concentration of 1 DAC for one hour, then the worker has been exposed to one DAC-hr. Therefore: $1 \text{ ALI} = 2,000 \text{ DAC-hr} = 5 \text{ Rem}$. Since the operational limit of 5 Rem applies to the sum of internal and external radiation exposure, if the worker has some external dose, the ALI must be modified or offset to account for this. For example, if the worker has 2 Rem from external sources or radiation, then only 3 more Rem is allowed from internal radiation, or expressed in DAC-hr, one $\frac{3}{5} \times 2,000 = 1,200 \text{ DAC-hr}$.

PROTECTION AGAINST CONTAMINATION

To protect against contamination:

- Minimize radioactive leakage
- Conduct frequent surveys
- Practice good housekeeping
- Utilize containments
- Maintain access control
- Utilize protective clothing
- Wear respiratory protection
- Conduct follow-up bioassays

The protective measures listed above are used to prevent, detect, and/or contain radioactive contamination. Since radioactive contamination can be inhaled and/or ingested, the above measures are also considered to be methods of protection against internal doses.

COMMON RADIATION SIGNS AND LABELS

The international symbol for radioactive material and radiation is a magenta or black three bladed design on a yellow background.

HAZARDOUS ENERGY CONTROL

LOCKOUT/TAGOUT

Review of data by the National Institute of Safety and Health (NIOSH) indicates there are three related factors contributing to the injuries and deaths occurring of workers when performing installation, maintenance, service, or repair work near hazardous energy sources:

- Failure to completely de-energize, isolate, block, and/or dissipate the hazardous energy source
- Failure to lockout and tagout energy control devices and isolation points after the hazardous energy source has been de-energized
- Failure to verify that the hazardous energy source was de-energized before beginning work

These fatalities could have been prevented if comprehensive hazardous energy control procedures had been implemented and followed.

RECOMMENDATIONS

NIOSH recommends that employers implement the following steps to prevent injuries and deaths of workers who must work with hazardous energy in their jobs:

- Comply with OSHA regulations.
- Develop and implement a hazardous energy control program.
- Identify and label all hazardous energy sources.
- De-energize, isolate, block, and/or dissipate all forms of hazardous energy before work begins.
- Establish lockout/tagout programs that require workers to secure energy control devices with their own individually assigned locks and keys—only one key for each lock the worker controls;
- Require that each lock used to secure an energy control device be clearly labeled with durable tags to identify the worker assigned to the lock;
- Make sure that the worker who installs a lock is the one who removes it after all work has been completed; and
- If work is not completed when the shift changes, workers arriving on shift should apply their locks before departing workers remove their locks.
- Verify by test and/or observation that all energy sources are de-energized before work begins.
- Inspect repair work before reactivating the equipment. Make sure that all workers are clear of danger points before re-energizing the system.
- Train ALL workers in the basic concepts of hazardous energy control. Include a hazardous energy control program with any confined-space entry program.
- Encourage manufacturers to design machines and systems that make it easy to control hazardous energy.

- Use of master keys should be reserved for unusual circumstances when the worker is absent from the workplace. However, if master keys are necessary, keep them under supervisory control. List the proper procedures for using them in the written program for controlling hazardous energy.

This information was copied from the Department of Energy website: <http://www.doe.gov>.
The information was not reprinted in its entirety.

HANDLING DRUMS AND CONTAINERS

The following points are offered as guidelines to protect employees and the environment when it is necessary to handle drums and containers. This material was obtained from the booklet "Hazardous Waste Operations & Emergency Response" which can be obtained from the Oregon Occupational Safety & Health website <http://www.cbs.state.or.us/external/osha>.

- Employers must inform workers of appropriate hazard warnings of labeled drums; removal of soil or coverings; and the dangers of handling unlabeled drums or containers without prior identification of their contents.
- Employers must assure that safe work practices are instituted before workers open a drum or container. Examples of safe work practices include protecting valuable equipment from becoming contaminated such as respirators and electric equipment.
- In areas where spills, leaks, or ruptures occur, employers must provide salvage drums, a suitable quantity of absorbent material, and approved fire-extinguishing equipment for small fires.
- Moving drums or containers must be kept at a minimum and a program must be implemented to contain and isolate hazardous substances being transferred into drums or containers.
- Only tools or equipment that prevent ignition must be used.
- All workers not carrying out the operation must be located at a safe distance and behind a suitable barrier to protect them from accidental explosions.
- Workers must not stand or work from drums or containers.
- If drums or containers bulge, swell, or show crystalline material on the outside, they must not be moved onto or from the site unless appropriate containment procedures have been implemented.
- Lab packs are to be opened only when necessary and by a qualified person.
- Damaged drums or containers must be emptied using a device classified for the material being transferred and be discarded properly.
- Before shipping to a licensed disposal facility, all drums and containers must be properly labeled and packaged for shipment.

