Chapter 296-857 WAC

LEAD

NEW SECTION

WAC 296-857-100 Scope. This chapter applies to all occupational exposure to lead.

Exemption: This chapter doesn't apply to agricultural operations covered by Safety standards for agriculture, chapter 296-307 WAC.

The basic rules in this chapter (WAC 296-857-20010 through 296-857-20070) apply to all workplaces with occupational exposure to lead. Once you have results from the exposure evaluation required by the basic rules, use Table 1 to determine which additional sections of this chapter apply.

Table 1
Chapter Sections That Apply to Your Workplace

If employee lead exposure is:	Then the sections marked with an "X" apply: Basic Rules 20010-20070	Medical Monitoring 30010-30040	Exposure Control Areas 40010-40060	Essential Information 500	Definitions 600
Below the action level (AL)	X			X	X
At or above the AL; **AND** **Below** the permissible exposure limit (PEL)	X	X		X	X
Above the PEL	X	X	X	X	X

Definitions:

Lead means metallic lead, inorganic lead compounds, and organic lead soaps. Tetraethyl lead and all other organic lead compounds are excluded from this definition.

Exposure is the contact an employee has with lead, 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.

Note: Some examples of construction work covered by this chapter include:
- Installation of products containing lead;
- Removal or encapsulation of materials containing lead, including lead abatement and inspection activities;
- Demolition or salvage of structures where lead or materials containing lead are present;

- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location where construction activities are performed;
- New construction, repair, alteration, renovation, or remodeling of:
– Structures, or parts of structures that contain lead or materials containing lead;
OR
– Substrates, or parts of substrates that contain lead or materials containing lead.
- Painting and decorating;
- Lead contamination or emergency cleanup.

NEW SECTION

WAC 296-857-200 Basic rules.

Your responsibility:

To evaluate employee exposure and protect employees from exposure to lead.

IMPORTANT:

The requirements in basic rules apply to all employers with employees exposed to lead.

WAC 296-857-20010
Cleaning practices.
WAC 296-857-20020
Training.
WAC 296-857-20030
Handwashing.
WAC 296-857-20040
Employee protective measures.
WAC 296-857-20050
Exposure evaluations for airborne lead.
WAC 296-857-20060
Notification.
WAC 296-857-20070
Exposure records.

NEW SECTION

WAC 296-857-20010 Cleaning practices. You must:

- Establish safe and effective housekeeping practices by doing all of the following:

– Keep surfaces as free of accumulations of lead as feasible.

– Use vacuuming or other cleaning methods that minimize airborne contamination from cleaning.

– Clean and dispose of contaminated items in ways that

prevent further exposure in the workplace.

– Follow the requirements in Table 2 when vacuum cleaners are used.

Table 2
Requirements for Vacuum Cleaning

If:	Then:
Any type of vacuum cleaner is used	✎ Use and empty the vacuum cleaner in a way that minimizes the release of lead back into the workplace; **AND** ✎ Locate the system discharge so that it does not expose employees.
A portable vacuum cleaner will be used	✎ Use a vacuum cleaner equipped with HEPA filtration.

Note: ✎ When you evaluate surface contamination, you may use NIOSH's wipe method 9100 or an equivalent method. Surfaces with contamination less than 200 micrograms per square foot (µg/ft^2) would **not** require further cleaning.
– To find this method, visit NIOSH's web site at http://www.cdc.gov/niosh and select "M" to search for the Manual of Analytical Methods.
✎ When you have tried vacuuming or other cleaning methods that minimize airborne contamination and have found them ineffective, you may use any of the following to clean up lead contamination:
– Shoveling, brushing, dry or wet sweeping;
– Compressed air with an effective ventilation system specifically designed to capture dust produced by the compressed air cleaning process.
✎ You should keep containers tightly covered when not in use to help prevent unnecessary exposure and accidental spills.

NEW SECTION

WAC 296-857-20020 Training.

You must:

✎ Make a copy of this chapter (WAC 296-857-100 through 296-857-600) readily available to all employees exposed to lead.

Note: Some ways you can make a copy available include providing employees with:
✎ A WISHA rules CD-Rom;
✎ Internet links;
OR
✎ A paper copy at a safety bulletin board.

✎ Make sure employees receive the appropriate level of training as specified in Table 3.

Table 3
Employee Training Levels

If an employee is or could be exposed:	Then make sure the employee receives:

✎ To any amount of lead	✎ Basic training, specific about lead, for each of the following topics: – Operations and locations in the work area where lead is present. – Methods and observations that may be used to detect the presence or release of lead in the work area. ✂ For example, a warning sign posted outside of exposure control areas or labels identifying lead-containing materials. – Health hazards associated with lead, including the symptoms and effects of exposure such as: ✂ Reproductive health effects on both males and females. ✂ Hazards to the developing fetus and children. – Physical hazards of lead compounds, if any. – Steps employees can take to protect themselves from lead, including at least the following: ✂ Appropriate work practices. ✂ Exposure controls. ✂ Emergency procedures. ✂ Personal protective equipment. ✂ Additional precautions for pregnant employees. ✂ Other procedures implemented by you. – Details of the hazard communication program you developed. **References:** ✎ For training requirements in other chapters, go to the safety and health core rules and find the sections: – Inform and train your employees about hazardous chemicals in your workplace, WAC 296-800-17030. – Train your employees to use PPE, WAC 296-800-16025.

✎ On any day to airborne lead at or above the action level (AL) **OR** ✎ To lead compounds that may cause eye or skin irritation, such as lead arsenate or lead azide.	✎ Basic training as described above; **AND** ✎ Additional training that: – Informs employees about the contents of this chapter. – Informs employees about the specific nature of the job assignment and operations that could result in exposure to lead at or above the AL. This includes characteristics of the operation such as the types of materials involved, equipment, and exposure controls. ✂ Exposure controls include local exhaust system ventilation and work practices, such as work practices related to PPE use, housekeeping, and lunchroom use. – Informs employees about the purpose of blood testing, medical examinations, and consultations. – Describes how you are fulfilling the blood testing, medical examination and consultation, and medical removal requirements of this chapter. – Instructs employees to not practice chelation to remove lead from their bodies except under direction of a licensed health care professional (LHCP). – Informs about content of the current exposure control plan. – Informs about the employee's right to access records.

NEW SECTION

WAC 296-857-20030 Handwashing.

You must:

✎ Provide handwashing facilities that meet the requirements in these separate chapters:

– For general industry applications, go to the safety and health core rules' section, Provide convenient and clean washing facilities, WAC 296-800-23025.

– For construction work, go to the safety standards for construction work section, Sanitation, WAC 296-155-140.

✎ Locate handwashing facilities near or next to work activities with lead exposure.

✎ Make sure employees wash their hands and faces at the end of the work shift.

Note: When employees wash while showering at the end of the work shift (turn to WAC 296-857-40040) they will meet this requirement to wash their hands and faces at the end of the work shift.
When work activities are located in areas where exposures are above the PEL, the location of handwashing facilities will also depend on where lunchrooms or eating areas are located (turn to WAC 296-857-40040).
Lead residues can be difficult to remove from hands during washing. Employees can use hand-wipe spot test kits (NIOSH method 7700) to quickly determine if handwashing is effective. To find this method, visit NIOSH's web site at http://www.cdc.gov/niosh and select "M" to search for the Manual of Analytical Methods.

NEW SECTION

WAC 296-857-20040 Employee protective measures.

IMPORTANT:

This section applies when employees are exposed to airborne lead and you haven't completed your exposure evaluation (WAC 296-857-20050).

You must:

✎ Protect employees who may be exposed to lead compounds that may cause skin or eye irritation by following the sections that apply in Personal protective equipment, WAC 296-800-160, found in the safety and health core rules.

✎ Protect employees who have a reasonable possibility of exposure to airborne lead above the permissible exposure limit (PEL) by following WAC 296-857-30010 through 296-857-600.

– Use Table 4 to identify work tasks and activities that are likely to exceed the PEL and provide appropriate levels of employee protection.

✂ Table 4 shows airborne exposure levels that are likely

to occur when exposure controls are not used, unless otherwise noted.

✂ After you complete your exposure evaluation required by WAC 296-857-20050, use the results of your evaluation to determine if you need to change employee protection.

Table 4
Examples of Tasks Likely to have Exposure Above the PEL

When:	The airborne exposure is likely to be:
✎ Lead-containing coatings or paint are present; **AND** ✎ Employees conduct any of the following tasks: – Abrasive blasting. – Torch cutting or burning. – Welding.	**At least 50** times the PEL (or 2,500 ☞g/m^3)
✎ Employees use lead containing mortar; **OR** ✎ Employees conduct lead burning; **OR** ✎ Lead-containing coatings or paint are present and employees conduct any of the following tasks: – Rivet busting. – Cleanup activities where dry abrasives are removed for disposal. – Abrasive blasting enclosure movement or removal. – Power tool cleaning **without** HEPA-equipped dust collection systems.	Between **10 and 50** times the PEL (or between 500 ☞g/m^3 and 2,500 ☞g/m^3)

✎ Lead-containing coatings or paint are applied, removed, or otherwise disturbed by employees conducting any of the following tasks: – Manual demolition of structures. – Manual (dry) scraping. – Manual (dry) sanding. – Heat gun applications. – Power tool cleaning **with** HEPA-equipped dust collection systems. – Spray painting. **Note:** ✎ Using wet methods generally lowers airborne exposure levels; however, you'll need to complete an exposure evaluation, as required by WAC 296-857-20050.	Between **1 and 10** times the PEL (or between 50 ☞g/m^3 and 500 ☞g/m^3)
✎ Other tasks recognized to expose employees above the PEL are conducted. Examples include: – Casting objects using lead, copper, zinc, or lead-containing alloys such as brass or bronze. – Breaking, recycling, or manufacturing lead-containing batteries. – Soldering. – Cutting, burning, or melting any lead-containing materials, such as babbit. – Sanding, cutting, or grinding lead-containing solder. – Formulating or processing lead-containing pigments or paints.	**Above the PEL** of 50 ☞g/m^3

– Operating or cleaning firing ranges where lead bullets are used.	

NEW SECTION

WAC 296-857-20050 Exposure evaluations for airborne lead.

IMPORTANT:

✎ Following this section meets the requirements to identify and evaluate respiratory hazards found in another chapter, Respiratory hazards, chapter 296-841 WAC.

✎ Requirements to protect employees before and during exposure evaluations are found in the previous section, Employee protective measures, WAC 296-857-20040.

