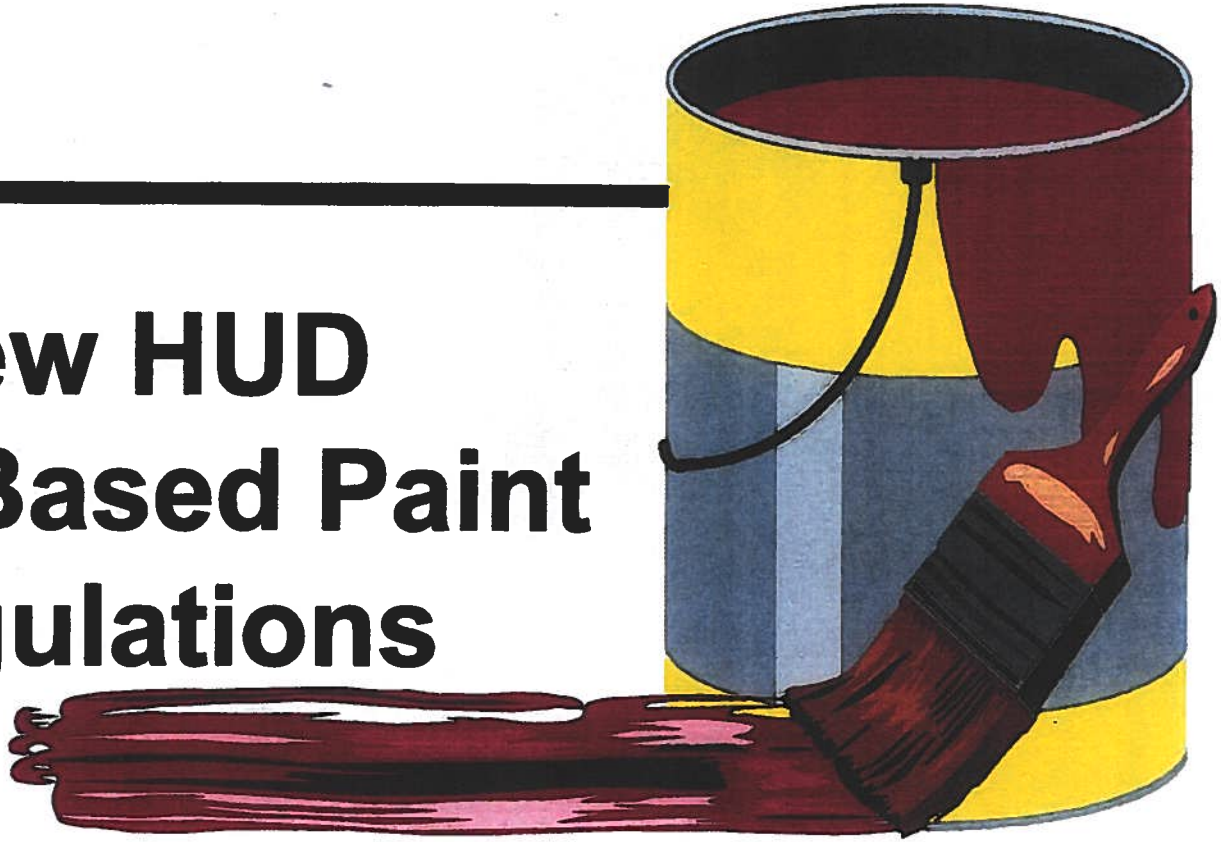


New HUD Lead-Based Paint Regulations

Prepared by
Office of Lead Hazard Control
U.S. Department of Housing and Urban Development

Safe Work Practices

- **Specifically required for:**
  - Ongoing LBP Maintenance
  - Paint stabilization
  - Rehab (<$5,000)
  - Standard treatments
- **Prohibited methods**
- **Occupant protection and worksite preparation**
- **Specialized cleaning**
- **Control dust generated with wet methods**
- **Contain dust and debris**
- **Proper clean-up and pass clearance**
- **Required above de minimis levels**

24 CFR 35.1350

De Minimis Levels

- **Exception to Safe Work Practices**
- **Work which disturbs less than:**
  - 20 square feet on exterior surfaces
  - 2 square feet in any one interior room or space
  - or 10 percent of area of a interior or exterior component with a small area (sills, baseboards, etc.) per room

24 CFR 35.1350

CHAPTER 15: CLEARANCE

Clearance: How To Do It

1. Decide who will conduct clearance. Clearance on all abatement projects and federally funded interim control work must be done by a certified risk assessor or inspector technician. The U.S. Department of Housing and Urban Development (HUD) strongly recommends the use of a certified risk assessor or inspector technician who is completely independent of the lead hazard control contractor to eliminate conflicts of interest. Some local jurisdictions may require a license to conduct clearance.
2. Finish the lead hazard control and cleanup effort. Seal floors before clearance testing (if necessary).
3. Wait 1 hour to allow any airborne dust to settle. Do not enter the work area during that hour.
4. Conduct visual examination.
   a. Determine if *all* required work has been completed and *all* lead-based paint hazards have been controlled.
   b. Determine if there is visible settled dust, paint chips, or debris in the interior or around the exterior.
5. Complete the Visual Clearance Form contained in this chapter; if all specified work was not completed, inform the owner and order completion of work and repeated cleanup, if necessary.
6. Conduct clearance dust sampling of floors, interior window sills, and window troughs using the protocol in this chapter.
7. Conduct clearance soil sampling if bare soil is present that was not sampled previously, or if exterior paint work was completed as part of the lead hazard control effort. Whenever exterior work has been done, it may be necessary to take samples from soil that is not bare to determine if contamination has occurred. If results are above 2,000 μg/g (or 400 μg/g in high contact play areas), compare the results to baseline soil sampling results to determine what additional measures are needed.
8. Complete the Dust and Soil Sampling Clearance Form contained in this chapter.
9. Submit samples to a U.S. Environmental Protection Agency (EPA) recognized laboratory participating in the National Lead Laboratory Accreditation Program (NLLAP) for analysis.
10. Interpret results by comparing them to the HUD Interim Clearance Standards contained in this chapter (until EPA issues its health-based leaded dust standards).
11. If clearance is achieved, go to step 15.
12. Order repeated cleaning or soil treatments if results are above applicable standards. Clean all surfaces the sample represents.
13. Continue sampling and repeated cleaning until the dwelling achieves compliance with all clearance standards.

14. Complete any related construction work that does not disturb a surface with lead-based paint (all work that does disturb painted surfaces or that could generate leaded dust should be completed as part of the lead hazard control effort).

