# HAZWOPER 8 HOUR CONTINUED EDUCATION

## Section 1 Introduction to HAZWOPER

Improper management and handling of hazardous materials (HAZMATs) can have negative effects on the environment, cause harm to people's health, and even lead to fatalities. It's important for workers who handle HAZMATs to learn proper management and handling techniques in order to prevent incidents where these materials are released into the environment.

It can be challenging to define hazardous waste and the process of regulating it is complex. The Resource Conservation and Recovery Act (RCRA), passed in 1976, provided a framework for proper management of hazardous waste from "cradle to grave," including creation, transportation, treatment, storage, and disposal. The Occupational Safety and Health Administration (OSHA) developed the Hazardous Waste Operations and Emergency Response regulations (HAZWOPER) and the Hazard Communication Standard (HCS) to protect workers who may come into contact with HAZMATs during cleanup work, at hazardous waste facilities, or when responding to emergencies. HAZWOPER and HCS are published in the 29 Code of Federal Regulations (CFR) § 1910.120 and 1910.1200, respectively. Note that the HAZWOPER standard is the same for general industry as it is for the construction industry. Table 1 below summarizes how hazardous waste regulations have evolved over time.

**Table 1 Hazardous Waste Regulations Have Evolved Over Time**

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| 1970 | Occupational Safety and Health Act (OSH Act) | Established Occupational Safety and Health Administration. |
| 1976 | Resource Conservation and Recovery Act (RCRA) | This act set rules for how hazardous waste is created, moved, handled, and disposed of. |
| 1980 | Comprehensive Environmental Response, Compensation, and Liability Act. CERCLA (Also called the Superfund) | This act created a system for dealing with unexpected spills of hazardous waste and for addressing environmental harm caused by hazardous waste disposal sites that were not controlled or abandoned prior to the RCRA's establishment. |
| 1983 | Hazard Communication Standard (HCS) | HCS required manufacturers and importers of chemicals to evaluate the hazards associated with the chemicals they produce and distribute. |
| 1986 | Superfund Amendments and Reauthorization Act (SARA) | SARA title 1 required federal OSHA to issue regulations protecting workers engaged in hazardous waste operations |
| 1990 | Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) | This Standard laid out guidelines for employers who work with hazardous waste or respond to emergencies involving the release of hazardous substances, in order to ensure the health and safety of those involved. |
| 2012 | HazCom2012 or HCS2012 | Adopted the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) to improve safety and health of workers. |

The HAZWOPER regulations apply to employers engaged in five categories of work operations mentioned in 29 CFR 1910.120(a)(1)(i-v), which are:

i. Clean-up operations required by a government body, whether federal, state, local or any other involving hazardous substances that are conducted at uncontrolled hazardous waste sites.
ii. Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976.
iii. Voluntary clean-up operations at sites identified by governmental bodies as uncontrolled hazardous waste sites.
iv. Treatment, storage, and disposal facilities operations that involve hazardous waste operations, for instance, a landfill that accepts hazardous waste.
v. Emergency response operations that involve the release of hazardous substances, for instance, a chemical spill at a manufacturing plant.

Note that these can be grouped into three categories: clean-up operations, TSD facilities, and emergency response.

## Section 2 Worker's Rights and Protections

The Occupational Safety and Health Act of 1970 (OSH Act) was enacted to ensure the safety of workers and prevent workplace-related injuries and fatalities. Under this law, employers are required to provide a work environment that is free from known hazards. The OSH Act established the Occupational Safety and Health Administration (OSHA) to enforce safety and health standards in the workplace, as well as provide training and assistance to employers and workers.

### 2.1 Workers' Rights under the OSH Act

1. Right to File a Confidential Complaint: Workers have the right to file a confidential complaint with OSHA to request a workplace inspection if they believe there are safety hazards present.
2. Right to Information and Training: Employers must provide workers with information and training about workplace hazards, preventive measures, and the specific OSHA standards applicable to their job. This training should be provided in a language and manner that workers can easily understand.
3. Right to Access Work-Related Injury and Illness Records: Workers have the right to review records of work-related injuries and illnesses that occur in their workplace.

4. Right to Obtain Test Results and Monitoring Data: Workers are entitled to receive copies of the results from tests and monitoring conducted to identify and measure workplace hazards.
5. Right to Access Medical Records: Workers have the right to obtain copies of their workplace medical records.
6. Right to Participate in an OSHA Inspection: Workers can participate in an OSHA inspection of their workplace and have the opportunity to privately discuss any concerns with the inspector.
7. Right to File a Complaint against Employer Retaliation: Workers can file a complaint with OSHA if they face retaliation from their employer for requesting an inspection or exercising any of their other rights under the OSH Act.
8. Right to Protection as a Whistleblower: Workers who report violations of the OSH Act or other federal statutes covered by OSHA jurisdiction are protected from retaliation by their employer.

Employers must respect and uphold these rights to ensure a safe and healthy workplace for their employees. OSHA's ultimate goal is to ensure that every worker returns home unharmed at the end of the workday, which is the most important right of all.

## 2.2 Employer Responsibilities

Employers have a crucial responsibility to ensure a safe workplace for their employees. They must comply with all OSHA safety and health standards and provide working conditions that are free from known hazards. Here are the key responsibilities of employers:

1. Display the OSHA Poster: Employers must prominently display the official OSHA poster that describes workers' rights and responsibilities under the OSH Act. The poster can be downloaded for free from the OSHA website.
2. Inform Workers about Hazards: Employers must inform their workers about workplace hazards through training, labels, alarms, color-coded systems, chemical information sheets, and other effective methods. The training should be provided in a language and vocabulary that workers can understand.
3. Provide Training: Employers must train workers on hazards, prevention methods, and relevant OSHA standards applicable to their job. This training must be conducted in a language and manner that workers can comprehend.
4. Keep Records: Employers are required to maintain accurate records of work-related injuries and illnesses. These records help identify patterns and areas that need improvement. Certain industries with more than 10 employees must also post a summary of the injury and illness log for workers to see.

5. Perform Tests and Monitoring: Employers must conduct workplace tests and monitoring as required by specific OSHA standards. This includes air sampling, noise monitoring, and other assessments to measure and control hazards.
6. Provide Protective Equipment: Employers must provide most protective equipment free of charge to employees. They are responsible for determining when such equipment is necessary to ensure worker safety.
7. Comply with OSHA Citations: Employers must comply with OSHA citations and correct any identified violations within the given timeframe. They should also post citations and injury/illness data in a visible location for workers to see.
8. Notify OSHA: Employers must notify OSHA within 8 hours of a workplace fatality or within 24 hours of work-related inpatient hospitalization, amputation, or loss of an eye.
9. Prohibit Retaliation: Employers must not retaliate against workers for exercising their rights under the OSH Act, including reporting work-related injuries or illnesses.

### 2.3 OSHA Worksite Inspections

OSHA conducts worksite inspections to enforce the law and protect workers' rights. Inspections are initiated without advance notice and are carried out by trained compliance officers. The priorities for inspections are based on various factors such as imminent danger, fatalities or hospitalizations, worker complaints, targeted inspections for specific hazards or high injury rates, and follow-up inspections.

During inspections, employers are not informed in advance, regardless of whether they are in response to a complaint or programmed inspections. Workers have the right to request an on-site OSHA inspection if they believe there are potential workplace hazards or violations. They can file a complaint with OSHA to initiate an inspection. Workers are protected from employer retaliation for exercising their rights, including filing a complaint.

Complaints can be filed through different methods, including submitting the OSHA complaint form online, mailing or faxing the form, or calling the local OSHA regional or area office. During an inspection, workers have the right to have a representative accompany the inspector, engage in private conversations with the inspector, and participate in meetings before and after the inspection.

After the inspection, if OSHA determines there are violations of standards or regulations, they issue citations and proposed penalties to the employer. Employers must post a copy of the citation in the workplace. Workers and employers have the right to contest citations, and workers can contest the time given to correct hazards.

If OSHA decides not to conduct an inspection or issue a citation, workers have the right to request a review of the decision by the OSHA regional administrator. It's essential for workers

to know their rights and protections against retaliation under the whistleblower provisions of the OSH Act.

Workers have the right to refuse to work in situations that present a risk of death or serious physical harm if there is not enough time for OSHA to inspect and the condition has been brought to the employer's attention. Workers should not leave the worksite solely because they filed a complaint.

OSHA's goal is to ensure safe and healthful workplaces, protect workers' rights, and address hazardous conditions promptly. Workers are encouraged to familiarize themselves with their rights and reach out to OSHA for assistance when needed.

