IUOE

National HAZMAT Program

8-HOUR HAZMAT REFRESHER

Skilled Support Certification

Compliant with the

OSHA 1910.120 and 1926.65

HAZWOPER Standards

Local 49 Training Center

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SECTION ONE

HEALTH AND SAFETY PLAN (HASP)

TEN ELEMENTS OF A HEALTH AND SAFETY PLAN

OSHA requires the **HASP** to cover a minimum of the following 10 elements:

1. Health and Safety Risk or Hazard Analysis
2. Employee training
3. Personal protective equipment (PPE)
4. Specific medical monitoring
5. Air monitoring
6. Site control
7. Decontamination
8. Emergency response
9. Confined spaces
10. Spill containment

The **HASP** must be available to employees. Be sure to review it and ask questions.

1. HEALTH AND SAFETY RISK OR HAZARD ANALYSIS

Determining the health and safety risk and analyzing the hazards is called site characterization.

It's a 3-step process.

- ✓ **STEP 1**: **Off-site characterization.** As much research and evaluation as possible is done beforehand **away from the site** so that workers can be protected the first time they actually enter it. This information can be attained through a research of records, interviews with those who know the site, and a survey of the site's perimeter.
- ✓ **STEP 2**: **On-site surveys and assessments.** There might be many unknown hazards present on the jobsite, so sampling is required to be conducted. Level B PPE is the minimum level of protection, according to OSHA, for entering the site the first time. Air monitoring, visual surveys, soil, and water sampling is also recommended of potential hazards. The survey should identify the hazards present. It should also give an accurate idea of the location, size, topography, and accessibility of the site.
- ✓ **STEP 3**: **Ongoing monitoring** which is the final phase of the site characterization process**.** This provides the **S&HO** with data that might indicate the need to change the HASP. The monitoring makes certain the HASP remains a living document.

Indicators of Dangerous Conditions

- ✓ Confined spaces that must be entered, such as containers, tanks, buildings, or trenches
- ✓ Bulging drums, foaming, or gas generation
- ✓ Extremely hazardous materials (for example, cyanide, phosgene)
- ✓ Visible vapor clouds
- ✓ Biological indicators (dead animals, vegetation)
- ✓ Strange odors

The final HASP describes the activities to be completed during cleanup, based on the hazards found, and how long they should take.

2. Employee Training

- OSHA requires that you receive a minimum of 40 hours of training.
- OSHA also requires that you receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced supervisor when you begin a job.
- Your employer is required to provide you with a copy of the **HASP,** review it with you to highlight the hazards on the jobsite, and share any updates or changes.

3. PERSONAL PROTECTIVE EQUIPMENT

- The HASP details the specific personal protective equipment (PPE) that is required for the HAZMAT site.

According to the Respirator Standard (1910.134) there are 3 things that must happen, before you ever wear a respirator:

1. Physical Exam
2. Trained on the respirator you're going to be wearing.
3. You are required to pass a fit test for the type of respirator to be used.

4. SPECIFIC MEDICAL MONITORING

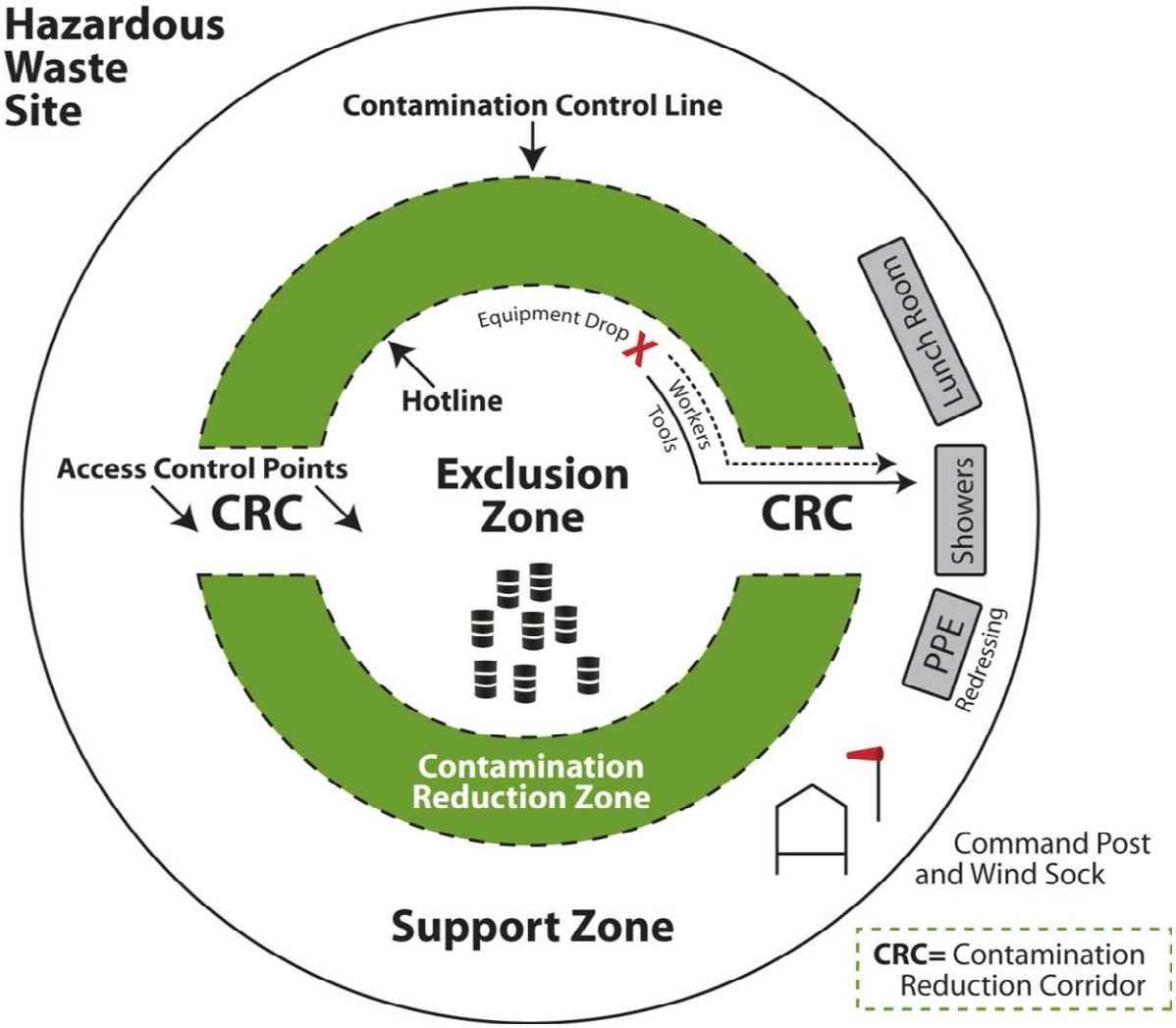
- The HASP identifies the standard medical monitoring program for the site, based on the hazard. The medical monitoring requirements vary from site to site, depending on the conditions of the site and the chemicals you are exposed to.

5. AIR MONITORING

- The HASP lists or identifies the following:
  - ✓ The chemicals to be monitored.
  - ✓ How frequently the air is to be checked.
  - ✓ Any activities that require additional monitoring.
  - ✓ Action levels – levels that trigger evacuation or ending an activity when exceeded.
  - ✓ Permissible Exposure Levels (PEL) for chemicals present on the worksite.
  - ✓ The types of monitoring instruments to be used, including how they are to be calibrated and maintained.

6. SITE CONTROL

- The HASP should cover the following site control requirements:
  - ✓ Security and physical barriers.
  - ✓ Work zones are established and clearly demarcated.
  - ✓ Control points regulate access to work zones.
  - ✓ In order to control hazardous materials from contaminating areas outside the site, the HASP designates **work zones.** The zones feature access control points to limit movement between zones.
  - ✓ Typically, there are 3 zones:
    1. **Exclusion Zone** – Hot Zone or Red Zone
    2. **Contamination Reduction zone** – the Buffer Zone
    3. **Support Zone** – Clean Zone



- ✓ The **buddy system** is standard operating procedure when working in a hazardous area. OSHA requires that you always perform work with another or within a group or team, this way you have someone to assist you if something goes wrong, to check each other for chemical or heat exposure.
- ✓ **Site security** prevents unauthorized, unprotected people from exposure to the site's hazards. It protects against vandals and illegal dumping. It prevents theft and promotes safe working conditions.
- ✓ A hazardous waste site requires 2 types of **Site Communications:**
  1. The **External**: outside agencies: fire department, police, hospital, or rescue team.
  2. The **Internal:** system is used to notify workers of emergencies, communicate work changes, maintain site control, or pass along safety information such as the amount of air or time left before the next rest period.
- ✓ **Standard Operating Procedures** (SOPs) are uniform instructions for doing a specific job.

7. **DECONTAMINATION PLAN**
   - Explains the decontamination procedure that must be in place before any workers or equipment enter an area where potential hazardous exposure might occur.
   - The plan explains
     - ✓ Disposal of contaminated clothing and decontamination water
     - ✓ Requirements for showering and cleaning contaminated personal
     - ✓ Decon of equipment and waste containers

8. **EMERGENCY RESPONSE PLAN**
   - The emergency response plan incorporates:
     - ✓ Advance planning.
     - ✓ Personnel roles.
     - ✓ Incident command system – chain of command.
     - ✓ Site map for emergency use.
     - ✓ Communication and locator systems.
     - ✓ Equipment needs.
     - ✓ Training and drills.
     - ✓ Escape routes and secure areas.
     - ✓ Self-rescue training.
     - ✓ Emergency response procedures.
     - ✓ Contact procedure for off-site assistance.
     - ✓ Follow-up evaluation of emergency response effectiveness.
     - ✓ Emergency aid and medical treatment.

   It's important to know your role in an emergency and how to react. This plan within the overall HASP offers you that information.

9. **CONFINED SPACES**
   - OSHA requires through the Confined Space Standard and the HAZWOPER Standard that your employer must have a program for training you in working within the Permit Required confined spaces.
   - If there is a designated confined space on the HAZMAT site, the OSHA rules must be followed.

10. **SPILL CONTAINMENT**
    - The HASP outlines the steps for reducing and cleaning of a spill:
      - ✓ Containing spilled material
      - ✓ Handling and isolating the spill quickly.
      - ✓ Alerting personnel if an emergency develops.
      - ✓ Notifying the appropriate agencies.
      - ✓ Documenting the occurrence and steps taken to handle the spill.

- Containing a spill can involve several approaches outlined in the plan:
  - ✓ Berms and dikes
  - ✓ Over-Packs.
  - ✓ Diversion and collection trenches or ditches.
  - ✓ Collecting pans under equipment.
  - ✓ Absorbent materials.
  - ✓ Vapor suppression and ventilation.
  - ✓ Solidification agents/foams or neutralizing agents.
- The emergency response plan identifies who decides the appropriate response in a spill and what response is necessary, such as evacuation.
- Depending on the hazard and quantity of the spilled material, a spill also might require certain Federal, State, or Local agencies to be notified.

REVISING THE HEALTH AND SAFETY PLAN

- The HASP is a living document. When conditions change at the site, so must the HASP. However, a new HASP isn't created when new tasks or hazards are identified; the current HASP is revised, instead.
- The site manager or **S&HO** is responsible for updating the HASP to reflect any changes at the site and for keeping it on site at all times.
- The **ongoing monitoring** that the HASP requires gives the best indication when it might be time to revise the HASP. Monitoring can show when exposure to hazards has increased above PELs, especially for those workers who may work the closest with the hazards at the site.

SECTION TWO

TOXICOLOGY – How chemicals affect your body.

Toxicology is the study of the nature and actions of chemicals on the body. Toxicity is the capability of a chemical to harm a living organism. The living organism you're concerned with is the human body.

Controls at the worksite help prevent your exposure to toxic chemicals:

- ✓ Site characterization – knowing what you're going to come in contact with.
- ✓ The zone system.
- ✓ The HASP.
- ✓ The decontamination processes.
- ✓ The air monitoring taking place while working with the hazard.
- ✓ The PPE and respirators you wear to protect you from the hazard.
- ✓ The primary concern is reducing exposure to any harmful chemical.

ROUTES OF EXPOSURE

There are 5 routes or ways that chemicals can affect us:

1. Inhalation
2. Ingestion
3. Absorption
4. Contact
5. Injection

INHALATION

Inhalation is the most common route of entry for chemicals and it's also the most efficient way for a chemical to enter your body.

ABSORPTION

Often the skin stops chemicals from entering your body. However, some chemicals can be absorbed all the way through the various layers of skin into the bloodstream, causing systemic problems/poisoning.

It's easiest to be absorbed in the following areas:

- **Groin** – can absorb 300 times faster
- **Bottom of the feet**
- **Eyelids and Armpits**
- **Rest of the skin**

CONTACT

Local irritation would be:

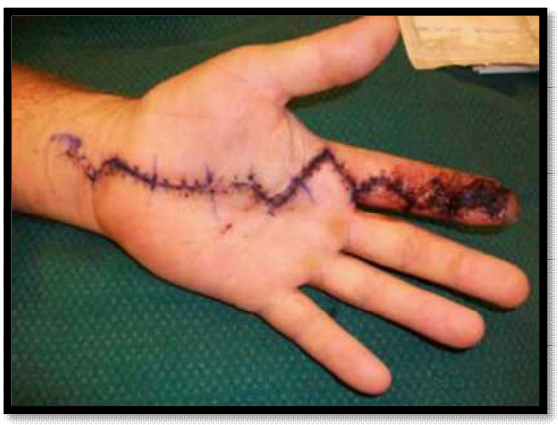
- ✓ Burns
- ✓ Blistering
- ✓ Rashes
- ✓ Festering/non-healing wounds

These would be the most common type of chemical exposure injury, and in fact they usually never get reported.

INGESTION

Swallowing a toxic chemical through the digestive tract is another way of exposing your body to a health hazard. It's easier to ingest chemicals through the mouth than you might think.

- ✓ When you eat, drink, smoke, or apply cosmetics in a contaminated area, you run the risk of contaminating your hands and ingesting the contaminant.
- ✓ That's why you're told to **always wash your hands** before you eat when you work around hazardous chemicals.
- ✓ Ingesting toxic chemicals can damage your digestive tract.
- ✓ Physical effects can arise as well if the body is able to break down the chemical and allows the chemical to get into the bloodstream, which moves it throughout the body.



INJECTION

Injection, hydraulic or pneumatic pressure systems could be the most common route of entry for heavy equipment operators.

Toxic substances can be injected into your body through:

- ✓ Puncture wounds
- ✓ Cuts or scrapes
- ✓ High pressure spray of gas or liquid

For example, pressurized hydraulic fluid poses serious injection potential.

CHEMICALS IN THE BODY

Your body will react 3 ways when exposed to a chemical:

> Toxic chemicals damage the body by speeding up or slowing down body functions.

1. **Metabolize:** When the body metabolizes a chemical, it breaks it down, or changes its composition.
2. **Store:** The body can store the chemical so that it accumulates to dangerous levels later.
3. **Excrete:** If the body can't absorb the chemical, it can simply pass it out through urine, feces, or exhaled air.

INDIVIDUAL SUSCEPTIBILITY FACTORS

- **Health status:** If you're sick and your immune system is weakened, you are more susceptible to the chemicals.
- **Age:** You are born very susceptible to chemicals and build up immunity as you grow.
- **Sex:** Men and women react differently to some chemicals.
- **Pregnant or Nursing women:** chemicals can be delivered to the babies.
- **Genetics:** Genetically you maybe more or less susceptible to certain chemicals.
- **Race:** Some chemicals react differently for members of certain races

TARGET ORGANS

- The organs most affected by toxic substances are called target organs.
- The following are your bodily systems that might be affected by chemicals:

> Remember, any part of the body can be affected by chemicals.

  - ✓ **Skin**: the largest organ of the body by weight.
  - ✓ **Central Nervous System (CNS)** includes the brain and spinal cord. Look for symptoms such as staggering, slurring of speech, dizziness, trembling, and twitching to indicate exposure.
  - ✓ **Liver** helps digest fats, filters many substances from your blood, and store some sugars. Chronic exposure to certain chemicals can cause liver problems. If you notice a yellowing of your skin (jaundice), you're probably experiencing liver problems.
  - ✓ **Kidneys** filter blood, produce urine, and keep a proper acid-base balance. Any problems urinating might indicate exposure to a hazardous chemical.
  - ✓ **Blood and blood-forming system** circulates oxygen, carbon dioxide, infection-fighting organisms, proteins, sugars, and toxins throughout the body.
  - ✓ **Reproductive system** includes all organs necessary for fertilization, conception, and gestation. Common problems are sterility, infertility, and disrupted hormone activity.
  - ✓ **Respiratory system** regulates the oxygen and carbon dioxide in the body. Beware of any breathing difficulties to indicate exposure.
  - ✓ **Eyes** acids and corrosives damage the eyes by direct contact. Some toxins enter the eye and go straight to the bloodstream or brain.

The person who can best tell whether you're suffering from chemical exposure is you. If you're feeling sick and you've been working around chemicals, let your doctor know. Bring a list of chemicals from the **Safety Data Sheet (SDS)** if possible. The doctor might not know to suspect chemical exposure when you're feeling ill if you don't alert him or her about your potential exposures.

HEALTH EFFECTS

- To understand the effects of a chemical on your body, you need to know what kind of exposure you've had and how quickly the symptoms appear.
- These effects fall into two classifications:
  1. **ACUTE:** Acute effects typically display these characteristics:
     - **Exposure:** One-time, high-level exposure.
     - **Effects:** Symptoms are usually immediately apparent but can be delayed.

     ✓ Acute does not mean mild. One severe exposure can cause permanent tissue damage or even death.
     ✓ Here are some examples of acute effects:
     - **Inhaled contaminants**: coughing, wheezing, nose and throat burning.
     - **Skin contact**: redness, rash, blistering.
     - **Ingested contaminants**: nausea, vomiting, diarrhea.

  2. **CHRONIC:** Chronic effects typically display these characteristics:
     - **Exposure:** Low-level exposure over a long period of time.
     - **Effects:** Symptoms may not show up for 10 to 20 years.

DOSE RESPONSE RELATIONSHIPS

Some chemicals you work with are harmless. That's true to some extent, but it points out an important concept: **ALL SUBSTANCES ARE POTENTIALLY TOXIC!**

- The toxic potential of a chemical is defined by the relationship between:
  - The dose of the chemical
  - The response that is produced in a biological system.
- This is called the **dose response relationship**.
- Quite simply: **It's the dose that makes the poison**.

EXPOSURE LIMITS

- All based on an 8-hour Time Weighted Average (TWA).
- Measured in:
  - ✓ **Parts per million** (ppm) or
  - ✓ **Milligrams per cubic meter** (mg/m^3).

- **Permissible Exposure Limits** (**PEL) – Legal limits**
  - ✓ OSHA regulations establish the legal PELs. These are important because they are the only exposure limits that are legally binding for an employer.

THE LOWER THE PEL; THE MORE DANGEROUS THE CHEMICAL.

- **Threshold Limit Values (TLV) – Recommended limits**
  - ✓ TLVs are the oldest exposure limits in existence.
  - ✓ Created by the American Conference of Governmental Industrial Hygienists (ACGIH).
  - ✓ Also measured in **ppm** or **mg/m^3**.

- **Recommended Exposure Limits (REL) – Recommended limits**
  - ✓ Created by National Institute of Occupational Safety and Health (NIOSH)
  - ✓ They're based on up to **10 hours** of exposure per day using a time-weighted average.
  - ✓ Also measured in ppm or mg/m^3.

- On a **Safety Data Sheet** you might see all three limits (PELs, TLVs, & RELs) listed, so it's important to understand each and remember that **only OSHA's PELs are legally binding.**

- **Short-Term Exposure Limit (STEL)**
  - ✓ The **maximum** concentration of a chemical to which you can be exposed to:
    - For a short period of time – 15 minutes
    - A maximum of 4 times throughout the day
    - With at least one hour between exposures.

- **Immediately Dangerous to Life or Health (ILDH)**
  - ✓ OSHA has set IDLH levels. This is the maximum concentration, in the air, from which you could escape within 30 minutes without any escape-impairing symptoms or any irreversible health effects.
  - ✓ Any unknown situation is treated as an IDLH atmosphere and requires, **at a minimum, Level B PPE**, until sampling and site determination has been completed.

If you face an IDLH situation, leave immediately until you can return with proper PPE.

The 30 minutes defined by OSHA does not mean you should wait 30 minutes before leaving.

SECTION THREE

HAZARD COMMUNICATION – HAZCOM
GLOBAL HARMONIZED SYSTEM – GHS

What is hazard communication?
Hazard Communication (HAZCOM) is the communication of chemical hazards to workers.

- **OSHA has a HAZCOM standard. Why do we need one?**
  - ✓ 32 million workers work with or are exposed to one or more chemical hazards - OSHA.
  - ✓ Over 70 million chemicals are commercially available – CHEMCATS
  - ✓ Over 600 new chemicals are introduced every year – CAS
  - ✓ Only 295,207 substances are inventoried or regulated-CHEMLIST
  - ✓ Roughly 22% of workplace diseases and injuries are caused by chemicals (International Labor Organization)

According to the International Labor Organization's (ILO) 2016 report on occupational disease, there are 53 known occupational diseases caused by chemical agents.

- **The HAZARD COMMUNICATION STANDARD (HCS) is also known as:**
  - ✓ "HAZCOM" and was previously known as: "**RIGHT TO KNOW**"
  - ✓ GHS now goes with the phrase "**RIGHT TO UNDERSTAND**"
  - ✓ OSHA 29 CFR 1910.1200

- Knowledge acquired under the HCS will help employers to:
  - ✓ Provide safer workplaces for their employees.
  - ✓ Share the information about the chemicals being used.
  - ✓ Take steps to reduce exposures.
  - ✓ Substitute less hazardous materials and chemicals.
  - ✓ Establish proper work practices.

- **Requirements in the HAZCOM standard designed to protect workers**
  - ✓ Written HAZCOM Program
  - ✓ Company chemical inventory and control
  - ✓ Hazard classification of chemicals
  - ✓ SDSs available for hazardous substances in the workplace
  - ✓ Labeling of hazardous chemicals
  - ✓ Documented training of employees
  - ✓ Employers make required information available to all employees

- **MAJOR CHANGES TO THE HAZARD COMMUNICATION STANDARD:**
  - ✓ **Hazard classification:** Chemical manufacturers and importers are required to determine the hazards of the chemicals they produce or import.
  - ✓ **Labels:** Chemical manufacturers and importers must provide a label that includes a signal word, pictogram, hazard statement, and precautionary statement for each hazard class and category.
  - ✓ **Safety Data Sheets:** The new format requires 16 specific sections, ensuring consistency and presentation of important PPE protection information.
  - ✓ **Information and training:** Those workers are trained and employers document the new requirements established in the standard. To include the new label elements, SDS format, location of SDSs, and all other current training requirements.