15. Issue any necessary statements of lead-based paint compliance or releases and maintain appropriate records.

16. Permit residents into the cleared work area.

Chapter 15: Clearance

I. Introduction

A. Purpose of Clearance

Clearance refers to the various environmental evaluation procedures used to determine if:

- The lead hazard control work was actually completed as specified.
- The area is safe for unprotected workers to enter.
- The area is a safe place for residents and young children to live.

Since most lead hazard control work generates a considerable amount of leaded dust, and since previous studies have indicated that cleaning can be accomplished only with great care and skill (HUD, 1991), it is necessary to determine if the cleaning was successful. Some type of clearance is required for all forms of lead hazard control. Certified risk assessors or certified inspector technicians (clearance examiners) can best recommend the exact type of clearance testing to be employed on a specific project. The process outlined in this chapter provides a means of determining if lead hazards have been controlled.

B. Clearance as the Endpoint

If clearance criteria are met, the contractor who performed the work can conclude that the job is complete. However, if the clearance criteria are not met, the contractor must complete the work and/or repeat the cleaning process until the area is clean enough to meet clearance criteria. For example, if the job included the removal and replacement of all windows, but the clearance examiner determines that one window has been overlooked, the contractor must remove and replace it as originally specified (in addition to carrying out any necessary additional cleaning in that area). Similarly, if excessive leaded dust levels remain, the contractor's job cannot be considered complete until leaded dust levels are below clearance standards. Normally, the final payment to the contractor is withheld until compliance with clearance standards is achieved.

The clearance examination described in this chapter is similar to the punchlist that follows a typical construction or repair job. The major difference is that the normal visual check is almost always augmented with environmental testing since leaded dust and soil hazards are not visible to the naked eye.

The clearance examination protects *all* parties involved—the job contractor, the owner, and the resident. The process provides the contractor with an objective determination that the job was completed safely. The owner will have assurance that the abatement job was successful in correcting hazards and that the amount of leaded dust left after the work was completed is at a safe level. The resident can be certain that dangerous shortcuts were not taken during the work process and that resident children will be safe.

C. Conflicts of Interest

The owner should retain the services of a certified risk assessor or a certified inspector technician to determine compliance with clearance criteria. The clearance examiner must not be paid or employed, or otherwise compensated by the lead hazard control contractor and should have no vested interest in seeing that the job is completed on schedule. The clearance examiner's *only* concern should be that compliance with clearance standards has been achieved.

This does not mean that job supervisors should not perform their own visual assessments of the quality of the cleanup job performed by their workers. Such assessments will help ensure that clearance criteria are met the first time around.

Some owners of multiple dwelling units may wish to have lead hazard control work performed by their own trained crews, rather than

contract for such services. In this case it is essential that clearance testing be performed by an independent third party whose payment is not dependent on completion of the job within any particular time period.

The clearance procedures contained in this chapter should always be included in the job specifications so that performance responsibilities are clear.

II. Time Between Completion of Cleanup and Clearance

Clearance dust sampling should be performed no sooner than 1 hour after completion of the final cleanup to permit airborne leaded dust to settle. Clearance dust sampling is for *settled* leaded dust, not airborne leaded dust, since the main source of lead exposure for children is through contact with contaminated surfaces followed by ingestion. Most children in the United States. are *not* lead poisoned by inhalation (ATSDR, 1988). Airborne leaded dust sampling is not recommended for clearance purposes in lead hazard control work.

While often performed for asbestos abatement projects, air sampling does not appear to be a useful tool for determining if clearance has been achieved in lead hazard control work. Because asbestos fibers are known to have low settling velocities (that is, they take a long time to settle out of the air), air sampling can be used to determine the effectiveness of the cleanup effort in asbestos abatement jobs. But because dust particles typically generated during lead abatement jobs are larger, denser, more spherical, and heavier, settling time is much faster.

The U.S. Department of Housing and Urban Development's (HUD's) *Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing* recommended 24 hours as the minimum waiting period to allow airborne lead-contaminated particles to settle, although no justification for the 24-hour waiting period was provided (HUD, 1990a). The reduction in the waiting period before sampling from 24 hours to 1 hour marks an important change in the new recommendations. The current *Guidelines* recommend 1 hour because the additional amount of leaded dust that would settle onto floors after 1 hour is negligible. The analysis supporting this finding is summarized below. (A full description of the analysis can be found in Appendix 11.)

Analysis of the settling velocity of airborne leaded particulate has demonstrated that nearly all particulate greater than 5 μm in diameter will have settled out of the air within an hour. It is estimated that any remaining airborne particulate less than 5 μm would contribute no more than an additional 5 $\mu g/ft^2$ of lead to surface dust, even if all of it were to settle out of the air. This is well below the HUD Interim Clearance Standard for floors (100 $\mu g/ft^2$) and also well below the routine limit of quantitation for wipe sampling (25 $\mu g/ft^2$). Therefore, a reduction in the waiting period to 1 hour is justified. This change will contribute to significant cost savings by cutting 1 day off the length of the abatement job (reducing relocation costs and job delays). Entry into the area should be prohibited during the 1-hour waiting period to keep turbulence and re-entrainment of particulate matter to a minimum.

III. Visual Examination Procedures

Clearance occurs in two main phases: visual examination and environmental sampling (dust and, if exterior work was conducted, soil sampling). A standard Visual Clearance Form can be found at the end of this chapter (see Form 15.1).

A. Determination of Completed Work

A visual examination determines whether the work on all interior and exterior surfaces to be treated was in fact completed and to ensure that no visible settled leaded dust or debris are present. Visual clearance is a relatively straightforward process requiring an understanding of the scope of the job and a keen eye for detail. It is

essential that clearance examiners have full knowledge of the extent of the work and specifically which surfaces did *not* require treatment. The clearance examiner should have access to any risk assessment or paint inspection report as well as the job scope of work or specifications and a report from the owner or contractor that the work has been completed.

The visual examination of completed work should be done on a room-by-room basis to ensure that all areas are examined (this includes the exterior and common areas). In most cases the visual examination will be conducted by a clearance examiner when the environmental samples are collected.

When paint removal and repainting or soil removal and covering is planned, verification of the removal of the lead hazards will be necessary prior to the completion of work. In these instances the owner or a representative of the owner (which may be the hazard control contractor) may take responsibility for confirming that the hazard is removed prior to repainting or covering. This allows the owner to avoid the expense of having the clearance examiner travel to the job site twice—once to verify the hazard removal and again to collect environmental samples. On the other hand, owners may choose to have the clearance examiner confirm that the work was actually completed. Regardless of who verifies the hazard removal, verification should be documented on Form 15.1.

