



SUMMARY OF THE OSHA CADMIUM STANDARD

Division of Epidemiology, Environmental & Occupational Health Services

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WHAT IS THE CADMIUM STANDARD?

The cadmium standard is an enforceable standard of the U.S. Dept of Labor, Occupational Safety and Health Administration (OSHA). It is designed to protect workers in the private sector who come into contact with cadmium or its compounds on the job. The standard limits exposure to cadmium much more than required in the past. It requires employers to make the following provisions for employee protection from cadmium: exposure monitoring, medical surveillance, recordkeeping, regulated areas, emergency procedures, hazard communication and personal protective equipment.

IS THE STANDARD IN EFFECT?

OSHA promulgated the final cadmium standard on 9/14/92. Many parts of the standard went into effect on 12/14/92; longer periods to comply are given for certain provisions. The cadmium pigment and iron and steel industries have some special exemptions due to their lawsuits against the standard. A listing of start dates is on page 13.

WHAT TYPES OF WORKPLACES ARE COVERED?

There are four types of private sector workplaces covered. The standards for them are numbered as follows:

- 1910.1027 general industry
- 1928.1027 agriculture
- 1915.1027 shipyards
- 1926.63 construction

The standard for general industry is identical to the standards for agriculture and shipyards. The standard for construction has some differences based on the fact that construction worksites differ from other establishments in many ways.

HOW DOES THIS DOCUMENT HELP IN UNDERSTANDING THE STANDARD?

This summary covers the major provisions of the standard and provides a good basic introduction to understanding it. **IT IS NOT A SUBSTITUTE FOR THE FULL STANDARD WHICH SHOULD ALSO BE CONSULTED.** Emphasis is on the standard for general industry; key provisions of the standard for construction are also summarized. The contents of this document are as follows:

- Narrative summary of the OSHA cadmium standard pages 1-8
- Information on cadmium available from NJDOH and OSHA page 9
- Other occupational health resources for employers page 10
- OSHA tables 1 and 2 on SECALS and respirators page 11
- OSHA Appendix A on biological monitoring page 12
- Start dates for the OSHA cadmium standard page 13
- Table of contents of the OSHA cadmium standard page 14
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HOW ARE EMPLOYEES EXPOSED?

Cadmium is a soft, blue-white, malleable, lustrous metal or grayish-white powder. Exposure can occur in the following industries and operations:

- **Refining, smelting, and recycling** of metal containing or coated with cadmium.
- **Metal finishing** using cadmium electroplating.
- **Manufacturer** of nickel-cadmium and silver-cadmium **batteries**.
- **Welding, burning, torch-cutting, grinding, or abrasive blasting** on surfaces either plated with cadmium or painted with cadmium-containing paints.
- Brazing or **silver soldering** with alloys containing cadmium.
- **Manufacturer** of decorated glass and china **with transfers** containing cadmium pigments.
- **Printing colored transfers** containing cadmium pigments.
- **Manufacture** of cadmium-containing **pigments** for coloring plastics, ceramic glazes, paints and enamels.
- **Manufacture** of plastics, paint, ceramics **using pigments** containing cadmium.
- **Using** cadmium-containing **paints, enamels and glazes**.
- **Manufacture and use** of cadmium heat and light **stabilizers** for plastics; cadmium **catalysts**; and cathode ray tube **phosphors** containing cadmium.
- **Characterization, remediation, transportation, disposal, or storage** of **hazardous waste** containing cadmium eg. incinerator fly ash.
- **Wrecking and demolition** where cadmium is present.
- **Maintaining or retrofitting** cadmium-coated equipment.
- **Recycling** telephone and electric **cable with plastic insulation** containing colored cadmium pigments.

WHAT ARE CADMIUM'S HEALTH EFFECTS?

Cadmium is most dangerous if it is breathed in and less so if it is swallowed. High exposure may cause nausea, salivation, vomiting, cramps and diarrhea followed by severe lung damage and death. This can be delayed for several hours. Repeated lower exposures can cause permanent kidney damage, emphysema, anemia and increased risk of cancer of the lung, kidney, and possibly prostate and testes.