## Section 3 Overview of Hazardous Substances

### 3.1 Hazardous Materials

Hazardous materials are regulated in the United States by several agencies, including the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the Department of Transportation (DOT), and the Nuclear Regulatory Commission (NRC). The DOT uses the term "hazardous materials" to cover substances classified into nine hazard classes, each with its own subcategories. These classes include explosives, gases, flammable liquids, flammable solids, oxidizing substances, toxic and infectious substances, radioactive materials, corrosives, and miscellaneous hazardous goods. Hazardous substances and hazardous wastes are classified under Class 9 (Miscellaneous Hazardous Goods) by the DOT and regulated by the EPA.

Overall, the definitions and regulations surrounding hazardous materials vary depending on the agency and context. But, all highlight the importance of compliance with relevant guidelines to ensure the safe handling, transport, and disposal of these materials.

### 3.2 Hazardous Waste, Substances, and Chemicals

According to the EPA, a hazardous substance is defined as any chemical that, if released into the environment above a certain threshold, requires reporting. The level of federal involvement in handling such incidents depends on the threat to the environment. The EPA maintains a list of hazardous substances in Title 40, Code of Federal Regulations, Part 302, Table 302.4. OSHA also refers to hazardous substances in the context of emergency response, defining them as substances that may result in adverse effects on the health or safety of employees.

Hazardous waste is a term used by the EPA under the Resource Conservation and Recovery Act (RCRA) to regulate certain chemicals. According to the EPA, solid waste is considered hazardous if it exhibits characteristics of hazardous waste, is listed as hazardous waste in regulations, is a

mixture containing both hazardous and non-hazardous waste, or is derived from the treatment, storage, or disposal of listed hazardous waste.

According to OSHA, "chemical substances" refer to chemical elements and their compounds in their natural state or obtained through production processes. This definition includes any additives necessary for product stability and impurities derived from the production process. However, solvents that can be separated without affecting the substance's stability or composition are excluded. Under the Hazard Communication Standard (HCS), a "hazardous chemical" is defined as any chemical classified as a physical hazard, health hazard, simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified.

Contrary to common perception, chemicals can exist in various forms, including:

- **Dusts**
- **Fumes**
- **Fibers**
- **Mists**
- **Vapors**
- **Gases**
- **Solids**
- **Liquids**

### 3.3 Evaluating and Classifying Hazardous Substances

In order to ensure the safety of employees when handling chemicals in the workplace, it is crucial for employers to provide comprehensive information about the identities and hazards associated with these chemicals. The purpose of the HCS is to ensure the classification of hazards for all chemicals produced or imported and the transmission of hazard information to employers and employees. This includes developing a written Hazard Communication Program, listing hazardous chemicals, labeling containers, preparing Safety Data Sheets (SDSs), and providing employee training.  The classification process includes identifying hazards associated with a chemical, deciding whether it meets the definition of a hazardous chemical, and determining the appropriate hazard classes and categories.

The HCS mandates that employers and manufacturers develop and distribute chemical information following specific guidelines.
In 2012, the HCS was aligned with the United Nations Globally Harmonized System of Classification and Labeling of Chemicals (GHS), which offers several significant advantages, including:

1. Consistent Classification and Communication
   The GHS provides a uniform and coherent approach to classifying chemicals and conveying hazard information through labels and Safety Data Sheets. This promotes consistency in the understanding of hazards among different stakeholders.
2. Improved Hazard Information
   By adopting the GHS, the quality and consistency of hazard information in the workplace are enhanced. This ensures that workers have access to accurate and standardized information, enabling them to take appropriate safety precautions.
3. Reduced Trade Barriers
   The implementation of a globally harmonized system for chemical classification and labeling helps to reduce trade barriers. It simplifies the process of exchanging chemical information between different countries and facilitates international trade.
4. Productivity Enhancements
   Businesses that handle, store, and use hazardous chemicals on a regular basis benefit from the consistent application of hazard communication standards. The harmonization of chemical labeling and classification systems leads to increased productivity and operational efficiency.
5. Cost Savings
   Adhering to the GHS requirements for updating SDSs and labels for classified chemicals results in cost savings for businesses. It streamlines the process of periodic updates and ensures compliance with the latest hazard communication standards.

By following the HCS and aligning with the GHS, employers can effectively communicate chemical hazards, protect their workers, and promote a safer work environment.

The HCS applies to chemicals present in the workplace that may expose employees under normal conditions of use or in foreseeable emergencies. A foreseeable emergency refers to potential occurrences such as equipment failure or uncontrolled release of a hazardous chemical. If a hazardous chemical is known to be present by the chemical manufacturer or the employer, it is covered by the standard. A hazardous chemical is defined as one classified as a physical hazard, health hazard, simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified. It includes chemicals employees may be exposed to during normal operations or in emergencies. Office workers or bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered. However, employees operating equipment that involves hazardous chemicals as part of their work duties are covered by the provisions of the HCS.

The HCS does not apply to certain substances and situations. These exceptions include:

- Regulated hazardous waste during remedial or removal action.
- Tobacco or tobacco products
- Wood or wood products that are not processed or treated with hazardous chemicals (except when generating dust)
- Manufactured items that have a specific shape or design and do not release significant amounts of hazardous chemicals during normal use
- Food, alcoholic beverages, and cosmetics intended for personal consumption or retail sale
- Consumer products used in the workplace as intended by the manufacturer, with exposure levels comparable to consumer use
- Nuisance particulates that do not pose health or physical hazards
- Ionizing and non-ionizing radiation
- Biological hazards

Chemical manufacturers, distributors, and importers have different requirements than employers who use manufactured chemicals. Manufacturers and importers must evaluate and classify the chemicals they produce or import according to the HCS. Employers are not required to classify chemicals unless they choose not to rely on the classification provided by the manufacturer or importer. Employers have responsibilities such as proper labeling, maintaining SDSs, providing information and training, and developing a written Hazard Communication Plan. Manufacturers, importers, and employers must consider available scientific literature and evidence when classifying chemicals.

### 3.4 Hazardous Waste Sites and Generators

A hazardous waste site is an area (land or water) contaminated by hazardous waste that poses a risk to human health or the environment. Abandoned or uncontrolled hazardous waste sites that EPA identifies for cleanup are known as Superfund sites. Such sites can be on public or private property.

Many businesses produce hazardous waste as a byproduct of their operations, and they typically store it temporarily before sending it to a facility that specializes in treating, storing, or disposing of hazardous waste (known as a TSD facility).

The term "generator" refers to any individual or organization that produces hazardous waste as listed or characterized in part 261 of title 40 of the CFR. The amount of hazardous waste generated in a calendar month determines which regulations apply to the generator.

Under RCRA, hazardous waste generators are the first link in the hazardous waste management chain. It is the responsibility of generators to determine if their waste is hazardous and to ensure that it is properly managed and treated prior to recycling or disposal. Generators must document that the hazardous waste they produce is appropriately identified, managed, and treated. After generation, hazardous waste transporters can move the waste to a facility that can recycle, treat, store, or dispose of it. Treatment, storage, and disposal facilities (TSDFs) provide temporary storage and final treatment or disposal for hazardous waste.

## Section 4 Hazard Identification

### 4.1 Where are the Hazards?

Understanding the nature of workplace hazards is the first step toward effectively protecting employees. Here are some common hazards present in the workplace:

- Workplaces often involve the presence of hazardous materials, including raw materials used in manufacturing (e.g., wood, metal, plastic), as well as toxic chemicals (e.g., solvents, acids, bases, detergents) utilized at various stages of the process.
- Stationary machinery and equipment may lack proper guarding or be in a state of disrepair due to inadequate preventive or corrective maintenance.
- Tools may not receive proper maintenance, such as the sharpening of saw blades or the replacement of worn-out safety harnesses.
- The work environment may expose employees to extreme noise levels, flammable or combustible atmospheres, or poorly designed workstations. Slippery floors, cluttered aisles, missing or damaged guardrails, ladders, or floor hole covers can also pose hazards.
- Employee factors, such as fatigue, distractions, or lack of mental and physical capacity, can contribute to unsafe conditions.

The list of potential safety hazards in a workplace can be extensive. It is crucial for both workers and supervisors to possess the necessary knowledge and awareness to promptly identify and eliminate workplace hazards. It is important to remember that an accident only occurs when there is both a hazard and exposure to that hazard (Hazard + Exposure = Possible Accident).

