Lead

Preventing Exposure at Work

WorkSafeBC

WORKING TO MAKE A DIFFERENCE

worksafebc.com

About WorkSafeBC

WorkSafeBC (the Workers' Compensation Board) is an independent provincial statutory agency governed by a Board of Directors. It is funded by insurance premiums paid by registered employers and by investment returns. In administering the *Workers Compensation Act*, WorkSafeBC remains separate and distinct from government; however, it is accountable to the public through government in its role of protecting and maintaining the overall well-being of the workers' compensation system.

WorkSafeBC was born out of a compromise between B.C.'s workers and employers in 1917 where workers gave up the right to sue their employers or fellow workers for injuries on the job in return for a no-fault insurance program fully paid for by employers. WorkSafeBC is committed to a safe and healthy workplace, and to providing return-to-work rehabilitation and legislated compensation benefits to workers injured as a result of their employment.

WorkSafeBC Prevention Information Line

The WorkSafeBC Prevention Information Line can answer your questions about workplace health and safety, worker and employer responsibilities, and reporting a workplace accident or incident. The Prevention Information Line accepts anonymous calls.

Phone 604 276-3100 in the Lower Mainland, or call 1 888 621-7233 (621-SAFE) toll-free in British Columbia.

To report after-hours and weekend accidents and emergencies, call 604 273-7711 in the Lower Mainland, or call 1 866 922-4357 (WCB-HELP) toll-free in British Columbia.

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WorkSafeBC Publications

Many publications are available on the WorkSafeBC web site. The Occupational Health and Safety Regulation and associated policies and guidelines, as well as excerpts and summaries of the *Workers Compensation Act*, are also available on the web site: WorkSafeBC.com

Some publications are also available for purchase in print:

Phone:	604 232-9704
Toll-free phone:	1 866 319-9704
Fax:	604 232-9703
Toll-free fax:	1 888 232-9714
Online ordering:	WorkSafeBC.com and click on Publications; follow the links for ordering

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Contents

Introduction

Everyone absorbs some lead from the food they eat and the air they breathe. However, if you are exposed to lead at work, it is more likely that you will have higher levels of lead in your body than the general public.

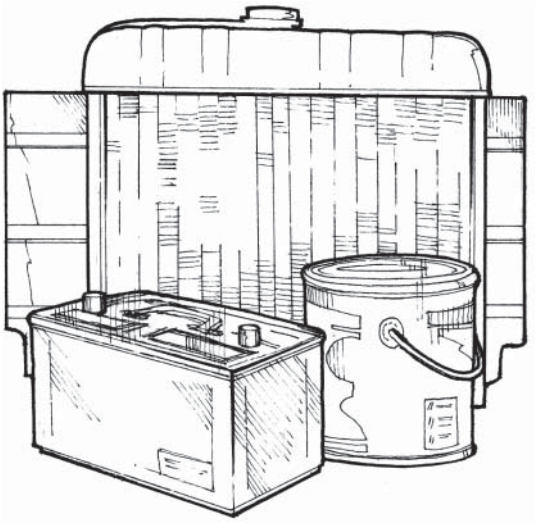
There are two types of lead, organic and inorganic. Organic lead is less common and has different properties and health effects than inorganic lead. In British Columbia, exposure to organic lead is no longer a concern because of the elimination of leaded gasoline. This booklet only discusses inorganic lead exposure in the workplace.

Welding may be a source of lead exposure if lead is in the coating or in the metal being welded.

Where are workers likely to get high lead exposure?

Workers who are at most risk of high lead exposure include those who work in workplaces or industries where activities such as the following are done:

- Lead smelting, casting, and refining
- Lead battery manufacturing and recycling
- Demolition or renovation of bridges, dams, structures, and buildings where lead-based paints or coatings were used
- Lead abatement (removal of lead-based paints and coatings)
- Radiator repair and manufacturing where lead solder is present or being used
- Welding, brazing, and soldering products where lead is in the metal, on the metal, or in the solder or braze
- Using lead-based babbitt metal in saw filing shops and working with babbitt bearings



Radiators, batteries, and paint are some products that may contain lead.