WHAT ARE THE MAJOR REQUIREMENTS OF THE OSHA STANDARD?

Exposure Limits and Methods of Compliance

The standard limits airborne exposure to 5 micrograms per cubic meter of air (5 ug/m³ or 0.005 mg/m³) as a time weighted average, eight hour Permissible Exposure Limit (PEL). Engineering and work practice controls are the preferred method of reducing exposure and must be implemented even if not sufficient to reduce exposures below the PEL. Respirators are required where engineering and work practice controls are not feasible or are being implemented. Worker rotation to achieve compliance is prohibited.

Separate Engineering Control Airborne Limits (SECALs) are set for certain processes in six selected industries as shown in Table 1 of the OSHA standard reprinted on page 11. SECALs are either 15 or 50 ug/m³ for those processes where OSHA has determined that it is not feasible to reduce exposures to the PEL.

An *Action Level* (AL) of 2.5 ug/m³ is established as the level at and above which employers must initiate certain compliance activities, such as exposure monitoring and medical surveillance.

The employer's obligation to implement engineering and work practice controls to comply with the PEL or the SECAL is not triggered until an employee is exposed above the PEL for a total of 30 or more working days during a year. Where the exposure is for fewer than 30 working days and the exposure is only intermittent, the employer may use any mix of controls to achieve the PEL, including respirators.

Exposure Monitoring

Employers must perform initial employee exposure monitoring unless they can demonstrate by means of objective data that exposures are below the AL. If initial monitoring shows exposure over the AL the monitoring must be done periodically; at least every 6 months. If initial exposures are below the AL and are confirmed by repeat monitoring seven or more days later, then monitoring for those employees can be discontinued. If changes occur in the manufacturing process, raw materials, or work practices such that new employees and exposed or employee exposure is increased, then additional monitoring is required.

Appendix E of the standard details sampling strategies and methods to be used. Monitoring must be accurate and representative of the highest exposures in each job, work area, and shift. The affected employees or their union must be given the opportunity to observe the monitoring and the results being obtained. Employees must be notified within 15 days of the results and, if necessary, of corrective actions being taken.

Regulated Areas

Where the TWA-PEL is exceeded or can reasonably be expected to be exceeded, the employer shall establish regulated areas with limited access, posted at every entry point with signs reading:

**DANGER
CADMIUM
CANCER HAZARD
CAN CAUSE LUNG AND KIDNEY DISEASE
AUTHORIZED PERSONNEL ONLY
RESPIRATORS REQUIRED IN THIS AREA**

Food, beverages, tobacco, gum, and cosmetics are not permitted to be taken into or used in regulated areas.

Respirators

Respirators are required 1) in regulated areas, 2) where exposure is above the PEL, 3) where employees exposed above the AL request them, and 4) in emergencies. Where respirators are required, the employer shall have a complete respirator program, provide them at no cost to the employees and assure that they are properly fitted, used and maintained. Selection is based upon airborne cadmium levels. At 10x the PEL or less, a half mask, air-purifying respirator equipped with a HEPA filter is allowed. More protective respirators are required at higher exposures; selection advice is given in Table 2 of the OSHA standard reprinted on page 11. Respirators must be fit-tested annually and specific protection factors achieved. Appendix C of the standard contains respirator fit-testing procedures. Powered Air Purifying Respirators (PAPRs) must be made available to workers who choose to use this type of respirator, provided a PAPR will provide adequate protection.

Employees required to wear respirators must have limited *medical exams* prior to being assigned to an area where respiratory protection is required unless they have had a comparable exam within the preceding 12 months. Employees must be allowed to leave a regulated area to readjust face pieces, to change filters or to wash their faces to avoid skin irritation. Employees who experience difficulty breathing while wearing a respirator are entitled to a medical evaluation.