This next section serves as an outline of the following topics. The purpose of this section is to assist a company with developing a complete written program.

- BACKGROUND
- SITE SPECIFIC HASP
- KEY PERSONNEL
- HAZARD ASSESSMENT
- TRAINING
- PPE
- TEMPERATURE EXTREMES
- MEDICAL SURVEILLANCE
- EXPOSURE MONITORING
- SITE CONTROL
- DECONTAMINATION
- EMERGENCY RESPONSE PLAN
- EMERGENCY ACTION PLAN
- CONFINED SPACE ENTRY
- SPILL CONTAINMENT

This reference material was obtained from the Department of Energy website, <http://www.doe.gov>. It has not been reproduced in its entirety.

Health and Safety Plan Guidelines

INTRODUCTION

This document is based on 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 headquarter's 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.

This document makes 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.

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.

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. 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.

SITE SPECIFIC HEALTH AND SAFETY PLAN (HASP)

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.

KEY PERSONNEL

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.

HAZARD ASSESSMENT

Hazard assessment is a methodology used to identify inherent or potential hazards that 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.

TRAINING

In 29 CFR 1910.120(e) different levels of training are required, depending on the task to be performed. 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.

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.

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. 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.

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.

EXPOSURE MONITORING

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.

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.

DECONTAMINATION

29 CFR 1910.120(k) does not contain specific procedural development requirements in the area of decontamination. 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.

EMERGENCY RESPONSE PLAN

The site management must develop and implement an Emergency Response Plan (ERP) in accordance with requirements of 29 CFR 1910.120(l), if employees 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.

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.

CONFINED SPACE ENTRY

The following confined space entry procedures are derived from 29 CFR 1910.146, American National Standards Institute (ANSI) Recommendation Z117.1-1989, and the Department of Energy.

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.

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.

KEY PERSONNEL

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

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 | | |
| State Authority: | | |
| National Response Center: | | |
| Center for Disease Control: | | 404-488-4100 |
| Chemtrec: | | 800-424-9555 |
| Site Emergency Operations Center: | | |
| DOE Emergency Operations | | 202-896-8100 Center (National Center): |

ONSITE PERSONNEL

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.

Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) should be identified by name. A designated alternate for each SSHO should be identified by name. 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.

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.

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 Field Team Leader should be identified by name. 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.

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 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.

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. 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.

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 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.

Security Officer

The individual who is responsible for managing site security 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.

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 stop work 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.

OPTIONAL PERSONNEL

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.

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.

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.

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.

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 Manager, 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.

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.

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.

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.

Multidisciplinary Advisors

Advisors include 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.

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.

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).

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.

OTHER SOURCES OF ASSISTANCE

Procedures for contacting the Emergency Response Center should be established and identified. A general description for contacting the 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. 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.

HAZARD IDENTIFICATION

A hazardous material spill has 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, tornadoes, 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).

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.

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. 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.

HAZARD LIST - 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.

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

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.

JOB/TASK ANALYSIS

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.

HAZARD CONTROLS

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. 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.

ENGINEERING CONTROLS

Hazards subject to engineering controls generally include those that 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 through 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.

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 demarcation 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 that 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.

PERSONAL PROTECTIVE CLOTHING

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. 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.

The overall objectives of this chapter are:

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

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 radiological 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.

SELECTION OF PPE

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.

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.

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 |

Level A PPE

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).

Protective Clothing

- 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).
- 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.

Level B PPE

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).

Protective Clothing

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

Level C PPE

Respiratory Protection

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

Protective Clothing

- Coveralls

- 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
- Hard hat (as needed), and
- Hearing protection (as needed).
- Other Protective Apparatus
- Cooling unit/system,
- Cold weather gear/clothing, and
- Protection from biological hazards/pests.

Level D PPE

Respiratory Protection

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

Protective Clothing

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

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.

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, Select the respirator cartridge(s) for Level C,
4. Determine level of protective clothing for the work areas and specific work activities, 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.

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. The table below 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.

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. | Examination by industrial physician for suitability to work. |
| | Untrained operator; failure to perform task. | Train operators. Dry run. |
| 2. Empty Tank | Gas or liquid in tank. | Approved written operating procedures. |
| | Improper valve line-up. | 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. | Obtain work permit signed by safety and maintenance supervisors. |
| | Improper oxygen level. | |
| | Chemical exposure. | Test air by qualified person. |
| | Gas, dust, vapor: irritant toxic | Ventilate to 19.5% - 23.5% oxygen and less than 10% LEL of any flammable gas. |

TEMPERATURE EXTREMES

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.

MEDICAL SURVEILLANCE PROGRAM

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 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.

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.

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.