In multifamily housing of similar construction, it is not necessary to perform a visual examination of every single unit. Instead, a random sample of abated units can be visually examined before the paint is applied. The abatement contractor should not know ahead of time which units will be visually inspected prior to repainting. The random sample size can be determined by using the table for lead-based paint inspections (Table 7.3). Random sampling of single-family dwellings is not possible due to the large variability in construction and work. Therefore, each single-family dwelling should be cleared individually.

In the case of a child with an elevated blood lead level, local authorities may require that the treatment of all indicated surfaces be verified by a government employee or certified third party, especially in cases where the abatement has been ordered by local authorities. Clearance examiners should determine if the property they are investigating has been abated as a result of a legal or regulatory proceeding. If so, the enforcement agency should be contacted to coordinate clearance procedures, prevent duplication of effort and, most importantly, ensure that the private clearance process is not inadvertently overstepping the bounds of the normal practices of the local health department or childhood lead-poisoning prevention program.

1. Paint Removal and Repainting

All surfaces where paint has been removed should be visually examined *prior to repainting.* If clearance is conducted after new paint is applied, it is often impossible to determine if the old paint was actually removed. Areas commonly overlooked during paint removal projects include the underside of interior window sills and handrails, backside of radiator ribs, bottom edge of doors, top of doorframes, and the back edge of shelving.

For both onsite and offsite removal, the clearance examiner or the owner should examine the bare surfaces to ensure that there is no visible residue. If residue remains, the component should be cleaned prior to repainting or refinishing.

Wipe sampling and x-ray fluorescence (XRF) testing are not appropriate tools for determining the effectiveness of paint removal from a particular surface. Wipe sampling cannot dislodge any leaded dust that may have been absorbed into the substrate during the removal process, nor can it remove paint that is still bonded to the substrate. Wipe sampling *is* appropriate for measurement of settled leaded dust on floors, interior window sills, and window troughs. It is not appropriate to apply the settled leaded dust clearance standard to these components since the bare surface will be sealed with new paint,

thus rendering the dust inaccessible. Appendix 1 describes how much lead-contaminated dust can remain on a surface (at least 35,000 μg/ft²) before it would cause the newly applied paint to become lead-based paint (at 0.5 percent).

2. Building Component Removal and Replacement

If building components coated with lead-based paint were removed as a lead hazard control measure, the clearance examiner should have detailed knowledge of the scope of the replacement activities so that actual removal can be verified. Each building component specified for replacement should also be examined to determine if it was overlooked during the lead hazard control work.

3. Enclosures

Complete installation of enclosure systems, such as new drywall, paneling, or siding, can be best evaluated by direct visual observation. The clearance examiner should determine that the mechanical fastening system used to hold the enclosure to the substrate is adequate. This is especially important for ceilings. All seams and edges in the enclosure should be sealed to provide a "dust-tight," but not necessarily airtight, system.

4. Soil Treatments

Soil treatments, which typically consist of some form of covering or removal and/or replacement, can be assessed by direct visual observation to determine if the covering is present. For example, if sod or asphalt has been used as a soil covering, the clearance examiner should determine if all bare areas have been covered by the sod or asphalt, as specified.

No visible lead-based paint chips should be observed in soil following lead hazard control work. It is not necessary to turn over or rake soil to look for paint chips. A visual examination of the surface is adequate.

If exterior work on lead-based paint has been performed, baseline soil samples should have been collected but not necessarily analyzed until clearance soil samples have been collected, analyzed, and compared to clearance standards. It may be necessary to collect samples from soil that is not bare to determine if contamination has occurred. If post-hazard control soil levels are below applicable limits, the preabatement samples need not be analyzed. The clearance level for most soil is 2,000 μg/g (400 μg/g for small, high-contact play areas). If post-hazard control soil levels are greater than or equal to the applicable limits, the baseline samples should be analyzed to determine where additional work is needed. If paint chips originating from the work are identified in the soil, they should be picked up with a high-efficiency particulate air (HEPA) vacuum.

5. Encapsulants

Another category of lead hazard control that can best be assessed visually is the application of encapsulants. Assuming that the encapsulant was properly selected for the surface undergoing treatment and that patch tests were conducted as recommended in Chapter 13, the clearance examiner can determine if the encapsulant is in fact present.

6. Interim Controls

Visual examination of the wide variety of interim control measures consists of a confirmation that all lead-based paint (either suspected or identified through testing) is stabilized and that any friction, impact, and other surfaces marked for treatment in the risk assessment report or project specifications have all been properly treated. No known or suspected lead-based paint should be in a deteriorated condition in a cleared dwelling.

B. Visual Examination for Settled Dust and Debris

There should be no evidence of settled dust following a cleanup effort. If dust is observed, the contractor must be required to repeat the cleaning effort *before* clearance dust samples are collected to avoid conducting dust sampling twice. Any settled dust present following abatement or interim control work provides sufficient evidence that cleanup was not adequate (see Figure 15.1).

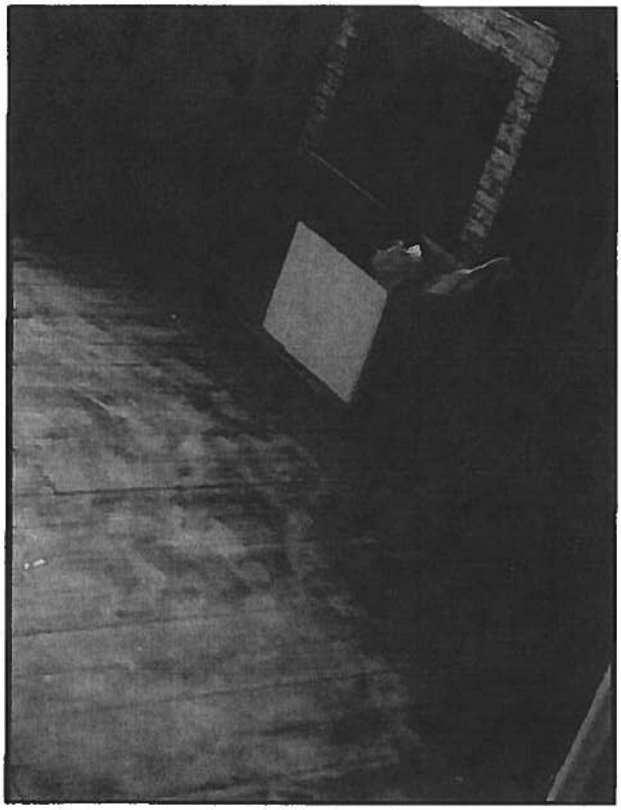
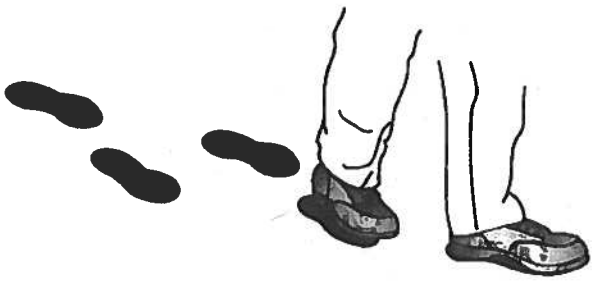


