WASHINGTON STATE UNIVERSITY

Environmental Health and Safety

LEAD MANAGEMENT PLAN

Updated January 29, 2021

WASHINGTON STATE UNIVERSITY

ENVIRONMENTAL HEALTH, SAFETY AND RISK MANAGEMENT

Lead Program Manager

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Attachments

1.0 Purpose

The purpose of this Washington State University (WSU) Lead Management Plan is to protect employees, students, campus visitors and children from the toxic effects of lead and comply with applicable state and federal regulations. This plan outlines methods to:

- Identify lead containing materials that might be disturbed during construction/renovation or demolition activities,
- Assess the hazard from potential lead disturbance,
- Control lead exposure hazards to WSU employees, students and campus visitors
- Address lead hazards and lead disturbances associated with WSU child-occupied and target housing located on campus.

2.0 Applicable Regulations

WAC 296-155-176 – *Lead in Construction*
WAC 296-62-07521 – *Lead in General Industry*
WAC 365-230 – *Lead-Based Paint Activities*
WAC 173-303 – Dangerous Waste Regulations
40 CFR Part 745 – *EPA Requirements for Lead-Based Paint Activities in Target Housing and Child Occupied Facilities (TSCA Title IV)*
40 CFR Part 260 to 273 – *EPA Resource Conservation Recovery Act*
24 CFR Part 35 – *HUD Requirements for Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance*

3.0 Introduction

3.1 Health Hazards of Lead Exposure

Lead enters the body either by ingestion or inhaling lead dust or fume. Lead has no function in human biological processes and interferes with blood formation, reproduction, nerve, muscle function and urinary tract function. When absorbed in high doses, lead can be toxic.

3.2 Lead-Containing Materials

Any material that potentially contains lead must be sampled or assumed to contain lead before it is disturbed.

The following materials potentially contain lead:

1. Paint
2. Lead acid batteries
3. Lead pipes
4. Electrical cable covering
5. Brick mortar

6. Pottery glazes
7. Stained glass windows
8. Terne metal (lead 80% / 20 % tin coated – usually old roofing)
9. Lead solder
10. Lead shielding for x-rays and radioactive materials
11. Historic pesticides and the ground upon which they were applied

4.0 Definitions

Abatement – Any measure or set of measures designed to permanently eliminate lead-based paint hazards including, but not limited to:

a. The removal of paint and dust, the permanent enclosure or the encapsulation of lead-based paint with an EPA-approved encapsulate, the replacement of painted surfaces or fixtures, or the removal or covering of soil, when lead-based paint hazards are present in such paint, dust or soil and
b. All preparation , cleanup, disposal, and post-abatement clearance testing activities associated with such measure (WAC 365-230-020 (1))

Action Level (AL) – Employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter ($\mu g/m^3$) of air (WAC 296-155-17605 (1))

Child-Occupied Facility – A building (or portion thereof) constructed before 1978 that is visited regularly by a child who is 6 years of age or less, on at least 2 different days within a given week, if each day's visit is at least 3 hours and the combined weekly visit is at least 6 hours in length, and the combined annual visits are at least 60 hours in length. Child occupied facilities include, but is not limited to a day-care center, a preschool, and a kindergarten classroom (WAC 365-230-020 (11)).

Competent Person – An employee capable of identifying existing and predictable lead hazards in the environment or working conditions and has authorization to take prompt corrective measures to eliminate them (WAC 296-155-17605 (2)).

HUD Guidelines – U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing (2012 Edition).

Lead-Based Paint – A paint or surface coating that contain lead equal or in excess of 1.0 milligrams per square centimeter (mg/cm^2), 0.5% by weight, or 5,000 micrograms ($\mu g/g$) per gram (WAC 365-230-020 (49)).

Permissible Exposure Limit (PEL) – The employer shall assure that no employee is exposed to lead at concentrations greater than 50 micrograms per cubic meter of air ($\mu g/m^3$) averaged over an 8-hour period (WAC 296-155-17607(1)).

Target Housing – Any housing constructed before 1978, except any of the following:

a. Housing for the elderly or persons with disabilities, unless any 1 or more children age 6 years or less resides or is expected to reside in that housing.
b. A zero bedroom dwelling (i.e. dorm, studio apartment)
c. An unoccupied dwelling unit pending demolition (WAC 365-230-020 (78)).

5.0 Roles and Responsibilities

Environmental Health and Safety

a) Will provide and assist WSU departments with lead awareness training
b) Serve as department consultant for lead issues
c) Serve as department liaison to DOSH/Washington Labor and Industries
d) Assist departments with the collection of air and bulk samples used to evaluate worker exposures and waste designation
e) Collection and maintenance of lead sampling and worker exposure monitoring records
f) Provide quality control/quality assurance on lead-related projects
g) Recommend appropriate engineering controls, work practices and personal protective equipment
h) Periodically review and update this Lead Management Plan

Facilities Services

a) Supervisors and employees ensure this Lead Management Plan is followed
b) Supervisors or shop leads designate Competent Persons to oversee work that may impact lead containing materials
c) Estimators or shop Supervisors must determine lead content of suspect lead-containing materials for shops projects by using XRF or bulk sampling analysis and transmit results to EH&S for each project
d) Project Managers of public works projects must ensure a lead survey is completed and given to the contractor prior to bid.
e) Supervisors and employees ensure that potentially exposed workers receive annual awareness training and medical surveillance (if applicable).
f) Supervisors distribute exposure monitoring data to all affected employees
g) Supervisors notify EH&S of lead-related work by submitting Lead Work Plans

