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## Chapter 296-848 WAC Safety Standards for Arsenic (Form Number F414-130-000)

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This book contains rules for Safety Standards for arsenic, as adopted under the Washington Industrial Safety and Health Act of 1973 (Chapter 49.17 RCW).

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## Chapter 296-848 WAC ARSENIC

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## **WAC 296-848-099 Definitions.**

**Action level.** An airborne concentration of inorganic arsenic of 5 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) of air calculated as an eight-hour time-weighted average.

**Authorized personnel.** Individuals specifically permitted by the employer to enter the exposure control area to perform duties, or to observe employee exposure evaluations as a designated representative.

**Breathing zone.** The space around and in front of an employee's nose and mouth, forming a hemisphere with a 6- to 9-inch radius.

**CAS (chemical abstract service) number.** CAS numbers are internationally recognized and used on safety data sheets (SDSs) and other documents to identify substances. For more information see <http://www.cas.org/about>.

**Day.** Any part of a calendar day.

**Designated representative.** Any one of the following:

- (a) Any individual or organization to which an employee gives written authorization.
- (b) A recognized or certified collective bargaining agent without regard to written employee authorization.
- (c) The legal representative of a deceased or legally incapacitated employee.

**Emergency.** Any event that could or does result in the unexpected significant release of inorganic arsenic. Examples of emergencies include equipment failure, container rupture, or control equipment failure.

**Exposure.** The contact an employee has with inorganic arsenic, whether or not protection is provided by respirators or other personal protective equipment (PPE). Exposure can occur through various routes of entry such as inhalation, ingestion, skin contact, or skin absorption.

**Inorganic arsenic.** Elemental arsenic (As), copper aceto-arsenite, and inorganic compounds containing arsenic (measured as As), except arsine. Inorganic compounds do not contain the element carbon.

**Licensed health care professional (LHCP).** An individual whose legally permitted scope of practice allows him or her to provide some or all of the health care services required for medical evaluations.

**Permissible exposure limits (PELs).** PELs are employee exposures to toxic substances or harmful physical agents that must not be exceeded. PELs are also specified in WISHA rules found in other chapters. The PEL for inorganic arsenic is an eight-hour time-weighted average (TWA8) of 10 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ).

**Time-weighted average (TWA8).** An exposure limit averaged over an 8-hour period that must not be exceeded during an employee's workday.

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-099, filed 11/06/2018, effective 12/07/2018.]

## WAC 296-848-100 Scope.

This chapter applies to all occupational exposure to inorganic arsenic.

### Definitions:

**Inorganic arsenic.** Elemental arsenic (As), copper aceto-arsenite, and inorganic compounds containing arsenic (measured as “As”), except arsine. Inorganic compounds do not contain the element carbon.

**Exposure.** The contact an employee has with inorganic arsenic, whether or not protection is provided by respirators or other personal protective equipment (PPE). Exposure can occur through various routes of entry such as inhalation, ingestion, skin contact, or skin absorption.

### **EXEMPTIONS:**

*This chapter does not apply to any of the following:*

1. *Exposures during agricultural operations.*
2. *Pesticide applications, including the treatment of wood with preservatives.*
3. *Use of wood treated with inorganic arsenic.*
4. *Arsine, a gas identified by Chemical Abstract Service (CAS) Registry No. 7784-42-1.*
5. *Inorganic arsenic present in a form and handled in such a way that airborne exposure could occur. For example, inorganic arsenic present in glass is fused in the material. Due to the fused form, airborne exposure cannot occur when the glass is scored and subsequently broken.*

All requirements in this chapter will not apply to every workplace with an occupational exposure. The following steps will show you which requirements apply to your workplace.

**Step 1:** Follow requirements in the basic rules sections, WAC 296-848-20010 through 296-848-20090.

- This includes completing an exposure evaluation, as specified in Exposure evaluations, WAC 296-848-20060, to:
  - Obtain employee 8-hour exposure monitoring results of airborne inorganic arsenic; and
  - Determine if employee exposure monitoring results are above, at, or below these values:
    - ◆ 8-hour time-weighted average (TWA<sub>8</sub>) . . . . . 10 micrograms per cubic meter (µg/m<sup>3</sup>).
    - ◆ 8-hour action level (AL) . . . . . 5 µg/m<sup>3</sup>.

**Step 2:** Use employee exposure monitoring results from Step 1 and follow Table 1 to find out which additional sections of this chapter apply to your workplace.

<b>Table 1 Sections That Apply To Your Workplace</b>	
<b>If:</b>	<b>Then continue to follow the Basic Rules, and these additional requirements:</b>
<ul style="list-style-type: none"> <li>Employee exposure monitoring results are above the TWA<sub>8</sub></li> </ul>	<ul style="list-style-type: none"> <li>Training, exposure monitoring, and medical monitoring, WAC 296-848-30005 through 296-848-30080; and</li> <li>Exposure control areas, WAC 296-848-40005 through 296-848-40045.</li> </ul>
<ul style="list-style-type: none"> <li>Employee exposure monitoring results are:               <ul style="list-style-type: none"> <li>At or below the TWA<sub>8</sub> and</li> <li>At or above AL</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Training, exposure monitoring, and medical monitoring, WAC 296-848-30005 through 296-848-30080.</li> </ul>
<ul style="list-style-type: none"> <li>Employee exposure monitoring results are below the AL;</li> <li>Eye or skin irritation from exposure to inorganic arsenic cannot occur</li> </ul>	<ul style="list-style-type: none"> <li>No additional requirements apply if exposures remain stable.</li> </ul>
<ul style="list-style-type: none"> <li>Employees could experience eye or skin irritation from exposure to inorganic arsenic</li> </ul>	<ul style="list-style-type: none"> <li>Training in WAC 296-848-30005.</li> <li>Washing, showering, and changing in WAC 296-848-40030.</li> <li>Personal protective equipment (PPE) in WAC 296-848-40040.</li> </ul>

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-100, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-100, filed 12/21/04, effective 05/01/05.

## WAC 296-848-200 Basic rules.

**Your responsibility:** To measure and minimize employee exposure to inorganic arsenic.

***Important:***

*The sections listed in basic rules apply to all employers covered by the scope of this chapter, WAC 296-848-100. To find additional sections that may apply to you, go to the Scope, WAC 296-848-100, and follow Table 1.*

<b>You must meet the requirements</b>	<b>in this section</b>
Preventive measures	<a href="#">WAC 296-848-20010</a>
Washing facilities	<a href="#">WAC 296-848-20025</a>
Exposure evaluations	<a href="#">WAC 296-848-20060</a>
Notification	<a href="#">WAC 296-848-20070</a>
Exposure records	<a href="#">WAC 296-848-20090</a>

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-200, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-200, filed 12/21/04, effective 05/01/05.]