Protective Work Clothing and Equipment

The following must be provided at no cost to employees exposed above the PEL or if the possibility of skin or eye irritation exists:

- Coveralls or similar full-body work clothing,
- Gloves, head coverings, and boots or foot coverings,
- Face shields, vented goggles, or other appropriate eye and face protection.

These items must be provided clean and dry at least weekly. The employer must clean, launder, repair and replace as needed. Dirty equipment must be stored, transported, and cleaned in designated ways to prevent cadmium exposure. Shaking or blowing off equipment must be prohibited.

Hygiene Facilities and Lunchroom

The employer must provide clean change rooms with separate storage facilities for street clothing and protective work clothing and equipment for employees exposed above the PEL. These employees must shower during the end of the work shift and must not be able to take home any cadmium contaminated clothing or equipment.

The employer must provide handwashing facilities and assure that employees exposed above the PEL wash their hands and faces prior to eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics.

The employer must provide a clean lunchroom for employees exposed above the PEL and have them remove protective clothing or clean surface cadmium from their clothing by HEPA-filtered vacuuming before entering. Tables for eating must be maintained free of cadmium and exposures in the lunchroom must be below the AL.

Housekeeping

All surfaces must be maintained as free as practicable of accumulations of cadmium, preferably by using HEPA-filtered vacuum equipment. Shoveling, dry or wet sweeping, and brushing may only be used where vacuuming or other method that minimize the likelihood of cadmium becoming airborne have been tried and found not effective. Compressed air may not be used for cleaning unless it is used with ventilation to capture the dust created.

All cadmium spills must be cleaned up as soon as possible.

Employee Information and Training

Employers must include cadmium in their hazard communication program which includes but is not limited to assuring the presence of labels on and Material Safety Data Sheets for products containing cadmium. Labels shall include at least the following:

**DANGER
CONTAINS CADMIUM
CANCER HAZARD
AVOID CREATING DUST
CAN CAUSE LUNG AND KIDNEY DISEASE**

Employee training must be understandable and provided at the time of initial assignment and at least annually thereafter. The following topics must be covered:

- Health hazards of cadmium,
- Sources of cadmium exposure in the specific workplace,
- Controls in place in the specific workplace,
- Measures employees can take to protect themselves,
- Purpose and description of medical tests and examinations,
- Employee rights to see and copy their medical records and exposure records.

Written Compliance Program

The employer is required to develop a written compliance program to show how exposure to cadmium above the PEL will be controlled. Elements are to include a description of the relevant aspects of each operation in which cadmium is emitted; a report of the technology considered in meeting the cadmium exposure limit; a description of the specific methods that will be used to achieve compliance, including the underlying documents justifying the choice of methods; air monitoring data characterizing cadmium emission sources; a detailed implementation schedule, with progress documented by appropriate underlying documents; a work practice program; and a written plan for emergency situations. The written compliance program must be reviewed and updated at least annually to reflect significant changes in the employer's compliance status. The plan must be provided upon request for examination and copying to affected employees and union representatives.

Emergency Plan

The employer is required to develop and implement a written plan for dealing with emergency situations involving substantial releases of airborne cadmium.

Medical Examinations

The employer must provide medical examinations initially, periodically (semiannually to biennially), after acute exposure due to an emergency, and at termination of employment to employees who are or may be exposed to cadmium above the action level 30 or more days per year. Employees previously exposed must also be included unless the employer can show that exposure was not for a total of more than 60 months. The medical surveillance provisions are aimed at accomplishing three main interrelated purposes: First, identifying employees at higher risk of adverse health effects from excess, chronic exposure to cadmium; second, preventing cadmium-induced disease; and third, detecting and minimizing existing cadmium-induced disease. The core of medical surveillance in this standard is the quarterly to annual monitoring of the employee's biological indicators of: (a) recent exposure to cadmium with a cadmium blood test; (b) cadmium body burden with a cadmium urine test; and (c) kidney damage potentially associated with exposure to cadmium with a beta-2-microglobulin test. Actions triggered by elevated test results are summarized in Appendix A, Attachment 1 reprinted on page 12, including the frequency of biological monitoring and physical exams.