The GHS has set criteria for classification of chemicals according to 3 major categories:

1. Physical hazards
2. Health hazards
3. Environmental hazards.

- **Hazard Communication Standard Labels**

GHS has updated the requirements for labeling of hazardous chemicals to include the following:

- ✓ All labels will be required to have pictograms
- ✓ A signal word, hazard or warning
- ✓ PPE requirements
- ✓ Precautionary statements
- ✓ Product and Supplier identification
- ✓ Supplemental information can also be provided on the label as needed.

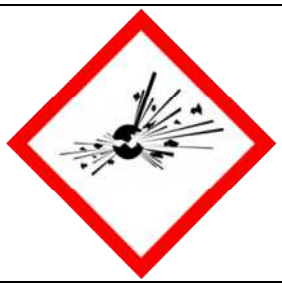
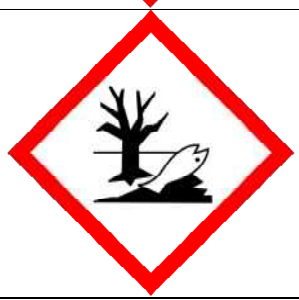
- **Signal words are used to emphasize and to discriminate between levels of hazard**
  - ✓ A signal word refers to a word used to indicate the relative level of severity of hazard and alert the reader to a potential hazard on the label.
  - ✓ **"DANGER"** is used for the more severe hazard categories. For example, "Danger" is used for Acute Toxicity Category 1, 2 and 3 chemicals.
  - ✓ **"Warning"** is used for Category 4.

- **These are the hazard statements for chemicals that are ACUTELY toxic:**
  - ✓ Category 1: "Fatal if swallowed"
  - ✓ Category 2: "Fatal if swallowed"
  - ✓ Category 3: "Toxic if swallowed"
  - ✓ Category 4: "Harmful if swallowed"
  - ✓ Category 5: "Maybe harmful if swallowed"

The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked

Pictogram hazard symbols to identify the hazards

	**The Health Hazard pictogram looks like this and warns of:** ✓ Carcinogen – causes cancer ✓ Mutagenicity – mutates cells or tissue ✓ Reproductive toxicity ✓ Respiratory sensitizer – damages lungs or airways ✓ Target organ toxicity – dangerous for select organs
	**The Flame pictogram looks like this and warns of:** ✓ Flammables ✓ Pyrophoric – bursts into flames when exposed to air ✓ Self-heating – suddenly heats up during different conditions ✓ Emits flammable gas ✓ Self-reactives ✓ Organic peroxides
	**The Exclamation Mark pictogram looks like this and warns of:** ✓ Irritant – skin and eye ✓ Skin sensitizer – blister or burn ✓ Acute toxicity – harmful ✓ Narcotic effects ✓ Respiratory tract irritant – coughing, wheezing, burning of lungs ✓ Hazardous to ozone layer (**non-mandatory**)
	**The Gas Cylinder pictogram looks like this and warns of:** ✓ Gases under pressure
	**The Corrosion pictogram looks like this and warns of:** ✓ Acids ✓ Skin corrosion/ burns ✓ Eye damage ✓ Corrosive to metals

	**The Exploding Bomb pictogram looks like this and warns of:** ✓ Explosives ✓ Self-reactive ✓ Organic peroxides
	**The Flame over a Circle pictogram looks like this and warns of:** ➢ Oxidizers – a fuel and supports combustion
	**The Skull and Crossbones pictogram looks like this and warns of:** ➢ Acute toxicity (severe) ➢ Highly poisonous
	This pictogram is **Non-mandatory under HCS**. While the GHS includes criteria on classifying chemicals for aquatic toxicity, these provisions were not adopted in the GHS Final Rule **because OSHA does not have the regulatory authority to address environmental concerns**.

Category 1	Category 2	Category 3	Category 4	Category 5
 **DANGER** **Fatal if swallowed**	 **DANGER** **Fatal if swallowed**	 **DANGER** **Toxic if swallowed**	 **WARNING** **Harmful if Swallowed**	**No Symbol** **WARNING** **May be harmful if swallowed**

The Hazard Communication Standard 2012 Safety Data Sheet (SDS)

The information contained in the SDS is largely the same as the MSDS, except now the SDSs are required to be presented in a consistent user-friendly, 16-section format.

Section 1: Identification – This section identifies the chemical on the SDS as well as the recommended uses. It also provides the essential contact information of the supplier.
Section 2: Hazard(s) Identification – This section identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards.
Section 3: Composition/Information on Ingredients – This section identifies the ingredient(s) contained in the product indicated on the SDS, including impurities and stabilizing additives. This section includes information on substances, mixtures, and all chemicals where a trade secret is claimed.
Section 4: First-Aid Measures – This section describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical.
Section 5: Fire-Fighting Measures – This section provides recommendations for fighting a fire caused by the chemical.
Section 6: Accidental Release Measures – This section provides recommendations on the appropriate response to spills, leaks, or releases, including containment and cleanup practices to prevent or minimize exposure to people, properties, or the environment.
Section 7: Handling and Storage – This section provides guidance on the safe handling practices and conditions for safe storage of chemicals.
Section 8: Exposure Controls/Personal Protection – This section indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure.
Section 9: Physical and Chemical Properties – This section identifies physical and chemical properties associated with the substance or mixture.
Section 10: Stability and Reactivity – This section describes the reactivity hazards of the chemical and the chemical stability information.
Section 11: Toxicological Information – This section identifies toxicological and health effects information or indicates that such data are not available.
Section 12: Ecological Information (NON-MANDATORY) – This section provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment.
Section 13: Disposal Considerations (NON-MANDATORY) – This section provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices.
Section 14: Transport Information (NON-MANDATORY) – This section provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea.
Section 15: Regulatory Information (NON-MANDATORY) – This section identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS.
Section 16: Other Information – This section indicates when the SDS was prepared or when the last known revision was made. The SDS may also state where the changes have been made to the previous version.

SECTION FOUR

MONITORING and INSTRUMENTATION

The monitoring is important for knowing what hazards are at your jobsite, how serious they are, and what should be done to ensure your short-term and long-term safety.

The monitoring program is a required part of the HASP and is needed to provide for a safe environment during HAZMAT operations.

- There are numerous reasons for carrying out workplace or site monitoring:
  - ✓ Identify hazards.
  - ✓ Determine the level of worker PPE needed.
  - ✓ Evaluate the effectiveness of PPE, engineering controls, and work practices.
  - ✓ Assess worker exposure to chemical, physical, and biological hazards.
  - ✓ Determine compliance with occupational and environmental regulations.
  - ✓ Locate and evaluate potential sources of contamination.
  - ✓ Evaluate uncertain exposures.
  - ✓ Evaluate the effectiveness of the decontamination process.
  - ✓ Identify the need for further sampling requirements.

There are 2 major methods used for identifying or measuring chemical, physical, and biological hazards:

1. **Direct Reading Instruments**
   - ✓ They were developed as early warning devices.
   - ✓ They are the main instruments of initial site monitoring and continuous and ongoing site surveys.
   - ✓ They give you an instant readout to let you know about any dangers present.
   - ✓ They also swiftly alert you to flammable or explosive atmospheres, oxygen deficiency, specific gases, vapors, and ionizing radiation.

2. **Laboratory Analysis**
   - ✓ Although there are plenty of benefits to using direct reading instruments, they also have their drawbacks:
     - Perhaps their most glaring weakness is that they rarely are sensitive enough to measure smaller concentrations of a contaminant, though that smaller concentration may be hazardous.
     - They're also limited in their ability to track multiple chemicals. Typically, they are designed to track one or two gases.

➢ **Portable Direct Reading Instruments**

Portable direct reading instruments are a key part of your safety at a jobsite, especially sites in which it is not possible or realistic to set up permanent monitors.

Here are some of the more common types of portable instruments:

- ✓ Combustible gas and oxygen indicator
- ✓ Flame ionization detector
- ✓ Photoionization detector
- ✓ Detector tube
- ✓ Sound level meter
- ✓ Radiation detector

➢ **Limitations**

Direct reading instruments are not without flaw. They have several limitations:

- ✓ They usually detect and/or measure only specific classes of chemicals.
- ✓ They might detect more than one substance, thus giving false readings.
- ✓ Temperature, wind speed, rainfall, and humidity might affect their accuracy.
- ✓ Worksite activities might physically disturb the contaminants, thus changing the concentration and their rate of emission.
- ✓ Correct calibration is essential, and they require constant checks.
- ✓ Their detection range might be limited.
- ✓ The response time of some instruments might be inadequate.

- **Personal Monitoring Devices**

They measure your exposure to certain types of physical or chemical agents. They can be battery operated and detect various forms of energy, fibers, dust particles, sound, temperature, and radiation.

Here are some common personal monitoring devices:

- ✓ Personal combustible gas and oxygen indicators
- ✓ Carbon monoxide monitors
- ✓ Chlorine and hydrogen sulfide monitors
- ✓ Colorimetric dosimeters
- ✓ Self-reading dosimeters (noise, radiation)

- ✓ If you are asked to wear a personal monitoring device, wear it as instructed.
- ✓ Don't tamper with or remove it during the monitoring period.

THEY WILL BE WORN IN YOUR "BREATHING ZONE"

- **Detector Tube**

A colorimetric detector tube is a glass vial containing a chemical that reacts with the specific contaminant being monitored. The tubes can be used to measure the concentrations or presence of a wide variety of compounds.

Accurate + or – 25%

People use detector tubes to screen for specific organic and inorganic gases and vapors and to detect leaks.

NOT TO BE USED TO DETERMINE APPROPRIATE PPE.

- **On-Site Monitoring**
  - ✓ Known or suspected contaminated areas.
  - ✓ Perimeter or Area samples.
  - ✓ Decontamination area
  - ✓ Workers breathing or work zone

- **Periodic Testing and Continuous Monitoring**
  - ✓ Conditions change at a worksite.
  - ✓ What the monitoring found when the job started might not be exactly the same once the job is progressing.
  - ✓ OSHA and the HASP require the monitoring to be done on a periodic schedule.
  - ✓ What may be safe to breathe one day might be hazardous to your health later once contaminants are released or disturbed.
  - ✓ Verify proper PPE and protection.
  - ✓ Spills

SECTION FIVE

Medical Surveillance

- A medical surveillance program provides a way for your employer to evaluate your health if your job exposes you to hazardous agents.
- "**Medical Screening**" is essential for your early diagnosis and treatment.
- "**Medical surveillance**." involves a broader picture. Its purpose is to detect, document, and then eliminate the cause of the hazard, so it focuses on prevention.

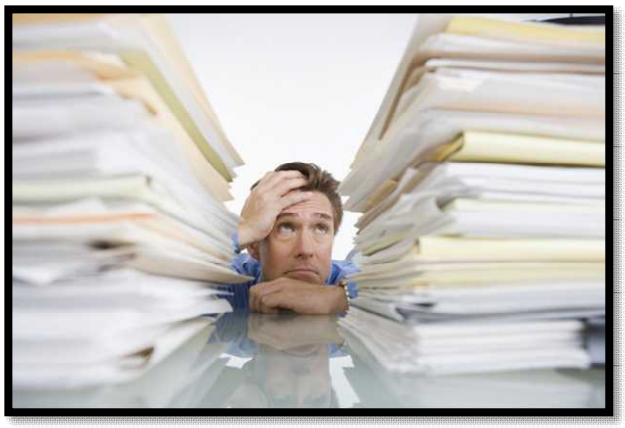
Medical Surveillance Requirements

- The OSHA has specific guidelines that regulate medical surveillance programs. Employers must maintain a medical surveillance program is required when:
  - ✓ Workers are exposed or potentially exposed to hazardous wastes or health hazards above OSHA's PELs for 30 or more days per year.
  - ✓ Workers wear approved respirators for 30 or more days per year.
  - ✓ Workers not wearing appropriate PPE are exposed to accidental or emergency releases of hazardous wastes above exposure limits.
  - ✓ Workers show symptoms of an illness that may have started from exposure to hazardous substances.
  - ✓ Workers are members of hazardous materials (HAZMAT) teams.

Medical Surveillance Program Provisions

- A medical surveillance program must be in place for each workplace where there is potential for employee exposure to health risk situations or the wearing of respirators.
- Created by a Licensed Health Care Professional (Occupational Physician) and an employer's Safety Officer.
- All physical examinations must be done by a licensed physician without cost to you the employee, with no loss of pay, and at a reasonable time and place.
- You must have a Physicians Written Opinion to wear a respirator.
- Most exams must be performed annually or every two years, if approved by a physician.
- A complete medical and work history is included in the physical exam.
- You must be found "fit for duty."
- Exams must be performed any time you are injured or become ill because of an exposure to a hazardous material or when you show signs of exposure.

- **Medical Records**



In some situations, OSHA requires physical exams before, during, and after many jobs that expose or potentially expose you to hazardous conditions, as part of the medical surveillance.

- Your employer must provide the doctor:
  - ✓ A copy of the OSHA standard specific to the workplace.
  - ✓ A description of your duties as they relate to the hazard.
  - ✓ Employers receive a medical report.
  - ✓ The estimated exposure level of the hazard.
  - ✓ A description of the PPE and/or respiratory equipment to be used.
  - ✓ Any information from previous medical examinations for possible comparisons.

- **Recordkeeping**

According to OSHA standards (29 CFR 1910.20), **employers** are required to provide workers with information they need to monitor their own safety and health. The standard allows workers exposed to hazardous materials to access their medical records. OSHA may also access their medical records.

- Employers must:
  - ✓ Keep exposure/monitoring records for 30 years.
  - ✓ Keep medical records for the length of employment plus 30 years.
  - ✓ Provide the records to the employee upon termination of employment.
  - ✓ Advise the worker of the location and availability of the records.
  - ✓ Notify the NIOSH if they plan to stop doing business. A new owner is allowed to take over the maintenance of the records.

- **Medical Exam**

Your employer also receives a detailed report that covers:

  - ✓ Your fitness for duty.
  - ✓ Your ability to wear all relevant PPE.
  - ✓ Comparisons to previous medical exams.
  - ✓ Comparisons to the overall finding and trends of all workers involved.
  - ✓ Recommendations for ways to prevent or reduce potential adverse health effects.
  - ✓ Biological monitoring consists of collecting and analyzing blood, urine, sputum or other body fluids and tissues to look for evidence of exposures to a variety of hazardous chemicals.
  - ✓ Whether you can go back to work, after being treated for any job-related injury.

SECTION SIX

RESPIRATORY PROTECTION

Why Wear a Respirator?

Your nose and mouth, in fact, provide a major route for toxic substances to enter your body. Without the proper protection breathing can put you at risk. That is why respiratory protection is so important. one of the most dangerous hazards you face is one you likely cannot see; **AIRBORNE HAZARDS**

- **Respirator Protection Program**

Your employer is also responsible for creating and maintaining a respiratory protection program (29 CFR 1910.134) as part of the personal protective equipment program. Both are part of the OSHA required HASP.

- 10 mandatory parts to the Respirator Protection Program:
  1. One person designated to be in charge of the program.
  2. Written procedures for choosing and using respirators.
  3. Program must be reviewed for effectiveness annually.
  4. Everyone wearing a respirator must have a medical exam.
  5. Everyone wearing a respirator must have documented training.
  6. Can only use NIOSH approved respirators.
  7. Respirators must be chosen based on the hazards.
  8. Everyone wearing a respirator must have documented fit tests.
  9. Respirators must be inspected and repaired.
  10. You must be provided with a safe place to store your respirator.

- **Training**

If you are going to use a respirator, OSHA requires that you receive proper training from your employer.

- Documented Respirator Training must:
  - ✓ Occur **BEFORE** you use the respirator;
  - ✓ Be understandable to you based on your education level and language background;
  - ✓ It must be comprehensive enough to cover all the items necessary;
  - ✓ It must be provided annually or more often if necessary.
  - ✓ The training should make clear how to properly use the respirator and ensure a proper fit.
  - ✓ It also should make clear the consequences of improper use or fit, such as chronic disease or death because of exposure to airborne contaminants

- **Respiratory Selection**

The type of respirator you wear depends on a number of factors:

- ✓ Toxicity of the hazard.
- ✓ Concentration of the contaminant
- ✓ Type of hazardous material
- ✓ The amount of oxygen present
- ✓ The nature and extent of the hazard
- ✓ Mobility
- ✓ Work requirements and conditions
- ✓ Limitations and characteristics of the available respirators.

✓ **Respiratory Types**

Respirators fall into 2 categories:

1. **Air Purifying (APR):** They use filters or sorbents to remove harmful substances from the air before you breathe it. It is important to understand that air purifying respirators ***DO NOT*** supply oxygen. For this reason, you ***CANNOT*** wear an air purifying respirator when oxygen levels are below 19.5 percent by volume or in an IDLH atmosphere.
2. **Supplied Air (SAR):** provide you clean air from a source other than the surrounding contaminated work atmosphere. SARs and self-contained breathing apparatus (SCBA) would both deliver clean air from a fixed source. Both of them will deliver the clean air, to your respirator; through an airline hose which can be up to 300 feet long.

- **Types of Airflow**

Respirators are further organized by the type of airflow they supply to the facepiece. There are 3 types:

1. **Negative pressure respirators:** you draw air into the facepiece, through the appropriate filter, when you inhale.
2. **Continuous flow respirators:** you receive a continuous flow of air through a filter or hose into the facepiece. There are some SARs and all Powered Air Purifying Respirators (PAPR) fall into this category.
3. **Positive pressure/Pressure demand respirators:** the highest level of protection, maintains a positive pressure in the facepiece whether you are inhaling or exhaling. They have a pressure regulator and an exhalation valve to maintain the positive pressure. Even if a leak develops, the regulator keeps you from inhaling contaminated air.



- **Respiratory Protection for Levels of PPE**

PPE Level	Summary	Protection Required
A	- Highest level of skin and eye protection. - Highest level of respiratory protection.	Totally enclosed chemical protective clothing/suit (CPC) SCBA, or SAR-E
B	- Requires the highest level of respiratory protection - Required appropriate level of skin protection.	CPC suit SCBA, or SAR-E
C	- Appropriate APR or SAR respiratory protection - Required appropriate level of skin protection.	CPC suit APR, PAPR, or SAR
D	- The atmosphere contains no known hazards. - No respiratory protection - Minimal skin protection.	Work Clothes

- **Particulate Filters**
  - ✓ Effective for dust, fumes, and mist.
  - ✓ Ineffective for gases, vapors, or oxygen deficiency.

Those classes are organized into three filter series based on their ability to remove particles as a result of oil aerosols in the work environment:

N = **N**ot resistant to oil
R = **R**esistant to oil
P = oil **Proof**

Then within each series are three levels of particulate filter efficiency:
95 – Will filter out 95% of the contaminants.
99 – Will filter out 99% of the contaminants.
100 – Will filter out 99.97% of the contaminants.

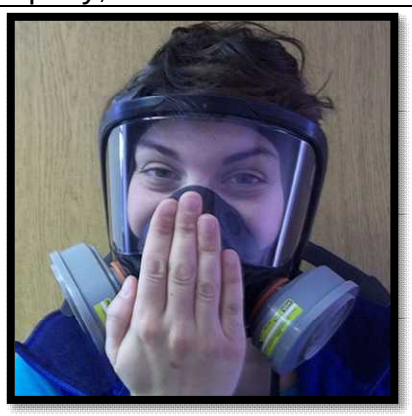
This table summarizes the different effectiveness of the filters you might be wearing:

N	R	P
100	100	100
99	99	99
95	95	95

- **OSHA Requirements before you can wear a respirator**
  - ✓ The OSHA Respirator Standard requires an employer to have a Respirator Protection Program and there are 3 specific things that must occur **BEFORE** you ever wear a respirator.
  1. **Medical Evaluation or Respirator Screen**
  2. **Fit Test**
  3. **Training**

- **2 Types of Fit Testing**
  - ✓ **Qualitative Fit Test:** checks the quality of the respirator's seal with your face.
  - ✓ **Quantitative Fit Test:** uses a computer or testing device that is connected to your mask, to measure the actual amount of leakage into the respirator.

- **2 types of user seal or fit check**

Positive pressure check:	**Negative pressure check**
✓ Cover the exhalation valve of the respirator. ✓ Exhale gently for about 10 seconds. ✓ If the respirator fits, a slight pressure should build up inside the facepiece. ✓ If air leaks out, the respirator does not fit properly, and the seal is inadequate	✓ Cover the filter openings with your hands. ✓ Inhale gently for about 10 seconds. ✓ If the respirator fits, the facepiece should collapse inward slightly. ✓ If it does not fit, the facepiece will not collapse, and you will feel an air leak
	

- **Maintenance and Care**
  - ✓ To make certain you have the most effective equipment; the employer must have a proper maintenance and care plan in place for the respirators.
- **Cleaning and Disinfecting:** The employer must provide you with a respirator that is clean, sanitary, and in good working order.
  Respirators must be cleaned and disinfected at the following intervals:
  - As often as necessary to maintain sanitary conditions.
  - Before another individual uses it when the same respirator is issued to two or more workers.
  - After each use for emergency respirators.
  - After each use for fit testing and training respirators.
- **Inspection:** Respirators used in routine situations are to be inspected before each use and during cleaning.
  - Inspections look for wear and tear.
  - They check the respirator's function, tightness of connections, and condition of the various parts.
  - SCBAs must be inspected monthly, and the air and oxygen cylinders must be maintained in a fully charged state.
  - When the pressure falls below 90 percent of the manufacturer's recommended pressure level, they must be recharged.
  - The regulators and warning devices also must be checked to ensure they are working.
  - Any cartridges and canisters for respirators must be replaced as necessary.
  - The employer is required to keep inspection records.
- **Repairs:** Respirators that fail an inspection or are found to be defective must be removed from service and either discarded, repaired, or adjusted.
- **Storage:** Respirators must be packed or stored in a way that prevents the facepiece and exhalation valve from deforming.

SECTION SEVEN

PERSONAL PROTECTIVE EQUIPMENT – PPE

Personal Protective Equipment

When you enter a site containing hazardous waste or other potential hazards, protecting your own health and well-being is your first concern. Appropriate PPE for the hazards present should protect your:

- Respiratory system
- Skin
- Eyes
- Face
- Hands
- Feet
- Head
- Body
- Hearing

You might think that the best answer is to overprotect yourself. The key is to know what PPE is appropriate for the hazard you'll face.

PPE Program

A written PPE program guides you as an operating engineer to know what PPE is appropriate for the hazard you are going to be exposed to.

- A solid PPE program identifies:
  - ✓ The hazards at the site
  - ✓ Provides medical and environmental monitoring
  - ✓ Training on the selection, use, maintenance, and decontamination of your PPE
  - ✓ Reviewed annually to make sure it is still effective.
- The program fulfills two basic objectives:
  1. Protect you as the wearer from safety and health hazards.
  2. Protect you from incorrect use or malfunction of the PPE.

Who Pays for PPE?