### WAC 296-848-20010 Preventive practices.

- (1) You must effectively communicate the hazards of inorganic arsenic by doing both of the following:
- (a) Keep container labels free of statements that contradict or detract from the labels' hazard warning.

*Note: You may use labels required by other laws, rules, or ordinances in addition to, or in combination with, labels required by this section.*

- (b) Labels are not required when the inorganic arsenic in the product is bound in such a manner so as to make unlikely the possibility of airborne exposure to inorganic arsenic. (Possible examples of products not requiring labels are semiconductors, light emitting diodes and glass.)

*Note:*

- You should keep containers tightly covered when not in use to help prevent unnecessary exposure and accidental spills.*
- Contaminated items should be handled and disposed of to prevent further exposure in the workplace. For example, vacuuming or wet wiping contaminated equipment helps prevent the release of dust into the air.*

*Reference:*

*Additional requirements are found in other chapters.*

1. *For spills, leaks, or other releases, go to Emergency response, chapter [296-824](#) WAC.*
2. *For labeling go to WAC [296-901-140](#) Hazardous communications.*

- (2) You must establish safe and effective housekeeping and maintenance practices by doing all the following:
- (a) Develop and keep a written housekeeping and maintenance plan that lists appropriate frequencies for:
    - (i) Housekeeping operations; and
    - (ii) Cleaning and maintaining dust collection equipment.
  - (b) Keep surfaces free of accumulations of inorganic arsenic, to the degree feasible.
  - (c) When cleaning floors and other accessible surfaces:
    - (i) Use vacuuming or other cleaning methods that minimize the release of inorganic arsenic into the air.
    - (ii) Do not use compressed air.
    - (iii) Select vacuums that have high efficiency particulate air (HEPA) filters.
    - (iv) Use and empty vacuums in a way that minimizes the release of inorganic arsenic back into the workplace.

*Note:*

1. *Shoveling or brushing may be used only when vacuuming or other cleaning methods have not been effective.*
2. *Using non-HEPA vacuums will increase inorganic arsenic contamination in air or on area surfaces.*

- (3) You must maintain ventilation systems, including dust collection equipment, to make sure they are effective. Do all of the following:
- (a) Perform periodic inspections for effectiveness.
  - (b) Periodically clean the equipment.
  - (c) Keep a note of the most recent inspection for effectiveness, and cleaning or maintenance.
- (4) You must prevent eye or skin contact with:
- (a) Arsenic trichloride; and
  - (b) Liquid or particulate forms of inorganic arsenic when contact could cause eye or skin irritation.

*Note: Arsenic trichloride is corrosive and can be quickly absorbed through skin.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-20010, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 14-07-086 (Order 13-08), § 296-848-20010, filed 03/18/14, effective 05/01/14. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-20010, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-20025 Washing facilities.**

You must provide washing facilities for employees exposed to inorganic arsenic.

*Reference: For additional washing facility requirements, go to another chapter, the Safety and health core rules, chapter [296-800](#) WAC, and find the section titled, Provide convenient and clean washing facilities, WAC [296-800-23025](#).*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-20025, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-20025, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-20060 Exposure evaluations.**

***Important:***

1. *This section applies when workplace operations create potential airborne exposure to inorganic arsenic.*
2. *When you conduct an exposure evaluation in a workplace where an employee uses a respirator, the protection provided by this respirator in ton considered.*
3. *Following this section will fulfill the requirements to identify and evaluate respiratory hazards found in chapter [296-841](#) WAC, Airborne contaminants.*

- (1) You must conduct an employee exposure evaluation to accurately determine airborne concentrations of inorganic arsenic by completing Steps 1 through 5 of the Exposure Evaluation Process, each time any of the following apply:
  - (a) No evaluation has been conducted.
  - (b) Changes have occurred in any of the following areas that may result in new or increased exposures:
    - (i) Production.
    - (ii) Processes.
    - (iii) Exposure controls such as ventilation systems or work practices.
    - (iv) Personnel.
  - (c) You have any reason to suspect new or increased exposure may occur.



- (2) You must provide affected employees and their designated representatives an opportunity to observe exposure monitoring during Step 4 of the Exposure Evaluation Process.
- (a) Make sure observers do not interfere with exposure measurements.
  - (b) Make sure observers are entitled to:
    - (i) An explanation of your exposure measurement and monitoring procedures;
    - (ii) Observe all tasks of exposure measurement performed at the workplace; and
    - (iii) Receive a copy of the exposure measurement results when you obtain them; or are allowed to record the exposure measurement results, if made during observations.
  - (c) Make sure observers who enter areas with inorganic arsenic exposure:
    - (i) Are provided with and use the same protective clothing, respirators, and other personal protective equipment (PPE) that employees working in the area are required to use; and
    - (ii) Follow safety and health requirements that apply.

### Exposure Evaluation Process

***Important:***

*Following the Exposure Evaluation Process is not necessary when you have documentation conclusively demonstrating inorganic arsenic exposures for a particular operation and material, cannot exceed the action level (AL) during any conditions reasonably anticipated. Documentation can be based on quantitative information such as soil test results or qualitative information such as observations of how inorganic arsenic-containing materials are handled.*

- *Retain this documentation for as long as you rely on it.*

**Step 1:** Identify all employees who have potential airborne exposure to inorganic arsenic in your workplace.

**Step 2:** Select employees from those identified in Step 1 who will have their 8-hour exposures monitored. Make sure the exposures of the employees selected represent 8-hour exposures for all employees identified in Step 1, including each job classification, work area, and shift.

*Note: A written description of the procedure used for obtaining representative employee exposure monitoring results needs to be kept as part of your exposure records required by this chapter in Exposure records, WAC 296-848-20090. This description can be created while completing Steps 2 through 4 of this exposure evaluation process.*

- Step 3:** Determine how you will obtain employee exposure monitoring results.
- Select and use a method that meets the following criteria for accuracy:
    - $\pm 25\%$ , with a confidence level of 95%, when concentrations are potentially at or above an 8-hour time-weighted average of 10 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ); or
    - $\pm 35\%$ , with a confidence level of 95%, when concentrations are potentially between the 8-hour time-weighted averages of 5  $\mu\text{g}/\text{m}^3$  and 10  $\mu\text{g}/\text{m}^3$ .