- Manufacture of products containing lead (for example, paint, plastics, ammunition, and ceramics)
- Scrap metal salvage and recycling
- Working at firing ranges
- Working at fire assay laboratories

Workers in plumbing, electronics, and printing may also be exposed to lead, but in much smaller quantities. Even workers who are not exposed to lead daily as part of their activities may be exposed to high levels of lead for short periods of time during maintenance, cleaning, and laundry duties.

Family members of lead workers, particularly children and pregnant women, are at risk of lead exposure if lead dust is taken home on clothes, on footwear, on the skin, or in the hair.

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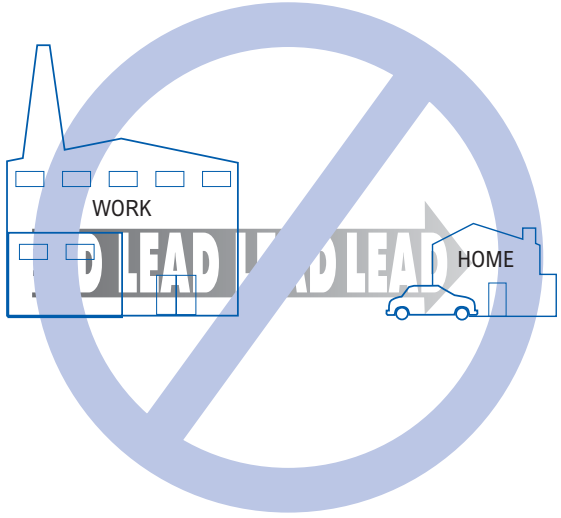


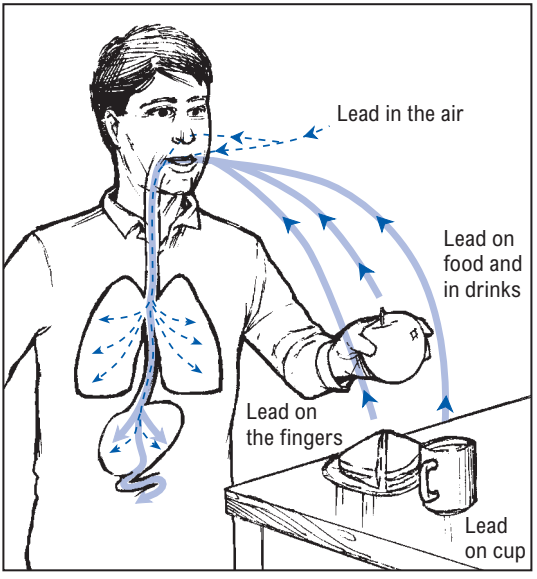
Don't take lead home.

How does lead get into the body?

Lead enters your body in one of two ways — when you breathe it in or when you swallow it. Inorganic lead is not significantly absorbed through intact skin. The following are examples of how lead can enter your body:

- Breathing in lead dust or fume
- Drinking or eating food contaminated with lead
- Eating or drinking from contaminated cups, bowls, etc.
- Biting your nails or smoking when your fingers are contaminated with lead
- Putting objects contaminated with lead in your mouth (such as pens and pencils from the work area)
- Smoking or chewing gum where there is lead dust or fume

Lead gets into your body when you breathe in lead dust or fume or when you swallow lead.



The amount of lead that gets into your body may be very different from your co-workers who are working under identical conditions. Some possible reasons for variations in lead intake include work practices and attention to personal hygiene.

Once the lead is in your bloodstream, it is carried throughout the body and stored in various body tissues, mostly in the bones. The body can naturally get rid of lead over time. However, if lead enters your body faster than your body can get rid of it, lead may build up or accumulate in your body.

Suppose water is running into a bathtub with the drain open. If the water runs into the tub faster than it runs out through the drain, the tub will slowly fill and overflow. Similarly, if lead enters the body faster than the body can get rid of it, lead accumulates and health problems may occur.