OSHA requires employers to provide and to pay for PPE, required by the company for workers to do their jobs safely and in compliance with OSHA standards. Where equipment is very personal in nature and is usable by workers off the job, the matter of payment may be left to labor management negotiations.

Chemical Protective Clothing (CPC) and Accessories

The HASP will identify the proper CPC, based on the type, concentration, and form of the chemical that was identified during site characterization. This information is critical in determining what CPC must be worn to protect you from the jobsite hazard.

Selection of Chemical Protective Clothing

Regardless, the employer is responsible under OSHA regulations for ensuring that the PPE necessary to protect you from injury or illness is adequate and of safe design and construction for the work you perform. The most appropriate clothing material and accessories will depend on the chemicals you'll be exposed to and the job you have to accomplish on the jobsite.

Permeation, Degradation, and Penetration

- **Permeation:** when a chemical dissolves and passes through protective material**.**
- **Degradation:** when the fabric loses its effectiveness as a barrier because chemicals have broken it down**.**
- **Penetration** is when chemicals pass through zippers, stitched seams, pinholes, or other openings in the material.

- Five major factors affect the rate of permeation, degradation, and penetration:
  1. **Contact time** – how long will you and the CPC be exposed to the hazard?
  2. **Concentration** – how strong is the mixture of the hazard?
  3. **Temperature** – what is the temp you and the CPC will be exposed to?
  4. **Size of contaminant materials** – microscopic or boulder size?
  5. **Physical state of the wastes** – is it water, gas, or solid?

Selection of HAZMAT PPE

- The level of PPE needed is **established through air monitoring**.
- The respiratory protection you need is what determines the level of protection.
- It's required by OSHA and is an important part of the HASP to continually monitor your environment and to reevaluate your ensemble.

Remember, the PPE that is required for HAZMAT sites and deals with chemical protection does not eliminate the PPE required by OSHA for other hazards.

- Hardhats and High Visibility vests
- Fall Protection
- Steel toe boots
- Etc…

The four levels of PPE range from Level A, offering the most protection, to Level D, which offers the least protection.

Level	Type of PPE	What it provides
A	**RECOMMENDED:** - Pressure demand, Full facepiece SCBA or pressure demand-supplied air respirator with escape SCBA. - Fully encapsulating, chemical resistant suit. - Inner chemical resistant gloves. - Chemical resistant Safety boots/shoes. - Two-way radio communications. **OPTIONAL:** ➢ Cooling unit. ➢ Coveralls. ➢ Long cotton underwear. ➢ Hardhat. ➢ Disposable gloves and boot covers.	➢ The highest available level of respiratory protection. ➢ The highest level of skin, and eye protection.
B	**RECOMMENDED:** - Pressure demand, Full facepiece SCBA or pressure demand SAR-E. - Chemical resistant clothing. - Inner and outer chemical resistant gloves. - Chemical resistant safety boots/shoes. - Hardhat. - Two-way radio communications. **OPTIONAL:** ➢ Coveralls. ➢ Disposable boot covers. ➢ Face shield. ➢ Long cotton underwear.	➢ The same level of respiratory protection as Level A. ➢ Appropriate skin protection. Less skin protection than Level A. ➢ OSHAs **minimum** level of protection recommended for initial site entries until the hazards have been further identified.

Level	Type of PPE	What it provides
C	**RECOMMENDED:** - PAPR, Full-facepiece, or half-faced APR, filter equipped respirator. - Chemical resistant clothing. - Inner and outer chemical resistant gloves. - Chemical resistant safety boots/shoes. - Hardhat. - Two-way radio communications. **OPTIONAL:** ➢ Coveralls. ➢ Disposable boot covers. ➢ Face shield. ➢ Escape mask. ➢ Long cotton underwear.	➢ Same level of skin protection as level B. ➢ Appropriate but a lower level of respiratory protection.
D	**RECOMMENDED:** - Regular work clothes. - Coveralls. - Safety boots/shoes. - Safety glasses or chemical splash goggles. - Hardhat. **OPTIONAL:** ➢ Gloves. ➢ Escape mask. ➢ Face shield.	

Training

- OSHA requires that your employer trains you on the PPE you will use on a HAZMAT site.
- You need to get as comfortable as possible in the PPE and also have confidence in it's ability to protect you.
- Training should take place before you use the PPE in a hazardous environment and is required to be repeated annually, covering the following:
  - ✓ **Personal Use Factors:** Some of your own personal features also play a role in your safety.
  - ✓ **Donning:** A routine for putting on the different levels of PPE, especially fully encapsulating suits and self-contained breathing apparatus, should be established and practiced periodically.
  - ✓ **Doffing:** Just like donning your equipment, you also should establish a routine for taking it off and practice it. Your **primary concern is preventing the transfer of contaminants** from the work area to your body, the decontamination assistants, and others.
  - ✓ **In-use Monitoring:** You must understand everything about the CPC and PPE you're wearing. If you're having problems while wearing your PPE, let your supervisor know. Report your concern.
  - ✓ **Limitations**: how the system works, heat stress issues, communication and vision restrictions, movement and equipment operation restrictions, and where the weak points might be.
  - ✓ **Inspection:** The PPE must be inspected at various times to ensure it's still effective.
  - ✓ **Storage:** They need a place that limits exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Often equipment fails because it hasn't been stored properly.
  - ✓ **Maintenance and Repair:** Only people properly trained or competent people, trained in the manufacturer's recommended procedures, should handle maintenance and repair of chemical protective clothing or any type of PPE.

During doffing always assume PPE is contaminated. Don't do everything right all day and then contaminate yourself going through the decon line!

Issues on a HAZMAT site that need to be reported or recorded:

- Damaged, torn, or compromised PPE
- Unusual odors
- Skin, eye, or lung irritation
- Physical discomfort or lack of energy
- Headaches
- Nausea
- Any kind of unexpected pain

SECTION EIGHT

DECONTAMINATION – DECON

Importance of Decontamination

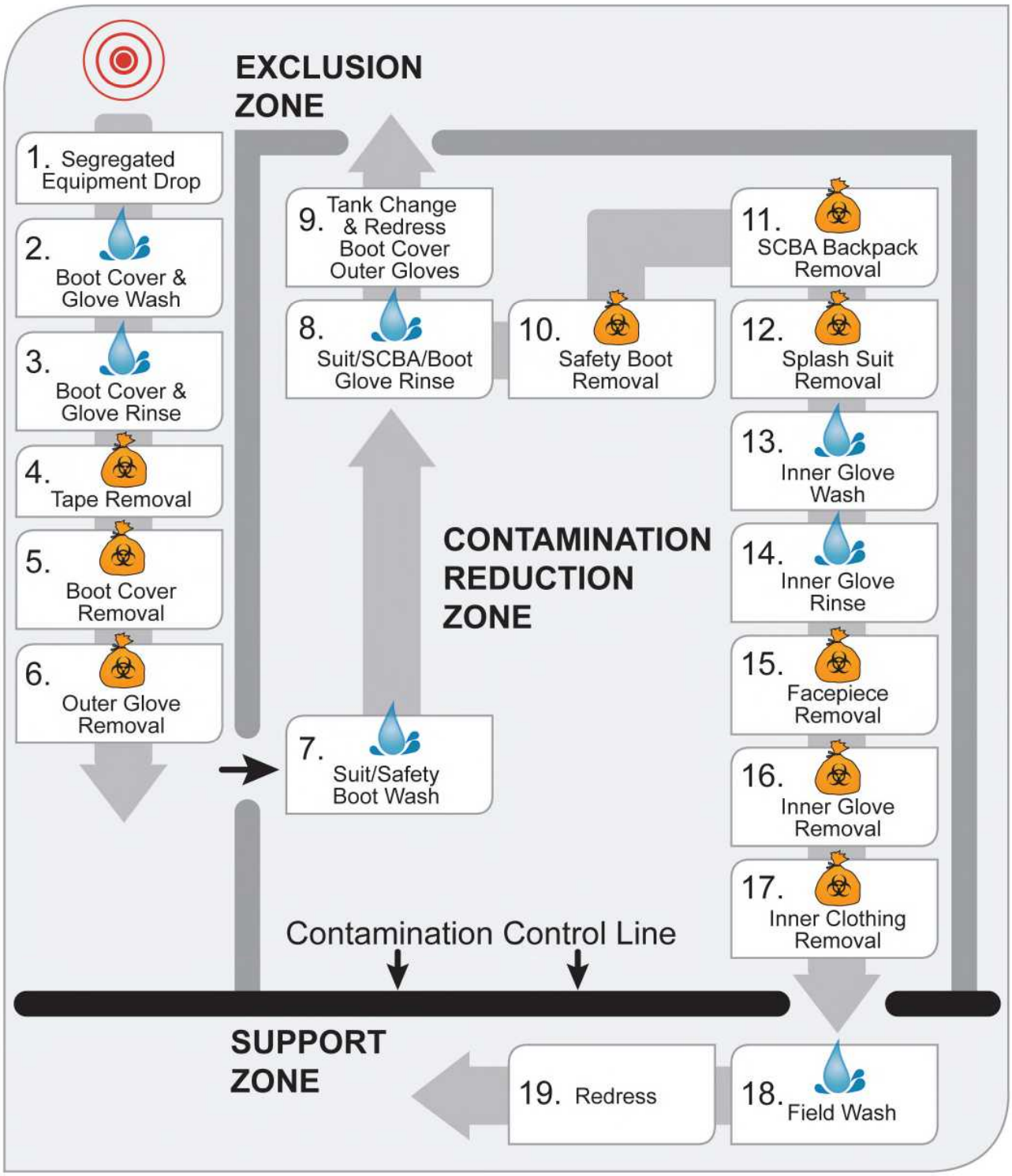
- It's a fact of life in your work as an operating engineer; you probably will have to work around hazardous materials.
- Decontamination is the process of removing or neutralizing contaminants that have collected on you, your PPE, your tools, and on your equipment.
- Decontamination is vital to everyone's health and safety at a HAZMAT site; including those in the surrounding community who don't want to see contaminants move from the site into their area.

Decontamination Plans

- If hazardous chemicals, waste, or materials are at a jobsite, then the site must have a decontamination plan as part of its overall HASP.
- You must be trained on and the plan must be in place before you or your equipment enters an area where you might be exposed to hazardous materials.
- The decon plan lays out the SOPs that help minimize contact with hazardous materials. It also outlines decontamination steps and procedures once exposure has taken place. A thorough decontamination plan covers the following:
  - ✓ The specific hazardous materials to be handled on the site.
  - ✓ Number and layout of decontamination stations.
  - ✓ Equipment needed.
  - ✓ Appropriate methods for decontamination.
  - ✓ Procedures to prevent contamination of clean areas.
  - ✓ Methods and procedures to reduce your contact with contaminants when you remove your PPE.
  - ✓ Methods for disposing or storage of clothing and equipment that isn't completely decontaminated.
- The plan **IS NOT** a static document.
- It needs to change whenever site conditions change, PPE changes, or site hazards are reassessed based on new information/monitoring.

MAXIMUM DECONTAMINATION LAYOUT

LEVEL **B** PROTECTION



Methods of Decontamination

There are 2 main methods for removing contamination:

1. **Physical Removal:** dislodging the chemical by scraping, brushing, wiping, rinsing, or evaporation.
2. **Chemical Removal:** Certain solvents can act like a dry cleaning or neutralizing fluid to remove a contaminant by chemical interaction.

Decontamination Effectiveness

Here are some ways to detect contamination:

- **Visual observation:** You might be able to see the hazardous material still on clothing or equipment. Or you might notice the protective suit is discolored or has other damage. That's an indicator of contamination.
- **Ultraviolet light:** The UV wand, that you've seen on various crime shows, works for certain contaminants as well, in particular those that are fluorescent.
- **Cleaning solution analysis:** If the final rinse solution shows an abnormally high level of contaminants, that's an indication of contamination and ineffective decon.
- **Wipe sampling:** A collection swab is wiped over the surface of the protective clothing. The swab is sent to the lab for analysis or could react immediately to the presence of a chemical.
- **Testing for permeation:** To find out definitively whether your clothes are contaminated, this method takes a sample of your clothing and sends it to a lab for analysis.

Decontamination Line

- The line is a sequence of stations, each administering a specific decontamination procedure to effectively eliminate all hazardous material.
- Decon people, equipment, tools, and waste containers.

Location

Locating the decontamination line requires knowledge of the 3-zone system.

1. **EXCLUSION ZONE**.
2. **CONTAMINATION REDUCTION ZONE** (CRZ)
3. **SUPPORT ZONE**.

- Decontamination area will have separate lines for personnel, tools, waste containers, and heavy equipment.
- Level A, B, and C HAZMAT sites require you to be deconned each time you exit the exclusion zone and move through the CRZ. Level D HAZMAT sites do NOT require personnel decontamination.
- EPA requires all hazardous waste must be disposed of properly, so no hazardous waste can be left on tools or equipment.

Station Parameters

A decontamination area can be a busy place, and the decontamination plan should account for this.

- Within each decon line; stations must be separated to prevent cross-contamination of different workers or incompatible chemicals.
- The stations should be arranged in order of decreasing contamination, and it's best if they can be arranged in a straight line.
- Cooling stations or special considerations.

Decontamination Line Workers

- The level of PPE you must wear is based on the hazards you will be exposed to.
- Generally, those at the beginning of the line require the same level of PPE as the worker in the exclusion zone.
- When you're working the line, assume that your equipment is contaminated, even if it's been washed. Avoid touching or walking in obviously contaminated areas.
- Remember too that line workers must be decontaminated as well because their work on the line has exposed them to contaminants.

Equipment Decontamination or Disposal Heavy Equipment Procedures

Here are typical procedures for decontaminating heavy equipment:

- Set up a decontamination pad with tools, sprayers, and a containment system to collect and treat waste.
- Remove covers, guards, shields, panels, and plates.
- Scrape, brush, or shovel to remove any loose material.
- Collect, contain, and dispose of all hazardous materials.
- Scrub, wash, and rinse.
- Determine the extent of contamination remaining.
- Check restricted areas such as frames and voids.
- Sample fabrics, paint, tires, rubber products, and plastics.
- Remove all appropriate fluids, tires, hoses, fabrics, insulation, etc.
- Perform final decontamination as required by results of samples taken.
- Replace any fluids or components removed for decontamination.

Don't be in a rush when it comes to decontamination. While decontaminating a person, it might take just a few minutes but decontaminating equipment might involve hours.

Emergency Decontamination

- The first priority in an emergency is to prevent loss of life or severe injury to site personnel.
- If immediate medical treatment is required to save a life, decontamination is the first step in the process.
  - ✓ Don't forget the medical personnel treating the injured person will usually not accept or provide aid until the victim has been decontaminated.
  - ✓ If a person has been contaminated with an extremely toxic or corrosive material that could cause severe injury or loss of life, perform decontamination immediately.
  - ✓ If the illness is heat related, get the victim out of their protective suit as soon as possible.
  - ✓ The Decontamination and Emergency Response Plans in the HASP need to provide ways to remove contaminants from anyone who is having medical issues and to provide medical assistance.

SECTION NINE

RADIATION

- Radiation is just another, more dangerous, hazard.
- The hazard must be identified and you then must be protected with the proper PPE, if you're exposed to this hazard.
- If you are going to work at a Department of Energy (DOE) or Nuclear Regulatory Commission (NRC) site, you will have extensive training on this specific hazard and all of the on-site requirements.

Ionizing vs. Non-ionizing Radiation

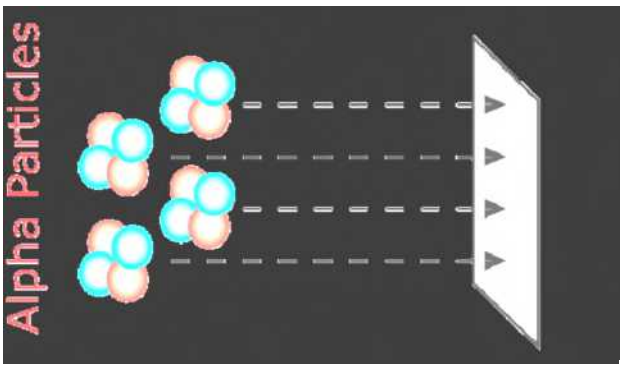
- **Non-ionizing radiation** is radiation or energy in motion that is not strong enough to remove an electron from an atom.
  Examples of non-ionizing radiation:
  - ✓ Ultraviolet light
  - ✓ Visible light
  - ✓ Infrared light
  - ✓ Microwaves
  - ✓ Radio waves.

Radiation . . .
- Is energy in motion.
- May be particles or rays/waves.
- Is invisible, odorless, and tasteless.

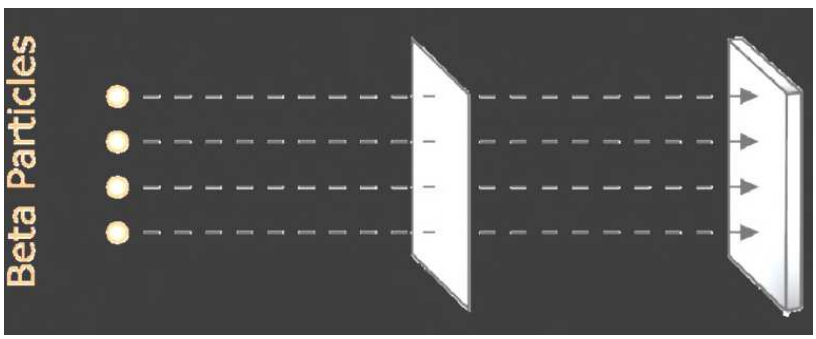
- **Ionizing radiation** can damage living tissue. With ionizing radiation, the nucleus of an atom gives off energy strong enough to detach an electron from an atom. Ionizing radiation travels from its source at a very high speed and, depending on its type, might be able to penetrate easily through very dense materials.

The 3 basic types of ionizing radiation are:

1. **Alpha radiation** is the **LARGEST** particle (form of radiation) that travels only a few centimeters in the air. Alpha radiation can usually be **stopped by a piece of paper** or a protective layer of intact skin. Alpha radiation is not an external hazard because it can be stopped so easily. However, it is an internal hazard. In other words, it doesn't cause problems unless it gets into your body.

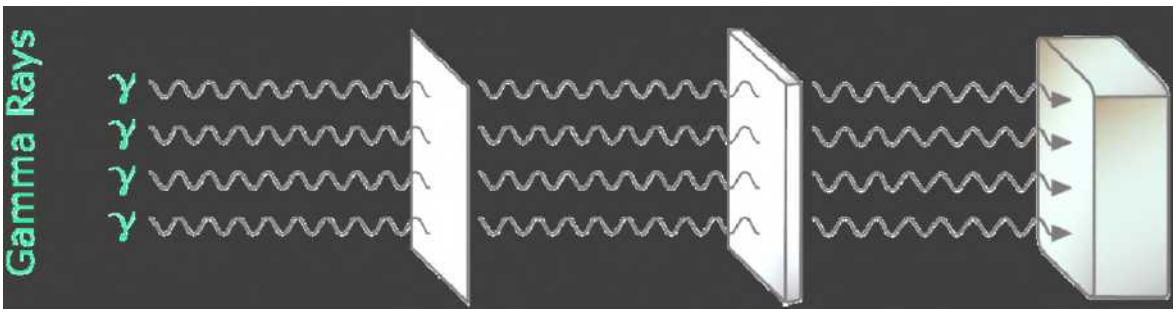


2. **Beta radiation** can travel 10-20 feet in the air. **BETA PARTICLES** are **much smaller than ALPHA PARTICLES**; nearly 8,000 times smaller. Most beta particles can be **shielded by an appropriate thickness of aluminum, plastic, glass, and safety glasses**.



Beta radiation is an external hazard to your skin and eyes. While it can burn your skin, it generally cannot penetrate to deep tissue such as the bone marrow or internal organs. However, if taken into body, beta radiation can be a hazard similar to alpha radiation with more energy.

3. **Gamma radiation** is a wave-type radiation. Gamma rays are a form of electromagnetic radiation produced by subatomic particle interactions, such as radioactive decay.
    a) Gamma rays are often produced right alongside alpha and beta particles.
    b) Gamma rays have a high frequency and high energy.
    c) Gamma radiation **HAS THE GREATEST PENETRATING POWER** and can travel many feet in the air.
    d) It requires a thick layer of **dense material** such **as lead or steel for shielding**.
    e) The higher the energy of the rays, the thicker the shielding required.
    f) Gamma radiation is a hazard to both the outside and inside of your body.
    g) Rather than affecting a small area of tissue near the radiation source, gamma/X-ray radiation can cause radiation exposure to the whole body.



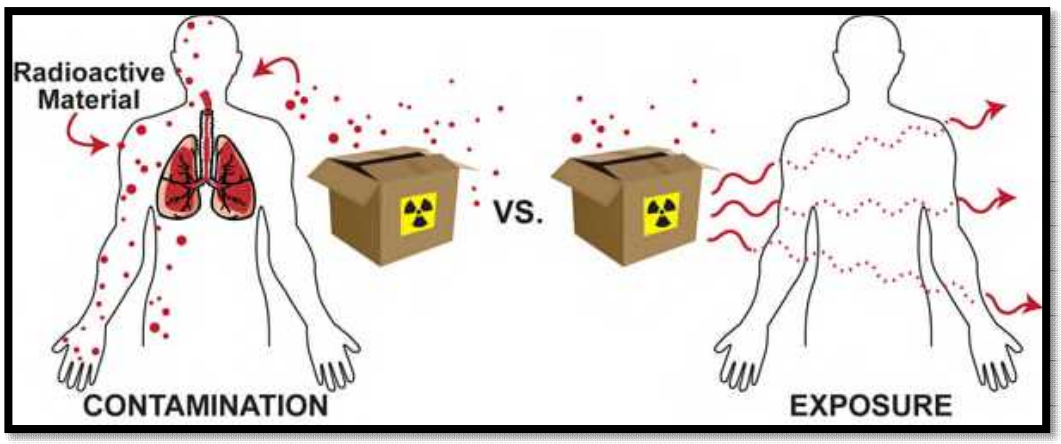
Background Radiation

- Radiation reaches us from the sun and outer space.
- It reaches us from radon in the air, water, and soil around us.
- This always-present radiation is called **background radiation**.
- Most other radiation exposure comes from medical irradiation, such as X-rays or CT scans.
- Coleman® lanterns were made with thorium.
- Most smoke detectors contain a small amount of the alpha emitter americium-241. This isotope is extremely dangerous if inhaled or ingested, but the danger is minimal if the source is kept sealed.

Biological Effects of Radiation

Contamination vs. Exposure

- **Contamination:** occurs when radioactive material is deposited on or in an object or a person. Radioactive materials released into the environment can cause air, water, surfaces, soil, plants, buildings, people, or animals to become contaminated.
- A contaminated person has radioactive materials on or inside their body. If radioactive contamination gets onto your clothes or intact skin, it can be removed through decontamination procedures. If radioactive contamination gets into your body through inhalation (lungs), ingestion (through eating or mucus), or direct contact (directly into your bloodstream through a cut), it becomes an internal contamination hazard and may lead to high exposure.