You must:

(1) Conduct an employee exposure evaluation to accurately determine airborne concentrations of lead by completing Steps 1 through 7 of the exposure evaluation process in this section, each time any of the following apply:

✎ No evaluation has been conducted. For example, an exposure evaluation is required when your employee will perform a new task or operation with lead exposure.

✎ Changes have occurred in any of the following areas that may result in new or increased exposures during any work shift:

– Production;

– Processes, including materials and equipment;

– Exposure controls such as work practices or ventilation systems;

– Personnel.

✎ There's any reason to suspect new or increased exposure may occur.

Note: Start an employee exposure evaluation on the first day of exposure. When this isn't possible, start within forty-eight hours of employee exposure.

(2) Provide affected employees or their designated representatives an opportunity to observe exposure measurement.

✎ Observers are entitled to all of the following:

– Receive an explanation of your exposure measurement and monitoring procedures;

– Observe Step 4 of the exposure evaluation process;

– Record exposure measurement results made during observations, or receive a copy of the exposure monitoring results when you obtain them.

✎ Make sure observers entering areas with lead exposure are:

– Provided with and required to use the same protective

clothing, respirators, and other personal protective equipment (PPE) employees working in the area are required to use;

AND

– Required to follow safety and health procedures that apply.

✎ Make sure observers don't interfere with exposure measurement.

Note: The observer's employer needs to provide required PPE for that observer; however, this section requires the job-site employer to make sure the appropriate PPE is worn.

Exposure evaluation process

Step 1: Identify all employees who have potential airborne exposure to lead. Include at least:

✎ Employees who have complaints of symptoms that may be caused by lead exposure;

✎ Any information, observations, previous measurements of airborne lead, and calculations that indicate employee exposure.

Note: You can skip Steps 2 through 7 for a particular material and the operation where it's used, if you have documentation conclusively demonstrating that employee exposure cannot meet or exceed the action level (AL) during any reasonably anticipated conditions.

The documentation can be based on observations, data, calculations, or previous air monitoring results. Previous air monitoring results:

– Need to meet the accuracy required by Step 3.

– May be from outside sources, such as industry or labor studies.

– Need to be based on data that represents work operations conducted under conditions being evaluated in your workplace.

Keep your documentation as required by this chapter in Exposure records, WAC 296-857-20070.

Step 2: Select employees from those identified in Step 1 who will have their exposures to lead monitored.

✎ Make sure the exposures of the employees selected represent full-shift exposures for all employees identified in Step 1, including exposures for each shift, work area, and task.

✎ Make sure you consider emergencies and infrequent routine work such as annual maintenance tasks.

✎ If you expect exposures below the action level (AL), you may limit your selection to those employees reasonably believed to have the highest exposures. However, if you find these employees' exposures to be at or above the AL, then you need to complete this process again, starting at Step 2, to represent all employees identified in Step 1.

Step 3: Determine how you'll obtain employee exposure monitoring results for airborne lead.

✎ Select and use a sampling and analysis method that is accurate to ± 25%, with a confidence level of 95%.

Step 4: Obtain employee exposure monitoring results by collecting air samples that represent the exposures of employees identified in Step 2.

✎ Collect samples for each employee selected in Step 2 that represents their full-shift exposure.

✎ Make sure samples are collected from each selected employee's breathing zone.

✎ Always collect breathing zone samples outside of respirators.

Note: The following are examples of methods for collecting samples representative of full-shift exposures.
– Collect one or more continuous samples, such as a single full-shift sample or several two-hour samples over the entire work shift.
– Take at least five brief samples, such as fifteen-minute samples, during the work shift and at randomly selected times.
When you document that one shift consistently has higher exposure results than another for a particular operation, you may:
– Limit sample collection required by this step to the work shift with higher exposures;
AND
– Use those results to represent all employees performing the operation on other shifts.

Step 5: Have the samples you collected analyzed, to obtain monitoring results.

Step 6: Determine if employee exposure monitoring results are:

✎ At or above the action level (AL) concentration of 30 micrograms of lead per cubic meter of air (☞g/m³).

✎ Above the permissible exposure limit (PEL).

– The PEL for an 8-hour workday is 50 ☞g/m³.

– For an employee exposed to lead for more than eight hours in a workday, adjust the PEL using the following formula:

400 ÷ the hours worked in the day = Adjusted PEL value for the day

– Example calculation showing an adjusted PEL value of 40 µg/m³ for a 10-hour workday:

400 ÷ 10 = 40 ☞g/m³

Note: Use employee exposure monitoring results to determine if you need to change employee protection.
The assigned protection factor of the respirator is not used to reduce your employee exposure monitoring results.
You may contact your local WISHA consultant for help:
– Interpreting data or other information;
– Determining employee exposure monitoring results.
To contact a WISHA consultant at a service location near you, go to another chapter, the Safety and health core rules, chapter 296-800 WAC, and find the section, Other resources.

Step 7: When exposures are at or above the AL, monitor your employees' airborne lead exposure by repeating Steps 4 through 6 at the frequencies specified in Table 5.

Note: Complete a new exposure evaluation for the employees affected, starting at Step 1, when you find that new or increased exposure occurs due to changes in:
– Production;
– Processes;
– Exposure controls, including materials and equipment;
– Personnel.

Table 5
Periodic Exposure Evaluation Frequencies

If employee exposure monitoring results:	**Then:**
✎ Are **at or above** the action level (AL), but **below** the permissible exposure limit (PEL).	Conduct additional exposure monitoring at least every six months for the employees represented by the monitoring results.
✎ Are **above** the PEL.	Conduct additional exposure monitoring at least every three months for the employees represented by the monitoring results.

✎ Have decreased from above the PEL: – To a concentration at or above the AL, but below PEL; **AND** – The decrease is demonstrated by two consecutive exposure evaluations made at least seven days apart.	You may **decrease** your monitoring frequency to every six months for the employees represented by the monitoring results.
✎ Have decreased to below the AL; **AND** ✎ The decrease is demonstrated by two consecutive exposure evaluations made at least seven days apart.	You may **stop** periodic employee exposure monitoring for employees represented by the monitoring results.

NEW SECTION

WAC 296-857-20060 Notification.

You must:

✎ Provide written notification of exposure monitoring results to employees represented by your exposure evaluation within five business days after the results become known to you.

– When employee exposure monitoring results are above the permissible exposure limit (PEL), also provide written notification of all the following within fifteen business days after the results become known to you:

✂ Corrective actions being taken and an implementation schedule.

✂ Any reason why exposures can't be lowered to below the PEL.

Note: Corrective actions include exposure controls and any repairs to exposure controls. For examples of exposure controls, see Table 1 in another chapter, Respiratory hazards, chapter 296-841 WAC.
You can notify affected employees either individually or post the notifications in areas readily accessible to affected employees.
Posted notification may need specific information that allows affected employees to determine which monitoring results apply to them.

Notification may be:
– In any written form, such as hand-written or e-mail;
– Limited to the required information, such as exposure monitoring results.
When notifying employees about corrective actions, your notification may refer them to a separate document that is available and provides the required information.

NEW SECTION

WAC 296-857-20070 Exposure records.

You must:

✎ Establish and keep complete and accurate records for all exposure monitoring conducted under this chapter. Make sure the exposure record includes at least:

– The name and unique identifier of:

✂ The employee sampled;

AND

✂ All other employees represented by the sampled employee;

– A description of the methods used to obtain exposure monitoring results and evidence of the method's accuracy;

– A description of the procedure used to obtain representative employee exposure monitoring results;

– The date, number, duration, location, and result of each sample taken;

– Any environmental variables that could affect exposure concentration measurements;

✂ Examples of environmental variables include temperature, humidity, altitude, and wind speed.

– A description of the work task or activity being monitored, including the lead-containing materials.

– The type of respirators worn, if any.

Note: It's useful to also record:
– Personal protective equipment worn by the employee;
AND
– Any exposure controls in use, for example, ventilation systems, enclosures, use of wet methods, and specific work practices.

You must:

✎ Keep employee exposure records for at least thirty years.

✎ Follow additional recordkeeping requirements in Table 6, when applicable.

Table 6
Requirements For Additional Documentation

If you use documentation to:	Keep the documentation for:	And make sure it includes the following information:

Demonstrate that employee exposure is below the action level (AL) for lead.	At least thirty years.	✎ The name and unique identifier of each affected employee. ✎ The date of the determination. ✎ The location of the work activity within the workplace. ✎ A description of the work activity. ✎ All information, observations, previous measurements of airborne lead, calculations, and other documentation that you used to demonstrate employee exposure.
Support an exemption from the shower and lunchroom requirements in WAC 296-857-40040 for construction work during your exposure evaluation period.	As long as the exemption applies.	✎ The same information as listed above in this table.

NEW SECTION

WAC 296-857-300 Medical monitoring.

Your responsibility:

To monitor employee health and prevent health effects associated with lead exposure.

IMPORTANT:

These sections apply when employee exposure is at or above the action level (AL) concentration of 30 micrograms of lead per

cubic meter of air (☞g/m^3).

WAC 296-857-30010
Blood testing and medical examinations.
WAC 296-857-30020
Medical removal.
WAC 296-857-30030
Chelation.
WAC 296-857-30040
Medical records.

NEW SECTION

WAC 296-857-30010 Blood testing and medical examinations.

IMPORTANT:

✎ If you determine whether an employee can safely wear a respirator while following the medical examination requirements in this section, then you also meet the medical evaluation requirement found in another chapter, Respirators, chapter 296-842 WAC.

✎ Tables 7 though 9 are at the end of this section.

You must:

(1) Make blood lead testing available to employees as specified in Table 7, and do all the following:

✎ Provide written notification to each employee tested, within five business days of receiving the employee's results. Make sure the notification informs the employee of:

- Whether the employee's blood lead result is any one of the following:

✂ Below 40 ☞g/dl;

✂ Between 40 ☞g/dl and 50 ☞g/dl;

✂ Over 50 ☞g/dl;

AND

- That temporary medical removal and related benefits are required by this chapter when blood lead levels from a periodic and two-week follow-up blood test exceed 50 ☞g/dl.

✎ Make sure the licensed health care professional (LHCP) providing the blood testing services uses a laboratory approved by OSHA or a laboratory that you verify:

- Currently participates in a blood lead proficiency testing program run by the College of American Pathologists, the New York State Department of Health, or the Wisconsin State Laboratory of Hygiene;

AND

- Has achieved a cumulative score of at least eighty-nine percent during the past twelve months of testing.