*Note: Here are examples of methods that meet this requirement:*

1. *OSHA Method ID105 found by going to <http://www.osha.gov/dts/sltc/methods/>.*
2. *NIOSH method 7901 found by going to <http://www.cdc.gov/niosh/homepage.html> and linking to the NIOSH Manual of Analytical Methods.*

- Step 4:** Obtain employee exposure monitoring results by collecting air samples representing employees identified in Step 1.
- Sample at least one shift representative of the 8-hour exposure, for each employee selected in Step 2.
  - Make sure samples are collected from each selected employee's breathing zone.

*Note:*

1. *You may use any sampling method that meets the accuracies specified in Step 3. Examples of these methods include:*
  - a. *Real-time monitors that provide immediate exposure monitoring results.*
  - b. *Equipment that collects samples that are sent to a laboratory for analysis.*
2. *The following are examples of methods for collecting samples representative of 8-hour exposures.*
  - a. *Collect one or more continuous samples, for example, a single 8-hour sample or 4-2 hour samples.*
  - b. *Take a minimum of 4 to 7 brief samples, such as 15-minute samples, during the work shift and at times selected randomly.*
3. *For work shifts longer than eight hours, monitor the continuous eight-hour portion of the shift expected to have the highest average exposure concentration.*

**Step 5:** Have the samples you collected analyzed to obtain monitoring results representing 8-hour exposures.

- Go to the Scope of this chapter, WAC 296-848-100, and compare employee exposure monitoring results to the values found in Step 1 and follow Step 2 to determine if additional sections of this chapter apply.

*Note:*

1. *You may contact your local DOSH consultant for help*
  - a. *Interpreting data or other information.*
  - b. *Determining eight-hour employee exposure monitoring results.*
2. *To contact a DOSH consultant:*
  - a. *Go to the Safety and health core rules, chapter [296-800](#) WAC.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-20060, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-20060, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-20070 Notification.**

- (1) You must provide written notification of exposure monitoring results, including notification about whether exposures exceed the permissible exposure limit (PEL), to employees represented by your exposure evaluation, within 5 business days after the monitoring results become known to you.
  - (a) In addition, when employee exposure monitoring results are above the permissible exposure limit (PEL), provide written notification of all the following within 15 business days after these exposure monitoring results become known to you.
    - (i) Corrective actions being taken and a schedule for completion; and
    - (ii) Any reason why exposures cannot be lowered to below the PEL.

*Note:*

1. *You can notify affected employees either individually or post the notifications in areas readily accessible to affected employees.*
2. *When notifying employees about corrective actions, your notification may refer them to a separate document that is available and provides the required information.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-20070, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-20070, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-20090 Exposure records.**

- (1) You must establish and keep complete and accurate records for all exposure monitoring conducted under this chapter. Make sure the record includes, at least:
  - (a) The name, Social Security number or other unique identifier, and job classification of the employee sampled and all other employees represented by the sampled employee.

- (b) A description of the methods used to obtain exposure monitoring results and evidence of the method's accuracy.
- (c) A description of the procedure used to obtain representative employee exposure monitoring results.
- (d) The date, number, duration, location, and the result of each sample taken.
- (e) Any environmental conditions that could affect exposure concentration measurements.

*Note: It is useful to record personal protective equipment worn by the employee in addition to the type of respirator worn.*

- (2) You must keep exposure monitoring records for at least 30 years.

*Reference:*

1. *To see additional requirements for employee exposure records including access and transfer requirements, go to another chapter, Employee medical and exposure records, chapter [296-802](#) WAC.*
2. *Exposure monitoring records need to be kept longer than thirty years for employees participating in medical monitoring. Go to Medical records, WAC 296-848-30080, found within this chapter.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-20090, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-20090, filed 12/21/04, effective 05/01/05.]

## **WAC 296- 848-300 Training, exposure monitoring, and medical monitoring.**

**Your responsibility:** To detect any significant changes in employee health and exposure monitoring results.

<b><i>Important:</i></b>
<p>1. <i>These sections apply when skin or eye irritation could occur or when employee exposure monitoring are either:</i></p> <ul style="list-style-type: none"> <li>a. <i>At or above the action level (AL) of 5 micrograms per cubic meter (<math>\mu\text{g}/\text{m}^3</math>) for inorganic arsenic; or</i></li> <li>b. <i>Above the permissible exposure limit (PEL) of 1q0 <math>\mu\text{g}/\text{m}^3</math> for inorganic arsenic.</i></li> </ul>

<b>You must meet the requirements</b>	<b>in this section</b>
Training	<a href="#">WAC 296-848-30005</a>
Communication of hazards	<a href="#">WAC 296-848-30007</a>
Periodic exposure evaluations	<a href="#">WAC 296-848-30010</a>
Medical evaluations	<a href="#">WAC 296-848-30030</a>
Medical records	<a href="#">WAC 296-848-30080</a>

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-300, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 14-07-086 (Order 13-08), § 296-848-300, filed 03/18/14, effective 05/01/14. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-300, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-30005 Training.**

- (1) You must train employees:
  - (a) Who are exposed above the action level (AL) of 5 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) of air; or
  - (b) Who could experience eye or skin irritation from exposure.
- (2) You must provide training:
  - (a) At the time of initial assignment; and
  - (b) At least every 12 months after initial training.
- (3) You must make sure training and information includes all of the following:
  - (a) A review of WAC 296-848-100 through 296-848-40045, and 296-848-500.
  - (b) The following health information about inorganic arsenic:

- (i) Inorganic arsenic is a poison and can affect your body if it is swallowed or inhaled.
  - (ii) Exposure to airborne concentrations of inorganic arsenic may cause lung cancer and can be a skin irritant.
  - (iii) Arsenic trichloride can be absorbed readily through your skin and is especially dangerous.
  - (iv) Wash hands thoroughly before eating or smoking to minimize your risk for swallowing inorganic arsenic.
- (c) The purpose for medical evaluations and a description of how you are fulfilling the medical evaluation requirements of this chapter found in Medical evaluations, WAC 296-848-30030.
- (4) You must make a copy of each of the following readily available to all employees required to be trained under this section:

*Reference:*

1. *To see additional training and information requirements in other chapters, go to the:*
  - a. *Respirator rules, chapter [296-842](#) WAC.*
  - b. *WAC [296-901-140](#), Hazard communications.*
2. *When following these requirements, include specific information about potential exposures to inorganic arsenic, such as the type of operations, locations, quantities, exposure sources, exposure controls, inorganic arsenic use, and storage.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-30005, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 14-07-086 (Order 13-08), § 296-848-30005, filed 03/18/14, effective 05/01/14. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-30005, filed 12/21/04, effective 05/01/05.]

