



**WAGNER-MEINERT LLC**  
*Engineers – Contractors*

## **CADMIUM EXPOSURE CONTROL PLAN (Section 27)**

### **PURPOSE:**

The purpose of this procedure is to ensure that the employees of Wagner-Meinert, LLC, sub-contractors, company property, and host company property are properly protected against all occupational exposures to cadmium and cadmium compounds, in all forms, in all construction work where an employee may potentially be exposed to cadmium. Construction work is defined as work involving construction, alteration and/or repair, including but not limited to the following:

- (A) Wrecking, demolition or salvage of structures where cadmium or materials containing cadmium are present.
- (B) Use of cadmium containing-paints and cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium-containing paints.
- (C) Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain cadmium, or materials containing cadmium.
- (D) Cadmium welding; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys.

### **SCOPE:**

The procedure covers any oxygen fuel gas and electric arc cutting and welding operation that could become a source of ignition in a hazardous area. The procedure applies to all employees and contractors working in the facility. If hot work includes hot tapping, the procedures and precautions are to be approved by the Project Manager and Safety Director.

## RELATED DOCUMENTS

**Appendix 6A      Hot Work Permit                      (Page 10-11)**  
**Confined Space Program**

### REFERENCE:

A) *Ventilation and protection in welding, cutting, and heating.* - 1926.353

B) *Cadmium - Toxic and Hazardous Substances* – 1926.1127

C) *Chromium (VI)* - 1910.1026

- 1.0 Reference 1910.1027 (f)(2)(ii)(A)**
- 2.0 Mechanical Ventilation**
- 3.0 Welding, Cutting, and Heating in Confined Spaces**
- 4.0 Welding, Cutting, or Heating of Metals of Toxic Significance**
- 5.0 Inert-Gas Metal-Arc Welding**
- 6.0 General Welding, Cutting, and Heating**
- 7.0 Permissible Exposure Limit (PEL)**
- 8.0 Training**
- 9.0 Emergency Situations**
- 10.0 Medical Surveillance**
- 11.0 Program Review and Updates**

#### **1.0 Reference 1910.1027 (f)(2)(ii)(A)**

##### Where cadmium is omitted

Welding processes on metals (See sections 2.0, 3.0, 4.0, 5.0, and 6.0)

##### Machinery Use

Welders

##### Materials Processed

Steel Pipe Welding

##### Controls in Place

Mechanical Ventilation and Engineering controls for special circumstances  
(See sections 2.0, 3.0, 4.0, 5.0, and 6.0)

##### Crew Size

Varies with size of job

### Employee Job Responsibilities

All personnel are required to follow safe work practices that they will be trained on.

### Engineering Plans

Mechanical Ventilation and Engineering controls for special circumstances (See sections 2.0, 3.0, 4.0, 5.0, and 6.0)

### A report of technology considered in meeting the PEL

A report of normal welding areas and monitoring of areas during welding procedures to determine if the TWA is being reached. Remonitoring if conditions change.

### Air monitoring data

Air monitoring data will be recorded to assure the concentration of cadmium in excess of five micrograms per cubic meter of air (5 ug/m<sup>3</sup>), calculated as an eight-hour time-weighted average exposure (TWA).

### Implementation

A detailed schedule of implementation will be recorded.

### A Work Practice Program

Safe work practice program is followed at all times by our personnel.

### A Written Plan for Emergency Situations

We have a written plan for emergency situations

## **2.0 Mechanical Ventilation**

- 2.1 Mechanical Ventilation shall consist of either general mechanical ventilation systems or local exhaust systems.
- 2.2 General mechanical ventilation shall be of sufficient capacity and so arranged as to produce the number of air changes necessary to maintain welding fumes and smoke within safe limits.

- 2.3 Local exhaust ventilation shall consist of freely movable hoods intended to be placed by the welder or burner as close as practicable to the work. This system shall be of sufficient capacity and so arranged as to remove fumes and smoke at the source and keep the concentration of them in the breathing zone within safe limits.
- 2.4 Contaminated air exhausted from a working space shall be discharged into the open air or otherwise clear of the source of intake air.
- 2.5 All air replacing that withdrawn shall be clean and respirable.
- 2.6 Oxygen shall not be used for ventilation purposes, comfort cooling, blowing dust from clothing, or for cleaning the work area.
- 2.7 Ventilation and filter systems will be checked prior to each use to assure that they are working properly. No work is to be done in an area that requires the ventilation.