In order to assure that biological monitoring results are accurate and reliable, OSHA requires that the employer make sure that collection and handling of biological samples is done in a manner that assures reliability and that analyses are performed in proficient laboratories. OSHA has developed a non-mandatory protocol to guide employers and laboratories in these matters-see Appendix F of the standard.

All of what follows are requirements of this section:

Physician Qualifications

- Licensed,
- Familiar with OSHA standard and Appendices,
- Familiar with employees duties, exposures, personal protective equipment, previous medical results.

Lab Qualifications

- Demonstrated proficiency. Acceptable performance in the Quebec Toxicology Center Interlaboratory Comparison Program is desirable.

Physician's Written Medical Opinion

- Diagnoses related to cadmium,
- Opinion of risk from further cadmium exposure,
- Biological monitoring results,
- Recommendations on duties, use of personal protective equipment, medical removal,
- Statement that employee has been informed of results, recommendations,

- Specific findings and diagnoses unrelated to cadmium must not be revealed.
- Must be obtained by employer promptly and provided to employee within two weeks.

Multiple Physician Review

- Employee may choose a second physician to:
- Review 1st physician's findings, determinations, recommendations,
- Conduct additional exam and tests as necessary,
- First two physicians must resolve differences or 3rd physician must.

Informing Employee

- Copy of written medical opinion,
- Copy of biological monitoring results and explanation sheet,
- Upon request, copy of information on duties, exposures, personal protective equipment, etc. provided to the physician.

Medical Examination Content

Initial

- Medical and work history,
- Current medications that could damage the kidney
- Smoking history
- Biological monitoring,
 - cadmium in urine (CdU), cadmium in blood (CdB),
 - beta-2-microglobulin in urine (B₂-M).

Periodic, Emergency or Termination

- As in initial, plus:
- Physical exam emphasis on blood pressure, lungs and urinary system,
 - Prostate palpation (males over 40),
- Chest x-ray,
- Pulmonary function tests,
- Additional biological monitoring,
 - Blood urea nitrogen, complete blood count, serum creatinine
 - Urine albumin, glucose, proteins.

Respirator Usage

- Medical and work history,
- Blood pressure,
- Questions 3-11 and 25-32 in Appendix D
- Biological monitoring,
 - CdU, CdB, B₂-M,
- Any other tests the physician deems appropriate.

Medical Removal

An employee must be temporarily removed from work and placed in a job with cadmium exposure below the AL (or below the PEL if the reason for removal is inability to wear a respirator) whenever a physician determines in a written opinion that the employee should be removed from cadmium exposure due to any medically sufficient reason,

including:

- Abnormal biological monitoring results.
- Abnormal examination results.
- Signs or symptoms of cadmium - related dysfunction.
- Inability to wear a respirator.

The employer must maintain the employee's wages, benefits and seniority during up to 18 months with each medical removal. The employee must continue to receive medical surveillance. The employee may be returned when the physician certifies that continued medical removal is no longer necessary.

Recordkeeping

The employer must maintain accurate and complete records pertaining to the following. Records must be kept for the indicated period of time:

- Exposure monitoring, at least 30 years;
- Documentation for exemption from initial monitoring, at least 30 years;
- Medical Surveillance, duration of employment plus 30 years;
- Training, one year beyond date of training.

SPECIAL PROVISIONS FOR CONSTRUCTION

Competent Person

A person must be designated by the employer who is capable of identifying existing and potential cadmium hazards in the workplace and the proper methods to control them in order to protect workers and who has the authority to take needed corrective action.

Prohibitions Against Use of Equipment

High-speed abrasive disc saws and similar abrasive power equipment shall not be used for work on cadmium or cadmium-containing materials unless they are equipped with appropriate engineering controls to minimize emissions, if the exposure levels are above the PEL. Materials containing cadmium shall not be applied by spray methods, if exposures are above the PEL, unless employees are protected with certain specified respirators, and measures are taken to limit overspray and prevent contamination of adjacent areas.