## **WAC 296-848-30007 Communication of hazards.**

### Hazard communication – General.

- (1) Chemical manufacturers, importers, distributors and employers must comply with all requirements of the Hazard Communication Standard (HCS), WAC [296-901-140](#) for inorganic arsenic.
- (2) In classifying the hazards of inorganic arsenic at least the following hazards are to be addressed: Cancer; liver effects; skin effects; respiratory irritation; nervous system effects; and acute toxicity effects.

- (3) You must include inorganic arsenic in the hazard communication program established to comply with the HCS, WAC [296-901-140](#). Employers must ensure that each employee has access to labels on containers of inorganic arsenic and to safety data sheets, and is trained in accordance with the requirements of HCS and WAC 296-848-30005.

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-30007, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 14-07-086 (Order 13-08), § 296-848-30007, filed 03/18/14, effective 05/01/14.

### WAC 296-848-30010 Periodic exposure evaluations.

#### **EXEMPTION:**

- *Periodic exposure evaluations are not required if exposure monitoring results conducted to fulfill requirements in Exposure evaluation, WAC 296-848-20060, are below the action level (AL).*

You must obtain employee exposure monitoring results as specified in Table 2 by repeating Steps 2, 4, and 5 of the Exposure Evaluation Process found within this chapter, in Exposure evaluations, WAC 296-848-20060.

*Note: If you document that one work shift consistently has higher exposure monitoring results than another for a particular operation, then you limit sample collection to the work shift with higher exposures and can use results to represent all employees performing the operation on other shifts.*

<b>Table 2 Periodic Exposure Evaluation Frequencies</b>	
<b>If 8-hour employee exposure monitoring results:</b>	<b>Then:</b>
Are between the: <ul style="list-style-type: none"> <li>– Action level (AL) of 5 micrograms per cubic meter (<math>\mu\text{g}/\text{m}^3</math>); and</li> <li>– Permissible exposure limit (PEL) of 10 <math>\mu\text{g}/\text{m}^3</math></li> </ul>	Conduct additional exposure evaluations at least every 6 months for the employees represented by the monitoring results.
Are above the PEL	Conduct additional exposure evaluations at least every 3 months for the employees represented by the monitoring results.
For employees previously above the PEL, have decreased: <ul style="list-style-type: none"> <li>– To a concentration between the PEL and AL; and</li> <li>– The decrease is demonstrated by 2 consecutive exposure evaluations made at least 7 days apart</li> </ul>	You may decrease your evaluation frequency to every 6 months for the employees represented by the monitoring results.

<b>Table 2 Periodic Exposure Evaluation Frequencies (Cont.)</b>	
Have decreased to below the AL; and The decrease is demonstrated by 2 consecutive exposure evaluations made at least 7 days apart	You may stop periodic employee exposure evaluations for employees represented by the monitoring results.

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-30010, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-30010, filed 12/21/04, effective 05/01/05.]

### WAC 296-848-30030 Medical evaluations.

***Important:***

*Medical evaluations conducted under this section will satisfy the medical evaluation requirement found in another chapter, Respirators, chapter [296-842](#) WAC.*

- (1) You must make medical evaluations available to current employees who have been, are, or will be exposed to inorganic arsenic concentrations above the AL:
  - (a) At least 30 days in any 12-month period; or
  - (b) A total of 10 years or more of combined employment with you or previous employers with at least 30 days of exposure per year.
- (2) You must make medical evaluations available at no cost to employees.
- (3) You must pay all costs, including travel costs and wages associated with any time spent outside of the employee's normal work hours.
- (4) You must make medical evaluations available at reasonable times and places.
- (5) You must make medical evaluations available by completing Steps 1 through 6 of the Medical Evaluation Process for each employee covered.

*Note:*

1. *Employees who wear respirators need to be medically evaluated to make sure the respirator will not harm them, before they are assigned work in areas requiring respirators. Employees who decline to receive medical examination and testing to monitor for health effects caused by inorganic arsenic are not excluded from receiving a separate medical evaluation for a respirator use.*
2. *If employers discourage participation in medical monitoring for health effects caused by inorganic arsenic, or in any way interfere with an employee's decision to continue with this program, this interference may represent unlawful discrimination under RCW 49.17.160, Discrimination against employee filing, instituting proceeding, or testifying prohibited-Procedure-Remedy.*



## Medical Evaluation Process

**Step 1:** Identify employees who qualify, as stated above, for medical evaluations.

**Step 2a:** Make medical evaluations available for employees identified in Step 1 at the following times:

- Initially, when employees are assigned to work in an area where exposure monitoring results are, or will likely be, above the action level for at least 30 days in a 12-month period.
- Periodically as specified in Table 3.
- When employment with exposure ends, if the employee has not had an evaluation within the 6-month period before exposure ends. Include in these evaluations the same content as specified in Table 4 for initial evaluations, excluding a chest X ray.

<b>Table 3 Frequencies for Periodic Medical Evaluations</b>	
<b>For:</b>	<b>Provide periodic medical evaluations every:</b>
Employees less than 45 years old with less than 10 years of exposure above the AL	12 months
Employees 45 or older; and Employees with more than 10 years of exposure above the AL	6 months; and 12 months to obtain a 14 by 17-inch posterior-anterior chest X-ray for monitoring purposes, unless the LHCP has determined a different frequency for periodic X-rays.

**Step 2b:** Provide appropriate medical examination and emergency treatment when an employee identified in Step 1 develops signs or symptoms commonly associated with inorganic arsenic exposure.

**Step 3:** Select a licensed healthcare professional (LHCP) who will conduct or supervise examinations and procedures.

**Step 4:** Make sure the LHCP receives all of the following before the medical evaluation is performed:

- A copy of this chapter.
- A description of the personal protective equipment (PPE) each employee being evaluated for uses or will use.
- Information from previous employment-related examinations when this information is not available to the examining LHCP.
- Instructions that the written opinions of the LHCP provides you be limited to the following information.
  - Results from examinations and tests.
  - The LHCP's opinion about whether or not medical conditions were found that would increase the employee's risk for impairment from exposure to inorganic arsenic.

- Any recommended limitations for:
  - Inorganic arsenic exposure; and
  - Use of respirators or other PPE.
- A statement that the employee has been informed of medical results and medical conditions caused by inorganic arsenic exposure requiring further examination or treatment.

**Step 5:** Make the medical evaluation available to the employee. Make sure it includes the content listed in Table 4, Content of Medical Evaluations.

**Step 6:** Obtain the LHCP's written opinion for the employee's medical evaluation and give a copy to the employee.

- Make sure the written opinion is limited to the information specified for written opinions in Step 4.