### 4.2 Hazard Categories

To facilitate hazard identification, we can refer to the following 13 hazard categories, adapted from Product Safety Management and Engineering by Willie Hammer:

- **Acceleration**: Fall hazards resulting from sudden changes in speed or motion.
- **Biohazards**: Hazards related to harmful bacteria, viruses, fungi, and molds, often transmitted through the air or blood.

- **Chemical reactions:** Hazards arising from violent chemical reactions, leading to explosions, material dispersion, or heat emissions.
- **Electrical hazards**: Hazards associated with exposure to electrical current, encompassing shock, ignition, heating, unexpected startup, failure to operate, and equipment explosion.
- **Ergonomics**: Hazards resulting from the physical demands of the work, such as lifting, pushing, pulling, and twisting, leading to strains and sprains.
- **Explosives and explosions**: Hazards related to quick releases of gas, heat, noise, light, and overpressure, particularly with high explosives.
- **Flammability and fires**: Hazards related to the presence of fuel, oxidizers, and ignition sources, potentially leading to combustion and accidental fires.
- **Temperature**: Hazards arising from extreme temperatures in the workplace, causing trauma or illness.
- **Mechanical hazards:** Hazards associated with tools, equipment, machinery, and objects containing pinch points, sharp edges, rotating parts, instability, ejected parts, or materials that could cause injury.
- **Pressure**: Hazards arising from increased pressure in hydraulic and pneumatic systems, which may lead to ruptures and injuries.
- **Radiation**: Hazards resulting from exposure to electromagnetic radiation, with different frequencies posing varying degrees of potential injury, from burns to tissue destruction.
- **Toxics:** Hazards related to materials that are considered toxic when they cause harm to the skin and internal organs, entering the body through inhalation, ingestion, absorption, or injection.
- **Vibration/Noise**: Hazards resulting from prolonged exposure to vibration or noise, leading to adverse physiological and psychological effects.

Note that some of these hazards are not related to HAZWOPER and will not be covered in this course.

### 4.3 Safe Practices for Chemical Exposure

Some common chemicals found at hazardous waste sites are lead, methylene chloride, and chromium. To protect employees from exposure to hazardous chemicals, it is essential to implement the following recommended precautions and safe work practices:

- Maintain a Safety Data Sheet (SDS) for each chemical used in the facility and make it easily accessible to all employees in a language and format that they can clearly understand.
- Adhere to the instructions provided on the SDS for the proper handling of hazardous chemicals.

- Develop and maintain a written Hazard Communication Program that covers SDSs, labeling, and employee training.
- Provide comprehensive training to employees on the requirements of the Hazard Communication Program, including how to read and use SDSs effectively.
- Educate employees about the risks associated with each hazardous chemical they work with.
- Ensure spill clean-up kits are available in areas where chemicals are stored and have a written spill control plan in place.
- Train employees on spill clean-up procedures, including personal protection measures and proper disposal of materials.
- Supply appropriate PPE to employees and enforce its use.
- Store chemicals safely and securely to prevent accidents or unauthorized access.
- Label each container of a hazardous substance with standardized Globally Harmonized System (GHS) labels.

### 4.4 Analyzing the Workplace for Chemical Hazards

To assess and analyze the workplace for chemical hazards, a simple four-step process can be followed:

1. Conduct a workplace assessment to identify the hazardous chemicals currently being used. This can be done through inspections and reviewing records.
2. Create a list of hazardous chemicals based on the assessment results.
3. Obtain SDSs for each chemical on the list.
4. Analyze the hazards presented by each chemical using the SDS, considering:
   **Form of the chemical:** Is it a solid, liquid, or gas?
   **Route of exposure**: Does the chemical come into contact through ingestion, inhalation, absorption, or injection?
   **Amount or dose received by the body**: How much of the chemical enters the body?
   **Toxicity of the chemical**: How poisonous is the chemical?

### 4.5 Bloodborne Pathogens

Bloodborne pathogens are infectious materials found in human blood and certain body fluids that can cause disease in humans. These pathogens include, but are not limited to, Hepatitis B, Hepatitis C, and Human Immunodeficiency Virus. They are capable of causing serious illness and pose a significant health risk if not properly managed.

Occupational exposure refers to the reasonable anticipation of skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials (OPIM) during an employee's duties. Blood includes human blood, its components, and products derived from

human blood. OPIM encompasses various body fluids, unfixed tissue or organ samples, as well as cultures and experimental animal materials infected with bloodborne pathogens.
The primary goal of OSHA's Bloodborne Pathogens Standard is to minimize or eliminate occupational exposure to disease-causing microorganisms found in human blood and body fluids. Key elements include:

- **Annual Training:** All employees with potential occupational exposure must receive annual training to minimize their risk.
- **Primary Pathogens of Concern:** The major bloodborne pathogens are Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV).
- **Exposure Control Strategies:** Employers must develop and enforce comprehensive exposure control strategies for all bloodborne diseases, which includes a formal Exposure Control Plan.

### 4.6 Atmospheric Hazards in Confined Spaces

Many accidents in confined spaces occur because workers are unaware of the dangers or potential hazards present in or near the space. Often, workers may not consider the new hazards and conditions that can arise during work in confined spaces. Therefore, it is crucial to thoroughly identify all confined space hazards and understand how they can impact the health and safety of workers entering the space before entering such spaces.

Confined space hazards can be broadly categorized into two primary categories:

1. **Atmospheric Hazards:** These hazards pertain to issues with the air within the space, such as oxygen deficiency, the presence of harmful gases, or the accumulation of combustible dust. This will be the focus of this section.
2. **Non-Atmospheric Hazards:** These hazards encompass physical risks and other conditions resulting from equipment, electrical contact, materials, temperature extremes, and hazardous surfaces.

A hazardous atmosphere refers to any atmosphere that can incapacitate, injure, impair self-rescue, or cause acute illness or death to workers and rescuers entering confined spaces. Examples of hazardous atmospheres within confined spaces include:

- Oxygen concentrations below 19.5% (oxygen deficiency) or above 23.5% (oxygen enrichment) at sea level.
- Flammable or explosive gases, vapors, or mists exceeding 10% of their lower flammable or explosive limits.
- Combustible dust suspended in the air, obscuring vision within five feet or less.
- Atmospheric concentration of substances with acutely toxic effects exceeding their Permissible Exposure Limits.

- Any other atmospheric condition immediately dangerous to life or health (IDLH).

Atmospheric concentrations of substances incapable of causing death, incapacitation, impairment, injury, or acute illness are not included in hazardous atmospheres.

For guidance on acceptable atmospheric conditions, consult reputable sources such as:

- Safety Data Sheets (SDSs)
- OSHA Permissible Exposure Limits - Annotated Tables
- National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards

### 4.7 Heat and Cold Stress

Temperature extremes pose significant risks to the health, safety, and comfort of personnel involved in hazardous waste site activities. Site health and safety personnel must consider the two main dangers, heat stress and cold exposure, when making decisions regarding PPE selection, work mission duration, standard operating procedures, and medical monitoring.

Wearing PPE puts hazardous waste workers at a higher risk of developing heat stress, which can lead to various health issues and even serious illness or death. To prevent heat stress, management should take the following steps:

- Adjust work-rest schedules and mandate work slowdowns as needed.
- Rotate personnel and job functions to minimize overstress or overexertion at one task.
- Add additional personnel to work teams.
- Perform work during cooler hours of the day if possible or at night with adequate lighting.
- Provide shelter or shaded areas for rest periods, preferably air-conditioned if available.
- Encourage workers to maintain optimal physical fitness and acclimatize to site conditions.
- Provide cooling devices to aid in body heat exchange (field showers, hose-down areas, cooling jackets or suits).
- Train workers to recognize and treat heat stress.

To prevent cold stress and related injuries, considerations must be given to both the individual and the environment, as follows:

- Avoid exposure to humidity and high winds.
- Minimize contact with wetness or metal.
- Wear adequate and appropriate clothing layers to retain body heat and allow sweat evaporation.
- Protect the feet, hands, head, and face as they are the most susceptible to cold.

- Wear several layers of clothing for better insulation and adjust layers as needed.
- Use windproof and waterproof outer layers.
- Monitor for early signs and symptoms of cold stress.

### 4.8 Exposure to Asbestos

Asbestos is a hazardous material commonly found in construction materials. Asbestos refers to a group of naturally occurring fibrous minerals known for their high tensile strength, flexibility, and resistance to heat, chemicals, and electricity. It is widely recognized as a health hazard, and its use is strictly regulated by OSHA and the EPA. Asbestos fibers, which pose health risks, are too small to be seen with the naked eye.