Medical Surveillance

Medical surveillance programs are automatically required for all employees who, for 30 days or more per year, work in specific jobs. These jobs include: electrical grounding with cadwelding; cutting, brazing, burning, grinding or welding on surfaces that were painted with cadmium-containing paints; electrical work using cadmium-coated conduit; using cadmium containing paints; cutting and welding cadmium-plated steel; brazing or welding with cadmium alloys; fusing of reinforcing steel by cadmium welding; maintaining or retrofitting cadmium-coated equipment; and wrecking and demolition where cadmium is present. Medical surveillance is also required for employees previously performing these jobs unless the employer can show that they were not performed for a total of more than 12 months.

INFORMATION ON CADMIUM

AVAILABLE FROM THE NEW JERSEY DEPARTMENT OF HEALTH
609-984-1863

- Booklet:** *Case Studies in Environmental Medicine, Cadmium Toxicity*
CP05 Summarizes information on exposure sources, biologic fate, physiologic effects, clinical evaluation and treatment, and management of cadmium toxicity. The discussion of biologic indicators on pages 12 and 13 is particularly useful. Continuing education credit is available to physicians who use this monograph and complete the post test.
- Brochures:** *What Physicians Need To Know About Occupational Cadmium*
CP02 *Exposure* Summarizes the medical surveillance requirements of the OSHA Cadmium Standard and lists contacts for further information.
- CP01 *Your Cadmium Level* Patient education on cadmium exposure in the workplace. Physicians will be provided with bulk copies for distribution upon request.
- Publication:** *Summary of the OSHA Cadmium Standard* Gives further details
CP06 about all the requirements of the OSHA standard, including medical surveillance.
- List:** *Laboratories proficient in the "OSHA Cadmium Proficiency Testing*
CP07 *Program"* Laboratories vary considerably in their proficiency in analyzing cadmium biological monitoring samples. This is a list of laboratories which participate successfully in the OSHA Cadmium Proficiency Testing Program. This proficiency program is sponsored by the Quebec Toxicology Center and is the only one available on the North American continent. The NJDOH recommends that only labs on this list be used for the analysis of cadmium biological monitoring tests.

AVAILABLE FROM OSHA

- Software:** *GOCAD Cadmium Biological Monitoring Advisor Expert System*
A tool to provide timely, accurate, and consistent interpretations of the biological monitoring requirements of the OSHA cadmium standard. Available from OSHA by contacting Caroline Freeman or Julie Pesak at 202-219-7111.
- Booklet:** *Occupational Exposure to Cadmium* Summarizes the OSHA cadmium standard and sources of assistance from OSHA. Publication 3136. OSHA publications office at 202-219-4667 or NJDOH at 609-984-1863.
- Standard:** *OSHA Cadmium Standard* Complete text of the standard. Federal Register of 9/14/92. OSHA publications office at 202-219-4667 or NJDOH at 609-984-1863.

OTHER OCCUPATIONAL HEALTH RESOURCES FOR EMPLOYERS

Technical Information on Cadmium: The Cadmium Council, Inc., 703-709-1400.

Telephone Consultation: New Jersey Department of Health, Occupational Health Service, 609-984-1863.

Information: Toll-free number to request information on occupational health issues. NIOSH, 1-800-35-NIOSH.

Publications: To request OSHA publications: 202-219-4667, fax 202-219-9266.
To request NIOSH publications: 513-533-8287.

Interpretations of OSHA Standards: OSHA, Marlton, 609-757-5181; Avenel, 908-750-3270; Parsippany, 201-263-1003; Hasbrouck Heights, 201-288-1700.

Handbook: OSHA Handbook for Small Business. \$4.00 from the Government Printing Office, 202-783-3238, publication 029-016-001-441.