- **Radiation exposure** is when the particle or wave energy given off by radioactive materials penetrates a person's body. **The exposed person is not necessarily contaminated**. Exposure to radiation can occur when a person or an object is close enough to radioactive material to be affected by it without touching it. For example, when a person has an X-ray, he or she is exposed to radiation.
  - ✓ Contaminated people are exposed to radiation released by the radioactive material on or inside their bodies.
  - ✓ Uncontaminated people can be exposed by being too close to radioactive material or a contaminated person, place, or thing.

Rem (radiation equivalent man) indicates the amount of biological damage that may result from the radiation exposure.

<50 rem	No obvious effects, but blood chemistry changes
100 rem	Minor radiation sickness in about 10 percent of exposed population
150 rem	Minor radiation sickness in about 25 percent of exposed population
200 rem	Radiation sickness in about 50 percent of exposed population
300 rem	Radiation sickness in all exposed; 20 percent death rate within a month
450 rem	About 50 percent death rate without medical treatment
500 rem	Radiation sickness within four hours; more than 50 percent death rate
1,000 rem	Radiation sickness within 1-2 hours; 100 percent death rate

RADIATION EXPOSURE AND GUIDELINES

Personnel Monitoring Records

Every employer must maintain:

- Dosimetry records
- Records of radiation exposure of all employees for whom personnel monitoring is required.
- Employers must advise employees of their individual exposure at least once a year.

NRC and DOE annual dose equivalent limits (10 CFR 20 and 10 CFR 835):

- 5 rem/year total effective whole body
- 15 rem lens of the eye in a calendar year
- 50 rem skin, extremity, or organ
- 0.5 rem during pregnancy

OSHA exposure limits for calendar quarter (29 CFR 1910.1096):

- ✓ 1.25 rem for whole body: head and trunk, active blood-forming organs, lens of eyes, or gonads
- ✓ 18.75 rem for hands and forearms, feet and ankles
- ✓ 7.5 rem for skin or whole body

Personnel Monitoring Equipment

The two most common types of personnel monitoring equipment that your employer might give to you are:

1. **Film badges:**
   - The film badge is a plastic holder with a clip on the back to attach to your clothing. The film placed inside the badge contains a variety of metal filters. The film allows for an estimation of the radiation dosage and energy because the energy level of the radiation interacts differently with each filter.
   - You wear a film badge for about a month.
2. **Thermoluminescent Dosimeter (TLD):**
   - The second most common device for recording the radiation dose you might receive.
   - They are required to be worn in controlled areas and should be worn on the upper portion of the body.
   - TLDs are advantageous because they are tissue equivalent, can be worn for three months, can be reused, are highly accurate and sensitive, and do not fog.

Sometimes radiation work requires the use of multiple types of personnel monitoring equipment at the same time.

Here are other instruments you might encounter:

- ✓ **Dose rate meter** measures the dose rate in an area. This instrument reads in mrem/hr and/or rem/hr.
- ✓ **Portal monitor or an automatic whole-body monitor** checks your whole body for contamination before you exit into a clean area.
- ✓ **Hand and foot monitors** check your hands and feet for contamination at exit areas.
- ✓ **Friskers or handheld contamination monitors** are often placed in different areas in a building to check workers and equipment for contamination whenever they exit an area.

ALARA (As Low As Reasonably Achievable)

- ➢ Most radiological professionals wisely agree that **NO** exposure is a good exposure.
- ➢ Exposure limits set by OSHA, NRC, and DOE are conservative, employers and employees should make every effort to keep exposure **as low as reasonably achievable** to further reduce risks.

Employee Responsibilities

- ✓ Read all signs. A sign or posting may change from day to day.
- ✓ Obey posted, written, or oral directions.
- ✓ Report unusual conditions, leaks, spills, or alarming area monitors.
- ✓ Be aware of changing conditions.
- ✓ Practice safe work practices for contamination control.
- ✓ Use methods to minimize radioactive waste.

The main objectives or goals of an ALARA program would be:

- ➢ **Time –** Reducing the time spent in a radiation area directly reduces radiation dose.
- ➢ **Distance –** Most radiation levels rapidly decrease with increased distance from a radiation source.
- ➢ **Shielding –** Shield yourself from the radiation source. If possible, shielding material should be placed between the body and the radiation source to reduce the exposure to the body.

SECTION TEN

HEAT AND COLD STRESS

Hyperthermia – Heat Stress
Hypothermia – Cold Stress

- Prolonged exposure to either cold or hot-humid temperatures can cause serious health problems.
- Heat-related and cold-related illnesses can result if you are not aware of the risks, the warning signs, and what to do about treating the illness before it worsens.
- **Prior heat injury also increases the chance that someone will develop a heat-related illness again**.
- The body reacts to extreme hot environments, by circulating more blood to the skin.
- Evaporation of sweat from your body has a cooling effect, but you have to be working in an environment that permits the evaporation.
- Remember too with sweating that **fluids and salts must be replaced**, or you will become dehydrated.

Heat Cramps

- Heat cramps are caused by an imbalance in the body's blood minerals and electrolytes, because of excessive sweating. Sweating removes water from the body and leaves the salts. Excess salt concentration can result in muscle cramping.
  Here are symptoms of heat cramping:
  - ✓ Severe muscle cramping – legs and stomach usually
  - ✓ Thirst from fluid loss (cannot be used alone as a guide for heat cramps)

Heat Exhaustion

- Heat exhaustion is what you will experience before you go into Heat Stroke.
- You need to listen to your body because it's telling you that you need to cool down.
- It is not as serious as heat stroke but can still cause uncomfortable symptoms and should not be taken lightly.
  Here are symptoms of heat exhaustion:
  - ✓ Cool, sweaty, clammy skin
  - ✓ Thirst – cotton mouth
  - ✓ Headache
  - ✓ Nausea
  - ✓ Vertigo – dizziness
  - ✓ Extreme weakness
  - ✓ Cotton mouth

Heat Stroke

- Heat stroke is the most serious heat-related illness.
- It occurs when the body's core temperature rises to critical levels.
- This is a medical emergency, and you must receive immediate medical attention because heat stroke can result in death – **CALL 911.**
  Here are signs and symptoms of heat stroke:
  - ✓ Hot, dry skin with a red, mottled, or bluish appearance
  - ✓ Confusion – total disorientation
  - ✓ High body temperature
  - ✓ Loss of consciousness
  - ✓ Convulsions
  - ✓ Lack of sweating (the body is no longer has fluid to cool itself)
  - ✓ Dizziness
  - ✓ Nausea
  - ✓ Coma and Death

IMPORTANT: Victims of heat stroke will die unless treated promptly.

Work Practices for Avoiding Heat Stress Injuries

- The following are a few work practices that can greatly reduce the chance that you or a coworker will develop heat stress illnesses:
  - ✓ Drink small amounts of water frequently to replace body fluids lost through sweating.
  - ✓ Wear light-colored, loose fitting clothing whenever possible.
  - ✓ Schedule heavy work during the coolest parts of the day.
  - ✓ Take your breaks in the shade if possible.
  - ✓ Avoid caffeine and alcohol.
  - ✓ Eat bananas and nutritional meals.
  - ✓ Be aware that PPE may increase the risk of heat stress.
  - ✓ Use a sunscreen with a sun protection factor (SPF) of at least 30. This won't protect you from the heat stress illnesses listed above, but they will feel worse if you also have a sunburn.

to Cold Stress

Four factors contribute to cold stress conditions:

1. Cold air temperature
2. Wind chill
3. Air humidity
4. Contact with cold water

- Wind chill is the effect of the wind speed on how cold the air actually feels.
- Wind chill can have a great effect on the temperature that your body and you **THINK** you are experiencing.

Hypothermia

- Hypothermia occurs when more heat escapes from your body than your body can produce.
- Blood flow shifts from your hands, feet, arms, and legs to your body "core" (chest and abdomen).

IMPORTANT NOTE:

An important rule of treatment for hypothermia is that **a person is not considered dead until he/she is *warm* and declared dead.**

There are many accounts of hypothermic patients that were considered dead but recovered when they warmed up. The low temperatures prevent tissue damage that would have occurred if blood flow was cut off for a long period of time.

There are three stages of hypothermia:

Stage 1 (MILD) – Core Body temperature drops by 1.8 to 3.6 degrees Fahrenheit (96.8 to 95).

- ✓ Shivering occurs.
- ✓ Hands become numb and cannot perform tasks.
- ✓ Breathing is quick and shallow.
- ✓ Goose bumps form.
- ✓ Victim may feel warmer, but they are heading into Stage 2.

Stage 2 (MODERATE) – Core Body temperature drops by 3.8 to 7.6 degrees Fahrenheit (94.8 to 91).

- ✓ Movements are slow.
- ✓ Shivering gets extreme.
- ✓ Mild confusion is apparent.
- ✓ Victim becomes pale while lips, ears, fingers, and toes become blue.

Stage 3 (SEVERE) – Core Body temperature is now **below** 89.6 degrees Fahrenheit.

- ✓ Shivering stops.
- ✓ Speaking is difficult, thinking is sluggish, and amnesia may occur.
- ✓ Irrational behavior is common.
- ✓ Cellular processes shut down.
- ✓ Exposed skin becomes blue and puffy.
- ✓ Walking is almost impossible.
- ✓ At near-end Stage 3, most organs fail and clinical death occurs. Brain death will take longer than organ failure.

For **MILD TO MODERATE** hypothermia OSHA recommends the following:

- Move the worker to a warm area and try to get him or her to stay active.
- Do not leave the worker alone.
- Remove any wet clothing and replace with dry clothes or blankets and cover the head.
- Drink a warm, but not hot, sugary, caffeine-free drink.

For **SEVERE** hypothermia:

- Do all of the above and contact emergency medical personnel – 911.
- Cover all extremities completely.
- Place warm objects such as a hot pack or water bottles on the victim's head, neck, chest, and groin. Arms and legs should be warmed last.
- Treat the worker very gently.
- Hospital treatment is required.

Frostbite

- Frostbite occurs at temperatures of 30^0 F or lower, but wind chills can allow frostbite to occur at above freezing temperatures if skin freezes and loses water.
- Frostbite affects body extremities because blood flow has been directed to the core body organs because of cold temperatures.
- Skin adheres to cold metals and injuries can result if the skin is torn away from the fingers or hands.
- Here are signs and symptoms of frostbite:
  - ✓ Stinging or aching of hands or feet followed by numbness.
  - ✓ Skin color becomes red, then purple, then white, and eventually black when the tissue dies.
  - ✓ Skin may blister.

- Here are OSHA recommended treatments for frostbite:
  - ✓ Contact medical personnel.
  - ✓ Do not rub the affected areas.
  - ✓ Move the person to a warm area and do not leave the person alone.
  - ✓ Wrap the area and do not let it get cold again. Warming and re-cooling will cause severe tissue damage.
  - ✓ If help is delayed, immerse in **warm** (maximum 105^0 F) water or cold water. **Cold water will be warmer than the frozen tissue**.

Snow Blindness

- Sunburn or freeze cornea.
- Red & burning eyes.
- May occur 8 – 12 hours after exposure.
- Same as Arc Flash burns.
- Very painful and highly sensitive to light.

Trench Foot

- Trench foot occurs because of prolonged exposure to damp, unsanitary, and cold conditions.
- It was quite a problem for soldiers in the trenches during both World Wars, Korea, and in Vietnam.
- The most important thing you can do to prevent trench foot is to keep your feet dry.
- You can get trench foot on hot summer days, when your feet stay wet all day, and there is enough moisture that you need to dry out your work boots.
- Here are signs and symptoms of trench foot:
  - ✓ Tingling, itching, or burning sensations in feet.
  - ✓ Blisters may be present.
  - ✓ White wrinkled skin that comes loose from the capillary bed.

- Treatment for trench foot is similar to the treatment for frostbite. Take the following steps recommended by OSHA:
  - ✓ Soak feet in warm water, then wrap with dry cloth bandages.
  - ✓ Drink a warm, sugary drink.
  - ✓ Obtain medical assistance.

Work Practices for Avoiding Cold Stress Injuries

Follow these practices on the job to prevent a cold stress injury:

- Always be prepared for weather changes if there is a potential for cold exposure.
- Always have appropriate clothing and PPE on cold jobsites.
- Wear at least 3 layers of clothing:
  1. **OUTER LAYER** breaks the wind – impervious outer layer.
  2. **MIDDLE LAYER** provides insulation – flannel, wool, and fleece.
  3. **INNER LAYER** allows ventilation – moisture wicking long underwear.

- Don't wear tight-fitting layers; loose clothing allows better ventilation.
- Wear insulated footwear; wool not cotton.
- Wear a hat because 30 percent of body heat is lost through your head.
- Drink plenty of liquids but avoid caffeine and alcohol.
- Eat high calorie foods to maintain energy reserves.

STAY AWAY FROM COTTON!!!

SECTION ELEVEN

BLOODBORNE PATHOGENS and BIOSAFETY

- Millions of workers run the risk of occupational exposure to bloodborne pathogens.
- Operating engineers, stationary engineers, hazardous material workers, and workers in construction and demolition are also exposed to these disease-causing organisms.
- OSHA standards cover risk identification, employer responsibilities in risk management, post-exposure follow-up procedures, recordkeeping, and strategies for universal precautions.

Are You at Risk?

- If you come into contact with any infectious bodily fluids or tissues on the job, you are at risk.
- Pathogens can enter the body through the mucous membranes of the eyes, mouth, and nose or through broken skin.
  These industries have potential exposure to bloodborne pathogen hazards:
  - ✓ Sewage repair and removal
  - ✓ Construction
  - ✓ Landfill workers
  - ✓ Cooling towers or air conditioning demolition
  - ✓ Brush and tree clearing/removing
  - ✓ Building decontamination or demolition
  - ✓ HAZMAT jobsites

What Are Pathogens?

- A pathogen is any organism that causes a disease: bacteria, viruses, parasites, or fungi.
  Here are some examples of infectious fluids:
  - ✓ Blood, including blood components and products made from blood
  - ✓ Semen or Vaginal fluid
  - ✓ Cerebrospinal fluid
  - ✓ Pleural (lung) fluid
  - ✓ Pericardial (heart) fluid
  - ✓ Peritoneal (abdominal) fluid
  - ✓ Stomach fluid and contents
  - ✓ Saliva or Lung fluid
  - ✓ Any tissue or organ, other than intact skin (living or dead)

Pathogens, Transmission, and Symptoms

- This section reviews the pathogens that may be present at a variety of workplaces and the ways in which you may be exposed.

Human Immunodeficiency Virus (HIV): a disease that gradually destroys the body's immune system and, therefore, its ability to fight disease and infection.

- HIV is a chronic disease whose symptoms can be treated; **BUT CANNOT BE CURED**.
- HIV is spread by contact with contaminated blood and body fluids. Emergency Responders are at risk for the disease, as are any workers who come in contact with blood, at any worksite.

- Symptoms of HIV may not develop for many years.

  If there are symptoms:
  - ✓ They are mild and flu-like, and the infected person appears to get better.
  - ✓ The person may not know he or she is HIV-infected, yet he or she can transmit the disease to other people.

  The disease progresses and symptoms such as:
  - ✓ Rapid weight loss
  - ✓ A dry cough
  - ✓ Fever
  - ✓ Night sweats
  - ✓ Profound and constant fatigue
  - ✓ Diarrhea that lasts for more than a week
  - ✓ Pneumonia
  - ✓ Memory loss

Hepatitis A (HAV)**:** an acute liver disease.

- The disease lasts from several weeks to several months; it does **NOT** lead to a long-lasting (chronic) infection.
- Infected by ingestion of food or drinks contaminated by even microscopic amounts of fecal material containing the virus or by close person-to-person contact.

  Symptoms of HAV infections:
  - ✓ Nausea – Vomiting – Diarrhea
  - ✓ Fever
  - ✓ Rashes
  - ✓ Fatigue
  - ✓ Dark-colored urine

NOTE: Some people do not have any symptoms at all. These people can still spread the virus.

There is a vaccine that can prevent hepatitis A.

Hepatitis B (HBV)**:** a liver disease that can involve long-term illness leading to permanent liver damage and liver cancer.

The disease is spread:

- ✓ Through contact with blood and other bodily fluids infected with HBV.
- ✓ Through sharing contaminated needles.
- ✓ Through an infected mother to her newborn.

Symptoms of HBV infections:

- ✓ Flu-like illness
- ✓ Nausea – Vomiting – Diarrhea
- ✓ Weight loss
- ✓ Jaundice (yellowish skin/eye)
- ✓ Dark-colored urine
- ✓ Liver cirrhosis
- ✓ Liver cancer.

- ➢ It is estimated that approximately 1.25 million people in the United States are carriers of HBV.
- ➢ They do not know they have the disease, yet they can pass the disease to other people.
- ➢ There are about 150,000 deaths from HBV every year.

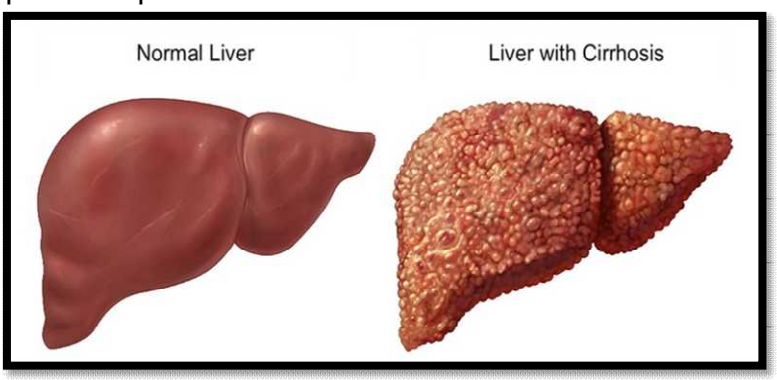
There is a vaccine that can prevent hepatitis B.

Hepatitis C (HCV)**:** a deadly liver disease.

- ➢ This infection sometimes produces an acute illness, but is most often a long-lasting, chronic illness that leads to cirrhosis of the liver and liver cancer.
- ➢ HCV is transmitted from person to person through contact with the blood or fluids from an infected person.

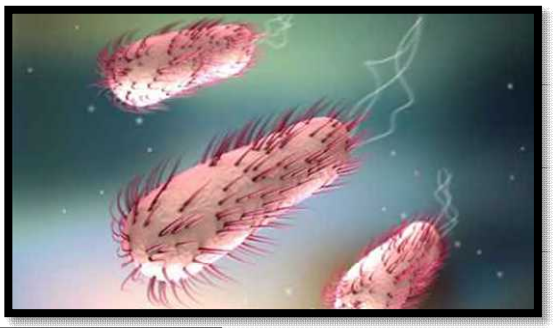
Symptoms are similar to the other types of hepatitis and include:

- ✓ Nausea – Vomiting – Diarrhea
- ✓ Loss of appetite
- ✓ Weight loss
- ✓ Jaundice (yellowish skin/eye)
- ✓ Itchy skin
- ✓ Liver cirrhosis
- ✓ Liver cancer



There is a treatment for HCV but NO vaccine.

WATERBORNE DISEASES



E. COLI: a group of bacteria about 3 microns long.

There are different strains:

- Some strains live normally in your intestines and are part of our digestive system and cause no disease.
- Others strains are not compatible with humans and cause serious gastrointestinal-digestive problems.

Symptoms include:

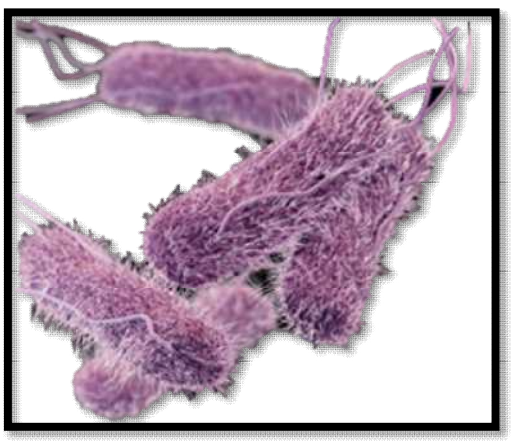
- ✓ Abdominal pain
- ✓ Bloody diarrhea
- ✓ High fever
- ✓ Excessive gas
- ✓ Loss of appetite
- ✓ Extreme stomach cramping
- ✓ Vomiting.

- E. coli bacteria is present in the sewage processed by treatment plants and the by-product contains these disease-producing bacteria. The bio-solid by-product is sometimes transported by truck to land applications.

- **In the United States**, it is **NOT** legal to apply this product directly to fruits or vegetables.
- Workers may come into direct or indirect contact with E. coli bacteria in the bio-solids during the treatment, transport, or application process or during any work that involves land to which this material has been applied.
- Demolition, excavation, repair or sewer workers can also easily come in contact with E. coli on jobsites. Any place that human sewage is present.

SALMONELLA: bacteria that causes a variety of diseases.

- Some kinds of salmonella cause serious disease, but most cases are food-related illnesses.
- The Centers for Disease Control and Prevention (CDC) reports that there are approximately 1.4 million cases of foodborne illness reported annually.
- There are more than 500 related deaths in the United States each year.
- Salmonella is the most common bacterial infection caused by contaminated food.



- Workers can come into contact with land and water contaminated with feces containing the salmonella bacteria.
- Falling into contaminated water on the job and ingesting some of the water can lead to salmonella infection.
- Food can become cross-contaminated (from one food to another) and also from the unwashed hands of an infected food handler.

Symptoms include:

- ✓ Extreme Diarrhea
- ✓ Severe abdominal cramping
- ✓ High fever
- ✓ Headache
- ✓ Cycle through bouts of chill
- ✓ Constant nausea
- ✓ Explosive vomiting
- ✓ Rapid De-Hydration

Cholera: is caused by the consumption of contaminated water, using contaminated water on crops, or by consuming fish from contaminated water.

- Bacterial disease that affects the intestinal tract.
- 50% mortality rate.
- Spreads and can become epidemic in hot summer conditions.

  Possible sources of the bacteria:
  - ✓ Municipal water supplies.
  - ✓ Ice made from municipal water supplies.
  - ✓ Food and drinks sold by street vendors.
  - ✓ Vegetables and fruits watered with contaminated water.
  - ✓ Eating raw or undercooked fish/seafood caught in polluted waters.

Symptoms of cholera:

- ✓ Severe watery/milky diarrhea
- ✓ Rapid dehydration
- ✓ Rapid pulse
- ✓ Dry skin
- ✓ Extreme fatigue
- ✓ Nausea – Vomiting
- ✓ Painful abdominal cramping

Giardiasis: Also known as beaver fever or backpacker's diarrhea, this disease is caused by a parasite – *Giardia lamblia*.

- The parasite is transmitted through contaminated water and food.
- Close contact with animals and humans infected with the parasite.
- Infects about 200 million people worldwide each year.