*Note: If the written opinion contains specific findings or diagnoses unrelated to occupational exposure, send it back and obtain a revised version without the additional information.*

<b>Table 4 Content of Medical Evaluations</b>	
<b>When conducting:</b>	<b>Include:</b>
An initial evaluation	<ul style="list-style-type: none"> <li>• A work history and medical history including:               <ul style="list-style-type: none"> <li>– Smoking history.</li> <li>– The presence and degree of respiratory symptoms such as breathlessness, cough, sputum production, and wheezing.</li> </ul> </li> <li>• A physical examination that includes:               <ul style="list-style-type: none"> <li>– A 14 by 17-inch posterior-anterior chest X ray and the International Labor Office UICC/Cincinnati (ILO U/C) rating.</li> <li>– A nasal and skin examination.</li> </ul> </li> <li>• Additional examinations the licensed healthcare professional (LHCP) believes appropriate based on the employee's exposure to inorganic arsenic or respirator use.</li> </ul>
Periodic evaluations for employees less than 45 years old with less than 10 years of exposure above the action level (AL)	<ul style="list-style-type: none"> <li>• The same content as specified for initial evaluations repeated every 12 months.</li> </ul>

<b>Table 4 Content of Medical Evaluations (Cont.)</b>	
<p>Periodic evaluations for employees:</p> <ul style="list-style-type: none"> <li>• 45 or older; or</li> <li>• With more than 10 years of exposure above the AL</li> </ul>	<ul style="list-style-type: none"> <li>• The following content repeated every 6 months:           <ul style="list-style-type: none"> <li>– A work history and medical history including:               <ul style="list-style-type: none"> <li>▪ Smoking history.</li> <li>▪ The presence and degree of respiratory symptoms such as breathlessness, cough, sputum production, and wheezing.</li> </ul> </li> <li>– A physical examination that includes a nasal and skin examination.</li> <li>– Additional examinations the LHCP believes appropriate based on the employee's exposure to inorganic arsenic or respirator use.</li> </ul> </li> <li>• A physical examination, repeated every 12 months that obtains a 14 by 17-inch posterior-anterior chest X-ray and the International Labor Office UICC/Cincinnati (ILO U/C) rating</li> </ul>

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-30030, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-30030, filed 12/21/04, effective 05/01/05.]

#### **WAC 296-848-30080 Medical records.**

***Important:***

*This section applies when a medical evaluation is performed, or any time a medical record is created for an employee exposed to inorganic arsenic.*

- (1) You must establish and maintain complete and accurate medical records for each employee receiving a medical evaluation and make sure the records include all the following:
  - (a) The employee's name and Social Security number, or other unique identifier.
  - (b) A description of the employee's duties.
  - (c) A copy of the licensed healthcare professional's (LHCP's) written opinions.
  - (d) The anticipated or representative employee exposure monitoring results provided to the LHCP for the employee.
- (2) You must maintain medical evaluation records for the duration of employment plus 30 years.

*Note: Your medical provider may keep these records for you. Other medical records, such as the employee's medical history or X-ray, need to be kept as a confidential record by the medical provider and accessed only with the employee's consent.*

*Reference: To see additional requirements for employee medical records, including access and transfer requirements, go to Employee medical and exposure records, chapter [296-802](#) WAC.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-30080, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-30080, filed 12/21/04, effective 05/01/05.]

## WAC 296-848-400 Exposure control areas.

**Your responsibility:** To protect employees from exposure to inorganic arsenic by using feasible exposure controls and appropriate respirators.

***Important:***

*These sections apply when employee exposure monitoring results are above the permissible exposure limit (PEL) of 10 micrograms per cubic meter  $\mu\text{g}/\text{m}^3$  of air.*

<b>You must meet the requirements</b>	<b>in this section</b>
Exposure control plan	<a href="#">WAC 296-848-40005</a>
Exposure controls	<a href="#">WAC 296-848-40020</a>
Exposure control areas	<a href="#">WAC 296-848-40025</a>
Clean-up facilities and lunchrooms	<a href="#">WAC 296-848-40030</a>
Personal protective equipment (PPE)	<a href="#">WAC 296-848-40040</a>
Respirators	<a href="#">WAC 296-848-40045</a>

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-400, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-400, filed 12/21/04, effective 05/01/05.]

## WAC 296-848-40005 Exposure control plan.

***Important:***

*Use of employee rotation to control exposures is not advisable since inorganic arsenic is a known carcinogen.*

- (1) You must establish and implement a complete written exposure control plan that includes at least the following, for exposure control areas:
  - (a) A description of each operation releasing inorganic arsenic, for example:
    - (i) Crew size.
    - (ii) Current exposure controls.
    - (iii) Materials processed.
    - (iv) Machinery used.
    - (v) Operating procedures.
    - (vi) Maintenance practices.

- (b) Exposure evaluation data.
  - (c) A report of the technology considered for exposure controls.
  - (d) Engineering plans and studies used as a basis for selecting exposure controls.
  - (e) A detailed schedule for implementing:
    - (i) Feasible exposure controls, if immediate implementation is not possible.
    - (ii) Changes to enhance current exposure controls, when necessary.
  - (f) An analysis of the effectiveness of the exposure controls considered, when controls will not reduce exposures to or below the permissible exposure limit (PEL).
  - (g) Other relevant information.
- (2) You must review and update your exposure control plan at least every 6 months to keep it current.
  - (3) You must implement exposure controls on the quickest schedule feasible if controls will not reduce exposure to or below the PEL.
  - (4) You must provide a copy of your exposure control plan to affected employees and their designated representatives, when they ask to review or copy it.

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-40005, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-40005, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-40020 Exposure controls.**

<b><i>Important:</i></b>
<ol style="list-style-type: none"> <li>1. <i>Use of employee rotation to control exposures is not advisable since inorganic arsenic is a known carcinogen.</i></li> <li>2. <i>Respirators and other personal protective equipment (PPE) do not substitute for feasible exposure controls.</i></li> </ol>

You must use feasible exposure controls to reduce exposures to or below the permissible exposure limit (PEL), or as low as achievable.

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-40020, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-40020, filed 12/21/04, effective 05/01/05.]

### **WAC 296-848-40025 Exposure control areas.**

- (1) You must establish temporary or permanent exposure control areas where airborne concentrations of inorganic arsenic are above the permissible exposure limit (PEL) by doing all the following:
  - (a) Distinguish the boundaries of exposure control areas from the rest of the workplace in any way that minimizes employee access.
  - (b) Allow only authorized personnel to enter exposure control areas.