Training: New York/New Jersey Educational Resource Center, EOHSI Centers for Education and Training, 908-235-5062, fax 908-235-5133.

Information/Publications: Resource Center of EOHSI, 908-932-0110, fax 908-932-0122.

Industrial Pollution Prevention: Find safer substitutes for hazardous chemicals and processes. NJ Institute of Technology, 201-596-5864, fax 201-596-6367.

Onsite Consultation: Free onsite consultation to assist employers in recognizing and correcting violations of OSHA standards. New Jersey Dept. of Labor, 609-984-3507. Health Hazard Evaluation Program, NIOSH, 513-841-4428.

TABLE 1. - SEPARATE ENGINEERING CONTROL AIRBORNE LIMITS (SECALs) FOR PROCESSES IN SELECTED INDUSTRIES

Industry	Process	SECAL ($\mu\text{g}/\text{m}^3$)
Nickel cadmium battery	Plate making, plate preparation	50
	All other processes	15
Zinc/Cadmium refining*	Cadmium refining, casting, melting, oxide production, sinter plant	50
Pigment manufacture	Calcine, crushing, milling, blending	50
	All other processes	15
Stabilizers*	Cadmium oxide charging, crushing, drying, blending	50
Lead smelting*	Sinter plant, blast furnace, baghouse, yard area	50
Plating*	Mechanical plating	15

*Processes in these industries that are not specified in this table must achieve the PEL using engineering controls and work practices as required in I(1)(i)

TABLE 2. - RESPIRATORY PROTECTION FOR CADMIUM

Airborne concentration or condition of use ^a	Required respirator type ^b
10 x or less	A half mask, air purifying respirator equipped with a HEPA ^c filter. ^d
25 x or less	A powered air-purifying respirator ("PAPR") with a loose-fitting hood or helmet equipped with a HEPA filter, or a supplied-air respirator with a loose-fitting hood or helmet facepiece operated in the continuous flow mode.
50 x or less	A full facepiece air-purifying respirator equipped with a HEPA filter, or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied air respirator with a tight-fitting half mask operated in the continuous flow mode.
250 x or less	A powered air-purifying respirator with a tight-fitting full facepiece equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting full facepiece operated in the continuous flow mode.
1000 x or less	A supplied-air respirator with half mask or full facepiece operated in the pressure demand or other positive pressure mode.
>1000 x or unknown concentrations	A self-contained breathing apparatus with unknown concentrations a full facepiece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full facepiece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode.
Fire fighting	A self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

^a Concentrations expressed as multiple of the PEL.

^b Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL ($10 \times 5 \mu\text{g}/\text{m}^3 = 50 \mu\text{g}/\text{m}^3$). A full facepiece respirator is required when eye irritation is experienced.

^c HEPA means High Efficiency Particulate Absolute.

^d Fit testing, qualitative or quantitative, is required.

SOURCE: *Respiratory Decision Logic*, NIOSH, 1987.

APPENDIX A

Attachment 1-Appendix A Summary Chart and Tables A and B of Actions Triggered by Biological Monitoring

Appendix A Summary Chart: Section (1)(3) Medical Surveillance

Categorizing Biological Monitoring Results

(A) Biological monitoring results categories are set forth in Appendix A Table A for the periods ending December 31, 1998 and for the period beginning January 1, 1999.

(B) The results of the biological monitoring for the initial medical exam and the subsequent exams shall determine an employee's biological monitoring result category.

Actions Triggered by Biological Monitoring

(A) (i) The actions triggered by biological monitoring for an employee are set forth in Appendix A Table B.

(ii) The biological monitoring results for each employee under section (1)(3) shall determine the actions required for that employee. That is, for any employee in biological monitoring category C, the employer will perform all of the actions for which there is an X in column C of Appendix A Table B.

(iii) An employee is assigned the alphabetical category ("A" being the lowest) depending upon the test results of the three biological markers.

(iv) An employee is assigned category A if monitoring results for all three biological markers fall at or below the levels indicated in the table listed for category A.