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 the requirements of 29 CFR 1910.120 (f)(8) and 29 CFR 1910.1020. Access to medical

records should be consistent with the requirements of 29 CFR 1910.1020. The employee medical records will be held in confidence by the employer to the extent permitted by law.

EXPOSURE MONITORING

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.

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.

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 that 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.

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 air contaminants to be monitored/sampled and the locations and frequency of monitoring should be specified. 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. 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.

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.

For selection of all instruments, a number of factors should be considered such as:

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

SITE CONTROL

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.

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.

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.

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.

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.

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. 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.

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.

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.

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.

COMMUNICATION NETWORK

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.

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.

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.

DECONTAMINATION

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 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.

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.

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.

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.

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 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 that 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.

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.

COLLECTION, STORAGE, AND DISPOSAL

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.

EMERGENCY RESPONSE PLAN

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. 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.

The minimum required elements of the ERP 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.

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.

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.

EMERGENCY ALERTING

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.

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.

CRITIQUE OF RESPONSE AND FOLLOW-UP

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?

EMERGENCY ACTION PLANS

An emergency action plan (EAP) is necessary if companies choose to 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 such disasters as fire, hurricanes, blizzards, toxic chemical releases, and floods. The Plan should be totally integrated and coordinated with the 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).

CASE STUDY #1

THE PLATING COMPANY

You work for a plating company as their safety person. The plating company employs 70 people. On a warm, sunny afternoon at approximately 1:00 pm. you receive a frantic call regarding a spill in the warehouse. You hurry to the warehouse to respond. The warehouse is a separate building located approximately 30 feet behind the main plant. When you reach the scene, a number of employees are outside the building and sick to their stomachs. You question an employee for more information:

Where is the spill?

What was it?

What are your symptoms?

Is anyone else inside?

The spill is inside but the identity of the source unknown. Another worker was driving a forklift and backed into a storage rack. The driver had been issued verbal warnings in the past regarding his reckless forklift operation. The rack toppled and the containers stored on that rack crashed to the floor. A number of the containers broke and spilled their contents. The other employees began to vomit and had difficulty breathing – like the oxygen was being sucked out of the air - they immediately ran outside for fresh air. It is believed that a few people are missing but it is unknown if they were in the warehouse area or in the main plant at the time of the accident. It is possible that one employee was between the storage racks conducting an inventory when the accident occurred.

What would be your first course of action?

What level of PPE will you wear if you choose to enter the building?

You call 911 for assistance and enter the building to look for clues regarding the material that spilled and the location of other victims. In the warehouse, they store cyanide tablets, sulfuric acid, hydrochloric acid, sodium hydroxide, and sodium metabisulfite. Without approaching to close, you can see that the spilled material is a white powder and has a bad odor. Further observation reveals a number of barrels located near the spilled material. The bung on one or two barrels has been removed – this is a common practice in the warehouse to allow the release of stored pressure in the barrel. There are no other employees in sight.

What is the spilled material?

What might be in the open barrels and is there any need to be concerned about the contents?

The fire trucks have arrived and the firechief approaches you for information. The fire department does not have any information regarding the materials in your warehouse. In addition, the media has heard of the spill and they are sticking a microphone in your face and bombarding you with questions. The media are “hot” for a story because an elementary school is located within a block of your facility and this could be “BIG” news.

Below is a drawing of the plant’s location:

Ask the teacher to draw the diagram on the board.

Looking at this picture – what are some potential problems?

How will you deal with the media and the firechief?

What will you do to account for any additional or potential victims?

Will you evacuate your plant or any of the neighbors? Is so, how far away?

What are some potentially other hazardous outcomes and how will you prevent those from occurring?

How will you clean up the spill?

What level of PPE will the team wear?

What might you do differently in the future?

CASE STUDY #2

MERCURY SPILL

You are the hazardous waste team at a major hospital. Policy at the hospital is that if a potentially hazardous material is spilled that your team is called immediately to clean up the spill and assure proper disposal.

It is late afternoon on a Friday and you are called to respond to a spill in a patient's room. You respond to the call and find that the hospital staff has already taken care of the spill.

Being late on a Friday afternoon and you are anxious to go home – are you satisfied that the spill has been taken care of or should you look further into the incident?

(Of course I assume you will follow-up or there would be no point to continue to create this case study!)

THE FOLLOW-UP

The patient in the hospital room is Mr. Jones - a 75-year-old man that has been admitted repeatedly over the last 6 months. Mr. Jones has a reputation amongst the nurses of being demanding and grouchy. The dietary staff was delivering Mr. Jones meal when he had an outburst and pushed the tray to the floor. Housekeeping was called and cleaned the mess.

The hospital's meatloaf has often been described as "toxic" – can you go home now? What other workplace issue should be addressed regarding Mr. Jones behavior?

