

ARSENIC AWARENESS TRAINING

Substance: Arsenic

CAS Registry Number: None

Synonyms: Arsenicals, Arsenic Black, Arsenic-75, Colloidal Arsenic, Gray Arsenic, Metallic Arsenic.

Description: Elemental arsenic is ordinarily a steel, gray metallic material with no smell or taste. It is an element that is common in the earth's crust. It can also enter the atmosphere during certain combustion activities such as coal burning. Arsenic can enter your body through ingestion or inhalation. Arsenic has long been recognized as a poison. In large doses, Arsenic is lethal, in smaller doses it can irritate the digestive track, affect the production of blood cells, cause fatigue, and other effects described in more detail below. When hydrogen comes into contact with Arsenic it reacts to form the toxic gas arsine. Arsenic is commonly used in industry to treat wood to make it resistant to rotting and decay. Arsenic has also been used as a pesticide. However, Arsenic is now illegal to use as a pesticide. Arsenic is used in metal alloys such as lead acid batteries. Also, Arsenic is used in semi-conductors and light-emitting diodes.

Arsenic occurs in two solid modifications: yellow Arsenic and gray or metallic Arsenic. Arsenic is non-flammable, very brittle and crystalline in form. It tarnishes in air and when heated, rapidly oxidizes to Arsenic oxide which has a garlic odor. Arsenic can cause death when ingested in doses greater than 60 ppm. It can also cause irritation to the stomach or intestines when ingested in smaller doses. Other effects include decreased production of red and white blood cells, fatigue, abnormal heart rhythm, blood-vessel damage, sore throat, irritated lungs, and impaired nerve function. These symptoms can cause fatigue and a pins and needles sensation in the hands and feet.

Chronic exposure to Arsenic can produce a change of color in the skin. This change manifests in darker skin and the appearance of warts on the palms, soles, and torso. This can ultimately develop into skin cancer. Inhaled Arsenic also increases the risk of lung cancer.

The regulatory agencies that regulate Arsenic are the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA). The National Institute of Occupational Science and Health (NIOSH) has also set a non-regulatory ceiling limit that should never be exceeded. NIOSH has designated Arsenic as carcinogenic. The EPA regulates Arsenic within its drinking water standards. Arsenic must never be discharged into the environment without a permit. OSHA regulates Arsenic under the General Industry Standard's Arsenic Standard, 1910.1018.

The Action Level for Arsenic is 5 micrograms per cubic meter of air ($5 \mu\text{g}/\text{M}^3$) 8-hour time weighted average (8-hour TWA). The OSHA Permissible Exposure Limit for Arsenic is 10 micrograms per cubic meter of air ($5 \mu\text{g}/\text{M}^3$) 8-hour time weighted average (8-hour TWA).

The key provisions of the Arsenic regulations include: A limit on work place exposure of 0.01 milligram Arsenic per cubic meter of air over an 8-hour time weighted average (0.01 mg/M³ 8-hour TWA).

A recommended Exposure Limit (REL) Ceiling (C) has been set by NIOSH at 0.002 milligrams per cubic meter of air (0.002 mg/M³). NIOSH recommends that this limit never be exceeded.

Where the exposure levels are exceeded, employers must:

1. Use engineering controls and work practices to reduce exposure. These controls and practices may be supplemented by respirators where necessary.
2. Establish and implement a written compliance program to achieve the limits..
3. Establish exposure monitoring and training programs for employees subjected to Arsenic exposure above the limits.
4. Identify as a regulated area any location where airborne concentrations of Arsenic are expected to exceed the limits.

Respiratory protection: Respirators shall be used to control exposure only in the following circumstances:

- While feasible engineering and work practice controls are being installed
- During maintenance, repair and other operations for which engineering controls are not feasible
- In work situations where there is a potential for exposure at or above the Permissible Exposure Limit (PEL)
- In emergencies

Action Level (5 µg/M³ 8-Hour TWA): If the eight-hour concentration of Arsenic is equal to or exceeds the action level, employers must begin periodic exposure monitoring and training.

Exposure Monitoring: If initial monitoring is below the action level, no additional monitoring is required. If the monitoring results are above the action level and below the permissible exposure limit, then monitoring must be repeated at least once every 6 months. If the monitoring results are above the permissible exposure limit, then monitoring must be repeated at least quarterly. Employees must be notified of all results within 5 working days of receiving the monitoring results.

Medical Surveillance: The standard requires a comprehensive medical surveillance program to be conducted by or under the supervision of a licensed physician. Employers must provide medical surveillance annually to employees who are exposed to Arsenic levels greater than the action level for over 30 days per year. Medical surveillance consists of a questionnaire, a chest x-ray, a nasal and a skin examination.

Regulated Areas: Employers must identify areas where exposure to Arsenic exceeds the PEL. These areas must be clearly marked and only authorized persons allowed to enter. Eating, drinking, and applying cosmetics is prohibited in regulated areas.

Communication of Arsenic Hazards to Employees: Establish regulated areas where exposure to Arsenic exceeds the 8-hr TWA, and clearly mark them to only allow authorized persons to enter. Provide the signs and labels specified by the standard clearly indicating Arsenic's carcinogenic hazards and the prohibition of eating or drinking in regulated areas. Train and orient workers at initial assignment and then annually if they are at risk, at or above the action level. Maintain a Material Safety Data Sheet that conforms to the provision of OSHA's hazard communication standard, 29 CFR 1910.1200(g).

Record Keeping: Exposure records and medical records must be retained for 40 years or the duration of the employment plus 20 years, whichever is longer. Workers, former employees, and their designated representatives may have access to the records upon request.

Applicability: This standard applies to all occupational exposures to inorganic Arsenic except for employee exposures in agriculture or resulting from pesticide application, the treatment of wood with preservatives or the utilization of Arsenically preserved foods. An employer who claims exemption from this standard must keep records that document this determination

To protect Arsenic workers against exposure, follow these safety precautions:

- Only trained workers are allowed in Arsenic work areas.
- Proper personal protective equipment should always be worn while in the work area.
- See a doctor if you are exposed to Arsenic.
- No food is allowed in the Arsenic work area.

Emergency procedures: In a medical emergency call 911, then 4111.

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult administer oxygen.

Skin Contact: Flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician

Eye Contact: Flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eye lids with fingers. Call a physician.

Ingestion Effects: Wash out mouth with water provided person is conscious. Call a physician immediately. Have victim drink a cup of water to reduce the concentration of Arsenic in the body. Obtain medical attention immediately.

Before working with any chemical review the Material Safety Data Sheet.

MSDS: MSDSs are available from EH&S at X4150, at the MSDS centers or on the web at <http://www.hazard.com>.