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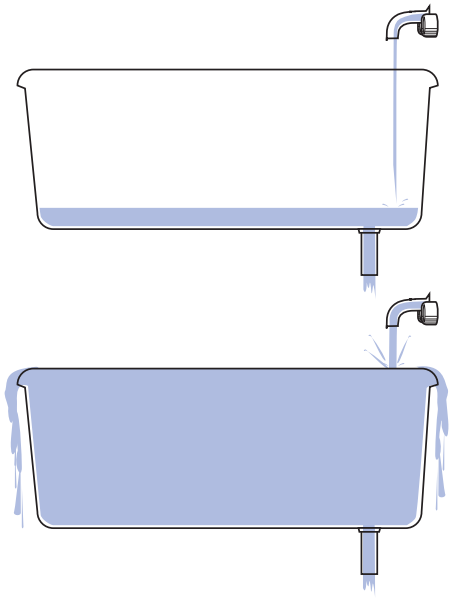


An overflowing bathtub is similar to a body accumulating more lead than it can naturally get rid of.

What are the health problems associated with lead exposure?

Common symptoms of high lead levels include a general feeling of tiredness and weakness, general aches and pains, headaches, loss of weight, abdominal pain, and possible constipation. A worker with a high lead level may have only one of these complaints, or a number of them, or none. Symptoms of lead exposure may take a long time to develop. Workers with similar exposures to lead may have different symptoms, which may also vary in severity. All workers need to prevent or minimize lead exposure.

Children are generally considered at higher risk for health problems from lead exposure than adults.

Possible effects of lead absorption are anemia, nerve damage causing muscle weakness, kidney damage, high blood pressure, and reproductive effects in both men and women. Adverse effects may also occur to a developing fetus (such as low birth weight and developmental delays) when the mother is exposed to even fairly low levels of lead. If a woman has been exposed to a significant amount of lead before pregnancy, then during pregnancy, lead may come out of the body tissues where it is stored and it may enter the blood and the fetus. Lead is also excreted in breast milk.

Children are generally considered at higher risk for health problems from lead exposure than adults. In addition to the health problems suffered by adults, children may also have problems with mental and physical development.

How can lead exposure be prevented at work?

This is the most important question of all, because health problems from lead exposure can be prevented. The solution is to minimize the amount of lead absorbed by your body. Employers may be required to implement an exposure control plan to minimize workers' exposure to lead. Under Part 6 of the Occupational Health and Safety Regulation, air monitoring is required and an exposure control plan must be developed if workers are or may be exposed to lead in excess of 50 percent of the exposure limit, or if exposure through any route of entry could cause elevated blood levels. Detailed information about exposure control plans and exposure limits is included in Part 5 of the Regulation.

To control lead exposure, you must be aware of the work processes that create the risk of lead exposure. In work areas where hazardous lead exposures may occur, signs must be posted at the boundaries to warn workers of the potential hazard.

In the Regulation

- See the OHS Regulation for more information on exposure control plans and exposure limits: Sections 5.48 to 5.59.
- See the OHS Regulation for more information on requirements for lead: Sections 6.59 to 6.69.

In fire assaying laboratories, lead is used in the analysis of rock samples.

There are five main types of control measures for preventing overexposure to lead: substitution, engineering controls, administrative controls, protective equipment, and good personal hygiene.

Substitution

The most effective way to eliminate lead contamination is to replace a lead-containing material with one that does not contain lead or with one that contains less lead. Because lead is designated as a substance that is "a possible human carcinogen" and "a possible reproductive toxin," employers must replace lead materials whenever practicable. The following are two examples:

- Replace lead-based babbitt metal with lead-free babbitt metal (for example, a tin-based babbitt metal).
- Replace lead-based white paint with lead-free titanium dioxide paint.

Before substituting materials, ensure that the new material does not contain another product that is just as hazardous or more hazardous than lead. Check the material safety data sheet (MSDS) to help identify potentially hazardous components.

Engineering controls

Engineering controls are developed by reviewing the actual production process in order to find ways to minimize and, if possible, eliminate the amount of lead contaminant being released into

the atmosphere. The following are some common engineering control measures.