Figure 15.1 Visible Dust Indicates Cleaning Should Be Repeated.

Lead Tracking

Lead dust can be transported from one area to another on shoes.

Tracking lead dust from one area to another is a big problem on lead hazard control jobs. Lead dust can be tracked on shoes from the work area to the outside. Sometimes lead dust from the outside soil is tracked into the work area. Lead dust from a porch or nonwork area can get tracked into a cleaned area. When this happens, the whole area must be cleaned.



There are conflicting reports regarding the use of the so-called "white glove test" as part of the visual examination. Some housing agencies have indicated that they find this to be a useful preliminary examination tool, while others indicate that this test almost always shows some discoloration, even if surfaces have been cleaned well. Until it has been demonstrated to effectively predict leaded dust levels, use of the "white glove test" is left to the discretion of the examiner and is not recommended by HUD. The "white glove test" is *not* a substitute for laboratory analysis of dust samples.

Finally, the grounds around the dwelling should also be examined visually to make certain that all waste and debris have been removed and that leaded dust or paint chips were not transferred outside the dwelling. For example, waste should not be left at the curbside for trash pickup; all waste should be removed from the site. The examiner should be particularly conscientious about looking for paint chips when exterior components have been disturbed.

IV. Clearance Dust Sampling

A visual examination alone is not adequate for determining if a residence is safe for occupancy, since small dust particles are not visible to the naked eye. A person with normal eyesight cannot detect individual dust particles smaller than 50 μm in diameter (Olishifski, 1983). Data indicate that a significant percentage of the dust generated during abatement is smaller than 50 μm (Mamane, 1994; NIOSH,

1993b). Since these smaller dust particles are associated with an increased risk of lead poisoning, clearance dust testing is required to determine if a leaded dust hazard remains following lead hazard control work.

Unless U.S. Environmental Protection Agency (EPA) regulations establish different clearance levels, the following HUD clearance standards should be used, based on wipe sampling:

- 100 $\mu g/ft^2$ for floors.
- 500 $\mu g/ft^2$ for interior window sills.
- 800 $\mu g/ft^2$ for window troughs and exterior concrete or other rough surfaces.

There is no standard for vacuum sampling at this time.

Portable XRF analyzers have not yet demonstrated a capacity to detect dust lead levels in the range of interest. Wet chemical field test kits are also not sufficiently reliable for routine analysis of leaded dust at this time and do not yield quantitative data that can be compared to clearance standards.

Dust samples must be analyzed by laboratory methods such as atomic absorption spectroscopy, inductively coupled plasma-emission spectroscopy, laboratory XRF using standard methods, or other equivalent analytical methods (see Appendix 14). Only laboratories that participate in a national proficiency testing program and are recognized by EPA should be used.

If the dust sample from any surface indicates a leaded dust level above the clearance standard, all similar surfaces in the dwelling that sample represents (e.g., all interior window sills or floors) should be recleaned and retested. Only the similar components need to be recleaned, not necessarily the entire dwelling. If any such surface fails twice, the property owner should consider additional hazard control measures and/or further sealing of the surface. See sections D and VII for further disussion interpreting dust sampling results.

A. Multifamily Housing (20 or More Units)

It is possible to conduct clearance dust sampling in a number of randomly selected dwelling units in multifamily housing where similar dwelling units have undergone comparable types of lead hazard control activity. The random sampling can be performed for a portion of the housing development or for all of it. In either case the randomly selected units represent a specified group of housing units. The contractor must not know in advance which units will be sampled since this would bias the results. In addition, it is necessary to choose an adequate number of randomly selected units (Table 7.3). Significant cost savings could be realized with such a sampling plan.

However, the implications of random clearance sampling should be understood fully before it is used. First, if the random sampling shows that levels of leaded dust are too high, it will be necessary to reclean not only the affected component in the selected dwelling unit, but also the affected component in *all* the other units that the randomly selected unit was meant to represent. Alternatively, all the units represented by the randomly selected unit could be sampled individually to determine which ones need recleaning. The costs of repeated sampling should be compared with the costs of repeated cleaning. Regardless of whether all the represented units are sampled or recleaned, a further delay in permitting residents back into the area is possible when using random clearance sampling.

Second, insurance carriers covering lead hazard control work may demand a high degree of assurance that the work was performed properly in each and every dwelling. The extra cost of dust sampling in all units is likely to be minor compared to the liability of a child with an elevated blood lead level in an abated unit that was not sampled but was later found to contain high leaded dust levels.

Third, there has been a significant failure rate in attaining compliance with clearance dust standards in both the ongoing public housing program and the HUD Demonstration Project

(HUD, 1991). In the latter study, failure rates on the initial wipe tests were 19 percent for floors at 200 $\mu g/ft^2$, 14 percent for window sills, and 33 percent for window troughs. In one large abatement job for a public housing authority, 15 percent of the housing units failed the clearance tests and required recleaning (Jacobs, 1993a). While this failure rate can be partially attributed to abatement strategy, variable contractor performance, and perhaps the inexperience of the abatement industry, the high rate of failure argues for more extensive unit-by-unit testing.

In spite of all these caveats, there is one special situation that may lend itself well to random clearance sampling. A large *vacant* apartment building or housing development that will not be immediately reoccupied following abatement could conceivably be randomly sampled at the end of the project and, if necessary, completely recleaned. Alternatively, all units could be sampled to determine which ones require recleaning.

