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Module 5: Health Hazards in Construction

Module Description

The Hazard Communication Standard (HCS) provides information to workers and employers about various chemical hazards that exist in the workplace, and what protective measures they can take to prevent the adverse effects of such hazards.

This module will give you a basic understanding of how to deal with hazardous chemicals and how workers can prevent and protect themselves from chemical hazards at a construction worksite.

Module Learning Objectives

At the conclusion of this module, you should be able to:

- Describe the purpose of The Hazard Communication Standard (HCS).
- Discuss labels and Safety Data Sheets.
- Differentiate between physical and health hazards associated with hazardous chemicals.
- Distinguish between symbols used to identify hazards.
- State how to prepare and implement a written hazard communication program.
- Define training and its importance.

Lesson 1: Introduction to Hazard Communication Standard

Lesson Focus

This lesson focuses on the following topics:

- The Hazard Communication Standard (HCS)
- Hazardous Materials
- Important Definitions

The Hazard Communication Standard (HCS)

The Need of a Hazard Communication Standard (HCS)

According to OSHA, over 650,000 hazardous chemical products exist and hundreds of new ones are being introduced annually. More than 32 million workers are potentially exposed to one or more chemical hazards in more than 3 million American workplaces.

The Concept of Hazard Communication Standard (HCS)

The simple idea behind the Hazard Communication Standard (HCS) is that workers have both a need and a *right to know* about the hazards and identities of the chemicals they are exposed to when performing their tasks and duties.

The Hazard Communication Standard Coverage

Implementation of HCS for all those companies who import, produce, distribute or use hazardous chemicals in the United States is mandatory. They must provide proper information and training to all of their affected employees.

The Hazard Communication Standard covers both physical (such as explosive, flammable) and health (acute and chronic) hazards. Being a worker or an employer there is a need and a "right to know" how you can perform job responsibilities safely.

Hazardous Materials

Hazardous and toxic materials are those chemicals that may be present in a workplace and have the capacity to cause harm. Mixtures, fuels, solvents, paints, and dusts are all considered hazardous substances or materials.

Recognition of Hazardous Chemicals

Before working with or using chemicals, it is important to recognize those that may be physically hazardous or are capable of posing health problems to you. Recognition of hazardous chemicals prior to work can reduce the risk of chemical accidents. Depending on exposure, chemicals can cause many serious health effects such as cancer, nervous system damage, lung damage, liver damage, kidney damage, and reproductive system effects.

Important Definitions

Personal Protective Equipment

The devices or clothing used by workers to protect against hazards in the environment are called personal protective equipment (PPE).

Example:
Some common examples of PPE are the items that follow.

- Respirators
- Gloves
- Chemical splash goggles

Toxicity

The term toxicity is used to describe the ability of a substance to cause a harmful effect. Almost everything is toxic at some dose or concentration.

Flashpoint

The factor that determines whether a liquid is flammable or not is its flashpoint.

The flashpoint is a minimum temperature at which a liquid produces enough vapor within a test vessel in adequate concentration to form a flammable mixture with air near the surface of the liquid.

Flammable Liquids

Flammable liquids are those that have a flashpoint below 100 °F (37.8 °C). Flammable materials require more care than combustible materials because they ignite at lower temperatures.

Combustible Liquids

Combustible liquids are those which have a flashpoint at or above 100 °F (37.8 °C).

Container

Container means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For the purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

Exposure or Exposed

Exposure (or exposed) means that an employee is subjected, as a condition of employment to a chemical that is a physical or health hazard, including potential (accidental or possible) exposure. "Subjected" in terms of health hazards includes any route of entry (such as inhalation, ingestion, skin contact, absorption, or injection.)

Hazard Warning

Hazard warning means any pictograms, words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which conveys the specific physical and health hazard(s), including target organ effects of the chemical(s) in the container(s).

Immediate Use

Immediate use means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

Any hazardous material decanted—transferred from a primary to a secondary container—should have the labeling information transferred to the secondary container also.

Organic Peroxide

Organic peroxide is any carbon-containing compound with two oxygen atoms joined together. Organic peroxides can be severe fire and explosion hazards.

Oxidizer

An oxidizer is a chemical other than a blasting or explosive agent that initiates or promotes combustion in other materials, thereby causing fire either by itself or through the release of oxygen or other gases.

Pyrophoric

Pyrophoric means a chemical will ignite spontaneously in air at a temperature of 130 °F (54.4 °C) or below.

Unstable (Reactive)

Unstable (reactive) means a chemical that in its pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shocks, pressure, or temperature.

Water-Reactive

Water-reactive means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

Lesson Summary

The simple idea behind the Hazard Communication Standard (HCS) is that workers have both a need and a right to know about the hazards and identities of the chemicals they are exposed to when performing their tasks and duties. This standard covers both physical and health hazards.