✎ Make sure the laboratory uses sampling and analysis methods for blood lead levels and zinc protoporphyrin that are accurate to at least ± 15% with a confidence level of 95%.

Note: Blood sampling and analysis for free erythrocyte protoporphyrin is acceptable as an alternative to the zinc protoporphyrin test.
Although zinc protoporphyrin test results aren't used to determine blood sampling and analysis frequencies, these results are used by LHCPs to gauge an employee's risk for health effects caused by lead exposure.

You must:

(2) Make appropriate medical examinations and consultations available to employees who meet the criteria in Table 8.

✎ When providing medical examinations and consultations, complete the Medical Examination Process, Steps 1 through 10, found in this section.

(3) Provide any blood testing, medical examinations, and medical consultations required by this chapter.

✎ At no cost to employees, including travel costs and wages associated with any time spent obtaining blood testing, medical examinations, and medical consultations.

✎ At reasonable times and places.

(4) Follow the recommendations of the LHCP provided in their written opinion.

Note: Employees who decline to receive blood testing or medical examinations and consultations to monitor for health effects caused by lead are still required to get a separate medical evaluation for respirator use. These requirements can be found in another chapter, Respirators, chapter 296-842 WAC.
The following may represent unlawful discrimination under RCW 49.17.160, Discrimination against employee filing, instituting proceeding, or testifying prohibited--Procedure--Remedy:
– If you discourage employees from receiving blood testing, medical examinations and consultations for health effects caused by lead;
OR
– If you interfere in any way with an employee's decision to continue with blood testing, medical examinations and consultations.

Medical examination process

Step 1: Select a licensed health care professional (LHCP) who will conduct or supervise examinations and consultations.

Step 2: Make sure the LHCP receives, before any medical examination or consultation is performed, all of the following information:

✎ A copy of this chapter (WAC 296-857-100 through 296-857-600).

✎ A description of the duties of the employee being evaluated and how these duties relate to lead exposure.

✎ The anticipated or representative exposure monitoring results for the employee being evaluated, including monitoring results pertaining to any other toxic substances, if applicable.

✎ A description of the personal protective equipment (PPE) each employee being evaluated uses or will use.

✎ Information from previous employment-related examinations, such as prior blood lead determinations and written medical opinions, when you have access to this information and it's not available to the examining LHCP.

✎ Instructions that the written opinions the LHCP provides to you be limited to the following information:

- The LHCP's opinion about whether or not the employee has

medical conditions that would put the employee at increased risk for material impairment to health from exposure to lead;

– Any recommended special protective measures or limitations for the employee's exposure to lead;

– Any recommended limitation on the use of respirators, including a determination of whether the employee can wear a powered air-purifying respirator when an LHCP determines the employee can't wear a negative-pressure respirator;

– Whether the employee's blood lead result is any one of the following:

✂ Below 40 ☞g/dl;

✂ Between 40 ☞g/dl and 50 ☞g/dl;

✂ Over 50 ☞g/dl.

✎ Instruction to advise the employee of any occupational or nonoccupational medical condition that dictates further medical examination or treatment.

Note: You should include a brief statement about the purpose of the examination. Doing this may help you get the information you need to meet the requirements of this chapter. Sample statements for you to consider:
– The examination is to establish routine, baseline medical information for the employee.
– This examination is needed to obtain a second medical opinion to determine if the employee can return to their former job status.

Step 3: Provide medical examinations and consultations to employees. Make sure each medical examination and consultation includes the appropriate content listed in Table 9.

Note: Use Table 8 to determine the type of examination and consultation needed.

Step 4: For each employee who receives a medical examination or consultation required by this chapter, do all of the following:

✎ Obtain the LHCP's written opinion.

✎ Make sure the written opinion is limited to the information specified for written opinions in Step 2, and doesn't contain unauthorized information such as specific findings, test results, diagnoses, or other specific medical information.

✎ Follow the LHCP's recommendations.

Note: If the written opinion contains unauthorized information, send it back and obtain a revised version without the unauthorized information.
You can access specific medical information only if the employee provides the LHCP with a medical release.
Medical removal requirements in WAC 296-857-30020 of this chapter apply when the LHCP's written opinion indicates the employee has a medical condition that puts the employee at increased risk for material impairment to health from lead exposure.

Step 5: Within 5 business days from the day you received the LHCP's written opinion, do all of the following:

✎ Make sure the employee receives a copy of the LHCP's written opinion.

✎ Notify each employee that they may seek a second medical opinion from an LHCP of their choice each time a medical examination or consultation is conducted by an LHCP you selected.

✎ Make sure the notification informs the employee:

– That the employee is expected to do all of the following, when seeking a second opinion, within fifteen business days from

when they receive either your LHCP's written opinion or your notification, whichever is received later:

✂ Inform you, in writing or verbally, that they will seek a second medical opinion;

✂ Initiate steps to make an appointment with the LHCP they select;

✂ Provide written authorization for you to receive a written opinion from the LHCP for the examination.

– That the employer is required to pay for the second opinion when the employee decides to seek this and they meet the fifteen-day deadline. Also, the notification needs to tell the employee how the second opinion will be paid for if the deadline isn't met.

– About the content of the medical evaluation, including:

✂ A review of findings, recommendations, and determinations of the first LHCP;

✂ Examinations, consultations, or tests necessary to obtain their medical opinion.

Note: Your notification to the employee should be in writing.
You may decline to complete and pay for any additional medical examinations when the employee doesn't meet the conditions specified in your notification.
You may follow an alternate process to resolve disagreements about written opinions, as long as it's as expeditious and protective for the employee as Steps 6 through 10.
✎ For example, you and the employee can agree to jointly select the second LHCP and eliminate the need for a third LHCP review.

IMPORTANT:

Follow Steps 6 through 10 once an employee decides to seek a second opinion.

Step 6: Make sure the employee's LHCP (second LHCP) and the third LHCP, if used, receive a copy of the information in Step 2.

Step 7: Provide medical examinations and consultations to employees. Make sure each medical examination includes the appropriate content from Table 9.

✎ During this step, the employee's LHCP:

– Reviews findings, determinations, or recommendations from your LHCP;

AND

– Conducts medical examinations, consultations, and laboratory tests as specified in Table 9.

Step 8: Obtain a written opinion from the employee's LHCP. Make sure the employee receives a copy of the written opinion within five business days from the day you receive it.

✎ Review the findings, determinations, and recommendations in this second opinion and if they're:

– Consistent with the written opinion from your LHCP, make sure you follow the recommendations, and skip Steps 9 and 10.

– Inconsistent with the written opinion from your LHCP, work with the employee to make sure the LHCPs try to resolve any disagreements.

✂ If the LHCPs quickly resolve disagreements, make sure

you follow the joint LHCPs' recommendation and skip Steps 9 and 10.

✂ If disagreements aren't resolved within thirty days, continue to Steps 9 and 10.

Step 9: Work with the employee through your respective LHCP, to select a third LHCP.

✎ The third LHCP:

– Reviews findings, determinations, or recommendations from the previous LHCPs;

AND

– Conducts medical examinations, consultations, and laboratory tests as specified in Table 9.

Note: The employer's LHCP (first LHCP) and the employee's LHCP (second LHCP) may continue to resolve their differences while the third opinion is being scheduled.

Step 10: Obtain a written opinion from the third LHCP. Make sure the employee receives a copy of the written opinion within five business days from the day you receive it.

✎ Follow the third LHCP's recommendations **unless** you and the employee agree to follow the recommendations consistent with one of the three LHCPs.

Table 7
Frequencies for Blood Testing

		If the employee:	Then:
Initial Blood Testing	**Construction Work;** **AND** **Nonconstruction Work.**	✎ Could have exposure to lead at or above the action level (AL) on **any day.**	✎ Make blood sampling and analysis for blood lead level and zinc protoporphyrin available either: – Before the employee's assignment to the job, when you can anticipate such exposure; **OR** – Within forty-eight hours of discovering that exposures could or will meet or exceed the AL.
Periodic Blood Testing	**Construction and Nonconstruction Employees** who could have exposure to lead at or above the AL for **more than thirty days** in any twelve-month period.	✎ Has a blood lead level **below** 40 ☞g/dl.	✎ Make blood sampling and analysis for blood lead level and zinc protoporphyrin available: – At least every two months for the first six months of exposure, for new employees; **AND**

			– At least every six months thereafter. **Note:** ✎ If an employee's only lead exposure occurs occasionally, you may alter timing of blood testing to coincide with peak exposure times, to obtain useful test results.
		✎ Has a blood lead level **between** 40 and 50 ☞g/dl.	✎ Provide blood sampling and analysis for blood lead and zinc protoporphyrin at least every **two months,** until results from two consecutive tests show the blood lead level has decreased to below 40 ☞g/dl.
		✎ Has a blood lead level **above** 50 ☞g/dl.	✎ Provide a **follow-up** blood test within two weeks to confirm this level.
		✎ With a blood lead level above 50 ☞g/dl is **medically removed.**	✎ Provide blood sampling and analysis for blood lead and zinc protoporphyrin at least **monthly** during medical removal, until results from two consecutive tests show the employee's blood lead level has decreased to below 40 ☞g/dl.

Table 8
Employees Eligible for Medical Examinations and Consultation

	If the employee:	Then make available:
Construction Work	✎ Could be exposed to lead at or above the action level (AL) for more than thirty days in a twelve-month period; **AND** ✎ Has had a blood lead level result above 40 ☞g/dl.	✎ A **high blood lead** medical examination and consultation as specified in Table 9, as soon as possible. **Note:** ✎ The examination and consultation needs to be made available as soon as possible if the employee hasn't had an examination in the previous twelve months.

		✎ The medical examination and consultation doesn't have to be provided more frequently than every twelve months.
Nonconstruction Work	✎ Could be exposed to lead at or above the action level (AL) for more than thirty days in a twelve-month period.	✎ An **initial** medical examination and consultation as specified in Table 9, either: – Before the employee's assignment to a job with such exposure; **OR** – Within forty-eight hours of discovering that the job could or does have such exposure; **AND** ✎ A **periodic** medical examination and consultation every twelve months after the initial examination and consultation.
Construction and Nonconstruction employees who could have exposure to lead at or above the action level (AL) **for more than thirty days** in a twelve-month period.	✎ Could be exposed to lead at or above the action level (AL) for more than thirty days in a twelve-month period; **AND** ✎ Notifies you of any of the following: – They have developed signs or symptoms commonly associated with lead poisoning. – They desire medical advice about the of effect of current or past exposure to lead on their ability to procreate a healthy child. – She is pregnant. – They have experienced difficulty in breathing during respirator fit testing or use.	✎ An **unplanned** medical examination and consultation as specified in Table 9, as soon as possible.
	✎ Is medically removed from exposure to airborne lead due to either: – A blood lead level above 50 ☞g/dl; **OR** – A risk for material impairment to health from exposure to lead.	✎ **Medical removal** examinations and consultations with the content specified in Table 9: – As often as medically appropriate; **AND** – When the employee hasn't been returned to their former job status by the end of **eighteen months,** to facilitate **a final medical determination** to obtain a concluding written opinion.