Whether random clearance sampling or unit-by-unit clearance sampling is performed, repeated sampling should *always* be performed in all units that required recleaning. In short, most cases of lead hazard control will require that clearance dust sampling be conducted in every unit treated. With additional research and innovative abatement and cleaning techniques that improve compliance rates with clearance dust standards, it may be possible to sample only a fraction of the units treated.

B. Single-Family Housing and Multifamily Housing (Fewer Than 20 Units)

Clearance dust sampling should be conducted in every single-family dwelling unit and in all multifamily housing with fewer than 20 units. Because treatment and housing conditions vary so greatly in these housing units, random sampling is inappropriate.

C. Clearance Dust Sampling and Floor Sealant Application

Wipe samples should be collected after application of a floor sealant, not before. In lead hazard control programs, coating floors with a sealant is often one of the final measures completed. The purpose of sealing floors is not to trap leaded dust underneath the sealant, but to provide a surface that can be cleaned effectively by the resident. The type of flooring determines the type of sealant. Wooden floors should either be painted with a deck enamel or coated with polyurethane, concrete floors should be sealed with a concrete sealant, and tile floors should be sealed with appropriate wax.

The maintenance and monitoring system should check the integrity of the floor sealant at least yearly.

D. Location and Number of Clearance Dust Samples

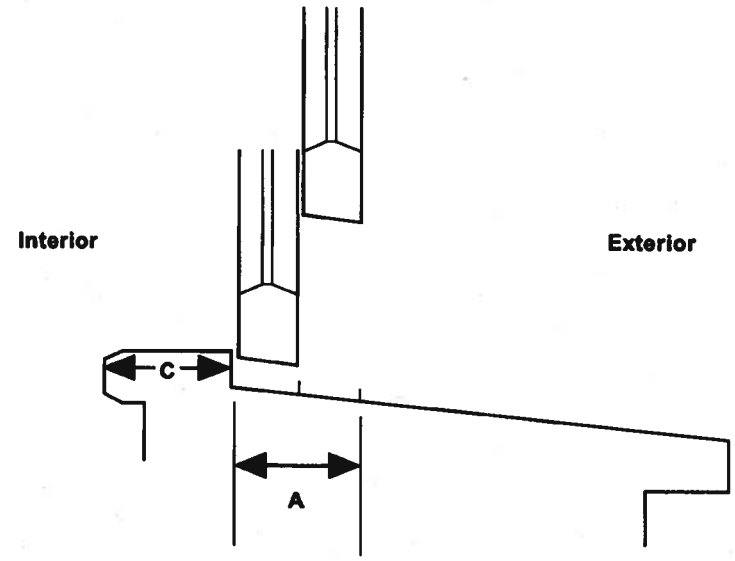
Clearance dust samples should be taken either from specific locations near the area where the lead hazard control treatment was done, from nearby high-traffic areas (around doorways, for example), or from other areas. The clearance examiner may determine which specific site is best based on the type of treatment, visual observation, and professional judgment. The abatement contractor must not know exactly where the clearance samples will be collected.

The number of clearance samples depends on whether composite or single-surface samples are collected.

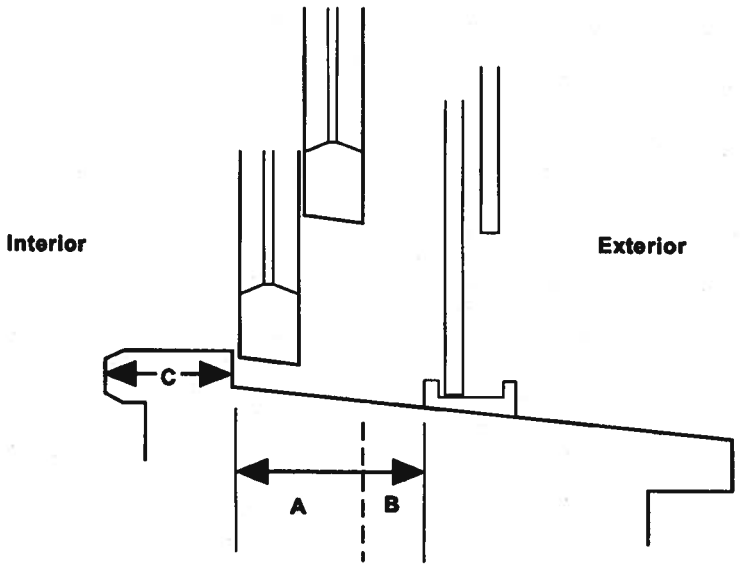
1. Single-Surface Sampling

Single-surface sampling can be conducted using essentially the same methodology as that described in Chapter 5 and Appendix 13. However, the number and location of clearance samples is based on the type of containment used and the number of rooms treated, not on the use pattern of the room (as is the case for risk assessment purposes). The three building components that should be tested are floors, interior window sills, and window troughs. A window trough is the part of the window in which both sashes sit when lowered. An interior window sill (sometimes called the stool) is the part of the window ledge facing the interior of the room (see Figure 15.2 for an illustration of areas to be sampled).

Figure 15.2 Window Locations for Dust Sampling.



1. Sectional view of window (with no storm window) showing window trough area, A, to be tested. Trough is the surface where both window sashes can touch the sill when lowered. The interior window sill (stool) is shown as area C. Interior window sills and window troughs should be sampled separately.



2. Sectional view of window (including storm window) showing window trough area, A and B, to be tested. Trough extends out to storm window frame. The interior window sill (stool) is shown as area C. Interior window sills and window troughs should be sampled separately.

Courtesy: Warren Friedman

The field sampling and analytical methods for collecting and analyzing wipe dust samples are in Appendixes 13 and 14, respectively. Until the EPA standards and protocols are established, wipe sampling should be performed on all surfaces. While vacuum samples can be collected, neither HUD nor EPA can provide standards to interpret vacuum sampling results at this time. Until vacuum sampling standards have been established, wipe sampling is the preferred method.

Readers should note that these *Guidelines* recommend the following precautions when conducting dust sampling (see Appendix 13.1):

- A standard sampling motion should be used.
- Only certain brands of wipes can be used (unless equivalence is demonstrated through side-by-side field sampling).
- Whatman™ filters and thick diaper wipes should not be used (Whatman™ filters are not sufficiently durable and some thick diaper wipes are too difficult for the laboratory to digest).
- Field-spiked wipe samples will need to be included in the sample stream in a blind fashion (i.e., the lab should not know the amount of lead spiked onto the wipe) to ascertain the efficiency of the laboratory digestion procedure.
- Hard-shelled containers (not plastic bags) must be used to contain wipe samples, since the container must be rinsed thoroughly and quantitatively. A nonsterilized 50-ml polypropylene centrifuge tube works well.