As a worker or an employer there is a need and a right to know how you can perform your job responsibilities safely. Hazard warning means any pictograms, words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which conveys the specific physical and health hazards of the chemicals contained.

Lesson 2: Labels, SDSs, Symbols, Hazards, and Training

Lesson Focus

This lesson focuses on the following topics:

- Labels
- Safety Data Sheet (SDS)
- Symbols
- Hazards
- Controlling Physical and Health Hazards
- Written Hazard Communication Program
- Training

Labels

Any written, printed, or graphic materials displayed on or affixed to containers of hazardous chemicals are called labels. Labels are considered the most immediate source of information about chemicals and their hazard potential. It is obligatory that all hazardous chemicals containers be labeled.

The following information must be included on all labels:

- Complete chemical name or names, no abbreviations; formula may be used as an option.
- A warning statement (symbol or message) conveying hazardous substances contained.
- The manufacturer's name, address, and contact information.
- Labels must appear on each container. Labels must be legible and must be written in English, although other languages can be used if required.

Note: Many manufacturers of chemicals include safe handling procedures on labels.

Colors on Labels

This is a label created by the Paint and Coatings Association. Its use is voluntary and is not part of OSHA's Haz Com Standard, but many manufacturers use it on containers used, or shipped, to help further identify hazards of the material in the container.

The following colors are used on this voluntary label to represent different types of hazards:

- **Blue** is used to indicate the degree of health hazards.
- **Red** indicates how flammable the chemical is.
- **Yellow** represents the reactivity characteristics of the material.
- The **white** field is used to display any other special symbols such as PPE or if the material is an oxidizing agent or is water reactive.

Safety Data Sheet (SDS)

Safety Data Sheet (SDS) provides detailed information about a specific hazardous material. Although labels are a good way to provide information about hazardous chemicals, sometimes you need more information about the chemical, but it may not be possible to provide all the information on a label.

SDS must be maintained in the facility for use by personnel while the material is in the facility, and must be retained for a period of at least 30 years.

SDS Presentation

The following information must be included in an SDS.

- Identification of the substance or mixture and of the supplier
- Hazard Identification
- Composition/Information on ingredients
- First aid measures
- Fire-fighting measures
- Accidental release measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties
- Stability and reactivity
- Toxicological information

The following information may also be included on a SDS, if desired:

- Ecological information
- Disposal information
- Transport information
- Regulatory information
- Other information

Note: It is the employer's responsibility to translate the information contained on the SDS, into any understandable format, and convey that information about the hazards associated with working with any of the hazardous materials in the facility, before an employee is ever exposed to the hazard.

SDS must always be immediately available to all affected employees for review; however, they can be stored electronically.

Click "PDF" for more information

Chemical Manufacturer and SDSs

It is obligatory that chemical manufacturers include all the hazard information on SDSs and distribute it to their customers/clients at the time of first shipment of the hazardous chemicals or materials.

Note: It is necessary that manufacturers or importers of hazardous chemicals must update an SDS within three months of discovering new and important information about chemical hazards.

Availability of SDSs

Every employer must train every affected employee in the information derived from the SDS for each hazardous material in the facility, before exposing the employee to the hazard. An employee should ideally only need to consult an SDS on an infrequent or emergency basis.

Note: Remember, it is the employer's responsibility to ensure that each employee who handles or uses any hazardous material knows where SDSs are located and how to read and understand them.

Symbols

OSHA created no symbols or specific color designation as part of the Haz Com Standard. However, OSHA does endorse the use of U.S. Dept. of Transportation's hazard class symbol and color system in any employer's training programs.

Whenever you are working with materials that have a DOT hazard class shipping label, you should be aware that this represents a specific hazard. Information regarding specific hazards denoted by DOT labels is contained on the material's SDS.

Explosive symbols (DOT hazard class labels) are used with those materials which release a great amount of energy in the form of light, expanding pressure, and heat within a short passage of time. Water reactive materials react with water and can explode. Furthermore, unstable reactive materials can react or become self-reactive subject to pressure, temperature, or shock.

Compressed gas cylinder symbols were created by the Compressed Gas Association and adopted by OSHA, and should appear on every cylinder of compressed hazardous gas.

Gases are used in various manufacturing processes. Because these gases are bottled under great pressure, misuse or unsafe handling could lead to an accident.

> **Note:** Do not expose flammable or combustible materials to fire, heat, sparks, flames or any other source of heat or ignition.