- (c) Post signs at access points to exposure control areas that include this warning:

**DANGER  
INORGANIC ARSENIC  
MAY CAUSE CANCER  
DO NOT EAT, DRINK OR SMOKE  
WEAR RESPIRATORY PROTECTION IN THIS AREA  
AUTHORIZED PERSONNEL ONLY**

- (i) Make sure signs are kept clean and well lit so they are easy to read.
- (ii) Keep signs and areas near them free of statements that contradict or detract from their message.

*Note: This requirement does not prevent you from posting signs required by other laws, rules, or ordinances.*

- (2) You must make sure employees entering exposure control areas have an appropriate respirator.
- (3) You must prevent all of the following activities from occurring in exposure control areas unless they are conducted in required lunchrooms, change rooms, or showers:
- (a) Eating food or drinking beverages.
- (b) Smoking.
- (c) Chewing tobacco or gum.
- (d) Applying cosmetics.

*Note:*

1. *You may use permanent or temporary enclosures, caution tape, ropes, painted lines on surfaces, or other materials to visibly distinguish exposure control areas or separate them from the rest of the workplace.*
2. *When distinguishing exposure control areas, you should consider factors such as:*
  - a. *The level and duration of airborne exposure.*
  - b. *Whether the area is permanent or temporary.*
  - c. *The number of employees in adjacent areas.*

*Reference: To see other requirements for respirators within this chapter, go to Respirators, WAC 296-848-40045.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-40025, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 14-07-086 (Order 13-08), § 296-848-40025, filed 03/18/14, effective 05/01/14. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-40025, filed 12/21/04, effective 05/01/05.]

**WAC 296-848-40030 Clean-up facilities and lunchrooms.**

- (1) You must provide the following facilities for employees who could experience eye or skin irritation from exposure to inorganic arsenic or who work in exposure control areas:
  - (a) Clean change rooms with separate storage for street clothes and personal protective equipment (PPE).
  - (b) Shower facilities.
- (2) You must make sure employees who could experience eye or skin irritation from exposure to inorganic arsenic or who work in exposure control areas:
  - (a) Shower at the end of the work shift; and
  - (b) Wash their hands and face before eating.
- (3) You must provide lunchrooms for employees working in exposure control areas that are:
  - (a) Located so they are readily accessible to the employees.
  - (b) Temperature controlled.
  - (c) Under positive pressure compared to surrounding areas.
  - (d) Provided with a filtered air supply.

*Note: Lunchrooms may be located within exposure control areas, but are considered separate from the exposure control area.*

- (4) You must do the following when exposures in exposure control areas exceed an 8-hour time-weighted average of 100 micrograms of arsenic per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ):
  - (a) Provide facilities for employees working in exposure control areas where they can remove excess contamination from protective clothing and shoes.
  - (b) Make sure employees vacuum protective clothing and clean or change shoes before entering showers, change rooms, or lunchrooms.

*Reference: To see additional requirements for hygiene facilities*

1. Go to the safety and health core rules, chapter [296-800](#) WAC.
2. Find drinking water, bathrooms, washing facilities, and waste disposal, WAC [296-800-230](#).

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-40030, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-40030, filed 12/21/04, effective 05/01/05.]

**WAC 296-848-40040 Personal protective equipment (PPE).**

- (1) You must provide PPE at no cost to employees, make sure employees use, and maintain their PPE as follows:
  - (a) Provide clean and dry protective clothing to employees who could experience eye or skin irritation from exposure to inorganic arsenic or who work in exposure control areas.



- (b) Provide impervious protective clothing to employees exposed to arsenic trichloride.

*Note:*

1. *Arsenic trichloride is corrosive and can be readily absorbed through skin.*
2. *Examples of protective clothing appropriate for inorganic arsenic exposures include:*
  - a. *Coveralls or similar full-body work clothing.*
  - b. *Gloves, and shoes or coverlets.*
  - c. *Face shields or vented goggles when necessary to prevent eye irrigation.*

- (c) Make sure employees do not remove inorganic arsenic from PPE by blowing or shaking.

- (d) Make sure protective clothing is removed:

- (i) In change rooms; and
- (ii) At the end of the work shift.

- (e) Make sure contaminated protective clothing that will be cleaned, laundered, or disposed of, is placed in a closed container located in the change room.

Make sure the container prevents the release of inorganic arsenic.

- (f) Launder protective clothing:

- (i) At least weekly if employees work in areas where exposure monitoring results of inorganic arsenic are below an 8-hour time-weighted average concentration of 100 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ); or
- (ii) Daily if employees work in areas where either exposure monitoring results of inorganic arsenic are above an 8-hour time-weighted average concentration of 100  $\mu\text{g}/\text{m}^3$  or when more frequent washing is needed to prevent skin irritation.

- (g) Maintain the effectiveness of PPE by repairing or replacing it, as needed:

- (i) Dispose of protective clothing if it will not be repaired.

- (2) You must inform individuals who clean or launder protective clothing about the possible health effects associated with inorganic arsenic, including carcinogenic effects, by doing the following:

- (a) Provide the information in writing; and

- (b) Label containers of contaminated PPE with the following warning:

<b>DANGER:</b>	
<b>CONTAMINATED WITH INORGANIC ARSENIC MAY CAUSE CANCER DO NOT REMOVE DUST BY BLOWING OR SHAKING DISPOSE OF INORGANIC ARSENIC CONTAMINATED WASH WATER IN ACCORDANCE WITH APPLICABLE LOCAL, STATE OR FEDERAL REGULATIONS</b>	

*Reference:* To see additional Personal protective equipment requirements go to the Safety and health core rules, chapter [296-800 WAC](#), and find the section titled, PPE, WAC [296-800-160](#).

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-40040, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 14-07-086 (Order 13-08), § 296-848-40040, filed 03/18/14, effective 05/01/14. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 09-05-071 (Order 08-36), § 296-848-40040, filed 02/17/09, effective 04/01/09. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-40040, filed 12/21/04, effective 05/01/05.]