Symptoms include:

- ✓ Loss of appetite
- ✓ High fever
- ✓ Explosive diarrhea
- ✓ Blood in the urine
- ✓ Stomach cramps
- ✓ Constant Vomiting
- ✓ Excessive gas – flatulence
- ✓ Stomach gas – burping

AIRBORNE DISEASES

Legionnaires' disease: a respiratory infection caused by the *Legionnella pneumonia* bacteria.

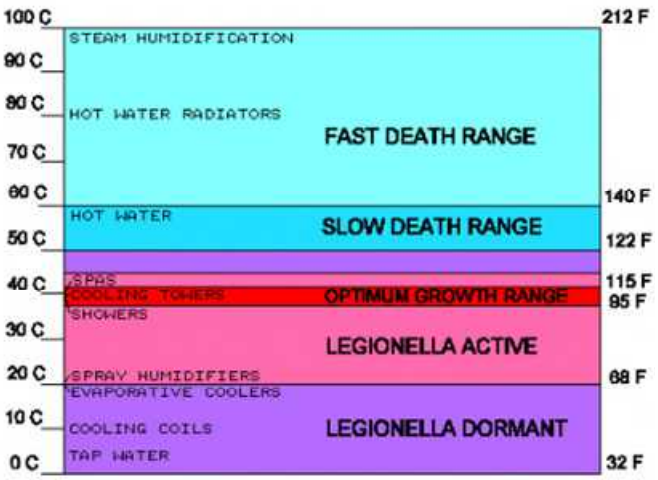
- The bacteria has been linked and found to water delivery systems, air cooling towers, and air conditioning systems.
- The death rate for people who get Legionnaires' disease who have high risk factors is **50 percent**, especially when antibiotics are started late.
- Treatment for these "Pneumonia" like symptoms can lead to fatalities.

Symptoms include:

- ✓ Muscle aches and stiffness
- ✓ Joint pain
- ✓ Headache
- ✓ Fever
- ✓ Chills
- ✓ Coughing of blood
- ✓ Shortness of breath
- ✓ Chest pain
- ✓ Diarrhea

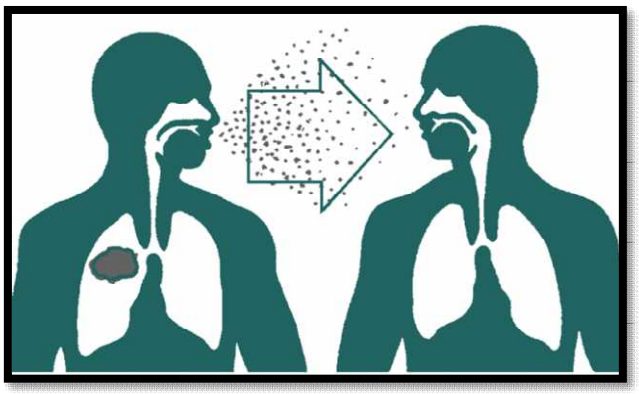
Complications can also include lung failure.

Water cooling towers and the HVAC systems connected to them, have proven to be one of the major locations where these bacteria have been found.

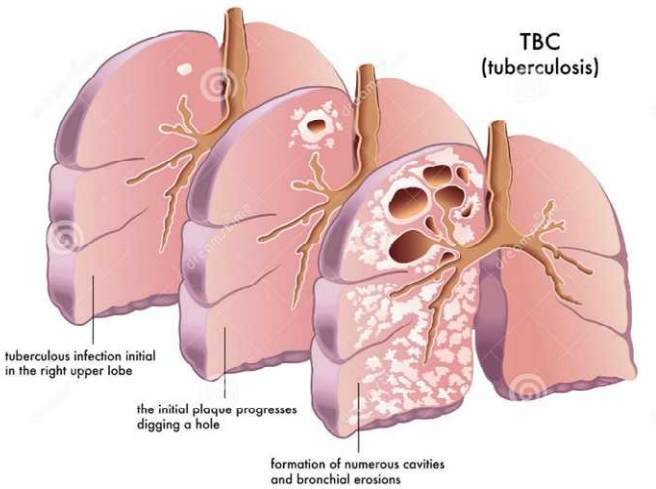


Tuberculosis (TB): Tuberculosis is a respiratory illness caused by the *Mycobacterium tuberculosis* bacteria.

- Almost one-third of the world's population is infected with these bacteria, with 8 million cases developing each year.
- It kills approximately 3 million people per year.
- In the United States TB cases started to decline in 1900 because of improved living conditions, but they have increased recently because of the rise in HIV infections.



- Tuberculosis bacteria are passed from person to person by infected droplets. When an infected person coughs, sneezes, or talks, infected mucus, phlegm, or saliva are inhaled and enter the mucus membranes of another person.
- The bacteria can move throughout the body over time.

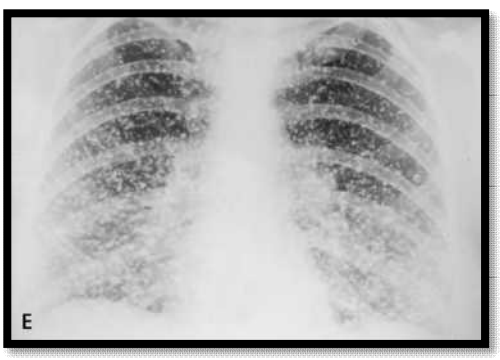


Symptoms for tuberculosis are:

- ✓ Persistent Cough
- ✓ Fever
- ✓ Night sweats
- ✓ Fatigue
- ✓ Wight loss
- ✓ Coughing up blood
- ✓ Coughing up large amounts of frothy phlegm
- ✓ Chest pain (from coughing)
- ✓ Extreme breathing difficulty.

Histoplasmosis:, is caused by a fungus or mold. *Histoplasmosis capsulatum*.

- Also, called: Farmers Lung, Ohio River Valley Fever or Darling's Disease.
- The fungus grows in the black soil, and if the soil is contaminated with animal, bird, or bat droppings, it may have an even higher concentration of the fungus.
- The fungus has also been found in poultry houses, caves, and bird roosts.
- Infection occurs when airborne fungal particles or spores are inhaled and the spores start creating mold colonies in your lungs.
- Some people have no symptom while others have tuberculosis-like symptoms.



Symptoms include:

- ✓ Fever
- ✓ Chills
- ✓ Cough
- ✓ Chest pain

ANIMAL-BORNE DISEASES

Rabies: a viral disease that is spread when infected saliva enters the body through a bite or break in the skin.

- The virus travels to the brain and causes brain swelling.
- Rabies can be transmitted through bites from any infected animal, but the animals that usually spread rabies are bats, foxes, raccoons, skunks, and dogs.

Symptoms include:

- ✓ Anxiety
- ✓ Stress
- ✓ Drooling
- ✓ Convulsions
- ✓ Numbness
- ✓ Loss of muscle function
- ✓ Pain at bite site
- ✓ Swallowing difficulty.

Death from respiratory failure usually occurs within seven days after symptoms appear, if not treated.

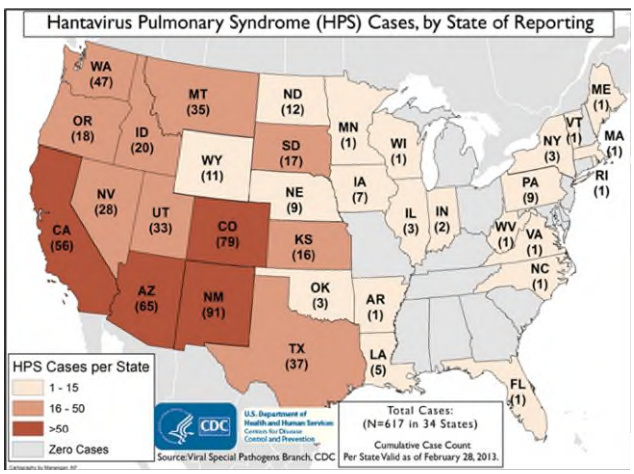
Hantavirus: a serious viral disease spread by rodent urine and feces.

- Humans are infected when they inhale contaminated dust from the nests or droppings from mice.
- More than **50 percent** of people die when they contract Hantavirus pulmonary disease.
- Workers can become infected when demolishing or cleaning vacated or condemned buildings or other enclosed areas.

Symptoms include:

- ✓ Flu-like initial conditions
- ✓ Fever
- ✓ Chills
- ✓ Muscle aches
- ✓ Headache
- ✓ Nausea
- ✓ Vomiting

- These initial symptoms progress after a short period of feeling better to;
- Bodily fluid seepage into the lungs and respiratory failure.



INSECT BORNE DISEASES

Lyme or Rocky Mountain Spotted Fever disease: caused by the bacteria found in the mouths of Deer, Star, or Dog ticks.

- Ticks are infected when they bite deer or mice with the disease, and you are infected when the tick bites you.
- These diseases have been reported in most parts of the United States.
- The tick that carries the disease is so small it can barely be seen and you may not realize you have been bitten.

Early Lyme symptoms include:

- ✓ Fever
- ✓ Headache
- ✓ Fatigue
- ✓ Depression
- ✓ Sometimes a characteristic skin rash/bullseye

Late stage Lyme symptoms are:

- ✓ Sore joints
- ✓ Heart irregularities
- ✓ Central nervous system disturbance

Lyme Disease can be disabling and very difficult to treat in the later stages.

- 250 – 1200 cases of Rocky Spotted Fever reported annually in the US.
- 90% of victims infected during April – September.
- Need 24 – 48 hours of a feeding tick to put you at risk.

Early stage Rocky Mountain Spotted Fever symptoms are:

- ✓ Symptoms appear 3 to 12 days after being bit.
- ✓ High Fever
- ✓ Headache
- ✓ Aching muscles
- ✓ Rash may appear on the 2nd or 3rd day of the fever
- ✓ Cough
- ✓ Intestinal problems

Late stage Rocky Mountain Spotted Fever symptoms are:

- ✓ Causes death in 25% of “Un-Treated” cases
- ✓ Meningitis
- ✓ Pneumonia
- ✓ Deafness
- ✓ Cardiac problems
- ✓ Joint pain
- ✓ Forgetfulness

West Nile virus: a viral disease spread by mosquitos. First identified in Uganda, Africa, but the West Nile virus has spread throughout the United States. The disease is spread when a mosquito bites an infected bird and then bites a human.

Most people infected with the virus do not realize they have been exposed. More severe forms of the disease result in life threatening West Nile encephalitis or West Nile meningitis.

Symptoms include:

- ✓ Flu-like symptoms
- ✓ Fever
- ✓ Headache
- ✓ Back pain
- ✓ Muscle aches
- ✓ Sore throat
- ✓ Nausea
- ✓ Vomiting

These symptoms last for about 3 to 6 days.

Zika virus: another viral disease spread by mosquitos. As many as 4 out of 5 people infected with the Zika virus have no signs or symptoms. If symptoms do occur, they usually appear 2 to 7 days after being bitten.

Symptoms include:

- ✓ Mild fever
- ✓ Rash
- ✓ Joint or muscle pain
- ✓ Headache
- ✓ Red eyes

The OSHA Standard

- The OSHA standard applies to any employee who has occupational exposure to blood or potentially infectious material.
- **Therefore, any worker who can potentially come into contact with blood or body fluids from accidents in the workplace is covered under the standard**.

Employer Responsibilities

- Knowing your employer's responsibilities will make you more aware of the hazards of your job, will help you know how to find information about a hazard, and will help you have a safer work environment.

Recordkeeping for Bloodborne Pathogens

- Your employer is responsible for establishing and maintaining medical records for bloodborne pathogen exposures.
- In addition, records must be kept describing the training you receive for dealing with potential bloodborne hazards in the workplace.

Universal Precautions

- Universal precautions are an approach to infection control that treats **ALL** human blood and other potentially infectious bodily fluids as if they were infectious for HIV, HBV, or other bloodborne pathogens.
- Under universal precautions workers use gloves, masks, and gowns if exposure to blood or other potentially infectious materials is likely.
- They also use engineering and work practice controls to limit exposure risks.

Workplace Precautions

- Thoroughly wash any body part exposed to blood and blood products with antibacterial soap.
- Training on the proper procedures for cleaning up body fluids
- Use PPE whenever you are dealing with potentially infectious materials. This includes gloves, masks, gowns, aprons, face shields, protective eyewear, mouthpieces, and other ventilation devices.
- Do not allow potentially infectious materials to contact work clothes, street clothes, skin, or mucous membranes.
- For pathogens that are spread by insects, tuck your pant legs into boots, tuck your shirt into your pants, and spray insect repellant containing **DEET** on clothes and exposed skin.

§1910.120 Hazardous Waste Operations and Emergency Response Standard

(a) ***Scope, application, and definitions*** (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:

(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);

(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.*);

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

(iv) Operations involving hazardous wastes that are conducted at treatment, storage, and 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

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

(2) ***Application.*** (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).

(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).

(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) 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.

(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 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. Excepted employers who are not required to have employees engage in emergency response, who direct their employees to evacuate in the case of such emergencies

and who meet the requirements of paragraph (p)(8)(i) of this section are exempt from the balance of paragraph (p)(8) of this section.
(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.
(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.
(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 affects.
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 paragraphs (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 103(14) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (42 U.S.C. 9601).
(B) Any biological 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 or a pathogen where acute or chronic health effects may occur in exposed employees. It also includes stress due to temperature extremes. The term *health hazard* includes chemicals that are classified in accordance with the Hazard Communication Standard, 29 CFR 1910.1200, as posing one of the following hazardous effects: Acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); aspiration toxicity or simple asphyxiant. (*See* Appendix A to §1910.1200—Health Hazard Criteria (Mandatory) for the criteria for determining whether a chemical is classified as a health hazard.)
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 cause irreversible or delayed adverse health effects 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 §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 §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.
(1) *General.* (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.
(ii) The written safety and health program shall incorporate the following:
(A) An organizational structure;
(B) A comprehensive workplan;
(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;
(D) The safety and health training program;
(E) The medical surveillance program;
(F) The employer's standard operating procedures for safety and health; and
(G) Any necessary interface between general program and site specific activities.
(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.

(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, including those identified in the employer's information program.
(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.
(2) *Organizational structure part of the site program* – (i) The organizationa1 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:
(A) A general supervisor who has the responsibility and authority to direct all hazardous waste operations.
(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.
(C) All other personnel needed for hazardous waste site operations and emergency response and their general functions and responsibilities.
(D) The lines of authority, responsibility, and communication.
(ii) The organizational structure shall be reviewed and updated as necessary to reflect the current status of waste site operations.
(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.
(i) The comprehensive workplan shall address anticipated clean-up activities as well as normal operating procedures which need not repeat the employer's procedures available elsewhere.
(ii) The comprehensive workplan shall define work tasks and objectives and identify the methods for accomplishing those tasks and objectives.
(iii) The comprehensive workplan shall establish personnel requirements for implementing the plan.
(iv) The comprehensive workplan shall provide for the implementation of the training required in paragraph (e) of this section.
(v) The comprehensive workplan shall provide for the implementation of the required informational programs required in paragraph (i) of this section.
(vi) The comprehensive workplan shall provide for the implementation of the medical surveillance program described in paragraph (f) of this section.
(4) *Site-specific safety and health plan part of the program* – (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.
(ii) *Elements.* The site safety and health plan, as a minimum, shall address the following:
(A) A safety and health risk or hazard analysis for each site task and operation found in the workplan.
(B) Employee training assignments to assure compliance with paragraph (e) of this section.

(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.
(D) Medical surveillance requirements in accordance with the program in paragraph (f) of this section.
(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.
(F) Site control measures in accordance with the site control program required in paragraph (d) of this section.
(G) Decontamination procedures in accordance with paragraph (k) of this section.
(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.
(I) Confined space entry procedures.
(J) A spill containment program meeting the requirements of paragraph (j) of this section.
(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.
(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* (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.
(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.
(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.

(4) *Required information.* The following information to the extent available shall be obtained by the employer prior to allowing employees to enter a site:
(i) Location and approximate size of the site.
(ii) Description of the response activity and/or the job task to be performed.
(iii) Duration of the planned employee activity.
(iv) Site topography and accessibility by air and roads.
(v) Safety and health hazards expected at the site.
(vi) Pathways for hazardous substance dispersion.
(vii) Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up site employees at the time of an emergency.
(viii) Hazardous substances and health hazards involved or expected at the site, and their chemical and physical properties.
(5) *Personal protective equipment.* Personal protective equipment (PPE) shall be provided and used during initial site entry in accordance with the following requirements:
(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.
(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.
(iii) If the preliminary site evaluation does not produce sufficient information to identify the hazards or suspected hazards of the site, an ensemble providing protection 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 a description of Level B hazards and the recommendations for Level B protective equipment.)
(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.
(6) *Monitoring.* The following monitoring shall be conducted during initial site entry when the site evaluation produces information that shows the potential for ionizing radiation or IDLH conditions, or when the site information is not sufficient reasonably to eliminate these possible conditions:
(i) Monitoring with direct reading instruments for hazardous levels of ionizing radiation.
(ii) Monitoring the air with appropriate direct reading test equipment (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).
(iii) Visually observing for signs of actual or potential IDLH or other dangerous conditions.
(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.
(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.
(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.
(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* (1) *General.* Appropriate site control procedures shall be implemented to control employee exposure to hazardous substances before clean-up work begins.
(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.
(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* (1) *General.* (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.
(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.
(2) *Elements to be covered.* The training shall thoroughly cover the following:
(i) Names of personnel and alternates responsible for site safety and health;
(ii) Safety, health and other hazards present on the site;
(iii) Use of personal protective equipment;
(iv) Work practices by which the employee can minimize risks from hazards;
(v) Safe use of engineering controls and equipment on the site;
(vi) Medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards; and
(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.

(3) *Initial training.* (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.
(ii) Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geo-physical 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.
(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.
(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).
(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 training, 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 not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.
(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.
(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 successfully 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.
(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.

(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.
(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 work experience.
(f) *Medical surveillance* (1) *General.* Employers 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.
(2) *Employees covered.* The medical surveillance program shall be instituted by the employer for the following employees:
(i) All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no 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;
(ii) All employees who wear a respirator for 30 days or more a year or as required by §1910.134;
(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
(iv) Members of HAZMAT teams.
(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:
(i) For employees covered under paragraphs (f)(2)(i), (f)(2)(ii), and (f)(2)(iv):
(A) Prior to assignment;
(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;
(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;
(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;
(E) At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary.

(ii) For employees covered under paragraph (f)(2)(iii) and for all employees including those of employers covered by paragraph (a)(1)(v) 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:
(A) As soon as possible following the emergency incident or development of signs or symptoms;
(B) At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary.
(4) *Content of medical examinations and consultations.* (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.
(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.
(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.
(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:
(i) A description of the employee's duties as they relate to the employee's exposures.
(ii) The employee's exposure levels or anticipated exposure levels.
(iii) A description of any personal protective equipment used or to be used.
(iv) Information from previous medical examinations of the employee which is not readily available to the examining physician.
(v) Information required by §1910.134.
(7) *Physician's written opinion.* (i) The employer shall obtain and furnish the employee with a copy of a written opinion from the attending physician containing the following:
(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.
(B) The physician's recommended limitations upon the employee's assigned work.
(C) The results of the medical examination and tests if requested by the employee.
(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.
(ii) The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposures.

(8) *Recordkeeping.* (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 1910.1020.
(ii) The record required in paragraph (f)(8)(i) of this section shall include at least the following information:
(A) The name and social security number of the employee;
(B) Physician's written opinions, recommended limitations, and results of examinations and tests;
(C) Any employee medical complaints related to exposure to hazardous substances;
(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, 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.
(1) *Engineering controls, work practices and PPE for substances regulated in subparts G and Z.* (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.
(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.
(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 employee exposures to or below the permissible exposure limits or dose limits for substances regulated by 29 CFR part 1910, subpart Z.
(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.
(iv) The provisions of 29 CFR, subpart G, shall be followed.
(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 SDS 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.
(3) *Personal protective equipment selection.* (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.
(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.
(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.
(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.
(v) The level of protection provided by PPE selection shall be increased when additional information on site conditions indicates 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.)
(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.
(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.
(4) *Totally-encapsulating chemical protective suits.* (i) Totally-encapsulating suits shall protect employees from the particular hazards which are identified during site characterization and analysis.
(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.)
(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.)
(5) *Personal protective equipment (PPE) program.* A written 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.
(i) PPE selection based upon site hazards,
(ii) PPE use and limitations of the equipment,
(iii) Work mission duration,
(iv) PPE maintenance and storage,
(v) PPE decontamination and disposal,
(vi) PPE training and proper fitting,
(vii) PPE donning and doffing procedures,
(viii) PPE inspection procedures prior to, during, and after use,
(ix) Evaluation of the effectiveness of the PPE program, and
(x) Limitations during temperature extremes, heat stress, and other appropriate medical considerations.

(h) *Monitoring* (1) *General.* (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.
(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.
(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 or oxygen-deficient environments.
(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:
(i) When work begins on a different portion of the site.
(ii) When contaminants other than those previously identified are being handled.
(iii) When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling).
(iv) When employees are handling leaking drums or containers or working in areas with obvious liquid contamination (e.g., a spill or lagoon).
(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 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. 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.
(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* (1) *General.* (i) Hazardous substances and contaminated soils, liquids, and other residues shall be handled, transported, labeled, and disposed of in accordance with this paragraph.

(ii) Drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain.
(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.
(iv) Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.
(v) Site operations shall be organized to minimize the amount of drum or container movement.
(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.
(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.
(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.
(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.
(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.
(xi) Soil or covering material shall be removed with caution to prevent drum or container rupture.
(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.
(2) *Opening drums and containers.* The following procedures shall be followed in areas where drums or containers are being opened:
(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.
(ii) Employees not actually involved in opening drums or containers shall be kept a safe distance from the drums or containers being opened.
(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.
(iv) Controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment shall be located behind the explosion-resistant barrier.
(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.
(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.

(vii) Employees shall not stand upon or work from drums or containers.
(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.
(4) *Radioactive wastes.* Drums and containers containing radioactive wastes shall not be handled until such time as their hazard to employees is properly assessed.
(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:
(i) All non-essential employees shall be evacuated from the area of transfer.
(ii) Material handling equipment shall be provided with explosive containment devices or protective shields to protect equipment operators from exploding containers.
(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.
(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.
(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.
(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.
(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):
(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.
(ii) If crystalline material is noted on any container, the contents shall be handled as a shock-sensitive waste until the contents are identified.
(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.
(8) *Shipping and transport.* (i) Drums and containers shall be identified and classified prior to packaging for shipment.
(ii) Drum or container staging areas shall be kept to the minimum number necessary to identify and classify materials safely and prepare them for transport.
(iii) Staging areas shall be provided with adequate access and egress routes.