Hazards

There are frequently two types of hazards (physical and health) present in a workplace where hazardous chemicals or materials are present. Physical hazards are one of two major definitions of hazards covered by OSHA's Hazard Communication Standard. These hazards are responsible for hundreds of deaths and injuries each year in the United States. Accidents involving physical hazards are often the consequence of a lack of training or neglect, concerning the flammability of chemicals. Fire and explosion are common physical hazards.

Health Hazards

Hazardous chemicals can affect our health in different ways. Generally, two terms—acute and chronic—are used in order to understand the nature of the health hazards.

Determination of Health Hazards

Determining whether a hazard is affecting the health of a worker or not can be very difficult. Often, the signs and symptoms of acute or chronic health effects are the same as those possessed by a non-occupationally exposed person.

For example, lung cancer, kidney failures, and nervous system breakdowns are some common health problems that may occur in occupationally exposed persons but, of course, can also be found in non-occupationally exposed persons as well.

Acute effects indicate that symptoms have occurred rapidly as compared to chronic effects, which means symptoms have manifested themselves over a period of time. The former are of short duration and/or the result of short-term exposures.

> **Example:** If you accidentally spill a strong acid on your hand and the acid begins to burn your skin, this is an accident (an acute effect) as opposed to an illness effect.

Chronic Health Hazards

Chronic effects develop as a result of long-term exposures. Some manifestation examples of chronic effects are:

- Silicosis
- Some dermatitis (others may be from an acute exposure)
- Lung Cancer (from occupational exposure to carcinogens)

> **Note:** Asbestos is a good example of a chronic health hazard. Those people who are exposed to asbestos may take several years to develop serious lung diseases.

Health Hazard Symbols

The following symbols are used to identify various kinds of health hazards:

- The skull and crossbones symbol represents a poisonous material.
- The hand and test tubes symbols are used to identify corrosive materials.
- The radiating fan symbol is used to represent radioactive materials.

Routes of Exposure-Health Hazards

Health hazards can affect a body through four routes of entry:

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

> **Note:** Be sure you understand the information contained on labels and SDSs before working with hazardous chemicals.

Skin Absorption

Some chemicals enter into the body by absorption through the skin. Always use personal protective equipment or clothing in order to protect your body from skin contact with hazardous material. If you are exposed, the proper response should be initiated, based on the chemical involved and the nature of the exposure.

Inhalation

Inhalation is the most common route of entry into the body. It normally occurs when you inhale fumes, vapors, hazardous gasses, or dust. It is the employer's responsibility to be aware of such hazards in the workplace and to protect employees from inhalation hazards.

Ingestion

Do not eat or smoke immediately after handling any hazardous material. When working with hazardous materials, wear appropriate PPE, and then always wash your hands properly before eating, drinking, or smoking.

Basic First Aid

First aid should be provided only by individuals who are properly trained and provided with the proper protective equipment.

The employer must ensure prompt first aid treatment for injured employees, either by providing for the availability of a trained first aid provider at the worksite, or by ensuring that emergency treatment services are within reasonable proximity of the worksite. Adequate first aid must be available in the critical minutes between the occurrence of an injury and the availability of physician or hospital care for the injured employee.

While OSHA does not prescribe a number of minutes, they have long interpreted the term 'near proximity' to mean that emergency care must be available within no more than 3-4 minutes from the workplace. Medical literature establishes that, for serious injuries such as those involving stopped breathing, cardiac arrest, or uncontrolled bleeding, first aid treatment must be provided within the first few minutes to avoid permanent medical impairment or death. Accordingly, in workplaces where serious accidents such as those involving falls, suffocation, electrocution, or amputation are possible, emergency medical services must be available within 3-4 minutes, if there is no employee on the site who is trained to render first aid.

OSHA does exercise discretion in enforcing the first aid requirements in particular cases. For example, they recognize that in workplaces, such as offices, where the possibility of such serious work-related injuries is less likely, a longer response time of up to 15 minutes may be reasonable.

Blood-borne Pathogens

Bloodborne pathogens are pathogenic microorganisms that are found in human blood, tissue, and organs. These pathogens can cause various diseases including the Human Immunodeficiency Virus (HIV) and the Hepatitis B virus (HBV).

Employees must make sure that they never come in contact with any blood or body fluids without proper safeguards in place. If they have to handle any such fluids, they must wear all appropriate personal protective equipment, especially gloves and safety glasses.

Employees must handle and dispose of all sharps—such as needles and syringes—carefully in order to avoid suffering a puncture wound or laceration.