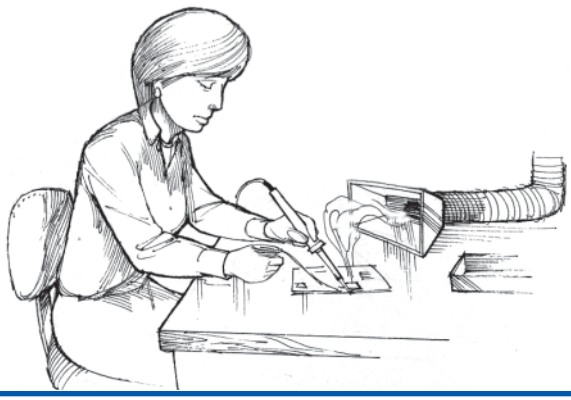
Enclosure of work processes

Sometimes lead-containing materials cannot be avoided and are required for, or produced by, the production process. Totally enclosing a specific task or process that produces lead contamination will minimize or eliminate lead exposure for all workers. Partially enclosing or segregating a task or process may reduce lead exposure for some workers but not for all workers.

Local exhaust ventilation

Lead contamination from a process can be decreased at the source by installing local exhaust ventilation. This option can be used where the lead being released is fairly localized — for example, in welding, brazing, and casting operations. These ventilation systems must be carefully designed to ensure that they:

- Effectively remove the lead dust or fume
- Do not alter or interfere with the work process



Ventilation should draw lead fume or dust away from the work and the worker.

- Do not increase the lead exposure to other workers (for example, by exhausting the lead fume or dust to other work areas)
- Do not increase the lead exposure to the worker by pulling the lead fume past the worker's breathing area

This is the wrong position for an exhaust hood. Ventilation must not draw lead fume or dust past the worker's breathing area.

Process modification

In some situations, it may be possible to consider modifying processes to reduce the amount of lead fume or dust generated. For example, wet working methods can reduce the amount of lead dust produced. Pressurized water should be used to remove lead-based paint instead of stripping the paint with a heat gun. However, there still may be significant levels of lead dust generated if the water pressure is too high. Another example is to cut lead or lead-containing metals by hand sawing or mechanical shearing instead of using oxy-fuel torches or arc-air gouging.

In lead abatement projects, removal of lead-based coatings exposes workers to lead dust.

Administrative controls

Administrative controls include worker education and training, good housekeeping, proper use of washing facilities, clean eating and drinking areas (separate from work areas), safe work procedures, maintenance of equipment, work scheduling, and implementation of a health protection program.

Education and training

In the Regulation

See the OHS Regulation for information on maintaining records of training and other activities: Section 6.68.

Workers who may be exposed to lead require adequate training and instruction in the following:

- Hazards of lead, including sources of exposure, routes of entry into the body, and possible health effects
- Correct operation and use of any required engineering controls (such as local exhaust ventilation systems)
- Written safe work procedures
- Proper use, maintenance, and limitations of personal protective equipment and clothing
- Importance of personal hygiene and decontamination procedures
- Purpose and significance of workplace lead dust monitoring and results (exposure data) — workers have a right to know the results of workplace sampling
- Purpose and significance of any health monitoring program
- Purpose and benefits of work scheduling and job reassignments

Good housekeeping

Employers and workers should ensure that work areas are kept clean and free of lead dust. Surfaces should be cleaned with water, wet mops, wet rags, and vacuums with high efficiency particulate air (HEPA) filters to prevent lead dust from contaminating work clothes and tools. Surfaces should not be wiped or swept when dry as this will raise lead dust into the air where it can be inhaled and cause further contamination to other surfaces.

Rags, mops, and filters contaminated with lead must be handled and disposed of according to safe work procedures established by the employer.