(iv) Bulking of hazardous wastes shall be permitted only after a thorough characterization of the materials has been completed.
(9) *Tank and vault procedures.* (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.
(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* (1) *General.* Procedures for all phases of decontamination shall be developed and implemented in accordance with this paragraph.
(2) *Decontamination procedures.* (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.
(ii) Standard operating procedures shall be developed to minimize employee contact with hazardous substances or with equipment that has contacted hazardous substances.
(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.
(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.
(3) *Location.* Decontamination shall be performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.
(4) *Equipment and solvents.* All equipment and solvents used for decontamination shall be decontaminated or disposed of properly.
(5) *Personal protective clothing and equipment.* (i) Protective clothing and equipment shall be decontaminated, cleaned, laundered, maintained or replaced as needed to maintain their effectiveness.
(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.
(6) *Unauthorized employees.* Unauthorized employees shall not remove protective clothing or equipment from change rooms.
(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.
(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* – (1) *Emergency response plan.* (i) An emergency response plan shall be developed and implemented by all employers within the scope of paragraphs (a)(1) (i)-(ii) of this 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.

(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 29 CFR 1910.38.
(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:
(i) Pre-emergency planning.
(ii) Personnel roles, lines of authority, and communication.
(iii) Emergency recognition and prevention.
(iv) Safe distances and places of refuge.
(v) Site security and control.
(vi) Evacuation routes and procedures.
(vii) Decontamination procedures which are not covered by the site safety and health plan.
(viii) Emergency medical treatment and first aid.
(ix) Emergency alerting and response procedures.
(x) Critique of response and follow-up.
(xi) PPE and emergency equipment.
(3) *Procedures for handling emergency incidents.* (i) In addition to the elements for the emergency response plan required in paragraph (l)(2) of this section, the following elements shall be included for emergency response plans:
(A) Site topography, layout, and prevailing weather conditions.
(B) Procedures for reporting incidents to local, state, and federal governmental agencies.
(ii) The emergency response plan shall be a separate section of the Site Safety and Health Plan.
(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.
(iv) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.
(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.
(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.
(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* (1) *Potable water.* (i) An adequate supply of potable water shall be provided on the site.

(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.

(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.

(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.

(2) *Non-potable water.* (i) Outlets for non-potable 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.

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

(3) *Toilet facilities.* (i) Toilets shall be provided for employees according to the following 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 one urinal per 40 employees.
More than 200	One toilet seat and one urinal per 50 employees.

(ii) Under temporary field conditions, provisions shall be made to assure that at least one toilet facility is available.

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

(A) Chemical toilets;

(B) Recirculating toilets;

(C) Combustion toilets; or
(D) Flush toilets.
(iv) The requirements of this paragraph for sanitation facilities shall not apply to mobile crews having transportation readily available to nearby toilet facilities.
(v) Doors entering toilet facilities shall be provided with entrance locks controlled from inside the facility.
(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.
(5) *Temporary sleeping quarters.* When temporary sleeping quarters are provided, they shall be heated, ventilated, and lighted.
(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 published exposure levels and which are under the controls of the employer; and shall be so equipped as to enable employees to remove hazardous substances from themselves.
(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.
(i) Showers shall be provided and shall meet the requirements of 29 CFR 1910.141(d)(3).
(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 a clean area where they can remove, store, and put on street clothing. The second area, with an exit to the worksite, shall provide employees with an area where they can put on, remove and store work clothing and personal protective equipment.
(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.
(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.* (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.
(2) New technologies, equipment or control measures available to the industry, such as the use of foams, absorbents, adsorbents, neutralizers, or other means to suppress the level of air contaminates 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.)".

(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.

(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.

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

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

(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.

(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.

(7) *Training program* (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 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.

(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.

(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.
(8) *Emergency response program* (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 employer's 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 29 CFR 1910.38.
(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:
(A) Pre-emergency planning and coordination with outside parties.
(B) Personnel roles, lines of authority, and communication.
(C) Emergency recognition and prevention.
(D) Safe distances and places of refuge.
(E) Site security and control.
(F) Evacuation routes and procedures.
(G) Decontamination procedures.
(H) Emergency medical treatment and first aid.
(I) Emergency alerting and response procedures.
(J) Critique of response and follow-up.
(K) PPE and emergency equipment.
(iii) *Training.* (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.

(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.
(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 at least yearly. The method used to demonstrate competency for certification of training shall be recorded and maintained by the employer.
(iv) *Procedures for handling emergency incidents.* (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:
(*1*) Site topography, layout, and prevailing weather conditions.
(*2*) Procedures for reporting incidents to local, state, and federal governmental agencies.
(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.
(C) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.
(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.
(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.
(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 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.
(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 and 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 in accordance with 29 CFR 1910.38.

(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 to the extent that they are not addressed elsewhere:
(i) Pre-emergency planning and coordination with outside parties.
(ii) Personnel roles, lines of authority, training, and communication.
(iii) Emergency recognition and prevention.
(iv) Safe distances and places of refuge.
(v) Site security and control.
(vi) Evacuation routes and procedures.
(vii) Decontamination.
(viii) Emergency medical treatment and first aid.
(ix) Emergency alerting and response procedures.
(x) Critique of response and follow-up.
(xi) PPE and emergency equipment.
(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.
(3) *Procedures for handling emergency response.* (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.
(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.
(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.
(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 firefighting operations beyond the incipient stage for any incident.
(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.

(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.
(vi) Back-up personnel shall stand by with equipment ready to provide assistance or rescue. Advance first aid support personnel, as a minimum, shall also stand by with medical equipment and transportation capability.
(vii) The individual in charge of the ICS shall designate a safety official, 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.
(viii) When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official 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.
(ix) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.
(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.
(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.
(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.
(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:

(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:
(A) An understanding of what hazardous substances are, and the risks associated with them in an incident.
(B) An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.
(C) The ability to recognize the presence of hazardous substances in an emergency.
(D) The ability to identify the hazardous substances, if possible.
(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.
(F) The ability to realize the need for additional resources, and to make appropriate notifications to the communication center.
(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:
(A) Knowledge of the basic hazard and risk assessment techniques.
(B) Know how to select and use proper personal protective equipment provided to the first responder operational level.
(C) An understanding of basic hazardous materials terms.
(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.
(E) Know how to implement basic decontamination procedures.
(F) An understanding of the relevant standard operating procedures and termination procedures.
(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:
(A) Know how to implement the employer's emergency response plan.
(B) Know the classification, identification and verification of known and unknown materials by using field survey instruments and equipment.
(C) Be able to function within an assigned role in the Incident Command System.

(D) Know how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician.
(E) Understand hazard and risk assessment techniques.
(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.
(G) Understand and implement decontamination procedures.
(H) Understand termination procedures.
(I) Understand basic chemical and toxicological terminology and behavior.
(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:
(A) Know how to implement the local emergency response plan.
(B) Understand classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment.
(C) Know of the state emergency response plan.
(D) Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist.
(E) Understand in-depth hazard and risk techniques.
(F) Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available.
(G) Be able to determine and implement decontamination procedures.
(H) Have the ability to develop a site safety and control plan.
(I) Understand chemical, radiological and toxicological terminology and behavior.
(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:
(A) Know and be able to implement the employer's incident command system.
(B) Know how to implement the employer's emergency response plan.
(C) Know and understand the hazards and risks associated with employees working in chemical protective clothing.
(D) Know how to implement the local emergency response plan.
(E) Know of the state emergency response plan and of the Federal Regional Response Team.
(F) Know and understand the importance of decontamination procedures.
(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.

(8) *Refresher training.* (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.
(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.
(9) *Medical surveillance and consultation.* (i) Members of an organized and designated HAZMAT team and hazardous materials specialists shall receive a baseline physical examination and be provided with medical surveillance as required in paragraph (f) of this section.
(ii) Any emergency response employees who exhibits 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.
(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.
(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:
(i) Meet all of the requirements of paragraphs (b) through (o) of this section; or
(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, 1910.134, 1910.1200, and other appropriate safety and health training made necessary by the tasks they are expected to perform 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.
Appendix A to §1910.120—Personal Protective Equipment Test Methods
This appendix sets forth the non-mandatory examples of tests which may be used to evaluate compliance with §1910.120 (g)(4) (ii) and (iii). Other tests and other challenge agents may be used to evaluate compliance.
A. Totally-encapsulating chemical protective suit pressure test
1.0 – Scope
1.1 This practice measures the ability of a gas tight totally-encapsulating chemical protective suit material, seams, and closures to maintain a fixed positive pressure. The results of this practice allow the gas tight integrity of a totally-encapsulating chemical protective suit to be evaluated.
1.2 Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.
2.0 – Definition of terms
2.1 *Totally-encapsulated chemical protective suit (TECP suit)* means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, legs and respirator; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves and boots.
2.2 *Protective clothing material* means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.
2.3 *Gas tight* means, for the purpose of this test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.
3.0 – Summary of test method
3.1 The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pre-test suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the pressure drop is excessive, the TECP suit fails the test and is removed from service. The test is repeated after leak location and repair.
4.0 – Required Supplies
4.1 Source of compressed air.
4.2 Test apparatus for suit testing, including a pressure measurement device with a sensitivity of at least ¼ inch water gauge.
4.3 Vent valve closure plugs or sealing tape.
4.4 Soapy water solution and soft brush.
4.5 Stop watch or appropriate timing device.
5.0 – Safety Precautions
5.1 Care shall be taken to provide the correct pressure safety devices required for the source of compressed air used.
6.0 – Test Procedure
6.1 Prior to each test, the tester shall perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.
6.1.1 Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or face piece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.
6.1.2 Close all closure assemblies.

6.1.3 Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air source equipped with a pressure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component shall be replaced and a second test conducted with another component removed to permit a complete test of the ensemble.
6.1.4 The pre-test expansion pressure (A) and the suit test pressure (B) shall be supplied by the suit manufacturer, but in no case shall they be less than: (A) = three inches water gauge; and (B) = two inches water gauge. The ending suit pressure (C) shall be no less than 80 percent of the test pressure (B); i.e., the pressure drop shall not exceed 20 percent of the test pressure (B).
6.1.5 Inflate the suit until the pressure inside is equal to pressure (A), the pre-test expansion suit pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure (B), the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure (C), the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B − C) shall be defined as the suit pressure drop.
6.1.6 If the suit pressure drop is more than 20 percent of the suit test pressure (B) during the three-minute test period, the suit fails the test and shall be removed from service.
7.0 – Retest Procedure
7.1 If the suit fails the test check for leaks by inflating the suit to pressure (A) and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which is an indication of a leak. Repair all identified leaks.
7.2 Retest the TECP suit as outlined in Test procedure 6.0.
8.0 – Report
8.1 Each TECP suit tested by this practice shall have the following information recorded:
8.1.1 Unique identification number, identifying brand name, date of purchase, material of construction, and unique fit features, e.g., special breathing apparatus.
8.1.2 The actual values for test pressures (A), (B), and (C) shall be recorded along with the specific observation times. If the ending pressure (C) is less than 80 percent of the test pressure (B), the suit shall be identified as failing the test. When possible, the specific leak location shall be identified in the test records. Retest pressure data shall be recorded as an additional test.
8.1.3 The source of the test apparatus used shall be identified and the sensitivity of the pressure gauge shall be recorded.
8.1.4 Records shall be kept for each pressure test even if repairs are being made at the test location.
Caution
Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.
Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.
B. Totally-encapsulating chemical protective suit qualitative leak test
1.0 – Scope
1.1 This practice semi-qualitatively tests gas tight totally-encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.
1.2 Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method. ASTM test methods are available to test suit materials for these characteristics and the tests are usually conducted by the manufacturers of the suits.
2.0 – Definition of terms

2.1 *Totally-encapsulated chemical protective suit (TECP suit)* means a full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, legs and respirator; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer and respirator by itself or in combination with the wearer's gloves, and boots.
2.2 *Protective clothing material* means any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.
2.3 *Gas tight* means, for the purpose of this test method, the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.
2.4 *Intrusion Coefficient* means a number expressing the level of protection provided by a gas tight totally-encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the intrusion coefficient the greater the protection provided by the TECP suit.
3.0 – Summary of recommended practice
3.1 The volume of concentrated aqueous ammonia solution (ammonia hydroxide NH_4 OH) required to generate the test atmosphere is determined using the directions outlined in 6.1. The suit is donned by a person wearing the appropriate respiratory equipment (either a positive pressure self-contained breathing apparatus or a positive pressure supplied air respirator) and worn inside the enclosed test room. The concentrated aqueous ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured, using a high range ammonia length of stain detector tube. When the ammonia vapor reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed, the test room concentration is measured again. The suited individual exits the test room and his stand-by person measures the ammonia concentration inside the suit using a low range ammonia length of stain detector tube or other more sensitive ammonia detector. A stand-by person is required to observe the test individual during the test procedure; aid the person in donning and doffing the TECP suit; and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric ammonia indicator strip of bromophenol blue or equivalent is placed on the inside of the suit face piece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual shall leave the test room immediately.
4.0 – Required supplies
4.1 A supply of concentrated aqueous ammonium hydroxide (58% by weight).
4.2 A supply of bromophenol/blue indicating paper or equivalent, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure. [pH 3.0 (yellow) to pH 4.6 (blue)]
4.3 A supply of high range (0.5-10 volume percent) and low range (5-700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.
4.4 A shallow plastic pan (PVC) at least 12″:14″:1″ and a half pint plastic container (PVC) with tightly closing lid.
4.5 A graduated cylinder or other volumetric measuring device of at least 50 milliliters in volume with an accuracy of at least ±1 milliliters.
5.0 – Safety precautions
5.1 Concentrated aqueous ammonium hydroxide, NH_4 OH, is a corrosive volatile liquid requiring eye, skin, and respiratory protection. The person conducting the test shall review the SDS for aqueous ammonia.
5.2 Since the established permissible exposure limit for ammonia is 35 ppm as a 15 minute STEL, only persons wearing a positive pressure self-contained breathing apparatus or a positive pressure

supplied air respirator shall be in the chamber. Normally only the person wearing the totally-encapsulating suit will be inside the chamber. A stand-by person shall have a positive pressure self-contained breathing apparatus, or a positive pressure supplied air respirator available to enter the test area should the suited individual need assistance.
5.3 A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.
5.4 The test room shall be large enough to allow the exercise protocol to be carried out and then to be ventilated to allow for easy exhaust of the ammonia test atmosphere after the test(s) are completed.
5.5 Individuals shall be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.
6.0 – Test procedure
6.1.1 Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of concentrated aqueous ammonia solution per cubic foot of test area volume to determine the approximate volume of concentrated aqueous ammonia required to generate 1000 ppm in the test area.
6.1.2 Measure this volume from the supply of concentrated aqueous ammonia and place it into a closed plastic container.
6.1.3 Place the container, several high range ammonia detector tubes, and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.
6.2.1 In a non-contaminated atmosphere, open a pre-sealed ammonia indicator strip and fasten one end of the strip to the inside of the suit face shield lens where it can be seen by the wearer. Moisten the indicator strip with distilled water. Care shall be taken not to contaminate the detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.
6.2.2 If problems are encountered with this method of attachment, the indicator strip can be attached to the outside of the respirator face piece lens being used during the test.
6.3 Don the respiratory protective device normally used with the suit, and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.
6.4 Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.
6.5 Open the container with the pre-measured volume of concentrated aqueous ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the concentrated aqueous ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of the ammonia solution.
6.6 After two minutes a determination of the ammonia concentration within the chamber should be made using the high range colorimetric detector tube. A concentration of 1000 ppm ammonia or greater shall be generated before the exercises are started.
6.7 To test the integrity of the suit the following four minute exercise protocol should be followed:
6.7.1 Raising the arms above the head with at least 15 raising motions completed in one minute.
6.7.2 Walking in place for one minute with at least 15 raising motions of each leg in a one-minute period.
6.7.3 Touching the toes with a least 10 complete motions of the arms from above the head to touching of the toes in a one-minute period.
6.7.4 Knee bends with at least 10 complete standing and squatting motions in a one-minute period.
6.8 If at any time during the test the colorimetric indicating paper should change colors, the test should be stopped and section 6.10 and 6.12 initiated (See ¶4.2).

6.9 After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.
6.10 Exit the test area.
6.11 The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.
6.12 After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.
6.13 The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas. The fan shall be vented to the outside of the building.
6.14 Any detectable ammonia in the suit interior (five ppm ammonia (NH_3) or more for the length of stain detector tube) indicates that the suit has failed the test. When other ammonia detectors are used a lower level of detection is possible, and it should be specified as the pass/fail criteria.
6.15 By following this test method, an intrusion coefficient of approximately 200 or more can be measured with the suit in a completely operational condition. If the intrusion coefficient is 200 or more, then the suit is suitable for emergency response and field use.
7.0 – Retest procedures
7.1 If the suit fails this test, check for leaks by following the pressure test in test A above.
7.2 Retest the TECP suit as outlined in the test procedure 6.0.
8.0 – Report
8.1 Each gas tight totally-encapsulating chemical protective suit tested by this practice shall have the following information recorded.
8.1.1 Unique identification number, identifying brand name, date of purchase, material of construction, and unique suit features; e.g., special breathing apparatus.
8.1.2 General description of test room used for test.
8.1.3 Brand name and purchase date of ammonia detector strips and color change data.
8.1.4 Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.
8.1.5 Actual test results shall list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data shall be recorded as an additional test.
8.2 The evaluation of the data shall be specified as “suit passed” or “suit failed,” and the date of the test. Any detectable ammonia (five ppm or greater for the length of stain detector tube) in the suit interior indicates the suit has failed this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass fail criteria.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.
Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

Appendix B to §1910.120—General Description and Discussion of the Levels of Protection and Protective Gear

This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section.

As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work on-site.

Selection of the appropriate PPE is a complex process which should take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards; their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact); and the performance of the PPE *materials* (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, should be considered in relation to the employee's tasks. The effects of PPE in relation to heat stress and task duration are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to up-grade or down-grade the level of PPE protection to match the tasks at hand.

The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

Part A. Personal protective equipment is divided into four categories based on the degree of protection afforded. (See part B of this appendix for further explanation of Levels A, B, C, and D hazards.)

I. ***Level A*** – To be selected when the greatest level of skin, respiratory, and eye protection is required. The following constitute Level A equipment; it may be used as appropriate;

1. Positive pressure, full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
2. Totally-encapsulating chemical-protective suit.
3. Coveralls.1
4. Long underwear.1
5. Gloves, outer, chemical-resistant.
6. Gloves, inner, chemical-resistant.
7. Boots, chemical-resistant, steel toe and shank.
8. Hard hat (under suit).1
9. Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

II. ***Level B*** – The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.
The following constitute Level B equipment; it may be used as appropriate.
1. Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.1
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots, outer, chemical-resistant steel toe and shank.
7. Boot-covers, outer, chemical-resistant (disposable).1
8. Hard hat.1
9. [Reserved]
10. Face shield.1
III. ***Level C*** – The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met.
The following constitute Level C equipment; it may be used as appropriate.
1. Full-face or half-mask, air purifying respirators (NIOSH approved).
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls).
3. Coveralls.1
1Optional, as applicable.
4. Gloves, outer, chemical-resistant.
5. Gloves, inner, chemical-resistant.
6. Boots (outer), chemical-resistant steel toe and shank.1
7. Boot-covers, outer, chemical-resistant (disposable)1.
8. Hard hat.1
9. Escape mask.1
10. Face shield.1
IV. ***Level D*** – A work uniform affording minimal protection, used for nuisance contamination only.
The following constitute Level D equipment; it may be used as appropriate:
1. Coveralls.
2. Gloves.1
3. Boots/shoes, chemical-resistant steel toe and shank.
4. Boots, outer, chemical-resistant (disposable).1
5. Safety glasses or chemical splash goggles*.
6. Hard hat.1
7. Escape mask.1
8. Face shield.1

Part B. The types of hazards for which levels A, B, C, and D protection are appropriate are described below:

I. ***Level A*** – Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin;
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
3. Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

II. ***Level B*** – Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

NOTE: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

III. ***Level C*** – Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin;
2. The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
3. All criteria for the use of air-purifying respirators are met.

IV. ***Level D*** – Level D protection should be used when:

1. The atmosphere contains no known hazard; and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

NOTE: As stated before, combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

As an aid in selecting suitable chemical protective clothing, it should be noted that the National Fire Protection Association (NFPA) has developed standards on chemical protective clothing. The standards that have been adopted by include:

NFPA 1991—Standard on Vapor-Protective Suits for Hazardous Chemical Emergencies (EPA Level A Protective Clothing).

NFPA 1992—Standard on Liquid Splash-Protective Suits for Hazardous Chemical Emergencies (EPA Level B Protective Clothing).

NFPA 1993—Standard on Liquid Splash-Protective Suits for Non-emergency, Non-flammable Hazardous Chemical Situations (EPA Level B Protective Clothing).

These standards apply documentation and performance requirements to the manufacture of chemical protective suits. Chemical protective suits meeting these requirements are labelled as compliant with the appropriate standard. It is recommended that chemical protective suits that meet these standards be used.

Appendix C to §1910.120 – Compliance Guidelines

1. ***Occupational Safety and Health Program***. Each hazardous waste site clean-up effort will require an occupational safety and health program headed by the site coordinator or the employer's representative. The purpose of the program will be the protection of employees at the site and will be an extension of the employer's overall safety and health program. The program will need to be developed before work begins on the site and implemented as work proceeds as stated in paragraph (b). The program is to facilitate coordination and communication of safety and health issues among personnel responsible for the various activities which will take place at the site. It will provide the overall means for planning and implementing the needed safety and health training and job orientation of employees who will be working at the site. The program will provide the means for identifying and controlling worksite hazards and the means for monitoring program effectiveness. The program will need to cover the responsibilities and authority of the site coordinator or the employer's manager on the site for the safety and health of employees at the site, and the relationships with contractors or support services as to what each employer's safety and health responsibilities are for their employees on the site. Each contractor on the site needs to have its own safety and health program so structured that it will smoothly interface with the program of the site coordinator or principal contractor.

Also those employers involved with treating, storing or disposal of hazardous waste as covered in paragraph (p) must have implemented a safety and health program for their employees. This program is to include the hazard communication program required in paragraph (p)(1) and the training required in paragraphs (p)(7) and (p)(8) as parts of the employers comprehensive overall safety and health program. This program is to be in writing.

Each site or workplace safety and health program will need to include the following: (1) Policy statements of the line of authority and accountability for implementing the program, the objectives of the program and the role of the site safety and health supervisor or manager and staff; (2) means or methods for the development of procedures for identifying and controlling workplace hazards at the site; (3) means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures and practices that pertain to individual employees and supervisors; (4) means for the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner; (5) means to anticipate and prepare for emergency situations; and (6) means for obtaining information feedback to aid in evaluating the program and for improving the effectiveness of the program. The management and employees should be trying continually to improve the effectiveness of the program thereby enhancing the protection being afforded those working on the site.

Accidents on the site or workplace should be investigated to provide information on how such occurrences can be avoided in the future. When injuries or illnesses occur on the site or workplace, they will need to be investigated to determine what needs to be done to prevent this incident from occurring again. Such information will need to be used as feedback on the effectiveness of the program and the information turned into positive steps to prevent any reoccurrence. Receipt of employee suggestions or complaints relating to safety and health issues involved with site or workplace activities is also a feedback mechanism that can be used effectively to improve the program and may serve in part as an evaluative tool(s).