Auxiliary Facility Services (AFS)

a) Supervisors and employees ensure this Lead Management Plan is followed
b) Management designates Competent Persons to oversee lead-related work
c) Supervisors identify projects that disturb lead-based paint in WSU student apartments which may be regulated by the Renovation Repair and Painting (RRP) rule (see Section 7.0)

d) Supervisors request EH&S to perform sampling/analysis of suspect lead containing materials
e) Supervisors and employees ensure that potentially exposed workers receive annual awareness training and medical surveillance (if applicable)
f) Supervisors distribute exposure monitoring data to all affected employees
g) Supervisors notify EH&S of lead-related work and submit an applicable Lead Work Plan

6.0 Lead in Construction

The following addresses in-house construction activities performed on WSU properties. Painting activities, unless part of a routine scheduled maintenance plan, are considered construction activities in this section. Additional requirements applying to child-occupied facilities and target housing are addressed separately in Section 7.0.

6.1 Trigger Tasks

Trigger tasks involve the potential disturbance of lead-containing materials. Performing these tasks "triggers" the employee protection requirements in WAC 296-155-17609. If the project includes any of the trigger tasks listed below, this Lead Management Plan must be followed and/or addressed.

1. Demolition of structures or materials that may contain lead coatings
2. Scraping/sanding of painted surfaces
3. Heat gun application to painted surfaces
4. Cleaning surfaces with power tools
5. Spray painting
6. Sweeping/shoveling lead containing materials
7. Rivet busting
8. Abrasive blasting of components with lead coatings
9. Welding on painted or lead-containing surfaces
10. Cutting painted or lead-containing surfaces
11. Torch burning of paints or coatings

6.2 Awareness Training

All workers that perform the trigger tasks on lead-containing materials must attend annual lead awareness training. Supervisors provide EH&S a list of employees that require training. EH&S provides the training in compliance with WAC 296-155-17625.

6.3 Lead Identification

If trigger tasks will be conducted on any materials that may contain lead, the material(s) need to be sampled before the start of the project. Project Managers of public works projects must ensure a lead survey is completed and given to the contractor prior to bid. For shops projects, the job estimator or shop supervisor is responsible for sampling suspect materials prior to disturbance. EH&S will also perform the sampling if

requested in writing. EH&S charges may apply. Sample results must be recorded in the project file and transmitted to the Lead Program Manager via electronic mail to Matt McKibbin – mrmckibbin@wsu.edu.

6.4 Written Lead Work Plan

The job estimator or shop supervisor must complete a Lead Work Plan (Attachment A) prior to any project that involves trigger tasks with a lead-containing material. A copy of the plan must be sent to the EH&S Lead Program Manager and kept in the project files. EH&S will review the plan for appropriate engineering controls, work practices, personal protective equipment and air sampling strategies and make recommendations. If a negative exposure assessment (NEA) has been documented and approved by EH&S for the operation within the past 12 months (see Section 6.5.2), a Lead Work Plan may be omitted. Use of an NEA must be documented by the employees' department in the project files.

6.5 Air Monitoring

Personal breathing-zone air monitoring shall be conducted to determine occupational exposures to lead while performing trigger tasks. Employees who perform worker exposure monitoring must be proficient in the use of air monitoring equipment, sampling media, and procedures associated with NIOSH Method 7082 (Attachment D). E&HS will assist supervisors and employees with exposure air monitoring if requested in writing. Charges to the project may apply. The supervisor is responsible for distributing the sampling results to all affected employees.

6.5.1 Initial Exposure Assessments

In the absence of similar air monitoring data within the past 12 months for a specific trigger task operation, an initial exposure assessment must be completed for the project. An exposure above the permissible exposure limit (PEL) is assumed until the initial exposure assessment is completed. By rule, exposures and associated respiratory protection may be assumed based on the trigger task performed (see Attachment B). Additionally, advanced work practices outlined in Section 6.7 are required while performing the work. If air monitoring results indicate exposures above the PEL, advanced work practices and appropriate respiratory protection must continue.

For exposures above the action level of 30 µg/m^3 and below the PEL of 50 µg/m^3, minimum work practices outlined in Section 6.6 may be used. However, the Competent Person shall review the work practices with the workers performing the lead work and consult with EH&S on additional engineering controls and exposure monitoring to ensure that exposures remain below the PEL.

6.5.2 Negative Exposure Assessments (NEA)

When exposure assessments have determined exposures below the action level, or negative exposure, air sampling may be discontinued. However, in order to apply the

current job to a previous NEA, it must be documented and approved by EH&S within the previous 12 months and the following practices must be similar:

a) Current process
b) Type of material, including % of lead content
c) Control methods/engineering controls
d) Work practices
e) Environmental conditions (i.e. interior/exterior, air flow)

Whenever there has been a change noted in the practices above that may result in additional lead exposure, additional air monitoring and a new or modified Lead Work Plan is required for the project. All Lead Work Plans must be approved by EH&S prior to commencement of work.

6.6 Minimum Work Practices

Employees working with lead-containing materials must minimize dust generation and lead contamination. The following work practices must be used while performing work impacting lead containing materials. Additional requirements for work performed above the PEL or work without adequate air monitoring data is provided in Section 6.7.

