

Inorganic Arsenic

Training on the hazards of arsenic in
the workplace



Developed by the Division of Occupational Safety & Health
(DOSH) for employee training

May, 2009

What this training will cover

Health hazards of arsenic

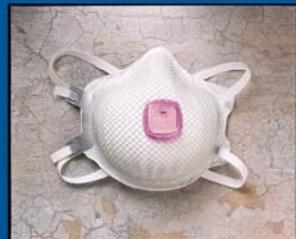
How you are exposed to arsenic

How to protect yourself from arsenic

Use of respirators

Medical surveillance

DOSH rules on arsenic



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The information in this presentation is specific to inorganic arsenic compounds. Arsenic can also be found in an “organic” form with health effects entirely different from “inorganic” arsenic, but it is not covered by the DOSH rules or in this training.

In Washington state, arsenic can be found:

In soil around old smelter sites,



In old orchard soil,



In treated lumber,



[Link to handout on treated lumber](#)

In scrap metal



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[Note: this optional slide shows some known sources of arsenic in the state of Washington.] Arsenic is found in soil at the old Asarco Smelter site in Tacoma and two older smelter sites in Everett and Northport, and a few other hazardous waste sites. Arsenic has also been found in the soil of some older or former orchards in eastern Washington where it was used as a pesticide years ago. It does not break down or change to a less harmful form in soil.

Lumber treated with arsenic typically has a green tint. It was often called “CCA” meaning copper, chromium, arsenic and was used to prevent rotting in posts, playground equipment and plywood that is in contact with the ground. When the lumber or logs do eventually rot, the arsenic remains in the soil. Its use for treatment of lumber used in residences has recently been banned, but is it still allowed for industrial and agriculture use. [Employer: handling arsenic-treated lumber is exempted in the WISHA Arsenic Rule, so all the requirements of that rule do not apply to persons handling treated lumber. That does not reduce its hazard however, particularly if arsenic-treated lumber is sanded or sawed. In addition, business that actually treat lumber with arsenic are covered by the WISHA arsenic rule.]

Arsenic is used in small amounts in batteries and in lead paint and other metal coatings. Arsenic is still used in computer chips but is only hazardous during manufacturing or in disposal or recycling of old computers parts.

Arsenic has also been found in some well water in the Pacific Northwest, but most wells are tested and those that are too high in arsenic are taken out of service.

You may have heard there is arsenic in some seafood, but it is in a non-toxic form as “organic arsenic”.

Exposure to Arsenic at Work

In Washington, workers have recently been exposed to arsenic while:

Torch-cutting scrap metal



Sawing treated lumber



Working in a battery manufacturing plant



Working at a hazardous waste site



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[Note: this optional slide lists where WISHA found worker exposure to arsenic in 2002-2004] "Arsenic is found as a contaminant in lead batteries, in lead paint, and in metal coatings. Arsenic was also a contaminant in slag used for sandblasting which ended up at a hazardous waste site."

Arsenic Exposure

You may be or are exposed to arsenic at this jobsite in the following activities or locations:

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Employer: describe the quantity, location, manner of use, storage, source of exposure and specific activities that could or will result in employee exposure to arsenic.

Health Hazards of Arsenic

Exposure to arsenic can cause:

- Sore throat,
- Skin rash, irritation and warts,
- Numbness in hands and feet,
- Lung cancer and other cancers,
- Death



Arsenic Warts

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You may have heard about people being murdered by poisoning their food or drink with arsenic. Arsenic was formerly used as rat poison and was easy to obtain. It had no taste, and could be added to food without the victim's knowledge. Heavy exposure to arsenic - actual arsenic poisoning - will cause other symptoms besides the ones listed on this slide, including stomach pain and cramps, nausea and vomiting, damage to blood and blood vessels, and abnormal heart rhythm and eventually death. At lower levels, it can cause lung cancer if inhaled as a dust over many years.

Arsenic effects on skin

Dust containing arsenic can cause skin irritation and other skin problems.

The form of arsenic known as arsenic trichloride is easily absorbed through the skin.

Protective gloves and clothing must be worn when handling products containing arsenic or if arsenic dust can get on your skin.

Link to more health information about inorganic arsenic:

<http://www.lni.wa.gov/wisha/rules/arsenic/html/296-848-600.htm#60010>



Note: If arsenic trichloride is handled, impervious gloves and protective clothing must be provided.

Arsenic Exposure

How can arsenic get in your body?

Inhaling arsenic fumes while torch-cutting metal,



Inhaling dust from sawing arsenic-treated lumber, or dust from contaminated soil,



Swallowing arsenic dust on your hands while eating, drinking or smoking.



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In electronic plants, workers can be exposed to arsenic fume during the manufacturing process. Most processes in this industry are now well controlled, but occasionally, these controls can malfunction. Long exposure to arsenic dust on the skin will cause redness and irritation. One form of arsenic – arsenic trichloride - can be absorbed through the skin. A few of years ago, a number of workers dismantling the old Rainier Beer plant were exposed to high levels of arsenic fume while cutting up the old tanks.

Health Hazards of Arsenic

Arsenic Exposure Limits

WISHA has set a level in the air that can't legally be exceeded.