You track down the person from housekeeping that cleaned Mr. Jones room and ask some additional questions. Based on your questions, you learn that during Mr. Jones outburst, the thermometer on his bedside table fell and broke on the floor – releasing the mercury. Housekeeping used some paper towels, a broom, and a dustpan to clean up the spilled mercury and broken thermometer. All of the waste went into the trash. The broom and dustpan, along with the trash bag, were returned to the housekeeping closet located a few feet down the hall.

The problem was resolved – all is well . . . or is it?

Was the spill cleaned correctly?

What should have been done with the waste?

Is any follow-up needed? What?

CASE STUDY #3

URANIUM HEXAFLUORIDE

It is a spring day and the ground is already saturated with water after many days of rain. Today is no different. A thunder and lightning storm hit the area earlier with gusting winds. The storm has knocked out electricity in a majority of the neighborhoods. A private carrier, hired by the Department of Energy, is transporting uranium hexafluoride through town. Due to gusting winds, slick roads, and taking a curve to fast, the truck overturns into a ditch. The side of the truck is punctured and, as a result, a small spill is trickling down the hill and into a ditch that is filling up with rainwater run-off. You are a member of the emergency management team for this town and are immediately contacted by the police department to respond to the spill.

Due to the accident, the road is impassable for traffic. It is 4:30 p.m. and traffic is already backing up and you expect traffic to increase through the area as people attempt to reach their homes after work. The ambulance has been contacted and is on its way to transport the unconscious truck driver to the hospital.

The police are running around like "chickens with their heads cut-off" as they try to attack all the problems at once. The police have blocked the road and are not letting any vehicles pass. The truck had hit a power pole and there is a downed wire that appears to not be energized.

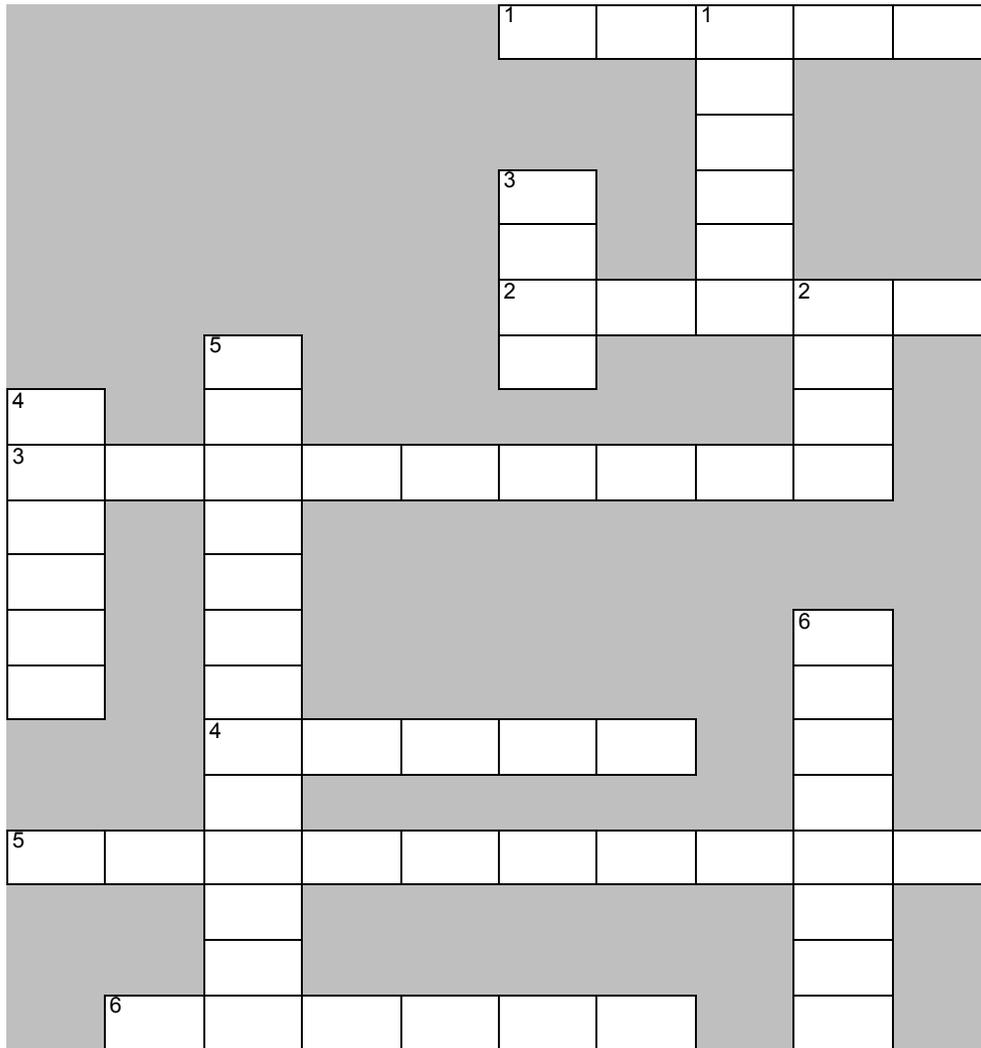
Your job is to take charge of the situation. What needs to be done and in what order will you do it?