- Appropriate use of Personal Protective Equipment (PPE) is required by the Bloodborne Pathogens Standard (if exposure to blood and other potentially infectious materials is anticipated and where occupational exposure remains after institution of engineering and work practice controls).
- Wear appropriate gloves and other required PPE when hand contact with blood, mucous membranes, other potentially infectious materials (OPIM), or non-intact skin is anticipated, and when performing vascular access procedures, or when handling contaminated items or surfaces.
- Employer must ensure that employees wash hands and any other exposed skin with soap and water or flush mucous membranes with water as soon as feasible after contact with blood or OPIM.
- Employers must provide readily accessible hand washing facilities.
- Properly dispose of PPE. Protective clothing must be removed before leaving the work area, and placed in an appropriately designated area or container for storage, washing, decontamination, or disposal.

Temperature Stress

Extremely hot or cold temperatures at the work site can cause various disorders. Employees must make sure to take protective measures against heat and cold stresses.

Heat Stress

Heat stress is one of the most common occurrences in the workplace. It can cause various disorders, including heat exhaustion, heat cramps, and heat stroke. The symptoms of heat stress may include headaches, thirst, nausea, muscle cramps, dizziness, and weakness. Due to the severity of the consequences of heat stress, employers must

regularly monitor all potentially affected employees and their workplaces and take appropriate preventive measures.

Sunburns can be avoided by keeping the skin covered with sun blocking material. If an employee experiences heat cramps, she or he should first be taken to an air-conditioned or fanned area, provided water to drink, and monitored appropriately.

Heat exhaustion is caused by excessive exposure to heat and/or physical activity. Medical attention should immediately be sought for any employee suffering from heat exhaustion.

If left untreated, heat stroke can be fatal. Therefore, heat stroke should be considered a medical emergency. Until the paramedics arrive, the employee must be kept cool.

Cold Exposure

Frostbite and hypothermia are two disorders that can be caused by exposure to cold temperatures. If there is a risk of cold exposure, employees must always dress warmly and there should be limited exposure to the skin.

Cold temperatures that result in inadequate circulation of the blood to the extremities, such as the fingers and toes, may cause frostbite. Employees with frostbite must not move or rub the affected area, but must instead seek medical attention immediately and warm the affected areas slowly to avoid causing irreversible tissue damage.

Hypothermia is characterized by lowered body temperature. If an employee experiences hypothermia, he must immediately receive appropriate medical attention.

Controlling Physical and Health Hazards

There are a number of ways through which you can control physical and health hazards associated with chemicals in a workplace. The following measures can protect you from physical and health hazards.

- Safe Work Practices
- Product Substitution
- Engineering Controls
- Training and Communication
- Environmental Monitoring
- Personal Monitoring
- Personal Protective Equipment

Safe Work Practices

Safe work practices help assure that you are using chemicals safely and correctly.

Product Substitution

There are many chemicals that perform similar jobs. One of the many responsibilities an employer has is to attempt to find a chemical that is less toxic but able to accomplish the same job.

Engineering Controls

An orderly and well-designed workplace can minimize exposure to hazardous chemicals. Some engineering controls, like exhaust systems and wetting systems used to control dust, are good examples of hazard control.

Training and Communication

Training and communication play an essential role in every field of life. It is vital to know how to work safely with hazardous chemicals.

Environmental Monitoring

Environmental monitoring is a component in keeping an environment free from a buildup of hazardous chemicals that could lead to an unsafe working environment.

Personal Monitoring

Monitor yourself and coworkers for symptoms (such as dizziness, eye or throat irritation, skin rashes) that would indicate that you or your coworkers have been exposed to a hazardous material or chemical. If these or other symptoms appear, report them to your supervisor immediately.

Personal Protective Equipment

Always use gloves, aprons, masks, or other PPE whenever called for on a label or SDS.

Hazard Communication Program

It is required that all chemical manufacturers, importers, and distributors convey complete information about a chemical and its hazards in the form of labels and SDSs. It is also mandatory that employers conduct hazard communication training programs in order to provide complete information to their employees through SDSs, labels, and training sessions.

Note: Employers are responsible for informing and training their employees about the hazards that exist in their workplaces.

Written Hazard Communication Program

A written program must be established in all workplaces where employees are exposed to hazardous chemicals. It should include a list of all hazardous chemicals that are present in the workplace and indicate where employees can get copies of written information about safe chemical handling procedures.

A written program also indicates the person in the facility that is responsible for the various aspects of the program. The written program must also describe requirements and information about labels, SDSs, and employee training.

Note: Written programs may not be required in laboratories and those workplaces where employees are dealing with sealed containers.

Training

Training must be provided to all employees exposed to hazardous chemicals. It must include information on how to handle chemicals safely, how to read and understand labels, SDSs, and other warning information, and what PPE is required before handling or using the hazardous material. It is required, and critical, that employees be trained before working with materials that represent a hazard.

Note: Remember, it is not sufficient to just provide SDSs to read.

Lesson Summary

Labels are considered the most immediate source of information about chemicals and their hazard potential. It is obligatory that all hazardous chemical containers be labeled.