DOSH legal Limit: **10 micrograms per cubic meter** – like a drop of red dye in 55-gallon drum of water.

If the level in the air is above **5 micrograms per meter**, certain protective steps must be taken.

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This DOSH legal limit is called the “permissible exposure limit” or PEL. If the level is below this legal limit, harmful effects would not likely occur.

However, because arsenic is so toxic, the PEL is an extremely small amount in the air. A “microgram” is the amount of dust on the head of a pin or one piece of a paperclip cut into a million pieces. A “cubic meter” is approximately the size of cube 3 feet square. Just as you could not see the dye coloring in the 55-gallon drum of water, you would not be able to see 10 micrograms of arsenic dust in a cubic meter of air, it would be invisible. However, visible dust may also contain a tiny amount of arsenic which could still exceed the permissible limit.

If the level in the air is above 5 microgram per meter – called the “action level” – we must provide you with medical exams and train you on arsenic. More about this later.

Air Monitoring

We do regular air monitoring of arsenic in the air by attaching an air sampling device to a person working around arsenic like the photo on the right. You have the right to observe this monitoring.

Results of our air monitoring are as follows:



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[You can present air monitoring records on this slide or the results can be posted in an accessible location or passed out as a handout. The results should be compared to the action limit and the Permissible Exposure Limit (PEL).]

Controls

We have put the following controls in place to reduce the amount of arsenic you are exposed to:

[List controls here]

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“Controls can include wetting soil or dust, exhaust ventilation or completely closing or isolating an operation or process where arsenic is used.”

If there are no feasible controls or the controls don't reduce levels below the PEL, then the only way to protect workers is through the use of respirators, gloves and protective clothing.

Warning Signs and Labels

Warning signs are posted at the entrance to any area where the levels of arsenic exceed the DOSH permissible limits.

These areas are called "exposure control areas". No one can enter them without a respirator or protective clothing.

All containers containing arsenic also must have a warning label.

Danger
Inorganic Arsenic
Cancer Hazard
Authorized Personnel Only
No Smoking or Eating
Respirator Required

Danger
Contains Inorganic Arsenic
Cancer Hazard
Harmful If Inhaled or Swallowed
Use Only With Adequate Ventilation
or Respiratory Protection

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Employer: If you do not have areas where the PEL levels are exceeded, the warning sign requirements do not apply. Before your employees use a respirator, you must have a complete respirator program including medical evaluations, fit testing and training.

Worksite Exposure Control Areas

[List specific worksite exposure control areas where respirators must be worn here.]

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Employer: Use this slide if you have areas where arsenic levels exceed the PEL and respirators are required to be worn.

How to Protect Yourself

Required Work Practices

Wear respirators assigned to you,



Wear coveralls and gloves if working with arsenic-contaminated dust or dirt,



Wash your hands before eating, drinking or smoking.

Use the separate change room and clean lunch area we have provided.



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“ Don’t eat, drink or smoke in the work area where you are exposed to arsenic. Arsenic on your hands will easily transfer to your food and other items you ingest. We have a separate area or room for those activities. We will provide the respirators, gloves and coveralls at no cost to you.”

How to Protect Yourself

Required Work Practices

Don't take your work clothing or boots home,

Dispose or have protective clothing laundered by us,

Keep your street clothing in a clean place,

Clean your respirator daily and store in a clean, dry place.



Don't do this!

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These measures will prevent you from taking arsenic home to your family or getting arsenic on your face or inside your respirator. It will also help keep arsenic out of your vehicle.

We have provide you with a separate change room and separate storage area for your protective clothing.

In addition we have provided a separate, clean lunchroom or meal area where there is no contamination from arsenic containing dust. And, we will either launder your protective clothing for you, or provide you with disposable protective clothing which we will collect and dispose at the end of the day or shift.

How to Protect Yourself

More Required Work Practices

Don't remove dust by blowing down or shaking out your clothing.

Compressed-air hose



Take a shower at the end of the shift when required. Showers are required if levels in the air are above the DOSH PEL.



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“ Blowing down or shaking out your work clothing will just create arsenic dust which you or others could inhale. .

Instead, use a HEPA vacuum to remove arsenic-containing dust from clothing. Decontaminate any equipments by immersion, wet wipes, or other method appropriate for the item.

Showers are required on some jobs.” [Indicate whether showers are required on this job and where they are located. WISHA arsenic regulation require that employees wear protective clothing and take showers at the end of the shift if they are exposed to arsenic levels above the permissible exposure limit.]

How to Protect Yourself

More required work practices

Don't dry sweep or blow down dust containing arsenic,



Use a vacuum with high efficiency (HEPA) filters for cleanup,



Use exhaust ventilation when sawing or sanding arsenic-treated wood.



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“Instead of sweeping, use a vacuum cleaner with a special high efficiency filter. A regular vacuum will not filter out the very fine arsenic dust.

If you are cutting arsenic-treated wood, the ventilation system must either vent into a collector outdoors or into a indoor tight bag.”

HEPA is short for “High efficiency particulate air” filter.

Required work practices at this worksite

[List worksite-specific work practices that reduce or control exposures here.]