ACROSS

1. A tool used to physically remove a contaminant
2. We use the _____ system when entering the "hot" zone
3. The other term for the "hot" zone is _____
4. Your Health and Safety plan should include a person to answer questions to the _____
5. You conduct air _____ to determine the exposure levels.
6. It is important to keep the site _____ from unauthorized personnel.

DOWN

1. The direction that you should approach a spill from
2. The level of PPE may be upgraded or _____ graded depending on the situation
3. Respiratory protection using its own air source
4. IDLH stands for Immediately Dangerous to Life and _____
5. The process of removing contaminants from personnel and equipment
6. The success of a Safety Plan rests largely on _____ employees to carry out their tasks.



TOXICOLOGY

TERMS:

OSHA – Occupational Health and Safety Administration

ACGIH – American Conference of Governmental Industrial Hygienists

NIOSH – National Institute for Occupational Safety and Health

DEFINITIONS:

PEL stands for Permissible Exposure Limit. PELs are legal limits set by _____.

REL stands for Recommended Exposure Limit. RELs are set by _____. RELs are not legally enforceable – they are as their name applies, recommendations.

TLV stands for Threshold Limit Value. TLVs are recommended guidelines offered by _____.

TWA stands for _____ . TWAs are based on an ____ hour work shift and a _____ hour work week.

Ceiling Value is an exposure level that shall not be exceeded during any part of the work day.

STEL stands for Short Term Exposure Limit. An STEL is a _____ minute TWA exposure.

IDLH stands for _____.

PPM stands for Parts Per Million which means one part contaminant per one million parts of air. One part per million is equivalent to 1 inch in 16.7 miles or 1 teaspoon in 1,300 gallons.

There are four routes of exposure. Those routes of exposure are:

- 1.
- 2.
- 3.
- 4.

The principal route of entry into the body is through _____.

What is the importance of the notation “skin” in toxicological data? _____

Toxicology is a function of dose and time. A chemical’s ability to do damage as a result of exposure to a single large dose is known as _____. Chemical damage due to low level repeated exposures over a long period of time is known as _____.

When the chemical affects the site of exposure, such as the skin from an acid burn, this is known as a _____ affect.

When the chemical does not affect the its initial site of contact but attacks other organs known as target organs, this is known as _____ affect. An example is the affect that lead has on neurons resulting in loss of memory, muscle tremors, loss of muscle coordination and others.

DESIGN-A-LINE

You are a new member on a decontamination team. Below is a list of the materials your company has to work with. Design a decontamination line with the supplies. You will be decontaminating an entry crew dressed in Level C protection. The contaminant is in the form of dirt/dust. Proper decontamination can be achieved by washing with a mild detergent and water.

SUPPLIES

Large plastic tarps measuring 12ft by 18ft.

Yellow caution tape

Sponges

Soft bristle brushes

Large plastic bags

Duct tape

Hose

Siphon pump

Overpack drums

Tags and marking pens

5-gallon buckets

2-gallon hand-pump sprayer

Two small inflatable child's pools

Are there any other supplies you would request from your boss for the same decontamination (Level C and dirt)?

ASSESS THE SITUATION

You are the safety person for a contractor that has been hired to remove an underground fuel tank from a defunct gas station. The building and pumps have already been removed and only the underground tank remains. A survey has been done of the area and the soil around the tank has not been contaminated but there is still some fuel left in the tank. The quantity of fuel and the condition of the tank are unknown.

The site is located on a busy street corner and there is power lines overhead. The pavement has not yet been broken at the site. The city and EPA want proof, after the job is done, that the ground has not been contaminated by the fuel left in the tank or your company will be tagged with the bill for clean-up.

Directions: Divide the job up into tasks and list the hazards that could be associated with each task. What precautions will you take to prevent any of those hazards from becoming a reality.

UNFAMILIAR TERMS

Confinement -

Methods used to limit the physical size of the area of the release. Examples are covering a solid spill with a tarp to prevent particles from becoming airborne or building berms out of available materials to capture liquids in a pool. A volatile liquid may be sprayed with foam.

Containment -

Methods used to restrict the material to its original container. Examples include repositioning a leaking barrel so that the hole is on top, putting a plug into the hole or patching it, or transferring the material to another container.

Diversion -

The controlled movement of liquid from one area to another. For example, building a wall of dirt to redirect the flow of liquid to the desired area.

Diking -

Confining a land spill to an area by building a dike out of available material.