It is the employer's responsibility to translate the information contained on the SDS, into any understandable format, and convey that information about the hazards associated with working with any of the hazardous materials in the facility, before an employee is ever exposed to a hazard.

Lesson 3: Hazardous Materials

Lesson Focus

This lesson focuses on the following topics:

- Introduction
- Silica
- Asbestos
- MDA—Methylenedianiline
- Lead

Introduction

What are some of the health hazards in a construction site?

Degreasers: These solvents can cause many serious health effects, including lung cancer.

Chemically treated materials: For example, chemically treated wood particles, which one might breathe in.

Asbestos: Handling asbestos containing materials, like pipe insulation.

Silica: Rocks, bricks, and masonry products that when crushed, ground, cut, or drilled create silica dusts, which can cause silicosis, an irreversible scarring of the lungs.

> **Note:** Silica, or crystalline silica, is basically quartz; one of the minerals found in the earth's crust. Tridymite, and Cristobalite are other forms of silica.

Silica

Permissible Exposure Limit for Silica Dust

Employee exposure to silica dust (breathable quartz) must not exceed 50 micrograms per cubic meter of air averaged over an 8-hour work shift as of June 23, 2016.

Preventing exposure to silica dust can be achieved by using engineering and administrative controls, like wetting down soil at a construction site, having workers use respirators, monitoring dust level, and using drill systems and grinding tools that apply water to minimize the creation of dust at the point of generation.

More Information:

The Effects of Silica to Your Health

Silicosis can disable a person in many ways, making breathing difficult and painful. Silicosis may also cause death, or cause lung cancer. Symptoms associated with silicosis also include loss of appetite, fevers, and loss of body weight.

Silicosis Types

Silicosis can be classified in two degrees:

Acute Silicosis: Develops after a few months or as long as 2 years following exposures to extremely high concentrations of respirable crystalline silica.

Chronic Silicosis: Usually occurs when exposed at moderate to low concentrations of respirable crystalline silica for 15-20 years.

Note: ***Where can silica be found and what work tasks can expose you to silica dust?***

Silica can be found in construction materials (bricks, tile, concrete, sand, and masonry products), on demolition sites, and in such tasks as:

- Sand blasting, abrasive work that can create respirable crystalline silica
- Transportation or dumping of sand, crushed rock, and blocks
- Drilling operations
- Sanding, sawing, cutting, or grinding of masonry materials

Asbestos

Asbestos is the generic term for a group of naturally occurring, fibrous minerals with high tensile strength, flexibility, and resistance to heat, chemicals, and electricity.

In the construction industry, asbestos is found in installed products such as sprayed-on fireproofing, pipe insulation, floor tiles, cement pipe and sheet, roofing felts and shingles, ceiling tiles, fire-resistant drywall, drywall joint compounds, and acoustical products. Because very few asbestos-containing products are being installed today, most worker exposures occur during the removal of asbestos and during the renovation and maintenance of buildings and structures containing asbestos.

Exposure by inhaling loose asbestos fibers can cause disabling or fatal diseases such as gastrointestinal cancer, cancers of the lung or lung-cavity lining, and the severe lung

impairment asbestosis. The symptoms of these diseases often do not appear for 20 or more years after initial exposure.

Classification of Asbestos Work

Class I is the most potentially hazardous class of asbestos job and involves the removal of thermal system insulation and sprayed-on or troweled-on surfacing asbestos-containing materials.

Class II includes the removal of other types of asbestos-containing materials that are not thermal system insulation, such as resilient flooring and roofing materials containing asbestos.

Class III focuses on repair and maintenance operations where asbestos- containing or presumed asbestos-containing materials are disturbed.

Class IV pertains to custodial activities where employees clean up asbestos-containing waste and debris.

PEL—Permissible Exposure Limit

Employee exposure to asbestos must not exceed 0.1 fibers per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. Short-term exposure must also be limited to not more than 1 f/cc, averaged over 30 minutes. Rotation of employees to achieve compliance with either permissible exposure limit (PEL) is prohibited.

Asbestos and Smoking

Studies show that smokers who are exposed to asbestos have a greatly increased risk of lung cancer. Quitting smoking will reduce the risk of lung cancer. People who were exposed to asbestos on the job at any time during their life, or who suspect they may have been exposed, should not smoke. If they smoke, they should stop.

General Compliance Requirements

For any employee exposed to airborne concentrations of asbestos beyond the allowable limits, the employer must provide and ensure the use of protective clothing, such as coveralls or similar full-body clothing, head coverings, gloves, foot coverings, face shields, vented goggles, or other appropriate protective equipment wherever the possibility of eye irritation exists. The employer must also provide and ensure the use of respirators where necessary. The employer must provide medical examinations for workers who, for 30 or more days per year, engage in Class I, II, or III work or experience related to asbestos.

