



Research & Development Highlights

Evaluation of the Cleanup of Lead Paint Dust in Houses

Introduction

Lead contamination in housing can be caused by activity that disturbs old leaded paint surfaces, such as renovations. Exposure to lead can lead to a variety of health problems, especially in children and fetuses.

A previous CMHC study was undertaken to examine the efficiencies of various cleaning methods under laboratory conditions; see the report, *Effectiveness of Clean-Up Techniques for Lead Paint Dust*. This subsequent project took place in real houses with dust generated by renovation activity. It evaluated the efficiency of four clean-up protocols for leaded paint dust on floors, and compared the results to current and proposed U.S. federal guidelines for acceptable cleanliness after lead abatement.

Research Program

A field study was conducted on 20 test rooms from 9 houses slated for demolition in Windsor, Ontario.

Two test procedures were used for the detection of leaded paint. An X-ray fluorescence (XRF) measurement was taken followed by paint chip removal using a heat gun with a built in scraper blade. The results of both methods were then compared.

The test rooms were isolated to limit the spread of paint dust. All moveable objects were removed and non-moveable objects covered and sealed with 6 mil polyethylene. All

carpets were removed and the underlying floor cleaned.

Leaded paint dust was generated by sanding a 0.36 m² area in each room as well as removing a piece of trim. A 6" angle grinder with a medium abrasive pad and rubber backing was used in all rooms except the first one sampled.

Four floor cleaning protocols were used ranging from common household cleanup methods to the cleaning method for leaded dust as recommended by U.S. federal guidelines. These are as follows:

Method 1

- Floor is dry swept with a corn broom in 1 direction only.
- Floor is vacuumed in perpendicular directions with utility vacuum (shop vac). The original liner bag is used and preloaded to at least 10% capacity.

Method 2

- Floor is vacuumed in perpendicular directions with household vacuum cleaner fitted with floor brush. A new filter is used and preloaded.
- Floor is sponge mopped in perpendicular directions with a water/household cleaner solution. Contaminated sponge mop is rinsed out in cleaning solution. There is no clean rinse procedure.

Method 3

- Floor is vacuumed in perpendicular directions with utility vacuum (see above).
- Floor is sponge mopped in perpendicular, directions with a water/lead cleaning solution. Contaminated sponge mop is rinsed out in cleaning solution.
- Floor is rinsed in perpendicular directions with same mop but clean rinse water.

Method 4 (as recommended by U.S. federal guidelines)

- Floor is vacuumed in perpendicular directions with wet/dry HEPA vacuum without collection bag.
- Floor is sponge mopped in perpendicular directions with a water/TSP solution. The solution is applied via a garden type water sprayer. The mop head is wrung out in a contaminated water bucket.
- Floor is rinsed in perpendicular directions using same mopping method.
- Floor is vacuumed again with HEPA vacuum.

Wipe samples were taken before and after clean-up to determine the amount of leaded paint dust on the floors. This analysis followed protocol as established by U.S. federal guidelines.

Data was tabulated for:

- average lead concentration in paint on walls by XRF (mg/cm^2);
 - average lead concentration in paint on walls by chemical testing (%);
 - floor type;
 - floor condition;
- pre-cleaning lead surface concentration on

floors (jg/in^2); and

- post-cleaning lead surface concentration on floors (jg/in^2).

Findings

The average lead in paint concentrations on walls found by chemical analysis were consistently lower than the XRF results. It is presumed that the earliest paint layers (containing the highest concentrations of lead) were not successfully collected during paint sample removal.

The concentration of leaded paint dust on floors before cleaning ranged from 33,900 jg/in^2 to 220,000 ILtg/m^2 with an average of 103,000 ug/m^2 . The higher values correspond to the higher paint lead values found on the walls during XRF testing.

Test measurements of leaded dust on walls indicated that these concentrations were too low to affect post-cleaning floor concentrations, in the event of dust transfer.

Airborne lead measurements were excessively high during power sanding and dry sweeping.

Results for lead concentrations after various cleaning methods indicated that methods 3 and 4 were much more effective in removing leaded paint dust than methods 1 and 2. The mean clean-up efficiency after methods 1-4 was 93.3%, 85.1%, 98.5% and 99.2% respectively.

The condition of the flooring played a key role in the clean-up effectiveness. Coincidentally, only method 4 was performed exclusively on "good" floor surfaces. All others had one or more "poor" floors in their sample. Poor flooring was not

cleaned effectively with any method. Field observations noted that wet cleaning methods tended to continuously transfer dust held in damaged surfaces back onto the clean surface.

Implications for the Housing Industry

Contractors, renovators and do-it-yourself homeowners should consider a number of factors when undertaking a renovation which may disturb leaded paint and its subsequent clean-up:

- Any process which involved several steps (i.e. vacuuming, sponge mopping, rinsing) and repetition will likely reduce lead levels to acceptable levels.
- Methods 3 and 4 worked most effectively in this study at minimizing residual lead on floors.
- Dry sweeping should be avoided as it contributes to high levels of airborne leaded dust.
- Power sanding should be done in a controlled setting with appropriate exhaust and protective equipment.
- Damaged floor surfaces should be protected with plastic sheeting before disturbing the paint. If contaminated, the damaged floor should be removed or permanently covered with new flooring.
- Paint chip samples obtained by use of heat guns may not adequately collect all paint

layers, giving lower readings than the XRF. A bulk sample including the substrate material may give more satisfactory results.

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Research Report.- Evaluation of the Cleanup of Lead

Paint Dust in Homes (1995)

Research Consultant: Pinchin Environmental Consultants Limited.

A full report on this research project is available from the Canadian Housing Information Centre at the address below.

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