Competent Person

a) All lead-related work must be supervised by a Competent Person designated by the WSU department performing the work.
b) This person must be capable of identifying existing and predictable lead hazards in the environment or working conditions and has authorization to take prompt corrective measures to eliminate them.

Limit Dust Generation

a) Wet materials before and during disturbance
b) Use HEPA vacuums or wet mop to clean up dust and debris as soon as practical.
c) Do not perform dry sweeping, use compressed air, or use vacuums not equipped with HEPA filters

Hygiene

a) Before breaks and at the end of the work day, wash hands and face.
b) Do not eat, drink, smoke or apply cosmetics at the job site.

Limit Contamination

a) Clean tools, equipment, etc. before taking them from the job site
b) Do not wear contaminated clothing outside of the job site
c) Wash or dispose of contaminated clothing prior to re-use

Protect Surfaces

a) Use plastic drops underneath work areas to collect dust and debris.
b) Use plastic over horizontal building surfaces and equipment to prevent contamination of nearby desks and equipment.

6.7 Advanced Work Practices

These advanced work practices must be used in addition to the minimum work practices for all work that disturbs lead containing materials and airborne concentrations of lead are either not known or determined to be above the PEL of 50 µg/m^3 of air.

6.7.1 Personal Protective Equipment (PPE)

A. Respiratory Protection

See Attachment B for respirator selection. Employees required to use respirators must be enrolled in the respiratory protection program which includes medical clearance for the use of negative pressure respirators, annual fit tests and training. Contact the EH&S Respiratory Protection Program administrator at 335-3041 for more information.

B. Protective Clothing and Equipment

Protective work clothing, gloves, hats, shoes and eye protection must be provided while performing lead-related work. Disposable Tyvek type protective coveralls are recommended. Washable protective clothing must be disposed of or stored in designated changing areas at the end of each shift and not taken off-site unless for the purpose of laundering. Laundering facilities must be informed the clothing is or may be lead contaminated and have appropriate facilities and programs in-place to manage lead contaminated clothing and waste water.

6.7.2 Hygiene Facilities and Practices

A. Clean Room

Clean change areas must be established outside the lead work area. These areas must be kept clean and provide a means of separating street-clothes from contaminated clothing and equipment to prevent cross-contamination.

B. Shower

A shower and soap shall be made available to employees to use at the end of each work shift. Showers are located at the McCluskey insulator shop. Showers located in academic buildings on campus may be used with the approval of EH&S and the Competent Person.

6.7.3 Engineering Controls

Engineering controls should be used as practical to reduce the amount of dust generated during work and minimize migration of dust outside the work area.

Methods available include:

1. Isolation of the work area with plastic barriers (i.e. doorways, HVAC intakes)
2. Power tool dust collection systems
3. HEPA equipped scrubbing machines with local exhaust

6.7.4 Demarcation of Work Area

Signs and/or warning tape shall be posted outside the lead work area. Signs should say:

Danger Lead Work Area
May Damage Fertility or the Unborn Child
Causes Damage to the Central Nervous System
Do not Eat, Drink or Smoke in this Area

6.8 Lead Waste

Lead-containing construction waste may be regulated as a dangerous waste in the state of Washington. Below, EH&S has compiled a list of common waste streams associated with construction and maintenance projects and corresponding management instructions to comply with dangerous waste and environmental regulations. Contact EH&S if your waste cannot be categorized in the list below.

Metallic lead components (i.e. roof flashing, wall sheeting) – Recycle at surplus if not contaminated with asbestos, biological, radioactive or chemical hazards. Contact EH&S for instructions on handling and disposal of contaminated items.

Painted construction waste (i.e. gypsum, wood, plaster) – Mixed debris with lead-containing coatings of <1.0 mg/cm^2 as analyzed by XRF or <5,000 parts per million by bulk sample analysis may be disposed as general construction waste. For waste above this threshold, additional analytical testing may be required. Contact EH&S Environmental Services for waste management instructions.

Contaminated soil – Projects which involve soil contaminated with lead-containing paint chips must reviewed by EH&S. Additional analytical testing and soil removal may be required to comply with Washington dangerous waste and Model Toxic Control Act (MTCA) regulations.

Paint chips – Paint chips must be managed as dangerous waste. Contact EH&S Environmental Services for waste management instructions.

Dangerous waste generated by WSU must be disposed by EH&S through the state contract, unless otherwise directed by EH&S.

6.9 Quality Control/Quality Assurance (QA/QC) Program

At the discretion of the Lead Program Manager, EH&S will conduct periodic QA/QC of lead-related work performed on campus to ensure conformance with the Lead Management Plan. Activities may include additional air monitoring, visual inspections, review of work practices and paint sampling. All work performed above the Action Level must include an EH&S on-site review of work practices at the start of the project.

6.10 Medical Surveillance

All employees which may be exposed above the lead action level of 30 µg/m^3 of air, including employees who perform trigger tasks with unknown exposures, must receive initial medical surveillance. Medical surveillance consists of biological monitoring at a minimum, which includes tests for blood lead and zinc protoporphyrin levels.

Employees with occupational lead exposures above the action level for 30 or more days per year and/or blood lead levels above 40 micrograms per deciliter (µg/dl) require additional biological monitoring and consultation with a physician as required by WAC 296-155-17621. Any employee with occupational exposures above the action level and blood lead level above 50 µg/dl must be temporary removed from work involving lead exposure. Departments with employees in these categories must consult with EH&S to comply with the additional regulatory requirements. The employees department must pay for all medical surveillance required by regulations.