Recordkeeping

The employer must keep an accurate record of all measurements taken to monitor employee exposure to asbestos. This record must include: the date of measurement, operation involving exposure, sampling and analytical methods used, and evidence of their accuracy; number, duration, and results of samples taken; types of protective devices worn; name, social security number, and the results of all employee exposure measurements. This record must be kept for 30 years.

What Kinds of Building Materials May Contain Asbestos?

Exposure to asbestos dust can occur at major construction job sites, in shipyards, in industry, and during construction or renovation of buildings. Even workers' families and friends can be at risk, as asbestos can often be carried on clothing.

There are many products containing asbestos. The following list gives an idea of the widespread use of asbestos, even though more products than those listed here may contain asbestos.

More Information:

Product	Location Includes	Approximate Range of %	Primary Dates of
Roofing tiles	Roofs	20 – 30	1930 – present
Roofing shingles	Roofs	20 – 32	1930 – present
Sprayed coating	Ceilings, walls, and Steelwork	1 – 95	1935 – 1978
Troweled coating	Ceilings, walls	1 – 95	1936 – 1978
Asbestos—cement sheet	Fireplaces, boilers	20 – 50	1930 – present
Millboard, rollboard	Walls, commercial buildings	80 – 85	1925 – present
Asphalt—asbestos tile	Floor	26 – 30	1920 – 1980
Preformed pipe wrap	Pipes	50	1926 – 1975

Paper tape	Furnaces, steam valves, flanges, electrical wiring	80	1901 – 1980
Putty (mudding)	Plumbing joints	20 – 100	1900 – 1973
Gaskets/Packing	Pipe flanges, boiler doors, valves, pipes	10 – 80	1900 – 1989
Hot tops	Used with ingot molds in the steel pouring process	10 – 80	1960 – 1980

MDA—Methylenedianiline

Introduction

Mehyhlenedianiline (MDA) is a light-brown crystalline solid with a faint amino-like odor. It is slightly soluble in water and soluble in alcohol and benzene. It is used for making polyurethane foams, which have a variety of uses, such as insulating materials. It is also used for making coating materials, epoxy glues, dyes, and rubber.

Routes of exposure to MDA include skin absorption, inhalation, and ingestion. Short-term (acute) overexposure to MDA may produce symptoms such as fever, chills, loss of appetite, vomiting, and/or jaundice. Short-term contact with MDA may irritate the skin, eyes, and mucous membranes, and sensitization to MDA may also occur. Long-term (chronic) overexposure may cause cancer as well as damage to the liver, kidneys, blood, and spleen.

In the construction industry, MDA is used to coat exterior surfaces, such as concrete structures, pipes, and floors. These surfaces, located inside or outside of buildings, are often coated by spray application. The standard, however, covers both spray and roll-on applications.

Permissible Exposure Limit

Time-Weighted Average and Short-Term Exposure Limit

No employee may be exposed to MDA above the permissible exposure limit (PEL) of 10 parts per billion (ppb) as an 8-hour time-weighted average (TWA), or above a short-term exposure limit (STEL) of 100 ppb over a 15-minute sampling period.

Action Level

The action level for a concentration of airborne MDA is 5 ppb as an 8-hour TWA. When the action level is reached, an employer must begin compliance activities such as exposure monitoring, medical surveillance, or temporary removal. The employer shall repeat such monitoring for each such employee at least every six months.

Regulated Areas

Regulated areas must be established where airborne concentrations exceed or are expected to exceed the PEL, and where employees handle or use non-airborne MDA liquids or mixtures. These areas must be marked off from the rest of the workplace to minimize the number of persons potentially exposed.

No eating, drinking, smoking, chewing of tobacco or gum, or applying of cosmetics is permitted in regulated areas. Access to regulated areas must be limited to authorized persons only, and employees working in these areas must be required to wear appropriate personal protective equipment and protective clothing which will prevent or minimize exposure.

Decontamination Areas

Decontamination areas, located outside of, but as near as practical, to the regulated area must also be established for decontaminating workers, materials, and equipment contaminated with MDA. The decontamination area must include an equipment storage area, wash area, and clean change area.

Emergency Situations

The employer must develop a written plan for emergency situations for each construction operation. The employer must identify emergency escape routes at each specific construction site before construction operations begin. The plan must also make use of appropriate protective equipment and clothing for employees and a means to alert and evacuate employees in the case of an emergency.

Exposure Monitoring

Breathing-zone air samples that are representative of each employee's exposure to airborne MDA over an 8-hour period will determine employee exposure. Determination of employee exposure to the STEL must be made from breathing zone air samples collected over a 15-minute sampling period. The MDA standard requires that initial monitoring be performed for employees exposed to MDA unless objective or historical monitoring data prove that exposures are below the action level. MDA operations within a regulated area

need not be monitored periodically if all employees are wearing supplied-air respirators while working in that regulated area.