Retention -

Retaining hazardous materials in an excavated pit, pond, lagoon, or basin. Examples include placing a 55-gallon drum under a dripping valve or digging a pond with excavating equipment.

Dams -

A method to control materials spilled into a waterway.

Overflow dam -

Used when the material is heavier than water (specific gravity is greater than 1). The material will sink and the dam will allow relatively uncontaminated water to flow over the barrier.

Underflow dam -

Used to confine hazardous materials that float on the surface of the water. A dike constructed with a pipe placed lower on the upstream side and higher on the downstream side allows the uncontaminated water to flow up the pipe. This technique is limited to small waterways.

Booms -

A confinement method for material that floats and is insoluble in water. Acts as a barrier for a collection point where the material can later be skimmed off the top of the water. This method is not effective in rough water.

Permeation -

A chemical action involving the movement of a chemical, on a molecular level through intact material.

Penetration -

The movement of a substance through the closures - such as zippers, buttonholes, seams, and flaps - or other design features of chemical-protective clothing, and through punctures, cuts, and tears.

Degradation -

A chemical action involving the molecular breakdown of protective clothing or equipment due to contact with a chemical.

Chemical-Protective Clothing -

This type of clothing can be classified in two ways: (1) liquid splash-protective clothing (2) vapor-protective clothing. Both are designed to provide a shield or to isolate a person from chemical hazards.

Immediately Dangerous to Life and Health (IDLH) -

A situation that occurs when a maximum concentration of hazardous substance in the air will cause irreversible health effects if you do not escape within thirty minutes.

LEPC -

Local Emergency Planning Committee. The agency that creates a local emergency response plan for a community or facility.

Exclusion Zone -

Also known as the Hot Zone. The area that contains gross contamination.

Contamination Reduction Zone -

Also known as the Warm Zone. The area established between the exclusion and support zones.

Contamination Reduction Corridor -

The station where personnel are decontaminated and located in the Contamination Reduction Zone.

Support Zone -

Also known as the Cold Zone. The clean area outside of the contamination reduction zone. The area where incident resources support the hazardous materials operation and where equipment and people are not expected to become contaminated.

Reference materials for the definitions include "Decontamination for Hazardous Materials Emergencies" by Timothy V. Henry and an Occupational Health and Safety Dictionary.

ADDITIONAL RESOURCES

VERBAL RESOURCES

CHEMTREC
1-800-424-9300

BUREAU OF EXPLOSIVES
1-202-835-9500

NATIONAL RESPONSE CENTER
1-800-424-8802

CHEMICAL MANUFACTURER (MSDS)

SHIPPER

PRINTED RESOURCES

Emergency Handling of Hazardous Materials in Surface Transportation

From: Bureau of Explosives
Association of American Railroads
1920 "L" Street, NW
Washington, DC 20036

Emergency Response Guidebook

From: Materials Transportation Bureau
Research and Special Projects Administration
U.S. Department of Transportation
Washington, DC 20590

Dangerous Properties of Industrial Materials. By N. Irving Sax

From: Van Nostrand Reinhold Company
135 W. 50th Street
New York, NY 10020
- or a bookstore

Pocket Guide to Chemical Hazards

From: National Institute for Occupational Safety and Health (NIOSH)
1-800-35NIOSH
Free of charge

Condensed Chemical Dictionary by Gessner G. Hawley

From: Van Nostrand Reinhold Company
135 W. 50th Street
New York, NY 10020
- or a bookstore

Resources Available from the Division of Safety & Hygiene (DSH) Libraries

(800) 644-6292 (614) 466-7388

library@bwc.state.oh.us

www.ohiobwc.com

Safety training:

- Safety talks, outlines and scripts - DSH Safety leader's discussion guide, Training Center's One-hour safety presentations, reference books, web resources
- Videos – hundreds of safety and health topics
- Books and articles on training techniques

Machine and equipment safety:

- Safety standards (ANSI, NFPA, CGA)
- Books and articles on power presses, material handling equipment, lockout/tagout, etc.

Sample written programs:

- DSH program profiles and sample written programs
- Reference books
- Internet resources

Illness and injury statistics:

- Statistics from the U.S. Bureau of Labor Statistics
- National Safety Council's *Injury Facts*
- National Institute of Occupational Safety & Health (NIOSH) studies

Hazard communication and chemical safety:

- Chemical safety information
- Material safety data sheets (MSDSs)
- Sample written programs
- Videos
- Internet resources

Safety standards

- American National Standards Institute (ANSI) standards (including standards for construction, machinery and equipment, personal protective equipment)
- National Fire Protection Association (NFPA) fire codes (including the Life Safety Code and the National Electrical Code)
- Compressed Gas Association (CGA) standards

Other topics of interest (books, articles, magazines, videos and standards):