### **3.0 Welding, Cutting, and Heating in Confined Spaces**

- 3.1 Except as provided in paragraph 3.2 of this section, and paragraph 3.3 of this section, either general mechanical or local exhaust ventilation meeting the requirements of paragraph 2.1 through 2.6 of this section shall be provided whenever welding, cutting, or heating is performed in a confined space.
- 3.2 When sufficient ventilation cannot be obtained without blocking the means of access, employees in the confined space shall be protected by air line respirators in accordance with the requirements of Section 5.0 of this part, and an employee on the outside of such a confined space shall be assigned to maintain communication with those working within it and to aid them in an emergency.
- 3.3 Lifelines." Where a welder must enter a confined space through a manhole or other small opening, means shall be provided for quickly removing him in case of emergency. When safety belts and lifelines are used for this purpose they shall be so attached to the welder's body that his body cannot be jammed in a small exit opening. An attendant with a pre-planned rescue procedure shall be stationed outside to observe the welder at all times and be capable of putting rescue operations into effect.

### **4.0 Welding, Cutting, or Heating of Metals of Toxic Significance**

- 4.1 Welding, cutting, or heating in any enclosed spaces involving the metals specified in this subparagraph shall be performed with either general mechanical or local exhaust ventilation meeting the requirements of section 2.0 of this section:
  - 4.1.1 Zinc-bearing base or filler metals or metals coated with zinc-bearing materials.

- 4.1.2 Lead base metals.
- 4.1.3 Cadmium-bearing filler materials.
- 4.1.4 Chromium-bearing metals or metals coated with chromium-bearing materials.
  
- 4.2 Welding, cutting, or heating in any enclosed spaces involving the metals specified in this subparagraph shall be performed with local exhaust ventilation in accordance with the requirements of paragraph (a) of this section, or employees shall be protected by air line respirators in accordance with the requirements of Section 6.0 of this part.
  - 4.2.1 Metals containing lead, other than as an impurity, or metals coated with lead-bearing materials.
  - 4.2.2 Cadmium-bearing or cadmium-coated base metals.
  - 4.2.3 Metals coated with mercury-bearing metals.
  - 4.2.4 Beryllium-containing base or filler metals. Because of its high toxicity, work involving beryllium shall be done with both local exhaust ventilation and air line respirators.
  
- 4.3 Employees performing such operations in the open air shall be protected by filter-type respirators in accordance with the requirements of Section 5.0 of this part, except that employees performing such operations on beryllium-containing base or filler metals shall be protected by air line respirators in accordance with the requirements of Section 6.0 of this part.
  
- 4.4 Other employees exposed to the same atmosphere as the welders or burners shall be protected in the same manner as the welder or burner.

## **5.0 Inert-Gas Metal-Arc Welding**

- 5.1 Since the inert-gas metal-arc welding process involves the production of ultra-violet radiation of intensities of 5 to 30 times that produced during shielded metal-arc welding, the decomposition of chlorinated solvents by ultraviolet rays, and the liberation of toxic fumes and gases, employees shall not be permitted to engage in, or be exposed to the process until the following special precautions have been taken
  - 5.1.1 The use of chlorinated solvents shall be kept at least 200 feet, unless shielded, from the exposed arc, and surfaces prepared with chlorinated solvents shall be thoroughly dry before welding is permitted on such surfaces.

- 5.1.2 Employees in the area not protected from the arc by screening shall be protected by filter lenses meeting the requirements of Subpart E of this part. When two or more welders are exposed to each other's arc, filter lens goggles of a suitable type, meeting the requirements of Subpart E of this part, shall be worn under welding helmets. Hand shields to protect the welder against flashes and radiant energy shall be used when either the helmet is lifted or the shield is removed.
- 5.1.3 Welders and other employees who are exposed to radiation shall be suitably protected so that the skin is covered completely to prevent burns and other damage by ultraviolet rays. Welding helmets and hand shields shall be free of leaks and openings, and free of highly reflective surfaces.
- 5.1.4 When inert-gas metal-arc welding is being performed on stainless steel, the requirements of paragraph (c)(2) of this section shall be met to protect against dangerous concentrations of nitrogen dioxide.