Medical Surveillance

A medical surveillance program is required under the supervision of a licensed physician, without cost, for those employees who are:

- Exposed at or above the action level for more than 30 days per year.
- Subject to 15 or more days of dermal exposure.
- Exposed in an emergency.
- Showing signs and symptoms of MDA exposure.

The employer must conduct exams at least annually or more often following the initial exam, emergency situations, or when the employee develops signs and symptoms associated with MDA exposure. The examining physician must provide in writing the results of these exams to the employer or employee.

The employer must provide the examining physician(s) with:

- A copy of the MDA standard and its appendices.
- A description of the affected employee's duties related to potential MDA exposure.
- The employer's current actual or representative MDA exposure level.
- A description of the protective equipment or clothing used.
- Information from previous employment-related medical exams.

An employer must temporarily remove an employee from work when occupational exposure to MDA is at or above the action level, or where dermal exposure to MDA may occur, in the following circumstances:

- Following an initial exam
- Following periodic exams
- Following an emergency situation
- When an employee has signs/symptoms indicative of acute MDA exposure
- When the examining physician determines that an employee's abnormal liver function tests are not associated with MDA exposure but may be exacerbated as a result of occupational exposure to MDA

An employee may return to her or his former job status when:

- The employee no longer shows signs or symptoms of MDA exposure.
- The physician so advises.

- A subsequent medical determination shows the employee no longer has a detected medical condition that poses an increased health risk from MDA exposure.

Control Methods

Respiratory Protection

Employers must provide (at no cost to the employee) and ensure the use of respirators when engineering and work practice controls are being installed; when engineering and work practice controls are not sufficient to reduce exposure to or below the PEL; when engineering controls are not feasible in repair or maintenance and spray application processes; and during emergencies. Keep in mind that engineering controls MUST BE USED to the fullest extent feasible.

Protective Clothing and Equipment

The employer must provide personal protective equipment and clothing, at no cost to the employee, and ensure the proper use of such equipment when the employee is subject to dermal exposure to MDA; where liquids containing MDA can be splashed into the eyes; or where airborne concentrations of MDA are in excess of the PEL.

Recommended protective clothing and equipment may include, but are not limited to, aprons, coveralls, gloves, foot coverings, face-shields, and/or goggles. It is the employer's responsibility to determine the appropriate PPE and ensure it is used. However, employees informed of the possibility of their exposure to MDA should take precautions including reading of the standard associated with it (see 29 CFR 1926.60).

Recordkeeping

MDA exposure is a rare occurrence in the construction industry.

The employer must keep an accurate record of all measurements taken to monitor employee MDA exposure for at least 30 years. This record must include:

- The date of measurement.
- The operation involving MDA exposure.
- The sampling and analytical methods used and evidence of their accuracy.
- The number, duration, and results of samples taken.
- The description of the type of respiratory protective devices used.
- The name, social security number, and exposure of the employees whose exposures are represented through the information.

Lead

Pure lead (Pb) is a heavy metal at room temperature and pressure. As a basic chemical element, lead can combine with various other substances to form numerous lead compounds. Lead has been poisoning workers for thousands of years. Lead can damage the central nervous system, cardiovascular system, reproductive system, hematological system, and kidneys. When absorbed into the body in high enough doses, lead can be toxic. In addition, a worker's lead exposure can harm the development of the worker's children.

Reproductive Risks

Lead is toxic to both male and female reproductive systems. Lead can alter the structure of sperm cells, and there is evidence of miscarriage and stillbirth in women exposed to lead or whose partners have been exposed. Children born to parents who were exposed to excessive lead levels are more likely to have birth defects, mental development issues, or behavioral disorders.

Worker Exposure

Lead is most commonly taken into the body by inhalation. When workers breathe in lead as a dust, fume, or mist, their lungs and upper respiratory tract deliver the lead into the body. They can also absorb lead through the digestive system if it enters the mouth and is ingested.

In construction, lead is used for roofs, cornices, paints, and tank linings. In plumbing, soft solder, used chiefly for soldering tinplate and copper pipe joints, is often an alloy of lead and tin.

Workers potentially at risk for lead exposure include those involved in iron work, demolition work, painting, lead-based paint abatement, plumbing, heating and air conditioning maintenance and repair, electrical work, carpentry, renovation, and remodeling work. Plumbers, welders, demolition workers, and painters are among those workers most often exposed to lead.

Among workers at the highest risk of lead exposure are those involved in:

- Abrasive blasting.
- Welding, cutting, and burning on steel structures.