(v) An employee is assigned category B if any monitoring result for any of the three biological markers fall within the range of levels indicated in the table listed for category B, providing no result exceeds the levels listed for category B.

(vi) An employee is assigned category C if any monitoring result for any of the three biological markers are above the levels listed for Category C.

(B) The user of Appendix A Tables A and B should know that these tables are provided only to facilitate understanding of the relevant provisions of paragraph (1)(3) of this section. Appendix A Tables A and B are not meant to add to or subtract from the requirements of those provisions.

Appendix A Table A

Categorization of Biological Monitoring Results

APPLICABLE THROUGH 1998 ONLY

Biological marker	Monitoring result categories		
	A	B	C
Cadmium in urine (CdU) (µg/g creatinine)	≤3	>3 and ≤15	>15
β ₂ -microglobulin (β ₂ -M) (µg/g creatinine)	≤300	>300 and ≤1500	>1500*
Cadmium in blood (CdB) (µg/liter whole blood)	≤5	>5 and ≤15	>15

* If an employee's β₂-M levels are above 1,500 µg/g creatinine, in order for mandatory medical removal to be required (See Appendix A Table B), either the employee's CdU level must also be >3 µg/g creatinine or CdB level must also be >5 µg/liter whole blood.

APPLICABLE BEGINNING JANUARY 1, 1999

Biological marker	Monitoring result categories		
	A	B	C
Cadmium in urine (CdU) (µg/g creatinine)	≤3	>3 and ≤7	>7
β ₂ -microglobulin (β ₂ -M) (µg/g creatinine)	≤300	>300 and ≤750	>750*
Cadmium in blood (CdB) (µg/liter whole blood)	≤5	>5 and ≤10	>10

* If an employee's β₂-M levels are above 750 µg/g creatinine, in order for mandatory medical removal to be required (See Appendix A Table B), either the employee's CdU level must also be >3 µg/g creatinine or CdB level must also be >5 µg/liter whole blood.

Appendix A Table B-Actions Determined by Biological Monitoring

This table presents the actions required based on

the monitoring result in Appendix A Table A. Each item is a separate requirement in citing non-compliance. For example, a medical examination within 90 days for an employee in category B is

separate from the requirement to administer a periodic medical examination for category B employees on an annual basis.

Require actions	Monitoring result categories		
	A ¹	B ¹	C ¹
(1) Biological monitoring:			
(a) Annual	x		
(b) Semiannual		x	
(c) Quarterly			x
(2) Medical examination:			
(a) Biennial	x		
(b) Annual		x	
(c) Semiannual			x
(d) Within 90 days		x	x
(3) Assess within two weeks:			
(a) Excess cadmium exposure		x	x
(b) Work practices		x	x
(c) Personal hygiene		x	x
(d) Respirator usage		x	x
(e) Smoking history		x	x
(f) Hygiene facilities		x	x
(g) Engineering controls		x	x
(h) Correct within 30 days		x	x
(i) Periodically assess exposure		x	x
(4) Discretionary medical removal			x
(5) Mandatory medical removal		x	x
			x ²

¹ For all employees covered by medical surveillance exclusively because of exposures prior to the effective date of this standard, if they are in Category A, the employer shall follow the requirements of paragraphs (1)(3)(i)(B) and (1)(4)(v)(A). If they are in Category B or C, the employer shall follow the requirements of paragraphs (1)(4)(v)(B)-(C).

² See footnote Appendix A Table A.

**START DATES
OSHA CADMIUM STANDARDS
9/14/92 FEDERAL REGISTER**

The overall start date for the cadmium standards is **December 14, 1992**. Although compliance must be achieved as soon as possible, longer periods are allowed to comply with certain provisions. Small businesses with 19 or fewer employees have been given additional time to comply. The number of days to comply are given below with the number of days for small business given second, where applicable. Approximate start dates are also shown underneath the number of days. The listing is in order according to when the provisions go into effect.