## **6.0 General Welding, Cutting, and Heating**

- 6.1 Welding, cutting, and heating, not involving conditions or materials described in section 3.0, 4.0, or 5.0 may normally be done without mechanical ventilation or respiratory protective equipment, but where, because of unusual physical or atmospheric conditions, an unsafe accumulation of contaminants exists, suitable mechanical ventilation or respiratory protective equipment shall be provided.
- 6.2 Employees performing any type of welding, cutting, or heating shall be protected by suitable eye protective equipment in accordance with the requirements of type of work being performed.

## **7.0 Permissible Exposure Limit (PEL)**

- 7.1 The employer shall assure that no employee is exposed to an airborne concentration of cadmium in excess of five micrograms per cubic meter of air (5 ug/m<sup>3</sup>), calculated as an eight-hour time-weighted average exposure (TWA).
- 7.2 If the TWA is reached then Wagner-Meinert, LLC will expand and implement this program to meet compliance for this standard.

## **8.0 Training**

- 8.1 The Safety Director is responsible for conducting Welding, Cutting, or Heating of Metals of Toxic Significance training for this company's workers.

All employees have access to written procedures at all times. All training will be documented.

- 8.2 The training will be based on general hazard categories including Mechanical Ventilation, Welding, Cutting, and Heating in Confined Spaces, Welding, Cutting, or Heating of Metals of Toxic Significance, Inert-Gas Metal-Arc Welding, General Welding, Cutting, and Heating, and Permissible Exposure Limit (PEL).
- 8.3 At the annual refresher session each worker will receive a sample material safety data sheet and a copy of the company's Welding, Cutting, or Heating of Metals of Toxic Significance program including the completed chemical information list. These items will be used as training materials.
- 8.4 Workers will view Welding, Cutting, or Heating of Metals of Toxic Significance worker training powerpoint presentation
  - 8.4.1 The requirements of OSHA's Welding, Cutting, or Heating of Metals of Toxic Significance Standard;
  - 8.4.2 The routes of entry of chemicals into the human body;
  - 8.4.3 The methods and observations that may be used to detect the presence or release of hazardous welding fumes in the workplace;
  - 8.4.4 The Welding, Cutting, or Heating of Metals of Toxic Significance hazards.
  - 8.4.5 The measures that workers can take to protect themselves from the hazards, such as work practices, emergency procedures and personal protective equipment (PPE).
- 8.5 Employees will participate in a lecture and be encouraged to engage in discussion on:
  - 8.5.1 The identity of the company's contact person for worker questions or concerns regarding hazardous chemicals on the job site;
  - 8.5.2 The location of the company's Welding, Cutting, or Heating of Metals of Toxic Significance program and material safety data sheets;
  - 8.5.3 The contents of the company's Welding, Cutting, or Heating of Metals of Toxic Significance program, including the chemical information list;
- 8.6 At the initial training session and at each subsequent training session, workers will be encouraged to ask questions and engage in discussion about Welding, Cutting, or Heating of Metals of Toxic Significance.

- 8.7 A Welding, Cutting, or Heating of Metals of Toxic Significance training session will be arranged for each new worker. Workers will receive the company's initial Welding, Cutting, or Heating of Metals of Toxic Significance training before they are permitted to start work where exposure to a hazard could occur.
- 8.8 Each time a new hazard is introduced into the workplace, all company workers will receive training on the identity of the new hazard, the hazards associated with them and how they can protect themselves from the hazards.
- 8.9 All training will be documented, Identity of employee trained, the signature of the person who conducted the training and date of the training. Records must be kept 1 year. The sign in sheet will be kept by the Safety Director for at least one year.