Exposure to asbestos is commonly associated with the following health issues:

- **Asbestosis**: A condition characterized by the scarring of lungs with fibrous tissue, leading to breathing difficulties and often requiring oxygen assistance.
- **Cancer**: Lung cancer is the most prevalent form of cancer associated with asbestos exposure. Other areas of the body, such as the throat, gastrointestinal tract, and kidneys, can also develop cancer due to asbestos exposure.
- **Mesothelioma**: A rare and often fatal cancer that typically occurs in the chest cavity.

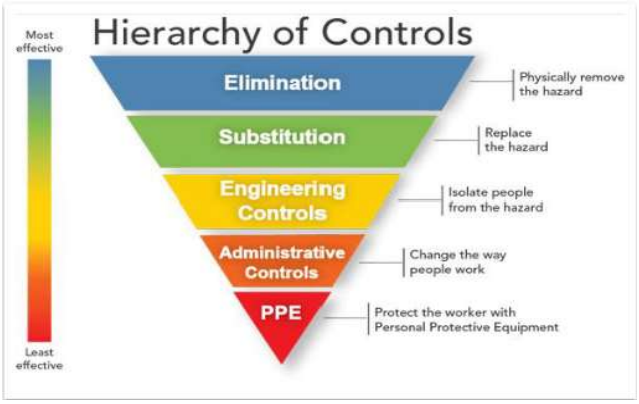
Construction workers may encounter asbestos during various activities, including:

- Demolition or salvage work involving structures containing asbestos.
- Removal or encapsulation of asbestos-containing materials.
- Construction, alteration, repair, maintenance, or renovation of structures or substrates containing asbestos.
- Installation of products containing asbestos.
- Clean-up of asbestos spills or emergencies.
- Transportation, disposal, storage, containment, and housekeeping activities involving asbestos or asbestos-containing products.

## Section 5 Hazard Control

Controlling exposures to occupational hazards is essential for safeguarding workers. The hierarchy of controls offers a framework for determining effective and feasible control measures. One representation of this hierarchy, developed by CDC/NIOSH, is as follows:

**Figure 2.1 Controlling the Hazards**




This figure emphasizes that control methods higher in the hierarchy are generally more effective and provide greater protection compared to those lower in the hierarchy. Following this approach promotes the implementation of inherently safer systems, significantly reducing the risk of illness or injury.

1. **Elimination**: The best approach is to eliminate hazardous substances altogether. This can be achieved by finding alternatives or greener solutions. For example, replacing toxic cleaners with non-toxic, biodegradable options can significantly reduce chemical hazards. Elimination should be the primary goal to mitigate risks.
2. **Substitution**: If complete elimination is not possible, substituting hazardous substances with less toxic alternatives is the next best strategy. The aim is to select substances that have lower toxicity levels, reducing the need for extensive administrative controls or PPE. In the design or development stage, it may be relatively simple and cost-effective to eliminate or substitute hazards. However, for established processes, substantial changes in equipment and procedures might be necessary.
3. **Engineering Controls:** This strategy focuses on redesigning processes that involve toxic chemicals to eliminate or minimize exposure to the hazardous substance itself. This can be achieved by implementing measures such as total enclosure or ventilation systems. Engineering controls aim to control the hazard at its source or along the path to minimize risk. Well-designed engineering controls provide a high level of worker protection and are independent of worker behavior. Although the initial cost of implementing engineering controls may be higher, they often lead to lower operating costs in the long run and can generate cost savings in other areas of the process.
4. **Administrative Controls:** By changing work procedures, administrative controls aim to reduce the duration, frequency, and severity of exposure to chemical hazards. While this strategy does not eliminate or reduce the hazard itself, it focuses on modifying work

practices through written safety policies, rules, supervision, and training. However, it relies heavily on employee compliance and adherence to safe practices.

5. **PPE**: The use of PPE is often a mandatory requirement when working with hazardous chemicals. PPE acts as a physical barrier between the worker and the hazard. However, it is important to note that relying solely on PPE does not eliminate or reduce the hazard itself. Proper training and consistent use of PPE are crucial for this strategy to be effective. While administrative controls and PPE may be relatively inexpensive to establish, they can be costly to sustain over the long term. It's important to note that administrative controls and PPE are generally less effective compared to higher-level control measures. They rely on worker compliance and are unable to fully control all employee behaviors at all times.

By prioritizing control measures based on the hierarchy, organizations can establish safer work environments by systematically addressing hazards and reducing the risk of harm to employees. Any system that relies on human behavior is inherently unreliable.

## Section 6 Personal Protective Equipment Basics

The use of Personal Protective Equipment (PPE) is essential when entering hazardous waste sites to protect individuals from potential hazards. PPE is designed to shield individuals from chemical, physical, and biological dangers that may be present. Proper selection and use of PPE can effectively safeguard the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing. This module provides an overview of the different types of PPE suitable for hazardous waste sites and offers guidance on their selection and usage. Additionally, it addresses the importance of considering physiological factors such as heat stress when using PPE.

### 6.1 Compliance with PPE

Compliance with PPE requirements is mandated by OSHA regulations found in 29 CFR Part 1910. Private contractors working on Superfund sites are also obligated to adhere to applicable OSHA provisions and any additional federal or state safety requirements specified by the overseeing lead agency, as outlined in 40 CFR Part 300 by the U.S. Environmental Protection Agency (EPA).

It is important to note that no combination of protective equipment and clothing can protect against all hazards. Therefore, PPE should be utilized in conjunction with other protective measures. It is crucial to recognize that the use of PPE itself can pose significant risks to workers, such as heat stress, physical and psychological stress, impaired vision, mobility, and communication. The level of associated risks generally increases with the extent of PPE

protection. However, both over-protection and under-protection can be hazardous and should be avoided.

## 6.2 Developing a PPE Program

It is crucial to establish a written PPE program for work at hazardous waste sites. The primary objectives of such a program are to protect the wearer from safety and health hazards and to prevent injuries resulting from incorrect use or malfunction of the PPE. To accomplish these goals, a comprehensive PPE program should incorporate the following elements:

1. **Hazard identification**: Identify and assess the specific hazards present at the site that require the use of PPE.
2. **Medical monitoring**: Implement a system for monitoring the health of workers who utilize PPE to ensure their well-being and detect any potential adverse effects.
3. **Environmental surveillance**: Regularly monitor the work environment to assess the effectiveness of PPE in reducing exposure to hazards.
4. **Selection, use, maintenance, and decontamination of PPE**: Establish protocols for selecting appropriate PPE based on identified hazards, guidelines for correct usage, procedures for maintenance and decontamination, and guidelines for proper storage.
5. **Training:** Provide comprehensive training to employees on the selection, use, limitations, maintenance, and decontamination of PPE. This training should also cover the recognition of potential hazards and the importance of following safety protocols.

The written PPE program should include policy statements, procedures, and guidelines. Copies of the program should be readily accessible to all employees, with a reference copy available at each work site. It is also important to make technical data, maintenance manuals, relevant regulations, and other essential information easily accessible.

The PPE program should undergo an annual review to ensure its effectiveness. The review should encompass various aspects, including:

- Surveying each site to ensure compliance with relevant regulations
- Evaluating the number of person-hours workers spend wearing different types of protective ensembles
- Analyzing accident and illness records
- Assessing levels of exposure
- Reviewing the adequacy of equipment selection, operational guidelines, decontamination procedures, and maintenance programs
- Evaluating the effectiveness of training and fitting programs
- Coordinating with other elements of the safety and health program
- Assessing the degree to which program objectives are being met

- Reviewing program records
- Making recommendations for program improvement and modification
- Evaluating program costs

The results of the program evaluation should be shared with employees and presented to top management. This allows for the implementation of necessary adaptations and improvements to the program.