For the development and implementation of the program to be the most effective, professional safety and health personnel should be used. Certified Safety Professionals, Board Certified Industrial Hygienists or Registered Professional Safety Engineers are good examples of professional stature for safety and health managers who will administer the employer's program.

2. ***Training***. The training programs for employees subject to the requirements of paragraph (e) of this standard should address: the safety and health hazards employees should expect to find on hazardous waste clean-up sites; what control measures or techniques are effective for those hazards; what monitoring procedures are effective in characterizing exposure levels; what makes an effective employer's safety and health program; what a site safety and health plan should include; hands on

training with personal protective equipment and clothing they may be expected to use; the contents of the OSHA standard relevant to the employee's duties and function; and, employee's responsibilities under OSHA and other regulations. Supervisors will need training in their responsibilities under the safety and health program and its subject areas such as the spill containment program, the personal protective equipment program, the medical surveillance program, the emergency response plan and other areas.

The training programs for employees subject to the requirements of paragraph (p) of this standard should address: the employers safety and health program elements impacting employees; the hazard communication program; the medical surveillance program; the hazards and the controls for such hazards that employees need to know for their job duties and functions. All require annual refresher training.

The training programs for employees covered by the requirements of paragraph (q) of this standard should address those competencies required for the various levels of response such as: the hazards associated with hazardous substances; hazard identification and awareness; notification of appropriate persons; the need for and use of personal protective equipment including respirators; the decontamination procedures to be used; preplanning activities for hazardous substance incidents including the emergency response plan; company standard operating procedures for hazardous substance emergency responses; the use of the incident command system and other subjects. Hands-on training should be stressed whenever possible. Critiques done after an incident which include an evaluation of what worked and what did not and how could the incident be better handled the next time may be counted as training time.

For hazardous materials specialists (usually members of hazardous materials teams), the training should address the care, use and/or testing of chemical protective clothing including totally encapsulating suits, the medical surveillance program, the standard operating procedures for the hazardous materials team including the use of plugging and patching equipment and other subject areas.

Officers and leaders who may be expected to be in charge at an incident should be fully knowledgeable of their company's incident command system. They should know where and how to obtain additional assistance and be familiar with the local district's emergency response plan and the state emergency response plan.

Specialist employees such as technical experts, medical experts or environmental experts that work with hazardous materials in their regular jobs, who may be sent to the incident scene by the shipper, manufacturer or governmental agency to advise and assist the person in charge of the incident should have training on an annual basis. Their training should include the care and use of personal protective equipment including respirators; knowledge of the incident command system and how they are to relate to it; and those areas needed to keep them current in their respective field as it relates to safety and health involving specific hazardous substances.

Those skilled support personnel, such as employees who work for public works departments or equipment operators who operate bulldozers, sand trucks, backhoes, etc., who may be called to the incident scene to provide emergency support assistance, should have at least a safety and health briefing before entering the area of potential or actual exposure. These skilled support personnel, who have not been a part of the emergency response plan and do not meet the training requirements, should be made aware of the hazards they face and should be provided all necessary protective clothing and equipment required for their tasks.

There are two National Fire Protection Association standards, NFPA 472—“Standard for Professional Competence of Responders to Hazardous Material Incidents” and NFPA 471—“Recommended Practice for Responding to Hazardous Material Incidents”, which are excellent resource documents to aid fire departments and other emergency response organizations in developing their training program materials. NFPA 472 provides guidance on the skills and knowledge needed for first responder

awareness level, first responder operations level, hazmat technicians, and hazmat specialist. It also offers guidance for the officer corp who will be in charge of hazardous substance incidents.

3. ***Decontamination***. Decontamination procedures should be tailored to the specific hazards of the site, and may vary in complexity and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method may not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by re-using PPE. References in appendix D may be used for guidance in establishing an effective decontamination program. In addition, the U.S. Coast Guard's Manual, “Policy Guidance for Response to Hazardous Chemical Releases,” U.S. Department of Transportation, Washington, DC (COMDTINST M16465.30) is a good reference for establishing an effective decontamination program.

4. ***Emergency response plans***. States, along with designated districts within the states, will be developing or have developed local emergency response plans. These state and district plans should be utilized in the emergency response plans called for in the standard. Each employer should assure that its emergency response plan is compatible with the local plan. The major reference being used to aid in developing the state and local district plans is the *Hazardous Materials Emergency Planning Guide,* NRT-1. The current Emergency Response Guidebook from the U.S. Department of Transportation, CMA's CHEMTREC and the Fire Service Emergency Management Handbook may also be used as resources.

Employers involved with treatment, storage, and disposal facilities for hazardous waste, which have the required contingency plan called for by their permit, would not need to duplicate the same planning elements. Those items of the emergency response plan that are properly addressed in the contingency plan may be substituted into the emergency response plan required in 1910.120 or otherwise kept together for employer and employee use.

5. ***Personal protective equipment programs***. The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered at a hazardous substance site.

As discussed in appendix B, no single combination of protective equipment and clothing is capable of protecting against all hazards. Thus PPE should be used in conjunction with other protective methods and its effectiveness evaluated periodically.

The use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. For any given situation, equipment and clothing should be selected that provide an adequate level of protection. However, over-protection, as well as under-protection, can be hazardous and should be avoided where possible.

Two basic objectives of any PPE program should be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program should include hazard identification, medical monitoring, environmental surveillance, selection, use, maintenance, and decontamination of PPE and its associated training.

The written PPE program should include policy statements, procedures, and guidelines. Copies should be made available to all employees, and a reference copy should be made available at the worksite. Technical data on equipment, maintenance manuals, relevant regulations, and other essential information should also be collected and maintained.

6. *Incident command system (ICS).* Paragraph 1910.120(q)(3)(ii) requires the implementation of an ICS. The ICS is an organized approach to effectively control and *manage* operations at an emergency incident. The individual in charge of the ICS is the senior official responding to the incident. The ICS is not much different than the “command post” approach used for many years by the fire service. During large complex fires involving several companies and many pieces of apparatus, a command post would be established. This enabled *one* individual to be in charge of managing the incident, rather than having

several officers from different companies making separate, and sometimes conflicting, decisions. The individual in charge of the command post would delegate responsibility for performing various tasks to subordinate officers. Additionally, all communications were routed through the command post to reduce the number of radio transmissions and eliminate confusion. However, strategy, tactics, and all decisions were made by one individual.

The ICS is a very similar system, except it is implemented for emergency response to all incidents, both large and small, that involve hazardous substances.

For a small incident, the individual in charge of the ICS may perform many tasks of the ICS. There may not be any, or little, delegation of tasks to subordinates. For example, in response to a small incident, the individual in charge of the ICS, in addition to normal command activities, may become the safety officer and may designate only one employee (with proper equipment) as a back-up to provide assistance if needed. OSHA does recommend, however, that at least two employees be designated as back-up personnel since the assistance needed may include rescue.

To illustrate the operation of the ICS, the following scenario might develop during a small incident, such as an overturned tank truck with a small leak of flammable liquid.

The first responding senior officer would implement and take command of the ICS. That person would size-up the incident and determine if additional personnel and apparatus were necessary; would determine what actions to take to control the leak; and, determine the proper level of personal protective equipment. If additional assistance is not needed, the individual in charge of the ICS would implement actions to stop and control the leak using the fewest number of personnel that can effectively accomplish the tasks. The individual in charge of the ICS then would designate himself as the safety officer and two other employees as a back-up in case rescue may become necessary. In this scenario, decontamination procedures would not be necessary.

A large complex incident may require many employees and difficult, time-consuming efforts to control. In these situations, the individual in charge of the ICS will want to delegate different tasks to subordinates in order to maintain a span of control that will keep the number of subordinates, that are reporting, to a manageable level.

Delegation of task at large incidents may be by location, where the incident scene is divided into sectors, and subordinate officers coordinate activities within the sector that they have been assigned. Delegation of tasks can also be by function. Some of the functions that the individual in charge of the ICS may want to delegate at a large incident are: medical services; evacuation; water supply; resources (equipment, apparatus); media relations; safety; and, site control (integrate activities with police for crowd and traffic control). Also for a large incident, the individual in charge of the ICS will designate several employees as back-up personnel; and a number of safety officers to monitor conditions and recommend safety precautions.

Therefore, no matter what size or complexity an incident may be, by implementing an ICS there will be *one individual in charge* who makes the decisions and gives directions; and, all actions, and communications are coordinated through one central point of command. Such a system should reduce confusion, improve safety, organize and coordinate actions, and should facilitate effective management of the incident.

7. *Site Safety and Control Plans.* The safety and security of response personnel and others in the area of an emergency response incident site should be of primary concern to the incident commander. The use of a site safety and control plan could greatly assist those in charge of assuring the safety and health of employees on the site.

A comprehensive site safety and control plan should include the following: summary analysis of hazards on the site and a risk analysis of those hazards; site map or sketch; site work zones (clean zone, transition or decontamination zone, work or hot zone); use of the buddy system; site communications; command post or command center; standard operating procedures and safe work practices; medical assistance and triage area; hazard monitoring plan (air contaminate monitoring,

etc.); decontamination procedures and area; and other relevant areas. This plan should be a part of the employer's emergency response plan or an extension of it to the specific site.

8. *Medical surveillance programs.* Workers handling hazardous substances may be exposed to toxic chemicals, safety hazards, biologic hazards, and radiation. Therefore, a medical surveillance program is essential to assess and monitor workers' health and fitness for employment in hazardous waste operations and during the course of work; to provide emergency and other treatment as needed; and to keep accurate records for future reference.

The *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* developed by the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), the U.S. Coast Guard (USCG), and the Environmental Protection Agency (EPA); October 1985 provides an excellent example of the types of medical testing that should be done as part of a medical surveillance program.

9. *New Technology and Spill Containment Programs.* Where hazardous substances may be released by spilling from a container that will expose employees to the hazards of the materials, the employer will need to implement a program to contain and control the spilled material. Diking and ditching, as well as use of absorbents like diatomaceous earth, are traditional techniques which have proven to be effective over the years. However, in recent years new products have come into the marketplace, the use of which complement and increase the effectiveness of these traditional methods. These new products also provide emergency responders and others with additional tools or agents to use to reduce the hazards of spilled materials.

These agents can be rapidly applied over a large area and can be uniformly applied or otherwise can be used to build a small dam, thus improving the workers' ability to control spilled material. These application techniques enhance the intimate contact between the agent and the spilled material allowing for the quickest effect by the agent or quickest control of the spilled material. Agents are available to solidify liquid spilled materials, to suppress vapor generation from spilled materials, and to do both. Some special agents, which when applied as recommended by the manufacturer, will react in a controlled manner with the spilled material to neutralize acids or caustics, or greatly reduce the level of hazard of the spilled material.

There are several modern methods and devices for use by emergency response personnel or others involved with spill control efforts to safely apply spill control agents to control spilled material hazards. These include portable pressurized applicators similar to hand-held portable fire extinguishing devices, and nozzle and hose systems similar to portable firefighting foam systems which allow the operator to apply the agent without having to come into contact with the spilled material. The operator is able to apply the agent to the spilled material from a remote position.

The solidification of liquids provides for rapid containment and isolation of hazardous substance spills. By directing the agent at run-off points or at the edges of the spill, the reactant solid will automatically create a barrier to slow or stop the spread of the material. Clean-up of hazardous substances is greatly improved when solidifying agents, acid or caustic neutralizers, or activated carbon adsorbents are used. Properly applied, these agents can totally solidify liquid hazardous substances or neutralize or absorb them, which results in materials which are less hazardous and easier to handle, transport, and dispose of. The concept of spill treatment, to create less hazardous substances, will improve the safety and level of protection of employees working at spill clean-up operations or emergency response operations to spills of hazardous substances.

The use of vapor suppression agents for volatile hazardous substances, such as flammable liquids and those substances which present an inhalation hazard, is important for protecting workers. The rapid and uniform distribution of the agent over the surface of the spilled material can provide quick vapor knockdown. There are temporary and long-term foam-type agents which are effective on vapors and dusts, and activated carbon adsorption agents which are effective for vapor control and soaking-up of the liquid. The proper use of hose lines or hand-held portable pressurized applicators provides good mobility and permits the worker to deliver the agent from a safe distance without having to step into the

untreated spilled material. Some of these systems can be recharged in the field to provide coverage of larger spill areas than the design limits of a single charged applicator unit. Some of the more effective agents can solidify the liquid flammable hazardous substances and at the same time elevate the flashpoint above 140 °F so the resulting substance may be handled as a nonhazardous waste material if it meets the U.S. Environmental Protection Agency's 40 CFR part 261 requirements (See particularly §261.21).

All workers performing hazardous substance spill control work are expected to wear the proper protective clothing and equipment for the materials present and to follow the employer's established standard operating procedures for spill control. All involved workers need to be trained in the established operating procedures; in the use and care of spill control equipment; and in the associated hazards and control of such hazards of spill containment work.

These new tools and agents are the things that employers will want to evaluate as part of their new technology program. The treatment of spills of hazardous substances or wastes at an emergency incident as part of the immediate spill containment and control efforts is sometimes acceptable to EPA and a permit exception is described in 40 CFR 264.1(g)(8) and 265.1(c)(11).

Appendix D to §1910.120 – References

The following references may be consulted for further information on the subject of this standard:

1. OSHA Instruction DFO CPL 2.70—January 29, 1986, *Special Emphasis Program: Hazardous Waste Sites.*
2. OSHA Instruction DFO CPL 2-2.37A—January 29, 1986, *Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities.*
3. OSHA Instruction DTS CPL 2.74—January 29, 1986, *Hazardous Waste Activity Form, OSHA 175.*
4. *Hazardous Waste Inspections Reference Manual,* U.S. Department of Labor, Occupational Safety and Health Administration, 1986.
5. Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency, *Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies.* December 18, 1980.
6. *National Priorities List,* 1st Edition, October 1984; U.S. Environmental Protection Agency, Revised periodically.
7. *The Decontamination of Response Personnel,* Field Standard Operating Procedures (F.S.O.P.) 7; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, December 1984.
8. *Preparation of a Site Safety Plan,* Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, April 1985.
9. *Standard Operating Safety Guidelines;* U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.
10. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities,* National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and Environmental Protection Agency (EPA); October 1985.
11. *Protecting Health and Safety at Hazardous Waste Sites: An Overview,* U.S. Environmental Protection Agency, EPA/625/9-85/006; September 1985.
12. *Hazardous Waste Sites and Hazardous Substance Emergencies,* NIOSH Worker Bulletin, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; December 1982.
13. *Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide;* U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; October 1984.
14. *Fire Service Emergency Management Handbook,* International Association of Fire Chiefs Foundation, 101 East Holly Avenue, Unit 10B, Sterling, VA 22170, January 1985.
15. *Emergency Response Guidebook,* U.S Department of Transportation, Washington, DC, 1987.
16. *Report to the Congress on Hazardous Materials Training, Planning and Preparedness,* Federal Emergency Management Agency, Washington, DC, July 1986.
17. *Workbook for Fire Command,* Alan V. Brunacini and J. David Beageron, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269, 1985.
18. *Fire Command,* Alan V. Brunacini, National Fire Protection Association, Batterymarch Park,, Quincy, MA 02269, 1985.
19. *Incident Command System,* Fire Protection Publications, Oklahoma State University, Stillwater, OK 74078, 1983.
20. *Site Emergency Response Planning,* Chemical Manufacturers Association, Washington, DC 20037, 1986.
21. *Hazardous Materials Emergency Planning Guide,* NRT-1, Environmental Protection Agency, Washington, DC, March 1987.

22. *Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety.* U.S. Department of Transportation, Washington, DC, May 1983.
23. *Disaster Planning Guide for Business and Industry,* Federal Emergency Management Agency, Publication No. FEMA 141, August 1987.
(The Office of Management and Budget has approved the information collection requirements in this section under control number 1218-0139)

JOB TITLE	DEFINITION	TRAINING REQUIREMENTS
ON-SCENE **INCIDENT COMMANDER**	Oversees HAZMAT team and is knowledgeable in command and management structure. ➢ Does not necessarily have extensive knowledge of certain technical aspects.	Minimum of 24 hours of training equal to first responder operations level. Additional competency in areas listed in 29 CFR 1910.120(q)(6)(v) ➢ Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
SKILLED SUPPORT PERSONNEL	➢ Expert in operation of specialized equipment. ➢ Not necessarily employees of facility where spill has occurred. ➢ May perform temporary emergency work **Examples:** Heavy equipment and crane operators, medical personnel	➢ 40 Hour HAZWOPER Worker training. ➢ Must receive initial briefing at site before participation in emergency response as required by 29 CFR 1910.120(q)(4) ➢ Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
SPECIALIST EMPLOYEES	➢ Employees outside immediate release area who assist on-scene incident commander. ➢ All activities coordinated through individual in charge of incident command system **Example:** Heavy Equipment Operators, industrial hygienist	➢ Must meet requirements of 29 CFR 1910.120(q)(5) ➢ Demonstrated competencies listed in NFPA Standard 472-1992 for specialist categories C, B, and A
FIRST RESPONDER **AWARENESS LEVEL**	➢ Individuals likely to witness or discover a release and who are trained to initiate emergency response sequence **Example:** security personnel	➢ Must meet requirements of 29 CFR 1910.120(q)(4) ➢ Demonstrated competencies listed in 29 CFR 1910.120, Appendix E

FIRST RESPONDER **OPERATIONS LEVEL**	➢ Individuals who respond to releases in defensive fashion and confine it from a distance. **Examples:** firefighters, process operators	➢ Minimum of eight hours of training or sufficient experience to demonstrate competency in areas listed in 29 CFR 1910.120(q)(6)(ii)1 ➢ Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
HAZMAT TECHNICIAN	➢ Responds to releases for purposes of stopping release ➢ Process operators may take limited action if they: 1. Have informed incident commander of emergency, 2. Have adequate PPE, 3. Have adequate training in procedures they are to perform, and 4. Employ the buddy system	➢ At least 24 hours of training equal to the first responder operations level and additional competency in areas listed in 29 CFR 1910.120 (q)(6)(iii)2 ➢ Demonstrated competencies listed in 29 CFR 1910.120, Appendix E
HAZMAT SPECIALIST	➢ Duties parallel to HAZMAT technician ➢ Requires knowledge of substances to be contained	➢ Includes demonstrations and hands-on performance and proficiency ➢ At least 24 hours of training equal to HAZMAT technician level. ➢ Additional competency in areas listed in 29 CFR 1910.120(q)(6)(iv)2

NOTE: IT IS IMPORTANT TO DETERMINE STATE AND LOCAL REQUIREMENTS IN YOUR JURISDICTION.

GLOSSARY

Absorption	The uptake of substances by a tissue; chemicals can enter the body through the skin by direct contact.
Acclimatization	An adaptation of the body to changes in the climate or environment, such as temperature.
Action level	The level of toxic substance that requires medical surveillance, usually one-half the permissible exposure limit.
Acute	A sudden health condition, typically not long-lasting, which is caused by an exposure that is unexpected.
Acute dose	A large dose over a short period of time.
Acute effect	An adverse effect, with severe symptoms, that develops rapidly and come quickly to an exposure.
Airborne radioactivity	Contamination that is dispersed in the air in the form of dust, vapor, or gas. Airborne radioactivity is commonly expressed as micro curies per milliliter, or the amount of radioactive material in each unit volume of air.
Air purifying respirators (APR)	Respirators that use filters or sorbents to remove harmful substances from the air before you breathe it.
ALARA	An acronym for **A**s **L**ow **A**s **R**easonably **A**chievable. This is a radiation safety principle for minimizing radiation doses and releases by employing all reasonable protective methods.
Allergy	An abnormal response to a chemical in a hypersensitive person.
Alpha radiation	Large particle form of ionizing radiation that travels only a few centimeters in the air. Could be stopped by a sheet of paper.
American Conference of Governmental Industrial Hygienists (ACGIH)	ACGIH is a charitable scientific organization that advances and recommends occupational and environmental health levels and suggested standards. ACGIH has been respected for its dedication to the industrial hygiene, occupational, environmental health, and safety communities.
Arc flash	Explosive release of molten and burning material from equipment caused by high amperage arcs.
Area sample	A collection of gas from devices placed within designated areas and operated over specific times and then analyzed in the lab to provide estimates of contaminant exposure and information about the sources of exposure.
Asbestos	A mineral fiber mined from the earth composed mainly of six minerals: Chrysolite, amosite, crocidolite, anthophyllite, tremolite, and actinolite.
Asbestosis	A scarring of the lungs that can develop 7-30 years after asbestos exposure and progress to disability and death.
Assigned protection factor (APF)	A number that reflects the level of protection that a properly functioning respirator would be expected to provide to an individual, the respirator is properly fitted and users trained on it's proper use.

Glossary

Background radiation	The ever-present radiation in the world around us.
Beta radiation	Smallest particle form of ionizing radiation that can travel 10-20 feet in the air. Could be stopped by aluminum sheeting.
Biohazard	Organisms, body fluids, or products of organisms that are potential risks to humans.
Biomedical monitoring	Collecting and monitoring blood, urine, sputum, and other body fluids to look for chemical hazards.
Blanking (or blinding)	The absolute closure of a pipe, line, or duct.
Blood	When used in OSHA documents, blood refers to human blood, human blood components, and products made from human blood.
Bloodborne pathogens	Microorganisms that are present in blood and cause disease.
Body core	The deep structures of the body, such as the liver and intestines; a term used especially when comparing core body temperatures with temperatures of the skin or peripheral tissues.
Body harness	Straps that may be secured about the person in a manner that distributes the fall-arrest forces over at least the thighs, pelvis, waist, chest, and shoulders with a means for attaching the harness to other components of a personal fall arrest system.
Bridging	A hazard that occurs when grain or similar loose material clings to the sides of a container that is being emptied from below, resulting in a hollow space or void, being carved out below the thin layer remaining on top (the bridge).
Buddy system	A standard operating procedure when working in a hazardous area, which involves always performing work with another employee or within a group or team.
Bulking	The mixing together of compatible hazardous wastes and their placement in bulk containers, such as tanks or vacuum trucks, for shipment to treatment or disposal facilities.
Bung	A stopper on a drum head to allow liquid to be released.
Calibration gas (reference gas)	A known gas that a direct reading instrument analyzes to ensure the instrument is working properly.
Carcinogen	Anything that causes cancer.
Ceiling Limit (CL)	The level of a toxic substance in the workplace that should never be exceeded.
Central Nervous System (CNS)	The brain, nerves, and spinal cord.
Characterization	Lab analysis to identify the hazardous waste in a drum or contaminated soil.