Employees may opt out of medical surveillance by signing a declination document (Attachment A). Employees who choose to opt out must contact EH&S.

7.0 Child-Occupied Facilities and Target Housing

This section specifically addresses the federal and state regulations that pertain to lead-based paint in child-occupied facilities and target housing. For the purpose of these regulations, the definition of a child-occupied facility and target housing applies to the WSU student apartments operated by Auxiliary Facility Services (AFS) and the WSU Children's Center located on Olympia Avenue. All facilities affected by these regulations have been surveyed for the presence of lead-based paint and are available for review electronically by request to EH&S.

Laws and rules regarding lead-based paint in child-occupied facilities and target housing are be broken down into two categories, 1) Lead Renovation, Repair, and Painting rules and 2) Lead Risk Assessment and Abatement rules.

7.1 Lead Renovation, Repair and Painting (RRP) Rule

Any project at WSU student apartments or the Children's Center which disturbs lead-based paint falls under the RRP rule. Projects which impact materials that do not meet the definition of lead-based paint must still be performed according to the minimum provisions of this document.

AFS and the Children's Center must ensure the following requirements are met for any in-house construction, renovation, demolition or maintenance activities that impact lead-based paint:

1. **EH&S Notification** – EH&S must be notified of all projects which will disturb lead-based paint by submitting a Lead Work Plan to the Lead Program Manager.

2. **Occupant Notification** - Distribute and obtain receipt of the EPA lead pamphlet website (www.epa.gov/lead/pubs/brochure.htm) to affected occupants between 7 days and no more than 60 days before work begins. Notices must also be posted for work in common areas.

3. **Certifications -** All work must be completed by Lead Renovators certified by the Washington Department of Commerce or trained by such individuals to use lead-safe work practices for their task**.** The department must also be a certified firm. EH&S maintains all certification records to verify current status.

4. **QA/QC** – EH&S must perform cleaning verification at the conclusion of each project. At the discretion of the Lead Program Manager, EH&S may conduct additional air monitoring, dust wipe sampling, visual inspections and review of work practices.

5. **Recordkeeping** – All associated documents including the Lead Work Plan, worker training certificates, daily logs and the occupant confirmation receipt of the EPA lead pamphlet must be submitted to the EH&S Lead Program Manager for archive.

7.2 Lead Risk Assessment and Abatement

Lead-based Paint Condition Assessments

The EH&S Lead Program Manager, will periodically inspect and document the condition of lead-based paints at the WSU student apartments and Children's Center. EH&S will report the results and offer recommendations to the department which operates the facility. Inspections and reporting will be conducted by a licensed Lead Risk Assessor and reported in accordance to HUD guidelines.

Lead Abatement

Lead abatement is defined as a means or measure designed to permanently eliminate lead-based paint hazards. At WSU, these conditions would be identified and/or addressed by the EH&S Lead Program Manager. Currently, WSU is not equipped to perform lead abatement work in-house. EH&S will advise the affected department of lead abatement options.

ATTACHMENTS

LEAD WORK PLAN
(Lead in Construction)

Please complete prior to any project that disturbs paint or other suspect lead materials. Use back of page if you need more room.

Project Name: _____ Project Manager: _____

Work Order/Project Number: _____ Start Date: _____ Completion Date: _____

Project Name/Description: _____

Lead Competent Person: _____ Shop: _____

Employee: _____ Shop: _____

Employee: _____ Shop: _____

Employee: _____ Shop: _____

Employee: _____ Shop: _____

Employee: _____ Shop: _____

What activities will disturb lead: _____

_____

Respiratory protection: ❑ None ❑ Half Face APR ❑ Full Face APR ❑ PAPR

Work practices: ❑ scraping ❑ sanding ❑ power washing ❑ abrasive blasting ❑ demolition

Specific work practices: _____

What engineering controls/ventilation will be used: _____

_____

_____

What type of enclosure will be used: _____

_____

Will a shower be on-site: ❑ yes ❑ no Will warning signs be posted: ❑ yes ❑ no

What personal protective equipment will be used: _____

_____

Describe waste handling procedures (consult with EH&S): _____

Competent Person Signature: _____ Date: _____

Lead bulk sample #/XRF reading: _____ mg/cm^2 Bulk: _____ (mg/kg, ppm, %) Substrate: _____

Lead bulk sample #/XRF reading: _____ mg/cm^2 Bulk: _____ (mg/kg, ppm, %) Substrate: _____

Has employee exposure previously been determined: ❑ yes ❑ no Air results: _____ Negative ❑

Air monitoring sample numbers: _____ Where: _____ Date: _____

How is current project similar to earlier exposure assessment? _____

_____

Individual responsible for air monitoring: _____ Analytical lab: _____

Please send form to EH&S via email to Matthew McKibbin, mrmckibbin@wsu.edu

LEAD WORK PLAN
(Target Housing and Child-Occupied Facilities)

Please complete prior to any project that disturbs paint or other suspect lead materials. Use back of page if you need more room.