## Section 7 Respiratory Protection

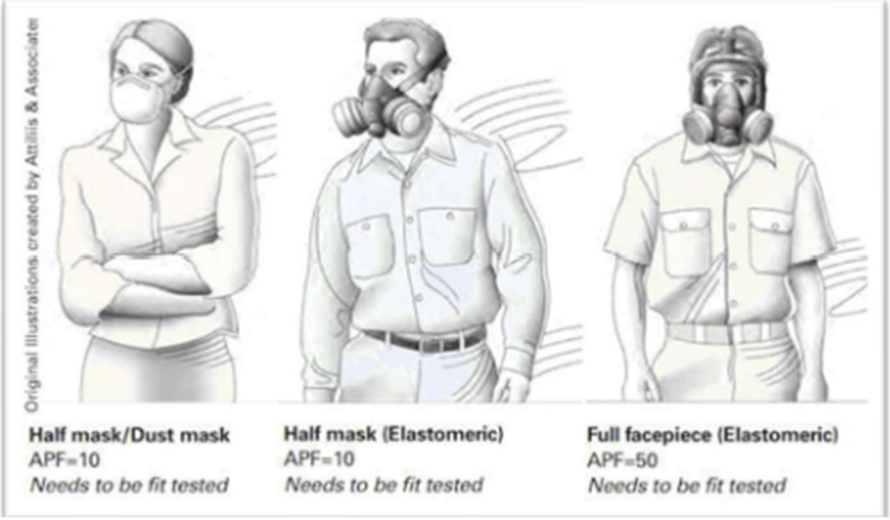
### 7.1 Introduction to Respiratory Protection

Respiratory protective devices are commonly used in various industries to minimize exposure to airborne contaminants and oxygen-deficient atmospheres. Air quality testing and the information from Safety Data Sheets (SDSs) are used to determine the appropriate type of respiratory protection. Respirators should only be used for protection against substances that have been approved for their specific use. It is important to follow proper guidelines for cleaning, disinfecting, and replacing respirators, ensuring the highest level of protection.

**Types of Facepieces**

Various types of facepieces are available for different respirator models. The commonly used ones at hazardous waste sites are full facepieces and half masks. Full-facepiece masks provide comprehensive coverage from the hairline to below the chin, including protection for the eyes.

Half masks cover the lower part of the face, extending from below the chin to over the nose. However, it's important to note that half masks do not provide protection for the eyes.



**Tight-Fitting vs Loose-Fitting Respirators**

**Tight-fitting respirators** are designed to create a seal with the wearer's face. They come in three types: quarter mask, half mask, and full facepiece. Components of tight-fitting respirators typically include a facepiece, eyepiece (for full-facepiece masks), inhalation and exhalation valves, and an air source or air-purifying element.

On the other hand, **loose-fitting respirators** have a respiratory inlet covering that forms a partial seal with the face. Examples include loose-fitting facepieces, hoods, helmets, blouses, or full suits that completely cover the head. Supplied air hoods used by abrasive blasters are a well-known type of loose-fitting respirator.


**Positive-Pressure vs Negative-Pressure Respirators**

Respirators can be categorized based on the air flow supplied to the facepiece, either maintaining positive pressure or negative pressure.

**Positive-pressure respirators** maintain a higher pressure inside the facepiece throughout both inhalation and exhalation. There are two main types of positive-pressure respirators:

- **Pressure-Demand Respirators**: These respirators utilize a pressure regulator and an exhalation valve on the mask to maintain positive pressure. During normal breathing, the mask remains pressurized. However, during high breathing rates or in the event of a leak, a continuous flow of clean air is supplied to the facepiece to prevent contaminated air from entering.
- **Continuous-Flow Respirators**: These respirators deliver a continuous stream of air into the facepiece. The constant flow of air prevents the infiltration of ambient air. However, continuous-flow respirators consume air supply more rapidly compared to pressure-demand respirators.

For example, Powered Air-Purifying Respirators (PAPRs) operate in a positive-pressure continuous-flow mode by using filtered ambient air. While they primarily maintain positive pressure, it's important to note that during maximal breathing rates, a negative pressure may be created momentarily in the facepiece of a PAPR. **Negative-pressure respirators**, on the other hand, rely on inhalation to create a negative pressure or vacuum inside the facepiece. When properly fitted, the negative pressure helps draw air through the respirator's filtering elements, ensuring that contaminants are captured before inhalation. However, one significant drawback of these respirators is that if there are any leaks in the system, such as a cracked hose or an improperly fitted mask, the user may inhale contaminated air.

## 7.2 Regulations

Federal regulations mandate the use of respirators that have undergone testing and approval by NIOSH and the Mine Safety and Health Administration (MSHA). Approved respiratory equipment will have clear approval numbers displayed. However, it's important to note that not all respiratory equipment on the market is approved. NIOSH periodically publishes a list called the Certified Equipment List, which includes all approved respirators and respiratory components.

**Assigned Protection Factor**

The level of protection provided by a respirator is indicated by its Assigned Protection Factor (APF). The APF is determined experimentally by measuring the seal of the facepiece and leakage from the exhalation valve. It represents the relative difference in substance concentrations outside and inside the facepiece maintained by the respirator. More information on APFs can be found in OSHA Publication 3352, Assigned Protection Factors.

**Exposure Limits**

When the identity and concentration of chemicals in the air are known at a worksite, a respirator should be selected with a sufficiently high protection factor to ensure the wearer is not exposed to chemicals above the applicable limits. These limits include the American Conference of Governmental Industrial Hygienists' Threshold Limit Values (TLVs), OSHA's Permissible Exposure Limits (PELs), and NIOSH's Recommended Exposure Limits (RELs). These limits are designed to protect workers who may be exposed to chemicals consistently throughout their working life. OSHA's PELs are legally enforceable exposure limits and represent the minimum level of protection that must be met.

### 7.3 EPA Levels of Protection

The EPA Levels of Protection (Levels A, B, C, and D) serve as a starting point for assembling PPE ensembles. However, each ensemble should be tailored to the specific situation to provide the most appropriate level of protection.

**Level A Protection**: Level A is used when the highest level of respiratory, skin, and eye protection is required. It is suitable for chemicals that pose a high risk to the skin or in confined, poorly ventilated areas. Level A equipment includes positive pressure Self-Contained Breathing Apparatuses (SCBAs), totally encapsulating chemical-protective suits, gloves, boots, and other optional items.

**Level B Protection**: Level B protection provides the same respiratory protection as Level A but offers less skin protection. It is recommended for situations where a high level of respiratory protection is required but the skin hazard is less severe. Level B equipment includes positive pressure SCBAs or Supplied-Air Respirators (SARs), hooded chemical-resistant clothing, gloves, boots, and other optional items.

**Level C Protection**: Level C protection offers the same level of skin protection as Level B but provides a lower level of respiratory protection. It is suitable when atmospheric contaminants or direct contact will not adversely affect exposed skin, and specific air contaminants have been identified. Level C equipment includes Air-Purifying Respirators (APRs), hooded chemical-resistant clothing, gloves, boots, and other optional items.

**Level D Protection**: Level D protection is sufficient when no respiratory protection and minimal skin protection are required. It is used when work is conducted outside the Exclusion Zone and the atmosphere contains at least 19.5 percent oxygen. Level D equipment includes coveralls, gloves, boots, safety glasses or goggles, hard hat, and other optional items.

## Section 8 Site Safety and Health Program

The HAZWOPER standard mandates that every employer formulates and executes a written Safety and Health Program for each category of hazardous waste sites before work commences.

The Safety and Health Program is pivotal in identifying, evaluating, and managing safety and health hazards while providing emergency response procedures for every hazardous waste site. A comprehensive and robust Safety and Health Program is crucial in reducing work-related injuries and illnesses and in upholding a safe and healthy work environment.

The program outlines the work policies, practices, and procedures, and encompasses the following items:

- Organizational Structure
- Detailed Work Plan
- Site Characterization and Assessment
- Site-Specific Health and Safety Plan (HASP), aka Site Safety Plan
- Safety and Health Training Program
- Medical Surveillance Program
- Standard Operating Procedures

The written Safety and Health Program needs to be updated periodically and accessible to all impacted employees, contractors, and subcontractors.

A vital dimension of planning is coordination with the existing response community. A nationwide response system was conceived through a National Contingency Plan sanctioned by Congress to initiate procedures for coordinating reactions to hazardous substance releases into the environment. This National Contingency Plan sets up response teams comprised of representatives from federal agencies as well as state and local governments. An especially crucial point of contact for hazardous waste site activities is the EPA-appointed official in charge of synchronizing federal activities related to site cleanup.

## 8.1 Site Characterization

The effectiveness of protective measures is heavily dependent on the accuracy, detail, and comprehensiveness of the information about a site. This information directly impacts how well hazards are identified and managed. Site characterization is a dynamic and continuous process, crucial for developing a comprehensive HASP.