	General Industry* Agriculture** Shipyards***		Construction****	
	<i>Small Business</i>		<i>Small Business</i>	
Permissible Exposure Limit			90d 03/14/93	150d 05/14/93
Handwashing Facilities	60d 02/14/93		60d 02/14/93	120d 04/14/93
Exposure Monitoring	60d 02/14/93	120d 04/14/93	60d 02/14/93	120d 04/14/93
Regulated Areas	90d 03/14/93	150d 05/14/93	90d 03/14/93	150d 05/14/93
Respiratory Protection	90d 03/14/93	150d 05/14/93	90d 03/14/93	150d 05/14/93
Employee Information and Training	90d 03/14/93	180d 06/14/93	90d 3/14/93	180d 06/14/93
Initial Medical Surveillance	90d 03/14/93	180d 06/14/93	90d 03/14/93	180d 06/14/93
Written Compliance Program	1 year 12/14/93 update annually		90d 03/14/93	180d 06/14/93
Changerooms, showers, lunchroom	1 year 12/14/93		60d 02/14/93	120d 04/14/93
Engineering Controls	2 years 12/14/94		120d 04/14/93	240d 08/14/93

* 1910.1027 for general industry

** 1928.1027 for agriculture

*** 1915.1027 for shipyards

**** 1926.63 for construction

NOTE 1: Settlement agreements reached 3/19/93 with several employers extend the time period for them to comply with certain provisions of the standard. Employers include Gates Energy Products, Inc., Big River Zinc, SAFT America Inc., Jersey Miniere Zinc, and any company in the iron and steel industry, SIC Code 3312.

NOTE 2: A federal appeals court stayed the cadmium standard as it applies to cadmium pigments on 12/3/93. Eventually the stay will be lifted or upheld. A different exposure limit may be specified for cadmium pigments.

Prepared by NJDOH
12/15/93

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OSHA CADMIUM STANDARDS
9/14/92 FEDERAL REGISTER**

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* 1910.1027 for general industry		
** 1928.1027 for agriculture		
*** 1915.1027 for shipyards		
**** 1926.63 for construction		

Prepared by NJDOH
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TRIGGERS FOR VARIOUS PROVISIONS OF THE OSHA CADMIUM STANDARD

PROVISION	TRIGGERED BY USE OF CADMIUM	TRIGGERED BY EXPOSURE ≥ AL	TRIGGERED BY EXPOSURE > PEL	OTHER TRIGGERS	TRIGGERED BY BIOLOGICAL MONITORING RESULTS IN CATEGORY		
					A	B	C
- Exposure Monitoring	- Initial	- Every 6 months	- At least every 6 months	- Certain job titles in construction - Changes in the mfg. process, raw materials, or work practices		- Assess within 2 wks	- Periodically assess - Assess within 2 wks
- Regulated Areas - Work Practices			X X*		- Assess within 2 wks	- Assess within 2 wks	- Assess within 2 wks
- Engineering Controls - Compliance Program			X* X	- Exposure > SECAL	- Assess within 2 wks	- Assess within 2 wks	- Assess within 2 wks
- Respiratory Protection	- If employee requests		X	- Regulated areas - Emergencies	- Assess within 2 wks	- Assess within 2 wks	- Assess within 2 wks
- Emergency Plan - Personal Protective Equipment	X - If skin or eye irritation occurs		X				
- Hygiene Areas, Lunchroom			X		- Assess within 2 wks	- Assess within 2 wks	- Assess within 2 wks
- Housekeeping - Employee Training	X X						
- Medical Surveillance - Biological Monitoring		- 30 or more days per year		- Previously exposed - Respirator use - Difficulty breathing while wearing a respirator - Emergencies - Termination - Work in certain construction jobs - Physician opinion	- Biennial - Annual	- Annual - Semiannual	- Semiannual - Quarterly
- Discretionary Medical Removal - Mandatory Medical Removal						X	X

* if exposed ≥ 30 days/year and no SECAL applies