The minimum number of clearance samples recommended in each room is shown in Table 15.1. Field sampling data can be recorded on Form 15.2.

Further information on wipe sampling technique can be obtained from ASTM Standard ES–30–94.

2. Composite Clearance Dust Sampling

When lead hazard control treatments are similar in multiple rooms of the same dwelling, composite samples may be collected. For composite sampling each room treated must be included. The total number of required samples will depend on the number of rooms treated and whether those treatments are similar (see Table 15.1). Wipe samples are composited in the field, not in the laboratory, by inserting up to four wipes from four surfaces into the same tube. The laboratory analyzes all four wipes as one sample using a modified analytical procedure (see Appendix 13).

An example of a composite sampling scheme can be found in the example below. Field sampling data can be recorded on Form 15.2a.

The rules for combining subsamples into a sin-gle composite sample described in Chapter 5 for risk assessment also apply to clearance sampling. Those rules are as follows:

- Separate composite samples are required from carpeted and hard surfaces (e.g., a single composite sample should not be collected from both carpeted and bare floors).
- Separate composite samples are required from each different component sampled (e.g., a composite sample should not be collected from both floors and interior window sills).
- Separate composite samples are required for each dwelling.
- Floor surface areas sampled in each room should be approximately the same size (approximately 1 ft^2). Interior window sill and window trough sampling sizes are dependent on window characteristics, but should also be similar from room to room, if possible (e.g., the surface sampling area should not be skewed so that one room is oversampled).
- For composite wipe samples, a separate wipe must be used for each spot sampled (each subsample).

Table 15.1 Recommended Minimum Number and Location of Single-Surface Dust Samples

Clearance Category	Category Description	Number and Location of Single-Surface Wipe Samples in Each Area[1]	Number and Location of Composite Wipe Samples
1	Interior treatments No containment within dwelling	Two dust samples from at least four rooms in dwelling (whether treated or untreated): ◆ One interior window sill or window trough, alternating between rooms. ◆ One floor. AND ◆ For common areas, one for every 2,000 ft² of a common area room floor (if present).	Three composite samples for every batch of four rooms (whether treated or untreated): ◆ One floor composite. ◆ One interior window sill composite. ◆ One window trough composite. AND ◆ For common areas, one floor subsample for every 2,000 ft² (if present); up to 8,000 ft² can be sampled for each composite.
2	Interior treatments With containment (plastic sheeting as airlock on doors between treated and untreated areas)	Same as Category 1 but only in every *treated* room (up to four rooms) AND One floor sample outside the containment area but within 10 feet of the airlock to determine the effectiveness of the containment system. This extra single-surface sample is recommended in 20 percent of the treated dwellings in multifamily housing and *all* single-family homes. ◆ For common areas, one floor sample for every 2,000 ft² and one floor sample outside containment.	Same as Category 1 but only in every *treated* room AND One floor sample outside the containment area but within 10 feet of the airlock to determine the effectiveness of the containment system. This extra single-surface sample is recommended in 20 percent of the treated dwellings in multifamily housing and *all* single-family homes. ◆ For common areas, one floor subsample for every 2,000 ft² (up to 8,000 ft² for each composite) and one floor sample outside containment.
3	Exterior treatments	Two dust samples as follows: ◆ At least one dust sample on a horizontal surface in part of the outdoor living area (e.g., a porch floor or entryway). ◆ One window trough sample on each floor where exterior work was performed. An additional trough sample should be collected from a few lower floors to determine if troughs below the area were contaminated by the work above.	Two dust samples as follows: ◆ One composite on a horizontal surface in part of the outdoor living area (e.g., a porch floor or entryway). ◆ One window trough composite for every four floors where exterior work was performed, including lower floors where exterior work was not done, if present.
4	Routine maintenance work	At least 1 floor dust sample for every 20 high-hazard jobs near the work area (see Chapter 17 for definition of "high hazard").	Same as single-surface sampling.
5	Soil treatment	One dust sample from the entryway.	One dust sample from the entryway.

[1] A room includes a hallway or a stairway. If no window is present, collect just one floor sample. When a closet is treated, the room to which it is attached should be tested. A closet is not considered to be a separate room. If all rooms received similar treatments and cleaning, only four rooms need to be sampled for clearance purposes. More rooms may need to be sampled in larger dwellings. The room to be sampled should be selected based on where most of the dust-generating work was done or in the judgment of the clearance examiner.

- The same wipe should not be used to sample two different spots. All subsamples should be inserted into the same tube. No more than four different wipes should be inserted into a single container for a composite sample. Acceptable recovery rates have been found when no more than four wipes are analyzed as a single sample (Jacobs, 1993b).

Because composite sampling requires fewer samples than single-surface sampling, sampling costs may be reduced. Also, more surfaces are often sampled than would be possible for single-surface sampling. The drawback to composite sampling, however, is that if only one of the composite samples fails, all similar components in each room will have to be recleaned or each room will need to be sampled individually. In contrast, if one of the single-surface samples fails, only one room will have to be recleaned.

Composite samples should not be taken from rooms that have dramatically different conditions. For example, if the clearance examiner has some reason to believe that cleanup was not performed adequately in a room, a single-surface sample should be collected there. In some cases both single-surface samples and composite samples may be needed.

V. Clearance Soil Sampling

If no exterior lead hazard control work was performed, it is not necessary to conduct any soil sampling. Clearance soil sampling should be conducted following any abatement or interim control treatment on the exterior of a house or soil treatment. The purpose of such testing is to ensure that the treatment did not contaminate soil surrounding the dwelling.

Clearance soil sampling is typically conducted around the foundation of the house, although it is also important to collect samples in play areas that could have been contaminated as a result of the work. All soil samples should be composite samples. If the exterior work involved covering bare soil areas only, clearance soil samples are not needed; a visual examination is adequate. A detailed protocol for soil sampling is provided in Appendix 13 and ASTM ES–29–94. Sampling data can be recorded on Form 15.3.

There is evidence that soil lead levels can increase following abatement if proper precautions are not taken. For example, in one study, 6 percent of the dwellings had statistically significant increases in soil lead levels when compared to pre-abatement soil lead levels (NIOSH, 1990).

