

Midland Engineering Co., Inc. Safety Management System			Doc No:	CADMIUM
			Initial Issue Date	12/08/15
			Revision Date:	Initial Version
Chapter 38-Cadmium			Revision No.	0
			Next Review Date:	12/08/16
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## PURPOSE

The Cadmium Program is essential to the safety of our employees. The purpose of Cadmium Program is to inform personnel of the dangers of Cadmium and their rights if exposed.

## SCOPE

This procedure applies to all operations involving Midland Engineering Co., Inc..

## REFERENCES

1910.1027 and 1926.1127

## INTRODUCTION

Cadmium (Cd) is a soft, malleable, bluish white metal found in zinc ores, and to a much lesser extent, in the cadmium mineral greenockite. Most of the cadmium produced today is obtained from zinc byproducts and recovered from spent nickel-cadmium batteries. Cadmium and its compounds are highly toxic and exposure to this metal is known to cause cancer and targets the body's cardiovascular, renal, gastrointestinal, neurological, reproductive, and respiratory systems. Worker exposure to cadmium can occur in all industry sectors but mostly in manufacturing and construction. Workers may be exposed during smelting and refining of metals, and manufacturing batteries, plastics, coatings, and solar panels

## DEFINITIONS

Action level (AL) is defined as an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air (2.5 ug/m<sup>3</sup>), calculated as an 8-hour time-weighted average (TWA).

Authorized person means any person authorized by the company and required by work duties to be present in regulated areas or any person authorized by the OSH Act or regulations issued under it to be in regulated areas.

Employee exposure and similar language referring to the air cadmium level to which an employee is exposed means the exposure to airborne cadmium that would occur if the employee were not using respiratory protective equipment.

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*Final medical determination* is the written medical opinion of the employee's health status by the examining physician under paragraphs (I)(3)-(12) or, if multiple physician review under paragraph (I)(13) or the alternative physician determination under paragraph (I)(14) is invoked, it is the final, written medical finding, recommendation or determination that emerges from that process.

*High-efficiency particulate air [HEPA] filter* means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

*Regulated area* means an area demarcated by the company where an employee's exposure to airborne concentrations of cadmium exceeds, or can reasonably be expected to exceed the permissible exposure limit (PEL).

#### **TRAINING, RECORDS, & COMPLIANCE**

All employees with the potential of being exposed to cadmium shall be trained, initially prior to assignment and annually thereafter, in this procedure. Additional training shall include Respiratory Protection Policy, Personal Protective Equipment Policy, and the Emergency Response Policy. All training shall be recorded and maintained at the corporate office. Additional training materials can be obtained from a Service District library and Safety Director. Every effort shall be made to protect employee/owner exposure to cadmium.

This policy is available for employee/owners or their representative to review or copy at the job site. The written compliance programs shall be reviewed and updated at least annually, or more often if necessary, to reflect significant changes in the company's compliance status. Written compliance programs shall be provided upon request for examination and copying to affected employees, designated employee representatives as well as to the Assistant Secretary, and the Director. Procedures shall be developed and implemented to minimize employee exposure to cadmium when maintenance of ventilation systems and changing of filters is being conducted.

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## Testing, Air Monitoring, Identifying, Maintenance, Ventilation, Protection Devices, and Communication

The client facility representative is solely responsible for:

- Testing
- Air monitoring
- Identifying
- Maintenance
- Upkeep of ventilation systems
- Protection devices
- Decontamination and personal hygiene facilities
- Communicating with Midland Engineering Co., Inc.. Supervision about the location of areas and surfaces, which pose potential exposure to cadmium.

## EXPOSURE

The Supervisor is responsible for communicating with the client facility representative and Midland Engineering Co., Inc. Safety Director concerns pertaining to identifying work areas and surfaces, which pose potential exposure to cadmium. The Supervisor is to ensure that the Employee Protection Program is implemented whenever cadmium levels are at 2.5 micrograms per cubic meter of air calculated as an 8-hour time weight average. If at any time an employee/owner is suspicious or aware of potential exposures that are not addressed, the employee/owner is to contact the Supervisor who will then coordinate with the client representative and the Midland Engineering Co., Inc. Safety Director in addressing the Employee-owners concerns.

Where the PEL is exceeded, Midland Engineering Co., Inc. shall implement this compliance program to reduce employee exposure to or below the PEL by means of engineering and work practice controls. To the extent that engineering and work practice controls cannot reduce exposures to or below the PEL, the company shall utilize the use of appropriate respiratory protection to achieve compliance with the PEL.

Once areas and surfaces of potential cadmium exposure have been identified, the Supervisor is to coordinate with the client facility representative and the Midland Engineering Co., Inc. Safety Director to ensure Employee-owners are adequately protected from harmful exposure. This protection may include engineering controls, Respiratory Protection, Policy, Personal Protective Equipment Policy, and additional training that may be needed for a safe completion of tasks.