Project Name: _____ Form completed by: _____

Work Order/Project Number: _____ Work Start Date: _____ Work Completion Date: _____

Project Location/Description: _____

Certified Lead Renovator(s): _____ Non-certified Worker(s)_____

Employee: _____ Employee:_____

Employee: _____ Employee:_____

Have non-certified workers been trained in the applicable skills for this job? ❑ Yes ❑ No

Has non-certified worker training been documented and approved by EH&S? ❑ Yes ❑ No

---

Which lead-based paints will be disturbed (color/location)?_____

Lead content of paint: XRF:_____mg/cm^2 Bulk: _____(mg/kg, ppm, %) Substrate: _____

Occupant Notification

Affected occupants notified and presented with EPA Renovate Right Pamphlet? ❑ Yes ❑ No

Receipt of occupant notification must be included in work plan. Pamphlet must be distributed between 7 and 60 days prior to commencement of work.

Work Practices/Controls

Describe the restricted lead work area. Include security measures and if occupants will be present during work:

_____

_____

Work practices: ❑ scraping ❑ sanding ❑ power washing ❑ abrasive blasting ❑ demolition

Additional specific work practices: _____

Prohibited work practices: 1) Open flame torch burning 2) Use of heat guns >1,100 °F 3) Power sanding/grinding/planning, needle guns, abrasive blasting and sandblasting without HEPA vacuum attachment.

What engineering controls/containment methods will be used to prevent the spread of dust (include with sketch)? _

_____

_____

_____

_____

Where are warning signs posted?: _____

Note: Be specific. Draw your containment and/or restricted work area, decon area, windows to be sealed etc. Will stick mats be used? What kind of dust control methods will be used?

EH&S Comments: _____

_____

_____

Employee Exposure Monitoring

Has employee exposure previously been determined: ❑ Yes ❑ No

If NO:

Individual responsible for air monitoring: _____ Analytical lab: _____

Note: Use Attachment C for respiratory protection requirements. Consult with EH&S for other PPE requirements.

If YES (attach previous laboratory data):

Was negative exposure determined? ❑ Yes ❑ No

If relying on previous exposure data, how is current project similar to earlier exposure assessment (if applicable):_

_____

_____

Note: All negative exposure assessments (NEAs) must be approved by EH&S prior to use

PPE/Hygiene

Respiratory protection: ❑ None ❑ Half Face APR ❑ Full Face APR ❑ PAPR

Will hand/face washing be available on-site: ❑ Yes ❑ No If not, where?_____

Are showers required? ❑ Yes ❑ No If so, where?_____

What personal protective equipment will be used? _____

_____

Waste

Describe waste handling procedures:_____

Dangerous Waste? (consult with EH&S) ❑ Yes ❑ No

POST-WORK CHECKLIST

For Certified Lead Renovator

1. Conduct post-work visual inspection. The work area needs to be clean!
2. Contact EH&S to conduct post-renovation cleaning verification
3. Submit daily logs to EH&S

I certify that to the best of my knowledge, the above information is correct and work was completed according to this work plan using EPA lead safe work practices:

Certified Lead Renovator: Name _____Signature: _____ Date: _____

For EH&S 3rd Party Use:

Is negative exposure assessment accepted (if, applicable)? ❑ Yes ❑ No

Has job passed post-renovation cleaning verification? ❑ Yes ❑ No

Notes: _____

_____

EH&S 3rd Party: Name:_____ Signature: _____Date: _____

Lead Management Program
Washington State University
Respirator Selection Table

Trigger tasks listed below are assumed to result in the corresponding lead levels and require the minimum respirator until air monitoring demonstrates a lower exposure. For known lead exposures, the listed respirator or one providing a greater protection factor should be used.

Trigger Task	Airborne Lead Levels	Minimum Respirator
Manual demolition of structures with lead coatings	≤500 µg/m^3	1/2 face air purifying respirator with HEPA filters
Manual scraping of lead coatings		
Using power tools equipped with dust filtration to clean lead coatings		
Spray painting using lead paint		
Using heat guns on lead coatings		
Manual sanding of lead coatings		
Burning lead	500-2500 µg/m^3	Tight fitting powered air purifying respirator with HEPA filters
Using lead containing mortar		
Rivet busting where lead coating is present		
Using power tools not equipped with dust filtration to clean lead coating		
Cleanup after using dry expendable abrasive blasting		
Moving and removal of enclosures used for abrasive blasting		
Abrasive blasting lead coatings	greater than 2500 µg/m^3	Full face supplied air respirator in pressure demand mode
Welding lead coatings		
Cutting lead coatings		
Torch burning lead coatings		

Medical Surveillance Declination Form

Memorandum

To: Environmental Health and Safety
Campus Mail Stop 1172

From: _____

Date: _____

Subject: Medical Surveillance – Lead

I acknowledge that I have been and will be assigned to projects where I may be working with or exposed to lead-containing materials.

I acknowledge that I have been advised of and understand the dangers inherent in being exposed to lead-containing materials.

I also understand that exposure to lead-containing materials can cause kidney, reproductive, nerve and other physiological damage. I acknowledge that I have received training in use of procedures and equipment to protect others and myself. I covenant and faithfully agree to take all precautions required of me.

I understand and acknowledge that monitoring of lead and zinc protoporphyrin levels carried out according to guidelines in WAC 296-62-07725 are helpful in providing protection from lead hazards. I acknowledge and verify that my employer has made such a medical surveillance available at no cost to me.

I acknowledge that WSU has made available ongoing lead medical surveillance, but I hereby refuse to submit to such medical examination for personal reasons not in anyway associated with race, religion, handicap or other protected activity.