There should be no visible paint chips on the surface of the soil near the foundation. However, soil sampling near the foundations of dwellings is often complicated by the presence of paint chips embedded in or under the soil surface from previous repainting efforts. The hazard associated with these paint chips in the soil is difficult to assess since it is often not practical to sample all the different paint chips that may be present. Therefore, these paint chips should be considered a part of the soil. They should not be sampled preferentially or excluded when collecting or analyzing the soil. Laboratories should be instructed to disaggregate (force) paint chips through the soil sieve as part of the analytical process.

If the paint chips were generated by hazard control work, they should be picked up with a HEPA vacuum. A visual examination is usually adequate. If the clearance soil samples are above 2,000 µg/g in the yard (or 400 µg/g in bare, high-contact play areas), the baseline soil samples should be analyzed to determine if soil lead levels were already high before the work began. Soil samples collected during risk assessments (if one was performed) can be used for this purpose.

A. Multifamily Housing (20 or More Units)

If a large complex of multifamily housing has undergone similar lead hazard control work, random sampling of the soil around the buildings can be conducted using the sampling scheme for lead-based paint inspection. The drawbacks of conducting random clearance sampling are the same for soil as for dust (see the section on clearance dust sampling earlier in this chapter).

Example of Clearance Composite Sampling Scheme

A house has undergone an abatement job involving extensive interior paint removal (clearance category 1) and has passed a visual examination. The owner and the clearance examiner have agreed to use composite clearance dust sampling to minimize expenses. The house has eight rooms that were treated, four of which are carpeted, and all of which have windows.

At a minimum, the clearance examiner should collect the following samples:

No.	Description
1	Composite carpeted floor sample (one subsample from each of the four carpeted rooms).
1	Composite hard floor sample (one subsample from each of the four uncarpeted rooms).
1	Composite interior window sill sample, with a subsample collected from a location in four selected rooms.
1	Composite window trough sample, using the same procedure as for interior window sills.

This results in a total of four composite samples for analysis. If single-surface sampling had been completed under the recommendations in Table 15.1, it would have been necessary to collect eight samples (four rooms x two samples/room = eight samples/dwelling).

B. Single-Family Housing

If exterior lead hazard control work was done, composite soil samples should be collected near the building foundation close to the work area and in nearby play areas that could have been contaminated by the work. All single-family housing units should be cleared.

C. Number and Location of Clearance Soil Samples at Each Building

One composite soil sample should be collected around the perimeter of the building. If only selected faces of the building were treated, the samples should come from those faces.

A second composite soil sample should be collected from any nearby play areas.

In both cases bare soil should be sampled preferentially. If there is no bare soil, the soil covering should be sampled to determine if it has been contaminated by the lead hazard control work.

VI. Clearance Paint Testing

XRF testing of surfaces that have been stripped and repainted is not recommended. If the paint has been removed, removal should be assessed visually prior to repainting. If for some reason it is not possible to visually determine that the paint has been removed, then XRF readings can be taken. The protocols described in Chapter 7 apply.

Some forms of interim control involve paint film stabilization (repainting). In this case the clearance examiner must visually inspect all painted surfaces to determine if they are all sealed, intact, smooth, and cleanable.

VII. Interpretation of Clearance Testing Results

A. Visual Examination Results

Interpreting the results of the visual examination is a straightforward process. If there is visual evidence that work on building components or soil is incomplete, the clearance examiner should inform the owner and contractor and ensure that the work is completed *before collecting any dust or soil samples*. In situations where job specifications are used, they should clearly state that failure to pass the clearance visual examination means failure to comply with clearance standards.

Table 15.2 Interim HUD Clearance Dust Standards (Wipe Sampling Only)[1]

Surface	Leaded Dust Loading (µg/ft²)	Leaded Dust Loading (mg/m²)[2]
Bare and carpeted floors	100	1.08
Interior window sills	500	5.38
Window troughs	800	8.61
Exterior concrete or other rough surfaces	800	8.61

[1] No clearance standards are currently available for vacuum sampling.

[2] To convert from µg/ft² to mg/m², multiply by 0.01076.

B. Dust Results

Interim HUD clearance dust standards are shown in Table 15.2. These may be revised subject to EPA's issuance of regulations.

No standard method has been developed to correlate the wide variety of vacuum methods available with the wipe sampling standards. Until and unless EPA regulations state otherwise, all hard surfaces should be tested with wet wipe samples. While vacuum sampling is acceptable, there is no HUD Interim Clearance Standard for vacuum sampling at this time, making interpretation of vacuum sampling results against recognized standards impossible.

The results of dust samples collected using a vacuum method may be reported in lead concentration (µg/g) and loading (µg/ft²); wipe sampling results are reported in loading only. For clearance purposes, however, the lead concentration cannot be used to determine the effectiveness of the cleanup. It is possible to remove nearly all leaded dust from a surface, but not change its concentration significantly, since most cleaning methods do not preferentially remove lead from the dust. However, adding lead-free soil or dust to the area *will* reduce the concentration, even in the absence of cleaning. In short, leaded dust loading (not leaded dust concentration) should be used to determine if an adequate cleanup job has been completed. If leaded dust levels exceed those given in Table 15.2, the contractor must repeat the cleaning until compliance is achieved.

The recleaning should be focused on those surfaces where the sampling results indicate that the first round of cleaning was inadequate. For example, if floor leaded dust levels are above the standard, but interior window sills and window troughs are below the standard, only the floors need to be recleaned. Similarly, if single-surface samples fail in one room, then only that room and any rooms not sampled need to be recleaned. If composite samples fail, then *all* the surfaces the composite represents need to be recleaned (or resampled individually to determine which ones require recleaning). For example, consider the two examples shown in Tables 15.3 and 15.4.

In Table 15.3, only the floors in Rooms 1 and 2 require recleaning (assuming a four-room unit). In Table 15.4 the window troughs should be recleaned in all four rooms and any rooms not sampled. While the window troughs could conceivably be sampled individually to determine which ones require recleaning, it is likely to be far more cost-effective to simply reclean all of them. When cleaning troughs, the sills should also be cleared, even if they were not originally contaminated. In both examples, repeated sampling of the recleaned surfaces should be completed to ensure that the recleaning was sufficiently effective.