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Employer: list the practices you require on this slide.

Respirators

Type of Respirators for Arsenic

In some jobs involving arsenic, you may need a respirator.

The type of respirator worn depends on the amount of arsenic in the air.

We will provide you with the proper respirator and provide medical evaluations, fit-testing, and additional training



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Respirators are required if the amount in the air is more than the Permissible Exposure Limit (PEL). We provide the respirators at no cost to you. Respirators are always the "P100" type which provide the highest filtering capacity of the various types of respirators. You can tell them by the pink color of the cartridges. If the amount of arsenic in the air is more than 10 times the permissible limit, then we must provide you with respirators that supply clean air either from a tank or a hose.

Employer: Training on the use of these respirators can be done here or separately.

Respirators You Must Use

[List or describe what respirators must be used and the job tasks or locations where use is required.]

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Show or describe the respirators used at the specific jobsite or task.

Respirators

Using Respirators

Respirators must be worn at all times when the amount of arsenic in the air is above the legal limit.



You must have a medical evaluation before you wear a respirator.



Respirators must fit properly to prevent leaks.

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“Taking your respirator off just for minute can overexpose you to arsenic in the air. Respirators are only as good as they fit. If they leak, you will have a false sense of protection. A medical evaluation is required because respirators themselves cause some stress to the body, especially if a person has lung or heart problems.” This medical evaluation starts with a medical questionnaire. [If your employees wear respirators, they will need further training on their use, limitations and maintenance.]

Respirators

Respirators Must Fit Properly

You must pass a respirator fit-test before you wear a respirator to protect yourself from inhaling arsenic.

You can't have a beard when you wear a tight-fitting respirator.

We will train you on how to use your respirator.



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“The fit test is not a written test, but a test where you try on the respirator and we test how well it fits. A beard prevents a tight fit, even a day’s growth may cause leakage. You must be clean shaven to wear a tight-fitting respirator. We will cover the use of respirators in separate training.”

Medical Monitoring

What medical monitoring is needed?

Anyone who is exposed to arsenic above the "action level" 30 days or more in one year's time must be offered a medical exam.

The medical exam includes a chest x-ray and nasal and skin examination.

We offer you a medical exam at least once a year.



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"The action level is an amount or concentration of arsenic in the air or 5 micrograms per cubic meter. This is half the amount where you are required to wear a respirator. The purpose of the medical exam is too make sure you are not having any health problems from getting too much arsenic in your body. We are required to offer you this medical exam even if you wear a respirator. [optional: If you are over 45 years old, we are required to offer the medical exam every 6 months. [Note: although similar, this medical monitoring requirement is not the same as a medical evaluation required for wearing a respirator. Medical evaluations are required if you wear a respirator, medical monitoring for arsenic is offered to you, but you don't have to take the medical exam. However, we do provide the medical exam at no cost to you." [Employers: you can make medical monitoring a condition of hiring and employment.]

More on Medical Exams

We will provide additional medical exams if you develop any signs or symptom associated with arsenic.

We will provide the doctor information on your arsenic exposure and respirator.

We will get the doctor's written opinion on the results of the exam and any further steps recommended to protect you.

You will get a copy of the doctor's report.



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“The additional medical exams will also be provided at no cost to you.

Since your medical records are private, we only get a copy of the doctor's written opinion rather than your complete medical records.”

Worksite Medical Surveillance Program

[Describe details of worksite specific medical surveillance program here.]

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Instructor: you can fill in who will do your medical evaluations, arrangements for paying for them, and other details for the employee.

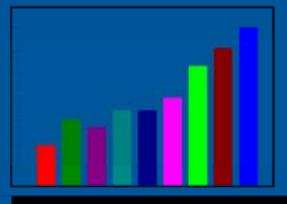
Records

Medical and Air Sampling Records

You have the right to see any of your medical records related to arsenic.



You also have the right to see results of any air sampling for arsenic we have done.



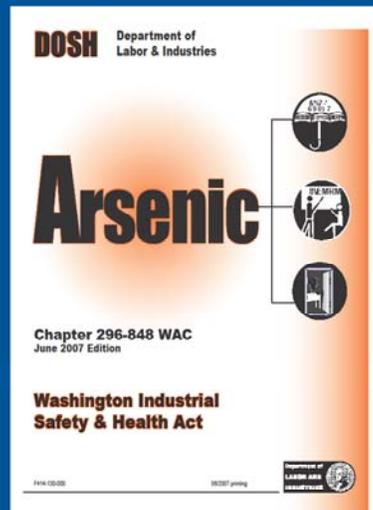
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“Medical records are kept at the doctor’s office and you can ask for them. You will be notified of our air sampling results within 5 days after we receive them. We will also tell you about our plans to reduce exposures within 15 days. [If you have any records of air samples taken at the job site, inform your employees where these results can be viewed or post them or give affected employees copies.]

Arsenic Regulations

The DOSH arsenic regulation contains much more information in detail.

A copy of this standard is available.



<http://www.lni.wa.gov/WISHA/Rules/arsenic/default.htm>

“ The points we have covered here are required in this standard.”