_____
Date

NIOSH Method 7082 – Lead by Flame AAS

LEAD by Flame AAS 7082

Pb MW: 207.19 (Pb) CAS: 7439-92-1 (Pb) RTECS: OF7525000 (Pb)
223.19 (PbO) 1317-36-8 (PbO) OG1750000 (PbO)

METHOD: 7082, Issue 2 **EVALUATION: FULL** **Issue 1: 15 February 1984 Issue 2: 15 August 1994**

OSHA : 0.05 mg/m^3
NIOSH: <0.1 mg/m^3; blood Pb ≤60 µg/100 g
ACGIH: 0.05 mg/m^3

PROPERTIES: soft metal;
d 11.3 g/cm^3; MP 327.5 °C
valences +2, +4 in salts

SYNONYMS: elemental lead and lead compounds except alkyl lead

SAMPLING		MEASUREMENT	
SAMPLER:	FILTER (0.8-µm cellulose ester membrane)	**TECHNIQUE:**	ATOMIC ABSORPTION SPECTROPHOTOMETER, FLAME
FLOW RATE:	1 to 4 L/min	**ANALYTE:**	lead
VOL-MIN:	200 L @ 0.05 mg/m^3	**ASHING:**	conc. HNO_3, 6 mL + 30% H_2O_2, 1 mL; 140 °C
-MAX:	1500 L	**FINAL SOLUTION:**	10% HNO_3, 10 mL
SHIPMENT:	routine	**FLAME:**	air-acetylene, oxidizing
SAMPLE STABILITY:	stable	**WAVELENGTH:**	283.3 nm
BLANKS:	2 to 10 field blanks per set	**BACKGROUND CORRECTION:**	D_2 or H_2 lamp, or Zeeman
ACCURACY		**CALIBRATION:**	Pb^{2+} in 10% HNO_3
RANGE STUDIED:	0.13 to 0.4 mg/m^3 [1]; 0.15 to 1.7 mg/m^3 (fume) [2]	**RANGE**	10 to 200 µg per sample [2,3]
BIAS:	− 3.1%	**ESTIMATED LOD:**	2.6 µg per sample [4]
OVERALL PRECISION($\hat{S}_{rT}$):	0.072 [1]; 0.068 (fume) [2]	**PRECISION ($\bar{S}_r$):**	0.03 [1]
ACCURACY:	± 17.6%		

APPLICABILITY: The working range is 0.05 to >1 mg/m^3 for a 200-L air sample. The method is applicable to elemental lead, including Pb fume, and all other aerosols containing lead. This is an elemental analysis, not compound specific. Aliquots of the samples can be analyzed separately for additional elements.

INTERFERENCES: Use D_2 or H_2 continuum or Zeeman background correction to control flame or molecular absorption. High concentrations of calcium, sulfate, carbonate, phosphate, iodide, fluoride, or acetate can be corrected.

OTHER METHODS: This method combines and replaces P&CAM 173 [3] and S341 [4,5] for lead. Method 7300 (ICP-AES) and 7105 (AAS/GF) are alternate analytical methods. Method 7505 is specific for lead sulfide. The following have not been revised: the dithizone method, which appears in P&CAM 102 [5] and the lead criteria document [6]; and P&CAM 191 (ASV) [7].

REAGENTS:

1. Nitric acid, conc.*
2. Nitric acid, 10% (v/v). Add 100 mL conc. HNO_3 to 500 mL water; dilute to 1 L.
3. Hydrogen peroxide, 30% H_2O_2 (w/w), reagent grade.*
4. Calibration stock solution, 1000 µg/mL Pb. Commercial standard or dissolve 1.00 g Pb metal in minimum volume of (1+1) HCl and dilute to 1 L with 1% (v/v) HCl. Store in a polyethylene bottle. Stable ≥ one year.
5. Air, compressed, filtered.
6. Acetylene
7. Distilled or deionized water.

* See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: Cellulose ester filter, 0.8-µm pore size, 37-mm diameter, in cassette filter holder.
2. Personal sampling pump, 1 to 4 L/min, with flexible connecting tubing.
3. Atomic Absorption Spectrophotometer with an air-acetylene burner head and background correction.
4. Lead hollow cathode lamp or electrode dischargeless lamp.
5. Regulators, two-stage, for air and acetylene.
6. Beakers, Phillips, 125-mL, or Griffin, 50-mL with watchglass covers.**
7. Volumetric flasks, 10- and 100-mL.**
8. Assorted volumetric pipets as needed.**
9. Hotplate, surface temperature 140°C.
10. Bottles, polyethylene, 100-mL.

** Clean all glassware with conc. nitric acid and rinse thoroughly with distilled or deionized water before use.

SPECIAL PRECAUTIONS: Concentrated nitric acid is an irritant and may burn skin. Perform all acid digestions in a fume hood. Hydrogen peroxide is a strong oxidizing agent, a strong irritant, and corrosive to the skin. Wear gloves and eye protection.

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Sample at an accurately known flow rate between 1 and 4 L/min for up to 8 h for a total sample size of 200 to 1500 L for TWA measurements. Do not exceed a filter loading of ca. 2 mg total dust.

SAMPLE PREPARATION:

NOTE 1: The following sample preparation gave quantitative recovery (see EVALUATION OF METHOD) [4]. Steps 4 through 9 of Method 7300 or other quantitative ashing techniques may be substituted, especially if several metals are to be determined on a single filter.