- Confined spaces
- Electrical safety
- Job safety analysis
- New employee orientation
- Powered industrial trucks
- Respiratory protection
- Safety culture
- Scaffolds

Directories and lists of vendors of safety equipment

Occupational Safety & Health Administration (OSHA) regulations

Manual of Uniform Traffic Control Devices (MUTCD)

Recommendations of useful Internet sites

BWC publications

**INTERNET WEB SITES
FOR
OCCUPATIONAL SAFETY & HEALTH INFORMATION
April 2005**

GENERAL

NATIONAL SAFETY COUNCIL (NSC)

<http://www.nsc.org/>

The NSC has a user friendly web site for innovative and current information on home, farm and community, on the road and workplace safety and as well statistical data and charts.

NORTH DAKOTA WORKFORCE SAFETY & INSURANCE

<http://www.workforcesafety.com/>

For workplace safety, North Dakota's WSI site puts forth their "safe operating procedures" page where they give information on accident and near miss reports, substance abuse, material handling and storage, walking and working surfaces, and safety program development and orientation.

OCCUPATIONAL & INDUSTRIAL SAFETY RESOURCES

<http://www.khake.com/page59.html>

Maintained by a Vocational Information Center, this web site provides links to occupational and industrial safety with lists of directories, national centers, hotlines and help lines as well as specific area coverage such as emergency, disaster and natural hazards, and tool, machine and equipment safety options.

OKLAHOMA STATE UNIVERSITY

<http://www.pp.okstate.edu/ehs/>

The Department of Environmental Health & Safety at OSU offers an online safety resource library that is constantly being updated with topics from A-Z including specific areas of safety such as fire, construction, HAZCOM and training. Go to the "Links Library" option.

SAFETY DIRECTORY

<http://www.safetydirectory.com/>

Safety Directory.com is an Internet gateway to occupational health & safety sites. This web site is indexed with information on industry specific topics, training, illness and injury, as well as safety publications and resources.

FEDERAL GOVERNMENT

CENTERS FOR DISEASE CONTROL & PREVENTION (CDC)

<http://www.cdc.gov/>

The CDC is always a good resource for current medical issues throughout the United States. Health topics from A-Z give an in-depth look at most communicable diseases as well as topics such as safe driving, violence, and air pollution, and workplace safety and health topics.

FEDERAL EMERGENCY MANAGEMENT ASSOCIATION (FEMA)

<http://www.fema.gov/>

For up-to-date information on active disasters and emergencies nationwide access this web site first. Publications include options for emergency preparedness and prevention, response and recovery, disaster fact sheets, and public awareness information.

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY & HEALTH (NIOSH)

<http://www.cdc.gov/niosh/homepage.html>

NIOSH's web site provides current information on many services as well as safety research, including ergonomics programs, respirators, and mining safety. At the chemical page you will find databases and other helpful resources, information on personal protective equipment, as well as government agency web sites of interest.

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION (OSHA)

<http://www.osha.gov>

OSHA'S official web site includes media releases, online publications, statistics, standards & directives, "Technical Links," training center courses, "hot topics," and "what's new" as well a very useful A-Z index page.

INTERNATIONAL RESOURCES

HEALTH & SAFETY EXECUTIVE (HSE)

<http://www.hse.gov.uk/>

The United Kingdom has an international safety web site with a good deal to offer on occupational safety & health. Drop down boxes offer A-Z industry information, health and safety topics, tools, research, as well as publications and statistics.

ERGNET

<http://www.sunderland.ac.uk/~ts0qli/ergnet.htm>

The University of Sunderland in the UK is an international web site directory of "places for ergonomics and human factors". Featuring lists of sources such as societies, organizations, government bodies, institutes, centers and laboratories, this site also gives links to journals, a research database and other general ergonomic sites.

OHIO

OHIO EPA (OEPA)

<http://www.epa.state.oh.us>

At the official web site for Ohio's Environmental Protection Agency; use the "Topic Index" to find regulations and information on permits, hazardous waste, pollution prevention, wastewater, wetlands, and much more.

OHIO STATE LIBRARY/OHIOLINK

<http://winslo.state.oh.us>

At **OhioLink**, a statewide library and information network, you can search the State Library of Ohio's collection for the BWC's Division of Safety & Hygiene library books as well as other Ohio College and university library collections. Also available at this web site are searchable versions of Ohio Administrative laws and rules, electronic databases, and other Ohio library directories.

SPECIFIC (BY SUBJECT)

CONSTRUCTION

<http://www.cdc.gov/elcosh/index.html>

CDC's **eLCOSH** is a comprehensive library of construction-related safety information presented in both English and Spanish with items listed under trade, hazard, job site, and others. Also see: The Construction Industry Safety Council, a Center to Protect Workers' Rights resource center at <http://www.buildsafe.org/RSC.htm> for OSHA publications in PDF and hazard alerts.