	✎ Requests a **second medical opinion.**	✎ **Second opinion** (and third, if needed) medical examinations and consultations as often as medically appropriate with the content specified in Table 9.

Table 9
Content of Medical Examinations

When conducting:	Include:
An initial, periodic, or high-blood lead medical examination and consultation.	✎ A detailed work and medical history including: – Past exposure to lead (occupational and nonoccupational activities). – Personal habits including smoking and hygiene. – History of gastrointestinal, hematological, renal, cardiovascular, reproductive, and neurological problems. ✎ A complete physical examination with particular attention to: – Teeth and gums. – Gastrointestinal, hematological, renal, cardiovascular, and neurological systems. – Pulmonary status, if respirators will be used. ✎ A blood pressure measurement. ✎ A blood sample and analysis that determines: – Blood lead level (BLL). – Hematocrit and hemoglobin determinations, red cell indices, and examination of peripheral smear morphology. – Zinc protoporphyrin (ZPP) or free erythrocyte protoporphyrin (FEP). – Blood urea nitrogen. – Serum creatinine. ✎ A routine urinalysis with microscopic examination.

	✎ Additional tests the examining LHCP determines are necessary.
An **unplanned** medical examination and consultation.	✎ Content as determined by the examining LHCP; **AND** ✎ A pregnancy test or laboratory evaluation of male fertility, if requested by the employee.
Medical removal examinations and consultations.	✎ Content as determined by the examining LHCP; **AND** ✎ A pregnancy test or laboratory evaluation of male fertility, if requested by the employee; **AND** ✎ A final medical determination within eighteen months from when the removal began.
Second opinion (and third opinion, if needed) examinations and consultations.	Medical examinations, consultations, and laboratory tests as necessary to complete the LHCP's review.

NEW SECTION

WAC 296-857-30020 Medical removal.

You must:

(1) Temporarily remove an employee from areas where lead exposure is at or above the action level (AL) when either of the following occurs:

✎ The written opinion from your LHCP recommends removal from lead exposures due to a medical condition that puts the employee at increased risk for material impairment to health;

OR

✎ Results from a periodic blood test and two-week follow-up show the employee's blood lead level (BLL) is above 50 ☞g/dl.

– If a follow-up blood test isn't conducted within two weeks, temporarily remove the employee from exposure to lead at or above the action level (AL).

(2) Follow any protective measures or limitations specified

for the employee during temporary removal by your LHCP's (first LHCP) written opinion.

✎ When your employee seeks a second opinion, continue to follow your LHCP's written opinion until either:

– You complete Steps 6 through 10 of the medical examination process in the previous section, Blood testing and medical examinations, WAC 296-857-30010;

OR

– You and the employee reach an agreement consistent with the recommendations of one of the LHCPs.

(3) Continue the employee's temporary removal until one of the following occurs:

✎ Results from two consecutive blood tests show the employee's blood lead level has decreased to below 40 ☞g/dl.

✎ The employee's construction job concludes. For example, the employee's hiring agreement specifies work on a single project and the project has been completed.

✎ A final medical determination has been completed. Follow the LHCP's recommendations, including special protective measures and any limitations on the employee's exposure to lead, **and** do either of the following:

– Return the employee to their former job status, when indicated;

OR

– Permanently remove the employee from work with lead exposure at or above the AL.

Note: When returning the employee to their former job status, you may apply terms established by a collective bargaining agreement to make sure the employee's current and previous rights to a specific job classification or position that existed before removal are fulfilled.
Some options for removal, if recommended by the LHCP, may include:
– Reducing the employee's daily exposure time;
– Transferring the employee to another job, if available.

You must:

(4) Provide medical examinations and consultations to obtain a final medical determination, when the employee hasn't been returned to their former job status by the end of eighteen months of temporary removal. This provides you with a concluding written opinion.

✎ For a final medical determination, do all the following:

– Cover the content as detailed in Table 9.

– Follow the medical examination process in the previous section, WAC 296-857-30010.

– Include the employee's medical record as described in Medical records, WAC 296-857-30040, as part of the information you provide the LHCP for this final medical determination.

Note: When a final medical determination allows an employee with a BLL above 40 ☞g/dl to return to his or her former job status, temporary removal:
– Isn't automatically required when the employee's BLL is above 50 ☞g/dl unless specified by a written opinion;
AND
– Is decided by the employer's LHCP. If the employee seeks a second opinion, then temporary removal is decided by the outcome from completing Steps 6 through 10 of the medical examination process found in the previous section, Blood testing and medical examinations, WAC 296-857-30010.

You must:

(5) Maintain medical removal benefits throughout the temporary medical removal period. These include the employee's current pay rate, seniority, and other employment rights and benefits as though the employee had not been removed.

✎ Also provide medical removal benefits to an employee when:

– You choose to medically remove the employee, or place other limitations on the employee;

AND

– Medical removal or limitations aren't required by this chapter.

Note: You may choose to provide medical removal benefits for employees who refuse to participate in blood testing, medical examinations, or medical consultations made available to them during the removal period.
If you are required to provide medical removal benefits and the employee will receive compensation for lost pay from **other sources,** you may reduce your medical removal benefit obligation to adjust for the amount provided by these sources at the time the employee receives such compensation.
– This reduction in your medical removal benefit obligation doesn't include worker's compensation payments the employee receives for treatment-related expenses.
– Examples of other sources are:
✂ Public or employer-funded compensation programs, including worker's compensation programs;
✂ Employment by another employer, made possible by the employee's removal.

NEW SECTION

WAC 296-857-30030 Chelation.

You must:

✎ Make sure all the following is done when the LHCP determines that chelation is an appropriate therapy or diagnostic tool:

– The employee is notified in writing that chelation is necessary, before chelation begins.

– A licensed health care professional (LHCP) supervises chelation in a clinical setting.

– Chelation is administered with thorough and appropriate medical monitoring.

✎ Make sure any person you employ or retain doesn't promote or otherwise engage in prophylactic chelation of any employee.

Note: Prophylactic chelation isn't allowed due to the risk for harmful side effects.

NEW SECTION

WAC 296-857-30040 Medical records.

IMPORTANT:

This section applies any time a medical record is created for an employee exposed to lead.

You must:

✎ Establish and maintain accurate medical records for each employee receiving a blood test, medical examination, or consultation for lead exposure and make sure the records include the following:

– The employee's name and unique identifier;

– A description of the employee's duties;

– A copy of the licensed health care professional's (LHCP's) written opinions;

– The anticipated or representative employee exposure monitoring results provided to the LHCP for the employee;

– A copy of the results of biological monitoring, including blood lead testing;

– A copy of medical examination results including required medical and work histories;

– A copy of any employee medical complaints related to lead exposure;

– A description of laboratory procedures used;

– A copy of any standards or guidelines used to interpret test results, or references to such standards or guidelines.

✎ Establish and maintain accurate medical removal records for each occasion that temporary medical removal occurs, and make sure the records include the following:

– The name and unique identifier of the employee removed;

– The date the employee was medically removed;

– A statement of whether or not removal was due to a blood lead level (BLL) above 50 ☞g/dl;

– A brief description of how each removal was or is being accomplished;

– The date the employee was returned to their former job status.

✎ Maintain medical records for the duration of employment plus thirty years.

✎ Maintain each employee's medical **removal** records for at least the duration of the employee's employment.

Note: Your medical provider may keep these records for you.
Medical removal records may be kept as part of the employee's medical record.
Medical records, except for LHCPs' written opinions, may be accessed only with the employee's written consent.

NEW SECTION

WAC 296-857-400 Exposure control areas.

Your responsibility:

To protect employees from exposure to lead by using feasible exposure controls and appropriate respirators.

WAC 296-857-40010
Exposure control areas.
WAC 296-857-40020
Exposure control plan.
WAC 296-857-40030
Exposure controls.
WAC 296-857-40040
Showering, changing and eating facilities.
WAC 296-857-40050
Protective clothing and equipment.
WAC 296-857-40060
Respirators.

NEW SECTION

WAC 296-857-40010 Exposure control areas.

IMPORTANT:

Exposure control areas required by this chapter may be part of a temporary or permanent worksite.

You must:

✎ Establish temporary or permanent exposure control areas, where employee exposure to airborne lead is above the permissible exposure limit (PEL), by doing all the following:

- Clearly identify the boundaries of exposure control areas from the rest of the workplace in any way that minimizes employee access;

- Post signs at access points to exposure control areas that:

✂ Are easy to read (for example, they are kept clean and well lit);

AND

✂ Include this warning:

WARNING Lead Work Area POISON HAZARD No Smoking or Eating

- Keep signs and areas near them free of statements that contradict or detract from the warning message.

Note: This requirement doesn't prevent you from posting additional signs.

You must:

- Allow only authorized personnel to enter exposure control areas.

- Make sure food, beverages, tobacco products, and gum

aren't present or consumed in exposure control areas. In addition, don't allow cosmetics to be present or applied in these areas.

Note: When distinguishing exposure control areas, you should consider factors such as:
– The level and duration of airborne exposure;
– Whether the area is permanent or temporary;
– The number of employees in adjacent areas.
You may use permanent or temporary enclosures, caution tape, ropes, painted lines on surfaces, or other materials to visibly distinguish exposure control areas or to separate them from the rest of the workplace.
Employees may consume food, beverages, tobacco products, and gum in areas such as clean lunchrooms located within exposure control areas.
Cosmetics may be applied in change rooms and lunchrooms.

NEW SECTION

WAC 296-857-40020 Exposure control plan.

You must:

✎ Establish and implement a site-specific, written exposure control plan that reflects current work conditions and includes **at least** the following for your exposure control areas:

– A description of each activity releasing lead, for example:

✂ The number of employees exposed (crew size);

✂ Employee job responsibilities;

✂ Current exposure controls;

✂ Materials involved;

✂ Equipment used;

✂ Operating procedures;

✂ Maintenance practices.