NOTE 2: The Appendix gives a microwave digestion procedure which may be necessary for complete recovery of lead from some matrices, especially epoxy-based paint.

3. Open the cassette filter holders and transfer the samples and blanks to clean beakers.
4. Add 3 mL conc. HNO_3, and 1 mL 30% H_2O_2 and cover with a watchglass. Start reagent blanks at this step.
   NOTE: If PbO_2 is not present in the sample, the 30% H_2O_2 need not be added [2,4].
5. Heat on 140 °C hotplate until volume is reduced to about 0.5 mL.
6. Repeat two more times using 2 mL conc. HNO_3 and 1 mL 30% H_2O_2 each time.
7. Heat on 140 °C hotplate until ca. 0.5 mL liquid remains.
8. When sample is dry, rinse the watchglass and walls of the beaker with 3 to 5 mL 10% HNO_3. Allow the solution to evaporate to dryness.
9. Cool each beaker and dissolve the residues in 1 mL conc. HNO_3.
10. Transfer the solution quantitatively to a 10-mL volumetric flask and dilute to volume with distilled water.

NOTE: If the concentration (M) of any of the following is expected to exceed the lead concentration (M) by 10-fold or more, add 1 mL 1 M Na_2EDTA to each flask before dilution to volume: CO_3^{2-}, PO_4^{3-}, I^-, F^-, CH_3COO^-. If Ca^{2+} or SO_4^{2-} are present in 10-fold or greater excess, make all standards and samples 1% (w/w) in La^{3+}[3].

CALIBRATION AND QUALITY CONTROL:

11. Prepare a series of working standards covering the range 0.25 to 20 µg/mL Pb (2.5 to 200 µg Pb per sample).
    a. Add aliquots of calibration stock solution to 100-mL volumetric flasks. Dilute to volume with 10% HNO_3. Store the working standards in polyethylene bottles and prepare fresh weekly.
    b. Analyze the working standards together with the blanks and samples (steps 14 and 15).
    c. Prepare a calibration graph of absorbance vs. solution concentration (µg/mL).
12. Aspirate a standard for every 10 samples to check for instrument drift.
13. Check recoveries with at least one spiked media blank per 10 samples. Use method of standard additions occasionally to check for interferences.

MEASUREMENT:

14. Set spectrophotometer as specified by the manufacturer and to conditions on page 7082-1.
    NOTE: An alternate wavelength is 217.0 nm [8]. Analyses at 217.0 nm have slightly greater sensitivity, but poorer signal-to-noise ratio compared to 283.3 nm. Also, non-atomic absorption is significantly greater at 217.0 nm, making the use of D_2 or H_2 continuum, or Zeeman background correction mandatory at that wavelength.
15. Aspirate standards, samples, and blanks. Record absorbance readings.
    NOTE: If the absorbance values for the samples are above the linear range of the standards, dilute with 10% HNO_3, reanalyze, and apply the appropriate dilution factor in the calculations.

CALCULATIONS:

16. Using the measured absorbances, calculate the corresponding concentrations (µg/mL) of lead in the sample, C_s, and average media blank, C_b, from the calibration graph.
17. Using the solution volumes (mL) of the sample, V_s, and media blanks, V_b, calculate the concentration, C (mg/m^3), of lead in the air volume sampled, V (L):

$$C = \frac{C_s V_s - C_b V_b}{V}, \ mg/m^3.$$

NOTE: µg/mL = mg/m

EVALUATION OF METHOD:

Method S341 [9] was issued on October 24, 1975, and validated over the range 0.13 to 0.4 mg/m^3 for a 180-L air sample, using generated atmospheres of lead nitrate [1]. Recovery in the range 18 to 72 µg Pb per sample was 98%, and collection efficiency of 0.8-µm mixed cellulose ester filters (Millipore Type AA) was 100% for the aerosols. Subsequent studies on analytical recovery of 200 µg Pb per sample gave the following results [2,4]:

Species	Digestion Method	Analytical Recovery, %
Pb metal	HNO_3 only	92 ± 4
Pb metal	$HNO_3 + H_2O_2$	103 ± 3
PbO	HNO_3 only	93 ± 4
PbS	HNO_3 only	93 ± 5
PbO_2	HNO_3 only	82 ± 3
PbO_2	$HNO_3 + H_2O_2$	100 ± 1
Pb in paint*	HNO_3 only	95 ± 6
Pb in paint*	$HNO_3 + H_2O_2$	95 ± 6

*Standard Reference Material #1579, U.S. National Institute of Standards and Technology.

Additional collection efficiency studies were also done using Gelman GN-4 filters for the collection of Pb fume, which had geometric mean diameter of 0.1 µm [2]. Mean collection efficiency for 24 sampling runs at flow rates between 0.15 and 4.0 L/min was > 97 ± 2%. Overall precision, $\hat{S}_{rT}$, was 0.072 for lead nitrate aerosol [1,9] and 0.068 for Pb fume [2,4].

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James B. Perkins, David L. Wheeler, and Keith Nicholson, Ph.D., DataChem Laboratories, Salt Lake City, UT, prepared the microwave digestion procedure in the Appendix.

APPENDIX - MICROWAVE DIGESTION FOR LEAD IN PAINT CHIPS (AND OTHER MATRICES)

This procedure is an alternative to the procedure presented in the Sample Preparation section of this method. It provides a rapid, complete acid digestion prior to analysis by flame atomic absorption (FAA), heated graphite furnace atomic absorption (HGFAA), and inductively coupled plasma spectroscopy (ICP) [10].

