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SURFACE LEAD DUST MANAGEMENT IN OWNED AND SUPPORTED INFRASTRUCTURE

BACKGROUND

This bulletin aims to provide comprehensive information regarding workplaces where lead may be utilized, the associated health risks of lead exposure, available exposure control measures, and the specific requirements outlined in Alberta's Infrastructure guidelines for lead surface contamination.

The guideline establishes standards for workplaces where hazardous materials, including lead contamination, are present or may potentially be encountered. This bulletin clarifies these requirements and offers guidance to employers on implementing effective strategies to ensure a safe working environment for both employees and occupants.

WHAT IS LEAD

Lead (Pb) is a dense, soft, and odorless metal that occurs in a variety of forms, including elemental lead, inorganic and organic lead compounds, and lead-based paints. In indoor environments, lead is most commonly encountered as dust, paint chips, or surface residues resulting from the deterioration of lead-containing materials. Due to its chemical stability and resistance to natural breakdown, lead can remain in buildings for many decades, posing a persistent health risk if not identified, monitored, and effectively controlled. Proper management and mitigation are therefore essential to minimize exposure for building occupants and workers.

LEAD EXPOSURE PATHWAYS

The health effects of lead are consistent regardless of its source or route of exposure. Once absorbed, lead is primarily excreted through urine, with smaller amounts eliminated via feces, sweat, and the shedding of skin cells. A significant portion, however, is deposited in bone tissue, where it can remain for decades and may be mobilized back into the bloodstream over time, particularly during periods such as aging or pregnancy.

Exposure to lead can result in both acute and chronic health effects, depending on the level and duration of exposure. Short-term exposure to high concentrations may produce acute symptoms, while prolonged exposure to lower levels can lead to chronic health impacts. Lead toxicity can affect multiple organ systems, including the nervous, renal, cardiovascular, gastrointestinal, hematological, and reproductive systems.

Inorganic lead, in particular, is associated with a spectrum of effects ranging from subclinical functional changes to more pronounced clinical symptoms, and in rare cases, acute lead poisoning.

Lead can enter the body through inhalation or ingestion. Exposure may occur under several common circumstances, including:

- Inhaling airborne lead dust or fumes;
- Consuming food or beverages that have been contaminated with lead;
- Using dishes, cups, or utensils that contain or are contaminated with lead;
- Transferring lead from contaminated hands to the mouth, such as during nail biting or smoking without prior handwashing;
- Smoking or chewing gum in environments where lead dust or fumes are present;
- Placing objects from contaminated work areas in the mouth.

These pathways highlight the importance of maintaining proper hygiene and avoiding behaviours that can increase the risk of exposure in contaminated environments.

LEAD IN THE WORKPLACE

Up until the 1980s, lead was commonly used in paint because it made paint stronger, gave it brighter colors, and helped it dry faster. Even today, lead paint is still used for things like yellow road lines, and there are no restrictions on its use in industrial coatings.

Lead paint that is in good condition and left alone is not usually a hazard. The most common way that workers may be exposed to lead at the work site is when tasks are done that produce airborne lead dust, fume or vapour. Issues arise when the paint chips, peels, or gets damaged. If it's sanded, scraped, or burned, it can release lead dust, mist, or fumes. These particles can then be inhaled or swallowed by workers and by others nearby, including children.

LEAD SURFACE SAMPLING

Wipe sampling is the most commonly used and standardized method for evaluating lead contamination on surfaces. The procedure involves using a pre-moistened wipe, typically dampened with deionized water or alcohol, to collect dust from a defined surface area, often one square foot or 100 cm^2.

Collected samples are then submitted to a laboratory for analysis, usually via atomic absorption spectroscopy (AAS) or inductively coupled plasma (ICP), to quantify the lead content, typically expressed in micrograms per square foot.

Several protocols are widely recognized and referenced for this purpose, including NIOSH Method 9100, ASTM E1728 (Standard Practice for Wipe Sampling of Surfaces for Lead), and ASTM E1792 (Standard Specification for Wipe Sampling Materials for Lead in Surface Dust). These methods are endorsed by the U.S. Environmental Protection Agency (EPA) and the Department of Housing and Urban Development (HUD) for abatement clearance testing and serve as the compliance standard for both clearance and exposure evaluations.

Wipe sampling is valued for its simplicity, cost-effectiveness, and ability to provide quantitative results that can be directly compared to regulatory standards or guidelines.

Once laboratory results are obtained, they should be evaluated against relevant standards to assess the potential health hazard and determine the need for further action

There are also various lead test kits that can check dust or paint chips however Alberta Infrastructure does not recognize lead analysis by this type of sample collection method.

INFRASTRUCTURE RECOMMENDED LIMITS

In Canada, there is currently no uniformly adopted, standardized framework for establishing surface lead dust limits across occupational settings, and regulatory approaches vary by jurisdiction. Some provinces emphasize risk management through targeted cleaning and housekeeping practices to control settled dust, while others incorporate a combination of surface contamination control and airborne lead concentration limits to manage potential exposure.

In the absence of prescribed occupational surface dust criteria, the most defensible approach is to apply a risk-based framework grounded in established principles of Occupational Hygiene. This includes identifying potential sources, minimizing dust accumulation through routine cleaning, and verifying that airborne lead concentrations remain within applicable occupational exposure limits.

Within Alberta, regulatory oversight is primarily focused on airborne exposure limits under occupational health and safety legislation, with less emphasis on defined surface dust thresholds.

As such, where surface lead contamination is a concern, it is common practice to adopt conservative, health-protective reference values such as residential dust guidelines developed by the United States EPA which is intended to minimize exposure risk for children under six, rather than for the general adult population as screening tools rather than strict compliance criteria. These values can help inform cleaning objectives and assess the effectiveness of control measures, while recognizing that they are based on child sensitive exposure assumptions and may be more stringent than necessary for typical adult workplace environments.

Accordingly, the recommended course of action is to implement a combination of proactive housekeeping measures, source control (if applicable), and, where warranted, targeted surface sampling to verify the effectiveness of cleaning. This integrated approach provides a practical and technically defensible means of managing potential lead dust exposure in the absence of formally established occupational surface limits in Alberta.

Therefore, Alberta Infrastructure has adopted the following surface limits for acceptable lead levels:

- Daycares (children < 6 years) - 5 µg/ft^2
- Residential (children < 6 years) - 5 µg/ft^2
- Schools (K to 9) - 40 µg/ft^2
- Longterm Care Facilities - 40 µg/ft^2
- Office and Commercial Workspaces - 200 µg/ft^2

These guidelines or an equivalent standard developed by a reputable and credible organization would be considered appropriate surface clearance criteria in Alberta Infrastructure owned and supported facilities.

As a best practice, surface wipe sampling should be complemented by airborne lead monitoring to provide a more comprehensive assessment of potential exposure. Airborne sampling allows for direct comparison to established occupational exposure limits and helps contextualize surface dust results in terms of actual inhalation risk. The integration of both surface and airborne data strengthens the overall exposure assessment and supports more informed decision-making.

CLOSURE

Lead in the office workplace is primarily a concern in older buildings with lead-containing paints or materials. Exposure can affect multiple organ systems and accumulate over time. Surface sampling, using wipe methods and air sampling is a practical way to assess contamination. Comparing results to established guidelines ensures that workspaces meet safety standards for employees and visitors. Regular monitoring and adherence to guideline criteria are essential to maintain a healthy office environment.

CONTACT INFORMATION

For information or assistance, contact the Applied Ecosciences Unit Manager within Technical Services Branch at (780) 422-7472.