– Air monitoring data which documents the sources of lead emissions;

– A report of the technology considered for exposure controls;

– A description of what you will do, including engineering plans and studies used as a basis for selecting exposure controls, to reduce lead exposures to:

✂ Below the PEL, if feasible;

OR

✂ The lowest achievable level, when exposures can't be reduced below the PEL.

– A detailed schedule for implementing the plan, including construction contracts, purchase orders for equipment, and other documentation.

– Relevant work practices, including at least:

✂ Use of personal protective equipment, including respirators;

✂ Housekeeping;

✂ Use of change areas, showers, lunchrooms, and handwashing facilities.

– A job rotation schedule, when this will be used to reduce airborne exposure. Include the following information:

✂ Name and unique identifier of each employee on the rotation schedule;

✂ Each employee's daily exposure duration and level at each job or work station location;

✂ Other information that may help evaluate the reliability of using job rotation to reduce airborne exposure.

– Frequent and regular inspections of job sites, materials, and equipment.

✂ When construction work is performed, these inspections must be made by a competent person and documented in writing.

– Other relevant information.

✎ Review and update your exposure control plan to make sure it's effective and reflects current work conditions.

✎ Make your exposure control plan available at the worksite.

✎ Allow affected employees and their designated representatives to review or copy the plan when requested.

NEW SECTION

WAC 296-857-40030 Exposure controls.

IMPORTANT:

✎ Respirators and other personal protective equipment (PPE) are **not** exposure controls.

✎ Exposure controls include the use of ventilation systems, wet methods, and work practices to reduce airborne exposures. For more examples, see Respiratory hazards, chapter 296-841 WAC.

You must:

✎ Use feasible exposure controls to reduce exposures to or below the permissible exposure limit (PEL) or as low as achievable, except as specified in Table 10 for exposures during specified nonconstruction work.

Note: You may use either respirators or a combination of respirators and feasible exposure controls to protect employees from exposure that is between the limit specified in Table 10 and the PEL.

Table 10
Exposure Reduction Levels For Nonconstruction Work

If airborne lead exposures occur for:	**Then use feasible exposure controls to reduce such exposures to below:**

✎ **Less** than thirty days in a twelve-month period.	✎ 200 ☞g/m^3.
✎ **More** than thirty days in a twelve-month period, in either: – The manufacture of brass and bronze ingots; **OR** – A nonferrous foundry with fewer than twenty employees.	✎ 75 ☞g/m^3.

You must:

✎ Do the following when mechanical ventilation is used as an exposure control:

– Routinely measure appropriate system performance indicators such as capture velocity, duct velocity, and static pressure at least every three months to verify the effectiveness of the system.

✂ In addition to routine measurement, measure within five days of any change in production, process, or control that may result in a change in system performance.

Note: A three-month frequency for measuring system performance indicators isn't appropriate for all work circumstances. System performance indicators need to be measured each time the system is set up at a job site or when a system that hasn't been used for a long period of time is put back into operation.
Employee exposure evaluations are required by Exposure evaluations for airborne lead, WAC 296-857-20050, when mechanical ventilation system measurements show that employee exposure could increase. OSHA's Technical Manual provides helpful information for specific construction activities, such as abrasive blasting in Section V, Chapter 3, of the manual. Visit http://www.osha.gov and search the site index for Technical Manual.

You must:

– Make sure you do all the following when ventilation air is recirculated back into the workplace:

✂ Use a high-efficiency particulate air (HEPA) filter and a reliable back-up filter;

✂ Use controls that monitor lead levels in the air returning to the workplace and automatically bypass the system if it fails.

Exemption: When hand-held, vacuum-shrouded tools equipped with HEPA filtration are used during construction work, you aren't required to monitor lead levels in the tool's exhaust air or have an automatic bypass.

You must:

– Make sure the bypass controls are maintained and operated according to the manufacturer's specifications.

NEW SECTION

WAC 296-857-40040 Showering, changing, and eating facilities.

Exemption: You aren't required to provide showers and lunchrooms for construction work tasks listed in Table 4 of this chapter, when

you have documentation showing a reasonable possibility that employee lead exposure will be below the permissible exposure limit (PEL) for the task being performed.
This exemption applies only while you are performing your exposure evaluation required by this chapter in Exposure evaluations for airborne lead, WAC 296-857-20050.

You must:

(1) Provide the following facilities for employees who work in exposure control areas and keep them as free of lead contamination as feasible:

- Shower facilities;
- Clean change rooms with storage for street clothes separated from storage for protective clothing, work clothes, and protective equipment, to prevent cross-contamination from lead;
- Lunchrooms.

Note: Lunchrooms may be located within exposure control areas, but are considered separate from the exposure control area.
You may provide eating areas instead of lunchrooms for employees performing construction work.
Change areas are allowed for employees performing construction work as long as they are kept clean and meet other requirements in this chapter.

You must:

(2) Make sure employees who work in exposure control areas:

- Do either of the following before leaving the exposure control area to enter the eating areas or lunchroom:

– Remove protective clothing and equipment;

OR

– Remove dust from protective clothing and equipment using cleaning methods that don't disperse lead dust, such as vacuums equipped with HEPA filters.

- Wash their hands and faces before eating, drinking, smoking, applying cosmetics, or taking breaks.
- Shower at the end of the work shift.
- Don't leave the workplace wearing any clothing or equipment worn while working in the exposure control area.

Note: Clothing includes shoes or boots, unless effective shoe covers are used in the exposure control area.

You must:

(3) Make sure eating areas such as lunchrooms:

- Are located so they are readily accessible to the employees;

AND

- Meet these additional requirements when lunchrooms are provided and located inside exposure control areas:

– Operate with a temperature-controlled, HEPA-filtered air supply;

– Operate under positive pressure compared to surrounding areas;

– Are maintained below the permissible exposure limit (PEL).

NEW SECTION

WAC 296-857-40050 Protective clothing and equipment.

You must:

(1) Provide employees with appropriate protective clothing and equipment as follows:

✎ Provide clean and dry protective clothing to employees at the frequencies in Table 11.

Table 11
Frequencies For Providing Protective Clothing

For employees with an 8-hour exposure level:	Provide protective clothing at least:
Above the permissible exposure limit (PEL) but **below** 200 micrograms per cubic meter (☞g/m^3)	Weekly
Above 200 ☞g/m^3	Daily

Note: You may choose to launder protective clothing or replace it at the required frequency.
Examples of protective clothing appropriate for lead exposures include:
– Coveralls or similar full-body work clothing;
– Gloves;
– Hats;
– Shoes or disposable shoe covers;
– Face shields or vented goggles, when necessary to prevent eye irritation.

You must:

(2) Make sure PPE is used and maintained by making sure:

✎ Employees don't:

– Remove lead from PPE by blowing, shaking, or other actions that release lead dust into the air;

– Clean or launder protective clothing or equipment at home.

✎ Employees put on protective clothing in a clean change room.

✎ Protective clothing is removed:

– In change rooms;

AND

– Prior to leaving the work site.

✎ Contaminated protective clothing that will be cleaned, laundered, or disposed of, is placed in a closed container that:

– Prevents the release of lead;

AND

– Is located in the change room.

✎ It's repaired or replaced, as needed, to maintain effectiveness.

(3) Inform individuals who clean or launder protective

clothing about the potentially harmful health effects associated with lead, by doing all the following:

✎ Provide this information in writing. For example, you can provide a copy of Health and hazard information about lead, found in WAC 296-857-50010.

✎ Label containers of contaminated PPE with the following warning:

CAUTION: Clothing contaminated with lead Do not remove dust by blowing or shaking Dispose of lead-contaminated wash water as applicable local, state, or federal regulations require

NEW SECTION

WAC 296-857-40060 Respirators.

IMPORTANT:

✎ This section applies when:

– Employee exposure is above the permissible exposure limit (PEL), such as when, the employee performs a task listed in Table 4 of this chapter;

OR

– An employee exposed to lead requests a respirator.

✎ The requirements in this section are in addition to the requirements in:

– Respiratory hazards, chapter 296-841 WAC;

– Respirators, chapter 296-842 WAC.

✎ Medical examinations meeting applicable requirements in WAC 296-857-30010 meet the medical evaluation requirement found in Respirators, chapter 296-842 WAC, when the examination includes an evaluation of the employee's ability to use a respirator.

You must:

✎ Develop a written respirator program as required by another chapter, Respirators, chapter 296-842 WAC, and include the following additional requirements:

– That employees use respirators when:

✂ They're in an exposure control area;

✂ Feasible exposure controls are being put in place;

✂ You determine that exposure controls aren't feasible;

✂ Feasible exposure controls don't reduce exposures to, or below, the PEL;

✂ They're performing tasks listed in Table 1 that are presumed to have exposures above the PEL;

✂ Responding to emergencies;

✂ An employee requests a respirator.

– Make sure air-purifying respirators selected have high-efficiency particulate air (HEPA) filters or N-, R-, or P-100 filters.

– Provide an employee with a powered air-purifying respirator (PAPR) when this type of respirator will provide proper protection and:

✂ A licensed health care professional (LHCP) allows this type of respirator in their written opinion;

AND

✂ The employee chooses to use this type of respirator.

NEW SECTION

WAC 296-857-500 Essential information.

Your responsibility:

To make sure employees and licensed health care professionals (LHCPs) receive a standard level of information about lead.

WAC 296-857-50010

Health ~~and hazard~~ information about lead.

WAC 296-857-50020

Medical guidelines.

NEW SECTION

WAC 296-857-50010 Health information about lead.

You must:

✎ Provide a copy of this section to:

– Employees as required in Training, WAC 296-857-20020;

AND

– Licensed health care professionals as required in Steps 2 and 6 of the medical examination process found in Blood testing and medical examinations, WAC 296-857-30010.

Table 12
General Health Information About Lead

What is lead?

In this chapter, the word "lead" means:

- Elemental lead (metallic).
- All inorganic lead compounds such as those found in paint.
- A class of organic lead compounds called **lead soaps.**

Tetraethyl lead and all other organic lead compounds aren't covered by this chapter.

How does lead get into my body?

- Breathing (inhaling) lead can occur when you are exposed to lead-containing particles such as dust, fume, or mist. Once inhaled, these particles deposit lead in your upper respiratory tract and lungs.
- Swallowing (ingesting) lead can occur when:
  - You have lead on your hands and then handle food, smoke cigarettes, or put on lipstick or lip balm;
    OR
  - Food, cigarettes, or other items have been placed where lead could settle on them, and then you put the contaminated items in your mouth.
- Lead particles brought home on your clothes, shoes, or body can be inhaled or ingested by household members.
- Lead is not absorbed through your skin, except for tetraethyl lead and other organic lead compounds that aren't covered by this chapter.