Shower and change facilities

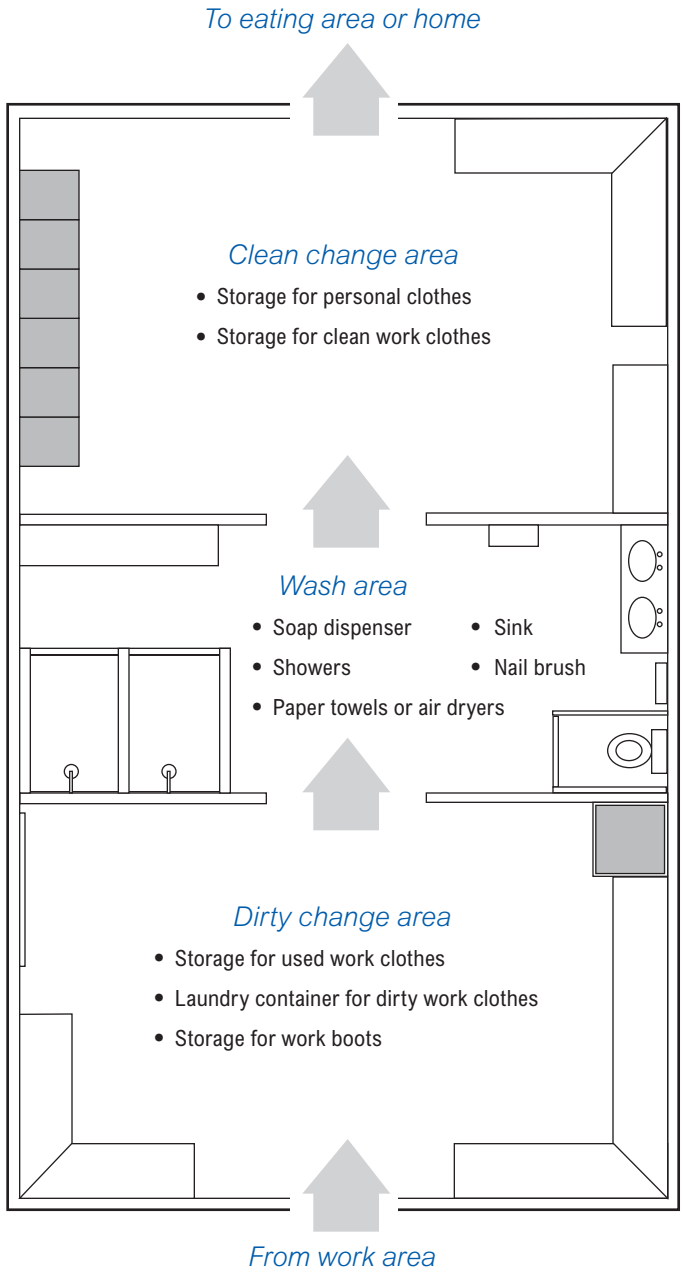
Adequate washing, showering, and change facilities must be provided for lead-exposed workers so they can wash thoroughly before work breaks and shower at the end of each shift. There must be a separate area designated for clean clothing (work and personal) and another area for contaminated work clothes, with showering and washing facilities in between.

In addition to sinks, wash areas should be supplied with nail brushes, individual paper towels or air dryers (not communal or reusable towels), and soap dispensers (not soap bars).

In the Regulation

See the OHS Regulation for more information on personal hygiene: Sections 5.82 to 5.84.

Properly designed change and wash areas ensure that lead contamination is removed before workers eat or go home.



Eating facilities

A separate room completely isolated from the work area should be provided for storing food, drinking, and eating food. Workers should remove contaminated clothing before eating. The eating area should be near the washing and changing rooms so that workers do not have to pass through the shop floor area after washing before a meal or coffee break. Eating, drinking, storing of food, and smoking must not be allowed in the work areas.

Safe work procedures

Employers should develop and implement safe work procedures for activities where workers are or may be exposed to lead. For example, coatings and metals should be checked for lead before starting activities such as welding, grinding, and drilling; lead babbitting pots should be checked so that they are maintained at proper temperatures to minimize lead fume. In addition, some activities require detailed, step-by-step safe work procedures on how to perform the work safely. For example, if lead is found in a coating, a detailed safe work procedure is required on how to remove the coating before work begins.

Equipment maintenance

Employers and workers need to work together to ensure all equipment is working properly, especially exhaust ventilation systems that remove lead fume and dust. Workers should report equipment problems and failures immediately.