There are three phases of site characterization:

1. Preliminary Off-Site Evaluation: Conducting reconnaissance away from the site, including perimeter observations
2. On-Site Surveys: Restricted to reconnaissance personnel for detailed surveys

3. Ongoing Monitoring: Continuous monitoring for updated site conditions post-initial safety clearance

According to 29 CFR 1910.120 (c)(2), a preliminary off-site evaluation of a site's characteristics must be conducted by a Qualified Person before entering the site. The purpose is to assist in selecting appropriate employee protection methods prior to site entry. The off-site characterization should be used to develop a HASP that addresses the work to be done and outlines procedures to protect the health and safety of the entry team. It is typically led by the Project Team Leader, often involving external experts for accurate hazard interpretation.

Following the preliminary off-site evaluation and the initial site entry, a more detailed survey of the site's specific characteristics is conducted. The survey verifies and supplements information from the preliminary off-site characterization and aims to identify existing hazards and assist in selecting appropriate engineering controls and PPE for employees. The entry team typically includes two workers entering the site and two outside support personnel, equipped with PPE and ready for emergency response.

### 8.2 Components of the HASP

The Site Safety Plan's development should involve both the off-site and on-site management and be reviewed by occupational and industrial health and safety experts, physicians, chemists, or other relevant personnel. The plan should, at the very least:

- Assign key personnel and alternates responsible for site safety
- Describe the hazards associated with each operation performed
- Ensure personnel are adequately trained to fulfill their job responsibilities and to manage the specific hazardous situations they might encounter
- Outline the protective clothing and equipment to be worn by personnel during various site operations
- Define any site-specific medical surveillance requirements
- Outline the program for periodic air monitoring, personnel monitoring, and environmental sampling, if needed
- Define the actions to be undertaken to mitigate existing hazards (e.g., containment of contaminated materials) to create a safer work environment
- Define site control measures and include a site map
- Establish decontamination procedures for personnel and equipment
- Outline a Contingency Plan for safe and effective response to emergencies
- Outline the site's Standard Operating Procedures (SOPs)

SOPs are standardizable activities (like decontamination and respirator fit testing), for which a checklist can be used. These procedures should be:

- Pre-formulated
- Based on the best available information, operational principles, and technical guidance
- Field-tested by qualified health and safety professionals (and revised as necessary)
- Relevant to the types of risk at that site
- Easy to understand and apply
- Provided in writing to all site personnel (who should be briefed on their usage)
- Included in training programs for site personnel

## 8.3 Medical Surveillance

To ensure employee safety, medical surveillance may be necessary for those who are exposed to hazardous substances during their work. This includes regular medical exams and consultations for individuals who may be at risk of overexposure to such substances. The following table outlines which employees are required to undergo medical surveillance.

**Table 2 Summary of HAZWOPER Medical Surveillance**

| **Employee Type** | **Medical Surveillance** |
|---|---|
| Employees who may be exposed to hazardous substances at or above Permissible Exposure Limits (PELs) or published exposure levels for 30 or more days a year. | • Before assignment<br>• Every 12 months unless the physician recommends a longer<br>• interval (not to exceed 24 months)<br>• At termination of employment and reassignment |
| Employees who wear a respirator for 30 or more days a year or who are required by 1910.134, Subdivision 2/I to wear a respirator.<br>Members of HAZMAT teams. | • Immediately after reporting symptoms indicating overexposure |
| Employees who show symptoms of overexposure to hazardous substances. | • As soon as possible after an employee reports symptoms<br>• When a physician determines that an examination is necessary |

Some key points about the medical examination are:

- The health assessment should be conducted under the guidance of a licensed medical practitioner.

- The doctor should be well informed about the worker's responsibilities, their exposure to harmful substances, and the personal protective gear they utilize.
- A written report of the physician's findings should be provided to the employee.
- The employer is obliged to maintain records of the health assessment, which include the employee's name and the doctor's written judgment regarding the employee's health suitability to perform hazardous waste tasks or to use respiratory protection.

## Section 9 Overview of Training

Anyone stepping onto a hazardous waste site must fully comprehend the potential health and safety risks associated with the site's activity. Personnel that can potentially encounter hazardous substances must have a deep understanding of the programs and procedures detailed in the Site Safety Plan, and they must be trained to operate safely in contaminated zones. Visitors to the site must receive suitable training regarding hazard recognition and the site's Standard Operating Procedures (SOPs), enabling a safe visit.

Education is the crucial starting point for establishing and maintaining an effective Hazard Communication (HazCom) Program. This section focuses on the communication of hazard information and the training of employees to work safely when exposed to those hazards. It covers the basic responsibilities of employers in effectively communicating HazCom to employees.

At a minimum, employees must be informed about the following:

- The requirements of the Hazard Communication Standard (HCS)
- Operations in their work area involving hazardous chemicals
- The location and availability of the written HazCom Program, including lists of hazardous chemicals and required SDSs

And the training must cover the following:

- Methods and observations to detect the presence or release of hazardous chemicals in the work area
- Physical and health hazards, such as simple asphyxiation, combustible dust, pyrophoric gas hazards, and other unclassified hazards of chemicals in the work area
- Measures employees can take to protect themselves from these hazards, including specific procedures implemented by the employer, emergency protocols, and proper use of PPE

- Details of the employer's HazCom Program, including explanations of labels on shipped containers and workplace labeling systems, as well as the SDSs, its organization, and how employees can obtain and use hazard information

The employer must also evaluate each employee's knowledge of workplace hazards, understanding of the standard's requirements, and familiarity with the HazCom Program.

The primary goals of training programs for employees involved in hazardous waste site activities are to:

- Alert workers to the potential hazards they might face
- Equip workers with the necessary knowledge and abilities to carry out the work with minimal risks to their health and safety
- Educate workers on the purpose and constraints of safety equipment
- Ensure workers can safely evade or respond to emergencies

The training level provided should align with the worker's roles and responsibilities. The training should enable employees to gain appropriate knowledge, skills, and experience in their tasks as follows:

- **Knowledge**: The training program should incorporate classroom/online and on-the-job instruction covering a broad spectrum of health and safety topics.
- **Skills**: Hands-on skill development should involve field drills simulating site activities and conditions.
- **Experience**: Onsite experience should be acquired under the direct guidance of trained, experienced personnel.

## 9.1 Training Methods

Employees must be trained when they are assigned to work with hazardous chemicals to ensure they are informed before exposure occurs. Providing employees with the SDS alone does not satisfy training requirements. Training programs should educate employees about the hazards in their work area (the who, what, where, when, and why) and provide practical guidance on working safely according to the HazCom Program (the how).

Training can be conducted through various methods, including:

- Classroom instruction
- Online instruction
- Interactive videos
- Hands-on demonstrations (which should always be included)

Regardless of the method, employees should have the opportunity to ask questions and ensure their understanding. All training should be presented in an understandable and succinct manner. Crucial information, such as the SOPs, should be provided in writing. If employees receive job instructions in a language other than English, then the HazCom training must also be conducted in that foreign language. All employees should also undertake refresher training at least once a year to reinforce the initial training and to update workers on any new policies or procedures.

Upon completion of training, employees may not need to receive a certificate, but the employer must verify training with some form of documentation that contains the completion date. Each employee's personnel file should contain a record confirming the completion of necessary training. It's essential to ensure all employees' training is current and relevant to their specific duties.

Employers must provide employees with comprehensive information and training on hazardous chemicals in their work area at the following times:

- At the time of their initial assignment
- Whenever a new hazard, previously untrained, is introduced into their work area

## Section 10 Overview of Site Control

### 10.1 Elements of the Site Control Program

The Site Control Program consists of various elements aimed at reducing worker and public exposure to chemical, physical, biologic, and safety hazards. Some of the key procedures to implement include:

1. **Site Mapping**: Compile a detailed site map that outlines the layout, potential hazards, and designated work zones within the site.
2. **Site Preparation**: Properly prepare the site for subsequent activities by addressing any immediate risks or hazards present.
3. **Work Zones**: Establish clearly defined work zones to control access and minimize the potential for cross-contamination between different areas of the site.
4. **Buddy System**: Implement the buddy system when necessary, ensuring that workers are paired up to provide mutual assistance and support.
5. **Decontamination Procedures**: Develop and strictly enforce decontamination procedures for both personnel and equipment to prevent the spread of hazardous substances.

6. **Site Security**: Establish appropriate site security measures to prevent unauthorized access and ensure the safety of personnel and the surrounding community.
7. **Communication Networks**: Set up effective communication networks to facilitate information sharing and emergency response within the site.
8. **Safe Work Practices**: Enforce safe work practices throughout the site, including the proper use of PPE and adherence to established protocols.