Other operations with the potential to expose workers to lead include:

- Lead burning.

- Using lead-containing mortar.
- Power tool cleaning without dust collection systems.
- Rivet busting.
- Cleanup activities where dry expendable abrasives are used.
- Movement and removal of abrasive blasting enclosures.
- Manual dry scraping and sanding.
- Manual demolition of structures.
- Heat-gun applications.
- Power tool cleaning with dust collection systems.
- Spray painting with lead-based paint.

Symptoms of Chronic Overexposure

Some common symptoms of chronic overexposure include:

- Loss of appetite
- Constipation
- Nausea
- Excessive tiredness
- Headache
- Fine tremors
- Colic with severe abdominal pain
- Metallic taste in the mouth
- Weakness
- Nervous irritability
- Hyperactivity
- Muscle and joint pain or soreness
- Anxiety
- Pallor
- Insomnia
- Numbness
- Dizziness

Worker Protection

The most effective means of protecting workers is to minimize their exposure through engineering controls, good work practices and training, and use of personal protective clothing and equipment, including respirators, where required. The employer should, as needed, consult a qualified safety and health professional to develop and implement an effective worker protection program.

More Information:

1. Equip power tools used to remove lead-based paint with dust collection shrouds or other attachments.
2. For abrasive blasting operations, build a containment structure that is designed to optimize the flow of clean ventilation air past the workers' breathing zones.
3. Maintain the affected area under negative pressure to reduce the chances that lead dust will contaminate areas outside the enclosure.
4. Equip the containment structure with an adequately sized dust collector to control emissions of particulate matter into the environment.
5. Choose materials and chemicals that do not contain lead for construction projects.
6. Replace lead-based painted building components such as windows, doors, and trim with new components free of lead-containing paint.
7. When applying lead paints or other lead-containing coatings, use a brush or roller rather than a sprayer.
8. Use non-silica-containing abrasives, such as steel or iron shot/grit sand, instead of sand in abrasive blasting operations when practical.
9. Put all lead-containing debris and contaminated items accumulated for disposal into sealed, impermeable bags or other closed impermeable containers.

Employers are required to post these warning signs in each work area where employee exposure to lead is above the PEL:

- Warning
- Lead work area
- Poison
- No smoking or eating

All signs must be well lit and kept clean so that they are easily visible.

Protective Clothing and Equipment

Employers must provide workers who are exposed to lead above the PEL, or for whom the possibility of skin or eye irritation exists, with clean, dry protective work clothing and equipment that are appropriate for the hazard. Employers must provide these items at no cost to employees. Appropriate protective work clothing and equipment used on construction sites includes:

- Coveralls or other full-body work clothing.
- Gloves, hats, and shoes or disposable shoe coverlets.
- Vented goggles or face shields with protective spectacles or goggles.
- Welding or abrasive blasting helmets.

- Respirators.

The Permissible Exposure Limit (PEL) to lead is 50 micrograms of lead per cubic meter of air (50 µg/m3) averaged over an 8-hour period. Employers must provide workers who are exposed to lead above the PEL with clean, dry protective work clothing and equipment that are appropriate for the hazard.

Workers responsible for handling contaminated clothing, including those in laundry services or subcontractors, must be informed in writing of the potential health hazard of lead exposure. At no time shall lead be removed from protective clothing or equipment by brushing, shaking, or blowing. These actions disperse the lead into the work area.

Recordkeeping

The employer must maintain any employee exposure and medical records to document ongoing employee exposure, medical monitoring, and medical removal of workers. This data provides a baseline to evaluate properly the employee's health.

Lesson Summary

Lead most commonly enters the body by inhalation. When workers breathe in lead as dust, fume or mist, their lungs and upper respiratory tract delivers the lead into the body. They can also absorb lead through the digestive system if it enters the mouth and is ingested.

The employer should, as needed, consult a qualified safety and health professional to develop and implement an effective worker protection program. Workers potentially at risk for lead exposure include those involved in iron work, demolition work, painting, lead-based paint abatement, plumbing, etc. Plumbers, welders, and painters are among those workers most often exposed to lead.

Children born to parents who were exposed to excess lead levels are more likely to have birth defects, mental development delays, or behavioral disorders. The employer must keep an accurate record of all measurements taken to monitor employee Methylenedianiline (MDA) exposure for at least 30 years.

The employer must conduct exams at least annually or more often following the initial exam, emergency situations, or when the employee develops signs and symptoms associated with MDA exposure. The examining physician must provide in writing the results of these exams to the employer and employee.

When the action level is reached, an employer must begin compliance activities such as exposure monitoring, medical surveillance, or temporary removal. The employer will repeat such monitoring for each such employee at least every six months.

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