Plan facilities carefully

In one work location the washing facilities were at the bottom of a flight of stairs. Workers had to go down the stairs to wash up and then go back up the stairs to the lunch area. When the blood lead levels of the workers increased, it was discovered that the handrail was the major source of the lead contamination. The workers used the handrail to go down the stairs before washing their hands, contaminating the handrail. They then used the handrail to go up the stairs after washing their hands, contaminating their clean hands.

Work schedules

The amount of time a worker is exposed to lead can be reduced through job rotation and varied work assignments. Such changes in work schedules will limit the amount of lead absorbed and allow the body time to naturally get rid of lead that has been absorbed. Also, work activities involving high lead levels can be scheduled in areas where and during times when fewer workers would be exposed.

An effective health protection program is required if workers may be exposed to potentially hazardous levels of lead.

Health protection program

In a work area where there is a risk of workers being exposed to potentially hazardous levels of lead, employers are required to have an effective health protection program. This may require regular monitoring of blood lead levels of workers. Records of any health monitoring must be maintained. Health monitoring is intended to detect increasing lead levels in workers before signs and symptoms occur. Individual workers have the right to know the results of their own health monitoring tests.

For information on health protection programs, contact WorkSafeBC at 604 276-3100 in the Lower Mainland and toll-free at 1 888 621-7233 within B.C.

Personal protective equipment

When other control measures are not technically possible, are impracticable, or do not provide adequate protection, personal protective equipment such as respirators must be used.

Employers are required to provide the necessary equipment and worker training on the proper use of such equipment. Workers must use and maintain the personal protective equipment provided to minimize lead exposure.

If respirators are required, they must be properly selected and fit-tested to ensure adequate protection from exposure to lead. Respirators must be regularly cleaned and properly stored to prevent lead contamination. Respirator filters must be inspected and replaced according to the manufacturer's instructions. For more information on proper selection and use of respirators, see WorkSafeBC Publications at the front of this book.

Even with other control measures, coveralls are usually worn. Coveralls prevent lead from collecting on personal clothing and workers' bodies. However, to be effective, coveralls must be properly done up, have no missing buttons, be repaired when holes develop, and be kept clean. Coveralls must be washed regularly (with the frequency of washing determined by the level of lead exposure), and disposable coveralls should be used where possible.

Commercial laundry services used to wash lead-contaminated clothing need to be informed that the clothing is contaminated with lead and requires special precautions.

In the Regulation

See the OHS Regulation for more information on personal protective clothing and equipment: Sections 8.1 to 8.44.

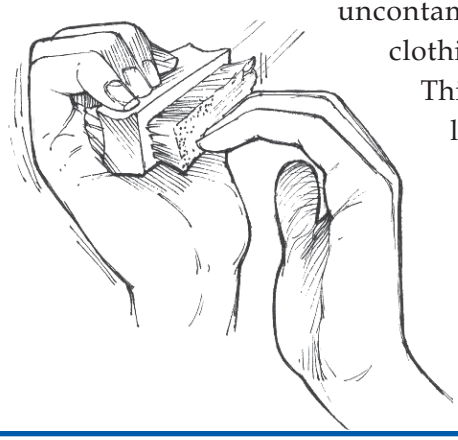
Lead-contaminated clothing should be washed separately from other clothing. Work clothes and boots should not be taken home. Commercial laundry services used to wash lead-contaminated clothing need to be informed that the clothing is contaminated with lead and requires special precautions.

Good personal hygiene

Washing thoroughly includes using nail brushes to clean hands and using paper towels or air dryers to dry hands.

Removing coveralls before coffee and meal breaks and washing thoroughly before eating, drinking, and smoking will reduce the possibility of lead contamination and further lead exposure during breaks. Hands should always be washed after removing dirty coveralls and gloves. Washing thoroughly includes using nail brushes to clean hands and using paper towels or air dryers to dry hands. Reusable or communal cloth towels should not be used. Workers should not bite their nails or chew gum during work.

After work shifts, workers exposed to lead should completely remove their clothes and shower (including washing their hair) before putting on uncontaminated personal clothing to go home. This will prevent lead from contaminating their vehicles and home environment.