## **9.0 Emergency Situations**

- 9.1 If an emergency of a substantial releases of airborne cadmium
- (a) Employees not essential to correcting the emergency situation shall be restricted from the area.
  - (b) Only certified respirator and Personal Protective Equipment trained personnel may enter to abate the situation.

## **10.0 Medical Surveillance**

If currently exposed - The employer 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 employer 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)

If Previously exposed - The employer 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 employer, unless the employer demonstrates that the employee did not prior to the effective date of this section work for the employer in jobs with exposure to cadmium for an aggregated total of more than 60 months.

To determine an employee's fitness for using a respirator, the employer shall provide the limited medical examination specified in the Respiratory Protection Program.

The employer shall assure that the collecting and handling of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine

(B(2)-M) taken from employees under this section is done in a manner that assures their reliability and that analysis of biological samples of cadmium in urine (CdU), cadmium in blood (CdB), and beta-2 microglobulin in urine (B(2)-M) taken from employees under this section is performed in laboratories with demonstrated proficiency for that particular analyte.

"Initial examination."

The employer shall provide an initial (preplacement) examination to all employees covered by the medical surveillance program required in paragraph (l)(1)(i) of this section. The examination shall be provided to those employees within 30 days after initial assignment to a job with exposure to cadmium or no later than 90 days after the effective date of this section, whichever date is later.

The initial (preplacement) medical examination shall include:

A detailed medical and work history, with emphasis on: past, present, and anticipated future exposure to cadmium; any history of renal, cardiovascular, respiratory, hematopoietic, reproductive, and/or musculo-skeletal system dysfunction; current usage of medication with potential nephrotoxic side-effects; and smoking history and current status; and

Biological monitoring that includes the following tests:

Cadmium in urine (CdU), standardized to grams of creatinine (g/Cr);

Beta-2 microglobulin in urine (B(2)-M), standardized to grams of creatinine (g/Cr), with pH specified.

Cadmium in blood (CdB), standardized to liters of whole blood (lwb).

Recent Examination: An initial examination is not required to be provided if adequate records show that the employee has been examined within the past 12 months. In that case, such records shall be maintained as part of the employee's medical record and the prior exam shall be treated as if it were an initial examination.

"Actions triggered by initial biological monitoring:"

If the results of the initial biological monitoring tests show the employee's CdU level to be at or below 3 ug/g Cr, B(2)-M level to be at or below 300 ug/g Cr and CdB level to be at or below 5 ug/lwb, then:

For currently exposed employees, who are subject to medical surveillance., the employer shall provide the minimum level of periodic medical surveillance.; and

For previously exposed employees, who are subject to medical surveillance, the employer shall provide biological monitoring for CdU, B(2)-M, and CdB one year after the initial biological monitoring.

For all employees who are subject to medical surveillance if the results of the initial biological monitoring tests show the level of CdU to exceed 3 ug/g Cr, the level of B(2)-M to exceed 300 ug/g Cr, or the level of CdB to exceed 5 ug/lwb, the employer shall:

Within two weeks after receipt of biological monitoring results, reassess the employee's occupational exposure to cadmium as follows:

Reassess the employee's work practices and personal hygiene;

Reevaluate the employee's respirator use, if any, and the respirator program;

Review the hygiene facilities;

Reevaluate the maintenance and effectiveness of the relevant engineering controls;

Assess the employee's smoking history and status;

Within 30 days after the exposure reassessment, take reasonable steps to correct any deficiencies found in the reassessment that may be responsible for the employee's excess exposure to cadmium; and,

Within 90 days after receipt of biological monitoring results, provide a full medical examination to the employee.. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the employee. If the physician determines that medical removal is not necessary, then until the employee's CdU level falls to or below 3 ug/g Cr, B(2)-M level falls to or below 300 ug/g Cr and CdB level falls to or below 5 ug/lwb, the employer shall:

Provide biological monitoring on a semiannual basis; and

Provide annual medical examinations.