What happens after lead enters my body?

- Once you inhale or swallow lead, it is absorbed into your blood and circulates throughout your body.
  - Nearly all (ninety-five percent) of **inhaled** lead is absorbed by your blood, while about ten percent of **ingested** lead is absorbed. By contrast, children can absorb five times as much ingested lead as adults.
- Some of this **blood lead** is quickly excreted from the body in urine. The remaining blood lead is transported to various organs and body tissues where it's stored.
  - Most of the blood lead (ninety percent) gets stored in your bones. This stored lead is released back into your blood over time.
  - The amount of stored lead grows when you keep absorbing more lead than your body excretes.
  - The more lead you store, the greater your chances of substantial and permanent damage to your body and health, in both the short term and long term.
- Even if you aren't having immediate symptoms, stored lead may cause irreversible damage; first to individual cells, then to organs, then to whole body systems.
- You may not feel the effects of stored lead for years, and when you finally do, there may not be much that can be done about it.

Why is it important to monitor my blood lead levels?

- There is an established link between blood lead levels and various health effects.
- Your blood lead level is an important indicator of how likely you are to acquire, over time, a lead-related health problem. **A measurement of your blood lead level:**
  - Shows how much lead is currently in your blood. This includes:
    - Lead absorbed due to recent exposures;

    AND

    - Stored lead (from past exposure) being released from bones and other organs/body tissues.
  - Won't tell you how much lead is stored in your bones and other organs/body tissues.
  - Is abbreviated as "PbB" and usually reported as an amount of lead per a standard amount (volume) of blood:
    - Micrograms of lead per deciliter of blood (abbreviated as "☞g/dl blood").
- **Your risk for having a lead-related health problem increases when your blood lead level gets above 40 ☞g/dl. Your risk continues to increase the longer your blood lead level remains above 40 ☞g/dl.**
  - Individual responses to lead vary. Current research shows some individuals experience health problems when their blood lead level is as low as 25 ☞g/dl.
  - In addition to blood testing, you'll need regular medical examinations and consultations to further monitor your health when your blood lead level climbs above 40 ☞g/dl.

What health effects are linked with lead exposure?

- Lead is a potent, systemic poison and affects many body organs and systems. **Early symptoms** of lead poisoning are often subtle and nonspecific.
  - Nervous system symptoms include:
    - Listlessness.
    - Fatigue.
    - Irritability.
    - Sleep disturbance.
    - Headache.
    - Difficulty concentrating.
    - Decreased libido (sex drive).
  - Digestive system symptoms include:
    - Abdominal cramps (lead colic).
    - Loss of appetite (anorexia).

- ✂ Nausea.
- ✂ Constipation.
- ✂ Diarrhea.
- – Musculoskeletal system symptoms include:
- ✂ Joint pain (arthralgia).
- ✂ Muscle pain or tenderness (myalgia).

✎ The health impairment and disease that lead causes can show up after periods of exposure **as short as days or as long as several years.**

– Very high, short-term exposures are extremely unusual, but not impossible. For example, if a single dose of lead is large enough, it can kill you in a matter of days. Serious brain damage **(acute encephalopathy)** may arise quickly after such exposures, beginning with seizures; followed by coma and then death from cardiorespiratory arrest (your brain stops telling your heart to beat and your lungs to breathe).

– It's more common to have exposure to **low levels** of lead (though still above the permissible exposure limit) sustained over a long period of time such as months or years (chronic exposure).

✎ At present, evidence is inadequate to determine whether lead causes **cancer** in humans.

✎ Tables 13 and 14 provide the broad range of health effects associated with lead exposures.

Table 13
Health Effects of Lead (Nonreproductive System Effects)

Affected Body System or Organ	Health Effect	Associated Symptoms
Digestive System	✎ Colic – This is a consistent, **early** health effect linked to lead poisoning. – Colic **typically** occurs at blood lead levels of 100-200 ☞g/dl. – This **rarely** develops at blood lead levels as low as 40-60 ☞g/dl.	✎ Abdominal pain. ✎ Cramps. ✎ Constipation. ✎ Nausea and vomiting. ✎ Loss of appetite (anorexia). ✎ Weight loss. ✎ Blocked bowel (obstipation). ✎ Diarrhea.
Blood-Forming System	✎ Anemia.	✎ No symptoms may be evident if the anemia is mild.

	– This is one of the **earliest** demonstrated effects of lead's ability to interfere with the blood-forming process. – Anemia **typically** occurs at blood lead levels of 50 ☞g/dl.	✎ When anemia is more severe, it's associated with a wide variety of symptoms, including: – Dizziness. – Paleness (pallor). – Getting tired easily (fatigue). – Irregular heart beat (tachycardia). – Weakness.
Nervous System (including the brain)	✎ Peripheral neuropathy (damage to nerves of the limbs, hands, and feet). – This is the most common manifestation of nervous system disease. – Early signs of this effect can be measured when blood lead levels are as low as 50 ☞g/dl, but symptoms often aren't observable at this stage. – Occasionally peripheral neuropathy can be reversed with therapy, but this is less likely in severe cases and any improvement is often only partial.	✎ Painless muscular weakness may be the first clinical symptom of peripheral neuropathy, usually involving the fingers and hand in the most active extremity. ✎ As peripheral neuropathy progresses, muscular paralysis is observed as: – "Wrist drop." – "Foot drop" (less common).
	✎ Neurotoxic effects manifesting as behavioral **disturbances:** – The risk for earliest symptoms can occur when blood lead levels are 60 ☞g/dl. – Central nervous system effects are frequently **not reversible** even if exposure stops and the person receives chelation therapy. If improvement does occur, typically it's only partial.	✎ The earliest symptoms are: – Irritability. – Restlessness. – Insomnia and other sleep disturbances. – Fatigue. – Dizziness (vertigo). – Headache. – Poor memory. – Tremor. – Depression. – Apathy. ✎ With more severe exposure, symptoms can progress to: – Drowsiness. – Stupor. – Hallucinations.

		– Delirium. – Convulsions. – Coma.
	✎ Brain damage (lead encephalopathy). – The onset of symptoms may arise suddenly and death may result within forty-eight hours. – Severe brain damage is generally observed at extremely high blood lead levels, for example, 460 ☞g/dl. – Symptoms of brain damage may occur at blood lead levels as low as 50 ☞g/dl.	The most severe, often fatal, form of brain damage may be preceded by: ✎ Vomiting. ✎ A feeling of dullness progressing to drowsiness and stupor. ✎ Poor memory. ✎ Restlessness. ✎ Irritability. ✎ Tremor. ✎ Convulsions. ✎ Coma. ✎ Cardiorespiratory arrest.
Cardiovascular System	✎ Hypertension (increased blood pressure). – This has been associated with blood lead levels as low as 30 ☞g/dl.	✎ High blood pressure.
Immune System	✎ Increased susceptibility to colds (due to decreased production of antibody and immunoglobulin plaque-forming cells). – Some evidence shows effects at blood lead levels between 20 and 85 ☞g/dl, but one study shows no effects at blood lead levels less than 50 ☞g/dl.	✎ Symptoms linked with immune suppression.
Kidneys	✎ Kidney disease (lead nephropathy). – People with lead-related kidney dysfunction may need kidney dialysis, or may die.	✎ Early kidney damage is often asymptomatic (you won't feel or see any symptoms). ✎ Specific testing may detect early signs, for example, nuclear inclusion bodies can frequently be identified in proximal renal tubular cells. ✎ Progressive interstitial fibrosis and impaired renal function are found as disease advances.
Gums	✎ Lead line (an irregular purplish line on the gums). – If present, this usually indicates severe and prolonged lead poisoning.	

Table 14
Reproductive System Health Effects of Lead

General Information	✎ Lead affects the reproductive system in both women and men, and can injure fetuses during pregnancy. ✎ There is evidence of miscarriage and stillbirth when **EITHER** the woman **OR** her male partner was exposed to lead. ✎ WISHA recommends that women and men who wish to have children keep their blood lead level **below** 30 ☞g/dl due to: – Lead's ability to pass through the placenta to the fetus. – Lead's demonstrated adverse health effects on reproductive function in both males and females. – The risk for genetic damage to the ovum and sperm.
Women	✎ Decreased fertility. ✎ Abnormal menstrual cycles including: – Very painful periods (dysmenorrheal). – Heavy or long periods (menorrhagia). – Lack of periods (amenorrhea). ✎ Miscarriages. ✎ Premature births. ✎ Stillbirths.
Men	✎ Decreased sex drive. ✎ Impotence (inability to have an erection). ✎ Sterility or very low sperm production (hypospermia), making it more difficult to impregnate a woman. ✎ Malformed sperm (teratospermia), making it more difficult to impregnate a woman. – As exposure to lead increases, the number of malformed sperm also increases. – This causes a risk for birth defects when the woman conceives. ✎ Sperm with decreased motility, making it more difficult to impregnate a woman.

Fetuses	✎ Lead crosses the placenta and enters the blood of the fetus. Once this occurs it can affect the fetus as it develops or tries to develop. ✎ Lead crossing the placenta can be detected as early as twelve to fourteen weeks into the pregnancy, and the amount that crosses continues to go up as the pregnancy progresses. By the time of birth, the amount of lead in the fetus's blood matches the amount in the mother's blood. ✎ Although there is little direct data on a fetus being damaged from exposure to lead (because such research presents many difficulties), it is generally assumed that a fetus and a newborn would be at least as susceptible to neurological damage as young children. ✎ Given the overall body of literature about how lead damages the health of children, WISHA **recommends you follow current public health guidance about maintaining safe blood lead levels in fetuses and children.** **Link:** Visit www.doh.wa.gov and click on "Topics A - Z" index to find lead information for children.
Children	✎ A child who has **one or both** parents who were exposed to excess levels of lead is **very likely** to face lifelong difficulties in the form of: – Birth defects. – Mental retardation. – Behavioral disorders that affect development and socialization. ✎ If a child's mother has had lead poisoning, the child is: – Likely to have: ✂ A lower weight at birth, which poses survival risks. ✂ Slower growth. ✂ Nervous system disorders.