Apparatus and Material [11-16]

1. Microwave apparatus requirements
   a. The microwave unit provides programmable power with a minimum of 574 W and can be programmed to within ± 10 W of the required power.
   b. The microwave unit cavity is corrosion resistant as well as ventilated. All electronics are protected against corrosion for safe operation.
   c. The system requires Teflon PFA digestion vessels (120-mL capacity) capable of withstanding pressures up to 7.5 ± 0.7 atm (110 ± 10 psi) and capable of controlled pressure relief at pressures exceeding 7.5 ± 0.7 atm (110 ± 10 psi).
   d. A rotating turntable is employed to ensure homogeneous distribution of microwave radiation within the unit. The speed of the turntable should be a minimum of 3 rpm.
   e. A safety concern relates to the use of sealed containers without pressure relief valves in the unit. Temperature is the important variable controlling the reaction. Pressure is needed to attain elevated temperatures but must be safely contained [12].
   f. Polymeric volumetric ware in plastic (Teflon or polyethylene), 50- or 100-mL capacity.
   g. Disposable polypropylene filter funnel.
   h. Analytical balance, 300-g capacity, and minimum ± 0.001 g.

Reagents

1. Nitric acid, concentrated, spectroscopy grade.
2. Reagent Water. Reagent water shall be interference free. All references to water in the method refer to reagent water that meets the ASTM Type 2 standard.

Procedure

1. Calibration of Microwave Equipment
   Calibrate microwave equipment in accordance with manufacturer's instructions. If calibration instructions are not available, see EPA Method 3051 [11].
2. All digestion vessels and volumetric ware must be carefully acid washed and rinsed with reagent water. All digestion vessels should be cleaned by leaching with hot (1:1) nitric acid for a minimum of fifteen minutes, rinsed with reagent water, and dried in a clean environment.
3. Sample Digestion
   a. Tare the Teflon PFA digestion vessel.
   b. Weigh out 0.1 g paint chip sample to the nearest 0.001 g into the tared Teflon PFA sample vessel. With large paint chip samples, measure out a 2 cm^2 piece, weigh to the nearest 0.001 g, and quantitatively transfer it to the vessel.
   c. Add 5.0 ± 0.1 mL concentrated nitric acid to the sample vessel in a fume hood. If a vigorous reaction occurs, allow the reaction to stop before capping the vessel. Cap the vessel and torque the cap to 12 ft-lb (16 N-m) according to the manufacturer's directions. The sample vessel may be connected to an overflow vessel using Teflon PFA connecting tubes. Place the vessels in the microwave carrousel. Connect the overflow vessels to the center well of the unit.
   d. Place the vessels evenly distributed in the turntable of the microwave unit using groups of two, six,

or 12 sample vessels. Any vessels containing 5 mL of nitric acid for reagent blank purposes are counted as sample vessels. When fewer than the recommended number of samples are to be digested, i.e., three samples plus one blank, the remaining vessels should be filled with 5 mL of nitric acid to achieve the full complement of vessels. This provides an energy balance since the microwave power absorbed is proportional to the total mass in the cavity [14]. Irradiate each group of samples to achieve a temperature of 180 °C in five minutes at a pressure of 50 psi. Continue to irradiate to achieve a temperature of 180 °C at 100 psi after 25 minutes. Continue digestion for five minutes. A sample digestion program for 12 samples is presented in the following table.

PROGRAM VARIABLES FOR PAINT CHIPS SAMPLE DIGESTION WITH NITRIC ACID

Stage	(1)	(2)	(3)
Power	90%	90%	0%
Pressure, psi	50	100	0
Run Time, min	10:00	20:00	05:00
Time @ P, min	05:00	15:00	00:00
Temperature	180°C	180°C	0°C
Fan Speed	100%	100%	100%

Number of Vessels:	12
Liquid Volume per Vessel:	5 mL
Sample Weight:	0.1 g

If the analyst wishes to digest other than two, six, or 12 samples at a time, use different values of power as long as they result in the same time and temperature conditions.

e. At the end of the microwave program, allow the vessels to cool for a minimum of five minutes before removing them from the microwave unit. If a loss of sample is detected (e.g., material in overflow collection vessel, liquid outside liner), determine the reason for the loss (e.g., loss of vessel seal integrity, use of a digestion time longer than 30 minutes, too large a sample, or improper heating conditions). Once the source of the loss has been corrected, prepare a new sample beginning at Section 2. If insufficient material is available for reanalysis, dilute remaining digestate and note that some sample loss may have occurred.

f. Uncap and vent each vessel in a fume hood. Add 20 mL reagent water, then reseal vessels and shake to mix thoroughly. Transfer the sample to an acid-cleaned polyethylene bottle. If the digested sample contains particulates which may clog nebulizers or interfere with injection of the sample into the instrument, allow the sample to settle or filter it:

Settling: Allow the sample to stand until the supernatant is clear (usually, overnight is sufficient). If it does not clear, filter the sample.

Filtering: The filtering apparatus must be thoroughly precleaned and rinsed with dilute nitric acid. Filter the sample through quantitative filter paper into a second acid-cleaned container.

The digestate is now ready for analysis for elements of interest using the appropriate method.

4. Calculations: Report the concentrations based on the actual weight of the original sample.