For all employees who are subject to medical surveillance, if the results of the initial biological monitoring tests show the level of CdU to be in excess of 15 ug/g Cr, or the level of CdB to be in excess of 15 ug/lwb, or the level of B(2)-M to be in excess of 1,500 ug/g Cr, Within 90 days after receipt of biological monitoring results, the employer shall provide a full medical examination to the employee. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the employee. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 15 ug/g Cr; or CdB exceeds 15 ug/lwb; or B(2)-M exceeds 1500 ug/g Cr, and in addition CdU exceeds 3 ug/g Cr or CdB exceeds 5 ug/liter of whole blood, then the physician shall medically remove the employee from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does

not show that a mandatory removal trigger level has been exceeded, then the employee is not required to be removed by the mandatory provisions of this paragraph. If the employee is not required to be removed by the mandatory provisions of this paragraph or by the physician's determination, then until the employee's CdU level falls to or below 3 ug/g Cr, B(2)-M level falls to or below 300 ug/g Cr and CdB level falls to or below 5 ug/lwb, the employer shall:

Periodically reassess the employee's occupational exposure to cadmium;

Provide biological monitoring on a quarterly basis; and

Provide semiannual medical examinations.

For all employees to whom medical surveillance is provided, beginning on January 1, 1999.

If the results of the initial biological monitoring tests show the employee's CdU level to be at or below 3 ug/g Cr, B(2)-M level to be at or below 300 ug/g Cr and CdB level to be at or below 5 ug/lwb, then for currently exposed employees, and for previously exposed employees, If the results of the initial biological monitoring tests show the level of CdU to exceed 3 ug/g Cr, the level of B(2)-M to exceed 300 ug/g Cr, or the level of CdB to exceed 5 ug/lwb,

If the results of the initial biological monitoring tests show the level of CdU to be in excess of 7 ug/g Cr, or the level of CdB to be in excess of 10 ug/lwb, or the level of B(2)-M to be in excess of 750 ug/g Cr, the employer shall: comply within 90 days after receipt of biological monitoring results, provide a full medical examination to the employee. After completing the medical examination, the examining physician shall determine in a written medical opinion whether to medically remove the employee. However, if the initial biological monitoring results and the biological monitoring results obtained during the medical examination both show that: CdU exceeds 7 ug/g Cr; or CdB exceeds 10 ug/lwb; or B(2)-M exceeds 750 ug/g Cr, and in addition CdU exceeds 3 ug/g Cr or CdB exceeds 5 ug/liter of whole blood, then the physician shall medically remove the employee from exposure to cadmium at or above the action level. If the second set of biological monitoring results obtained during the medical examination does not show that a mandatory removal trigger level has been exceeded, then the employee is not required to be removed by the mandatory provisions of this paragraph. If the employee is not required to be removed by the mandatory provisions of this paragraph or by the physician's determination, then until the employee's CdU level falls to or below 3 ug/g Cr, B(2)-M level falls to or below 300 ug/g Cr and CdB level falls to or below 5 ug/lwb, the employer shall: periodically reassess the employee's occupational exposure to cadmium; provide biological monitoring on a quarterly basis; and provide semiannual medical examinations.

"Periodic medical surveillance."

For each employee who is covered, the employer shall provide at least the minimum level of periodic medical surveillance, which consists of periodic medical examinations and periodic biological monitoring. A periodic medical examination shall be provided within one year after the initial examination and thereafter at least biannually. Biological sampling shall be provided at least annually, either as part of a periodic medical examination or separately as periodic biological monitoring.

The periodic medical examination shall include:

A detailed medical and work history, or update thereof, with emphasis on: past, present and anticipated future exposure to cadmium; smoking history and current status; reproductive history; current use of medications with potential nephrotoxic side-effects; any history of renal, cardiovascular, respiratory, hematopoietic, and/or musculo-skeletal system dysfunction; and as part of the medical and work history, for employees who wear respirators

A complete physical examination with emphasis on: blood pressure, the respiratory system, and the urinary system;

A 14 inch by 17 inch, or a reasonably standard sized posterior-anterior chest X-ray (after the initial X-ray, the frequency of chest X-rays is to be determined by the examining physician);

Pulmonary function tests, including forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV(1));

Biological monitoring, as required;

Blood analysis, in addition to the analysis required under paragraph (l)(2)(ii)(B), including blood urea nitrogen, complete blood count, and serum creatinine;

Urinalysis, , including the determination of albumin, glucose, and total and low molecular weight proteins;

For males over 40 years old, prostate palpation, or other at least as effective diagnostic test(s); and

Any additional tests deemed appropriate by the examining physician.