	– More likely to die during the first year of childhood. ✎ Children with blood lead levels: – Of 50-60 ☞g/dl can have significant neurobehavioral impairments (behavior problems stemming from brain and nerve problems). – As low as 25 ☞g/dl may show lead-related hyperactivity. ✎ Given the overall body of literature about how lead damages the health of children, WISHA **recommends you follow current public health guidance about maintaining safe blood lead levels in fetuses and children.** **Link:** Visit www.doh.wa.gov and click on "Topics A - Z" index to find lead information for children.

NEW SECTION

WAC 296-857-50020 Medical Guidelines.

You must

- Provide a copy of the medical guidelines in this section to:
  - Employees as required in Training, WAC 296-857-20020
    AND
  - Licensed health care professionals (LHCPs) as required in Steps 2 and 6 of the Medical Examination Process found in Blood Testing and Medical Examinations, WAC 296-857-30010.

Medical Guidelines
For Evaluating Employees With Lead Exposure

Part 1: WISHA's Requirements

In addition to requiring employers to train employees and protect them from lead exposure, this chapter (the Lead 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 lead.

The employer initiates this partnership by providing the LHCP with a copy of the rule and other supporting information. The LHCP can then **become familiar** with the medical monitoring requirements found in **WAC 296-857-30010 through 30040,** which address:

- Routine blood sampling and analysis
- Routine and unplanned medical examinations and consultations
- Medical opinions (including 2nd opinions)
- Notifications of blood test results
- Medical removal of an employee
- Restrictions for chelation therapy
- Medical records retention and content

Part 2. Lead Toxicology

Lead can affect many organ systems and can produce a wide array of signs and symptoms, some of which are nonspecific and subtle in nature, at least in the early stages of disease. Health Information About Lead **WAC 296-857-50010** of this chapter provides **basic information** about the health effects and symptoms associated with lead exposure.

In addition, consider the following information:

- Wide variation exists in individual susceptibility to lead poisoning. Clinically, the **most sensitive systems** are the:
  - Nervous system
  - Hematopoietic (blood forming) system
  - Gastrointestinal system
  - Cardiovascular system
  - Musculoskeletal system
  - Renal system
  - Reproductive system

- Lead had been found to have toxic effects on both the **central and peripheral nervous systems.**
  - The peripheral neuropathy resulting from lead exposure characteristically involves only motor function with minimal sensory damage and has a marked predilection for the extensor muscles of the most active extremity.
  - In addition to slowing of nerve conduction, electromyographical studies in patients with blood lead levels greater than 50 µg/dl have demonstrated a decrease in the number of acting motor unit potentials, an increase in the duration of motor unit potentials, and spontaneous pathological activity including fibrillations and fasciculation. Whether these effects occur at levels of 40 µg/dl is undetermined.
  - The lack of reversibility for peripheral neuropathy is possibly due in part to segmental

demyelination.

- The earliest demonstrated effect of lead involves its ability to inhibit at least two enzymes of the **heme synthesis** pathway at very low blood levels.
  - Inhibition of delta aminolevulinic acid dehydrase (ALA-D), which catalyzes the conversion of delta-aminolevulinic acid (ALA) to protoporphyrin, is observed at a blood lead level below 20 µg/dl whole blood. At a blood lead level of 40 µg/dl, more than 20% of the population would have 70% inhibition of ALA-D. There is an exponential increase in ALA excretion at blood lead levels greater than 40 µg/dl.
  - Another enzyme, ferrochelatase, is also inhibited at low blood lead levels. Inhibition of ferrochelatase leads to increased free erythrocyte protoporphyrin(FEP) in the blood which can then bind to zinc to yield zinc protoporphyrin. At a blood lead level of 50 µg/dl or greater, nearly 100 % of the population will have an increase FEP.
    - There is also an exponential relationship between blood lead levels greater than 40 µg/dl and the associated ZPP level, which has led to the development of the ZPP screening test for lead exposure.
  - While the significance of these effects is subject to debate, it is WISHA's position that these enzyme disturbances are early stages of a disease process which may eventually result in the clinical symptoms of lead poisoning. Whether or not the effects do progress to the later stages of clinical disease, disruption of these enzyme processes over a working lifetime is considered to be a material impairment of health.
  - Studies have indicated that most cases of lead-induced anemia, as well as shortened red-cell survival times, occur at lead levels exceeding 80 µg/dl. Inhibited hemoglobin synthesis is more common in chronic cases, whereas shortened erythrocyte life span is more common in acute cases.
    - In lead-induced anemias, there is usually a reticulocytosis along with the presence of basophilic stippling, and ringed sideroblasts, although none of the above are pathognomonic for lead-induced anemia.
- **Vascular and electrocardiographic changes** have been detected but have not been well characterized.
- **Renal toxicity** represents one of the most serious health effects of lead poisoning.
  - Early kidney disease is difficult to detect but probably reversible. The urinalysis is normal in early lead nephropathy and the blood urea nitrogen and serum creatinine increase only when two-thirds of kidney function is lost.
  - Measurement of creatinine clearance can often detect earlier disease as can other methods of measurement of glomerular filtration rate. An abnormal Ca-EDTA mobilization test has been used to differentiate between lead-induced and other nephropathies, but this procedure is not widely accepted.
  - A form of Fanconi syndrome with aminoaciduria, glycosuria, and hyperphosphaturia indicating severe injury to the proximal renal tubules is occasionally seen in children.
  - If kidney disease progresses, eventually extensive interstitial fibrosis ensues with sclerotic glomeruli and dilated and atrophied proximal tubules; all represent end stage kidney disease. Azotemia can be progressive, eventually resulting in frank uremia necessitating

dialysis. There is occasionally associated hypertension and hyperuricemia with or without gout.

- Exposure to lead can have serious effects on **reproductive function** in both males and females.
  - In male employees exposed to lead there appears to be a dose-response relationship for teratospermia.
  - Lead can pass through the placental barrier and lead levels in the mother's blood are comparable to concentrations of lead in the umbilical cord at birth. Transplacental passage becomes detectable at 12-14 weeks of gestation and increases until birth.

- Lead is thought to impair **thyroid function** and interfere with the **pituitary-adrenal axis**, but these effects have not been well defined.

References:

➢ Other sources for toxicology information include:

- Toxicological Profile for Lead. This document is from the Agency for Toxic Substances and Disease Registry (ATSDR) can be obtained by:
  - Visiting http://www.atsdr.cdc.gov/toxprofiles
    or
  - Calling 1-888-422-8737
- The OLPPP/HESIS Medical Guidelines: The Lead-Exposed Worker (July 2001). This guideline is from the Occupational Health Branch of the California Department of Health Services and can be obtained by:
  - Visiting http://www.dhs.ca.gov/ohb/OLPPP/medgdln.pdf
    or
  - Calling (510) 622-4300

Part 3: Setting Health Protection Goals

Although this chapter (the Lead rule) establishes a blood lead level (BLL) of **50 µg/dl** (or higher) as a trigger for removal of an individual from airborne exposure to lead above the action level (AL) of 30 µg/dl, the **LHCP's recommendations may be more stringent.** This flexibility:

- Is important for minimizing risk for adverse reproductive health effects to male and female employees. For example, BLLs of these individuals should be maintained below **30 µg/dl**. This will also minimize risk for health effects to the developing fetus.
- Allows the LHCP to restrict an individual's exposure to lead **regardless of the individual blood lead level result**, when the LHCP finds the individual is at increased risk for material impairment due to a medical condition.

The LHCP may work with the employer to go beyond the **minimum** requirements of this chapter and set a **more restrictive health protection goal** for individuals exposed to lead. For example, the LHCP can decide to follow the United States Public Health Services's goal of maintaining blood lead levels below **25 µg/dl.**

Part 4: Screening tests

Blood testing

Venous blood lead level (**BLL**) testing is the most useful screening and diagnostic test for recent or current lead absorption when there's no anemia present and the individual hasn't taken chelating substances. **BLLs respond relatively rapidly to abrupt or intermittent changes** in lead intake, and, for relatively short exposure periods, have a linear relationship to those intake levels.

- For individuals with high or chronic past exposure, BLLs often under-represent an individual's total body burden since most lead is stored in the bones. Consequently, a low BLL doesn't exclude an elevated total body burden of lead (stored lead in the bone, liver, kidney, and brain).
- During 1988-1991, the average BLL for adults was 3.0 µg/dl.
- When conducting blood testing:
  - Clean the skin thoroughly to avoid contamination from lead residues
  - Use lead-free blood containers
  - Have samples analyzed by an OSHA-approved laboratory or by a laboratory that meets the criteria in WAC 296-857-30010 of this chapter. The method of analysis used must also meet the criteria in that section.

A zinc protoporphyrin (**ZPP**) measurement is also required each time a blood lead level is measured. ZPP is a more reliable indicator of chronic lead absorption than BLL since it reflects lead absorption over the preceding 3 to 4 months. Analysis for free erythrocyte protoporphyrin (**FEP**) is acceptable as an alternative to ZPP testing.

- An increase in ZPP indicates lead is affecting the heme synthesis pathway. Lead prevents the enzyme ferrochelatase from inserting iron into the protoporphyrin molecule. As a result, zinc is substituted for iron in the protoporphyrin molecule, forming ZPP instead of heme.
- Normal values of ZPP are usually below 35 µg/dl. Increased ZPP can begin at a BLL as low as 20 µg/dl in some adults, but the test is not >90% sensitive until BLL exceeds 50 µg/dl. An elevated ZPP usually lags an increase in BLL by 2 to 6 weeks.
- ZPP is measured directly in red blood cells and is present for the cell's entire 120-day lifespan. The mean half-life of ZPP is 68 days.
- The hematofluorimeter is accurate and portable and can provide on-site, instantaneous results for employees who can be frequently tested via a finger prick. ZPP has a characteristic fluorescence spectrum with a peak at 594 nm.
- Careful attention must be given to calibration and quality control procedures. Limited data on blood lead ZPP correlations and the ZPP levels which are associated with adverse health effects are the major limitations of the test. Also it is difficult to correlate ZPP levels with environmental exposure and response varies somewhat with age and sex. Nevertheless, the ZPP promises to be an important diagnostic test for the early detection of lead toxicity, and its value will increase as more data is collected regarding its relationship to other manifestations of lead poisoning.

Urine Testing

Levels of delta-aminolevulinic acid (**ALA**) in urine are also used as a measure of lead exposure. ALA testing is relatively easy to perform, is inexpensive, and provides quick results. Disadvantages include:

- Variability in results
- Technical difficulty of obtaining complete 24-hour urine samples
- The necessity for the sample to have a specific gravity greater than 1.010
- The degradation of ALA in the presence of light.