Use a nail brush to wash hands and under finger nails to ensure all lead contamination is removed.

How can I find out if my lead exposure is too high?

Workers with high lead exposure may experience general signs and symptoms such as tiredness, weakness, abdominal pain, constipation, and general aches and pains. These symptoms, however, can also be caused by many other medical problems such as lack of sleep, indigestion, or rheumatism. In order to determine the cause of these common symptoms, the worker may have to be questioned and examined by a doctor. Blood tests may be required to confirm whether or not there is an excessive quantity of lead present. For more information on monitoring of blood lead levels and acceptable levels of blood lead, contact WorkSafeBC.

Measuring exposure

Air monitoring: The amount of lead in the air can be checked by sampling the air through a fine filter. The allowable amount of lead in the air cannot be more than 0.05 mg/m^3 (milligrams of lead per cubic metre of sampled air) averaged over an eight-hour work shift.

Surface monitoring: Laboratory surface wipe tests can indicate if lead is present on work surfaces and in surface coatings. There are also lead (Pb) test kits available for the general public to check for lead in surface coatings.

Health monitoring: A laboratory test is available to measure the amount of lead in a worker's blood.

What can be done for workers with elevated lead levels?

Analytical and hygiene services

For providers of analytical services and for exposure monitoring services, see your Yellow Pages under "Laboratories" and "Safety Consultants."

Workers with raised or high levels of lead can give their bodies time to get rid of excess lead naturally. It is usually sufficient to prevent the worker from absorbing further lead by eliminating or reducing their exposure to lead. This can be done by temporarily changing the work activity to one where there is no lead exposure or by adequately controlling the exposure to lead.

On rare occasions, a person with a high lead level may need to be admitted to hospital. Under strict medical supervision in hospital, drugs may be given to help the body get rid of unwanted lead.

WorkSafeBC Offices

Visit our web site at WorkSafeBC.com.

Abbotsford
2774 Trethewey Street V2T 3R1
Phone 604 276-3100
1 800 292-2219
Fax 604 556-2077

Burnaby
450 – 6450 Roberts Street V5G 4E1
Phone 604 276-3100
1 888 621-7233
Fax 604 232-5950

Coquitlam
104 – 3020 Lincoln Avenue V3B 6B4
Phone 604 276-3100
1 888 967-5377
Fax 604 232-1946

Courtenay
801 30th Street V9N 8G6
Phone 250 334-8765
1 800 663-7921
Fax 250 334-8757

Kamloops
321 Battle Street V2C 6P1
Phone 250 371-6003
1 800 663-3935
Fax 250 371-6031

Kelowna
110 – 2045 Enterprise Way V1Y 9T5
Phone 250 717-4313
1 888 922-4466
Fax 250 717-4380

Nanaimo
4980 Wills Road V9T 6C6
Phone 250 751-8040
1 800 663-7382
Fax 250 751-8046

Nelson
524 Kootenay Street V1L 6B4
Phone 250 352-2824
1 800 663-4962
Fax 250 352-1816

North Vancouver
400 – 224 Esplanade Ave. W. V7M 1A4
Phone 604 276-3100
1 888 875-6999
Fax 604 232-1558

Prince George
1066 Vancouver Street V2L 5M4
Phone 250 561-3700
1 800 663-6623
Fax 250 561-3710

Surrey
100 – 5500 152 Street V3S 5J9
Phone 604 276-3100
1 888 621-7233
Fax 604 232-7077

Terrace
4450 Lakelse Avenue V8G 1P2
Phone 250 615-6605
1 800 663-3871
Fax 250 615-6633

Victoria
4514 Chatterton Way V8X 5H2
Phone 250 881-3418
1 800 663-7593
Fax 250 881-3482

Head Office / Richmond
Prevention Information Line:
Phone 604 276-3100
1 888 621-7233 (621-SAFE)

Administration:
6951 Westminster Highway
Phone 604 273-2266

Mailing Address:
PO Box 5350 Stn Terminal
Vancouver BC V6B 5L5

After Hours Health & Safety Emergency
604 273-7711
1 866 922-4357 (WCB-HELP)

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