## WAC 296-848-40045 Respirators.

***Important:***

1. *The requirements in this section are in addition to the requirements found in other chapters:*
  - a. *Airborne contaminants, chapter [296-841 WAC](#).*
  - b. *Respirators, chapter [296-842 WAC](#).*

- (1) You must provide each employee with an appropriate respirator that complies with the requirements of this section, and require that employees use them in circumstances where exposure is above the permissible exposure limit (PEL), including any of the following circumstances:
  - (a) Employees are in an exposure control area.
  - (b) Feasible exposure controls are being put in place.
  - (c) Where you determine that exposure controls are not feasible.
  - (d) Feasible exposure controls do not reduce exposures to, or below, the PEL.
  - (e) Emergencies.
- (2) You must provide high-efficiency particulate (HEPA) filters or N-, R-, or P-100 filters for powered air-purifying respirators (PAPRs) and negative-pressure air-purifying respirators.
- (3) You must provide a powered air-purifying respirator (PAPR) to employees required to use respirators when:
  - (a) The employee chooses to use this type of respirator for a licensed health care professional (LHCP) recommends this type of respirator in their written opinion. and
  - (b) It will provide proper protection.
- (4) You must follow these additional specifications for inorganic arsenic compounds with significant vapor pressure such as arsenic trichloride and arsenic phosphide.
  - (a) Select front- or back-mounted gas masks equipped with HEPA filters and acid gas canisters or any full facepiece supplied-air respirator, when concentrations are at or below 500 mg/m<sup>3</sup>.
  - (b) Select for powered air-purifying respirators (PAPRs) and negative-pressure air-purifying respirators equipped with HEPA (or equivalent) filters and acid gas canisters when concentrations are at or below 100.

- (5) You must prohibit the use of half-facepiece respirators for protection against arsenic trichloride. This is because arsenic trichloride is corrosive and rapidly absorbed through the skin.

*Note: When selecting air-purifying respirators for protection against inorganic arsenic, you will need to consider whether other contaminants could be present at levels above permissible exposure limits and determine if a combination filter/gas-sorbent cartridge or canister is appropriate.*

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-40045, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 09-156-145 (Order 09-04), § 296-848-40045, filed 07/21/09, effective 09/01/09. Statutory Authority: RCW 49.17.010, .040, .050, and .060. 05-01-073 (Order 04-11), § 296-848-40045, filed 12/21/04, effective 05/01/05.]

**WAC 296-848-60010 Health information about inorganic arsenic.**

- (1) You must make this section readily available to employees as required in Training, WAC 296-848-30005.
- (2) You must provide this section to the licensed health care professional (LHCP) as required in Step 4 of the medical evaluation process found in Medical evaluations, WAC 296-848-30030.

**Table 5 General Health Information About Inorganic Arsenic****What is inorganic arsenic?**

In this chapter, “inorganic arsenic” means:

- The element arsenic;
- Arsenic-containing compounds that do not contain the element carbon;
- Cooper aceto-arsenite.

Arsine is a gaseous inorganic arsenic compound not addressed by requirements in this chapter. It is addressed in a separate chapter, Respiratory hazards, chapter [296-841 WAC](#).

**How does inorganic arsenic get into my body?**

Inorganic arsenic enters your body when you:

- Breathe in (**inhale**) airborne particles such as dusts, fume, sprays, or other aerosols that contain inorganic arsenic. You will also inhale inorganic arsenic particles when you smoke tobacco products that have become contaminated from contact with inorganic arsenic at work. Some compounds, including arsenic trichloride, can be inhaled as a vapor;
- Swallow (**ingest**) food, drink, cosmetics such as lip balm, sweat and other substances that become contaminated from contact with inorganic arsenic at work.

Inorganic arsenic particles brought home on your clothes, shoes, or body can be inhaled or ingested by household members.

Some inorganic arsenic compounds enter your body when **eye or skin contact** occurs. Arsenic trichloride is one example of a compound that is readily **absorbed** through the eyes and skin.

**What happens after inorganic arsenic enters my body?**

Once inorganic arsenic enters your body, some of it is changed into a less harmful organic form by the liver. Both the organic and inorganic forms leave your body in urine.

Most of the arsenic will be gone within several days, although some will remain in your body for several months and even longer.

**Why is medical monitoring necessary?**

Although exposure to inorganic arsenic is associated with various health effects, the most serious health effects are **lung and skin cancer**. The medical monitoring requirements in this chapter are established to minimize your risk for these diseases.

To learn more about the medical monitoring process, see Medical evaluation, WAC [296-848-30030](#).

**What health effects and symptoms are linked with exposure to inorganic arsenic?**

Exposure to inorganic arsenic is associated with various health effects ranging from **temporary local** effects such as skin irritation to **lasting systematic** effects due to gradual (chronic) or sudden (acute) poisoning. Such effects should not occur if the requirements in this chapter are followed.

**Skin Health Effects**

Arsenic trioxide, arsenic trichloride, and other trivalent compounds can cause **skin irritation** from direct contact.

**Table 5 General Health Information About Inorganic Arsenic (Cont.)**

- The following moist mucous membranes are most sensitive to irritation:
  - Eye and inner eyelid (conjunctiva);
  - Linings inside the nose, mouth, and respiratory system.
- Other sites most vulnerable irritation include:
  - Eyelids;
  - Angles (the space between 2 planes) of the ears, nose, and mouth;
  - Moist and macerated (softened by moisture) areas of skin;
  - Wrists;
  - Genitalia, if personal hygiene is poor.

Inorganic arsenic is also capable of causing keratosis (**small corns or warts**), especially on palms and soles.

Trivalent arsenic compounds are **corrosive** to skin:

- Brief contact will not cause irritation, but prolonged contact causes localized engorgement (hyperemia) which later forms vesicular (blister-like) or pustular (pimple-like) eruptions.
- Exposure can create perforations (holes) in the nasal septum (the tissue dividing the nasal cavity in half).

Arsenic trioxide and arsenic pentoxide exposure have been linked to **skin sensitization** (acquired sensitivity or allergy) **and contact dermatitis** (inflammation due to allergic or irritant reaction).

#### **Acute Poisoning Effects:**

Acute poisoning is usually linked to ingestion, not inhalation, of inorganic arsenic. Cases of acute poisoning **rarely** occur in occupational settings and inhalation-related cases are exceedingly rare.

When acute poisoning is due to **ingestion**, the following gastrointestinal symptoms develop within 1/2 to 4 hours:

- Tightening (constriction) of the throat followed by difficulty or inability to swallow (dysphagia), pain in the region above the belly button (epigastric pain), vomiting, and watery diarrhea. Blood may appear in vomit and stools;
- Shock may develop due to severe fluid loss when the amount of inorganic arsenic swallowed is sufficiently high. Death can occur in 24 hours.

When acute poisoning is due to inhalation:

- The following symptoms develop first:
  - Cough;
  - Chest pain;
  - Shortness of breath (dyspnea);
  - Giddiness;
  - Headache;
  - Extreme general weakness;
- Gastrointestinal symptoms will follow.