The level of site control required will vary based on site characteristics, size, and proximity to the community. The Site Control Program should be established early on in the planning stages of the project and be adaptable to evolving information and assessments. In many cases, it may be necessary to implement multiple measures simultaneously to ensure adequate site control and worker safety.

## 10.2 Security Measures

Site security is crucial to prevent unauthorized individuals from being exposed to site hazards, deter theft, and prevent increased risks from vandals or those attempting to abandon additional waste on the site. To maintain site security during working hours, the following measures should be implemented:

- **Support Zone and Access Control**: Implement robust security measures in the Support Zone and at Access Control Points to manage access and safeguard against unauthorized entry. This involves assigning personnel to oversee these points and ensuring compliance with entry and exit requirements.
- **Identification System**: Develop an identification system to validate authorized personnel and their approved activities. This system helps in maintaining a log of individuals present on-site and their specific roles.
- **Visitor Approval and Accompaniment**: All visitors should have explicit approval from the Project Team Leader. Trained site personnel must accompany them, providing appropriate protective equipment.
- **Physical Barriers**: Erect fences or other physical barriers around the perimeter of the site to enhance security. In the absence of a fence, utilize warning signs and employ guards to patrol the site, thereby deterring unauthorized access and potential vandalism.
- **Training for Guards**: Ensure that guards are fully informed about site hazards and are trained in emergency procedures to effectively respond to potential incidents.
- **Buddy System**: Implement a buddy system for activities in contaminated or hazardous areas. This system ensures mutual assistance, observation of exposure signs, integrity checks of protective clothing, and immediate communication to supervisors in

emergencies. Enforce this system at the Access Control Point for the Exclusion Zone and maintain constant visual or communication contact with a designated person in the Support Zone.

To maintain site security during off-duty hours, implement the following measures:

- **Surveillance During Off-Duty Hours**: Employ trained, in-house technicians familiar with the site, hazards, and safety protocols for surveillance. If using security guards, ensure they are extensively trained in safety procedures. Collaborate with local law enforcement agencies for sites posing significant health and safety risks.
- **Equipment Security Measures**: Implement strategies to secure equipment during non-operational hours, including locking mechanisms and surveillance.

## Section 11 Decontamination

### 11.1 Decontamination Plan and SOPs

A well-defined Decontamination Plan should be developed as part of the Site Safety Plan. This plan should determine the number and layout of decontamination stations, identify required decontamination equipment, establish appropriate decontamination methods, devise procedures to prevent contamination of clean areas, and outline measures to minimize worker contact with contaminants during the removal of personal protective clothing and equipment. It should also include methods for disposing of clothing and equipment that cannot be fully decontaminated. The Decontamination Plan should be periodically revised to accommodate changes in PPE, site conditions, or reassessment of site hazards.

Establishing SOPs is an initial step in the decontamination process to maximize worker protection by minimizing contact with waste and potential contamination. These SOPs can include practices such as avoiding direct contact with hazardous substances, utilizing remote sampling and handling techniques, protecting monitoring and sampling instruments through bagging, using disposable outer garments and equipment when appropriate, encasing sources of contaminants with plastic sheeting or overpacks, and adopting proper procedures for dressing before entering the Exclusion Zone. These procedures should be effectively communicated, enforced, and regularly reviewed during site operations to ensure compliance and worker safety.

## 11.2 Hazards in Decontamination

While decontamination is crucial for health and safety, it's important to be aware of potential hazards associated with the process. Certain circumstances can pose risks during decontamination. Some hazards related to decontamination include:

**Incompatibility with Hazardous Substances:** Decontamination methods must be compatible with the hazardous substances being removed. Some methods may react with contaminants, leading to explosions, heat generation, or the formation of toxic byproducts. It is necessary to assess the chemical compatibility of decontamination methods before their application.

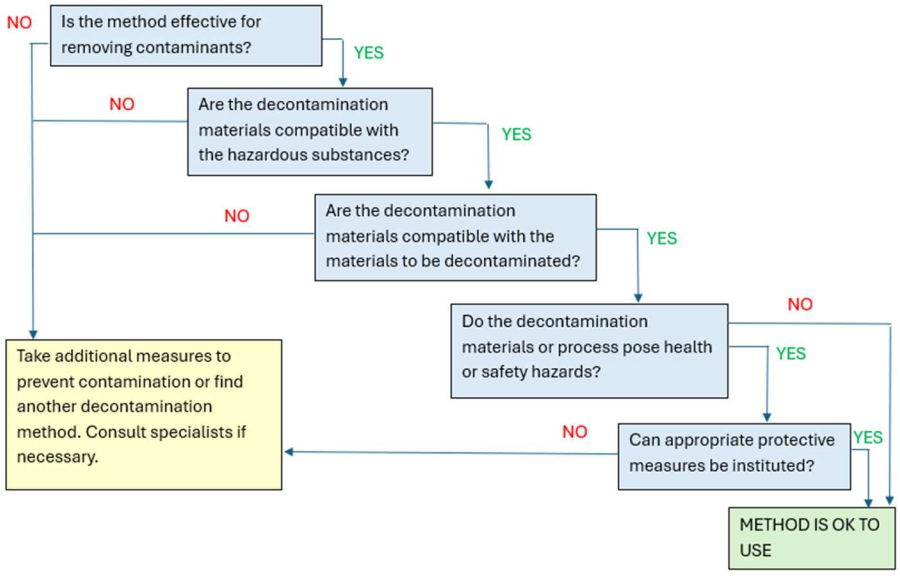
**Incompatibility with Clothing or Equipment**: Decontamination methods should be compatible with the clothing or equipment being decontaminated. For instance, certain organic solvents have the potential to permeate or degrade protective clothing. It is essential to consider the compatibility of decontamination methods with the specific materials to avoid compromising their effectiveness.

**Direct Health Hazards:** Some decontamination methods may directly pose health hazards to workers. Vapors from chemical decontamination solutions, for example, can be harmful if inhaled or they can be flammable. It is crucial to assess the potential health risks associated with decontamination solutions and take necessary precautions to protect both decontamination workers and those being decontaminated.

Prior to using any decontamination method, it is important to determine the chemical and physical compatibility of the decontamination solutions or materials. Any method that impairs the functioning of PPE by permeating, degrading, damaging, or compromising its safety should not be used. For decontamination methods posing direct health hazards, appropriate measures must be implemented to ensure the safety of decontamination workers and those undergoing the decontamination process.

The decision tree below provides guidance for evaluating the health and safety aspects of decontamination methods:

**Figure 1 Decision Tree for Evaluating Decontamination Methods**




## Section 12 Drums and Containers

### 12.1 Container Labeling

Labels on containers shipped from manufacturers or distributors (aka primary labels) must include the following six items:

- **Product Identifier:** This identifies the product or chemical name and should match the product identifier used on the SDS.
- **Supplier/Manufacturer Information:** This identifies the manufacturer's company name, address and telephone number.
- **Precautionary Statements:** These describe general preventative, response, storage or disposal precautions.
- **Hazard Pictograms:** Pictograms feature a symbol displayed on a white background, enclosed within a red border, and represent specific hazards. There are 9 different pictograms that identify risks in three different categories including: chemical/physical, health or environmental.
- **Hazard Statements:** These describe the nature and, when appropriate, the degree of the hazard for each hazard category.
- **Signal Words:** The GHS signal words "Danger" and "Warning" indicate the relative level of severity of the hazard. "Danger" is used for more severe hazard categories.

It is the responsibility of the employer to ensure that each workplace container of hazardous chemicals is properly labeled. Employers should supplement the information on workplace container labels through additional training, discussions about SDS information, and the use of signs or process sheets. This ensures that employees receive all the necessary hazard information that they would have obtained from a shipping label.

When chemical manufacturers, importers, distributors, or employers obtain new significant information about the hazards of a chemical, they must update the labels for that chemical within six months. It is their responsibility to ensure that containers of hazardous chemicals shipped after that time contain the updated information. If the chemical is not currently being produced or imported, the relevant party must include the new information on the label before shipping or reintroducing the chemical into the workplace.