Urinary lead level testing should **not** be used as a routine test. Workers with renal insufficiency, whether due to lead or some other cause, may have decreased lead clearance and, consequently, urine lead levels may underestimate true lead burden. In addition, this is considered to be less reliable than analysis of whole blood due to:

- Individual variability in urinary excretion capacity
- Technical difficulty of obtaining accurate 24-hour urine samples

The **pattern of urinary porphyrins** can be helpful in identifying lead poisoning. With lead poisoning, the urine concentrations of coproporphyrins I through III, porphobilinogen, and uroporphyrin I rise.

- The rise in coproporphyrin III is especially important to monitor. Levels exceed 5,000 ug/l in lead poisoned individuals, but correlation with BLL and ZPP aren't as good as those of ALA.
- Increases in urinary porphyrins aren't diagnostic of lead toxicity. Such increases may be seen with other conditions such as porphyria, some liver diseases, and in individuals with high reticulocyte counts.

Part 5: Clinical Evaluation of Employees Exposed to Lead

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 Work and Medical Histories

When obtaining **work history** from lead-exposed employees, ask the employee to describe current and past:

- Job duties and work processes where lead exposure occurred
- Forms of lead the employee was exposed to, such as dust or fume.
- Known exposures to other toxic substances
- Use of personal protective equipment used, including respiratory protection and a description of the equipment
- Medical monitoring, if any
- On-the-job personal hygiene practices, such as frequency of hand washing
- Smoking and eating habits in work areas, such as snacking while working
- Laundry procedures

It is also essential to get a thorough **medical history** that describes current and past:

- Medical conditions including any related to the following systems:
  - Hematological
  - Neurological

  - Gastrointestinal
  - Renal
  - Psychological
  - Gynecological or urological
  - Genetic
  - Reproductive
- Medications
- Surgeries and hospitalizations
- Allergies
- Smoking habits, if any
- Alcohol consumption, if any
- Non-occupational activities that can involve lead exposure, such as
  - Hunting, or firing range activities using lead-containing ammunition
  - Soldering with lead-containing solder
  - Arts that can involve lead such as pottery or stained glass
  - Vintage house restoration that disturbs lead paint
  - Collecting such as antique metal toys or lead soldiers

Ask the employee about potential **lead exposure during childhood.** Address:

- Peeling paint around the house
- Parental work
- Parental hobbies such photographic processes in a darkroom, stained glass, and re-loading
- Lead-containing substances routinely in use such as on a farm
- Growing up near a factory or manufacturing plant that used lead in its processes or products

Guidance for Physical Examinations

Include the following in your physical examination, with particular emphasis on the neurological, gastrointestinal, and cardiovascular systems:

System	Symptoms to look for
General	• Weight loss • Fatigue • Decreased appetite
Head, Eyes, Ears, Nose, Throat (HEENT)	• Headaches • Visual disturbance or decreased visual acuity

	• Hearing deficits or tinnitus • Pigmentation of the oral mucosa (lead line), or metallic taste in mouth
Cardiopulmonary	• Shortness of breath • Cough • Chest pains • Palpitations • Orthopnea
Gastrointestinal	• Nausea • Vomiting • Heartburn • Abdominal pain • Constipation or diarrhea
Neurological	• Irritability • Insomnia • Weakness (fatigue) • Dizziness • Loss of memory • Confusion • Hallucinations • Lack of coordination • Ataxia • Decreased strength in hands or feet • Disturbance in gait • Difficulty in climbing stairs • Seizures
Hematological	• Pallor • Easy fatigability • Abnormal blood loss • Melena

Reproductive (male or female, and spouse where relevant)	Any history of • Infertility or sterility • Impotence • Loss of libido • Abnormal menstrual periods • Miscarriages • Stillbirths • Children with birth defects
Musculoskeletal	• Muscle pains • Joint pains

You also need to:

- Check weight and blood pressure.
- Check the oral mucosa for pigmentation characteristic of possible Burtonian or lead line on the gingiva. However, bear in mind there may be no lead line even in severe lead poisoning if the employee thoroughly brushes and flosses daily.
- Be aware of skin pallor that might indicate anemia. Severe anemia might also be associated with a tachycardia. If you suspect anemia, look carefully to rule out blood loss, including through the gastrointestinal tract, as the source of the anemia before you consider lead poisoning.
- Do a complete neurological examination, including an adequate evaluation of the employee's mental state that covers:
  - Behavioral and psychological disturbances
  - Memory
  - Irritability
  - Insomnia
  - Hallucinations
  - Mental clouding
- Examine the employee's gait and coordination
- Observe closely for tremor
- Do a careful and detailed evaluation of peripheral nerve function including tests of sensory and motor function.
- Do strength testing, particularly of extensor muscle groups of all extremities.
- Do a cranial nerve evaluation
- Examine the abdomen thoroughly, making sure you
  - Auscultate for bowel sounds and abnormal bruits
  - Palpate for:
    - Organomegaly
    - Masses

- Diffuse abdominal tenderness

- Evaluate for possible early signs of congestive heart failure during the cardiovascular examination
- Assess the employee's pulmonary status, particularly if they may be expected to wear a respirator to protect from lead exposure
- Perform any laboratory tests as required in WAC 296-857-30010 of this chapter. In addition to these tests, you can order any other tests you deem necessary according to sound medical practice. Bear in mind that sophisticated and highly specialized testing should not be done routinely. When it is necessary, it should be done under the direction of a specialist.

Guidance for Follow-up Evaluations

If the **blood lead level and ZPP level** are equivocal, you may also find it appropriate to order the following tests:

- Delta aminolevulinic acid and coproporphyrin concentrations in the urine
- Dark-field illumination to detect basophilic stippling in red blood cells

It is recommended that a hematocrit be determined whenever a confirmed **ZPP of 50 µg/dl** is obtained to rule out a significant underlying anemia.

- If the ZPP is **in excess of 100 µg/dl** and not associated with abnormal elevations in blood lead levels, the laboratory should be checked to be sure the blood leads were determined as required by this chapter in WAC 296-857-30010.
- Blood lead studies should be repeated for all individuals with elevated ZPP levels to be certain that an associated elevated blood lead level has not been missed due to transient fluctuations in blood leads.

If you detect **anemia**, the following studies may be of value in identifying its cause:

- Examining the peripheral smear
- Requesting reticulocyte count
- Examining the stool for occult blood
- Checking serum iron and total iron binding capacity
- Checking bilirubin
- Checking for appropriate levels of vitamin B12 and folate, if appropriate

If you suspect a **peripheral neuropathy**, request nerve conduction studies. These studies have value both for diagnosis and as a baseline for monitoring the result of any therapy or comparing with future tests.

If you suspect **renal disease**, consider a 24-hour urine collection to check the following:

- Creatinine clearance
- Protein
- Electrolytes

Lead-induced renal disease may cause elevated uric acid, so there might also be value in requesting a check of the serum uric acid level.

If there seems to be **cardiovascular or cardiopulmonary** problems, you may choose to request an electrocardiogram and

chest x-ray.

Part 6: Chelation

The decision to initiate chelation therapy must be made on an individual basis and take into account the severity of symptoms felt to be a result of lead toxicity along with blood lead levels, ZPP levels and other laboratory tests as appropriate. **Unless frank and severe symptoms are present, therapeutic chelation is not recommended, given the opportunity to remove an employee from exposure and allow the body to naturally excrete accumulated lead.**

- EDTA and penicillamine, which are the primary chelating agents used in the therapy of occupational lead poisoning, have significant potential side effects and their use must be justified on the basis of expected benefits to the worker.

- As a diagnostic aid, the chelation mobilization test using CA-EDTA has limited applicability. According to some investigators, the tests can differentiate between lead-induced and other nephropathies. The test may also provide an estimation of the mobile fraction of the total body lead burden.

NEW SECTION

WAC 296-857-600 Definitions.

Action level

An airborne concentration of lead of 30 micrograms per cubic meter ($\mu g/m^3$) of air, calculated as an 8-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.

Chelation

Involves the use of a compound to bind and remove lead from the body. Chelation is used in 3 ways:

- For diagnosis of lead poisoning or lead-induced disease.
- For treatment of employees **with** symptoms of severe lead poisoning.
- To decrease blood lead levels in individuals when an LHCP hasn't determined this to be medically necessary. When chelation is used in this way, it's called **prophylactic chelation** and isn't permitted by this chapter due to the risk for serious side effects.

Competent person

- Is capable of identifying existing and predictable lead hazards in the surroundings or working conditions that are hazardous or dangerous to employees

AND

- Has the authority to take prompt corrective measures to eliminate them.

Construction work

Work done to construct, repair, demolish, or alter including the following examples:

- Installation of products containing lead
- Removal or encapsulation of materials containing lead, including lead abatement and inspection activities
- Demolition or salvage of structures where lead or materials containing lead are present
- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location where construction activities are performed
- New construction, repair, alteration, renovation, or remodeling of:
  - Structures, or parts of structures that contain lead or materials containing lead

  OR

  - Substrates, or parts of substrates that contain lead or materials containing lead
- Painting and decorating
- Lead contamination or emergency cleanup

Designated representative

Any one of the following:

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

Day

Any part of a calendar day.

Emergency

Any event that could or does result in the unexpected significant release of lead. Examples of emergencies include equipment failure, container rupture, fires, or control equipment failure.

Exposure

Contact an employee has with lead, 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.

HEPA (High-efficiency particulate air) filter

A filter that removes at least 99.97 % of monodisperse dioctyl phthalate (DOP) particles with a mean particle diameter of 0.3 micrometer, from contaminated air.

Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Tetraethyl lead and all other organic lead compounds are excluded from this definition.

Licensed health care professional (LHCP)

An individual whose legally permitted scope of practice allows him or her to provide **some or all** of the healthcare services for medical evaluations

Permissible exposure limit (PEL)

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 lead is a time-weighted average of 50 micrograms per cubic meter ($\mu g/m^3$) of air when the duration of exposure is 8 hours.

- When an employee is exposed to lead for more than 8 hours in a workday, the PEL is adjusted using the following formula:

400 ÷ the hours worked in the day =	Adjusted PEL value for the day

Example calculation showing an adjusted of PEL 40 µg/m^3 for a 10-hour workday:

400 ÷ 10 = 40 µg/m^3

Prophylactic chelation (see chelation)

Repair

To restore a building, machine, roadway, etc., to an original state after damage or decay.

Unique identifier

An employer-assigned number or code that allows for accurate identification and tracking of an employee. Due to privacy concerns, Social Security numbers aren't recommended.