ERGONOMICS

<http://www.ergoweb.com>

ERGOWEB provides current information on ergonomics and human factor science. Offered are: research, case studies, reference material and a forum for questions, answers and discussion.

LABORATORY SAFETY

<http://safety.science.tamu.edu/>

Texas A&M University College of Science is an optional choice for safety in the laboratory information. From hazard identification to waste disposal this web site offers thorough coverage of laboratory safe practices.

MATERIAL SAFETY SHEETS

<http://www.ilpi.com/msds/index.html>

This web site offers many solutions for finding MSDS (100 free sites) as well as chemical manufacturers and suppliers, pesticides including fertilizers, government sites, and other miscellaneous locations for chemical data. Also check any toxicological effects at <http://www.atsdr.cdc.gov/toxprofiles/> and health and safety information on household chemical ingredients at <http://householdproducts.nlm.nih.gov/>.

MOTOR CARRIER SAFETY PROGRAMS

<http://www.fmcsa.dot.gov/safetyprogs/saftprogs.htm>

The Federal Motor Carrier Safety Administration (FMCSA), an administration within the U.S. Department of Transportation, regulates and supports the Nation's interstate commercial carrier industry. The FMCSA web page offers several safety programs in PDF format such as brake safety, fatigue, HAZMAT safety, speed management, sharing the road safely, and other insurance and licensing information.

RADIATION

<http://www.physics.isu.edu/radinf/>

The Radiation Information Network offers a web site that is in-depth with information on radiation topics and issues. In addition to what's new in the field and general information there are regulatory, organizational and society links as well as research and educational resources available to access.

SAFETY STATISTICS

<http://stats.bls.gov/>

Occupational health and safety statistics by industry and occupation can be researched for injuries, illnesses, and fatality data at this web site starting with the "Overview of BLS Statistics on Worker Safety and Health" page.

SAFETY BRIEFINGS, MANUALS, PRODUCTS & PROGRAMS

OSHA POWERPOINT SAFETY PRESENTATIONS

<http://esf.uvm.edu/sirippt/powerpt.html>

An extensive safety PowerPoint presentation library is available at this web site featuring A-Z topics such as accident investigations, bomb threats, chemical spills, construction, electrical, hand tools, emergency response, fire safety, forklifts, JSA, laser, OSHA compliance, PPE, razor knife safety, safe lifting, and many more.

SAFETY PUBLICATIONS & VIDEO RESOURCES

<http://www.cbs.state.or.us/external/osha/standards/pub.htm>

A valuable resource for safety resources, the Oregon State's Department of Consumer and Business Publications web site is packed with downloadable information. Areas covered are agriculture, asbestos abatement, occupational exposures, HAZCOM, HAZMAT, HAZWOPER, safety practices, writing manuals and programs, tools of the trade, workers' compensation and ergonomics.

Ohio Bureau of Workers' Compensation, Div. of Safety & Hygiene Library
 30 W. Spring St., L-3, Columbus, OH 43215-2256
 (800) 644-6292, press option 2 - 2
 (614) 466-7388/ (614) 644-9634 (fax)
 E-Mail: library@bwc.state.oh.us

Saving You Time and Research

Requests for copies of OSHA standards, information on starting a safety committee, a video on accident investigation techniques -- these are some of the thousands of inquiries BWC's Division of Safety & Hygiene (DSH) libraries receive each year.

DSH has two libraries to serve you:

- The central library in the William Green Building in downtown Columbus;
- The resource center and video library located at the Ohio Center for Occupational Safety and Health (OCOSH) in Pickerington.

Both libraries are open 8 a.m. to 4:45 p.m., Monday through Friday. Your need for information does not require a visit to the library. You can phone, fax, or e-mail your requests and receive a quick response.

The central library provides free information services on the topics of occupational safety and health, workers' compensation and rehabilitation.

The OCOSH resource center provides similar services for those who visit OCOSH for meetings and training center classes.

Students from the DSH training center can use the services and collections of the libraries to assist with the completion of their course **follow-up activities**. The librarians have recommended a variety of resources for the follow-up activities and are available to answer questions and provide assistance.

The video library offers an extensive collection of videotapes to supplement your organization's safety and health training program. It is a convenient and popular source for Ohio employers to borrow quality occupational safety- and health-related training aids.

Visit our Web site at **www.ohiobwc.com**.

Central library
30 W. Spring St., Third Floor
Columbus OH 43215-2256
1-800-OHIOBWC
(614) 466-7388
(614) 644-9634 (fax)
library@bwc.state.oh.us

OCOSH resource center
13430 Yarmouth Drive
Pickerington OH 43147
1-800-OHIOBWC
Resource center (614) 728-6464
Video library (614) 644-0018