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## PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment may include:

- A respirator appropriate for cadmium particles, including PAPR's.
- Suitable coveralls and gloves.
- Activities should be conducted in well-ventilated areas to which access has been restricted.
- Plastic ground covers should be utilized to the extent possible to contain contaminants and facilitate cleanup.
- Gloves, respirators, coveralls, and rags should be decontaminated or placed in double bags, sealed and held for proper disposal.
- The need for Personal Medical Monitoring should be evaluated and provided as required.

Personal Protective clothing exposed to cadmium should not be cleaned by:

- Air blasting
- Shaking
- Any method that could create air borne cadmium particulate.

Employee/owners are to be notified within five working days, in writing, if they have identified unacceptable blood levels.

## PERSONAL HYGIENE

All Employee-owners exposed to cadmium should wash their hands and faces before eating, drinking or smoking. No eating, drinking or tobacco products are allowed in the area where possible cadmium exposure may occur. Workers should shower and decontaminate before leaving work site. Vehicles should not be parked in contaminated areas. Employee-owners are to maintain an extremely high level of personal hygiene.

## EMERGENCY SITUATIONS.

Situations involving substantial releases of airborne cadmium require the implementation of the written emergency response plan. The plan shall include provisions for the use of appropriate respirators and personal protective equipment. In addition, employees not essential to correcting the emergency situation shall be restricted from the area and normal operations halted in that area until the emergency is abated.

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## MEDICAL SURVEILLANCE

Medical surveillance shall be provided for employees who are or may be exposed to cadmium at or above the action level.

Currently exposed - The company shall institute a medical surveillance program for all employees who are or may be exposed to cadmium at or above the action level unless the company demonstrates that the employee is not, and will not be, exposed at or above the action level on 30 or more days per year (twelve consecutive months); and,

Previously exposed - The company shall also institute a medical surveillance program for all employees who prior to the effective date of this section might previously have been exposed to cadmium at or above the action level by the company, unless the company demonstrates that the employee did not prior to the effective date of this section work for the company in jobs with exposure to cadmium for an aggregated total of more than 60 months.

The company shall assure that all medical examinations and procedures required by this standard are performed by or under the supervision of a licensed physician, who has read and is familiar with the health effects section of Appendix A, the regulatory text of this section, the protocol for sample handling and laboratory selection in Appendix F, and the questionnaire of Appendix D. These examinations and procedures shall be provided without cost to the employee and at a time and place that is reasonable and convenient to employees.

## HEALTH EFFECTS

The major health effects associated with cadmium overexposure are described below.

### *Kidney*

The most prevalent non-malignant disease observed among workers chronically exposed to cadmium is kidney dysfunction. Initially, such dysfunction is manifested as proteinuria. The proteinuria associated with cadmium exposure is most commonly characterized by excretion of low-molecular weight proteins (15,000 to 40,000 MW) accompanied by loss of electrolytes, uric acid, calcium, amino acids, and phosphate. After prolonged exposure to cadmium, glomerular proteinuria, glucosuria, aminoaciduria, phosphaturia, and hypercalciuria may develop. Severe cadmium-induced renal damage may eventually develop into chronic renal failure and uremia (Ex. 55).

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### *Biological Markers*

It is universally recognized that the best measures of cadmium exposures and its effects are measurements of cadmium in biological fluids, especially urine and blood. Of the two, CdU is conventionally used to determine body burden of cadmium in workers without kidney disease. CdB is conventionally used to monitor for recent exposure to cadmium. In addition, levels of CdU and CdB historically have been used to predict the percent of the population likely to develop kidney disease (Thun et al., Ex. L-140-50; WHO, Ex. 8-674; ACGIH, Exs. 8-667, 140-50).

### *Lung and Prostrate Cancer*

The primary sites for cadmium-associated cancer appear to be the lung and the prostate (L-140-50). Evidence for an association between cancer and cadmium exposure derives from both epidemiological studies and animal experiments. Mortality from prostate cancer associated with cadmium is slightly elevated in several industrial cohorts, but the number of cases is small and there is not clear dose-response relationship. More substantive evidence exists for lung cancer.

### *Non-carcinogenic Effects*

Acute pneumonitis occurs 10 to 24 hours after initial acute inhalation of high levels of cadmium fumes with symptoms such as fever and chest pain (Exs. 30, 8-86B). In extreme exposure cases pulmonary edema may develop and cause death several days after exposure. Reduced pulmonary function and chronic lung disease indicative of emphysema have been observed in workers who have had prolonged exposure to cadmium dust or fumes. Cadmium need not be respirable to constitute a hazard. Inspirable cadmium particles that are too large to be respirable but small enough to enter the tracheobronchial region of the lung can lead to bronchoconstriction, chronic pulmonary disease, and cancer of that portion of the lung. All of these diseases have been associated with occupational exposure to cadmium (Ex. 8-86B). Particles that are constrained by their size to the extra-thoracic regions of the respiratory system such as the nose and maxillary sinuses can be swallowed through mucociliary clearance and be absorbed into the body (ACGIH, Ex. 8-692). The impaction of these particles in the upper airways can lead to anosmia, or loss of sense of smell, which is an early indication of overexposure among workers exposed to heavy metals. This condition is commonly reported among cadmium-exposed workers (Ex. 8-86-B).