For composite sampling the HUD Interim Clearance Standard should *not* be reduced by dividing the standard by the number of subsamples in the composite. The purpose of the

Table 15.3 Hypothetical Example of Single-Surface Clearance Dust Sampling Data

Room	Floors (μg/ft²)	Interior Sills (μg/ft²)	Window Troughs (μg/ft²)
1	475	40	60
2	878	65	90
3	30	70	75
4	50	40	80

Table 15.4 Hypothetical Example of Composite Clearance Dust Sampling Data

Surface	Rooms Included in Composite	Leaded Dust (μg/ft²)
Floors	1, 2, 3, 4	30
Interior window sills	1, 2, 3, 4	129
Window troughs	1, 2, 3, 4	3,695

composite sample is to average the lead loading in all rooms sampled to determine if *all* the rooms require additional cleaning. Composite sampling is used to determine the average lead loading in a group of rooms, not individual rooms. Since composite sampling is done in units with the same hazard control technique and since the method of correction is always the same (i.e., recleaning), it is not necessary to determine the leaded dust level in each room. Even a single-surface sample only represents a small area on a larger surface, in much the same way as a composite represents many surfaces over a larger area, e.g., all floors within a unit. For paint chip sampling, however, it *is* necessary to know the concentration on each surface sampled, making it necessary to divide the paint standard by the number of subsamples contained in a composite sample (see Chapter 5).

C. Soil Results

If clearance sampling shows that post-abatement soil samples are more than 2,000 μg/g, additional soil treatment should be required. If the area sampled is a high-contact play area, the soil should be no more than 400 μg/g.

VIII. Recordkeeping and Issuance of Statement of Lead-Based Paint Compliance

A. Recordkeeping Responsibilities

Three parties should maintain records of all abatement, interim control, risk assessment, inspection, and clearance results:

- Property owner.
- Contractor.
- Clearance examiner.

Some jurisdictions will also require submission of such records to an enforcement agency or a lead-safe housing registry.

B. Record Content

The records should include all laboratory results, quality control/quality assurance procedures, dates of both visual examination and environmental sampling, completed forms,

and appropriate identifiers for the property—the owner, inspector, job contractor, and resident(s).

Depending on the jurisdiction and the type of abatement or interim control work undertaken, the owner may be awarded a Statement of Lead-Based Paint Compliance. One State now issues a statement indicating that the property is "Lead-Free" when all lead-based paint is removed and all other lead hazards are corrected. The property is "Lead-Safe" when all lead-based paint *hazards* have been rectified (Rhode Island, 1993).

C. Length of Time

Statements of lead-based paint compliance and records of all clearance testing should be kept for the duration of the life of the building, since it is to the benefit of the owners to retain this information.

IX. Clearance and Reevaluation Procedures

The clearance process evaluates the effectiveness of the lead hazard control efforts immediately following cleanup. Reevaluation determines the continued effectiveness of all lead hazard control treatments (except complete removal of all lead-based paint). Reevaluation also determines whether any new lead-based paint hazards have appeared. Because most forms of lead hazard control have limited lifespans, they will require ongoing monitoring by the owner and a reevaluation by a certified risk assessor based on the reevaluation schedule for the specific property. The method and frequency of reevaluation is detailed in Chapter 6.

In those cases where the owner did not have a risk assessment or inspection before hazard control, the clearance examiner should conduct a risk assessment at the time of clearance to ensure that all lead-based paint hazards were, in fact, addressed.

Form 15.1
Lead Hazard Control Visual Clearance Form

Date _____

Name of clearance examiner _____

License no. (if applicable) _____

Name of property owner _____

Property address _____ Apt. no._____

Date cleanup completed _____

Time cleanup completed _____

Abatement/interim control contractor name _____

Address _____

Telephone no. _____

Check if repeat clearance examination _____

Room identifier	List all building components required to be treated in each room	Work on each component completed? (yes or no)	Visible paint chips seen? (yes or no)	Visible settled dust seen? (yes or no)	Additional work required?

Exterior soil _____Treated _____Not treated

If treated, is bare soil present? _____Yes _____No

Was contaminated soil removed? _____Yes _____No

Is additional soil treatment required? _____Yes _____No

NOTES:

Signature _____

Form 15.2
Lead Hazard Control Clearance Dust Sampling Form (Single-Surface Sampling)

Date _____

Name of clearance examiner _____

License no. (if applicable) _____

Name of property owner _____

Property address _____ Apt. no. _____

Clearance categories:

1. Interior treatments without containment.
2. Interior teatments with containment.
3. Exterior work on painted surfaces.
4. Routine maintenance.
5. Soil work.

Sample number	Room number or identifier	Surface type (floor, interior window sill, window trough)	Clearance category number	Dimensions of sample area (inches)	Area (ft^2) (can be completed by lab)	Result of lab analysis ($\mu g/ft^2$) (can be completed by lab)	Pass or Fail

Total number of samples on this page_____

Page _____ of _____

Date of sample collection ____/____/____ Date shipped to lab ____/____/____

Shipped by _____ Received by _____
(Signature) (Signature)

Form 15.2a
Lead Hazard Control Clearance Dust Sampling Form (Composite Sampling)

Date _____

Name of clearance examiner _____

License no. (if applicable) _____

Name of property owner _____

Property address _____ Apt. no._____

Clearance categories:

1. Interior treatments without containment.
2. Interior treatments with containment.
3. Exterior work on painted surfaces.
4. Routine maintenance.
5. Soil work.

Sample number	Name of room or identifiers included in sample	Dimensions of surface sampled in each room (inches x inches)	Total surface area sampled (ft^2)	Type of surface sampled (smooth floors, carpeted floors, interior window sills, window troughs)	Clearance category number	Lab result ($\mu g/ft^2$)	Pass or fail
	_____ _____ _____ _____	_____ X _____ _____ X _____ _____ X _____ _____ X _____					
	_____ _____ _____ _____	_____ X _____ _____ X _____ _____ X _____ _____ X _____					
	_____ _____ _____ _____	_____ X _____ _____ X _____ _____ X _____ _____ X _____					
	_____ _____ _____ _____	_____ X _____ _____ X _____ _____ X _____ _____ X _____					

Total number of samples on this page _____

Page _____ of _____

Date of sample collection ____/____/____ Date shipped to lab ____/____/____

Shipped by _____ Received by _____
(Signature) (Signature)

Form 15.3
Lead Hazard Control Clearance Soil Sampling Form (Composite Sampling Only)

Date _____

Name of clearance examiner _____

License no. (if applicable) _____

Name of property owner _____

Property address _____ Apt. no. _____

Sample number	Location	Bare or covered	Lab result (µg/g)
	building perimeter		
	building perimeter		

Sketch soil sampling plot plan. Collect only the top 1/2" of soil.

Total number of samples on this page _____

Page _____ of _____

Date of sample collection ____/____/____ Date shipped to lab ____/____/____

Shipped by _____ Received by _____
(Signature) (Signature)