GLOSSARY

Chemical Abstracts Service (CAS)	A registry number assigned to each chemical by the CAS that allows for efficient searching of chemical properties on computerized databases.
Chemical removal	Decontaminating, removing, or neutralizing a contaminant by chemicals or solvents. Should be recommended by an industrial hygienist or qualified health professional.
Chronic	A health condition that develops slowly in response to a low-level exposure to a hazard, over a long period of time; symptoms may not appear for 10-20 years.
Chronic doses	Small doses received over a long period of time.
Chronic effect	An adverse effect that develop slowly over a long period of time.
Circuit breaker	An over-current protection device that automatically shuts off the current in a circuit if an overload occurs.
Code of Federal Regulations (CFR)	A collection of federal regulations that have been approved by law.
Combustible gas and oxygen indicator	A portable direct reading instrument used especially in pre-entry testing to determine whether an atmosphere is combustible and how much oxygen is present.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	EPA rule responsible for cleaning up hazardous waste sites and spills, which may pose a threat to humans or to the environment.
Condensed decontamination	An approach to decontamination that combines full decontamination steps into fewer stations.
Conduction	The transfer of heat from a warmer object to a cooler object.
Container	Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, or storage tank. Pipeline systems, engines, fuel tanks, and other operating systems are **not** considered to be containers.
Contaminated	Having the presence of infectious or hazardous materials.
Contamination	Impurities on an object or person resulting from exposure to a harmful or hazardous substance.
Contamination Reduction Zone (CRZ)	The work zone or area where decontamination occurs; the buffer zone between the contaminated exclusion zone and the clean support zone.
Continuous flow respirator	A respirator that receives a continuous flow of air into the facepiece.
Controlled access zone	A work area designated and clearly marked in which certain types of work (such as overhand bricklaying) may take place without the use of conventional fall protection systems – guardrail, personal arrest, or safety net – to protect the employees working in the zone.

GLOSSARY

Convection	The transfer of heat by flowing materials; air flowing past the body can cool the body if the air being used is cool.
Curie (Ci)	A measure of the rate of nuclear disintegration.
Decontamination	Using physical or chemical means to remove or destroy bloodborne pathogens on a surface or item to a level where they can no longer cause disease. The item or surface would then be safe for handling, use, or disposal. Also, the process of removing, destroying, or reducing the activity of hazardous chemicals or radioactive contamination.
Decontamination line	A sequence of stations, which reduces and eliminates contamination.
Degradation	When a fabric loses its effectiveness as a barrier because chemicals have broken it down.
Demand flow regulator	A device that uses the suction force created when you inhale to open the regulator valve and let air flow into your facepiece.
Department of Energy (DOE)	The government agency responsible for cleaning up radioactive contaminated sites and disposing of radioactive waste.
Department of Health and Human Services	The U.S. government's principal agency for protecting the health of all Americans and providing essential human services.
Department of Transportation (DOT)	Government agency that regulates and oversees the transport of hazardous materials.
Detector tube	A glass vial containing a chemical that reacts with a specific contaminant. The appropriate tube would need to be used, based on the chemical being monitored. Each tube is for specific chemicals.
Direct reading instruments	Early warning devices that indicate the presence and amount of contaminants in a location.
Disaster	A widespread event affecting either large groups of people or a large geographical area or both and requiring immediate action by varying organizations with diverse resources.
Distributor	A business, other than a manufacturer or importer, which supplies and transports hazardous chemicals.
Doffing	To take off or remove clothing or PPE.
Donning	To put on clothing or PPE.
Dose rate	Rate at which radiation is deposited in the body.
Dose response relationship	The relationship between the dose of a chemical and the response that is produced in the body; C x T = Dose (when C= chemical concentration and T = exposure time).
Dosimetry	The calculation of the absorbed dose in matter and tissue resulting from the exposure to ionizing radiation.
Dust	Tiny solid particles carried by the air that are formed from processes that grind, crush, or impact the original material.

GLOSSARY

Emergency	A local accident or incident at a worksite requiring immediate attention.
Engineering controls	Controls that remove or isolate the hazards from the workplace.
Engulfment	To be swallowed up or immersed in material.
Ergonomics	The science of fitting workplace conditions and job demands to the capabilities of workers.
Evaporation	When a liquid turns into a gas.
Evaporative cooling	A cooling effect produced when sweat evaporates from the skin. Evaporative cooling is reduced under high humidity conditions, and the effectiveness of the body's cooling mechanism, therefore, is reduced.
Exclusion zone	Contaminated work area where hazardous materials are present; sometimes called the "hot zone" or "Red zone"; it is the innermost of the three zones and requires PPE and training for those entering it.
Exhaust system	A mechanical system that pulls air from the space using fans or fume hoods.
Explosive	A chemical that causes a sudden release of pressure, gas, and heat when subject to sudden shock, pressure, or high temperature.
Exposure incident	An event in which a worker has specific eye, mouth, mucous membrane, or skin contact with potentially infectious or hazardous materials.
External communications system	The communications system that connects the site with outside agencies such as the fire department, police, hospital, or rescue team.
Finance-Administration	A specialized part of an incident command structure that tracks the costs of responding to the incident and takes care of reimbursing responders.
First responder	The first person of authority at the scene of an event requiring immediate emergency attention; key tasks include surveying the scene and taking action to save lives and protect property.
Fixed monitoring system	A permanent device placed where a chemical release or hazardous condition might develop and where the condition can be detected quickly. Its main purpose is to provide an early warning so people can exit the area safely if danger arises.
Flame Ionization Detector (FID)	A portable direct reading instrument used to detect organic compounds, which are chemical compounds containing carbon, such as toluene and benzene.
Flammable	Easily set on fire; combustible. Flammable chemicals can be aerosols, gases, liquids, or solids.
Flashpoint	Minimum temperature at which a liquid gives off a vapor, in sufficient concentration, to ignite.
Frostbite	Injury after excessive exposure to extreme cold, freezing of skin/tissue.
Frostnip	A superficial injury/freezing of the skin only in response to cold temperatures; skin appears waxy and white.

GLOSSARY

Full decontamination	19 step decontamination procedures recommended by the EPA.
Gamma radiation	High penetrating, wave-type of ionizing radiation. Requires lead shielding.
General ventilation	Ventilation of an entire space.
Global Harmonization System (GHS)	The United Nations' system for classification and labeling of chemicals.
Ground Fault Circuit Interrupter (GFCI)	A device that detects current leakage from a circuit and immediately shuts off the current before levels are reached that could shock a worker.
Health and Safety Plan (HASP)	A written document required by OSHA on all HAZMAT sites to outline the hazards, procedures, and activities conducted on the jobsite.
Half-Life	Time it takes for radioactive material breakdown and emit half its radiation energy.
Hazardous chemical	Any chemical that poses a physical or health hazard.
Hazardous noise	Any sound capable of causing permanent hearing loss.
Hazardous waste	All substances to which exposure results or may result in adverse effects on the health and safety of employees.
Hazard warning	Words, pictures, or symbols that appear on a label or other appropriate form of warning to convey physical and health hazard information.
Health hazard	A chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed workers.
Health Insurance Portability and Accountability Act (HIPAA)	A law that establishes national standards for electronic health care transactions. It also addresses the security and privacy of health data.
Heat cramps	Painful muscle spasms that occur in hot working conditions when individuals drink large amounts of water but do not replace minerals.
Heat exhaustion	Occurs when a person in a hot environment loses too many fluids through sweating and does not drink enough to replenish the fluids.
Heat stress	Any heat illness caused by exposure to temperatures too high for the body.
Heat stroke	A severe condition resulting from prolonged exposure to excessive heat. It is the most serious heat stress illness in hot environments and can result in coma and death.
Hepatitis B virus (HBV)	A liver disease caused by the HBV, that can involve long-term illness leading to permanent liver damage and liver cancer.
Hierarchy of Controls	Categories of hazard controls in order of most preferred to least. The preferred order: elimination, substitution, engineering, administrative, and PPE.

GLOSSARY

Hyperthermia	Unusually high body temperature.
Hypothermia	Dangerous medical condition when the body's temperature drops below that required for normal body functions.
Human Immunodeficiency Virus (HIV)	A disease that gradually destroys the body's immune system and, therefore, its ability to fight disease and infection.
Immediately Dangerous to Health and Life (IDHL)	The maximum concentration of a hazard in the air from which you could escape within 30 minutes, without any escape-impairing symptoms or any irreversible health effects.
Immediate use	Condition in which a hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container.
Incident Commander (IC)	The highest ranking first responder, typically a police officer or firefighter, whose job is to establish the command, protect life and property, control personnel and equipment resources, maintain accountability for responders and the public safety, and act as a liaison to outside agencies.
Incident Command Structure (ICS)	On-site emergency management system that places the IC at the top of the management structure with four main areas reporting to the IC: planning, operations, logistics, and finance/administration.
Incubation period	The time between an infection and when symptoms appear.
Ingestion	Swallowing a chemical through the digestive tract.
Inhalation	Breathing in a chemical through the respiratory system; the most common route of entry for a potential toxic chemical.
Internal communications system	The communications system that is used within the site to notify workers of emergencies, communicate work changes, maintain site control, or pass along safety information.
Ionizing radiation	Radiation strong enough to pull an electron from an atom.
Isolation	Removing from service and protecting it against the release of energy or materials.
Label	Required written, printed, or graphic material affixed to containers of hazardous chemicals.
Laboratory analysis	A slower, but generally more accurate way of determining the presence and amount of contaminants in a location by the testing of solid, liquid, or gas samples collected from the location.
Lab pack	Drums that contain small-volume individual containers of laboratory sample wastes or other dangerous materials, typically disposed of from university laboratories, hospitals, and similar institutions.
Latency period	The length of time from when you were exposed to the harmful chemical to when symptoms begin to appear.
Local exhaust	A mechanical means of creating a vacuum and removing contaminants at the source from which they are generated or from an area where contaminants have accumulated.

GLOSSARY

Lockout/Tagout	Applying a physical lock and tag to the energy sources of circuits or equipment, after they have been shut off and de-energized, that alerts workers that circuits and equipment are not safe to use.
Logistics	A specialized part of an incident command structure that provides the facilities, services, materials, and personnel needed to operate equipment.
Mechanical ventilation	Using blowers or fans and ducts to ventilate a confined space; the most common type of ventilation.
Medical screening	Testing of health conditions that could identify potential health hazards and lead to early diagnosis and treatment of a person.
Medical surveillance	The monitoring of hazards in a workplace that have already been identified as posing risks for workers. The purpose of surveillance is to detect and then eliminate the cause of the hazard.
Mine Safety and Health Administration (MSHA)	A federal regulatory agency that covers all mining and mineral processing.
Mitigation	Actions that makes certain that emergency events do not get worse.
Mold	A type of fungus that can grow on various organic materials in the presence of water and oxygen and causes structural damage, respiratory problems, and foul odors.
National Incident Management System (NIMS)	An agency created in response to the 9/11 terrorist attacks; is responsible for emergency management through ICS and/or UCS.
National Institute for Occupational Safety and Health (NIOSH)	Organization that conducts and publishes research on job safety and health issues. Also, the agency that must approve respirators and filters.
Negative pressure respirators	An APR that draws air into the facepiece when you inhale; if a leak develops, you inhale contaminated air.
Non-Ionizing radiation	Radiation or energy in motion that is not strong enough to pull an electron from an atom.
Occupational exposure	An exposure to blood or other potentially infectious materials in the performance of a worker's job.
Occupational health	A branch of medicine that is concerned with the prevention and management of workplace injury, illness, and disability and that promotes the health and productivity of workers.
Occupational Safety and Health Administration (OSHA)	Federal agency that establishes and enforces safety and health standards in the workplace; the primary governing body for hazardous waste work.

GLOSSARY

Off-site characterization	The research and evaluation information collected before workers enter a HAZMAT jobsite; includes comprehensive data such as atmospheric hazards; site previous use records; topographical maps; surveys; photographs; meteorological and groundwater data; site, generator, transporter, and utility records.
Ongoing monitoring	Air, water, or material sampling that provides the safety and health officer with data that might indicate the need to change the HASP and PPE.
On-site surveys and assessments	Continuation and extension of the information from the off-site characterization; monitors the air, makes visual surveys of potential hazards, and collects and measures additional samples of soil and water.
Operations	A specialized part of an incident command structure that carries out the response activities identified in the incident action plan; the operations officer coordinates and communicates with the incident commander and develops tactics for completing the objectives assigned to operations.
Other potentially infectious materials	Any material that can cause disease. These include: - Human bodily fluids - Any unfixed tissue or organ from a living or dead human or other animal.
Other-than-Serious Violation	OSHA hazardous condition that would probably not cause death or serious physical harm but would have a direct and immediate negative effect on the safety and health of employees.
Over-Pack drum	Larger drums in which leaking or damaged drums are placed, on a HAZMAT site, for shipping or disposal.
Oxidizer	A chemical that initiates or promotes combustion in other materials.
Oxygen deficient	An atmosphere containing less than 19.5 percent oxygen by volume.
Oxygen enriched	An atmosphere containing more than 23.5 percent oxygen.
Parenteral	The piercing or entering of the mucous membrane of the body (OSHA definition); this could be by needle sticks, human bites, cuts, or scratches.
Particulate filter	A respirator that has a filter that captures contaminants, such as dust, fumes, and mist; **Does not** protect against gases, vapors, or oxygen deficiency.
Periodic testing and continuous monitoring	Ongoing checks of work and environmental conditions at a job to ensure that proper safety precautions (PPE, respiratory protection, engineering alternatives) remain current.
Penetration	The passing of chemicals through zippers, stitched seams, pinholes, or other openings in the material.
Permeation	The dissolution and passing of a chemical through material.

Glossary

Permeation rate	The time it takes a chemical to dissolve and pass through a material.
Permissible Exposure Limit (PEL)	An exposure limit that is published and enforced by OSHA as a legal standard.
Personal fall arrest system	A system including but not limited to an anchorage, connectors, and a body harness used to arrest a person in a fall from a working level.
Personal monitoring	Devices worn on the body or placed on or near the equipment one works with to determine individual exposure to contaminants.
Personal sample	A monitoring or sampling device worn by a worker, usually within the breathing zone, to collect data to be analyzed to determine individual exposure to an agent at different times and locations in the work area.
Personal Protective Equipment (PPE)	Specialized clothing or equipment, such as respirators and hard hats, which protect workers from hazards that they are exposed to.
Photo-Ionization Detector (PID)	A portable direct reading instrument used to detect many organic gases and vapors as well as a few inorganic ones.
Physical hazard	A chemical that is physically dangerous to individuals, such as combustible liquids, compressed gas, explosive, flammable, organic peroxide, oxidizers, pyrophoric, unstable, or water reactive.
Physical removal	The removal of contaminants by physical means, such as washing, scraping, brushing, wiping, rinsing, or evaporation.
Planning	A specialized part of an incident command structure that documents the status of resources and develops an incident action plan, which defines what responders will do and what resources will be used.
Pneumoconiosis	The general name for dust-related lung diseases.
Portable container	A container used to transfer chemicals from labeled containers, with the chemicals intended only for the immediate use of the person who performs the transfer.
Positive pressure Pressure demand respirator	A respirator that maintains, via a pressure regulator and exhalation valve, a positive pressure in the facepiece whether you are inhaling or exhaling.
Powered Air Purifying Respirator (PAPR)	A respirator that has a battery powered fan that pulls air through a filter, so clean air can be constantly delivered to a worker.
Pre-entry testing	The initial testing done to determine whether a site that might contain hazardous materials is safe to enter or will require PPE/respiratory protection, and the proper level of protection.
Preparedness	Actions that help ensure that an emergency response plan is in place in case a disaster might occur.
Primary container	An original container received directly from the manufacturer.
Qualitative fit test	A check of the quality of the respirator's seal with the user's face.

GLOSSARY

Quantitative fit test	A computer measurement of the actual amount of leakage into the respirator.
Radiation	The transfer of heat through space; hot surfaces radiate heat to the body; **AND** the excess energy given off by unstable atoms in the form of particles or rays/waves.
Radiation Absorbed Dose (RAD)	The absorbed dose of radiation in any material.
Radiation detector	A portable direct reading instrument that detects ionizing radiation (alpha, beta, or gamma).
Radiation Equivalent Man (REM)	The amount of biological damage done to the human body, that may result from radiation exposure.
Radiation exposure	The penetration of radiation into a person's body.
Radioactive decay	Natural process of unstable atoms becoming more stable, breaking down.
Radioactive material	Any material that contains unstable atoms and spontaneously emits radiation.
Recommended Exposure Limit (REL)	NIOSH exposure limit based on up to 10 hours of exposure per day using a time-weighted average and measured in parts per million (ppm) or milligrams per cubic meter (mg/m3).
Respirator	A device that protects the wearer from inhaling harmful substances in the form of airborne vapors, dust, fog, fumes, mist, smoke, spray, or dangerously low levels of oxygen.
Restricted area	OSHA required work zone in which access is limited to protect individuals from risk of exposure to hazardous materials.
Risk assessment	A series of logical steps to examine the hazards associated with a machine, system, or process; then to estimate the probability of harm occurring and the severity of that harm.
Roentgen (R)	A measure of the ionization (number of electrons knocked off atoms) produced by gamma rays or X-rays in the air.
Safety Data Sheet (SDS)	Provided by chemical manufactures to identify the potential hazards of chemicals.
Secondary container	Properly labeled containers such as drums or bottles that an employer might use to store smaller quantities of chemicals.
Second responder	Those persons called early on to an incident because of their special skills, trade, existing agreement of understanding, or assignments to help in cleanup and recovery.
Self-Contained Breathing Apparatus (SCBA)	Highest level of respiratory protection which includes a cylinder of compressed air, which is connected to a facepiece and regulator.

GLOSSARY

Serious Violation	OSHA condition that exists where there is a substantial possibility that death or serious physical harm can result.
Short-Term Exposure Limit (STEL)	Maximum concentration of a hazard, to which you can be; exposed for a short period of time (15 minutes), a maximum of four times throughout the day, with at least one hour between exposures.
Silicosis	An irreversible lung disease caused by exposure/breathing in dust of quartz and other silicates.
Site communications	A system of communications on a hazardous waste worksite; consists of two types of systems: the external communications and the internal communications systems.
Site map	A map that shows the topography, prevailing wind direction, drainage, and the location of buildings, containers, impoundments, pits, ponds, and streams and lays the groundwork for planning all phases of the work.
Sound level meter	A portable direct reading instrument that measures the intensity of sound at a given moment.
Staging	The moving of drums in an organized manner to designated areas.
Sterilize	To use physical or chemical means to destroy all microbial life, including highly resistant bacteria.
Supplied Air Respirators (SAR)	A respirator that directs a continuous flow of air (never pure oxygen) into a facepiece or hood by a supply line from a fixed source.
Supplied Air Respirators with Escape (SAR-E)	A supplied air respirator that also offers the user special protection from the hazards of a punctured line or loss of air supply; these are the only SAR approved for IDLH and oxygen-deficient atmospheres.
Supply system	A system for pushing fresh air into a space using blowers or natural air movement.
Support Zone	The “clean” area on the outermost perimeter of the site. Considered a non-contaminated zone, all administrative activities occur here.
Standard Operating Procedures (SOPs)	Uniform instructions for doing a specific job or activity.
Target organs	The organs most affected by toxic substances.
Technology Safety Data Sheet (TSDS)	A standardized report similar to a SDS prepared as a reference for workers who will use the new technology or new equipment.
Threshold	The lowest dose or exposure to a chemical at which a certain effect is observed.

GLOSSARY

Threshold Limit Value (TLV)	A recommended time-weighted average concentration under which most people can work consistently for eight hours a day, day after day, with no harmful effects. A table of these values and accompanying precautions is published annually by the American Conference of Governmental Industrial Hygienists.
Time-Weighted Average (TWA)	A concentration of an airborne toxic material which has been weighted or averaged, for a certain time, duration, and is usually eight hours.
Toxic	Poisonous or hazardous material.
Toxicity	The potential of a chemical to harm a living organism.
Toxicology	The study of the nature and actions of chemicals on the human body.
Trench foot	A medical condition caused by prolonged exposure of the feet to damp, unsanitary, and cold or hot conditions; also called immersion foot.
Unified Command System	A standardized, on-site emergency management system in which more than one agency has jurisdiction and multiple commanders agree to handle specific incident objectives; primarily used for large-scale crises.
Universal precautions	An approach to infection control that assumes that all human blood and bodily fluids are infectious for bloodborne pathogens.
Unrestricted area	An area in which the employer does not control employee access to protect individuals from exposure to radiation or radioactive materials. Radiation levels are essentially the same as background radiation. These areas require no monitoring, posting, or control requirements.
Unstable chemical	A chemical that will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shock, pressure, or temperature.
Ventilation	The method of providing an area with fresh air to replace the air that is contaminated.
Water reactive	A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.
Willful Violation	OSHA violation committed with an intentional disregard for, or plain indifference to, the requirements of OSHA regulations.
Wind chill	The temperature felt by the body from a combination of air temperature and wind speed.
Workplace monitoring	The process of collecting, detecting, and measuring the jobsite for chemical, physical, and biological hazards.
Work practice controls	Controls performed by workers, which reduce the likelihood of exposure to bloodborne pathogens by the way they work.

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
AIDS	Acquired Immune Deficiency Syndrome
AIHA	American Industrial Hygiene Association
ALARA	As Low as Reasonably Achievable
ANSI	American National Standards Institute
APF	Assigned Protection Factor
ASTM	American Society for Testing and Materials
CL	Ceiling Limit
CAS	Chemical Abstracts Service
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (also known as “Superfund”)
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
CPC	Chemical Protective Clothing
CPR	Cardiopulmonary Resuscitation
CRZ	Contamination Reduction Zone
CSHO	Compliance Safety and Health Officer
DHS	Department of Homeland Security
DNA	Deoxyribonucleic Acid
DOE	Department of Energy
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
FEMA	Federal Emergency Management Agency
GFCI	Ground Fault Circuit Interrupter
GHS	Global Harmonization System
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HEPA	High Efficiency Particulate Air Filter
HIPAA	Health Insurance Portability and Accountability Act
HIV	Human Immunodeficiency Virus
HSI	Heat Stress Index
IARC	International Agency for Research on Cancer
IAP	Incident Action Plan
ICS	Incident Command System
IDLH	Immediate Danger to Life and Health
JHA	Job Hazard Analysis

LEL	Lower Explosive Limit
LEPC	Local Emergency Planning Committee
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association
NIMS	National Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
PAPR	Powered Air Purifying Respirator
PEL	Permissible Exposure Limit
PFAS	Personal Fall Arrest System
PID	Photo Ionizing Detector
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
RDD	Radiation Dispersal Device
REL	Recommended Exposure Limit
RPP	Radiological Protection Program
S&HO	Safety and Health Officer
SAR	Supplied Air Respirator
SARA	Superfund Amendments and Reauthorization Act
SAR-E	Supplied Air Respirator with Escape bottle
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet
SG	Specific Gravity
SOP	Standard Operating Procedure
STEL	Short-Term Exposure Limit
TLV	Threshold Limit Value
TSDS	Technology Safety Data Sheet
TWA	Time-Weighted Average
UCS	Unified Command System
UEL	Upper Explosive Limit
UL	Underwriters Laboratories
VD	Vapor Density
VOC	Volatile Organic Compound
VP	Vapor Pressure