Periodic biological monitoring shall be provided.

If the results of periodic biological monitoring or the results of biological monitoring performed as part of the periodic medical examination show the level of the employee's CdU, B(2)-M, or CdB to be in excess levels beginning on January 1, 1999, in excess of the levels specified, the employer shall take the appropriate actions.

For previously exposed employees.:

If the employee's levels of CdU did not exceed 3 ug/g Cr and CdB did not exceed 5 ug/lwb, and B(2)-M did not exceed 300 ug/g Cr in the initial biological monitoring tests, and if the results of the followup biological monitoring one year after the initial examination confirm the previous results, the employer may discontinue all periodic medical surveillance for that employee.

If the initial biological monitoring results for CdU, CdB, or B(2)-M were in excess), but subsequent biological monitoring results required by (l)(3)(ii)-(iv) show that the employee's

CdU levels no longer exceed 3 ug/g Cr, CdB levels no longer exceed 5 ug/lwb, and B(2)-M levels no longer exceed 300 ug/g Cr, the employer shall provide biological monitoring for CdU, CdB, and B(2)-M one year after these most recent biological monitoring results. If the results of the followup biological monitoring, specified in this paragraph, confirm the previous results, the employer may discontinue all periodic medical surveillance for that employee.

However, if the results of the follow-up tests indicate that the level of the employee's CdU, B(2)-M, or CdB exceeds these same levels, the employer is required to provide annual medical examinations until the results of biological monitoring are consistently below these levels or the examining physician determines in a written medical opinion that further medical surveillance is not required to protect the employee's health.

1910.1027(l)(4)(vi)

A routine, biennial medical examination is not required to be provided in accordance with paragraphs (l)(3)(i) and (l)(4) if adequate medical records show that the employee has been examined in accordance with the requirements of paragraph (l)(4)(ii) within the past 12 months. In that case, such records shall be maintained by the employer as part of the employee's medical record, and the next routine, periodic medical examination shall be made available to the employee within two years of the previous examination.

1910.1027(l)(5)

"Actions triggered by medical examinations:"

1910.1027(l)(5)(i)

If the results of a medical examination carried out in accordance with this section indicate any laboratory or clinical finding consistent with cadmium toxicity that does not require employer action, within 30 days, shall reassess the employee's occupational exposure to cadmium and take the following corrective action until the physician determines they are no longer necessary:

Periodically reassess: the employee's work practices and personal hygiene; the employee's respirator use, if any; the employee's smoking history and status; the respiratory protection program; the hygiene facilities; and the maintenance and effectiveness of the relevant engineering controls;

Within 30 days after the reassessment, take all reasonable steps to correct the deficiencies found in the reassessment that may be responsible for the employee's excess exposure to cadmium;

Provide semiannual medical reexaminations to evaluate the abnormal clinical sign(s) of cadmium toxicity until the results are normal or the employee is medically removed; and

Where the results of tests for total proteins in urine are abnormal, provide a more detailed medical evaluation of the toxic effects of cadmium on the employee's renal system.

## **DOCUMENT MANAGEMENT:**

If after reading this program, you find that improvements can be made, please contact the Safety Director. We encourage all suggestions because we are committed to the success of our written Cadmium Exposure Control Plan. We strive for clear understanding, safe behavior, and involvement from every level of the company.

## **CHANGE CONTROL:**

- 11.0 All management system changes are reviewed annually, approved or disapproved by the Safety Committee.

This program was initially developed on June 28, 2006, replacing the former Cadmium Exposure Control Plan entirely.

Revision No. 1 (August 18, 2006)

Revision No. 2 (September 6, 2007)

Revision No. 3 (October 7, 2011)

## **PERSONNEL:**

The Owners of Wagner-Meinert, LLC have the ultimate responsibility for the Cadmium Exposure Control Plan. They have designated the Safety Director to manage the Cadmium Exposure Control Plan.