**Table 5 General Health Information About Inorganic Arsenic (Cont.)****Chronic Poisoning Effects:**

Cases of chronic poisoning caused by **ingestion** are also rare. Symptoms are:

- Weight loss;
- Nausea and diarrhea alternating with constipation;
- Skin pigmentation and eruptions;
- Hair loss;
- Numbness in hands and feet, “pins and needles” sensation, muscle weakness, and other symptoms resulting from peripheral neuritis;
- Horizontal white lines (striations) on fingernails and toenails.

**Inhalation** of inorganic arsenic is the most common cause of chronic poisoning in occupational settings. Symptoms associated with this condition are divided into 3 phases.

- 1<sup>st</sup> phase, earliest symptoms:
  - Weakness;
  - Loss of appetite;
  - Some nausea;
  - Occasional vomiting;
  - Sense of heaviness in the stomach;
  - Some diarrhea.
- 2<sup>nd</sup> phase symptoms:
  - Inflammation of the eyes and inner eyelid (conjunctivitis);
  - Inflammation, accompanied by an abundant discharge from mucous membranes (a catarrhal state) of the nose, larynx, and respiratory passage;
  - Symptoms associated with the common cold (Coryza), hoarseness, and mild tracheobronchitis may occur;
  - Skin lesions are common (eczematoid and allergic in type). Perforations (holes) in the nasal septum (the tissue dividing the nasal cavity in half) are the most typical lesions of the upper respiratory tract.
- 3<sup>rd</sup> phase symptoms (related to neuritis):
  - Numbness in hands and feet, “pins and needles” sensation, muscle weakness.
  - In severe cases, motor paralyzes occur. Initially affecting the toe extensors and the peronei (outer portion of the lower leg).
  - “Wrist drop” or “foot drop” (resulting from paralysis of flexor muscles of feet or hands) **only occur in the most severe cases.**

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-60010, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. WSR 07-03-153, § 296-848-60010, filed 1/23/07, effective 6/1/07.]

**WAC 296-848-60020 Medical guidelines.**

- (1) You must make this section readily available to employees as required in Training, WAC 296-848-30005.
- (2) You must provide this section to the licensed health care professional (LHCP) as required in Step 4 of the medical evaluation process found in Medical evaluations, WAC 296-848-30030.



**Table 6 Medical Guidelines For Evaluating Employees With Exposure**

**Part 1: DOSH's Requirements**

In addition to requiring employers to train employees and protect them from inorganic arsenic exposure, this chapter (the Arsenic rule) requires employers to monitor their employees' health with assistance from licensed health care professionals (LHCPs).

- For employees who will use respirators, the LHCP will also need to provide the employer with a written medical opinion clearing the employee for workplace respirator use.

These guidelines were designed to support an informed partnership between the LHCP and the employer when monitoring the health of employees exposed to inorganic arsenic.

The employer initiates this partnership by providing the LHCP with a copy of the chapter and other supporting information about the employee and job conditions. The LHCP can then become familiar with the medical monitoring requirements found in WAC 296-848-30030 and 286-848-30080, which address:

- Frequency and content for routine (initial and periodic) medical examinations and consultations;
- Emergency and other unplanned medical follow-up;
- Medical opinions;
- Medical record retention and content.

**Part 2: Inorganic Arsenic Toxicology**

**Health information about inorganic arsenic, WAC 296-848-50020** provides **basic information** about the health effects and symptoms associated with inorganic arsenic exposure.

In addition, consider the following information:

**Acute Poisoning**

Exfoliative dermatitis and peripheral neuritis may develop in patients who survive health effects due to acute poisoning (by ingestion).

Acute toxic symptoms of trivalent arsenical poisoning are caused by severe inflammation of the mucous membranes and greatly increased permeability of the blood capillaries.

**Acute and Chronic Poisoning**

In cases of acute and chronic poisoning, toxic effects to the myocardium (the middle layer of the heart) reported on EKG changes are now largely discounted and are attributed to electrolyte disturbances concomitant with arsenicalism.

Arsenic has a depressant effect upon bone marrow, with disturbances of both red blood cell production (erythropoiesis) and myelopoiesis.

**Chronic Poisoning**

Cases of chronic poisoning caused by ingestion are generally linked to patients taking prescribed medications. However, sputum from inhaled inorganic arsenic can be swallowed in addition to other ingested inorganic arsenic due to hand-to-mouth transfer.

Skin lesions are usually melanotic and keratotic and may occasionally take the form of an intradermal cancer of the squamous cell type, but without infiltrative properties.

**Table 6. Medical Guidelines For Evaluating Employees With Exposure (Cont.)**

Chronic hepatitis and cirrhosis have been described. Liver damage is still debated and as yet the question is unanswered.

Polyneuritis may be the prominent feature, but more frequently there are numbness and parasthenias of "glove and stocking" distribution. Horizontal white lines (striations) on the fingernails and toenails are commonly seen and are considered a diagnostic accompaniment of arsenical polyneuritis.

**References:**

- Other sources for toxicology information include:
  - ToxFAQs™ and the Toxicological Profile for Arsenic. Both of these free documents are available from the Agency for Toxic Substances and Disease Registry (ATSDR) and can be obtained by:
    - Visiting <http://www.atsdr.cdc.gov/toxprofiles>; or
    - Calling [1-888-422-8737](tel:1-888-422-8737).
  - A variety of technical resources on arsenic, available from the National Institutes for Occupational Safety and Health (NIOSH) by visiting <http://www.cdc.niosh/topics/chemicals.html>

**Part 3: Clinical Evaluation of Employees Exposed to Inorganic Arsenic****Important:**

- When an employee will use a respirator during work, the LHCP will need to determine whether the employee can safely wear a respirator and what limitations, if any, apply.

**Guidance for Physical Examinators**

In addition to its immediate diagnostic usefulness, a patient's initial examination will provide a baseline for comparing future test results.

This chapter establishes the minimum content for medical examinations. Additional tests such as lateral and oblique X rays or pulmonary function test may be useful.

You should also include palpation of superficial lymph nodes and a complete blood count when employees are exposed to any of the following compounds:

- Copper aceto-arsenite;
- Potassium arsenite;
- Sodium arsenite;
- Other materials associated with lymphatic cancer.

Arsenic trioxide and other inorganic arsenical dusts do not give rise to radiological evidence or pneumoconiosis.

[Statutory Authority: RCW 49.17.010, .040, .050, .060. 18-22-116 (Order 1628) § 296-848-60020, filed 11/06/2018, effective 12/07/2018. Statutory Authority: RCW [49.17.010](#), 49.17.040, 49.17.050, 49.17.060. WSR 07-03-153, § 296-848-60020, filed 1/23/07, effective 6/1/07.]