Unlabeled drums should be treated as hazardous until their contents are identified and appropriately labeled. Prior to handling unlabeled drums, they should be visually inspected to gain information about their contents. The inspection crew should examine the following items:

- Symbols, marks, or signs indicating hazardous contents (radioactive, leaking or deteriorated, bulging, explosive or shock-sensitive)
- Signs of deterioration such as corrosion, rust, and leaks
- The configuration of the drumhead (whole lid, bung, liner)
- The type of drum (polyethylene/PVC-lined, exotic metal, single-walled)
- Air monitoring samples near drums

## 12.2 Drum Safety Guidelines

By following these guidelines and safety practices, the risks associated with handling drums and hazardous waste containers can be minimized, ensuring the safety of personnel and preventing accidents.

- **Hazard Communication:** Clearly inform employees about potential hazards associated with the drums.
- **Inspection:** Carefully inspect drums for structural integrity and potential hazards before handling them. Move drums located in inaccessible areas to a location where they can be properly inspected.
- **Precautions for Handling:** Handle drums only when necessary to avoid accidents and warn personnel about potential handling hazards. Use appropriate PPE when necessary.
- **Handling:** Handle, transport, label, and dispose of hazardous substances and contaminated liquids and residues properly.

- **Handling Sequence:** Determine the most appropriate sequence for moving drums and containers to maximize safety.
- **Drum Standards:** Ensure drums and containers meet appropriate DOT, OSHA, and EPA regulations for the contained waste.
- **Training in Lifting Techniques:** Train workers and equipment operators in proper lifting and moving techniques for safe drum handling.
- **Spill Preparedness:** Keep salvage drums and absorbents readily available for immediate response to spills, leaks, or ruptures.
- **Spill Containment:** Implement a comprehensive spill containment program to effectively manage major spills. Construct containment berms for major spill incidents.
- **Safe Transfer of Contents:** In cases where drums cannot be moved without risking rupture, carefully transfer their contents into sound containers using appropriate devices.
- **Use of Overpack Containers:** Employ overpack containers for handling leaking or damaged drums. Prepare overpacks in advance before handling drums to streamline the process.
- **Use of Remote Equipment:** Use remote-operated equipment to eliminate the need for determining drum integrity before excavation. Isolate critically swollen drums until pressure can be relieved remotely.
- **Use of Detection Systems:** Apply detection systems to estimate the location and depth of buried drums, enhancing excavation safety.
- **Caution During Excavation:** Exercise caution when removing soil or covering material to avoid disturbing buried drums.
- **Fire Extinguishing Equipment:** Ensure fire extinguishing equipment is on hand to control incipient fires during handling and excavation.

### 12.3 Opening Drums

Drums should be opened using the following practices:

- Utilize remote methods for opening drums that are structurally compromised.
- Employ non-sparking tools whenever possible, especially in environments with flammable substances.
- If using a supplied-air respiratory protection system, supply air to operators via airlines and have escape SCBAs ready.
- Keep employees not directly involved in drum opening at a safe distance and use shields for protection against accidental explosions.
- Position controls for opening equipment, monitoring equipment, and fire suppression behind explosion-resistant barriers.

- Utilize material handling equipment and hand tools that are designed to prevent ignition in flammable atmospheres.
- Open drums in a manner that safely relieves any excess interior pressure.
- Ensure that employees do not stand or work on drums or containers to prevent accidents.
- Perform air monitoring during drum-opening activities to detect any hazardous emissions or changes in air quality.
- Avoid using picks, chisels, and firearms when opening drums.
- Minimize worker exertion by hanging or balancing the drum opening equipment.
- Open polyethylene or polyvinyl chloride-lined (PVC-lined) drums through the bung by removal or drilling. Then, reseal open bungs and drill openings quickly with new bungs or plugs.
- Decontaminate the equipment used to open the drums after each use.

### 12.4 Bulking and Shipping Materials

Following characterization, wastes are often mixed together and placed in bulk containers (such as tanks or vacuum trucks) for shipment to treatment or disposal facilities. This must be done at the final staging area by trained and experienced personnel. Use the following procedures when bulking wastes:

- Inspect each tank trailer and remove any residual materials prior to placing bulked items.
- To move hazardous liquids, use pumps that are properly rated by the National Fire Protection Association and that have a safety relief valve with a splash shield. Make sure the pump hoses, casings, fittings, and gaskets are compatible with the material being pumped.
- Inspect hose lines before beginning work to ensure that all lines, fittings, and valves are intact with no weak spots.
- Take special precautions when handling hoses as they could contain residual material that can splash or spill on the personnel operating the hoses.
- Store flammable liquids appropriately in approved containers.

The shipment of materials to offsite TSD facilities involves the use of waste hauling vehicles. DOT and EPA regulations for shipment of hazardous waste must be followed. Use the following procedures when shipping hazardous waste:

- Locate the Final Staging Area as close to the site exit as possible.
- Keep hauling vehicles and drivers in a safe area until loading begins.
- Give drivers appropriate PPE.

- Make sure drums are tightly sealed and overpack leaking/deteriorated drums prior to shipment.
- Cover the load with a layer of clean soil, foam, and/or tarp.
- Secure the load to prevent movement or release of hazardous waste during transportation.
- Decontaminate the tires prior to leaving the hazardous waste site.
- Weigh vehicles every so often and check that they are not releasing dust/vapor emissions.

## Section 13 Incident Command System

Given that local emergency response teams like police and fire departments are typically the first to respond to an incident, HAZWOPER necessitates the establishment of an Incident Command System (ICS). This is a universally applied approach to the command, control, and coordination of emergency response. It is designed to be adaptable and effective across different types of incidents and organizational structures, not limited by jurisdictional boundaries.

The main objective of implementing the ICS is to enhance safety, diminish confusion, ensure orderly and coordinated response efforts, and ultimately, efficiently manage the emergency situation.

**Incident Commander**

The Incident Commander (IC), or the Unified Command in situations with multiple incidents, bears the responsibility for all aspects of the response, which includes establishing incident objectives and overseeing all incident operations. Upon reaching the scene, the IC has numerous duties to attend to. Unless these responsibilities are explicitly assigned to another member of the Command or General Staff, they remain with the IC. The IC's key responsibilities include:

- Setting immediate priorities with a particular focus on ensuring the safety of responders, other emergency workers, bystanders, and individuals involved in the incident.
- Stabilizing the incident by prioritizing life safety and managing resources in an efficient and cost-effective manner.
- Defining the objectives for the incident and the strategy to accomplish these objectives.
- Establishing and supervising the incident organization.
- Approving the execution of the Incident Action Plan, whether communicated in writing or orally.

- Ensuring that sufficient health and safety measures are in place.

If the Safety Officer determines that certain activities present an IDLH or involve a condition of imminent danger, they hold the authority to modify, pause, or cease those activities. The Safety Officer is obligated to promptly notify the person leading the Incident Command System about any necessary actions to mitigate these risks at the emergency site.

**General Staff**

The General Staff consists of four primary departments: Operations, Planning, Logistics, and Finance/Administration. These responsibilities fall under the Incident Commander until they are delegated to another member. When these responsibilities are separated and assigned to different individuals under the Incident Commander, they are overseen by a section chief who can be supported by other functional units.

- The Operations Department holds the responsibility for all tasks directly linked to the response's primary mission.
- The Planning Department is accountable for collecting, evaluating, and distributing tactical information related to the incident. It also handles the preparation and documentation of Incident Action Plans.
- The Logistics Department is in charge of supplying the necessary facilities, services, and materials needed for responding to the incident.
- The Finance and Administration Department handles all financial, administrative, and cost analysis aspects associated with the incident.

## Section 14 Air Monitoring

Air monitoring is an important practice to determine the level of air contamination in areas where employees are potentially exposed to hazardous substances. It is mandatory to conduct monitoring during the site's initial entry and clean-up. Two types of air monitoring are personal sampling/monitoring and area sampling/monitoring. Personal sampling/monitoring measures individual employee exposures by sampling the air they breathe. Area sampling/monitoring, on the other hand, estimates exposures affecting groups of employees by testing the air for contaminants in specific locations or areas.

Employers are responsible for establishing a monitoring policy that applies to the site's conditions. This policy should describe what will be monitored, the monitoring equipment to be used, and the frequency of monitoring. Additionally, employers must specify the concentrations

of airborne contaminants that will trigger the reevaluation of the site's engineering controls, safe work practices, and PPE to ensure their effectiveness.

To ensure the safety of employees, air monitoring should be conducted at the beginning of the work and whenever hazardous conditions, or atmosphere are suspected. This is to immediately identify any condition that may pose an immediate danger to life and health or expose employees to hazardous levels of substances. During the cleanup phase of the hazardous waste operation, personal sampling should be used to monitor employees who are at higher risk of exposure to hazardous substances.